Abstract: 1

Digit ratios in children with fetal cocaine exposure

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Background Sexual dimorphism properties of 2D:4D ratio (length of the index finger to length of the ring finger) and the relationship of the digit ratio to human behavior, personality cognitive and physical abilities has been studied extensively within last 20 years. The growing body of literature supports the fact that 2D:4D ratio can be used as excellent candidate biomarker of prenatal sex hormone levels specifically, fetal androgen level (McIntyre MH,2006). While the effect of fetal cocaine exposure (FCE) on pubertal development has been explored (Bennett et al., 2015), there is very little data on the effects of FCE on androgen levels in utero and subsequently on 2D:4D ratio.

Objective The objectives of the current study were to:

(1) examine the 2D:4D ratio in pre-pubertal and adolescent age groups and cocaine exposed versus unexposed groups

(2) explore the relationships between androgen exposure in utero, gender and fetal cocaine exposure and environmental risk

Design/Methods Children (N = 341, 41% with PCE exposure; 52% were male) participated in a longitudinal study from birth to 17 years of age. Prior to statistical data analysis we used multiple imputation approach: CARTs-Decision Tree (n=5 data sets; SPSS version 20.0, IBMCorp., 2011). The effect of FCE and its potential interaction with both gender and e-risk was then examined using correlation analysis and logistic regression analysis.

Results Our results indicated that the was no significant differences in 2D:4D ratios between left and right hands at both age groups (Welch's F (1, 100.16) < .01, p = .98), however right and left hand ratios were different at age 6 and age 16 (Welch's F (1, 52.80) = 3.00, p = .06). In addition, we found that fetal cocaine exposure was related to left and right hand 2D:4D ratios (P =.001) with exposed subjects having lower digit ratios. We also explored a three-way interaction model (with FCE, gender, environmental risk) as a predictor of 2D:4D ratios. Our logistic regression analysis had shown that FCE was predictive of lower 2D:4D ratio of the right hand in 16-year -old age group (P=0.058), and that the male gender was highly predictive of a lower 2D:4D ratios.

Conclusion(s) Our study confirmed the hypothesis that fetal cocaine exposure affects morphometric parameters (2D:4D ratios) likely due to effect on fetal androgen levels. While previous research has demonstrated that FCE alters the timing of pubertal development (Bennett et al., 2015), our results suggested that this process begins with alteration of fetal androgen levels.

Abstract: 2

Variation in Myosin Light Chain Kinase levels in the Tracheal Aspirates from ELBW infants with and without BPD or PDA

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Background Bronchopulmonary Dysplasia (BPD) and Patent ductus arteriosus (PDA) lead to significant morbidity in Extremely Low Birth Weight (ELBW) infants. Myosin Light Chain Kinase (MYLK) gene encodes a smooth muscle myosin light chain kinase (smMLCK) isoform that mediates cell movement and signaling in smooth muscle cells and a non-muscle (nmMLCK) isoform that affects the endothelial barrier integrity and plays a role in inflammation. Decreased smMLCK activity leads to ductus arteriosus patency. In our previous study, the MYLK gene single nucleotide polymorphism (SNP) rs9840993 was significantly associated with BPD. Also, the alleles of MYLK SNPs rs820336, rs3796164 and rs9840993 were significantly different between the ELBW infants with and without PDA with the wildtype haplotype CAA for the three respective SNPs showing predisposition to PDA persistence.

Objective Our objective was to find if the MYLK protein levels were significantly different in the tracheal aspirates of ELBW infants with and without BPD or PDA; or, with different allelic distribution of the aforementioned three MYLK SNPs.

Design/Methods DNA was collected and isolated from ELBW neonates after obtaining parental consent. SNP genotypes were identified by RT-PCR using specific probes for MYLK gene SNPs – rs820336, rs3796164 and rs9840993. Also, tracheal aspirates were obtained from the neonates during the first 7 days of life and MYLK (smMLCK) protein levels in the tracheal aspirates were determined with MYLK ELISA (MBS102363, MyBioSource, San Diego, CA). BPD was defined as the need for Oxygen at 36 weeks postmenstrual age. PDA was defined as the need for medical or surgical treatment for ductal closure. Chi-square, Mann- Whitney U and t-test were performed for statistical analysis, with $p<0.05$ considered significant.

Results There was no significant difference in MYLK levels in the tracheal aspirates of patients with and without BPD as well as those with and without PDA. MYLK protein levels between the patients with homozygous wild-type alleles compared to those with any minor allele for the MYLK SNPs rs820336, rs9840993 and rs3796164 were not significantly different either.

Conclusion(s) Our study did not find significant differences in MYLK levels from the tracheal aspirates based on the diagnoses of

BPD or PDA, as well as based on allelic distribution of three MYLK SNPs. We speculate that this lack of an expected differential expression may be due to a compartmentalized expression of MYLK in smooth muscle cells.

Table 1. Demographic characteristics of infants with and without BPD and those with and without PDA

		BPD (7)	No BPD (5)	p value
Birth weight, g, median (IQR)		790 (670, 860)	770 (615, 945)	0.88
Gestational age, wks, median (IQR)		25 (24, 26)	26 (25, 26)	0.43
Male, %		40%	57%	0.56
Race, n	**Non-Hispanic White**	1	3	
	Non-Hispanic Black	2	2	
	Hispanic	2	0	
	Other	2	0	
		PDA (9)	**No PDA (3)**	**p value**
Birth weight, g, median (IQR)		670 (615, 938)	850 (790, 860)	0.46
Gestational age, wks, median (IQR)		25 (24, 27)	26 (25, 26)	0.51
Male , %		44%	67%	0.71
Race, n	**Non-Hispanic White**	3	0	
	Non-Hispanic Black	3	2	
	Hispanic	1	1	
	Other	2	0	

Table 2. Variation in Myosin Light Chain Kinase levels in the tracheal aspirates of infants with and without BPD and those with and without PDA

	BPD (7)	No BPD (5)	p value
MYLK levels, ng/mL, Mean ± SD (Range)	1.99 ± 1.16 (0.32-3.81)	1.75 ± 1.43 (0.34-4.12)	0.76
	PDA (9)	**No PDA (3)**	**p value**
MYLK levels, ng/mL, Mean ± SD (Range)	1.78 ± 1.10 (0.34-4.12)	2.23 ± 1.77 (0.32-3.81)	0.60

Table 3. Variation in Myosin Light Chain Kinase levels based on SNP alleles

MYLK SNPs	Homozygous wild-type alleles	Any minor allele	p value
rs820336 (C/T) MYLK levels in ng/mL, median (IQR)	2.57 (1.85, 3.81)	1.23 (0.34, 2.24)	0.18

rs9840993 (A/G) MYLK levels in ng/mL, median (IQR)	1.23 (0.34, 2.24)	2.83 (1.85, 3.81)	0.15
rs3796164 (A/G) MYLK levels in ng/mL, median (IQR)	2.02 (1.37, 2.49)	2.32 (0.83, 3.81)	1.00

Abstract: 3
An Unusual Presentation of Multiple Schwannomas in a Pediatric Patient
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Background Schwannomas are benign tumors arising from the sheaths of peripheral and cranial nerves. We present the case of teenage patient who presented concurrently with parotid and abdominal wall schwannomas. Each of these presentations is quite rare, especially in children. We are not aware of any reported similar cases in the literature.
Objective To describe an atypical presentation of schwannomas in a pediatric patient.
Design/Methods Case report
Results A fifteen year old female presented to the emergency room for evaluation of a mass at the angle of her left mandible, which had been present for one year. She also reported a smaller mass on the left side of abdomen, which had been present for approximately six months. She had discomfort when turning her head due to the presence of the submandibular mass. She also reported six kilograms weight loss over six months. Physical exam was remarkable for a palpable mass, approximately 3.5 cm, distal to the left submandibular edge with surrounding palpable lymph nodes that were non-tender. No facial palsy was present. Also noted was a 1 cm spherical mass on the left side of the abdomen that was non-tender. Neither mass had any overlying erythema or skin changes. No other masses were palpated and no supraclavicular or axillary nodes were appreciated.

Initial lab work was within normal limits. Ultrasound of the neck was suspicious for an abnormal lymph node and a computed tomography (CT) scan demonstrated a 4.5 cm parotid mass. The abdominal mass was reported as a 1.4 cm nodule in the musculature of the left anterior abdominal wall and appeared similar to the parotid one on CT.

The abdominal mass was excised and pathology report revealed a schwannoma. Fine needle aspiration of the parotid mass confirmed an additional schwannoma. There is no family history of neurofibromatosis, and the patient's genetic testing for NF2 and SMARCB1 was negative. The patient is currently undergoing evaluation by otolaryngology and neurosurgery for potential surgical options.
Conclusion(s) This case highlights a unique presentation of multiple rare schwannomas in a child. Less than 100 parotid schwannomas have been described in the literature, with only a handful noted in pediatrics. Abdominal wall schwannomas have been rarely described in the adult population, and we are not aware of any reported cases in children. Although rare, schwannomas should be considered in the differential diagnosis of parotid and abdominal wall masses in children.

Abstract: 4
Building Meaning in the Work of Residents Through Enhanced Communication: A Pilot Project
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Background Burnout is prevalent at all levels of medical education, including among resident physicians. It has been reported that physicians have significantly more emotional exhaustion, when compared to the general population. Pediatric residents reporting 39% burnout rates, correlating with decreased quality of patient care, increased medical errors, dysfunctional emotional reactions and impaired communication. Studies show residents spend more than 50% of their day documenting, with less than 10% involved in patient communication. Daily tasks of the residents include documenting in the electronic medical record (EMR), updating the sign out tool, completing orders, calling other members of the medical team and handing off between providers.
Objective Implement changes to communication hospital wide, to decrease the time residents spend documenting and handing off, with the goal of decreasing burnout among residents.
Design/Methods Single center pilot prospective study, impacting pediatric and rotating family medicine residents. EMR changes at Connecticut Children's Medical Center to handoff implemented July 2018 and new innovative progress note template rolling out January 2019. Time spent completing handoff between residents and analysis of time pediatric interns

spend documenting were analyzed before and after these interventions.
Results Interventions were created in a collaborative approach, with resident and attending input. Timed handoff data revealed that residents decreased sign out by average 6.5 seconds per patient, since implementation of the sign out documentation tool. Time reduced from an average of 120.8 seconds per patient sign out pre-intervention to 114.2 seconds after hand off changes were made. Prior to the roll out of the new progress note, intern residents spend on average 182.6 minutes per day actively working on the EMR, with an average of 66.4 minutes spent writing notes and 50.3 minutes completing clinical charge review daily.
Conclusion(s) Residents spend most of their day documenting and handing off between providers. Preliminary data reveals that these EMR changes are able to decrease the time spent handing off between providers. it is anticipated that documentation times will also reduce, once the new progress nore is rolled out. The additional time available allows for residents to spend more time with their patients, helping to improve the meaning in the work of physicians in training.

Abstract: 5
Twin Males with Sequential Ingestion of Single-Use Laundry Detergent Pod Leading to Duodenal Injury
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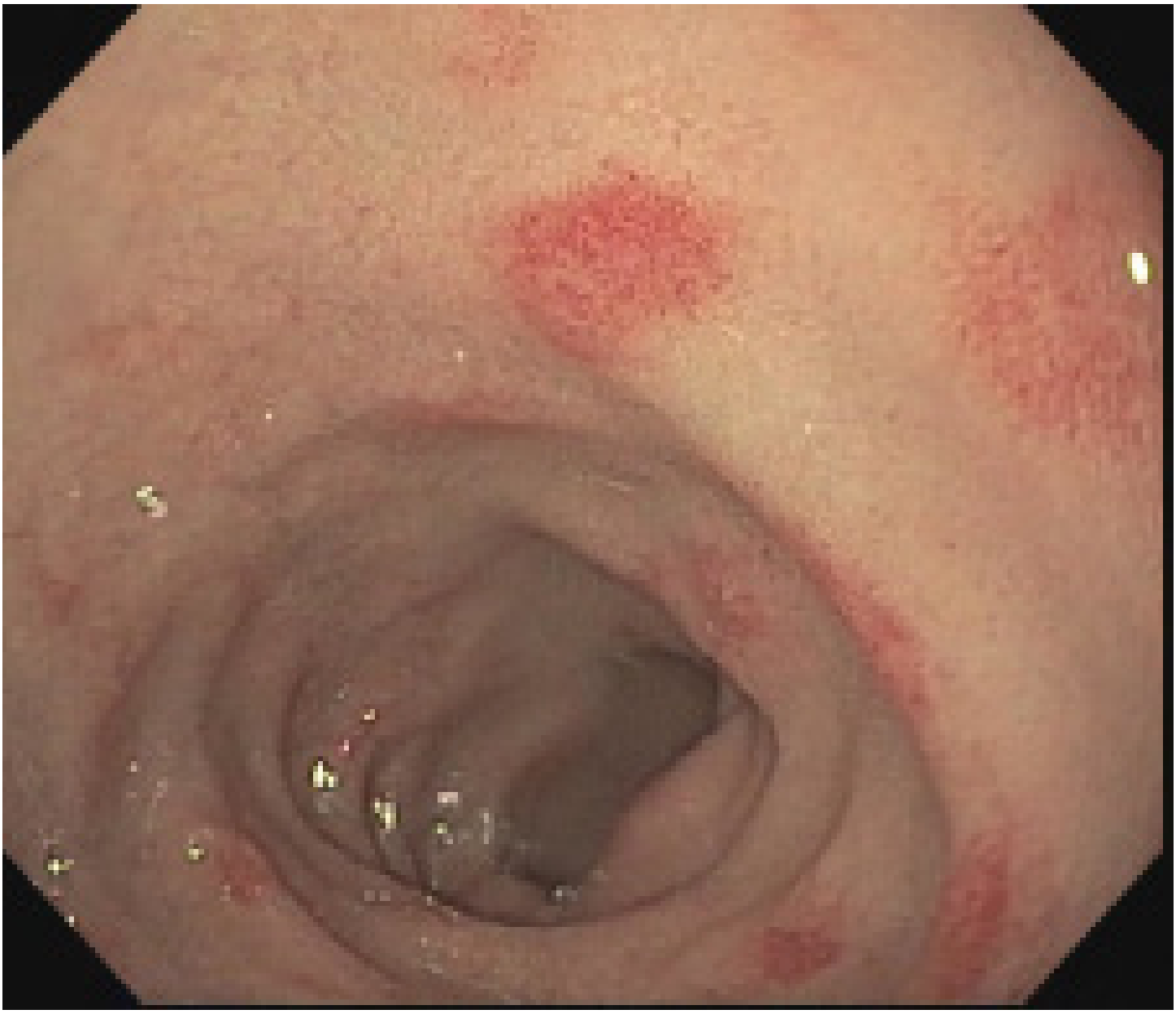
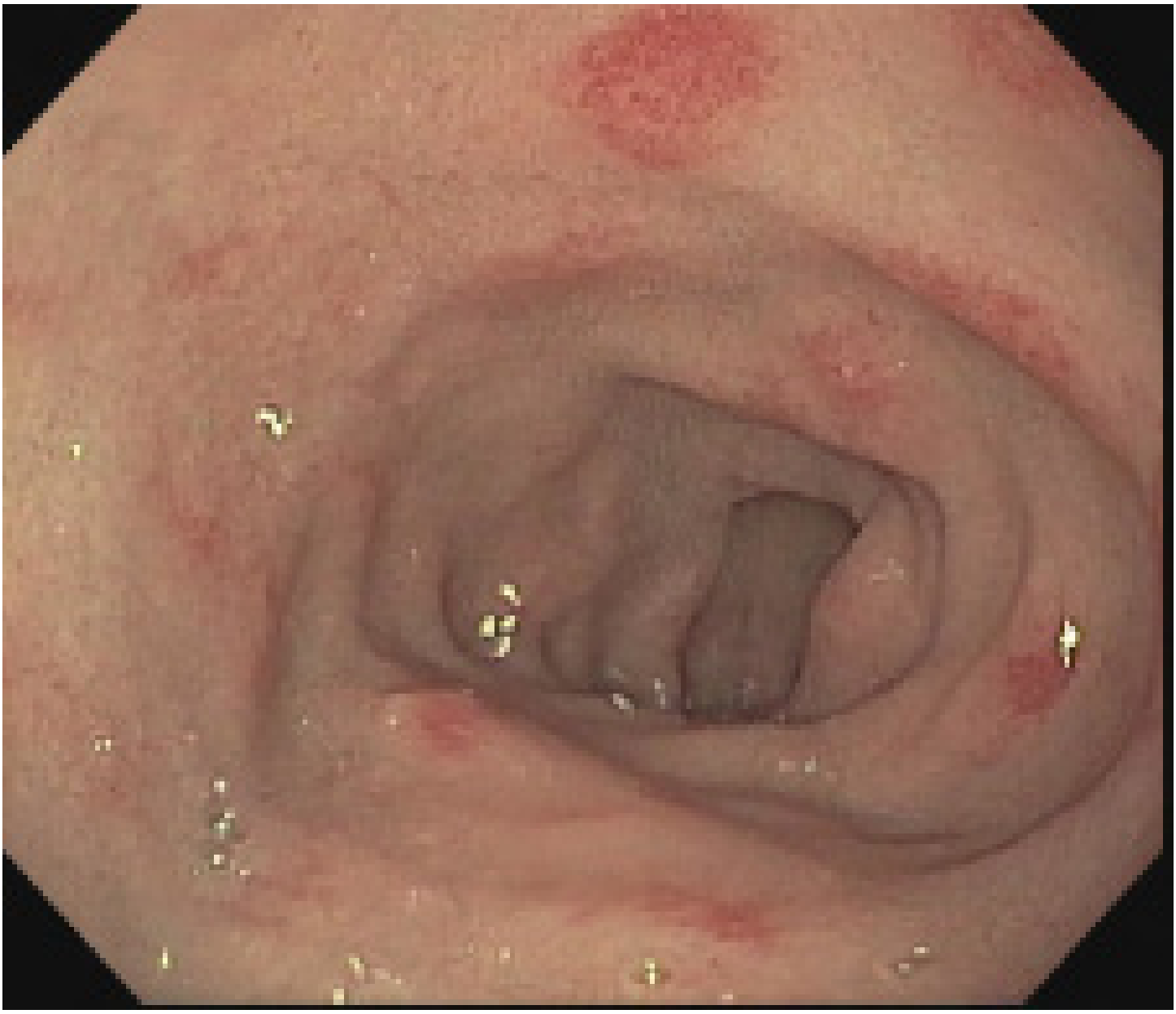
Background Various studies have looked at the consequences seen after toddler accidental ingestion of laundry detergent. However, very few cases have been reported in older patients. This case presents an interesting scenario of teenage related patients who have similar previously unreported findings on endoscopic evaluation after single-use laundry detergent pod ingestion.
Objective Patient One was a fourteen year old male with a history of depression who presented after intentional ingestion of a single-use laundry detergent pod. He vomited immediately after the ingestion and had continued epigastric pain, but was otherwise stable. Endoscopic evaluation revealed discrete erythematous patches in the duodenal bulb (figure 1) but was otherwise unremarkable. After observation for two days while awaiting inpatient psychiatric facility placement, abdominal pain improved. Five days later, the patient's twin brother (Patient Two) presented with the same history of intentional ingestion of a single-use laundry detergent packet, with similar symptoms of epigastric pain. Endoscopy once again revealed similar discrete erythematous patches in the duodenal bulb (figure 2). He too recovered uneventfully.
Design/Methods This was a case report that presents teenage related patients; with all information gathered from chart review and endoscopy images.
Results Extensive injuries have been reported after laundry detergent pod ingestion, including CNS depression, respiratory symptoms, and upper airway effects, sometimes requiring intubation. Gastrointestinal symptoms reported are usually abdominal pain and emesis. In those who undergo upper endoscopy, the usual findings are superficial esophageal injury, however, these cases were mostly seen in children under three years of age. Duodenal injury from laundry pod ingestion has not been previously reported, although it was seen clearly via endoscopy in both of our patients.
Conclusion(s) It is possible that this unreported atypical endoscopic finding in both related patients was due to their older age compared to most of the children with similar ingestions.





Abstract: 6

Pediatric Skin and Soft Tissue Infection (SSTI) Antibiogram and Antibiotic Prescription Pattern in the ER and In-patient Settings

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Background Antimicrobial resistance has posed significant challenge to effective treatment of SSTIs in the past two decades, with significant demographic variation in prevalence of commonly implicated organisms. The AAP recommends tracking of local antibiotic resistance, judicious use of empiric antibiotics in line with resistance patterns, and antibiotic stewardship to combat this challenge

Objective Characterization of SSTI antibiogram and antibiotic prescription patterns, with specific evaluation of methicillin resistant S. Aureus (MRSA) prevalence, trends in antibiotic resistance, and prescription patterns

Design/Methods We conducted a retrospective chart review of patients aged 0-21 years seen at the ER and In-patient units of the BronxCare Health System from Jan. 2013 to Dec. 2016. Study was approved. Data was collected using ICD-9/10 codes.

Information on patient demographics, SSTI type, empiric antibiotics, culture results and antibiotic sensitivity were obtained from EHRs. Data was analyzed using SAS 9.3® with bivariate comparison tested at α=0.05 significance level. Antibiogram was created with the WHONET software

Results Records for 2872 children were reviewed - 52% were females, mean age was 10 years, and 75% self-identified as Black or Hispanic. The majority (80%) presented with abscess or cellulitis with mean size of 4cm, mostly affecting the extremities (31%), gluteal/groin regions (14%) and head/neck regions (10%). Seventy-one percent (71%, n=574) of 811 cultures sent were positive, with *S. Aureus* and *Group A Streptococcus* reported in 83% and 5% of positive cultures, respectively. The prevalence of MRSA was 28% (39% of positive cultures), with 18% of MRSA demonstrating inducible Clindamycin resistance. MRSA was 99.1% sensitive to TMP-SMX. We observed a trend towards decreasing sensitivity of MRSA to clindamycin (from 93% to 75% with p=0.071); however, clindamycin still constituted 70% of all empiric antibiotics prescribed, with only 0.7% receiving TMP-SMX at initial encounter

Conclusion(s) Our data shows a high prevalence of MRSA in this population, with an increasing resistance to Clindamycin, but excellent sensitivity to TMP-SMX. Despite these patterns, clindamycin remains the predominant empiric antibiotic prescribed for SSTIs in the Pediatric ER and In-patient settings. Clinicians should consider utilizing local antibiogram in prescribing empiric antibiotics, and also follow culture results to make appropriate antibiotic changes for effective clinical response

Table 1 : Temporal Trend in MRSA Resistance

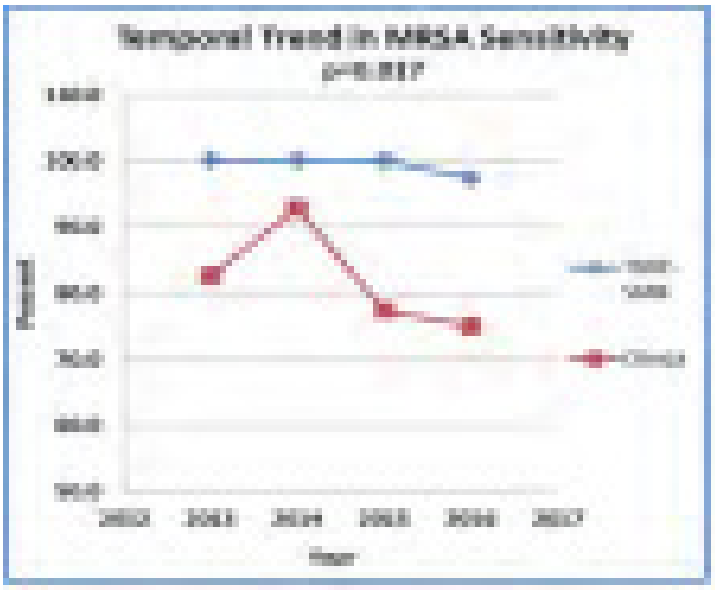
P_{trend} = 0.036	2013	2014	2015	2016
Clinda - R	12(17.5%)	4(7.0%)	12(22.6%)	11(25.0%)
Clinda - S	57(82.6%)	53(92.9%)	41(77.4%)	33(75.0%)
TMP-SMX - R	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (4.8%)
TMP-SMX - S	69 (100.0%)	57 (100.0%)	51 (100.0%	40 (97.2%)

Abbreviations – Clinda (Clindamycin), TMP-SMX (Cotrimoxazole Sulfamethoxazole), R (Resistance), S (Sensitive

Table 2 : Temporal Trend in Empiric Antibiotics Prescription Pattern

P_{trend} = <0.001	2013	2014	2015	2016
Augmentin	33 (7.7%)	28 (6.9%)	24 (4.8%)	13 (3.4%)
TMP-SMX	8 (1.9%)	7 (1.7%)	2 (0.4%)	3 (0.8%)
Clindamycin	235 (54.7%)	278 (68.8%)	368 (74.2%)	312 (81.0%)
Cephalexin	110 (25.6%)	69 (17.1%)	73 (14.7%)	46 (11.9%)
All Antibiotics	430	404	496	385

ANTIBIOGRAM (sensitivity percentages)	Ampicillin	Amoxicillin	Cefaxolin	Ceftriaxone	Cefotaxime	Ciprofloxacin	Clindamycin	Erythromycin	Gentamycin	Levofloxacin	TMP-SMX	Tetracycline	Vancomycin
Escherichia Coli, n=5	33	0	67	100	100	100	100	100	100	100	100	100	-
Grp A Streptococcus, n=31	100	100	100	100	100	-	-	-	-	-	-	96	100
Other Streptococcus, n=21	100	100	100	100	100	-	-	-	-	-	-	-	100
MRSA, n=229	3	3	0	0	3	13	82		94	84	99	91	100
MSSA, n=253	98	98	100	100	100	86	82		98	100	99	90	100
Pseudomonas, n=2	0	0	0	50	0	100	-	50	50	100	0	-	-
Proteus mirabilis, n=6	83	100	100	100	100	50	100	100	100	100	83	100	100
Strept. viridans, n=2	100	100	100	100	100	-	0	-	-	-	100	-	100
S. maltophilia, n=1	0	0	0	0	0	-	0	0	0	100	100	-	-
ESBL , n=1	0	0	0	0	0	100	0	0	0	100	0	100	-



Abstract: 7

CT or Observation? Investigation into the use of the pediatric emergency care applied research network (PECARN) in children less than 2 years of age

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Background The Pediatric Emergency Care Applied Research Network (PECARN) traumatic brain injury (TBI) age-based clinical prediction rules were developed to identify children at very low risk of a clinically significant head injury. According to PECARN, in children less than 2 years old certain criteria are provided in order to guide clinicians on the use of CT versus observation.

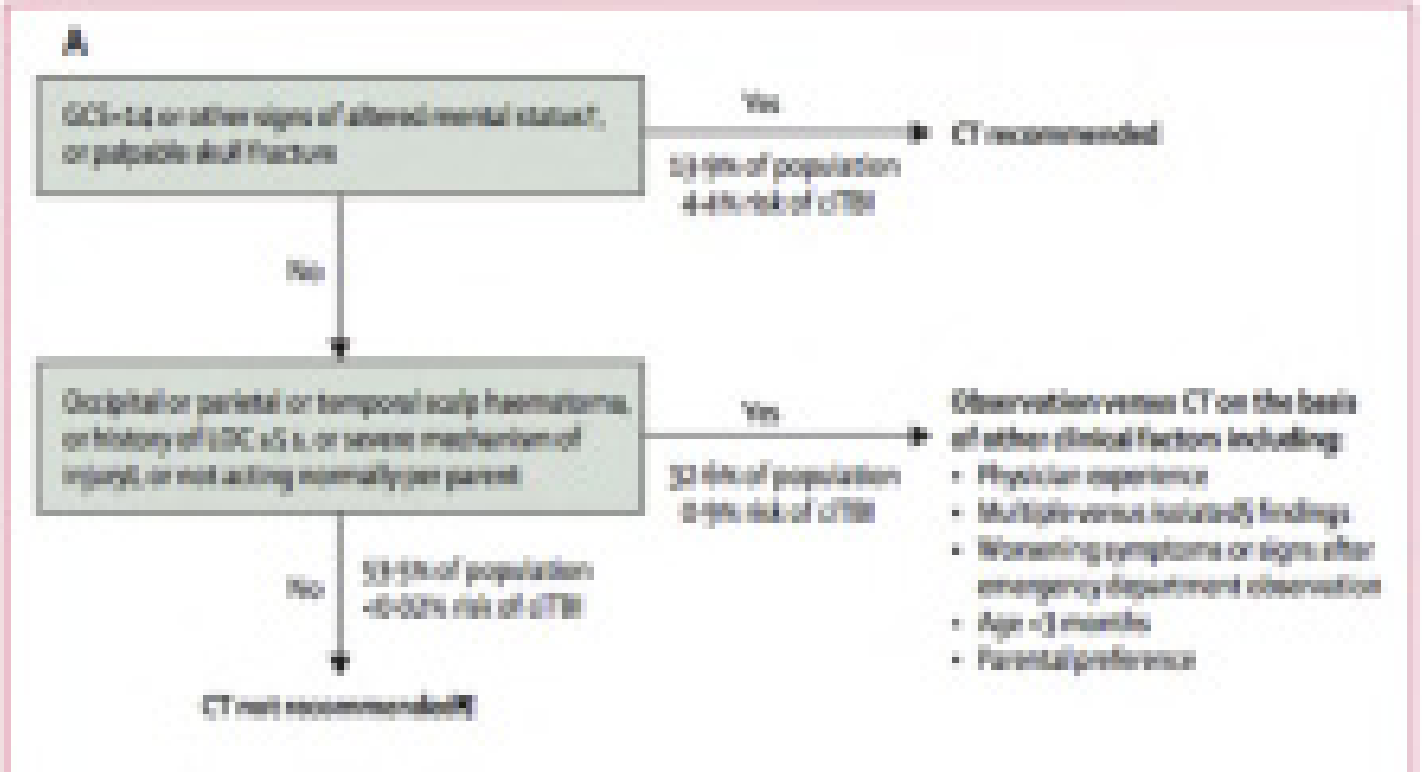
Objective Describe the medical and clinical findings in the patients less than 2 years old who meet the criteria for consideration of observation versus head CT based on PECARN guidelines.

Design/Methods IRB approval was obtained for this study. A retrospective chart review was performed on children less than 2yrs of age who presented to Staten Island University Hospital (SIUH) Emergency Department from January 1, 2013 to December 10, 2017 with head trauma. Patients were excluded if they had definitive indications for a CT scan [Figure 1] or no need for a CT scan based on PECARN. Children less than 2 years of age with an occipital or parietal temporal scalp hematoma, loss of consciousness greater than or equal to 5 seconds, severe mechanism of injury, or "not acting normally" as per parent were included.

The study described two cohorts- patients that received a head CT versus patients observed. Data points were collected for each cohort; injury mechanism, physician experience in years, worsening sign or symptoms, multiple vs. isolated findings, age less than 3 months, and parental preference for CT.

Results A total of 115 patients were selected from the SIUH trauma registry. Nine patients were excluded and 106 patients met the inclusion criteria. Based on the factors impacting decision making for CT versus observation, only physician experience and patient age were statistically significant. A head CT was more frequent in physicians with fewer years of experience (P=0.0072). Children less than 3 months of age were more likely to get a head CT (P= 0.0007). Patients with worsening signs or symptoms, multiple versus isolated findings, or parental preference did not yield significant findings.

Conclusion(s) Decision making within PECARN criteria for patients less than 2 years of age that do not definitively meet criteria for either head CT or observation and instead utilize additional metrics to make this determination is largely based on age and physician experience, rather than other objective measures.



Abstract: 8
Effectiveness of Magnesium Sulfate in Children and Adolescents with Status Asthmaticus
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Background Acute asthma (AA) exacerbation is a common reason for Pediatric Emergency Department (PED) visit. Pediatric Asthma Score (PAS) is used in children and adolescents aged 2 to 18 yrs to predict hospital admission and management. PAS is determined by age appropriate respiratory rate, age, oxygen requirements, auscultation, retractions and dyspnea. Studies have shown use of magnesium sulfate (MgS) to be safe and effective adjunct treatment with reduced hospital admission and shorter length of stay (LOS). There are no guidelines on when to administer MgS for AA.

Objective To explore if early administration of MgS reduces usage of continuous albuterol nebulization (CAN) and LOS.
Design/Methods Retrospective chart review of children and adolescents aged 2 to 18 yrs with AA exacerbation admitted to Flushing Hospital Medical Center between Jan 2012-Nov 2018. Exclusion criteria included children with cardiopulmonary disease and chronic respiratory disease. Demographic data included age, gender and previous asthma history (PAH). PAS was calculated at 0, 6, 12, 24, 48, 72 hrs and absolute change from 0 hrs to hospital discharge. Data collected include time of first dose of MgS, <3 hrs (early) or after 3 hrs (late) determined by arrival to the PED to time of dose, number of CAN and LOS. Data were analyzed using SPSS software, compared by linear regression, $p<0.05$ was considered significant.
Results Of 155 charts reviewed, 26 met exclusion criteria. Of remaining 129 charts, 57.4% received early administration (G1) and 42.6% late administration of MgS (G2). PAH was none or intermittent in 37.2% and persistent in 62.8%. G1 and G2 were compared for gender (71% vs 59% male), p=0.17, median age (6.1 vs 5.8 yrs), p=0.6, median baseline PAS (9.5 vs 8), $p<0.01$. Overall PAS decreased over time ($F=43.2$, $p<0.01$) with most significant decrease in G1 ($F=7.5$, $p<0.01$). Number of CAN as independent variable, G1 vs G2, mean 1.7 vs 3.2 ($t=3.5$, $p<0.01$), $F=6.2$, $p<0.01$. LOS as independent variable G1 vs G2, median 3 vs 5 days ($t=1.9$, $p=0.05$), $F=5.9$, $p<0.01$, with variables pneumonia ($t=2.6$, $p<0.01$) and PAH ($t=2.0$, $p=0.04$), $F=5.9$, $p<0.01$. Adverse effect included rash and hypotension, 1.5%.
Conclusion(s) In our small sample, early administration of MgS with higher baseline PAS, improved PAS faster, decreased number of CAN and LOS with and without covariables. MgS was well tolerated and appeared to be safe.

Abstract: 9
Improving Throughput in a Pediatric Emergency Department

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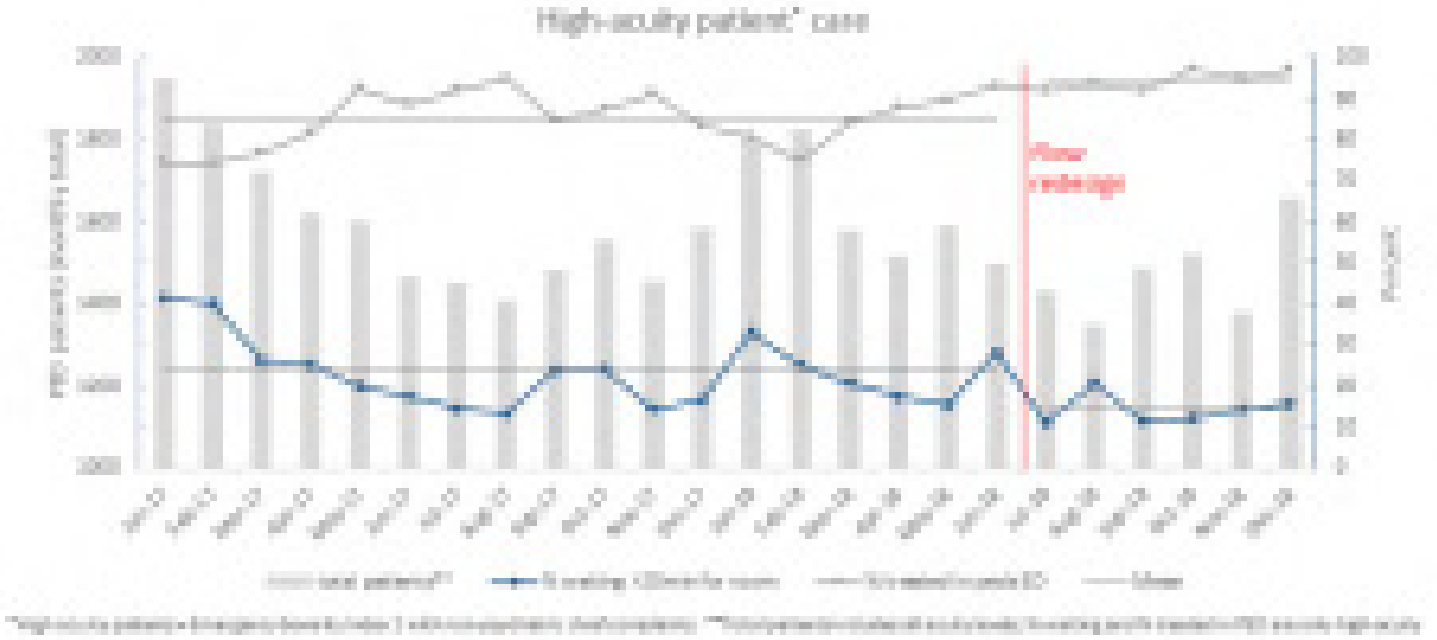
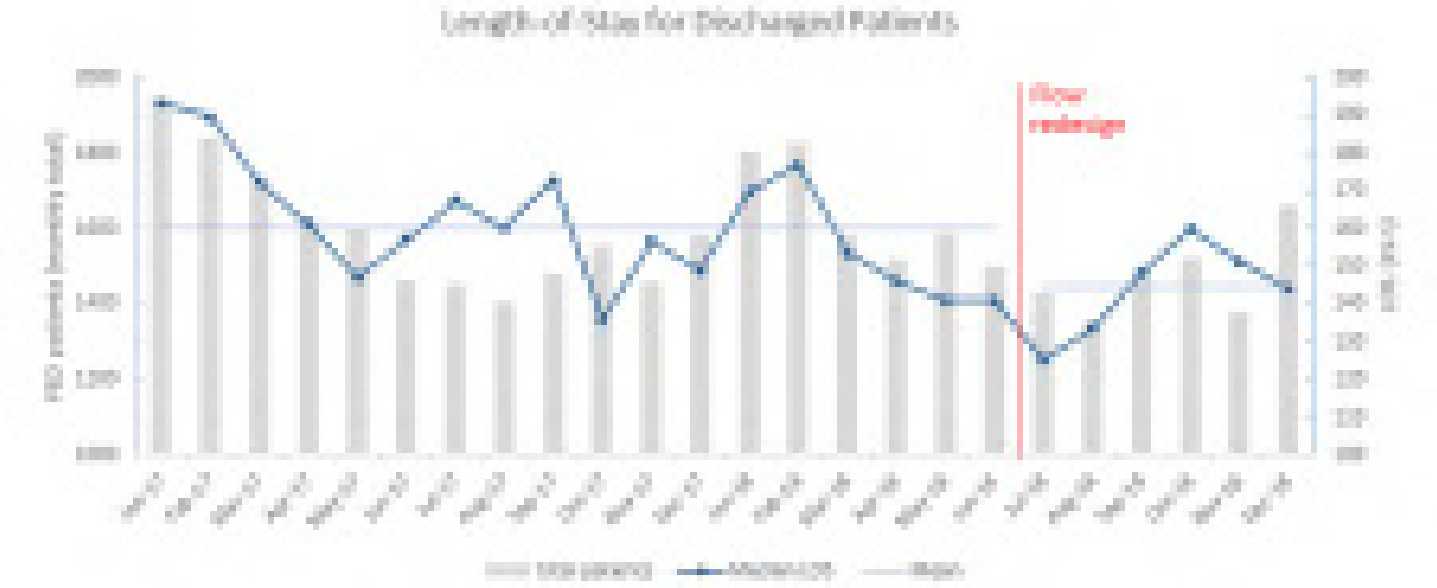
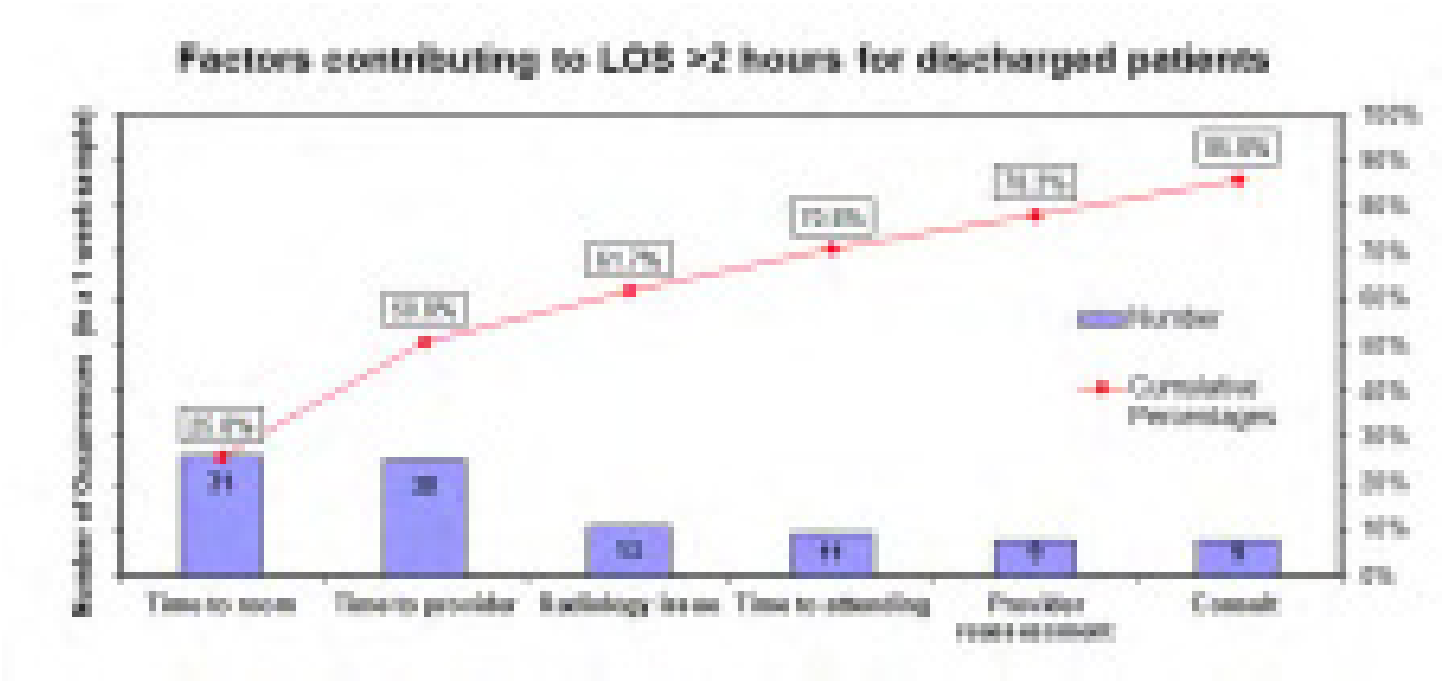
Background Emergency department (ED) flow can be inefficient, resulting in delays in care which can lead to adverse events for critically-ill patients and negatively impact patient satisfaction. Multiple strategies for improving flow exist but have not been well studied in a pediatric emergency department (PED).
Objective We implemented multiple changes to redesign PED patient flow, with the objectives of decreasing time-to-provider, reducing length-of-stay (LOS), and increasing prompt placement of high-acuity patients in PED rooms (pediatric patients frequently overflow into adult ED rooms in our ED).
Design/Methods A series of interventions were implemented and studied using quality improvement tools. Plan-do-study-act cycles were used to assess progress and identify areas for improvement. The initial interventions implemented in July 2018 included: bedside triage, the addition of two new patient treatment spaces, team-based patient assessment, and the utilization of an internal waiting area for patients nearing discharge to improve bed turnover. Further interventions will be implemented until sustained improvement is achieved.
Results Redesign of PED flow resulted in a decrease in time-to-provider from 21.6 minutes to 12.1 minutes. The percentage of high-acuity patients waiting >20 minutes for a room decreased substantially after redesign from 24.3% to 14.3%, however it increased slightly in higher volume fall/winter months. After flow redesign, more high-acuity patients were placed in the PED (84.2% before to 94.1% after redesign). PED LOS for discharged patients decreased from 160 minutes to 145 minutes and was at a record low for the first month after redesign, however LOS rose during higher volume months. Analysis of LOS after flow redesign revealed delays in room placement, provider evaluation and reassessment, and radiology delays. Addressing these delays with future interventions may help to improve flow during high-volume months.
Conclusion(s) Patient flow redesign in our PED decreased time-to-provider, LOS for discharged patients, and wait times for high-acuity patients; however the interventions were less effective in combating delays during high-volume fall/winter months.


High-acuity patient* care
Flow redesign


Length of Stay for Discharged Patients
Flow redesign



Abstract: 10

Prevalence of social health needs among pediatric emergency department users

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Background Social factors, such as housing and food insecurity, contribute adversely to the health of children but are not routinely evaluated in pediatric emergency departments (PEDs). Few studies have examined the prevalence of these social determinants of health (SDH) in PEDs and it is not known whether SDH increase the burden of utilization of PEDs.

Objective Our primary aim was to understand the prevalence of SDH in PED patients. Our secondary aim was to examine the prevalence of SDH in high (accessing the PED ≥ 2 times in the past 12 months) vs regular (accessing the PED once in the past 12 months) PED utilizers.

Design/Methods As part of the Accountable Health Communities initiative, we conducted a cross-sectional survey of Medicaid patients presenting to a tertiary care PED. The survey addressed five core areas of SDH: housing insecurity, food insecurity, transportation needs, utility needs, and personal safety. Based on a literature review of validated tools and expert consensus, 10 questions understandable to a broad audience across multiple settings were selected for the survey. Surveys were completed on tablets by caregivers of patients <13 years of age and by patients if ≥ 13 years of age and were offered in English and Spanish. Community-based resources were provided based on identified needs.

Descriptive statistics and chi square analysis were used to describe patients with social health needs.

Results 366 patients or caregivers were approached and 308 (84.2%) consented to completing the survey. Mean age was 90 months (SD 67 months) and 50.5% of patients screened were male. The median annual household income was $15,000 to $20,000. 174 (56.5%) screened positive for ≥ 1 SDH need. Of these, the most common SDH need identified was food insecurity in 105 patients (34.1%), followed by housing insecurity in 100 patients (32.5%), utility needs in 77 patients (25.0%), transportation needs in 69 patients (22.4%) and finally safety needs in 4 patients (1.3%). High PED utilizers were more likely to have an unmet health related social need (61.6%) compared with regular ED utilizers (50.0%), p=0.041 (table 1 provides further detail about SDH needs in high vs regular PED utilizers).

Conclusion(s) Our study is the first to demonstrate a high prevalence of social health needs among Medicaid beneficiaries presenting to a PED. These social needs are more frequently present in high vs regular PED utilizers. Addressing these social needs in the PED may improve the health of children and ultimately decrease PED utilization.

Table 1. Social health needs in High vs. Regular PED utilizers

	High PED Utilizer 123 (61.8%)	Regular PED Utilizer 181 (90.5%)	p-value*
Any social health need	106 (64.6)	68 (50.8)	0.04
Housing insecurity	66 (38.4)	34 (25.2)	0.03
Food insecurity	69 (40.1)	36 (27.3)	0.02
Transportation Needs	45 (28.1)	21 (15.8)	0.03
Utilities Needs	47 (27.6)	30 (22.2)	0.29
Safety	4 (2.3)	0 (0)	0.10

* Derived from χ^2 or Fisher's exact analysis (categorical variables)

Abstract: 11
The Effects of Family Trust in Medical Care Providers on Utilization of the Pediatric Emergency Room for Non-Emergent Concerns
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Background Patient trust is a significant but underexplored element in the interpersonal aspect of a patient-physician relationship. Limited research has evaluated the relationship between a family's trust in a child's primary care provider (PCP) and Emergency Department (ED) usage for non-emergent issues. The number of patients choosing to use the ED for non-emergent concerns is increasing annually.

Objective To identify whether parental trust in a child's PCP is a factor that may result in increased ED visits for non-emergent concerns. Secondary aims include identifying any association of age, sex, ethnicity, and interpersonal relationship of a parent and their child's PCP that affects their decision to seek care in the ED.
Design/Methods This is a pilot, cross-sectional, exploratory study. Trained research assistants (RA) asked a patient's medical provider for patient condition severity ranking on a scale of 1 (least) to 5 (most severe). RA then enrolled parents/legal guardians via a questionnaire administered on Qualtrics. Questions included: demographic information, history of previous ED and PCP visits, reason for current visit, and parent's numerical ranking of child's PCP on scale of 1 (least trusting) to 5 (most trusting) for 7 questions based on previously validated physician trust measurement yes/no scales. Respondents with an average of >4 were classified as having high trust in child's PCP.
Results 248 families completed the questionnaire: 83% of ED provider's severity ranking was 1 or 2. The majority (57%) of respondents, did not contact their child's PCP prior to their ED visit. 54% of families preferred the child's PCP for acute care visits, while 23% preferrred the ED. Of the respondents who preferred the child's PCP, mean trust ranking was 4.43 while the mean for respondents who preferred ED was 3.65. The top reasons for ED visits were: "It seemed like an emergency" (36%), "Hours at PCP were inconvenient/no availability" (23%), and "I am more confident in the ED staff to treat the current condition" (20%).
Conclusion(s) Caregivers who prefer the ED for acute care visits have a lower measured value of trust in their child's PCP. Families often perceive the acuity of their child's illness to be more severe than the ED provider and a PCP-level guidance program for caregivers may be able to improve this. Future studies could focus on obtaining PCP's perspective on lower perceived trust.

Abstract: 12
Zofran Prescription Practices Upon Discharge From the Pediatric Emergency Department
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Background Gastroenteritis and vomiting is a common presentation to pediatric emergency departments (PED). The use of ondansetron (Zofran) in PEDs has been rising in order to help promote oral rehydration. Zofran has been shown to reduce

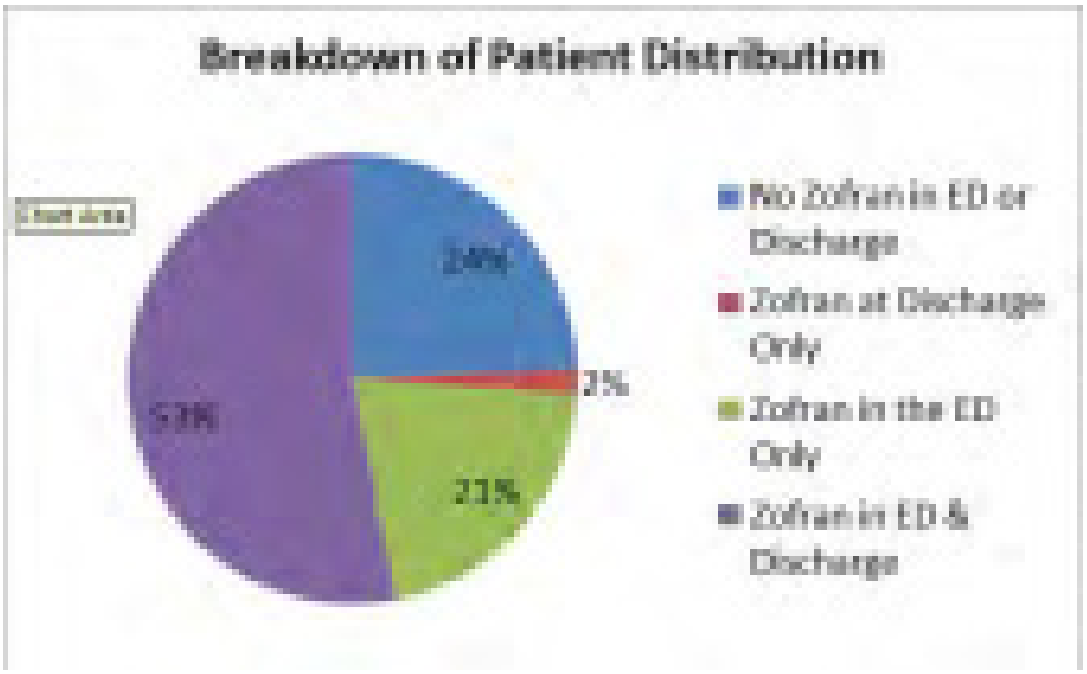
length of stay in the hospital, admission rates, IV placement and use of IV fluids. While multiple hospitals have clinical pathways to encourage oral rehydration therapy and guide Zofran use for mild-moderate dehydration in the PED, few hospitals have guidelines on Zofran prescription administration upon discharge.

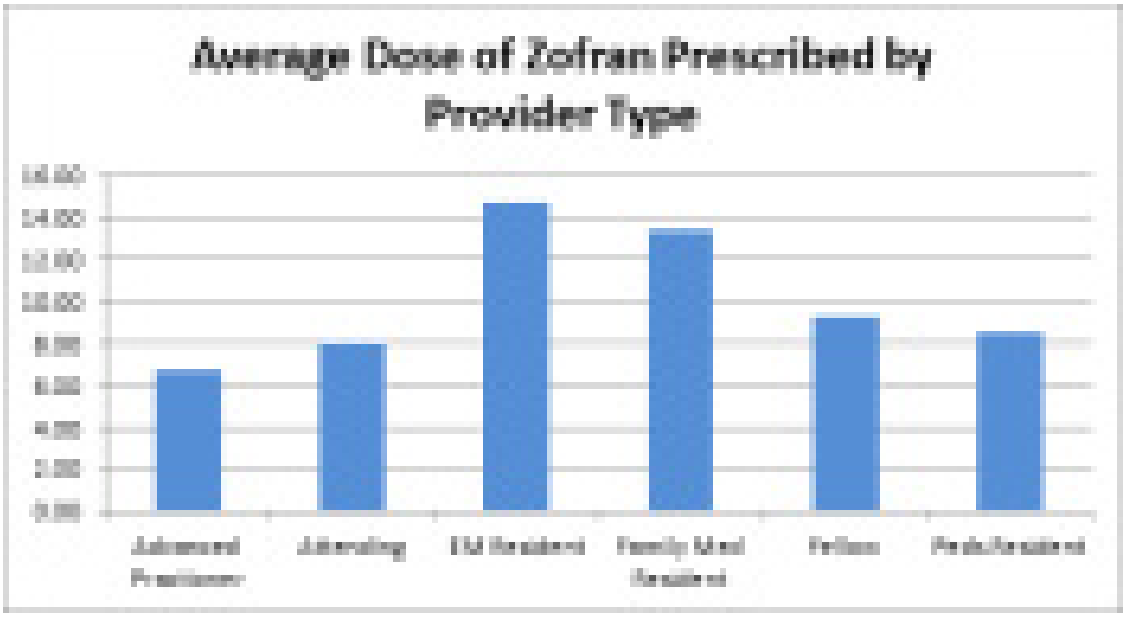
Objective The purpose of this study was to describe the prescription practices of Zofran at discharge for patients in the PED with acute nausea & vomiting, and determine if there is an association between the amount of Zofran prescribed and emergency department (ED) volume or provider level.

Design/Methods This was a retrospective cohort study that took place at Connecticut Children's Medical Center (CCMC). We reviewed 445 charts for patients 6mo- 18yo that presented to the pediatric emergency department for the diagnosis of nausea, vomiting, gastritis, gastroenteritis, or dehydration between January 1, 2016- December 31, 2018.

Results Our study included 115 charts of 95 different patients. Of the patients who received Zofran in the ED 71.8% of patients also recieved a prescription for Zofran upon discharge. The average number of doses of Zofran prescribed was 10.5 doses. We found that when accounting for age, gender, and triage level, emegency medicine (EM) residents prescribe more Zofran than any other provider type (P= 0.003). There was a general trend showing that the amount of Zofran prescribed goes down as the volume of patients in the ED goes up (P = 0.12). Finally children return to the ED at the same rate if given Zofran in the ED but not at discharge (P = 0.28), given Zofran in the ED and at discharge (P = 0.35), or did not get Zofran at all (P = 0.33).

Conclusion(s) The majority of patients who came to the pediatric emergency department for nausea, vomiting, dehydration or gastroenteritis recieve a prescription for Zofran upon discharge. If prescribed by an EM resident, the number of doses of Zofran prescribed was significnatly more than any other provider type in the ED. They were prescribed a small amount of Zofran during busier ED times. Regardless of the prescription or Zofran administration, patient's returned to the ED at approximatley the same rate, suggesting prescribing Zofran at discharge does not impact recidivism and may not be necessary for pediatric patients.





Demographic Characteristics

	n	Mean Age	Gender (% Female)	Mean Triage Level	Race/ Ethnicity
No Zofran Administration	28	4.93y (SD 5.73)	35.71%	3.21 (SD 0.83)	Black: 28.57% Hispanic: 25% White: 46.43% Other: 0%
Zofran at Discharge Only	2	4y (SD 0)	0%	4 (SD 0)	Black: 0% Hispanic: 50% White: 50% Other: 0%
Zofran in the ED Only	24	6.34y (SD 6.12)	53.57%	3.08 (SD 0.77)	Black: 12.5% Hispanic: 33.33% White: 54.17% Other: 0%
Zofran in the ED and at Discharge	61	6.50y (SD 5.1)	60.66%	3.43 (SD 0.72)	Black: 24.59% Hispanic: 31.15% White: 31.15% Other: 11.48% Refused: 1.63%

Abstract: 13
Photograph Acquisition Among Children & Adolescents with Burns in a Children's Emergency Department
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Background Regionalization of specialized care and concern for nonaccidental trauma are important reasons to consider photographic documentation and use of telemedicine in burn patients. Photographic documentation allows for distant consultants to evaluate patients' physical findings without the limitations of written or verbal description; this may prevent over- or under-triage and costly interfacility transport. Studies in adults have demonstrated the usefulness of photographic documentation in burn management.

Objective To describe the proportion of children with burns who have photographs uploaded to the electronic medical record (EMR) in a Pediatric Emergency Department (PED) and compare the patient and burn characteristics of those whose photographs were obtained versus those whose were not.

Design/Methods This is a retrospective chart review of patients ages 0 to 18 years who were evaluated for a burn in an urban, tertiary care PED during the 2017 calendar year. We identified patients in our EMR using chief complaint and diagnosis codes which contained the term "burn". Each chart was reviewed and data abstracted including demographics, event details and presence of a burn photograph was included in the encounter. All medical providers in the PED carry smartphones with a mobile health application that allows for automatic uploading of pictures into the patient EMR.

Results 104 patients were identified with a burn diagnosis (Table 1). Photographs were present in 63 (61%) of charts. Photographs were more likely to be taken in patients who were transferred to a regional burn center (44/83 (53%) discharged vs 17/17 (100%) transferred; p=.001) and if social work or child protective services was consulted (46/61 consulted vs. 17/42 not consulted; p<.001). Photographs were more likely to be taken in younger patients (mean 4 years obtained vs. 7 years not obtained; p=.001). There was a significant difference in presence of photographs among burns of varying degrees (p=.033). There was no statistical difference (p<.05) in gender, race/ethnicity, acquisition time of day or causative agent for patients with and without photographs.

Conclusion(s) While photographs are more frequently obtained for burns of higher complexity and if consulting services are involved, there are missed opportunities for patients who do not have photographic documentation of their injuries. Future studies will be conducted to assess the utility of photographs of burns in the EMR reduce the need for patient transportation to a regional burn center.

Table 1

PATIENT DEMOGRAPHICS (%)	
Male	58
Hispanic	38
African-American	34
BURN MECHANISM (%)	
Scald	58
Contact	35
DEPTH (%)	
Superficial	14
Partial Thickness	80
Full Thickness	6
%TBSA	
≤5	50/61 (82%)
6 to 9	5/61 (8%)
≥10	6/61 (10%)
DISPOSITION (%)	
Discharge	81
Admit	3
Transfer to Regional Burn Center	16

Abstract: 14

Abnormal Vital Signs on Initial Presentation of Otherwise Asymptomatic Toxic Ingestions: To worry or not to worry?

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Background Children account for a substantial portion of acute toxic exposures, however represent <6% of the exposure-related deaths. Initial assessment includes obtaining vital signs (VS), which can help guide management and help identify an unknown exposure. However, studies have shown that VS can be poor predictors of life-threatening conditions in pediatric patients and, as such, a single data point of VS may not adequately represent a patient's clinical picture.

Objective To review the management of acute xenobiotic exposures in asymptomatic pediatric patients presenting with abnormal VS.

Design/Methods This was a retrospective review of patients <18 years of age who presented to a tertiary care pediatric emergency department with toxic ingestions from 2014-2018. Abnormal VS were defined by age-adjusted reference ranges from The Harriet Lane Handbook. Asymptomatic was defined as normoglycemic, and with no documented evidence of altered mental status, respiratory distress, emesis, or acute rash on presentation. Ingestions of caustic substances, hydrocarbons, acetaminophen, salicylates, and/or extended release (XR) agents were excluded as these substances have more established treatment recommendations.

Results Of 254 identified charts, 201 were excluded: 92 ingested an excluded agent, 83 were symptomatic, and 26 were asymptomatic with normal VS. 53 patients who were asymptomatic with abnormal VS on presentation were included for analysis: 49% male, median age of 2.92 years. VS abnormalities included: systolic or diastolic blood pressure (n=46), heart rate (n=19), respiratory rate (n=12), and temperature (n=4). An ingested agent was identified in 50 cases [ingested >1 agent (n=9)], with drugs of abuse and NSAIDs as the most frequently reported agents. There were 8 identified ingestions as suicide attempts. 15 patients were admitted, and 7 of those admissions were in patients with suicide-related ingestions. A significant association of increased admission rates was observed when comparing asymptomatic patients with abnormal VS to those with normal VS (OR: 4.74, 95% CI: 0.95-45.6, p<0.05). When suicide-related ingestions were excluded, there was no statistically significant difference in admission rates.

Conclusion(s) Asymptomatic pediatric patients with abnormal VS following acute xenobiotic ingestions may not have an increased admission rate, unless related to a suicide attempt. Prospective studies are needed to assess ingestions in this unique group.

Abstract: 15

Asymptomatic Toxic Ingestions: How long is too long?

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Background Children account for approximately 60% of all toxic exposures but account for <6% of exposure-related deaths. Current management of asymptomatic patients who present to the pediatric emergency department (ED) post-exposure often includes a 6-hour observation period. This is an extrapolation from expected time to peak of immediate release xenobiotics. Currently, there is no widely-accepted pediatric reference to support this observation period.

Objective To explore the management and outcomes of acute xenobiotic exposures in asymptomatic pediatric patients.

Design/Methods This was a retrospective review of patients <18 years of age who presented to a tertiary care pediatric ED with suspected toxic ingestions from 2014-2018. Of those identified, only patients that were asymptomatic on presentation were included. This was defined as: normal vital signs, normoglycemic, and with no documented evidence of altered mental status, respiratory distress, emesis, or acute rash. Ingestions of caustic substances, hydrocarbons, acetaminophen, salicylates, and/or extended release (XR) agents were excluded as these substances require longer observations or have established treatment algorithms.

Results Of 254 identified charts, 228 were excluded: 136 were symptomatic and 92 ingested an excluded agent. 26 patients were included: 62% male, with a median age of 3.27 years. An ingested agent was identified in 25 patients [ingested>1 agent (n=2), drugs of abuse (n=4), ibuprofen (n=3), vitamins (n=3), silicon desiccants (n=2), exogenous hormones (n=2), anti-hypertensives (n=2), and other (n=8)]. There were no disclosed suicide attempts. Mean time from reported ingestion to disposition was 4.88±1.50 hours, from ingestion to registration was 1.57±1.27 hours, and from registration to disposition was

3.25±1.35 hours. Two patients were admitted, and both were discharged the following day. One ingested clonidine and had a desaturation event 2.5 hours after registration. The second was admitted within 2 hours for prolonged observation following a cabergoline ingestion. Of the 24 patients who were discharged from the ED, no therapeutic interventions occurred, and all diagnostic tests were performed within 4 hours of registration. None of the discharged patients returned within 72 hours. Conclusion(s) Although pediatric ingestions are often observed for 6 hours, our data suggests that a shorter observation period is unlikely to impact management. A prospective study is needed to further establish an adequate observation period prior to disposition and to optimize resource utilization.

Abstract: 16

The Parent's Perspective: A Focus Group Study on Spanish Interpreter Services for Hospitalized Children

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Background In recent decades, the US Census has shown a rise in Spanish-speakers, many of whom have limited English proficiency (LEP). Though hospital interpretation exists, parent perceptions of these services are unknown and are critical to identifying gaps and addressing them.

Objective To explore Spanish-speaking parents' views regarding roles of the interpreter and provider (attending, resident, or nurse) during an encounter, modalities of interpretation, and barriers to services.

Design/Methods Spanish-speaking parents of children discharged from the hospital medicine service at a tertiary care children's hospital were recruited by phone to participate in focus group discussions. Sessions were audio-recorded and transcribed in Spanish, translated into English, and verified for translation accuracy. Using Atlas.ti©, two coders created the coding scheme, independently coded the data, and achieved consensus. Qualitative methods were used for thematic analysis.

Results Four sessions (n=23 participants, Table 1) were held and several themes emerged. Roles: Parents felt the interpreter's primary role was to act as a conduit for word-for-word translation while having some medical knowledge (Table 2). They desired trustworthy interpreters who displayed kindness, attentiveness, and patience. Providers were seen as leaders of the encounter who should speak slowly and understandably, allot enough time for interpretation, and give frequent medical updates. Modalities: Live interpreters were preferred over telephone and video for their ability to convey body language and build relationships with families. Parents valued having live interpreters for registration/triage, emergencies, and medication teachings. Barriers: While some parents felt comfortable requesting interpreters, others expressed barriers such as shame/embarrassment, inability to request services, and use of other family members to interpret. A major systems barrier was identifying LEP patients.

Conclusion(s) Parents viewed interpreters with medical translation skills and providers who allotted sufficient time as key team members to keep them accurately informed about their child's care. They emphasized live interpreters' social skills as essential to creating trusting relationships and a main reason why they preferred this modality the most. Next steps include developing guidelines to optimize interpreter services and designing interventions to overcome parent-reported and systems barriers.

Table 1: Demographics of Parents in Focus Groups on Spanish Interpreter Services for Hospitalized Children

	Parents n=13
Age (years)	
Range	31-47
Mean (Standard Deviation)	38.5 (5.2)
Gender	
Female (%)	74
Country of Origin (%)	
Mexico	87
Other Regs	13
Number of years lived in the United States (%)	
<5	22
5-10	4
>10	74
Self-rated English proficiency- Comprehension (%)	
Very Well	0
Well	22
Not well	61
Not at all	17
Self-rated English proficiency- Spoken (%)	
Very Well	0
Well	13
Not well	65
Not at all	22
Number of hospitalizations in the past year (%)	
1	61
2-3	30
>3	4.5
Unanswered	4.5
Use of this interpretation modality during the most recent hospitalization (%)	
Live	91
Telephone	61
Video	9

Table 2: Key Quotes from Parents in Focus Groups on Spanish Interpreter Services for Hospitalized Children

	Quotes
Role of the Interpreter	"Communication...whatever we are saying, having them say it to the doctor equally... making sure it's not too different or using other words that don't apply..." "And being a little familiar and with medicine... if someone here knows English and Spanish and...they don't know anything about medicine and the doctor tells them or nothing...maybe [they] don't know how to translate [it]..." "Being kind with others, providing the right information, being patient with other people who are going through a difficult situation and...also people are very vulnerable..." "...for me it's important that they are kind, that they are trustworthy... to be able to tell them...what we need to say..."
Role of the Provider (attending, resident, or nurse)	"...they need to be aware of how to help them [interpreters] because sometimes I have noticed ... the doctor talks too much at once explaining everything and they don't know when to stop... I think the doctor should have the same rhythm as the translator." "Having the interpreter understand correctly so they can explain to us." "That they give you time because they are rushed when they arrive, they get there late and want to leave right away... and then you don't ask the question you wanted because you already understand that they are like 'I am leaving,' and 'I am leaving because of the other patients.'" "...we want to have good communication [about] the health of our children...we have to have a frequent [understanding] of what's going on, what's the procedure, what's going to happen..."
Modalities (live, telephone, or video)	"Over the phone, sometimes you hear it like it's both names (or bewildering), or it sounds fuzzy and via video call, you have to be speaking in kind of pauses, so in person is better." "Having the relationship in person and that they can see your worries in your eyes, in your expressions, in your hands, they become more sensitive towards you." "They [child] are ill...and we are nervous, so looking at the person can help build trust and over the phone one can get distracted mentally and sometimes we are not even listening [to] what the interpreter is saying...in person we see faces and we have to focus on what they are telling us..." "...the translator we had, she is a precious person...because if they see the

	in the hallway and well, they already know me and my [daughter] and 'oh Mrs. what are you doing here, God bless you!'"
Situations for the use Interpreter	"For me I think it's crucial since your arrival...because you explain to the person what symptoms the child has so they can go and talk to the doctor, not so that they half understood you and you understand half of what they said..." "It would be in emergencies, someone who speaks Spanish, so we can know exactly what's going on..." "[Discharge]...that's the most important time because I'll bring my child home and I need to know everything that I will be doing with my child, all his/her medications."
Barriers to Accessing Interpreter Services	"I'm a little bit ashamed, because someone will say: 'You speak Spanish?' Or if there is someone I hear speaks Spanish...I attend [to] myself with a nurse who speaks Spanish and with 'I help you in clinic you have where I'm here' but they change, the nurses every shift. But I think I am a little bit ashamed, in my case it was like: 'Let's see if someone say...or if I understand,' but I understand a little bit and sometimes they explain a little bit and...that is not satisfactory." "A common barrier that we [Hispanics] have...we are the ones knocking, seeking for something extra, so it's not about whether I request it or not, as if I were an interpreter, it's like we don't request for that extra..." "...you are relying on them to request an interpreter. And since I speak very little English and with my little English, [I said] to the nurse: 'I need speak Spanish for other people'..." "I went with my husband, he does speak English very well...but since he's like a third person...she was like 'Tell them this,' and then she told him to tell me and so on, it was like a little chain, and I was able to understand more or less [a] few words and I would remind." "'Do you speak a little bit of English?' And right there we can be the ones to blame because we say yes, but the truth is that we don't understand the majority of it. Of the little bit we can understand, I think we are just speaking two or three words. So...we don't understand the whole picture." "I think that they should know from the [0]...this is their language they speak, and already be ready..."

Abstract: 17
Understanding Resident Practice and Perceptions in Providing Discharge Instructions

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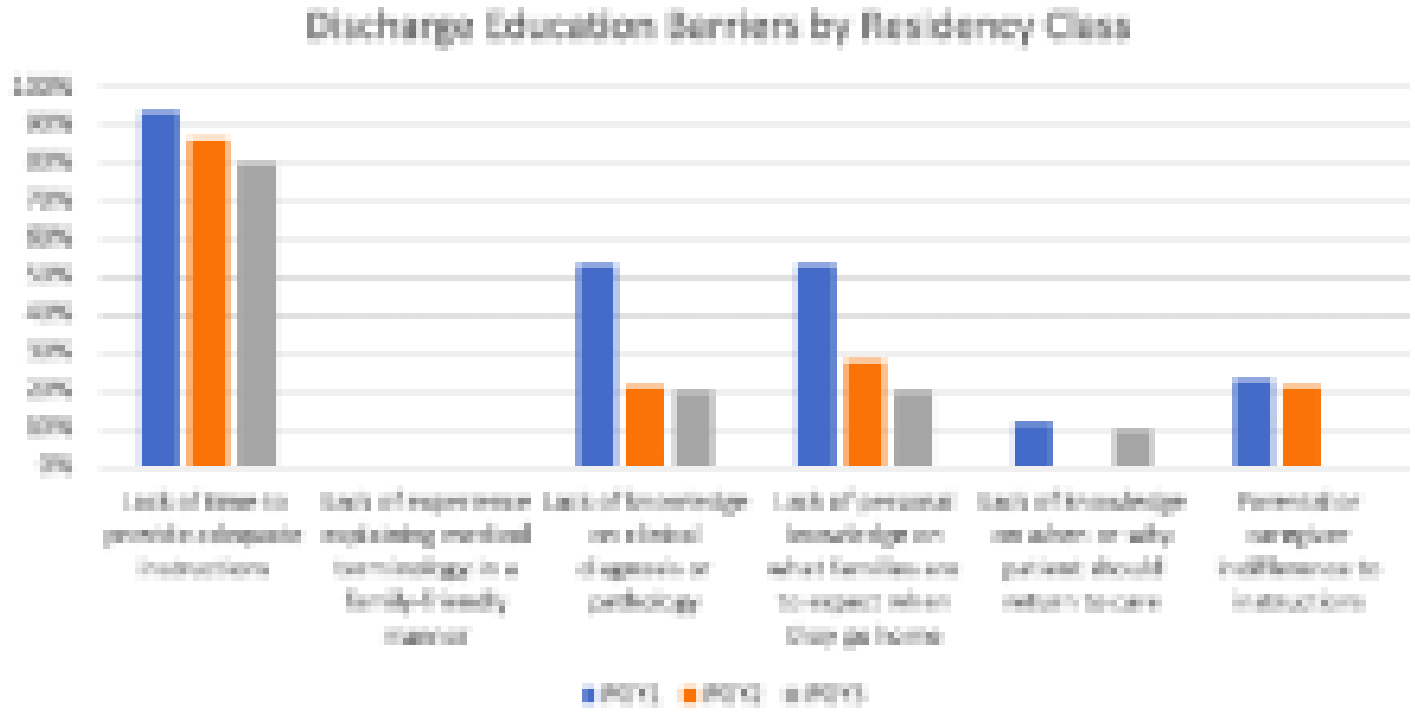
Background Family centered discharge education is vital in assuring understanding on when to return to care and in reducing subsequent clinical visits and readmissions. Little is known about resident practices and barriers to delivery of hospital discharge information.
Objective To assess resident comfort, practices, and barriers towards providing discharge education. To track resident compliance and parental satisfaction with disseminated discharge education sheets.
Design/Methods A cross-sectional de-identified survey of Pediatric residents of a tertiary care Pediatric hospital assessed comfort and barriers on providing discharge education. Descriptive statistics and chi-square tests examined association of comfort, barriers, and practices between training levels. One-page discharge information sheets were developed for ease of resident dissemination to families upon discharge and compliance tracked. Caregiver HCAHP survey responses were tracked to assess satisfaction with discharge information.
Results 44 surveys revealed that resident comfort in providing education on discharge instructions advances with training. 23% of first year residents feel at least very comfortable in comparison with their second and third year counterparts; 71% (p 0.0087, CI 12.6-69.7) and 90% (p 0.0010, CI 27.9-82.6) respectively. All residents identified at least one barrier to providing adequate instructions, with most selecting time. All residents selected lack of knowledge in at least one area. There was a significant difference between classes in barriers selected (p 0.03, CI 2.8-57.2; p 0.02, CI 7.1-63.8). Preliminary surveillance data since implementation of discharge sheet dissemination showed poor to fair distribution of discharge sheets but improvement in caregiver satisfaction on HCAHP surveys.
Conclusion(s) Pediatric resident comfort with providing discharge education increases significantly with training level. All residents selected at least one perceived barrier to providing this education, with 86% of residents selecting time. Understanding of these barriers and associations have helped direct class specific interventions, such as interactive sessions to work on timeliness of delivery. Future plans of the study are to resurvey all residents one year after completion of intervention, continue tracking resident dissemination of discharge information sheets and hospital quality HCAHP measures.



Abstract: 18
30-day readmission rates in an inner-city pediatric inpatient unit: A descriptive study
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Background Pediatric readmission rates are used as determinants for healthcare quality. Several factors are associated with readmissions and as suggested by recent studies, more than 25% of readmissions are potentially preventable. The pediatric readmission rates at the New York state and national level were 3.4% and 6.5% respectively. The three most common diagnoses that were readmitted in the U.S between 2009 and 2010 were seizures, bronchiolitis and anemia/neutropenia.
Objective To determine readmission rates and describe sociodemographic and clinical characteristics of pediatric patients who required readmission within 30 days.
Design/Methods This is a retrospective cohort study of patients 0-21 years of age admitted within 30 days after discharge between January 2012 to December 2017, conducted at a community hospital in the South Bronx. If a patient had more than two readmissions, only the first was taken into consideration.
Results There were 11946 patients admitted to the inpatient pediatric unit during the study period and 326 were readmitted within 30 days (2.7%). The highest and lowest readmission rates were in 2014 and 2017 at 3.5% and 1.9% respectively.
The mean age of the study population was 7 years, and 52.8% (172/326) were males. The most common readmission diagnoses were bronchiolitis (19.6%), asthma (14.7%), sickle-cell crisis (5.2%), post-appendectomy (4.9%) and vomiting (4.3%).
The highest number of readmissions occurred in the fall (30.4%). In readmitted patients, the median length of hospitalization was 3 days and there were 69.3% patients that were readmitted with the same diagnosis as the index admission. Among hospital factors for the readmitted patients, it was noted that 43.6% received primary care at the study-site hospital, 73% had follow-up appointments scheduled upon discharge, and 95.4% had insurance coverage.
Conclusion(s) Readmission rates in our study were lower than New York state and national rates, likely due to a smaller population of patients with chronic special care needs serviced at our institution. Care-coordination at discharge for respiratory illnesses has to be emphasized as they were the most common readmission diagnoses. Surveys of similar community hospitals in the area are needed to ascertain the readmission rates in the Bronx, and the associated environmental and educational factors.

Readmission rates by year

Baseline demographic and clinical characteristics			
	(n=326)		(n=326)
Age (mean, SD)	7 years (3.51)	Insurance, n (%)	
Sex, n (%)		Yes	313 (96.0)
Male	171 (52.8)	No	15 (4.60)
Female	154 (47.2)	PMD at BIHC, n (%)	
Ethnicity, n (%)		Yes	143 (43.8)
Latino	103 (31.3)	No	184 (56.4)
Black	101 (31.0)	F/U appointment made, n (%)	
White	1 (0.31)	Yes	238 (73.0)
Asian	1 (0.31)	No	68 (20.8)
Middle Eastern	1 (0.31)	Not sure	34 (10.4)
Other Race	119 (36.5)	Season, n (%)	
Language, n (%)		Spring	79 (24.2)
English	254 (77.9)	Summer	73 (22.4)
Spanish	68 (20.9)	Fall	99 (30.4)
French	1 (0.31)	Winter	75 (23.0)
Arabic	1 (0.31)	Length of first admission, days (IQR)	3 (2-4)
Others	2 (0.61)	Length of the readmission, days (IQR)	3 (2-4)
Religion, n (%)		Readmitted with same diagnosis, n (%)	
Christian	155 (47.5)	Yes	229 (69.3)
Muslim	23 (6.44)	No	106 (30.7)
Others	17 (5.21)	PICU, n (%)	
No Religion	97 (29.8)	Yes	66 (32.8)
Unknown	36 (11.0)	No	268 (79.8)

Socio-demographic characteristics

Abstract: 19

Comparison of High Flow Nasal Cannula, Continuous Positive Airway Pressure and Bilevel Positive Airway Pressure in Children and Adolescents with Acute Asthma

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Background Asthma is a common obstructive airway disease in children and adolescents. High flow nasal cannula (HFNC), continuous positive airway pressure (CPAP) and bilevel positive airway pressure (BiPAP) are non-invasive respiratory support (NIRS) modalities used in respiratory distress. Pediatric Asthma Score (PAS) is used in children and adolescents aged 2 to 18 years to guide in-patient management. PAS is determined by respiratory rate for age, oxygen requirement, auscultation, retractions and dyspnea. There are few studies comparing HFNC, CPAP and BiPAP in acute asthma (AA).
Objective To explore if HFNC is effective in management of AA.
Design/Methods Retrospective chart review of children and adolescents aged 2-18 years admitted to Flushing Hospital Medical

Center Jan 2012 to Nov 2018 with AA. Exclusion criteria included all patients with cardiopulmonary disease, PAS< 6 and restrictive respiratory disease. Data collected include age, gender, ethnicity, previous asthma history (PAH), type and days on NIRS, number of continuous albuterol nebulization (CAN), length of stay (LOS) and transfers. PAS was calculated at 0, 6, 24, 48 and 72 hrs. Data were analyzed using SPSS software, ANOVA and chi-square test, $p<0.05$ was considered significant.
Results Of 146 charts reviewed, 9 met exclusion criteria. Of the remaining 137, G_1 (13%) patients received HFNC, G_2 (9%) on CPAP/BiPAP and G_3 (77%) on no NIRS. G_1, G_2 and G_3 were compared for gender (44%, 50%, 54% male), median age (3.6, 6.3, 6.1 years), ethnicity (61%, 75%, 83% Hispanic) and median PAS on admission (7.7, 9.4, 9). PAH was none or intermittent in 28% and moderate asthma in 35%. PAS at baseline between groups, $F=2.72$, $p=0.07$, average number of CAN (1.2, 5.2, 2.1) $F=4.1$, $p=0.02$, average LOS (4, 5, 4 days) $F=5.36$, $p<0.01$, days on NIRS (1.5 vs 2.4 days), $t=2.67$, $p=0.01$ and PICU transfers (6%, 67%, 27%), $x^2=9.41$, $p<0.01$.
Conclusion(s) In our small sample, patients on HFNC were younger, required fewer number of CAN, shorter duration on NIRS, lower LOS and fewer transfers to PICU than those on CPAP/BiPAP.

Abstract: 20
The Role of the Inpatient Pediatric Provider in Addressing Postpartum Depression: A National Survey
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Background Postpartum depression (PPD) is estimated to affect 10-20% of mothers in the first postnatal year. The inpatient hospital setting offers an opportunity to provide mental health screening and support to patients' mothers. The 2019 AAP Policy Statement on Perinatal Depression recommends that PPD screening be performed for the parents of hospitalized infants.
Objective To investigate inpatient provider attitudes, knowledge, screening practices and referral processes for PPD.
Design/Methods A convenience sample of AAP Section of Hospital Medicine ListServ members (approximately 3200 self-identified hospitalists) were emailed an invitation to participate in an online survey at SurveyMonkey.com. A reminder was sent 30 days later. Informed consent was obtained and responses were collected anonymously. 22 mixed format questions addressed the following domains: demographics, experience, practice setting, attitudes and knowledge, current practices, and perceived barriers to PPD screening. Responses were calculated using descriptive statistics and compared using Pearson's chi-squared and Fisher's exact tests.
Results The survey was taken by 126 inpatient providers (0.05% view rate; 96% completion rate). Respondents were predominantly female and white (Table). 77% believe that recognizing PPD is their responsibility. 33% feel confident using a screening instrument. 65% know next steps to take if PPD is identified. 63% report that licensed clinical social workers (LCSW) offer or administer screening in their hospital. Mothers with positive screenings are most often referred to a LCSW, psychologist, or support group (Fig 1). 83% agree that time constraints interfere with screening. Insufficient local mental health resources and excessive wait times for mental health follow-up are common (Fig 2). 83% of providers don't have or aren't aware of institutional policies for inpatient PPD screening. There is no statistical significance between gender or years since completing training and frequency with which providers conduct screening ($p=0.82$; $p=0.61$).
Conclusion(s) Most inpatient pediatric providers feel that recognizing PPD is their responsibility, but confidence and practice in screening are variable. There are a myriad of both provider- and patient-centric barriers to referral for follow-up, especially insufficient mental health resources and excessive wait times for care. More knowledge of screening tools, hospital-based policies, and accessibility of follow-up resources may be opportunities for improvement.

Table. Respondent Demographics

Characteristic	All respondents, n = [illegible] (%)
Gender	
Female	[illegible] (64)
Race/ethnicity	
White/Caucasian	[illegible] (80)
Asian/Pacific Islander	[illegible] (11)
Latino or Hispanic	[illegible] (4)
Black or African American	[illegible] (1)
American Indian or Alaskan Native	[illegible] (0.8)
Other	[illegible] (2)
Time since training completed	
<1 year	[illegible] (2)
1-5 years	[illegible] (48)
6-10 years	[illegible] (23)
>10 years	[illegible] (27)
Currently practicing in hospital**	
Yes	[illegible] (94)
Area of current practice in the U.S.	
Northeast	[illegible] (37)
Midwest	[illegible] (23)
Southwest	[illegible] (15)
Northwest	[illegible] (12)
Southeast	[illegible] (13)
Israel	[illegible] (5)
Primary clinical setting	
Academic tertiary hospital with residents	[illegible] (52)
Community hospital with residents	[illegible] (24)
Community hospital without residents	[illegible] (23)
Other/Multiple sites	[illegible] (5)

Table. Respondent Demographics

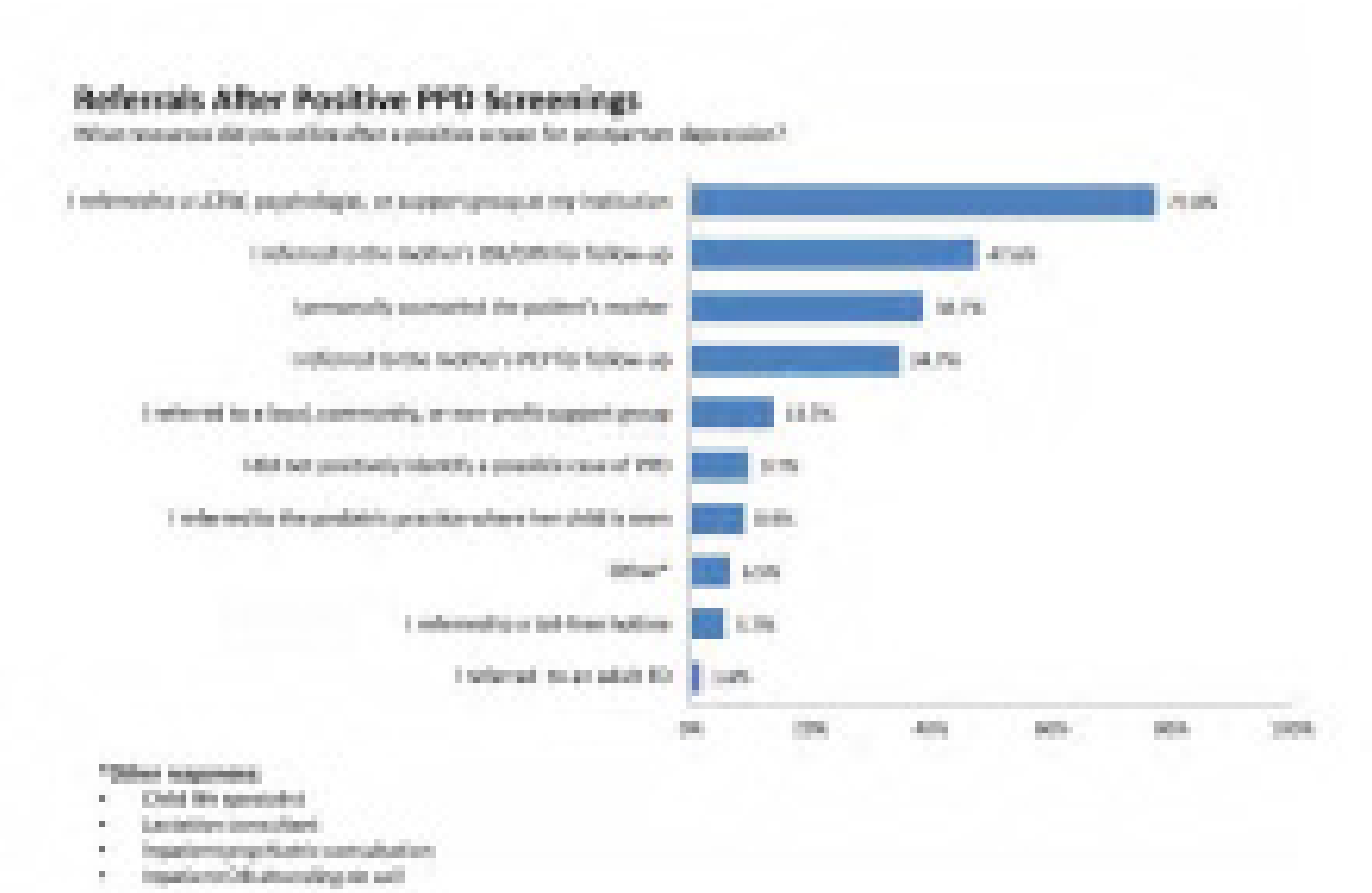

Figure 1. Referrals After Positive PPD Screenings

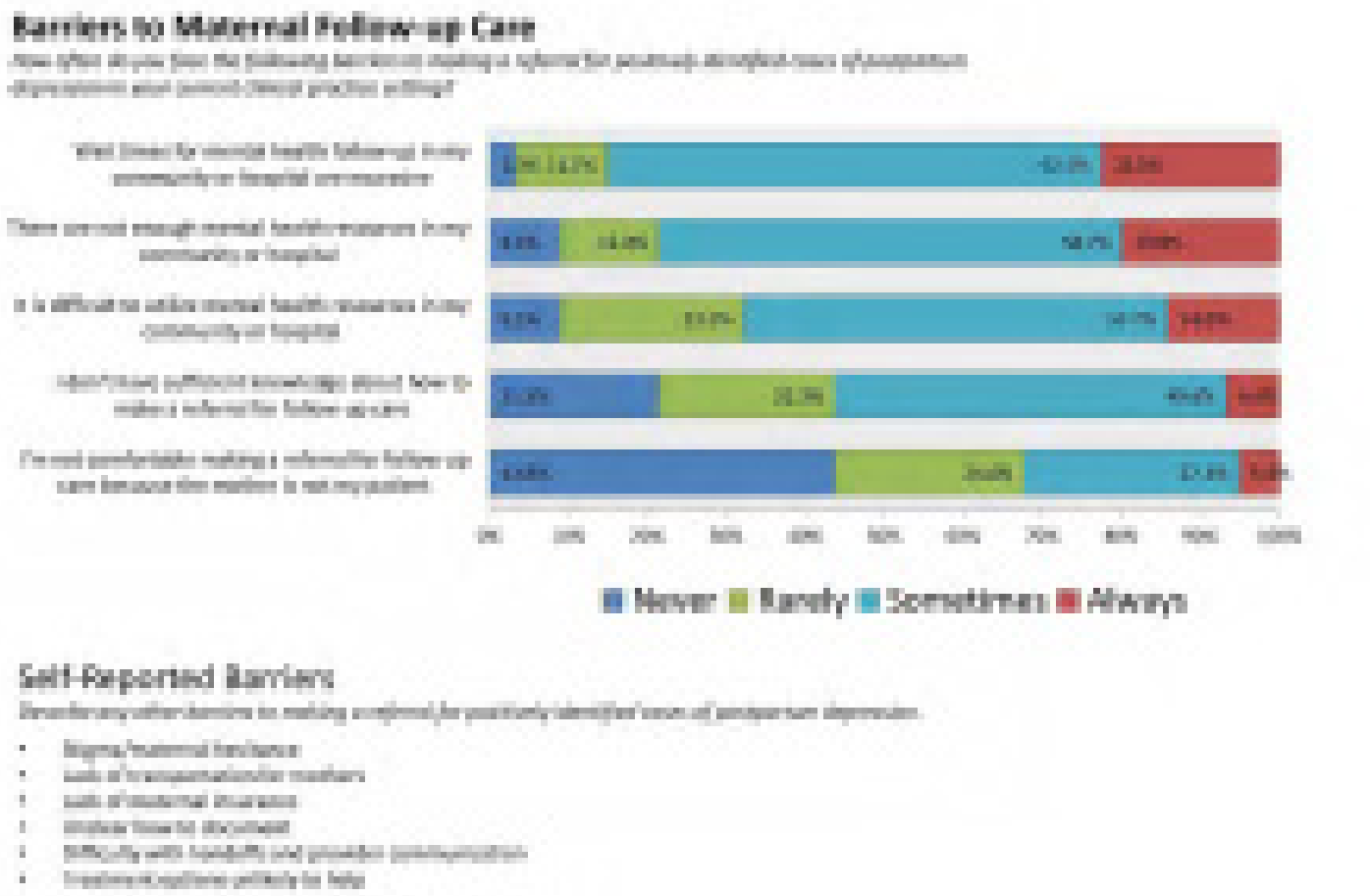

Figure 2. Barriers to Maternal Follow-up Care

Abstract: 21
Racial disparities among the provision of breast milk for preterm infants at Baystate Children's Hospital
Monique M. Abrams, Jennifer Marion, Rachana Singh, Laura Madore
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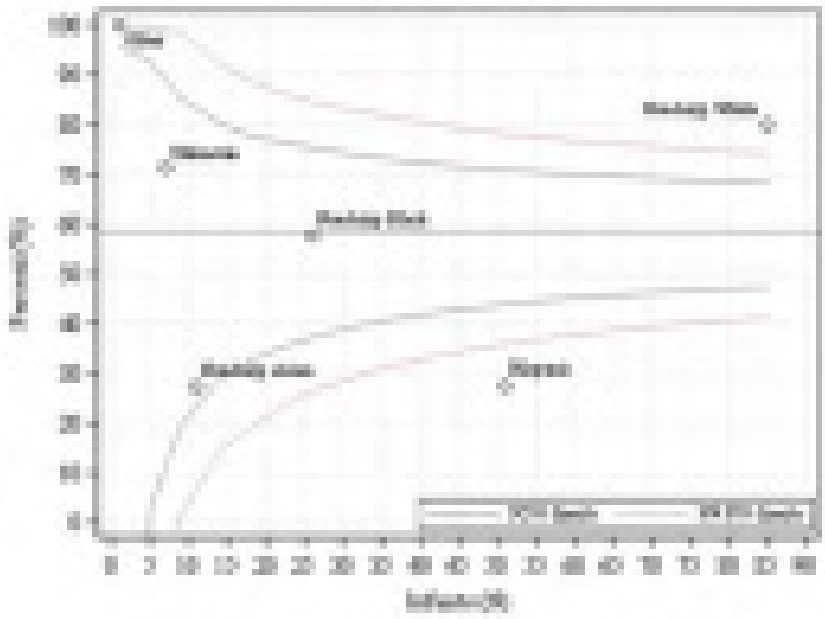
Background
Mother's own breast milk (MOM) is critical to optimizing health outcomes for all infants. Mothers of premature infants experience barriers to providing MOM including pump dependency, inadequate volumes, and lack of support. Premature infants in the U.S. are born disproportionately to African American and/or low-income women and research indicates these mothers are less likely to provide MOM.
Objective To evaluate whether race and/or ethnicity impact provision of MOM for very-low-birth-weight (VLBW; <1500g) preterm infants at NICU discharge from Baystate Children's Hospital (BCH) in Springfield, MA.
Design/Methods VLBW infants born between years 2015 - 2018 and survived to discharge were eligible. Infant characteristics such as receipt of MOM on day of ultimate discharge/transfer (primary outcome), receipt of MOM during the first week of life, gestational age, birthweight, rates of morbidity, and length of stay were collected, as were maternal factors such as race, ethnicity, age, intent to breastfeed, and time to first pump. Descriptive statistics were computed and comparisons made by Fisher's exact test and one-way ANOVA as appropriate (significance $p<0.05$).

Results There were 183 VLBW infants that qualified for this study. The predominant racial/ethnic groups were non-Hispanic Whites (47%), Hispanics (27.9%), and non-Hispanic Blacks (14.8%). As per Figure 1, 80% of Non-Hispanic White mothers continued to provide MOM at NICU discharge, compared to 59% of non-Hispanic Black mothers and only 28% of Hispanic mothers ($p<0.05$). This is despite similar rates of intentions to breastfeed and MOM initiation, and similar characteristics such as maternal age, gestational age, weight, morbidities such as NEC and sepsis, and length of stay across all races and ethnicities. Time to first pump was fastest in White mothers (6.22 ± 5.72 hours; $p<0.05$).

Conclusion(s) There is a notably large racial and ethnic disparity that exists within our unit regarding continued supply of MOM to preterm infants. Other NICUs do report a racial divide in MOM provision; however it appears unique to our center that Hispanic mothers have the worst rates. There are likely underlying socioeconomic components at play such as issues with transportation, work environments, and overall support that remain to be investigated. Our NICU is attempting to close this divide by increasing access to hospital-grade breast pumps and implementing breastfeeding peer counselors to help support our disadvantaged mothers.



Abstract: 22

Improving Use of Mother's Own Milk in a level II Special Care Nursery

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Background Collaborative efforts to improve mother's own milk (MOM) use in very low birth weight infants are present in many states. Similar attention is needed for infants in Special Care Nurseries (SCN) where MOM use is variable often due to delayed initiation of lactation in mothers.

Objective To improve rates of MOM intake among infants admitted to the Level IIB SCN at Winchester Hospital using a

bedside checklist.
Design/Methods Surveys were distributed to all nursing staff involved in the care of mother-baby dyads to understand the knowledge, attitude and behavior toward the use of MOM. Based on survey results, a checklist of actions was implemented to promote timely initiation of skin to skin, breastfeeding or breast milk expression and to improve communication between nurses in SCN and mother baby unit (MBU). We evaluated the effect of the utilization of the checklist by comparing rates of our outcomes. Primary outcome measures were any use of MOM and exclusive use of MOM at discharge. Data was also collected on maternal and neonatal characteristics, type and timing of first feed. Infants transferred in and out of SCN from other hospitals or from well baby nursery after 6 hours of life were excluded.
Results Three months before and three months after implementation of the checklist, there were 34 and 31 eligible infants respectively. Before and after the use of checklist, exclusive use of MOM at discharge was 18% and 23%, any use of MOM at discharge was 59% and 65%, respectively. There were no differences in the maternal and neonatal characteristics between infants who received MOM vs formula as the first feed or at discharge. Thirty percent of multiples were given MOM as first feed vs 76% in singletons. Among infants whose nurses completed documentation of checklist, 92% received MOM as the first feed, 100% received MOM at discharge and 46% received MOM exclusively at discharge. If nurses did not complete checklist these rates were 39%, 44% and 11%.
Conclusion(s) Implementation of a bedside checklist improved rates of MOM at discharge in this preliminary dataset. This project showed the importance of timely initiation of skin to skin, breast milk expression and communication between nurses in achieving adequate supply of MOM. Future work will aim to improve checklist utilization and education of staff and parents. We will also assess use of donor human milk and its impact on the use of MOM in our unit.

Abstract: 23
An Analysis of Parental Opinions of Human Milk Sharing Options
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Background Mothers who are unable to breastfeed their infants can obtain donor breast milk (DBM) from lactating mothers through milk banks (MB) or informal, "mother-to-mother" donation. Informal milk sharing is discouraged by the American Academy of Pediatrics (AAP), but has become increasingly popular, most likely through online milk sharing groups and personal anecdotes shared on parenting blogs. To date, however, no study has examined parental opinions and practices regarding DBM use expressed online.
Objective To study parental practices and perceptions of receiving/donating breast milk (BM) via informal/formal routes, as discussed on publicly-accessible online blogs.
Design/Methods Blog posts were identified by a Google search of "parenting blog AND donor breast milk" or "parenting blog AND milk sharing." Posts about parents receiving/donating BM were categorized as formal/informal and donated/received; posts applicable to multiple categories were counted multiple times. Medical necessity for DBM, opinions regarding donation routes, concerns about DBM, presence of research evidence, and physician involvement were assessed.
Results Overall, 122 posts from 2010-present were analyzed (receiving, n=65; donating, n=57). Informal milk sharing accounted for 75.4% (n=49) of posts about receiving DBM and 69.7% (n=37) of posts about donating BM. Milk bank DBM recipients were more likely than informal recipients to have a medical necessity (75% vs 30.7%, $p<.01$), involve physicians (75% vs 26.5%, $p< .01$), and cite positive emotions (93.8% vs 61.2%, $p< .05$). Milk bank donors were more likely than informal donors to involve physicians (25% vs 2.7%, $p<.05$). Parents generally favored the donation route they utilized ($p<.01$). A thematic analysis of concerns with DBM found that disease transmission was a primary concern among users of both informal (recipients, 40.8%; donors, 21.6%) and formal (recipients, 31.3%; donors, 15%) routes. Bacterial contamination was also a main concern for MB recipients (31.3%).
Conclusion(s) Given the prevalence of posts about informal milk donation, parents conducting online searches are more likely to find information about AAP-discouraged informal donation practices, most of which lacked important discussion of safety concerns. Furthermore, very few of those that partook in informal milk sharing discussed the practice with their physicians. It is therefore important that physicians proactively explain all milk donation options to parents and promote milk bank use while educating on the risks associated with obtaining BM informally.

Table 1: Characteristics of publicly available blog posts discussing receiving donor breast milk

	Via Informal Milk Sharing		Via Milk Bank		p-value
	Count	Percent	Count	Percent	
Number of Posts	49	75.4	16	24.6	--
Child in the NICU	8	16.3	11	68.8	<.01
Child with medical necessity for breast milk	15	30.7	12	75.0	<.01
In favor of milk banks	6	12.2	16	100.0	<.01
In favor of informal milk sharing	48	98.0	4	25.0	<.01
Listed concerns about using donor breast milk	23	47.9	7	43.8	insignificant
Positive emotions in response to receiving donor breast milk	30	61.2	15	93.8	<.05
Cited medical evidence	18	36.7	3	18.8	insignificant
Physician involved in using donor breast milk	13	26.5	12	75.0	<.01
Clinician involved in using donor breast milk	6	12.2	2	12.5	insignificant

Characteristics of publicly available blog posts discussing receiving donor breast milk

Table 2: Characteristics of publicly available blog posts discussing donating donor breast milk

	Via Informal Milk Sharing		Via Milk Bank		p-value
	Count	Percent	Count	Percent	
Number of Posts	37	64.9	20	35.1	–
In favor of milk banks	5	13.5	18	90.0	<.01
In favor of informal milk sharing	35	94.6	5	25.0	<.01
Listed concerns about using donor breast milk	9	24.3	4	20.0	Insignificant
Positive emotions in response to receiving donor breast milk	25	67.6	17	85.0	Insignificant
Cited medical evidence	4	10.8	3	10.0	Insignificant
Physician involved in using donor breast milk	1	2.7	5	25.0	<.05
Clinician involved in using donor breast milk	0	0.0	0	0.0	–

Characteristics of publicly available blog posts discussing donating donor breast milk

Table 3: Thematic Analysis of Concerns Regarding Donor Breast Milk

	Receiving Donor Breast Milk		Donating Breast Milk	
	Informally (n=49)	Via Milk Bank (n=16)	Informally (n=37)	Via Milk Bank (n=20)
Disease Transmission	20 (40.8%)	5 (31.3%)	8 (21.6%)	3 (15.0%)
Bacterial Contamination	15 (30.6%)	5 (31.3%)	4 (10.8%)	2 (10.0%)
Drug/Alcohol Transmission	17 (34.7%)	3 (18.8%)	7 (18.9%)	3 (15.0%)
Milk Dilution	1 (2.0%)	0 (0.0%)	1 (2.7%)	1 (5.0%)
Legality	0 (0.0%)	0 (0.0%)	1 (2.7%)	0 (0.0%)
Costs	0 (0.0%)	2 (12.5%)	0 (0.0%)	0 (0.0%)

Thematic Analysis of Concerns Regarding Donor Breast Milk

Abstract: 24

The MOM Project: Multidisciplinary initiative to increase the availability and use of mother's own milk (MOM) in our Neonatal Intensive Care Unit

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Background The use of breast milk has long been considered the standard for infant feeding and nutrition. It has been shown in preterm infants to decrease rates of sepsis and incidence of necrotizing enterocolitis and to improve neurodevelopmental outcomes. Despite these benefits, the rate of using mother's own milk in the Albany Medical Center neonatal intensive care unit was suboptimal.

Objective To increase the number of moms who provide breastmilk in our NICU.

Design/Methods IRB approved multidisciplinary quality improvement initiative started in 2017. Plan Do Study Act (PDSA) method was used. Baseline rates of mother's own milk (MOM) use in infants <33 weeks were established by a retrospective chart review from 1/2015-12/2016. Initial changes implemented in summer of 2017 included placing a pump in delivery room, education of L&D, postpartum, and NICU nurses on the benefits of breastmilk, developing educational handouts for mothers, setting a goal for time to first pump, and obtaining a lactation consult within 24 hours of NICU admission. Maternal questionnaires as well as data from the electronic medical record were used to assess the effectiveness of these changes.

Results Baseline data from 2015-2016 showed 55% of infants received MOM within first 48hrs and after implementation of the changes the rate increased to 79%. Results from other changes revealed pumps were placed in the delivery room 59% of the time, the importance of MOM was discussed with parents 71% of the time after NICU admission, the parent information handout was given in >95% of outpatient and inpatient prenatal consults, and 76% had met with lactation within 24hrs. We were unable to identify the time to first pump secondary to no consistent place to report.

Conclusion(s) The MOM project is an important on-going multidisciplinary QI initiative that has required several PDSA cycles to successfully improve our rates of MOM in our NICU. As a result of the recent data, an electronic method to record pumping times will be implemented, additional education for staff will be given, and a pump will be listed on the DR set up checklist. We plan to continue regularly evaluating our interventions to determine the best strategies to achieve optimal rates of MOM in our NICU.

Abstract: 25

Randomized Control Trial: Synchronized Non-Invasive Positive Pressure Ventilation (SNIPPV) with Neurally Assisted Ventilatory Assist (NAVA) versus non synchronized NIPPV in Extremely Low Birth Weight Infants

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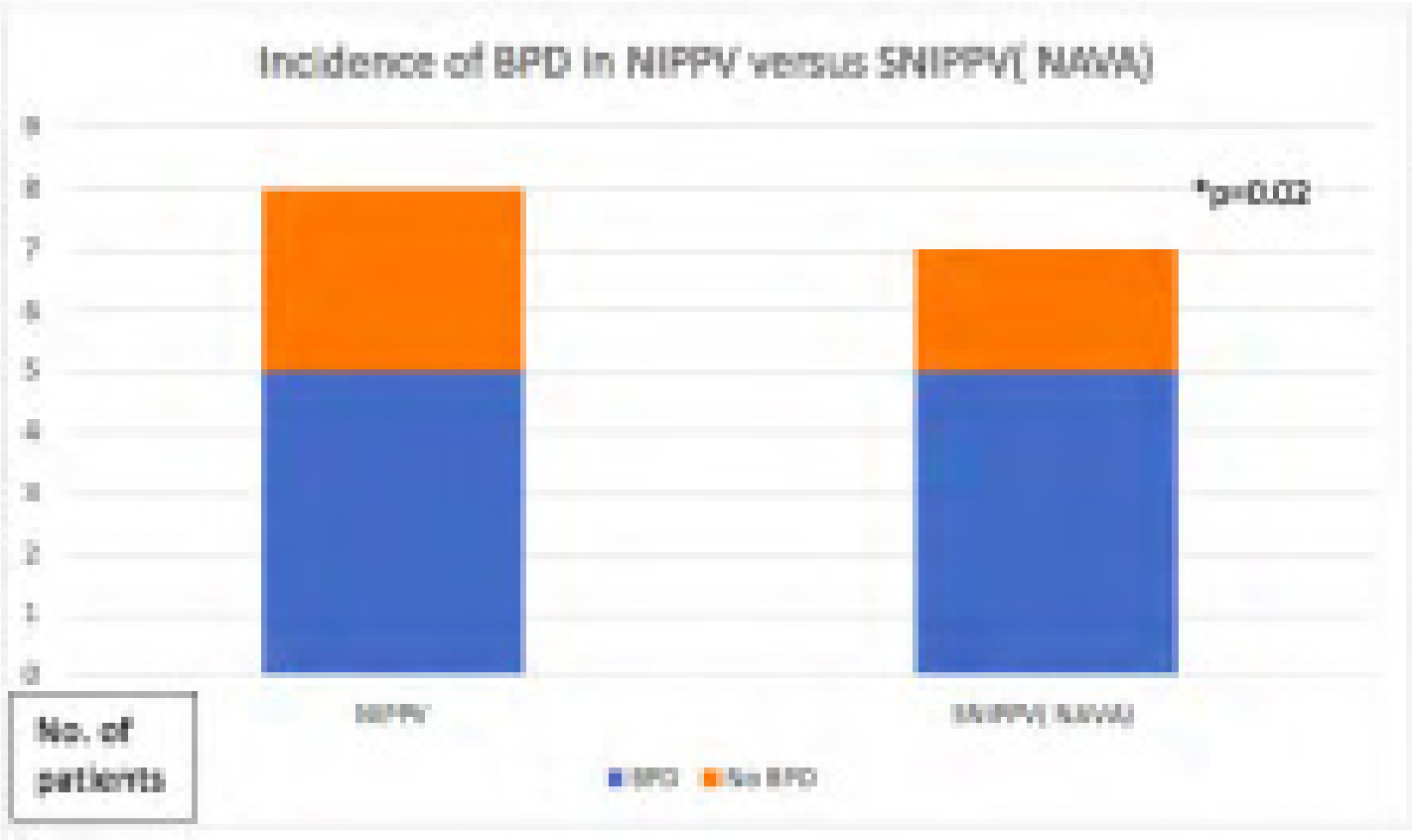
Background ELBW infants are at high risk for the development of bronchopulmonary dysplasia (BPD) and Ventilator-Induced Lung Injury (VILI), in part because of the need for mechanical ventilation utilizing an endotracheal tube (MVET). Gentle ventilation strategies like NCPAP are used to minimize the need for MVET. However, NCPAP may fail in ELBWs due to apnea. An enhancement to NCPAP is NIPPV, which delivers a rate above the continuous distending pressure. But, the breaths delivered with NIPPV are not synchronized which causes patient – ventilator asynchrony. SNIPPV utilizing NAVA has shown improvements in pulmonary mechanics and decreased work of breathing in preterm infants.
Objective The hypothesis is that SNIPPV will decrease the need for MVET and reduce BPD in ELBW infants as compared to NIPPV.
Design/Methods Ongoing clinical trial. Sample size analysis showed 30 ELBW infants needed to be enrolled and randomized to either SNIPPV group or NIPPV group respectively. Enrollment of the patients based on predetermined inclusion and exclusion criteria*. After informed consent, the study infants were reviewed according to extubation and re intubation criteria. MVET assessed at 7 days of life was the primary outcome. The secondary outcome is BPD, defined as oxygen requirement at 36 weeks PMA. Statistical analysis performed using chi square or fisher exact test for categorical data; and t-test or Mann Whitney for continuous data with statistical significance when *P*< 0.05. #NCT03613987 (clinicaltrials.gov)
Results In this preliminary data analysis, 15 patients were enrolled and randomized. 8 patients in NIPPV group had mean Birth weight (BW) 790.62+/-58.25 gm and Gestational age (GA) 26 weeks (25;27). 7 patients in the SNIPPV group had mean BW 725.7+/-141.7 gm and GA 26 weeks (25;27). There were no significant differences in the demographic characteristics between the two groups. Primary outcome of need of MVET at various time points did not differ between the two groups. Secondary outcome of BPD was similar in both the groups.
Conclusion(s) In this ongoing clinical trial, the preliminary data analysis shows the need for MVET in the two groups did not differ significantly. The incidence of BPD is high in both the groups, likely due to extreme prematurity. Additional sample size to be analyzed in the future.



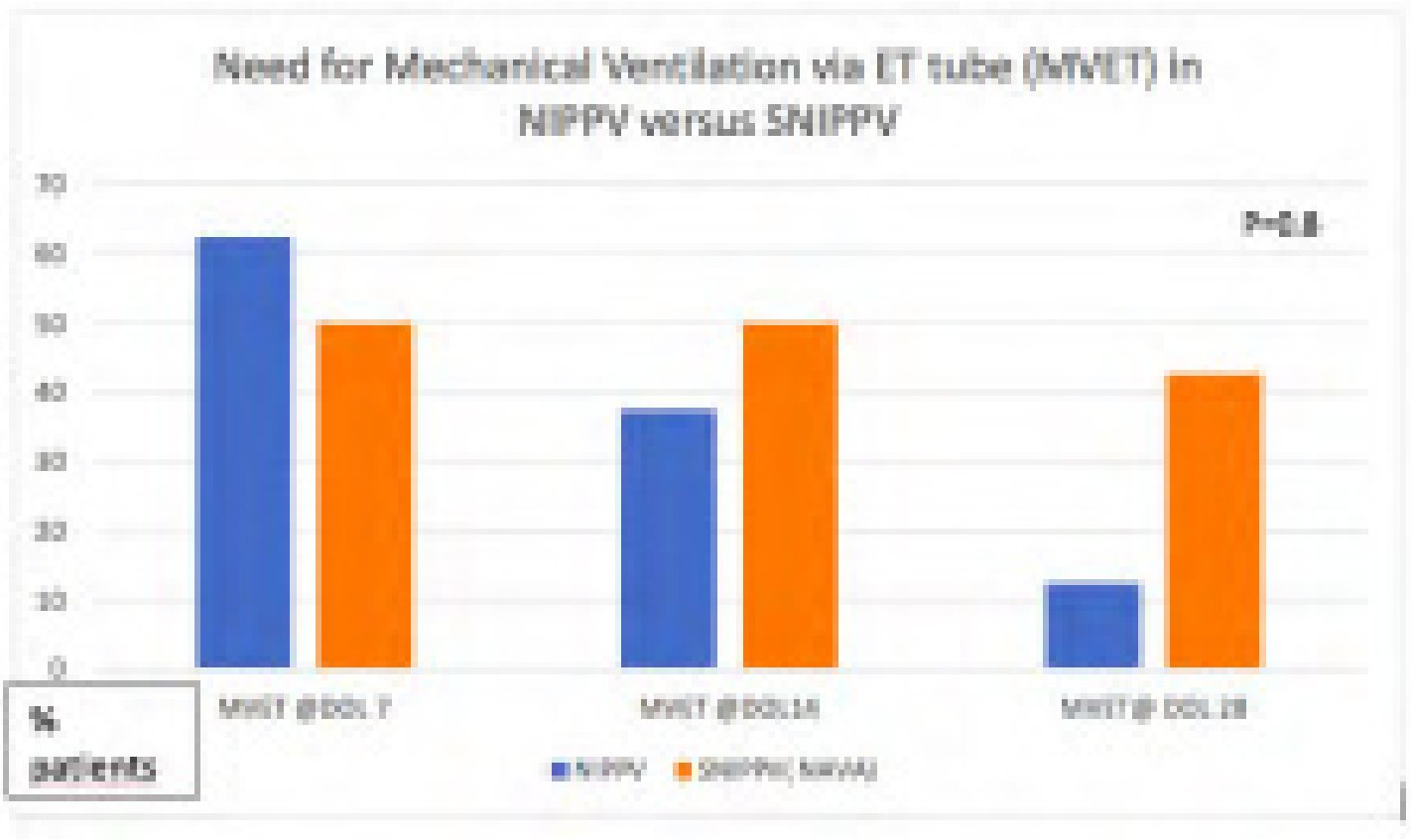


Table 1

Inclusion criteria	Exclusion criteria
1. Babies born less than 1kg and at 24-30 week gestation.	1. Babies with Grade 3-4 IVH
2. Babies who qualify for surfactant administration within 1.5 hour of birth	2.Babies with congenital anomalies

Table 2

Extubation Criteria	Re intubation criteria
Infant is receiving caffeine.	One apneic event requiring positive pressure ventilation
Infants can be extubated at any point, but must be extubated following a 12-hour period of clinical stability when the ventilator settings have met all the following criteria: -mean airway pressure (MAP) < 8cmH20, -FiO2 < 0.4, pH > 7.2, pCO2 < 70	More than 6 apneic events requiring stimulation within a 6-hour period.
	A deterioration in respiratory status as noted by any of the following criteria: -pH < 7.2, pCO2 > 70, FiO2 > 0.6,

	Or, if in the opinion of the attending neonatologist, the baby is failing either non-invasive strategy

Abstract: 26

A novel noninvasive approach for evaluating work of breathing (WOB) indices in a developmental rat model using respiratory inductance plethysmography (RIP)

Yan Zhu[1], Suhita Gayen nee Betal[2], Michael T. Favara[2], Gina Fong[2], Tariq Rahman[1], Thomas H. Shaffer[1], Zubair h. Aghai[2]
[1]Department of Biomedical Research and Center for Pediatric Lung Research, Nemours/A.I. duPont Hospital for Children, Wilmington, Delaware, United States, [2]Thomas Jefferson University/Nemours, Philadephia, Pennsylvania, United States

Background Pulmonary function testing (PFT) is an important component for evaluating the outcome of experimental rodent models of respiratory diseases. Since it is difficult to perform conventional PFT on non-ventilated rodents, respiratory inductance plethysmography (RIP) provides a noninvasive method of PFT requiring minimal cooperation. RIP measures work of breathing (WOB) indices including phase angle, percent ribcage (RC%), breaths per minute (BPM), and labored breathing index (LBI) on an iPad. This study is the first to use this newly developed RIP technique, *pneu*RIP, on rodents.
Objective The aim of this study was to evaluate the utility of the *pneu*RIP system in a developmental rat model, as well as establish normal values for the rat.
Design/Methods Five Sprague Dawley rats (245.9 ± 55.8g, 2 months old) were commercially acquired, anesthetized for 3 minutes with an induction dose of 5% isoflurane vapor and maintained with 3% inhaled isoflurane. The rats were placed on an infrared warming pad during 3.5 minutes of testing. Heart rate and SPO_2 were monitored using a pulse oximeter. The $ETCO_2$ was measured using a noninvasive cardiac output monitor (custom nasal prongs). The *pneu*RIP system uses two elastic bands: one band (RC) placed around the rib cage under the upper armpit and another band (AB) around the abdomen. Breaths per minute (BPM) was calculated at a rate of 10 measurements per second (Figure 1).
Results In general for humans & most mammals[ST1] , normal synchronous breathing is observed at phase angles < 30 ° and LBI < 1.05 (Paediatr Resp Rev (2018). As shown (Table 1), mean phase angle = 12.2° and LBI = 1.014, which is considered within the normal range for mammals. The results of HR, SPO_2, ET CO_2, and BPM were consistent with the results in our previous study (Pharmacology & Therapeutics (2014).
Conclusion(s) Noninvasive *pneu*RIP testing provided instantaneous PFT results. The *pneu*RIP method was accurate in measuring the phase angle, percent ribcage (RC%), and labored breathing index (LBI). This approach for assessment of PFT provided a rapid method of assessing immediate, and possibly longitudinal, PFT outcomes in a developing rat model that has been used to study many respiratory neonatal disorders such as hyperoxia, barotrauma and sepsis, etc..

Supported By: NIH COBRE: P30GM114736

Table1: Pulmonary Function Summary (Mean ± SD)

Mean	245.9	145.2	66.9	27.2	56.9	12.2	45	0.64
SD	35.7	22	1.6	0.3	7.2	0.7	1.8	0.22

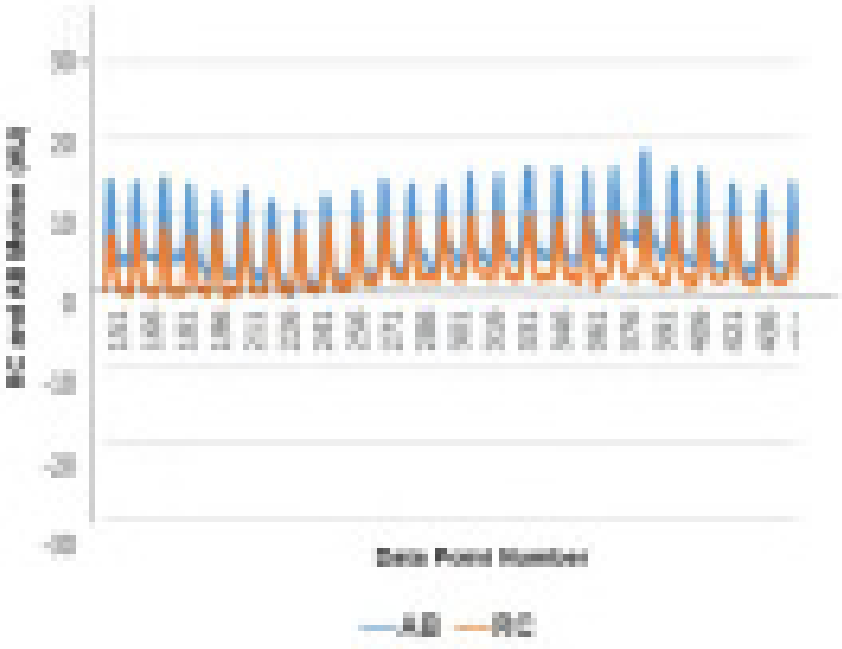


Figure 1: Typical RC and AB motion results.

Abstract: 27

Assessment of Caregiver Acceptability and Satisfaction of a Brief Multimodal Educational Intervention for Parents of Pediatric Patients with Mild to Moderate Persistent Asthma

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Background Asthma prevalence is particularly high in inner-city pediatric populations. Lack of healthcare access, low health literacy, and lack of understanding of the disease process and treatment play a significant role in poor outcomes. Parental understanding of core concepts can also vary based on provider teaching practice.

Objective To assess parental acceptance and satisfaction of a multimodal educational tool, including comprehensibility and utility of the materials and desire for continued use of the materials in future visits.

Design/Methods A multimodal education tool was developed, including a paper handout, medication identification stickers, and an asthma educational video (made in partnership with the Art Institute of Philadelphia). A sample of 26 parents of patients ages 4-11 years old with mild to moderate persistent asthma were recruited in a large inner-city pediatric clinic. At the initial visit, parents watched the video and the handout and stickers were provided. A survey was administered to assess parental acceptance and satisfaction of the educational materials. Subjects were contacted by telephone three months after the initial visit to survey their interim use of the handout and stickers and desire to watch the video and receive the materials at future visits.

Results On the initial survey, 100% of parents reported understanding everything in the video and 96% understood everything in the handout. Parents reported that sticker use would help them differentiate, and the multimodal educational tool would help them take better care of their child's asthma. At the three month follow up, 66% of parents reported use of the paper handout at home, 80% continued to use the stickers, and 66% of parents wanted to continue to view the video and receive the stickers and handout at future visits. The most common feedback was that parents felt the video was sufficient to watch once, while it would be helpful to review the handout and receive stickers at future visits.

Conclusion(s) Parents of asthmatic pediatric patients accept all components of the multimodal asthma educational tool as easy to comprehend and are optimistic of its utility in helping them better care for their child's asthma. Parents also expressed interest in receiving these tools at future visits.

Abstract: 28

Relationship between BMI and Asthma Severity in 6-15 year-olds

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Background Obesity has been identified as a risk factor for the development of asthma in children. Recent studies suggest children with obesity are at increased risk for asthma exacerbations.

Objective To evaluate the association between body mass index (BMI) and asthma severity in children in an urban, low income community.

Design/Methods We conducted a cross sectional study of children aged 6-15 years with the diagnosis of asthma (ICD 10 J45) seen at a pediatric practice at a medical center that serves an urban, low income community. The study population included a systematic sample of 194 children (19-20 per year of age) seen between January and December 2017. Charts were reviewed for age, gender, ethnicity, BMI percentile, insurance, controller medication used, asthma related hospitalizations, number of steroid courses and smoke exposure. Outcome measures were use of systemic steroids and hospitalizations for asthma exacerbations. We used analysis of variance (ANOVA) to examine the association of BMI (continuous), age and smoke exposure with the use of systemic steroids and/or hospitalizations for asthma exacerbations.

Results The majority of children were male (55%), minority (African American 77%, Hispanic/Latino 11%), and low income (public insurance 87%); 28% had cigarette smoke exposure. Asthma was classified as intermittent (44%), mild persistent (31%), moderate persistent (22%), severe (1.5%), and not classified (1.5%). A third of the children (37%) used low dose inhaled steroids, nearly one fifth (18%) used intermediate or higher dose inhaled steroids, 16% used multiple medications, and 27% did not use controller medications. We found no significant relationship between BMI and systemic steroid use for exacerbations ($p=0.227$), smoking and steroid use ($p=0.374$) or age and steroid use ($p=0.699$). There were no significant relationship between BMI and hospitalizations ($p=0.787$), smoke and hospitalizations ($p=0.799$) or age and hospitalizations ($p=0.396$).

Conclusion(s) BMI was not associated with asthma severity among children aged 6-15 years in a low income minority community.

Abstract: 29

Polysomnography (PSG) Use in Premature and Term Infants (TI) with Recurrent Apnea, Bradycardia (B) and Desaturations (DESAT) Facilitates Evaluation and Management in the Neonatal Intensive Care Unit (NICU)

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Background PSG is used as a diagnostic tool in sleep related breathing disorders. Indications and utility for inpatient PSG in complex TI and premature infants (PI) is not well described. The etiology of recurrent apnea, B and DESAT that persist beyond expected resolution in PI is often multifactorial due to central (C), obstructive (O) apnea and/or feeding related issues. We used PSG, ± swallow study (SS) and ENT evaluation where clinically indicated, to evaluate TI with congenital midfacial malformations and PI with persistent events.

Objective To determine: 1. The primary diagnostic role of PSG in TI with midfacial malformations and PI with recurrent apnea, B and DESAT. 2. The added value of an ENT evaluation and SS in establishing a diagnosis.

Design/Methods Retrospective chart review of infants evaluated by PSG in the NICU at NYP-Weill Cornell from January 2012 to April 2018. PSG measures C and O apnea and hypopneas to determine an apnea hypopnea index (AHI) as events per hr, categorized as mild (1-4), moderate (5-10) and severe (>10).

Results PSGs (n=48) were done on 31 infants; 15 (48%) were TI & 16 (52%) PI. PSGs in PI were done at a postmenstrual age of 41.5 wks. Clinical indications for PSG were: DESAT (n=22), suspected O apnea (n=14), stridor (n=2). Primary problems were Resp (n=11), Neurologic (n=5) or Craniofacial (n=15), (Table 1). Of all studies AHI was severe n=30 (63%), moderate n=11 (23%), mild n= 5 (10%), normal n=2 (4%). Events were obstructive n=23 (74%), central n=6 (19%), mixed n=1 (3.5%) and normal n=1 (3.5%). C apnea was noted in 4 PI. In follow-up PSGs (n=13), AHI improved in all (Table 2). Interventions occurred in 24 (77%) infants following PSGs (Table 3); clinical signs completely resolved after intervention in 18 (58%) infants. Improvement in AHI or clinical improvement was seen in 27 infants (87%); 4 did not show improvement. Concomitant studies included ENT evaluation (n=25) (abn n=20) (Table 4), and swallow study (n=14), 9 showing aspiration with 4 in PI.

Conclusion(s) To our knowledge this is the first report on the diagnostic value of inpatient PSGs in the NICU. AHI was moderate to severe in most infants (86%) and most often obstructive in nature (74%). Targeted interventions resulted in improvement in 87% of infants. PSGs, coupled with concomitant studies, are important in evaluating and guiding management of complex TI and PI with recurrent apnea B and DESATs.

Table 1: Primary Respiratory, Neurologic and Craniofacial Abnormalities Leading to Polysomnography

	Central Mean AHI (n=4)	Obstructive Mean AHI (n=9)
Initial Studies	21.2	54.2
Follow-up Studies	9.1	8.9

Table 2: Improvement in Apnea Hypopnea Index (AHI) for Patients with Follow-up Studies

Interventions	Patients (%)
Mandibular advancement surgery/ adjustment	7 (22.5)
CPAP or HFNC	4 (12.9)
Caffeine	4 (12.9)
Tracheostomy	4 (12.9)
O2 via NC	3 (9.6)
Supraglottoplasty	1 (3)
Tongue-lip adhesion	1 (3)
Reflux medication/formula change	1 (3)
No intervention	7 (22.5) [illegible]

Table 3: Interventions Following Polysomnography

Primary Diagnoses	ENT Finding
Craniofacial Abnormalities (n=15)	• Micrognathia (n=9) • Tracheal Sleeve (n=1) • Laryngomalacia (n=2) • Palatal collapse with glossoptosis (n=1) • Hypopharyngeal collapse with glossoptosis (n=1) • Choanal atresia and epiglottis with intermittent retroflexion/tracheal sleeve (n=1)
CNS Abnormality with hypotonia (n=3)	• Pooling of secretions with aspiration • Edematous epiglottis/arytenoids, general upper airway collapse • Pooling of secretions, hypotonia, glossoptosis.
Primary Respiratory in PI (n=2)	• Soft palate cleft edema of arytenoids, bronchomalacia • Arytenoid/vocal cord edema

Table 4: Abnormal ENT Findings

Abstract: 30

Placental pathology and MRI findings in infants with hypoxic ischemic encephalopathy following therapeutic hypothermia

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Background Hypoxic Ischemic encephalopathy (HIE) is associated with high mortality and adverse neurodevelopment. The placenta is a vital organ that when disrupted may lead to acute or chronic fetal stress. To date, few studies have assessed the relationship between placental pathology and early MRI findings among infants who underwent therapeutic hypothermia for HIE.

Objective The objective of this study was to determine the relationship between placental pathology and MRI abnormalities following therapeutic hypothermia.

Design/Methods This was a retrospective cohort study that included inborn infants born at a single regional delivery center who underwent therapeutic hypothermia for HIE. Initiation of therapeutic hypothermia was based on a clinical pathway with MRI performed in the first week of life. MRI was classified as either normal or abnormal as described by Weeke et al (Journal of Pediatrics, January 2018). MRI scoring was done by a pediatric radiologist masked to placental pathology which was abstracted from routine clinical evaluation. An abnormal admission white blood cell count (WBC) was considered < 5 or >40K/mm^3. Statistical analysis included Chi-Square, ANOVA and multivariable analysis using binary logistic regression.

Results The study sample included 85 infants; 31 infants had normal and 54 infants had abnormal MRIs. Infants with abnormal MRIs were of lower gestation, more likely to be male, born by Cesarean section and had a higher Apgar score at 5 minutes compared to infants with normal MRIs (Table). There were no differences in placental findings between groups (Table). After controlling for confounding variables gestational age (OR 1.35, 95% CI, 1.18-1.72), abnormal admission WBC (22.9, 3.09-53.81), vaginal delivery (12.9, 3.09-53.81), and male sex (4.4, 1.02-16.0) were independently associated with an abnormal MRI. None of the placental factors investigated were associated with abnormal MRI findings.

Conclusion(s) Within a cohort of infants receiving therapeutic hypothermia for HIE, pathologic placental findings were common. However, placental pathology was not associated with subsequent abnormal MRI findings. Earlier gestation, vaginal delivery, male gender, and admission WBC count were all independently associated with an abnormal MRI. While we cannot rule out an antecedent role for placental pathology in HIE, our data suggest that placental pathologic findings are not independently associated with subsequent abnormal MRIs.

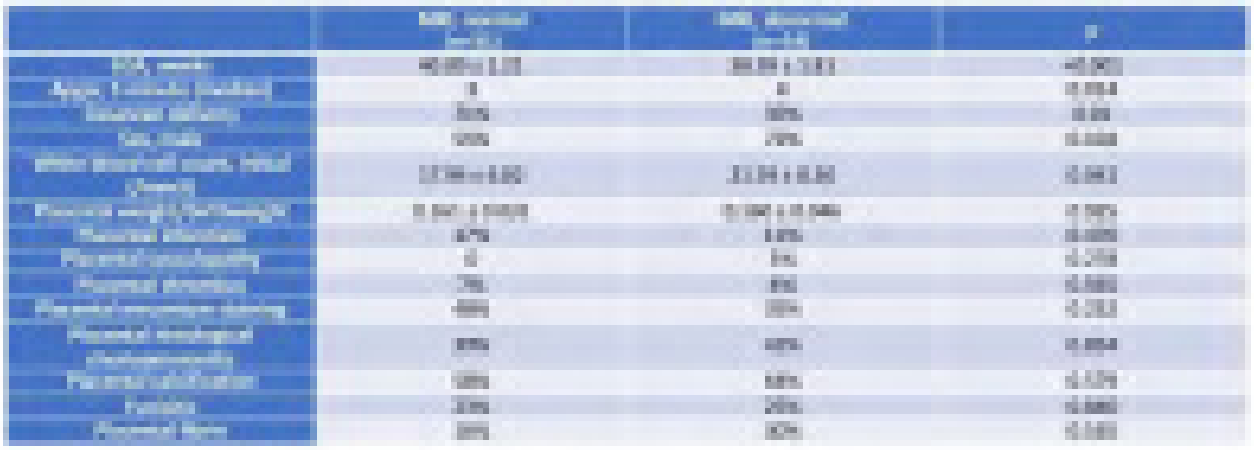

Table 1.

Abstract: 31

Predictors of Pharmacologic Treatment in Infants at Risk for Neonatal Abstinence Syndrome (NAS)

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Background The AAP recommends early and frequent assessment of newborns at risk for withdrawal symptoms (NAS) for a minimum of 3-7 days in the hospital. Few data are available to predict the need for pharmacologic treatment at the time of admission.

Objective To identify predictors of severity of withdrawal and requirement for pharmacologic treatment in infants at risk for drug withdrawal.

Design/Methods We conducted a cross sectional study of newborns >32 weeks gestation admitted to the NICU for NAS monitoring between April 2016 and October 2018. We excluded infants exposed only to marijuana, cocaine, or both. We abstracted maternal and infant demographics, drug exposure, maternal urine drug screen (UDS), infant UDS and meconium drug screen (MDS). Newborns were monitored for withdrawal using the Finnegan Neonatal Abstinence Scoring Tool. Three consecutive scores ≥ 8 triggered pharmacologic treatment.

Results Total of 97 newborns with drug exposure who met criteria were admitted during the study period. In addition to methadone and buprenorphine there was high rate of exposure to prescription opioids, benzodiazepines and multiple drug combinations. In multivariate regression analysis, positive infant UDS, exposure to methadone and buprenorphine were significant predictors of need for pharmacologic treatment in infants with NAS; gestational age and birth weight were not.

Conclusion(s) Exposure to long-acting opioids such as methadone and buprenorphine are significant predictors for need for pharmacotherapy in infants at risk for NAS in our patient population. Due to high rate of polydrug abuse, a study with larger

sample size is needed to determine the effect of various multiple drug combinations on the severity of withdrawal and the need for pharmacotherapy in infants with NAS.

Table 1. Multivariate Regression Analysis of Treated and Untreated Infants at Risk for NAS

	Odds ratio	95% CI	p
Maternal age (years)	1.11	0.98-1.26	0.09
Gestational age (weeks)	0.60	0.34-1.07	0.08
Birth weight (kg)	1.08	0.15-7.73	0.94
Maternal UDS +	1.83	0.28-11.82	0.53
Infant UDS +	7.21	1.50-34.68	0.01
Infant MDS +	1.72	0.35-8.39	0.50
Methadone	46.23	2.48-863.39	0.01
Buprenorphine	44.21	2.70-725.04	0.01
Oxycodone/other prescription opioids	4.25	0.57-31.53	0.16
Benzodiazepine	0.52	0.12-2.28	0.38
Phencyclidine	0.64	0.06-10.14	0.75
SSRIs	2.74	0.10-73.69	0.55
Marijuana	0.31	0.07-1.42	0.13
Cocaine	0.44	0.08-2.49	0.35

Table 1. Multivariate Regression Analysis of Treated and Untreated Infants at Risk for NAS

Abstract: 32

A Single-Center Case Series of outcomes of Extracorporeal Membrane oxygenation (ECMO) and Controlled Hypothermia (CH) in Neonates with Hypoxic Ischemic Encephalopathy (HIE) and Persistent Pulmonary Hypertension of the newborn (PPHN)

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Background Asphyxiated neonates with moderate to severe HIE and PPHN refractory to medical treatment, concomitant use of CH and ECMO can reduce mortality, however, available data on safety and associated morbidities is conflicting at best.
Objective To describe the characteristics and short term complications of neonates with HIE treated with CH and ECMO
Design/Methods Retrospective chart review of 12 neonates with HIE who underwent CH and ECMO therapies in our tertiary academic institution between 01/2011-05/2018.
Results Twelve neonates required combined ECMO and CH therapies (10% of CH group). One half of them required Veno-venous (VV) and the other Veno-arterial(VA) ECMO. One patient was placed on VV and transitioned to VA for cardiac support.
Confounding variables include culture-proven sepsis in 1 infant (8%) and pneumothorax in 6 infants (50%) .PPHN was the most common indication for ECMO secondary to meconium aspiration syndrome (MAS) in 58% of infants. Multi-organ

injury was variable with most of the patients exhibiting liver, kidney or heart injury. However, these indices recovered prior to ECMO de-cannulation and only 2 patients required continuous renal replacement therapy(CRRT) during ECMO.All neonates exhibited thrombocytopenia and abnormal coagulation profiles.

Five infants (40%) suffered moderate to severe coagulopathy resulting in 3 cases with intracranial hemorrhage (ICH), 1 with ICH and pulmonary hemorrhage and 1 had fulminant pulmonary hemorrhage.

Median(Md) length of hospital stay (LOS) was 41 days (Range: 21-92), excluding one mortality. LOS was significantly higher in VA with Md of 64 days (Range:21-92) vs. VV with Md of 30 days (Range:6-44).However ECMO run for VA was Md of 7 days (Range: 4-14) while VV was Md of 7.5 days (Range:6-8).While none of the infants required home oxygen or tracheostomy prior to discharge, 3 infants (25%) required gastrostomy tubes and another 2(15%) was transferred back with NG feeding for nutritional support and later from referral hospital were discharged with PO feeding.

Conclusion(s) Our case series illustrates that 90% of the neonates in this population benefited from combined CH and ECMO with some comorbidities including bleeding. ECMO remains a useful adjunct therapy in this population and can be fairly safely deployed with careful monitoring and aggressive restoration of hemostasis as a mainstay of therapy.

Characteristics of patients

Patient	Gestational age (weeks)	Birth Weight (grams)	Gender	Age at cooling (hours)	Age at Initiation ECMO (days)	Initial ph	Base deficit	Apgar 1 min	Apgar 5min	EEG seizure
1	40	3615	Male	2	1	6.95	13	1	1	Present
2	40	2590	Male	4	2	6.88	17	3	6	Present
3	41	4540	Female	5	2	6.97	18	2	3	Present
4	36	3170	Male	1	1	7.21	8	1	4	Absent
5	37	2431	Male	3	3	6.91	11	1	2	Absent
6	39	3400	Male	0.25	3	6.95	11	4	5	Absent
7	40	4000	Male	5	1	6.7	21	1	6	Absent
8	40	2912	Female	4	2	7.09	17	1	3	Absent
9	39	2815	Female	3	2	6.9	14	2	1	Absent
10	40	2816	Female	5	2	7.08	17	2	7	Absent
11	38	3993	Female	2	2	6.83	19.5	2	6	Absent
12	40	3290	Male	2	1	6.63	23	3	5	Present

Neonatal Outcomes

Patient	Initial Alanine transferase, units/L	Initial Aspartate transferase, units/L	Initial Troponin (ng/ml)	Initial Creatinine (mg/dl)	Number of Red blood cells transfusion	Number of Platelet transfusion	Number of Plasma transfusion	MRI findings
1	14	43	0.65	0.06	8	5	7	Unremarkable
2	48	174	0.83	0.05	1	2	1	Multicompartmental hemorrhage
3	51	195	0.93	0.2	1	2	6	Unremarkable
4	16	100	0.63	0.06	3	3	3	Grade II IVH

5	11	69	0.53	0.02	3	3	1	Subdural
6	16	45	0.58	0.06	5	3	1	Unremarkable
7	73	76	0.96	0.17	4	2	4	Unremarkable
8	25	101	0.83	0.06	2	5	2	Unremarkable
9	67	187	1.02	0.17	3	4	4	Unremarkable
10	44	125	0.72	0.12	6	4	10	Retro-cerebellar bleed with hydrocephalus
11	18	75	0,6	0.04	4	5	4	Small subdural
12	58	372	0.51	0	4	4	4	Unremarkable

Abstract: 33

Trends of Early Medication Usage in Extremely Low Birth Weight (ELBW) Infants, 2007-2017

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Background Evolving evidences regarding the efficacies and adverse effects of vitamin A (VitA), caffeine (CAF), dexamethasone (DEX), and indomethacin (INN) used early in life in ELBW infants have emerged in the past 2 decades. Inter-center variation in the use of these medications over time remains unknown.

Objective To examine 11-year trends in early medication use in ELBW infants among children's hospitals.

Design/Methods Pediatric Health Information System identified a retrospective cohort of ELBW infants (birth weight 500-999g with gestational age 24-28 weeks) admitted in 2007-2017. Additional eligibility criteria were listed in Table 1. Logistic regression was used to analyze the practice changes over time varying among hospitals by including the interaction term between years (in epochs) and hospitals, adjusting for patient-level characteristics such as demographics and need for mechanical ventilation.

Results 13591 (for VitA, DEX, CAF) and 13027 (for INN) ELBW infants from 36 hospitals met eligibility criteria. Table 2 showed the patient and hospital characteristics. There were statistically significant changes in the trends of VitA, CAF, and INN use over the 11-year period (Figure 1), both overall and within individual hospitals ($p<0.001$). The increasing use of VitA at the end of last decade was interrupted by a 3-year national shortage. 4 out of the 5 hospitals that currently use VitA had >70% use prior to the shortage (1 hospital had no prior data), however, 8 out of the 12 hospitals with >70% use prior to the shortage did not restart use. CAF adoption rate increased dramatically from 66% to 96% throughout the study period. INN prophylaxis had wide variation in use among hospitals. While the overall trend mildly decreased over the study period, 7 out of 27 hospitals had increased use of INN in 2017 compared to 2007. 2 hospitals had drastically decreased INN use (from >75% to <25% over the study period), and over half of the hospitals (22/36) did not use INN in 2017. There were no significant changes in DEX use, and overall usage remained low (<1%).

Conclusion(s) Changes in VitA, CAF, and INN usage rates over 2007-2017 are observed with significant variation among hospitals. Such variation was not associated with changes in hospital case mix, although VitA use was impacted by the 3-year shortage between 2011-2013. Future research is warranted to evaluate whether only a subgroup of ELBW infants would benefit (e.g. indomethacin) or whether current use is cost-effective (e.g. vitamin A) in the contemporary era.

Table 1: Eligibility Criteria for Study Cohort

Eligibility Criteria	VitA	DEX	CAF	INN
First admission year	2007-2017			
ELBW	BW 500 - 999g AND GA 24 0/7 - 28 6/7 weeks			
First admission	≤ 2 DOL			0 DOL
Length of stay	≥ 5 days			≥ 2 days
First use of medication	≤ 7 DOL			≤ 1 DOL

BW = birth weight, GA = gestational age, DOL = day of life.

Note: Hospitals that admit fewer than 10 ELBW infants in the first 2 DOL per year in the study period were excluded.

Patients without billing data <= 7 DOL (for VitA, DEX, CAF) or <=1 DOL (For INN) were excluded.

Table 1 Patient and Hospital Characteristics

	VLBW, BPD, DAH	BPD
PATIENTS, n	1068	1827
Birth weight, n (%)		
500-749g	346 (32.4)	320 (40.7)
750-999g	695 (64.7)	1196 (59.5)
Gestational age, n (%)		
24-28 weeks	367 (71.4)	1084 (71.4)
27-28 weeks	301 (28.6)	1072 (28.6)
Gender, n (%)		
Male	1054 (51.3)	1439 (48.7)
Female	1478 (50.4)	1588 (50.5)
Unknown	9 (0.3)	11 (0.3)
Race, n (%)		
White	1898 (32.5)	1588 (50.4)
Black	1889 (29.7)	1791 (29.3)
Asian	103 (3.3)	181 (3.2)
Other/Unknown	1518 (31.5)	1599 (31.5)
Ethnicity, n (%)		
Hispanic	1131 (25.7)	1909 (25.4)
Non-Hispanic	3559 (64.5)	4584 (63.8)
Unknown	1754 (25.3)	1771 (25.8)
Multiple gestations, n (%)	1236 (31.7)	2138 (34.4)
Congenital anomaly, n(%)	1450 (25.4)	1871 (24.7)
Age at first admission, n (%)		
0 DOL	1308 (30.6)	1887 (100.0)
1 DOL	804 (8.3)	n/a
1 DOL	346 (3.1)	n/a
Mechanical ventilation*, mean (s.d.)		
During first 3 DOL	1.168 (0.40)	n/a
during first 4 wks	n/a	0.679 (0.468)
Mortality at 3 months, n(%)	1208 (8.1)	1881 (3.1)
Medication use, n (%)		
dNA	3894 (36.3)	
NEI	764 (8.1)	
CAF	1348 (84.2)	
BPR		4146 (34.4)
NICHD NRN, n	32	
Associated with a NRN center†, n (%)	7 (21.9)	
Associated with a VLA trial site‡, n (%)	14 (31.9)	
Associated with a TPP trial site§, n (%)	7 (21.9)	
Region, n (%)		
Northeast	4 (12.1)	
Midwest	12 (33.3)	
South	10 (34.1)	
West	7 (18.4)	
Number of NICU/NICU pts, n (%)		
11-30	12 (33.3)	
31-50	10 (28.8)	
>50	10 (36.1)	
Approval of medication, n (%)		
dNA	30 (91.4)	
NEI	10 (63.5)	
CAF	30 (100.2)	
BPR	28 (77.8)	

NRN = Neonatal Research Network; VLA trial = Randomized Trial of Vitamin A Supplementation for Extremely Low Birth Weight; TPP trial = Trial of Prophylactic Indomethacin Prophylaxis in Preterm Infants.

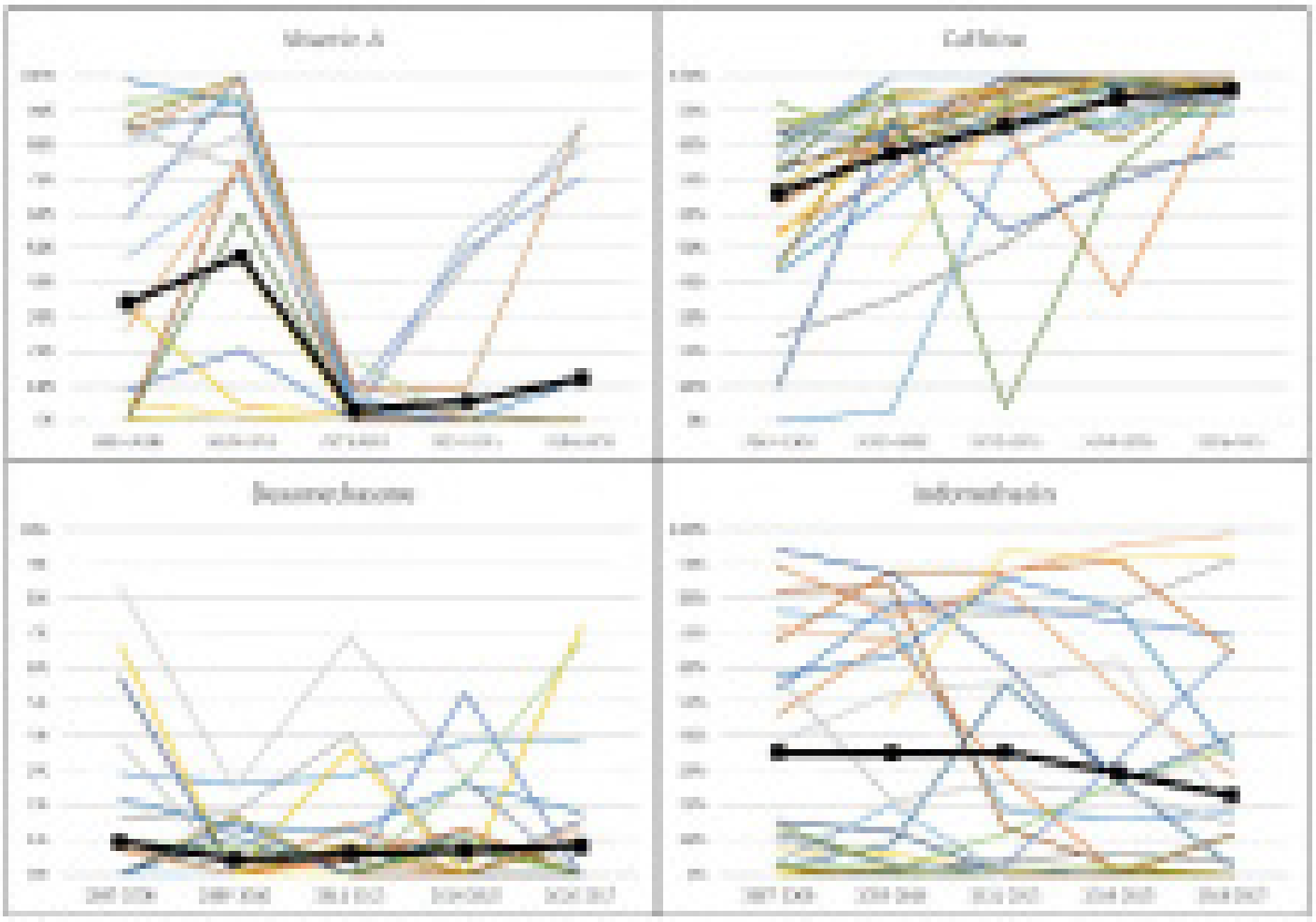
*Proportion of days on mechanical ventilation during first 3 DOL (for dNA, NEI, CAF) or during first 4 wks (for BPR).

†Hospitals that have the same academic affiliation with a current/past NRN center.

‡Hospitals that have the same academic affiliation with a VLA clinical trial site.

§Hospitals that have the same academic affiliation with a TPP clinical trial site.

Figure 1: Time Trends of Medication Use



Abstract: 34
Relationship of Cardiorespiratory Events to Gastroesophageal Reflux Episodes: Chicken or Egg First?
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Background Gastroesophageal reflux (GER) is common in preterm and term infants. While generally benign, it can cause significant morbidity in infants as well as prolong hospital stay. GER is frequently attributed to be a cause of cardiorespiratory events including apnea, bradycardia, or desaturations. It has been theorized that cardiorespiratory events could precede GER episodes. Multichannel intraluminal impedance with pH probe (MII-pH) is considered the gold standard for the evaluation of GER.
Objective To determine the temporal relationship between GER and cardiorespiratory events.
Design/Methods This is a retrospective data analysis of all infants who underwent MII-pH probe evaluation at Thomas Jefferson University Hospital from October 2009 to August 2018. Infants were referred for impedance studies by the primary team based on high clinical suspicion for pathologic GER. The impedance studies were reviewed and nursing report of cardiorespiratory events were then correlated with GER. Events were considered related to reflux if they occurred within two minutes of GER. The events related to GER were further classified based on occurrence of event before or after each GER episode.
Results 163 infants underwent MII-pH evaluation during the study period. Of these, 70 infants had nursing documentation of

apnea, bradycardia, or desaturation during their impedance study. A total of 3110 reflux episodes and 401 cardiorespiratory events (apnea 20, bradycardia 205, and desaturation 176) occurred during MII-pH probe evaluation. Only 64 reflux episodes (2.1%) were related to cardiorespiratory events. Of the related cardiorespiratory events, 27 (42%) occurred prior to reflux indicating that the GER could have been triggered by the cardiorespiratory event. There were no differences between numbers of events caused by acidic or non-acidic GER.

Conclusion(s) The overall correlation between GER episodes and cardiorespiratory events is low. Approximately half of the cardiorespiratory events occurred prior to GER episodes, suggesting that they may be the cause of GER.

Demographics.

	Infants with Reported Cardiorespiratory Events (n = 70)
Birth weight ± SD (g)	1576 ± 900
Gestational age (GA) ± SD (weeks)	31 ± 4.9
Corrected GA at study ± SD (weeks)	39.4 ± 3.6
Male gender (%)	41 (59%)
Black race (%)	35 (50%)
Reflux medication during study (%)	3 (4%)
Caffeine during study (%)	1 (1%)
Duration of study ± SD (hours)	21.8 ± 2.9

Data expressed in mean ± standard deviation.

Cardiorespiratory Events and Relation to GER.

Event Type	Number
Total Apnea	20
Apneas related to reflux	2 (10%)
Apneas before reflux	0
Apneas after reflux	2 (2 acidic, 0 non-acidic)
Total Bradycardia	205
Bradycardias related to reflux	32 (16%)
Bradycardias before reflux	13 (4 acidic, 9 non-acidic)
Bradycardias after reflux	19 (9 acidic, 10 non-acidic)
Total Desaturation	176
Desaturations related to reflux	30 (17%)
Desaturations before reflux	14 (8 acidic, 6 non-acidic)
Desaturations after reflux	16 (9 acidic, 7 non-acidic)

Abstract: 35

The Reliability of Oxi-pneumogram for the Diagnosis of Gastroesophageal Reflux in Neonates

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Background Gastroesophageal reflux (GER) defined as the passage of gastric contents into the esophagus is a common phenomenon in preterm infants and healthy neonates. But when the gastric contents cause troublesome signs or symptoms, it is called gastroesophageal reflux disease (GERD). The frequent coexistence of cardiorespiratory (CR) events (apnea, bradycardia, oxygen desaturation) and GER symptoms in infants gives the perception that there is association between these two events, and hence, has become the basis for the over-prescribing of antacid medications known to have significant adverse long term side effects in preterm infants. Therefore, many NICUs have adopted objective methods to diagnose GERD such as the multichannel intraluminal impedance (MII-pH) study. In the work up of evaluating infants with CR events, we use the non-invasive oxi-pneumogram and found a pattern which may help identify those patients that may benefit from MII-pH testing. We hypothesized that the oxi-pneumogram may be a surrogate that can reliably identify GER.
Objective To evaluate the reliability of the oxi-pneumogram in identifying infants with GER. We hypothesize that compared to the MII-pH study, the oxi-pneumogram can reliably identify infants with GER admitted to the NICU.
Design/Methods A prospective study of all neonates admitted to Stony Brook Children's Hospital NICU from December 2017 to present who were thought to have GERD and received an MII-pH study for the evaluation of GER. Oxi-pneumogram data was obtained at the same time as the MII-pH study and evaluated for a pattern consistent with GER. The study was approved by the Institutional Review Board. 54 subjects are needed for a sensitivity of ≥90% with a margin error of 15% and a specificity of ≥85% to demonstrate an alpha level of 0.05. Sensitivity and specificity will be used to evaluate the reliability of oxi-pneumogram.
Results 32 neonates weighing 650-4610g with gestational age 24-41 weeks were enrolled in the study since 12/2017 with a female to male ratio of 0.77:1. The sensitivity and the positive predictive values were 65% and 89% respectively of all patients but 80% sensitivity in those with CR symptoms.
Conclusion(s) Based on 32 recruited neonates, there is an increasing trend that participants with positive oxi-pneumogram for GER pattern are more likely to test positive for GERD on the MII-pH study.

Abstract: 36

Stewardship rounds and daily audits optimizes antibiotic utilization rates and decreases practice variation in an academic teritary care NICU

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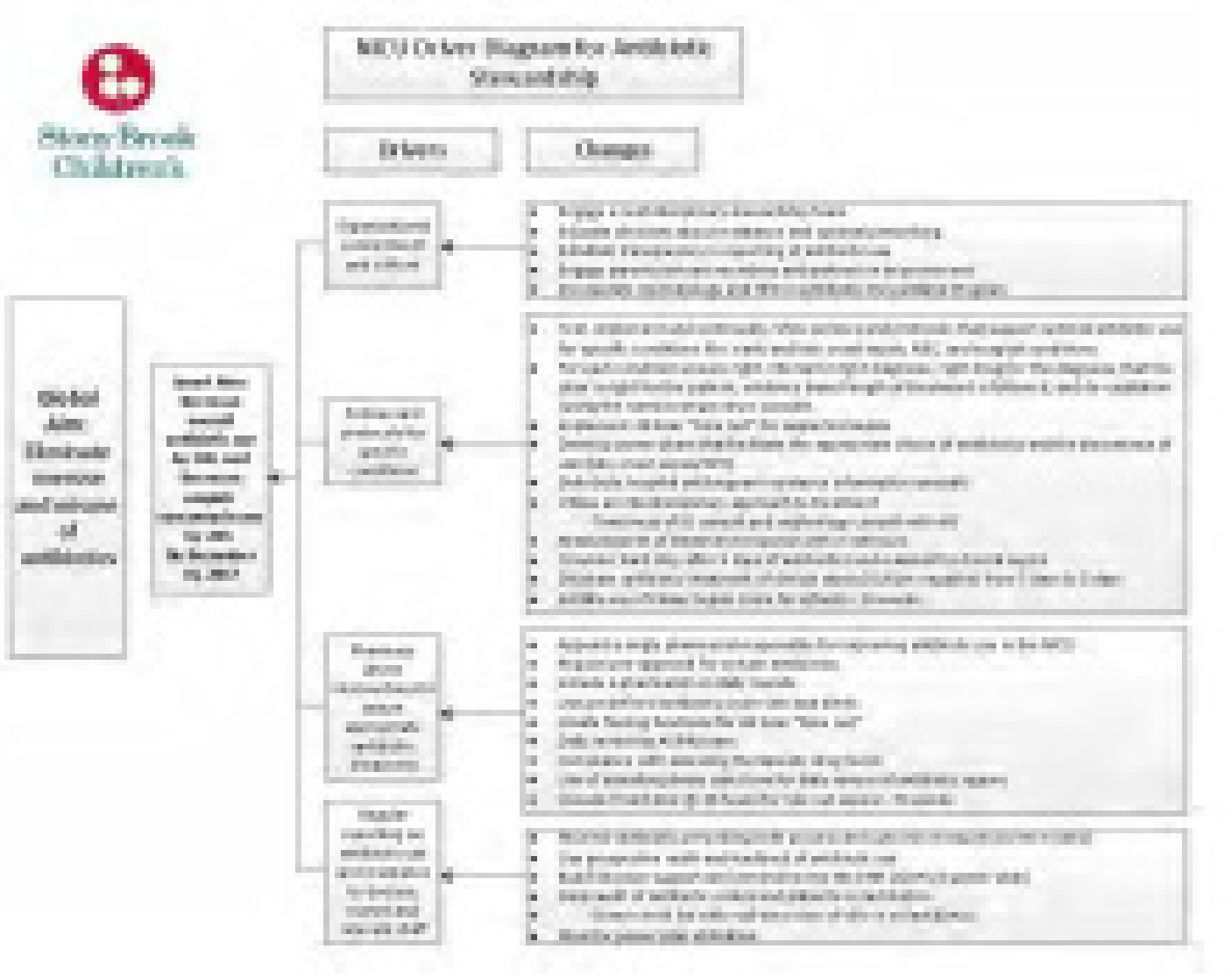
Background Antibiotic stewardship optimizes antibiotic use and reduces comorbidities. There are huge practice variations amongst caregivers regarding the choice and duration of antibiotic treatment in infants with culture negative early onset sepsis (EOS). Published guidelines lack evidence on the duration of antibiotic therapy for EOS or culture negative sepsis, thus its use is often left to the discretion of the caregiver.
Objective Decrease overall antibiotic use by 10% from January 2017 to December 2018. Decrease empiric Vancomycin use in NICU by 10 % from January 2017 to December 2018. Decrease empiric broad spectrum antibiotic use by 20% from January 2017 to December 2018
Design/Methods Antibiotic Stewardship team in the NICU (ASPIN) was convened in 2014 to minimize existing practice variations and improve prescribing attributes among caregivers. We joined a National collaborative in 2016 and established evidence based guidelines and best practices in improving our antibiotic utilization rates. A key driver diagram with bundles, PDSA cycles and prescribing guidelines were established with inputs from multidisciplinary team such as Infectious disease, nephrology, pharmacy, and medical teams. Daily audit reports were generated, which was incorporated into the daily rounds to enhance communication among team members, discussing the choice and duration of antibiotics. ASPIN had monthly meetings with feedback incorporated into future PDSA cycles.
Results Antibiotic usage rate (AUR) in 2015 was 500 per 1000 days in the pre-intervention period and declined to 430 per 1000 patient days in 2016 and further decrease to 404 per 1000 patient days in August 2017. Zosyn was preferred antimicrobial for NEC in 2016, but fell by 97% in 2017 with the new guidelines. Empiric Meropenam use fell to 0 in 2016 and 2017. Empiric Vancomycin use for late onset sepsis declined by 43% from January 2017 to August 2017. Additional data for 2018 is still in progress at the time of this abstract.
Conclusion(s) Incorporating daily audit reports into multidisciplinary rounds improves antibiotic use in our NICU. Guided treatment protocols minimizes practice variation with both choice and duration of antibiotic therapy. We decreased the use of broad spectrum antibiotics thereby decreasing the risk of antimicrobial resistance. Future directives include instituting hard stop at 36 hrs for early onset sepsis and use the EOS in decreasing antibiotic use in well appearing neonates admitted for choriomanionitis



Abstract: 37

Pneumocystis jirovecii (Pj) colonization in preterm infants

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Background Pneumocystis is a fungal respiratory pathogen causing opportunistic infections in immunocompromised hosts. Pj causes asymptomatic or mild respiratory illnesses, including pneumonia in immunocompetent hosts. Seroconversion occurs in most infants by 2 years of age and infants may be asymptomatic reservoirs of this pathogen. A recent study by Pilar Rojas suggested *Pj* colonization can be detected in 25 % of preterm nasal samples obtained at birth tested by nested PCR and could be a risk factor for developing RDS among preterms. Association of Pj and preterm medical complications is not well studied. In this study, I evaluated the prevalence of *Pj DNA* in preterm neonatal naso-oro pharyngeal archival swabs specimens from the PRISM study.
Objective 1. To determine prevalence of Pj in preterm infants samples and validate findings of previous published study using additional Pj nucleic acid targets. 2. Attempt to demonstrate trans placental passage of Pc in mouse models.
Design/Methods Single centered retrospective study of archival frozen naso-oropharyngeal swabs obtained from preterm infants <32weeks taken at birth, discharge and 1 year enrolled in the Prematurity and Respiratory Immune Systems and Microbiome (PRISM) study at URMC. 2 step nested PCR assays using both ribosomal primers which amplifies a portion of the gene, encoding the mitochondrial large subunit ribosomal RNA and 2. three sets of Surface Glycoprotein GpA specific primers (Degenerate, GpA1, GpA2) to three regions of GpA gene were used to detect presence of Pj in these preterm samples.
Results 90 samples from 30 babies at birth, discharge and 1 year did not show a consistent pattern of amplicons with ribosomal primers. Therefore confirmatory testing with (Degenerate, GpA1, GpA2) primers specific for Pj using confirmatory adult samples were developed which also did not detect the presence of Pj in these neonatal samples. Confirmatory gene sequencing of some of these amplicons demonstrated lack of homology to pneumocystis. Additionally, 2 sets of CB17 SCID pregnant Pc infected mice with 6 pups in each set, were studied to detect trans placental transmission. Pc was not detected in Pup lungs and placenta of each pup by silver staining or quantitative PCR with kexin primers specific for Pc.
Conclusion(s) Pneumocystis colonization could not be demonstrated in preterm newborns at birth. Additional studies are needed further to validate placental or air borne transmission of Pj in neonates.

Abstract: 38

Zika Virus Infection of the Human Placenta Across Gestation

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Background Zika virus (ZIKV) is a mosquito-borne and sexually transmitted *Flavivirus* that causes severe complications of pregnancy such as microcephaly and intrauterine growth restriction (IUGR). The recent epidemic of ZIKV in the Western Hemisphere has escalated into a public health crisis that affects our most vulnerable populations. Epidemiological studies have demonstrated that the greatest risk for birth defects from ZIKV occurs in the first trimester of pregnancy. Current evidence suggests that this is due to susceptibility of neuroprogenitor cells to ZIKV infection. However, there is a significant gap in our knowledge regarding the role of the human placenta in ZIKV infection during pregnancy. Importantly, our recent studies demonstrate that the susceptibility of the human placenta to the model RNA virus VSV is greatest during the 1st trimester.
Objective To determine whether the susceptibility of the human placenta to ZIKV infection varies across gestation. We hypothesize that the placenta is most susceptible to ZIKV in the 1st trimester.
Design/Methods Healthy placentas from uncomplicated pregnancies (6 from each trimester) will be collected for *in vitro* infection studies. Placental explants will be adapted to *in vitro* culture and then exposed to the Paraiba/2015 ZIKV strain. Mock infected explants will serve as negative controls. The explants will be cultured for up to 72 hours and the culture medium will be collected at 24, 48, and 72 hours to quantify the viral titers. The explants will also be evaluated by whole mount immunofluorescence (WMIF) to identify the specific placental cells infected by ZIKV, and assess placental pathology by examining expression of the apoptotic marker cleaved PARP. Hormone secretion will be monitored as a control for placental viability.
Results Our experiments to date were aimed to define the specific experimental conditions necessary to obtain optimal ZIKV infection of the placental tissues *in vitro*. Preliminary WMIF data (Figure 1) demonstrates staining for the ZIKV envelope protein (env) in a 22 week gestation placental explant after 72 hours postinfection. In contrast, no env staining was detected in a corresponding mock infected explant from the same 22 week gestation human placental tissue.
Conclusion(s) These preliminary results suggest that we can detect ZIKV infection in our model system.

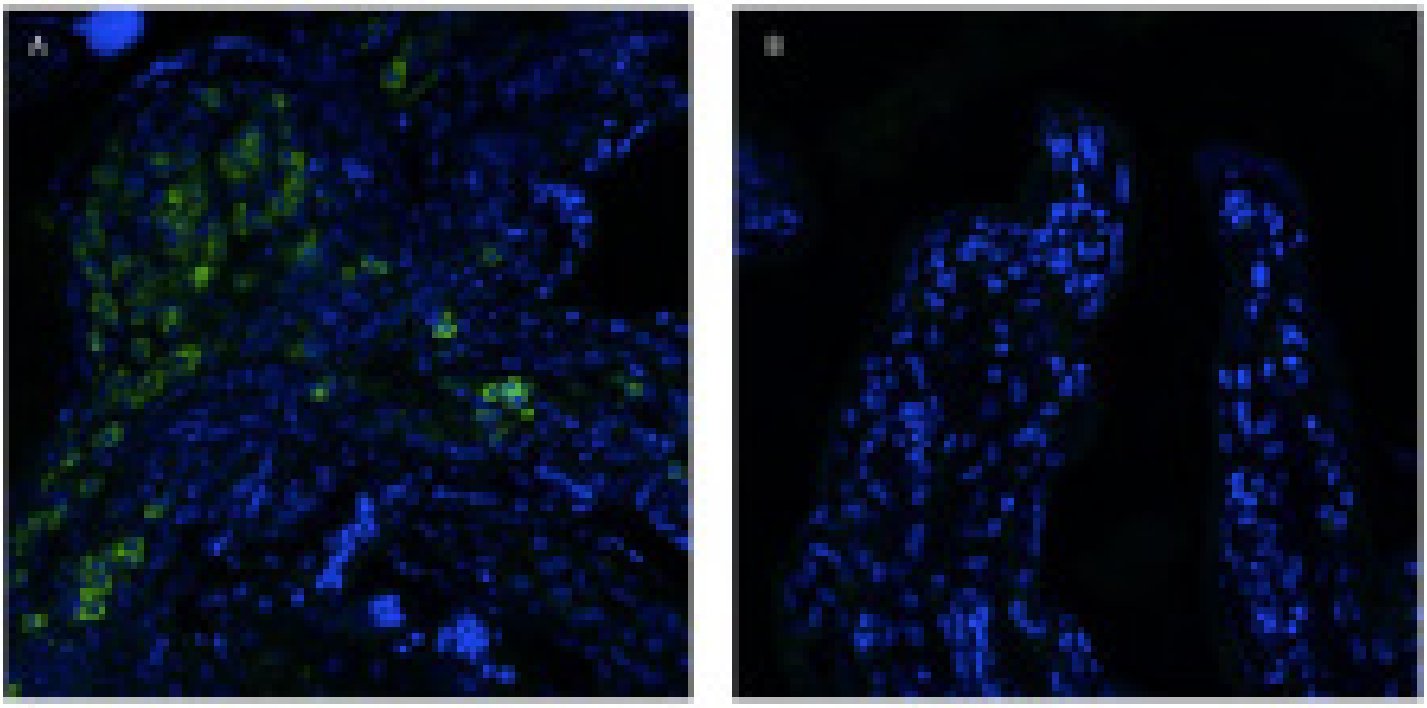

Figure 1: Second trimester human placental explants infected with the Paraiba/2015 strain of ZIKV (A) and mock infected (B). The placental explants were harvested at 72 hpi and subjected to WMIF using antibodies to 4G2 anti-pan-Flavivirus envelope protein (green). DNA was stained with DAPI (blue).

Abstract: 39

Pediatric SIRS and organ dysfunction criteria in late-onset sepsis in a quaternary NICU: a case-control study

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Background Current pediatric sepsis guidelines are based on Systemic Inflammatory Response Syndrome (SIRS) and organ dysfunction criteria. However, the diagnostic accuracy of these criteria has not been assessed in late-onset sepsis in Neonatal Intensive Care Units (NICUs), particularly in premature infants.

Objective Evaluate accuracy of SIRS criteria in identifying culture-proven late-onset neonatal sepsis. Assess prevalence of organ dysfunction and its relationship with SIRS criteria.

Design/Methods Retrospective case-control study of infants >72 hours old admitted to the Children's Hospital of Philadelphia (CHOP) level IV NICU between 1/1/2016-12/31/2017 who had sepsis evaluations (SEs: concurrent blood culture and antibiotics). Cases included infants who had SEs with positive blood cultures and antibiotic duration ≥7 days. Controls were matched by gestational and postmenstrual age (PMA), and had SEs with negative blood cultures and antibiotic duration ≤48 hours. We excluded infants <72 hours old, or if SE initiated outside the CHOP NICU or within 24 hours of admission. SIRS criteria were determined at time of SE, and organ dysfunction evaluated in the 72 hours after SE, as defined by the International Pediatric Sepsis Consensus Conference (fig. 1). Analysis included χ-square, Mann-Whitney, and summary statistics.

Results There were 77 case and 77 control SEs, with no crossover between groups (table 1). 42% of cases and 26% of controls met SIRS criteria at time of SE (p=0.06, table 2). Among infants ≤37 weeks PMA, SIRS criteria were met in only 17% of SEs (4/23 in both cases and controls). Test characteristics for SIRS in diagnosis of culture-proven sepsis were: sensitivity 42%, specificity 74%, positive predictive value 62%, and negative predictive value 56%. Cases met more SIRS criteria than controls (mean 1.42 vs 0.96, p=0.02); 6 SEs (all among cases) met all 4 SIRS criteria. Cases had higher rates of new organ dysfunction within 72 hours (40% vs 21%, p=0.01, table 2, fig.2); however, 58% of cases developing organ dysfunction did not meet SIRS criteria. Of 6 deaths (all cases with organ dysfunction), 2 did not meet SIRS criteria at SE.

Conclusion(s) SIRS criteria did not accurately identify culture-proven late-onset sepsis, with poorest accuracy in preterm infants. SIRS criteria did not predict later organ dysfunction or mortality. Novel risk assessment tools are needed to aid sepsis recognition and prediction of organ dysfunction, particularly in preterm infants who are at highest risk of infection.

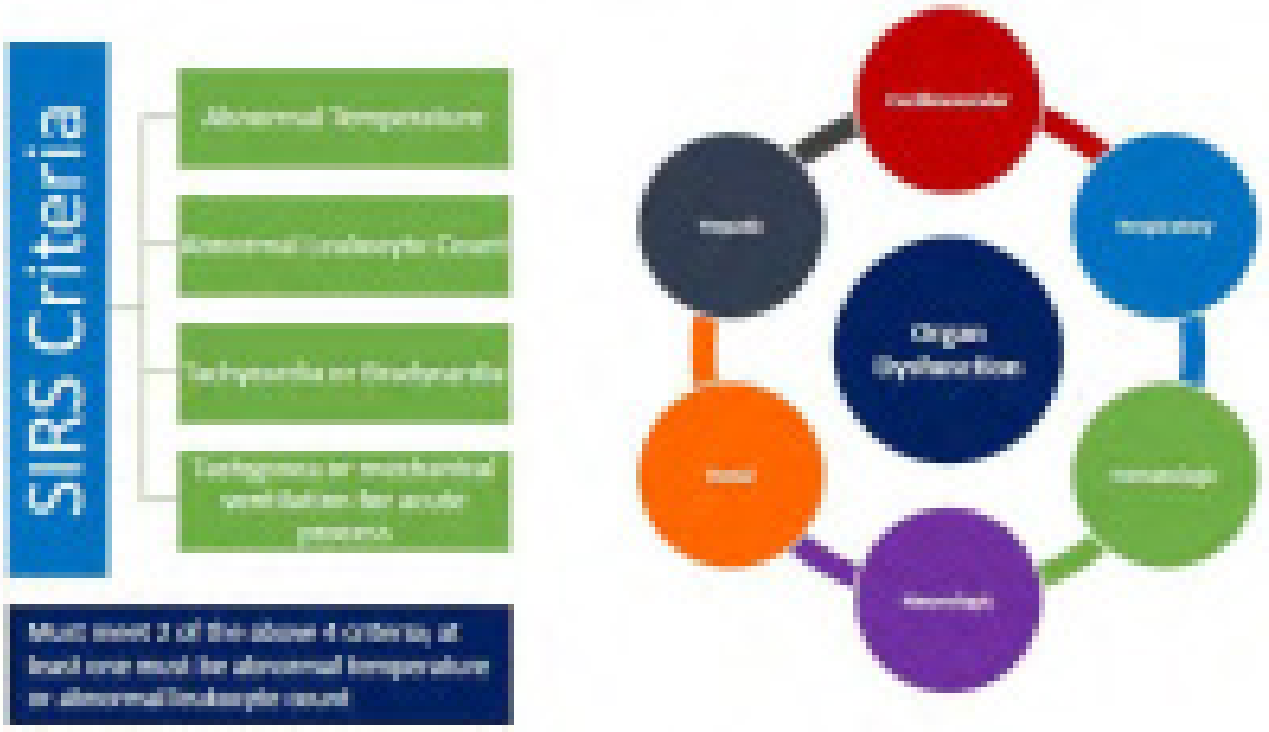
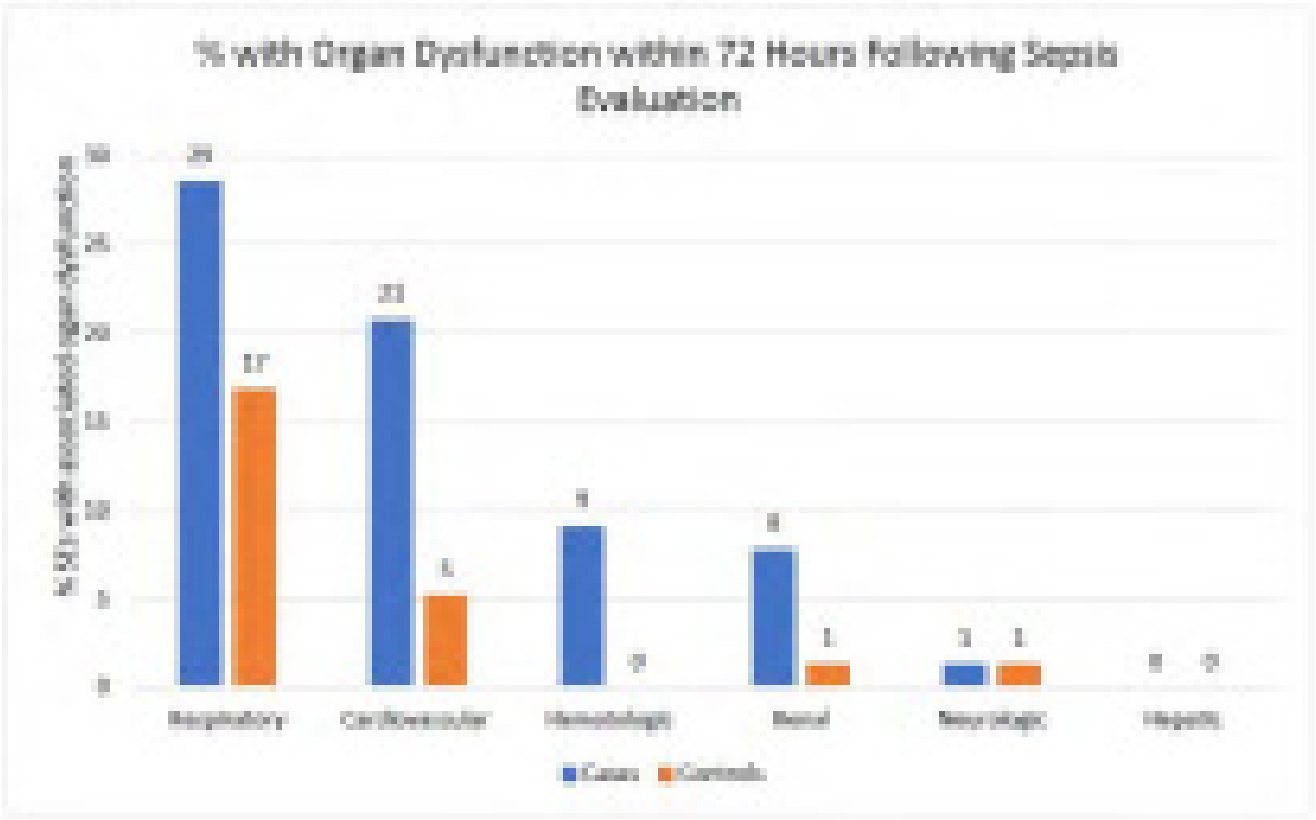

SIRS Criteria
Abnormal Temperature
Tachycardia or Bradycardia
Organ Dysfunction

Table 1: Study Demographics

	Cases	Controls	
	77 SIEs, 64 individual patients	77 SIEs, 77 individual patients	
Gestational Age	31 0/7 wk [23 0/7 – 40 0/7 wk]	30 5/7 wk [24 0/7 – 39 5/7 wk]	p=0.58
Corrected Gestational Age	40 2/7 wk [33 5/7 – 88 0/7 wk]	40 3/7 wk [37 1/7 – 82 5/7 wk]	p=0.76
% <37 weeks corrected gestational age	30%	30%	
Birth Weight	1358 g (450 – 4521 g)	1220 g (490 – 4400 g)	
Weight at time of event	3438 g (550 – 11300 g)	3380 g (720 – 9300 g)	
% male	52%	62%	
Race	39% white 27% black 35% other	45% white 17% black 27% other	

Table 2: Sepsis classification as per IPSCC guidelines

	Cases	Controls
SIRS + organ dysfunction	14/77 (17%)	4/77 (5%)
SIRS-only, no organ dysfunction	19/77 (25%)	16/77 (21%)
No SIRS, no organ dysfunction	32/77 (35%)	45/77 (58%)
No SIRS, + organ dysfunction	18/77 (23%)	12/77 (16%)



Abstract: 40
Screening CBC and CRP in late preterm and term neonates born to mothers with clinical chorioamnionitis.
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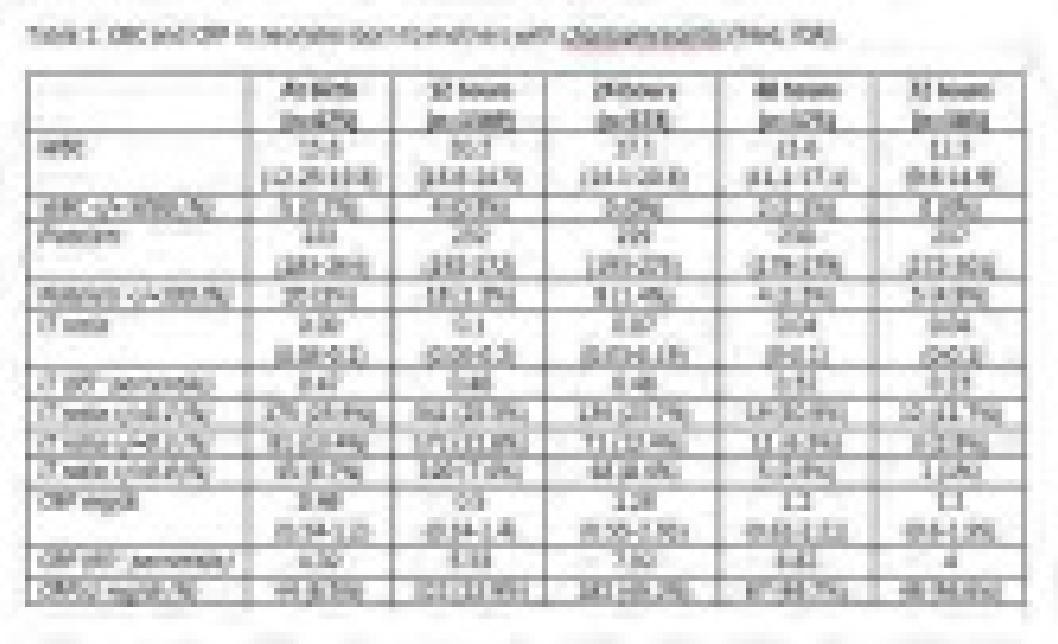
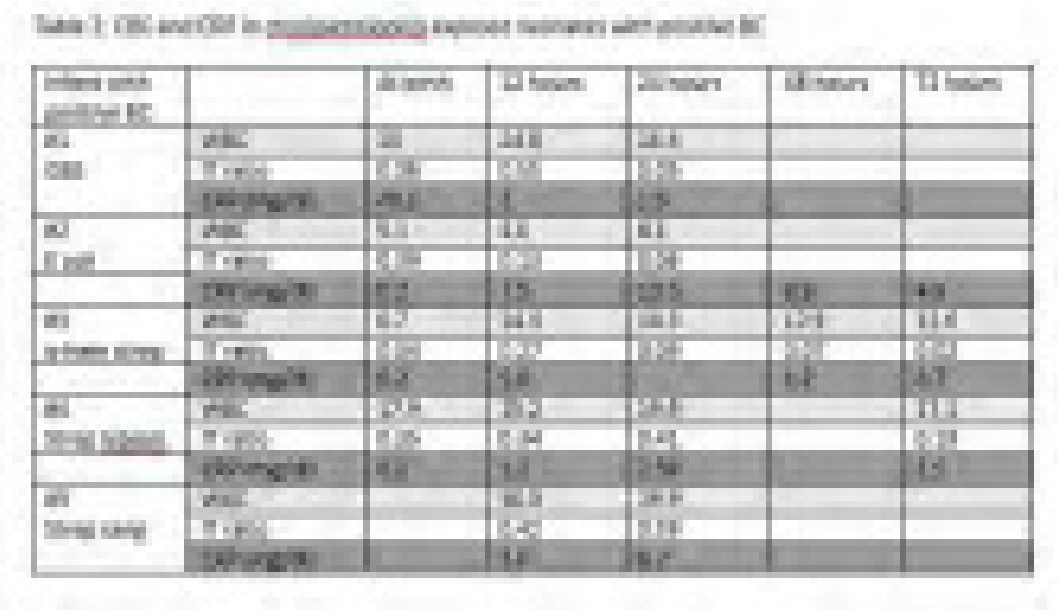
Background Chorioamnionitis is a major risk factor for early onset neonatal sepsis (EOS). Screening CBC and CRP is routinely performed in neonates born to mothers with clinical chorioamnionitis. The Committee on the Fetus and Newborn (COFN) does not recommend prolonging antibiotics course in asymptomatic neonates born to mothers with clinical chorioamnionitis with abnormal CBC or CRP but negative blood culture. However, we have recently reported that 44% of neonatal providers will treat healthy-appearing neonates born to mothers with chorioamnionitis with a prolonged course of antibiotics solely for abnormal CBC or CRP (Ayrepetyan AJP 2018).
Objective To determine the prevalence of abnormal CBC and CRP in neonates born to mothers with clinical chorioamnionitis and generate normative data in this sub-group of infants with increased risk of EOS.
Design/Methods This is a retrospective study on infants born between November 2006 and October 2018 at ≥ 35 weeks gestation and exposed to maternal chorioamnionitis. Abnormal IT ratio was determined as ≥ 0.2 and abnormal CRP > 1mg/dl. Infants' screening CBC and CRP at various postnatal time points were determined and compared with regard to maternal GBS status and prolonged rupture of membrane (≥ 18 hours).
Results This study included 1370 infants, with 1349 infants (98.5%) having CBC and CRP data obtained at 12 hours of life (HOL). CBC parameters and CRP over first 72 hours after birth is depicted in Table 1. Approximately 25% infants had abnormal IT ratio and 24% abnormal CRP at 12 hours of age. The 75th and 95th percentiles for IT ratio and CRP at 12 hours were 0.2 and 0.46 and 1.4 mg/dl and 5.3 mg/dl, respectively. Within this cohort, only 5 infants (0.36%) had culture EOS, all of them had abnormal CBC or CRP at 12 hours of age.
No significant differences existed between infants exposed to prolonged ROM versus no prolonged ROM and GBS colonization versus no GBS colonization with regard to values of WBC, median I/T ratio, platelets, or CRP at 12 HOL.
Conclusion(s) Approximately 25% of infants born to mothers with clinical chorioamnionitis have abnormal IT ratio and CRP

at 12 hours of age. The normative data generated in this cohort can be used to define abnormal CRP and CBC parameters in neonates born to mothers with clinical chorioamanionitis.





Abstract: 41

The role of antibody in Group B Streptococcus intestinal colonization and late-onset disease.

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Background *Streptococcus agalactiae* (Group B *Streptococcus*, GBS) is an important cause of late-onset (LO) neonatal sepsis in newborns. Though the pathogenesis of LO GBS sepsis is poorly understood, intestinal colonization is a critical precursor. We have developed a novel murine model of LO GBS infection that closely recapitulates the human disease state in which GBS first colonizes the newborn gastrointestinal (GI) tract and then transverses intestinal barriers to cause invasive disease. This model provides a platform to determine the role of circulating antibody in eradication of GBS from the GI tract and in the

prevention of LO infection.

Objective To determine the role of serum antibody in the clearance of intestinal colonization and the impact of specific immunization strategies on LO infection.

Design/Methods C57BL6/J mice age 11-12 days were gavaged with GBS (serotype III, 1x10^8 cfu/ml) or an equivalent volume of PBS to examine the serum antibody response to intestinal colonization. Mice were euthanized 20 days after exposure and serum anti- GBS IgG levels determined by ELISA. In a separate cohort, dams were given an intranasal whole-cell killed GBS vaccine or sham control (adjuvant only) on pregnancy days E13-E14. Serum was collected from dams and delivered pups to assess vertical transmission of anti-GBS antibody. A final cohort of pups delivered to dams that received GBS or sham vaccine were gavaged with GBS on DOL 11-12 and monitored for mortality and morbidity. Serial fecal sampling was conducted to determine duration of GBS intestinal colonization.

Results Intestinal colonization with GBS induces an endogenous antibody response with detectable serum anti-GBS IgG titers at dilutions of 1:100 and 1:1000 when compared to sham infected animals (p = 0.036, Figure 1). Maternal vaccination with whole cell GBS induces production of GBS-specific IgG in dams that is vertically transmitted to pups as determined by ELISA (median OD, P< 0.05, Figure 2 and 3). There was no significant difference in mortality (Log-rank, p= 0.726, Figure 4) or duration of colonization at 24 days post exposure (21% sham vs 33% GBS vaccinated, Chi-square p= 0.447) between pups born to GBS versus or sham vaccinated dams.

Conclusion(s) There is an endogenous IgG response to intestinal colonization with GBS in pups. Maternal vaccination with whole cell GBS vaccine elicits production of GBS-specific IgG in dams with subsequent vertically transmission to pups but did not confer protection against sustained GBS colonization or invasive LO disease.

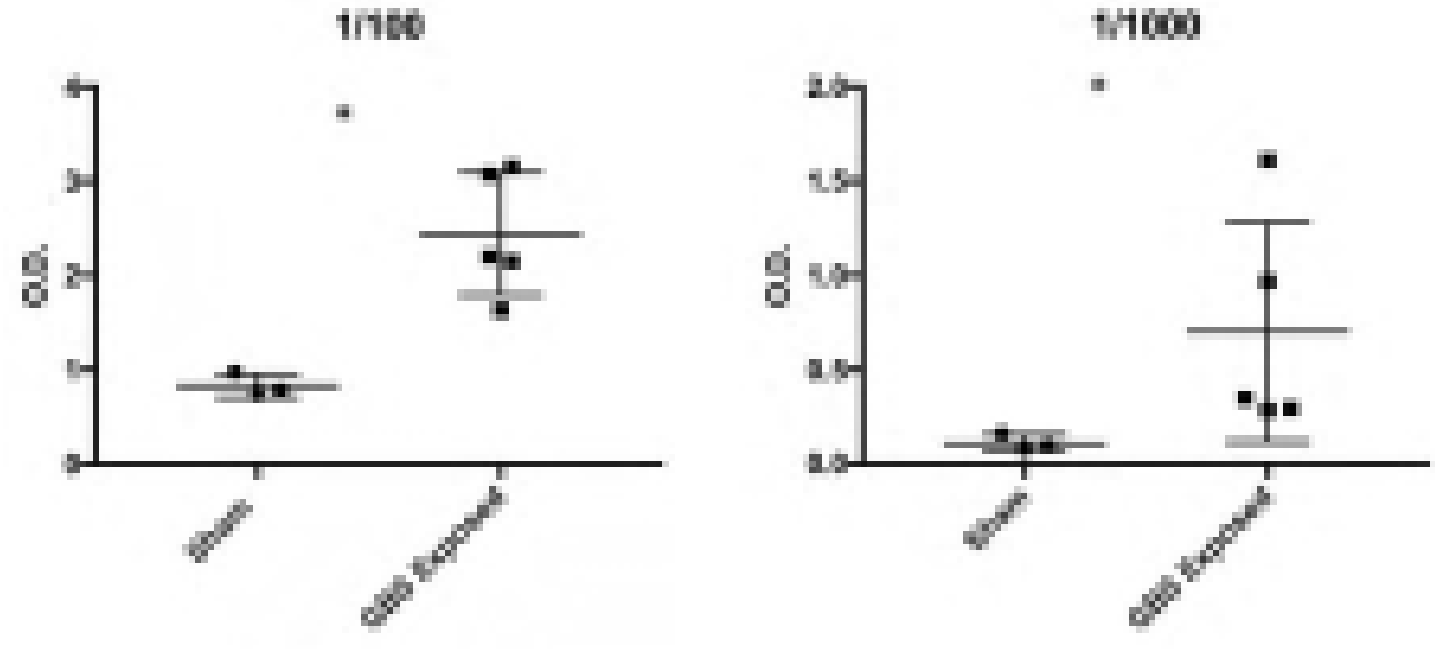

Figure 1: Serum anti-GBS IgG ELISA optical densities (O.D.) following gavage administration of GBS on day of life 11-12.

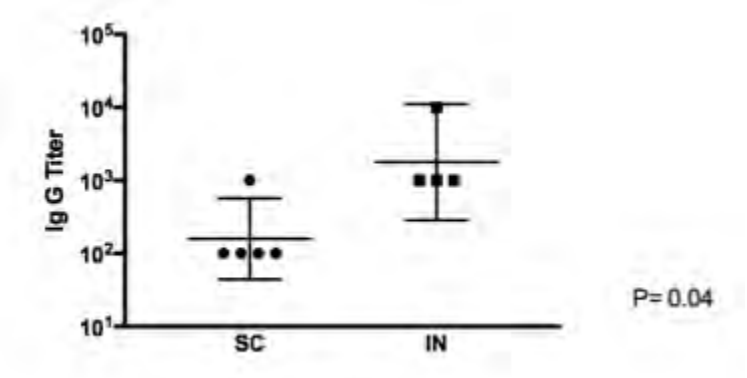

Figure 2: Anti-IgG specific titers (geographic mean with 95% CI) in pups following maternal immunization (O.D. = optical density, pre = prior to immunization, post = 18 days post immunization)

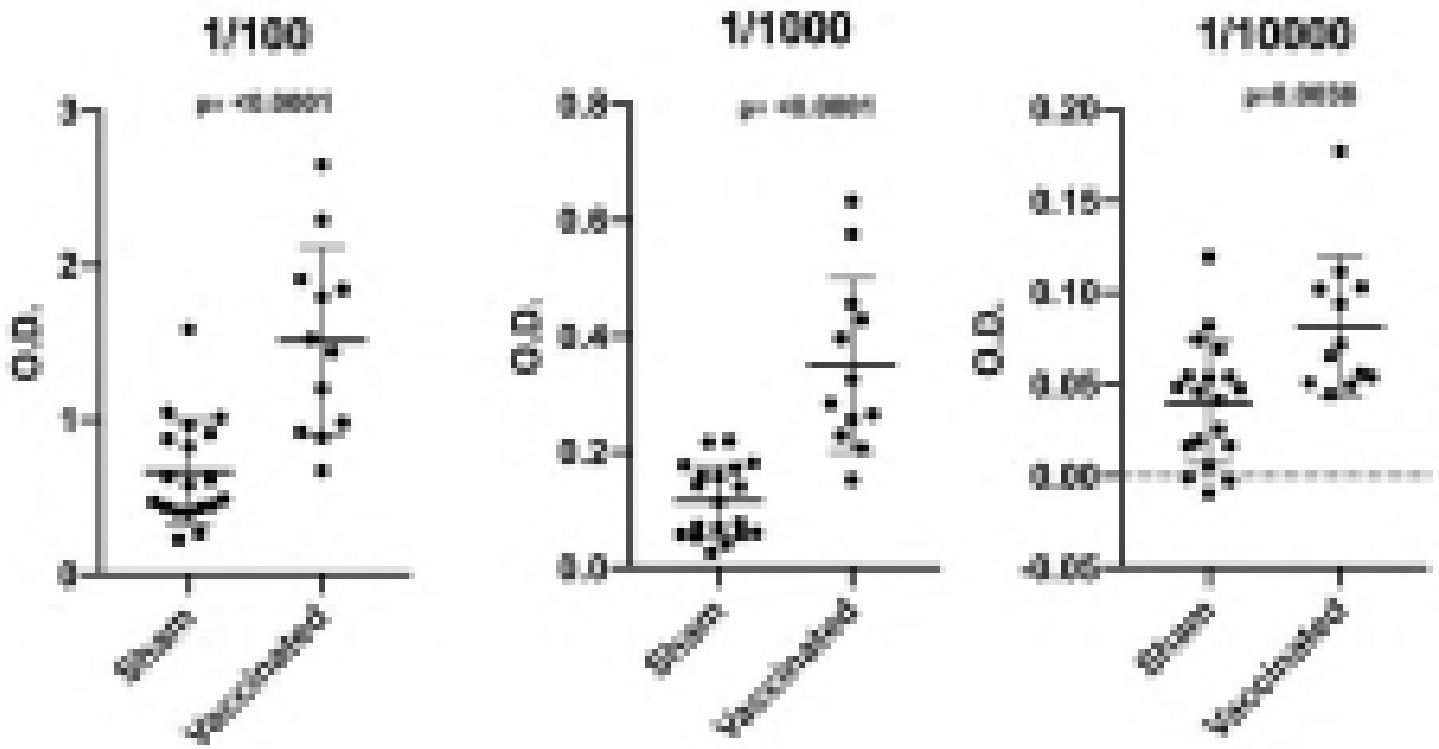

Figure 3: Anti-GBS IgG ELISA median optical densities (O.D.) of pups born to sham vaccinated and whole cell GBS vaccinated dams.

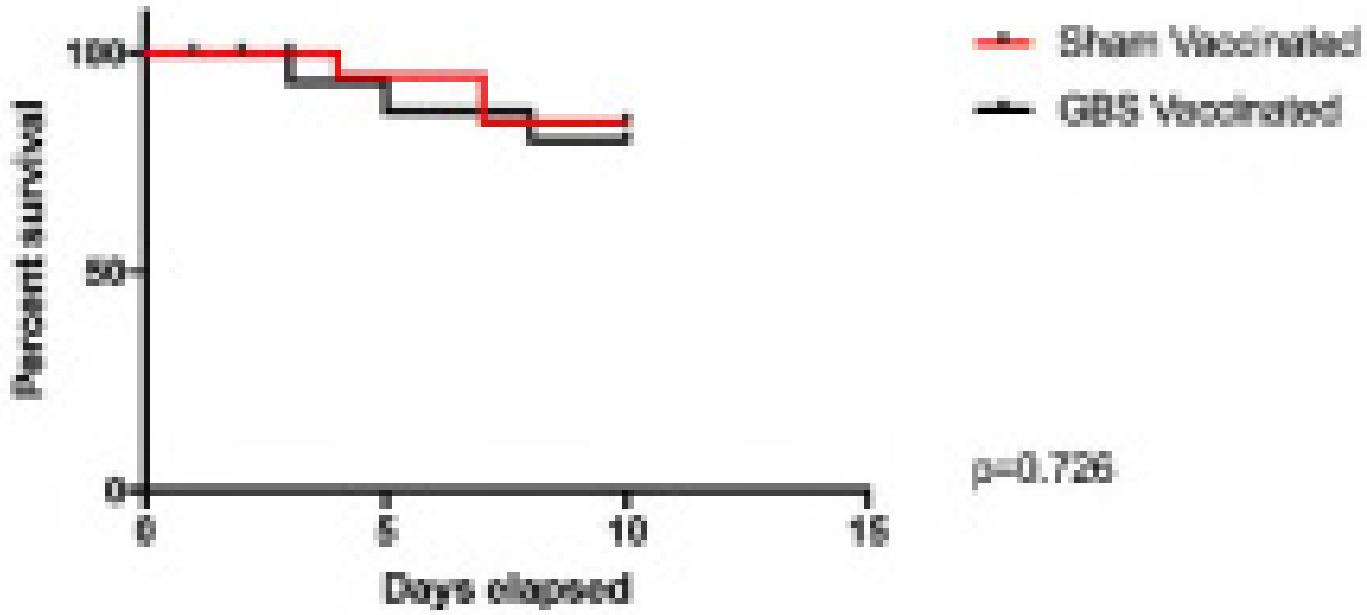

Figure 4: Survival of pups born to GBS vaccinated and sham vaccinated dams.

Abstract: 42

The Relative Effect of Severe Hypoxia versus Hyperoxia on Apoptotic Proteins in the Cerebral Cortex of Newborn Piglets

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Background Previously, we showed in the cerebral cortex of the newborn piglets that Caspase 3 and 9 increased following severe hypoxia and hyperoxia but at different magnitudes. BAD and Bax proteins are regulators of programmed cell death and cell survival in compliance with BcL2 protein. We have previously shown that hypoxia results in an increase expression of both BAD and BAX proteins. Increased expression of both BAD and BAX proteins has also been demonstrated following prolonged hyperoxia.

Objective The present study aims to assess the relative effect of severe hypoxia induced expression of BAD and BAX proteins compared to prolonged hyperoxia induced expression.

Design/Methods Anesthetized, ventilated piglets (3-5 days old) were grouped into hypoxia (n=36) and hyperoxia (n=35) and compared to respective normal controls. Hypoxia was induced by decreasing FiO2 to 0.07 for 1 hr. Hyperoxic piglets were exposed to an FiO2 of 1.0 for 1hr maintaining a PaO2 of 400mmHg. Neuronal nuclei were isolated and probed with Bax and BAD antibodies. Protein bands were detected by enhanced chemiluminescence, analyzed by imaging densitometry and expressed as absorbance (ODxmm^2). ATP and phosphocreatine were determined biochemically to document cerebral energy status.

Results ATP levels (mmole/g brain) in hypoxia were 4.3 ±0.2 in Nx and 1.42 ±in Hx. PCr levels (mmole/g brain) in hypoxia were 3.8 ±0.3 in Nx and 0.9 ±0.2 in Hx. ATP in hyperoxia were 4.7 ±0.3 in Nx and 4.9 ±0.4 in Hyx. PCr levels in hyperoxia were 4.1 ±0.3 in Nx and 4.0 ±0.4 in Hyx. In hypoxia, BAD protein expression increased from 106.7 ±7.2 in Nx to 160.8 ±26.8 in Hx. The Bax protein expression increased from 101.5 ±14.5 in Nx to 141.3 ± 14.7 in Hx, an increase of 33% and 38% respectively. In hyperoxia, BAD expression increased from 126.5 ±6.7 in Nx to 202.5±9.8 in Hyx and Bax expression increased from 122.8 ±10.8 in Nx to 199.8 ±14.4 in Hyx, an increase of 37% and 39% respectively.

Conclusion(s) The data show that upregulation of the BAX protein during 1 hour of hyperoxia is comparable to the resulting upregulation of BAX protein during severe hypoxia. While the mechanism following hypoxia is due to severe depletion of cerebral energy and thus stimulation of the apoptotic cascade the mechanism of upregulation following hyperoxia may be due to the production of free radicals despite unchanged energy levels.

Abstract: 43
The Underrepresentation of Individuals with Special Needs in Mainstream Parenting Magazines
Nikita Sood, Miriam Singer, Ruth Milanaik
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Background Parenting magazines, read by millions of individuals each year, are an important source of guidance for caregivers and significantly impact the way in which caregivers navigate issues related to child-rearing. Over the past ten years, these magazines have made strides in the areas of racial and gender diversity. However, no research to date has examined whether influential parenting magazines have also diversified to increase the representation of individuals with special needs.
Objective To analyze the portrayal of individuals with special needs in mainstream parenting magazines.
Design/Methods The two parenting magazines with the highest circulation in 2016, *Parents* (2.22 million) and *FamilyFun* (2.12 million) were chosen. For each magazine, 10 issues published between August 2016 and April 2018 were randomly selected for analysis. Visual depictions of adults and children in the images found in these issues were identified and evaluated for race, gender, adult activity (childcare, child play, child supervision, no child interaction), and an identifiable special need. Two independent researchers coded the data and inter-rater reliability was established.
Results In total, 2,487 images were analyzed containing 1,561 children and 857 adults. Only a very small minority (1.4%, n=22) of the children and an even smaller percentage (0.4%, n=3) of the adults appeared to have special needs. The majority (86.4%, n=19) of the children with special needs depicted were white and the majority (86.4%, n=19) were male. In total, 31.8% (n=7) of images depicting children with special needs were associated with the same single feature specifically about disabilities. Of adults with special needs, 66.7% were white (n=2) and 66.7% were male (n=2). None were shown performing childcare or child supervision activities.
Conclusion(s) Individuals of all ages with special needs are significantly underrepresented in popular parenting magazines, despite 6.2% of U.S. children ages 5-15 identifying as special needs and 20% of U.S. adults ages 16-64 identifying as such. Moreover, many of the depictions of children with special needs were associated with an article specifically focused on disabilities, further isolating this population instead of normalizing them. While companies such as Target have made a concerted effort to include individuals with special needs in their marketing, it is important that parenting magazines similarly increase and diversify their representation in order to be inclusive of all children and their caregivers.

Abstract: 44
The Resurgence of the Wet Nurse
Nikita Sood, Ruth Milanaik
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Background The last few years have seen a rise in informal milk sharing among breastfeeding mothers who are able to connect online to buy and sell their breast milk. Though this practice is discouraged by the medical community due to safety concerns, milk sharing is not a new phenomenon. In order to understand the motivations for milk sharing and encourage safe practices, we must first examine the origins and historical significance of milk sharing.
Objective To understand the history of milk sharing.
Design/Methods Scholarly literature regarding the history of infant feeding, wet nursing, and milk sharing were reviewed.
Results Practices of milk sharing can be traced to 2000 B.C., when wet nurses would breastfeed a child that was not biologically their own. At this time, wet nurses played a vital, lifesaving role in feeding infants who had no alternative form of nutrition if their mother could not provide enough breastmilk herself. Wet nursing evolved into a well-regulated profession, with laws and contracts that governed its practice, including a requirement for completion of a medical examination before being registered. Though commonplace, wet nursing did also face widespread criticism from those concerned about its effect on the mother-infant bond as well as the risk of disease transmission (exacerbated by the low socioeconomic status of many wet nurses). Despite these objections, the lack of hygienic bottles, suitable infant formula, and proper food sterilization techniques (to allow for storage of breastmilk) left feeding via wet nurse as the only safe alternative to a mother's own breastmilk for centuries. It was not until these inventions in the 18th and 19th century—combined with society's historical distrust of wet nurses—that wet nursing fell out of popularity.
Conclusion(s) Milk sharing is a practice that has been around for centuries. Wet nursing was considered the safest and most popular alternative form of nutrition until further options were invented, leading to the eventual decline in the profession. Now, society is seeing a resurgence in milk sharing practices through women with an oversupply who are storing extra breast milk and selling it. Unlike wet nursing, however, these interactions often take place away from the regulations and medical examinations that once kept this practice relatively safe. Physicians must understand the history of milk sharing—the

important role it once played and its previous status as a well-regulated profession—in order to best advocate to patients and to policymakers for safer sharing practices and regulations.

Abstract: 45

Seeking Support: Internet Habits of Parents during their NICU Infant's Stay

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Background Research has shown that people are turning to the Internet as a source of medical information. Parents of infants in the Neonatal Intensive Care Unit (NICU), specifically, are using the Internet to research their infant's health status. However, it is unknown what impact this may have on parental stress/confidence in their child's health care professionals (HCPs) and whether HCPs are being informed of this use of online medical information.
Objective To explore the impact of Internet use on NICU parents' confidence in their child's HCPs and overall stress.
Design/Methods Parents of NICU graduates participated in a 15 minute semi-structured interview during routine NICU follow-up visits. Interviewers asked parents to report frequency of: (1) Internet use to obtain information about their child's health, (2) discussion of online information with HCPs, (3) online information conflicting with HCP recommendations, and (4) believing online information more than HCPs (5-point Likert scale;1=Never to 5=Always). Parents were also asked the effect that the Internet had on their overall stress and on their confidence in HCPs (1=A lot less to 5=A lot more) as well as whether they would recommend that other NICU parents use the Internet during their stay, followed by demographic questions.
Results Of the 26 respondents (65.4% female, 42.3% white), 66.7% (n=16) reported using online search engines to inquire about their NICU infant's health. On average, those who used the Internet did so "Sometimes" to "Very Often" (mean=3.5) and discussed this online information "Sometimes" to "Very Often" with HCPs (mean=3.4). Though this online information reportedly "Rarely" conflicted with information from HCPs (mean=2.1) and was "Rarely" believed more than HCPs (mean=1.7), the online information did make parents feel slightly more stressed (mean=2.8) but more confident in their infant's HCP (mean=3.7). However, only 43.8% of those who reported using the Internet to obtain health information about their NICU baby said that they would recommend that other NICU parents utilize similar resources.
Conclusion(s) While the majority of parents used the Internet to research their NICU infant's health conditions, less than half of these parents recommended that other parents do so. These results, combined with the reported increase in stress, indicate that parents of NICU infants were generally negatively impacted by information found on the Internet and HCPs in NICUs should consider proactively addressing the Internet use of NICU parents and its potential effects.

Table 1: Average Ratings by Respondents for Questions about Internet Use in NICU

Interview Question	Average Response Rating (out of 5)
How frequently did you use Google (or other search engines) to learn more about your baby's health status while your baby was in the NICU?	3.5
When your baby was in the NICU, obtaining online medical information about your baby's health status made you feel: (1 for more stressed to 5 for less stressed)	3.8
How often did you discuss the medical information you obtained online with your baby's health professionals while your baby was in the NICU?	3.4
How frequently was the information you obtained online about your baby's health status different than the information given to you by health professionals)?	2.1
How often did you believe the information you received online more than you believed your baby's health professionals)?	1.7
How did the information you received online make you feel about your baby's health professionals)? (1Much more confident in health professionals to 5much less confident in health professionals)	3.7

Average Ratings by Respondents for Questions about Internet Use in NICU

Abstract: 46
Sirenomelia and Maternal Chlamydia Trachomatis Infection: Could there be an association?
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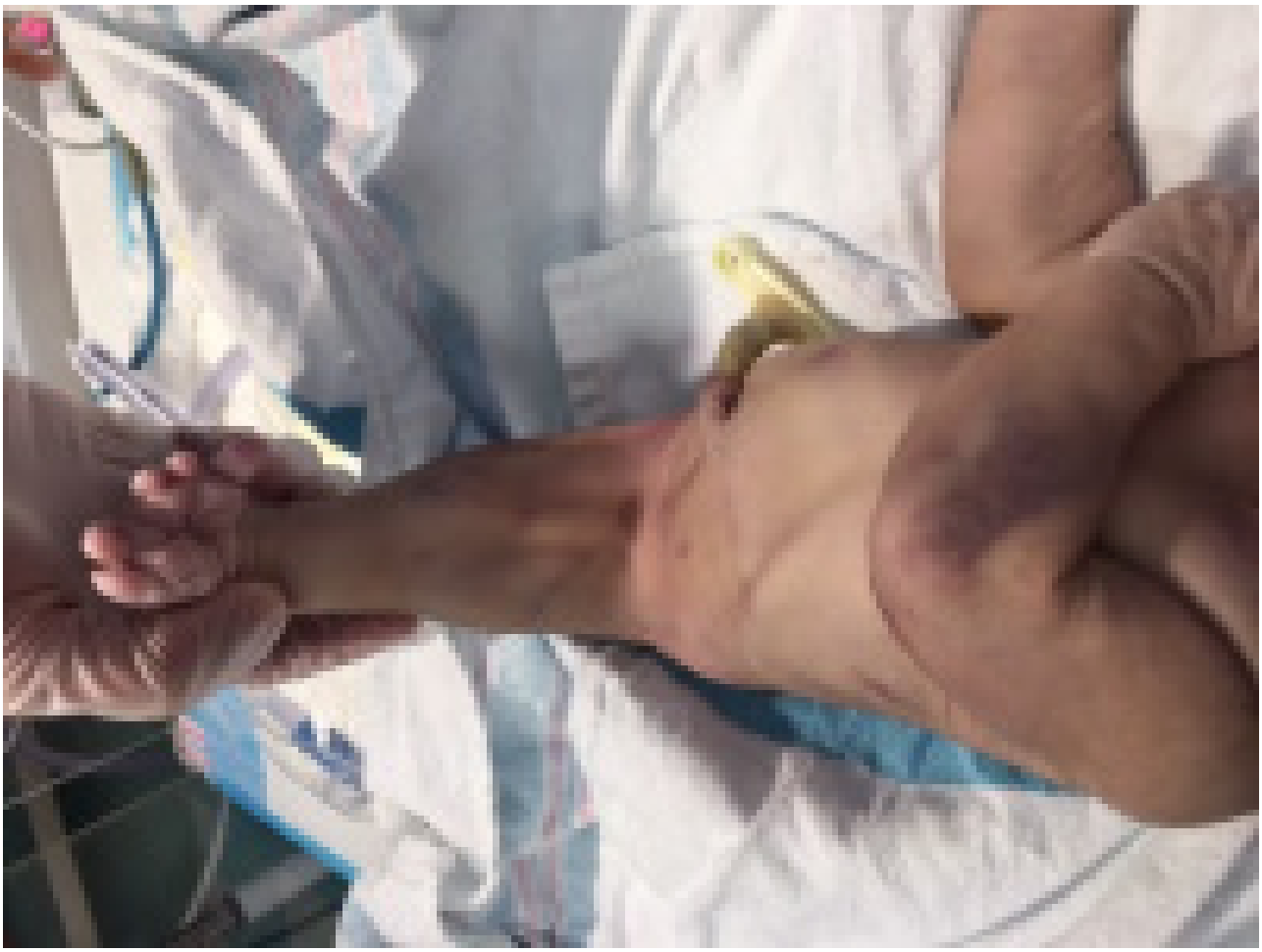
Background Sirenomelia is a lethal birth defect of unknown etiology. Defective blastogenesis due to a teratogenic insult during gastrulation phase of embryogenesis, resulting in malformation of notochord and caudal somites is the postulated pathogenesis. Chlamydia trachomatis (CT), an obligate intracellular pathogen, detected in abortus placentae more frequently than in controls, can penetrate placenta and affect the fetus. CT causes reorganization of host cell structures by interacting with centrosome proteins and cytoskeletal elements, namely F-actin, intermediate filaments & microtubules. As these organelles are implicated in cell division and cell migration, their defects could potentially result in defective embryogenesis. The embryopathic effects of CT are not documented.
Objective To report a case of sirenomelia in an infant born to a mother with an uncomplicated pregnancy except for a history of abortion and untreated gestational Chlamydia infection of unknown duration
Design/Methods Single case report
Results A non-consanguineous baby was born at 30 weeks gestation to a 27 year old AA G4P2 woman. Mother had a miscarriage at 4 months gestation, 11 months prior. On 1st AN visit at 22 weeks, fetal US was suboptimal due to anhydramnios. Maternal test results were normal except for + CT culture. She denied use of illicit or other drugs. CT culture was still +at delivery as she was non-compliant to therapy. At birth infant displayed sirenomelia with fused lower extremities (LE), 6 digits, and sacral pit and absent anus/genitalia/urethra, along with a flat nasal bridge, large low set ears, excess skin on nape of neck and absent anterior fontanelle. Autopsy revealed sirenomelia sequence with absent perineal development, a single midline fused LE, abdominal aorta terminating in a large vessel that entered umbilicus as umbilical artery, two midline retroperitoneal malformed testes with epididymis, a 2 mm focus of primitive renal parenchyma, sigmoid colon ending blindly

and no bladder/ureters/anus or cloaca. X--ray of LE showed a single femur, two tibias, one fibula, a common hind foot, midline fusion of the great toes, and three toes on each foot.

Conclusion(s) By reporting this case we intend to draw attention to maternal CT infection as a possible pathogenic factor in the development of sirenomelia given its documented specific fetopathic effects. This association, however, is speculative and more cases of sirenomelia with CT positive mothers need to be described in order to make definite conclusions about such a relationship.



Photograph showing fused lower extremities, absent genitalia, grossly underdeveloped pelvis and malformed single foot.

Photograph of the baby showing fused lower extremities and facial dysmorphism

Abstract: 47

Parental Resilience and Psychological Distress in the Neonatal Intensive Care Unit (PARENT Study)

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Background Resilience is the innate, yet modifiable process of positive adaptation in the setting of significant adversity. Parenting an infant in the NICU is oftentimes a crisis for families. Parental psychological distress negatively affects the quality of parent-child interactions and long term child development. Higher resilience has been related to a reduction in psychological distress, but this has not been studied in parents of NICU infants.
Objective 1) To determine the prevalence of resilience, depression, and anxiety during the early NICU hospitalization, 2) identify characteristics associated with resilience, and 3) evaluate the relationship between resilience and psychological distress Design/Methods This cross-sectional study enrolled parents of neonates ≤34 weeks gestational age at 2 weeks following delivery. The Connor-Davidson Resilience Scale (CD-RISC), Edinburgh Postnatal Depression Scale (EPDS), State-Trait Anxiety Inventory- State Anxiety (STAI-S), Parent Stress Scale-NICU (PSS-NICU), and the Multidimensional Scale of Perceived Social Support (MSPSS) were used to measure resilience, depression and anxiety symptoms, NICU-related stress, and social support. Parents were stratified into low or high resilience according to their CD-RISC score using 80 as cutoff (similar to previously published reports). A novel Neonatal Clinical Severity Score was used to assess the clinical status of the neonate. Descriptive and correlation analysis was performed.
Results In this ongoing study, 35 parents are enrolled to date. 40% of parents had high resilience scores, 40% experienced elevated depressive symptoms, and 31% screened positive for anxiety. Parents of infants with a younger gestational age (27.3

weeks vs 30.6 weeks), increased Neonatal Clinical Severity Score (10.5 vs 7.0), and greater social support (80.5 vs 74.0) reported higher resilience (p<0.05). As resilience scores increased, there was a trend towards less depression (ρ= -0.32, p=0.06) and anxiety symptoms (ρ= -0.31, p=0.07). Higher NICU-related stress correlated with greater depression (ρ= 0.51, p<0.05) and anxiety symptoms (ρ= 0.43, p<0.05).
Conclusion(s) NICU parents with less resilience are more likely to be parents of older, healthier neonates and have less social support. Decreased resilience correlates with more symptoms of depression and anxiety. Interventions directed at improving social support networks and addressing NICU-related stress may decrease the psychological distress of parenting in the NICU.

Test	All Parents (n=81)		Lower Resilience (n=21)		Higher Resilience (n=14)	
	Median	interquartile range	Median	interquartile range	Median	interquartile range
CD-RISC (0-100)	76	69-85.5	70	67-73	88.5	82.8-91.5
EPDS (0-30)	8	4.5-12	10	6-16	6	3.3-8.8
STAI-S (20-80)	36	28.5-41.5	38	33-43	33	27.3-37.8
PSS-NICU (0-5)	1.6	1.2-2.0	1.5	1.2-2.2	1.8	1.3-2.6
MSPSS (12-84)	78	68.5-81	74	66-78	80.5	73-84
Neonatal Clinical Severity Score	8	4-13	7	3-10	10.5	8-13

Abstract: 48
Reducing Neonatal Procedural Pain with Maternal Voice & White Noise
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Background Frequent exposure to multiple painful procedures during neonatal care in the neonatal intensive care unit can lead to detrimental long-term outcomes. Currently there is lack of standardized neonatal pain assessment and management in NICUs. Alternative pain therapies utilizing non-pharmacological methods such as maternal voice during procedures can potentially benefit both the neonate and the parents and provide family centered care.
Objective To establish a pain assessment model in infants receiving routine vaccination and evaluate the effect of maternal voice and white noise in reducing pain by promoting stability in heart rate (HR) and HR variability during the painful procedure of intramuscular immunization.
Design/Methods A prospective controlled study using maternal voice and white noise and continuous vital sign monitoring during routine two-month vaccination was designed in the NICU. Intramuscular vaccines were administered across three days (1 vaccine per day) with interventions of maternal voice and white noise given during two of the three days and the third day acting as a control for each participants. Prior to the prospective study a retrospective pilot study of vital sign changes around the vaccination was performed in 9 infants to establish the pain assessment model. Vital sign data one hour prior and after vaccination was extracted from a physiological data repository. HR characteristics before and after vaccination time were compared across all infants using paired t-test.
Results On modelling for HR responses following IM immunization maximal peak incremental HR response was observed in a 5-minute window pre/post vaccination with higher HR following vaccination (180 bpm vs. 176 bpm; p= 0.03) compared to the baseline across all infants, as shown in figure 1. HR changes were not significantly different if a longer window such as 1 hour was utilized (193 bpm vs. 189 bpm; p= 0.15) (figure 2). Based on the above findings a total of 32 infants have been enrolled in the prospective intervention arm of the study and data analysis is currently ongoing.
Conclusion(s) Our study suggests HR assessment prior to and after IM immunization is useful model to evaluate the effects of interventions aimed to alleviate procedural pain. Further, the expected HR rate increase from a painful procedure may be

more complex than anticipated necessitating a model that compares infant's mean baseline HR to the maximal HR after a narrow window following the procedure. This information is currently guiding our ongoing prospective study data analysis.

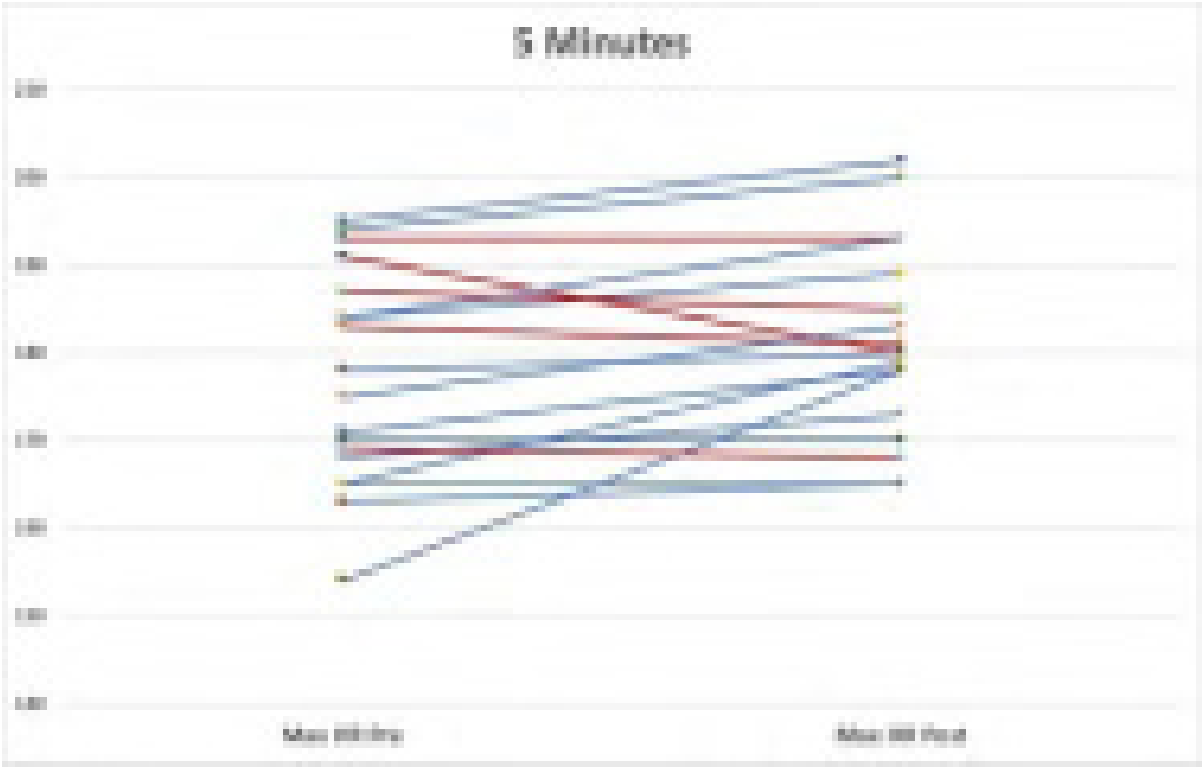

Figure 1: Max heart rate pre and post vaccination. Blue lines represent a HR increase. Red lines represent a HR decrease.

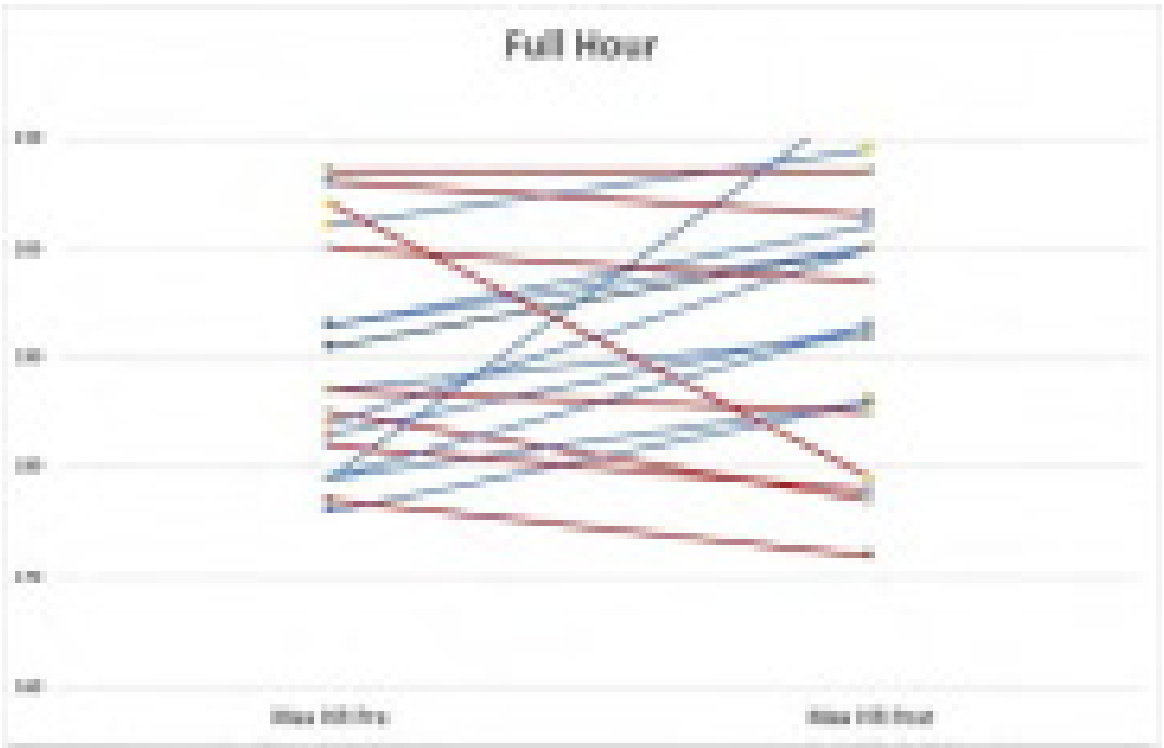

Figure 2: Max heart rate pre and post vaccination. Blue lines represent a HR increase. Red lines represent a HR decrease.

Abstract: 49

Predictors of Need for Pharmacotherapy in Substance Exposed Newborns

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Background Ongoing opioid use disorder (OUD) epidemic has resulted in birth of high number of substance exposed newborns (SENs). Best practices are evolving to improve outcomes for pregnancies impacted by OUD. Any need of pharmacotherapy (PhTx) for SENs leads to extended hospital length of stay (LOS), breach in maternal-infant bonding, potentially adverse neurocognitive outcomes - all leading to increased healthcare costs. Recent practices are focusing on non-pharmacologic (Non-PhTx) strategies, such as early skin-to skin (STS), maternal breast milk feeding (MBM) and environmental factors – such as rooming-in. Ability to identify predictors of need for PhTx for at risk SENs, may allow for even greater implementation of Non-PhTx strategies.

Objective To identify clinical predictors of need for pharmacotherapy for NAS in a cohort of SENs.

Design/Methods As part of an ongoing Quality Improvement initiative Baystate Children's Hospital (BCH) has been collecting de-identified data for all SENs admitted since 01/2015. Data collection includes descriptive characteristics of maternal-infant dyads including Non-PhTx as well PhTx interventions. Of note in 01/2017 the practice of antenatal maternal support through the EMPOWER program and rooming-in for eligible dyads during monitoring and treatment phases of NAS was implemented. We analyzed the overall cohort descriptive variables and then ran multivariable logistic regression to define proportions of SENs needing PhTx as well as to identify clinical variables associated with lower odds of needing PhTx.

Results A total of 386 SENs were admitted between 1/15 to 6/18, with 75.1% born at term with mean birth weight (BW) of 2878.4 (± 692.6) grams as shown in Table 1. The estimated proportions for need of PhTx based on clinical variables are displayed in Table 2. After adjusting for BW, GA and year of birth, early STS as well as birth year significantly lowered the odds for PhTx. While exclusive MBM feeding at discharge decreased the odds of requiring PhTx by 40% (OR =0.60 [CI 0.34-1.07]; p-value = .08) it did not reach statistical significance (Table 3).

Conclusion(s) Early STS and MBM were both associated with reductions in the need to initiate PhTx among SENs. However, the implementation of rooming-in strategy had the greatest impact on the need for PhTx for SENs, underscoring the benefits of Non-PhRx care provision to SENs. These strategies may potentially not only minimize neonatal exposure to PhTx, but also decrease healthcare costs while offering additional benefits of mother-infant dyad bonding.

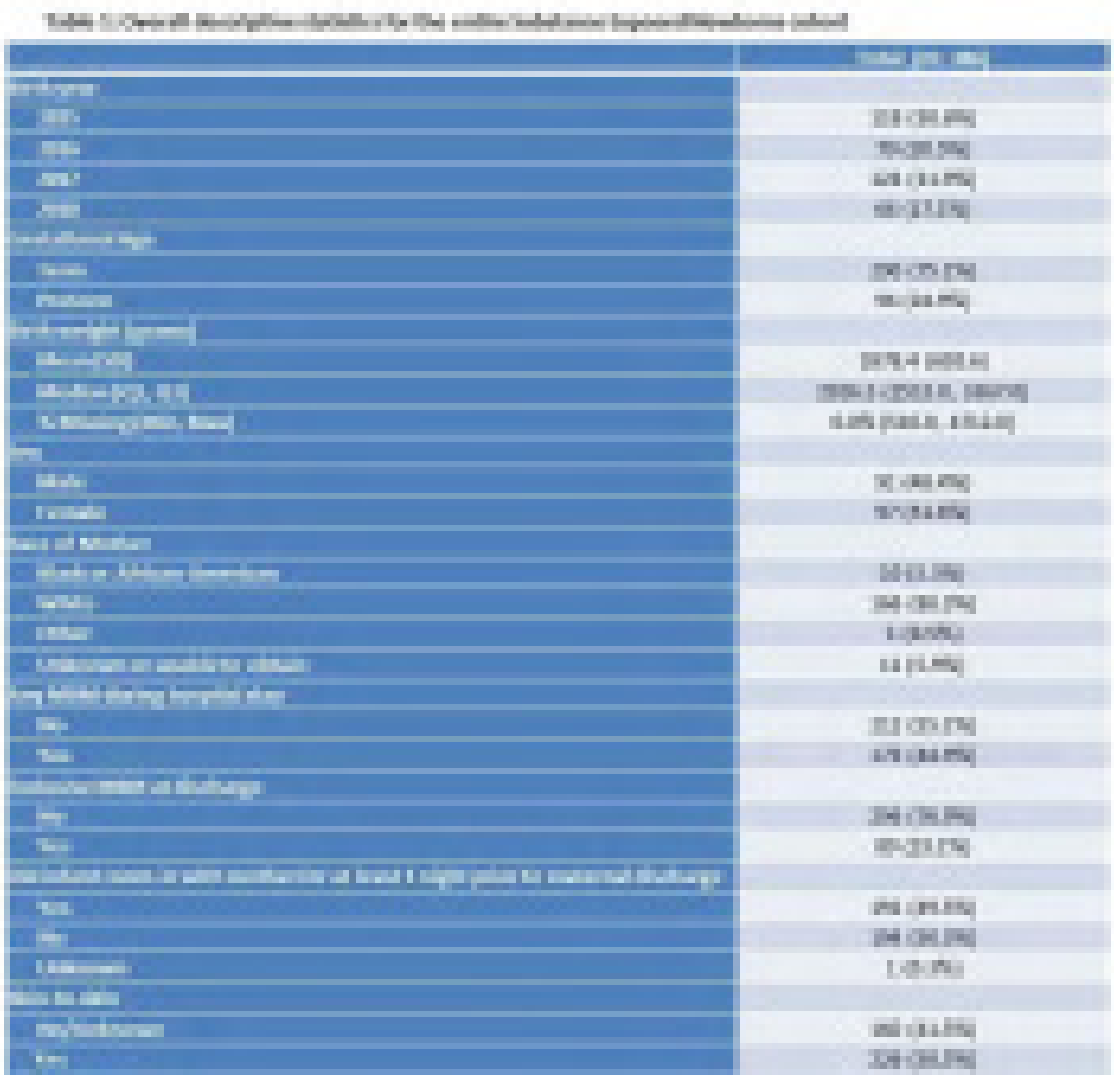
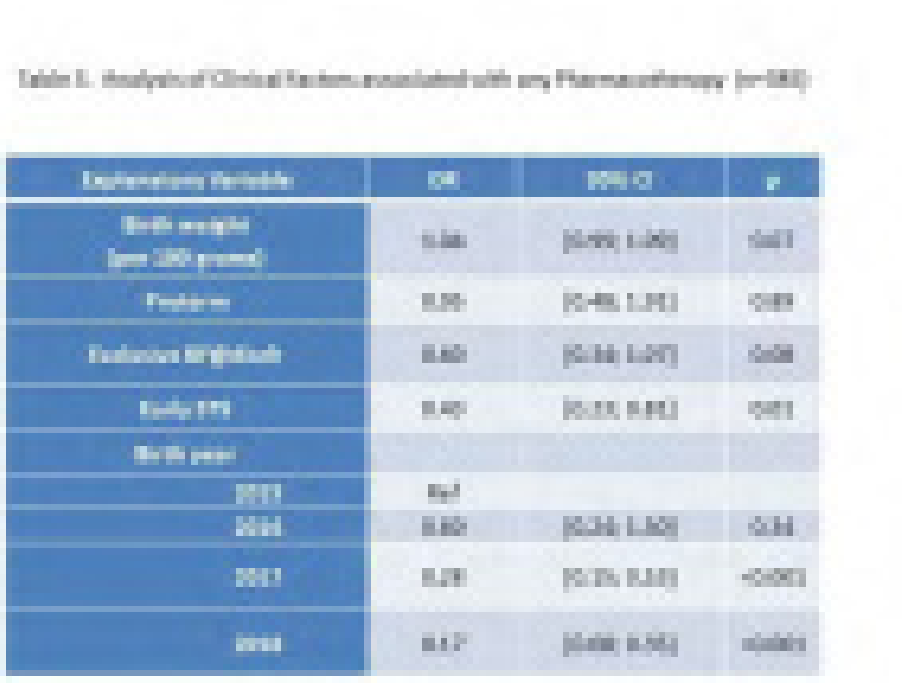


Table 2.

Estimated proportions of any pharmacotherapy (based on logistic regression analysis) (n = 383)

Characteristics	Percent	95% CI
Birth Status		
Term	0.60	(0.60, 0.71)
Preterm	0.64	(0.50, 0.76)
Parkinson Research Kandang		
Any Formula	0.67	(0.60, 0.73)
Only BF	0.51	(0.46, 0.57)
Drinking Water		
Well Use	0.75	(0.67, 0.82)
Pipa	0.58	(0.50, 0.65)
Birth Year		
2010	0.61	(0.54, 0.68)
2016	0.72	(0.65, 0.80)
2017	0.56	(0.47, 0.65)
2018	0.64	(0.50, 0.76)



Abstract: 50
Short-Term Neonatal Outcomes in Late Preterm Neonates After Antenatal Steroid
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Background Antenatal steroid (AS) is recommended for women at risk of late preterm (LP) deliveries (34-36 6/7 weeks) to reduce respiratory morbidities. Risk of neonatal hypoglycemia (NH) defined as blood glucose (BG) <40 mg/dl, hyperbilirubinemia and hypocalcemia are increased after AS. There are no studies evaluating the relationship between at least one dose of AS and short-term outcomes in LP neonates.
Objective To determine short-term outcomes in LP neonates after receiving AS.
Design/Methods Retrospective chart review of LP deliveries at Flushing Hospital Medical Center between January 2016 and November 2018. Exclusion criteria included mothers who received AS>7 days before delivery, treated with labetalol, multiple pregnancy, active bleeding, infection and diabetes mellitus (DM). Maternal demographic data included age, gravida, ethnicity, BMI, type of pregnancy, maternal comorbidities (gestational DM, hypertension, medication), doses of AS and mode of delivery. Neonatal data included gestational age (GA), birth weight (BW), gender, Apgar score, respiratory status, BG at delivery, bilirubin and calcium. Data were analyzed using STATA 15.0 software, Wilcoxon rank sum test, Fisher's exact test and chi square test, $p<0.05$ was considered significant.
Results Of 406 charts reviewed, 211 met exclusion criteria. Of remaining 195 singleton LP deliveries, 68 (35%) received AS (G1) and 127 (65%) did not receive AS (G2). Maternal age, gravida, ethnicity, BMI, BW, gender, Apgar score between G1 and G2 were similar, $p>0.05$. In G1, 50/68 (74%) received one dose of AS and 18/68 (26%) received two doses of AS. Time of AS to delivery was <24 hours in 62/68 (91%). Of 25/68 (37%) with NH, BG was obtained within 12 hours and NH occurred at

median time of 32 minutes of life, with 1.2 fold increased risk (95% CI 2.06-5.85). G1 and G2 were compared for GA, mode of delivery, respiratory status, NH, hyperbilirubinemia and hypocalcemia, Table 1.
Conclusion(s) In our small sample, one dose of AS decreased respiratory morbidities, increased the risk of NH and hyperbilirubinemia. Risk of hypocalcemia was not increased in LP neonates.

Table 1: Short term outcomes of G1 vs G2

	G1 (n=68)	G2 (n=127)	p value
GA	n (%)	n (%)	
34 weeks (%)	25 (36.8)	19 (15.0)	
35 weeks (%)	25 (36.8)	32 (25.2)	
36 weeks (%)	18 (26.5)	76 (59.8)	
Cesarean section	30 (44.1)	58 (45.7)	0.836
Respiratory resuscitation	15 (22.0)	15 (11.8)	0.059
NH	25 (36.8)	19 (19.8)	0.004
Hyperbilirubinemia	37 (54.4)	48 (37.8)	0.026
Hypocalcemia	22 (32.4)	15 (11.8)	0.116

p<0.05 was considered significant

Abstract: 51
Preterm Neonatal Bath: Friend or Foe?
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Background Research as it relates to preterm neonatal bathing is scarce. Unlike full term baths, preterm bathing can be a stressful experience, manifested by behavioral signs and perturbations in physiological parameters.
Objective A bathing guideline was created with a primary aim to achieve consistency in nursing practice. Secondary aim was to study tolerability of swaddled sponge bath by preterm neonates, based on physiological parameters and behavioral descriptors and evaluate whether gestational age (GA) at bath affected each outcome of interest.
Design/Methods We analyzed 406 baths given in the first 10 wks. Infant baths, given between 11/2017 and 5/2018 were evaluated in 204 infants, ages 24 to 41 weeks gestation and 490-4110 g birth weight. GA at bath was reported by group (< 28 weeks (n of baths = 132), 28 to <32 weeks (n= 146), and >= 32 weeks (n=128). Descriptive statistics were reported for all baths included in the study. For each outcome, a hierarchical model was used to examine the association between change in physiological parameter (HR, RR, Temp, and O2 Saturation) and postmenstrual age at bath adjusting for GA at birth and the physiological parameter before bath. A result was considered significant if $p < 0.05$.

Results Compliance with standardized bathing protocol was 90%. No significant differences were observed between bath GA groups in change in heart rate, respiratory rate and temperature (Table A). A significant difference was observed in percent O2 saturation from pre-Bath to post- Bath after adjusting for birth age and pre-Bath percent O2 saturation (p< 0.01). Behavioral responses indicated minimal stress-indicative motor behaviors, preserved ability to self-sooth and normal tone maintenance in majority of babies. Distress behaviors were dependent on gentleness of the caregiver and were less likely to occur with slow and fluidic motions compare to aggressive rubbing and abrupt extremity movements.
Conclusion(s) Standardization of bathing practice resulted in consistent and improved care. Emphasis on delayed first bath, followed by infrequent subsequent bath in a clinically stable baby showed that most premature infants are able to tolerate swaddled sponge bath. Caretakers need education on physiologic and behavioral signs of stress to gage bath tolerance.

	Vital Changes Pre and Post Bath					
	<28wk		28wk - 32wk		> 32wk	
	Pre	Post	Pre	Post	Pre	Post
Change in HR	153	151	153	151	141	140
Change in Saturation	96	96	97.2	97.8	98.6	98.5
Change in Temp	36.6	36.5	36.7	36.5	36.8	36.6
Change in RR	48	46	48	45	43	45
Average GA (wks)	25.4		29.4		34.8	
Average BW (gm)	768		1274		2052	
Average Day of 1st Bath (Days)	10.5		7.3		5.6	

Abstract: 52
USE OF THE OXIPNEUMOGRAM STUDY TO DIAGNOSE GASTROESOPHAGEAL REFLUX IN SYMPTOMATIC INFANTS IN THE NICU: A RETROSPECTIVE STUDY
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Background Gastroesophageal Reflux Disease (GERD) is a common diagnosis in the NICU that may be associated with apnea, bradycardia and/or cyanosis. The MII-pH study (Impedance study) is the gold standard to diagnose reflux but requires consultation with Pediatric GI. Often, the study is obtained and interpreted days after consultation. The oxipneumogram study (OxiPn), a 3 channel study of chest wall movement, heart rate and oxygen saturations, is readily available in every bedside monitor and can be performed and interpreted the same day. The OxiPn is read by the Infant Apnea Program and can be interpreted as likely GERD, equivocal, or normal based upon pattern recognition. This retrospective pilot study was designed to evaluate how often the OxiPn results suggestive of GERD were consistent with the results of the MII-pH study. Objective To determine whether OxiPn is a useful tool in identifying GERD in infants with cardiorespiratory events. We hypothesized that there were specific and consistent patterns on the OxiPn consistent with GERD.
Design/Methods
This retrospective chart reviewed all infants referred to the Infant Apnea Program who had an OxiPn study with subsequent MII-pH study from 2014 to 2017. The Apnea Program were consultants with complete access to the patient history and clinical data. We estimated that 54 patients were needed to detect a minimum specificity of 85% based of a 60% prevalence of GERD. Results Forty-nine patients' chart reviews were completed for inclusion. The mean birth weight was 1645 grams and mean GA 30 5/7 weeks. The mean number of days between the two studies was 9 days. Thirty-two infants had a positive OxiPn result suggestive of GERD and 100% or 32 were confirmed by MII-pH study. Ten infants had equivocal OxiPn results and eight of these had GERD by MII-pH. Seven infants had negative OxiPn results for GERD and 3 were confirmed negative by MII-pH study. Eleven of the 49 babies were treated with medication for GERD prior to OxiPn and 9 of these were positive by both OxiPn and MII-pH study and 2 were negative by both OxiPn and MII-pH. Only 10% of this patient population had a negative MII-pH study.
Conclusion(s) We found that a positive or equivocal OxiPn had a sensitivity of 90% for GERD with a positive predictive value of 95% and 60% specificity. The OxiPn is a useful tool in identifying infants with symptomatic cardiorespiratory events with GERD. Earlier diagnosis of symptomatic infants can lead to more expeditious treatment.

Abstract: 53

Predictors to Stop Neonatal Resuscitation After Cardiac Arrest

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Background Deciding how long resuscitative efforts should continue in a newly born infant with no heart rate and/or absent respirations with a very low heart rate after sustained resuscitative efforts remains a critically important and difficult management decision (Perlman et al. 2015). Besides gestational age, there are no other evidence-based parameters to assess the outcome of successful resuscitation. It has been suggested that an Apgar score of 0 at 10 minutes of age is an indication to consider discontinuing resuscitation efforts (very low-quality evidence). Additional predictive measures along with an Apgar score of 0 may aid in stopping resuscitation.

Objective To evaluate the use of monitoring end-tidal carbon dioxide ($ETCO_2$), venous blood gas parameters (pH, carbon dioxide - pCO_2, lactate) in a cardiac arrest ovine model to predict no return of spontaneous circulation (ROSC). We also evaluated the time taken to cardiac arrest secondary to asphyxia as a predictor for ROSC. The venous blood gas values were used for analysis as an umbilical venous catheter could be easily inserted in the delivery room.

Design/Methods Term ovine lambs (140 - 145 d gestation) were instrumented while in placental circulation (carotid, jugular catheters, umbilical venous catheter (UVC)). The jugular venous line was used for venous blood gas analysis. We used a respiratory monitor to continuously record $ETCO_2$ (mmHg) values throughout the resuscitation. Time taken for complete cardiac arrest was recorded. After 1 min of ventilation, coordinated chest compression (CC) and ventilation (3:1) were provided for 5 min. Epinephrine (EPI) via UVC was administered at 6 min and subsequently every 3 min until ROSC or until 20 min.

Results Out of 20 lambs, 11 achieved ROSC, while 9 did not. The baseline characteristics were similar between those that achieved ROSC to those that did not (figure 1-table 1). An ETCO of ≤ 5 mm Hg after 6 min of resuscitation (figure 2) had 100% sensitivity & 37% specificity to predict no ROSC. Similarly, time to cardiac arrest secondary to asphyxia (figure 3) of 13 min had 100% sensitivity & 73% specificity in predicting no ROSC. Venous pH, pCO and lactate were not helpful in predicting no ROSC.

Conclusion(s) In an asphyxiated cardiac arrest model with an Apgar score of 0, prolonged asphyxia leading to cardiac arrest (13 min) & an $ETCO_2$ of 5 mmHg or less during resuscitation predicted no ROSC. These findings may aid to stop resuscitation if the Apgar score remains zero. Clinical studies to validate these findings are needed.

Table 1: Characteristics at asphyxia

Characteristics	Spontaneous Circulation	No Spontaneous Circulation	p value
N	11	9	
Weight	4.53±0.80	3.74±0.06	0.06
Gender	M-5,F-6	M-5,F-4	1.00
Multiples	8	5	0.10
pH	6.8±0.2	6.8±0.3	1.00
$PaCO_2$ (mmHg)	133±15	144±13	0.11
PaO_2 (mmHg)	6±3	5±3	0.15

Table 1 - Characteristics at asphyxia

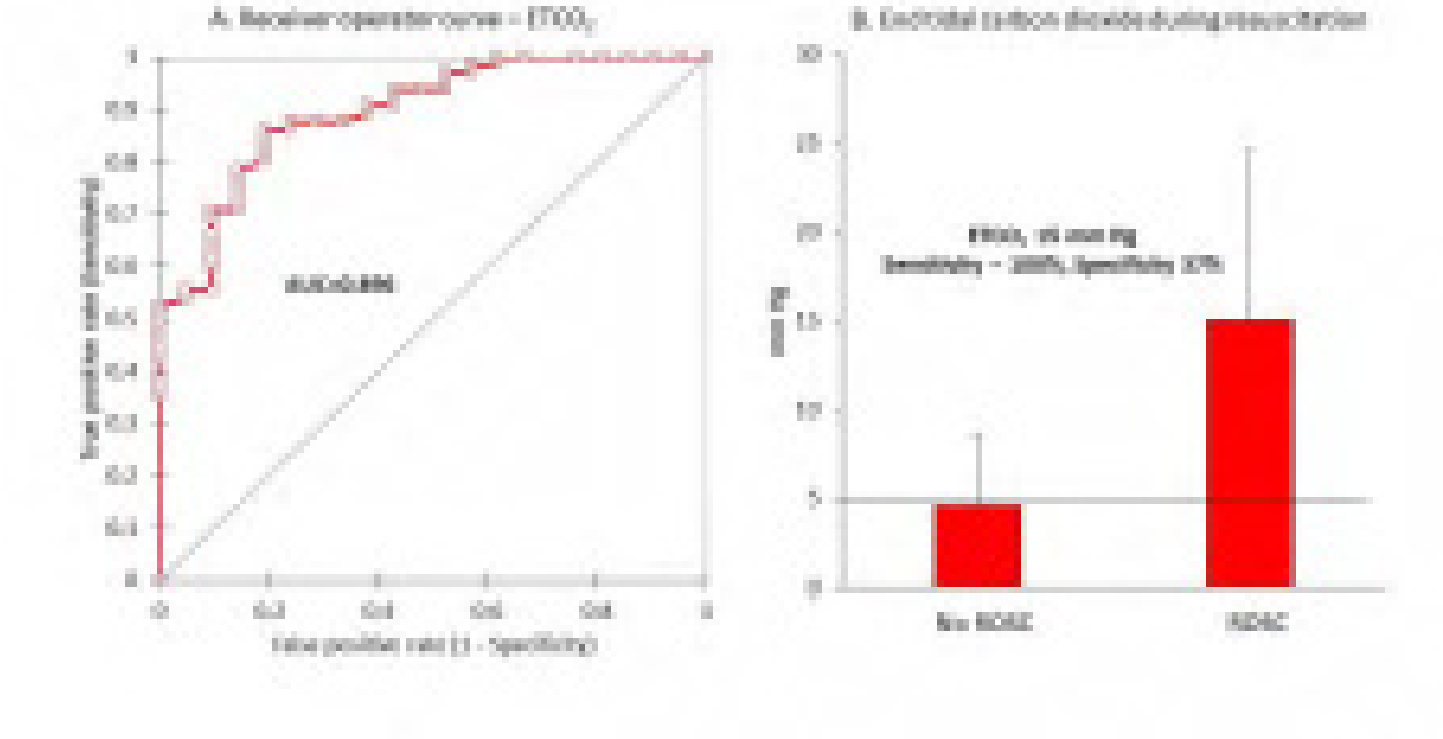

Figure 1 - A. Shows the receiver operator curve for ETCO in mmHg with a significant area under the curve of 0.896 for a value of less than or equal to 5 mmHg. B. Shows the difference between the $ETCO_2$ in mmHg between lambs that achieved ROSC vs. No ROSC.

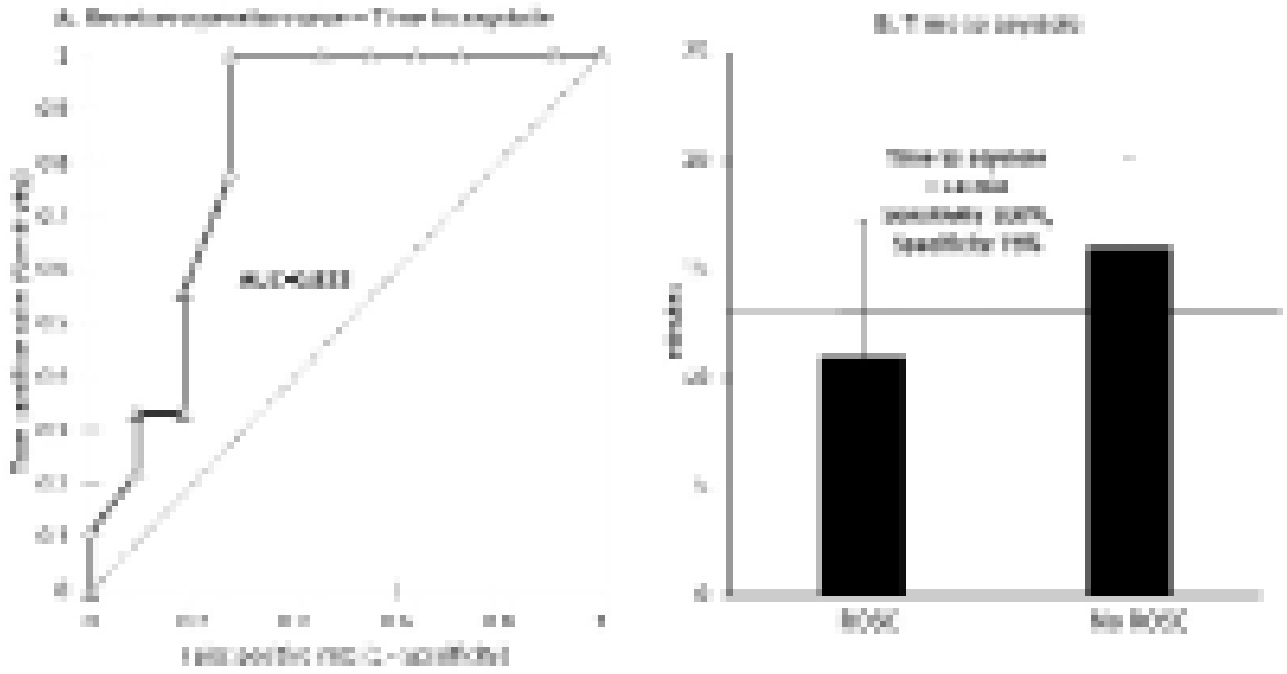

Figure 2 - A. Shows the receiver operator curve for time to asystole secondary to asphyxia in minutes with a significant area under the curve of 0.833 for time cut-off of 13 minutes. B. Shows the difference between the time to asystole secondary to asphyxia between lambs that achieved ROSC vs. No ROSC.

Abstract: 54

Is Heart Rate of 60/min the Optimal Cut-off for Initiating Chest Compressions? - Characteristics of Coronary Blood Flow during Asphyxia and Neonatal Resuscitation

Praveen Chandrasekharan[1], Sylvia Gugino[1], Carmon Koenigsknecht[1], Justin Helman[1], Munmun Rawat[1], Jayasree Nair[1], Deepika Sankaran[1], Vikash Agrawal[1], Satyan Lakshminrusimha[2]

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Background Neonatal Resuscitation Program (NRP) recommends starting chest compressions (CC), after effective positive pressure ventilation (PPV) for at least 30 seconds if the heart rate remains persistently below 60 per min. The rationale for choosing this cutoff for initiating CC is not clear. As heart rate is the primary determinant of cardiac output, bradycardia is likely to reduce coronary and cerebral flow. Improving coronary artery blood flow is crucial for restoring the heart's function. The effect of neonatal asphyxia on coronary flow remains unclear.

Objective To evaluate the coronary, carotid and pulmonary blood flows during asphyxia-induced-bradycardia in a transitional circulation model with an open ductus.

Design/Methods Near-term lambs (142 - 147 d, term neonate) were instrumented. Flow probes were placed around the left main coronary artery, left carotid and left pulmonary artery. The lambs were asphyxiated until cardiac arrest. The heart rates (HR) were continuously monitored using an invasive aortic line. Coronary, carotid and pulmonary flows were recorded and compared during asphyxia and resuscitation. The stages of comparison were 1) Baseline, 2) Asphyxia - HR >100/min, HR 100-80/min, HR 79-60/min, HR <60/min, 3) CC after cardiac arrest, 4) return of spontaneous circulation (ROSC) and 5) 30 min after ROSC.

Results We evaluated 14 lambs for this study. Four of these lambs achieved, return of spontaneous circulation (ROSC). There were five males, seven females and two sets of multiples. The peak coronary flows during diastole were significantly higher during asphyxia The flows during the period of HR 100 - 80/min during asphyxia was significantly different from HR 79-60/min, <60/min, baseline, CC and ROSC (figure 1). The peak coronary flows during an HR<60/min was similar to baseline.

The peak systolic carotid, pulmonary and the ductal flows were significantly lower for HR<60/min compared to baseline (figure 2, 3 & 4).

Conclusion(s) In spite of profound asphyxia bradycardia, peak coronary flows were maintained at pre-asphyxia levels while the peak pulmonary and carotid flows decreased. Initiating CC when the HR is <60/min may preserve pulmonary and cerebral circulation and assist in improving gas exchange and cerebral oxygen delivery respectively. More translational studies are needed to assess the effect of chest compressions with various heart rate ranges during asphyxia on blood flow to essential organs.

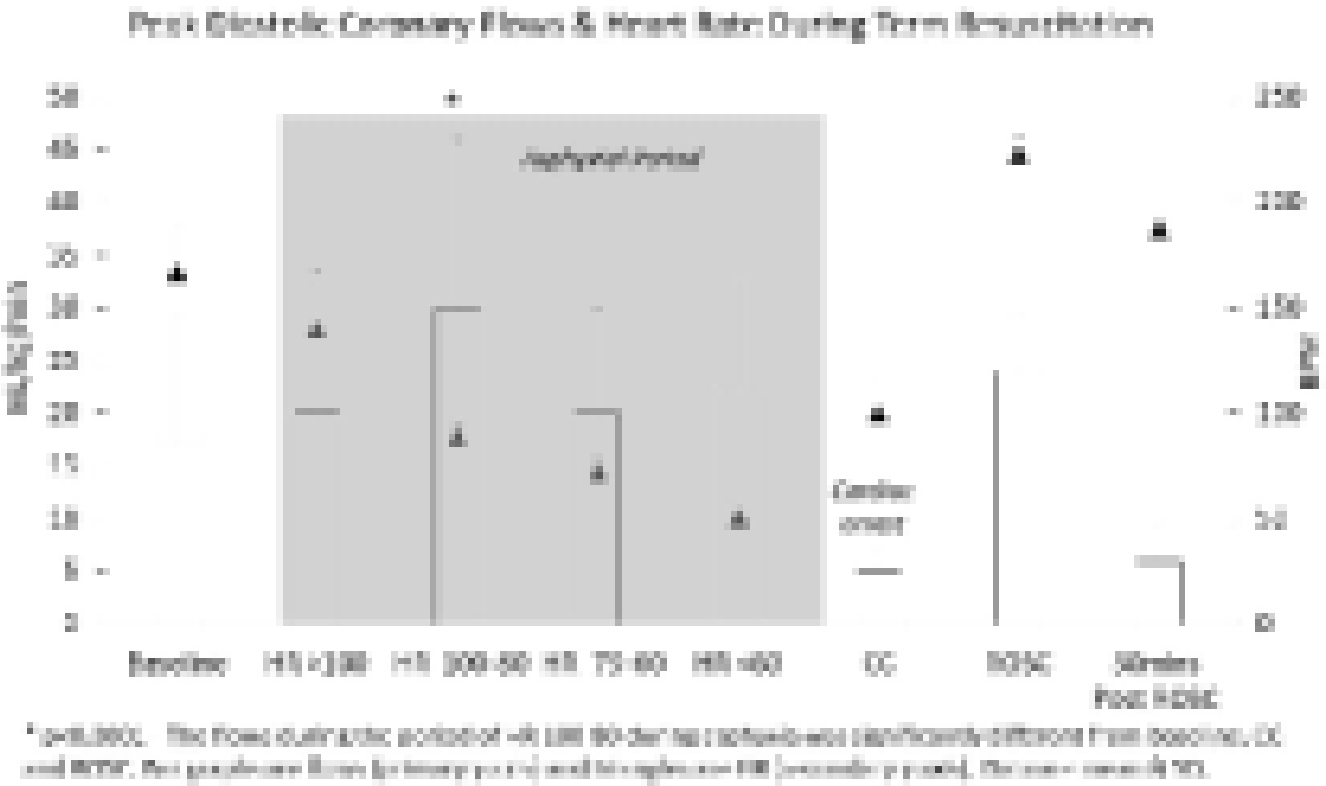

Figure 1 - Peak Diastolic Coronary Flows & Heart Rate During Term Resuscitation - * p<0.0001 - The flows during the period of HR 100-80 during asphyxia was significantly different from baseline, CC and ROSC. Bar graphs are flows (primary y-axis) and triangles are HR (secondary y-axis). Data are mean & SD.

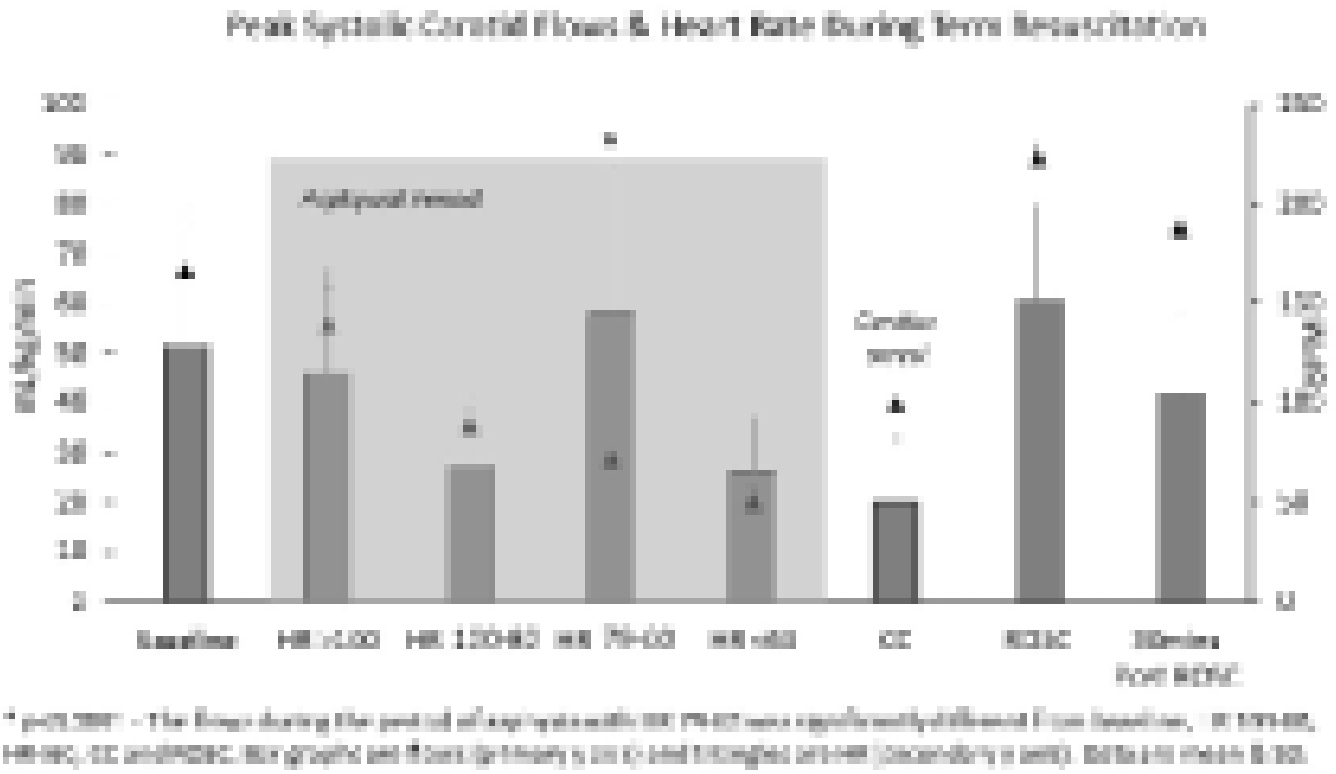

Figure 2 - Peak Systolic Carotid Flows & Heart Rate During Term Resuscitation - * p<0.0001 - The flows during the period of asphyxia with HR 79-60 was significantly different from baseline, HR 100-80, HR<60, CC and ROSC. Bar graphs are flows (primary y-axis) and triangles are HR (secondary y-axis). Data are mean & SD.

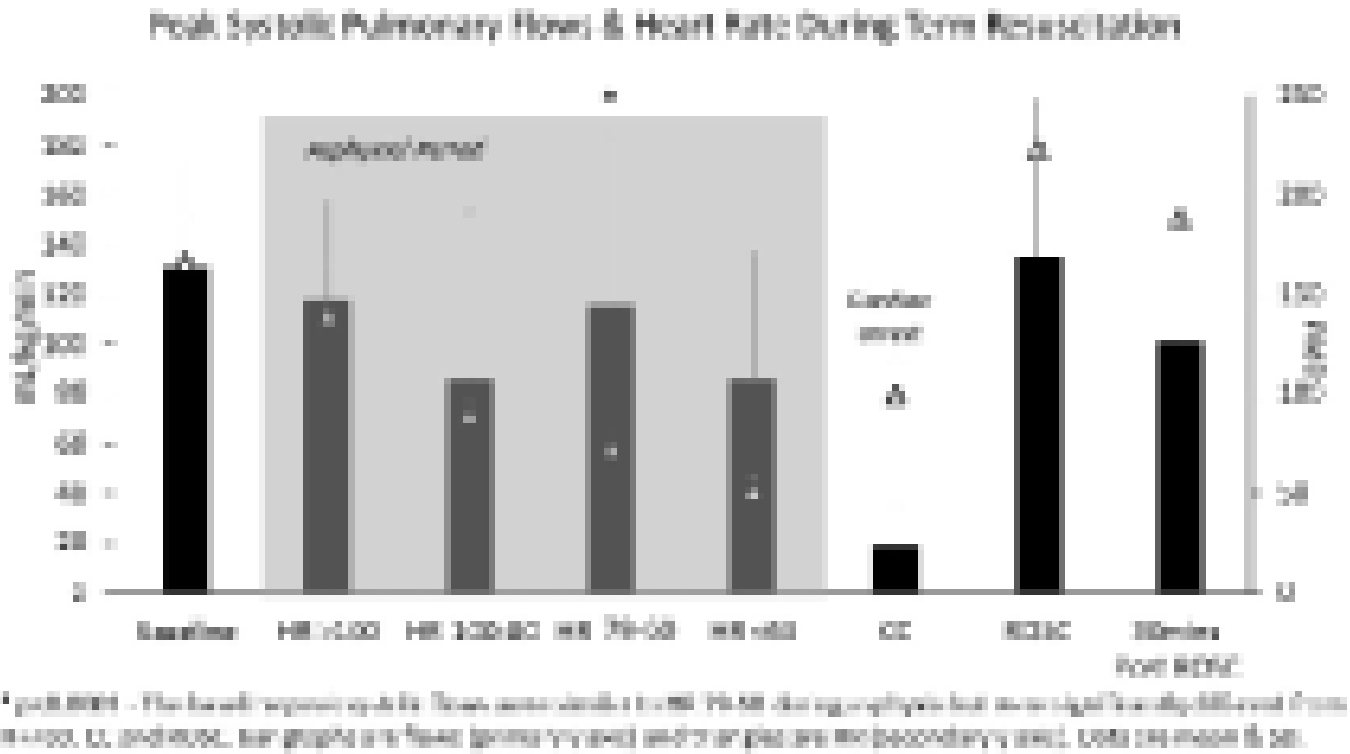

Figure 3 - Peak Systolic Pulmonary Flows & Heart Rate During Term Resuscitation - * p<0.0001 - The baseline peak systolic flows were similar to HR 79-60 during asphyxia but were significantly different from HR<60, CC and ROSC. Bar graphs are flows (primary y-axis) and triangles are HR (secondary y-axis). Data are mean & SD.

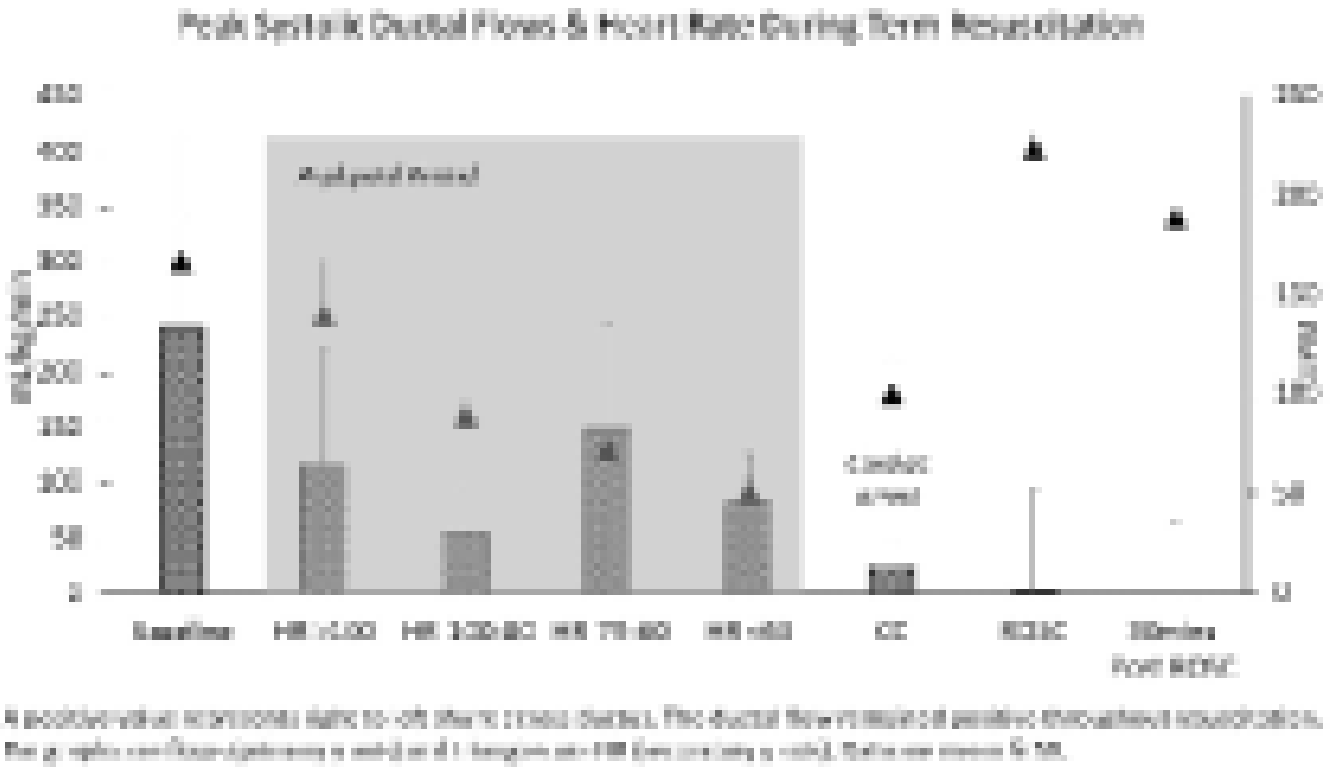

Figure 4 - Peak Systolic Ductal Flows & Heart Rate During Term Resuscitation - A positive value represents the right to left shunt across ductus. The ductal flow remained positive throughout resuscitation. Bar graphs are flows (primary y-axis) and triangles are HR (secondary y-axis). Data are mean & SD.

Abstract: 54A

Early Hypoxemic Respiratory Failure in Extremely Preterm Neonates: Characteristics, Mortality, and Neurodevelopmental Outcomes

Praveen Chandrasekharan[1], Satyan Lakshminrusimha[2], Dhuly Chowdhury[3], Krisa Van Meurs[4], Martin Keszler[5], Haresh Kirpalani[6], Abhik Das[3], Michele Walsh[7], Elisabeth Mcgowan[5], Rosemary Higgins[8], NICHD Neonatal Research Network[8]
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Background Extremely low birth weight infants (ELBW) are at risk for hypoxemic respiratory failure. These infants are frequently exposed to off-label use of inhaled nitric oxide (iNO). There is a lack of literature on the outcomes of these infants.
Objective To evaluate the outcomes of extremely low birth weight (ELBW) infants with early hypoxemic respiratory failure (HRF). Previous randomized trials and meta-analysis have suggested African-American infants with HRF may benefit from the use of inhaled nitric oxide (iNO) (Ballard et al. 2006, Askie et al. 2018). We also investigated whether African-American infants with early HRF had better outcomes following exposure to iNO compared to infants of other races.
Design/Methods Analysis of prospectively collected data from the Neonatal Research Network from 1/1/2007–12/31/2015. Inclusion criteria: Infants with birth weight ≤1000g and gestational age ≤26 weeks with maximal oxygen ≥ 60% on either Day 1 or Day 3 were labeled as "Early HRF". Birth weight, gestational age, gender, maternal chorioamnionitis, antenatal steroids, PPROM>18 hours, mode of delivery and center variation were used to develop a propensity score model. Using this approach, we also analyzed outcomes and effect of exposure to inhaled nitric oxide (iNO) based on race.
Results Among 7,639 ELBW infants born ≤26 weeks gestation, 22.7% had early HRF. Infants with early HRF had a mortality rate of 51.3% by 18-26 months corrected age, and the incidence of severe neurodevelopmental impairment (NDI) among

survivors was 41.2% (Figure 1). Mortality among infants treated with iNO was 59.4%. The composite outcomes of death or severe NDI were 71.2%. Female gender (aOR 2.4, [95% confidence interval 1.8-3.3]), birth weight ≥720g (aOR 2.3, [1.7-3.1]) and complete course of antenatal steroids (aOR 1.6, [1.1-2.2]) were associated with survival free of severe NDI at 18–26 months. African-American preterm infants had a similar incidence of early HRF (21.7% vs. 23.3%) but lower exposure to iNO (16.4% vs. 21.6%, p<0.001) compared to other races. There was no difference in death (68.4%) or severe NDI among survivors (37.8%) following iNO exposure among African-American preterm infants with early HRF (Figure 2). Conclusion(s) Early HRF in ELBW infants at ≤ 26 weeks gestation is associated with high mortality and NDI at 18-26 months. Use of iNO did not decrease the incidence of death or severe NDI. Outcomes following iNO exposure were not different in African-American infants.

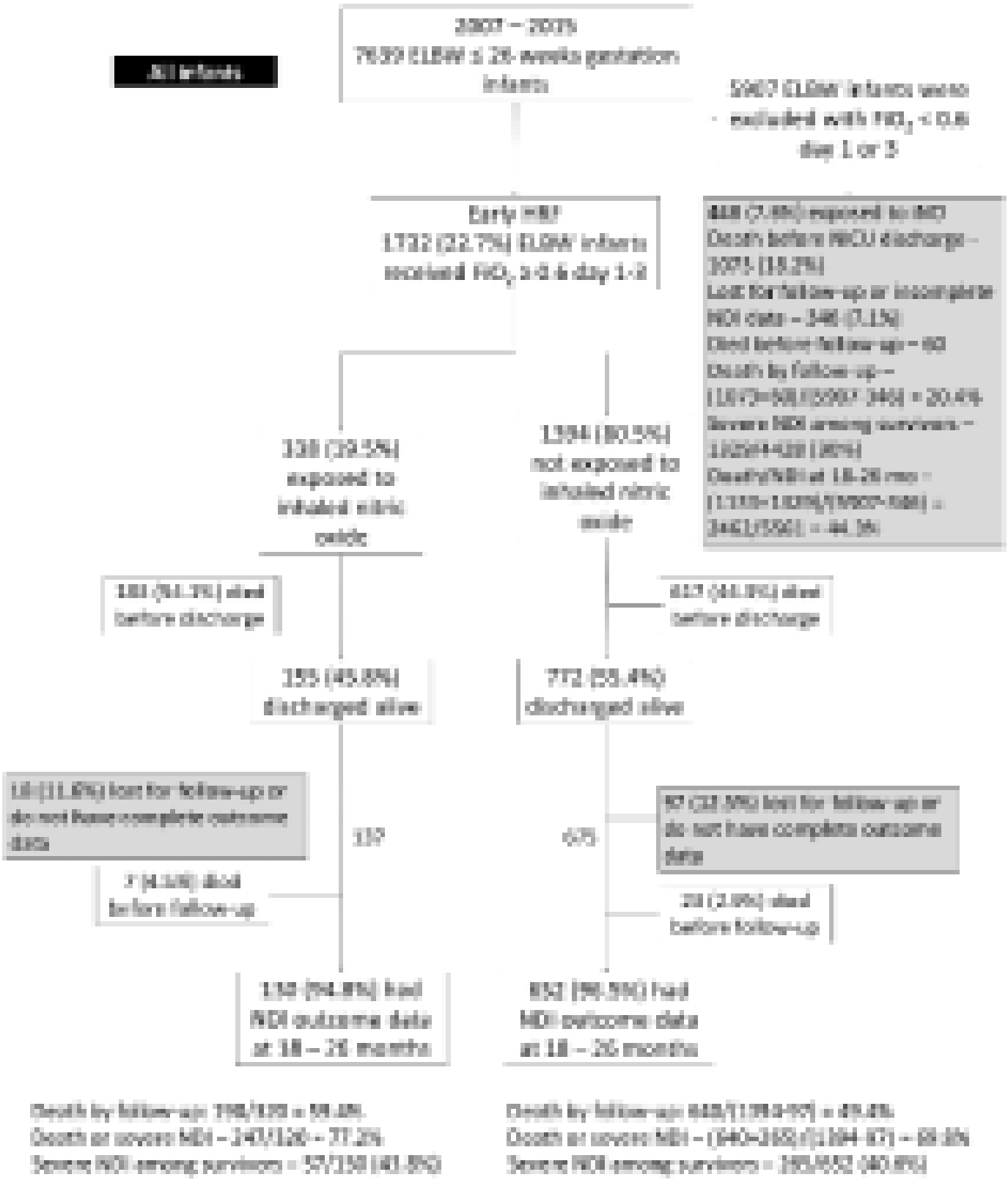

Figure 1: The flow chart of extremely low birth weight infants ≤ 26 weeks gestation with early hypoxemic respiratory failure.

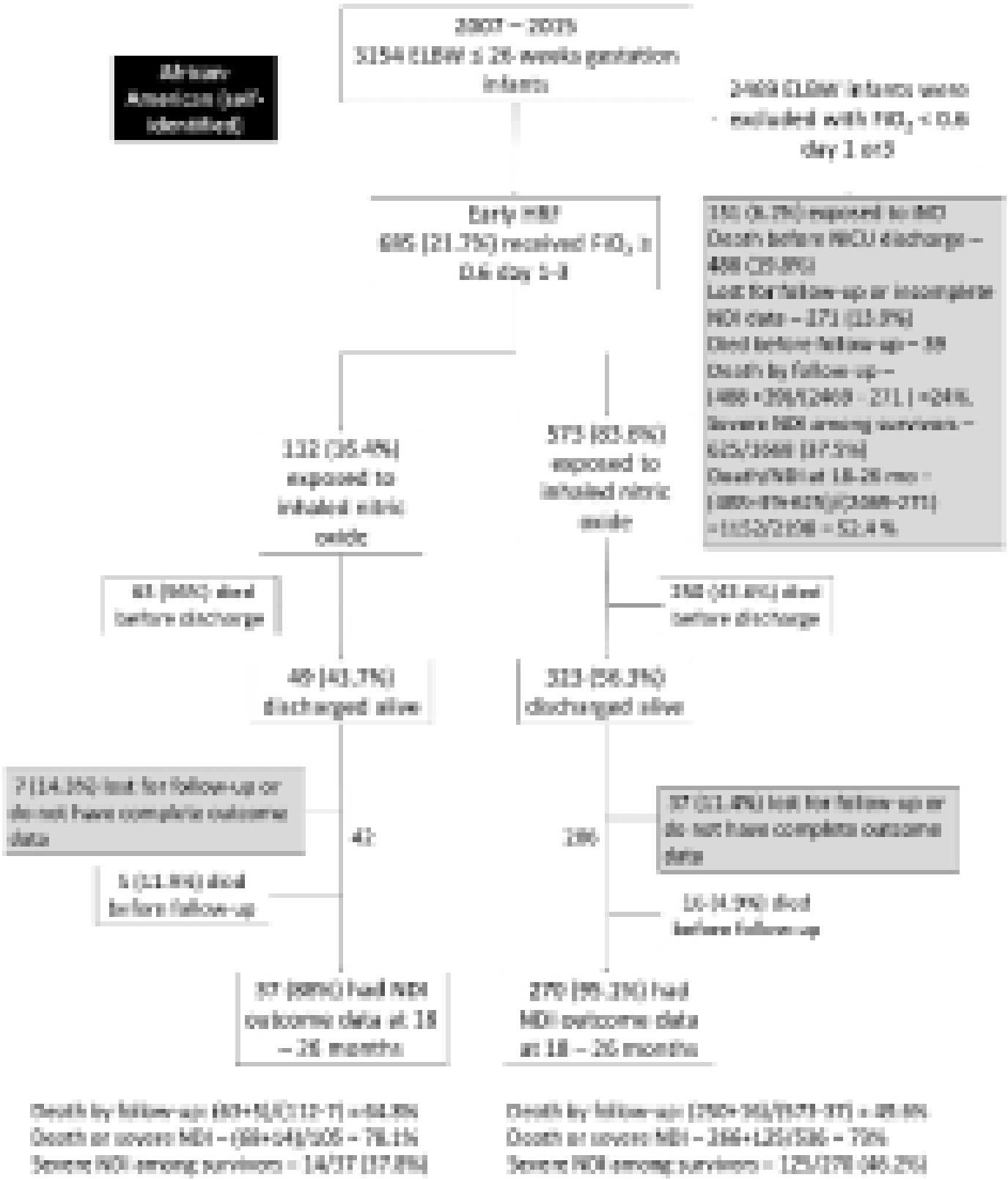

Figure 2: The flow chart of extremely low birth weight infants ≤ 26 weeks gestation with early hypoxemic respiratory failure whose parents self-identified as African-American.

Figure 2: The flow chart of extremely low birth weight infants ≤ 26 weeks gestation with early hypoxemic respiratory failure whose parents self-identified as African-American.

Abstract: 55

Relationship of NIRS cerebral and somatic autoregulation function vs clinical parameters of premature NICU patients born less than 34 weeks' gestation

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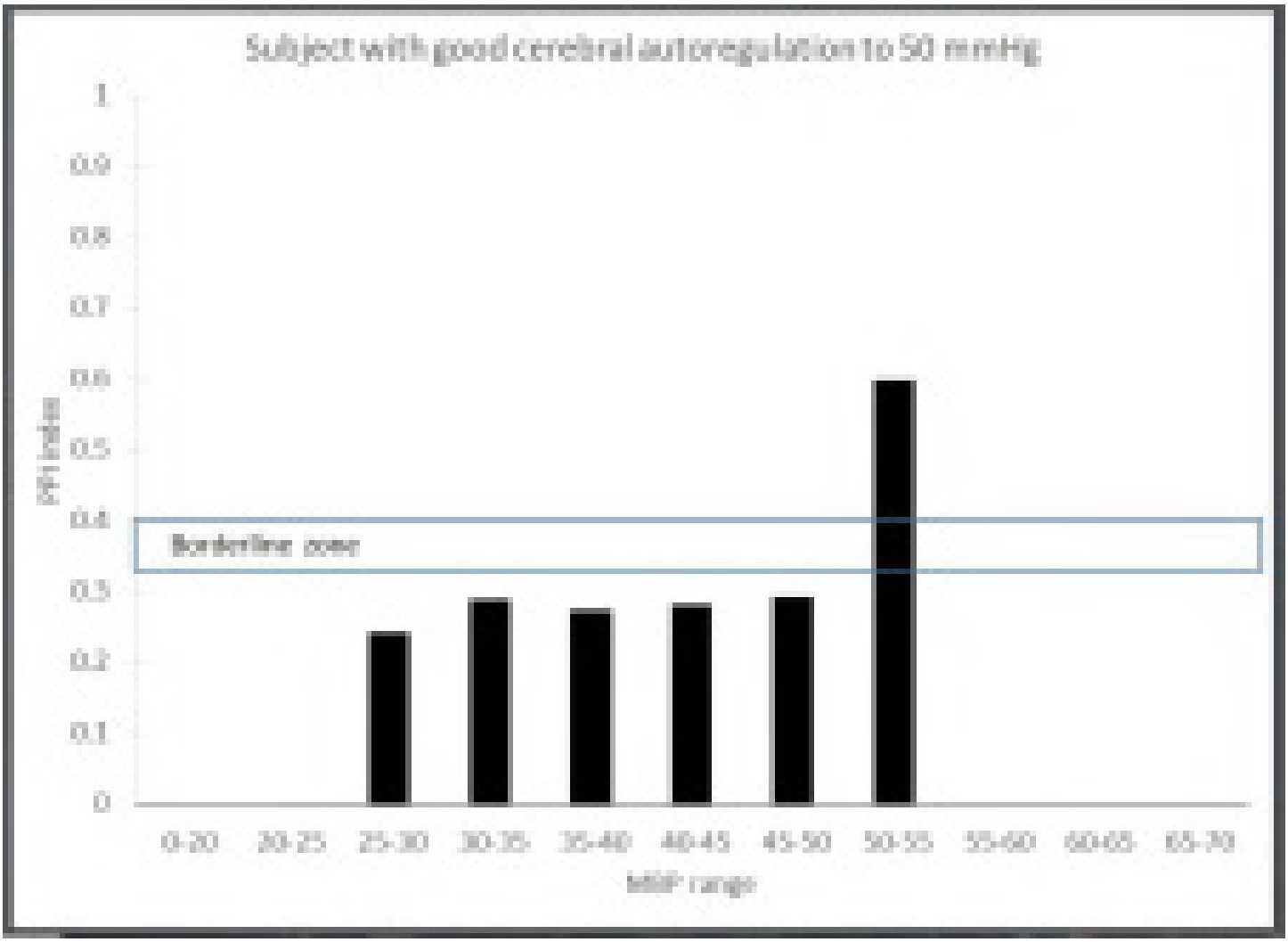
Background As neonates' transition from a relatively hypoxic environment to extra-uterine life, arterial oxygen saturation increases. Near-infrared spectroscopy (NIRS), which measures specific tissue oxygen saturation (StO2) noninvasively, is used to measure specific tissue oxygenation and calculate the organs' autoregulation function to determine if adequate tissue oxygenation is maintained in different physiologic conditions.

Objective Determine the relationships of NIRS brain and somatic autoregulation function to patients' clinical parameters related to their severity of illness i.e. use of vasopressors, neurologic outcomes and necrotizing enterocolitis.

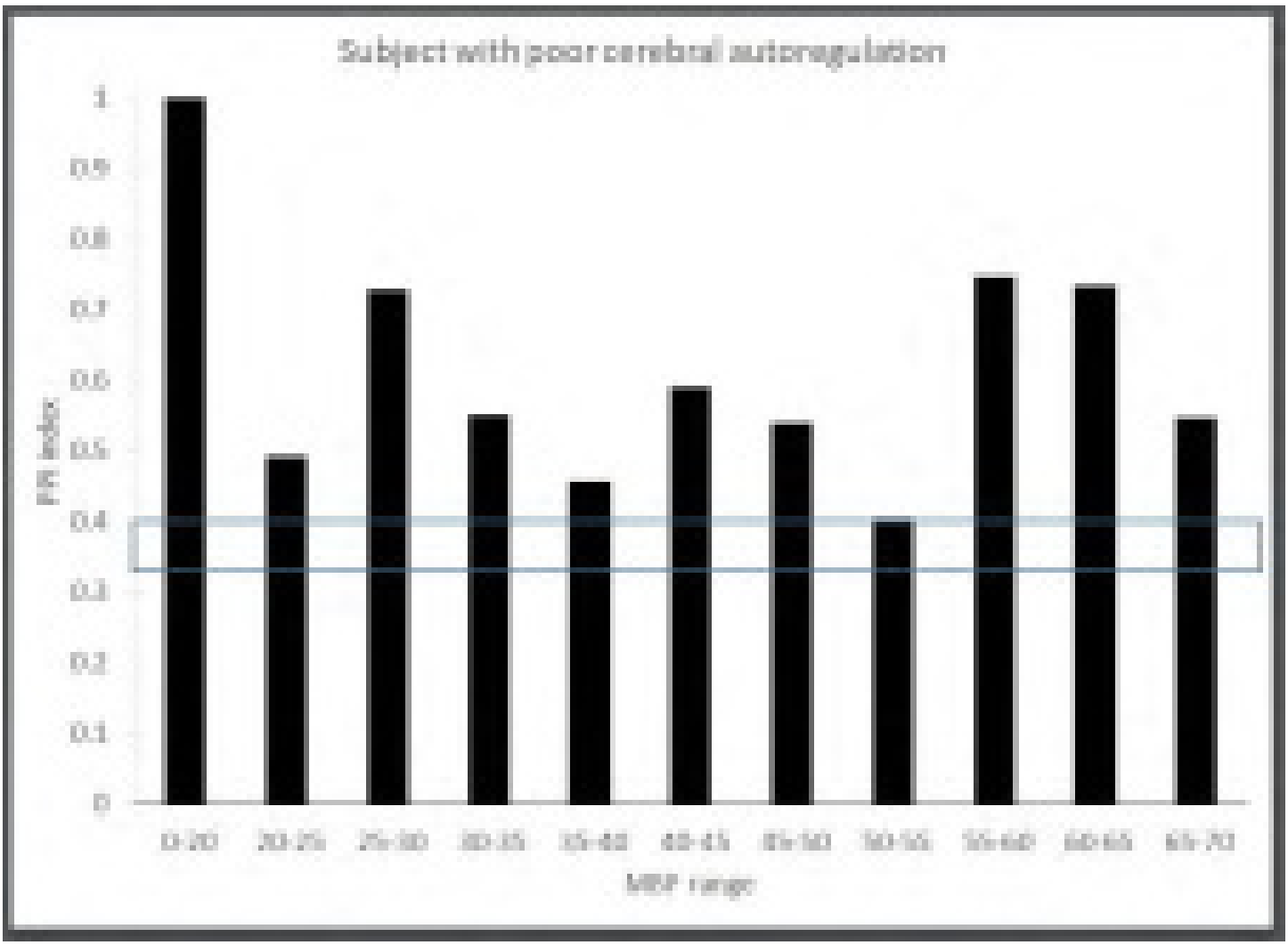
Design/Methods In this prospective cohort pilot study, neonates less than 34 weeks with arterial access, were enrolled. Neonates with comorbidities such as perinatal asphyxia, congenital anomalies or history of NEC were excluded. The FORE-SIGHT Elite (CASMED Inc., CT, USA) NIRS was placed on the forehead and right anterior abdominal wall, for 24 hours. Neonate's pulse oximetry, heart rate, respiratory rate and continuous arterial blood pressure were monitored. Continuous arterial blood pressure, arterial SpO2 and cerebral/somatic NIRS were used to derive autoregulation function by calculating a pressure passive index (PPI) from StO2 and mean arterial pressure (MBP) in 5 mmHg bins using the frequency domain coherence method.

Results Preliminary data was obtained from 11 neonates (0.56-2.37 kg, 23.2-33.2 weeks). Two neonates did not have arterial BP recordings and were excluded. Figures 1-2 show one subject with good and one with poor autoregulation as a function of PPI and MBP values. For normal autoregulation, PPI values tend to be low and constant for a range of MBP, and increase at certain lower and higher MBP values and MBP autoregulation thresholds. The PPI borderline zone is a hypothetical range of PPI values where autoregulation function is transitioning from good to poor. The table below provide data on 11 premature neonates' derived autoregulation function for MBP at 5 mmHg intervals by categorizing PPI values as 1= good, 2=borderline, and 3=poor autoregulation.

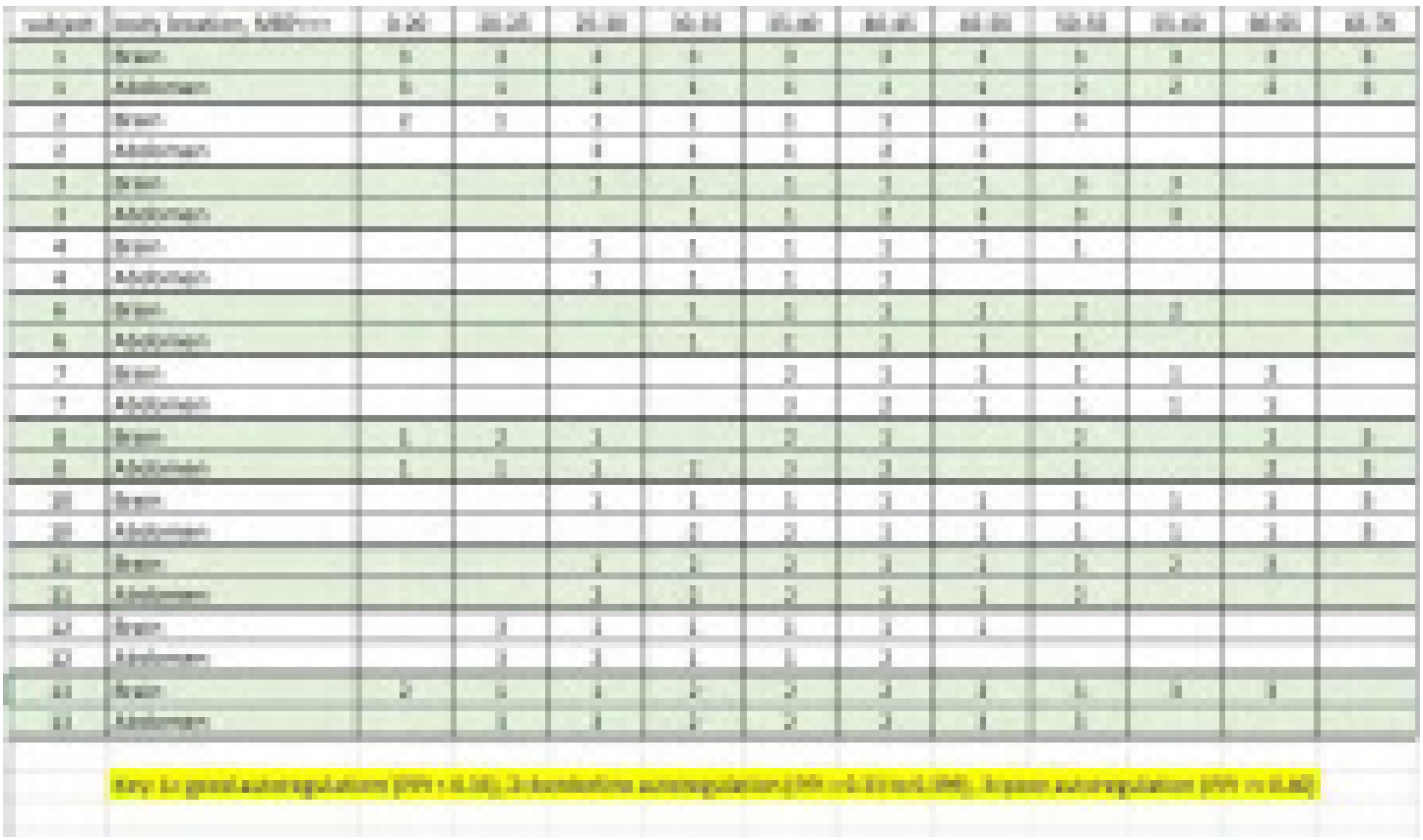
Conclusion(s) Our results show even the most premature neonates, as long as they maintain normal BP and systemic circulation can autoregulate cerebral perfusion. When BP are above or below the normal MBP for age, the neonate is at increased risk for losing brain and somatic autoregulation. This project is ongoing with more patients being enrolled.



Subject with good cerebral autoregulation to 50 mmHg



Subject with poor cerebral autoregulation



11 patients autoregulation

Abstract: 56

Airway Pressure and Tidal volume Delivered by Non-Invasive High Frequency Jet Ventilation using a Lung simulator

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Background Non-invasive ventilation (NIV) is the preferred mode of respiratory support for many NICU infants. Non-invasive high frequency ventilation (nHFV) has been used in many infants when CPAP or conventional NIV have failed. As it combines the advantages of HFV and nasal CPAP, it is thought to be better at removing carbon dioxide (CO_2) and maintain functional residual capacity. To date most studies were done using high frequency oscillatory ventilation. In many centers, high frequency jet ventilation (HFJV) is the preferred HFV device and there are no data regarding the use of HFJV to provide NIV in neonates.

Objective To evaluate the tracheal pressure (TP) and tidal volume (VT) delivered by nasal HFJV via a 3-D prototype neonatal nasal airway using a lung simulator.

Design/Methods A model neonatal lung was programmed into an ASL 5000 lung simulator (version 3.5, IngMar Medical) to represent a 1-3kg neonate with moderate to severely affected lungs: compliance, 0.5 mL/cm H_2O; resistance,70 cm H_2O/L/s; and simulated muscle pressure minus10cm H_2O (active model). A nose fixture created using a 3-D printer was attached to a standard 22–15-mm adapter and connected to the ASL 5000 to simulate a neonatal nasal passage. The model was subjected to HFJV via a size 3.0 nasal cannula using PEEP 5cm, no sigh breaths, I-time 0.02sec, rate 380bpm, with PIP of 25cm and then 30cm. The studies were repeated using a size 3.5 nasal cannula. TP and VT were continuously measured from the lung simulator and exported to a spreadsheet for analysis. Each experimental maneuver was replicated 3 times and the values for each study tabulated. Data were analyzed using paired t-test and $p < 0.05$ was considered significant.

Results The results for each experiment were highly reproducible. The measured TP was significantly lower than that set on the ventilator. There was a slight increase in the TP and VT when the PIP was changed from 25cm to 30cm. Both TP and VT

were significantly higher with a 3.5 compared to a 3.0 nasal cannula.
Conclusion(s) In this simulated lung model, there was a measureable TP and VT delivered by nHFJV. Both TP and VT were higher with a bigger size nasal cannula. The measured TP were significantly lower than the set ventilator pressures because of the leak via a nasal interface, but still a modest VT is delivered into the trachea. This combined with the faster rate of HFJV can provide higher minute ventilation with the potential to more effectively remove $CO_2$and may translate into important clinical benefits.

Airway Pressure and Tidal volume Delivered by Non-Invasive High Frequency Jet Ventilation

Size 3.0 Nasal Cannula	PIP 25cm	PIP 30cm
Mean Tracheal Pressure (cmH2O)	4.37± 0.24	4.6± 0.28
Mean Tidal Volume (mL)	3.92 ± 0.25	4.08 ± 0.3
Size 3.5 Nasal Cannula	PIP 25cm	PIP 30cm
Mean Tracheal Pressure (cmH2O)	6.14 ±0.32*	6.44 ±0.37*
Mean Tidal Volume (mL)	5.51±0.33*	5.78 ±0.39*

***p<0.05 compared to size 3 cannula. Data are presented as mean±SD**

Abstract: 57
Pressure Delivery in Oscillatory High Flow Nasal Cannula in a Premature Infant Lung Model
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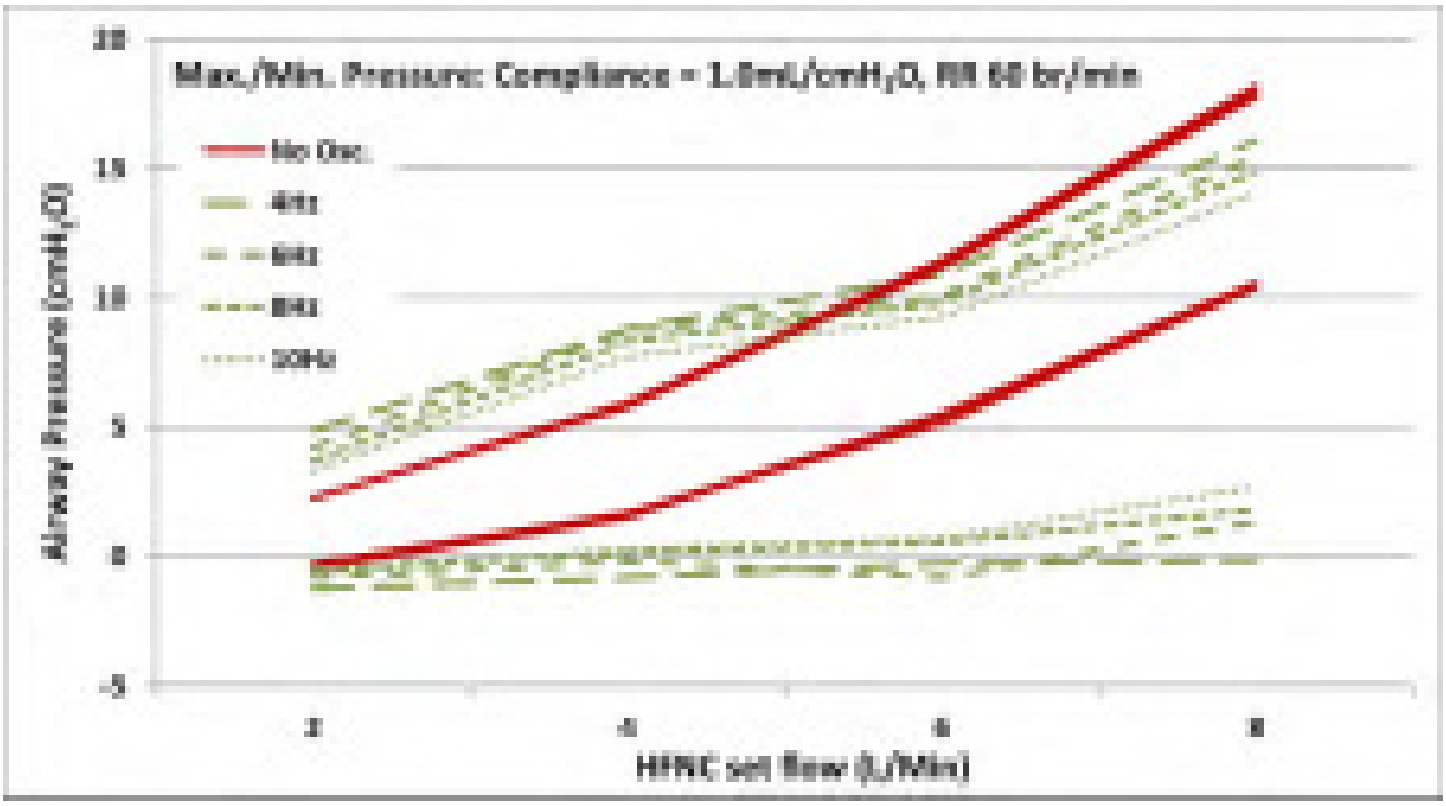
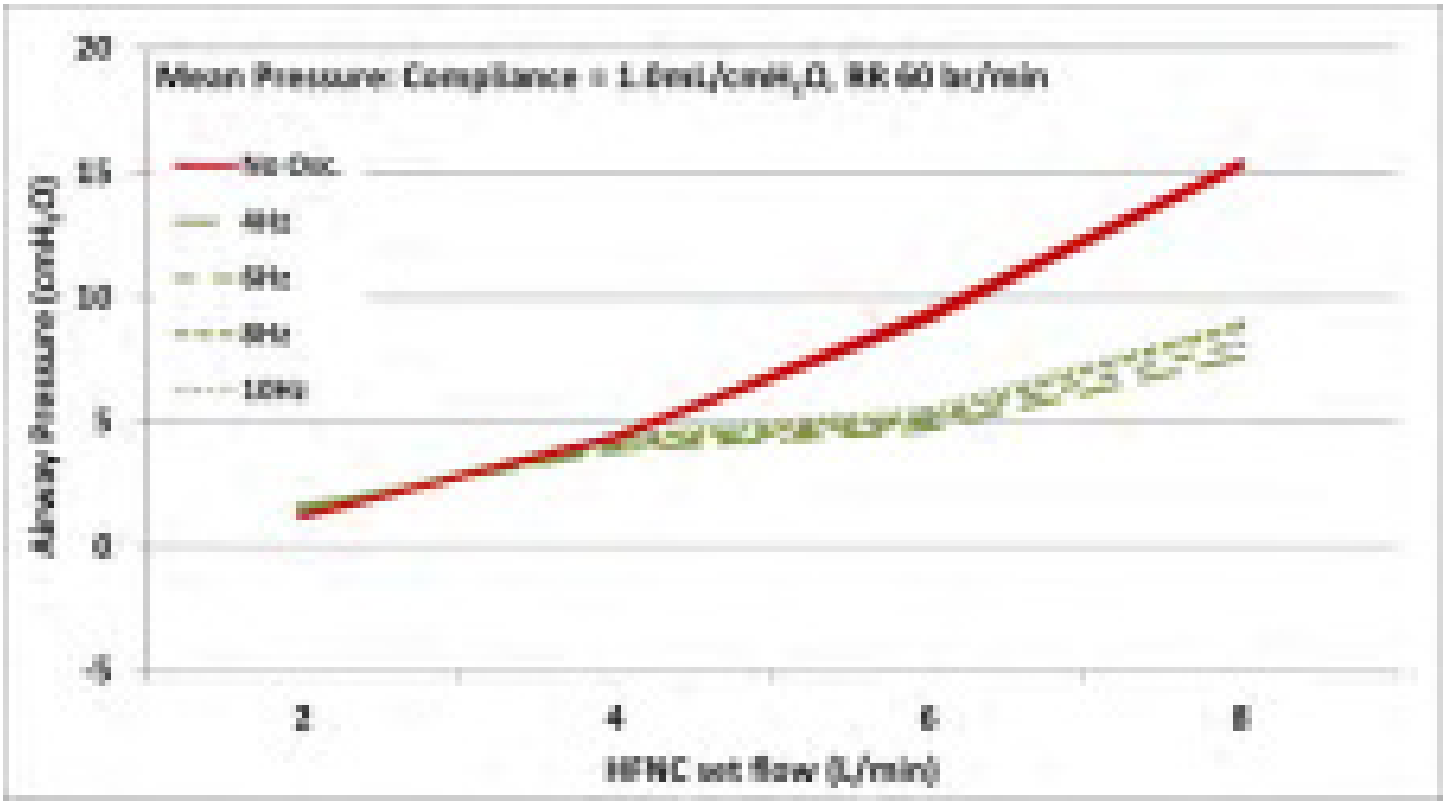
Background In a previous in-vitro lung model we found that superimposing oscillations of 4-10 Hz on the supply flow of a high flow nasal cannula (HFNC) system significantly improved CO_2 washout. However, the effect on delivered pressure was not reported.
Objective To compare delivered airway pressure in oscillated vs. non-oscillated HFNC in a premature infant lung model.
Design/Methods A premature infant lung simulator consisting of a 40 mL silicone bellows with a compliance of 0.5 or 1.0 mL/cmH_2O was connected to a 3D-printed replica of an upper airway from a 28wk premature infant with airway resistance of 22 cmH_2O/(L/s). Total model resistance was 73 cmH_2O/(L/s) and total instrumented dead space was 3.5 mL. The model lung was placed in a rigid chamber connected to a computer controlled piston to simulate spontaneous breathing at a tidal volume of 6.0 mL. A Fisher&Paykel Neonatal Oxygen Therapy (3.0mm OD) nasal cannula was used with prongs fixed at 1/2 nares diameter. Oscillation was achieved by passing the HFNC supply flow through a 3-way solenoid valve operating at 4, 6, 8 or 10 Hz with a 50% on-off duty cycle. 100% CO_2 was injected into the bellows at a constant rate of 12.0 mL/min. After End-Tidal CO_2 ($ETCO_2$) equilibration using non-oscillated supply flow, the solenoid valve was switched to oscillation mode and $ETCO_2$ was allowed to re-equilibrate. Airway pressure at the simulated trachea was measured at flows of 2, 4, 6 and 8 L/min at respiratory rates (RR) of 40 and 60 breaths/min for both model lung compliances.
Results Maximum/minimum and mean airway pressures as a function of non-oscillated and oscillated HFNC flow at 60 breaths/min and compliance of 1.0mL/cmH_2O are shown in Figures 1 and 2, respectively. For all frequencies, maximum oscillated pressures were greater than non-oscillated pressures at 2 and 4 L/min and less than non-oscillated pressures at 6 and 8 L/min. Positive minimum pressures were generated at 6 L/min for frequencies greater than 6 Hz and at 8 L/min for frequencies greater than 4 Hz. Results were similar for RRs of 40 and 60 breaths/min and lung compliances of 0.5 and 1.0 mL/cmH_2O (not shown).
Conclusion(s) In this novel in-vitro premature infant lung model, oscillatory HFNC improves CO_2 clearance while providing mean airway pressures similar to or below that of non-oscillatory HFNC without adding obvious risk of barotrauma. Delivered pressure may differ in variably compliant infant airways, therefore clinical trials are required to establish the safety and efficacy of Oscillatory HFNC.



Maximum and Minimum Pressure at 60 breaths/min. Compliance 1.0mL/cmH_2O.



Mean Pressure at 60 breaths/min. Compliance = 1.0 ml/cmH_2O.

Abstract: 58

The Impact of Kangaroo Mother Care on Work of Breathing Indices in Very Low Birthweight Infants

Maura Gable[1], Amy Mackley[2], Robert Locke[2], Thomas H. Shaffer[3], Kelley Z. Kovatis[2]

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Background Kangaroo Mother Care (KMC), defined as prolonged skin to skin care between a mother and her infant with the infant lying prone on mom's chest, has been shown to decrease morbidity and mortality and improve physiologic stability in very low birthweight (VLBW) infants. Previous studies have demonstrated reduced rates of bradycardia and desaturations during KMC. No studies have assessed the impact of KMC on work of breathing (WOB) indices and oxygen stability.

Objective To compare WOB indices and oxygen stability in VLBW infants requiring non-invasive respiratory support during KMC versus routine incubator or crib care.

Design/Methods This is a randomized prospective observational study of infants <37 weeks gestation and birthweight <1500 grams on non-invasive respiratory support (CPAP, HFNC, nasal cannula) (Figure 1). Phase angle, a WOB index representing the relative asynchrony between the thoracic and abdominal excursions, is noninvasively measured by respiratory inductive plethysmography (RIP). A phase angle range (40-180 deg.) represents increasing thoracoabdominal asynchrony. Work of breathing indices were measured for 20 minutes during each KMC and standard crib/incubator care (SC). The order of each treatment was randomized. A high resolution pulse oximeter with a 2 second sample rate collected data throughout the study.

Results The analysis includes 5/30proposed infants (Figure 2). The mean phase angle during SC (63.8 ±11 SD deg. (IQR 55.0-74.0)) and KMC (82.6 ±32 SD deg. (IQR 51.5-110.5)) was not statistically different (p=0.35) (Figure 3). The coefficient of variation for SC was 23% and for KMC was 50%. A linear mixed analysis was performed to control for respiratory support and randomization with no difference in results.

Conclusion(s) In this infant patient population with mild-moderate respiratory insufficiency, bedside, real-time RIP assessment of WOB indices was feasible; however, there was no difference between WOB indices during standard crib/incubator care and KMC. Further research, including additional enrollment of patients, longer study periods per treatment and incorporating oxygen stability (ongoing analysis) may better differentiate treatment advantages.

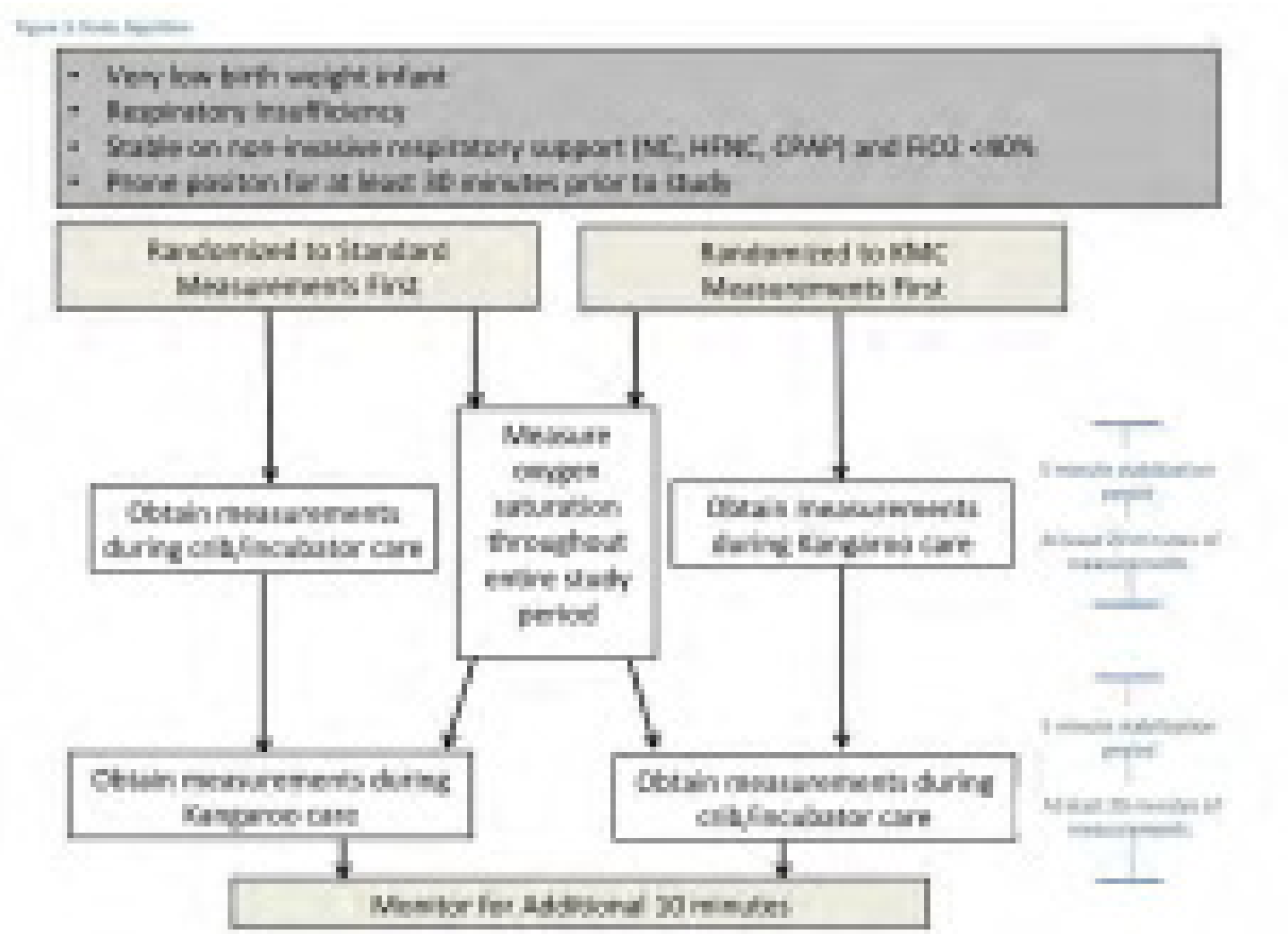


Figure 1: Study algorithm flow diagram and inclusion criteria.

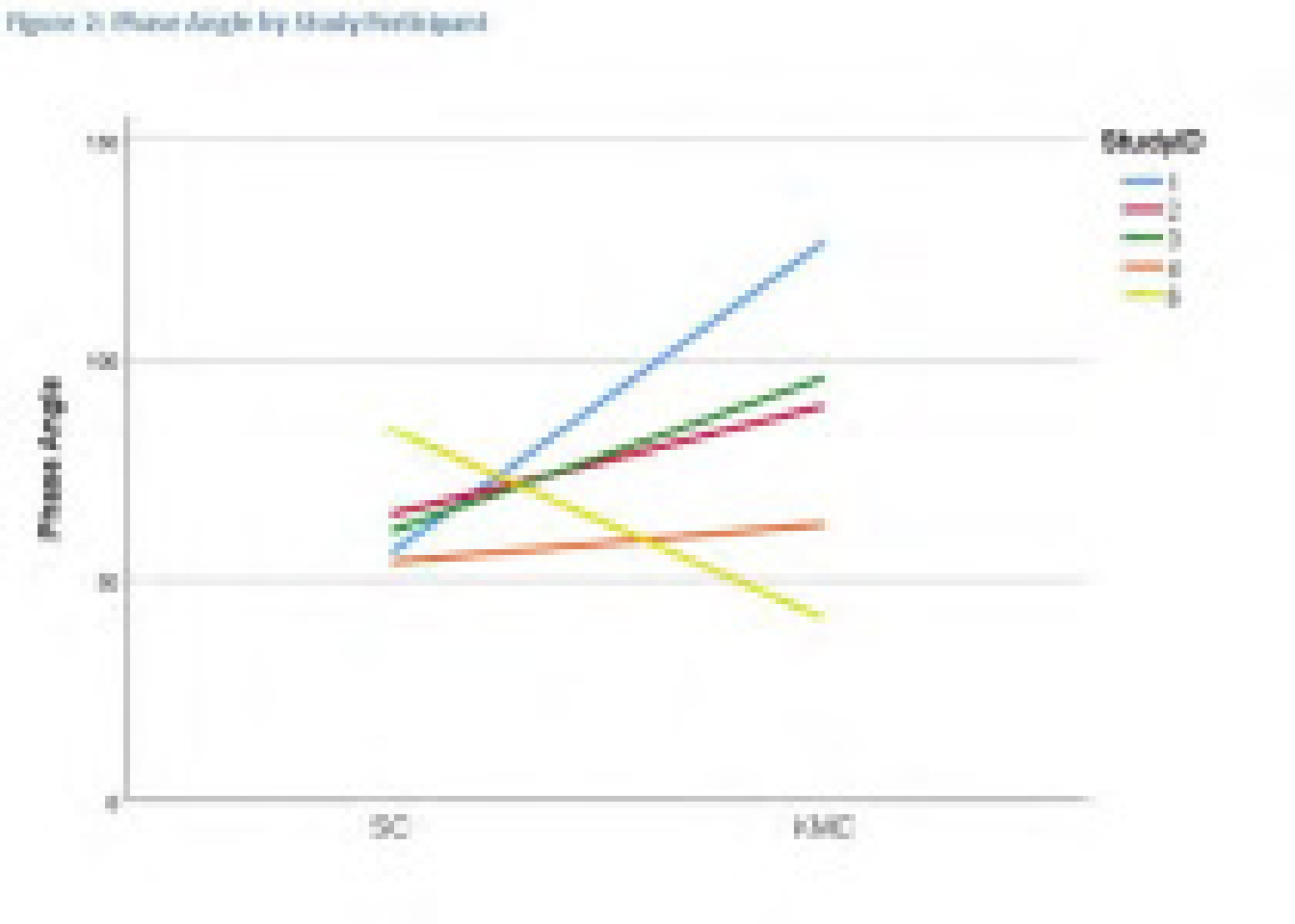


Figure 2: Line graph representing the average phase angle for each study participant during SC (standard care) and KMC (kangaroo mother care).

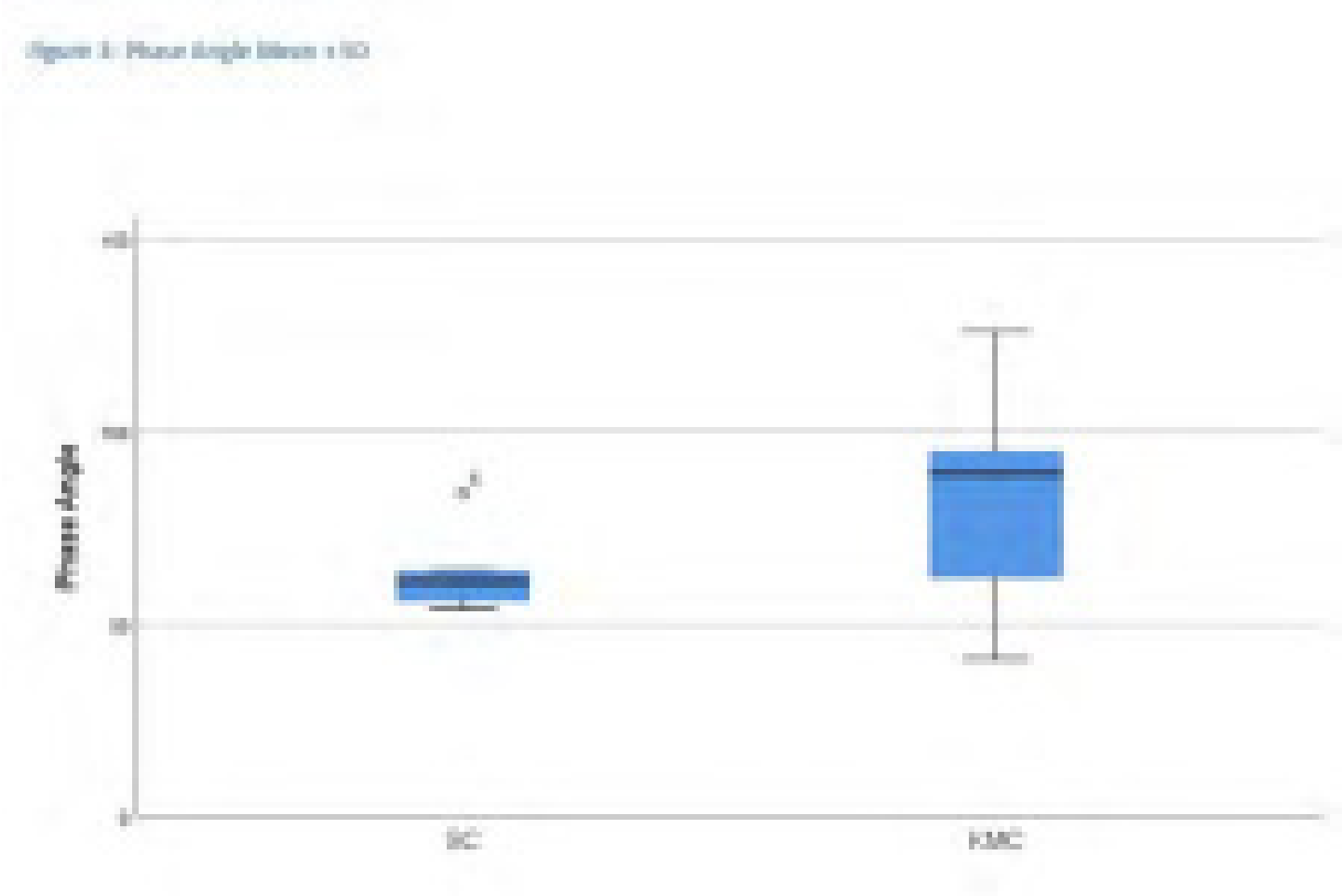


Figure 3: Mean phase angle, interquartile range, maximum and minimum phase angles during SC and during KMC.

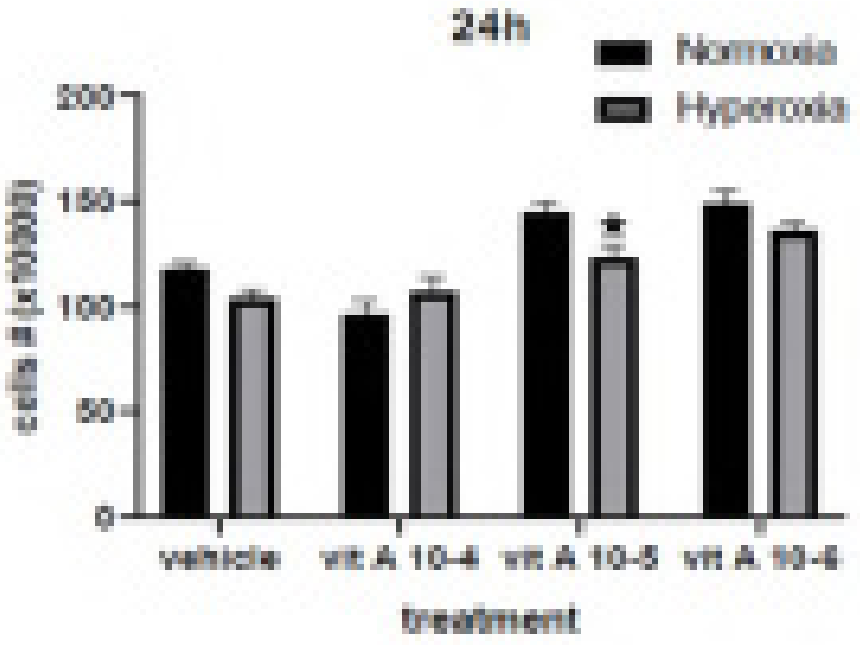
Abstract: 59
All trans-retinoic acid modifies the response of A549 alveolar epithelial cells to hyperoxia
Imtiaz Ahmed[1], Todd Umstead[2], Susan DiAngelo[2], Yuka Imamura[2], Patricia Silveyra[2], Zissis Chroneos[2]
[1]Neonatal-Perinatal Medicine, Penn State University , Hershey, Pennsylvania, United States, [2]Penn State University, Hershey, Pennsylvania, United States

Background Vitamin A supplementation has been shown to prevent bronchopulmonary dysplasia due to its role in lung maturation in preterm infants. However, information regarding its mechanism of action is lacking. Previous studies in cell culture have shown that hyperoxia inhibits cell proliferation in response to DNA damage. In this context, prior studies have also shown that the All- trans-retinoic acid (ATRA) metabolite of Vitamin A retinol facilitates recovery from hyperoxia induced cell damage, but the mechanism and the genes activated in human lung epithelial cells ATRA supplementation are poorly understood.
Objective The objective of the present study was to test the hypothesis that ATRA reduces hyperoxia-induced inflammatory damage in alveolar epithelial cells.
Design/Methods To test our hypothesis, we exposed A549 human lung epithelial cell to hyperoxia (95% O_2) for 24, 48 and 72 hours compared to normoxia (21% O_2) in the presence or absence of 10^{-4}, 10^{-5}, and 10^{-6} mM ATRA. To assess cellular proliferation, live cells were counted using a hemocytometer. Transcriptome responses were determined by RNAseq analyses. RNA sequence analysis was carried out at the Penn State's Functional Genomics Core facility. Significant transcriptome changes with a False Discovery Ratio of q<0.05 were obtained using Qiagen's Ingenuity Pathway Analysis (www.qiagen.com/Ingenuity) to identify gene network. Pathway inhibition or

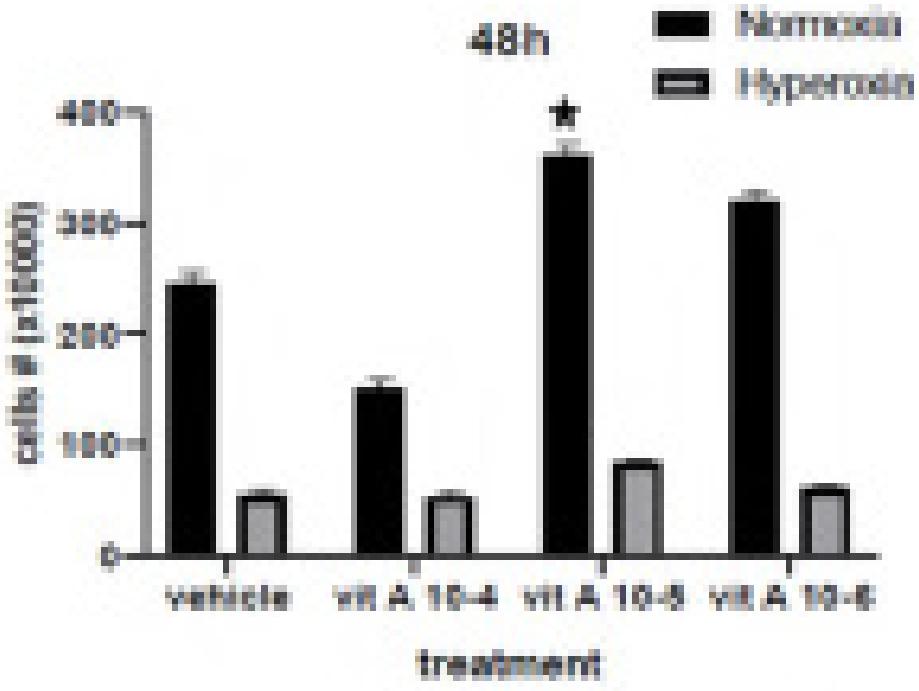
activation was assessed by z-score standard deviation analysis of log2ratio normalized data.

Results Hyperoxia significantly reduced proliferation of A549 cells compared to controls. Treatment with ATRA restored cellular proliferation after 48 hours in a concentration-dependent manner (Fig. 1). Comparative analysis revealed 834 unique genes affected in hyperoxia, 1253 common genes in both hyperoxia and hyperoxia+ATRA. 601 unique genes in hyperoxia+ATRA compared to normoxia and normoxia+ATRA controls (Fig 2). Upstream pathway analysis revealed that ATRA suppressed pathways regulating oxidative stress and innate immune response pathways.

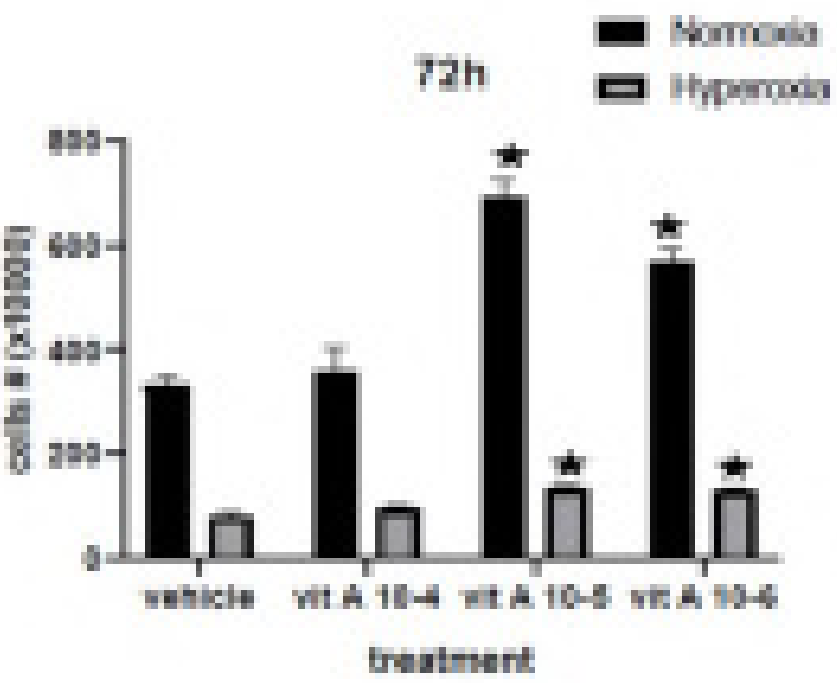
Conclusion(s) Our findings show that ATRA partially relieves the block in cellular proliferation by hyperoxia. Furthermore, ATRA suppresses oxidant and inflammatory responses genes to hyperoxia. Our findings support the use of vitamin A supplementation to decrease hyperoxia induced injury on the neoanatal respiratory epithelium and alleviate development of bronchopulmonary dysplasia.



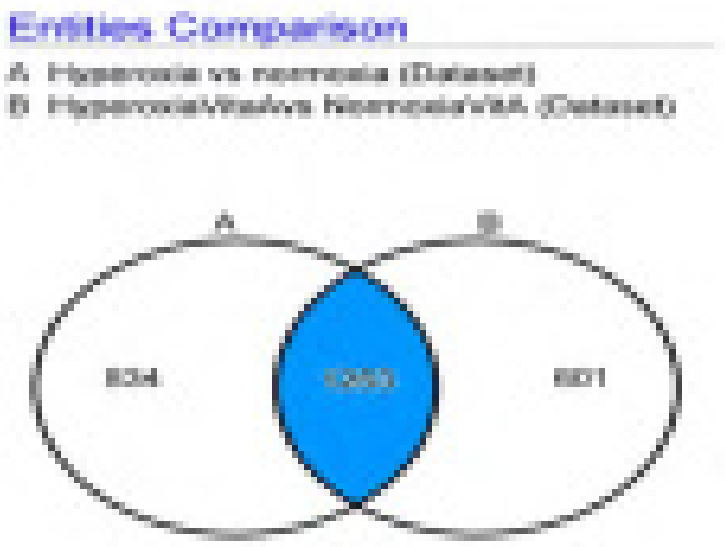
Hyperoxia decreased cellular proliferation when compared to control (normoxia) for 24 hour. Values represent means (+/- SD). Two-way ANOVA was done using Graph Pad Prism 5.0 (Graph Pad Software, Inc; San Diego, CA); n=3, *= p<0.05



Hyperoxia decreased cellular proliferation when compared to control (normoxia) for 48 hour. Values represent means (+/- SD). Two-way ANOVA was done using Graph Pad Prism 5.0 (Graph Pad Software, Inc; San Diego, CA); n=3, *= p<0.05



Hyperoxia decreased cellular proliferation when compared to control (normoxia) for 72 hour. Values represent means (+/- SD). Two-way ANOVA was done using Graph Pad Prism 5.0 (Graph Pad Software, Inc; San Diego, CA); n=3, *= p<0.05



Ven diagram showing the comaprision of the unique genes.

Abstract: 60

Utility of Bedside Dynamic Lung Compliance in Preterm Neonates with Respiratory Distress Syndrome

Leanna Laor, Sharlene Sy, Kara A. Beliard, Yaron Fireizen, Kashif Iqubal, Lily Lew, Susana Rapaport, Lourdes Cohen

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Background Respiratory distress syndrome (RDS) is common in premature neonates due to deficiency of alveolar surfactant, increased alveolar surface tension, microatelectasis and low lung volume. Pulmonary compliance is significantly reduced in RDS, resulting in increased work of breathing and need for assisted ventilation. Dynamic lung compliance (DLC) is the change in volume divided by the peak inspiratory transthoracic pressure. There are no data on usefulness of DLC in preterm neonates to determine readiness for extubation.

Objective To determine if DLC can determine extubation readiness in preterm neonates with RDS.

Design/Methods Retrospective chart review of all preterm ≤1500 grams admitted to Flushing Hospital Medical Center NICU from 2012-2017 with the diagnosis of RDS and intubated. Neonates with congenital anomalies and neurologic impairment were excluded. Maternal data included maternal age, multiple pregnancy and antenatal steroid status. Neonatal data included gestational age (GA), gender, treatment of patent ductus arteriosis (PDA), Maquet brand, SERVO–I ventilator transmitted tidal volume (Vt), peak end-expiratory pressure (PEEP) and peak inspiratory pressure (PIP) at intubation and at extubation to determine DLC. Data were analyzed using percentages, mean, standard deviations and chi-square, $p<0.05$ were considered to be significant.

Results Of 250 charts reviewed, 188 met exclusion criteria. Of the remaining 62, median GA was 28.85 weeks (17.7% between 25-27 weeks, 53.2% between 27.1-30 weeks, 29% between 30.1-35 weeks) and 64.5% male. Neonates were intubated within 12 hours of life and only one (1.6%) was intubated >24 hours of life. Mean maternal age was 30.95±5.8 years and 58% were singleton. Less than half (41.9%) did not complete antenatal steroids. DLC at the time of intubation, at time of extubation and delta DLC were determined. Binary logistic regression with delta DLC (p=0.38), GA (p=0.02) and treated PDA (p=0.81) predicted reintubation model (x^2 =8.87, p=0.03).

Conclusion(s) In our small sample, delta DLC was not predictive of readiness for extubation. GA was the single significant predictor of readiness for extubation.

Abstract: 61

Timing of Decreased Growth Velocity in Preterm Infants During NICU Hospitalization and Effect of Directed Volume Increase on Growth Trajectories

Shannon Rindone, Kaitlin Grindlay, Heather White, Susan A. Tripp, Lawrence Rhein
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Background Many preterm infants born appropriate for gestational age (AGA) are discharged from the neonatal intensive care unit (NICU) with growth failure (GF) (weight < 10%ile). To identify the optimal nutritional strategies to prevent GF in preterm infants, the specific timing of drop below the 10%ile may allow targeted nutritional interventions.
Objective To describe the timing of weight drop below the 10%ile in preterm infants during the NICU hospitalization.
Design/Methods We identified infants born ≤32 weeks gestation in the University of Massachusetts Memorial Medical Center NICU from January 2016 to June 2017 (cohort 1). We identified the subset of infants who were discharged home with GF and plotted the corrected gestational age (CGA) in which the infants dropped below the 10%ile. Based on this data, we created a feeding protocol implemented October 2017, and then compared pre- and post-protocol weekly weight changes (cohort 2: infants born January 2016-April 2018) to evaluate the impact of this change. Infants born SGA, with chromosomal abnormalities, or who died before discharge were excluded from analysis. Weights were collected weekly and plotted on the Fenton Growth Curve to obtain age-corrected Z-scores. Z-score change per week was graphed based on birth GA, comparing pre and post implementation of the feeding protocol.
Results We identified 19 infants (23%) born AGA in cohort 1 who were discharged from the NICU with GF. Of these infants, 90% dropped below the 10%ile between 33-36 weeks CGA (Figure 1). In further analysis of cohort 1, we observed that in addition to the expected weight decline after birth, many infants had another growth decline (negative change in z-score) between 35-36 weeks CGA, regardless of birth GA. Implementation of a protocol to increase enteral feeding volumes during 31-34 weeks CGA resulted in substantial pattern difference of weekly Z-score change (Figure 2). Despite the limited duration of enteral feed increase, the weekly weight changes persisted throughout the hospitalization, including to discharge.
Conclusion(s) Timing for preterm infants to drop below the 10%ile during NICU hospitalization is commonly seen between 33-36 weeks CGA, a time of potential increased energy and nutritional demands due to transition from gavage to oral feeding and from isolette to crib. Targeted increase in enteral feeding volume to address this expected timing of GF substantially and sustainably altered the weekly patterns of growth velocity.

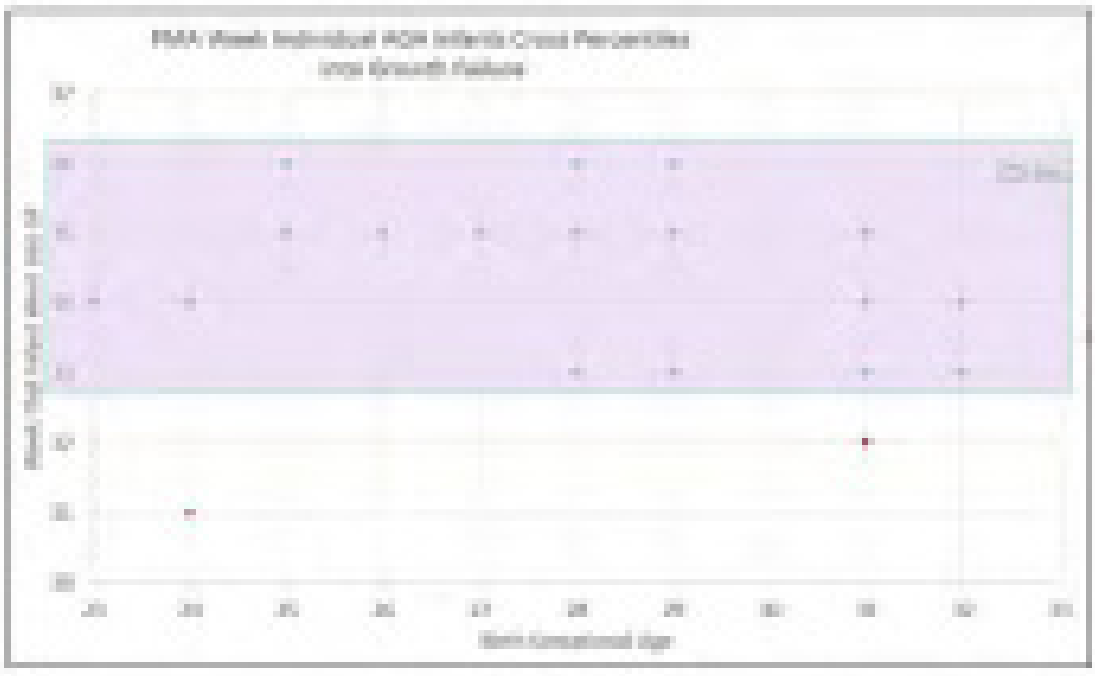

Figure 1: CGA at which Time Infants Cross Percentiles into Growth Failure showing that 90% of Infants drop <10th%ile during 33-36 weeks CGA

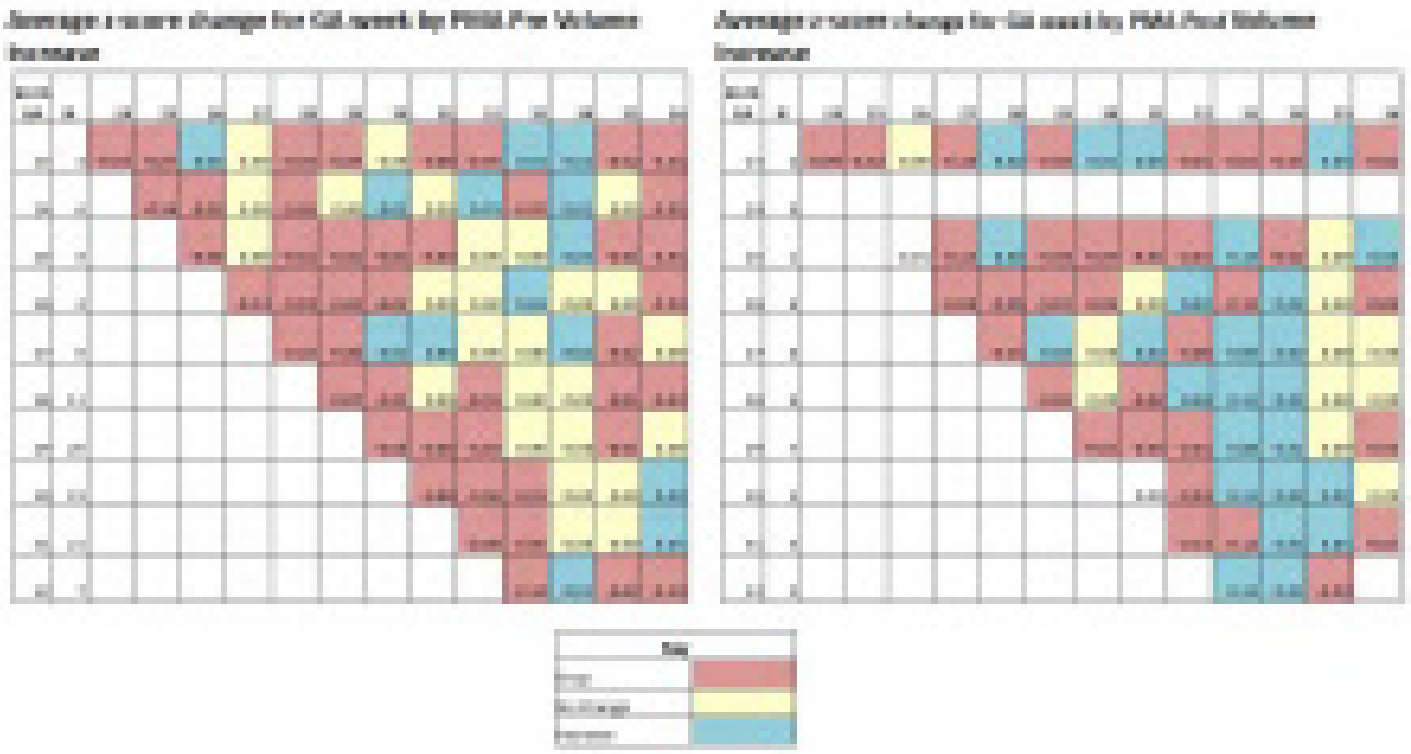

Figure 2: Average Change in Z-score by CGA Pre- and Post-Volume Increase Feeding Protocol (Cohort 2) showing less decreased growth velocity after protocol implementation

Abstract: 62
Seizure Activity in a Neonate
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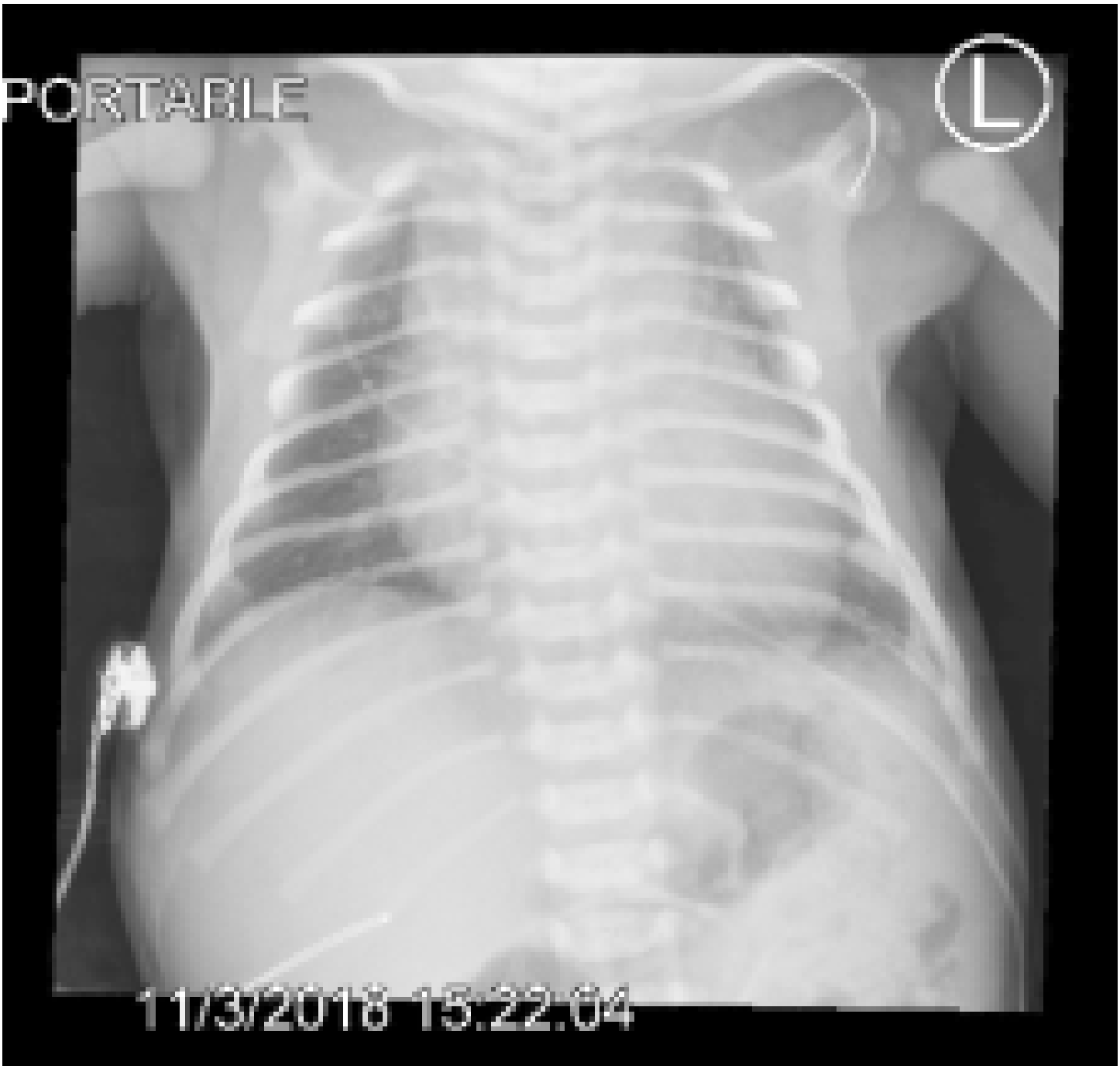
History (including chief complaint, history of present illness and relevant past and family medical history) A male infant with gestational age of 40 5/7 weeks was born to a 30 yo G1P0 mother with no pertinent past or family medical history, on no medications. Pregnancy course was benign with negative prenatal labs and normal ultrasounds. Infant was delivered via a primary C-section for failure to progress, with Apgars of 9-1, 9-5, and was admitted to the newborn nursery. Infant was stable overnight but was noted to be uninterested in feeding. On the pediatrician's initial exam, infant was found to have a 2/6 systolic ejection murmur and a slight differential between the upper and lower oxygen saturations. At 16 hours of life, infant was found to have tonic-clonic movements of the left upper arm and bilateral lower extremities that were not suppressible and were associated with oxygen desaturations during the movements. Infant was admitted to the NICU on CPAP with vitals within normal range including pre-ductal and post-ductal oxygen saturations. After the infant received a dextrose bolus for a BG of 26, there were no further episodes of hypoglycemia. Upon admission, the infant was placed on electroencephalogram monitoring and given a dose of Ativan and loaded with Phenobarbital. The infant was started on meningitic doses of ampicillin, gentamicin, and acyclovir. At 22 hours of life, the infant developed recurrent seizure activity and was found to have a left-sided facial droop. To control continued seizure activity, two more doses of Ativan, an additional load of phenobarbitol (level was 41.9), a dose of Keppra and a load of fosphenytoin were given.
Physical examination findings (including vital signs) Wt: 4.21 kg (95%)
Ht: 22.05 in (>99%)
HC: 37.5 cm (>99%)
Temp: 36.6 C
HR: 136
RR: 31

BP: 59/25 LL, 59/24 RL, 55/36 LA, 56/41 RA
Pulse Ox: 97%-100% on FiO2 27%
Physical exam within normal limits except pertinent positives:
CV: RRR, normal S1 and S2, 2/6 SEM; brachial/femoral pulses 2+, symmetric; CR< 3 sec
Lungs: clear to auscultation, no grunting, flaring, or retractions
Neuro: Arousable with minimal stimulation, PERRL, face symmetric with grimace to tickle, tongue midline, reduced tone in upper extremities bilaterally, moves all extremities, sensation intact
Reflexes: symmetric 2/4 LE, 1/4 UE, toes upgoing, weak moro
Laboratory or Diagnostic imaging or Procedures ABG: 7.38/32/110/19/-6
BMP: 137/5.9/106/20/17/1.2
LFTs: TP 3.7, Alb 2.6, T/D bili 5.4/0.8, Alk phos72, AST 49, ALT 20
BG: 26,100
CBC: 16.1>43.4<221 70 N, 8 B, I/T ratio 0.1
CSF: 112 RBC, 22N, 8L, 1E, gluc 75, Prot 179, 69 monos
Coags: INR 1.9, PT 20.1, aPTT 56.3
Mag: 1.7
Phos: 6.5
Calc: 7.2
Mec tox: negative
Plasma AA, Urine OA: WNL
Final Diagnosis Vein of Galen Malformation



Abstract: 63

An unusual presentation of Solitary rectal ulcer syndrome (SRUS) in a pediatric patient

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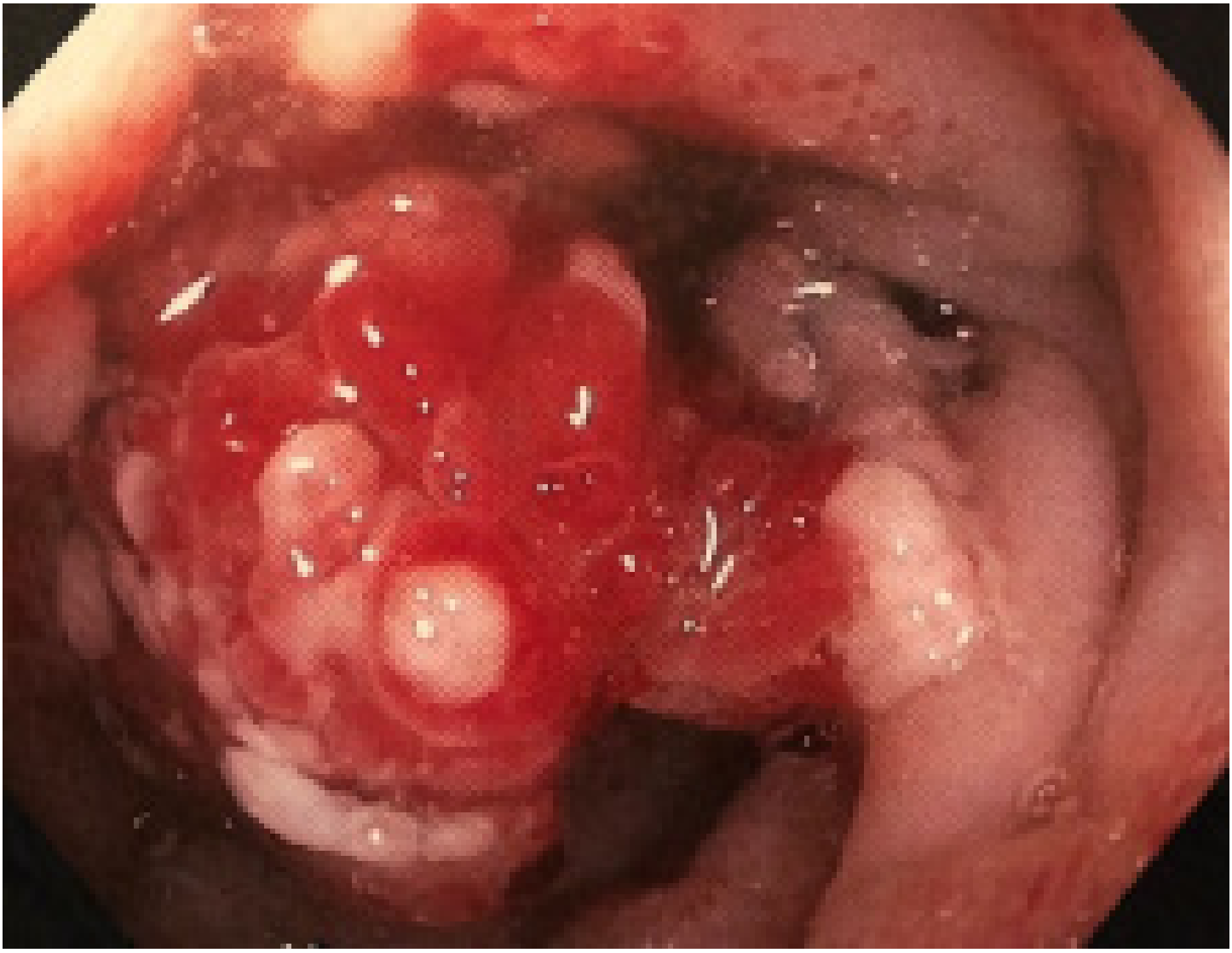
[1]Pediatrics, Staten Island University Hospital, SI, New York, United States, [2]Staten Island University Hospital, SI, New York, United States

History (including chief complaint, history of present illness and relevant past and family medical history) 12 year old M referred to the ED for severe anemia. CBC drawn the day prior to presentation showed Hgb of 4.5. The patient had experienced intermittent bloody stools mixed with mucus for approximately 3yrs with the last episode 4 mos PTA. Patient denied any other sxs. No subjective history of blood clotting disorders. No history of oral ulcers, skin lesions, joint pain or weight loss. No past medical or surgical history. Family history was non-contributory.

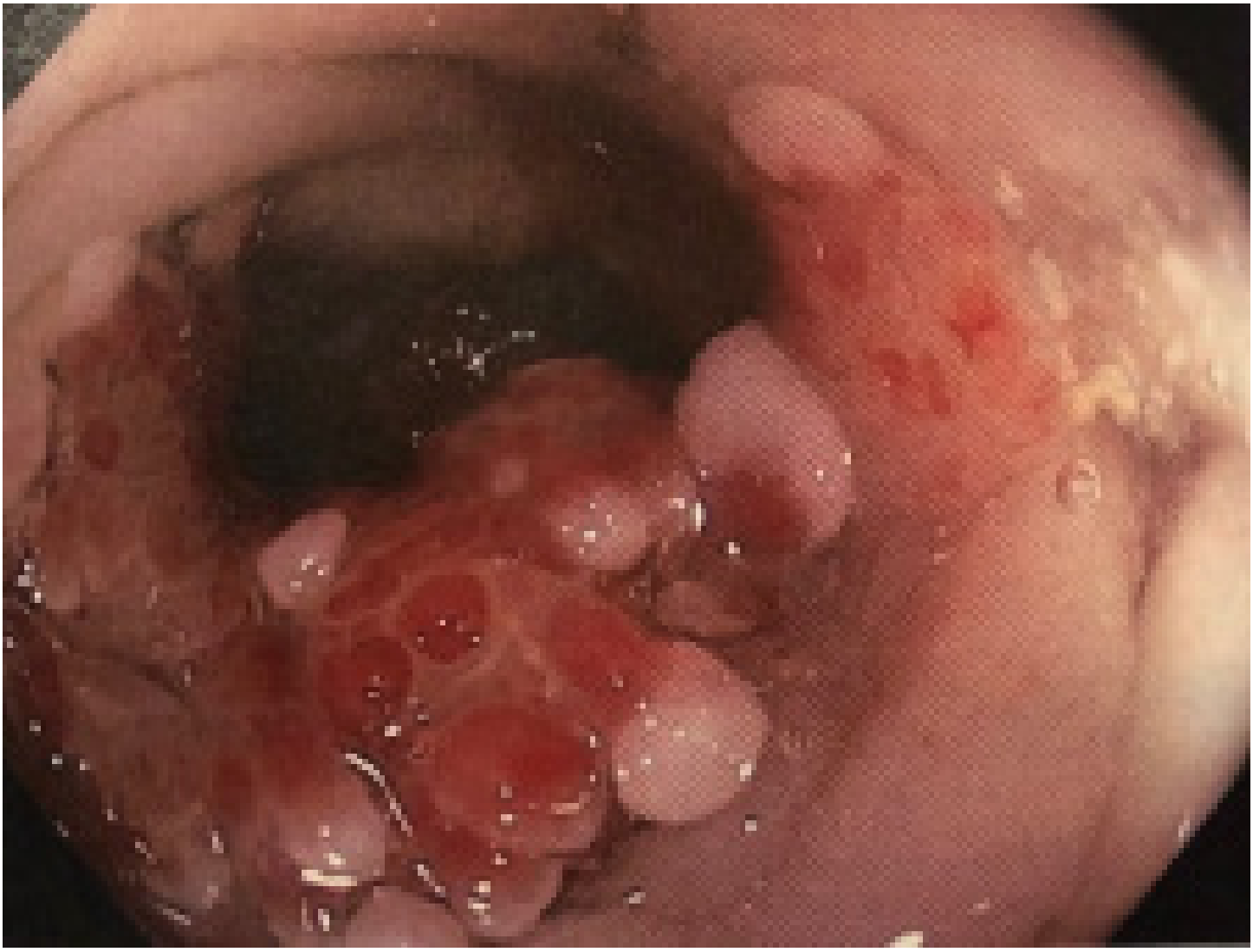
Physical examination findings (including vital signs) Temp 97.7F, BP 101/56, HR 86 bpm, RR 25 breaths/min & O2 saturation 100%. 10th percentile for ht (136cm) & 3rd percentile for wt (29.8kg). Patient was small for age, pale, in NAD with significant conjunctival pallor. Anal exam normal, rectal exam deferred. Remainder of the PE was wnl.

Laboratory or Diagnostic imaging or Procedures CBC: Hgb 4.4, Hct 18. MCV 57.1, total Fe 21, % Fe saturaton 5, ferritin 2, TIBC 415, reticulocytes 8.5. PT 11.1, PTT 25.9, INR 1.03. Celiac profile was wnl. Stool was formed with visible blood, + Hemoccult. Stool culture & C. difficle toxin were negative. Stool lactoferrin was wnl, stool calprotectin was elevated at 298. MRE of abdomen showed wall thickening & hyper-enhancement of the rectosigmoid colon extending to the anus. Upper endoscopy was wnl. On colonoscopy, the rectal muscosa appeared edematous also with an area of hyperemia. There were several polypoid lesions over the distal rectal mucosa (images 1 & 2). The lesions varied in size. There was white colored exudate covering the apical portions of the lesions. Photos were taken & forceps biopsy of the lesions were sent for path exam which revealed nonspecific changes to the mucosa. 3 weeks later, rectosigmoidoscopy revealed several isolated polypoid lesions on a broad base. Multiple photos were taken & lesions were resected & sent for path exam. Path report showed polypoid fragments of colonic mucosa with focal hyperplastic changes, ulceration with exuberant granulation tissue & acute inflammatory exudate & adjacent foci of lamina propria with firbromuscular stroma hyperplasia. Changes consistent with SRUS.

Final Diagnosis SRUS is a benign disorder that rarely presents in childhood. Unlike its name would imply, SRUS can include a variety of rectal lesions such as single or multiple polyps or polypoid lesions, hyperemic mucosa & single or multiple ulcers. The variation of lesions seen on endoscopy can make it difficult for clinicians to properly & speedily diagnose. SRUS can often be mistaken for IBD or even malignancy. This case demonstrates an unusual presentation of SRUS in a pediatric patient.



Lesion in rectum.



Lesion in rectum.

Abstract: 64

Invasive Group B Streptococcus as the initial presentation in Systemic Lupus Erythematosus in a previously healthy prepubertal female

Inna Kaminecki[1], Thomas Lipari[2], Anup Singh[2], Tiong The[2]

[1]Pediatrics, Monmouth Medical Center, Long Branch, New Jersey, United States, [2]Pediatrics, Saint Peter's University Hospital, New Brunswick, New Jersey, United States

History (including chief complaint, history of present illness and relevant past and family medical history)

A 10-year-old girl presented with fatigue, abdominal pain, fever, and vomiting. Symptoms started 3 weeks previously with complaints of diffuse abdominal pain, vomiting, and diarrhea. Five days prior to presentation she developed progression of the symptoms with multiple episodes of watery diarrhea, non-bloody vomiting, low urine output. She was also found to have puffiness of the face and edema of the lower extremities. Three months previously she experienced an episode of abdominal pain after a family trip to Mexico. The patient had a history of multiple urinary tract infections in the past.

Physical examination findings (including vital signs)

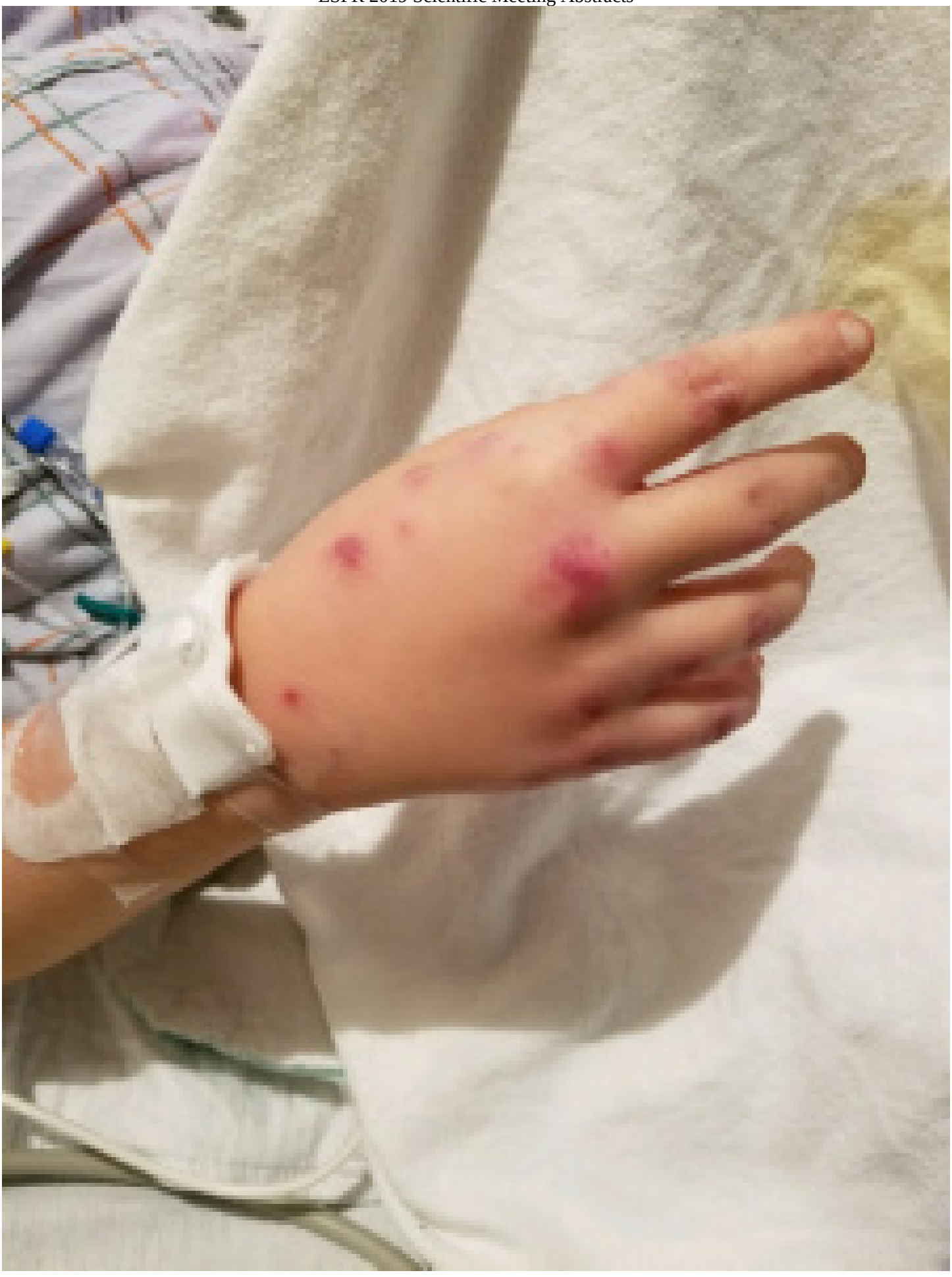
On physical examination the patient appeared ill. Her temperature was 38.2 C, heart rate 128 beats/min, respiratory rate 55 breaths/min, and blood pressure 134/78 mmHg. She had decreased breath sounds at bases bilaterally. Heart sounds were minimally muffled. Her abdomen was distended with diffuse tenderness in all quadrants. Muscle strength at upper and lower

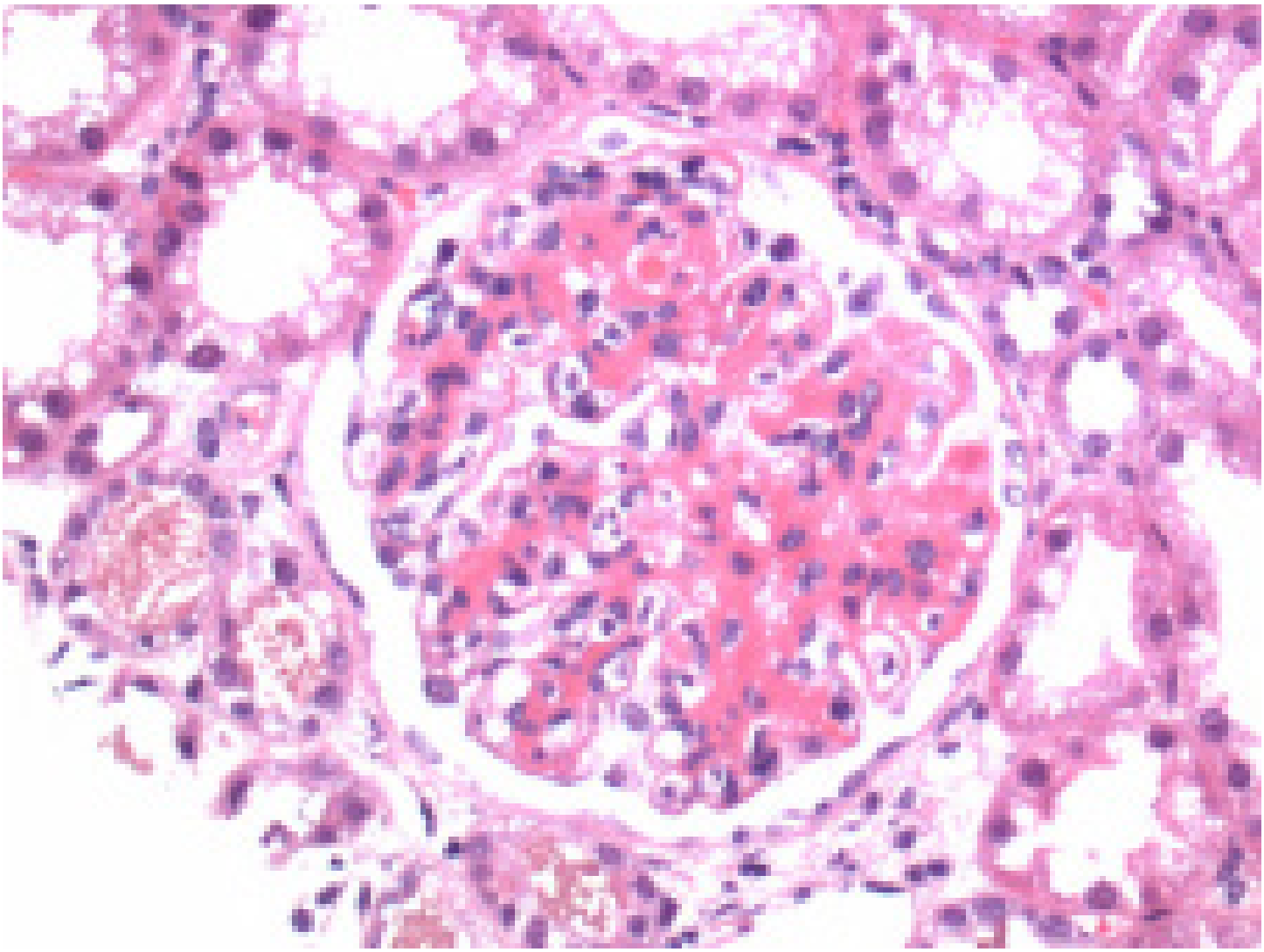
extremities was decreased bilaterally. Her skin was pale with erythematous painful subcutaneous rash over the dorsal surface of the hands and elbows (Figure 1). She was noted to have bilateral pitting edema +3 up to her ankles.

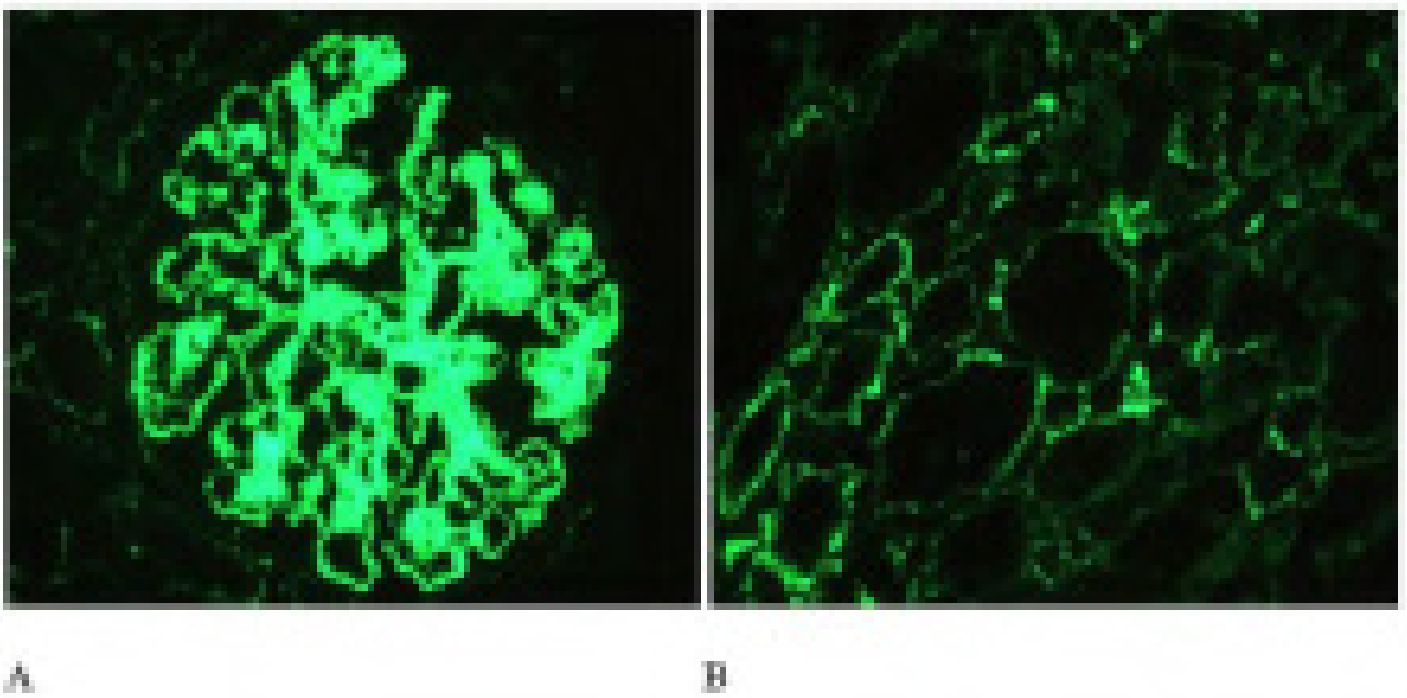
Laboratory or Diagnostic imaging or Procedures

Laboratory results: white blood cell count of 2,800/ µ/L with 21% bands, a hemoglobin level of 9.9 g/dL , a platelet count of 272 x 10^3/µL, a sodium level of 132 mEq/L, a potassium level of 5.4 mEq/L, a creatinine level of 5.49 mg/dL, blood urea nitrogen of 110 mg/dL, an albumin level of < 1.5 g/dL, a C-reactive protein level of 282 mg/L , an erythrocyte sedimentation rate of 56 mm/h. Urinalysis was positive for nitrites, leukocyte esterase, large blood and protein of 300 mg/dL. A computed tomographic scan of the abdomen was positive for anasarca, bilateral pleural effusions, pericardial effusion. Blood and urine cultures grew group B streptococcus (GBS). Peritoneal fluid showed a white blood cell count of 16,125/µ/L, and the culture was positive for GBS. Patient's complement studies showed decreased C3 complement level of 20 mg/dL and a decreased C4 complement level of 8 mg/dL . Her antinuclear and anti-double stranded DNA antibody tests were also positive. Kidney biopsy showed diffuse endocapillary and membranoproliferative glomerulonephritis with segmental membranous features, consistent with lupus nephritis class IV (Figure 2 and Figure 3).

Final Diagnosis Systemic lupus erythematosus

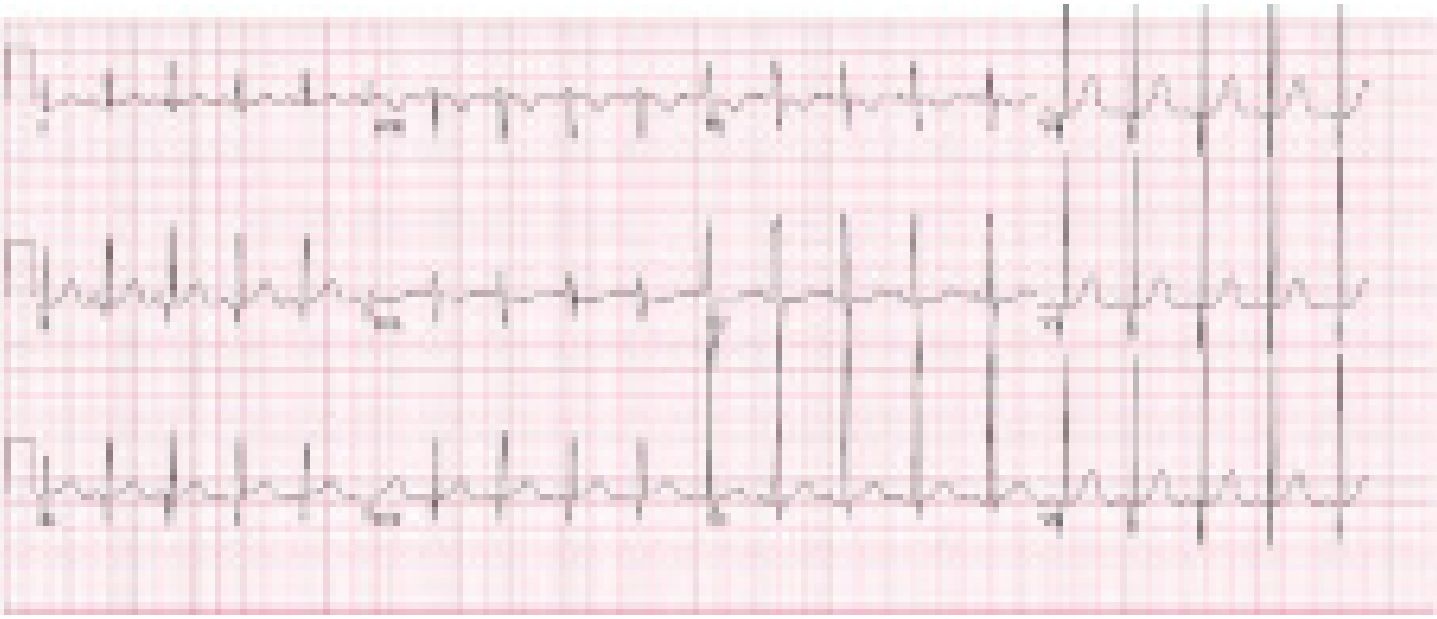


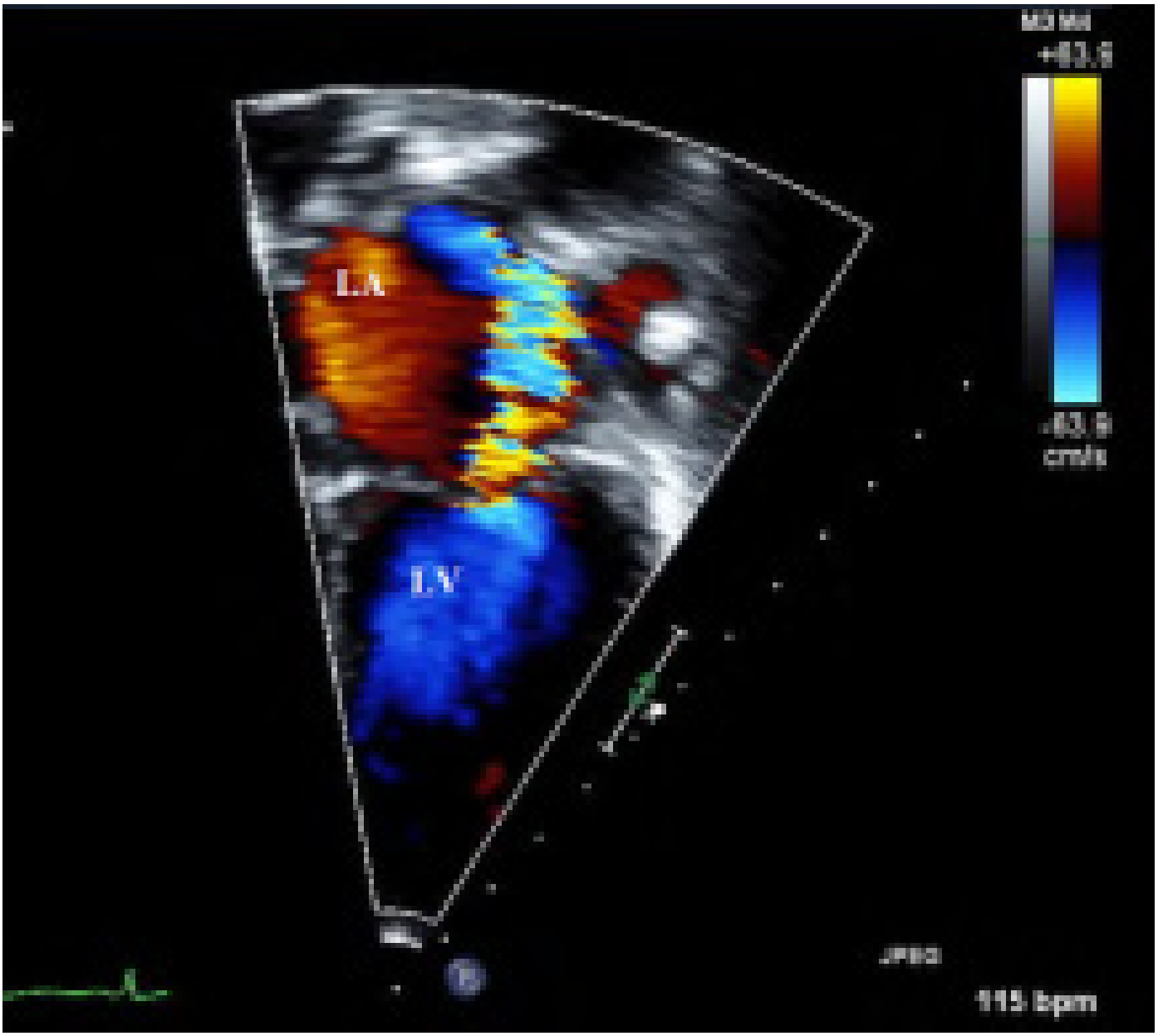




Abstract: 65
Delayed diagnosis of acute rheumatic fever in a patient with multiple emergency department visits
Inna Kaminecki, Renuka Verma, Jacqueline Brunetto, Loyda Rivera
Pediatrics, Monmouth Medical Center, Long Branch, New Jersey, United States

History (including chief complaint, history of present illness and relevant past and family medical history) A 5-year-old boy presented with a 3-month history of intermittent fevers, fatigue, migratory joint pain, and weight loss. Two weeks later, he started having pain in his knees, elbows, shoulders and neck. The patient was diagnosed with *Influenza* and completed a course of oseltamivir. His joint pain and intermittent fever persisted. He began to develop malaise, weakness, difficulty waking and was noted to have cough. During the next month the patient was evaluated twice in different emergency departments with the same complaints. Chest X-Ray findings were consistent with pneumonia and he was prescribed amoxicillin/clavulanic acid. Blood and urine cultures were negative. Three weeks later the patient presented to his pediatrician with complaints of bilateral ear pain. His fevers, joint pain, difficulty walking and fatigue persisted. Three months ago the patient was diagnosed with *group A Streptococcus* pharyngitis and was prescribed a 10-day course of amoxicillin.
Physical examination findings (including vital signs)
The patient appeared unwell, but nontoxic. His temperature was 36.0 ^{0}C, heart rate was 123 beats/min, respiratory rate was 23/min, blood pressure was 109/65 mm Hg. He had a V/VI holosystolic murmur with thrill at the mitral area with radiation to the axilla and interscapular area. The boy reported pain during active and passive motion of both knees and neck. His left knee was slightly swollen. Examination of the skin revealed presence of small (1 centimeter in diameter) painless, firm nodules over extensor surfaces of ankles and elbows bilaterally.
Laboratory or Diagnostic imaging or Procedures
Laboratory evaluation showed white blood cell count of 9.9 x 10^3 µ/L; platelet count of 495 x 10^3/µL; hemoglobin level of 11.2 g/dL; C-reactive protein of 84.3 mg/L and erythrocyte sedimentation rate of 93 mm/hr. Antistreptolysin-O titers were 4,133 IU/ml (reference range, <150 IU/ml). Results of urinalysis were normal. Electrocardiography showed normal sinus rhythm with signs of left ventricular hypertrophy with volume overload with increased R wave voltage above 98th percentile for age in leads V5, V6 and Q wave in lead V6 above 98th percentile for age (Figure 1). Echocardiographic findings included moderate left atrial enlargement, severe mitral valve regurgitation (Figure 2) and aortic valve regurgitation.
Final Diagnosis Acute rheumatic fever





Abstract: 66
A rare case of prenatal testicular torsion
Timothy Kita, Grzegorz Danielczok, Brienna Miller, Laura Madore
baystate medical center, Chicopee, Massachusetts, United States

History (including chief complaint, history of present illness and relevant past and family medical history) Patient XX was a full-term healthy, AGA infant boy born vaginally with reassuring prenatal labs and ultrasounds. At five hours of life, his right testis was noted to be firm, ecchymotic, and tender to palpation. XX was otherwise well appearing, feeding and voiding normally, and afebrile. There was bilateral scrotal swelling and an enlarged right testicle. The right scrotal sac had decreased transillumination compared to the left. A STAT ultrasound of scrotum and contents with duplex pelvis art/venous flow was ordered
Physical examination findings (including vital signs) Well appearing in no distress except when testicles palpated. Abdomen-soft, nontender without masses, 3 vessel cord. Pink-purple scrotum, bilateral hydrocele, firm right testis tender to palpation. Well-perfused throughout. The remainder of the exam was benign
Laboratory or Diagnostic imaging or Procedures Scrotal Ultrasound

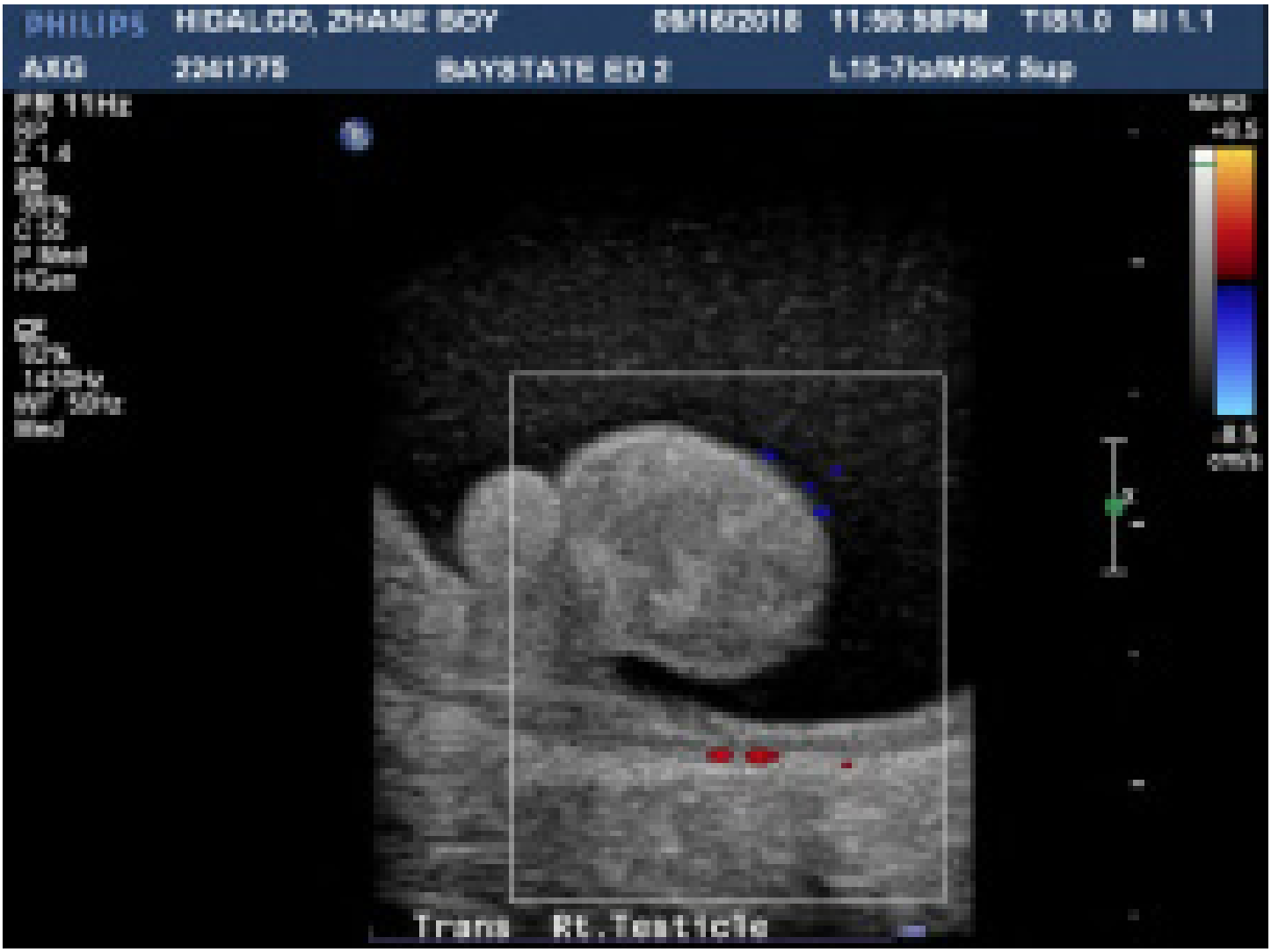
Right testicle size: 1.1 x 0.9 x 0.9 cm (0.5 cc)
Asymmetrical enlargement with a heterogeneous echotexture. No flow within the testes. A large hydrocele is noted with internal debris. There is marked discoloration of the right hemiscrotum. Findings concerning for torsion of the right testis

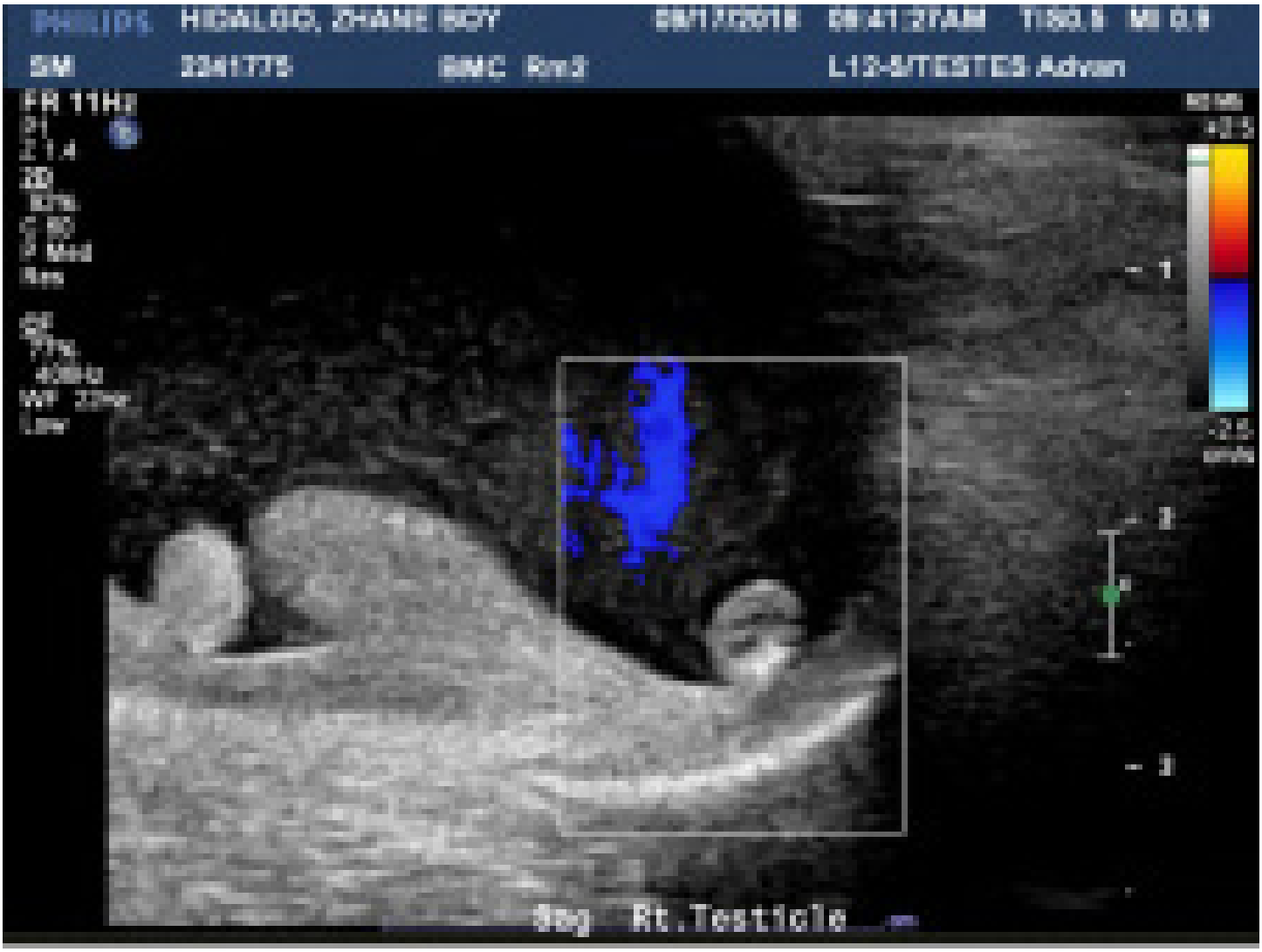
Left testicle size: 1.2 x 0.6 x 0.6 cm (0.2 cc)
A large hydrocele is present with debris
Otherwise normal.

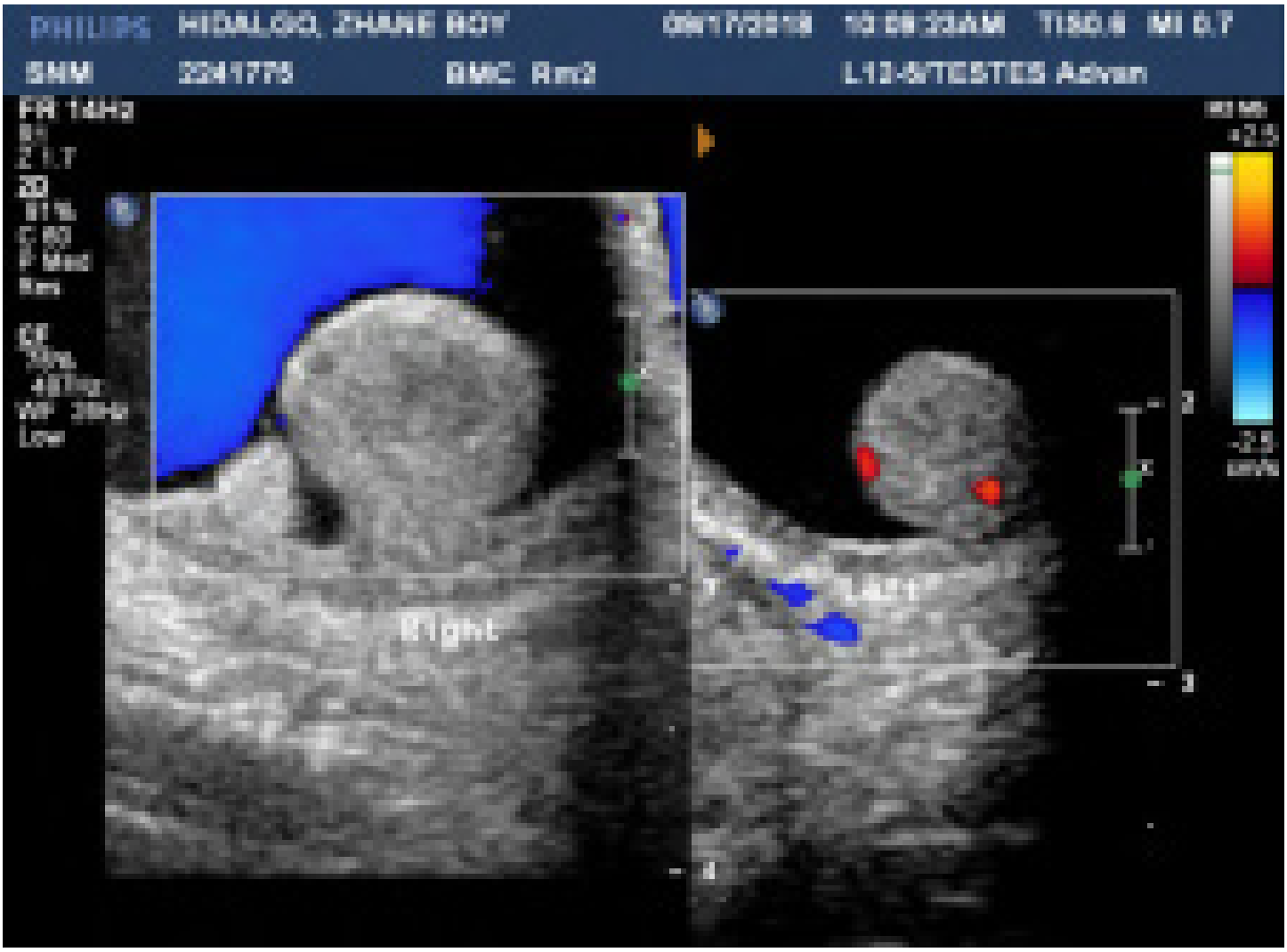
Pediatric surgery was consulted. No acute intervention was performed and a repeat US was recommended. Repeat US at 17 hours of life yielded similar findings. The surgical team re-evaluated and diagnosed prenatal-torsion with loss of right testicle, with plan for surgical exploration 2 days later.

Bilateral scrotal exploration with fixation of testicles performed without complication. No torsional twisting of right testis noted, though the epididymal head and the upper portion of the testicle had purple discoloration. These findings suggested a prior torsion; however, the inferior pole of the testicle and the adjacent epididymal body and tail were pink. Both testicles were deemed viable and were therefore re-implanted into the scrotum.

Neonatal testicular torsion is rare with a reported incidence of 6/100,000 live births, and represents ~10% of all cases of pediatric torsion. It is postulated that increased intrauterine pressure during late pregnancy results in a quick cremaster response at a time when there is a loose scrotum-tunica vaginalis attachment. Early prenatal torsion presents as a small/absent testicle; late torsion presents with enlarged firm discolored testicle. Management goal is to preserve contralateral testis.
Final Diagnosis Prenatal testicular torsion with preservation of the testis




Sag Rt.Testicle



Abstract: 67
Fussy Was-He
Tasha Desai[2], Danielle J. Chenard[1], Henry Chicaiza[2]
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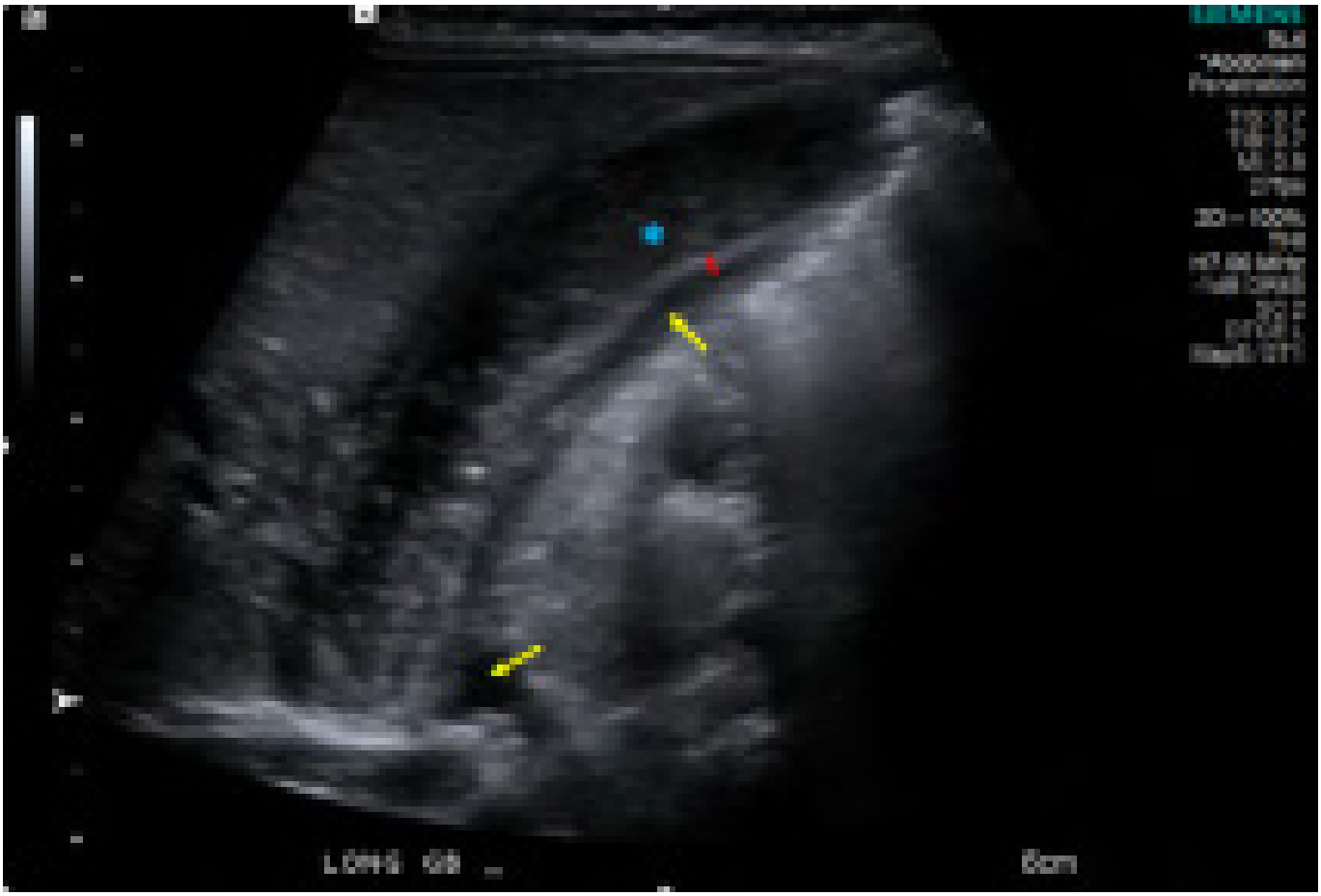
History (including chief complaint, history of present illness and relevant past and family medical history) This is a 4 month old male who was referred to the emergency department (ED) after 1 day history of fussiness and abdominal pain.
Mother reported that he had intermittent episodes of increased crying and poor nursing. He had a single episode of non-bloody, non-bilious projectile emesis described as the consistency of curdled milk. Due to concern for constipation, he was given a rectal suppository at home, resulting in a large non-bloody bowel movement without improvement in fussiness. There was no report of fever, cough, decreased urine output, hematuria or rash.
The patient was born via planned Cesarean section at 38 5/7 weeks with a birth weight of 3.03 kg. Maternal history was pertinent for use of Zoloft for anxiety/OCD and prenatal vitamins. He had an unremarkable nursery stay, and was discharged home at day 3 of life.
Recent travel history was notable for a trip to California, including the San Diego Zoo, and there was a pet porcupine at home.
Physical examination findings (including vital signs) Vital signs in the ED: temperature 36.7°C, pulse 108 bpm, blood pressure 112/70, respiratory rate 34 breaths/min, and weight 6.35 kg.
Physical examination was normal for age other than generalized abdominal tenderness (crying with palpation of abdomen). No masses were noted and bowel sounds were normal.

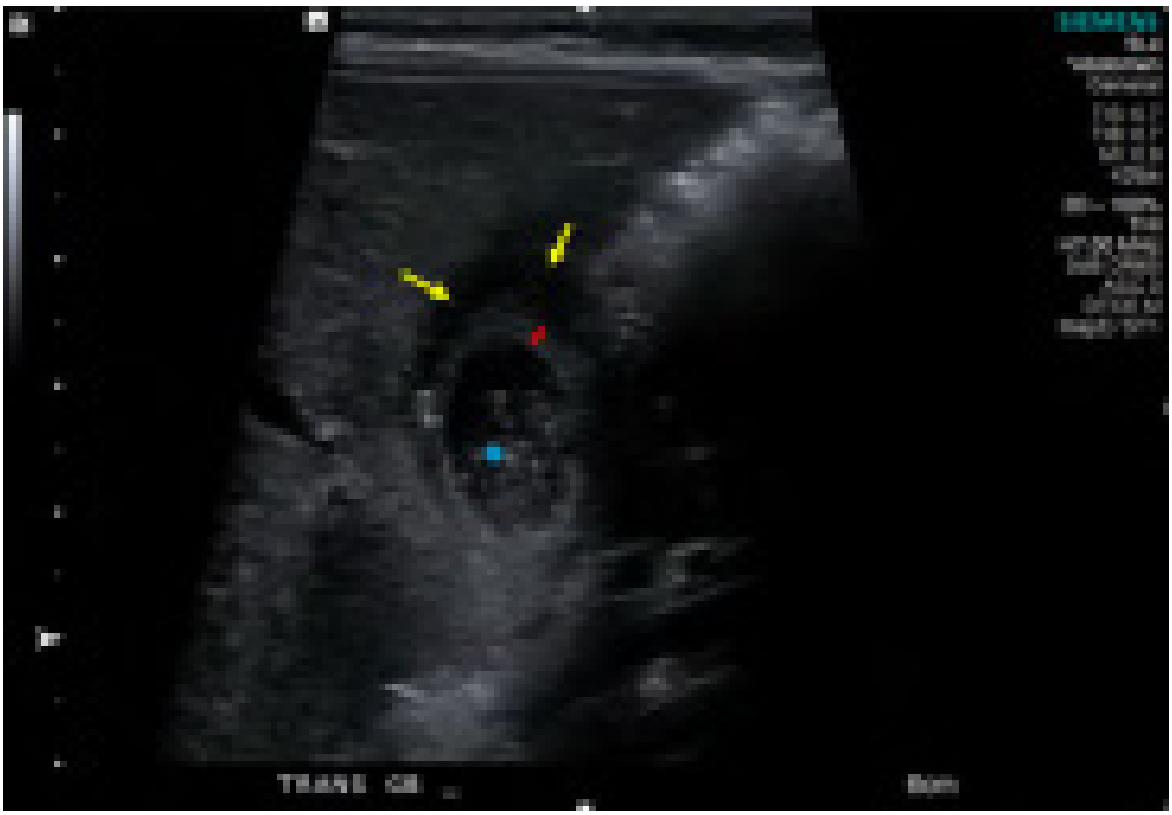
Laboratory or Diagnostic imaging or Procedures A limited abdominal ultrasound (US) did not show signs of intussusception, however, there was trace free fluid within the pelvis and in the pericholecystic location along with echogenic bile within the gallbladder lumen without cholelithiasis. A follow-up complete abdominal US demonstrated gallbladder wall thickening and a normal caliber common bile duct (0.1 cm).

Lab results were: WBC 16.7 thou/uL, hemoglobin 11.5 g/dL, hematocrit 33.2%, platelet 468 thou/uL, sodium 136 mmol/L, potassium 4 mmol/L, chloride 102 mmol/L, carbon dioxide 23 mmol/L, BUN 7 mg/dL, creatinine 0.2 mg/dL, glucose 88 mg/dL, INR 1, PT 11.1 sec, PTT 32 sec, AST 61 U/L, ALT 88 U/L, alkaline phosphatase 220 U/L, LDH 344 U/L, GGT 20 U/L, albumin 4.5 g/dL, total bilirubin 0.6 mg/dL, and direct bilirubin <0.2 mg/dL. Lipase was 19 U/L. CRP (0.28 mg/dL) and blood cultures were also drawn. Hepatitis panel was within normal limits.

Final Diagnosis A diagnosis of cholecystitis of viral etiology was made based on imaging and mild transaminitis, and the patient was admitted to the general surgery service for ranitidine and rehydration. Repeat US showed persistent gallbladder distention with echogenic sludge and improved gallbladder wall thickening. He had resolution of abdominal tenderness and emesis after oral and IV hydration, and was discharged home.



Distended gallbladder in longitudinal view with echogenic bile (blue asterisk), gallbladder wall thickening (red line), and pericholecystic fluid (yellow arrows).



Distended gallbladder in transverse view with echogenic bile (blue asterisk), gallbladder wall thickening (red line), and pericholecystic fluid (yellow arrows).

Abstract: 68

Undervirilized male infant with features of atypical CAH following prenatal exposure to Nystatin

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History (including chief complaint, history of present illness and relevant past and family medical history) Antifungals act on fungal sterols structurally similar to human cholesterol. Ketoconazole reversibly suppresses steroidogenesis by inhibiting several cytochrome P450 enzymes and reducing binding of Dihydrotestosterone (DHT) to its receptor. Use of Nystatin (N) during pregnancy was rarely associated with hypospadias. We report a male infant born to a mother treated with N during pregnancy, who presented with undervirilization and transient adrenal corticosteroid abnormalities.

The patient is an African boy born at 31 weeks in the US to consanguineous parents (second cousins) with weight and length appropriate for gestational age. In the Ivory Coast, the mother had acne, hirsutism and vaginal discharge during pregnancy for which she received vaginal Polygynax capsules containing N 100,000 IU, Neomycin Sulphate 35,000 IU & Polymyxin B 35,000 IU from first trimester to end of pregnancy (about 60 capsules). The infant had a 1 cm by 0.7 cm phallus, chordee, perineoscrotal hypospadias and bifid scrotum with bilaterally palpable gonads. 17 OHP on newborn screening was 304 ng/ml (nl <35), Karyotype 46 XY, SRY+ on FISH and no Mullerian structures were seen on ultrasound. Elevation of several adrenal corticosteroids did not indicate a specific enzymatic defect (Table 1). Hydrocortisone (HC) was started on day of life (DOL) 5 and Fludrocortisone (F) and NaCl on DOL 12. When first seen at Mount Sinai at 5 weeks of life, he was on HC (15 mg/m2/day), F (0.1 mg) and NaCl (1 gm). Genetic testing for 16 genes including *3βHSD, POR, CYP11A1, CYP21A2* was negative (Table 2). Over the next few months, HC, F and salt were gradually successfully discontinued. Retesting with Cosyntropin at 8 months of age indicated normal baseline and stimulated adrenal steroids. T/DHT response to hCG was normal.

Physical examination findings (including vital signs)

Laboratory or Diagnostic imaging or Procedures .

Final Diagnosis To our knowledge, this is the first report of severe undervirilization in a 46 XY infant with neonatal abnormalities in P450 Cyp 21 steroid pathway and clinical evidence of dysruption in fetal P450 Cyp 19 pathway. Since neonatal T and DHT were normal it is possible that fetal undervirilization resulted from insufficient T and DHT production or action during the critical time of sexual differentiation. We postulate that intrapartum use of Nystatin leads to severe but transient defects in corticoid and androgen synthesis and/or action.

Table 1 : Laboratory values (DOL- Day of Life, B- Baseline, S1- Stimulated with ACTH, S2-Stimulated with HCG)

	Reference Range	DOL 2	DOL 3-4	DOL 18	8 months (off HC)	18 months (off HC)
ACTH (pg/ml)	7.2-63		158 (B)		11 (B)	7.4 (B)
Cortisol (mcg/dl)	3-23		6.5 (B) 10 (S1)		19 (B) 28 (S1)	4.5 (12 pm)
Sodium (mmol/L)	134-144	142	144	134	140	141
Potassium (mmol/L)	3.6-5.3	6.3	5.8	6.9	5.7	4.9
Bicarbonate (mmol/L)	15-25	18	19	23	21	19
Plasma Renin Activity (ng/ml/hr)	Premature : 1 – 7 Days: 11 – 167 1– 11 Months: 3.35 – 37			174.1	7.8	3.1
Aldosterone (ng/dl)	Premature : 12-708 1-5 months: 3-76			106	11	
17 Hydroxyprogesterone (ng/dl)	156-472 (B) 334-1720 (S)	316 (B)	4853 (B1)		57 (B) 183 (S1)	22 (B)
17 Hydroxypregnenolone (ng/dl)	328-2806 (B) 881-9760 (S)		> 4000(S1)		328 (B) 1156 (S1)	34 (B)
Dehydroepiandrosterone Sulfate (mcg/dl)	122-710 (B)		2410 (B)			
11 Deoxycortisol (ng/ml)	< 0.1 – 23.8 (B)		1431 (B)		34 (B) 107 (S1)	
Testosterone (ng/dl)	31- 55 weeks Day 4 37-198	353 (B)			3.8 (B) 587 (S2)	
Dihydrotestosterone (ng/dl)	Premature 10-80		23 (B)		1.4 (B) 111 (S2)	
Testosterone : Dihydrotestosterone ratio	1.5-15.5 (S2)				5.3 (S2)	

Laboratory values (DOL- Day of Life, B- Baseline, S1- Stimulated with ACTH, S2-Stimulated with HCG)

Table 3 : XomeDxSlice results of gene panel tested (GeneDx)

CAH 21 Hydroxylase (CYP21A2)	Negative
3-beta-hydroxysteroid dehydrogenase deficiency (HSD3B2)	Negative
Androgen receptor (AR)	Negative
Janusdesis related Homeobox (ARX)	Negative
Cytochrome P450 Oxidoreductase (POR)	Negative
Hydroxysteroid 17-beta dehydrogenase 3 (HSD17B3)	Negative
Cytochrome P450 Family 11 (CYP11A1)	Negative
Chromobox protein homolog 2 (CBX2)	Negative
Metadherin/Eden Domain Containing protein 1 (NR5A1/D1)	Negative
Luteinizing Hormone/Choriongonadotropin Receptor (LHCGR)	Negative
Aldo-keto Reductase Family 1 Member C4 (AKR1C4)	Negative
Aldo-keto Reductase Family 1 Member C2 (AKR1C2)	Negative
Mitogen-Activated Protein Kinase 1 (MAP3K1)	Negative
Wingless-type MMTV integration site family member 4 (WNT4)	Negative
Wilms Tumor 1 (WT1)	Negative
Zinc Finger Protein, Multitype 2 (ZFPM2)	Negative

XomeDxSlice results of gene panel tested (GeneDx)

Abstract: 69

17-year old boy recurrent abdominal pain, pancytopenia, gross hematuria

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History (including chief complaint, history of present illness and relevant past and family medical history) 17-year old male with recurrent abdominal pain, pancytopenia, gross hematuria

Three months prior to presentation he was hospitalized with similar complaints of epigastric abdominal pain and fever. He had anemia, thrombocytopenia and too numerous to count RBC on urinalysis. Abdominal CT showed thickening of the wall of small bowel, cecum and ascending colon. *Clostridium difficile* toxin in stool was positive. He was treated with metronidazole and discharged with a diagnosis infectious colitis and concomitant IgA nephropathy.

His hematuria resolved, but he continued to have fatigue, anemia and thrombocytopenia.

Now he presented with severe abdominal pain, fever and dark-colored urine. On day 2 of admission his pain increased and inflammatory markers worsened, exploratory laparotomy was performed. Necrotic segment of jejunum was resected (Figure 1). Histopathology findings were consistent with an autoimmune process with small vessel vasculitis.

Bone marrow aspiration and biopsy were consistent with pancytopenia.

Further evaluation was done to determine the etiology of patient's pancytopenia and hematuria.

One month later, the patient later presented to an outside facility with similar complaints of abdominal pain and dark colored urine. He also had complaints of generalized malaise and upper respiratory symptoms. During this hospital stay, urinalysis revealed hemoglobinuria.

Physical examination findings (including vital signs) Vital signs are notable only for fever of 101.3 ºF. He is a muscular teenage boy, with weight at the 84th percentile, height at 95th percentile and BMI at 95th percentile.

On physical examination he is alert, oriented and in moderate distress due to abdominal pain.
Abdomen: Non-distended, soft, with tenderness on palpation at the left lower quadrant. No hepatosplenomegaly.
(Day 2) Abdomen: Rigid abdomen, diffused tenderness in abdomen
Laboratory or Diagnostic imaging or Procedures WBC: 3,900 µ/L
Hemoglobin: 9.6 g/dL
Platelet: 109 x 10^3/µL
Reticulocyte: 4.1%
ESR: 56 mm/hr
CRP: 196.8 mg/L
LDH: 1, 225 IU/L
BUN: 13 mg/dL
Creatinine: 0.91 mg/dL
Total bilirubin: 1.8 mg/dL
ASO: 378 IU/ ml (reference range, 0-200 IU/ml)
C3: 120 mg/dL
Direct Coombs: Negative
Urinalysis- TNTC RBC
Urine protein/creatinine ratio: 0.15.
CT Abdomen- Persistent segment of small bowel wall thickening and signs of possible microperforation (Figure 2).
ANA: 1:80
Anti-ds DNA: 1 IU/ml
Haptoglobin <15 mg/dL
PT: 16.9 seconds
PTT: 3.7 seconds
Hepatitis A, B, C, EBV, HIV: negative.
PNH Flow cytometry: 22% RBC with CD59 deficiency; 21.49% CD24 negative granulocytes and 50% CD14 negative monocytes.
Final Diagnosis Paroxysmal Noctural Hemoglobinuria

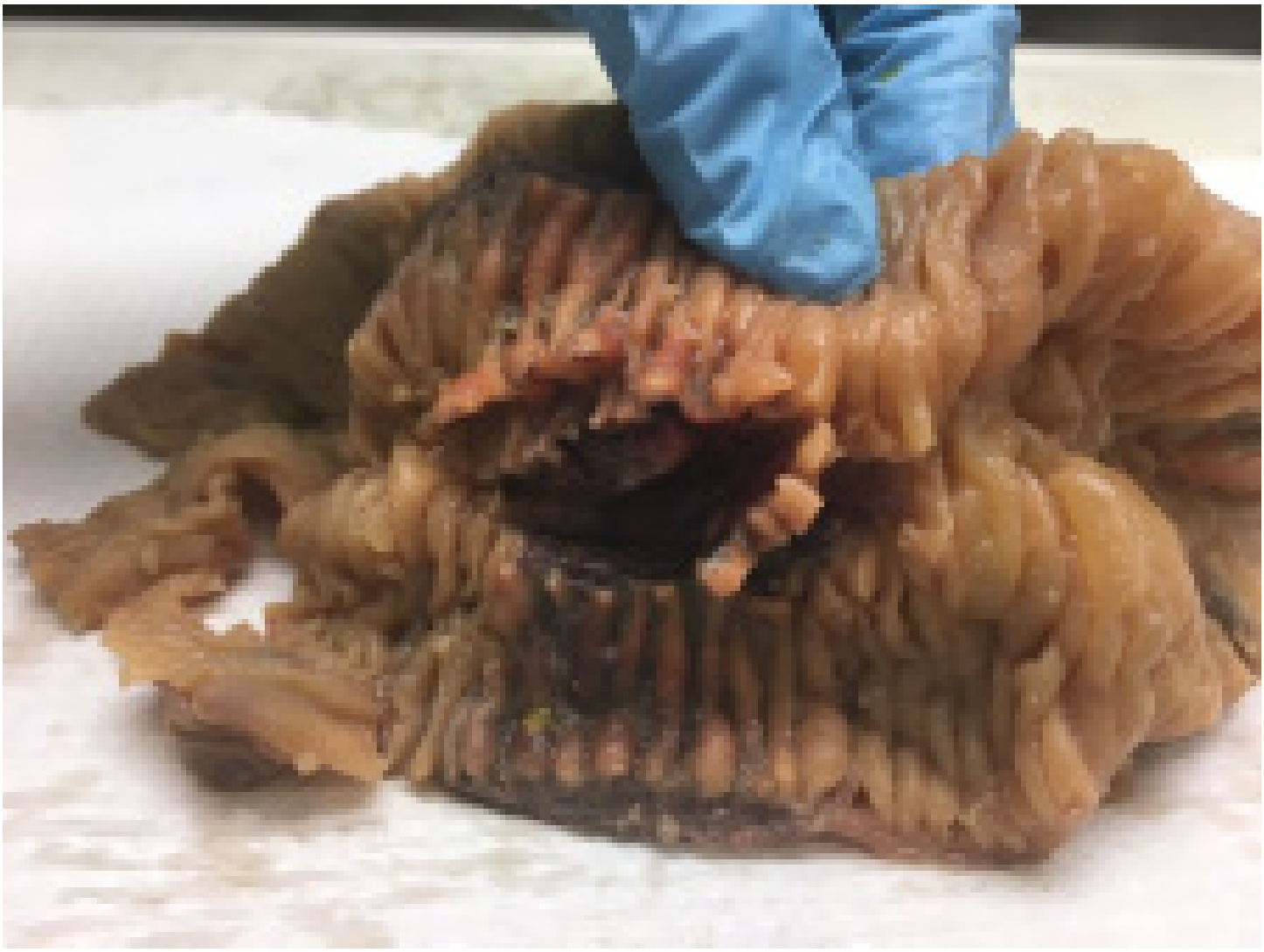
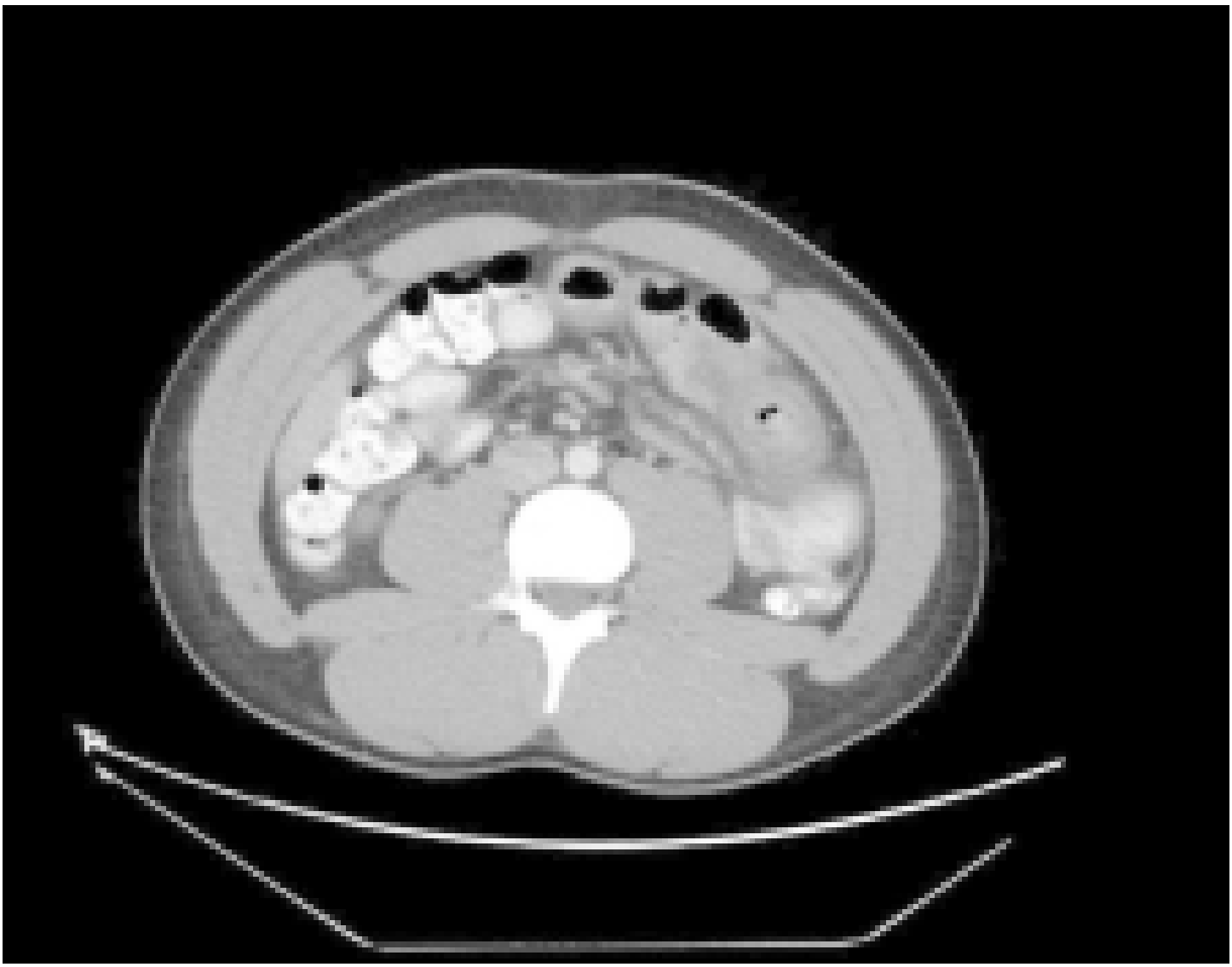


Figure- 1 Resected surgical specimen



CT Scan showing microperfortations

Abstract: 70
34 Month Old Boy with Neck Swelling and Pain
Manuel Penton, Margaret Hammerschlag
Pediatric Infectious Disease, SUNY Downstate Medical Center, Brooklyn, New York, United States

History (including chief complaint, history of present illness and relevant past and family medical history) A healthy 34 month old boy presented to his PCP for a suspected sore throat. A throat culture was obtained and he was given amoxicillin for a presumed streptococcus throat infection. Three days later, he returned to the PCP with neck swelling and fever to 102F. The throat culture from the initial visit was negative; amoxicillin was discontinued. Four days later, he returned to the PCP with worsening of his neck swelling, tenderness and persistent fever. The PCP sent him to the ER where he was febrile to 104F and had an "immobile, midline neck mass, mildly tender". WBC was 17,000 with 80% neutrophils, 11% lymphocytes and 4% monocytes. Ultrasound showed a large heterogeneous lobular mass, 2.4cm x 1.6cm x 2.4cm, occupying the left lobe of the thyroid. He was given amoxicillin/clavulanate and discharged. At the ENT clinic follow up 3 d later, an FNA of the neck mass was performed, amoxicillin/clavulanate was discontinued and clindamycin was started. Four days later he presented to the ED again for persistent fevers, enlargement of his neck mass with purulent drainage from the FNA site. A CRP was 167 and a

WBC was 21 with 79% neutrophils, 11% lymphocytes and 4% monocytes. CT scan results confirmed US findings and the patient was admitted to the ENT service for drainage of the neck mass. On admission, he was placed on IV clindamycin. The FNA culture grew alpha hemolytic streptococci, later identified as Streptococcus anginosus. The pediatric infectious disease service was consulted out of concern for persistent leukocytosis. The culture from the surgical drainage grew Eikenella corrodens alone. The patient was placed on ampicillin/sulbactam. WBC decreased to 10 with 57% neutrophils and 32% lymphocytes; the CRP fell to 82. The child was eventually discharged on amoxicillin/clavulanate.
Physical examination findings (including vital signs) T: 104F HR: 116. RR: 26. O2 saturation: 98% on room air
Exam benign except for the following:
Neck: Single large abscess with fluctuance, pointing, drainage and cellulitis (covering entire anterior of neck extending from submandible to sternum).

Laboratory or Diagnostic imaging or Procedures Initial WBC: 17; 80% neutrophils, 11% lymphocytes, 4% monocytes.
Repeat WBC: 21; 79% neutrophils, 11% lymphocytes, 4% monocytes.
Initial CRP: 167
Final WBC: 10; 57% neutrophils, 32% lymphocytes; CRP: 82

US and CT showed a large heterogeneous lobular mass, 2.4cm x 1.6cm x 2.4cm, occupying the left lobe of the thyroid.
Final Diagnosis Thyroid abscess due to Eikenella corrodens.

Abstract: 71
Eight Year Old Boy with Left Sided Facial Swelling and Fever
Manuel Penton, Margaret Hammerschlag, Natalie Banniettis
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History (including chief complaint, history of present illness and relevant past and family medical history) A previously healthy 8 yo boy presented to the pediatric service with L facial swelling and subjective fever for three days. Five days prior to admission, he began having left sided maxillofacial and dental pain. Two days later, his dentist extracted an impacted left upper molar. On the same day, the patient's mother noticed infraorbital and maxillofacial swelling along with a subjective fever. The patient was taken to the emergency department at an outside hospital and was sent home with a prescription for clindamycin. Over the next two days, the swelling worsened and extended to his left upper and lower eyelids. His fever persisted and he was taken on the day prior to admission to the emergency department at another hospital where facial imaging was done and he was transferred to our hospital for ophthalmology services.

Ophthalmology performed an anterior orbitotomy with incision and drainage of subperiosteal orbital abscess and placement of orbital drain. ENT performed a maxillary antrostomy and anterior ethmoidectomy. The patient was placed on IV vancomycin and piperacillin/tazobactam.

Physical examination findings (including vital signs) T 101.9, BP 108/62, HR 122, RR 24, Sat 99%

The exam was benign except for the following:
EYES: EOM limited due to pain but intact, no pain on eye movement, no diplopia. Left upper and lower eyelids with erythema, tenderness and marked edema. Left sclera with mild injection and temporal chemosis. Infraorbital fluctuance on left about 2cm.
Head and Neck: Marked left facial edema extending from left orbit to submandibular region, left cheek tense to palpation.

Laboratory or Diagnostic imaging or Procedures CMP, Coags, HGB/HCT generally within normal limits.
WBC: 7.46
Differential: N 65%, L 20%, M 9.5%
PLT 219
CRP 87

CT sinuses with contrast:
Left intraorbital abscess (8x20x16mm) at orbital floor. Maxillary and ethmoid sinusitis with orbital cellulitis. Total opacification of left maxillary sinus with erosion of the inferior maxillary sinus wall.

Final Diagnosis Orbital periostial abscess due to Eikenella corrodens.

Abstract: 72

Great news you have an infection!

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History (including chief complaint, history of present illness and relevant past and family medical history) Presenting complaint
16 year old male with a large right sided hemangioendothelioma on sirolimus therapy presents with an incidental finding of a new solid enhancing pulmonary nodule.
History of Presenting illness
A 16-year-old with history of an un-resectable right sided hemangioendothelioma which involves the right atrium, sub-cardiac space, and liver on sirolimus presented for surveillance MRI scan. A new solid enhancing 1.5 cm pulmonary nodule was seen in the right lower lobe. Due to concern for metastatic disease a wedge resection was planned. He was asymptomatic and well appearing at the time of imaging. Thoracotomy and wedge resection was performed, specimen was sent to pathology and microbiology.
Past medical history
The patient was diagnosed with a large right sided hemangioendothelioma 9 months prior to presentation. He was admitted to hospital in SVT and a right atrial mass was discovered on imaging. Due to the location the tumor was deemed un-resectable and he was started on sirolimus and amiodarone.
Epidemiologic history
The patient lived in Philadelphia all his life. Travel history was significant only for a trip to Disney world Florida two months prior to presentation. He had no contact with birds, reptiles or other animals. He had no ill contacts.
Physical examination findings (including vital signs) The patient had an entirely normal physical examination.
Laboratory or Diagnostic imaging or Procedures On MRI scan a solid enhancing 1.5 cm pulmonary nodule was seen in the right lower lobe.
Histology showed lung with a well -circumscribed focus of granulomatous inflammation with numerous pleomorphic round to oval yeast, located both within the cytoplasm of multinucleated giant cells and the surrounding extracellular matrix, particularly in the areas of necrosis. (Fig1)
Final Diagnosis Tissue cultures grew *Cryptococcus neoformans*.

Management
Serum cryptococcal antigen and CSF analysis was done to assess for disseminated disease. Both serum and CSF cryptococcal antigen were negative and CSF parameters were normal. Following current IDSA guidelines we opted to treat with fluconazole. Treatment was complicated by potential interactions between fluconazole and amiodarone following discussions with cardiology and clinical pharmacy we elected to treat with a lower dose of 200mg daily. He continues to be seen in follow up and is tolerating the medication well with no complications. He has remained well appearing and asymptomatic throughout this presentation.

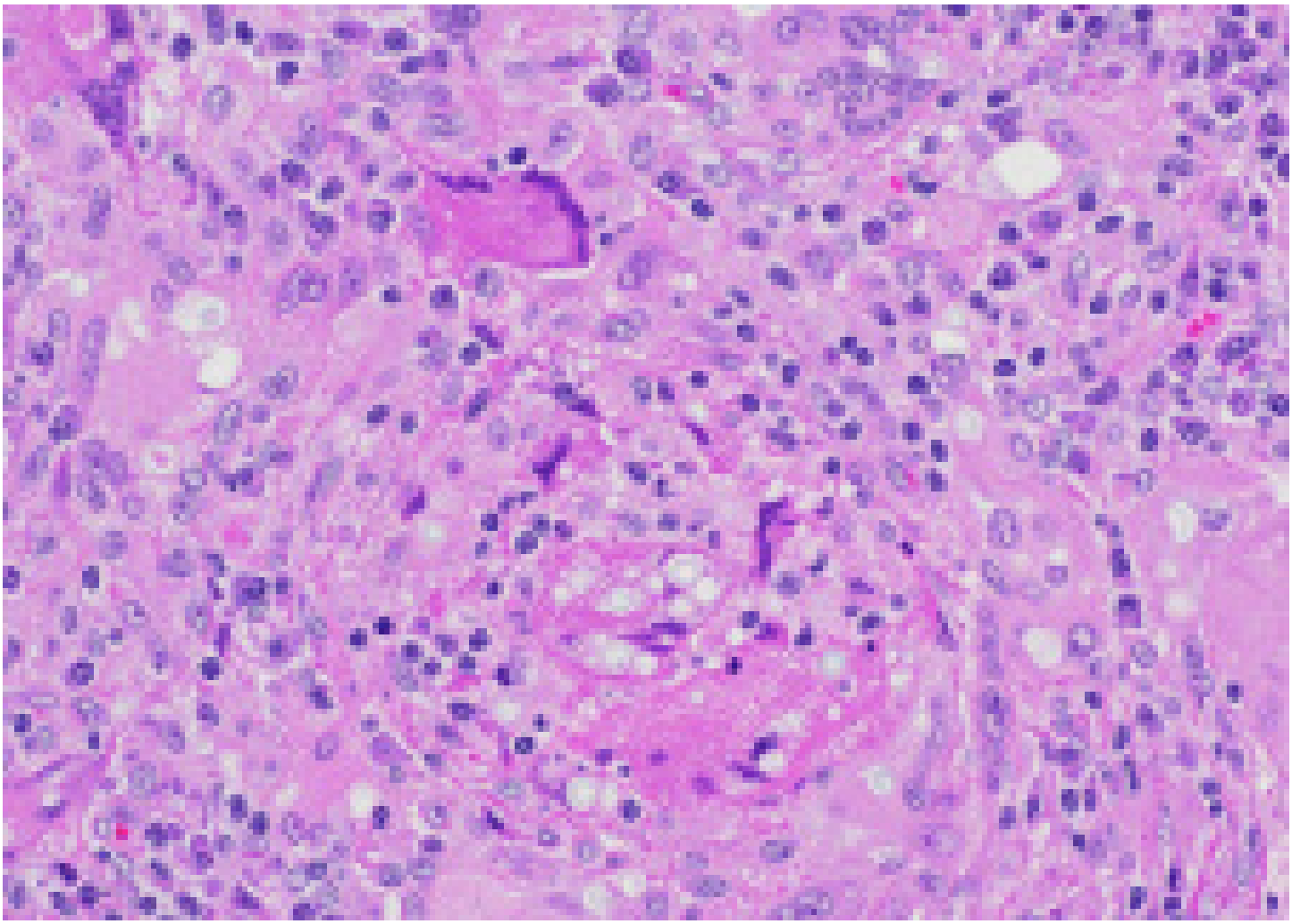

Fig1. Numerous pleomorphic round to oval yeasts.

Abstract: 73

Papillary Thyroid Carcinoma in a Pediatric Patient with Beta Thalassemia

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History (including chief complaint, history of present illness and relevant past and family medical history) The patient is a 15 year 4 month old female with beta thalassemia who has required chronic red blood cell transfusions since the age of 5 months. She initially presented to us for evaluation of secondary amenorrhea. She underwent a splenectomy at the age of 10 years and received chelating therapy with deferasirox and deferiprone. Her ferritin levels had been stable around 1500ng/mL for the year prior to presentation; however, MRI revealed iron deposition in her pancreas, liver, kidneys, bone marrow and pituitary gland.

Physical examination findings (including vital signs) On exam, her thyroid gland was asymmetric with the right lobe measuring 1cm larger than the left. The gland was firm in consistency with palpable lymph nodes along the right anterior cervical chain.

Laboratory or Diagnostic imaging or Procedures A thyroid ultrasound was completed which revealed an enlarged right lobe containing 3 focal hypoechoic masses with calcific foci. Biopsy obtained via fine needle aspiration was consistent with papillary thyroid carcinoma. She underwent total thyroidectomy and histological examination confirmed the diagnosis. Her postoperative course was uncomplicated and she was started on replacement therapy with levothyroxine.

Final Diagnosis Beta thalassemia is characterized by the abnormal synthesis of β hemoglobin chains resulting in hemolytic

anemia. Treatment involves frequent blood transfusions, which leads to deposition of iron in many organs, including endocrine tissue such as the thyroid gland. Iron overload has been associated with various malignancies, most notably liver and hematological. To date, 7 cases of papillary thyroid cancer in patients with beta thalassemia have been reported in the adult literature, but none in pediatrics.

To our knowledge this is the first case of papillary thyroid carcinoma in a pediatric patient with beta thalassemia. The incidence of thyroid cancer in patients with beta thalassemia is currently unknown, however there may be utility in routine surveillance of this patient population.

Abstract: 74

Short bones, long differential: a mystery case

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History (including chief complaint, history of present illness and relevant past and family medical history) Patient "SI" was born to a healthy 29yo G2P1→2 mother with normal prenatal and screening labs. Skeletal survey at 20 weeks showed short, bowed femurs but was otherwise normal. Amniocentesis with microarray analysis demonstrated normal XY male fetus with multiple regions of homozygosity (indicating parental common descent). Labor was induced for oligohydramnios at 38 weeks, and he required PPV in the delivery room with Apgars 1/7/8. NICU course was notable for prolonged respiratory support, multiple infections requiring prolonged IV antibiotics, marked temperature instability, and poor oral feeding.

Physical examination findings (including vital signs) Vitals initially WNL, although later developed extreme temp fluctuations (95 - 106 F); Weight 2.3kg (asymmetric growth restriction); Cardio: normal, no murmurs; Resp: increased work of breathing; Abd: soft, nontender, no masses; GU: normal male; MSK: shortened lower limbs with right femur bowing, feet adduction, camptodactyly, single palmar crease, and later developed significant right thigh swelling/erythema with fluctuance; Neuro: active, mildly hypertonic.

Laboratory or Diagnostic imaging or Procedures Echocardiogram on DOL 2 was significant for moderate pulmonary hypertension of the newborn. On DOL 14, developed fever, right thigh edema/erythema with a elevated WBC and CRP (36 mg/dL). Xray showed bowing and sclerosis of the femurs (Figure 1). MRI demonstrated diffuse myositis and subcutaneous edema of the proximal thigh. Blood cultures and drained fluctuant thigh mass were both positive for MSSA, and was treated with IV antibiotics. Due to persistent fevers, repeat xray was positive for osteomyelitis of the right femur (Figure 2), therefore 4 weeks of IV cefazolin was prescribed. Immunoglobulin levels and endocrine workup were normal.

Final Diagnosis A skeletal dysplasia panel confirmed the diagnosis of Stuve-Wiedemann syndrome (homozygous for LIFR mutation), a rare autosomal recessive condition with increased morbidity and mortality in infancy. Presentation includes long bone bowing, contractures, lethal autonomic dysfunction (hyperthermia, sweating), severe respiratory problems, poor feeding, increased pain tolerance, corneal clouding, and recurrent severe infections due to impaired STAT3 pathway resulting in features similar to hyper IgE syndrome. Intelligence is not affected, and rare long-term survivors have been reported.

After a 52 day NICU stay, "SI" was discharged home in room air, on g-tube feeds, and with twice daily temp monitoring. He continues to thrive as an outpatient with close multidisciplinary follow-up.

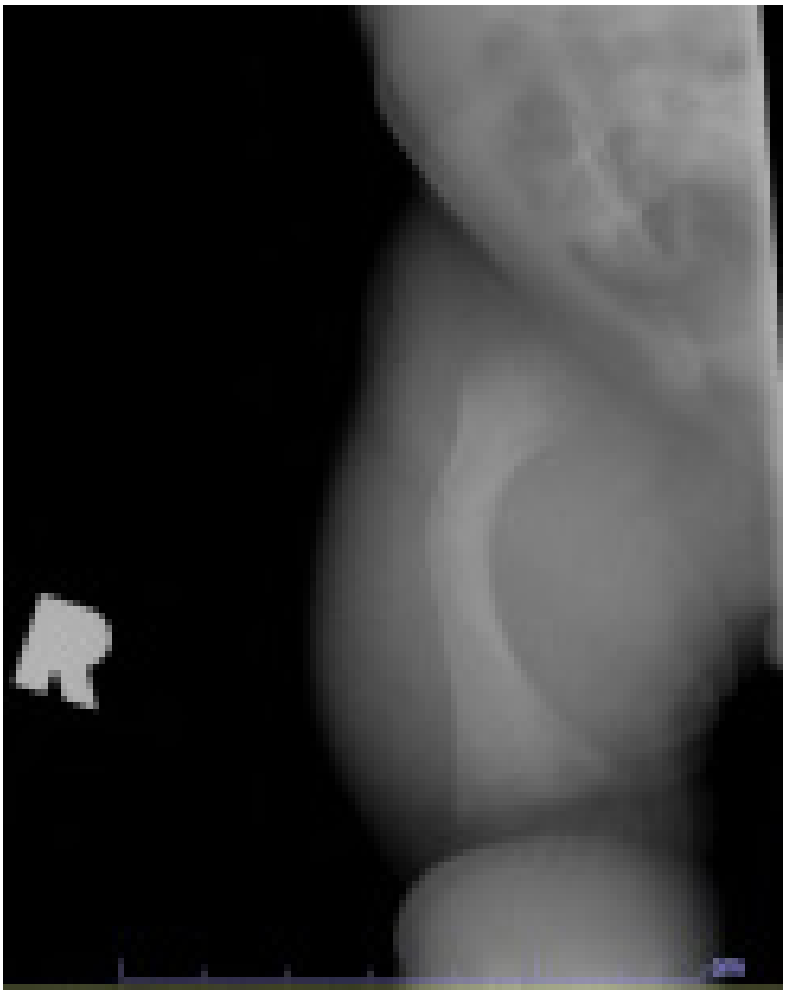


Figure 1: Right thigh xray on DOL 14 showing bowing and sclerosis of the femur with faint linear lucency extending through the posterior cortex of the mid femoral shaft

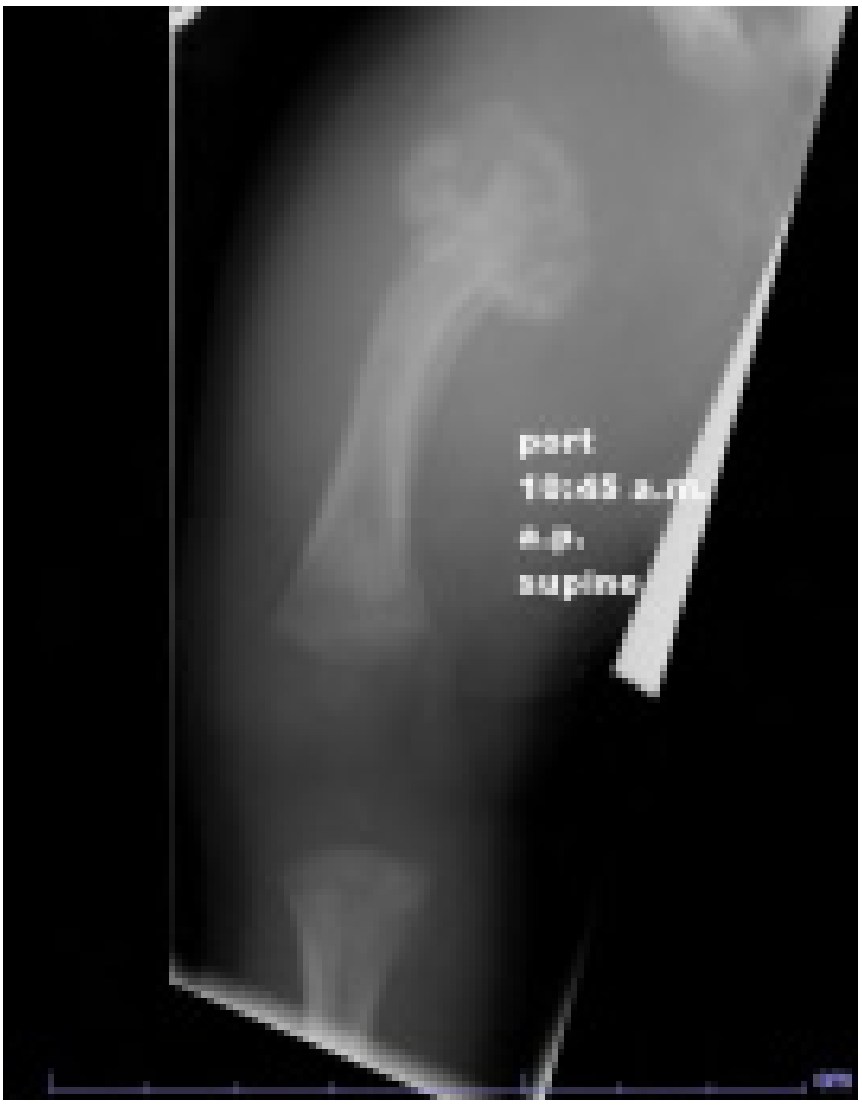


Figure 2: Right thigh xray on DOL 30 showing ill-defined lucency in the metaphysis with florid new bone formation adjacent to the right proximal femur with periosteal reaction extending along the shaft, concerning for osteomyelitis

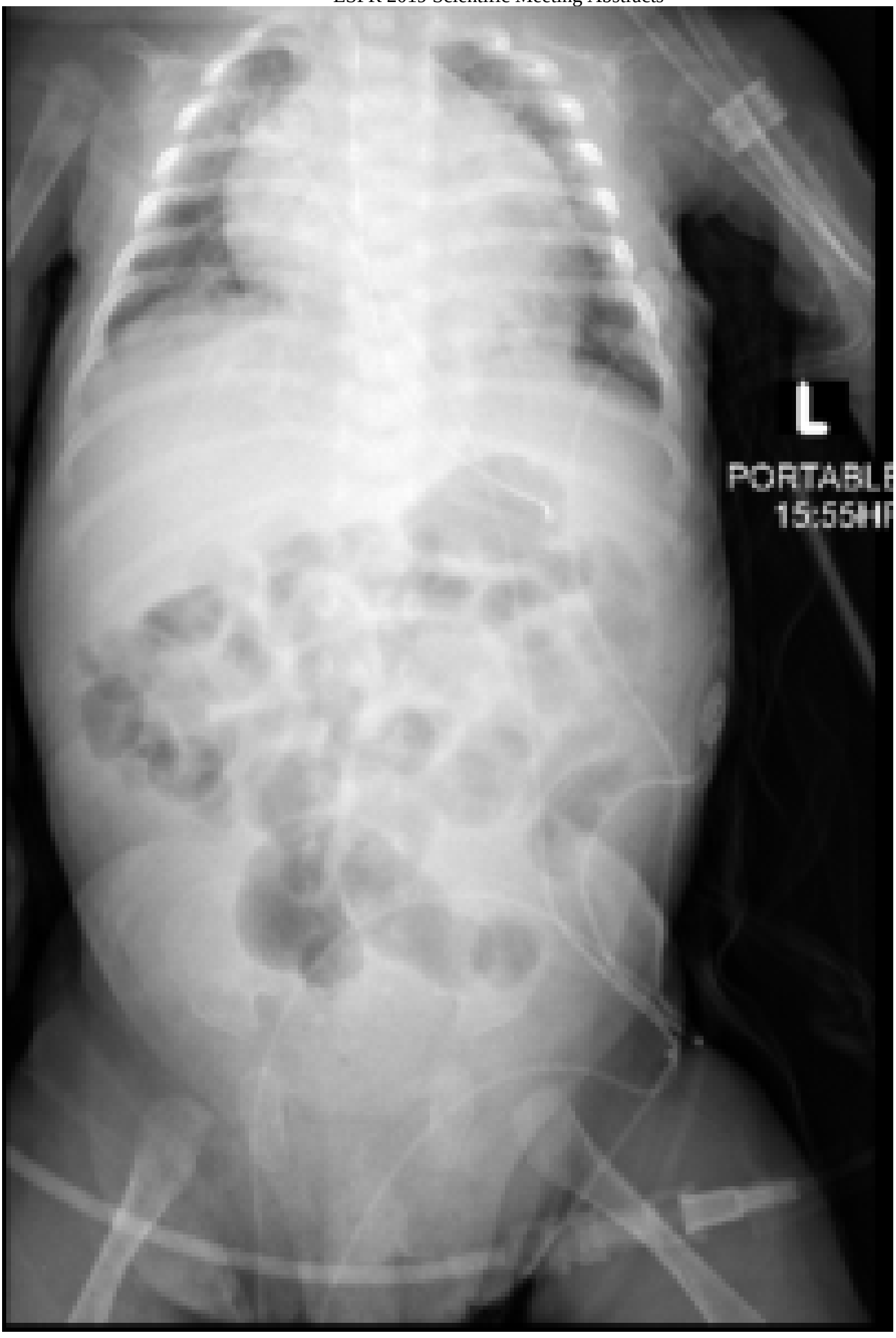
Abstract: 75
A Case of Neonatal Hypotonia, Feeding Difficulties and Respiratory Distress
Theresa Welgs, Hera Mahmood, Michael Schneider, Cesar Mesia, Vilmaris Quinones
NICU, St Christopher's Hospital for Children, Philadelphia, Pennsylvania, United States

History (including chief complaint, history of present illness and relevant past and family medical history) Case of a 2,535-gram female born at 37 weeks of gestation to a 26 year old G1P0 mother with pre-eclampsia. Prenatal labs and course as well as family history were unremarkable. Infant required CPAP in delivery room and was weaned to room air on day of life (DOL) 1. At birth, patient was noted to have axial hypotonia and head sparing growth failure. Sepsis evaluation was unremarkable and antibiotics discontinued at 48 hours. She intermittently required nasal cannula for desaturation and bradycardic events. On DOL 6, she was noted to have difficulty with oral feeds and poor weight gain requiring nasogastric fortified feeds. Throughout course, PO intake decreased, had frequent large emesis and failure to thrive ensued prompting increase to 24 calorie feeds and gastrostomy tube workup.

On DOL 49, patient noted to have increased work of breathing after emesis requiring CPAP. Despite escalation of respiratory

support, respiratory distress worsened.
Physical examination findings (including vital signs) Vital signs: HR 180, RR 95, SO2 97%, T 36.9C , BP 91/67
Alert infant with mild respiratory distress including nasal flaring, subcostal retractions, diminished breath sounds at bases bilaterally, distant heart sounds but no murmur. She also had dysmorphic features including frontal bossing, micrognathia, sunken eyes, inverted nipples and axial hypotonia.
Laboratory or Diagnostic imaging or Procedures CBC and coagulation parameters were normal. CMP revealed transaminitis and hypoalbuminemia (Table 1). CXR demonstrated bilateral patchy opacities and enlarged cardiac silhouette (Figure 1). Echocardiogram revealed a large pericardial effusion with tamponade physiology (Figure 2). Abdominal ultrasound showed small pleural effusions and ascites. Pericardiocentesis performed on DOL 50 for 45 ml serosanguinous fluid (Table 2) and insertion of pericardial drain.

Head ultrasound and brain MRI were concerning for mild bilateral parietal and cerebellar atrophy. Chromosomal microarray, DNA methylation studies and brain malformation panel were normal.
Final Diagnosis Neonatal PMM2-congenital disorder of glycosylation type I A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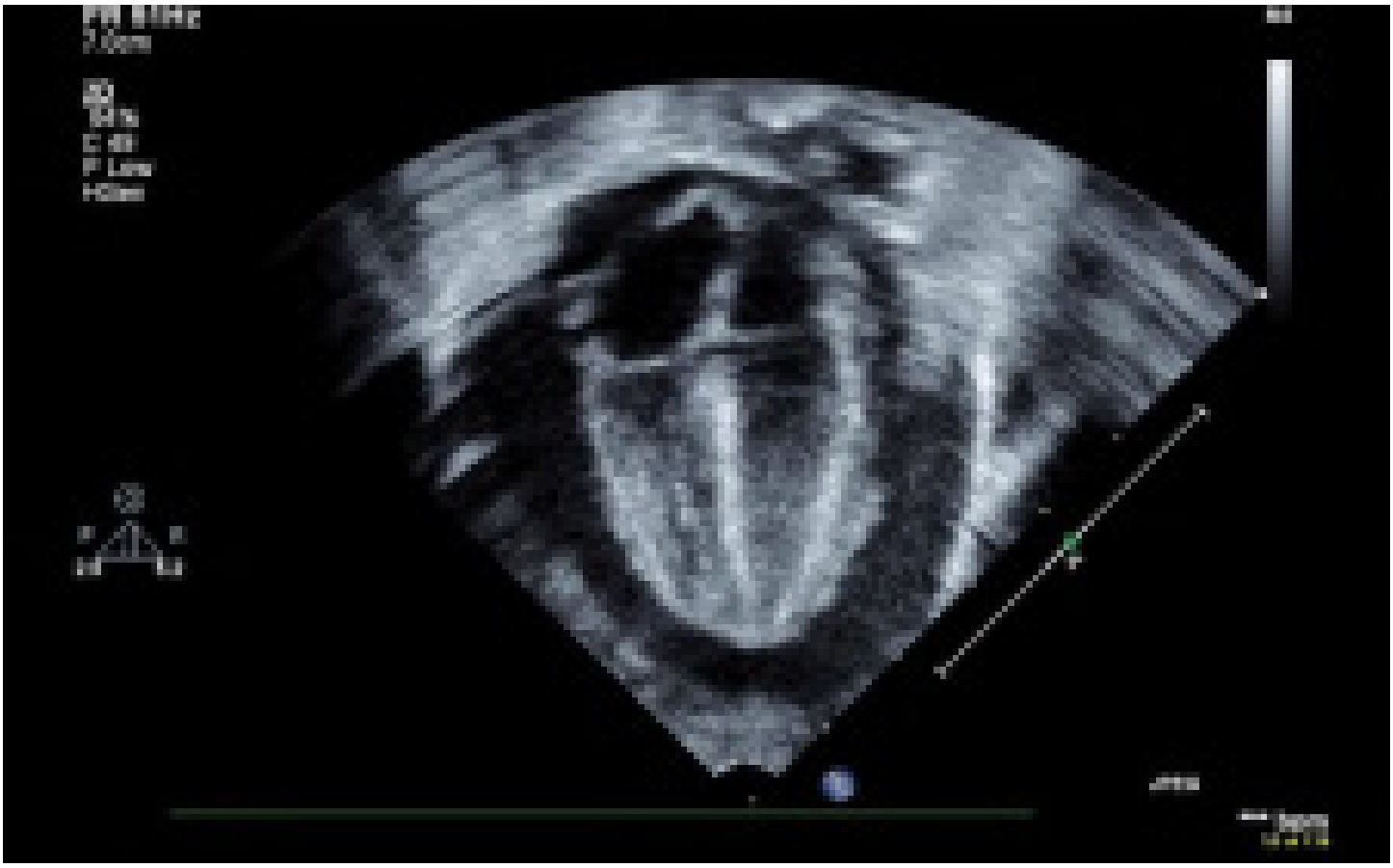


Routine Chemistry	
Sodium Level	134
Potassium Level	5.4
Chloride Level	101
CO2	27
AGAP	6 (L)
Calcium Level	9.1
BUN	18 (H)
Creatinine Level	<0.10 (L)
Total Protein	3.8 (L)
Albumin Level	2.2 (L)
Alk Phos	472 (H)
ALT	105 (H)
AST	105 (H)
Bilirubin Direct	0.29 (H)
Bilirubin Total	0.35
Glucose Level	66

Body Fluid Analysis	
Cell Count BF Type	Pericardial
Appearance BF	Bloody
Color BF	Red
RBC BF	174,000
Total Nucleated Cells BF	216
Body Fluid Differential	
Diff Cells # BF	100
Neutrophils BF	16
Lymphocyte BF	69
Macrophage BF	8
Other Cell BF	3
Reactive Lym BF	4

Abstract: 76
NEWBORN WITH POOR FEEDING AND RESPIRATORY DISTRESS
kelechi ikeri[1], Vilmaris Quinones Cardona[1], Michael Schneider[2], OGECHUKWU Menkiti[1]
[1]Neonatology, St Christophers Hospital for Children/Drexel University College of Medicine, Philadelphia, Pennsylvania, United States, [2]Neurology, St Christophers Hospital for Children/ Drexel University College of Medicine, Philadelphia, Pennsylvania, United States

History (including chief complaint, history of present illness and relevant past and family medical history) HPI:
Female infant delivered at 40 weeks gestation via cesarean section to a 32 year old G3P2 Bangladeshi female. Prenatal laboratories were unremarkable except for prolonged rupture of membranes and positive GBS with adequate intrapartum prophylaxis. Apgar scores of 7 and 9 at 1 and 5 minutes, respectively. Initially was breast and formula feeding well until presenting symptoms. Also, subsequently developed intermittent hiccups and jerking movements of the right upper and lower limbs. No history of fever, vomiting or diarrhea.

Family history of consanguineous marriage in parents and unclear cause of neonatal death of a female sibling in Bangladesh.
Physical examination findings (including vital signs) Physical Examination Findings include:
Vital signs within normal limits in room air except for respiratory rate of 90 bpm
Birth weight: 3.5kg (52%) Length: 51cm (55%) Head circumference: 34cm (26%)
Symmetric, well-nourished and hydrated female infant in mild respiratory distress with nasal flaring, subcostal retractions and clear lung fields. Also with notable lethargy, global hypotonia and hyporeflexia. No rash appreciated but pale and dusky appearing.
Laboratory or Diagnostic imaging or Procedures CBC:
WBC-16.2 x 10 -3/L
Hb-14.1mg/dl
Hct-40.1%
Platelets-305 x10-3/mL

BMP:
Na-146mmol/L
K-3.6mmol/L
Cl-99 mmol/L

HCO3-24mmol/L
BUN- <5mg/dl
Creatinine-0.55mg/dl
Ca-7.1mg/dl
Blood glucose-87mg/dl

LFTs:
AST-44 U/L
ALT-14 U/L
ALP-137U/L
Tprotein: 5.4 g/dl
Alb: 2.5 g/dl

ABG: pH: 7.56 pC02-27 p02-108 bicarb-34 BE +3.5, Lactate: 3.8, iCal: 0.78

Blood culture: negative

Chest x-ray: unremarkable

EEG: subtle, brief right-sided subclinical seizures

MRI brain without contrast: Linear T1 and T2 signal abnormality throughout the subcortical white matter, basal ganglia signal abnormality with restriction of diffusion also seen in the right frontal lobe (Figure 1).

Final Diagnosis Final Diagnosis:
Urea cycle defect: carbamoyl phosphate synthetase I gene mutation (homozygous) and N-acetyl glutamate synthetase gene mutation (heterozygous).

<u>Further testingTests leading to diagnosis:</u>
Ammonia level: 482

Amino Acid Profile:
Alanine 762mmol/L (235-410)
Ornithine 54 mmol/L (50-100)
Arginine 9 mmol/L (20-90)
Citrulline < 5mmol/L (10-30)
Glutamine 1016mmol/L (350-750)
Glutamic acid 139 mmol/L (20-95)

Infant required intubation for apnea related to seizures, hemodialysis and subsequently veno-arterial extracorporeal membrane oxygenation by 66 hours of life for 60 hours due to persistent hyperammonemia despite medical management.

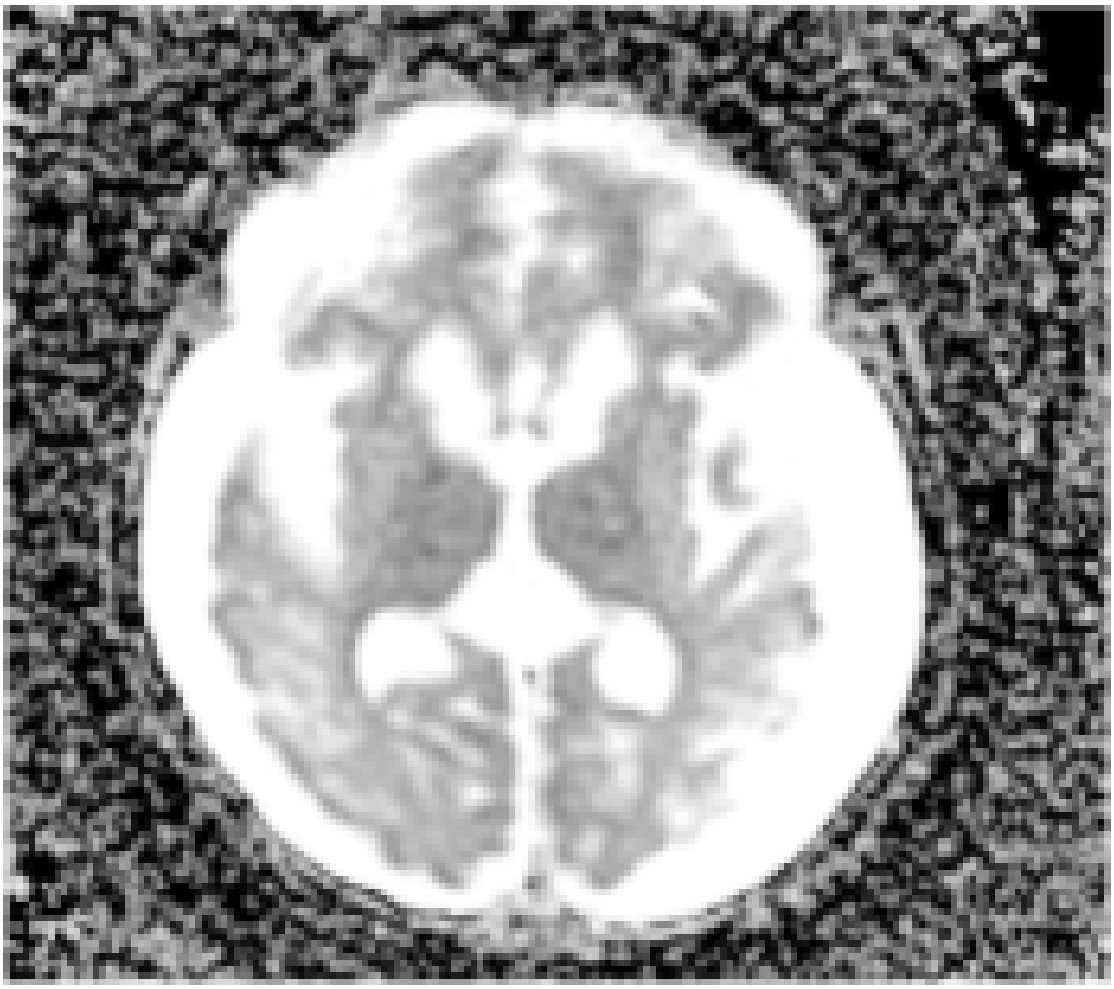


Figure 1: *MRI brain without contrast showing Linear T1 and T2 signal abnormality throughout the subcortical white matter and basal ganglia signal abnormality*

Abstract: 78

Current adolescent perspectives on school-based sex education

Jennifer Hale[1], Jacob Greenberg[2], Danielle J. Chenard[2], Carla M. Pruden[2], Alyssa S. Bennett[2]

[1]University of Connecticut School of Medicine, Farmington, Connecticut, United States, [2]Connecticut Children's Medical Center, Hartford, Connecticut, United States

Background Adolescents and young adults ages 15 to 24 years old account for approximately 50% of new sexually transmitted disease (STD) cases each year. School-based sex education has been shown to increase safer sex practices in adolescents, but the number of adolescents in the United States who report receiving formal sex education has been declining. Furthermore, the content of sex education may not accurately reflect current adolescent sexual practices.

Objective This study aims to describe the type of sexual behaviors covered in sex education curricula and to assess whether adolescents prefer more or less time dedicated to STD-related education.

Design/Methods We conducted a cross-sectional study of 34 full-time students ages 13 to 17 years old presenting to an urban pediatric emergency department. During a single study visit, participants completed a 17-item semi-structured interview and a 29-question self-administered electronic survey.

Results School was the most common source of sex education (67.6%), followed by parents (55.9%) and friends/peers (47.1%) (Figure 1). Half of the participants reported learning about vaginal sex during their school-based sex education, whereas 44.1% and 26.5% of participants acquired knowledge about oral sex or anal sex, respectively. The majority of participants (82.4%) learned about sex between a male and female during sex education, but only 14.7% obtained information about sex between 2 males or 2 females (Figure 2). Out of the 28 respondents, 26 thought that the amount of time learning about STDs in school should stay the same (35.7%) or increase (57.1%).

Conclusion(s) Adolescents describe school-based sex education that focuses predominantly on heterosexual relationships and vaginal sex. Adolescents are interested in spending more time learning about STDs as part of their sex education. Given potential gaps in school-based sex education, medical providers should discuss all types of sexual behaviors and STD prevention strategies with their adolescent patients.

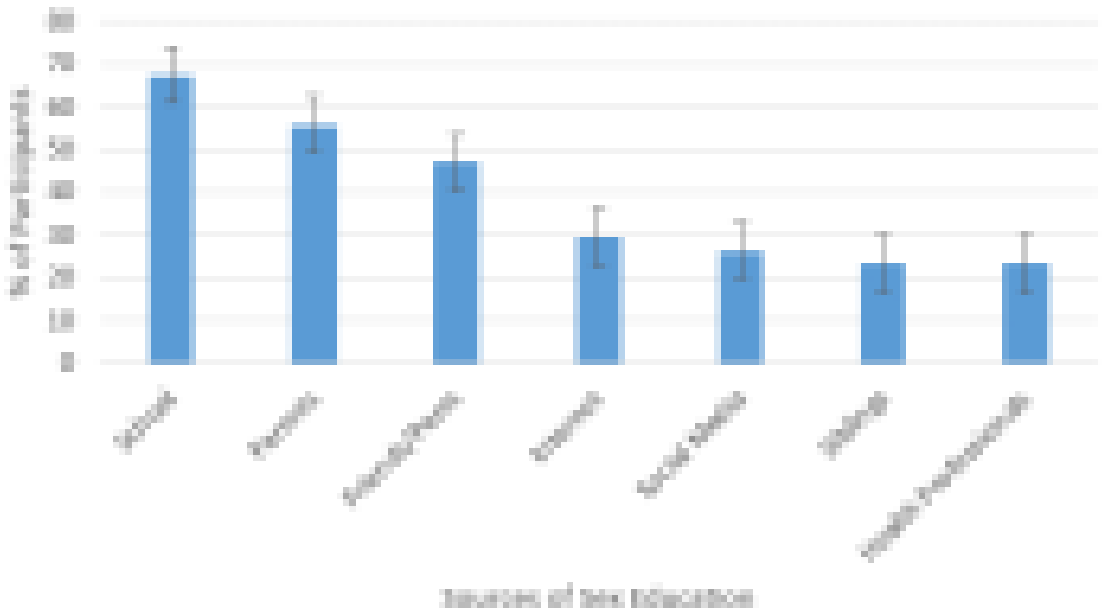


Figure 1: Percentage of participants who reported learning about sex from each source (N=34).

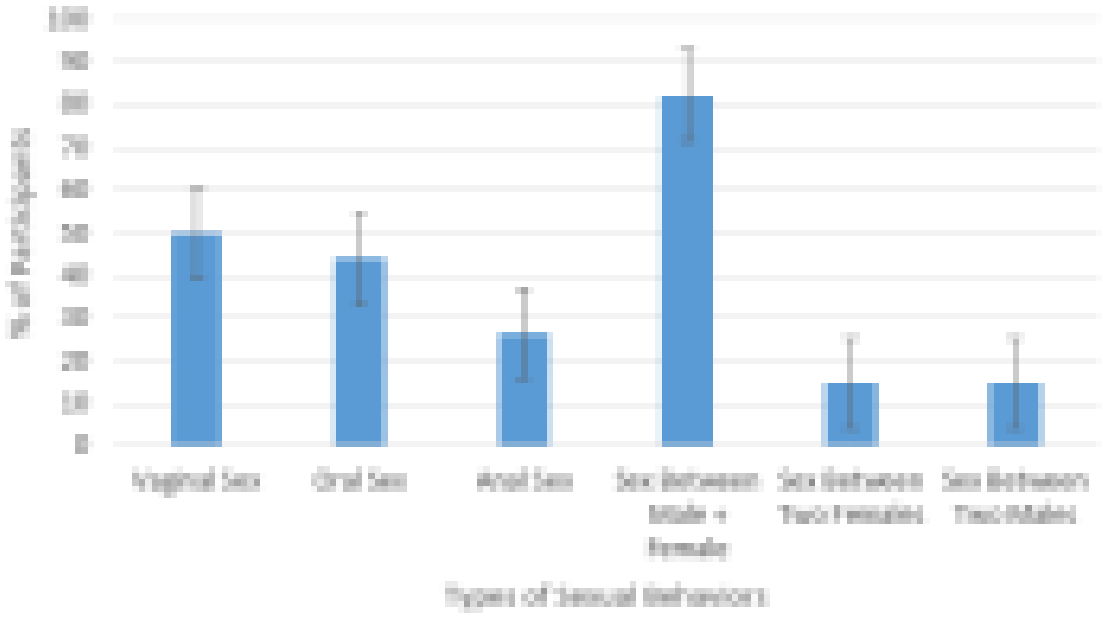


Figure 2: Percentage of participants who reported learning about specific types of sexual behavior (N=34).

Abstract: 79
Anticipatory Guidance, Period: Are Pediatricians Educating Pre-Menarchal Patients and Caregivers about Menstruation?
Nikita Sood, Miriam Singer, Andrew Adesman, Ruth Milanaik
Cohen's Children Medical Center , New Hyde Park , New York, United States

Background Menarche holds both cultural and medical significance, symbolizing a girl's entry to womanhood as well as serving as a key indicator of female health. The American Academy of Pediatrics (AAP) has highlighted the importance of providing anticipatory guidance (AG) surrounding menstruation to pre-menarchal adolescent females (PMAFs) and their caregivers, specifically encouraging clinicians to educate PMAFs and their parents about what to expect of a first menstrual period and the range for normal cycle length of subsequent menses. However, no study to date has investigated the extent to which pediatricians routinely provide such guidance.
Objective To investigate the attitudes, knowledge, and practices of pediatricians as they relate to the provision of AG surrounding menstruation.
Design/Methods An anonymous online survey was emailed to 2,250 pediatricians nationwide. In addition to demographic questions, respondents were asked to rate on 5-point Likert scales the proportion of PMAFs and caregivers to whom they provide AG (1=Almost None, 5=Almost All), their familiarity with AAP guidelines on AG (1=Not at All, 5=Extremely), and the importance of providing AG (1=Not at All, 5=Extremely). Data was analyzed using descriptive statistics and 2-sample t-tests.
Results Overall, 429 respondents met inclusion criteria (primary care pediatrician), with 78.8% female and 80.2% white. On average, physicians provided general AG to "most" PMAFs (mean=4.02). When asked about providing AG to their caregivers, physicians reported they advised between "some" and "most" caregivers about what to expect of the first menstrual cycle (mean=3.69) and range of normal menstrual cycle length (mean=3.71). Overall, female physicians provided AG to PMAFs and their caregivers significantly more frequently than male physicians (Table 1). Though physicians rated the importance of providing AG relatively high (mean=3.92), they rated their familiarity with relevant AAP guidelines low (mean=2.26); 57.3% of physicians reported they were "Slightly" or "Not at All" familiar with guidelines (Table 2).
Conclusion(s) Despite recognizing the importance of providing AG to PMAFs, the majority of pediatricians in this national sample were not familiar with AAP guidelines. As a result, pre-menarchal females, especially those with male pediatricians, may be left with unanswered questions and inadequate preparation for menarche. These findings highlight the need for better dissemination of the AAP's AG guidelines related to menstruation.

Table I: Mean Likert Scale Ratings Regarding the Provision of Menstruation Anticipatory Guidance

Question	Overall Average (N=429)	Female Average (N=338)	Male Average (N=90)	2-sample t-test p-value
"To how many of your pre-menarchal female patients do you provide menstruation anticipatory guidance?"	4.02	4.11	3.68	.008*
"How many curriculum of pre-menarchal female patients do you educate about what to expect of a first menstrual period?"	3.89	3.97	3.58	.0018*
"How many curriculum of adolescent girls do you educate about the range of normal menstrual cycle length?"	3.71	3.78	3.48	.0038*
"Please rate your familiarity with the AAP guideline surrounding anticipatory guidance for menstruation."	2.26	2.25	2.27	.87
"How important is it for pediatricians to provide anticipatory guidance surrounding menstruation to pre-menarchal female patients?"	3.92	3.99	3.68	.0014*

*Indicates significance (p-value <.05)

Mean Likert Scale Ratings Regarding the Provision of Menstruation Anticipatory Guidance

Table 2: Likert Scale Response Distributions Regarding the Provision of Anticipatory Guidance

Question	Percent of Respondents (N=429)
"To how many of your pre-menarchal female patients do you provide menstruation anticipatory guidance?"	
Almost All / Most	78.0
Some	14.2
Few / Almost None	9.8
"How many caretakers of pre-menarchal female patients do you educate about what to expect of a first menstrual period?"	
Almost All / Most	62.7
Some	22.1
Few / Almost None	15.1
"How many caretakers of adolescent girls do you educate about the range of normal menstrual cycle length?"	
Almost All / Most	59.2
Some	29.8
Few / Almost None	10.9
"Please rate your familiarity with the AAP guidelines surrounding anticipatory guidance for menstruation."	
Very / Extremely Familiar	11.9
Moderately Familiar	30.8
Slightly / Not at All Familiar	57.3
"How important is it for pediatricians to provide anticipatory guidance surrounding menstruation to pre-menarchal female patients?"	
Very / Extremely Important	71.1
Moderately Important	24.5
Slightly / Not at All Important	4.4

Likert Scale Response Distributions Regarding the Provision of Anticipatory Guidance

Abstract: 80

Knowledge and Attitudes Towards Contraceptives Among Adolescents and Young Adults

Aanchal Sharma[1], April Lee[2], Edward McCabe[2], Sona Jani[2], Anthony Gonzalez[3], Seleshi Demissie[3]

[1]Pediatrics, Staten Island University Hospital, Staten Island, New York, United States, [2]Division of Adolescent Medicine, Department of Pediatrics, Staten Island University Hospital, Staten Island, New York, United States, [3]Staten Island University Hospital, Staten Island, New York, United States

Background The American College of Obstetrics and Gynecology (ACOG) recommends intrauterine devices (IUDs) as first-line contraceptive choices for parous and nulliparous adolescents. The American Academy of Pediatrics (AAP) endorses the use of IUDs as contraception to parous adolescents and for protection against sexually transmitted infections. Research reveals young women have limited knowledge about and access to IUDs. Although the copper IUD can function as emergency contraception (EC), its use as such remains limited. Male partners can influence contraceptive decisions, making it important to understand their perspectives.

Objective This study aims to understand baseline contraceptive knowledge and attitudes of adolescents, allowing providers to improve sexual health education and overcome barriers faced by patients when choosing contraceptives.

Design/Methods Subjects were recruited at SIUH's adolescent clinic. Participants completed an anonymous survey that assessed their knowledge and attitude towards different methods of contraception, with an emphasis on the IUD. Participants were males and females, ages 13-21.

Results Completed surveys totaled 130 (99 females/31 males). When assessing awareness, percentage awareness per method was: male condoms (100%); oral contraceptive pills (OCPs) (92.2%); female condoms (89.9%); IUDs (66.7%); hormonal implants (63.3%); hormonal injections (76.2%); vaginal rings (72.1%); contraceptive patches (64.8%). 80.1% of participants were sexually active. 69.5% stated they/their partner were currently using a contraceptive method. 56.6% of females and 10.1% of males had heard of IUDs. Despite having heard of IUDs, both male and female participants lacked knowledge regarding specific IUD facts, whether or not they were sexually active. 78.7% of respondents were satisfied with their method of birth control, yet 22.7% had used EC in the past; only 6.4% who had used EC knew the copper IUD could be used for EC.

Conclusion(s) Barriers continue to exist for adolescents and young adults when it comes to contraception. The results of this study highlight the need for comprehensive education initiatives. A significant percentage of participants stated they required EC despite satisfaction with their birth control method and a large percentage of participants were unaware that the IUD could also be used as a form of EC. Enhanced contraceptive options counseling can help providers ensure that their patients make well-informed decisions about contraceptive methods, thus improving their quality of life.

Abstract: 81

Knowledge, Attitude and Practices of EpiPen Use in Youths with Food Allergy in an Urban Multiethnic Community

Freddy C. Solano[1], Jeffrey M. Manzano[1], Lily Lew[1], Steve Han[2], Gagan Gulati[1], Ashley Hiza[1], Patricia Burris-Warmoth[1], Susana Rapaport[1], Won H. Baik-Han[1]

[1]Pediatrics, Flushing Hospital Medical Center , Flushing, New York, United States, [2]St. George University School of Medicine, WI, Grenada

Background Prevalence of food allergy and occurrence of anaphylaxis from food allergy have increased over the years in the United States. Adolescents with food allergy are at particular risk of life threatening anaphylaxis. There are no studies of knowledge, attitude and practices of EpiPen use in youths with food allergy.

Objective To assess the awareness, knowledge (K), attitude (A) and practices (P) among youths with food allergy in an urban multiethnic community.

Design/Methods Descriptive cross sectional study by questionnaire in English or Spanish offered to youths aged 12-18 years visiting Flushing Hospital Medical Center with food allergy. Exclusion criteria included youths not literate in English or Spanish. Questionnaire included demographics (age, gender, ethnicity), questions on K (10), A (2) and P (4) about EpiPen use in food allergy reaction and anaphylaxis. Data were analyzed using percentages.

Results Of the 42 completed questionnaires, 60% were male, 74% Hispanics with mean age of 14.7±2.3 years. Family history of food allergy was in 62%. Diagnosis of food allergy by reaction was 100% and by blood test (IgE) in 60%. Most common reaction type involved skin 98%, most common food allergen was peanuts 38% followed by shellfish 33%. Definition of anaphylaxis was known in 26%, knowing EpiPen as best therapeutic option in 91% and half used EpiPen before. EpiPen was prescribed by a physician in 86%. Knowing the correct number of doses per pen was in 55%, location of injector in 78%, side effect of EpiPen in 50%, method of discarding EpiPen properly in 24% and swelling as an indication for EpiPen use in 67%. Only 10% carried EpiPen and 48% had an expired EpiPen at home. Location of where to inject was correctly identified in 57% and knowing correct method of administration in 21%.

Conclusion(s) Our youths have fair to good general knowledge on food allergy and food induced anaphylaxis. Healthcare providers need to educate their patients on anaphylaxis and the correct usage of EpiPen.

Abstract: 82

Underage Drinking and the Impact of Parents on Adolescent Decisions: A Blog Study

Ryan Padala, David Jimenez, Anna Kuznetsova, Ruth Milanaik

Developmental and Behavioral Pediatrics, Steven & Alexandra Cohen Children's Medical Center of New York, New Hyde Park, New York, United States

Background Underage drinking (UAD) research shows that adults who drank alcohol before the age of 15 are 6 times more likely to abuse alcohol compared to adults who started drinking after the age of 21. UAD is associated with risky behaviors such as illicit drug and tobacco use. Considering that 80% of teenagers admitted that their parents were the biggest influence on their decision to drink, online parenting blogs may provide unbiased valuable insight into parental opinions and policies on UAD.

Objective To assess unsolicited parental opinions on UAD.

Design/Methods Popular parenting blogs were searched using the terms "alcohol", "drinking" and "underage drinking." Posts were included if they discussed children <21 years of age and the author of the thread was the parent. Each post was analyzed for the parents' opinions on UAD, their "home alcohol policy," and at what age is it acceptable for a child to begin drinking.

Results 95 parental blog conversations, comprised of >5 individual responses each, were analyzed (48% concerned male children). Of the threads, 91% of parents indicated that their child had imbibed alcohol. Over a third (36%) of parents indicated it was acceptable for their child to imbibe at <15 years (Figure 1), with only 11.96% of parents indicating a 21 year minimum. When analyzed by gender, no significant differences were noted in parental acceptable mean minimum drinking age (16.0 years for female, 15.1 for male, p=.18). Many parents indicated that they allowed UAD "anywhere" (25%) with others permitting UAD under specific conditions such as allowing to "drink at home with family" (12%) and allowing UAD "under non familial adult supervision" (8%), but 26% of parents indicated they "did not allow their child to drink but they drank anyway" (Figure 2). Almost 10% of parents stated they "buy alcohol for their kids". Parental "home rules" on UAD were analyzed with the majority indicating that "safe and responsible UAD" was their home policy (Figure 3).

Conclusion(s) Alcohol remains one of the most abused substances for underage minors and can cause long lasting medical and social problems, making parents' permissiveness of UAD extremely concerning. Our study indicates that clinicians must provide strong anticipatory guidance prior to age 15 for all children; emphasizing not only the safety and medical concerns but also the potential legal ramifications of UAD. While clinicians counsel parents on a variety of other new teen anticipatory issues, early UAD counselling must remain a strong focus for clinicians.

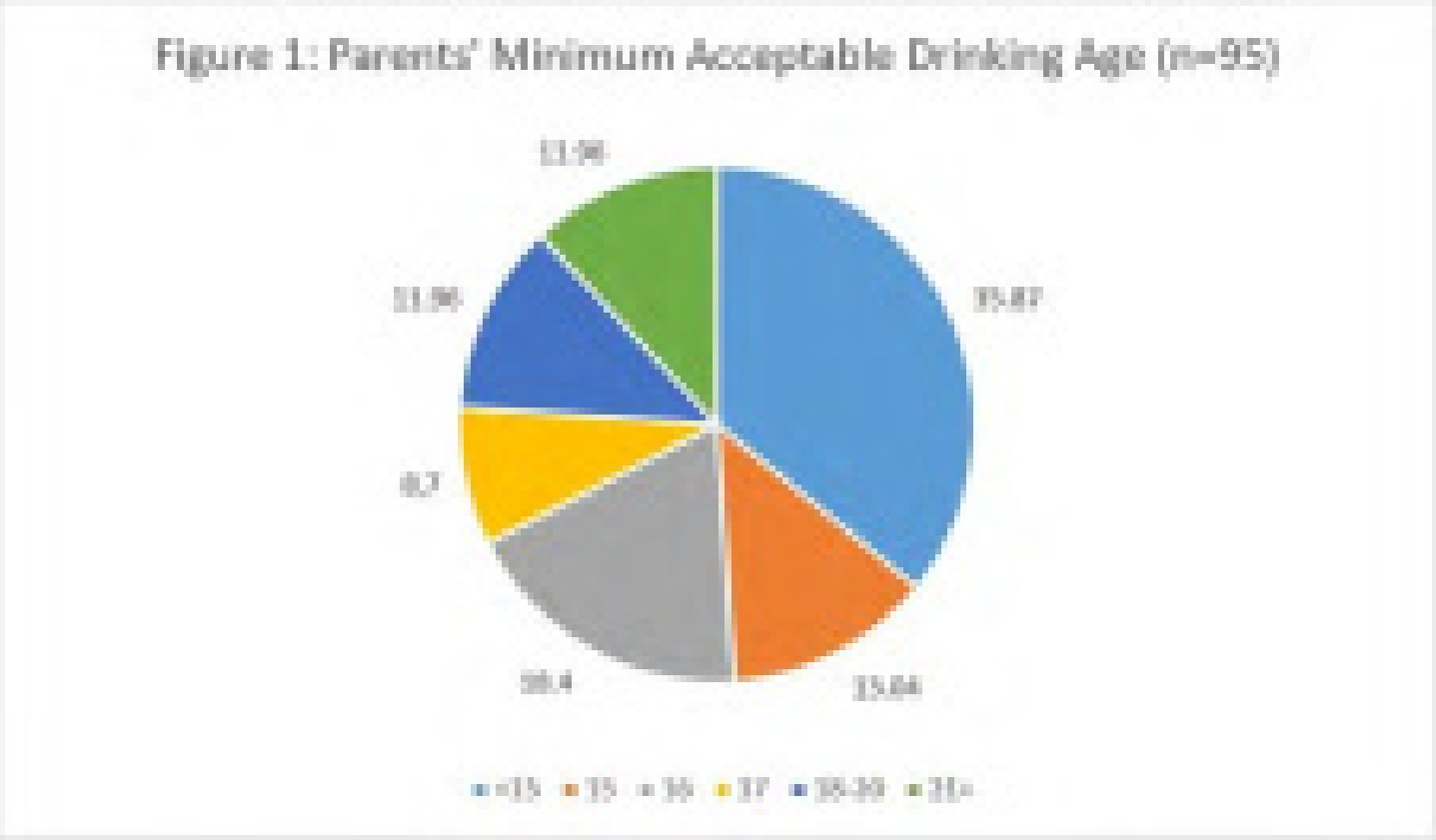


Figure 1: Parents' Minimum Acceptable Drinking Age (n=95)
<15
15
16
17
18-20
21+

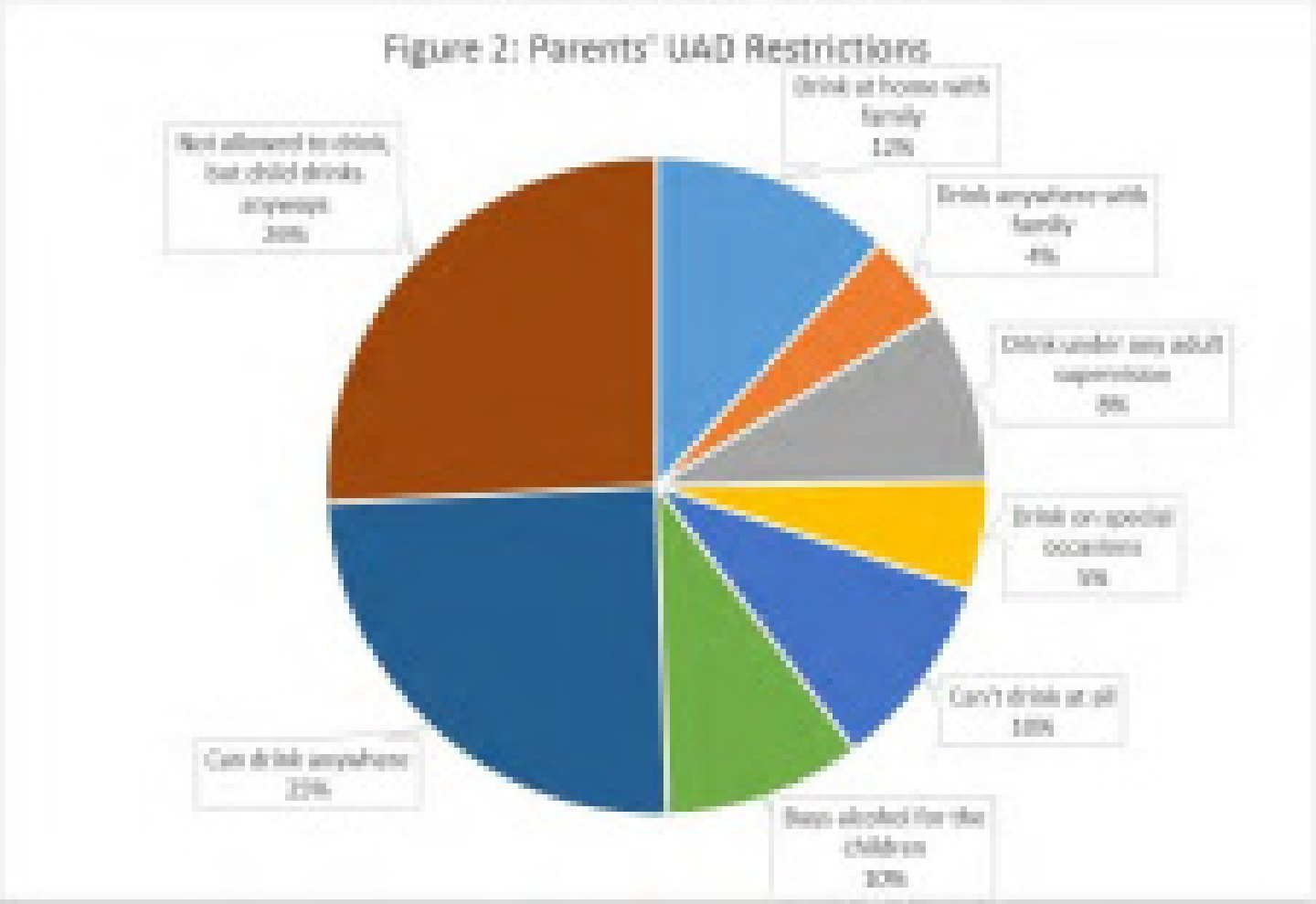
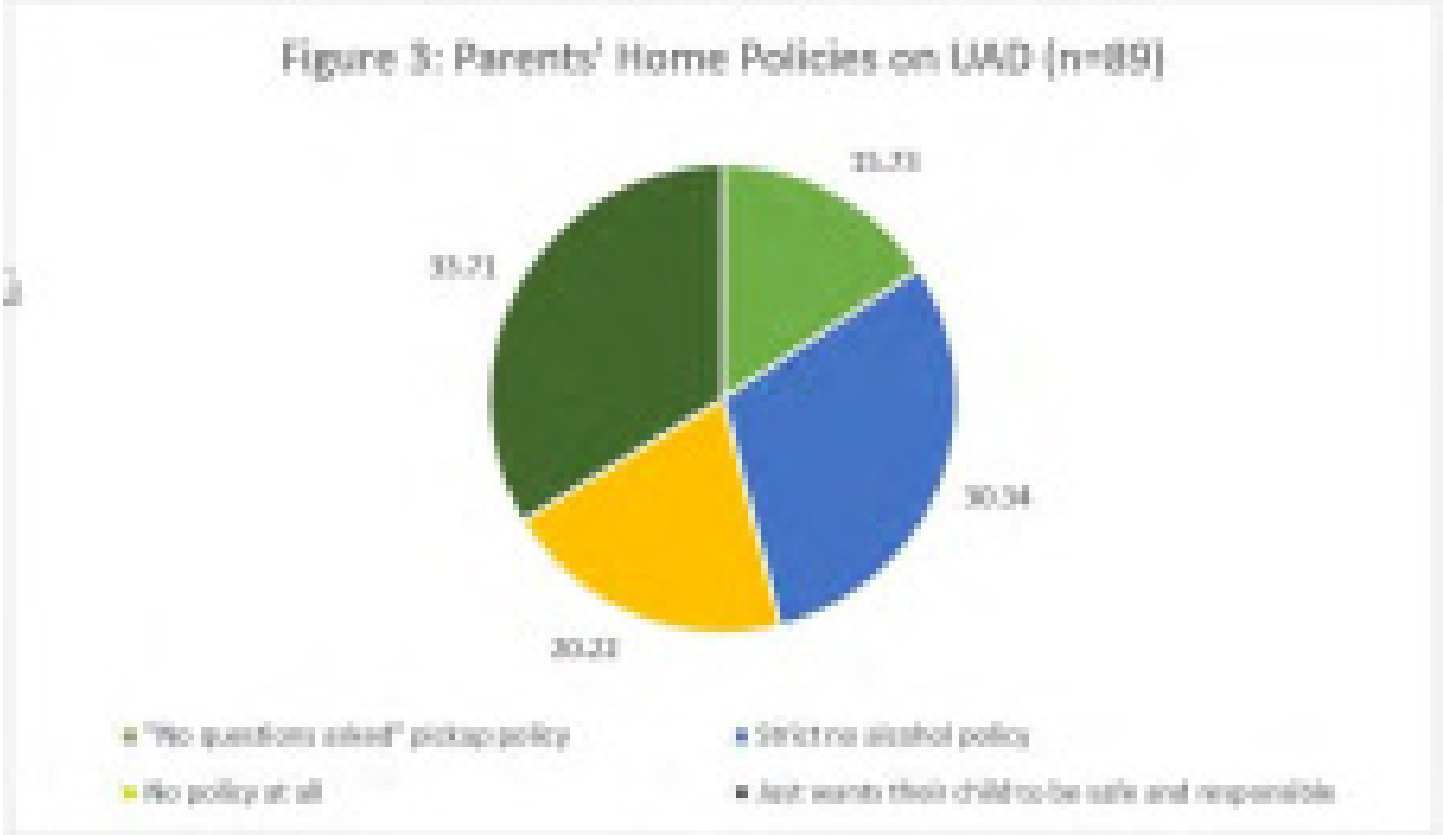


Figure 2: Parents' UAD Restrictions
Drink at home with family 12%
Drinks anywhere with family 4%
Drink under any adult supervision 9%
Drink on special occasions 9%
Can't drink at all 18%
Boys alcohol for the children 10%
Can drink anywhere 23%
Not allowed to drink, but child drinks anyways 20%



Abstract: 83

Talking Tampons with Female Adolescents: Pediatrician Knowledge, Attitudes, and Patient Education Practices Regarding Tampons

Miriam Singer, Nikita Sood, Andrew Adesman, Ruth Milanaik

Developmental and Behavioral Pediatrics, Northwell Health, Long Island City, New York, United States

Background Research indicates that most female adolescents and their parents are not knowledgeable about proper tampon usage and safety (PTUS). This knowledge deficit can cause anxiety and lead to serious health consequences such as Toxic Shock Syndrome. While the American Academy of Pediatrics (AAP) states that primary care pediatricians (PCPs) should instruct girls on the use of feminine products, no study has investigated PCPs' knowledge, attitudes, and patient education practices regarding tampons.

Objective To investigate PCPs' self-rated and measured knowledge of PTUS, as well as their practices surrounding the discussion of PTUS with adolescent female patients.

Design/Methods An anonymous survey was emailed to 2,250 pediatricians nationwide. The survey collected demographics and asked PCPs how often they discuss PTUS with female adolescent patients (5-point Likert scale; 1=Almost Never, 5=Almost Always). PCPs were also asked to rate their knowledge of PTUS (5-point Likert scale; 1=Not at All, 5=Extremely) and answer a series of multiple-choice questions (MCQ), each highlighting a specific area of PTUS. Chi-squared statistics and 2-sample t-tests were used to compare responses of female and male PCPs.

Results A total of 482 pediatricians participated (21.4% response rate), with 429 meeting inclusion criteria; 78.8% female; 80.2% White, 9.1% Asian, 3.5% Hispanic, 2.6% Black, 4.7% other. Overall, PCPs reported they were unlikely to discuss PTUS (composite mean=2.40, "Rarely" to "Sometimes"). Male PCPs were significantly less likely than female PCPs to discuss all PTUS topics assessed (Table 1). Compared to male PCPs, female PCPs had a significantly higher average self-rated PTUS knowledge (3.51, "Moderately" to "Very" vs. 2.48, "Slightly" to "Moderately"; p<.001) and MCQ correct response score (70.5% vs. 51.7%; p<.001). Table 2 summarizes the % correct for each MCQ and the p-values comparing male and female PCPs.

Conclusion(s) Overall, PCPs in a national sample reported that they "rarely" discuss topics related to safe tampon usage with female patients and exhibited low self-rated and measured knowledge of these important topics. Significant gender differences were noted, with male PCPs less knowledgeable about tampons and less likely to discuss tampon usage and safety. Given the AAP's recommendation that PCPs instruct girls on the use of feminine products, it is crucial that PCPs take active steps to ensure they are educating patients about tampons to protect the health of young females.

Table 1. Pediatrician Average Likert-Scale Likelihood Rating of Discussing Specific Topics Related to Tampon Usage and Safety And Comparisons Across Pediatrician Gender

Specific Tampon Topic	Overall Average (N=428)	Female Average (N=338)	Male Average (N=90)	t-test p-value
How to insert a tampon	2.08	2.24	1.49	<.001*
How often to change tampon	2.93	3.10	2.51	<.001*
Risks of tampons	2.85	2.93	2.56	.013*
Tampon use when sleeping	2.35	2.48	1.68	<.001*
Tampon use when swimming	2.45	2.62	1.82	<.001*
Relationship between tampons and hymen	1.83	1.88	1.61	.025*
Average of All Tampon Topics	2.40	2.52	1.91	<.001*

*Indicates significance (p-value <.05)

Table 2. Pediatrician Knowledge Related to Tampon Usage and Safety and Comparisons Across Pediatrician Gender

Tampon-Related Multiple Choice Question	Overall % Correct (N=428)	Female % Correct (N=330)	Male % Correct (N=98)	Chi-Squared p-value
What is the maximum time a tampon can remain in the body? [8 hours]	45.9	47.3	40.0	.214
Patients should use the lowest effective absorbency tampon in order to minimize risk of TSS? [Yes]	60.8	67.2	37.8	<.001*
Is there a recommended age at which patients can start using tampons? [No, it is up to patient preference]	78.8	87.6	45.6	<.001*
Can girls/women sleep with a tampon in? [Yes, but the tampon should be changed within 8 hours]	62.7	67.4	44.4	<.001*
Can girls/women swim in the ocean with a tampon inserted? [Yes]	82.2	86.7	65.6	<.001*
If a girl with an intact hymen uses a tampon, can the tampon tear her hymen? [Yes, it could tear the hymen but it is unlikely]	68.5	66.9	76.7	.074
Composite of All Tampon Questions				**t-test p-value**
	66.6	70.5	51.7	<.001*

*Indicates significance (p-value <.05)

Abstract: 84

Time Matters: Improving Efficiency and Accuracy of Preparing for Endotracheal Intubation

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Background Emergent pediatric intubation is a low-frequency, high-stakes procedure. It requires time-sensitive selection of specific equipment and team preparedness to ensure a safe and successful outcome. Areas for improvement were perceived in our ED, including the efficiency and accuracy of intubation preparation, motivating our initiative.

Objective To improve the accuracy of obtaining essential airway equipment from 65% to 90% and to decrease the time required to prepare for a pediatric intubation from 160 seconds by 20% from May to December 2018.

Design/Methods Following the Model for Improvement, a focus group representing key stakeholders was formed in March 2018. Perceived deficits with our airway preparation was objectively validated through baseline *in-situ* simulation drills and process mapping of faculty, fellows and technicians (Figure 1). The drills were scored for accuracy on an iteratively developed rubric based on published pediatric pre-intubation checklists (Figure 2). Potential interventions were tracked using a key driver diagram (Figure 3). We selected and prioritized interventions with high reliability to improve our interest outcomes. We reorganized key airway equipment in a centrally-located weight-based, color-coded airway cart, allowing equipment to be ready immediately when the appropriate drawer was opened. We educated staff on the changes as well as general airway equipment use through videos, departmental newsletters, and additional *in-situ* case simulations. Analysis for the study's outcomes was performed using pre and post intervention data.

Results 39 pre-intervention drills were completed. Through these assessments, baseline accuracy of gathering essential equipment was 65% and baseline time to prepare for intubation was 160 seconds. 20 post-intervention drills were performed.

Accuracy improved to 74% (p=<0.05) and time to prepare for intubation decreased to 109 seconds, a 32% change (p=<0.05). In sum, our time for equipment preparation exceeded our goal, the accuracy of equipment preparation improved but remains slightly below our target. Variation in time to preparedness improved as the standard deviation decreased from 69 to 33 seconds.

Conclusion(s) Through process analysis of *in-situ* simulation drills, our initial derived interventions are creating a more reliable process that may help improve our pediatric intubation readiness. Future directions include adaptation of a standardized pre-intubation checklist to further address efficiency and accuracy and create a sustainable change in our ED.

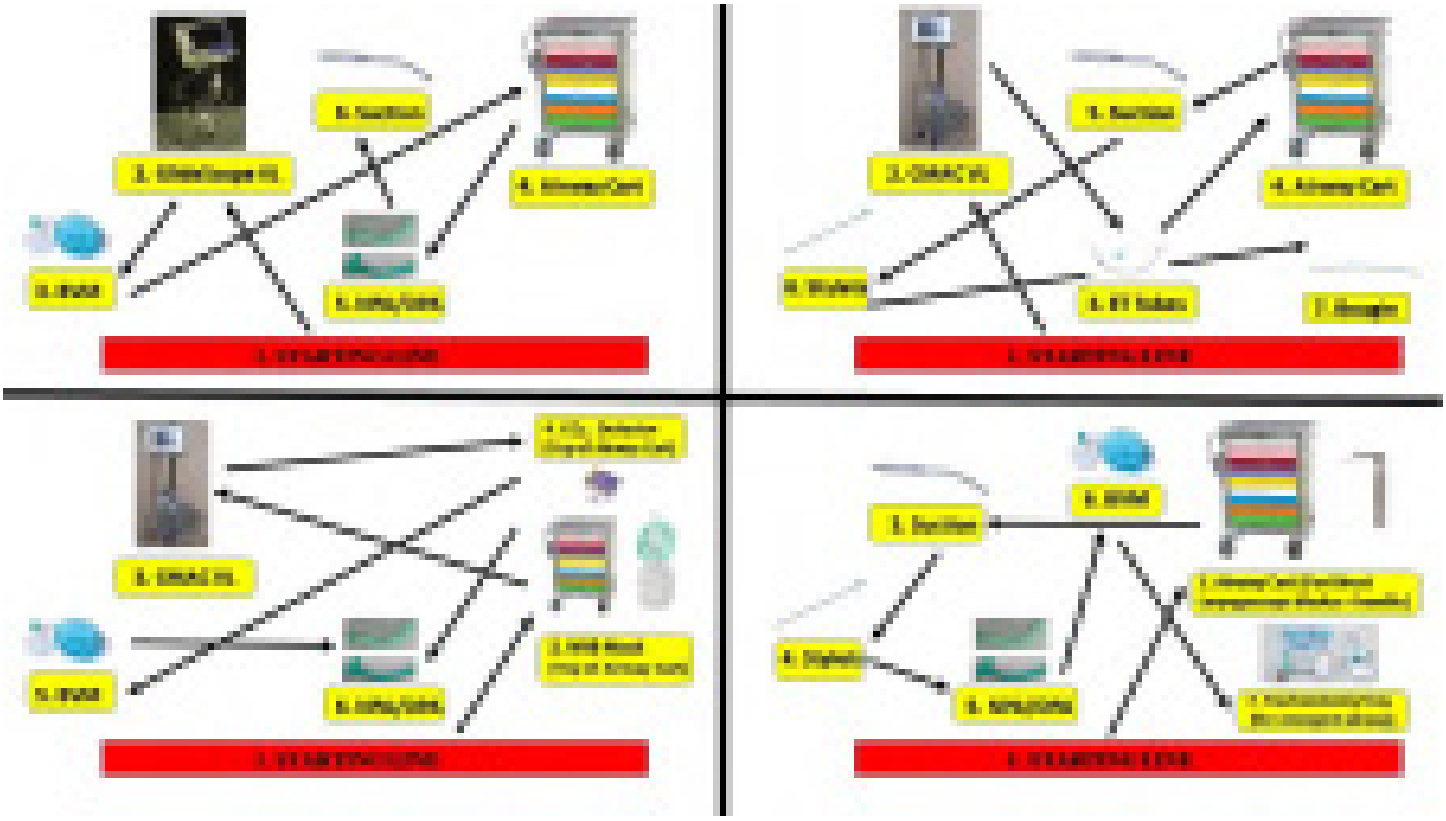

Figure 1: Baseline Process Map

PED Airway Simulation Assessment Cases

Figure 2: PED Airway Simulation Assessment Rubric

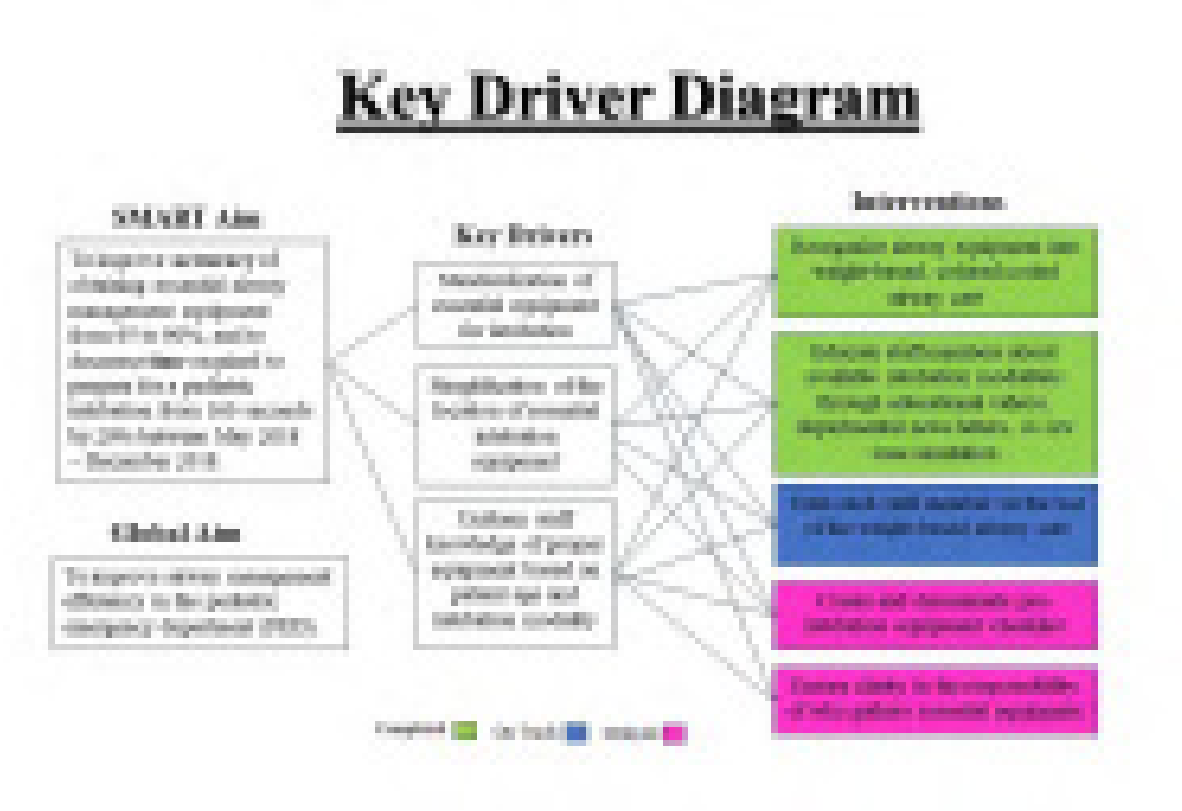

Figure 3: Key Driver Diagram

Abstract: 85
Point of Care Influenza Testing in the Emergency Department
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Background Existing literature demonstrates the availability of rapid flu test in the emergency department may influence physician decision making. In the absence of rapid turnaround testing for flu, symptoms that accompany influenza (fever or respiratory symptoms) in young children may prompt unnecessary ancillary testing. Little data exists on how availability of PCR based rapid flu testing changes physician ordering of costly, invasive, or time consuming tests in pediatric patients.
Objective Determine if the introduction of a rapid 15-minute turn-around point of care PCR-based flu test (compared to 2-hour turn around PCR-based hospital lab test) decreased the use of imaging, invasive testing, antibiotics, total length of ED stay, or altered antiviral medication administration in ED.
Design/Methods This study is a single center retrospective cohort study. Patient records from 11/1/14 to 5/31/2018 who had flu testing were identified and data was collected on age and gender, presenting symptoms, diagnosis, antibiotic treatment, antiviral treatment, laboratory and imaging testing ordered, and length of stay in ED. Utilization of testing, medication administration and length of stay was compared between the those patients who had hospital lab flu testing (with a 2 hours turn-around time) and those who had ED-based point of care (POC) testing (with a 15 minutes turn-around time). The POC ED-based test was introduced in the 2017-2018 influenza season.
Results A total of 227,269 patients were seen in the ER during the study period, a total of 2.7% (6264) of patients had flu testing. Prior to introduction of the POC flu test, 1.9% of patients had lab flu testing, compared to 5.3% after the introduction of the POC test ($p<0.01$). Among those who had flu testing performed, patients with the rapid POC test are less likely to have Chest Xray performed (34% vs 47%, $p<0.001$), CBC testing (25% vs 45.8%, $p<0.001$), Blood cultures (16.2% vs 30%, $p<0.001$), and urinalysis (12.6 vs 22.7%, $p<0.001$). Those patients with rapid POC testing were more likely to have antiviral medications used in the ED (20.5% vs 12.4%, $p<0.001$). Among those tested, antibiotic use in the ED and length of stay in the ED were not significantly different between the two groups.
Conclusion(s) After introduction of a point of care PCR based flu test, ancillary radiology and lab testing decreased

significantly. While point of care testing did not decrease length of stay, benefits include potential cost savings, decreased invasive testing, and earlier administration of time-sensitive antiviral medication.

Abstract: 86

Emergency Department Resource Utilization in the Management of Croup
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Background Croup is a common respiratory illness presenting to the ED and most common cause of upper airway obstruction in children age 3 months to 6 years. It is clinically diagnosed and enteral dexamethasone and nebulized racemic epinephrine are treatment mainstays. Several small studies have portrayed standard practices in outpatient and inpatient settings but no large cohort study has described ED utilization trends in the management of croup, especially in discharged patients. We aim to analyze trends in utilization of not routinely indicated resources (NRIRs) in the management of croup, such as viral and serum testing, chest and neck radiography, antibiotics, and parenteral dexamethasone.
Objective
Design/Methods Data from the Pediatric Health Information System was obtained and analyzed. We included encounters for children age 6 months to 12 years discharged from the ED from January 1, 2004 to December 31, 2017 with croup. Chronic conditions, asthma, other head, neck or lung infections, or where croup was a secondary diagnosis were excluded. Univariate associations between independent variables and resource utilization were determined. Multivariate logistic regressions comparing 0 versus ≥1 NRIRs were adjusted for all patient-level variables.
Results We identified 630,432 ED visits over 14 years across 49 children's hospitals with the diagnosis of croup. 91,469 (14.5%) encounters were excluded forming a cohort of 538,963 patients with median age of 25 months. 76% of these patients presented during fall or winter. 256,666 (48%) patients received any not routinely indicated resource. Initially, NRIR utilization rates ranged from 52% to 58% of all patient encounters with a significant downtrend after 2013 to range from 36% to 44% of all patient encounters (p<0.001) [Figure 1]. This decline was primarily driven by decreasing parenteral dexamethasone use with an inverse relationship to oral dexamethasone use [Figure 2 and 3]. Patient characteristics associated with higher odds of NRIR use include age >6 years, female sex, non-white race, private insurance, and presentation outside of fall season [Table 1].
Conclusion(s) To our knowledge, this is the first large cohort study to examine resource utilization in ED management of croup. We observed a significant decline in NRIR utilization over time which was mainly driven by the decreasing use of

parenteral dexamethasone and was inversely proportional to oral dexamethasone use. While NRIR rates are downtrending, continued high rates may be due to lack of formalized guidelines in ED croup management.

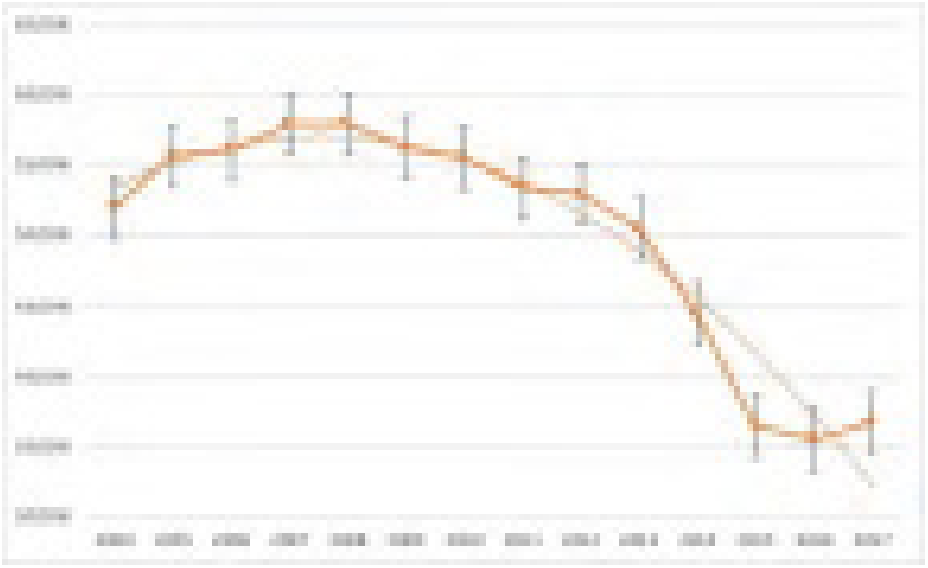

Figure 1: Not routinely indicated resource (NRIR) utilization rates over time. The dotted line represents a curvilinear regression analysis (R^2=0.932, p<0.0001).

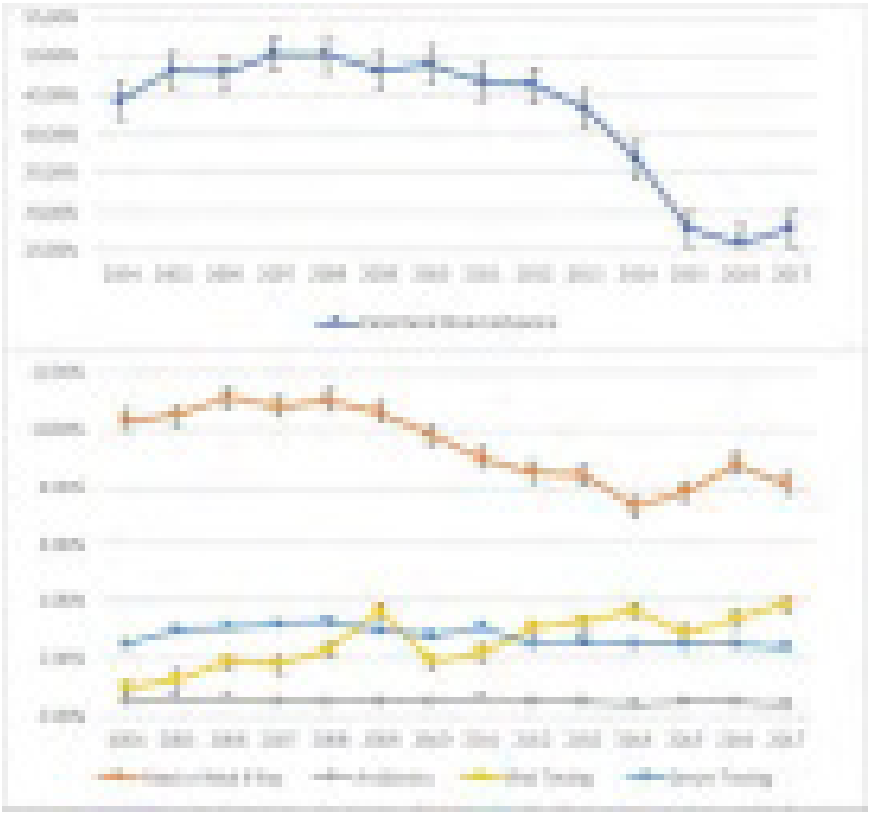

Figure 2: Individual resource utilization rates over time.

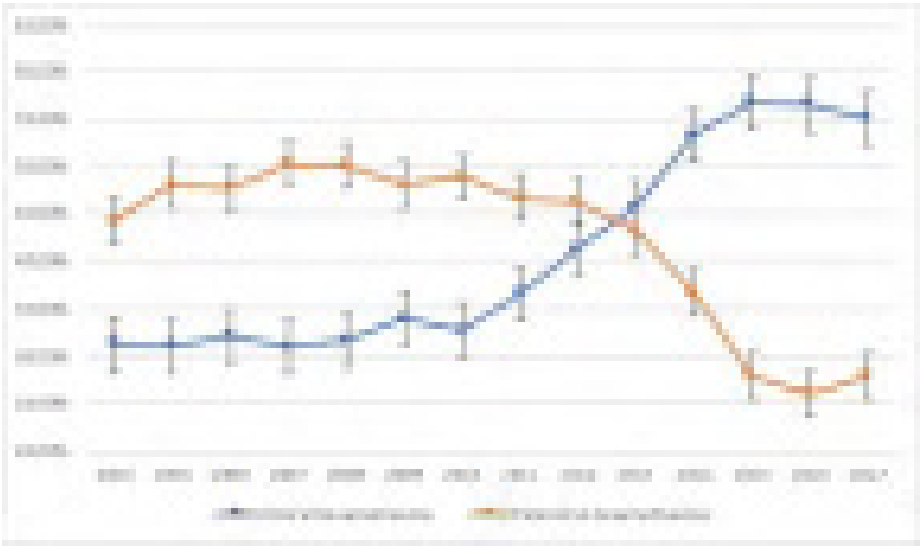

Figure 3: Enteral versus Parenteral Dexamethasone rates over time.

Age category				
Male			Ref	Ref
Female				
Race				
White			Ref	Ref
Black				
Hispanic				
Asian				
Other				
Insurance				
Public			Ref	Ref
Private				
Other				
Admission Season				
Fall			Ref	Ref
Winter				
Spring				
Summer				

Table 1: Associations with Utilization of ≥1 NRIR.

Abstract: 87
Antibiotic Selection for Urinary Tract Infections in a Pediatric Emergency Department
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Background With rising concerns about antibiotic resistance, including for urinary tract pathogens, appropriate use and selection of antibiotics is essential. Urinary tract infections (UTIs) are common in children with 11% of girls experiencing a UTI in childhood or adolescence; however, there are no national clinical guidelines for the management of UTIs in children ≥2 years in the United States. Variation in care exists and children may not always receive appropriate empiric treatment for UTIs.
Objective To study antibiotic prescription patterns for UTIs in female children aged 2 to 17 years in a pediatric emergency department (PED) and determine if empiric antibiotic treatment was appropriate.
Design/Methods A retrospective analysis of girls aged 2 to 17 years discharged from a PED between January 2017 and April 2018 with a diagnosis of UTI, including cystitis or pyelonephritis, without complications. The appropriateness of antibiotic prescriptions was evaluated, with appropriate antibiotic regimens defined *a priori* based on best-evidence and European clinical practice guidelines.
Results During the study period, 107 girls with UTI were included. Antibiotic prescriptions were appropriate in antibiotic type for 53 of 60 (88.3%) patients with cystitis and 38 of 47 (80.9%) patients with pyelonephritis. The most common inappropriate empiric antibiotics were amoxicillin (n=8) and fluoroquinolones (n=5). For prescriptions with appropriate antibiotic type, the dose and duration was appropriate for 41 of 53 (77%) patients with cystitis and 23 of 38 (60.5%) patients with pyelonephritis. The most common errors in dosing or duration were duration <10 days for pyelonephritis (n=14), duration >7 days for cystitis (n=12), and underdosing (n=5). Trimethoprim/sulfamethoxazole was prescribed frequently (n= 20) despite a 19% resistance rate among *E. Coli* isolates at our institution. There was no statistical difference in the frequency of appropriate antibiotic prescriptions between different types of providers (attending physicians, resident physicians, and advanced practice clinicians; p>0.05). Urine cultures were negative or contaminated in 14 of 90 (15.6%) patients with cultures sent, indicating substantial overuse of antibiotics.
Conclusion(s) This study reveals that there is room for improvement in empiric antibiotic prescriptions across provider cohorts in a PED for the management of uncomplicated cystitis and pyelonephritis in girls.

Abstract: 88
Clinical Signs and Symptoms Predictive of Pediatric Tubo-Ovarian Torsion in an Acute Setting
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Background Tubo-ovarian torsion (TOT) is a gynecological emergency among pediatric females requiring surgical intervention as definitive management. Current literature reports that earlier diagnosis leads to increased salvage of the ovary and therefore potentially decreased associated morbidity. The diagnosis of TOT can be challenging, as history and physical exam findings can be variable. Currently ultrasound (US) remains the diagnostic modality of choice. Using historical features, physical exam, laboratory, and imaging studies to suggest an earlier diagnosis can potentially help decrease morbidity.
Objective The aim of this study is to identify characteristics most associated with TOT in an acute setting compared to those without TOT.

Design/Methods We performed a 6-year retrospective case control study of female patients 5-17 years old, who were evaluated in the pediatric emergency department for suspicion of TOT and had diagnostic imaging. Patients were identified based on ICD 9/10 codes and indication for diagnostic imaging. From the electronic medical record we collected, demographic and clinical data, physical examination, laboratory and imaging results, and operative findings. We performed an analysis of patients with surgically identified TOT compared to those without TOT.
Results We reviewed 202 patients with suspected TOT with a mean age of 13.5 years (SD 3.2). A total of 97 cases were surgically evaluated, of which 56 patients (58%) had TOT. The mean age of patients with TOT was 14.3 years (SD 2.8) and 19% were premenarchal. When comparing TOT to those without TOT, there was no significant difference in pain duration, days since last menstrual period, white blood cell count and absolute neutrophil count. In those with TOT, 77% presented with nausea or vomiting compared to 57% in patients without TOT (p=0.014). Patients with TOT had a median adnexal volume (AV) ratio of 7.0 (IQR 2.4,18.9) compared to 1.5 (IQR 1.2,2.7) in those without TOT (p<0.001). The median AV ratio was 4.5 (IQR 2.8,7.5) in patients with negative torsion after surgical intervention (p=0.19). In 14.5% of cases with TOT, the ultrasound was interpreted as negative for TOT.

Conclusion(s) The diagnosis of TOT remains challenging as history and physical exam findings can mimic other causes of abdominal pain. Characteristics including nausea or vomiting and median AV ratio may be helpful in diagnosis. Ultrasound alone can miss a significant number of TOT.

Abstract: 89

Comparison of Automated Point-of-Care Urine Dipstick Testing with Laboratory Urinalysis in the Diagnosis of Urinary Tract Infection

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Background Urinary tract infections (UTI) are one of the most commonly diagnosed bacterial infections in children. Limited literature exists evaluating the accuracy of point-of-care (POC) urine dipstick and microscopic urinalysis for the evaluation of children with possible UTI in the emergency department (ED). In addition, there is limited data in current literature evaluating the prevalence of UTI in the pediatric Hispanic population.
Objective To compare the automated POC urine dipstick performed in the ED and microscopic urinalysis results using urine culture as the gold standard to determine the most accurate method to diagnose UTI in the pediatric ED. A secondary aim is to identify the prevalence of UTI in Hispanic children <5 years of age.
Design/Methods In this prospective study, a POC urine dipstick, microscopic urinalysis and urine culture were ordered for all pediatric patients in an urban pediatric ED with clinical suspicion for UTI. The results were compiled and sensitivities and specificities for each test were calculated with urine culture serving as the gold standard. A POC dipstick or microscopic urinalysis was termed positive if the result included "trace", "small", "medium" or "large" leukocyte esterase (LE), if nitrites were positive, or if there were >10 white blood cells per high powered field. Additional characteristics such as demographics, ED length of stay and final diagnoses were also collected.
Results 552 patients were included in this study. POC urinalysis was shown to have an overall sensitivity of 82.1% and a specificity of 77.9% with a positive predictive value (PPV) of 16.5%. Microscopic urinalysis was shown to have an overall sensitivity of 92.9% and a specificity of 67.7% with a PPV of 15.8%. Detailed results by lab value can be seen in the figures below. In this study, 7.7% of Hispanic patients less than or equal to age 5 had UTI confirmed by urine culture.
Conclusion(s) Microscopic urinalysis is a more sensitive screening test for UTI than POC urinalysis in the ED, however, specificity and PPV were similar between the two tests. No individual laboratory result alone on POC or microscopic urinalysis has a high PPV for UTI. The incidence of UTI in febrile Hispanic children ≤5 years old was 7.7%.

Point-of-care Dipstick Urinalysis Results

	Sensitivity (%)	Specificity (%)	Positive Predictive Value (%)
Trace LE	14.3	90.8	7.7
≤ Small LE	42.9	82.6	11.7
≤ Moderate LE	53.6	81.1	13.2
≤ Large LE	82.1	77.9	16.5
Nitrites	25.0	99.0	58.3
Overall POC UA	82.1	77.9	16.5

Microscopic Urinalysis Results

	Sensitivity (%)	Specificity (%)	Positive Predictive Value (%)
Trace LE	7.1	89.1	3.4
≤ Small LE	10.7	83.8	3.4
≤ Moderate LE	39.3	79.4	9.2

≤ Large LE	92.9	72.5	15.3
Nitrites	25.0	99.6	77.8
WBC >10	75.0	88.5	25.9
Overall Microscopic UA	92.9	67.7	15.8

Abstract: 94

Unequal Caregiver Age Representation in Mainstream Parenting Magazines

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Background In the U.S., the average age of parents with young children is increasing. Today, 15% of U.S. women who give birth are aged 35 years or older, compared to 8% in 1990. Additionally, approximately 2.7 million grandparents are primary caregivers for their grandchildren, a 12.5% increase since 2000. Parenting magazines, read by millions of individuals each year, are an important source of guidance for caregivers and significantly impact how they navigate issues related to child rearing. However, no research to date has examined whether the images found within parenting magazines represent caregivers of all ages.

Objective To evaluate the representation and portrayal of adults of various ages in parenting magazines.

Design/Methods The 2 parenting magazines with the highest circulation in 2016, *Parents* and *FamilyFun*, were chosen for assessment. For each magazine, 10 issues published between August 2016 and April 2018 were randomly selected for analysis. Visual depictions of adults in the images found in these issues were identified and the perceived age of the adult and activity engaged in by the adult (child supervision, day-to-day childcare tasks, play/bonding with child, or nothing child related) were recorded. Inter-rater reliability was established. Chi-squared statistics were used to compare the activities engaged in by adults in different age categories.

Results A total of 2,487 images depicting 842 adults were analyzed. The majority of adults (80.0%) appeared to be in their early 20s to early 30s and 12.6% appeared to be in their late 30s to early 40s. Only 4.0% appeared to be in their late 40s to 50s and an even smaller percentage (3.3%) appeared to be over the age of 60. Table 1 depicts the activities of adults in each age category. Compared to younger adults, adults in their late 40s or older were significantly less likely to be performing day-to-day childcare tasks (p=.003), playing with a child (p=.006), and engaging in any child-related activity (p<.001) (Table 2).

Conclusion(s) Despite the fact that the average age of caregivers in the U.S. is rising, images of young caregivers still dominate popular parenting magazines, often to the exclusion of other age categories. Moreover, when older caregivers are represented, they are less likely than younger caregivers to be depicted in child-rearing roles. It is essential that parenting magazines include more diverse age categories to be inclusive of caregivers of all ages.

Table 1. Activity and Perceived Age of Adult

Activity	Perceived Age							
	Early 20s-Early 30s (N=[illegible])		Late 30s-Early 40s (N=[illegible])		Late 40s-50s (N=34)		60+ (N=28)	
	Num	%	Num	%	Num	%	Num	%
Child Supervision	37	4.8	8	3.5	3	14.7	1	3.6
Day-to-Day Child Care	90	13.4	8	5.5	0	0.0	0	0.0
Play/Bonding with Child	256	38.0	40	40.6	9	26.5	4	14.3
Nothing Child-Related	301	44.7	47	44.3	20	58.8	23	82.1

Table 2. Activity of Adults in Early 20s to Early 40s Compared to Adults in Late 40s or Older

Activity	Perceived Age				Chi-Squared p-value
	Early 20s-Early 40s (N=780)		Late 40s or Older (N=62)		
	N	%	N	%	
Child Supervision	85	6.5	6	9.7	.068
Day-to-Day Child Care	98	12.6	0	0.0	.003*
Play/Reading with Child	299	38.3	13	21.0	.006*
Nothing Child-Related	348	44.6	43	69.4	<.001*

*Indicates significance (p<.05)

Abstract: 91

ASSOCIATION BETWEEN SLEEP QUALITY AND ASTHMA CONTROL: A CROSS SECTIONAL ANALYSIS IN AN URBAN COMMUNITY SETTING

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Background Asthma is a growing economic burden in the United States. To curb asthma-related illness, studies have evaluated modifiable risk factors. Sleep is of interest due to evidence that markers of acute inflammation rise in response to sleep manipulation with emerging data suggesting interleukin 6 may mediate a relationship between deficient sleep and asthma. Also seen was a shift towards T helper 2 (Th2) activity in sleep restriction, posing implications for conditions with excessive Th2 activity as seen in asthma. Studies between sleep quality and asthma control however have yielded inconsistent results. Adolescents are furthermore at risk for sleep deprivation, making sleep quality improvement an important intervention.

Objective To evaluate the relationship between sleep quality and asthma control among asthmatic adolescents at an urban university-affiliated community hospital.

Design/Methods Cross-sectional study evaluated sleep quality and asthma control among asthma patients ages 12 to 20. Patients evaluated in the pediatric ED and 3 ambulatory clinics in a university-affiliated hospital were recruited by convenience sampling between March 2017 and March 2018. The Asthma Control Test assessed asthma control and the Pittsburgh Sleep Quality Index assessed sleep quality. Univariate and multivariate methods were used in analysis.

Results Of 115 patients, 41.7% had uncontrolled asthma, 39.1% had persistent asthma, and 34.8% had poor sleep quality. Males consisted 38.3% of the group and mean age was 15.9 years (SD±2.5). Patients with poor sleep quality were more likely to have uncontrolled asthma with adjusted OR of 6.4 (95% CI 2.1, 19.8 p=0.001) after adjusting for age, gender, controller use, seasonal allergies, alcohol intake, and asthma-related ED visits. Patients with uncontrolled asthma were more likely to have poor sleep quality with adjusted OR of 4.6 (95% CI 1.9, 11.6 p=0.001) after adjusting for age, gender, caffeine intake, and sleep environment. Poor sleep environment is a predictor for poor sleep quality, while seasonal allergies and asthma-related ED visits a predictor for poor asthma control.

Conclusion(s) The data suggest poor sleep quality is a predictor for uncontrolled asthma and vice versa, suggesting clinicians need to develop strategies to counsel patients on better sleeping practices. While sleep disturbance is a recognized asthma symptom, further studies are needed to investigate the poor sleep quality among adolescents as potential burden to achieve optimal asthma control.

Abstract: 92

Healthy and Ready to Learn: The Impact of Early School Attendance on the School Readiness of Preschool-Aged Children in the United States

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Background Preschool enrollment in the U.S. has risen dramatically. As our nation's investment in early education continues to rise, it is important to determine if early schooling better prepares preschool-aged children (PAC) to succeed in kindergarten. Until recently, no single U.S. data source supported a multidimensional, population-based assessment of young children's school readiness. This changed with the 2016 National Survey of Children's Health (NSCH), which introduced "Healthy and Ready to Learn" (HRTL), a composite measure of school readiness (Ghandour et al, 2018; Child Ind Res). This derived measure reflects 4 developmental domains: Early Learning Skills (ELS), Self-Regulation (Self-Reg), Social-Emotional Development (S-E Dev) and Physical Health/Motor Development (PH/MD).

Objective To investigate, in a nationally representative sample of PAC, the relationship between early school attendance and school readiness.

Design/Methods Parent responses to the 2016 NSCH were analyzed. Using recently validated scoring criteria (Ghandour et al, 2018), children were classified as "On Track" or "Not on Track" (i.e., "Needs Support" or "At Risk") with respect to the HRTL composite measure, the 4 developmental domains, and each of the 7 ELS items. Using survey procedures to account for the complex survey design, prevalence ratios (PRs) for being "On Track" were estimated to compare PAC who started school to those who had not. Sex, preterm birth, parent education, household language, age order of household children, and whether the child had ongoing emotional, developmental or behavioral needs were tested as potential effect modifiers using interaction terms. Models were adjusted for 9 sociodemographic variables unless stratified by that variable due to effect modification.

Results The final sample consisted of 4,917 children ages 4-5 years: 3,455 enrolled in school; 1,462 not enrolled. (See Table 1 for sample characteristics). Compared to PAC who did not yet attend school, PAC who did were twice as likely to be "On Track" with regards to ELS and HRTL (Table 2). No differences were noted for Self-Reg, S-E Dev, or PH/MD. PAC who started school were more likely to be "On Track" for letter recognition and counting; see Table 3 for aPRs for each of the 7 ELS items.

Conclusion(s) Analyses of a nationally representative sample of PAC indicate that early school enrollment has a significant positive impact on children's early learning skills and on their overall school readiness.

Table 1. Characteristics of Children Ages 4-5 Years in the US who Did and Did Not Yet Start School (N = 4,917; source: 2016 National Survey of Children's Health)

Characteristics of Child	N (%) of Children in School (n=3455)	N (%) of Children Not in School (n=1462)	Rao-Scott Chi-square (p-value)
Child age			
4 Years	1010 (82.9)	902 (70.3)	46.8 (<.001)
5 Years	1846 (93.1)	308 (16.9)	
Child sex			
Male	1801 (91.7)	766 (40.3)	.70 (.40)
Female	1654 (90.3)	696 (31.7)	
Child race/ethnicity			
Hispanic	481 (20.5)	157 (30.4)	7.8 (.06)
White NH	2304 (38.8)	1105 (60.1)	
Black NH	326 (12.9)	56 (8.7)	
Multi-racial/Other, NH	321 (2.8)	164 (5.8)	
Prematurity (<37 weeks)			
Born <37 Weeks Gestation	303 (10.0)	149 (12.3)	.01 (.34)
Born ≥37 Weeks Gestation	3001 (90.0)	1256 (87.7)	
Birth order			
Only child	900 (28.1)	431 (30.8)	1.1 (.64)
Oldest child	864 (24.3)	332 (22.4)	
Second oldest	1203 (33.0)	498 (33.3)	
Third oldest	320 (14.6)	141 (10.2)	
Fourth or greater older child	73 (5.8)	36 (3.3)	
Highest level of education among reported adults			
Less than college degree	1858 (41.6)	938 (62.5)	.43 (.51)
College degree or higher	2387 (54.5)	868 (31.8)	
Respondent marital status			
Married or Not married but live with partner	2611 (79.2)	1131 (64.8)	7.3 (<.01)
Never married, Divorced/Separated/Widowed	493 (20.8)	196 (35.2)	
Household Income (as a % of Federal Poverty level)			
0 - 99%	381 (7.1)	329 (17.4)	7.3 (.05)
100 - 199%	524 (18.2)	277 (22.1)	
200 - 399%	1186 (28.1)	547 (33.4)	
400% +	1469 (31.5)	309 (17.2)	
Primary language spoken in home			
English	3172 (95.2)	1384 (90.3)	3.6 (.11)
Not English	264 (4.8)	72 (9.7)	
Children qualifying on the Children with Special Health Care Needs screener with ongoing emotional, developmental, or behavioral conditions			
Yes	191 (5.7)	95 (8.8)	10.5 (<.001)
No	3264 (94.3)	1367 (91.2)	

*Missing data: 82 for prematurity, 3 for birth order, 107 for education, 196 for marital status, 27 for primary language

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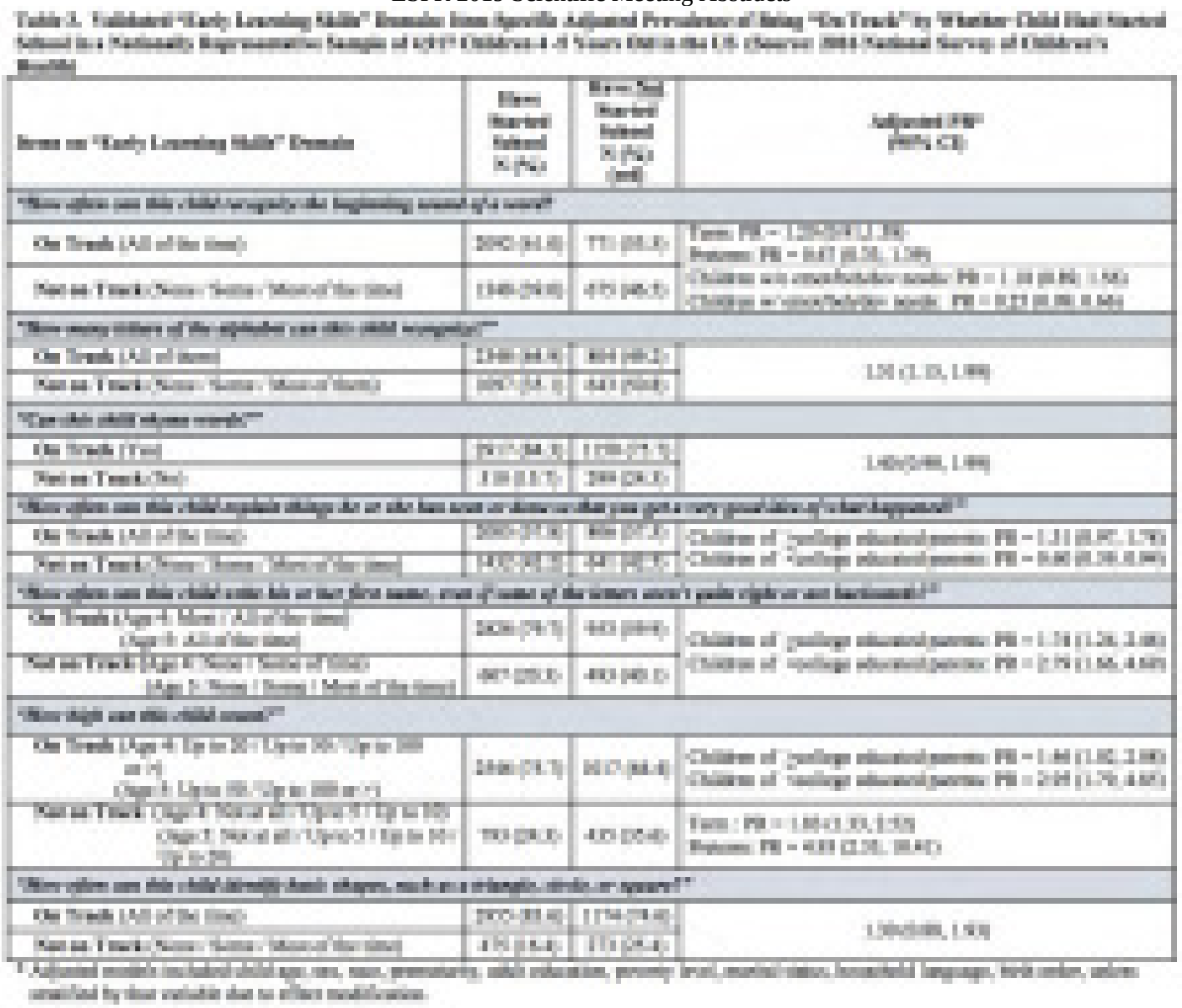

Abstract: 93

Where to get Donor Breast Milk? Self-Reported Parental Motivations and Concerns Regarding the Choice of Informal Milk Sharing versus Milk Banks

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Background The American Academy of Pediatrics (AAP) recommends exclusive breastfeeding prior to 6 months of age. However, many women are unable to produce enough milk to exclusively breastfeed their child and, thus, supplement infant diets with formula or donor breast milk (DBM). Though DBM is the ideal supplement to comply with AAP guidelines, it is often difficult for parents to obtain DBM safely from milk banks (MBs) and they are increasingly turning to informal "mother-to-mother" milk sharing (IMS) instead. Though this practice is discouraged by the AAP as it is potentially unsafe, few studies have examined parental perceptions of DBM and its sources.

Objective To study motivations and concerns regarding DBM usage from MB and IMS.

Design/Methods An anonymous survey was posted on Facebook and shared 330 times by various pages, including La Leche League USA, local La Leche Leagues, and state and local breastfeeding coalitions. Participants who self-identified as recipients of DBM reported from where they received DBM, why they chose that DBM source, and what concerns they had regarding DBM use as well as demographic questions.

Results A total of 655 responses (MB recipients: 35.6%, n=233; IMS 64.4%, n=422) were analyzed; 90.5% white. Of those who chose IMS, 55.9% (n=236) did not have any DBM concerns and 78.2% (n=330) stated that they did not medically screen the donors because they "trusted them." The greatest concerns over using DBM from IMS were alcohol/drug transmission (27.5%, n=116), potential disease transmission (24.6%, n=107), and bacterial contamination (19.7%, n=83) (Table 1). Motivations for using IMS over MBs were MB costs (53.3%, n=225), concerns about pasteurization affecting DBM quality in MBs (26.5%, n=112), and the inability to obtain prescriptions for MB DBM (23.0%, n=97). MB recipients cited health professional recommendation (45.5% n=106) and safety of breast milk (38.6%, n=90) as motivations for using MB (Table 2). Conclusion(s) Most respondents who reported obtaining DBM did so informally and the majority indicated they did not have concerns or take measures to reduce risks associated with IMS. It is clear that IMS participants underestimate these risks and, consequently, it is imperative that physicians educate parents on MBs and encourage safe milk sharing practices, including screening all potential donors in order to mitigate risks of disease and drug transmission through DBM.

Table 1: Motivations and Concerns of Informal Milk Sharing Recipients Regarding Donor Breast Milk Use

	Count	Percent
Total Recipients	422	--
For which reasons did you choose not to use breast milk from a milk bank?		
I did not know that milk banks were an option	91	21.6%
Milk banks require a prescription which I was unable to obtain	97	23.0%
The cost of milk from milk banks is too expensive	225	53.3%
I was worried pasteurization would compromise the quality of the breast milk	112	26.5%
The milk bank would not have provided me with enough breast milk to exclusively breastfeed for the amount of time I wanted	36	8.5%
Did you have any concerns regarding the use of donor breast milk?		
Yes, potential disease transmitted through breast milk	107	24.6%
Yes, potential presence of medication, alcohol, or illegal drugs in the breast milk	116	27.5%
Yes, potential bacterial contamination of breast milk	83	19.7%
Yes, potential dilution of breast milk in other types of milk	27	6.4%
Yes, cons of the breast milk	23	5.5%
Yes, possible legal issues	7	1.7%
No	236	55.9%

Motivations and Concerns of Informal Milk Sharing Recipients Regarding Donor Breast Milk Use

Table 2: Motivations and Concerns of Milk Bank Recipients Regarding Donor Breast Milk Use

	Count	Percent
Total Recipients	233	—
Were any of the following a motivation for choosing milk bank?		
Safety of breast milk	90	38.6%
Anonymity of donor	8	3.4%
Preferential donation to preterm or sick infants	64	30.5%
Health professional's recommendation	106	45.5%
Did you have any concerns regarding the use of donor breast milk?		
Yes, potential disease transmitted through breast milk	22	9.4%
Yes, potential presence of medication, alcohol, or illegal drugs in the breast milk	9	3.9%
Yes, potential bacterial contamination of breast milk	7	3.0%
Yes, potential the dilution of breast milk in other types of milk	2	0.9%
Yes, cost of the breast milk	24	10.3%
Yes, possible legal issues	9	3.9%
No	157	67.4%

Motivations and Concerns of Milk Bank Recipients Regarding Donor Breast Milk Use

Abstract: 90

ASSOCIATION BETWEEN PEDIATRIC OBSTRUCTIVE SLEEP APNEA AND DENTAL CARIES IN AN URBAN POPULATION

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Background Characterized as partial or complete obstruction of the upper airway during sleep, Obstructive Sleep Apnea (OSA) is the most commonly diagnosed sleep disorder. This condition is very prevalent in the pediatric population, with current estimates approaching 5-6%. Mouth breathing and dry mouth are common symptoms associated with OSA. Dry mouth is also well-documented as a risk for developing dental caries. Saliva possesses a protective property against the formation of dental plaques, a known progenitor of dental caries. In addition, poor oral hygiene has been linked to OSA in adults but there is limited data to suggest the same for children. Therefore, it is clinically relevant to investigate the risk of dental caries in pediatric OSA patients.
Objective To examine the association between OSA and the incidence of dental caries in an urban pediatric population.
Design/Methods Hospital-based, case-control study of 204 patients 2-20 years old who underwent Polysomnography (sleep study) from 2010-2018. Patients with OSA diagnosed by positive sleep studies (cases) were compared with controls who had negative sleep studies. Patients with facial anomalies, premature birth, and without dental visit records in our dental EMR within one year of the sleep study were excluded from the study. Multivariate logistic regression models were used for case-control comparisons.
Results 128/204 (62.7%) patients were diagnosed with OSA and 76/204 (37.3%) had negative sleep studies. OSA patients showed significantly higher prevalence and increased number of dental caries compared to controls (71.1% vs. 46.4%; mean number of caries 4.16 compared with 2.74, respectively). After adjusting for confounding variables, the association between OSA and dental caries was still significant (OR 2.86, 95% CI: 1.20-6.81, p<.01).

Conclusion(s) To our knowledge, this is the first report to show the positive association between pediatric OSA and an increased risk of dental caries in the United States. Further study is warranted to address causality and identify possible interventions.

Abstract: 95

Positional plagiocephaly diagnosis within a primary care network is associated with developmental delay

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Background There has been an increased incidence of positional plagiocephaly (PP) in the setting of supine infant sleep recommendations. A recent systematic review demonstrated associations between PP and developmental delay, with many prior study samples recruited from specialty clinics. However, primary care providers commonly identify and manage PP without specialty referral. The present study aims to evaluate the association between PP and developmental delay in a primary care cohort.

Objective

Design/Methods Our retrospective analysis used electronic medical record data from primary care sites within a children's health system spanning three states (Delaware, Pennsylvania, and Florida). We retrieved data from children ages 0-5 years who had a first primary care visit by age 12 months. Children with PP diagnosis by 12 months were classified in the PP group. Primary outcome was developmental delay including motor and language delay, identified by ICD9 and ICD10 codes. Those with craniosynostosis, trisomy 21, cleft lip and/or cleft palate, or cerebral palsy were excluded. Pearson Chi-Square and binary logistic regression analyses were conducted using SPSS, with multivariable models adjusting for gender, race, ethnicity, insurance, prematurity status (22-36 weeks gestation), diagnosis of abnormal tone, and diagnosis of torticollis.

Results Of 77,335 patients seen by 12 months, 2,524 (3.3%) were diagnosed with PP. Based on Pearson chi-square analysis, PP was associated with a ~2-fold greater odds (OR 2.262, 95% CI 2.036-2.513) of having any developmental delay ($\chi 2 = 243.148$, $P < 0.001$). In logistic regression analysis, PP was independently associated with an increased odds for any developmental delay diagnosis (AOR 1.715, 95% CI 1.527-1.925, Table 1). Infants with PP had more than two times greater odds of a motor delay diagnosis, and infants with PP had about a 50% increased odds of receiving a language delay diagnosis (Table 1).

Conclusion(s) Data from a large primary care cohort demonstrates an association between PP and both motor and non-motor delays, affirming findings in prior subspecialty literature. Primary care providers should consider enhanced developmental screening and/or referral for developmental evaluation for infants with PP.

Table 1

	Any developmental delay (N = 6,948) AOR (95% CI)	Motor delay (N=6,911) AOR (95% CI)	Language delay (N=5,473) AOR (95% CI)
Postnatal glucocorticoids	**1.719 (1.537 – 1.923)**	**3.381 (3.054 – 3.809)**	**1.419 (1.207 – 1.758)**
Gender			
Female	Reference	n.s*	Reference
Male	**1.971 (1.870 – 2.077)**	n.s*	**2.211 (2.081 – 2.357)**
Unknown	0.000 (0.000)	n.s*	0.000 (0.000)
Race			
White	Reference	Reference	Reference
Black	**0.865 (0.805 – 0.930)**	**0.454 (0.344 – 0.499)**	**0.874 (0.816 – 1.021)**
Asian	1.111 (1.036 – 1.119)	**0.800 (0.199 – 1.241)**	**1.099 (1.041 – 1.182)**
Other/missing	1.018 (0.988 – 1.119)	**0.928 (0.197 – 1.331)**	**1.046 (0.886 – 1.191)**
Ethnicity			
Non-Hispanic	Reference	n.s*	Reference
Hispanic	1.037 (0.981 – 1.107)	n.s*	**1.165 (1.044 – 1.283)**
Other/missing	**0.441 (0.341 – 0.578)**	n.s*	**0.598 (0.493 – 0.724)**
Insurance			
Medicaid	Reference	Reference	Reference
Private	**0.795 (0.748 – 0.858)**	**0.260 (0.215 – 1.311)**	**0.788 (0.735 – 0.865)**
Other/missing	**0.402 (0.353 – 0.458)**	**0.139 (0.071 – 0.280)**	**0.579 (0.525 – 0.648)**
Prematurity			
Term 37-45 weeks gestational age	Reference	Reference	Reference
Premature (23 – 36 weeks gestational age)	**1.641 (1.538 – 1.760)**	**2.797 (2.542 – 3.276)**	**1.378 (1.269 – 1.497)**
Missing gestational age	**0.771 (0.709 – 0.828)**	**0.681 (0.552 – 0.846)**	**0.867 (0.748 – 0.972)**
Abnormal rear diagnosis	**15.411 (13.868 – 19.688)**	**14.977 (10.938 – 28.502)**	**6.455 (5.853 – 8.133)**
Torsades diagnosis	**1.612 (1.388 – 1.879)**	**1.693 (1.323 – 2.161)**	**1.410 (1.221 – 1.727)**

AOR and CI in bold are significant at an α level of 0.05.

*Gender and ethnicity were removed from logistic regression for motor delay as no significant differences among gender or ethnicity categories were found.

Abstract: 96

Different Growth Curves are Needed for Extremely Low Birth Weight (ELBW) Infants on Exclusive Fortified Human Milk Diet

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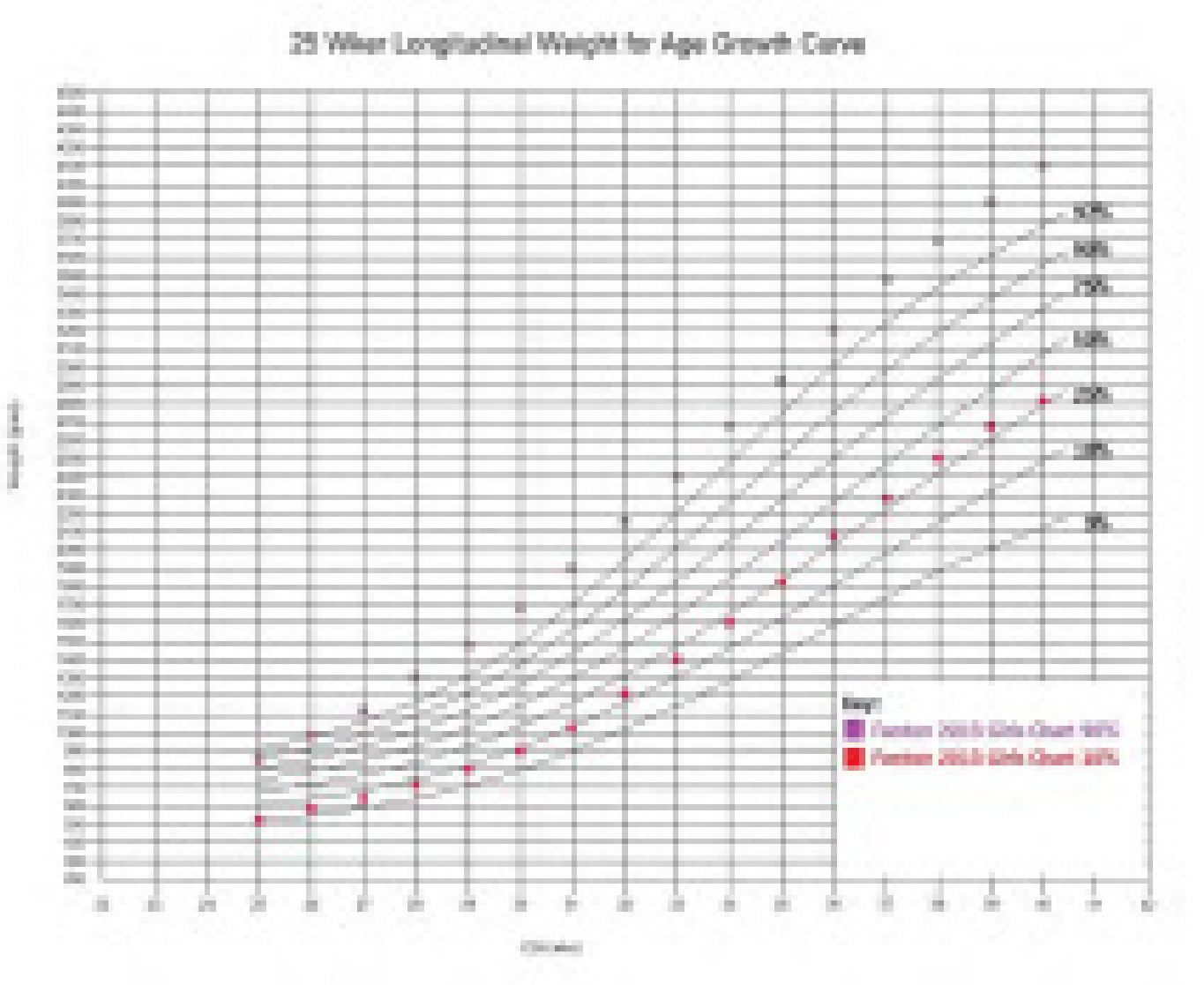
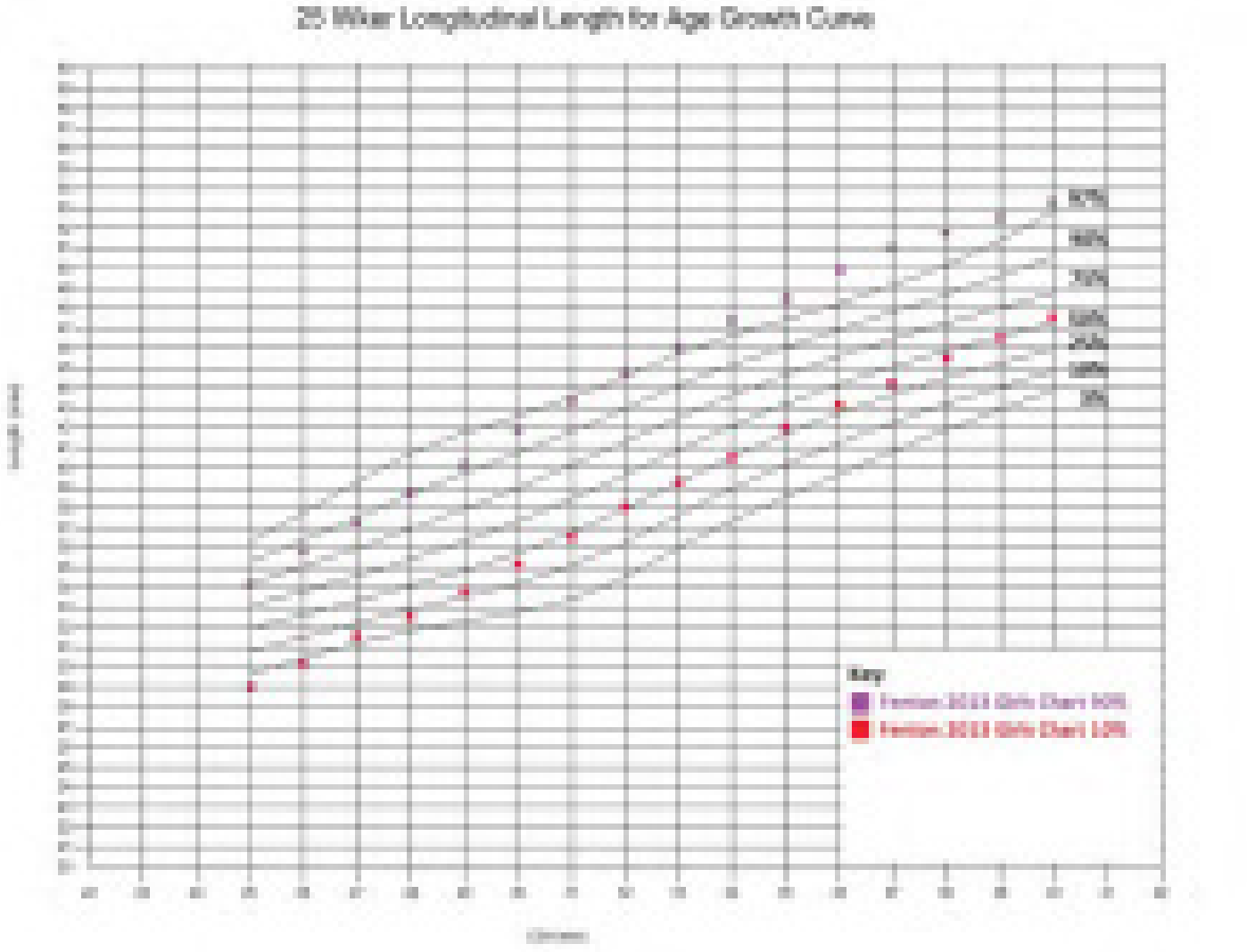
Background Optimal postnatal growth of preterm infants is currently defined as equivalent to the growth of 'the reference fetus' and extrauterine growth restriction (EUGR) in the past has been associated with poor neurodevelopmental (ND) outcomes. The most commonly used growth curve (Fenton 2013) is constructed based on cross-sectional data reflecting both intrauterine and postnatal growth without taking into account postnatal diet. Exclusive human milk diet (EHM) with mother's own or donor breast milk fortified with human milk derived fortifier may lead to slower weight gain and increasing the risk of being classified as EUGR. The correlations between EHM, EUGR as currently defined, and ND have not been assessed.
Objective We sought to develop a longitudinal-based, extrauterine growth curve for weight, length and head circumference in ELBW infants feeding EHM.
Design/Methods We obtained serial longitudinal anthropometric data as well as demographic and medical information for all infants born at 23-28 wks GA, between February 2015 – May 2018 who were fed EHM. We excluded those with diagnosis of hydrops, HIE, congenital malformation or those who died within 5 days of life or died before reaching full feeds. Weekly measurements of weight, head circumference and length for each gestational week between 23 and 28 were collected from birth until discharge or 40 weeks postmenstrual age (PMA). Separate longitudinal growth charts for each gestational age were constructed using the Least Mean Square (LMS) Algorithm. We defined EUGR for each GA cohort as weight < 10% at discharge or 40 wks PMA. EUGR rates using the Fenton 2013 curve were also assessed.
Results 195 ELBW infants met inclusion criteria: BW 883 ± 196g, GA 26 ± 1.64 wks (Mean ± SD). Rates of EUGR on Fenton vs. our growth charts were compared for each gestational week. Overall combined rate of EUGR was 32% vs. 8%. GA specific EUGR rates (%) were: 39 vs. 9, 38 vs. 7, 13 vs. 5, 31 vs. 6, 29 vs. 14, 46 vs. 6 for each GA week from 23 to 28 respectively. Length and Head circumference for each gestational age were also plotted and compared.
Conclusion(s) We have generated longitudinal, postnatal, gestational age specific growth charts for ELBW infants on exclusive human milk diet. Rates of EUGR for each GA on our growth charts were lower than the rates on the Fenton Chart. Whether EUGR defined by diet specific longitudinal growth curve will lead to different neurodevelopment outcome remains to be determined.


28 Week Longitudinal Weight for Age Growth Curve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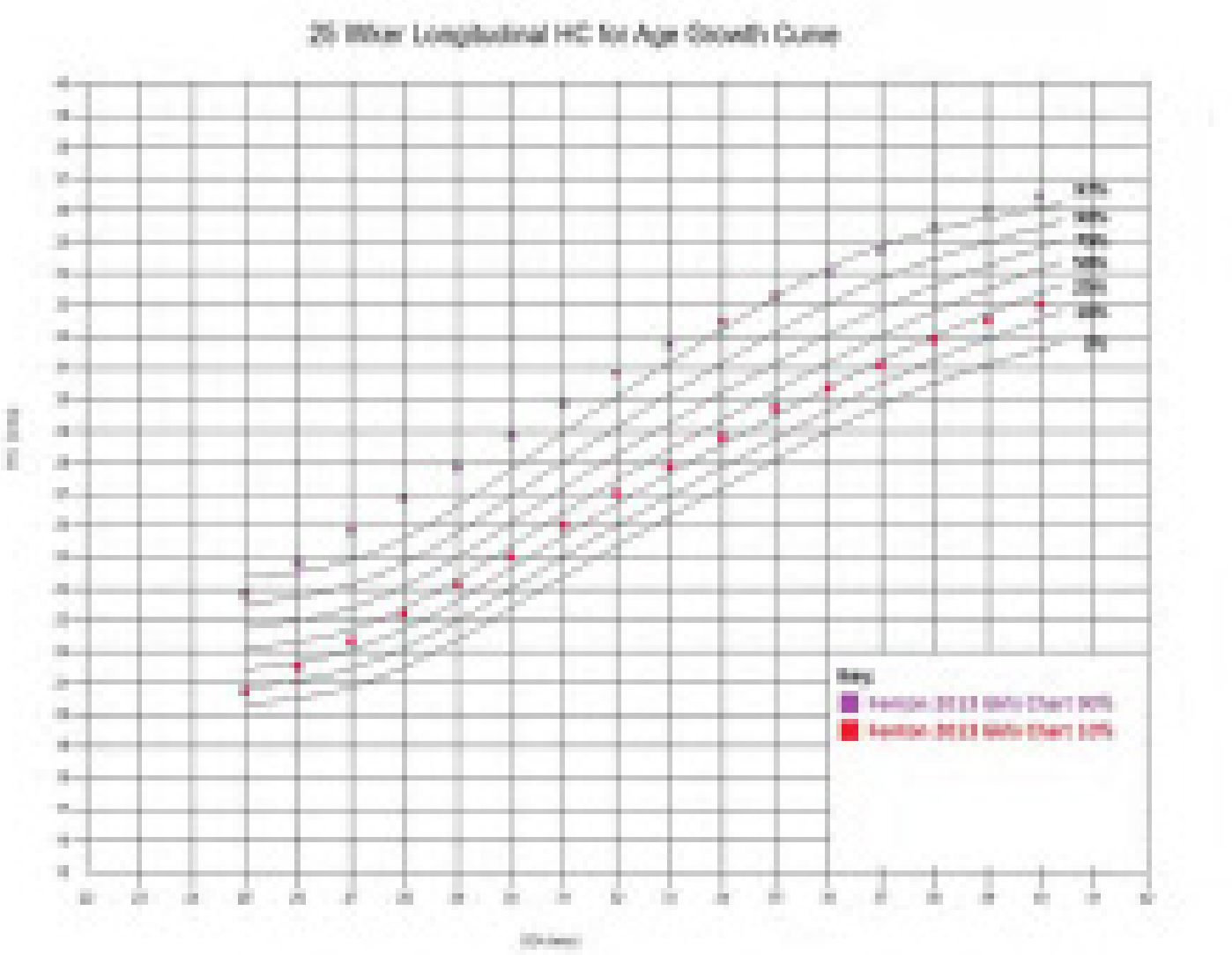

Abstract: 97

Impact of a Baby Friendly-Aligned Pacifier Policy on Pacifier Use at One Month of Age

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Background Pacifier use decreases the risk of Sudden Infant Death Syndrome (SIDS) but its impact on breastfeeding remains controversial. Baby Friendly USA advocates for avoidance of pacifiers and artificial nipples in breastfeeding infants while in the birth hospital. The impact of this early avoidance on future pacifier use is not clear.

Objective To evaluate the impact of a Baby Friendly-aligned restrictive pacifier policy on subsequent pacifier use and breastfeeding rates at one month of age.

Design/Methods We conducted a prospective two stage (pre and post) cohort study of newborns before and after implementation of a Baby Friendly-aligned restrictive pacifier policy at a birth hospital that serves an urban, low income, minority community. Consecutive mothers of term newborns admitted to the nursery participated in a telephone survey at one month of age. The survey was adapted from the validated Infant Feeding and Sleeping Practices.

Results 342 mothers participated (190 pre, 152 post): 63% were African American, 22% Hispanic, 81% public assistance, 31% primiparous, 82% received WIC, 32% delivered by C/Section. Pacifier adoption was significantly delayed in the post-group ($p<0.01$) but pacifier use by one month of age was comparable (pre 79%, post 78%). In the pre-group, female and male infants used pacifier at comparable rates (females 77%, males 80%) but in the post-group females were significantly less likely to use a pacifier after controlling for insurance, race, parity and delivery mode (females 68%, males 87%; aOR 0.35, 95% CI – 0.15-0.88, $p=0.02$). The post group had significantly higher rates of exclusive breastfeeding on day of discharge (pre 40%, post 51.3%, $p=0.04$), however, the rates of any and exclusive breastfeeding at one month of age were comparable (any

breastfeeding: pre 53.2%, post 53.3%; exclusive breastfeeding: pre 23.7%, post 24.3%).
Conclusion(s) A Baby Friendly-aligned restrictive pacifier policy in a birth hospital serving an urban, low income, minority community delayed pacifier adoption but did not impact overall pacifier use or breastfeeding rates at one month of age. The exploratory finding of lower pacifier use rates among females post-intervention needs verification in other populations before evaluating public heath relevance.

Abstract: 98
Is neurodevelopmental outcome affected by growth velocity in ELBW infants fed an exclusive human milk diet?
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Background An exclusive human milk (EHM) diet in ELBW infants is associated with many short-term benefits, including a decreased incidence of NEC, BPD, ROP and sepsis. It is also linked to an increased likelihood of extra-uterine growth restriction (EUGR), defined as weight <10%ile at discharge (DC). Although EUGR has been associated with poorer neurodevelopmental (ND) outcomes in ELBW infants, its role among those fed an EHM diet is unknown.
Objective Determine whether EUGR at DC adversely affects ND outcomes at 2 years corrected age (CA) in ELBW infants fed an EHM diet. Secondary aims were to compare EUGR vs. not and differences in short-term morbidities and 2 year growth.
Design/Methods Prospective cohort study of ELBW infants admitted to the NICU at MFCH born between Feb. 2015 – Sep. 2016 fed an EHM diet until 34 weeks corrected gestational age (CGA), and assessed at the Regional Neonatal Follow-up Program at 2 years CA. Assessment included Bayley Scales of Infant Development 3rd ed, (BSID III) which provided a cognitive composite score, and a developmental age value for gross/fine motor skills and receptive/expressive speech. A difference in developmental age (delta DA) was calculated for each child (Developmental age-CA).
Results 80 eligible ELBW infants survived to DC, and 1 died after NICU DC. 40 (51%) were seen for follow-up. 16 (40%) were EUGR at DC. There were no differences in baseline characteristics or neonatal morbidities between groups (Tables 1,2).
The median cognitive scores were similar between the 2 groups [median 90 (80-99) for EUGR vs. 95 (81-105) for not, p= 0.297].
There was no difference in delta DA between groups for any subtest of the BSID III (Table 3).
Growth velocity during the NICU stay was slower than goal fetal growth rate of 15 g/kg/day, which led to a drop in z-score for both groups (Figure 1). However, this was more pronounced in the EUGR group [median -1.50 (-2.09- -1.25) vs. -0.895 (-1.31- -0.37), p<0.001]. By 2 years CA, both groups demonstrated catch-up growth, but this was more evident in the EUGR group. Slow weight gain did not affect linear or head circumference (HC) growth.
Conclusion(s) EUGR during NICU stay did not, in our cohort, adversely affect ND outcomes as measured by the BSID III at 2 years CA among EHM fed ELBW infants. These findings challenge previous studies showing an association of slow growth velocity and poor ND outcome, suggesting a neuroprotective effect of an EHM diet in the ELBW population, which may be evident by preserved head growth.

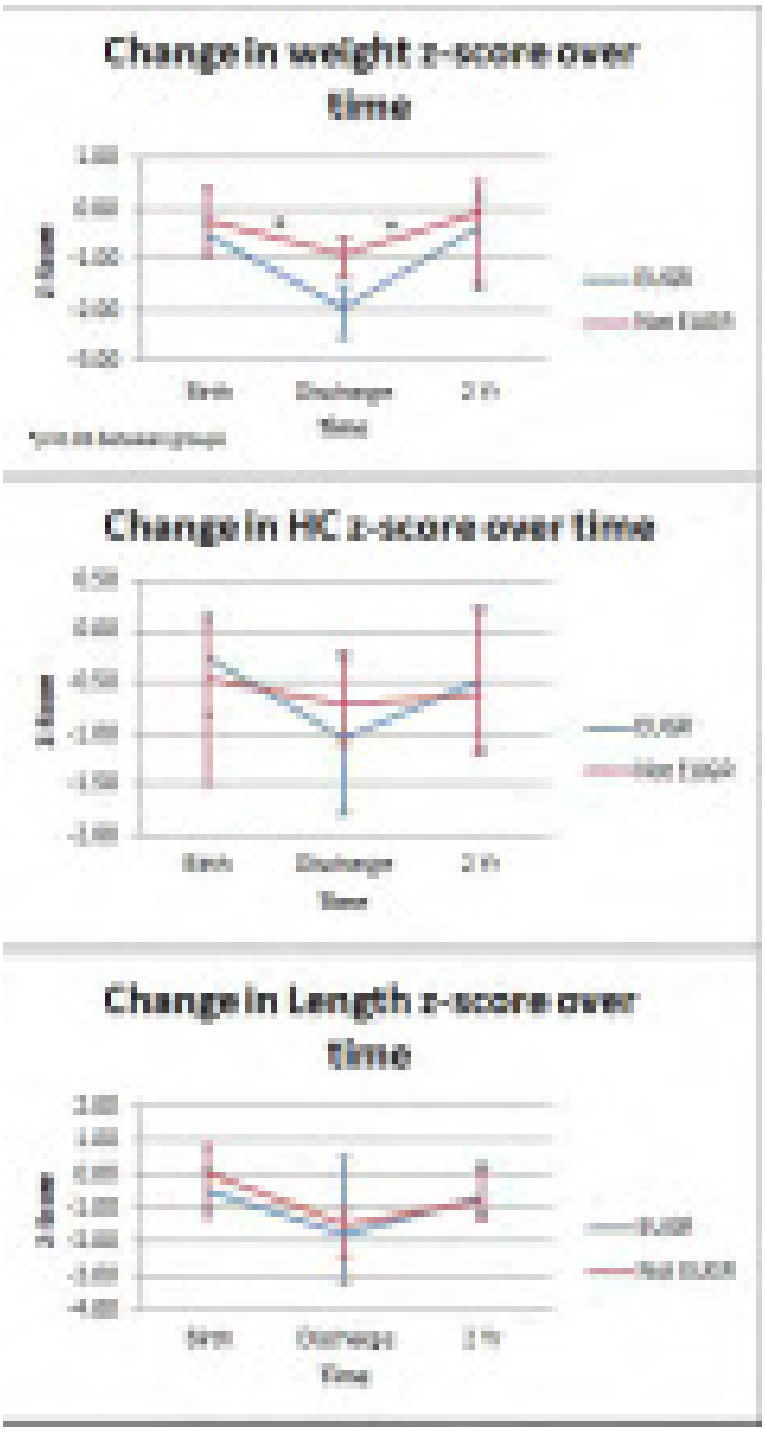

Table 1: Maternal demographics

	EUGR n=16	Not EUGR n=24	p-value
Maternal age, mean (±SD)	32 (±6)	30 (±7)	0.361
African American race, n (%)	5 (31)	8 (33)	0.890
Pre-eclampsia, n (%)	2 (13)	4 (17)	1.000

PPROM, n (%)	5 (31)	5 (21)	0.482
Antenatal steroids, n (%)	16 (100)	22 (92)	0.508
Chorioamnionitis, n (%)	1 (6)	8 (33)	0.061
C-section, n (%)	9 (56)	12 (50)	0.698
Magnesium, n (%)	13 (82)	14 (58)	0.130
Maternal substance use, n (%)	2 (13)	1 (4)	0.553
2 Parent home, n(%)*	14 (88)	5 (24)	0.568
Maternal education, high school or greater, n (%)**	14 (88)	19 (95)	0.574
Paternal education, high school or greater, n (%)***	12 (86)	16 (84)	1.000
English as primary language, n (%)	13 (81)	20 (84)	1.000

***n=37 (16 EUGR, 21 not EUGR); **n=36 (16 EUGR, 20 not EUGR); ***n=33 (14 EUGR, 19 not EUGR). Categorical variables analyzed by Chi-Square or Fisher's Exact Test. Continuous variables analyzed by T-test.**

Table 2: Neonatal Characteristics

	EUGR n=16	Not EUGR n=24	p-value
GA in weeks, mean (±SD)	25 (±1.5)	25 (±1.5)	0.366
Female, n (%)	7 (44)	11 (46)	0.897
Inborn, n (%)	15 (94)	19 (80)	0.373
Multiple gestation, n (%)	7 (44)	4 (17)	0.080
5 min APGAR <7, n (%)	10 (63)	10 (42)	0.197
BW in grams, median (IQR)	660 (582-853)	800 (565-898)	0.307
Birth HC in cm, median (IQR)	22.3 (21.1-23.9)	23.0 (20.9-23.9)	0.677
Birth length in cm, median (IQR)	31.8 (29.6-34.3)	33.2 (29.9-35.9)	0.319
SGA, n (%)	0 (0)	5 (21)	0.071
Exclusive mother milk, n (%)	6 (38)	11 (46)	0.601
DOL to regain BW, mean (±SD)	7 (±3)	7 (±3)	0.588
Days TPN, median (IQR)	22 (15-28)	16 (11-24)	0.084
BPD, n (%)	10 (63)	15 (63)	1.000
Severe ROP, n (%)	1 (6)	4 (17)	0.631
Severe IVH or PVL, n (%)	1 (6)	0 (0)	0.400
NEC, n (%)	2 (13)	0 (0)	0.154
Sepsis, n (%)	3 (19)	4 (17)	1.000
Surgical PDA, n (%)	4 (25)	6 (25)	1.000
CA at DC in weeks, median (IQR)	41.5 (38.3-42.8)	40.5 (39.0-43.0)	0.978
DC wt in grams, median (IQR)	2905 (2567-3246)	3198 (2795-3775)	0.136

DC HC in grams, median (IQR)	34.3 (32.5-35.9)	34.2 (33.5-35.9)	0.934
DC length in cm, median (IQR)	47.3 (44.0-51.1)	48.0 (45.6-49.9)	0.771
Growth velocity, g/kg/day, median (IQR)	12.0 (11.5-13.8)	13.3 (12.7-14.0)	0.019

Categorical variables analyzed using Chi-Square or Fisher's Exact Test, as appropriate. Continuous variables analyzed using T-test for parametric data and Mann-Whitney U for non-parametric data.

Table 3: 2 Year Neurodevelopmental and Anthropometric Outcomes

	EUGR n=16	Not EUGR n=24	p-value
CA at BSID III, median (IQR)	24.2 (22.7-26.4)	24.3 (23.4-26.7)	0.658
Cognitive BSID III Score for CA, median (IQR)	90 (80-99)	95 (81-105)	0.297
Cog ΔDA, median (IQR)	-2.6 (-7.7- -1.0)	-2.3 (-4.8-0.6)	0.553
Rec. language ΔDA, median (IQR)	-3.6 (-8.8-0.6)	-4.2 (-8.1- -1.5)	0.782
Exp. language ΔDA, median (IQR)	-6.7 (-11.6-3.0)	-5.6 (-8.4-1.5)	0.544
Fine motor ΔD, median (IQR)	-3.7 (-9.5- -1.2)	-2.7 (-4.3- -1.3)	0.448
Gross motor ΔDA, median (IQR)	-5.4 (-9.0- -4.1)	-4.3 (-6.1- -2.1)	0.109
2 yr FU wt in kg, median (IQR)	11.8 (10.9-12.7)	12.6 (10.6-13.2)	0.456
FTT, n (%)	3 (19)	5 (21)	1.000
2 yr HC in cm, median (IQR)	47.5 (46.2-48.5)	47.1 (46.3-48.9)	0.698
2 yr length in cm, median (IQR)	84.5 (83.5-86.0)	85 (82.5-87.8)	0.923

FTT <5% for weight. ΔDA = Developmental age in months-Corrected age in months. Categorical variables analyzed by Chi-Square or Fisher's Exact Test as appropriate. Continuous variables analyzed with Mann-Whitney U.

Abstract: 99
New England Donor Milk Macronutrient Analysis
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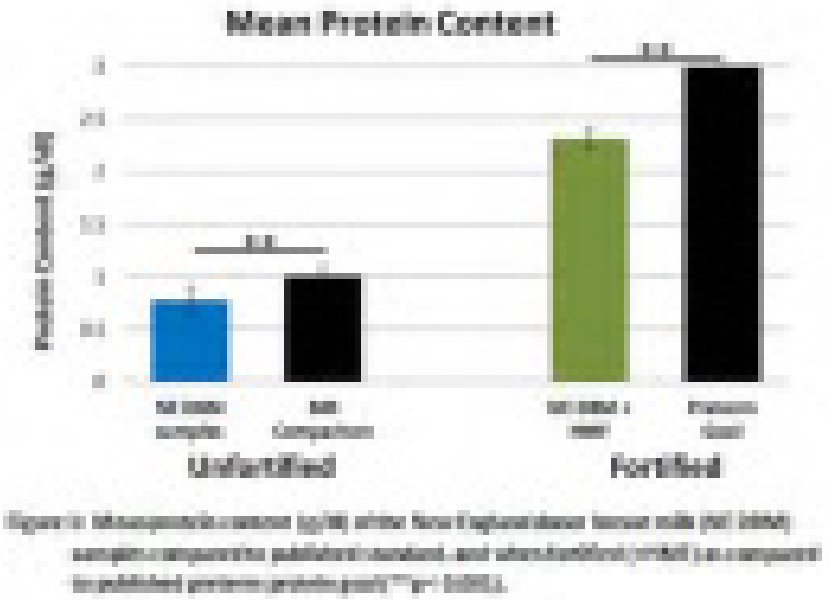
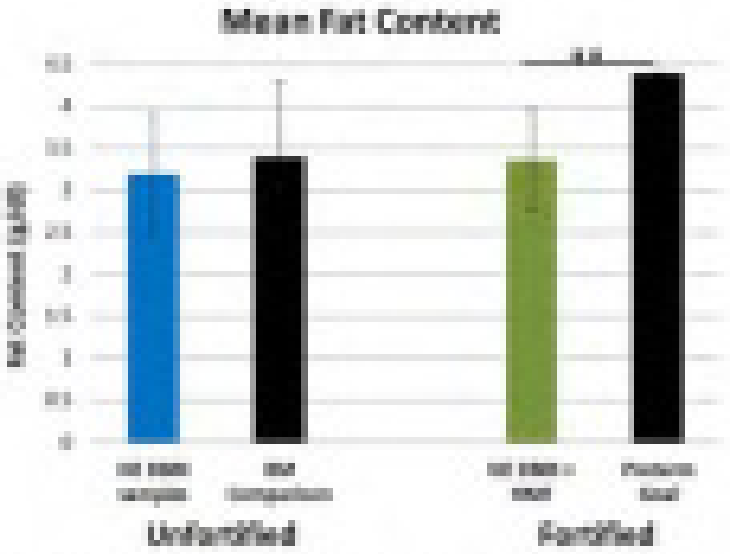
Background Human breast milk (BM) is the AAP-recommended form of nutrition for preterm infants. The nutritional qualities of BM can vary significantly, especially with human donor breast milk (DBM), which is pooled, pasteurized BM that many preterm infants receive when mother's own BM is unavailable. Little is known about the nutritional content of DBM from a single HMBANA-accredited milk bank which serves most of the New England-area NICUs.
Objective To describe the nutritional content of different batches of pooled, pasteurized DBM purchased from Mothers' Milk Bank Northeast over a 3 month period, and to compare these results to the published standards both with and without nutritional fortification.
Design/Methods Thirty different, pooled batches of DBM were thawed and a 9ml sample was warmed, homogenized, and analyzed in triplicate using a mid-infrared instrument (Miris Human Milk AnalyzerTM; Uppsala, Sweden). Descriptive statistics were computed and compared to national standards using t test analyses with significance of $p<0.05$. Results of nutritional fortification were also calculated based on addition of Similac Human Milk Fortifier (HMF), extensively hydrolyzed protein concentrated liquid (Abbott Nutrition, Columbus, OH); per protocol and package instructions, a 5ml packet (0.5g protein, 0.21g fat, 0.75g carbohydrate) added to 25ml of DBM provides an additional ~4 cal/oz. The study was reviewed by both the Baystate Medical Center IRB and the Research Committee of HMBANA.

Results The mean true protein of DBM samples was 0.78 ± 0.13 g/dl which is well below the BM standard of 1.0 g/dl; DBM+HMF increased protein to 2.31 ± 0.11 g/dl, but is well below the preterm goal of 3.0 g/dl (p<0.001; Figure 1). The DBM mean fat content of 3.19 ± 0.70 g/dl was not statistically significant from the BM standard of 3.4 g/dl; however DBM+HMF fat content was 3.36 ± 0.58 g/dl which is well below the preterm goal of 4.4g/dl (p<0.001; Figure 2). DBM mean carbohydrate content was consistent with the reported standards. The mean total energy was 19.87 ± 2.02 kcal/oz for DBM alone, and 22.96 ± 1.63 kcal/oz for DBM+HMF with a Protein/Energy ratio of 3.03 ± 0.22 g/100kcal of which 50% were below the preterm goal of 3.0 g/100kcal.

Conclusion(s) This study adds to the growing body of literature that pooled, pasteurized DBM falls below the assumed nutritional standards of mature BM, especially in regards to protein, and has significant nutritional variability. Even with nutritional fortification, DBM fails to meet the standards for preterm infants.





Abstract: 100

Reported Perceived versus Actual Barriers to Breast Milk Donation to Milk Banks

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Background Milk banks (MB), which are the primary source of donor breast milk for premature infants in Neonatal Intensive Care Units (NICUs) nationwide, help save lives every day. Unfortunately, low donation rates mean that milk banks are often unable to keep up with high demand. Despite this issue, few studies have examined the potential barriers that are limiting breast milk donations to milk banks.

Objective To study perceived and reported difficulties of women with a self-reported oversupply of breast milk regarding donating breast milk.

Design/Methods An anonymous survey was posted on Facebook and shared a total of 330 times by Facebook pages for La Leche League USA, local La Leche Leagues, and state and local breastfeeding coalitions nationwide. Participants who had an oversupply of breast milk were asked whether they donated breast milk or had considered doing so. Participants were then asked to identify whether aspects of donating breast milk were difficult or expensive and which part was the most difficult, followed by demographic questions.

Results A total of 2,216 responses (85.2% white) were analyzed, of whom 16.5% (n=365) had donated to MB and 23.4% (n=519) had considered donating. Of those who donated to MB, 74.0% (n=270) reported that the donation process was "extremely easy" or "easy" and 24.9% (n=91) stated that "no part" of the donation process was difficult. The aspect most often selected as "most difficult" was "medical tests/lifestyle changes," which was reported by 20.8% (n=76) of respondents. Of

those who considered donating, 41.0% (n=213) perceived the process as "difficult" or "extremely difficult," citing medical tests/lifestyle changes as the most difficult aspect (36.2%, n=188).

Conclusion(s) Mothers who consider donating seem to perceive larger barriers to donation than those who actually donate. Although those who donated overwhelmingly found the process "easy" or "extremely easy" and many found no aspect of the process difficult, those who considered donating seemed concerned, with many perceiving the process as quite difficult. It is imperative that milk banks along with healthcare professionals who work with infants and lactating mothers educate potential donors on the realities of donating to help minimize potentially unnecessary concerns. Milk banks should develop outreach materials in conjunction with the community of mothers who have successfully donated to milk banks that could serve as supportive resources for mothers considering donation.

Table 1: Reported Actual and Perceived Ease of Donation as Reported by Mothers with An Oversupply of Breast Milk Who Have Donated to a Milk Bank or Considered Donating

Ease of Donation	Donated (n=365)	Considered Donating (n=519)
Extremely Easy	23.2% (n=82)	2.9% (n=15)
Easy	48.8% (n=178)	17.0% (n=88)
Neutral	15.9% (n=58)	38.1% (n=203)
Difficult	8.5% (n=31)	34.9% (n=181)
Extremely Difficult	1.6% (n=6)	6.2% (n=32)

Reported Actual and Perceived Ease of Donation as Reported by Mothers with An Oversupply of Breast Milk Who Have Donated to a Milk Bank or Considered Donating

Table 2: Most Difficult Aspect of Donation as Reported by Mothers with An Oversupply of Breast Milk Who Have Donated to a Milk Bank or Considered Donating

Most Difficult Aspect of Donation	Donated (n=365)	Considered Donating (n=519)
Cost to ship/minimum donation	2.2% (n=8)	3.9% (n=20)
Finding where to donate	7.4% (n=27)	18.7% (n=97)
Expressing breast milk	14.8% (n=54)	11.8% (n=61)
Storing breast milk	6.3% (n=23)	6.6% (n=34)
Delivering breast milk	14.5% (n=53)	12.7% (n=66)
Medical Tests/Lifestyle Changes	20.8% (n=76)	36.2% (n=188)
No aspect is difficult	25.5% (n=93)	0.0% (n=0)

Most Difficult Aspect of Donation as Reported by Mothers with An Oversupply of Breast Milk Who Have Donated to a Milk Bank or Considered Donating

Abstract: 101

The Effect of Donor Breast Milk on Postnatal Growth and Metabolic Bone Disease in Premature Infants

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Background Preterm infants have increased nutrient demands met through human milk (HM) which consists of expressed breast milk (EBM) or donor breast milk (DBM), formula and total parenteral nutrition (TPN). HM can fail to meet caloric, protein and electrolyte needs of preterm infants leading to slower rates of growth. Nutrient analysis shows DBM has lower levels of protein compared to EBM and preterm formula. Metabolic bone disease (MBD) is associated with extremely low birth weight infants and inadequate nutrient intake due to prolonged duration of TPN.
Objective To compare rates of MBD and postnatal growth in preterm infants receiving DBM compared to EBM. Secondary objectives looked at feeding intolerance and co-morbidities in these infants.
Design/Methods This was a retrospective observational study. All infants born at NYU Langone Health and Bellevue Hospital who were ≤1500 grams and ≤32 weeks are eligible for DBM as per unit policy. We identified all premature infants born from 1/1/2014 to 1/1/2018 and divided into two groups, those who received ≥70% of all enteral feeds with either EBM or DBM. Demographic and clinical characteristic were collected from chart review. Growth and nutritional status specifically looking at laboratory biomarkers and radiographic signs of MBD were analyzed using SPSS 23. Alkaline phosphatase (AlkPO4) levels ≥500 were considered suggestive of MBD diagnosis.
Results 210 infants were included in the study, 156 in EBM and 54 in DBM group. We found that infants in the DBM group had higher mean levels of AlkPO4 compared to infants who were fed EBM with no difference in radiographic findings. They were also more likely to have AlkPO4 level > 500. Infants who were fed DBM had significantly higher weight gain per week. Infants who were fed DBM additionally had significantly higher serum albumin but not protein levels. There was no difference in feeding intolerance and neonatal co-morbidities.
Conclusion(s) Infants with a majority of DBM intake had a higher rate of MBD compared to those fed EBM. Infants being fed DBM require closer monitoring for MBD and early supplementation of vitamin D should be considered in these infants. Postnatal weight gain per week was higher in infants fed DBM compared to EBM, which may be related to earlier supplementation even though no significant difference in supplementation was found. While albumin levels were higher in the DBM group its significance is unclear with no difference found in total protein levels and BUN as compared to EBM group.

Demographics	ERM N=158	DRM N=54	p-value
Gestational Age, mean ± SD	28.65 ± 2.1	28.02 ± 2.34	NS
Birth, mean ± SD			
Weight (g)	1178.9 ± 349.1	1168.3 ± 372.9	NS
Length (cm)	37.1 ± 4.2	35.2 ± 4.8	< .01
Head Circumference (cm)	26. 2 ± 2.4	25.1 ± 2.5	< .01
Growth Parameters, n (%)			
Small for Gestational Age	14 (9)	4 (7)	NS
IUGR	13 (8)	7(13)	NS
Sex, n (%)			
Male	81 (52)	28 (52)	NS
Female	75 (48)	26 (48)	
Mode of Delivery, n (%)			
Spontaneous Vaginal Delivery	39 (25)	15 (28)	NS
C-Section	117 (75)	24 (62)	NS
Apgars, median			
1 Minute of Life	6	6	NS
5 Minutes of Life	8	8	NS
Resuscitation at Birth, n (%)	81 (51)	24 (44)	NS

Demographics

Nutrition and Growth Characteristics	ERW N=158	DRW N=54	p-value
Time to Initiate Feeds (days), mean ± SD	4.7 ± 4.8	5.4 ± 5.8	NS
Time to Advance (days), mean ± SD	10.8 ± 8.5	11.0 ± 9.3	NS
Time to Fortification (days), n (%) mean ± SD	19.1 ± 12.9	20.6 ± 12.6	NS
Time to Full Feeds (days), mean ± SD	41.0 ± 27.8	35.3 ± 24.5	NS
Days of TPN (days), mean ± SD	24.2 ± 19.7	20.8 ± 13.6	NS
Vitamin D Supplementation, n (%)	136 (86)	44 (81)	NS
Additional Supplements, n (%)			
Micronutrients	15 (10)	10 (19)	NS
Liquid Protein	47 (30)	18 (33)	NS
Discharge, mean ± SD			
Weight (g)	2548.1 ± 516.2	2732.2 ± 856.6	.08
Length (cm)	46.1 ± 3.0	46.2 ± 3.9	NS
Head Circumference (cm)	32.4 ± 2.0	32.7 ± 2.5	NS
Weight Gain, mean ± SD			
Per Week based on BW (g)	129.0 ± 46.7	145.5 ± 58.3	0.03

Nutrition and Growth Characteristics

Laboratory Biomarkers and Imaging for Metabolic Bone Disease	IRM N=156	CRM N=54	p-value
Serum Calcium, mean ± SD			
Week 1	9.33 ± 0.57	9.01 ± 0.56	NS
Week 2	9.84 ± 0.46	9.67 ± 0.58	NS
Week 3	9.91 ± 0.41	9.68 ± 0.48	NS
Week 4	9.78 ± 0.38	9.68 ± 0.49	NS
Serum Phosphorus, mean ± SD			
Week 1	5.05 ± 0.71	4.9 ± 0.92	NS
Week 2	5.90 ± 0.73	5.59 ± 0.88	NS
Week 3	5.94 ± 0.98	5.55 ± 1.279	NS
Week 4	5.8 ± 1.00	5.62 ± 1.24	NS
Alkaline Phosphatase, mean ± SD			
Week 1	259.2 ± 81.9	288.9 ± 115.1	.063
Week 2	305.4 ± 131.9	403.3 ± 169.8	.000
Week 3	358.7 ± 136.5	483.1 ± 223.1	.000
Week 4	429.5 ± 193.8	538.9 ± 249.8	.00
Alkaline Phosphatase > 500, n (%)	32 (20)	25 (46)	<.01
Evidence of Osteopenia on X-Ray, n (%)	62 (39)	27 (50)	NS
Bone Fractures, n (%)	1 (0.6)	1 (1.8)	NS

Laboratory Biomarkers and Imaging for Metabolic Bone Disease

Laboratory Biomarkers of Growth	[illegible] N=156	[illegible] N=54	p-value
Serum Sodium, mean ± SD			
Week 1	138.4 ± 11.2	139.2 ± 3.6	NS
Week 2	135.1 ± 9[illegible]	137.3 ± 2.7	NS
Week 3	134.9 ± 9[illegible]	136.3 ± 4.1	NS
Week 4	136.0 ± 3.6	135.7 ± 3.4	NS
Protein, mean ± SD			
Week 1	4.7 ± 0.7	4.8 ± 0.6	NS
Week 2	4.9 ± 0.6	4.9 ± 0.5	NS
Week 3	4.7 ± 0.6	4.8 ± 0.7	NS
Week 4	4.8 ± 0.6	4.8 ± 0.6	NS
Albumin, mean ± SD			
Week 1	2.7 ± 0.5	2.9 ± 0.4	0.01
Week 2	2.9 ± 0.4	3.0 ± 0.4	0.03
Week 3	2.8 ± 0.4	3.0 ± 0.5	.890
Week 4	2.8 ± 0.5	3.0 ± 0.5	.828
Blood Urea Nitrogen, mean ± SD			
Week 1	24.9 ± 7.3	27.0 ± 7.9	NS
Week 2	21.4 ± 11.1	23.8 ± 11.4	NS
Week 3	17.4 ± 10.2	19.8 ± 11.6	NS
Week 4	16.5 ± 12.7	15.7 ± 9.8	NS
BUN <9, n (%)	42 (27)	12 (22)	NS

Laboratory Biomarkers of Growth

Abstract: 102

Clonal expansion within circulating plasmblast populations lends support for an infectious disease etiology of Kawasaki disease.

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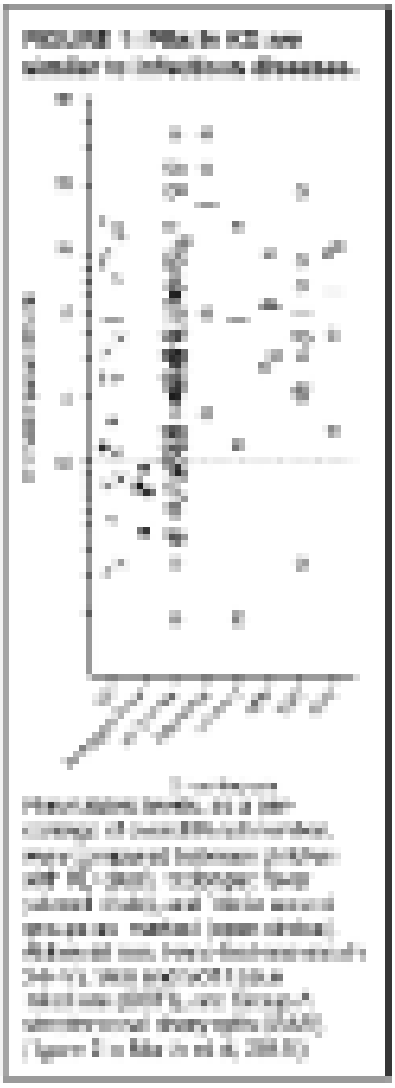
Background Kawasaki Disease (KD) is a childhood vasculitis, marked by prolonged fevers and coronary artery inflammation/aneurysms in near one quarter of those untreated. The cause remains unknown; however, epidemiologic and demographic data support a single preceding infectious agent may lead to KD. Plasmablasts (PBs) are a stage of transitional Bcells that lead to plasma cells, the longlived antibody producing cells of the bone marrow. After initial infection, peripherally circulating PB populations are enriched for cells with antibodies against the preceding infection.
Objective We have recently published data showing children with KD have similar PB responses to children with infections. We sought to define the antibody characteristics, including clonality, of these PBs during KD.
Design/Methods We used antibody repertoire nextgeneration sequencing to characterize memory and PB populations. Additionally, pairing of heavy and light chains was performed with Chromium Single Cell Gene Expression (10x Genomics, Pleasanton, CA) using the Human B cell Single Cell V(D)J Enrichment Kit.
Results From subject 24, antibody sequences using VH434 and a 19 amino acid length complementarity determining region 3 showed a massive expansion between day 4 and 6 of fever. Chromium single cell sequencing produced over 946 heavy and light chain paired sequences. Sequence comparison showed 40% of sequences demonstrated markers of clonal expansion,

which represented 100 clonal groups. One clonal group (2401) reflected the massive clonal expansion (VH434, CDR3 19) previously shown.
Conclusion(s) This clonal expansion within plasmablast populations supports that Kawasaki disease is caused by an infection. Antigen targeting of these monoclonal antibodies is currently being explored.



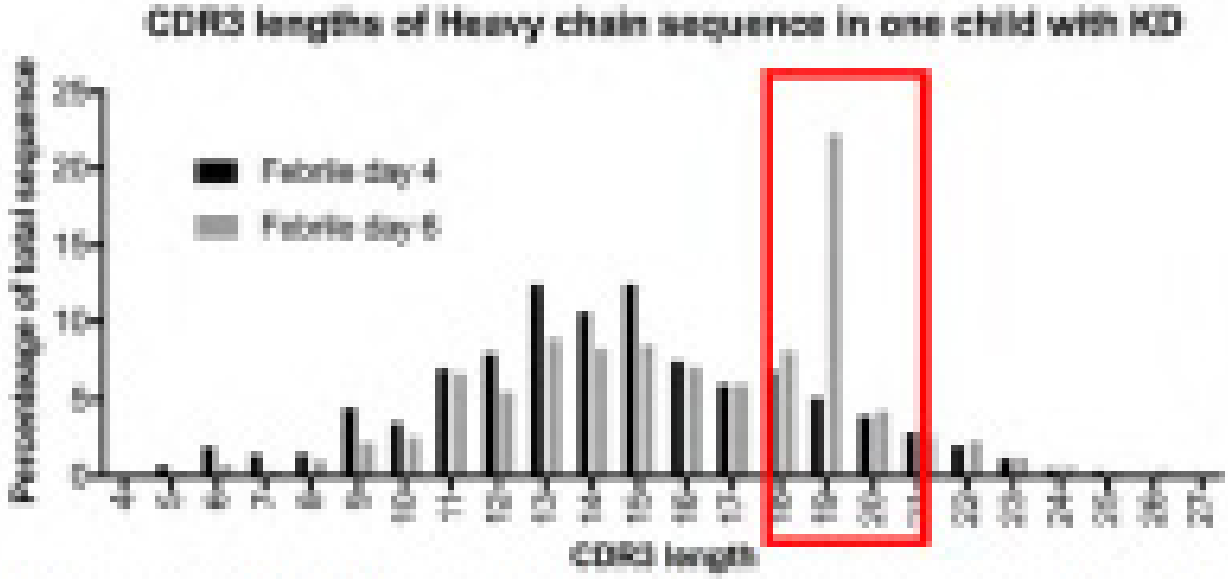


Figure 2: CDR3 analysis shows massive clonal expansion in subject 24's repertoire from day 4 to 6. RNA was extracted from total PBMCs and heavy chain primers were used on the Illumina MiSeq platform per the methods section. The IMGT HighV-QUEST Database matches sequences to the closest V-, D-, and J-gene families and allele and provided output of 265000 day 4 (black) and 190024 day 6 (gray) analyzed sequences. Sequences analyzed by CDR3 length are shown as percentage of total. Strikingly, there is a massive expansion of B cell sequences with CDR3 length of 19 on day 6 of fever (red box). This child's circulating PBs as a percentage of B cells for day 4 and 6 were 13.5% and 7.0% respectively.

Clonal Phylogenetic groups	Total clonal members	Unique nucle- Clonal Sequences	VH CDR3 length	VL CDR3 length
24-67*	18	8	19	11
24-02	6	5	15	9
38-28	6	4	17	9
24-20	6	5	11	8
30-39	8	5	15	11
24-40	5	5	20	13
38-67	8	8	18	8
24-177	4	4	14	9
24-439	2	2	11	11
24-441650	15	15	11	8
24-804	8	8	18	8
24-615	6	6	15	10
24-805	4	4	12	10
24-606	5	5	20	9

* related to sequences noted in primary database

Abstract: 103

Outcomes of Infants with Neonatal Listeriosis Supported with Extracorporeal Membrane Oxygenation from 1991-2017

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Background Listeriosis is a foodborne illness that remains a major public health concern due to the disease severity with high case fatality rates, primarily in fetuses and children under 1 year of age. Hirschl et al characterized outcomes for critically ill neonates with early-onset listeriosis requiring ECMO support from 1975-1991. Despite advancements in neonatal care, there has been no updates outlining the characteristics and outcomes of neonatal listeriosis supported with ECMO since that time.

Objective To describe the characteristics and outcomes of severe neonatal listeriosis requiring extracorporeal membrane oxygenation (ECMO).

Design/Methods Retrospective cohort of neonates with culture-proven listeriosis enrolled in the Extracorporeal Life Support Organization Registry between 1991 and 2017. Comparisons were made between this cohort and the previous case series from 1975-1991 by Hirschl et al. Analyses were performed using the Mann-Whitney U test and Fisher's exact test.

Results Twenty-two neonates had culture-proven *Listeria monocytogenes* infection and required ECMO from 1991-2017. 86% survived to discharge, compared to 67% in the previous cohort (p=0.21). The median ECMO duration was significantly shorter (131 vs. 210 hrs, p=0.01) despite longer hospital stay (34 vs 21 days, p=0.3). There were no differences in gestational age or weight.

Conclusion(s) Neonatal listeriosis continues to be an uncommon but potentially serious infection requiring ECMO support. These recent data suggest that survival of infants with listeriosis treated with ECMO may be improving.

Table 1: Characteristics and outcomes of neonates with severe Listeria monocytogenes infection supported with ECMO

Year	Patient No.	Age, days	Gestation, weeks	ECMO indication, A-a gradient	Duration of ECMO, hours	Mode of ECMO	Outcome	Hospital stay, days
1991	1	10	38	616	144	VA	Survived	-
1992	2	0	35	612	134	VV	Survived	67
1992	3	5	41	645	105	VA	Survived	-
1993	4	1	40	604	83	VA	Survived	45
1993	5	1	39	645	175	VA	Survived	53
1994	6	2	37	252	230	VV	Survived	23
1997	7	0	36	653	580	Conversion	Survived	54
1999	8	1	40.3	608	135	VA	Survived	19
1999	9	1	38	265	99	VV	Survived	35
2000	10	1	40	638	89	VA	Survived	18
2000	11	0	34	638	108	VA	Survived	8
2001	12	1	-	-	80	VV	Survived	9
2003	13	1	38	554	139	VA	Died	NA
2005	14	21	39	562	169	VA	Survived	46
2008	15	4	38.3	585	134	VV	Survived	42
2008	16	1	37	654	31	VA	Died	NA
2009	17	4	39	624	229	VA	Survived	48
2011	18	1	38	653	96	VA	Survived	28
2013	19	1	37	-	232	VV	Survived	38
2013	20	0	37	658	334	VA	Survived	48
2015	21	1	38	625	187	VA	Survived	43
2017	22	0	40	598	143	VA	Died	NA

Table 2: Comparison of patient factors and outcomes between Hirschl et al. and Cawley et al.

	Hirschl et al. (1975-1995)	Cawley et al. (2001-2017)	P-value
Survival	86.7%	88.6%	0.23
Gestational age (wks, median [IQR])	39 [38-40]	38 [37-39.5]	0.10
Weight (kg, median [IQR])	3.28 [3-3.6]	3.04 [2.78-3.3]	0.27
Duration of ECMO (hrs, median [IQR])	219 [170-320]	131 [98.25-208.5]	0.01
Time Off to extubation (hrs, median [IQR])	117 [84.25-405.5]	91 [46.75-185]	0.35
Hospital stay (days, median [IQR])	21 [18.5-41]	34 [23-48]	0.10

Abstract: 104

Respiratory syncytial virus hospitalization rates among term and preterm infants before and after changes to the American Academy of Pediatrics Policy on immunoprophylaxis: 2011–2017

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Background In 2014, the American Academy of Pediatrics (AAP) stopped recommending respiratory syncytial virus (RSV) immunoprophylaxis for otherwise healthy 29–34 weeks gestational age (wGA) infants.
Objective
This study compared RSV hospitalization (RSVH) rates between otherwise healthy 29-34 wGA preterm (PT) and term infants during the 2014–2017 RSV seasons versus the 2011–2014 RSV seasons.
Design/Methods Infants aged <1 year between July 1, 2012 and June 30, 2017 were selected in the MarketScan Commercial (COM) and Medicaid (MED) databases; otherwise healthy term (COM n=928,228; MED n=1,227,520) and PT infants (COM n=46,868; MED n=71,550) were identified. RSVH rates per 100 infant-seasons (November–March) for the 2011-2014 and 2014-2017 RSV seasons were calculated. Crude rate ratios showing the RSVH risk of PT relative to term infants were calculated. A multivariable difference-in-difference model was used to estimate the RSVH risk of PT relative to term infants before and after the 2014 policy change.
Results Among COM and MED PT infants <3 months CA and 3–<6 months CA, absolute RSVH rates increased, whereas rates decreased for term infants. Rate ratios comparing RSVH rates for PT vs. term infants were 106% and 64% higher in 2014-2017 than 2011-2014 for COM and MED infants <3 months chronologic age (CA) (COM: 3.7 vs. 1.8; MED: 4.1 vs. 2.5) and 100% to 48% higher for COM and MED infants 3–<6 months CA (COM: 4.4 vs. 2.2; MED: 3.7 vs. 2.5). Adjusted difference-in-difference rate ratios indicate that RSVH risks for 29-34 wGA infants aged <6 months compared to term infants increased significantly (P<0.05) after the policy change in all subgroups except in MED 29-30 wGA (P=0.06).
Conclusion(s) Relative (to term infants of similar CA) and absolute RSVH rates for infants 29–34 wGA in the US rose after the 2014 change in AAP policy that recommended against RSV immunoprophylaxis.

Abstract: 105
Text messaging and self-swabbing surveillance for influenza-like illness (ILI) and acute respiratory infections (ARI)
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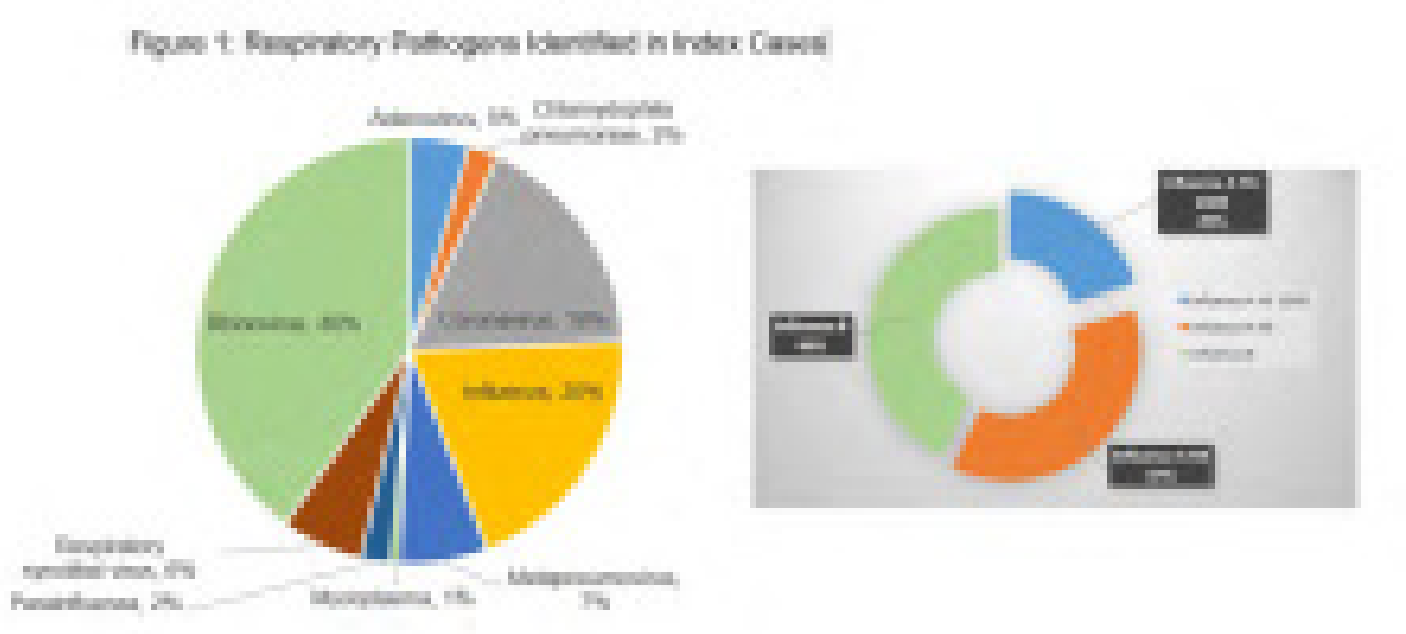
Background Precisely understanding household transmission dynamics of ILI/ARI, including identification of index and secondary cases, is unlikely during medical visits. Text messaging coupled with self-swabbing could improve timely identification of cases through community-based surveillance.
Objective To assess the feasibility of ILI/ARI surveillance using text messaging coupled with index and household contact self-swab collection in a diverse, community sample.
Design/Methods In the NIH-funded FluSafe study, households of at least 3 people, with at least one child <18 years old were enrolled into a study linking text message surveillance to an educational intervention aimed to reduce household transmission. Households received a surveillance text message 3x/week during the influenza season (November-March) and reported household members with ILI/ARI symptoms. Once symptoms were confirmed by project staff, the household index case self-obtained a nasal swab that day and all other household members took swabs on days 3 and 5 from index onset. Swabs were returned via postage-paid envelope and analyzed using an FDA-approved reverse-transcriptase multiplex PCR assay for respiratory pathogens.
Results In the first surveillance season (2017-18), 300 households with 1,501 participants were enrolled. A little under half (47.7%) of the participants were children (Table 1). Two-thirds of households were Spanish-speaking (65.3%). Most (84-93%) households reported via text message at least once a week with a mean and median of 90%. There were 316 reports of ILI/ARI that met criteria, with most reports made within 2 days of illness onset. We received swabs from 265 (83.9%) of the 316 episodes, including index cases and household contacts. Overall, 167 (62.3%) of 268 index cases (3 co-index cases) were positive for a respiratory pathogen of which 20% were positive for influenza (Figure 1). Swabs from household contacts had slightly higher proportions of rhinovirus (50%), coronavirus (21%), *Chlamydophila pneumoniae* (4%), and parainfluenza (3%) and less influenza (14%), adenovirus (4%) and metapneumovirus (3%) detected than index cases.
Conclusion(s) In this population, households successfully responded to ILI/ARI surveillance via text messaging. The majority of household returned self-swabs for both the index case and household contacts. Most index case swabs returned were positive for a respiratory pathogen. Text messaging and self-swabbing may be an effective form of timely surveillance and pathogen detection.

Table 1: Participant Characteristics

	N (%)
Gender	
Male	825 (55.0)
Female	676 (45.0)
Age Group	
<59 months	243 (16.3)
5-17 years	467 (31.4)
18-64 years	734 (49.4)
65 and over	43 (2.9)
Insurance	
Commercial	227 (15.3)
Public	1089 (73.3)
Uninsured/Underinsured	169 (11.3)
Language (Adults)	
English	269 (34.7)
Spanish	507 (65.3)
Race/Ethnicity	
Latino	1275 (85.5)
Black	180 (12.1)
White, non-Latino	33 (2.2)
Other, non-Latino	4 (0.3)



Abstract: 106

Risk factors for prolonged hospitalization in children with complicated appendicitis

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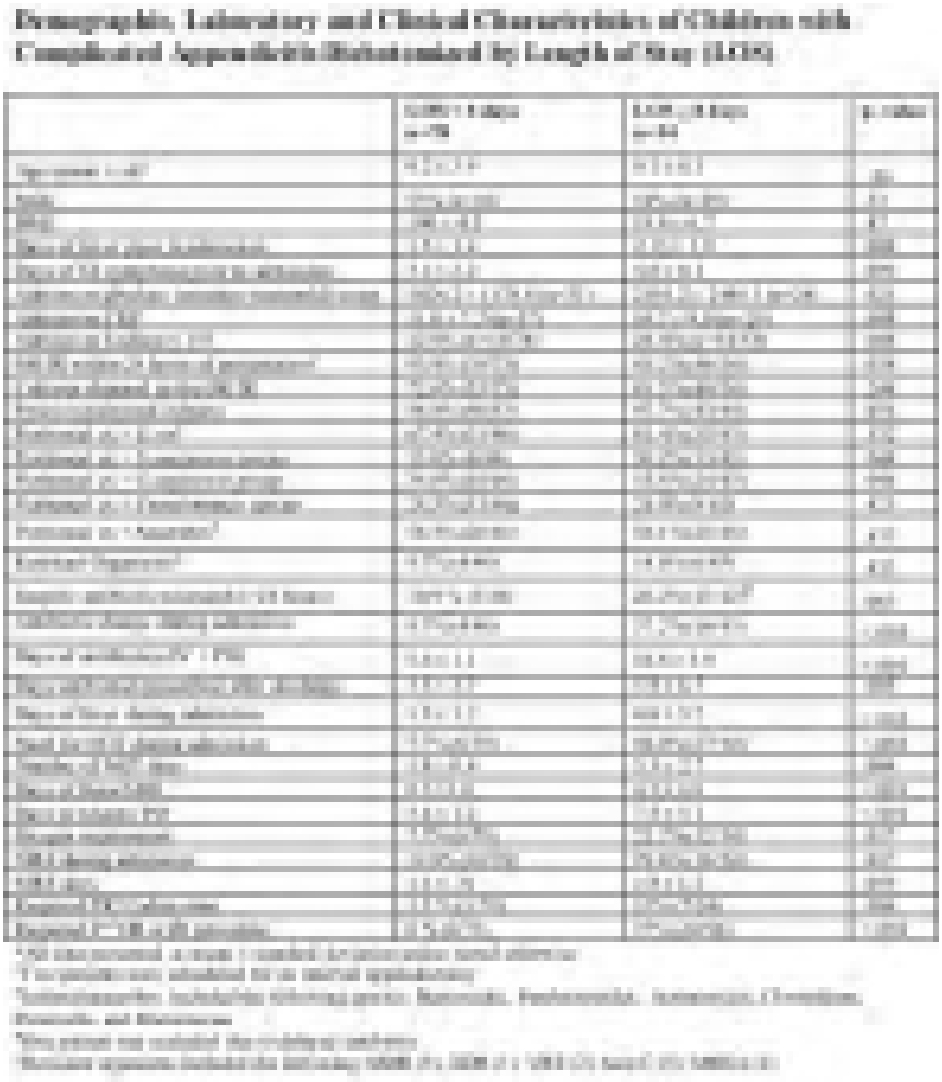
Background Complicated (perforated or gangrenous) appendicitis occurs in ~30% of children with appendicitis

Objective Identify risk factors associated with a longer length of stay (LOS) as a surrogate of increased morbidity in pediatric complicated appendicitis

Design/Methods We conducted a retrospective study of 132 children ≤18 years with surgically confirmed complicated appendicitis treated between October 2015 and April 2018 at the Children's Hospital at Montefiore, Bronx, NY. Demographics, clinical findings, cultures and readmissions within 6 months were reviewed. Empiric antibiotic therapy ≥24 hours that did not match susceptibilities of recovered intraperitoneal (IP) bacteria were defined as mismatches. Statistical analyses included Chi-square and t-tests

Results 132 patients were identified (Table 1). The mean (± SD) LOS was 8.23 ±3.7 days (d); thus the cohort was dichotomized into LOS≥8d (n=78) and LOS<8 d (n=54). No differences in race, sex or BMI were noted between the groups. LOS≥8d was associated with longer fever, gastrointestinal symptom duration (p< 0.01), higher admission CRP, absolute immature neutrophil count and lower serum sodium (all p<0.05). 116 patients had an operative (OR) or interventional radiological (IR) procedure within 24 h, 11 had a procedure after 24 h, and 5 were scheduled for delayed appendectomy. Children with LOS≥8d were less likely to have surgery within 24 h (p<0.05). 97 patients had IP cultures obtained; 89 yielded bacterial growth. The most common isolates were *E-coli* (74.1%), *B. fragillis* (34.8%), *S. constellatus* (24.7%), *P. aeruginosa* (24.7%), and *S. anginosus* (21.3%). Patients with LOS≥8d were more likely to have positive cultures (p=0.051) and to have cultures with *S.anginosus* group(*S. anginosus, S. intermedius,* and *S. constellatus*) (p<0.05). There was a nonsignificant increase in empiric antibiotic mismatch in patients with LOS≥8d (p=0.063), significantly more antibiotic changes (p<0.001), and total antibiotic days (p<0.001). LOS≥8d was associated with increased inpatient febrile days (p<0.001), need for NGT (p<0.001), ICU admission (p=0.006) and second OR/IR procedures (p<0.001)

Conclusion(s) Greater LOS is associated with longer duration and greater severity of symptoms, delayed surgery and peritoneal cultures yielding *S. anginosus*. This retrospective single center study suggests future prospective interventions such as early surgery and targeting antibiotics to cover *S. anginosus* and other prevalent bacteria that should be evaluated to assess their impact on LOS and clinical outcomes



Demographic, Laboratory and Clinical Characteristics of Children with Complicated Appendicitis Dichotomized by Length of Stay (LOS)

Abstract: 107

SEVERITY AND COSTS OF RESPIRATORY SYNCYTIAL VIRUS HOSPITALIZATIONS IN COMMERCIALLY INSURED PRETERM AND TERM INFANTS BEFORE AND AFTER THE 2014 AMERICAN ACADEMY OF PEDIATRICS POLICY CHANGE ON IMMUNOPROPHYLAXIS

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Background In 2014, the American Academy of Pediatrics (AAP) stopped recommending respiratory syncytial virus (RSV) immunoprophylaxis (IP) for otherwise healthy infants 29–34 weeks gestational age (wGA).

Objective This study examined the severity and costs of RSV hospitalizations (RSVH) among preterm 29-34 wGA (PT) and term infants before and after the policy change.

Design/Methods Infants aged <1 year between July 1, 2011 and June 31, 2016 were identified from commercial insurance claims in the Optum Research Database. Diagnosis codes identified otherwise healthy 29–34 wGA and term infants and RSVH. Length of stay (LOS), admission to the intensive care unit (ICU), and use of mechanical ventilation (MV) captured RSVH severity. Costs were adjusted to 2015 USD.

Results A total of 362,382 births (29–34 wGA and term without major health problems) were identified, of which 13,666 (3.8%) were PT. RSVH were more severe among PT infants in 2014–2016 vs 2011–2014, with a greater mean LOS (6.8 vs 4.7 days, *P*=0.008), a higher proportion of infants admitted to the ICU (42.4% vs 25.3%, *P*=0.014), and increased use of MV (14.1% vs 6.1%, *P*=0.067). Among term infants, LOS and ICU admissions were similar, but there was an increased use of MV in the 2014–2016 season (6.9% vs 4.2%, *P*=0.009). Mean costs (2015 USD) per RSVH were greater for PT infants in 2014–2016 compared to 2011–2014 ($29,382 vs $16,572, *P*=0.059), whereas mean costs per RSVH for term infants were similar ($15,011 vs. $15,472,*P*=0.705).

Conclusion(s) Severity and costs of RSVH increased for 29–34 wGA infants following the 2014 AAP RSV IP policy change.

Abstract: 108

Altered Neuroactive Steroid Levels Modify Transcriptome Signature In The Developing Hippocampus

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Background Abnormalities of the hippocampus (HC) are associated with impaired memory and cognition. In addition, recent evidence links abnormal HC neurogenesis with neurodevelopmental disorders. Premature neonates who miss the placental allopregnanolone (ALLO), which is thought to be neuroprotective, are at higher risk for these disorders. ALLO is positive modulator of GABAA-Rs. In developing hippocampal neurons, early GABA responses are excitatory, rather than inhibitory, due to high intracellular chloride levels. As neurons mature, at postnatal day 7 (P7), intracellular chloride declines and GABA becomes inhibitory. HC is known to be affected by prematurity and may be particularly susceptible to GABAergic alterations.

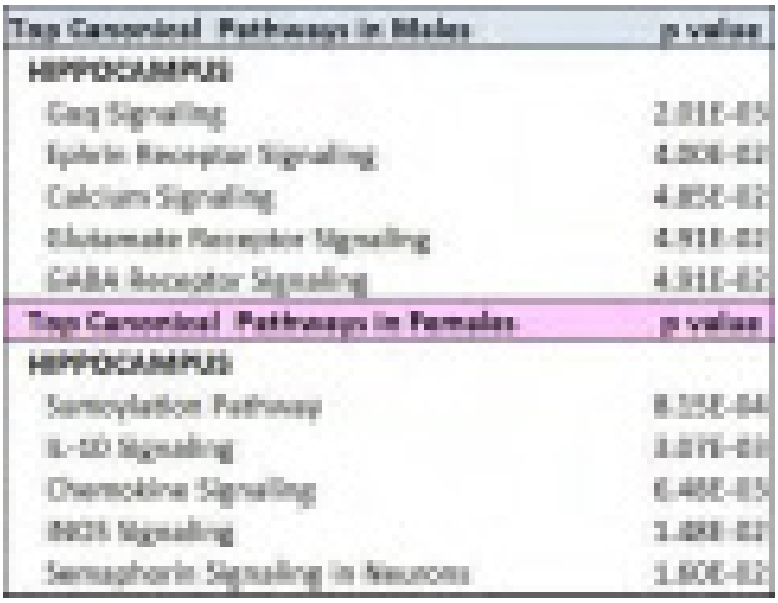
Objective To test the hypothesis that placental ALLO suppression results in abnormal HC development.

Design/Methods To assess the impact of placental ALLO deficiency, we generated a transgenic mouse line in which the gene encoding the enzyme responsible for ALLO production is specifically deleted by Cre-Lox recombination in the placenta, generating our novel mouse model Akr1c14^{Cyp19a}KO ($_{pl}$KO). Offspring from litters in which some placentas produce ALLO (control) and others in which placental ALLO is suppressed ($_{pl}$KO) are then compared.

An unbiased RNA sequencing approach was used to analyze long-term gene expression changes that may result from the lack of placental ALLO in at P30. Library preparation and sequencing was performed at the Penn State Hershey Genome Sciences Facility using an Illumina HiSeq 2000. The DEGs were analyzed using Ingenuity Pathway Analysis (IPA, Qiagen, Redwood City, CA).

Results Transcriptomic analysis of the HC revealed the top canonical pathways of the deregulated genes in males (619 DEGs) and females (586 DEGs) shown in table 1. The biological function and disease annotation is summarized in table 2. 64 genes, which have been associated with neuronal excitotoxicity and 38 genes associated with neuropsychiatric disorders in human, are deregulated in the HC of the ALLO placental knockout (plKO) mouse. Cellular and circuitry development, as well as long-term behaviors, are areas that are now being actively investigated.

Conclusion(s) Genetic pathways in developing HC may be particularly vulnerable to alterations that result in excitotoxicity or neuropsychiatric behaviors. Preterm infants exposed to low levels of ALLO after delivery or due to *in utero*placental dysfunction may benefit from ALLO hormone analog supplementation that could prevent brain injury and excitotoxicity.



Top Canonical Pathways in Males	p value
HIPPOCAMPUS	
Gaq Signaling	2.81E-03
Ephrin Receptor Signaling	4.30E-03
Calcium Signaling	4.85E-03
Glutamate Receptor Signaling	4.91E-03
GABA Receptor Signaling	4.91E-03
Top Canonical Pathways in Females	**p value**
HIPPOCAMPUS	
Sumoylation Pathway	8.19E-04
IL-10 Signaling	3.07E-03
Chemokine Signaling	6.46E-03
iNOS Signaling	1.68E-02
Semaphorin Signaling in Neurons	1.80E-02

Disease and Biological Functions in Males	Diseases or Functions Annotation	p value
HIPPOCAMPUS		
Nervous System Development and Function	formation of forebrain	1.40E-08
Nervous System Development and Function	generation of interneurons	4.62E-08
Neurological Disease	abnormal ventricular morphology	1.61E-04
Nervous System Development and Function	myelination	6.70E-04
Cell-To-Cell Signaling and Interaction	long-term potentiation	1.19E-03
Disease and Biological Functions in Females	**Diseases or Functions Annotation**	**p value**
HIPPOCAMPUS		
Cell Death and Survival	neuronal cell death	1.38E-08
Cellular Growth and Proliferation, Nervous System Development and Function	development of neurons	6.18E-06
Cellular Movement	migration of neurons	1.80E-04
Nervous System Development and Function, Tissue Morphology	quantity of neurons	1.81E-04
Neurological Disease	damage of central nervous system	1.44E-03
Cell Morphology, Nervous System Development and Function	neurogenesis	1.70E-03
Cell-To-Cell Signaling and Interaction, Nervous System Development and Function	long-term potentiation	1.24E-02

Abstract: 109

Effect of Inhaled Nitric Oxide on Cerebral Metabolism in Hypoxic Piglets.

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Background Inhaled nitric oxide (iNO) is commonly used as a pulmonary vasodilator to treat infants with pulmonary hypertension (PHN) to improve oxygenation, reduce mortality, and improve psychomotor development. In utero hypoxia and acidosis can increase pulmonary vascular resistance and cause PHN. Recent studies have noted the mortality of asphyxiated newborns with PHN and treated with both iNO and hypothermia to be higher compared with other causes of PHN. The effect of iNO on neurologic outcome after birth asphyxia is not clear.

Objective To test the hypotheses that iNO improves survival and reduces brain injury after hypoxia in piglets.

Design/Methods Fifty-six anesthetized male piglets (3-5 days old) were ventilated at FiO_2 0.21 (Nx) or $FiO_2$0.06 (Hx) x1h then FiO_2 0.21 x4hs, with or without iNO 20 ppm started 10 min after Hx/Nx at normal (39°C; NT) or hypothermic (33°C; HT) body temperatures. In addition, 6 normal non-instrumented, and 6 Hx non-reoxygentated (Hx-NR) piglets were included for baseline comparison. Cerebral cortex was harvested and cerebral water contents as marker of cerebral edema were determined as g H_2O/g tissue, along with levels of lactate and ATP (µMol/g tissue), and Na^+, K^+ ATPase enzyme activities (µMol Pi/mg tissue protein/h) as markers of cerebral energy status and neuronal membrane integrity were measured biochemically.

Results Hx resulted in consistent hypoxemia, acidosis and hypotension, and induced cerebral edema vs Nx (Table 1). Overall,

13 of 14 Hx piglets treated with iNO survived x4hs post Hx (1 HT did not), vs 20 of 24 non-treated Hx piglets (1 HT and 3 NT did not; p<0.01 vs iNO). In surviving Hx piglets, treatment with iNO was associated with worse cerebral edema, ATP depletion, cerebral lactic acidosis, and decreased Na^+, K^+ ATPase enzyme activity compared to non-treated piglets 4hs post Hx; HT did not reverse these occurrences (Figures 1A-D).

Conclusion(s) We conclude that iNO improves survival but could exacerbate brain injury after Hx. iNO may cause free radical injury and subsequent mitochondrial failure either directly, or through indirect augmentation of hyperemic cerebrovascular response after Hx. Na K ATPase enzyme is known to be sensitive to lipid peroxidation, and its activity was reduced after iNO in Hx piglets. The results caution against routine use of iNO in the immediate recovery phase after Hx and suggest a merit in establishing normal cerebral perfusion before initiating iNO therapy in asphyxiated infants with PHN, and to monitor for cerebral edema in hypoxic infants treated with iNO.

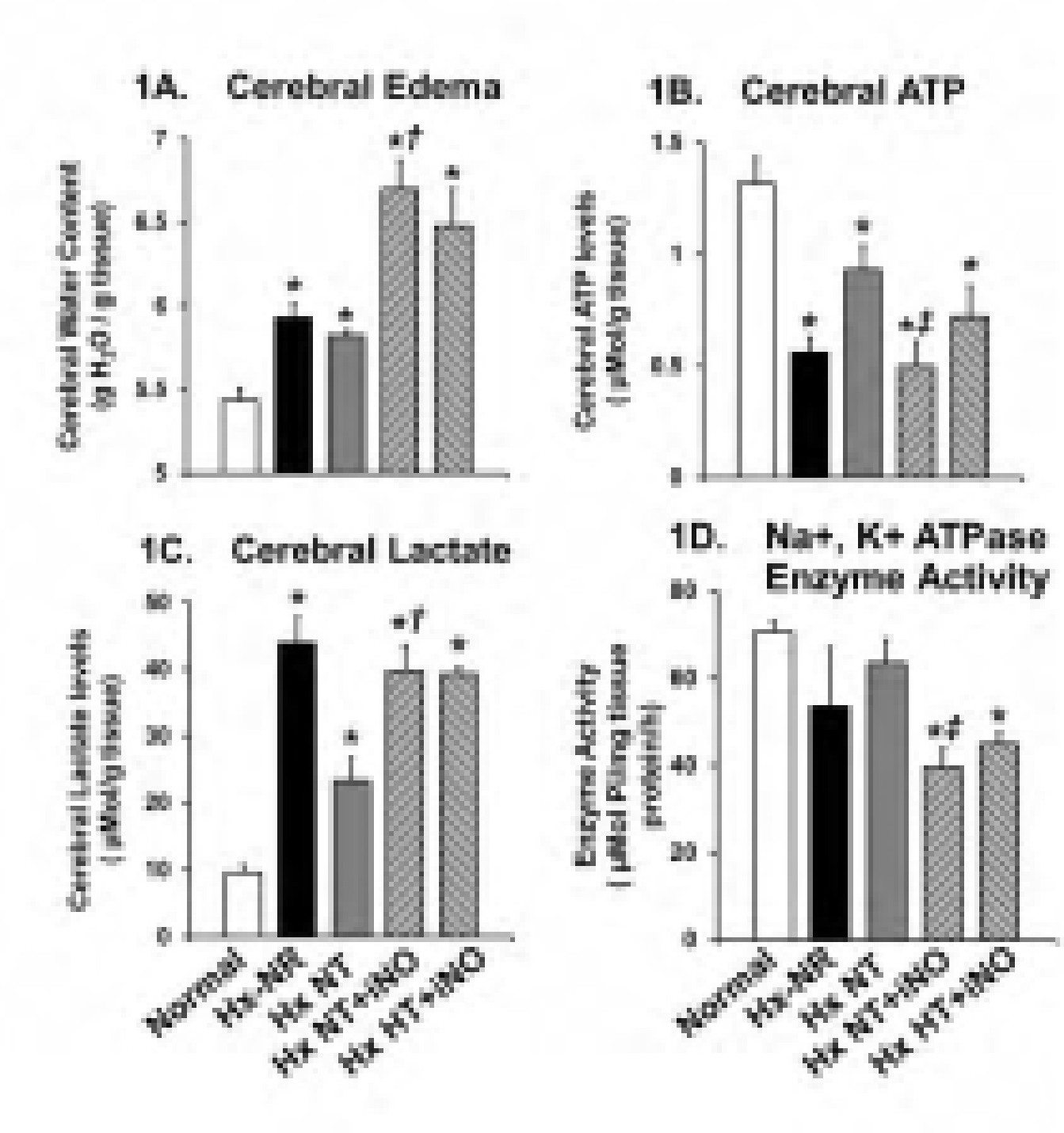

Figure 1. (A) Cerebral water contents and levels of (B) ATP, (C) lactic acid, and (D) Na+, K+ ATPase enzyme activities in the cerebral cortex of normal piglets (open bars) compared to hypoxic piglets that were either not re-oxygenated (Hx-NR; solid bars), reoxygenated for 4hs post hypoxia under normothermic conditions (Hx NT; shaded bars), treated with inhaled nitric oxide (iNO) for 4hs post hypoxia under normothermic (Hx NT +iNO; striped bars) or hypothermic conditions (Hx HT +iNO; reverse striped bars). Data are presented as Mean ± SE; *p < 0.01 vs normal using ANOVA; †p < 0.001 vs Hx NT using Two-Way ANOVA with Bonferroni test for post hoc comparison in Hx NT piglets of iNO treatment vs no treatment; ‡p < 0.05 vs Hx NT using ANOVA; p = NS for Hx HT iNO vs Hx NT +iNO; other comparisons are not shown.

Table 1. Physiological parameters and cerebral water contents in piglets.

Group	Lowest PaO2 (mmHg)	Lowest pH	Max BD	Lowest Systolic BP (mmHg)	Blood Glucose (mg/dL)	Cerebral Water Content (g H2O/g tissue)
Normal (N = 6)	NA	NA	NA	97 ± 11	96 ± 41	5.44 ± 0.16
Nx NT (N = 6)	78 ± 17	7.40 ± 0.08	-0.8 ± 5.3	75 ± 10	102 ± 32	5.61 ± 0.17
Nx HT (N = 4)	67 ± 12	7.36 ± 0.08	-6 ± 8.6	58 ± 20	130 ± 54	5.55 ± 0.33
Nx NT +iNO (N = 6)	73 ± 10	7.38 ± 0.10	0.3 ± 4.0	80 ± 6	102 ± 18	5.66 ± 0.10
Nx HT +iNO (N = 5)	95 ± 38	7.37 ± 0.08	-4.5 ± 7.6	62 ± 15	140 ± 22	5.62 ± 0.21
Hx-NR (N = 6)	17 ± 2*	6.85 ± 0.09*	-28.4 ± 2.7*	49 ± 22*	106 ± 21	5.93 ± 0.15*
Hx NT (N = 9)	23 ± 10*	7.04 ± 0.15*	-21.9 ± 5.2*	42 ± 12*	144 ± 56	5.82 ± 0.10
Hx HT (N = 8)	21 ± 4*	7.01 ± 0.13*	-20.6 ± 6.4*	53 ± 9	174 ± 40	5.85 ± 0.47
Hx NT +iNO (N = 7)	21 ± 4*	6.95 ± 0.11*	-24.7 ± 4.0*	50 ± 14*	168 ± 41	6.70 ± 0.45*
Hx HT +iNO (N = 6)	19 ± 4*	6.99 ± 0.11*	-22.6 ± 2.4*	43 ± 6	194 ± 31	6.48 ± 0.55*

Mean ± SD. *p < 0.05 versus corresponding normoxic controls (ANOVA). Nx: Normoxia; Hx: Hypoxia; NT: Normothermia; HT: Hypothermia; iNO: Inhaled nitric oxide.

Abstract: 110

Serial Plasma Biomarkers of Brain Injury in Infants with Hypoxic-Ischemic Encephalopathy (HIE) treated with Therapeutic Hypothermia (TH)

Meaghan McGowan[1], Alexandra O'Kane[1], Gilbert Vezina[3], Taeun Chang[1], Allen Everett[4], An N. Massaro[2]

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Background Inflammatory cytokines and Tau protein have been described as candidate circulating plasma biomarkers of brain injury in neonates with HIE undergoing TH. However, the temporality of serial measurements of these biomarkers during TH and post-rewarming has not been well described.

Objective To evaluate the ability of serially measured circulating plasma biomarkers to predict death or severe brain injury by MRI.

Design/Methods Infants with moderate or severe HIE treated with TH were enrolled in this prospective study. Waste plasma was collected at 0, 12, 24, 72, and 96 hours of TH from clinical laboratory specimens when available. Interleukin (IL)-6, IL-8, IL-10 and Tau protein were measured using electrochemiluminecense-based assays (Meso Scale Discovery, Rockville, MD). Routine post-cooling MRIs were scored for brain injury severity according to Barkovich (AJNR 1998). Adverse outcome was defined as death or severe brain injury by MRI (basal ganglia score ≥ 3 or watershed score ≥4). The bivariate association between biomarker levels and outcome groups were assessed with Mann-Whitney U tests. Logistic regression analyses were used to assess the ability of individual biomarkers to predict adverse outcome at each time point after controlling for Sarnat stage at presentation and 5-min Apgar score.

Results A cohort of 85 patients with HIE were enrolled with 3.2kg ± 0.7 mean birth weight, 38.7 weeks ± 1.5 mean gestational age, and 47% male. Median (range) 5-min Apgar was 4 (0-9), presenting pH was 6.95 (6.50-7.42) and 19% had severe encephalopathy. Cytokines peaked in the first 24 hours of cooling in the majority of patients, 83%, 69% and 87% for IL-6, IL-8, and IL-10 respectively. Conversely, the majority (56%) of patients had peak Tau measured during or after rewarming. Cytokine levels differed by outcome group in the first 0-12 hours, while Tau differed at 12- 96 hours (Figure 1). After adjusting for Sarnat stage and 5-min Apgar score, IL 6, 8, and 10 remained a significant predictor of adverse outcome at the initiation of cooling, while Tau protein was significant in predicting adverse outcomes during and after the rewarming period (Table 1).

Conclusion(s) Cytokine measurements are more useful in predicting adverse outcomes at the initiation of TH, while Tau protein measurements are more useful later in the course of TH and rewarming. These data support the concept that that a biomarker panel is needed to adequately determine risk of brain injury in babies with HIE.

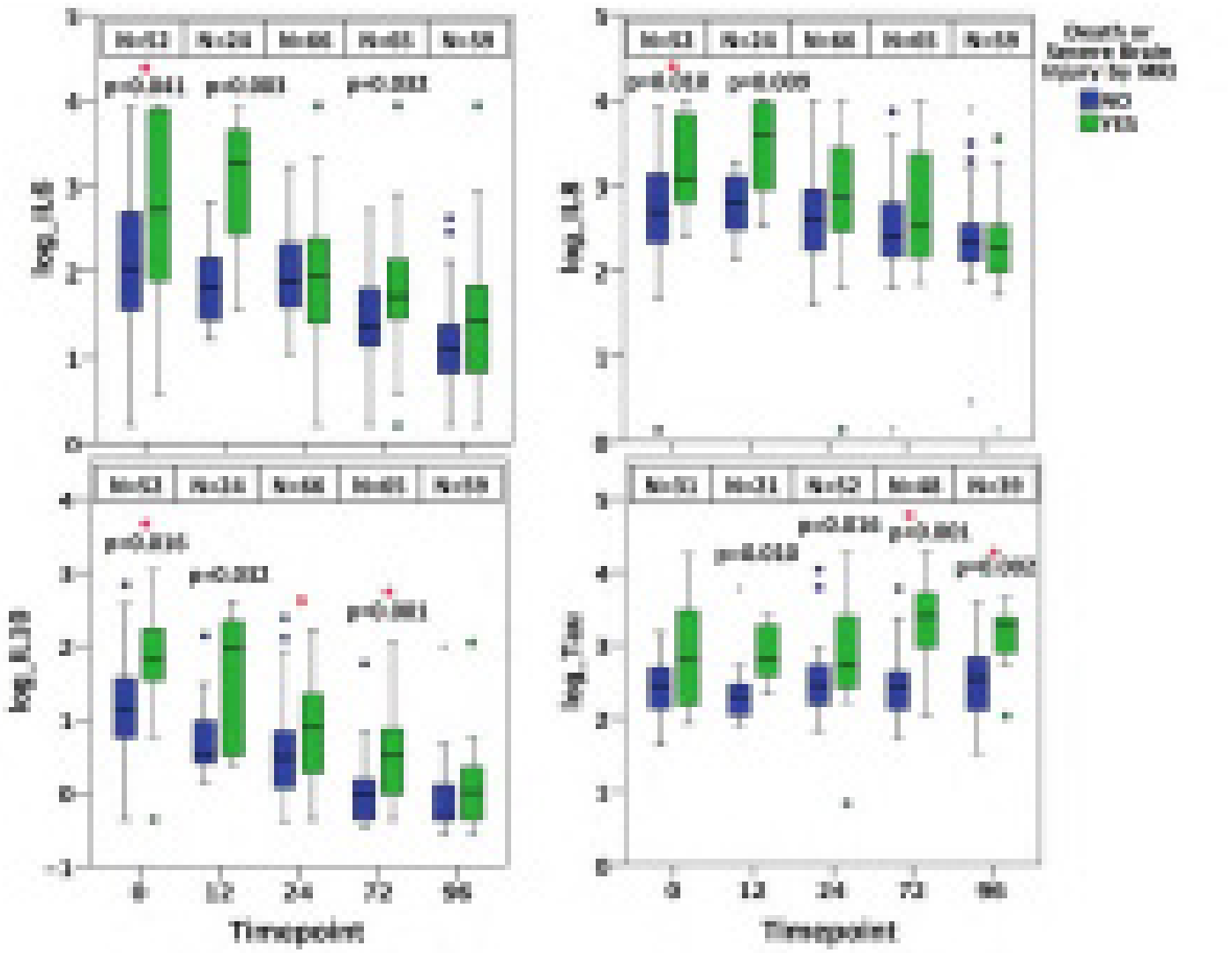

Figure 1. Biomarker levels over time by outcome group. Mann Whitney U p-values are presented. Red asterisks denote significant differences in multivariable analyses.

Table I. Prediction of Death or Severe Brain Injury by MRI.

Biomarker	Timepoint	Adjusted Odds Ratio	P value
IL-6	0	2.6	0.017
IL-8	0	5.3	0.014
IL-10	0	3.3	0.019
	24	2.6	0.030
	72	6.28	0.006
Tau	72	11.0	0.022
	96	12.9	0.017

Adjusted for Sarnat stage and 5-min Apgar.

Abstract: 111

HEART RATE VARIABILITY (HRV) MEASURES OF AUTONOMIC NERVOUS SYSTEM (ANS) FUNCTION RELATES TO NEONATAL NEUROBEHAVIORAL MANIFESTATIONS OF STRESS IN NEWBORNS WITH HYPOXIC-ISCHEMIC ENCEPHALOPATHY (HIE)

Allie Townsend[2], RB Govindan[3], Penny Glass[2], Judy Brown[2], Tareq Al-Shargabi[3], Taeun Chang[4], Adre du plessis[3], An N. Massaro[1]

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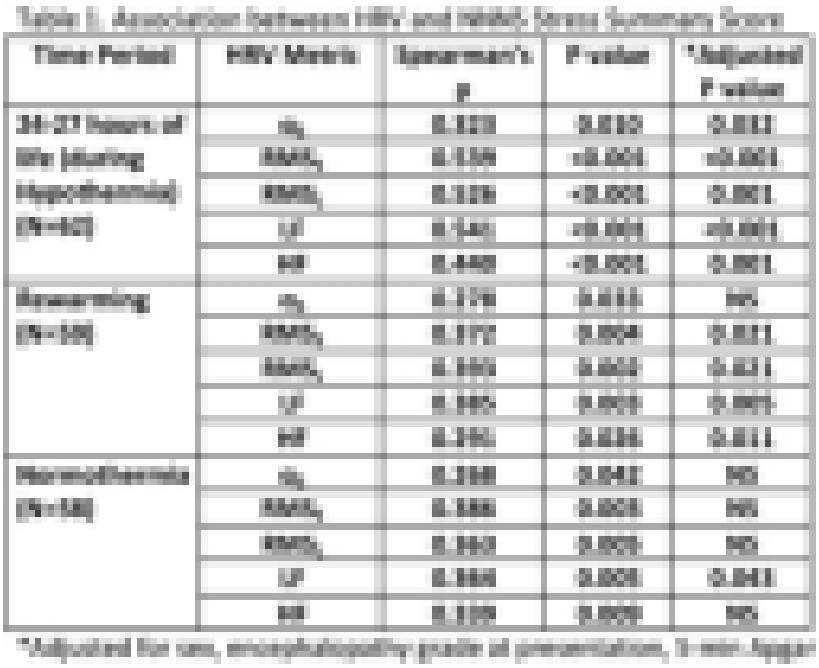
Background Assessment of HRV provides a quantitative measure of ANS function. The NICU Network Neurobehavioral Scale (NNNS) is a
standardized assessment of neurobehavioral integrity in the newborn. The NNNS Stress Summary Score reflects an infant's overall stress response to manipulation and includes 6 test items that are specifically indicative of the infant's autonomic functioning. Whether ANS dysfunction assessed by HRV during therapeutic hypothermia (TH) manifests as neonatal neurobehavioral abnormalities in babieswith HIE is unknown.
Objective To determine whether HRV measures are related to NNNS stress scores in babies with HIE.
Design/Methods Infants with HIE were enrolled in a prospective observational cohort study. HRV was quantified using spectral analysis
(SA) and detrended fluctuation analysis (DFA) (Govindan et al Comput Biol Med 2013 and Europhysics Lett 2014). DFA metrics included α exponents in short (α) and long (α) timescales and corresponding root mean square metrics (RMSs and RMS). SA metrics included low (LF) and high frequency (HF) power. HRV metrics were quantified during 3 time periods: 24-27 hours of life (during TH and peak of secondary injury), first 3 hours of rewarming (RW), and first 3 hours of normothermia (NT). NNNS exam was performed at 2 weeks of life (or NICU discharge if earlier) by a certified examiner. The correlation between HRV during each time period and NNNS Stress z-score, where higher score represents more optimal neurobehavioral performance, was assessed. For metrics with significant correlation, linear regression models were performed adjusting for sex, Sarnat encephalopathy grade at presentation and 5-min Apgar score.

Results A total of 68 infants underwent NNNS and had HRV data available during at least one time period of interest. For the overall cohort,
mean ± SD BW was 3.3 ± 0.6 Kg, GA 38.9 ± 1.8 weeks, and 59% were male. Median (range) 5-min Apgar was 3 (0-9), and 15% had severe
encephalopathy. α , RMS RMS LF and HF measured during all 3 periods positively correlated with NNNS stress scores, and remained independently associated at 24 hrs after adjusting for covariates (Table 1).
Conclusion(s) In newborns with HIE, lower HRV correlated with autonomic manifestations of stress in the neonatal period. This functional
correlation further supports HRV as a valuable physiological biomarker in this high-risk population.



Abstract: 112
Hemoglobin Volume Pressure Passivity Index (HVPPI) to Assess Cerebral Autoregulation (CAR) in Neonates with Hypoxic Ischemic Encephalopathy (HIE)
Alexandra C. O'Kane[1], RB Govindan[2], Jennifer Lee[3], Kenneth Brady[6], Meaghan McGowan[1], Penny Glass[4], Taeun Chang[1], Adre du plessis[2], An N. Massaro[5]
[1]Neurology, Children's National Medical Center, Washington, District of Columbia, United States, [2]Fetal Medicine, Children's National Medical Center, Washington, District of Columbia, United States, [3]Johns Hopkins University, Baltimore, Maryland, United States, [4]Psychology, Children's National Medical Center, Washington, District of Columbia, United States, [5]Neonatology, Children's National Medical Center, Washington, District of Columbia, United States, [6]Ann and Robert H Lurie Children's Hospital of Chicago, Chicago, Illinois, United States

Background Near infrared spectroscopy (NIRS)-based measures of CAR can identify neonates with HIE at risk of brain injury. However, modest predictive abilities have precluded previously described metrics from entering clinical care. We previously validated a novel autoregulation metric in a piglet model of induced hypotension (Govindan et al, Presented at the 11th Hershey Conference on Developmental Brain Injury, June 2018).
Objective To evaluate the ability of the hemoglobin pressure passivity index (HVPPI) to predict death or significant neurodevelopmental delay (NDD) at 15-30 months of age in neonates with HIE.
Design/Methods This is a prospective study of neonates with HIE who underwent therapeutic hypothermia (TH) at a level 4 NICU. Continuous cerebral NIRS and mean arterial blood pressure (MAP) from indwelling arterial lines were measured during TH at 22-32 hours of life. Multivariate autoregressive process was used to calculate the coherence between MAP and the sum total of the oxy- and deoxygenated Hb densities (HbT), a surrogate measure of cerebral blood volume (CBV). The HVPPI was calculated as the cosine-transformed phase shift at the frequency of maximal MAP-HbT coherence. Developmental outcomes were assessed by the Bayley Scales of Infant Development (BSID-III). The ability of the HVPPI to

predict death or NDD (defined as BSID-III cognitive or motor composite score <85) was assessed with area under the receiver operating curve (AUC) and logistic regression analyses. HVPPI was also compared to autoregulation metrics previously used in neonates: the hemoglobin volume index (HVx; Brady, Pediatrics 2009) and pressure passivity index (PPI; Tsuji, Pediatrics 2000).

Results A total of 30 neonates with moderate or severe HIE and available outcomes at 15-30 months were included. Six infants died and 9 infants had NDD. Characteristics of the study population are presented in Table 1. Median HVPPI was higher in infants who died or had NDD compared to intact survivors (Fig 1). After adjusting for sex, gestational age, 5-min Apgar score and encephalopathy grade at presentation, HVPPI remained a significant predictor of death or NDD (p=0.011). HVPPI had an AUC of 0.942, higher than either HVx or PPI (Fig 2).

Conclusion(s) In a cohort of 30 neonates with HIE, HVPPI was a reliable indicator of death or significant NDD at 15-30 months. Larger studies are warranted for further clinical validation of this method of evaluating CAR following HIE.

Table 1. Characteristics of the Study Population

	Total	Death or Neurodevelopmental Delay (n=15)	Survivors without Neurodevelopmental Delay (n=15)	P value
Gestational Age	39 (37-42)	38.5(37-41)	39.5(38-41)	0.193
Sex (n, % male)	14 (46.7%)	7 (46.7%)	7 (46.7%)	0.642
Encephalopathy Grade (n, % severe)	18 (60.0%)	8 (53.3%)	2 (13.3%)	0.029
1-min Apgar	1 (0-5)*	1 (0-2)	2 (1-5)*	0.013
5-min Apgar	3 (0-7)*	2 (0-5)	4 (1-7)*	0.053
Presenting pH	6.9 (6.5-7.18)	6.89 (6.18-7.14)	6.95 (6.35-7.18)	0.879
Presenting base deficit	21 (7-31)*	22.9 (14-31)*	17.95 (1-27)*	0.084

Data presented as median (range) unless otherwise indicated. Data available for *29/30, †27/30, ‡14/15, ¶15/15 patients

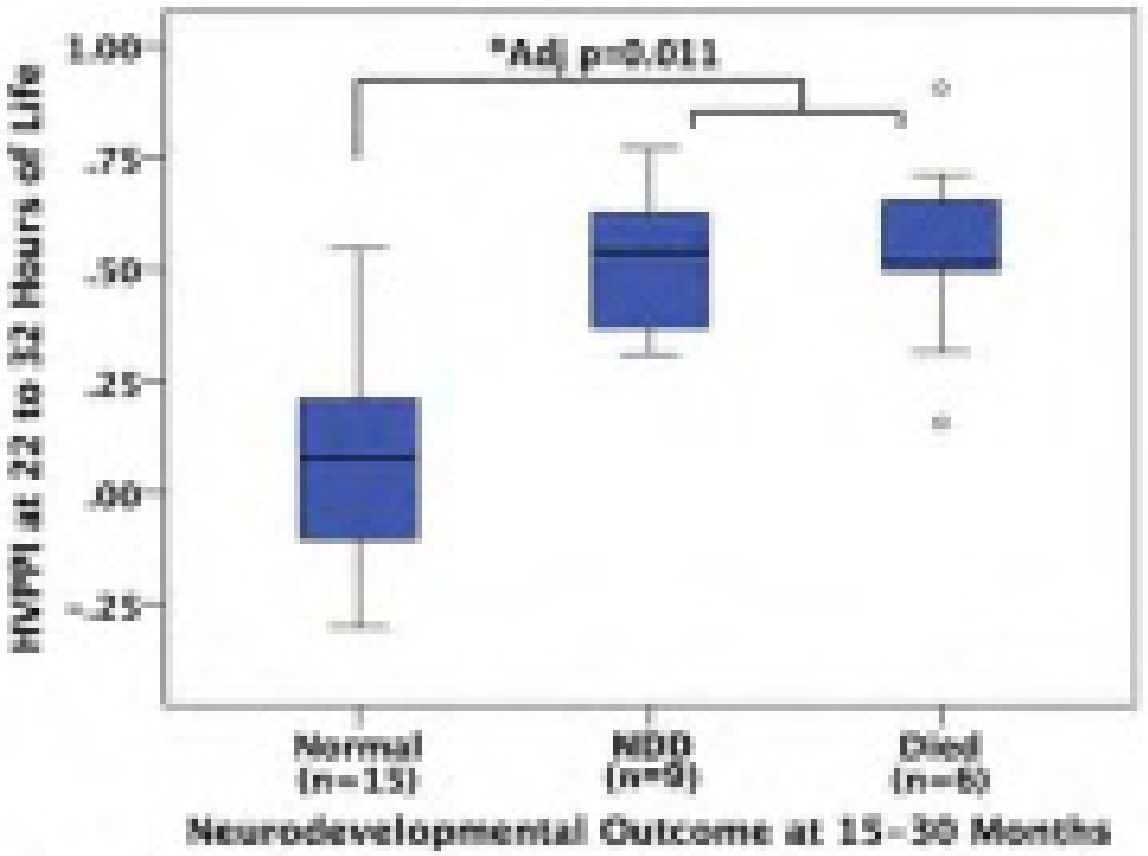


Figure 1: Patients with higher HVPPI at 22-32 hours of life were more likely to die or have neurodevelopmental delay (NDD).

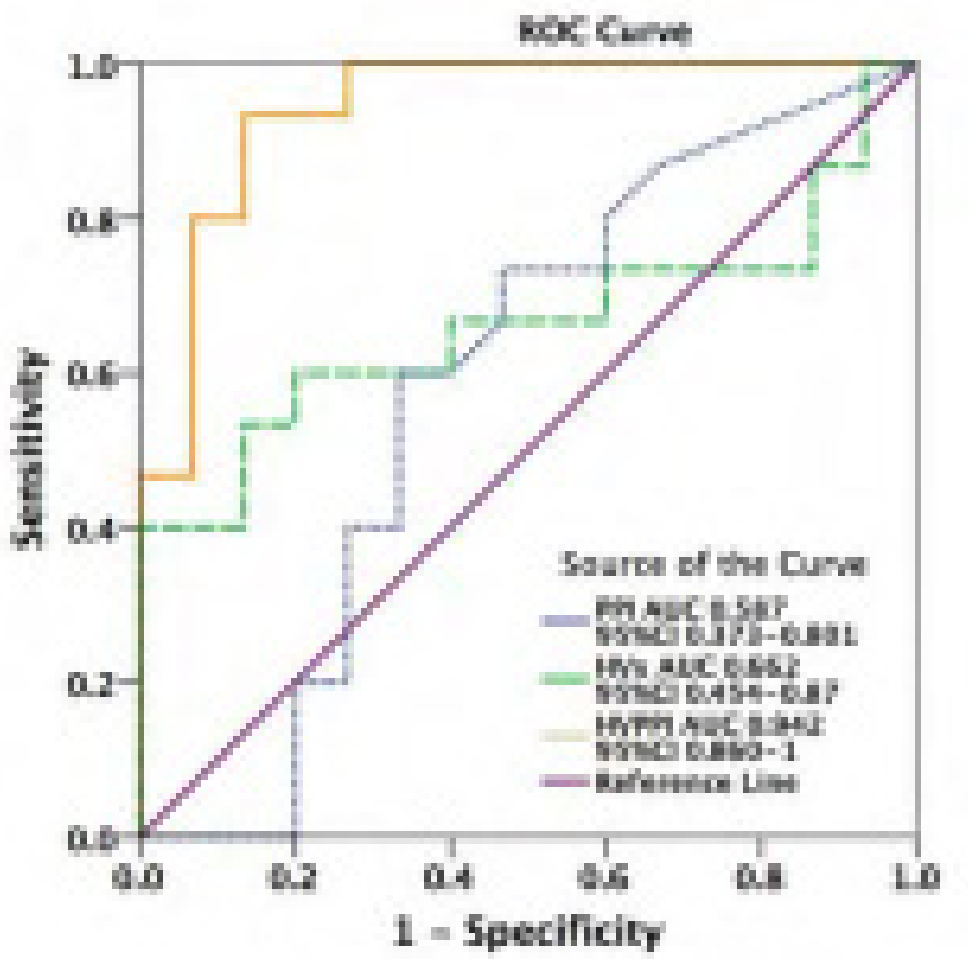


Figure 1: ROC curve comparing RFI, HVs, and HVRFI ability to differentiate outcome groups in neonates with HIE.

Abstract: 113

Neonatal HI impairs expression of Kv3.1b and formation of myelin in PV+ Interneurons blunting long-term depression in the hippocampus.

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Background In the mouse hippocampus, neonatal hypoxia-ischemia(HI): i) prevents the developmental emergence of interneurons (INs) expressing parvalbumin (PV) and calbindin-1, ii) impairs GAD65/67 expression, and iii) induces somatodendritic attrition of INs, at 8d after injury. These hippocampal IN disturbances correlate with memory impairment in the mouse and are not attenuated by therapeutic hypothermia (TH). These untargeted IN defects may explain the persistent memory impairments in humans surviving HIE treated with TH.

Objective To study whether neonatal HI persistently impairs expression of K channels and formation of the myelin necessary for electrophysiological maturation of CA1 PV+INs and results in altered synaptic plasticity.

Design/Methods We induced cerebral HI in C57BL6 mice at P10 with right carotid ligation and 45m of hypoxia(FiO =0.08), followed by normothermia (36°C, NT) or TH (31°C) for 4h with anesthesia-exposed shams as controls. At 24h (P11), 8d (P18) and 30d (P40) after injury, we assessed the expression of voltage-gated K channels (RT-PCR and IF-IHC), and the myelin tight junction marker, OSP (oligodendrocyte-specific protein,

IF-IHC). At P18 and P40, changes in long-term depression (LTD) were determined in extracellular field potentials in acute

brain slices.
Results K channels (Kv3.2, Kv3.1b, Kir2.2, K2p1.1, and K2p9.1) known to be involved in the fast-spiking electrical phenotype of PV+INs increased between P11 and P18. Neonatal HI, but not hypoxia alone, decreased Kv3.2, Kv3.1b and Kir2.2 by 40-50% (vs. sham, $p<0.05$) 8d after HI, but not earlier. Kv3.1b was exclusively expressed in cortical and hippocampal INs. In PV+INs, Kv3.1b expression in soma and axonal terminals decreased by ~80% in hippocampus, but not cortex at P18 and P40. OSP immunoreactivity (oriens >pyramidal cell> lacunosum moleculare layers) increased between P18 and P40 in the hippocampal CA1 and decreased in proximity to perisomatic axonal terminals of CA1 PV+INs after HI. In Schaffer collateral-CA1 synapses, excitatory post-synaptic potential (EPSP) slope decreased by 40% following low frequency stimulation (LTD) in both sham and hypoxia alone-exposed hippocampi at P18, a response blunted by HI. TH did not protect against these events.
Conclusion(s) Delayed and late impairments in the expression of Kv3.1b and the formation of myelin in axonal domains of hippocampal CA1 PV+INs may account for compromised synaptic plasticity and memory impairments after neonatal HI.

Abstract: 114
Association of Surfactant Protein Gene polymorphisms in Pediatric Acute Lung Injury
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Background Surfactant proteins (SP) are important for the innate host defense and essential for a physiological lung function; and are central to nearly all pulmonary diseases. SP gene single nucleotide polymorphisms (SNPs) have been associated with acute and chronic pulmonary diseases, including cystic fibrosis and play an important role in genetic susceptibility of an individual to variable outcome. Altered inflammatory processes and surfactant dysfunction are well documented in pediatric acute lung injury (PALI) and are associated with in-hospital mortality and morbidity. Among the PALI survivors, only few develop Pulmonary Dysfunction At Discharge (PDAD). Currently clinicians cannot predict who are at risk for PDAD.
Objective To study association of SFTPA1, SFTPA2, SFTPB, SFTPC, and SFTPD gene polymorphisms and their SNP-SNP interactions as potential marker for PDAD cohort of PALI.
Design/Methods We prospectively collected the blood samples of 248 patients with a diagnosis of PALI. Enrolled subjects were stratified by presence or absence of PDAD. PDAD was defined as a need for tracheostomy, oxygen, oral and/or inhaled steroids and bronchodilators at discharge (86 of 248). We genotyped a total of 14 SNPs of SFTPA1 (5), SFTPA2 (4), SFTPB (1), SFTPC (2), and SFTPD (2) genes using a PCR-based Restriction Fragment Length Polymorphism method. We tested the genetic (additive and/or dominant) effects of each of the 14 SNPs on PDAD using quantitative genetics principle. The p values were corrected by False Discovery Rate (FDR) and Holm-Bonferroni correction for multiple comparisons of single, two, and three SNP-SNP interaction model.
Results Demographic and clinical data of patients with and without PDAD are summarized in Table 1. A positive bacterial culture and worst oxygenation index predicted PDAD (Table 2). We did not find significant association of SP gene SNPs with PDAD in single or two SNPs model. However, three intergenic SNP-SNP interactions of SFTPA2 (rs1965708), SFTPA1 (rs1136451, rs1059057, rs4253527) and SFTPB (rs1130866) were observed to be associated with PDAD risk after Holm correction. Several other inter/intragenic SNP-SNP interactions were associated with increased PDAD risk after FDR correction (Table 3, Figure 1).
Conclusion(s) Our results indicate that SP gene polymorphisms are associated with the risk of PDAD in a cohort of PALI. Assessment of the interactions among SFTPA1, SFTPA2, SFTPB, SFTPC, and SFTPD gene polymorphisms confirmed an additive effect of SP SNPs on outcome (PDAD) of a complex disease such as PALI.

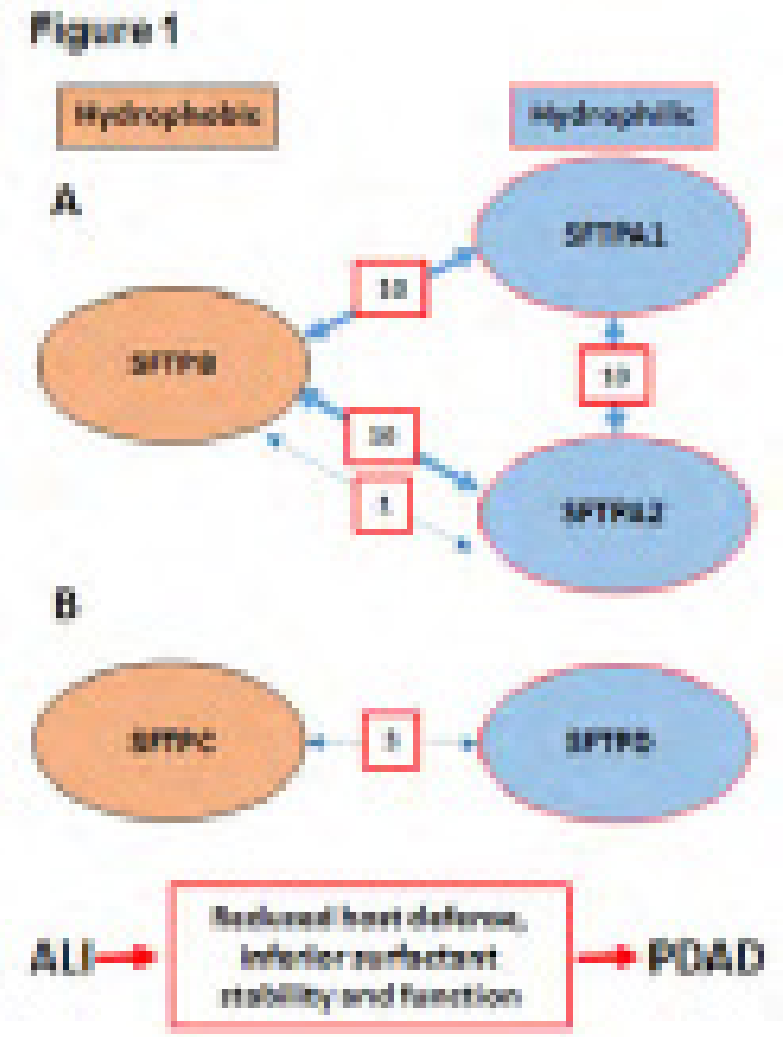

Figure 1. Summary of SNP interactions between genes encoding the surfactant proteins (SPs). Observed associations of 3-SNP model reveals the following: All SNP-SNP interactions are among the hydrophobic and the hydrophilic SPs. Panel A: SFTPA2 and SFTPA1 has the highest number of interactions with SFTPB (n = 10), in one case SFTPB interacts with two SNPs of SFTPA2, depicts by dotted line; Panel B: SFTPC interacts with SFTPD in various combinations of SNPs (n = 3).

Table 1: Demographics of the cohort stratified by presence of Pulmonary Dysfunction at Discharge (PDAD)

Variable	Whole cohort (n = 248)	No PDAD (n = 162)	PDAD (n = 86)	p Value
Demographics				
Age (months)	3.7 ± 4.5	2.8 ± 3.5	5.4 ± 5.6	< 0.001
Female/male (%/%)	99/149 (39/61)	63/99 (39/61)	36/50 (42/58)	0.892
Non-white race (%)	101 (41)	61 (38)	40 (47)	0.744
Hispanic ethnicity (%)	52 (21)	31 (19)	21 (24)	0.609
Admission diagnosis (%)				
RSV bronchiolitis	127 (51)	89 (55)	38 (44)	
Other bronchiolitis	56 (23)	39 (24)	17 (20)	

Other pneumonia Other respiratory failure Non-pulmonary	30 (12) 29 (12) 6 (2)	13 (8) 17 (10) 4 (2)	17 (20) 12 (14) 2 (2)	0.079
PRISM III score	4.6 ± 3.7	4.6 ± 3.6	4.8 ± 4.0	0.692
Oxygenation Initial OI (n = 93) Nadir OI (n = 184)	 9.3 ± 8.8 9.5 ± 9.3	 8.7 ± 7.5 8.2 ± 8.0	 10.3 ± 10.4 11.6 ± 10.8	 0.393 0.015
Highest ventilator parameters PIP (cmH2O)(n = 248) PEEP (cmH2O)(n = 248) ΔP (cmH2O)(n = 248) mPaw (cmH2O)(n = 224) Tidal volume (mL/kg)(n = 204)	 31.9 ± 6.5 6.6 ± 2.4 25.9 ± 6.5 14.5 ± 4.9 11.7 ± 4.6	 31.3 ± 6.3 6.3 ± 2.1 25.6 ± 6.3 14.4 ± 4.8 11.4 ± 3.8	 32.9 ± 6.8 7.1 ± 2.9 26.6 ± 6.7 14.9 ± 5.0 12.3 ± 5.7	 0.046 0.010 0.225 0.420 0.145
Three-day average ventilator parameters PIP (cmH2O)(n = 245) PEEP (cmH2O)(n = 241) ΔP (cmH2O)(n = 239) mPaw (cmH2O)(n = 220) Tidal volume (mL/kg)(n = 198)	 27.7 ± 5.4 5.8 ± 1.5 21.7 ± 5.2 11.7 ± 3.2 9.8 ± 3.4	 27.0 ± 4.9 5.6 ± 1.3 21.3 ± 4.9 11.5 ± 3.0 9.8 ± 3.1	 29.0 ± 6.1 6.2 ± 1.9 22.6 ± 5.9 12.0 ± 3.6 9.9 ± 4.0	 0.005 0.003 0.054 0.359 0.808
Specific virus positive (%)(n = 187) RSV Influenza Parainfluenza Adenovirus	 140 (75) 4 (2) 3 (1) 2 (1)	 102 (79) 3 (2) 1 (1) 1 (1)	 38 (64) 1 (1) 2 (2) 2 (3)	 0.034 1 0.330 0.242
Bacterial culture positive (%)(n = 195)	135 (70)	81 (63)	54 (82)	0.009
Ancillary therapies (%) Inhaled nitric oxide HFOV ECMO	 8 (3) 10 (4) 2 (1)	 2 (1) 5 (3) 1 (1)	 6 (7) 5 (6) 1 (1)	 0.020 0.316 1
Complications (%) Air leak Re-intubation (n = 252)	 20 (8) 29 (12)	 12 (8) 18 (11)	 8 (9) 11 (13)	 0.811 0.677
Duration of support Ventilator days Oxygen days PICU days Mortality (%)	 7.5 ± 7.9 10.9 ± 9.3 9.6 ± 9.0 6 (2)	 6.5 ± 4.0 10.0 ± 5.1 8.3 ± 4.6 2 (1)	 9.5 ± 12.1 12.7 ± 14.5 12.1 ± 13.5 4 (5)	 0.004 0.031 0.001 0.185
Pulmonary dysfunction at discharge (%) Mechanical ventilation Supplemental oxygen Oral/inhaled corticosteroids Bronchodilator	 4 (2) 16 (6) 36 (14) 66 (26)		 4 (5) 16 (18) 36 (41) 66 (77)	

a OSI is converted to OI

Table 2: Multivariable model for predictors of PDAD

Variable	Odds ratio	95% confidence interval	p value
Admission diagnosis			
RSV bronchiolitis	Ref	1	-
Other bronchiolitis	1.66	0.60 to 4.57	0.328
Other pneumonia	4.72	1.64 to 13.56	0.004
Other respiratory failure	1.11	0.31 to 3.99	0.869
Worst OI	1.07	1.02 to 1.12	0.005
Bacterial culture positive	4.38	1.66 to 11.56	0.003

Table 3. Genetic association of surfactant protein genes SFTPA1, SFTPA2, SFTPB, SFTPC, and SFTPD with PDAD by intergenic interactions.

Interaction	SNP #1		SNP #2		SNP #3		Epistasis Model	X2	p value	Correction
1	SFTPA2	rs1965708	SFTPA1	rs1136451	SFTPB	rs1130866	a1	3.29	0.02	Holm
2	SFTPA2	rs1965708	SFTPA1	rs1059057	SFTPB	rs1130866	a1	3.55	0.01	
3	SFTPA2	rs1965708	SFTPA1	rs4253527	SFTPB	rs1130866	a1	3.01	0.04	
4	SFTPA2	rs1965707	SFTPA2	rs1965708	SFTPB	rs1130866	a1	2.77	0.01	FDR
5	SFTPA2	rs1965707	SFTPA1	rs1136451	SFTPB	rs1130866	a1	2.48	0.01	
6	SFTPA2	rs1965707	SFTPA1	rs1059057	SFTPB	rs1130866	a1	2.5	0.01	
7	SFTPA2	rs1965707	SFTPA1	rs4253527	SFTPB	rs1130866	a1	2.57	0.02	
8	SFTPA2	rs1965708	SFTPA1	rs1059047	SFTPB	rs1130866	a1	3.68	0.01	
9	SFTPA2	rs1965708	SFTPA1	rs1136451	SFTPB	rs1130866	a1	3.29	0.01	
10	SFTPA2	rs1965708	SFTPA1	rs1059057	SFTPB	rs1130866	a1	3.55	0.01	
11	SFTPA2	rs1965708	SFTPA1	rs4253527	SFTPB	rs1130866	a1	3.01	0.01	
12	SFTPC	rs4715	SFTPC	rs1124	SFTPD	rs721917	a1	4.13	0.01	
13	SFTPC	rs4715	SFTPD	rs721917	SFTPD	rs2243639	a1	3.43	0.03	
14	SFTPC	rs1124	SFTPD	rs721917	SFTPD	rs2243639	a1	2.98	0.03	

FDR- False Discovery Rate

Abstract: 115

Impact of chronic diuretic exposures on enteral electrolyte use in infants with severe bronchopulmonary dysplasia admitted to United States Children's Hospitals.

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Background Prolonged exposures to diuretics with concomitant electrolyte supplementation are common in infants with severe bronchopulmonary dysplasia (sBPD). Characterization of the relationship between diuretic class or class combination and subsequent electrolyte use is lacking.

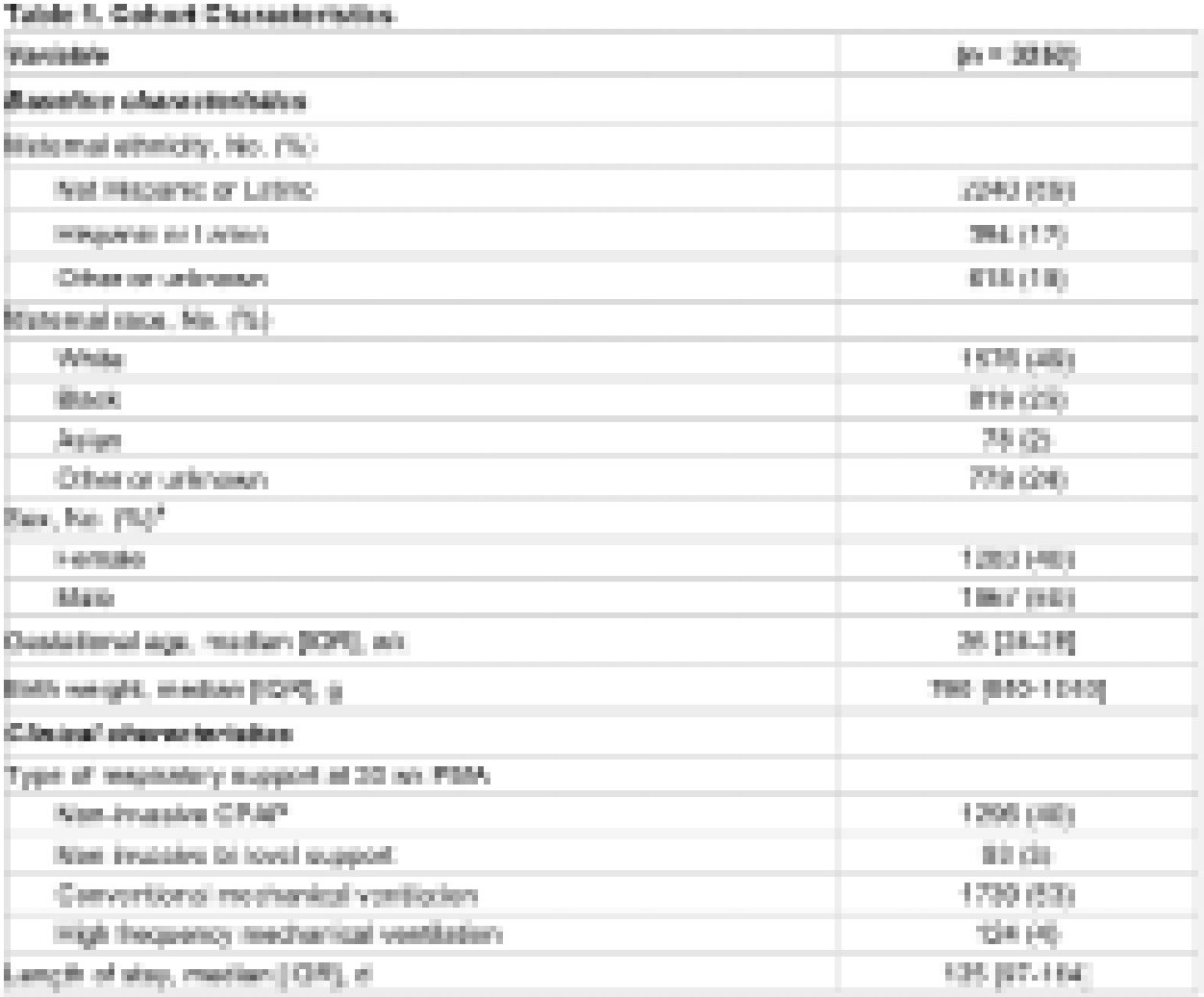
Objective To compare the association between chronic diuretic exposures and subsequent enteral electrolyte use among sBPD infants treated with different diuretic classes and class combinations.

Design/Methods We used the Pediatric Health Information System Database to generate a multi-center retrospective cohort of infants born < 32 weeks gestational age between 2007-2016 who met criteria for sBPD at 36 weeks corrected age. We defined chronic diuretic exposure as >7 days of contiguous use. We measured enteral NaCl and KCl use during periods of chronic diuretic use plus 3 days after diuretic cessation (exposure risk interval). All days without a consistent chronic diuretic exposure were used as a control period. We modeled the association using multilevel mixed-effects logistic regression with random intercepts for subjects and fixed-effects for center.

Results 3252 infants met criteria for sBPD. Table 1 displays demographic data. Loop monotherapy, thiazide monotherapy, and thiazide/potassium-sparing combination therapy were the most common chronic exposures (Table 2). All class and class combinations were associated with increased NaCl use compared to control, except potassium-sparing monotherapy (Fig. 1). All diuretic combinations increased NaCl use relative to monotherapies. All class and class combinations were associated with increased KCl use compared to control (Fig. 2). Addition of potassium-sparing to loop diuretics was not associated with reduced KCl use, while addition to thiazide and thiazide/loop combination therapy correlated with a modest decline in KCl use (Fig. 2). Thiazide monotherapy was associated with greater NaCl and KCl use than loop monotherapy (Fig. 1 & 2).

Conclusion(s) Nearly all chronic diuretic exposures are associated with increased enteral NaCl and KCl use. Diuretic combination use may exacerbate sodium wasting. The ability of potassium-sparing diuretics to mitigate potassium loss when added to other diuretics may be limited. Thiazides may result in similar or even greater sodium and potassium wasting than loop diuretics. Further exploration of these associations, outcomes, and harms mediated by diuretic induced electrolyte derangements is warranted.

Table 1.



Variable	(n = 3282)
Baseline characteristics	
Maternal ethnicity, No. (%)	
Not Hispanic or Latino	2240 (68)
Hispanic or Latino	394 (12)
Other or unknown	648 (19)
Maternal race, No. (%)	
White	1575 (48)
Black	819 (25)
Asian	76 (2)
Other or unknown	779 (24)
Sex, No. (%)[a]	
Female	1283 (49)
Male	1367 (51)
Gestational age, median [IQR], wk	26 [24-28]
Birth weight, median [IQR], g	780 [650-1010]
Clinical characteristics	
Type of respiratory support at 33 wk PMA	
Non-invasive CPAP*	1266 (46)
Non-invasive bi-level support	83 (3)
Conventional mechanical ventilation	1750 (53)
High frequency mechanical ventilation	124 (4)
Length of stay, median [IQR], d	135 [97-174]

Abbreviations: IQR, interquartile range; PMA, post-menstrual age; CPAP*, continuous positive airway pressure.
[a] n = 3282; represents greatest degree of missingness for subject characteristics/covariates

Table 2. Chronic Diuretic Exposures by Drug Class or Class Combinations in Infants with Severe Bronchopulmonary Dysplasia

Diuretic Class or Combination Used in Chronic Treatment Course, No. (%) [a]	Subjects Exposed During Admission [b] (n = 1252)	Subject-Days in Each Chronic Exposure Risk Interval [c] (n = 445,067)
None [d]	-	115,201 (67.5)
Loop monotherapy [e]	1215 (46.0)	89 884 (20.1)
Thiazide monotherapy [f]	618 (16.9)	19,797 (4.7)
Potassium-sparing monotherapy	29 (0.05)	1453 (0.3)
Loop and thiazide combination therapy	181 (5.6)	7865 (1.8)
Loop and potassium-sparing combination therapy	56 (1.1)	1838 (0.4)
Thiazide and potassium-sparing combination therapy	592 (21.3)	34543 (7.6)
Loop, thiazide and potassium-sparing combination therapy	59 (2.1)	2738 (0.6)

Abbreviations: IQR, interquartile range; PMA, post-menstrual age; CPAP, continuous positive airway pressure.
[a] Chronic treatment course defined as greater than seven contiguous days.
[b] Some subjects exposed to more than one chronic diuretic class or combination (non-concurrently) during admission.
[c] Exposure risk period defined as all subject-days within a treatment course greater than seven contiguous days and the subsequent three days.
[d] Includes some subjects and subject-days with other diuretic class exposures, non-chronic diuretic exposures and chronic but inconsistent exposures.
[e] Furosemide, bumetanide, or ethacrynic acid.
[f] Chlorothiazide, hydrochlorothiazide, or metolazone.
[g] Spironolactone

Table 2.

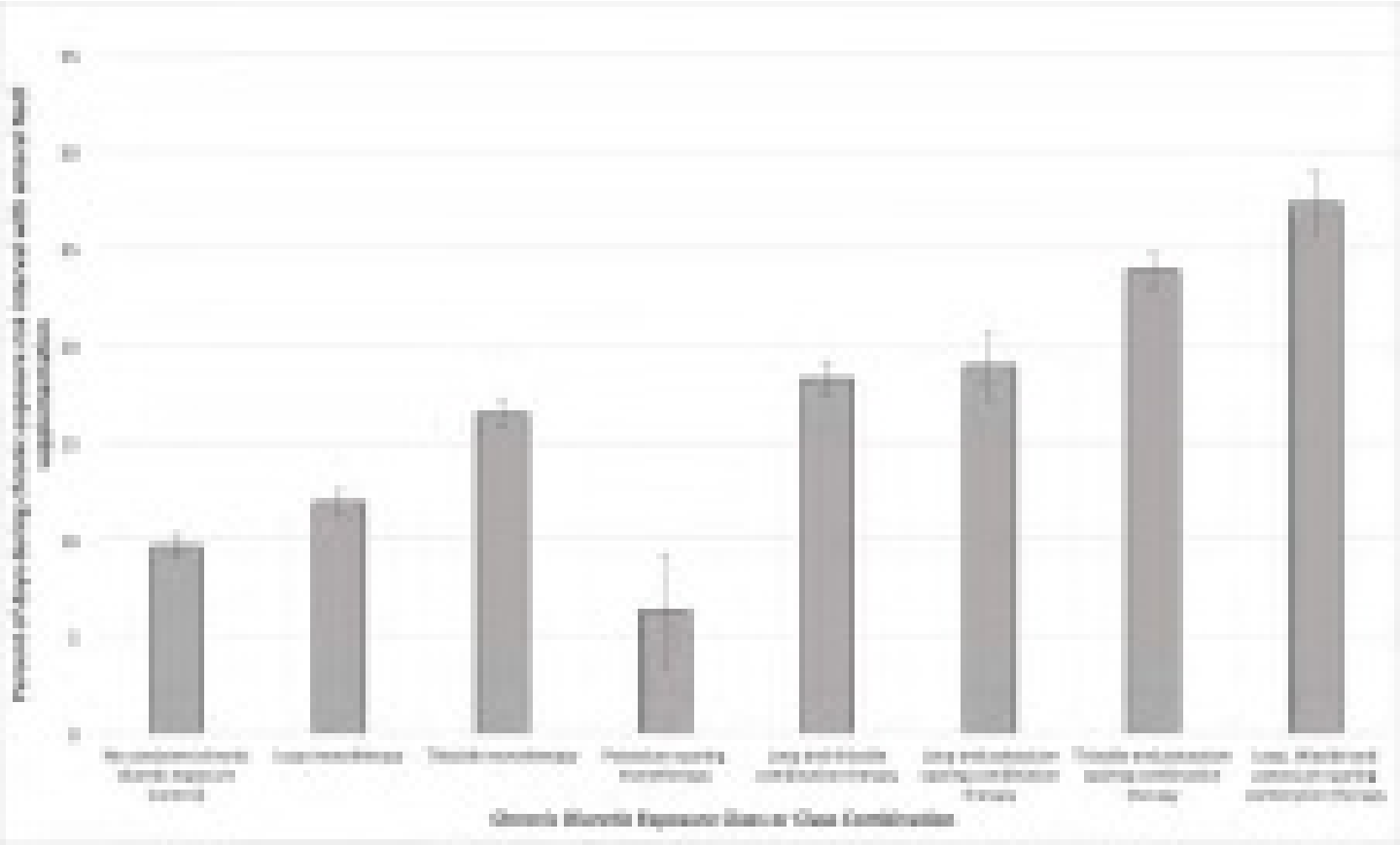


Figure 1. Impact of Chronic Diuretic Exposures on Enteral Sodium Chloride Supplementation in Infants with Severe Bronchopulmonary Dysplasia. Plot depicts estimated marginal means and 95% confidence intervals for all subject days without a consistent chronic diuretic exposure (control) and various chronic diuretic class or class combination exposures. Estimated marginal means obtained following adjustment for center (fixed effect) in multilevel mixed-effects logistic regression with patient level random intercepts to account for within subject correlations. $p < 0.05$ for all pairwise comparisons with the exception of potassium-sparing therapy vs control ($p = 0.06$), and loop and thiazide combination therapy vs loop and potassium sparing combination therapy ($p = 0.41$).

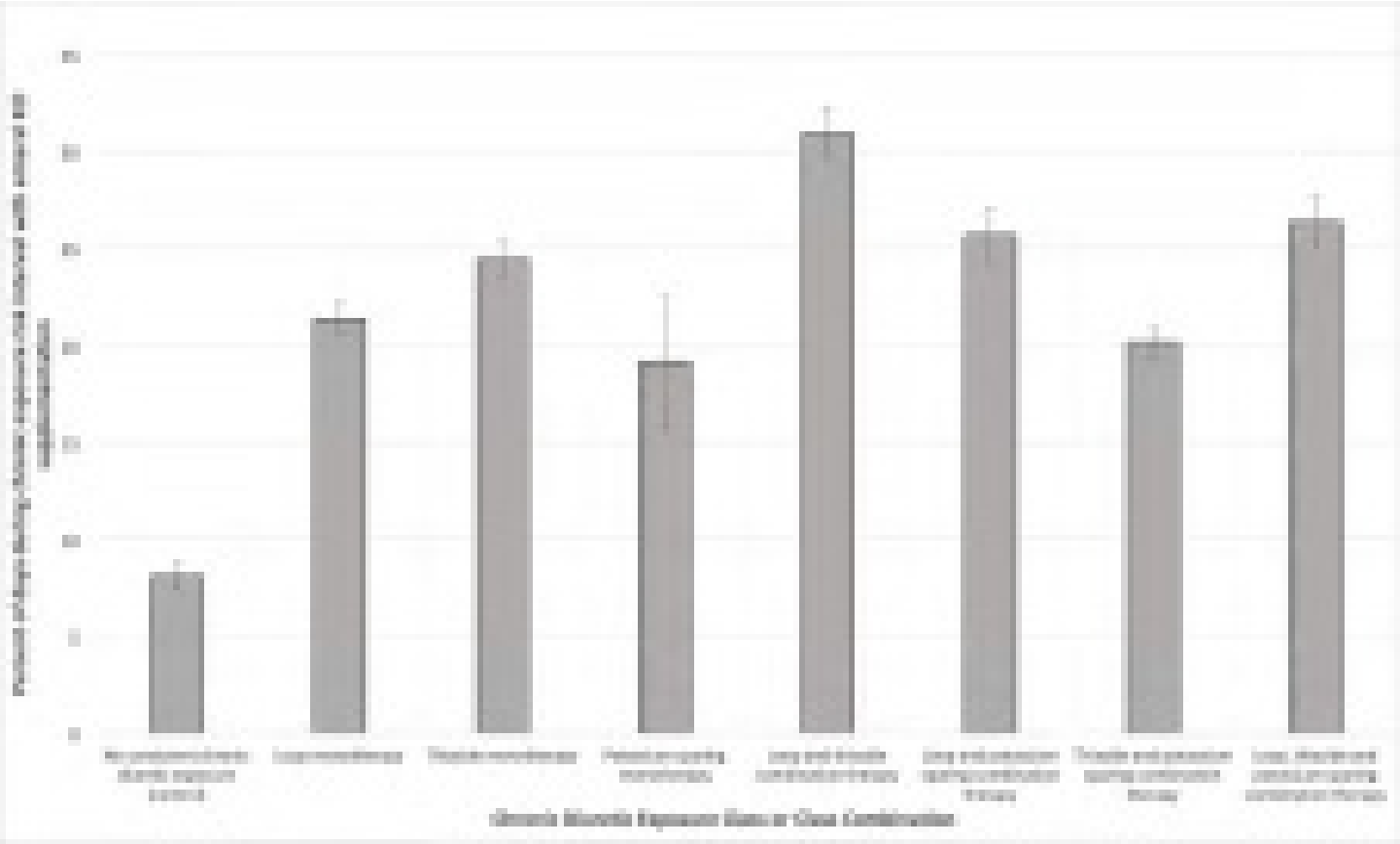


Figure 2. Impact of Chronic Diuretic Exposures on Enteral Potassium Chloride Supplementation in Infants with Severe Bronchopulmonary Dysplasia. Plot depicts estimated marginal means and 95% confidence intervals for all subject days without a consistent chronic diuretic exposure (control) and various chronic diuretic class or class combination exposures. Estimated marginal means obtained following adjustment for center (fixed effect) in multilevel mixed-effects logistic regression with patient level random intercepts to account for within subject correlations. $p < 0.05$ for all pairwise comparisons with the exception of potassium sparing monotherapy vs loop monotherapy ($p = 0.20$), potassium-sparing monotherapy vs thiazide and potassium sparing combination therapy ($p = 0.56$) and loop and potassium sparing combination therapy vs loop, thiazide and potassium sparing combination therapy ($p = 0.38$).

Abstract: 116

A Quality Improvement Project to Reduce the Incidence of Bronchopulmonary Dysplasia through Timely Mechanical Ventilator Weaning.

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Background Ventilator-induced lung injury (VILI) contributes to the pathogenesis of bronchopulmonary dysplasia (BPD). Permissive hypercapnia (pH ≥ 7.2; PCO2 45-55 mmHg) is safe and may reduce the duration of assisted ventilation. Cohen (CCMC) and North Shore (NSUH) are regional perinatal centers with > 300 VLBW infants annually. Baseline data showed that ventilator changes were made up to 160 min after blood gases that met criteria for weaning. These delays exposed infants to higher ventilator settings for longer durations, which can contribute to VILI.

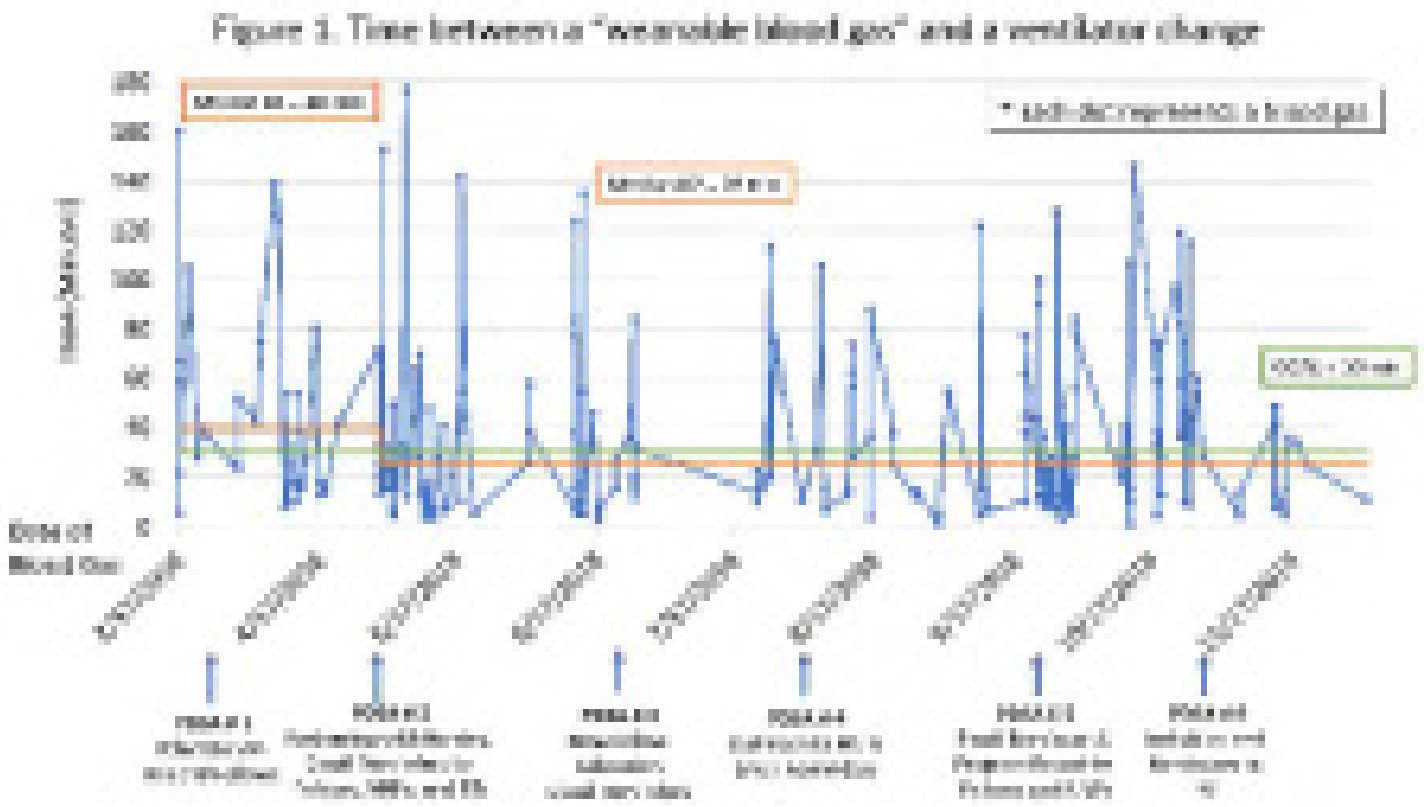
Objective For infants ≤ 32 wks gestation, between Mar-Dec 2018, the SMART aims were to 1) decrease the median time between a "weanable blood gas" and a ventilator change to < 30 min, and 2) decrease the monthly percent of extreme delays (> 2 hrs) to < 3%.

Design/Methods An interdisciplinary BPD Prevention Team conducted 6 PDSA cycles. In order to exclude infants with

established chronic lung or airway disease, only blood gases done in the 1st week were included. A "weanable blood gas" was defined as pH > 7.2 and arterial PaCO2 < 45 or capillary PaCO2 < 50. The time between each "weanable blood gas" and a ventilator wean was recorded. As a balancing measure, a wean was considered "unsuccessful" if the next blood gas indicated a pH of < 7.2 and the medical team responded to it. Specific PDSA cycles included: respiratory therapist (RT) and NICU fellow education, email reminders, announcements at nursing briefs, small group sessions with fellows, presentations at monthly NNP meetings, and individual reminders to RTs.

Results The median time from "weanable" blood gas to wean decreased from 40 to 26 min by May 2018, meeting the target of < 30 min (Fig. 1). This improvement occurred after 2 PDSA cycles that included an educational program for RTs and fellows, improved communication with nursing, and e-mail reminders. Similarly, the median monthly incidence of extreme delays decreased to 0%, meeting the target of < 3% (Fig. 2). The most effective interventions were progress report emails for fellows and NNPs, and individualized discussions with RTs. Only 5% of weans were "unsuccessful".

Conclusion(s) Repeated PDSA cycles led to a sustained decrease in the time to ventilator weaning. Major delays have become infrequent, and it is expected that deep-dives into each outlier will be effective to maintain improvement. Prompt weaning could reduce the incidence of VILI and BPD.



Abstract: 117

Factors associated with the development of late pulmonary hypertension (LPH) in preterm infants with bronchopulmonary dysplasia (BPD)

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Background Preterm infants with bronchopulmonary dysplasia (BPD) are at risk for development of late pulmonary hypertension (LPH), which has an increased risk of mortality and adverse neurodevelopmental outcomes. Complex interactions between antenatal and postnatal factors contribute to impair normal pulmonary vasculature, leading to altered growth, structure, and function of the developing pulmonary circulation after preterm birth.

Objective To investigate risk factors for developing LPH (PH diagnosed >28 day of life) in preterm infants with BPD.

Design/Methods We performed a retrospective case-control study of preterm infants admitted to our level IV referral neonatal intensive care unit (NICU) of a children's hospital in an urban area of Philadelphia over the period of 2012-16. We included preterm infants, who fit the National Institutes of Health (NIH) consensus definition for BPD at 36 weeks postmenstrual age. LPH was defined using specific echocardiographic criteria. We compared prenatal and postnatal characteristics between infants with or without BPD-associated LPH. Descriptive statistics, univariable, and multivariable models were evaluated, and results reported as odds ratios (OR) with 95% confidence intervals (CI).

Results Fifty-nine out of 258 infants (22.8%) included in the study cohort were diagnosed with LPH. Birth weight, small for gestational age, duration of mechanical ventilation, use of high frequency ventilation, longer duration of antibiotics, surgical closure of patent ductus arteriosus and severe BPD were confirmed as significant risk factors (all p <0.05) associated with the development of BPD-associated LPH. On multiple logistic regression analysis, the presence of maternal diabetes (2.3, 1.08-4.82), tracheostomy (6.2, 2.51-14.94), presence of tracheitis (1.9, 1.03-3.67), pneumothorax (3.4, 1.27-9.05), intraventricular hemorrhage (grade>=3) (2.5, 1.21-5.24), periventricular leukomalacia (2.7, 1.07-7.05) , systemic steroid use for BPD (5.0, 2.48-10.16) increased the odds of LPH, when controlled for gestational age and gender.

Conclusion(s) Several early clinical variables are predictive of the development of LPH in infants with BPD. In our study cohort, we confirmed previous risk factors and identified some novel factors associated with development of LPH in patients with BPD.

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Utility of an Outcome Estimator to Predict Severe Bronchopulmonary Dysplasia in Premature Neonates

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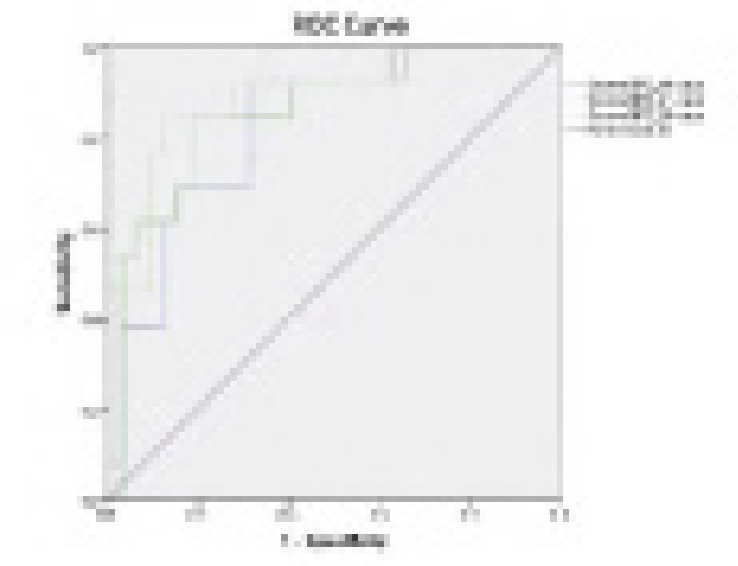
Background Bronchopulmonary Dysplasia (BPD) remains a common pulmonary morbidity despite advances in neonatal respiratory management. Outcomes are linked to gestational age (GA), birth weight (BW), respiratory support, and other co-morbidities. The ability to predict BPD severity early in life is essential to developing long-term management strategies to optimize care in this population.

Objective To assess the usefulness of the Neonatal BPD Outcome Estimator in predicting severe BPD in the very low birth weight (VLBW) population in an academic tertiary care regional perinatal center.

Design/Methods This is a single-center retrospective study including VLBW infants born 23-30 weeks gestation and <1250 grams born at the Stony Brook Children's Hospital NICU from 2015-2018. We categorized patients with severe BPD as those receiving O_2 for ≥ 28 days plus ≥ 30% O_2 or positive pressure at 36 weeks post menstrual age (PMA). The Neonatal BPD Outcome Estimator was used retrospectively to assess risk for severe BPD on postnatal day 14, 21, and 28 in comparison to mild BPD, moderate BPD, no BPD, and death. Probabilities for the outcome of severe BPD were expressed as mean percentages ± standard deviation at each point in time. Sensitivity, specificity, positive predictive values (PPV), and negative predictive value (NPV) were calculated and an ROC curve was created to test the accuracy of the BPD Outcome Estimator to predict severe BPD at each postnatal day.

Results A total of 268 charts of VLBW patients were reviewed, and 129 patients met our inclusion criteria with a mean GA 27 ± 2.1weeks and mean BW 892 ± 208g. Thirty-one patients (24%) were diagnosed with severe BPD at 36 weeks PMA. The mean probabilities for severe BPD at 14, 21, and 28 postnatal days were 23 ± 8, 21 ± 9, and 25 ± 8 respectively using the BPD Outcome Estimator. Sensitivity, specificity, PPV, and NPV for predicting severe BPD were similar at all points in time with the following ranges: sensitivity 65-68%, specificity 87-92%, PPV 62-72% and NPV 89-90%. ROC curves demonstrate increasing accuracy with AUC 0.829, 0.856, and 0.913 at 14, 21, and 28 postnatal days respectively.

Conclusion(s) The Neonatal BPD Outcome Estimator provides prognostic information that can be useful in identifying infants at high risk for poor outcomes who could benefit from early respiratory interventions. Prospective studies are needed to determine respiratory strategies that will provide the most benefit, least harm, and show the greatest reduction in severity and outcomes.



Receiver Operating Characteristic (ROC) Curve for the Neonatal BPD Outcome Estimator at 14, 21, and 28 postnatal days.

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Central Lymphatic Flow Disorder is Associated with Worse Outcomes in Infants with Severe Bronchopulmonary Dysplasia

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Background Lymphatic flow disorders in infants are challenging to recognize and manage and are associated with high morbidity and mortality. Novel lymphatic imaging has helped improve identification of lymphatic flow disorders in infants with severe bronchopulmonary dysplasia (BPD). We have pioneered the use of magnetic resonance lymphangiogram (MRL) in this vulnerable population to establish a diagnosis. Interventions for patients with central lymphatic flow disorder (CLFD) and severe BPD vary based on imaging findings but may include Lipiodol embolization, thoracic duct externalization, or surgical ligation of abnormal lymphatic vessels.

Objective To characterize the clinical course and outcomes of infants with severe BPD and lymphatic flow disorder after MRL and targeted lymphatic intervention.

Design/Methods This descriptive study includes infants admitted to the Children's Hospital of Philadelphia Neonatal/Infant Intensive Care Unit (N/IICU) between September 2015 and December 2018 with a diagnosis of severe BPD who underwent an MRL to diagnose lymphatic flow disorder. Patient characteristics, results of lymphatic imaging and interventions, and outcomes were analyzed.

Results Ten patients met the inclusion criteria. The gestational age and birth weight were 26 1/7 ± 1 5/7 weeks and 778 ± 280 grams (mean ± SD), respectively. All patients were mechanically ventilated within 1 day of birth and 2 of the 3 survivors required mechanical ventilation at N/IICU discharge. All patients had anasarca, 6 had chylothorax, and 1 had chylous ascites (Table 1). The patients underwent MRL at a postmenstrual age of 48 3/7 ± 2 4/7 weeks (mean ± SD). 7 patients died, 2 of which had thoracic duct externalization and the other 5 were not favorable candidates for intervention based on imaging results. Of the 3 infants who survived to N/IICU discharge, 1 was treated with Lipiodol embolization and 1 had an abnormal lymphatic vessel surgically ligated (Table 2).

Conclusion(s) Lymphatic flow disorders in infants with severe BPD are likely under-recognized but are associated with high morbidity and mortality. These disorders may be a marker of disease severity. Further research to identify risk factors, predictors of mortality and potential therapeutic interventions is warranted in this high-risk population.

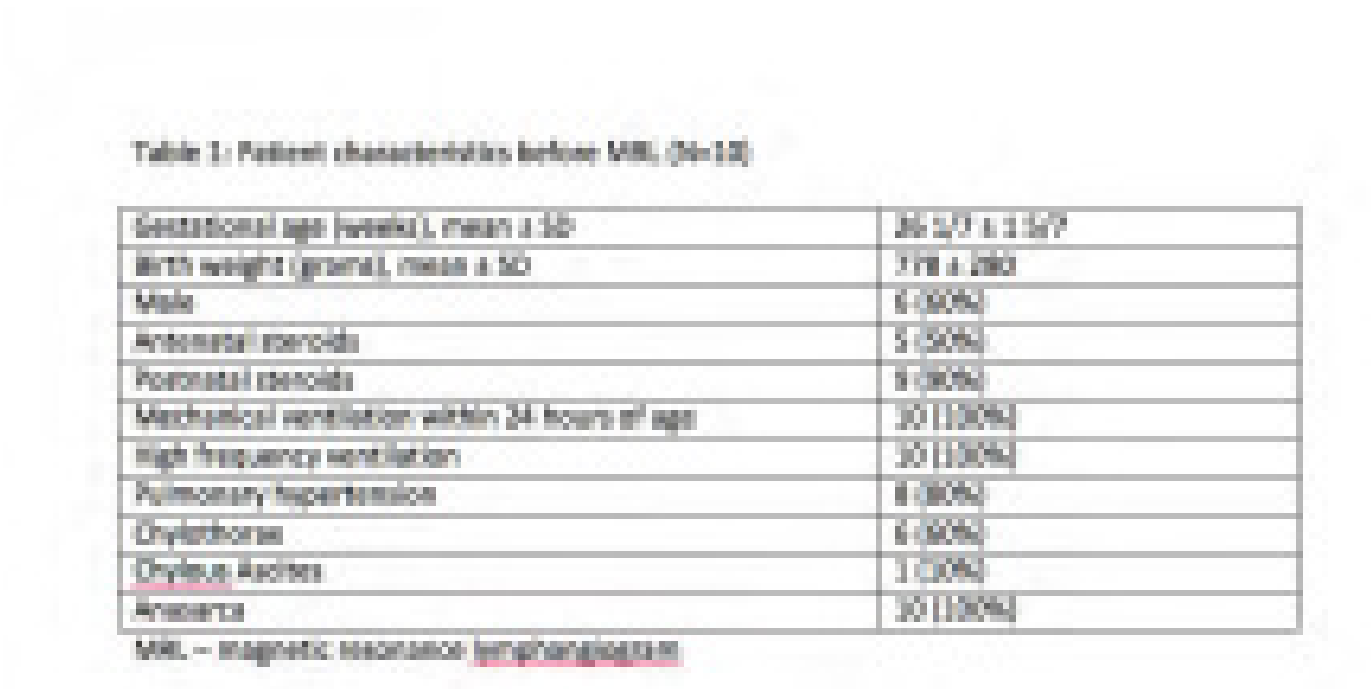

Table 1: Patient characteristics before MRL (N=10)

Gestational age (weeks), mean ± SD	26 1/7 ± 1 5/7
Birth weight (grams), mean ± SD	778 ± 280
Male	6 (60%)
Antenatal steroids	5 (50%)
Postnatal steroids	9 (90%)
Mechanical ventilation within 24 hours of age	10 (100%)
High frequency ventilation	10 (100%)
Pulmonary hypertension	8 (80%)
Chylothorax	6 (60%)
Chylous Ascites	1 (10%)
Anasarca	10 (100%)

MRL – magnetic resonance lymphangiogram

Table 1

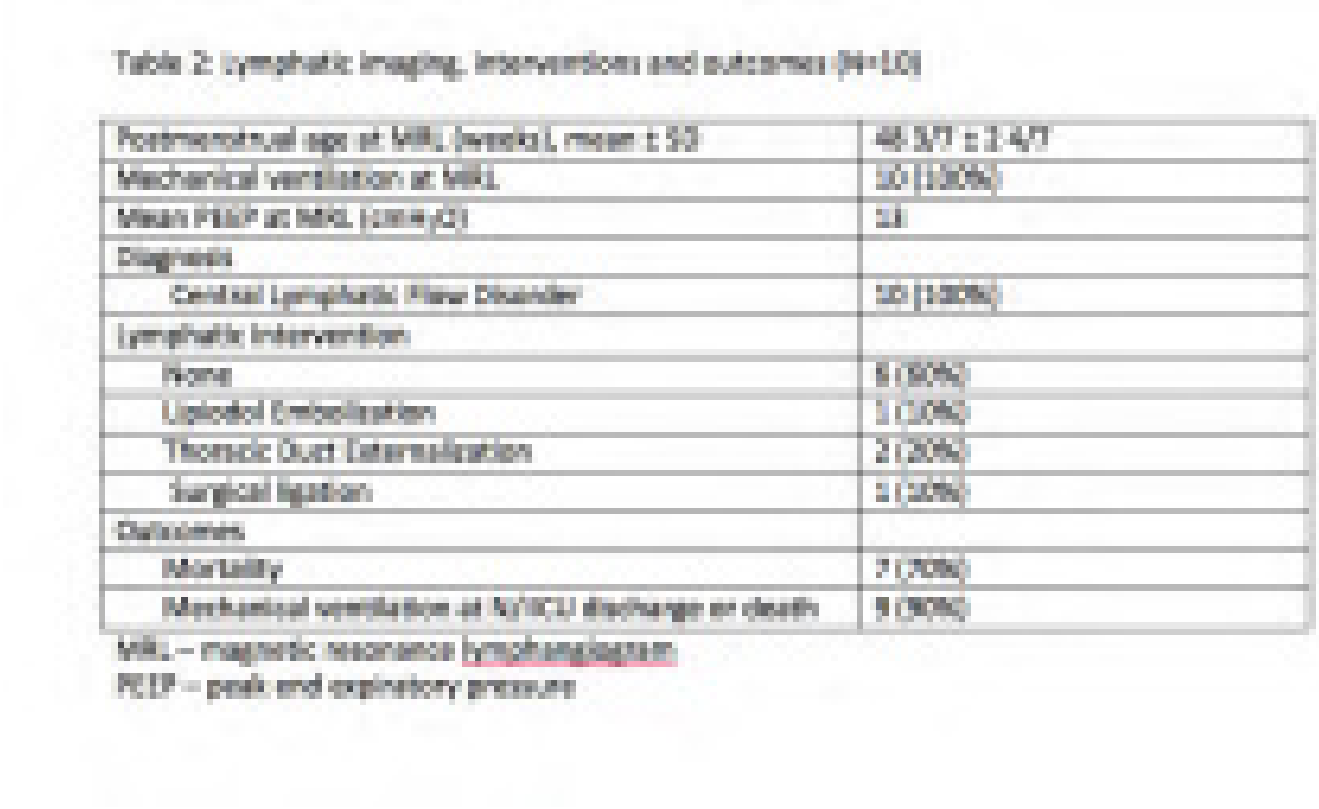

Table 2: Lymphatic imaging, interventions and outcomes (N=10)

Postmenstrual age at MRL (weeks), mean ± SD	46 3/7 ± 2 4/7
Mechanical ventilation at MRL	10 (100%)
Mean PEEP at MRL (cm H2O)	5.8
Diagnosis	
Central Lymphatic Flow Disorder	10 (100%)
Lymphatic Intervention	
None	6 (60%)
Lipiodol Embolization	1 (10%)
Thoracic Duct Catheterization	2 (20%)
Surgical ligation	1 (10%)
Outcomes	
Mortality	7 (70%)
Mechanical ventilation at NJ/ICU discharge or death	9 (90%)

MRL – magnetic resonance lymphangiogram
PEEP – peak end expiratory pressure

Table 2

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The Impact of Pediatric Peritoneal Dialysis on Caregivers' Self-Reported Health and Well-Being

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Background Peritoneal dialysis (PD) is the most common treatment modality for children with end-stage kidney disease (ESKD) with approximately 50%-70% of children on dialysis receiving PD. PD is a nightly, home-based therapy provided by caregivers (generally a parent or relative). Benefits of PD include allowing children to attend school, continue daily routines, and take part in social interactions. Limited literature exists on the experiences of caregivers of children with chronic kidney disease (CKD) and children on chronic dialysis.

Objective To evaluate the self-reported health and well-being of caregivers of children undergoing PD.

Design/Methods Prospective study of caregivers of children on chronic PD using the PROMIS sleep disturbance, fatigue, general life satisfaction, meaning/purpose, and positive affect measures. An open-ended questionnaire was administered with questions about their experience providing PD, effort and work load involved, transportation and financial constraints, as well as an option for providing comments regarding its impact on their well-being. Caregiver demographic information and clinical data for the children were also collected.

Results The study sample comprised 14 caregivers (ages 26-40 years) caring for 10 children (Table 1). Three caregivers (21%) were male. Median age of children was 3 years (range 1.7 – 17 y). Mean T-scores were: fatigue 51.2 ± 2.0, life satisfaction 46.8 ± 3.1, meaning and purpose 52.7 ± 3.2, and positive affect 45.2 ± 2.2, respectively (Table 2). T-scores are based on a mean of 50 and standard deviation (SD) of 10 in the general adult reference population. In their written comments, caregivers expressed feelings of loss, the importance of knowing the impact of dialysis prior to initiation, the need for a support group, and the value of home nursing.

Conclusion(s) Caregivers of children on chronic PD had low-normal mean PROMIS T-scores for measures of fatigue, life satisfaction, meaning/purpose, and positive affect when compared to the general adult population. Our findings highlight opportunities to improve caregiver experience that can be implemented in future studies.

Table 1: Demographics Caregiver characteristics n=52	
Age yrs. (Median, range)	[illegible]
Gender, female n (%)	[illegible]
Race	
White	[illegible]
Black or African American	[illegible]
Ethnicity	
Hispanic or Latino	[illegible]
Hours (per day) spent on PH related care among caregivers	
1-3 hours	[illegible]
4-6 hours	[illegible]
7-9 hours	[illegible]
10-12 hours	[illegible]
Pediatric population characteristics n=39	
Age, years, Median (range)	[illegible]
Age at PH onset, Median (range)	[illegible]
Gender, female	[illegible]
Race	
White	[illegible]
Black or African American	[illegible]
Ethnicity	
Hispanic or Latino	[illegible]
Clinical Data	
Had pre-enrollment admissions in the last year, Median (range)	[illegible]
Had pre-enrollment infections in the last year, Median (range)	[illegible]

Table 2: Caregiver PROMIS Measures

PROMIS Measure	Raw Score (average, range)	Avg. Adjusted T-score*	Avg. Standard Error
Upper Extremity (modified Short Form) [SF]	17.2 (14-20)	--	--
Fatigue SF 8a	18.9 (8-29)	51.8	2.8
General Life Satisfaction SF 8a	23.3 (7-32)	49.8	3.1
Meaning/Purpose SF 8a	32.9 (16-40)	52.7	3.2
Positive Affect SF 8a	31.3 (15-39)	49.7	3.3

* T-scores based on mean of 50 (standard deviation of 10) in general adult reference population

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Diverse Composition of the Tissue-Specific Immune Repertoire on Both Sides of the Fetal Maternal Interface

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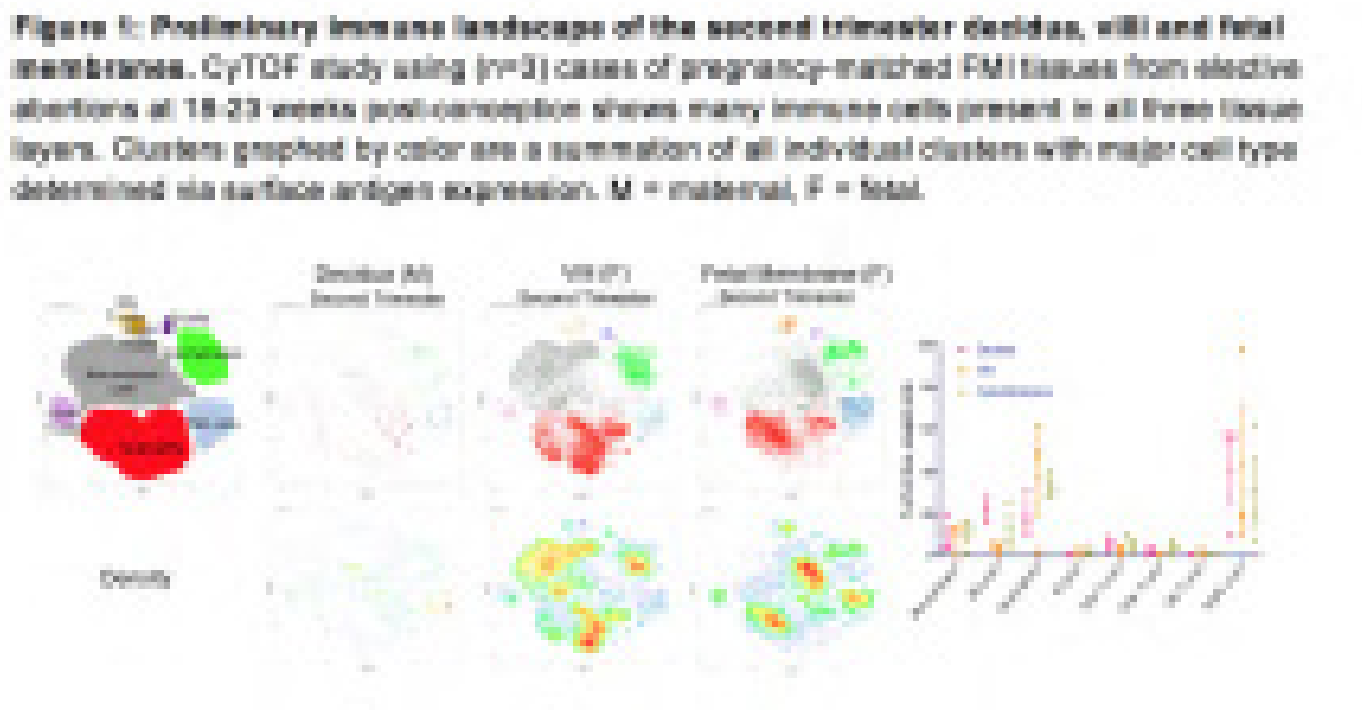
Background During pregnancy, the maternal immune system must maintain a delicate homeostasis to prevent rejection of paternal antigens presented by the developing semi-allogenic fetus. In healthy pregnancies, labor is marked by the well-defined transition to an inflammatory state in reproductive tissues. An early induction of inflammation may upset homeostasis and induce spontaneous preterm labor (sPTL). sPTL remains the number one cause of death in infants under five yet the specific etiology of most cases is unclear. However, the healthy immune composition of the fetal tissues at the fetal-maternal interface (FMI) throughout human pregnancy has not been defined in depth in later gestation. Investigation into the immune cells maintaining tolerance at the FMI throughout pregnancy has been stagnated by access to fetal tissue. Our lab is uniquely positioned to acquire fetal, preterm, and term FMI tissue samples on a weekly basis. Additionally, we have developed a method to store and re-isolate viable immune cells from frozen tissue resulting in limited batch variability in fetal-tissue experiments. With these unique resources and innovative methodologies, this study has elucidated fetal leukocyte populations in FMI tissues that may contribute to the initiation of labor.
Objective To elucidate the role of fetal immune cells in the tissues at the fetal maternal interface.
Design/Methods Fetal (18-23 week) and term (38-40 week) placentas were collected from elective terminations by the University of Pittsburgh Health Sciences Tissue Bank and the Magee Obstetrics Maternal and Infant Biobank. Placental layers were manually isolated and cells were stained with a 40 metal-conjugated antibody panel and analyzed via mass cytometry (CyTOF).
Results This in-depth immune profiling revealed distinct populations of antigen presenting cells, cytolytic and helper T cells, B cells and NK cells between the three tissues (Fig 1). The composition of the immune profile of the placenta changes throughout gestation in each of the three layers at the maternal-fetal interface.
Conclusion(s) Taken together these findings suggest that both the fetal and maternal tissues at the placental-uterine interface harbor complex immune systems. Further investigation into these systems will provide us with a better understanding of the immune homeostasis necessary for healthy pregnancies.



Abstract: 122

The Effect of Intermittent Hypoxia-Hyperoxia during Nephrogenesis vs Nephronal Maturation and Risk of Kidney Disease and Hypertension in Adult Mice

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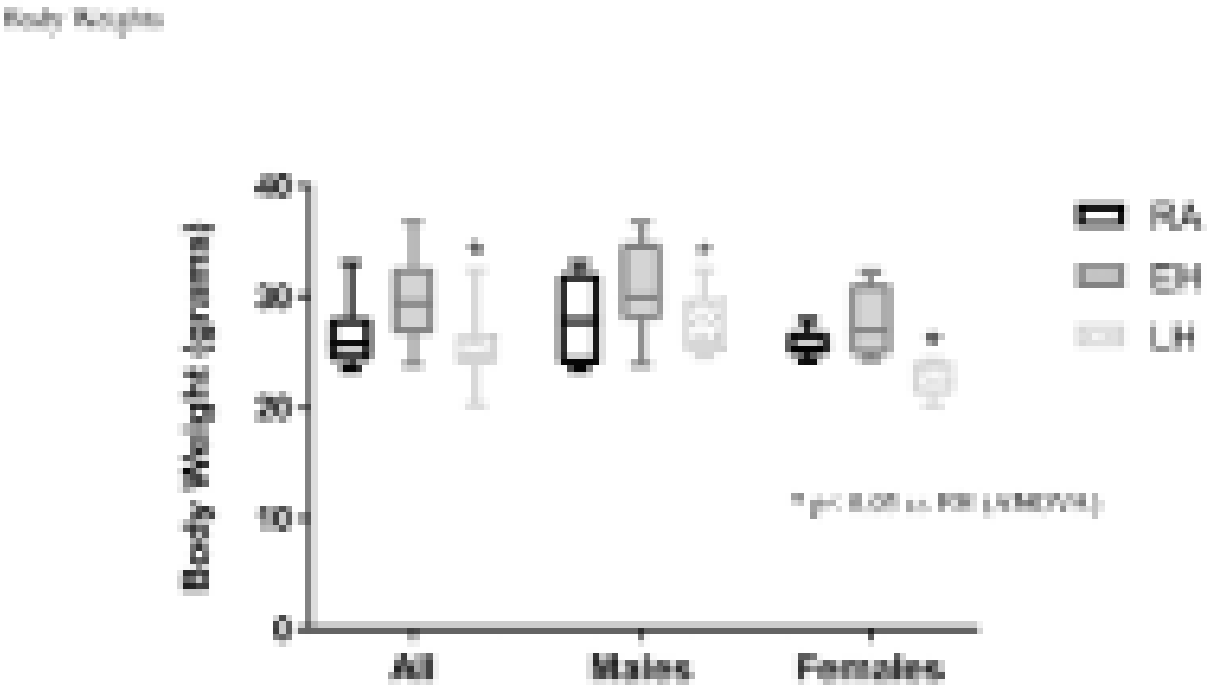
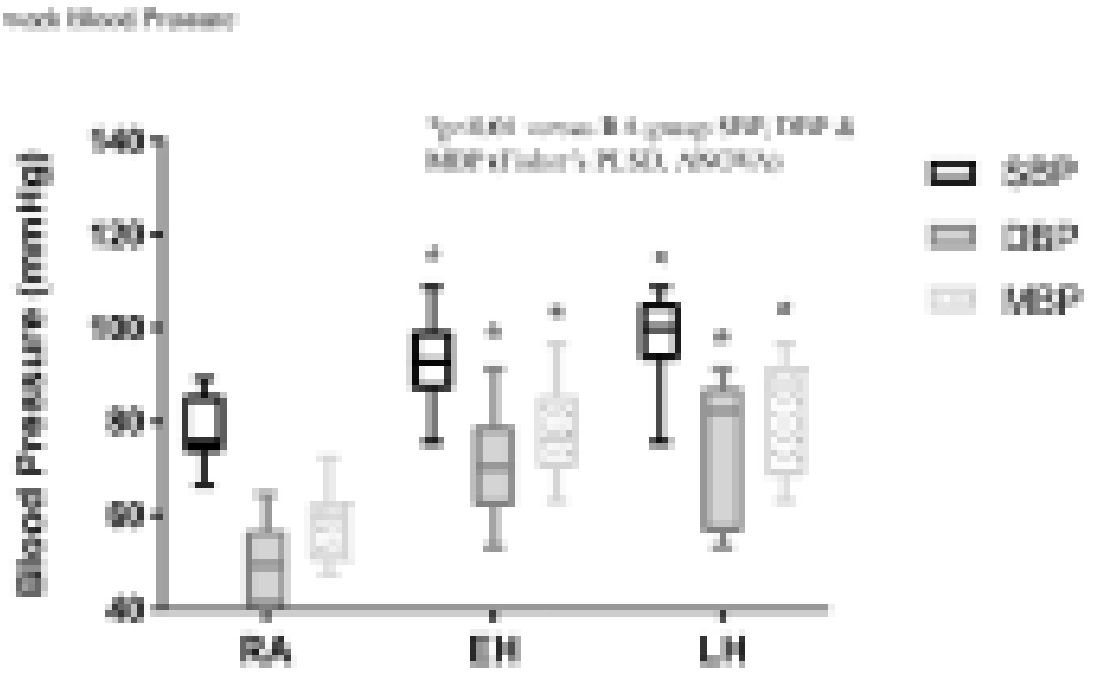
Background Premature neonates are at increased risk for renal complications later in life. Nephrogenesis is not complete until 34-36 wks gestation, therefore, infants born premature are at risk for reduced kidney size & nephron number. Repeated hyperoxic & hypoxic events during their postnatal course can adversely impact nephron formation & maturation.
Objective To investigate the role of variable oxygen (O_2) exposure early in life during nephrogenesis & nephron maturation on development of hypertension & renal disease in adult mice.
Design/Methods Newborn mice litters were randomized within 12h after birth to 12%O_2 (4h) followed by 50%O_2 (4h) with recovery in 21%O_2 (room air) for 16h (Early hypoxia-hyperoxia, EH) for 4 days (4 cycles). Similar exposure performed in litters from postnatal days 4-8, randomized to Late hypoxia-hyperoxia group (LH). Controls remained in room air (RA group). Non-invasive tail blood pressures obtained at 8-10 wks. 24-hr urine collection obtained at 12 wks. Terminal blood collection obtained at sacrifice (16wks).
Results <u>Body weight.</u> Both male & female mice in the LH group weighed significantly less compared to other groups (p <0.05 *vs* EH, ANOVA, Fig.1.). <u>BP data.</u> EH & LH groups had significantly higher systolic (SBP), diastolic (DBP), & mean blood pressures (MBP) compared to RA group at 8wks (p< 0.01 *vs* RA group SBP, DBP,& MBP, ANOVA, Fig.2). Gender specific differences were noted in BP with males demonstrating higher SBP & MBP (p<0.01 *vs* RA group, ANOVA) & female mice with higher MBP & DBP (p <0.01 *vs* RA, ANOVA) in both EH & LH groups. <u>Serum chemistries.</u> BUN was significantly lower in the EH group (p < 0.05 *vs* RA, ANOVA), whereas both phosphorus & sodium were lower in the LH group (p <0.05 *vs* RA, ANOVA). <u>Urine Protein/Creatinine (P/C).</u> Mice in EH group had significantly higher urine P/C compared to other groups (p <0.05 *vs* LH & RA, ANOVA); especially males.
Conclusion(s) Blood pressure was significantly higher at 8 wks in EH & LH groups. Higher urine P/C in EH group may suggest that oxygen alters nephronal development leading to protein loss in urine. Abnormalities in serum chemistries & lower body weight in LH group suggest that oxygen may be toxic during nephronal maturation. We speculate that the differential effects of O_2 on glomerular & tubular integrity during nephrogenesis *vs* nephronal maturation may determine clinical presentation in adult mice. This may have relevance in adult onset kidney disease in premature infants exposed to O_2.



Male & female mice in the late hypoxia-hyperoxia (LH) group weighed significantly less compared to early hypoxia-hyperoxia group (EH).



EH & LH groups had significantly higher systolic (SBP), diastolic (DBP), & mean blood pressures (MBP) compared to RA group at 8 weeks.

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Paucity of End Organ Damage in Children with Primary Hypertension
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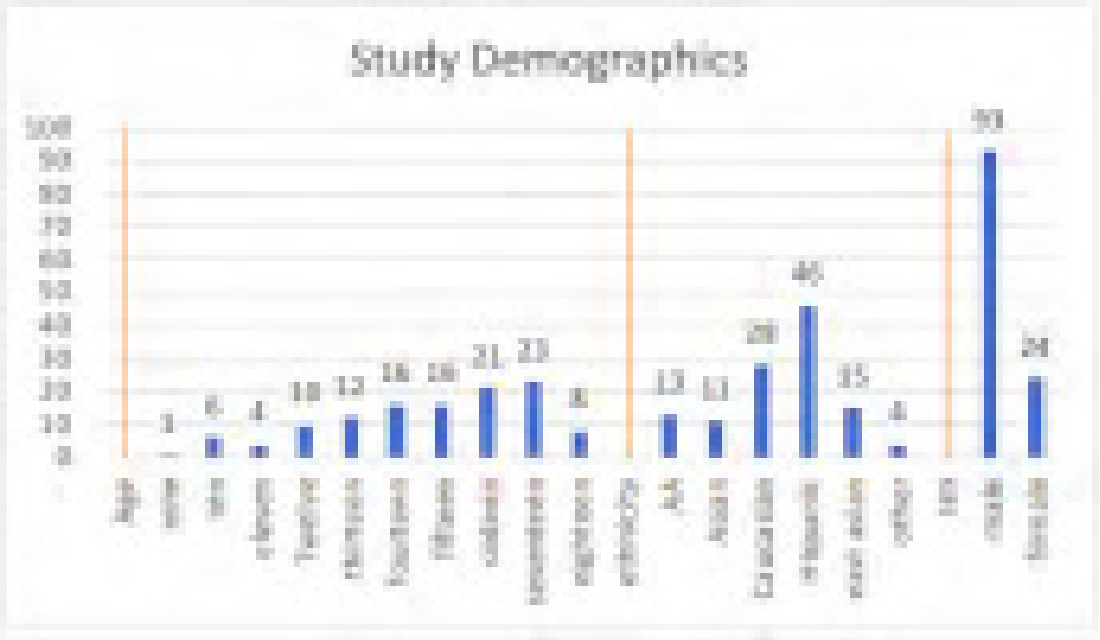
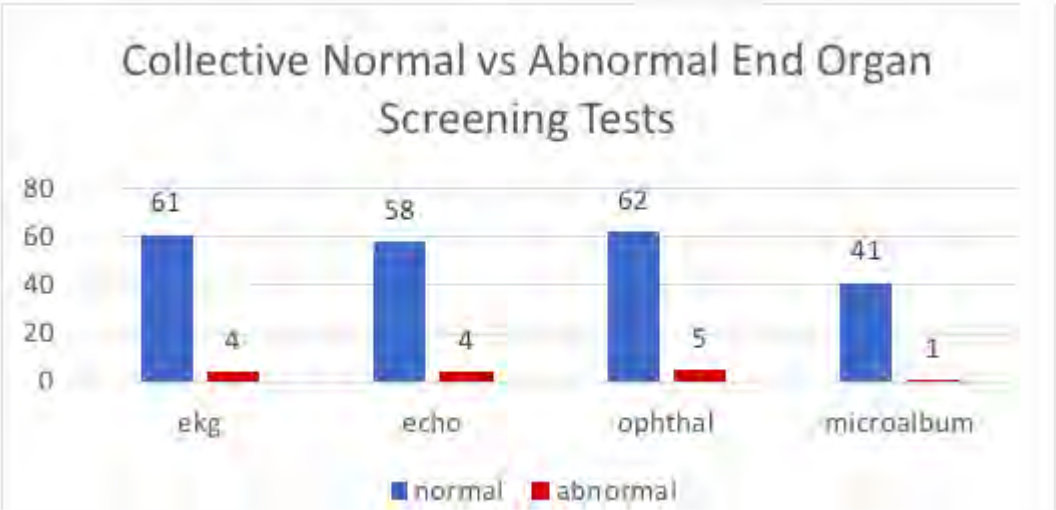
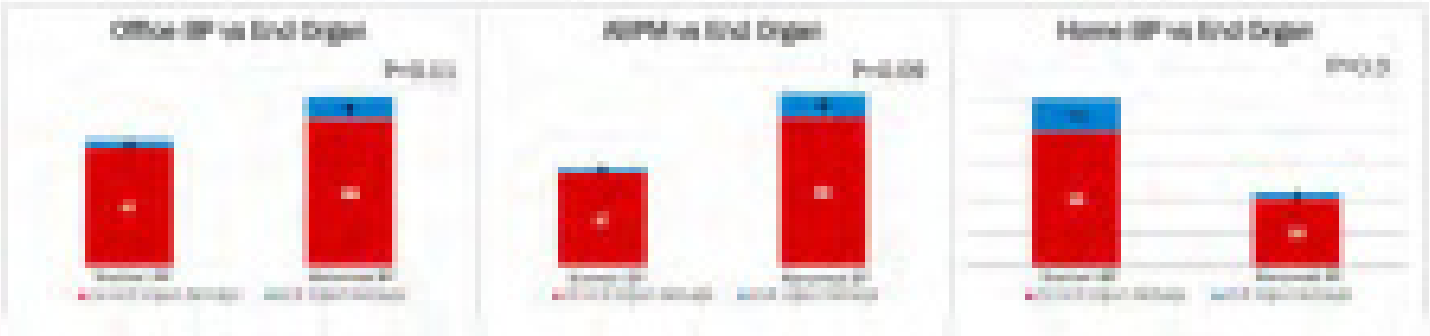
Background The prevalence of hypertension in children is increasing. It is estimated to be between 3-5 percent. Long term uncontrolled hypertension in adults is associated with cardiovascular disease and early mortality. In 2017 the HTN task force revised its guidelines for screening for target end organ involvement. Previously testing for hypertensive cardiomyopathy and microalbuminuria were suggested.
Objective The purpose of this study was to determine the prevalence of target organ involvement in children diagnosed with primary hypertension and to see if it aligns with the new guidelines. Secondarily we want to investigate which blood pressure measurement modality best predicts end target organ involvement.
Design/Methods In 2016, 2996 patients were referred to the Pediatric Nephrology practice at Saint Peter's University Hospital. On retrospective chart review, 350 patients were identified with hypertension; 117 of these patients met the inclusion criteria (age between 8-18, normal UA, no prior history of kidney disease, diabetes, heart disease, and ocular pathology) and were assumed to have primary hypertension, each then had an ABPM done. Of these 117 patients, the prevalence rate of end organ damage in the form of microalbuminuria, ventricular hypertrophy, and hypertensive retinopathy was obtained. The target end organ involvement and BP staging was compared based on the different modalities measured. Statistical analysis was performed using the Fisher exact testing.
Results See tables below
Conclusion(s) From this study we conclude that end organ changes afflicts only a small portion of patients with suspected primary
HTN within the first year of diagnoses or referral. We concur with current guideline to limit end organ involvement to screening for children with prolonged uncontrolled HTN or to whom medications are being entertained after failure of lifestyle changes. We also agree abandoning the screening for microalbuminuria. Among the 3 different blood pressure measurement modalities ambulatory blood pressure monitoring it appears to offer the best potential for identifying children with end organ involvement



Study Demographics



Comparing the prevelence of end organ damage utilizing 4 different screening tests



Comparing 3 different blood pressure measuring modalitites to best identify end organ damage with abnormal blood pressures from normal blood pressures.

Abstract: 124

Outcomes Associated with Unrecognized Acute Kidney Injury (AKI) in an Inner-City Children's Hospital

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Background AKI has been shown to increase the risk of mortality, length of hospital stays (LOS), hypertension (HTN), and impaired renal function at discharge. Lack of recognition of AKI during admission may lead to poorer outcomes.
Objective To describe the prevalence, characteristics, and outcomes of patients with unrecognized AKI in an inner-city hospital.
Design/Methods We performed a retrospective chart review of patients aged 0-21 admitted to the Children's Hospital at Montefiore from December 2016 - June 2017 who had at least 2 serum creatinine values recorded within 7 days. AKI was defined in accordance with Kidney Disease: Improving Global Outcomes (KDIGO) criteria. Recognized AKI was defined as documentation within the electronic medical record of "acute kidney injury," "AKI," or ICD 9/10 codes for AKI; unrecognized AKI as creatinines that met KDIGO criteria without documentation of the aforementioned phrases; and no AKI as normal creatinines.
Results Baseline demographics, presence of renal consultation, electrolyte disturbances, HTN, and LOS were described for 184 patients (Table 1). The median age was 14 years (IQR 11,18), and a majority of patients identified as Hispanic. AKI developed in 18% of admissions (n=33). 57% of AKI episodes were unrecognized by providers (n=19). A higher rate of unrecognized AKI was associated with diabetic ketoacidosis (DKA) (p=0.01) and Stage 1 AKI (p=0.29), although the latter did not reach statistical significance. Those with unrecognized AKI had a trend towards lower eGFR at admission 77.1 (IQR 69.5,96.6) and at discharge 105.6 (IQR 73.4,126.4). 12% (n=4) of all patients with AKI developed HTN. LOS of those with recognized AKI was significantly longer than those unrecognized (p=0.015). Of those with recognized AKI, 64% (n=9) had renal consults and 57.1% (n=8) had renal follow up.
Conclusion(s) We identified new data on the prevalence of unrecognized AKI with its potential adverse outcomes. Providers failed to identify AKI over 50% of the time, especially Stage 1 AKI and AKI in patients with DKA. Those with unrecognized AKI tended to have impaired eGFR on admission. AKI was associated with new onset HTN, demonstrating the importance of identification and follow up of AKI. We hope to utilize a larger cohort to study whether the creation of educational tools for house staff in recognition of AKI, along with the development of electronic medical record KDIGO-based AKI alerts, may increase awareness and improve outcomes.

Table 1. Demographic Data and Characteristics of Patients without Acute Kidney Injury (AKI) versus Unrecognized and Recognized AKI.

Demographic Data and Characteristics[a]	No AKI (N = 61)	Unrecognized AKI (N = 8)	Recognized AKI (N = 8)
[illegible]	[illegible]	[illegible]	[illegible]
Sex — n(%)			
Male	39 (64)	5 (63)	7 (100)
Female	22 (36)	3 (37.5)	1 (14)
Ethnicity (%)			
White	8 (13)	1 (13)	1 (14)
Hispanic	30 (49.2)	6 (75)	5 (71)
African American	17 (28)	1 (13)	1 (14)
Other	6 (9.8)	—	0 (0)
Admission Diagnostic Category — n (%)			
Cardiac	9 (15)	3 (38)	—
Gastrointestinal	4 (7)	—	1 (14)
Renal/GU	4 (7)	1 (13)	—
Pulmonary	10 (16)	1 (13)	1 (14)
Neurologic	8 (13)	1 (13)	2 (29)
Hepatic	13 (21)	1 (13)	1 (14)
Sepsis	5 (8)	—	1 (14)
Rhabdomyolysis	1 (2)	0 (0)	0 (0)
Other	7 (11)	1 (13)	1 (14)
Weight (kg) (IQR) [range]	81 (70)	90 (108)	94 (108)
eGFR (ml/min/1.73m²) — n (%)			
Grade 1	—	4 (50)	5 (71)
Grade 2	—	2 (25)	1 (14)
Grade 3	—	2 (25)	1 (14)
Creatinine on admission (mg/dL) (%)	57 (93)	4 (50)	0 (0)
Median eGFR (IQR) — ml/min/1.73m²			
Admission	87.4 (63.4, 134.7)	100.5 (80.6, 111.5)	80.1 (57.4, 101.2)
Minimum	82.3 (58.5, 114.9)	77.1 (62.8, 98.6)	62.1 (50, 100.5)
Discharge	100.5 (83.5, 131.3)	105.5 (73.4, 135.4)	85.6 (72.3, 101.1)
Nephrotoxin exposure (yes) — n (%)[b]	11 (18)	1 (13)	1 (14)
Vasopressor — n (%)	7 (11)	1 (13)	1 (14)
Mechanical ventilation — n (%)	11 (18)	1 (13)	1 (14)
Renal replacement therapy — n (%)	—	—	1 (14)
Death — n (%)[c]	1 (2)	1 (13)	1 (14)
Discharge to hospice — n (%)	5 (8)	1 (13)	1 (14)

[a] Data presented as median (IQR) or number (%). Abbreviations: AKI, acute kidney injury; eGFR, estimated glomerular filtration rate.

[b] Exposure to known nephrotoxic medication.

[c] Hospital death or discharge to hospice.

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Factors Associated with Short-Term Survival in Neonates with Autosomal Recessive Polycystic Kidney Disease (ARPKD)

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Background ARPKD is a rare cause of chronic kidney disease that typically manifests during infancy and is commonly complicated by respiratory insufficiency leading to increased perinatal mortality. Advancements in neonatal respiratory care have led to improved survival, and strategies such as nephrectomy and dialysis have also shown potential benefits. However, the optimal approach and the factors associated with survival in the neonatal period remain unclear.

Objective To describe the epidemiology, complication, and management in neonates with ARPKD and to analyze factors associated with short-term survival at 3 months of life (MOL) from a national cohort.

Design/Methods A retrospective cohort of infants diagnosed with ARPKD admitted to a children's hospital within 3 days of life from 2007-2017 was identified from the Pediatric Health Information System. Survival curves were produced from the Kaplan-Meier (K-M) estimator. Cox regression model with time-dependent covariates when appropriate assessed the association between survival and specific risk factors such as respiratory complications and need for certain treatments.

Results 378 neonates with ARPKD were identified from the 11-year national cohort. Patient characteristics were listed in Table 1. The majority of patients were >= 2500g, late preterm or term, male, and notably 70% had a co-existing congenital anomaly. Most deaths occurred within 2 weeks (112/148 deaths) with 3-month survival rate of 56% (Figure 1a). By 1 MOL, 5% of patients had received ECMO, 10% nephrectomy, and 16% peritoneal dialysis (PD), with K-M survival curves shown in Figure 1b-d. Multivariable Cox regression (Table 2) revealed co-existing congenital anomaly and need for mechanical ventilation (both conventional and high frequency) were significant factors associated with worse survival ($p<0.01$), and PD was associated with improved survival ($p=0.02$).

Conclusion(s) Vast majority of deaths occurred within 2 weeks of life in patients with ARPKD diagnosed in the perinatal period. Need for mechanical ventilation, likely representing disease severity, was associated with worse survival. ECMO use did not lead to increased mortality, suggesting ECMO may be beneficial in some infants with the most severe respiratory failure, but also that the decision to offer ECMO may be related to the perceived likelihood that an infant may survive off ECMO. Future studies are warranted to identify the optimal timing and the subgroup of patients who may benefit from PD.

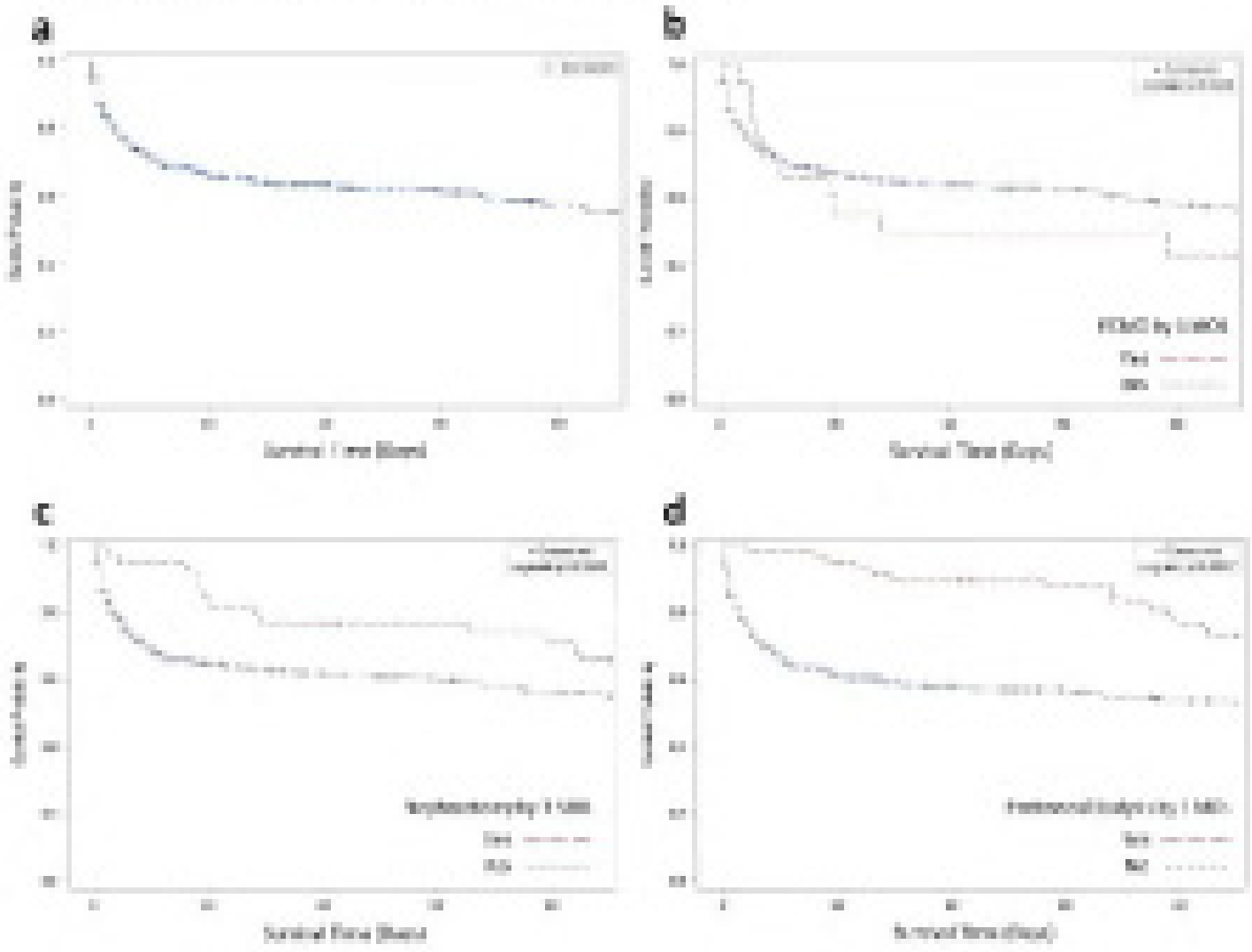
Table 1: Baseline Characteristics, Complications, and Management of sBPD Diagnosed in the Perinatal Period

	Total	Survivors at 3 months	Non-Survivors at 3 months	Lost to follow-up before 3 months
PATIENTS, n	616 (100.0)	168 (36.4)	388 (63.0)	60 (34.4)
Birth weight, n (%)				
Unknown	10 (2.7)	1 (0.7)	9 (5.4)	0 (0.0)
<1000g	20 (5.3)	9 (5.8)	8 (5.1)	4 (6.4)
1000-2499g	87 (28.8)	33 (28.9)	48 (27.6)	24 (23.1)
>=1500g	261 (69.1)	96 (68.6)	95 (64.3)	70 (76.1)
Gestational age, n (%)				
Unknown	24 (3.9)	11 (5.2)	21 (10.2)	2 (3.6)
22-28 weeks	11 (2.8)	3 (2.2)	6 (4.1)	2 (3.2)
29-30 weeks	36 (7.3)	11 (8.8)	15 (10.1)	3 (4.3)
31-36 weeks	280 (39.7)	98 (52.8)	89 (43.2)	27 (28.6)
>=37 weeks	234 (35.1)	45 (29.6)	38 (25.7)	52 (35.4)
Male, n (%)	314 (46.5)	11 (56.8)	89 (59.4)	50 (64.4)
Race, n (%)				
White	337 (58.1)	94 (58.1)	71 (48.0)	67 (67.4)
Black	36 (8.4)	23 (9.4)	24 (8.4)	0 (0.0)
Other/Unknown	113 (28.4)	31 (22.5)	63 (43.6)	21 (22.1)
Ethnicity, n (%)				
Hispanic	71 (19.8)	30 (21.7)	26 (17.6)	17 (18.1)
Not Hispanic	228 (68.8)	88 (68.8)	83 (54.7)	54 (58.7)
Unknown	81 (21.5)	30 (24.5)	43 (27.7)	7 (23.2)
Multiple gestation, n (%)	8 (2.1)	3 (2.2)	3 (2.7)	0 (0.0)
Co-existing congenital anomaly, n(%)	204 (33.8)	96 (69.6)	103 (69.9)	35 (38.0)
Age at first intubation, n (%)				
0 DOL	249 (84.6)	79 (67.5)	102 (75.7)	56 (69.4)
1 DOL	75 (25.1)	30 (28.3)	37 (34.3)	18 (20.7)
2 DOL	16 (5.6)	13 (9.6)	10 (7.4)	12 (13.0)
3 DOL	18 (6.4)	10 (7.3)	9 (7.7)	10 (10.1)
Respiratory distress syndrome, n (%)	61 (18.7)	24 (17.6)	28 (18.5)	11 (12.0)
Pneumothorax, n (%)	148 (39.4)	54 (38.1)	77 (51.0)	18 (19.6)
Pulmonary hypertension, n (%)	208 (27.6)	63 (28.2)	98 (30.2)	37 (30.2)
Surfactant given within 2 DOL, n (%)	81 (22.4)	36 (28.8)	48 (32.9)	7 (7.6)
Nitric Oxide use within 2 DOL, n (%)	130 (34.1)	50 (37.7)	71 (46.6)	9 (9.8)
Conventional ventilation[1], median (IQR)	1 (5)	1 (10)	1 (5)	0 (1)
High frequency ventilation[1], median (IQR)	0 (1)	0 (0)	0 (2)	0 (0)
ECMO within 1 MOL, n (%)	18 (4.8)	7 (5.2)	10 (6.8)	1 (1.1)
Nephrectomy within 1 MOL, n (%)	39 (10.3)	14 (10.4)	23 (15.5)	2 (2.2)
Hemodialysis within 1 MOL, n (%)	21 (5.6)	9 (6.6)	11 (7.4)	1 (1.1)
Peritoneal dialysis within 1 MOL, n (%)	35 (15.6)	10 (29.4)	25 (20.1)	0 (0.0)

DOL - days of life, MOL - months of life, ECMO - extracorporeal membrane oxygenation, IQR - interquartile range

[1]Days on conventional or high frequency ventilation within 1 MOL

Figure 1: Kaplan-Meier Survival Curves



a) overall survival for entire cohort, b) survival stratified by ECMO use by 1 IMDL,
c) survival stratified by nephrectomy by 1IMDL, d) survival stratified by peritoneal dialysis by 1 IMDL

Table 3: Cox Proportional Hazards Regression for 1-Month Survival

	Unadjusted HR (95% CI)	Adjusted HR (95% CI)
Birth weight		
<1500g vs. >=2500g	0.88 (0.48-1.61)	0.72 (0.36-1.43)
1500-2499g vs. >=2500g	1.22 (0.84-1.77)	1.09 (0.71-1.70)
Unknown vs. >=2500g	1.59 (0.65-3.91)	1.55 (0.59-4.09)
Gestational age		
32-36 weeks vs. <=31 weeks	1.42 (0.86-2.37)	2.05 (1.10-3.84)
37-37 weeks vs. <=31 weeks	1.77 (1.05-3.00)	1.46 (0.84-2.57)
38-38 weeks vs. <=31 weeks	1.47 (0.89-2.39)	1.10 (0.65-1.83)
Unknown vs. <=31 weeks	1.54 (0.95-2.50)	1.39 (0.79-2.43)
Gender		
Male vs. Female	1.18 (0.85-1.64)	1.17 (0.81-1.68)
Race		
Black vs. White	1.19 (0.87-1.61)	1.18 (0.81-1.71)
Other/Unknown vs. White	**1.67 (1.17-2.38)†**	**1.67 (1.15-2.42)†**
Ethnicity		
Not Hispanic vs. Hispanic	1.00 (0.73-1.35)	0.88 (0.63-1.24)
Unknown vs. Hispanic	**1.75 (1.07-2.87)†**	1.29 (0.75-2.19)
Multiple gestation		
Multiple vs. Single/Unknown	0.29 (0.04-2.04)	0.51 (0.06-3.93)
Co-existing congenital anomaly		
Present vs. Not Present	**3.04 (2.21-4.17)†**	**2.60 (1.62-4.11)†**
Age at first admission, n (%)		
1 DOL vs. 0 DOL	**0.39 (0.21-0.70)†**	0.56 (0.40-1.13)
2 DOL vs. 0 DOL	0.68 (0.37-1.32)	1.03 (0.63-2.16)
3 DOL vs. 0 DOL	**0.29 (0.11-0.77)†**	0.50 (0.21-1.12)
Respiratory distress syndrome		
Present vs. Not Present	1.06 (0.73-1.55)	0.79 (0.48-1.27)
Pneumothorax		
Present vs. Not Present	**1.88 (1.30-2.69)†**	1.11 (0.68-1.77)
Pulmonary hypertension		
Present vs. Not Present	**1.79 (1.22-2.57)†**	1.03 (0.70-1.53)
Surfactant given within 2 DOL		
Yes vs. No	**1.99 (1.41-2.80)†**	1.32 (0.87-2.02)
Nitric Oxide[‡]	**1.75 (1.12-2.57)†**	1.37 (1.00-2.49)
Conventional ventilation[‡]	**2.79 (1.96-3.82)†**	**2.56 (1.59-3.85)†**
High frequency ventilation[‡]	**3.37 (2.40-5.09)†**	**3.04 (1.97-4.17)†**
ECMO[‡]	1.48 (0.73-4.08)	0.87 (0.31-2.48)
Nephrectomy[‡]	1.53 (0.84-2.80)	1.52 (0.79-2.92)
Hemodialysis[‡]	1.79 (0.89-6.79)	1.92 (0.45-5.81)
Peritoneal dialysis[‡]	0.33 (0.08-1.01)	**0.16 (0.06-0.70)†**

HR = Hazard ratio, CI = confidence interval

[‡]time-dependent covariates in Fine & Gray SHR.

†p-value <0.05

‡p-value <0.01

Abstract: 126

DNA Fragmentation Following Hypoxia versus Hyperoxia in the Cerebral Cortex of Newborn Piglets.

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Background Previously, we showed that Caspase 3 and 9 activity increased following exposure to severe hypoxia and hyperoxia but of different magnitudes in the brain of newborn piglets. DNA fragmentation is a final marker of programmed cell death. An increase in DNA fragmentation has been demonstrated following severe hypoxia and hyperoxia in the newborn piglet brain.
Objective The present study aims to assess the relative effect of hypoxia induced DNA fragmentation as compared to hyperoxia induced activation.
Design/Methods Anesthetized, ventilated piglets (3-5 days old) were grouped into hypoxia (n=18) and hyperoxia (n=10) and compared to their respective normal controls. Hypoxia was achieved by decreasing FiO2 to 0.07 for 1 hr. Hyperoxic piglets were exposed to an FiO2 of 1.0 for 1hr maintaining a PaO2 of 400mmHg. DNA was isolated from the neuronal nuclei and measured by absorbance at 260 nm. DNA was separated by electrophoresis on 1% agarose gel. DNA base pair fragments were compared to a standard 1 Kb DNA ladder. ATP and phosphocreatine were determined biochemically to document cerebral energy status.
Results ATP levels (mmole/g brain) in hypoxia were 4.3 ±0.2 in Nx and 1.42 ±in Hx, a 66% decrease from Nx. PCr levels (mmole/g brain) in hypoxia were 3.8 ±0.3 in Nx and 0.9 ±0.2 in Hx, a 76% decrease from Nx. ATP in hyperoxia were 4.7 ±0.3 in Nx and 4.9 ±0.4 in Hyx. PCr levels in hyperoxia were 4.1 ±0.3 in Nx and 4.0 ±0.4 in Hyx. In hypoxia, DNA fragmentation increased from 800.8 ±148 in the normal group to 1732.7 ±193.8 in hypoxia, an increase of 54%. In hyperoxia, DNA fragmentation increased from 314.3 ±23.7 in the normal group to 691.5 ±35.8 in hyperoxia, also an increase of 54%.
Conclusion(s) The data show there is a similar increase in DNA fragmentation following hypoxia and/or hyperoxia. During hypoxia, DNA fragmentation is mediated by Caspase 9 dependent Caspase 3 activation that leads to Caspase activated DNase, leading to fragmentation of nuclear DNA. There is also increased activation of Caspase 3 dependent activation of CAD (Caspase activated DNase) leading to increase nuclear DNA fragmentation, during hyperoxia. This pathway leading to DNA fragmentation by way of enzymatic activation may be shared by hypoxia and hyperoxia at the mitochondrial level. While there is injury from both mechanisms, there is decreased cellular energy during hypoxia as opposed to increased oxygen free radicals.

Abstract: 127

Effect of Anesthesia with Nitrous Oxide on Na/K ATPase enzyme in the Piglet Brain

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Background We have previously shown that nitrous oxide (N_2O) reduces Na/K ATPase enzyme activity in the cerebral cortex (CC) of piglets and can induce anesthesia by slowing the restoration of neuronal membrane potential. However, the specific mechanism of action of N_2O in the brain remains poorly understood.
Objective To investigate the mechanism of action of N_2O on Na/K ATPase enzyme in the piglet brain, and to test the hypotheses whether N_2O acts directly or via second messenger systems.
Design/Methods Six male piglets were ventilated with N_2O at FiO_2 0.21 x 4h, then their brains were harvested and compared to 6 normal non-instrumented piglets. Levels of lactate and ATP (µMol/g tissue) were determined to assess cerebral energy status. Expression of Na/K ATPase subunits in the membrane fraction of CC was determined using Western blots. The membrane fractions with or without the endoplasmic reticulum (ER) from normal CC were incubated in vitro with N_2O, and Na/K ATPase enzyme activity with and without N_2O was determined (µMol Pi/mg tissue protein/h). The effect of N_2O on cytosolic second messenger system soluble guanylate cyclase (sGC), a known receptor of nitric oxide (NO; a molecule that closely resembles N_2O) was also determined using HPLC.
Results Anesthetized piglets had mild decrease in their blood pressure from baseline (74±10 vs 99±14; $p<0.01$), but maintained normal PaO_2, pH, cerebral ATP and lactate. Exposure to N_2O in vivo decreased Na/K ATPase activity by 26% (70.7±5 in normal vs 52.6±10 in N_2O; $p<0.01$), but not the expression of Na/K ATPase proteins (Figure 1). Incubation of the cerebral membrane fraction or sGC in vitro with N_2O did not change the activities of the Na/K ATPase or sGC enzymes (Figure 2). Removal of the ER fraction by centrifugation decreased Na/K ATPase activity by 29% and eliminated the effect of N_2O on Na/K ATPase in vitro.
Conclusion(s) We conclude that N_2O decreases Na/K ATPase enzyme in the brain through indirect action possibly involving second messenger systems related to the ER. Studies have indicated that the N-terminal of the Na/K ATPase α-subunit binds directly to the inositol 1,4,5-triphosphate (IP_3)-ligand binding domain of IP_3receptor (IP_3R) located on the surface of the ER,

which regulates calcium influx. N_2O has also been shown to decrease trans-sarcolemmal calcium influx. We propose N_2O affects intracellular calcium signaling and IP_3R pathways in the brain. Understanding of mechanism of action of anesthetic agents can help develop safer strategies for sedation in infants and children.

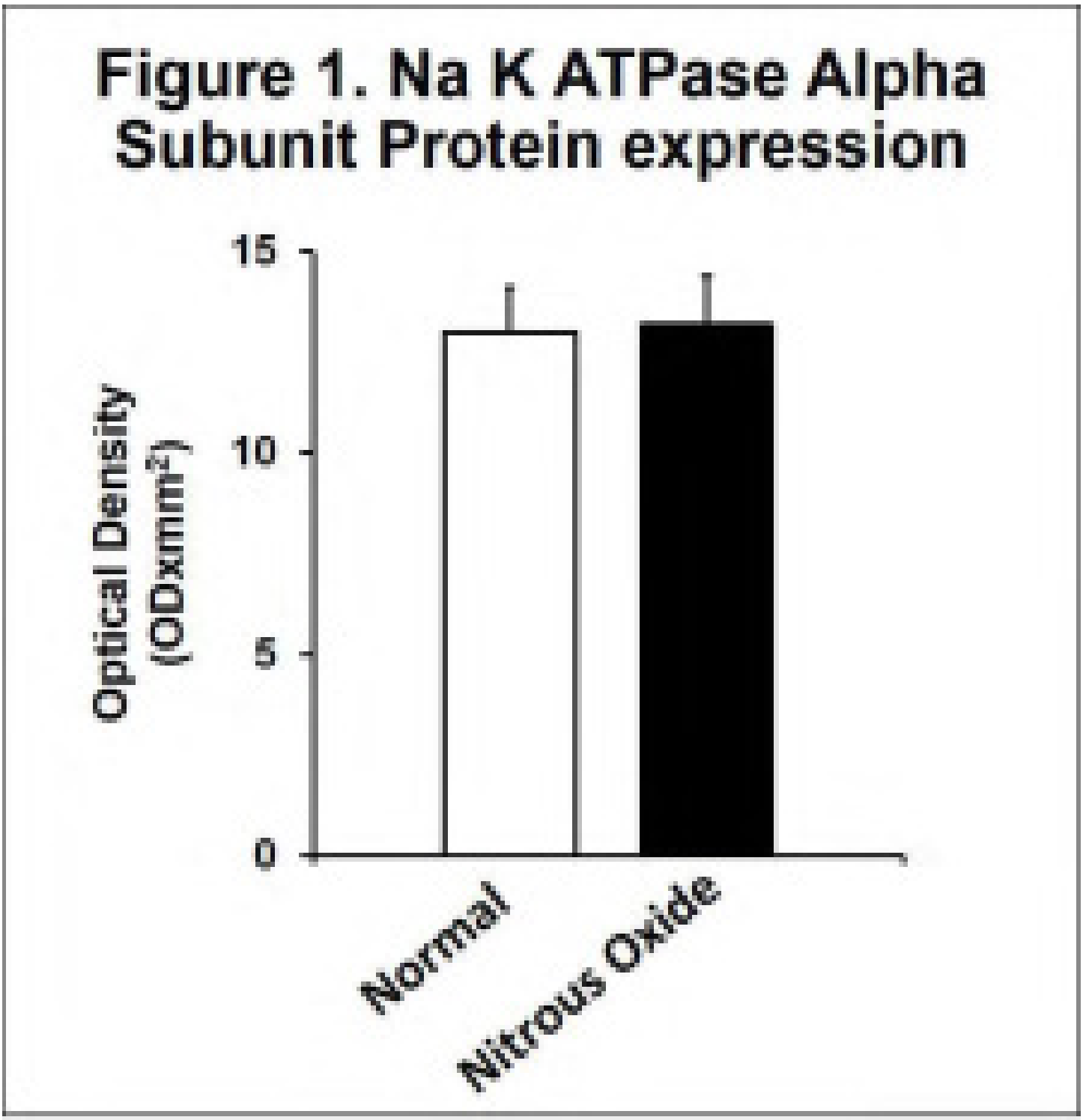

Figure 1. Na/K ATPase expression of the α-subunit protein (active site) in membrane fractions of piglets exposed to N_2O (solid bars) and normal piglets (open bars; M±SD; p=0.42).

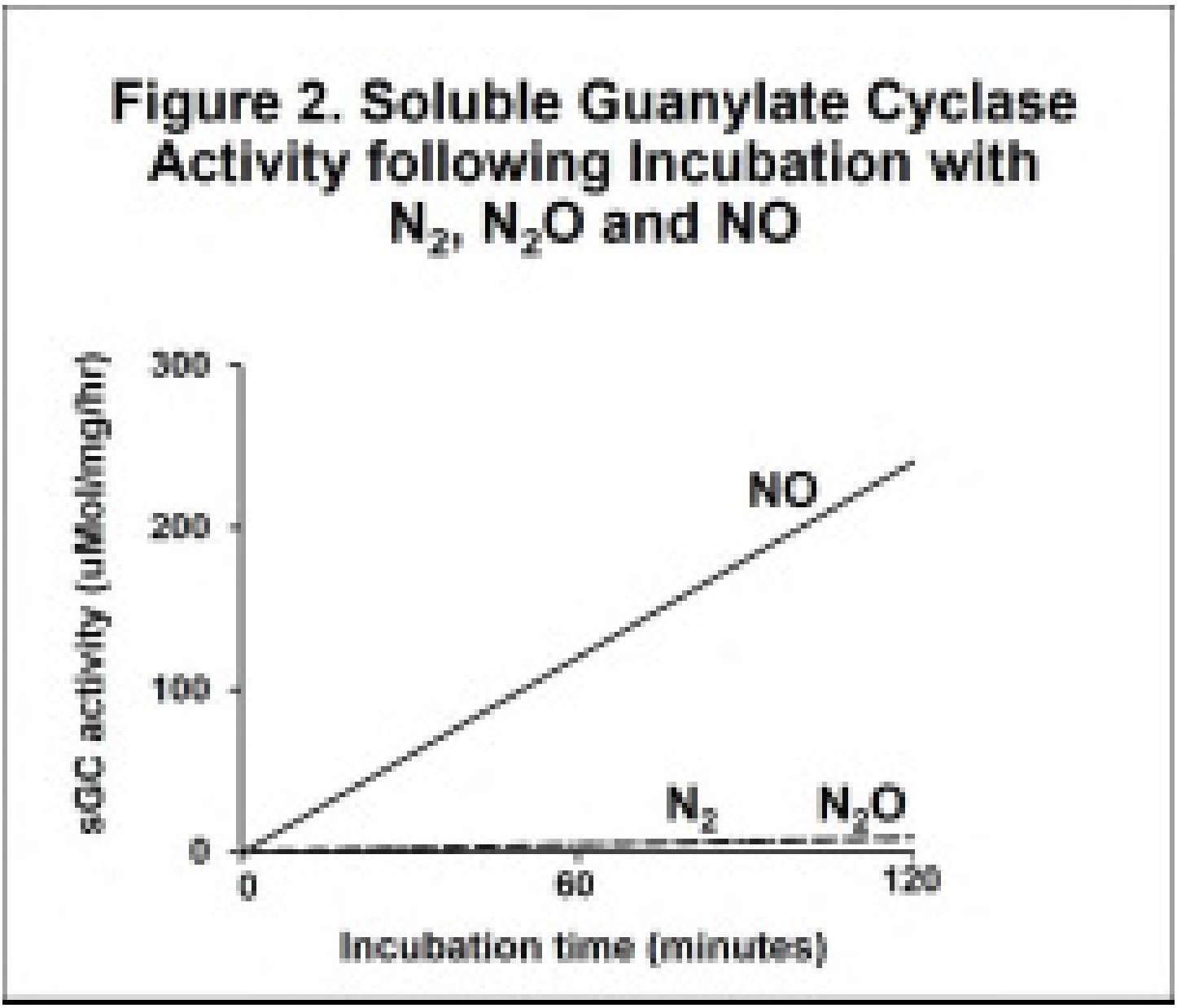

Figure 2. Activity of recombinant soluble Guanylate cyclase enzyme when incubated in vitro with saturating concentrations of GTP and nitrogen gas (N_2; dotted line; negative control), nitrous oxide gas (N_2O; dashed lined; tracing overlapping N_2) or nitric oxide gas (NO; solid line; positive control). Produced cGTP was measured using HPLC.

Abstract: 128

Retrospective Criteria for Cannulation in a New Pediatric Extracorporeal Membrane Oxygenation (ECMO) Program
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Background Extracorporeal Membrane Oxygenation (ECMO) can be used to support neonatal and pediatric patients with severe cardiac or respiratory failure. Multiple criteria have been used to decide when to initiate ECMO, including Oxygenation Index (OI), alveolar-arterial oxygen gradient (A-aDO2) and hypoxemia. With optimization of medical management and advances in technologies, however, use of strict cut-offs in these values has become obsolete.The ECMO

program at Hassenfeld Children's Hospital (HCH) at NYU Langone Medical Center was started in March 2015. Here, the decision to employ ECMO is a shared decision between the medical and surgical directors of the pediatric ECMO program.
Objective The objective of this study was to evaluate all patients who received an ECMO consultation at our institution, and to determine what clinical differences exist between those patients who were ultimately placed on ECMO and those who were not, despite a lack of strict criteria for ECMO cannulation. We aimed to determine whether there were differences in OI, A-aDO2, paCO2, paO2, pH, lactate, and mean arterial blood pressure.
Design/Methods We conducted an IRB-approved retrospective chart review of all neonatal and pediatric patients who received a consultation from the Hassenfeld Children's Hospital ECMO team between March 2015 and May 2018. Patients who had contraindications to ECMO or whose parents declined ECMO were excluded. Demographic and clinical information were collected.
Results 50 patients received ECMO consultations, and of those 19 (38%) were placed on ECMO. There were no statistically significant differences in demographics between those who did and did not require ECMO. There were significant differences in the lowest oxygen saturation, lowest paO2, peak oxygenation index, peak A-aDO2, peak lactate, and lowest pH between the patients who went on ECMO and who did not; however, there was no difference in the peak pCO2 between the 2 groups. There was no difference in the incidence of echocardiographic findings associated with pulmonary hypertension. The patients who went on ECMO were on more vasoactive medications than those who did not.
Conclusion(s) Although strict cut-offs are no longer used as criteria for cannulation onto ECMO, in our new ECMO program the patients who received ECMO had more severe physiologic derangements than those who did not receive ECMO. Having a high pCO2, consistent with inability to ventilate, was not independently associated with need for ECMO.

Demographics	ECMO (n=19) Median (IQR)	Non-ECMO (n=31) Median (IQR)	P-value
Age (days)			
NICU patients	1.00 (0.24 – 1.00)	1.00 (0.52 – 1.00)	NS (0.74)
PICU patients	780.00 (1.00 – 780.00)	1566.46 (12.00 – 1566.46)	NS
Mean Weight (kg)			
NICU patients	3.14 (2.75 – 3.14)	3.12 (1.81 - 3.12)	NS (0.41)
PICU patients	12.01 (2.65 – 12.01)	22.05 (3.70 – 22.05)	NS
Sex			
Male	9	22	NS (0.14)
Primary Diagnosis			
Cardiac	5	13	NS (0.56)
Respiratory	14	18	
Type of ECMO			
V/V	5	N/A	N/A
V/A	14		

Demographics

Clinical Features	ECMO (n=19) Median (IQR)	Non-ECMO (n=31) Median (IQR)	P-value
Lowest SO_2 (%)	56 (2-56)	83 (29-83)	0.03
Lowest PaO_2 (mmHg)	31 (16-31)	44 (23-44)	0.001
Peak OI	67.1 (38.7-67.1)	29.7 (6.54-29.7)	<0.001
Peak $A\text{-}aO_2$	620.4 (554.4-620.4)	602.8 (150.2-602.8)	0.004
Peak lactate (mmol/L)	5.0 (1.94-5)	2.6 (1.1-2.6)	0.004
Lowest pH	6.97 (6.72-6.97)	7.19 (7.01-7.19)	0.001
Highest $PaCO_2$ (mmHg)	75.3 (48.2-75.3)	68.3 (45.4-68.3)	NS (0.251)

Results: Physiologic Parameters

Abstract: 129

T cell memory results in increased lung inflammatory monocytes and cytokine production following cecal ligation and puncture (CLP).

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Background The immune system of laboratory mice differs from that of mice exposed to environmental stimuli who have more T cell memory. In previous studies, we have used an anti-CD3ε activating antibody to induce T cell memory in laboratory mice subjected to CLP, a well-established animal model of sepsis. In this study we examine the effects of anti-CD3ε antibody treatment on CLP-induced lung injury.

Objective 1) To assess the effects of anti-CD3ε antibody on lung immune cell composition and function. 2) To examine the effects of anti-CD3ε antibody treatment on CLP-induced lung injury.

Design/Methods C57/BL6 mice were injected with anti-CD3ε antibody (n=10) or isotype antibody (control; n=10). After 35

days, 5 mice from each group were sacrificed (baseline). An additional 5 mice from each group underwent CLP and were sacrificed 24 hrs later. We performed 1) blood gas analysis to assess gas exchange, 2) bronchoalveolar lavage (BAL) to assess protein content and 3) flow cytometry to identify leukocyte sub-populations and to assess cytokine production. Data were analyzed using 2-sided T-tests.
Results Treatment with anti-CD3ε antibody increased the baseline fraction of CD4/CD8 memory T cells (p=0.0014, 0.0136) and CD4/CD8 effector memory T cells (p=0.0086, 0.0177) in lung. The fraction of naïve CD4/CD8 T cells (p=0.0383, 0.0075) decreased. CLP decreased the fraction of CD8+ T cells (p=0.0005). The fraction of inflammatory monocytes was increased (p=0.0124). CLP also increased production of IL2 (p=0.0088) and TNFα (p=0.0002) by CD4 T cells and of INFg (p=0.0113) and TNFα (p=0.0007) by CD8 T cells. There were no statistically significant differences in blood gas results or BAL protein concentration.
Conclusion(s) Anti-CD3ε activating antibody increased the fraction of CD4/CD8 memory T cells and decreased the fraction of naïve CD4/CD8 T cells in the lungs of C57/BL6 mice. This change in T cell memory altered CLP-induced changes in inflammatory monocytes and in the ability of activated T cells to secrete pro-inflammatory cytokines. T cell memory may alter the immune response to an inflammatory insult which may contribute to failures translating bench research findings to humans. Our findings may have important implications for the use of CLP as a model for sepsis-induced lung injury.

Abstract: 130
The Effect of Hyperoxia on Lactate Production in the Cerebral Cortex of Newborn Piglets
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Background Previously we showed that hyperoxia leads to cell death via free radical production and activation of the apoptotic pathway. There is a deprivation of energy seen with hypoxia but not in hyperoxia. The regulation of cerebral energy metabolism are key factors in the pathogenesis of secondary cerebral damage. In a state of energy dysfunction, there is evidence showing that the brain can use substrates other than glucose, including lactate. Lactate, an indicator of anaerobic metabolism, has also been established as a marker of poor neurological status following acute hypoxic brain injury in the newborn piglet.
Objective The present study aims to assess the relative toxicity of hyperoxia by measuring lactate production as compared to hypoxia in the cerebral cortex of newborn piglets.
Design/Methods Anesthetized, ventilated piglets (3-5 days old) were grouped into normal(n=6), hypoxia (n=5), and hyperoxia (n=8). Hypoxia was induced by decreasing FiO2 from 0.07 for 1 hr. Hyperoxic piglets were exposed to an FiO2 of 1.0 for 1hr while maintaining a PaO2 of 400mmHg. The cytosol was isolated following centrifugation and lactate levels were measured spectrophotometrically. ATP was determined biochemically to document cerebral energy status.
Results ATP levels (mmole/g brain) from 1.3 in Nx to 0.73 in Hx, a decrease of 44% from Nx. There is no difference in ATP levels in Nx compared to Hyx, with percent difference of 4%. As shown previously, lactate (mmol/g) levels increased in hypoxia from normoxia from 9.37 to 40.04 with a p value < 0.05 and an increase of 76% from Nx. In this study, the lactate level in Hyx of 7.94 did not differ from Nx of 9.37, a percent difference of 15%.
Conclusion(s) Lactate accumulates in the brain after hypoxia, but not after hyperoxia. The fact that energy levels did not change during hyperoxia supports the lack of lactate changes in hyperoxia in the present study compared to normoxia. We have previously shown that during hyperoxia there is increased activation of the apoptotic proteins and DNA fragmentation. However, the ability to maintain ATP production through the electron transport chain appears to remain intact during hyperoxia. Alternatively, the presence of oxygen may have removed additionally lactic acid by replacing it in its former position in the tissues (Fletcher and Hopkins). In contrast to hypoxia, the anaerobic pathway is not activated during hyperoxia, allowing for continuation of aerobic metabolism, via pyruvate entrance into the kreb cycle, limiting lactate production.

Abstract: 131
Trends in the incidence of bronchopulmonary dysplasia after the introduction of NAVA (Neurally adjusted ventilatory assist) mode of ventilation.
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Background Extended periods of invasive ventilation may lead to lung injury resulting in evolving bronchopulmonary dysplasia (BPD). Different modes of ventilation have been studied and all except volume guarantee mode, has failed to show a reduction in the incidence of BPD. There can be significant asynchrony with patient efforts in traditional ventilators. NAVA

improves patient-ventilator synchrony in neonatal as well as older population. A less explored area is the effect of NAVA ventilation on the incidence of bronchopulmonary dysplasia.
Objective To study the difference in rates of bronchopulmonary dysplasia in VLBW and ELBW infants before and after the introduction of the NAVA mode of ventilation.
Design/Methods This is a retrospective cohort study comparing rates of BPD before and after implementation of NAVA. NAVA group included patients born from 2015-2017 after the introduction of NAVA, and the non-NAVA group included patients born from 2011-2014. Eligibility criteria included very low birth weight (VLBW) and extremely low birth weight (ELBW) neonates if they spent any time on invasive or non-invasive ventilation. Neonates with congenital anomalies, subglottic stenosis were excluded. BPD was defined using the NICHD definitions. For data analysis, each cohort was divided into 3 subgroups based on gestational age. Changes in the rate of BPD, hospital days, total ventilator hours, and home oxygen therapy were compared between the 2 cohorts.
Results Neonates born at 29-32 weeks'gestation in the NAVA cohort had lower rates of mild (7.1% vs. 2.3 %) and severe BPD (3.6% vs. 0%), as well as an increased percentage with no BPD (77.3% vs. 71.4%) compared to the Pre-NAVA group. Neonates born at 23-25 6/7 weeks' gestation in the NAVA cohort, had reduced mild (15% vs 11.1%), severe BPD (5.6% vs. 0%) and increased percentage of neonates with no BPD (55% vs. 44%) compared to the Pre-NAVA group. No significant difference was found in oxygen requirement at 28 days or 36 weeks' postmenstrual age, total hospital days and total intubated hours between the two cohorts. NAVA was associated with a decreased percentage of patients that went home on oxygen in 29-32 week (9.1% vs. 18%) and 23-25 6/7 week (36% vs. 45%) among subgroups
Conclusion(s) NAVA mode was associated with reduction in mild and severe BPD in 23-25 6/7 and 29-32 weeks' gestation infants, and fewer patients discharged home on oxygen.

Home Oxygen therapy

Groups	Pre-NAVA	NAVA	P value 9 significant <0.05)
23-25 6/7 weeks	45% (9/20)	36% (13/36)	0.5
29-32 weeks	18% (5/28)	9.1% (4/44)	0.27

BPD in two cohorts

Groups	No BPD	Mild BPD	Moderate BPD	Severe BPD
23-25 6/7 week Pre-NAVA	0% (0/20)	15% (3/20)	30% (6/20)	55% (11/20)
23-25 6/7 NAVA	5.6% (2/36)	11% (4/36)	39% (14/36)	44% (16/36)
29-32 weeks Pre-NAVA	71% (20/28)	7% (2/28)	10.7% (3/28)	10.7% (3/28)
29-32 weeks NAVA	79% (35/44)	2.3% (1/44)	18% (8/44)	0% (0/44)

Abstract: 132
National Variation of Early Use of Selected Medications in Extremely Low Birth Weight (ELBW) Infants
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Background Understanding variation in clinical management may identify areas needing quality improvement or practices lacking consensus. Emerging evidence suggests prophylactic use of caffeine (CAF) is beneficial whereas early use of dexamethasone (DEX) is associated with significant adverse effects in ELBW infants. Prophylactic use of indomethacin (INN) and vitamin A (VitA) remains controversial. However, contemporary usage of these medications among children's hospitals is not well-characterized, nor are patient or hospital factors associated with receipt of medication.
Objective To describe national variation of selected early medication use in ELBW infants, and to examine hospital and patient factors that influence current usage.
Design/Methods A retrospective cohort of ELBW infants (birth weight 500-999g with gestational age 24-28 weeks) admitted in 2016-2017 from hospitals participating in the Pediatric Health Information System was identified for analysis. Additional

eligibility criteria were listed in Table 1. Spearman's rank correlation was calculated to determine if use of one medication is correlated with use of another among hospitals. Multivariable logistic regression assessed the association between medication use with patient factors such as demographics and need for mechanical ventilation, and with hospital factors such as ELBW patient volume.

Results 2539 (for VitA, CAF, DEX) and 2464 (for INN) eligible ELBW infants were identified from 33 hospitals in 2016-2017. Table 2 showed the patient and hospital baseline characteristics. There was substantial variation in medication use among hospitals (Figure 1). The only hospital factor associated with current use of any medication was prior use of medication from 2007-2008 ($p<0.05$ for all medications). Only use of VitA and INN were significantly correlated (Spearman's coefficient=0.38, $p=0.03$). Statistically significant patient-level factors associated with use of medication are listed in Table 3. There remained significant inter-center differences in usage of VitA, CAF, and INN ($p<0.001$) that were still unexplained by patient characteristics including mechanical ventilation in early life.

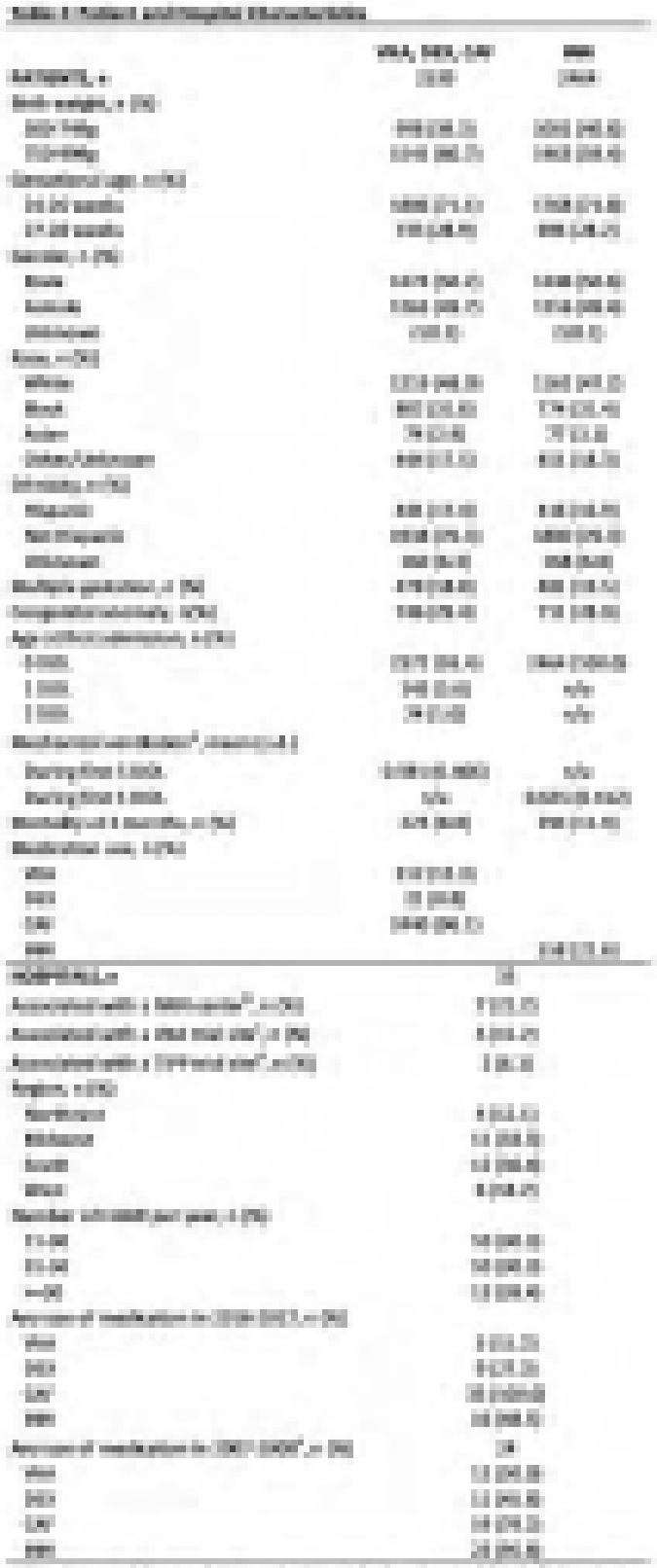
Conclusion(s) Significant variation of medication use exists nationally that are not explained by patient case-mix or hospital characteristics, suggesting that there are other unmeasured factors influencing usage, such as provider preference. A national quality improvement collaborative is essential to reduce unwarranted variations in the use of these early treatments.

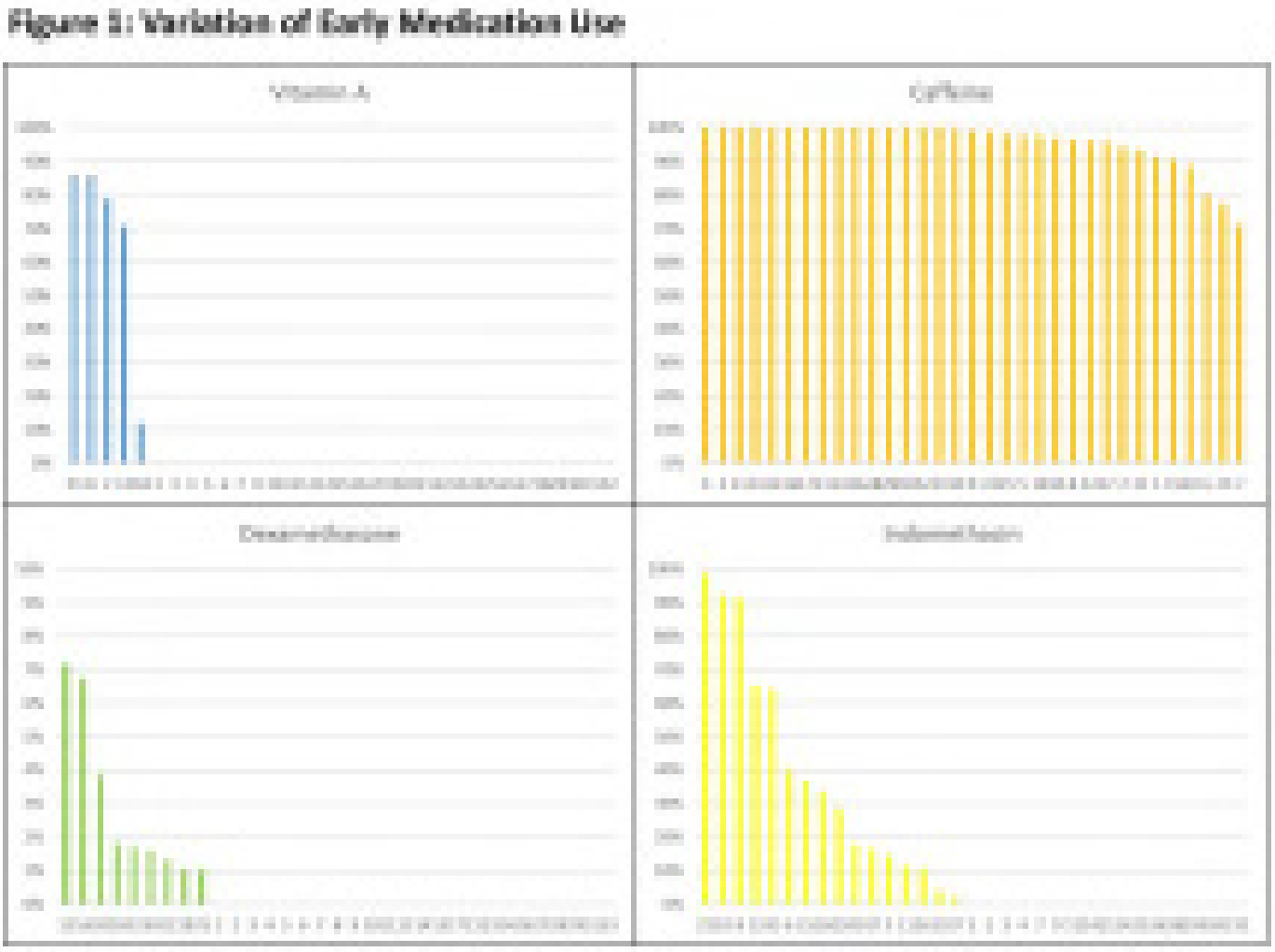
Table 1: Eligibility Criteria for Study Cohort

Eligibility Criteria	VitA	DEX	CAF	INN
First admission year	2016-2017			
ELBW	BW 500 - 999g AND GA 24 0/7 - 28 6/7 weeks			
First admission	≤ 2 DOL			0 DOL
Length of stay	≥ 5 days			≥ 2 days
First use of medication	≤ 7 DOL			≤ 1 DOL

BW = birth weight, GA = gestational age, DOL = day of life.

Note: Hospitals that admit fewer than 10 ELBW infants in the first 2 DOL per year in the study period were excluded. Patients without billing data <= 7 DOL (for VitA, DEX, CAF) or <=1 DOL (For INN) were excluded.





Abstract: 133

Too much of a good thing: How instant access to answers interferes with residents learning vaccines

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Background Childhood immunizations are an important part of pediatric residency education and fall under the practice-based learning, patient care and medical knowledge core competencies of the ACGME. Studies have shown that although knowledge of vaccines correlate with years of training, deficits still persist. Many institutions use an EMR that alerts the provider when a vaccine is due. These systems do not necessarily benefit resident education, and may undermine learning. At our institution, residents are given a registry that lists required vaccines at the beginning of each patient visit. Dependency on this appears to prevent independent competency in this critical aspect of pediatric care. There is little data on resident knowledge of immunizations, the impact of an immunization curriculum, or the effects of access to an immunization registry.
Objective To implement a curriculum that will improve resident knowledge of vaccine schedules, side effects and contraindications, and make residents more competent in vaccine administration without the aid of a registry.
Design/Methods A pre-test was given to each pediatric resident in July 2018 and a post-test was given 5-6 months later. The intervention consisted of links to online modules, a series of noon conferences, and withholding of the vaccine registry. The test questions assessed resident knowledge of vaccine schedules and important vaccine contraindications. Results of the pre-test and post-test were input into Microsoft Excel and analyzed using basic statistics and paired t-test. The primary outcome measure was the change in test score average from pre-test to post-test.
Results 39 residents participated in the study (15 PGY-1, 14 PGY-2 and 10 PGY-3). Each completed a pre- and post-test. Overall, scores increased by 16.4% (60.9 to 70.9, p<0.001). PGY-1 residents' post-test scores improved 20.9% (52.1 to 63.0, p=0.037), PGY-2 residents' post-test scores improved 15.4% (64.9 to 74.8, p=0.016) and PGY-3 residents' post-test scores improved 13.1% (68.5 to 77.5, p=0.010) when compared to pre-test scores.
Conclusion(s) There was a significant improvement in resident test scores with the elimination of the registry, inclusion of the noon conference lectures and links to online modules. However, the continued low test scores suggest a continued deficit in knowledge regarding vaccine administration for individual patients. Further tailored teaching and restriction of registry access may be required to address this gap.

Abstract: 134
Medical Errors during Training: How Do Residents Cope
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Background Physicians' self-perceived medical errors lead to substantial emotional distress. Medical errors during residency are associated with increased burnout, and depression, which in turn can impact patient safety. Yet, it is unclear how medical residents cope with their direct involvement in medical errors, and how they gain emotional support around disclosure.
Objective To assess the impact of self-perceived medical errors on residents' well-being, the range of coping strategies during training, and the extent of individual and institutional support
Design/Methods A cross sectional electronic survey was administered via email to 400 residents across all specialties in a single urban tertiary-care medical center in Philadelphia. The survey covered 4 domains focusing on their "most serious medical error during residency": 1) Self-perceived involvement, 2) emotional response, 3) coping strategies (using a validated scale), 4) personal and institutional support
Results Respondents: 109 medical residents from Internal Medicine (32%), Pediatrics (29%), Emergency Medicine (20%), or other (19%). Level of training: PGY3 (32%), PGY2 (29%), PGY1 (28%), PGY4-6 (11%). 1) Self-perceived involvement in medical errors: Table 1 enumerates residents' classification of their most serious medical error during training; 7% of those errors resulted in permanent consequences to their patients. 2) Emotional responses: most residents acknowledged a sense of guilt, remorse and inadequacy to a moderate or great extent after the event. 3) Coping strategies: majority reported using adaptive coping strategies after errors. Open-ended responses pointed to fear of retaliation and judgement. 4) Personal and institutional support: 75% did not discuss their medical error with the patient/family; 43% could not recall a debriefing session; 8% did not discuss the error with anyone. Among 47% residents who discussed their error with a faculty member, 25% did not feel supported. PGY2's were least likely to feel supported.
Conclusion(s) Self-perceived medical errors during residency were widespread among responders (95%), with 1:5 self-classified as moderate to severe (life-threatening). Most residents used adaptive coping strategies after an event, but expressed fear of consequences, which may in turn effect patient safety. Future interventions focusing on residents' emotional responses regarding medical errors should also address other key factors identified in our survey: patient safety, disclosure skills, post-event debriefing,faculty involvement and training, and institutional support.

Table 1: Most serious medical error in residency

Type of Error	% of residents

NEAR-MISS (an error occurred but did not reach the patient)	76
MINIMAL (an error reached the patient, causing minimal or no detectable harm)	45
MODERATE (moderate patient harm, requiring intervention)	13
SEVERE (life-threatening, requiring intervention to sustain life	6
None	5
Death	1

Abstract: 135

Knowledge Deficiencies of Pediatric Residents Regarding Celiac Disease and Gluten-Free Diets

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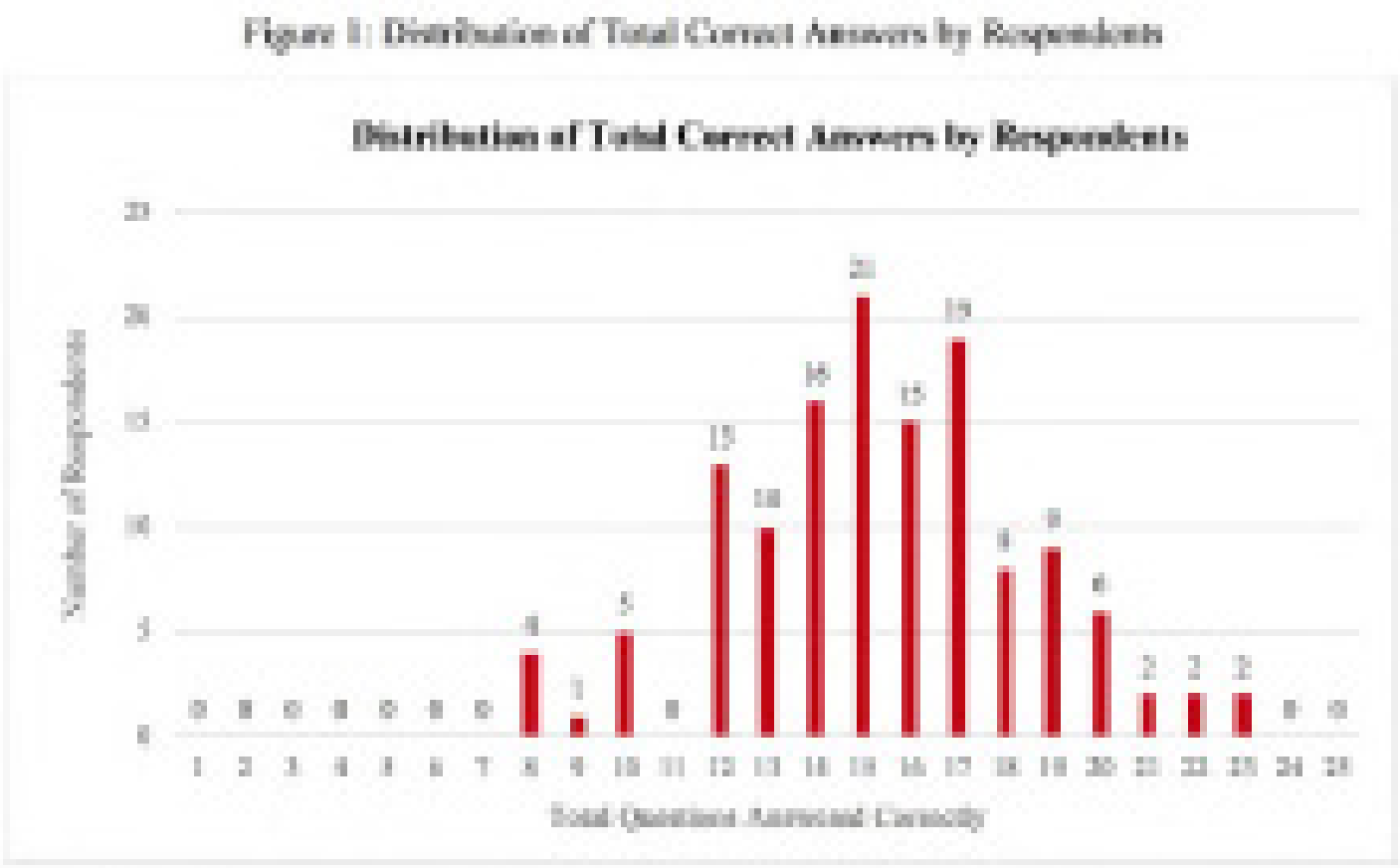
Background Worldwide, rates of Celiac Disease (CD) diagnosis are on the rise, with an increase from 0.2% to 1% in the U.S. alone over the last 50 years. CD, in which the protein gluten erodes the small intestines, necessitates that patients adhere to a strict gluten-free diet (GFD). It is therefore important that pediatric residents (PRs) be knowledgeable about CD so that they may advise patients and their parents on the disorder and necessary lifestyle changes. To date, however, no study has examined whether PRs are in fact knowledgeable about these topics and where specific knowledge gaps may lie.

Objective To examine significant gaps in PR knowledge of CD/GFDs, contributing to lower self-reported comfort in parental guidance.

Design/Methods Via an anonymous, online survey that was emailed to Chief Residents for distribution to residents in their program, PRs were asked 25 factual questions about GFDs and CD, including gluten-containing foods, who to recommend for a CD screening, and diagnosis, symptoms, and prevalence of CD, among others. Data was then analyzed using descriptive statistics.

Results Of the 133 respondents, the majority of PRs (89.4%, n=119) greatly underestimated the prevalence of Celiac Disease and the majority did not know to screen a child for CD if they had a parent with the disease (66.9%, n=89) or if the child patient had Down Syndrome (75.2%, n=100). Only 14.4% (n=55) of pediatric residents correctly selected endoscopy as the "Gold Standard" for CD diagnosis. Of the questions asking about certain foods, respondents commonly missed recognizing that breakfast cereals (60.2% missed, n=80), cookies (31.6% missed, n=42), and soy-containing products (55.6% missed, n=74) contain gluten. Overall, no resident correctly answered all of the factual questions and the average number of correct answers was 15.38 out of 25, with only 9.0% (n=12) scoring 80% correct or higher (Figure 1).

Conclusion(s) Our study has shown that there are significant gaps in PR knowledge of CD/GFDs. Especially concerning were the underestimation of CD, the lack of understanding of diagnosing CD, and the inability to recognize individuals that should be routinely screened for CD. While identification of all gluten-containing foods may not be essential knowledge, respondents frequently missed identifying several common child-geared foods containing gluten, which may have concerning implications for their ability to adequately counsel parents asking about GFD-safe foods.



Distribution of Total Correct Answers by Respondents

Abstract: 136

Impact of a High-Fidelity Simulation Curriculum on Multidisciplinary Teamwork During Resuscitation and Transport of ELBW Infants

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Background There is a paucity of studies evaluating the impact of simulation on teamwork during the transport of ELBW infants from the delivery room to the NICU, a crucial period that can impact ELBW infant morbidity and mortality.

Objective We hypothesize that a multidisciplinary high-fidelity simulation curriculum will improve teamwork during resuscitation and transport of ELBW infants from the DR to the NICU, and decrease the time to complete key resuscitation and transport tasks.

Design/Methods A needs assessment was performed by obtaining a teamwork survey of all NICU providers and direct observation of 8 high risk deliveries using the Clinical Teamwork Scale (CTS) (Fig 1).

A prospective cohort study evaluated the effect of high-fidelity simulation scenarios involving ELBW infant resuscitation and transport upon teamwork. A total of 7 teams (each with 1 NICU fellow, 2 NICU nurses, and 1 RT) performed a series of 3 scenarios, spaced about 2 months apart. Debriefing focused on improving teamwork. All scenarios were videotaped and graded for teamwork skills by 3 independent raters using the CTS. Times to complete key resuscitation and transport tasks were recorded.

A post-intervention teamwork survey of all NICU providers was obtained 3 months later.

Results 70-83% of respondents in the pre-intervention survey (n=54) felt current teamwork was satisfactory to exceptional. However, on direct observation of high-risk deliveries, providers scored in the CTS average category (5.25-6.25 out of 0-10). In the simulation cohort, there was no significant difference in CTS scores from Scenario 1 to 3. However, scenarios led by first-year fellows showed a trend towards improvement in all CTS categories (Fig 2). Overall, time to complete key resuscitation and transport tasks decreased, with a significant decrease in the time to attach the pulse oximeter (0.8 min to 0.6 min, p=0.02), to transfer the infant to the transport isolette (11.8 min to 8.7 min, p=0.05), and exit the DR (14.0 min to 10.4

min, p=0.02) (Fig 3).

Post-intervention survey responses (n=56) demonstrated an overall improvement in self-perception of teamwork behaviors following completion of the simulation curriculum (Fig 4).

Conclusion(s) A high-fidelity teamwork-based simulation curriculum decreased time to complete key clinical tasks in the resuscitation and transport of an ELBW infant. There was no significant increase in teamwork scores; however, there was a trend towards increased teamwork in scenarios led by junior fellows.

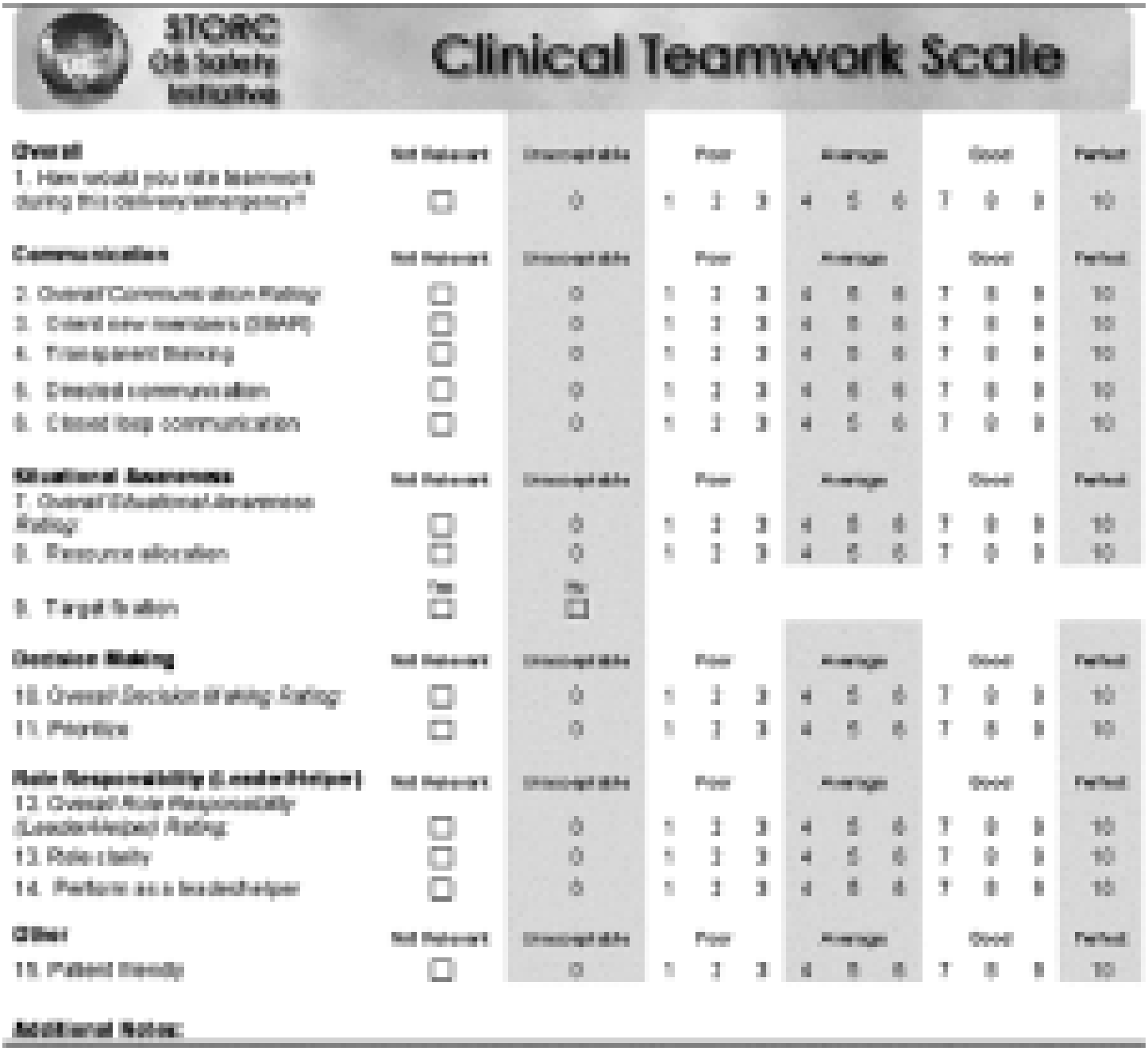

Figure 1: The Clinical Teamwork Scale. This is an objective tool to assess multidisciplinary teamwork that has been previously validated in the delivery room.

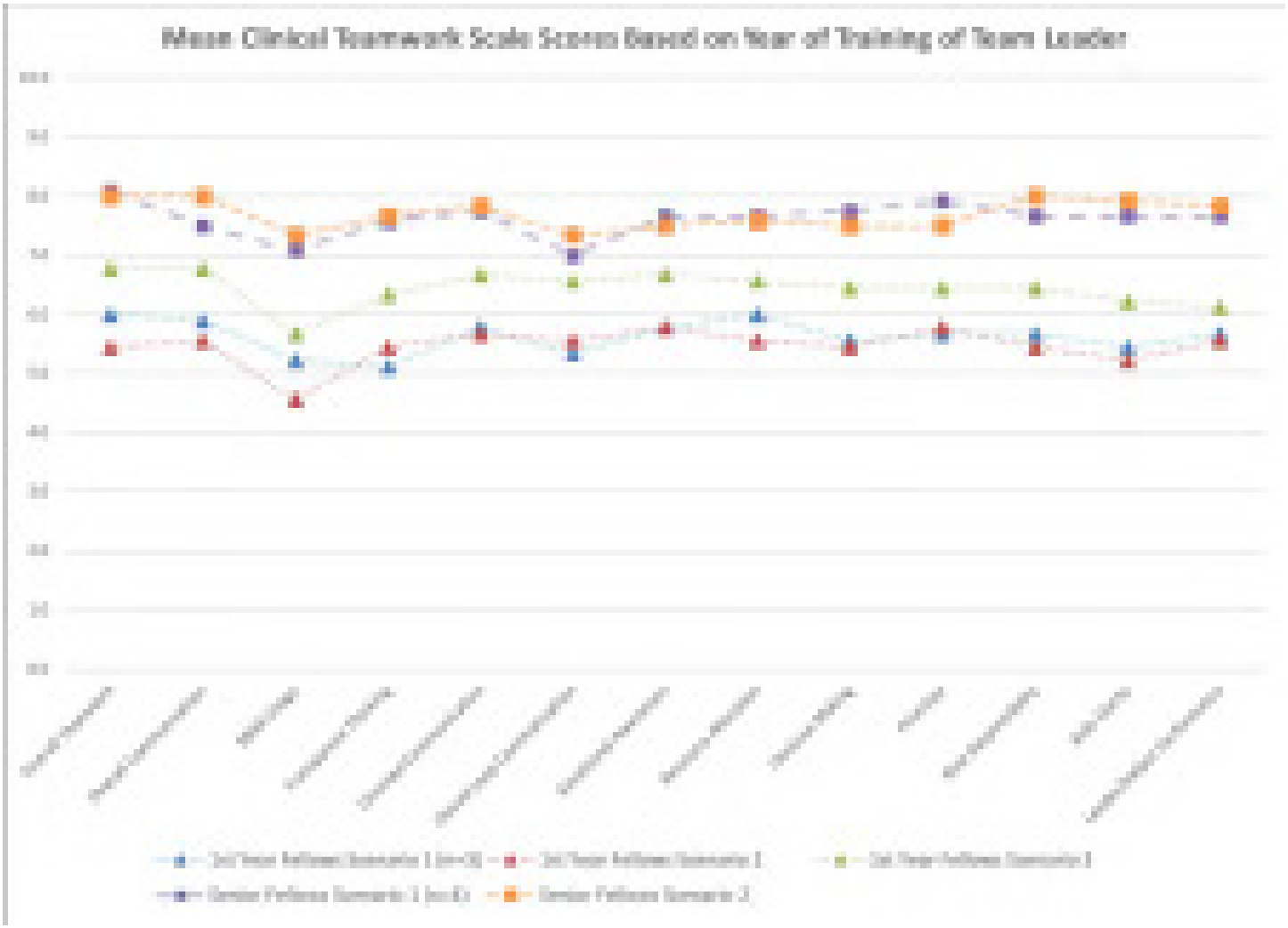

Figure 2: Mean Clinical Teamwork Scale Scores Based on Year of Training of Team Leader. There was an overall improvement in all CTS categories from Scenario 1 to Scenario 3 for scenarios led by first year fellows.

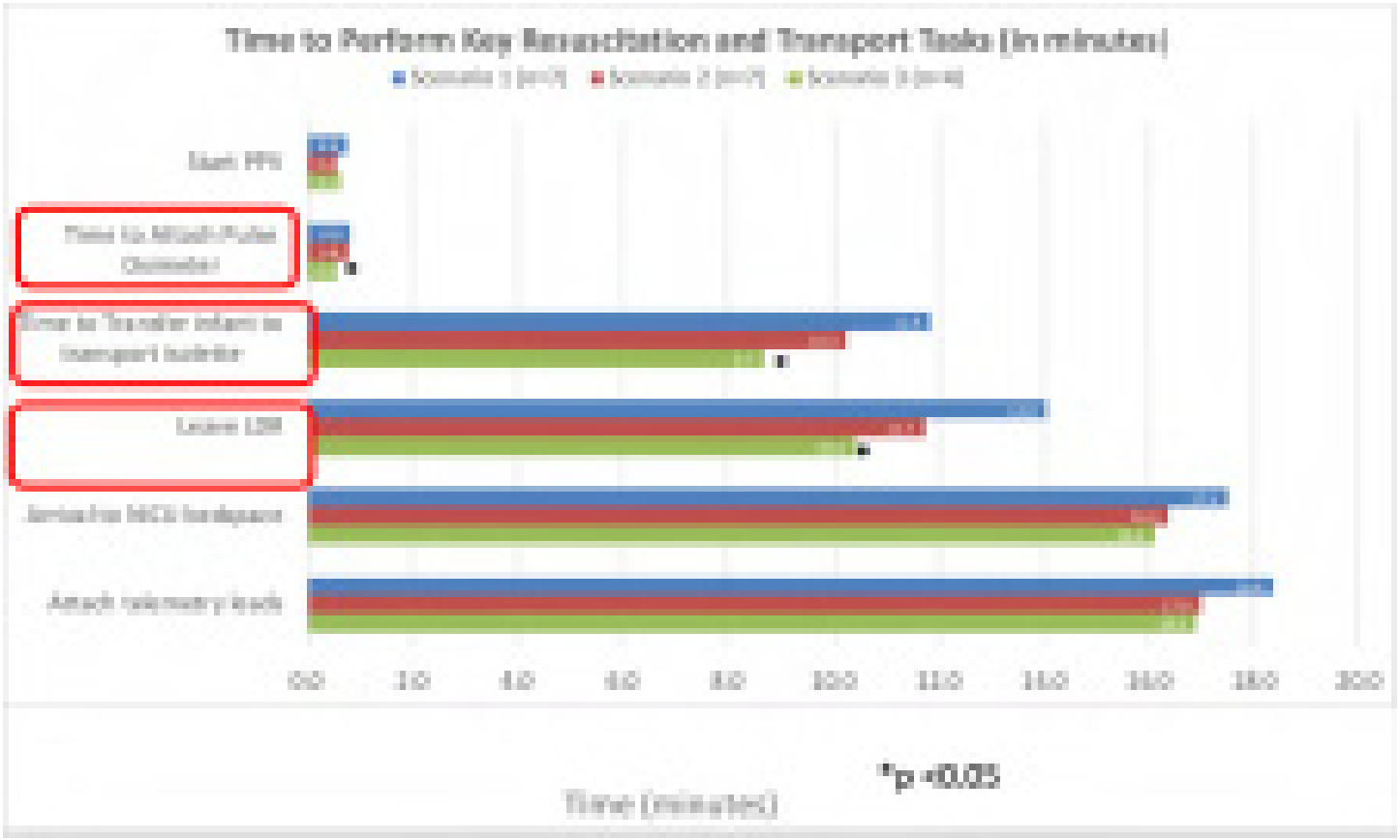

Figure 3: Time to Perform Key Resuscitation and Transport Tasks (in minutes).

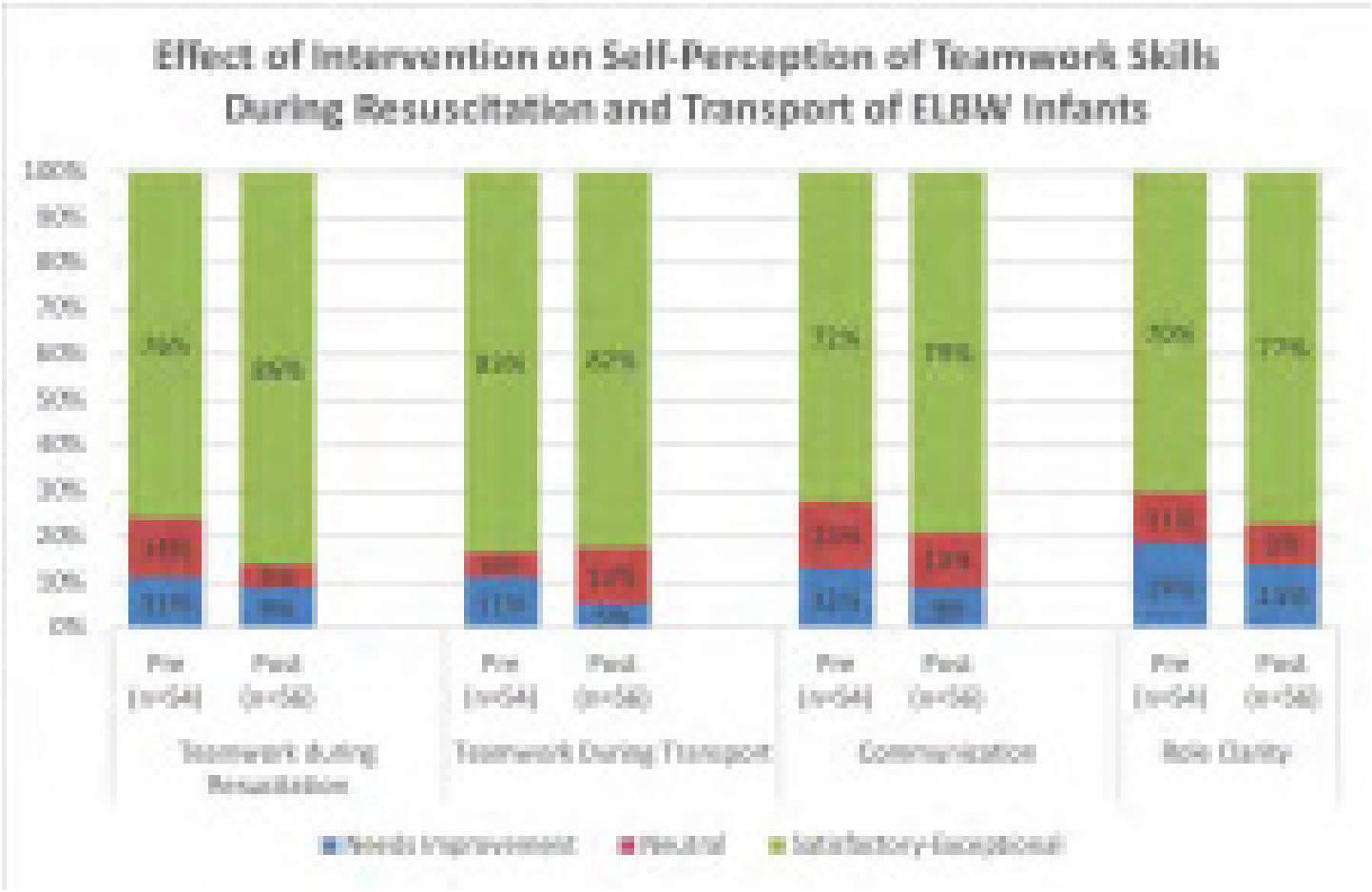

Figure 4: Effect of Intervention on Self-Perception of Teamwork Skills During Resuscitation and Transport of ELBW Infants. A comparison of pre-intervention and post-intervention survey responses showed that the percentage of survey respondents rating teamwork skills as satisfactory to exceptional increased, whereas those rating teamwork skills as needing improvement decreased.

Abstract: 137

An Interprofessional Unit Based Feedback Workshop

Heidi M. Herrick[1], Rebecca Tenney-Soeiro[2], Chavis Patterson[1], Kristen Gerhardt[1], Scott Switalski[3], Laura Robinson[3], Anne Ades[2]

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Background Feedback is paramount to maintain and improve interprofessional collaboration, communication, and clinical skills. Team performance has been shown to improve with intrateam feedback in multiple studies. Unfortunately, giving and receiving feedback are challenging skills to master. In response to the identification of the need for more effective and increased feedback by all levels of providers in the Neonatal and Infant Intensive care unit (N/IICU), we created a N/IICU specific feedback workshop.

Objective To design and implement an interprofessional N/IICU specific feedback workshop. To determine whether the feedback workshop improved feedback comfort and practices as compared to baseline.

Design/Methods We designed a 2-hour interprofessional feedback workshop that featured active discussion and role-playing of N/IICU specific scenarios. All participants took a pre-workshop survey to evaluate baseline frequency of feedback and assess comfort and skill. A post-workshop survey was administered one month after completion of the workshop to evaluate changes from baseline. Pre and post-workshop survey results were compared using sign tests. An evaluation was completed at

the end of the session to ensure the workshop met learner's needs.
Results We held 22 sessions from 12/2017 through 9/2018 with a total of 252 attendees. 193 (77%) people completed the pre-workshop survey representing 12 different healthcare professions within the N/IICU (Table 1). 129 (51%) people completed the one-month post-workshop survey. Baseline data revealed that most providers provided feedback 3-5 times per month. Post-workshop surveys showed a statistically significant improvement in comfort giving feedback (p=0.04). There was no change in comfort receiving feedback or in frequency of feedback given or received. Open-ended evaluations of the workshop were overwhelmingly positive.
Conclusion(s) These results show that a feedback curriculum is feasible, widely accepted, and has the potential to improve feedback comfort and skills. The workshop focused primarily on giving feedback, rather than receiving, which may explain the improved comfort with giving but not receiving feedback. The lack of an increase in feedback delivery demonstrates the need for continued efforts to reinforce a culture of feedback. Our next steps are to offer ongoing mini-workshops for additional feedback training.

Table 1. Workshop Attendees by profession*

Healthcare Profession	Number of participants
Registered Nurse	120
Physician	18
Nurse Practitioner	17
Physician Assistant	14
Respiratory Therapist	9
Speech Therapist	6
Social Worker	2
Nutritionist/Dietician	2
Occupational Therapist	2
Case Manager	1
Physical Therapist	1
Safety Quality Specialist	1

*Representing only participants who completed pre-workshop survey

Abstract: 138
Assessment of Narcotic Prescribing and Prescription Fill Rates in Pediatric Patients with Acute Long Bone Fractures
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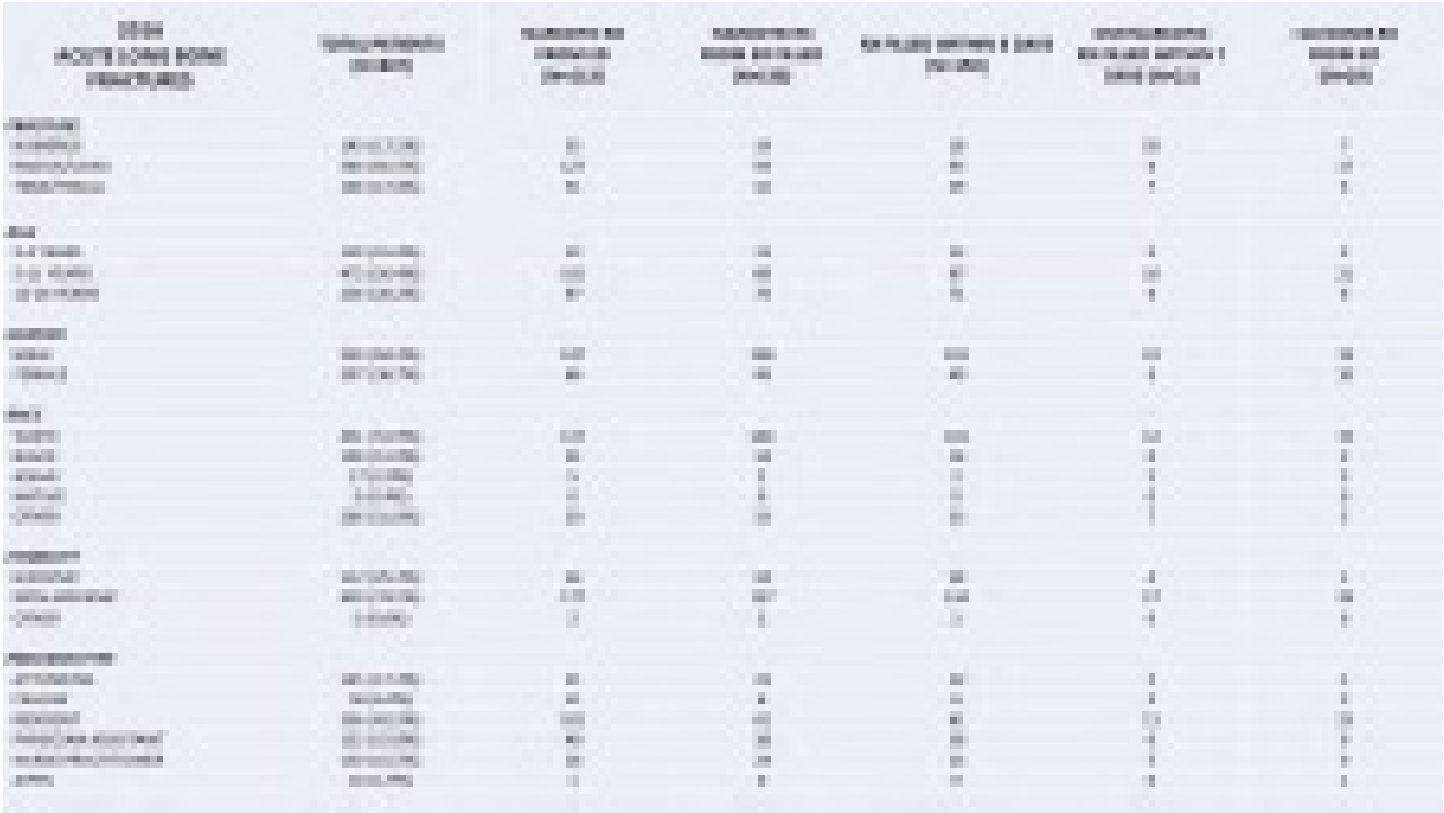
Background Emergency Department (ED) providers may be contributing to the opioid epidemic by prescribing narcotics. Or the epidemic may be causing a fear of prescribing/filling narcotics resulting in under-treatment of pain. Prescription (Rx) filling behaviors have not been previously described. This is a novel approach to evaluate pediatric narcotic prescribing and Rx filling practices using a state prescription monitoring program (PMP) database.
Objective To determine narcotic Rx practices for children ages 2-18 years with acute long bone fractures.
Design/Methods A retrospective chart review was conducted to identify patient charts for humerus, radius/ulna, and tibia/fibula fractures in 2016. Inclusion criteria were age 2-18 years, acute long bone fracture, and discharged from ED. A PMP was used to determine if/when the patient had filled an ED provided narcotic Rx or if one was given by any outside

provider.

Results 1311 charts were reviewed and 474 excluded. Among the patients (n = 837) included they were 63% male; 54% white vs 12% black; 25% Hispanic, and mean age was 8.8 ± 3.9 years. 213 (25%) received narcotic Rx and 153 (72%) filled their Rx. 150 (98%) of all filled Rx were within 3 days. See figure 1 for detailed data. Chi squared analysis showed that narcotic Rx were given most often to 5-11 year olds (48%, p<0.05); whites (64%, p<0.001); non-Hispanics (84%, p<0.001); and males (69%, p<0.05). However, filling rates were greatest for 2 to 4-year olds (100%, p< 0.05). Tibia/fibula fractures had a higher rate of Rx (35%, p<0.01) and fill (80%, p<0.05). Rx with >18 narcotic doses were given 14% of the time and mostly by trainees (86%). Only 3% of non-narcotic Rx patients received one from an outside provider.

Conclusion(s) One quarter of patients discharged from the ED with acute long bone fractures received narcotic Rx and most were actually filled. Those most likely to receive narcotic Rx were 5-11 year olds, white, non-Hispanic and male. Pain control needs for 2-4 year olds should not be overlooked as they received the least narcotic Rx but had the highest fill rate. This may indicate that the younger aged patients are being under treated. Rx's beyond the recommended 3 days of dosing were most often written by trainees which may demonstrate an educational opportunity. Outside narcotic Rx were rarely found in PMP, which may indicate that pain control needs are mostly addressed by the PED. Future studies should explore parental perceptions about filling, using and disposing of narcotic Rx's.



Abstract: 139

Quality Improvement Initiative to Reduce Door-to-Insulin Time for Diabetics in the Pediatric Emergency Department

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Background Diabetic ketoacidosis (DKA) is a leading cause of morbidity and mortality in pediatric diabetics with an incidence from 1-10% per year. Current guidelines from the International Society for Pediatric and Adolescent Diabetes (ISPAD) recommend prompt insulin administration in the setting of DKA.

Objective To reduce the door-to-insulin time from a mean of 211 minutes to 170 minutes (~20%) for diabetics with ketosis presenting to a tertiary care pediatric emergency department (ED) over a period of six months.

Design/Methods A multidisciplinary team process mapped the care of diabetic patients presenting to the ED with hyperglycemia and ketosis. A standardized clinical pathway was created to streamline the delivery of fluids and insulin with a target insulin administration time of 120 minutes from ED arrival. Subcutaneous insulin was the preferred route of initial insulin administration in all patients requiring insulin. Boluses were given over 30 minutes and nursing protocol was set to

check blood glucose after bolus completion and report the result to the provider. A bicarbonate level of less than 13 was used to delineate patients requiring IV insulin infusion. An order set was created to facilitate utilization of the pathway and all staff were trained on its use. Baseline values were obtained from January 1, 2017 to December 11, 2017 and the pathway was implemented on December 12, 2017. Plan-do-check-act cycles were utilized to identify and resolve barriers to prompt insulin delivery. Our primary outcome measure was door-to-insulin time and our secondary outcome measure was discharge rate from the ED. Our balancing measure was 72 hour return to the ED. Statistical process control methods were used to monitor outcome measures over time.

Results We identified 290 ED visits from January 1, 2017 to September 24, 2018. Of these, 143 (49.3%) occurred after pathway implementation. An immediate special cause shift was detected upon pathway implementation in December. The door-to-insulin time decreased from a baseline mean of 211 minutes to 154 minutes (Fig. 1). The rate of admission from the ED decreased from a baseline of 79% to 69% (Fig. 2). There was no impact on ED length of stay or hospital length of stay. Within the study population, no children discharged from the ED returned within 72 hours of evaluation.

Conclusion(s) A multidisciplinary quality improvement initiative was associated with decreased door-to-insulin times and hospital admissions without an increase in 72 hour returns to the ED.

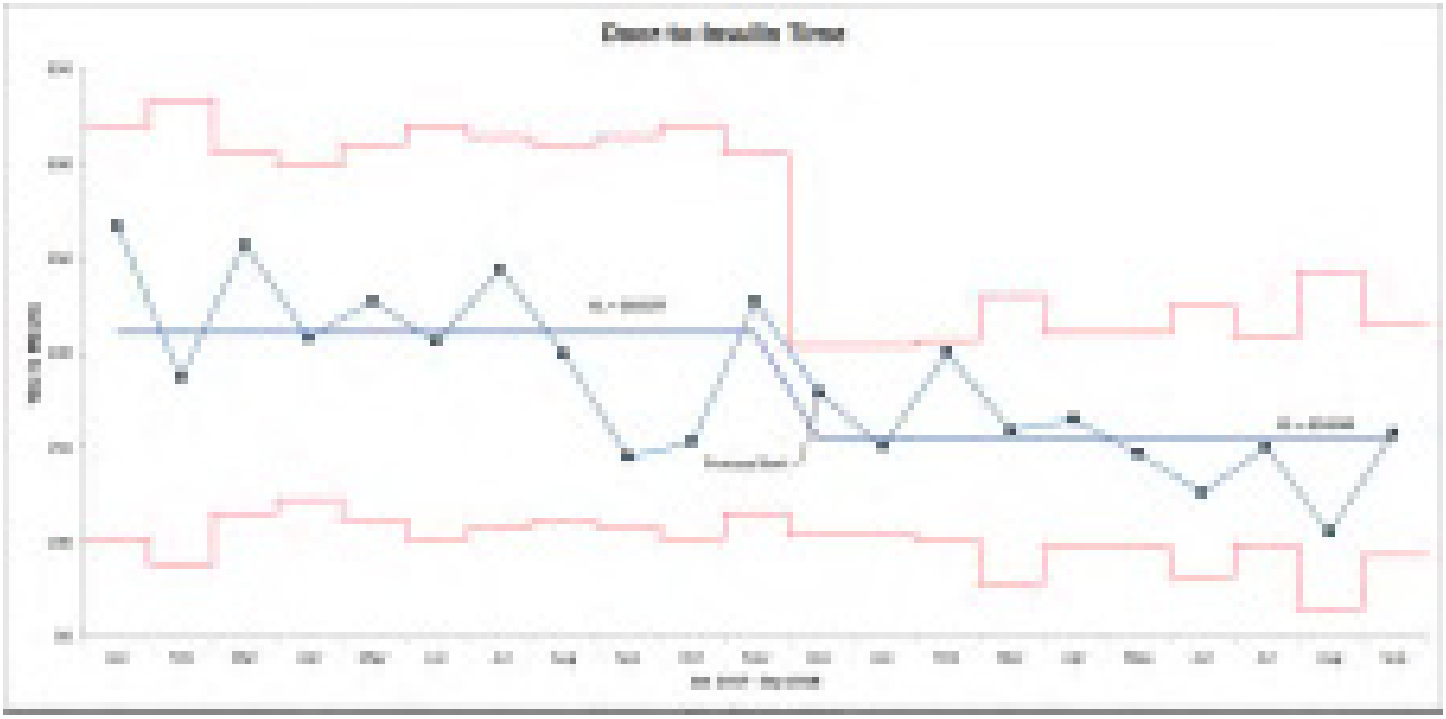

Fig. 1: Door-to-insulin time from January 2017 to September 2018

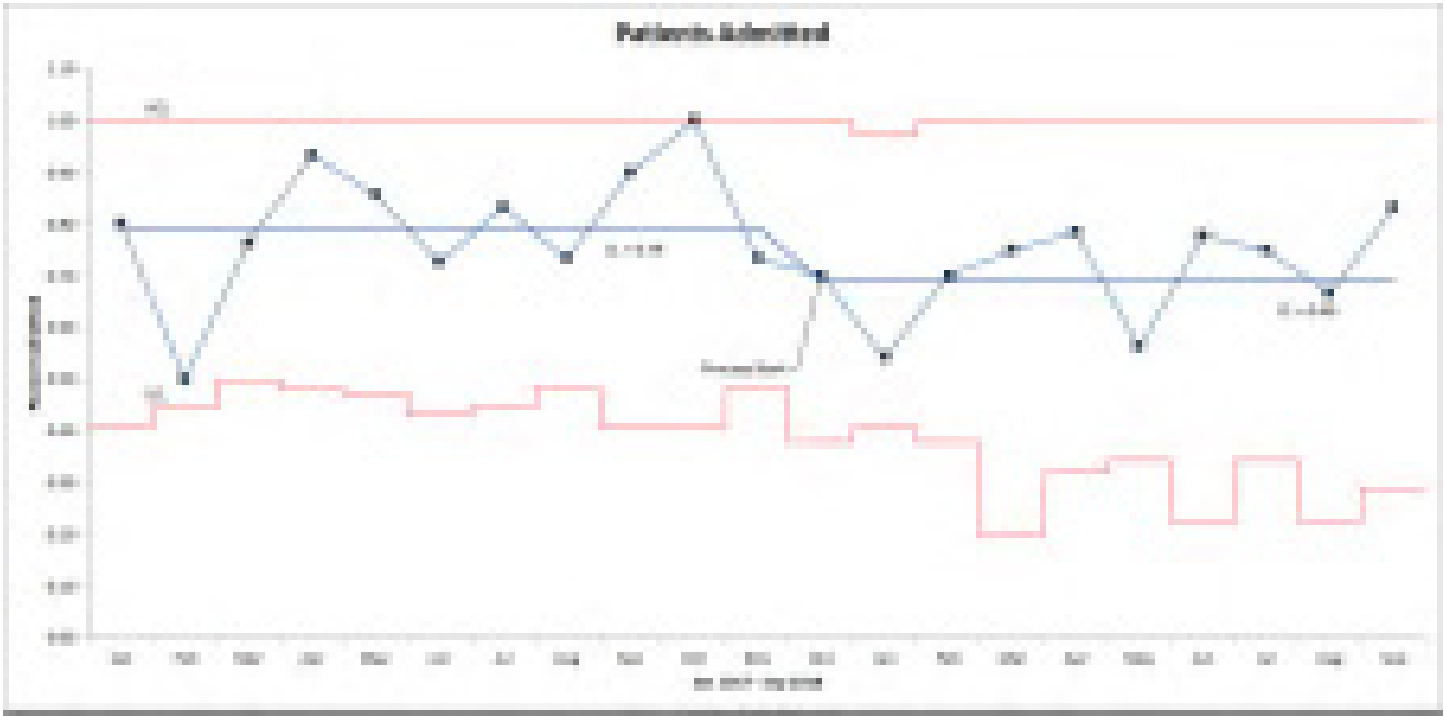

Fig. 2: Percentage of diabetic patients admitted from January 2017 to September 2018

Abstract: 140

Comparison of Paper and Electronic Medical Record Documentation for Trauma Activations in a Pediatric level 1 Trauma Center

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Background There is increasing utilization of the electronic medical record (EMR) in the emergency department (ED). Historically, documentation of trauma activations has been recorded on paper. There is limited data on the accuracy of documentation of trauma activations in the EMR as compared to a paper chart.

Objective To compare the accuracy of trauma activation documentation between a paper chart and the electronic medical record in a pediatric ED.

Design/Methods We conducted a study of all trauma activations at a level 1 pediatric trauma center from September 2017 to October 2018. At our institution, trauma activations are video-recorded. These videos were reviewedwere reviewed and data points collected as part of a quality improvement initiative. We used the video recordings to compare the accuracy of documentation in both the paper chart and the EMR. The data points collected included pre-arrival information, components of the primary and secondary survey, and interventions. Pre-Arrival documentation includes arrival of the patient, ED attending, and trauma service. Intervention documentation includes procedures and administration of intravenous fluids and pain medications. The IRB reviewed the protocol and granted a waiver.

Results One hundred and six video-recorded trauma activations were reviewed. In total, we collected 1,614 data points from the recordings. Of those, 805 data points were compared to their corresponding paper chart with 710 data points correctly documented (88.2%). The remaining 809 data points were compared to their corresponding documentation in the EMR with 681 data points being correctly documented (84.2%). Overall, we found that documentation on paper was significantly more accurate than documentation in the EMR (p=0.019). When analyzed in subcategories of pre-arrival information, primary and secondary survey, and interventions, documentation on the paper chart was found to be significantly more accurate than the EMR for the primary and secondary survey (p=0.001). There was no significant difference in accuracy of documentation of pre-arrival information or interventions (see Figure 1).

Conclusion(s) Documentation of trauma activations is overall more accurate using a paper chart than the electronic medical record. Although, the documentation was accurate for the majority of individual categories using both a paper chart and the

EMR, we found significantly less accuracy in documentation of the components of the primary and secondary survey in the EMR.

Figure 1: Rates of correct documentation between the paper flow chart and EMR.

Method of Documentation	Correct Documentation	Incorrect Documentation	p-values
All data points			
Paper (n=805) EMR (n=809)	88.2 % 84.2 %	11.8 % 15.8 %	p= 0.019
Pre-Arrival			
Paper (n=202) EMR (n=208)	88.1 % 89.4 %	11.9 % 10.6 %	p= 0.676
Primary/Secondary Survey			
Paper (n=500) EMR (n=501)	87.3 % 80.4 %	12.2 % 19.6 %	p= 0.001
Interventions			
Paper (n=103) EMR (n=100)	90.3 % 92 %	9.7 % 8 %	p= 0.669

Abstract: 141

Improving Time to Pain Medication for Sickle Cell Patients at a Pediatric Emergency Department

Angelica M. Garcia[1], Isabel Gross[1], Christopher Woll[1], Kei Wong[1], Meghan R. Beucher[2], Seth Woolf[1], Storm Liebling[1], Beth L. Emerson[1]

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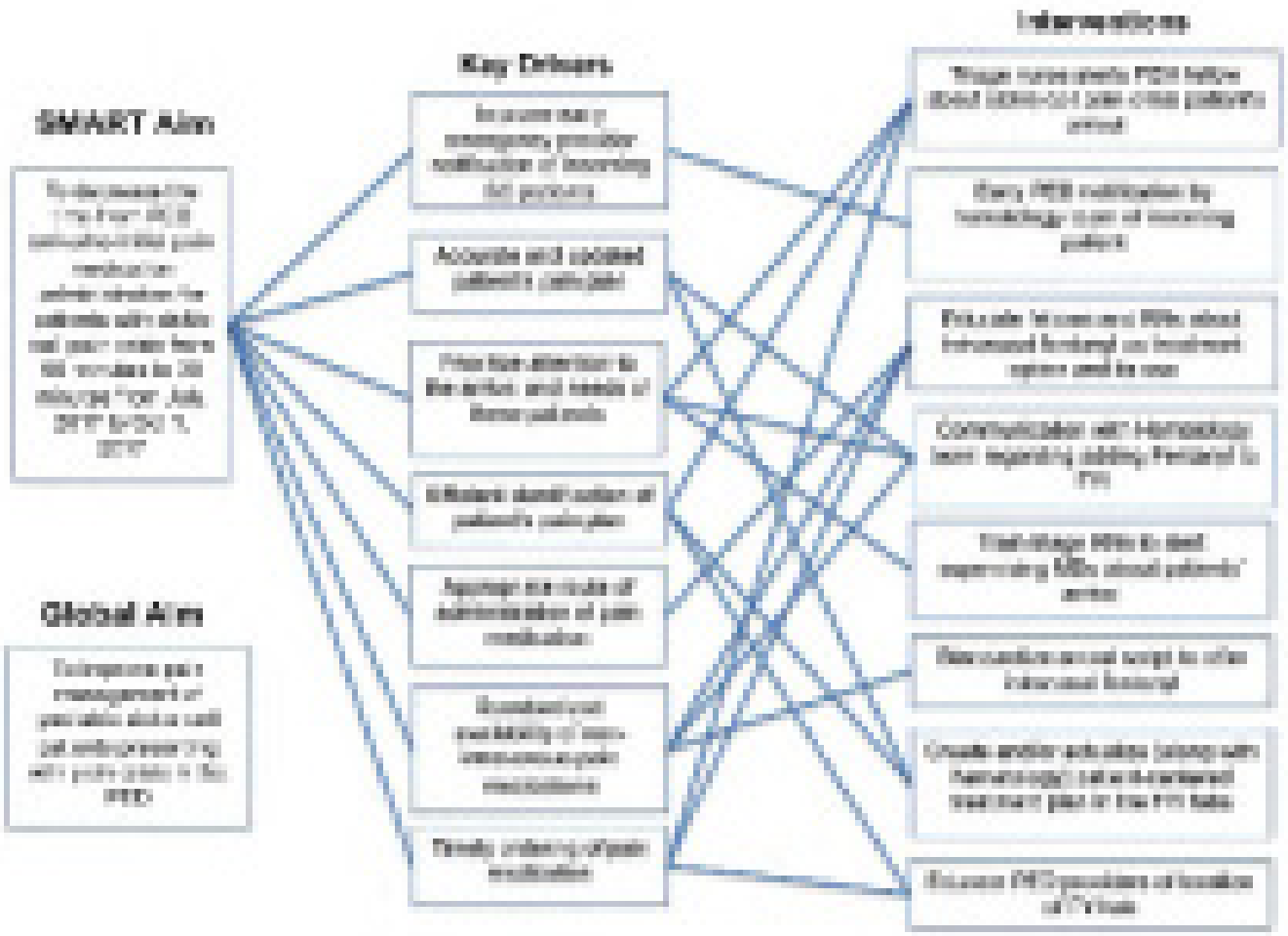
Background A vaso-occlusive episode (VOE) is the most common complication in sickle cell patients and also the primary reason for emergency department visits in this population. An integral part of delivering high quality care to these patients is timely and effective pain control, which is often delayed and ineffective.

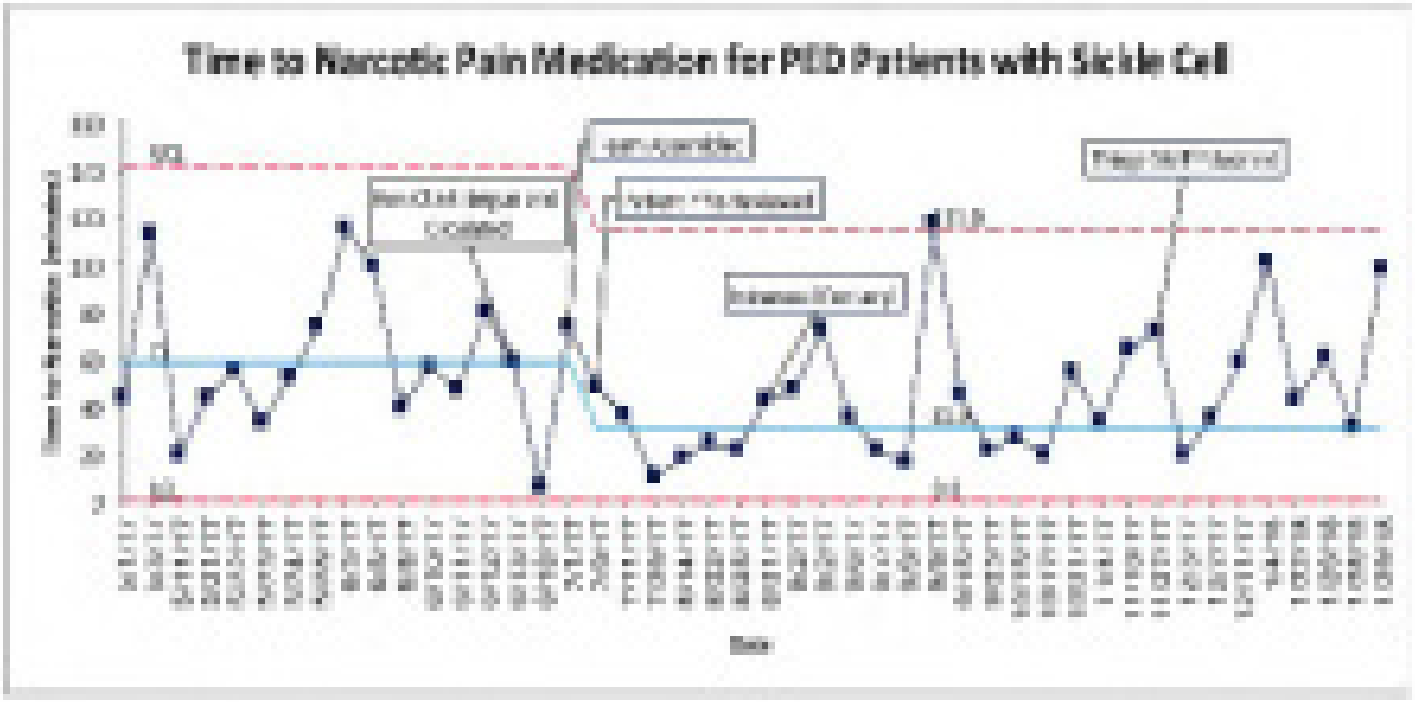
Objective Our aim was to decrease the time between arrival to the pediatric emergency department (PED) and initial pain medication administration in patients with sickle cell pain crises from 60 minutes to 30 minutes starting in July 2017.

Design/Methods This is a quality improvement project using the Model for Improvement (Plan-Do-Study-Act (PDSA)) methodology. A key driver diagram was developed (Figure 1). The first PDSA cycle addressed early emergency provider notification of a sickle cell patient by the hematology team. This was followed by prompt medication ordering by PED providers, as well as education about the location of pain plan in the electronic medical record. Finally, we identified the selection of pain medication as a key driver to be addressed by offering intranasal fentanyl. We implemented the changes and interventions over the period of July 2017 through October 2017 at an urban tertiary care pediatric emergency department. Baseline data was obtained prior to initiation of QI project. Data consisted of time to pain medication at arrival to PED for sickle cell patients prior, during, and at the culmination of our QI project.

Results We demonstrated improvement in time to pain medication administration from 60 minutes to 31 minutes, reflecting a decrease in time to pain medication from arrival to the PED (Figure 2) over the course of three months.

Conclusion(s) Our team was able to successfully decrease the average time to pain medication administration for sickle cell patients presenting with pain crises from 60 minutes to 31 minutes. These results suggest that once the key stakeholders are involved in the process and changes are done at all levels, improvement in the quality of care provided to sickle cell patients in the PED can occur. The methods utilized for this study can be implemented to other subsets of patients with time sensitive conditions presenting to the PED. Further observation of the time to pain medication is important to assess the effectiveness and sustainability of this change.


SMART Aim
Global Aim
Key Drivers
Interventions



Abstract: 142

Epinephrine produces brisk cerebral reperfusion and worsens neurological outcome in experimental pediatric asphyxial cardiac arrest

Onome Oghifobibi[1], Michael Wolf[2], Melissa Nicholas[1], Andrew Toader[1], Henry Alexander[2], Cameron Dezfulian[2], Hulya Bayir[2], Patrick Kochanek[2], Robert Clark[2], Mioara Manole[1]

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Background It is indisputable that Epi improves the rate of return of spontaneous circulation (ROSC) after cardiac arrest (CA): every minute delay of Epi is associated with a 4-9% lower odds of survival. However, Epi was recently shown to worsen neurological outcome in piglets subjected to ventricular fibrillation CA. A recent randomized clinical study in adults showed, despite improved 30-day survival, no effect of Epi vs. placebo on survival to discharge with good neurological outcome. It is suggested that Epi exerts cerebral detrimental effects by decreasing cerebral blood flow (CBF). The effects of Epi on CBF, oxygenation and neurological outcome after pediatric asphyxial CA have not been assessed

Objective Administration of Epi at resuscitation decreases CBF, brain oxygenation, and worsens neurological outcome after pediatric asphyxial CA in immature rats

Design/Methods Anesthetized and tracheally intubated 16-18 day old rats underwent 9.5min asphyxial CA. The rats were resuscitated with chest compressions and were randomized to receive Epi or saline (n=7/group). Brain tissue oxygen (PbO_2) and cortical CBF were recorded from baseline to 120min after ROSC. Reduced glutathione (GSH) was measured in brain tissue at 120min after ROSC. Neurological outcome was assessed on days 1-5 and memory acquisition was assessed using the Morris water maze on days 7-12 post-CA (n=6-8/group)

Results ROSC was achieved in all rats. Time to ROSC was shorter in rats treated with Epi (34±12 vs 63±26s, p<0.02). Post-ROSC CBF was higher at 1, 2, and 3 min post ROSC in rats treated with Epi, fig 1 (61±13 vs 34±8, 68±13 vs 49±9, and 87±8 vs 69±14%, p<0.01 2-way RMANOVA), and was similar in the two groups from 4-120 minutes. PbO_2did not differ between groups. GSH levels were similar in the two groups. Rats treated with Epi had worse memory acquisition compared to both sham operated rats and saline treated rats, fig 2 (probe trial, 21±8 vs 36±8 vs 31±13%, p<0.02 Epi vs. sham and saline) Conclusion(s) Administration of Epi at resuscitation from asphyxial CA produced a brisk cerebral reperfusion and worsened neurological outcome compared with saline. Further studies detailing effects of Epi on cortical microcirculation using in-vivo multiphoton microscopy are underway. Detailed assessment of the impact of Epi on oxidative stress immediately post-resuscitation are warranted. Our studies serve as a platform to assess potential adjuvant therapies at resuscitation to mitigate the detrimental cerebral effects of Epi

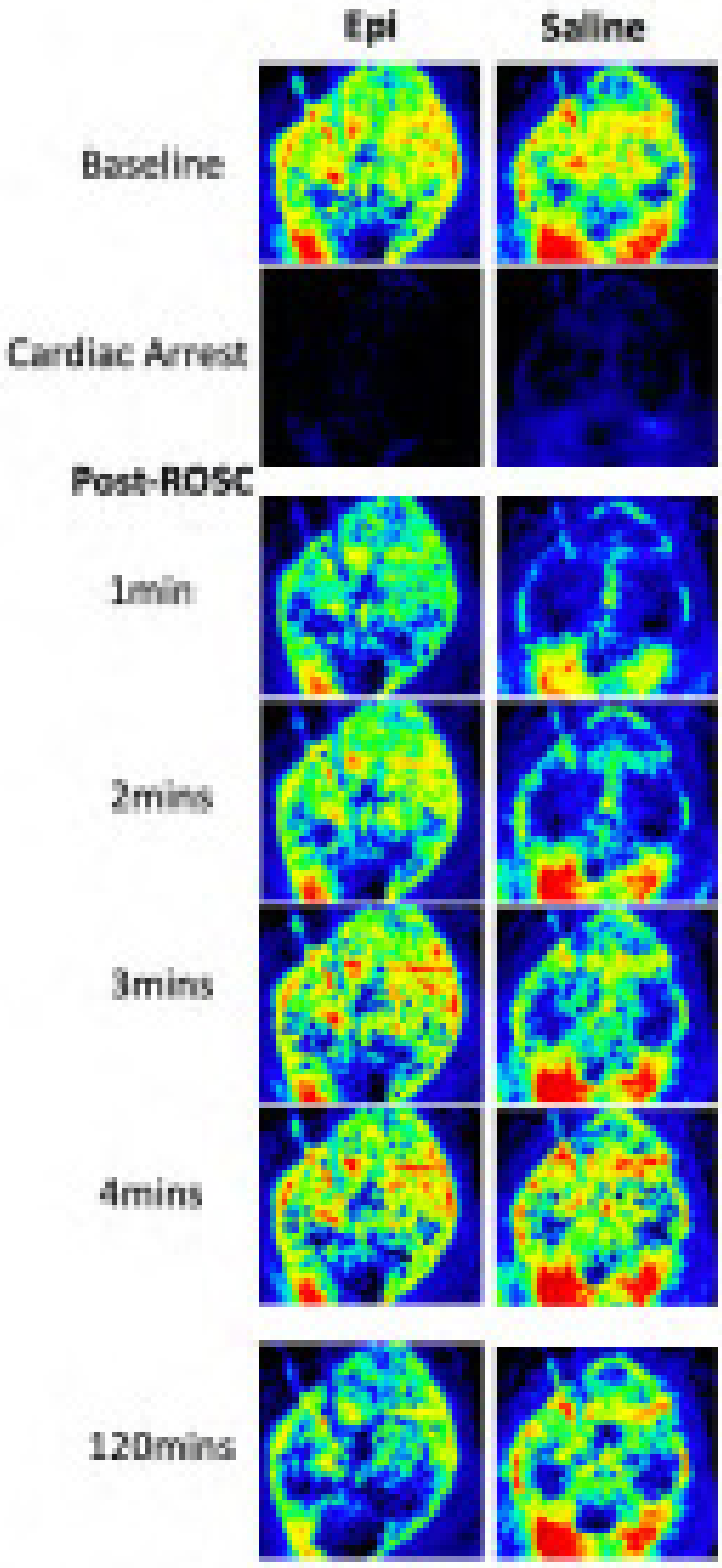

Figure 1: Laser speckle images of cortical perfusion in representative rats from Epi and Saline group

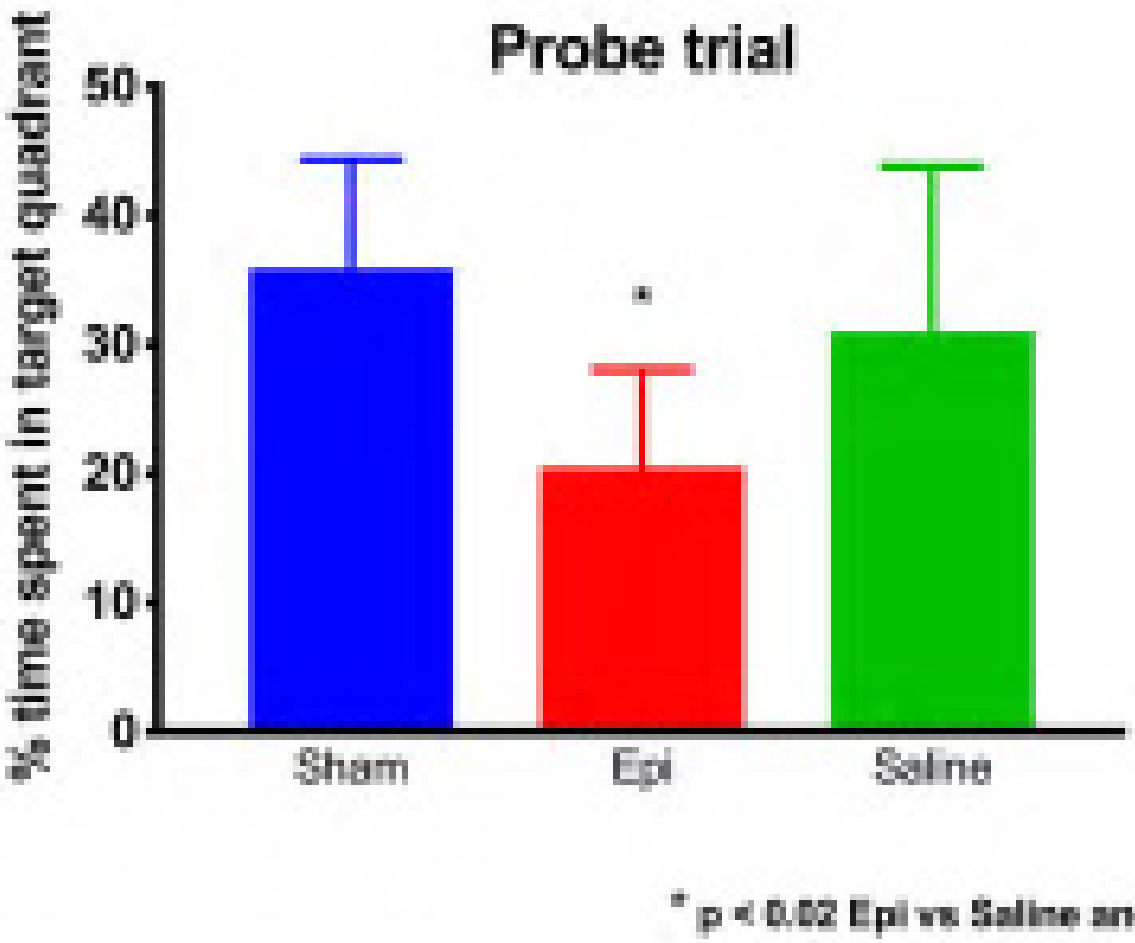

Figure 2: Memory acquisition measured by Morris water maze. Probe trial measures the % time spent in the correct (target) quadrant. Saline treated rats perform similar to non-injured sham rats, while Epi treated rats perform worse.

Abstract: 143

Impact of Early Insulin Administration on Critically Ill Patients in Diabetic Ketoacidosis
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Background Diabetic ketoacidosis (DKA) is a leading cause of morbidity and mortality in diabetic patients with an incidence from 1-10% per year in known diabetics. Currently, the International Society for Pediatric and Adolescent Diabetes (ISPAD) recommends insulin administration within 1-2 hours after starting fluid resuscitation in patients presenting with DKA. Objective To examine the impact of early insulin administration on urine ketone clearance in critically ill patients in DKA. Design/Methods We performed a retrospective cohort study of children presenting to a tertiary care emergency department (ED) in severe DKA from January 1st, 2017 to September 30th, 2018. Using a power of 80 percent, a calculated sample size of 86 patients was required to show a 10 percent difference in urine ketone clearance. Severe DKA was defined as patients with new or existing diabetes that met the following criteria: blood glucose ≥ 200 mg/dL, urine ketones ≥ 40, serum bicarbonate < 13 mmol/L, and requiring admission to the pediatric intensive care unit. All patients were treated with intravenous insulin and fluids as per standard DKA protocols. We compared patients that received insulin within 120 minutes of arrival to the ED with patients that received insulin after 120 minutes of arrival. Our primary outcome was time to clearance of urine ketones.

Secondary outcomes included resolution of acidosis as measured by achieving a bicarbonate level of ≥ 13 and hospital length of stay.
Results We identified 105 patients in severe DKA from January 2017 through September 2018. The majority of patients were female (n=67, 64%) with a median age of 15 years (interquartile range [IQR] 10 to 18 years). Of the 105 patients identified in severe DKA, 45 (43%) received insulin administration within 120 minutes of arrival to the ED and 60 (57%) received insulin after 120 minutes of arrival with a mean difference of 92 minutes (95% CI, 76-107, P≤0.001). There was no significant difference in time to urine ketone clearance (1476 min vs 1407 min, P=0.57). There was no significant difference in time to resolution of acidosis as measured by bicarbonate (921 min vs 739 min, p=0.12) or hospital length of stay (66 hr vs 63 hr, p=0.69).
Conclusion(s) Timely initiation of insulin for patients in severe DKA as per current guidelines does not significantly impact time to urine ketone clearance, recovery from acidosis, or hospital length of stay.

Abstract: 144
The impact of antibiotic stewardship program in reducing necrotizing enterocolitis rates (NEC) in a Neonatal intensive care unit
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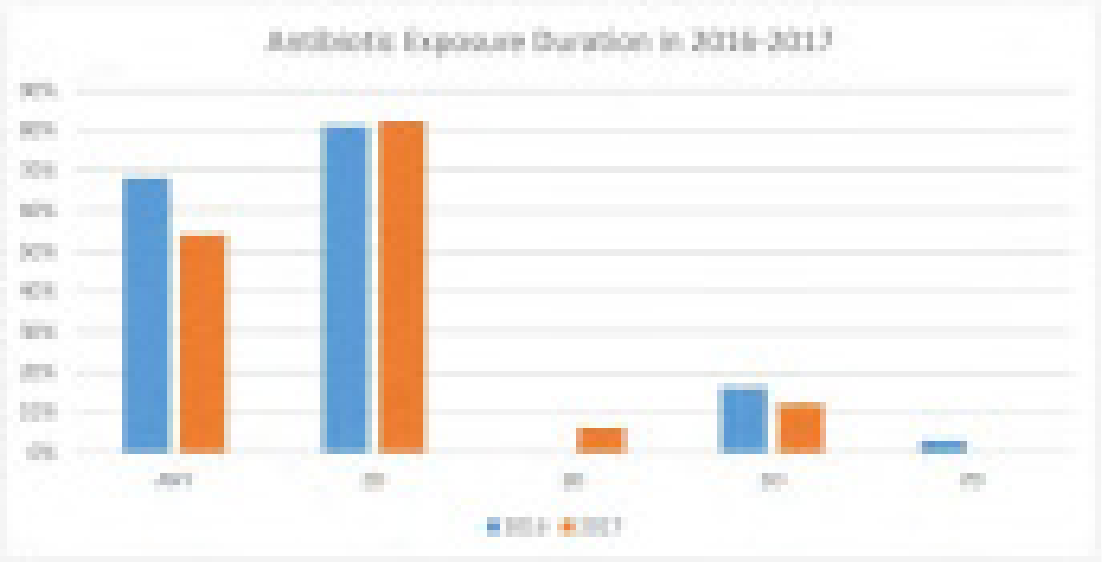
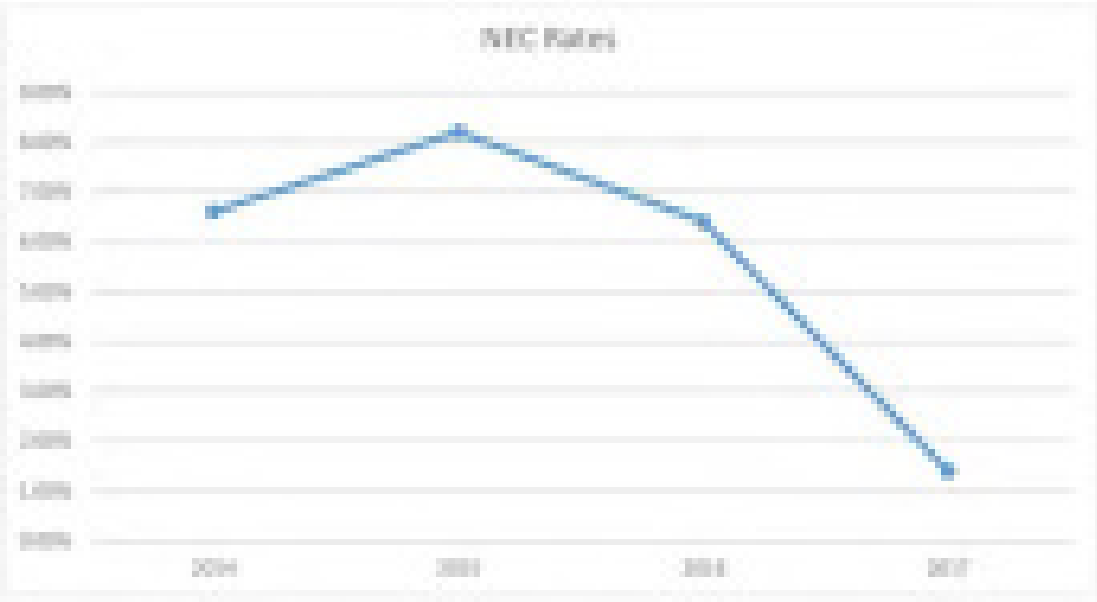
Background Exposure to antibimocrobial agents during postnatal period can result in unintended consequences. Early exposure to antibiotics in the perinatal period can have long term sequela in altering the gut microbiome of infants and thereby increase susceptibility to obesity, asthma and atopy as well as infection including NEC.
Objective Decrease in antibiotic utilization rates (AUR) and overall use of antibiotics in early onset sepsis from Jan 2017 to Dec 2018. We hypothesized that a decrease in antibiotic use could result in a decrease in our incidence of NEC by as much as the drop in antibiotic use.
Design/Methods Antibiotic stewardship team was convened in 2015 to optimize antibiotics utility and minimize existing practice variations and improve prescribing attributes among caregivers, thereby reducing comorbidities related to antibiotic use. Our Institution joined VON national collabrative in 2016. A key driver diagram with bundles and prescribing guidelines were established with input from Infectious disease, Nephrology, the medical teams, pharmacy, nursing and hospital quality improvement. Daily audit tools were incorporated into multidisciplinary rounds to enhance communication among team members regarding choice, duration of antibiotics and improve prescriber documentation reason for antimicrobial. The team had monthly meetings and established PDSA cycles. Data collection was ongoing and disseminated to NICU teams at monthly meetings with feedback incorporated into future PDSA cycles.
Results Antibiotic utilization rate (AUR) has consistently declined since Jan 2015 (Fig-1) 500 per 1000 days during pre-intervention period decrease by 18.6% % to 320 per 1000 patient days in 2017 continued to show a downward trend in 2018. The duration of antibiotic use for culture negative early onset sepsis continued to trend more 2-day course and no babies received > 5 day course in 2017. Any exposure to antibiotics decreased from 68% in 2016 to 54% in 2017. The rate of NEC declined (Fig- 2)
Conclusion(s) Instituting daily antibiotic stewardship rounds along with multidisciplinary rounds can decrease antibiotic use in a tertiary care NICU. Eliminating empiric use of broad spectrum antibiotics also lowered NEC rates (Bell's Stage II and greater). Guided treatment protocols targeting disease-specific conditions minimize variation with both choice and duration of antibiotic therapy. Future directions include eliminating antibiotic therapy on well appearing term infants at low risk


Antibiotic Exposure Duration in 2016-2017


NEC Rates

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Abstract: 145

A Randomized Study of Delayed Cord Clamping (DCC) in Preterm Infants (PI) 28 to 34 6/7 wks Gestational Age (GA)

Laura Perretta, Morgan Spaight, Vivien Yap, Jeffrey Perlman

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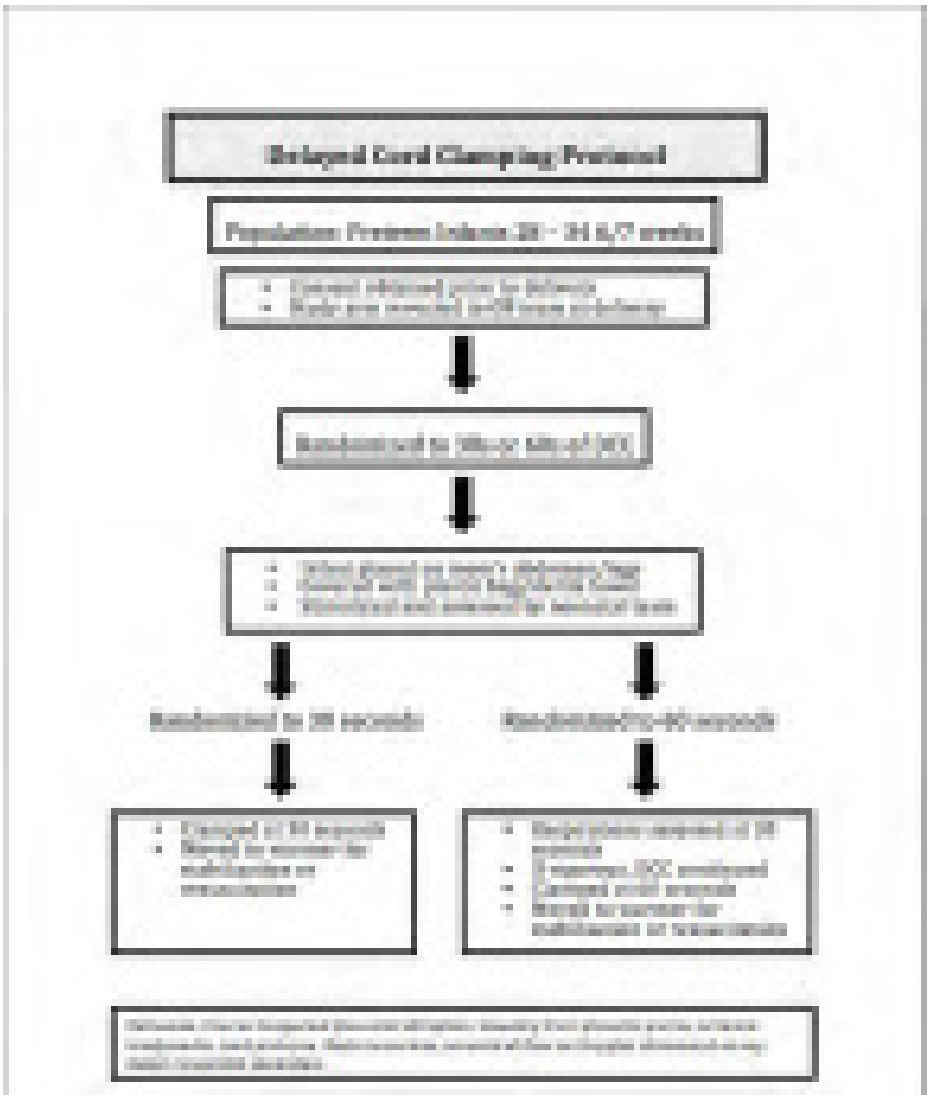
Background We previously reported preliminary evidence regarding safety of DCC for up to 60 sec in spontaneously breathing PI 28 to 34 6/7 wks GA related to postnatal transition to extrauterine life. We report the findings of this trial stopped early due to lack of recruitment caused by loss of equipoise of obstetricians and parents who showed preference for longer duration of DCC.

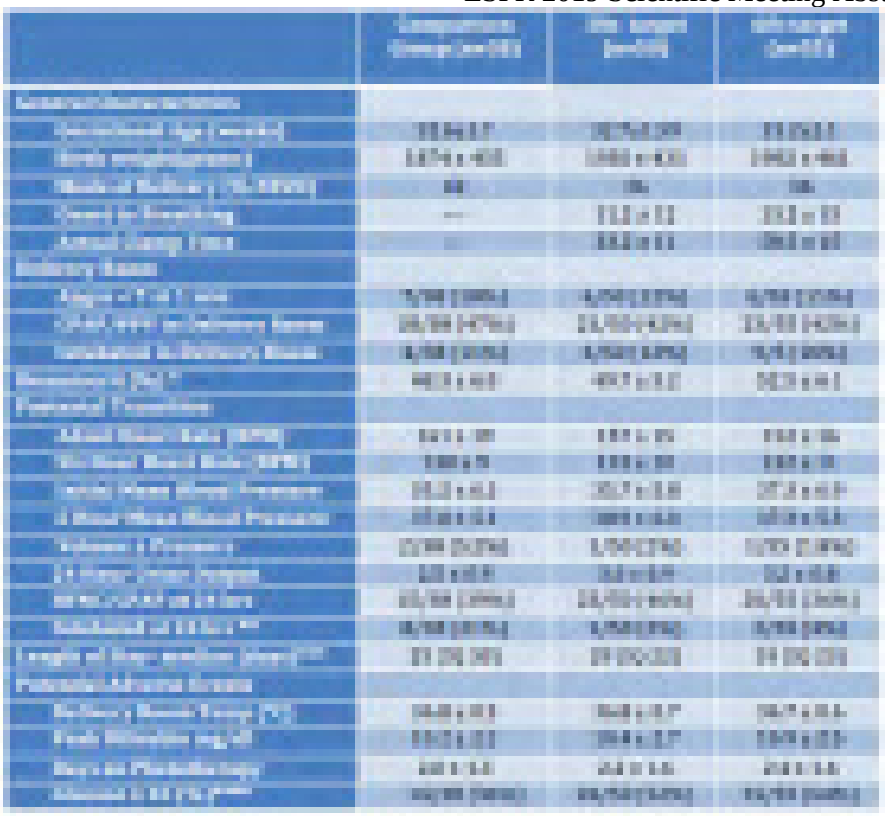
Objective To determine the effects of 30 or 60 sec of DCC on initial hematocrit (HCT), heart rate (HR) and blood pressure (BP) at birth and at 6 hrs in PI 28 to 34 6/7 wks GA.

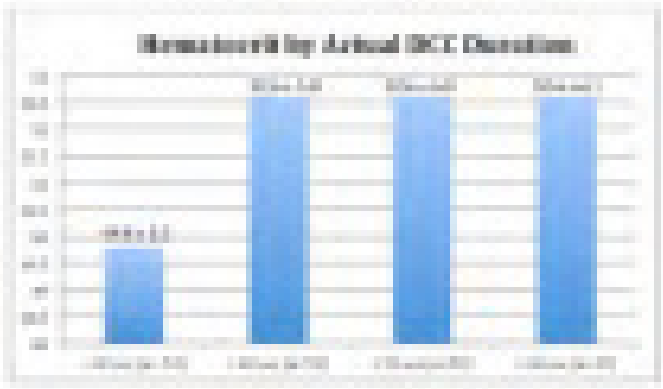
Design/Methods An IRB approved randomized controlled trial was conducted at Weill Cornell NYPH from 7/15-7/18. Mothers with threatened preterm delivery between 28 and 34 6/7 wks GA were eligible for enrollment. Infants where parental consent could not be obtained served as a comparison (COMP) group. Primary outcome was defined as 3% difference in HCT between 30 and 60 sec DCC.

Results PI (n=105) were randomized to DCC for 30 sec (n= 50) or 60 sec (n= 55). There were no differences in birth weight, GA, delivery room resuscitation (Table 1). Onset of spontaneous respirations (RESP) was 12 ± 13 sec; 5 initiated RESP > 30 sec. Overall, the HCT was 49.7 ± 5.2 vs 52.5 ± 6.1% for 30 vs 60s respectively (p=0.006). When analyzed by actual measured duration, the difference in HCT was already apparent at < 40 sec (n=53) vs ≥ 40 sec (n=52) i.e. 49.8 ± 5.5 vs 52.6 ± 5.8 (p=0.006) respectively.The initial HR ↓ by 6 hrs for both 30 & 60 sec (p=0.0005); mean BP ↑ for 30sec (p=0.001) but not for 60 sec (p=0.50) of DCC; findings similar to the COMP group. PI requiring intubation at 24 hrs was ↓ with DCC vs COMP i.e. 8/38 (COMP) vs 1/50 (30 sec) (p=0.02) & vs 60 secs (2/55) (p=0.01). No infant presented with polycythemia & no differences in hyperbilirubinemia was noted. More infants with 60 sec of DCC vs COMP group exhibited hypoglycemia i.e. 35/55 vs 14/38 (p=0.01) respectively. DCC of 60 vs 30 sec was associated with a ↓ in length of stay i.e. median 19 vs 29 days (IQ range 22, 23) (p=0.007).

Conclusion(s) This randomized study supports growing evidence that DCC through 60 secs is associated with significant benefits. Thus a significant ↑ in HCT was seen when DCC ↑ from 30 to 60 sec, already apparent by 40 sec. DCC of 60 sec was associated with a significant ↓ in LOS; this is of unclear etiology. However hypoglycemia was more common with 60 sec DCC vs COMP. These data indicate that DCC of up to 60s in this targeted preterm population is clinically beneficial. NCT02478684







Abstract: 146

Differences in maternal gene expression in Cesarean Section delivery compared with vaginal delivery
Prachi Kothiyal, Wendy Wong, Xinyue Liu, Kathi C. Huddleston, Keriann M. Schulkers, John Niederhuber, Suchitra Hourigan
Inova, Falls Church, Virginia, United States

Background Babies born by Cesarean Section (CS) delivery are known to have an increased risk of certain chronic immune mediated, inflammatory and metabolic adverse health outcomes later in life compared with those born by vaginal delivery.

The mechanism leading to these increased health risks is unclear. There is little knowledge of differential gene expression between vaginal and CS delivery which could potentially explain some of these health differences.

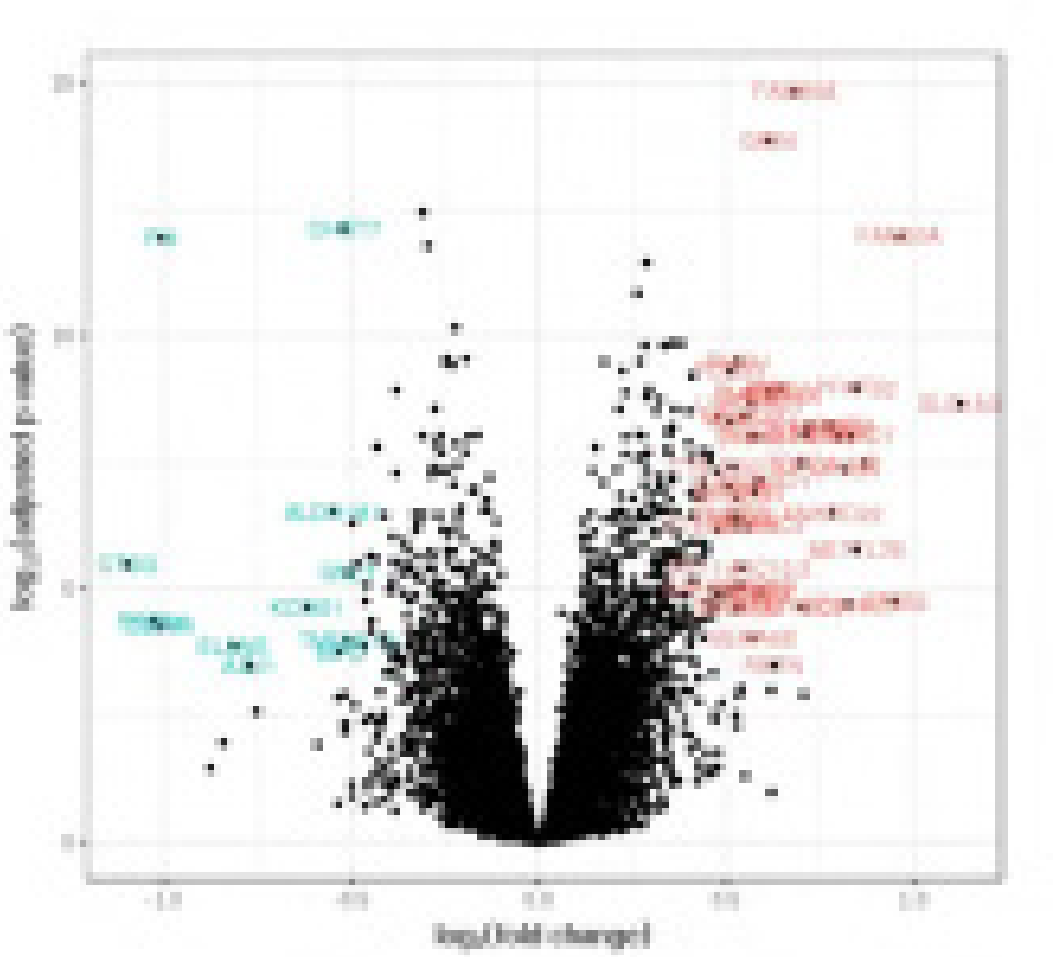
Objective To compare gene expression in mothers who had a CS delivery versus a vaginal delivery.

Design/Methods Pregnant mothers recruited in the Inova "First 1,000 Days of Life and Beyond" study had blood processed for packed cell RNA isolation prenatally and within a day of delivery. RNA samples were sequenced by the Illumina HiSeq2000. Gene-level and transcript-level expression quantifications were performed using RSEM 1.3.0 against the Gencode26 reference transcript annotation. Pathway and enrichment analyses for differentially expressed genes were performed using Reactome and ToppGene.

Results RNASeq data for delivery samples from 327 mothers (N=181 CS, N=146 vaginal delivery) who delivered at full-term was analyzed. A design matrix was created to include maternal pre-pregnancy BMI, age, ethnicity and processing batch. 944 genes were differentially expressed between CS and vaginal delivery at an adjusted p-value<0.0005(Figure 1). An equivalent analysis was also run on prenatal samples to confirm that the differential expression was not due to pre-existing conditions in mothers who delivered by CS. None of the genes differentially expressed in delivery samples were found in prenatal samples (median p-value=1).

"Immune system" pathways were enriched in CS delivery with the top overrepresented pathways related to *interleukin signaling*, (81 genes in Reactome, p-value 3.40×10^{-6}, FDR 0.005) including IL-12 related pathways, and *neutrophil degranulation* (p-value 2.72×10^{-5}, FDR 0.019). Genes were also enriched in "autoimmune disease" pathways in CS delivery.

Conclusion(s) Differentially expressed genes were found in mothers after CS versus vaginal delivery, with an enrichment of immune system and autoimmune related pathways in CS delivery. This could be hypothesized to partially explain some of the increased adverse inflammatory and autoimmune health outcomes seen in infants delivered by CS. Further exploration is needed to see if similar changes are seen in gene expression, or gene products, in the offspring with additional evaluation of their clinical outcomes.



Volcano plot for differential gene expression between cesarean and vaginal delivery samples. Genes with adjusted p-value < 0.0005 and absolute log2(fold change) > 0.5 are highlighted. Red and blue denote over- and under-expression in cesarean compared to vaginal delivery respectively.

Abstract: 147

Monitoring Adherence to a Clinical Practice Guideline (CPG) for Antibiotic Use for the Care of Neonates with Necrotizing Enterocolitis (NEC) in a Referral-Based Quaternary Care Neonatal Intensive Care Unit (NICU) in an Urban Setting

Geoffrey L. Bajwa[1], Yanick Vibert[2], Ishminder Kaur[2], Vineet Bhandari[2], Suzanne M. Touch[2]

[1]Neonatology, Reading Hospital Tower Health, Philadelphia, Pennsylvania, United States, [2]Drexel University College of Medicine, Philadelphia, Pennsylvania, United States

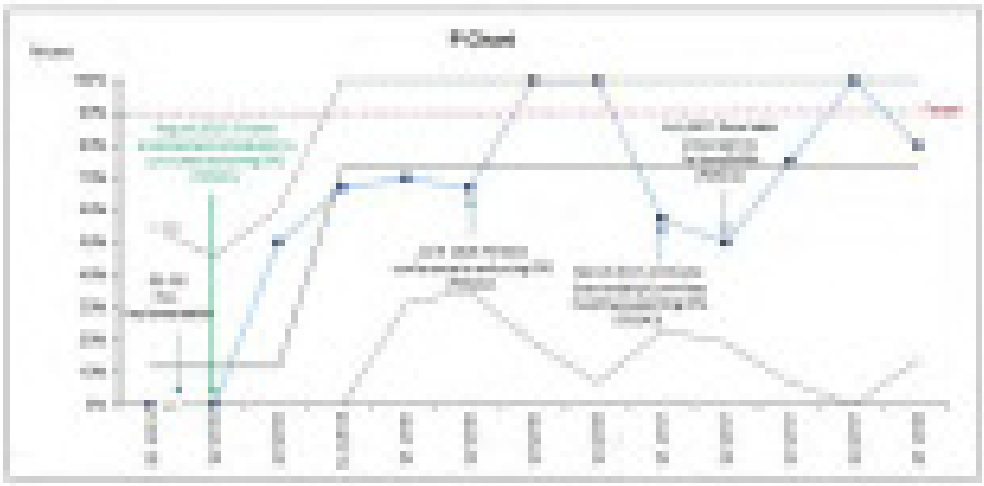
Background NEC remains a significant cause of morbidity and mortality in the NICU. While antibiotics remain a mainstay of treatment for NEC, there is a wide discrepancy in the choice of antibiotics used in its management. Overuse of broad spectrum antibiotics has been shown to increase the risk of developing multidrug resistant organism colonization. In 2015, a CPG agreed upon by the Sections of Neonatal-Perinatal Medicine, Pediatric Surgery, and Pediatric Infectious Disease at St. Christopher's Hospital for Children, was instituted, recommending the use of ampicillin, gentamicin and metronidazole as the drugs of choice for the treatment of NEC in our institution.

Objective To improve provider adherence to this NEC CPG to > 90%, with a secondary objective of reducing broad spectrum antibiotic use in the NICU.

Design/Methods A retrospective chart review was performed to establish pre-implementation data of antibiotic regimens prescribed to infants diagnosed with NEC stage IIA-IIIB by Modified Bell's Criteria (1/2015-7/2015) after which the NEC CPG was launched. A series of interventions was performed, encompassing four PDSA cycles, to improve provider adherence to this CPG.

Results Our results are presented in the P Chart below (Image 1), and rules for special cause variation were applied.

Conclusion(s) While we did not achieve our goal of 90% adherence to the CPG, we did succeed in improving the adherence from an average of 11.76% during the pre-intervention period to an average of 73.33% by using a series of email reminders and educational presentations. We were able to identify a number of challenges in complying with the CPG. As we are a referral center, many infants transferred with a primary diagnoses of NEC were admitted on antibiotics, which at times, providers were reluctant to change. In addition, documentation of indications for deviation from the CPG was occasionally lacking. The most common deviations from the CPG surrounded the use of a 3rd or 4th generation cephalosporin or piperacillin-tazobactam. Future interventions are aimed at targeting collaboration with referring institutions regarding antibiotic choices, as well as the development of NEC order sets in the electronic medical record.



Abstract: 148

Gestational age specific mucosal immune dysregulation in necrotizing enterocolitis

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Background Necrotizing enterocolitis (NEC) is associated with severe prematurity but can occur in term infants. Currently, diagnosis is by clinical and radiographic findings. The pathogenesis is unclear but feeds, dysbiosis, hypoxia and immune dysregulation have been implicated. Data from our group substantiates a complex fetal mucosal immune system with innate and adaptive components (with abundant memory T-cells) by 17 weeks' gestation age (GA). No known studies have performed deep immunophenotyping in NEC.

Objective We hypothesize that immune dysregulation contributing to NEC differs by GA at birth.

Design/Methods Intestinal tissue collected at first surgery for NEC, spontaneous intestinal perforation (SIP) or intestinal atresia (TC) was cryopreserved. Deep immunophenotyping via mass cytometry using single cell suspensions stained with antibody tagged heavy metals was performed. NEC cases were split into 3 groups: extreme preterm (EP) (n=6), preterm (PT) (n=3) and term (FT) (n=1) based on GA at birth (23-26, 31-32, 39 weeks respectively). Infants with SIP (n=4) and TC (n=2) were controls. Data was analyzed via manual gating and automated clustering (FlowSom).

Results Our data show dysregulation of innate and adaptive mucosal immunity in NEC and SIP that differs by GA as compared to TC. Increased macrophages were present in EP and PT (63.1%,p=0.007, 71.4%,p=0.002) but not FT NEC cases (28.8%,p=0.83) as compared to SIP (32.7%)(Fig 1A). While all patients with NEC and SIP had reduced innate lymphoid cells(ILCs) and natural killer(NK) cells and trend towards increased neutrophils compared to TC in both manual gating and FlowSom(Fig 1B, 3). Major differences were also observed in T-cells with decreased abundance in NEC (FT 12.5%, EP 16.2%, PT 31.4%) compared to both SIP and TC (46.5%, 35.4%) via manual gating and FlowSom (Fig 2,3). The remaining T-cells in PT, FT NEC and SIP were predominantly naïve, while EP and TC were dominated by effector memory (Fig 2B, C). Th2 T-cells dominated SIP (60.1%) when compared to EP, PT (31.8%p=0.01, 32.5%,p=0.03) and TC (26.3%,p=0.02) while FT was similar (61%) (Fig 2 D).

Conclusion(s) We conclude that immune dysregulation occurs in SIP and NEC. Increased macrophages, decreased T-cells and

a novel finding of decreased ILCs and NK-cells characterized NEC. SIP was similar to NEC with increased neutrophils but T-cell population differed. T-cell subsets differed within NEC subgroups suggesting a different pathogenesis. There is a need for NEC reclassification by GA to account for varied disease subtypes.

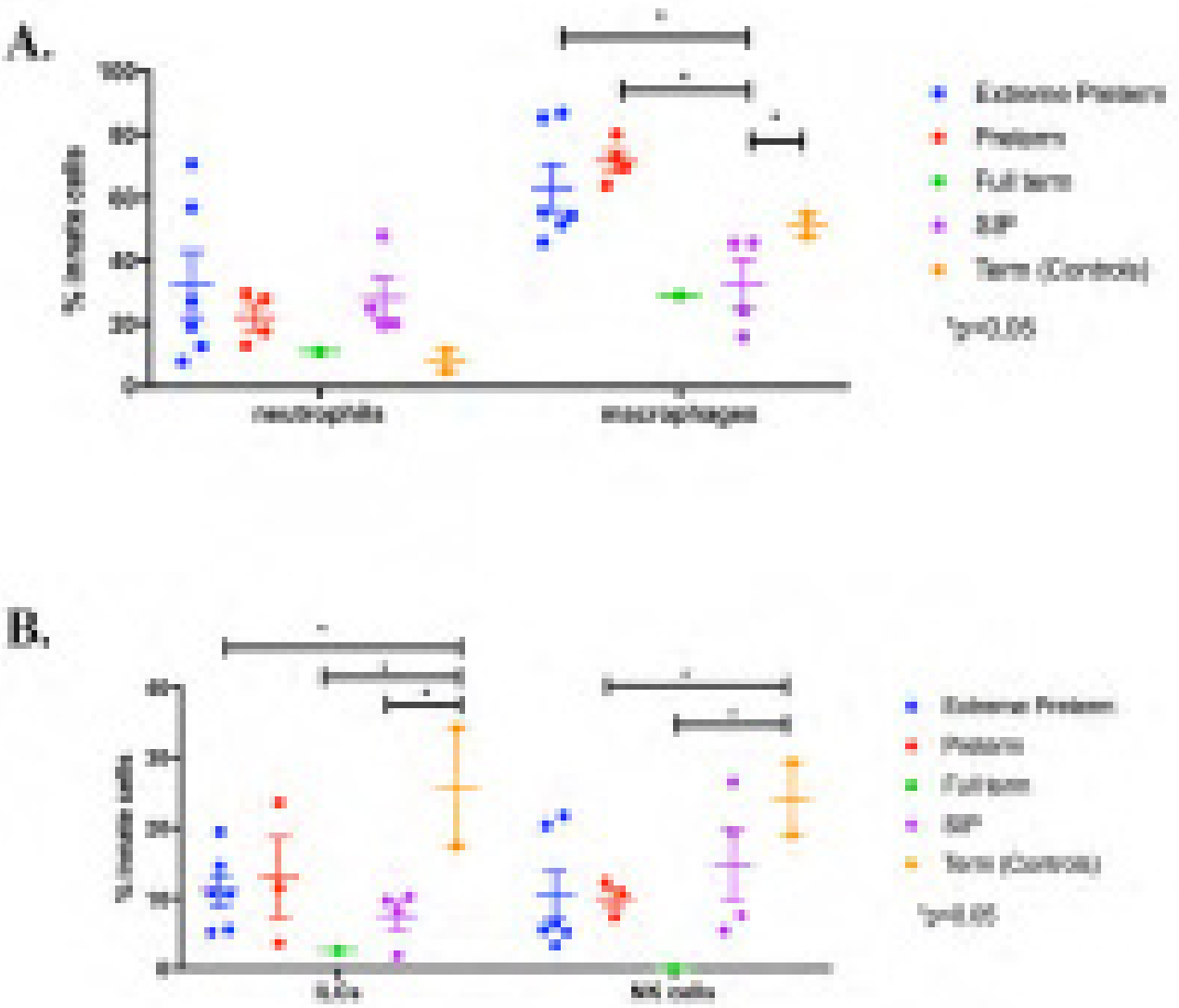


Figure 1. Dysregulation in innate cell populations in NEC. Cells expressed as a percent parent population in all groups vs control. A. Neutrophils (CD45+CD66b+) and macrophages (CD14+) expressed as a percentage of all innate cells. B. ILCs (CD127+) and NK cells (CD56+) expressed as a percentage of all innate cells (CD45+CD3-CD19-).

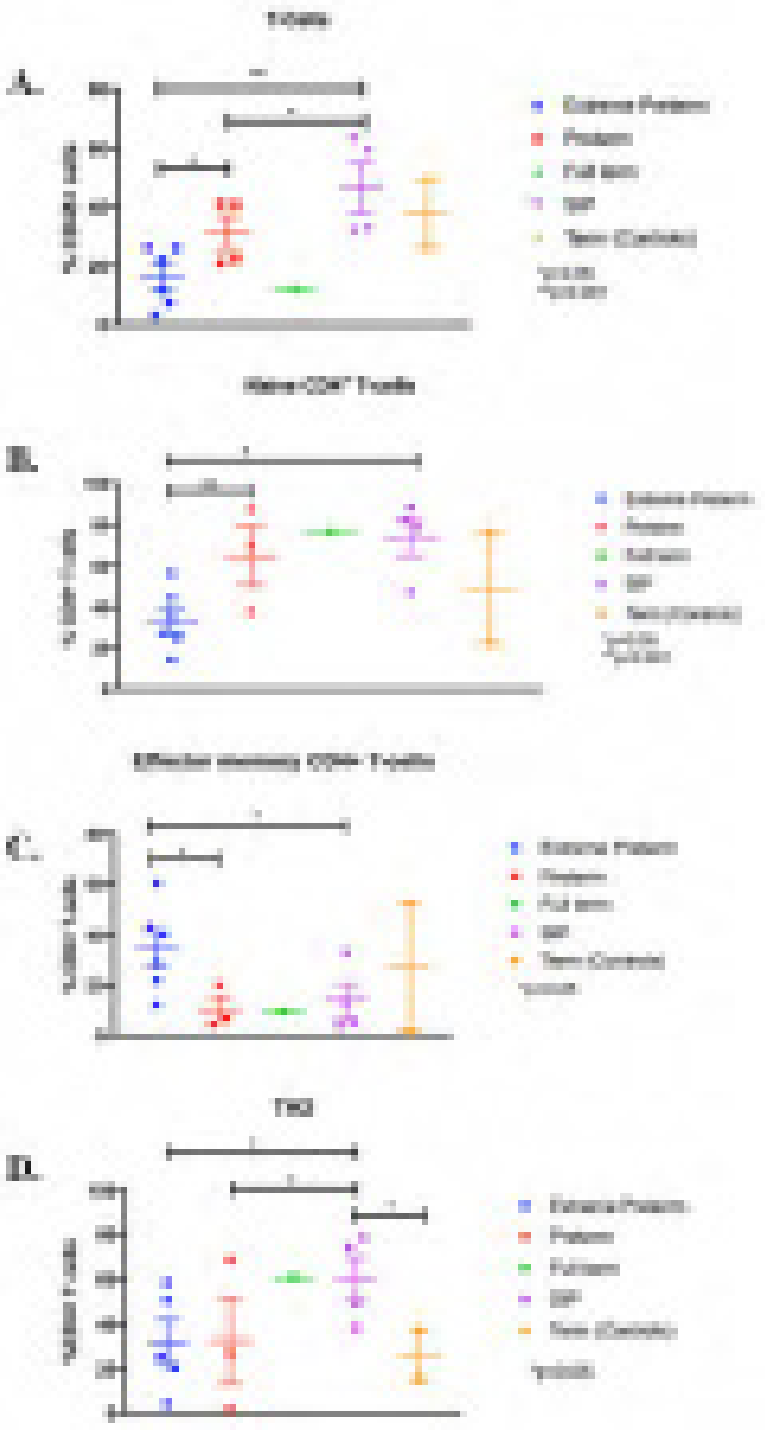
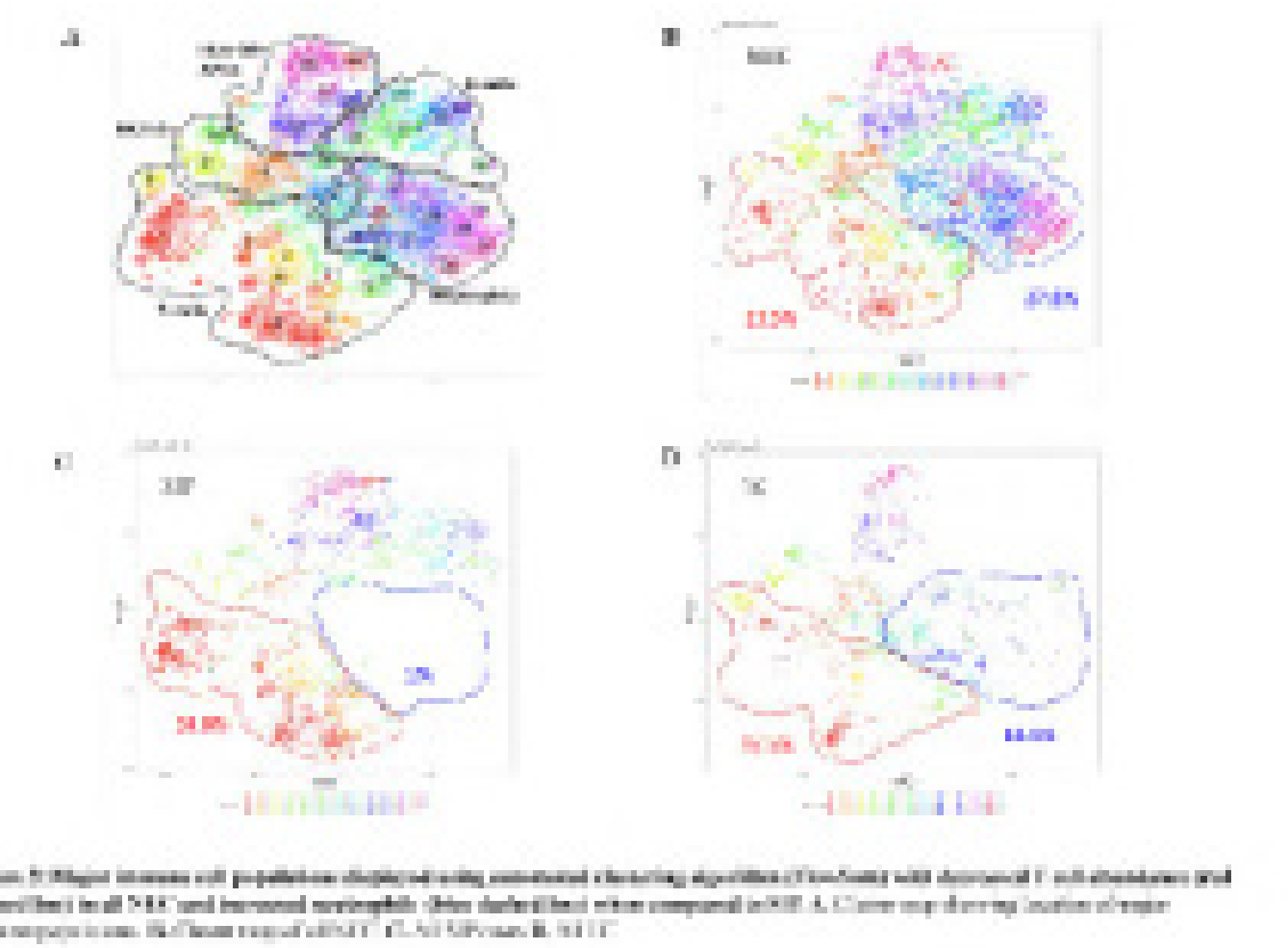


Figure 2: T cells are significantly decreased in necrotizing enterocolitis naïve T cells are predominant in PT, FT, SIP, TC while effector memory T cells are predominant in EP. A. T cells as a percentage of total CD45+ cells. B. Naïve CD4+ T cells (CD45RA+CCR7+) as a percentage of CD4+ T cells. C. Effector memory CD4+ T cells (CD45RA-CCR7-) as percentage of CD4+ T cells. D. Th2 T cells (CCR6-CXCR3-) as a fraction of total CD4+ T cells.



Abstract: 149
The Utility of Monocyte Counts in Predicting Severity of Necrotizing Enterocolitis
Suneetha Desiraju, Julian Bensadoun, David A. Bateman, Sudha Kashyap
Columbia University, New York, New York, United States

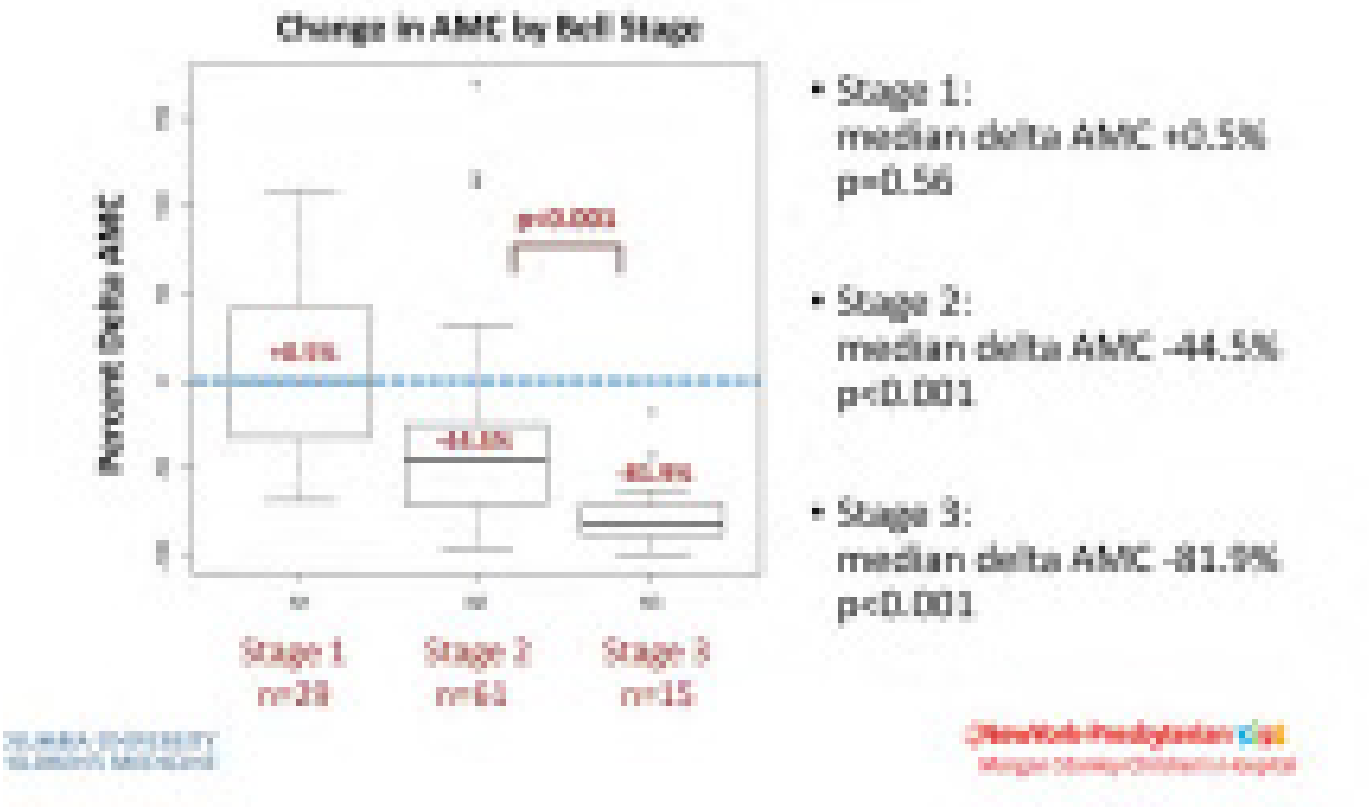
Background Necrotizing enterocolitis (NEC) is a potentially devastating disease of preterm newborns characterized by severe gut inflammation. There appears to be a final common pathway of intestinal injury, implicating monocyte-derived macrophages (Mohankumar 2012). As these cells are consumed, peripheral monocytes are recruited to repopulate the intestinal pool resulting in a perceptible drop in the serum monocyte count (Remon 2014).
Objective The objective of this study is to determine whether the change in absolute monocyte count (AMC) at illness onset can predict eventual severity of disease at its peak. A secondary aim is to determine whether a drop in AMC is observed in bacteremic infants without NEC, as the two illnesses can have similar symptoms at illness onset.
Design/Methods A 5-year retrospective chart review was performed on preterm infants with NEC or bacteremia. The percent change in AMC at illness onset relative to the most recent pre-illness value was calculated for each case.

NEC infants were further divided into Bell Stages 1, 2, and 3. Staging was based on duration of NPO diet and antibiotics, as well as evidence of SIRS, surgical intervention, or death. Stage 1 babies were NPO and on antibiotics for 2-3 days, with documentation that concern for NEC resolved. Stage 2 babies were on an NPO diet and treated with antibiotics for at least 7 days, with no evidence of SIRS or need for surgery. Stage 3 babies were on an NPO diet and treated with antibiotics for at least 7 days, with evidence of SIRS, surgical intervention, or death. Babies were included in the bacteremia group if they had a

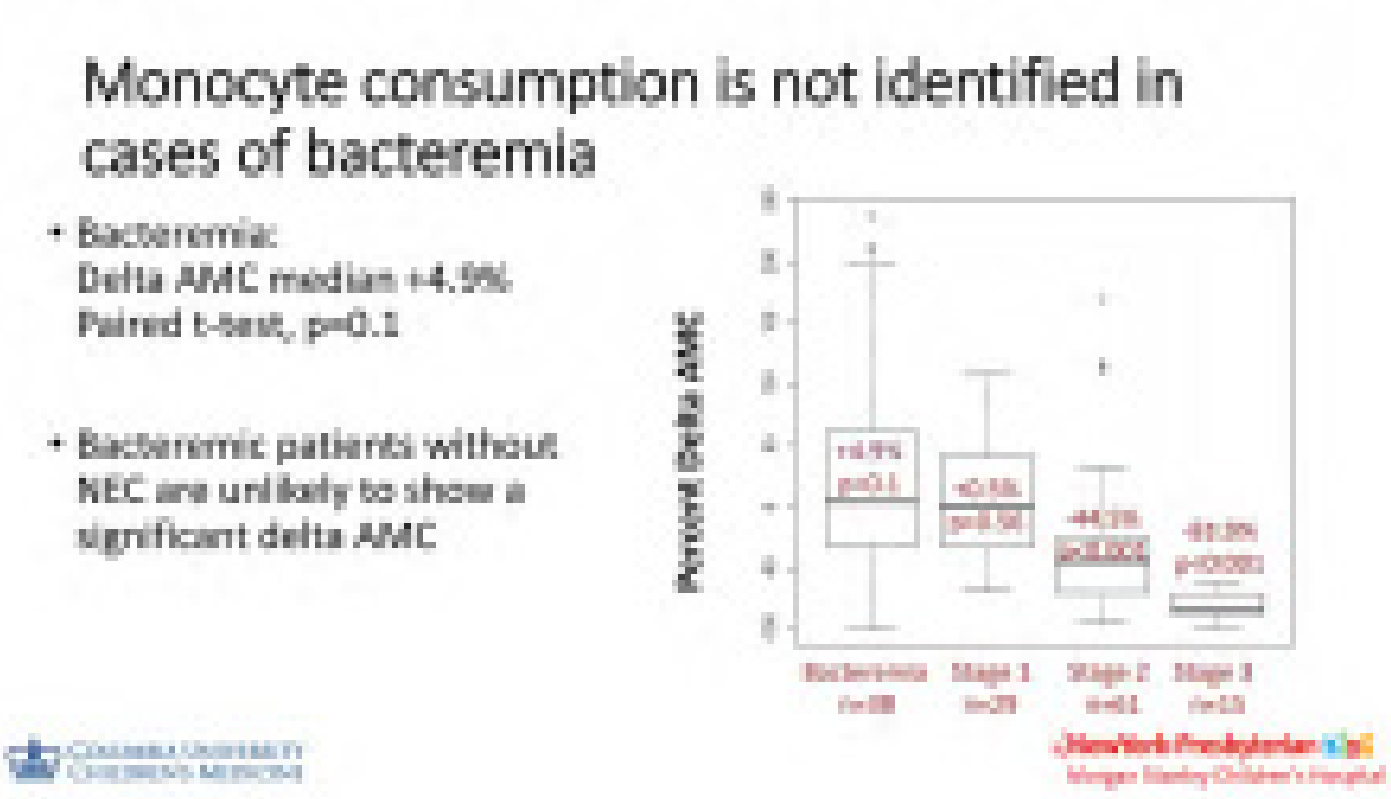
positive blood culture without concern for NEC.

Formula:
Percent delta AMC = (AMC at illness onset - AMC prior to illness)*(100) / (AMC prior to illness)

Exclusion criteria: gestational age 33+ weeks, congenital gastrointestinal anomalies, outborns.
Results Of the 105 infants identified with NEC, infants with Stage 1 NEC (n=29), Stage 2 (n=61) and Stage 3 (n=15) had a drop of 0.5%, 44.5% and 81.8% in AMC respectively. The drop in AMC in Stage 2 was significantly greater than in Stage 1(p=0.01) and that observed in Stage 3 was significantly greater than both in Stage 1 and 2 (p<0.001). No drop in AMC was observed in infants with bacteremia (n=38, p=0.1)
Conclusion(s) These observations suggest that the severity of NEC at its peak can be predicted from the AMC at illness onset relative to baseline. They also suggest that bacteremic babies might be distinguished from those with NEC using the change in AMC as a predictive marker.



Percent Delta AMC at NEC Illness Onset, by Bell Stage



Percent Delta AMC in Cases of Bacteremia vs NEC

Abstract: 150

Early elevated Vitamin C plasma levels are associated with greater risk of later Bronchopulmonary Dysplasia in the Premature Infant

Nayef Chahin[1], Jie Xu[1], Alpha Fowler[2], Karen D. Hendricks-Munoz[1]

[1]Pediatrics-Neonatology, Children's Hospital of Richmond at Virginia Commonwealth University and Virginia Commonwealth University School of Medicine, Richmond, Virginia, United States, [2]Pulmonary Disease and Critical Care Medicine, Virginia Commonwealth University Health and Virginia Commonwealth University School of Medicine, Richmond, Virginia, United States

Background Vitamin C (Ascobic Acid (AA) in the preterm neonate is dependent on adequate maternal AA levels from active placental transfer and later parenteral supplementation through TPN as well as bioavailability in human milk with initiation of feeds. AA, is a well-known antioxidant, anti-inflammatory regulator, and immune response enhancer recently identified as a potential lifesaving agent in adults presenting with pneumonia and sepsis. Preterm infants are extremely susceptible to inflammatory complications of sepsis, Bronchopulmonary Dysplasia (BPD) and Necrotizing Enterocolitis (NEC) leading to increased morbidity and mortality in this population. We hypothesized that early week 1 low AA plasma levels will be associated with a higher risk of common neonatal morbidities sepsis, BPD and NEC

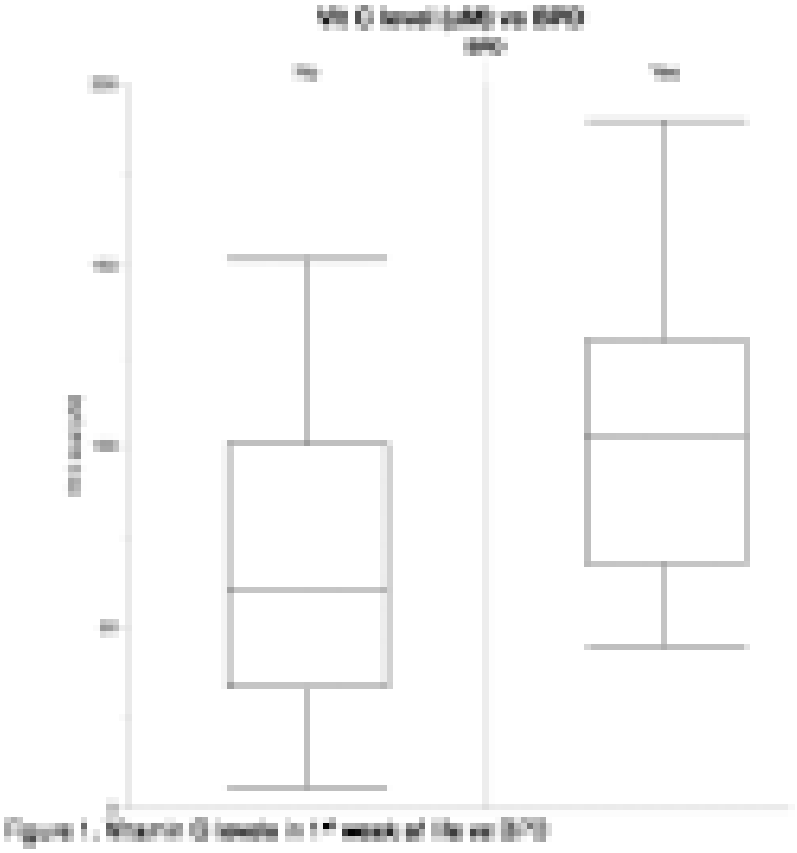
Objective To evaluate AA plasma levels in the first week of life and its association with later risk of infection, BPD, NEC and mortality

Design/Methods The study was approved by the IRB of VCU School of Medicine and maternal consent was obtained prior to patient enrollment. Blood samples from infants ≤34 weeks of gestation were collected on day 1 and weekly. Medical outcome was collected from the medical records. AA levels were determined by fluorescent method using a Tecan Safire2® plate reader. Statistical analysis was performed using student t-test, ANOVA and chi-square when appropriate with JMP software. A $p < 0.05$ was considered statistically significant

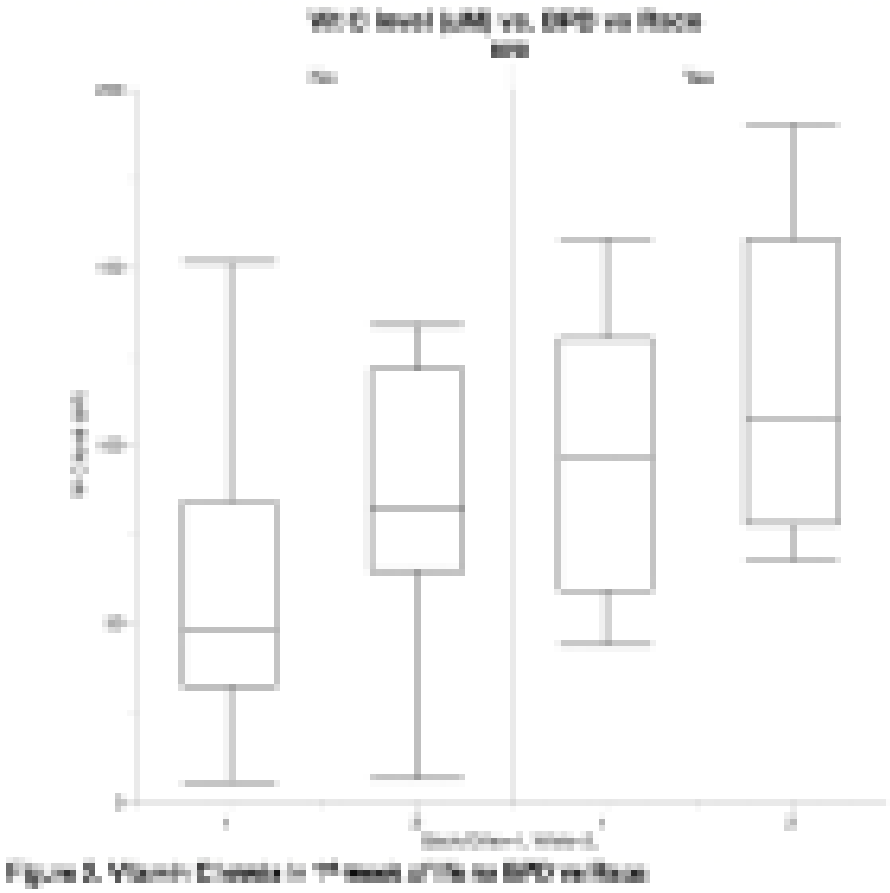
Results Forty-eight patients were included in the study, mean gestational age was 29 ± 3 weeks (range 23 to 34). Three infants expired and 14/48 (29%) were diagnosed with BPD, defined as need for oxygen at 36 weeks corrected age. AA levels for BPD infants were 104 ± SD compared to 68 ± SD in those who did not develop BPD (p=0.0081) (Figure 1). When differentiated by

race White infants who developed BPD had a higher mean AA levels 97± 42 compared to Black/Other infants 70 ± 42 (p=0.003) (Figure 2)

Conclusion(s) Contrary to our hypothesis, these results suggest that early life elevated AA levels were significantly associated with infants who developed later BPD affecting White infants to a greater degree than Black/Other infants. There was no significant influence of early AA levels noted for the other morbidities such as NEC, Infection or mortality



Plasma Vitamin C levels and BPD



Plasma Vitamin C levels and BPD and Race

Abstract: 151

ELBW Infants Who Progress to BPD Have Lower Pulmonary Expression of TGF-β1

Morgan Salton[1], Shaili Amatya[1], Sharina Rajbhandari[1], Vanessa Trinh[2], Lance Parton[1]

[1]The Regional Neonatal Center, Division of Newborn Medicine, Westchester Medical Center, Valhalla, New York, United States, [2]New York Medical College, Valhalla, New York, United States

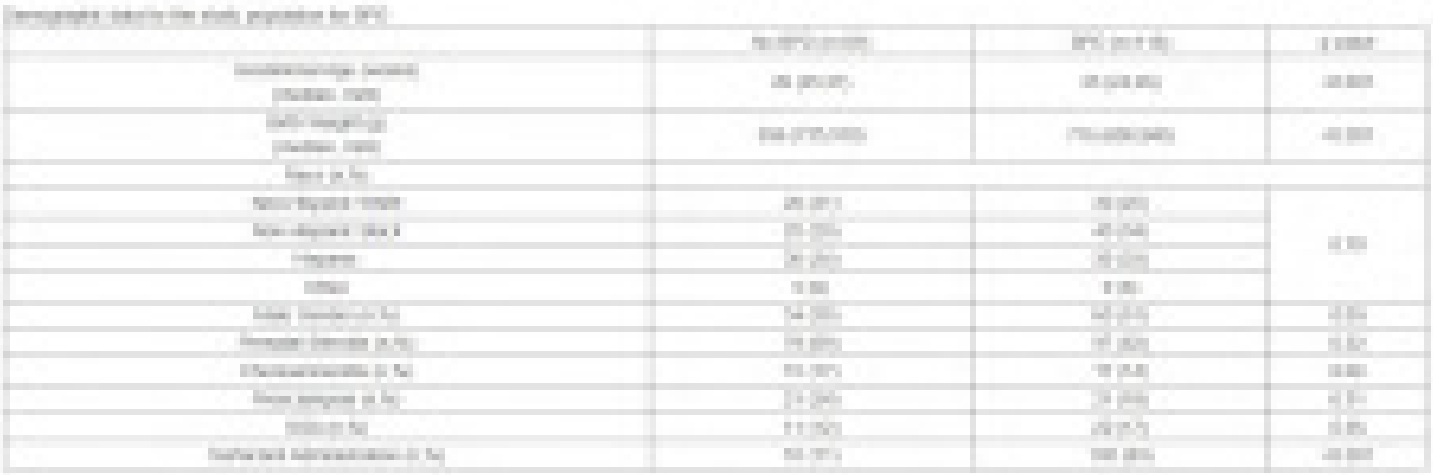
Background BPD is a chronic lung condition in ELBW infants that results in alveolar simplification and has strong genetic foundations (~80%). TGF-β is an excellent gene candidate for mediating susceptibility to BPD as TGF-β signaling plays a role in alveolarization through the regulation of branching and septation in developing lungs as well as being a pro-inflammatory mediator. In our previous study one SNP of TGF-β (rs1800470) was found to be associated with BPD (p=0.046), while four others were not. TGF-β also plays a role in cardiovascular remodeling. The closure of the ductus arteriosus has been found to be regulated by TGF-β through its effects on vascular smooth muscle. Previously we did not find an association between these five TGF-β SNPs and PDA in ELBW infants.

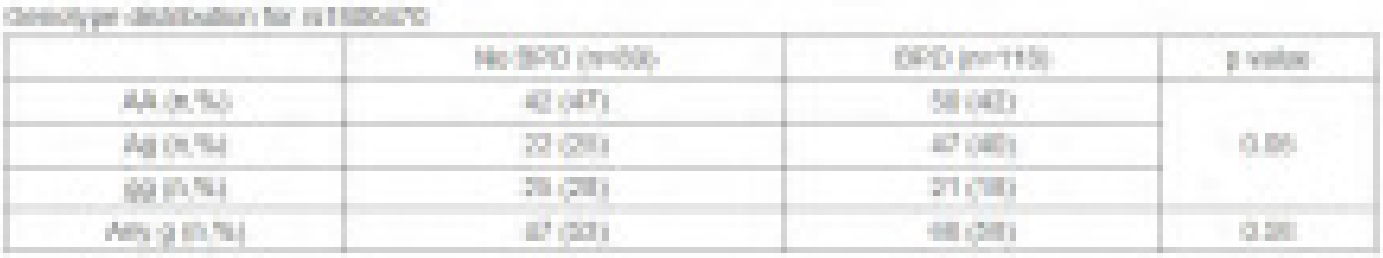
Objective We sought to determine whether TGF-β protein expression was increased in ELBW infants with BPD or PDA compared to those without.

Design/Methods This is an ongoing cohort study of ELBW infants (<1000g) without congenital or chromosomal abnormalities. BPD is defined as supplemental oxygen requirement at 36 weeks PMA. PDA is defined on whether medical or surgical treatment was required or not. IRB approved parental consent was obtained and buccal swabs collected (n=211). DNA was isolated using QIAMP Blood Mini Kit (Qiacube) and subjected to allelic discrimination using Taqman probes for rs1800469, rs1800470, rs1700471, rs1984072, and rs12029576 during real time PCR. Tracheal aspirates were collected from intubated infants within first seven days of life. TGF-β1 protein concentrations were measured using a human TGF-β1 ELISA kit. Chi-squared, Mann-Whitney, t-test, and z-test performed with p<0.05 denoting statistical significance.

Results Patients with BPD were born earlier (p<0.001) and at a lower birth weight (p<0.001). For rs1800470, there is a statistically different genotype distribution between ELBW infants with BPD and those without (p=0.046). Infants without BPD had higher protein concentrations of TGF-β1 isolated from their tracheal aspirates than those with BPD (34.6+/-10.3 pg/mL; 20.3+/-12.4 pg/ml; respectively, p=0.005). No significant association with PDA was seen.

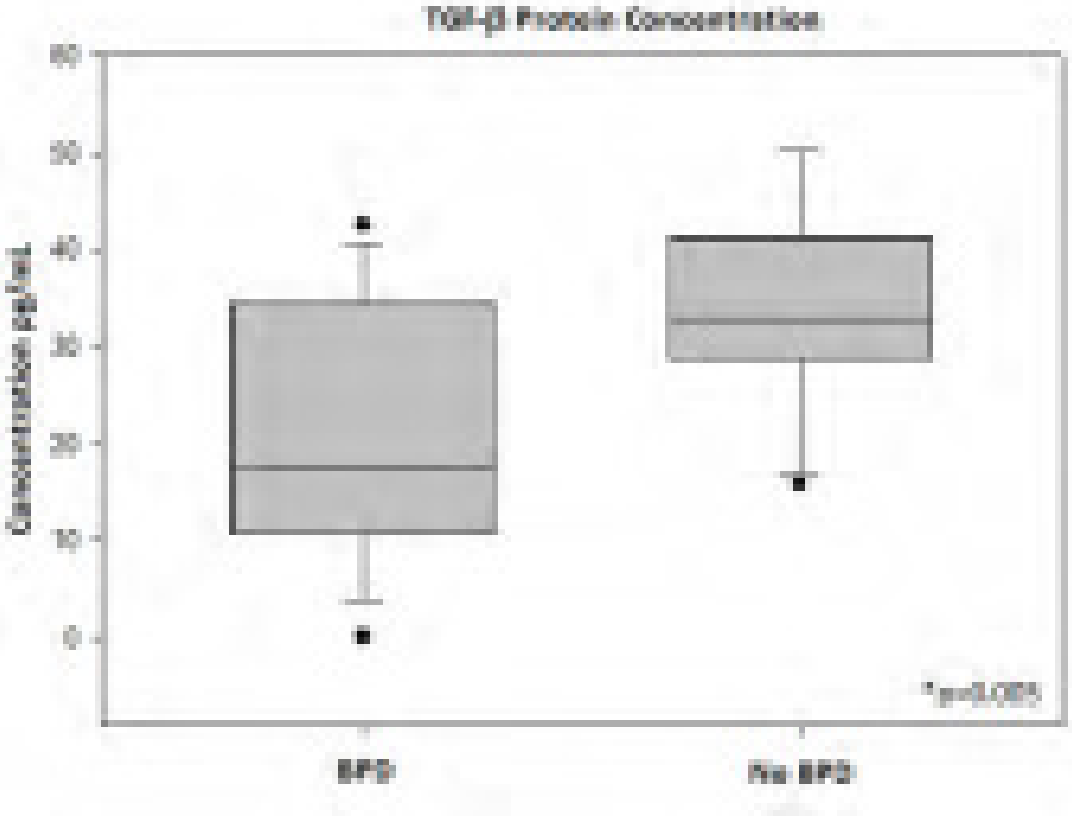
Conclusion(s) A genetic variation of TGF-β (rs1800470) is associated with the development of BPD in ELBW infants. The same association was not seen with PDA. Pulmonary expression of TGF-β1 in the first week of life was decreased in ELBW infants who progressed to BPD. We speculate that this decreased TGF-β1 protein expression contributes to impaired alveolarization and subsequent BPD.





TGF-β1 protein expression in the study population for BPD

	No BPD (n=10)	BPD (n=17)	p value
Concentration (pg/mL) (mean +/- SD)	34.6 +/- 18.3	20.3 +/- 12.4	0.005



Abstract: 152

Hyperoxia Alters Gene Expression in Newborn Rat Lungs.

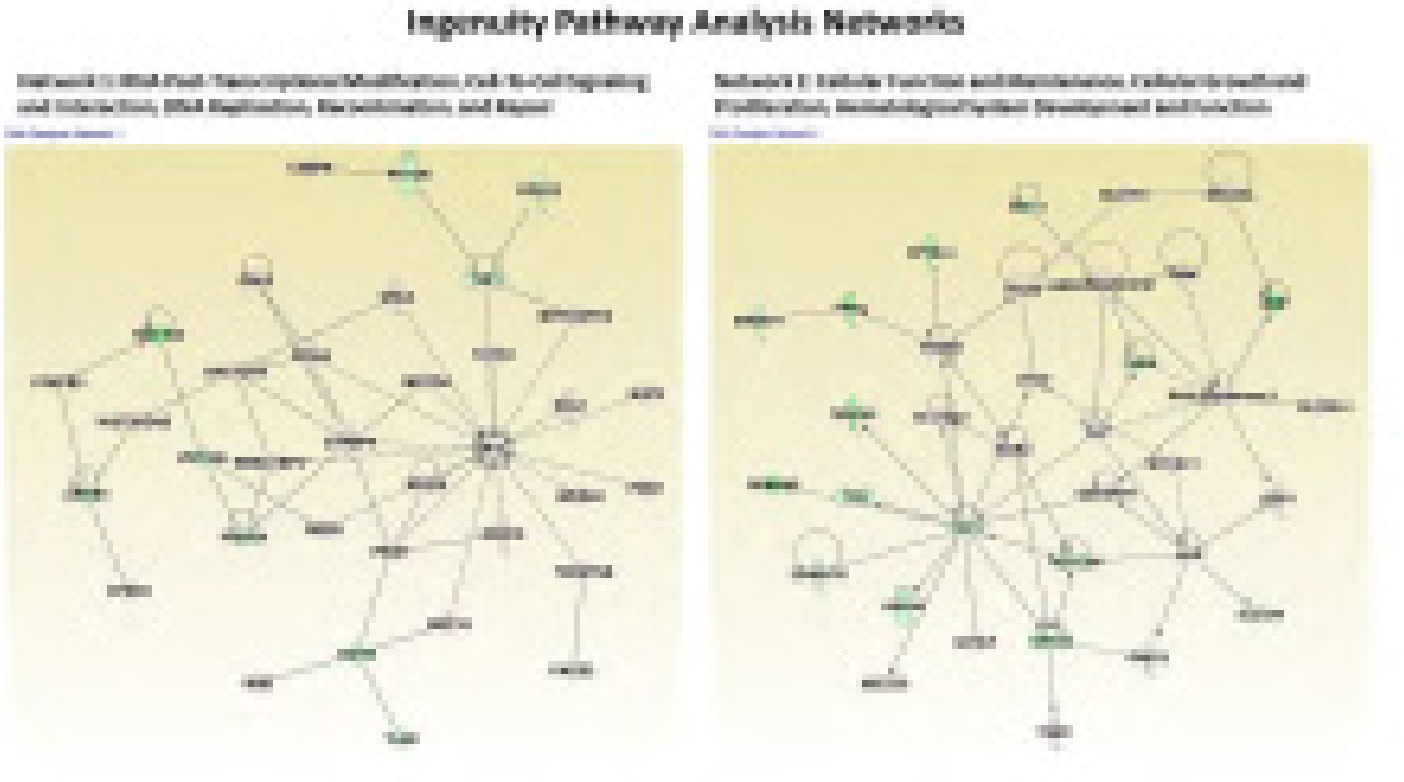
Michael T. Favara[1], Gina Fong[1], Suhita Gayen nee Betal[1], Deepthi Alapati[2], Nida Zubair[3], Sankar Addya[3], Zubair h. Aghai[1]
[1]Neonatology/Pediatrics, Thomas Jefferson University / Nemours, Philadelphia, Pennsylvania, United States, [2]Nemours, Wilmington, Delaware, United States, [3]Cancer Biology, Thomas Jefferson University, Philadelphia, Pennsylvania, United States

Background Bronchopulmonary dysplasia (BPD) is a chronic respiratory condition that commonly affects extremely premature infants and can cause significant morbidity and mortality. Hyperoxia has been shown to be a major contributor to the pathogenesis of BPD and plays key roles in inflammation, immune response, as well as activation of apoptosis. Microarrays can measure the expression of large numbers of genes, and experiments help reveal differential gene expression and can identify new therapeutic targets.
Objective To determine the changes in the mRNA transcriptome and to identify key genes and pathways involved in prolonged hyperoxia exposure in rat lungs.
Design/Methods Eight newborn Sprague-Dawley rat pups were divided and kept in either room air (control group) or in 80-85% oxygen (hyperoxia group) for seven days. The pups were sacrificed on day of life seven and lung tissues were collected. Total RNA was isolated from lung tissue using Qiagen miRNeasy mini kit. Genome-wide microarray screening was performed using an Affymetrix WT-plus Rat Clariom S Gene chip.
Results A total of 1580 genes were differentially expressed (613 up-regulated, 967 down-regulated) in the hyperoxia-exposed

group compared to the room air group (fold change ≥ 1.5, p-value ≤ 0.05). Key up- and down-regulated genes with their functions are illustrated in Table 1. Ingenuity Pathway Analysis (IPA) identified 180 significant canonical pathways; top pathways included immunological changes, inflammation, and development. IPA Networks 1 and 2, associated with cell signaling and interaction, growth and proliferation are shown in Figure 1. Top upstream regulators as predicted by IPA include TNF, TGF-β1, IL-1β, IFN-γ, and VEGF-α. Diseases and biological functions picked up by IPA analysis include cellular movement, respiratory disease and development, immune cell trafficking, organismal injury and development, and cardiovascular disease.

Conclusion(s) Exposure to hyperoxia induces significant differential gene expression in the lungs of neonatal rat pups. This alteration of gene expression may contribute to hyperoxia-induced lung injury, lung development, BPD, and long-term pulmonary morbidities.

Table 1. Key up- and down-regulated genes in hyperoxia exposure versus room air.



Top Ingenuity Pathway Analysis (IPA) networks in hyperoxia-exposed rats.

Abstract: 153
Maturation of Oxygen Extraction Responses in Premature Neonates
Farah Hussain[1], JOSEPH D. DECRISTOFARO[1], Catherine R. Messina[2], Jonathan P. Mintzer[1]
[1]Pediatrics - Neonatology, Stony Brook Children's Hospital, Stony Brook, New York, United States, [2]Stony Brook University School of Medicine, Stony Brook, New York, United States

Background Impaired cerebral oxygenation is a proposed risk factor for Sudden Infant Death in both premature and full-term neonates. Current hospital discharge-readiness screening procedures do not address the physiologic oxygenation effects of body position changes and enteral feeding in newborns. Near-infrared spectroscopy (NIRS) may aid in demonstrating maturation of tissue oxygenation responses to these routine stressors.
Objective The aim is to determine the physiologic maturation of tissue oxygen extraction patterns among preterm infants approaching term-equivalence. We hypothesize that preterm neonates will demonstrate increased cerebral regional oxygen saturation (rSO_2) variability compared to a cohort of full-term neonates and that non-cerebral sites will demonstrate similar responses.
Design/Methods In this proof of concept, comparative prospective observational study, we collected cardiopulmonary data and cerebral, renal, splanchnic, and peripheral muscle rSO_2 data in supine and prone positions before and after two consecutive feeds. The premature NICU cohort included infants born < 30 weeks GA who underwent data collection once during the 34th week postmenstrual age (PMA) and again within three days of discharge. Comparison was made to a well baby nursery (WBN) cohort of asymptomatic term infants preparing for discharge within 48 hours.
Results The NICU cohort was comprised of 13 infants with mean (± SD) GA 28 ± 1.6 wk and BW 1138 ± 260 g. Of the 13 infants in the NICU cohort, 5 later met exclusion criteria, thus only 8 infants were eligible for discharge data collection. The WBN cohort was comprised of 20 infants with GA 39.2 ± 1.1 wk and BW 3271 ± 552 g. Via within-group ANOVA, body position changes and/or feeding status produced no statistically significant variability in rSO_2 for all organ systems in both the NICU and WBN cohorts (Fig 1-4). In addition, the NICU cohort always demonstrated lower rSO_2 at all monitoring sites compared to the WBN cohort ($p<0.001$ for all comparisons). No rSO_2 maturational effect was observed in the NICU cohort between 34 wks PMA and term-equivalence.

Conclusion(s) NIRS can provide information on tissue rSO_2 stability in neonates. Among grouped data, body position changes and/or feeding status did not affect cerebral, renal, splanchnic, or peripheral muscle rSO_2. At both 34 wks PMA and term-equivalence, preterm infants demonstrated significantly lower rSO_2 compared to WBN neonates. Further study is required to analyze rSO_2 patterns within individual infants to determine outliers to this phenomenon.

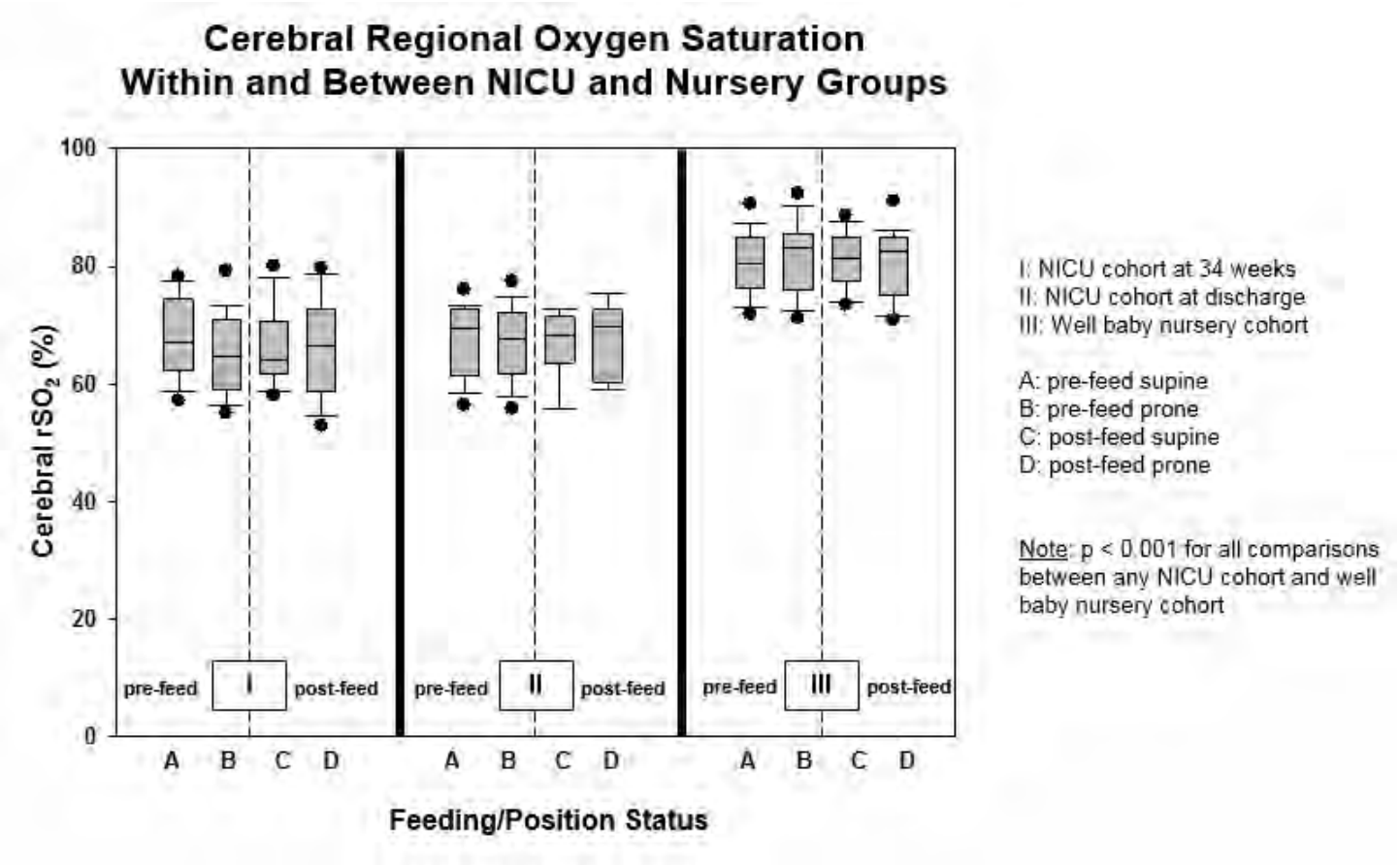


Figure 1

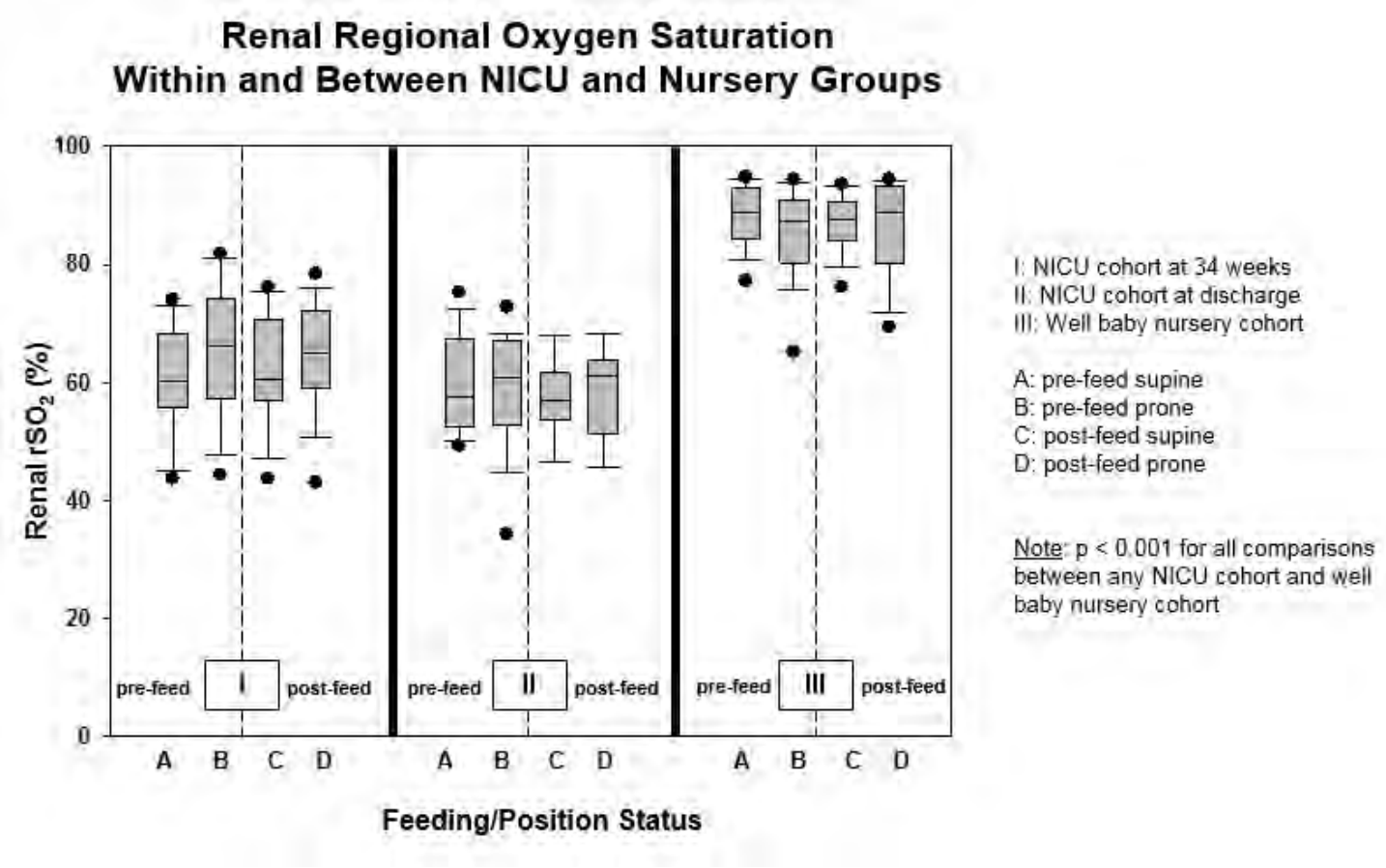

Renal Regional Oxygen Saturation
Within and Between NICU and Nursery Groups
Renal rSO2 (%)
100
80
60
40
20
0
pre-feed
I
post-feed
pre-feed
II
post-feed
pre-feed
III
post-feed
A B C D
A B C D
A B C D
Feeding/Position Status
I: NICU cohort at 34 weeks
II: NICU cohort at discharge
III: Well baby nursery cohort
A: pre-feed supine
B: pre-feed prone
C: post-feed supine
D: post-feed prone
Note: p < 0.001 for all comparisons between any NICU cohort and well baby nursery cohort

Figure 2

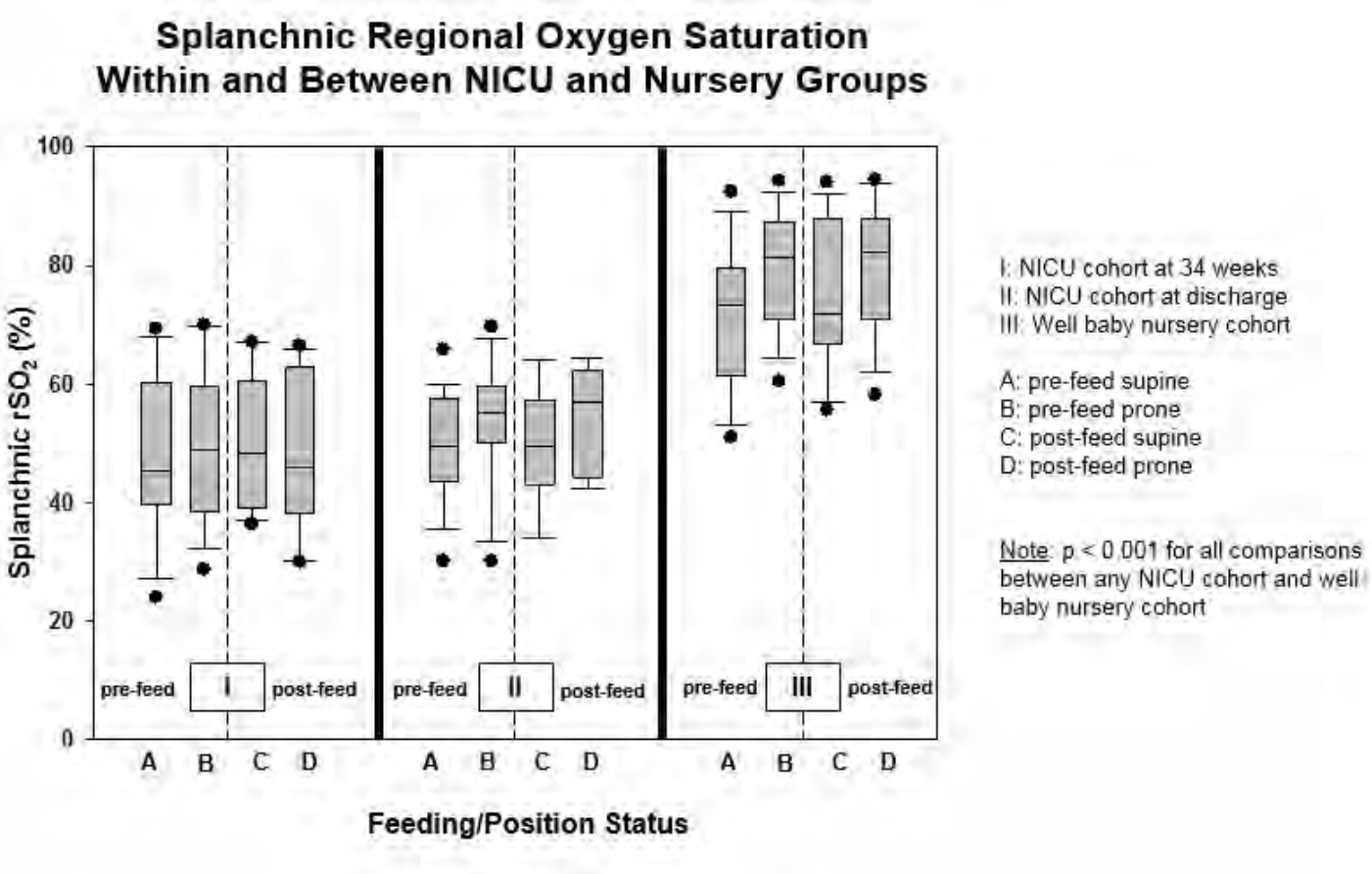

Splanchnic Regional Oxygen Saturation
Within and Between NICU and Nursery Groups
Splanchnic rSO2 (%)
100
80
60
40
20
0
pre-feed
I
post-feed
pre-feed
II
post-feed
pre-feed
III
post-feed
A B C D
A B C D
A B C D
Feeding/Position Status
I: NICU cohort at 34 weeks
II: NICU cohort at discharge
III: Well baby nursery cohort
A: pre-feed supine
B: pre-feed prone
C: post-feed supine
D: post-feed prone
Note: p < 0.001 for all comparisons between any NICU cohort and well baby nursery cohort

Figure 3

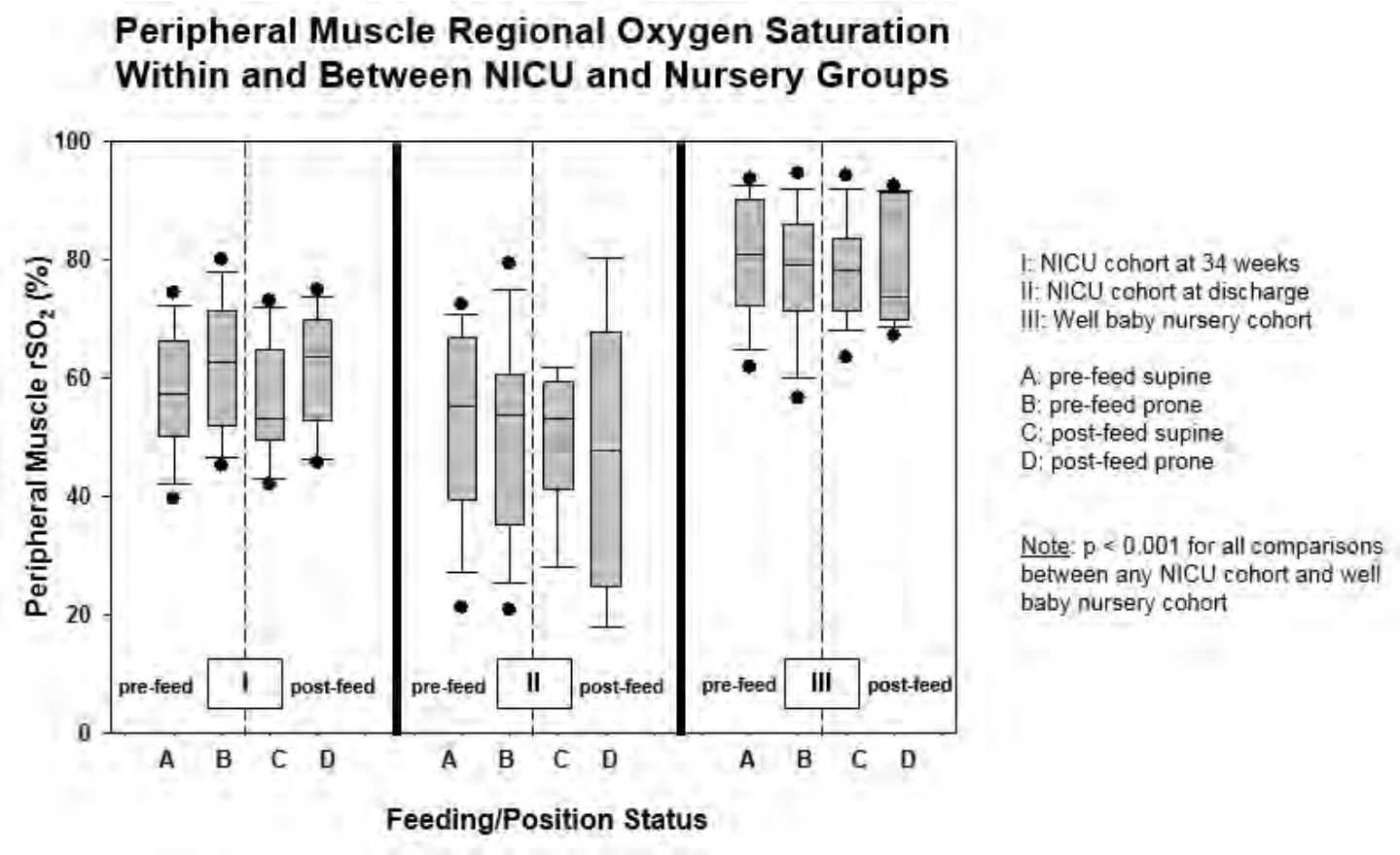


Figure 4

Abstract: 154

Mitochondria-Targeted Antioxidant Therapy Accelerates Recovery of Compromised Alveolarization and Pulmonary Vascular Disease in BPD

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Neonatology, University at Buffalo, Buffalo, New York, United States

Background Bronchopulmonary dysplasia (BPD) is the most common morbidity associated with prematurity. Despite advances in neonatal care, significant gaps remain in both prevention and treatment of disease. Prior studies identify that mitochondrial oxidative stress contributes to the phenotype observed in a neonatal hyperoxia BPD model and that mitochondrial dysfunction persists after neonatal exposure. We hypothesize that treatment with a mitochondria-targeted antioxidant following hyperoxia may accelerated recovery of BPD.

Objective To determine if treatment with a mitochondria-targeted antioxidant following hyperoxia

1. Accelerates recovery of compromised alveolarization and pulmonary vascular disease.

2. Improves growth parameters paralleling recovery of disease.

Design/Methods Newborn C57Bl6 mice were exposed to normoxia (21% O_2, control) or hyperoxia (75% O_2, BPD) from birth (postnatal day 0 or P0) through P14. Following exposures, mice were randomized to 7 days of treatment with a mitochondria-targeted antioxidant, mitoTEMPO (MT: 0.7 µg/g subcutaneous) or PBS vehicle (V). Daily weights were monitored during treatment. All mice were sacrificed at P21 for collection of heart and lung tissue. Heart tissue was micro-dissected for analysis of RVH using Fulton's Index ([RV/(LV+S)]). Lungs were inflation fixed with 4% formalin and morphometric analysis of alveolarization (mean linear intercept, MLI) and vascular remodeling (medial wall thickness, MWT) was performed.

Results 42 offspring were randomized to normoxia (N, control) and hyperoxia (H, BPD) with 20 and 22 mice in each group. Average weights at P14 were comparable in all treatment groups. However, mitoTEMPO attenuated growth failure associated with BPD as evidenced by improved weight gain following hyperoxia (Fig. 1). MitoTEMPO did not impact RVH in control

mice but accelerated recovery of hyperoxia-induced RVH in the BPD mice (Fig. 2) as well as vascular remodeling (Fig. 3). In addition, mitoTEMPO improved alveolarization with significantly lower mean linear intercept (Fig. 4).

Conclusion(s) Novel therapeutics to address the growing burden of BPD are greatly needed. Our data identifies that treatment with a mitochondria-targeted antioxidant following hyperoxia attenuates growth failure and accelerates recovery of compromised alveolarization as well as RVH and vascular remodeling, supporting the critical contribution of prolonged mitochondrial dysfunction and oxidative stress to disease.

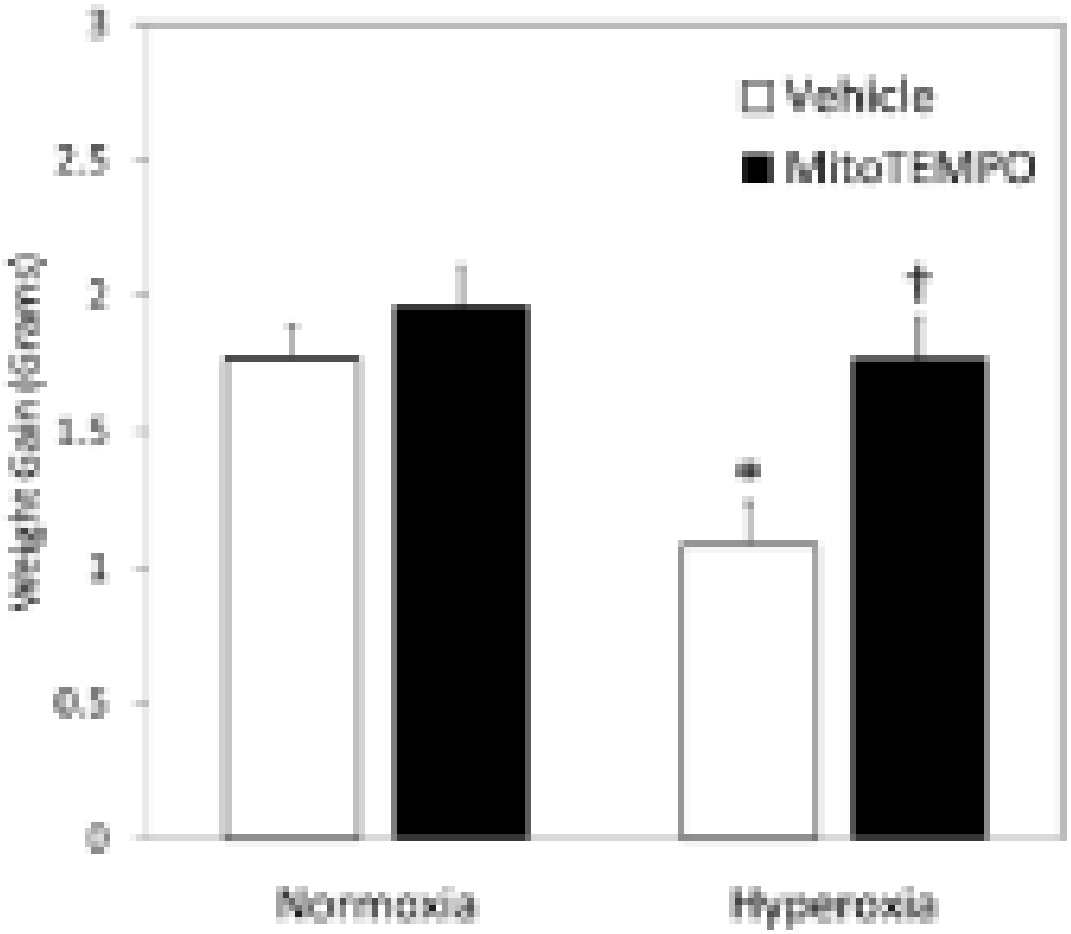

Figure 1. Treatment with MitoTEMPO resulted in improved weight gain following hyperoxia. *ρ < 0.05 compared with normoxia + vehicle and †ρ < 0.05 compared with hyperoxia + vehicle.

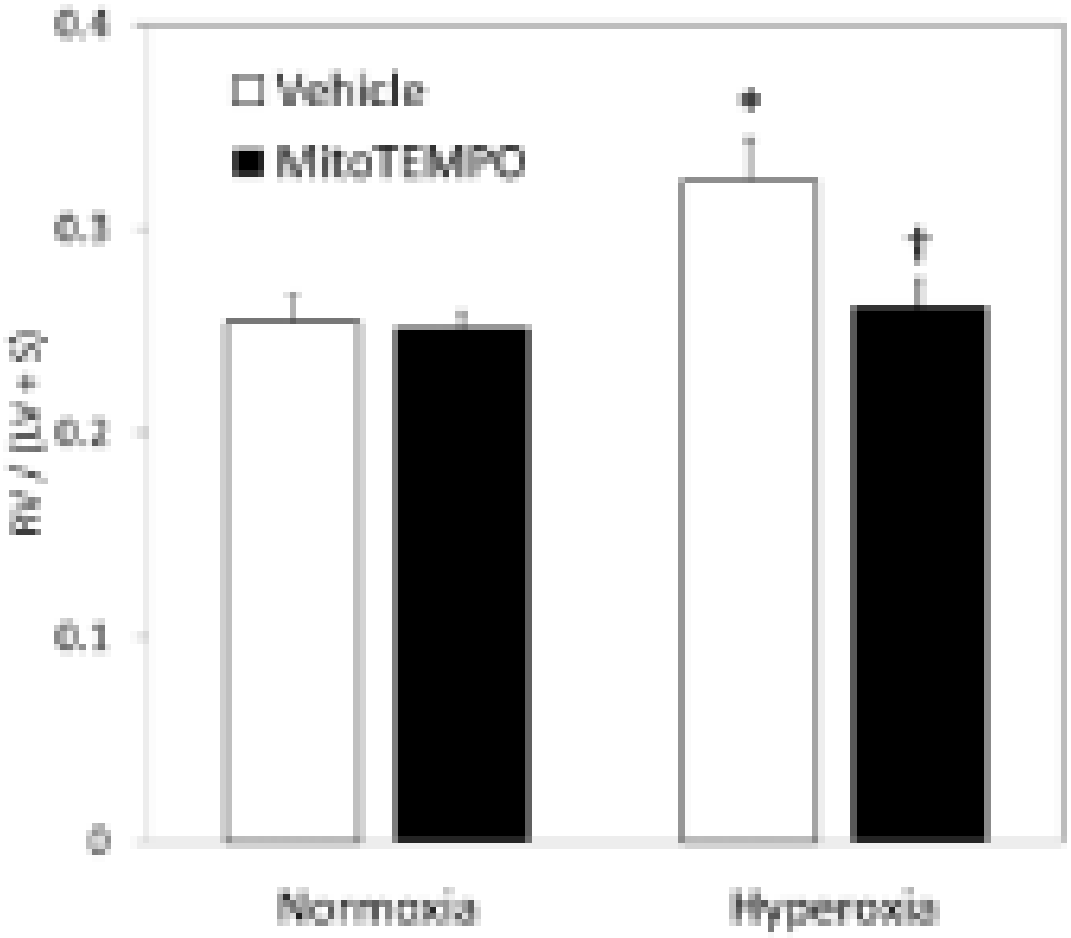

Figure 2. MitoTEMPO accelerates recovery of RVH following hyperoxia. 21 day-old mice treated with daily mitoTEMPO for 7 days following hyperoxia demonstrated attenuation of RVH. *ρ < 0.05 compared with normoxia + vehicle and †ρ < 0.05 compared with hyperoxia + vehicle.

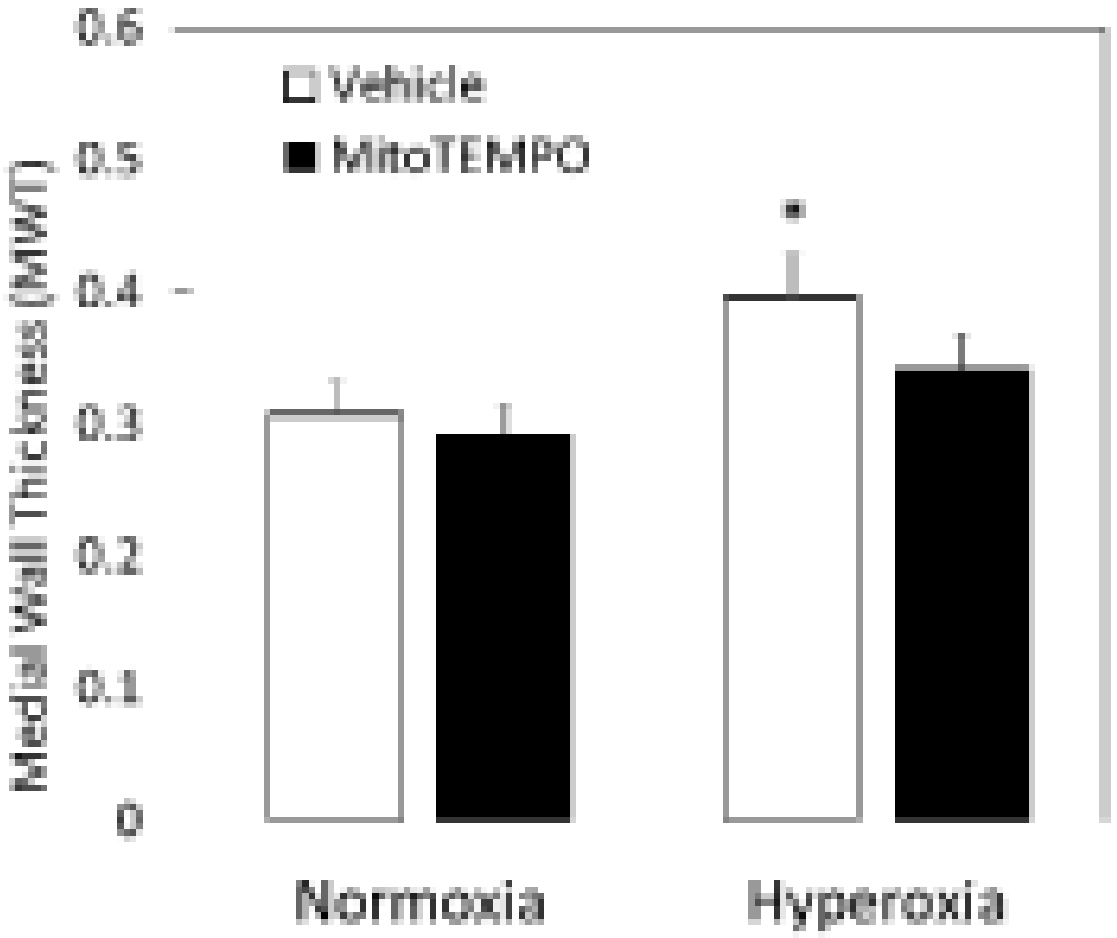

Figure 3: MitoTEMPO accelerated recovery of vascular remodeling. Increased medial wall thickness (MWT) with hyperoxia was attenuated in those who received mitoTEMPO. *ρ < 0.05 compared with normoxia + vehicle

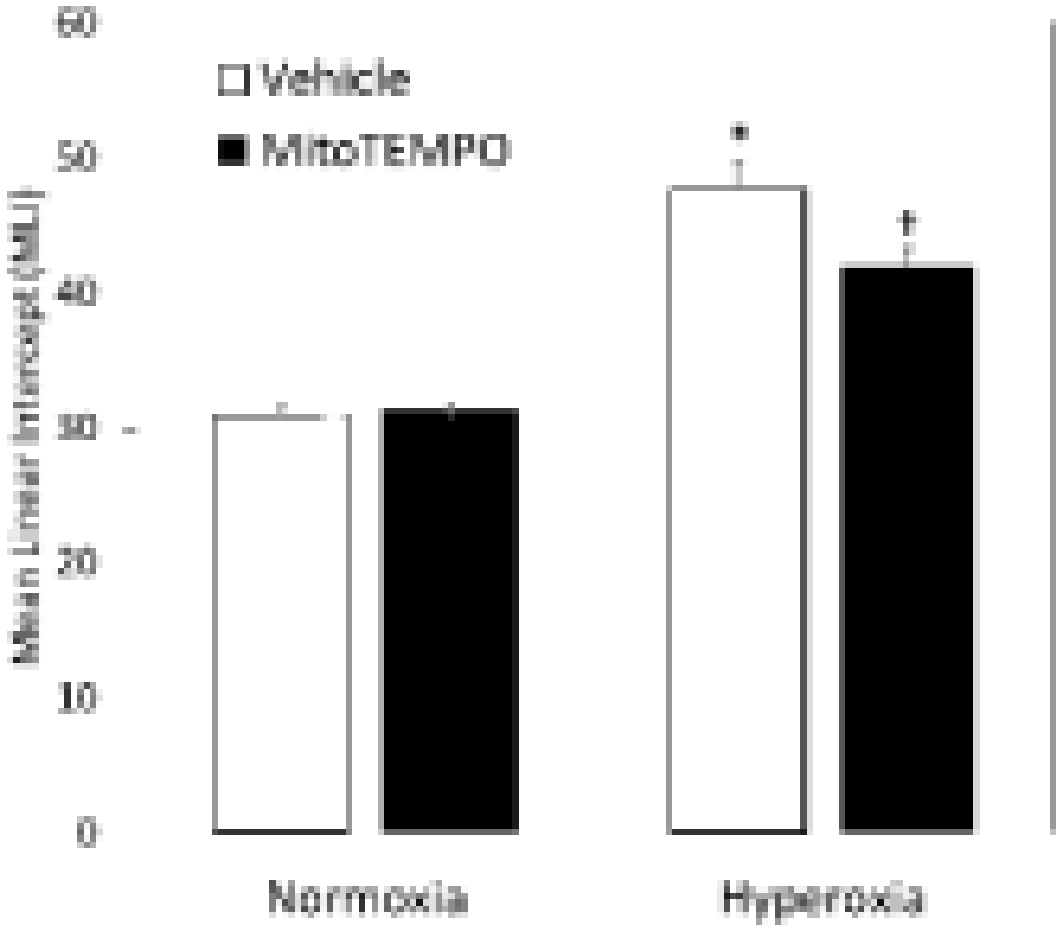

Figure 4. MitoTEMPO improved alveolarization following hyperoxia. Increased mean linear intercept (MLI) with hyperoxia was attenuated by treatment with mitoTEMPO. *ρ < 0.05 compared with normoxia + vehicle and †ρ < 0.05 compared with hyperoxia + vehicle.

Abstract: 155

Novel Biomarkers for Bronchopulmonary Dysplasia (BPD) and BPD-associated pulmonary hypertension (PH)

Mitali Sahni[1], Bettie Yeboah[2], Vineet Bhandari[1]

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Background BPD and BPD-associated PH (BPD-PH) are chronic inflammatory cardiopulmonary diseases with devastating short- and long-term consequences. A major challenge for clinicians is the lack of a reliable method for identifying babies at risk of developing BPD and BPD-PH. There is no reliable biomarker that can predict severity, help in diagnosis or monitor response to therapy for BPD or BPD-PH.

Objective To quantify and compare the levels of potential biomarkers in neonates with

i) BPD; ii) BPD with PH; iii) PH without BPD; and iv) in normal neonates without any BPD or BPD-PH. The antenatal and perinatal factors associated with the levels of biomarkers in the infants were also compared.

Design/Methods Scavenged blood from discarded samples was obtained from neonates meeting the eligibility criteria for the diagnoses noted above. Normal neonates without any BPD or PH were classified as term control (TC) if born at >35 weeks gestational age (GA) or preterm control (PC) if born at <35 weeks GA. Data on antenatal and perinatal factors were collected.

Multiple cytokine and proteins were measured using ELISA. The Institutional Review Board at Drexel University approved the study. Fischer exact test was used to compare baseline maternal and neonatal characteristics. One-way ANOVA was used to compare levels of biomarkers between different groups.

Results A total of 61 patients have been enrolled, to date - 9 PC, 17 TC, 25 with BPD, 7 with PH and 3 with BPD-PH. Table 1 shows selected study cohort demographics. Table 2 summarizes the differences between biomarker levels in the different groups. Higher levels of ICAM-1 were present in infants with BPD, compared to PC. Specific cytokines (IL6, IL8, IL10 and TNF*α*) were significantly increased in infants with PH, compared to TC. Levels of IL-1β were significantly increased and MCP-1 were significantly decreased in infants with BPD-PH, compared to TC, PC and infants with PH. In infants with BPD who develop PH (BPD-PH), IL-6 rises significantly over time.

Conclusion(s) Specific patterns of biomarkers can be discerned in babies with BPD and BPD-PH.

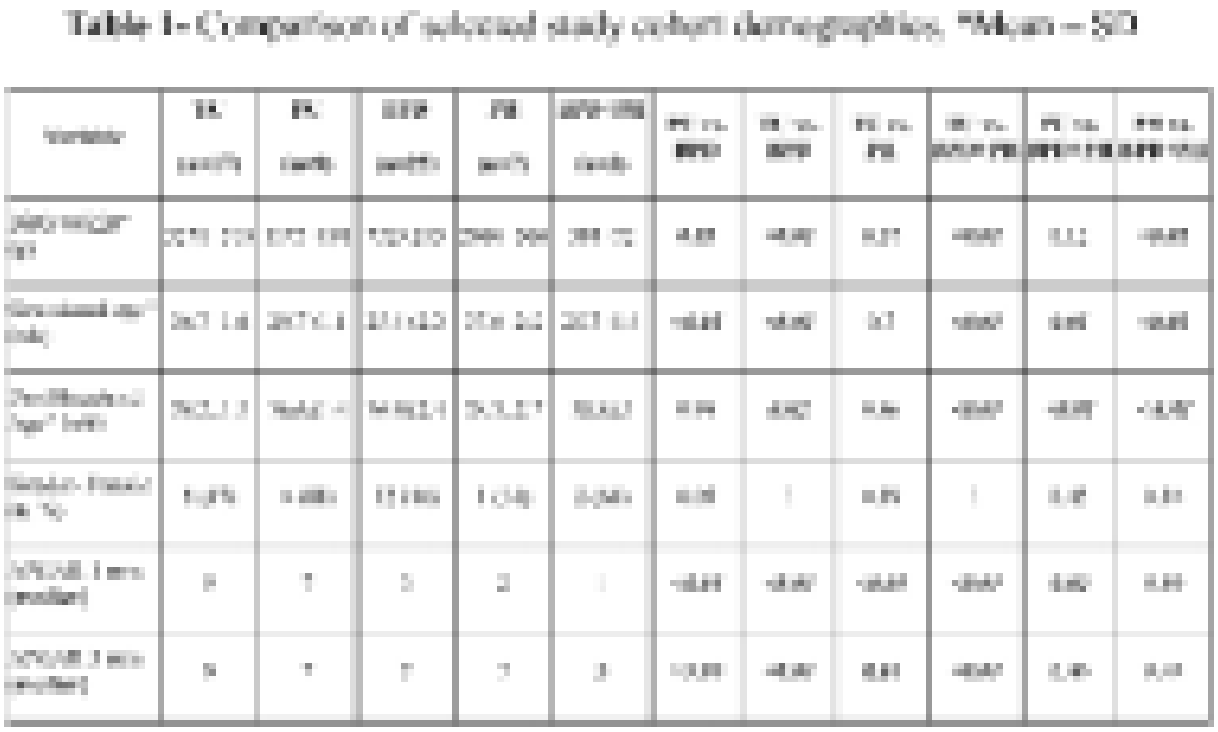

Table 1- Comparison of selected study cohort demographics, *Mean ± SD

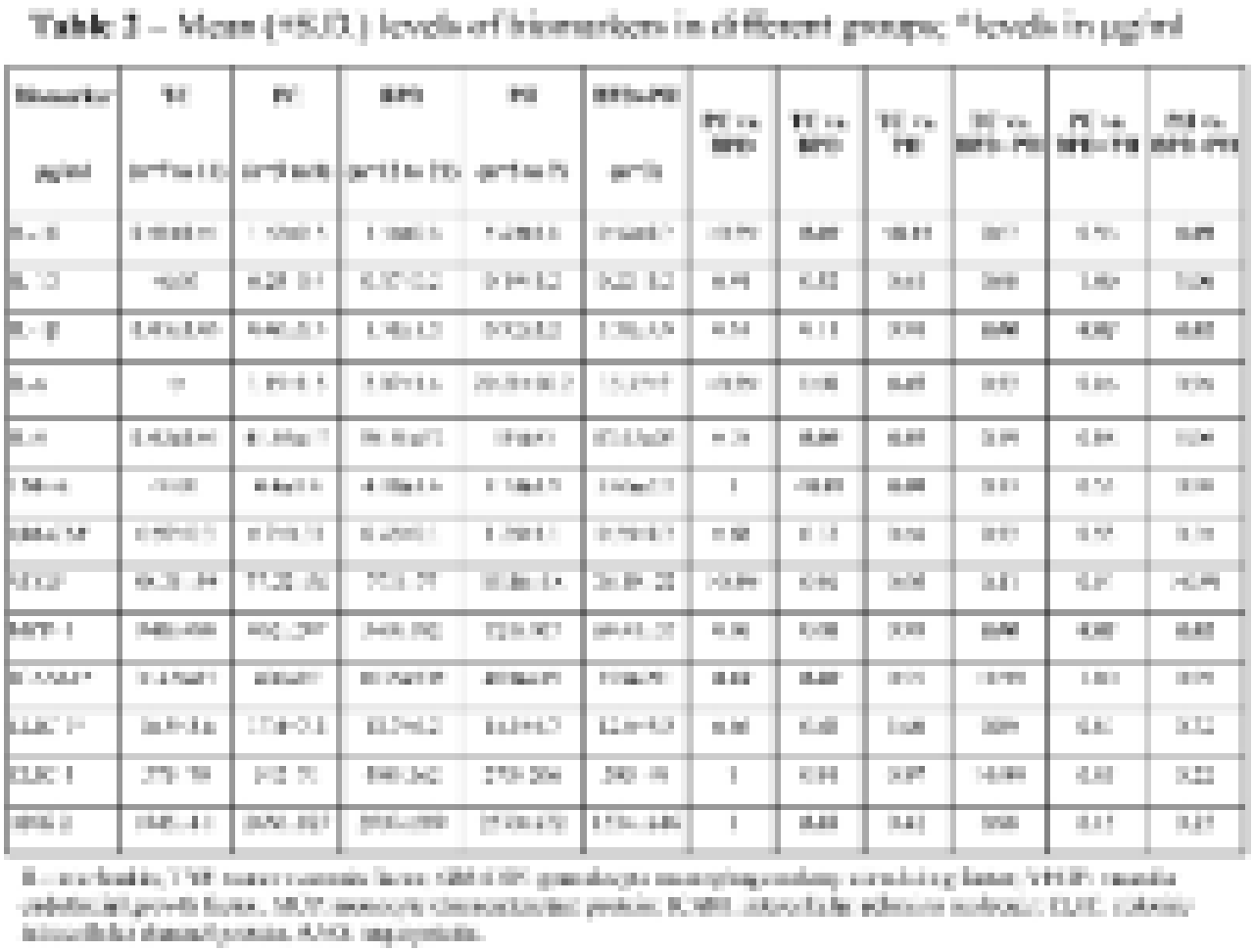

Table 2 – Mean (±SD) levels of biomarkers in different groups; *levels in µg/ml

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Can Knowing Past Mistakes Change Future Prescribing Practices? A QI Project to Reduce Medication Errors in the NICU

Kathryn Kauffman[1], Samantha Mumford[2], Michael Dejos[2], Kevin Sullivan[2]

[1]Neonatology, Thomas Jefferson University Hospital/Nemours, Alfred I duPont Hospital for Children, Wilmington, Delaware, United States, [2]Neonatology, Nemours/Alfred I. duPont Hospital for Children, Newark, Delaware, United States

Background Medication prescribing errors can cause serious harm and are potentially lethal. Preterm and critically ill neonates are at an increased risk of harm from errors due to their size, immature organ systems, disease severity, and pharmacologic factors.

Objective To evaluate if monthly feedback of prior errors to prescribers in a level IV neonatal intensive care unit (NICU) can influence medication prescribing error rates.

Design/Methods From a database of pharmacist interaction with medication orders, we identified potential medication errors and established baseline patterns of errors from January 2017 to June 2018 in the Nemours/AI duPont level IV NICU. Errors were categorized based on type (dose, dose optimization, scheduling, formulation, discontinuation, duplication, route of administration, PRN qualifiers, wrong patient, and TPN errors) and underwent secondary analysis by the research team. To better understand the causes of errors, a survey was sent to the medical providers regarding feedback of prior errors, medication safety culture, perceptions of common errors and potential contributors to their own order errors. Using the

review of prior errors and survey results, a monthly report was created to provide prescribers feedback on recent errors and tips for prevention.

Results Fifty-eight percent (18/31) of providers responded to the initial survey. They indicated that prescribers were frequently aware of errors but did not report them, dosing was perceived as the most common type of error, and distractions were the biggest contributor to prescribing errors. Baseline error data showed a median of 30.6 errors per 1000 orders CI [26.9, 37.3], most commonly scheduling errors (170/732 errors) and incorrect dose (169/732 errors), with TPN as the most common medication ordered incorrectly (57 errors/732 errors).

Conclusion(s) The feedback intervention began in July 2018 and ongoing data collection to track effect on overall error rate and types of errors with further data available by April 2019. Some highlighted errors noted during monthly feedback included morphine drip dose and formulation errors and adjustment for renal impairment. Errors continue to be selected based on potential harm to the patient and common themes seen during the month of prescribing.

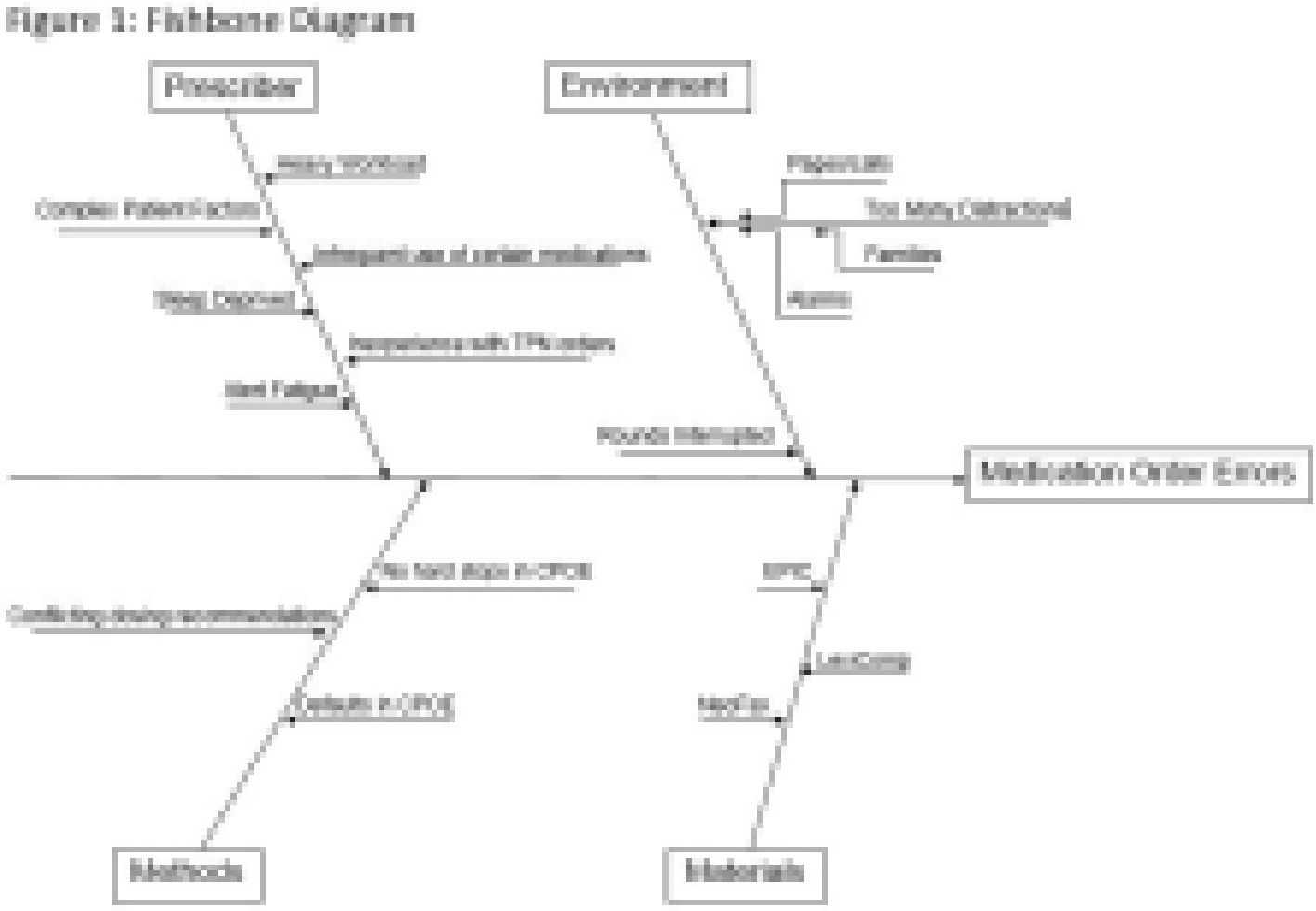

Figure 1: Fishbone Diagram

Figure 2: SPC Chart

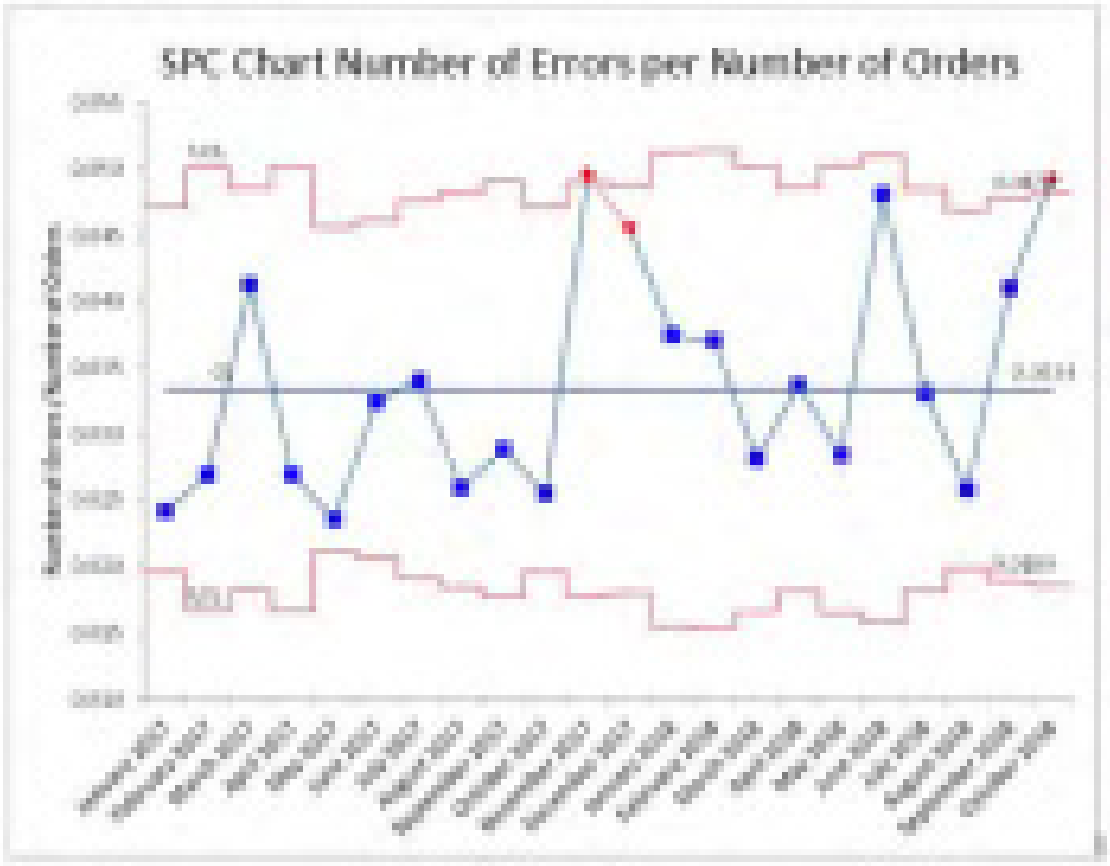

Figure 2: SPC Chart

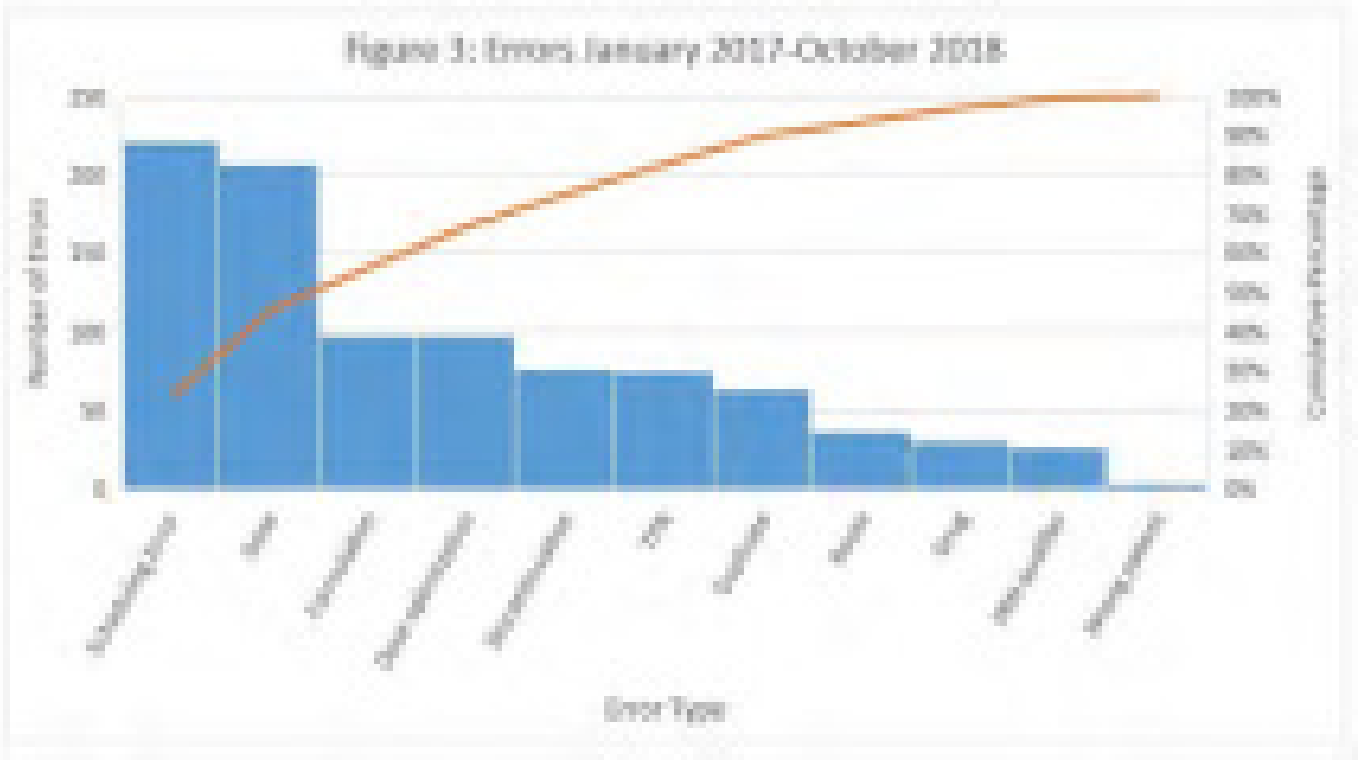

Figure 3: Pareto Chart of Errors by Type

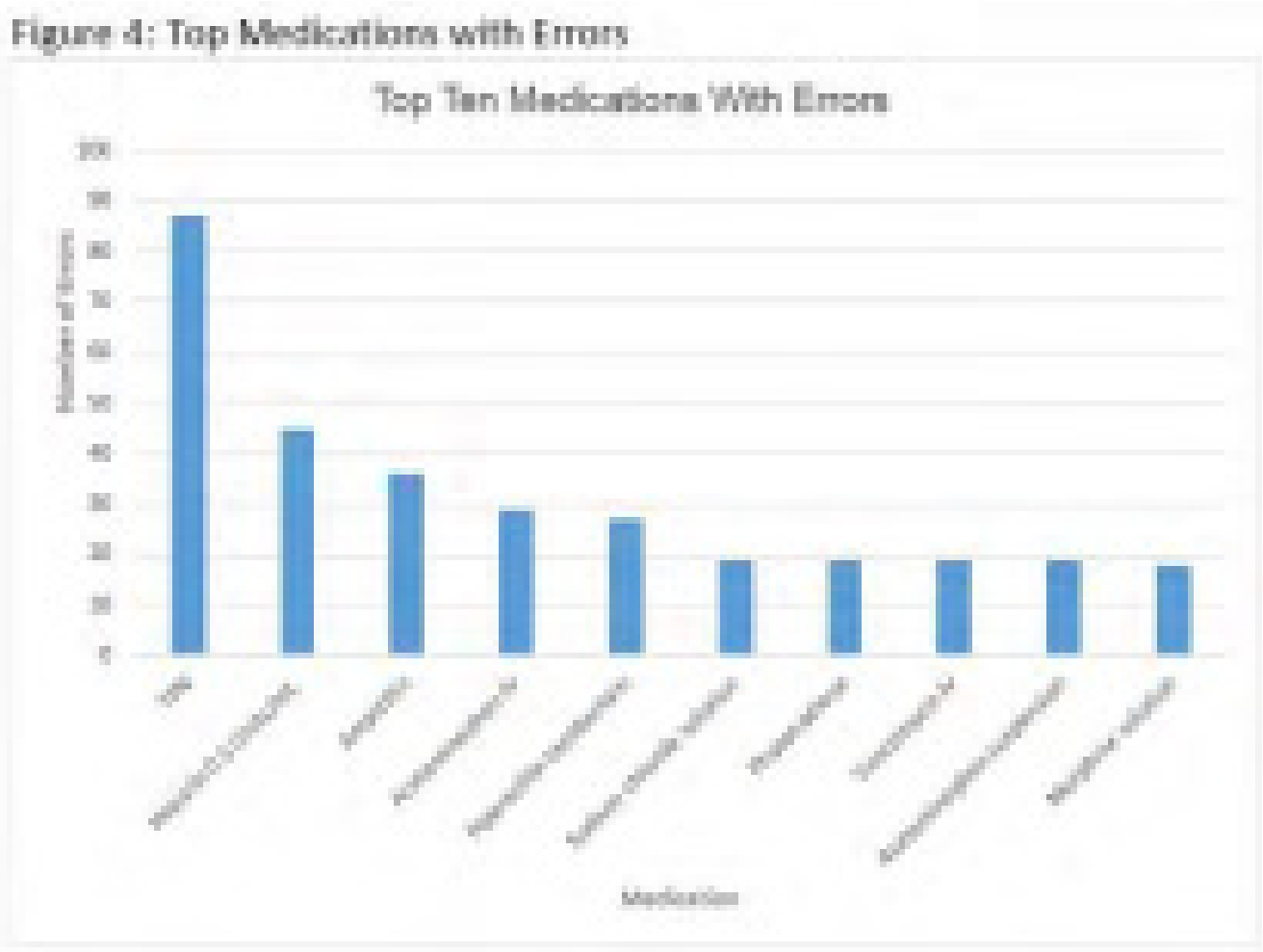

Figure 4: Top Medication with Errors

Abstract: 157

Chronic Lung Disease Prevention Using an Extubation Criteria Tool in the Neonatal Intensive Care Unit: A Quality Improvement Project

Farah Hussain[1], Catherine R. Messina[2], Jennifer Pynn[1]

[1]Pediatrics - Neonatology, Stony Brook Children's Hospital, Stony Brook, New York, United States, [2]Stony Brook University School of Medicine, Stony Brook, New York, United States

Background The very low birth weight (VLBW) population is at risk for complications of prematurity including chronic lung disease (CLD). CLD is associated with chronic respiratory and cardiovascular morbidity, neurodevelopmental delays, and growth failure. Strategies to reduce duration of time intubated and on a ventilator may help decrease the development of CLD.

Objective This quality improvement project aimed to decrease overall rates of CLD in VLBW neonates in the Stony Brook Children's Hospital NICU. Our aim was a 20% reduction in the mean number of days to first planned extubation by developing and implementing an Extubation Criteria Tool.

Design/Methods Retrospective data was collected from VLBW infants with birthweight <1500 g as a baseline from January 2017 to December 2017. A CLD Prevention Committee was formed and, using sequential Plan-Do-Study-Act cycles, an Extubation Criteria Tool was developed and implemented. Intubated infants were screened daily and, if they met extubation criteria, discussions were held with the primary team to further assess clinical status in preparation for a potential extubation. Ongoing prospective data has been collected following implementation of the tool. Data collected includes demographic data, days to first planned extubation, need for reintubation, and CLD diagnosis.

Results The pre-tool group consists of 45 infants with mean (± SD) GA 28 ± 2.7 wk and BW 1038 ± 248 g. The post-tool group consists of 46 infants with GA 28.5 ± 2.6 wk and BW 1104 ± 295 g. Both groups had similar baseline characteristics (Table 1). There was a trend towards decreased incidence of CLD in the post-tool group (pre 46.7%, post 41.3%; p=0.606). Using the Extubation Criteria Tool, the mean days to first planned extubation decreased from 10.4 days to 4.4 days (p=0.023), which is a 58% reduction (Fig 1). Of those who were extubated, 40% needed to be reintubated within 72 hours due to increasing oxygen requirement, work of breathing, or apnea/bradycardia/desaturation events.

Conclusion(s) In VLBW infants, there was a trend towards decreased CLD associated with the use of an extubation criteria tool. Use of formal extubation criteria was also significantly associated with earlier extubation. Limitations of the study include a lack of uniform criteria for reintubation and small sample size. Further prospective data is being collected. Future PDSA cycles will include education of the staff as well as implementation of strategies to optimize non-invasive ventilation.

Demographic and Baseline Characteristics (n=91)

	Pre-Tool (n=45)	Post-Tool (n=46)	p-value
Male gender, n (%)	25 (55%)	25 (54%)	0.908
Vaginal delivery, n (%)	15 (33%)	14 (30%)	0.797
Gestational age in weeks, mean (± SD)	28 (± 2.7)	28.5 (± 2.6)	0.923
Birth weight in grams, mean (± SD)	1038 (± 248)	1104 (± 295)	0.086
Surfactant administration, n (%)	31 (69%)	27 (59%)	0.312

Table 1

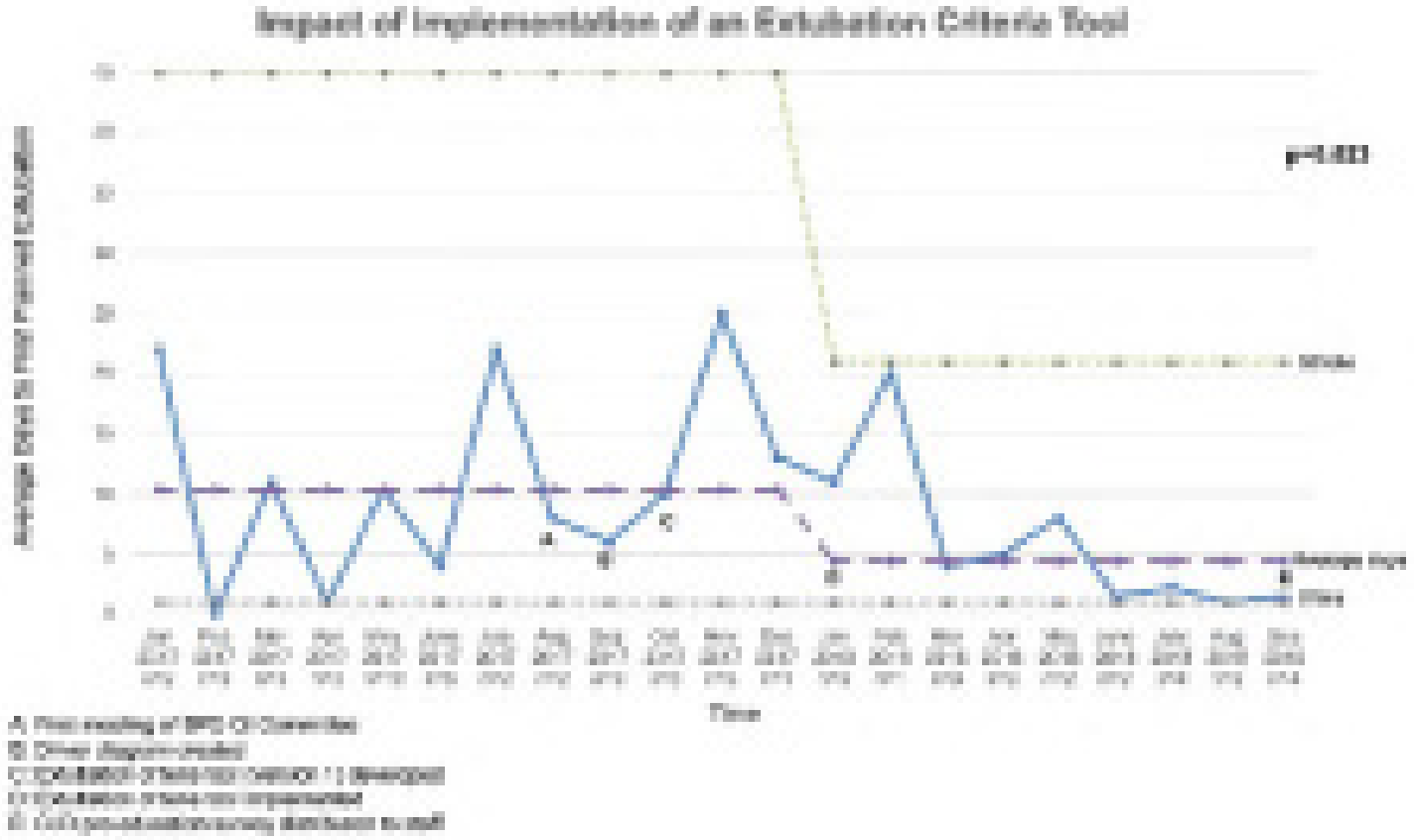

Figure 1

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Implementation of Umbilical Cord Blood Culture (UCBC) Sampling with Minimal Contamination Rates in a Level III Neonatal Intensive Care Unit (NICU)

Vilmaris Quinones Cardona[1], David Cooperberg[2], Endla K. Anday[1], Alison Carey[1]

[1]Neonatology, St Christopher's Hospital for Children/Drexel University College of Medicine, Philadelphia, Pennsylvania, United States, [2]Pediatrics, St Christopher's Hospital for Children/Drexel University College of Medicine, Philadelphia, Pennsylvania, United States

Background Peripheral venous blood culture is the gold standard for detecting bacteremia in neonates. However, UCBC is a convenient method to ensure adequate blood volume for isolation of bacterial pathogens. UCBC has been shown to grow equivalent organisms to peripheral blood culture (PBC), however, concern exists on higher contamination rate.
Objective 1. To achieve a 0% contamination rate in all UCBC samples collected. 2. To obtain UCBC samples in at least 90% of neonates ≥37 weeks' gestation admitted to the NICU due to maternal chorioamnionitis in a 12-month period.
Design/Methods Observational time series conducted at a Level III NICU between 3/2017-11/2018. Number of eligible admissions, neonatal and maternal characteristics, UCBC, PBC and placental pathology results were collected. The percent of UCBC samples collected from eligible admissions and contamination rate of UCBC per month were displayed using P charts. Established rules for detecting special cause were applied. Fig 1 highlights aims, key drivers and interventions.
Results A total of 79 neonates were included (Table 1). Nine neonates (11.3%) were diagnosed with clinical sepsis by the primary team. There were no statistically significant differences in baseline characteristics between the clinical sepsis and the asymptomatic group. The mean number of UCBC samples collected was 81.9% over 21 months. There was special cause variation in the contamination rate from 7.32% to 0% with 8 consecutive points below the mean (Fig 2). Of the 5 positive UCBCs, 2 (Escherichia coli and Streptococcus anginosus) correlated with clinical sepsis. All PBCs were negative. The seven additional cases of clinical sepsis had negative UCBCs and PBCs.
Conclusion(s) UCBC sampling can be effectively implemented in the NICU. Barriers to achieve our sample collection goal

included the need for consent and late diagnosis of chorioamnionitis after the placenta was sent for testing. Contamination rate was successfully eliminated once drying the umbilical cord was implemented before performing sterile collection. UCBC identified bacterial pathogens in 2 infants with clinical sepsis who had negative PBC. Keys to success included collaborations with obstetricians, education and inter-disciplinary involvement of NICU providers. The success of this quality improvement project has lead to implementing exclusive UCBC collection for infants with suspicion for early onset sepsis in our NICU.

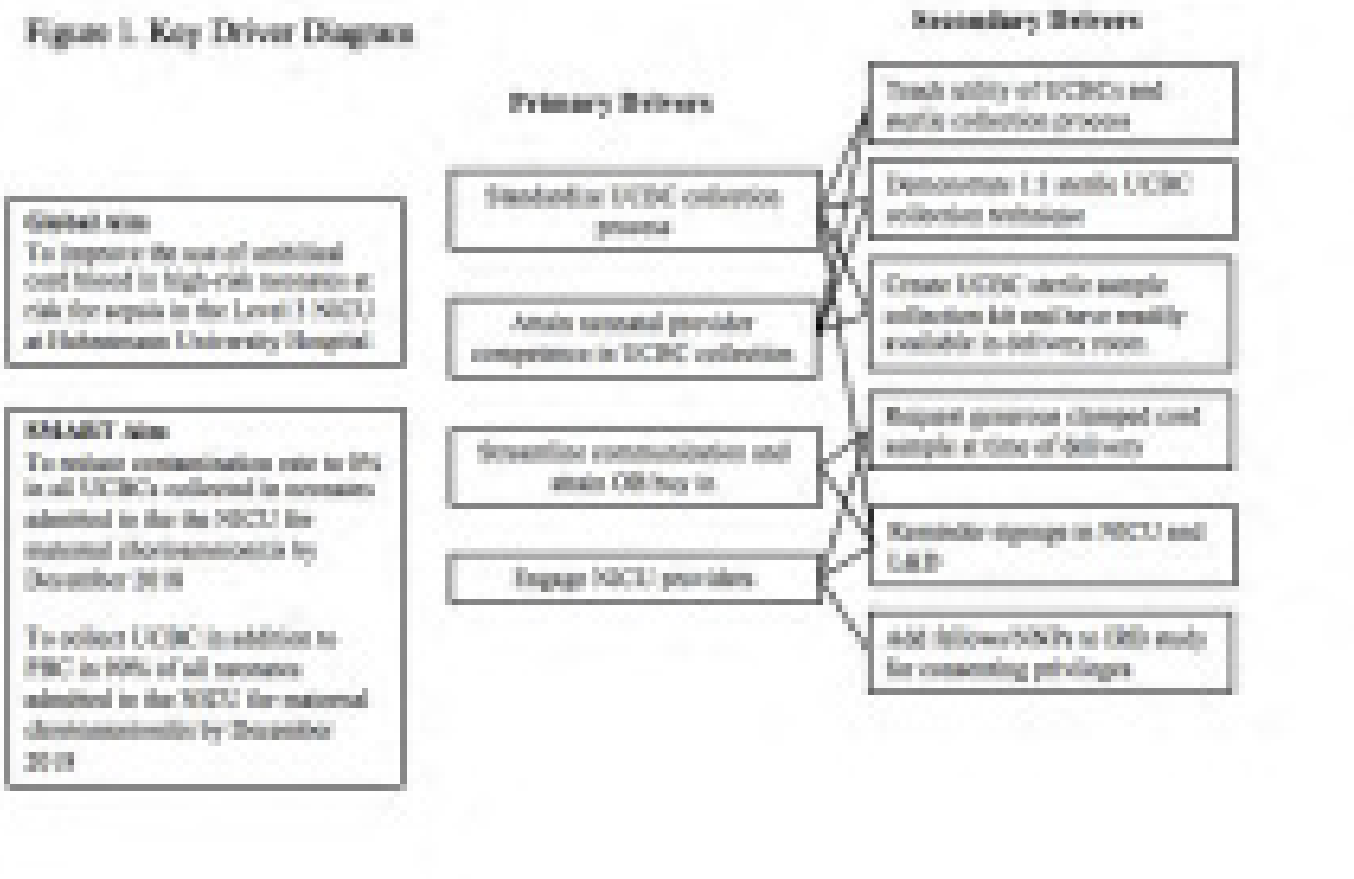

Figure 1. Key Driver Diagram

Table 1. Neonatal and Maternal Characteristics

Parameters	Clinical Sepsis (n=9)	Asymptomatic (n=78)	p-value
Gestational age (weeks)	40 +/-1	39.5 +/-1.1	0.35
Weight (grams)	3617 +/-410	3350+/-462	0.14
Male	5 (55.5%)	41 (58.6%)	0.86
5 minute Apgar	8.1 +/- 1.3	8.6 +/- 0.8	0.065
Maternal temperature (F)	101.5 +/-0.9	101.2 +/-0.7	0.31
Prolonged rupture of membranes	4 (44%)	18 (25.7%)	0.25
GBS +	2 (22.2%)	19 (24%)	1
Intrapartum antibiotics	9 (100%)	63 (90%)	1
Placental chorioamnionitis	8 (88%)	49 (68%)*	0.15
* 2 placental pathology results not available			

Table 1. Neonatal and Maternal Characteristics

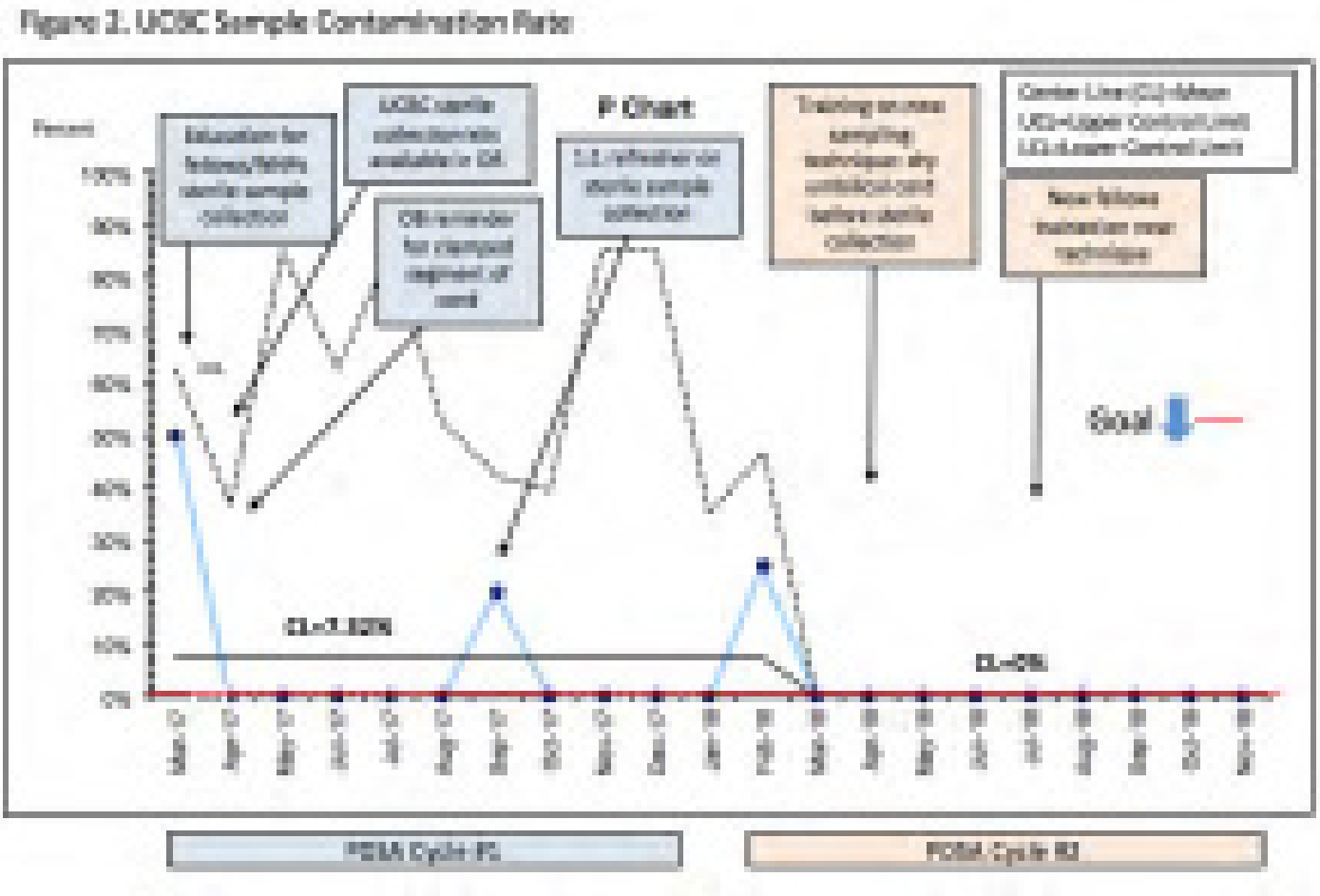

Figure 2. UCBC Sample Contamination Rate

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Quality Improvement Project to Decrease Incidence and NICU admissions secondary to hypothermia in a Baby Friendly Hospital

Noel Joseph, Alena Connelly, Ulka Kothari, Mary Brassil, Dawn Christie, Maureen Kim, MD Hanna, Amrita Nayak
Pediatrics, NYU Winthrop , Mineola, New York, United States

Background NYU Winthrop was the 1st hospital on Long Island, NY to receive the designation of Baby Friendly Hospital. As infants in baby-friendly hospitals are allowed to room in with the mom, there is increased risk for hypothermia, as it is difficult to monitor for room temperature, swaddle adherence, or early warning signs of hypothermia. Hypothermia (temp <97^0 F) is significant post-natal morbidity requiring the transfer of babies from the mother-baby unit (MBU) to the NICU. Previously in our hospital, there was no protocol for managing hypothermia in the MBU, leading to unnecessary NICU admissions.

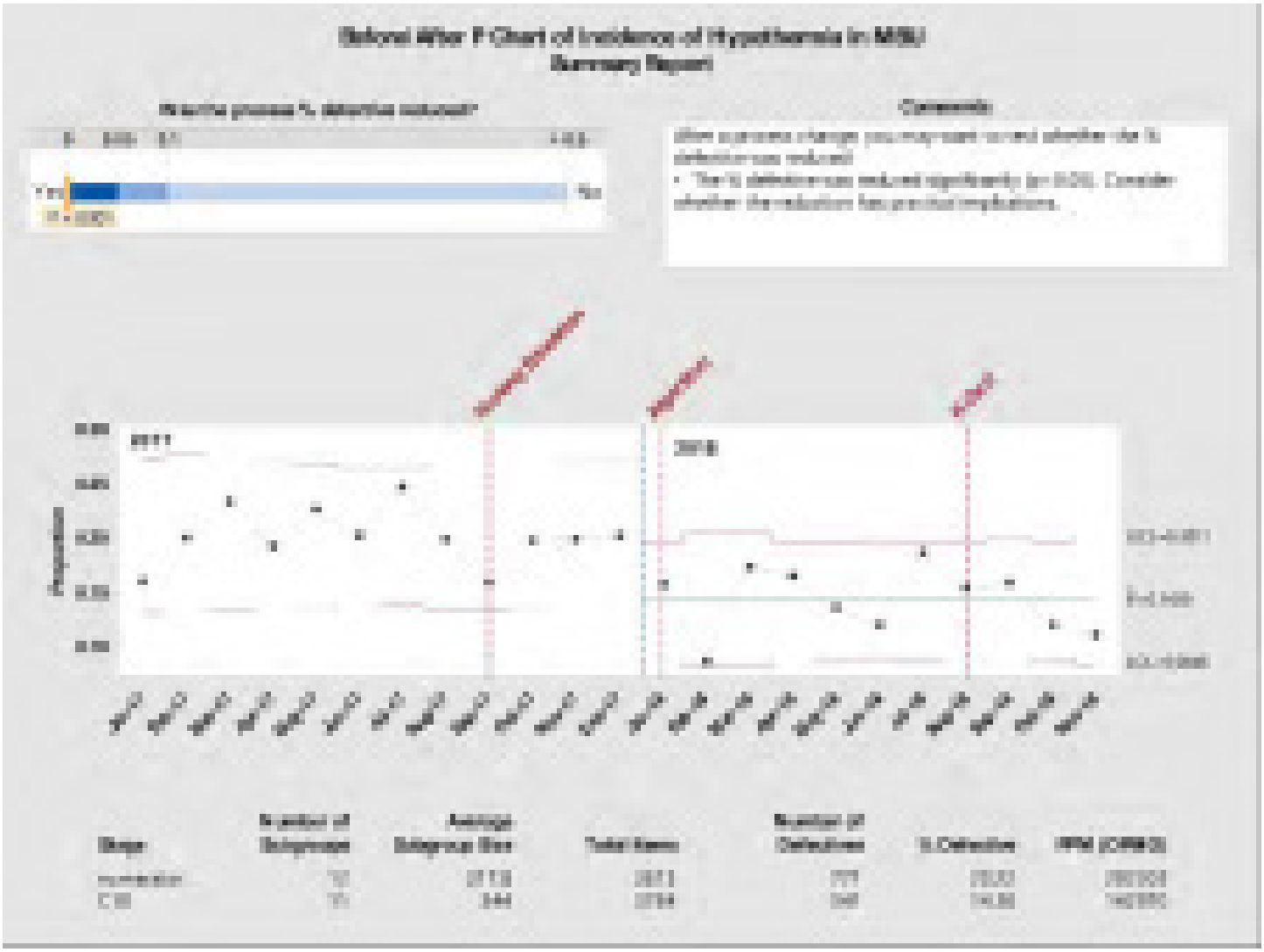
Objective Decrease the incidence of hypothermia in MBU as well as NICU admissions secondary to hypothermia by 10% in 2018

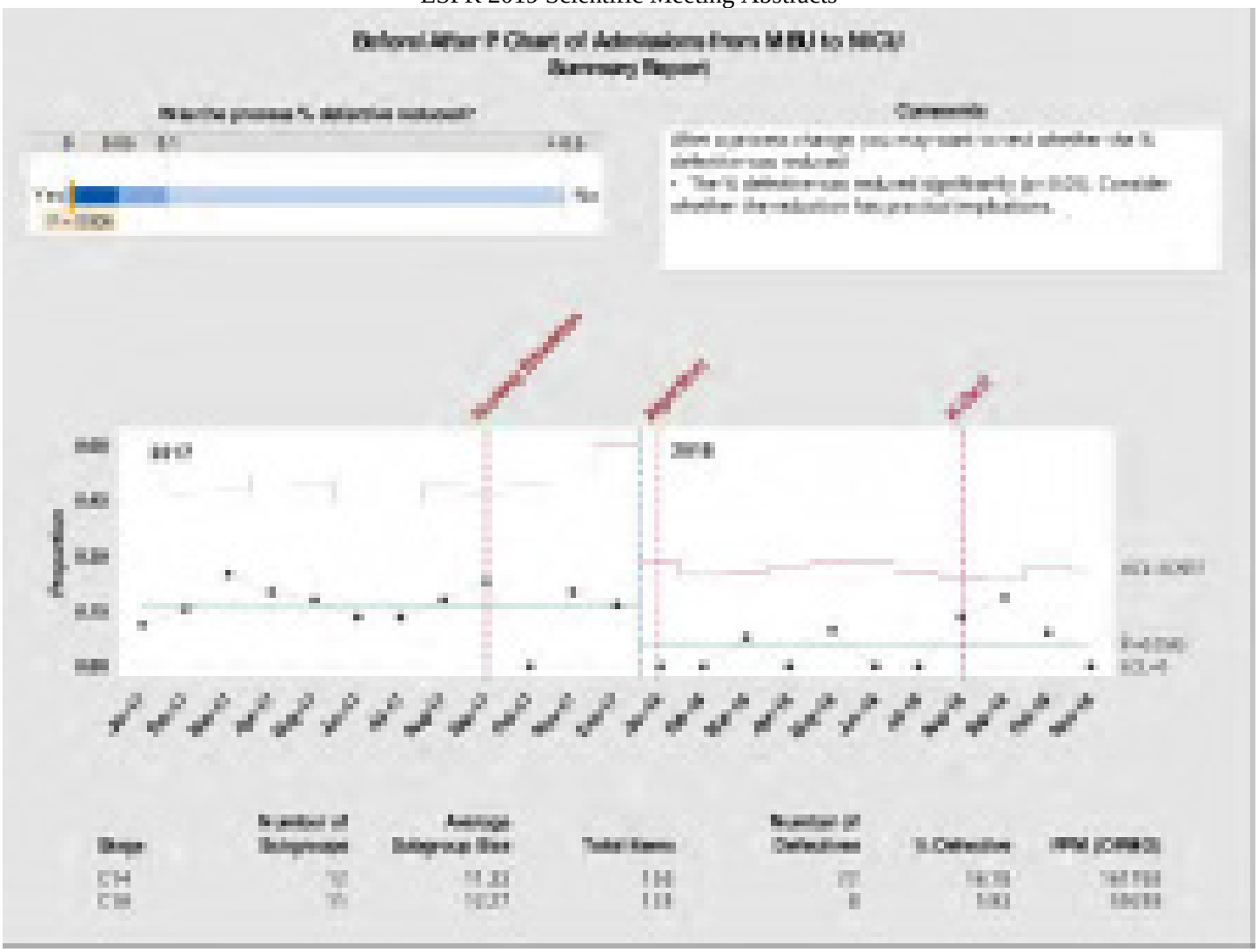
Design/Methods We performed a retrospective chart review of all infants ≥35 weeks admitted to the NICU from MBU with a temperature of <97.7^{0}F. We excluded infants with conditions or symptoms unrelated to hypothermia that would warrant a NICU admission. An interdisciplinary team was assembled to evaluate the current MBU hypothermia management by constructing a process map to identify opportunities for improvement and perform interventions. Intervention "1" consisted of nursing education. Intervention "2" saw implementation of a hypothermia algorithm. Intervention "3 " utilized K-Cards to assess adherence to protocol and education to parents.

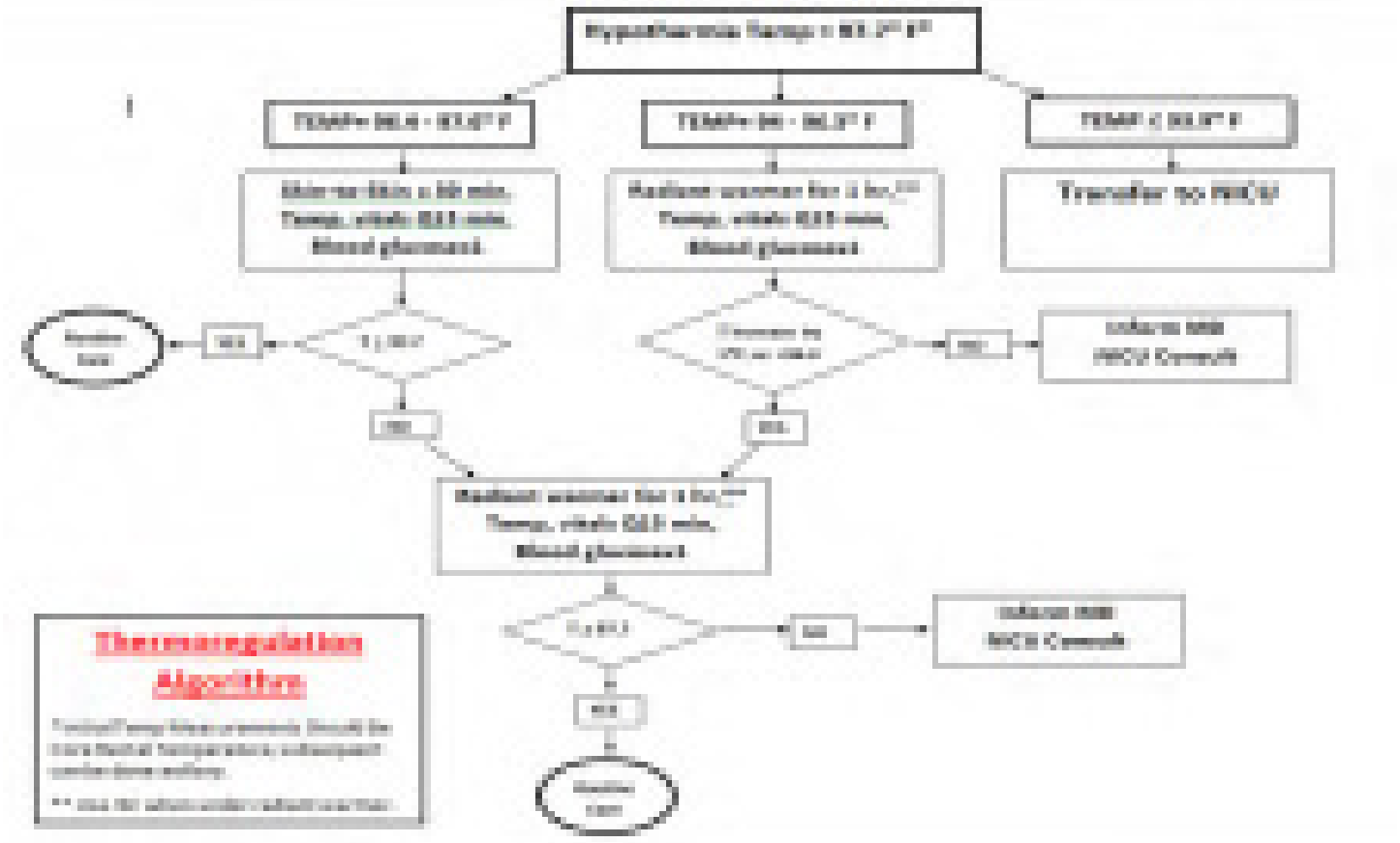
Results Incidence of hypothermia in MBU prior to Intervention "1" was consistently above 20%. Total admissions from MBU

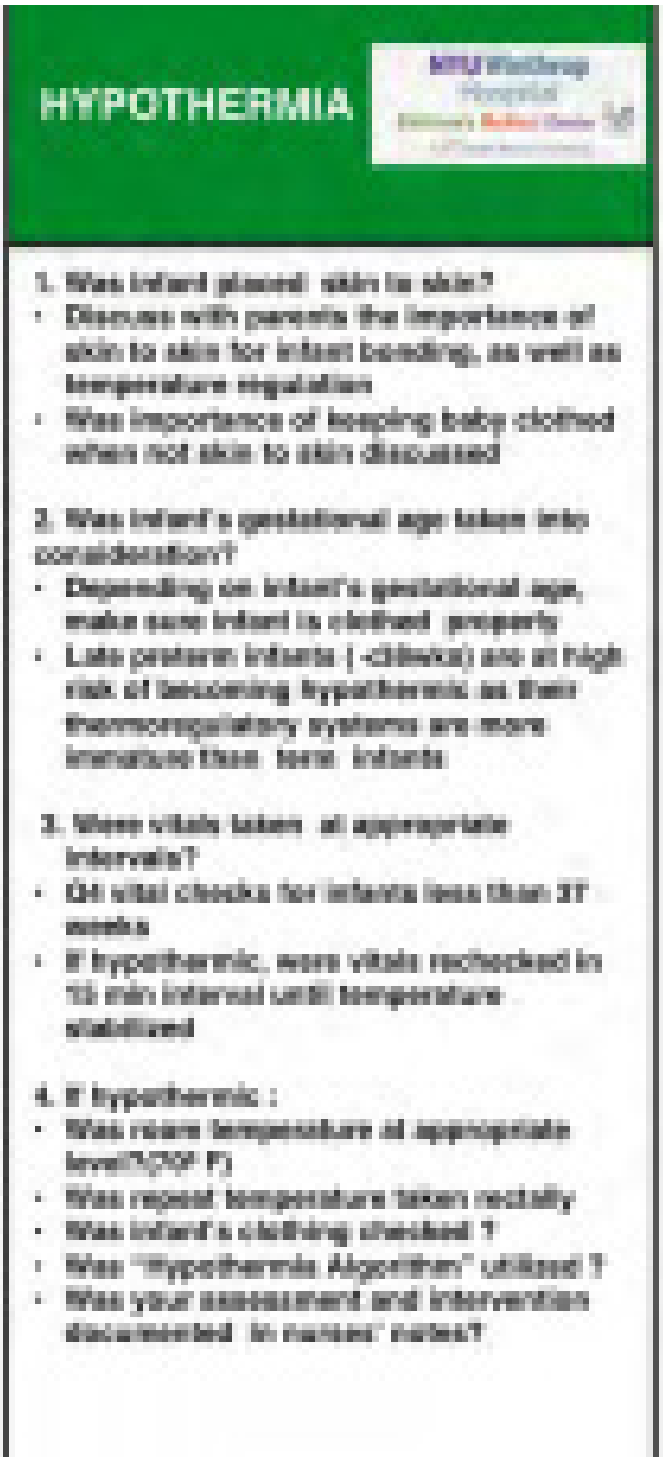
to the NICU secondary to hypothermia ranged between 15-19%. After intervention "2", the incidence of hypothermia decreased to < 15% in MBU. Overall rate of admission from MBU per month due to hypothermia decreased to less than 10%. Upon starting K-card audits a slight decrease in incidence of hypothermia was observed.

Conclusion(s) As infectious causes were excluded, hypothermia is likely secondary to factors such as late preterm gestational age, low birth weight and environmental temperature. With education and algorithm implementation, we were able to increase awareness of warning signs for hypothermia and allow for a step-wise algorithm to safely rewarm infants and decrease the need for NICU admissions. We observed a slight improvement after K-card audits as method of reinforcing hypothermia protocol adherence and education. However, to further decrease the incidence of hypothermia, partnership with parents is needed. Key cards utilization will further educate parents on preventive measure and normorthermia practices






Transfer to NICU
Thermoregulation Algorithm



Abstract: 160

Standardizing Surfactant Delivery to Decrease BPD in the Era of Non-Invasive Ventilation

JEONGEUN KIM, Mariana R. Brewer, Barry Weinberger, Joanne Casatelli, Joanna Beachy, Spinazzola Regina, Perveen Shahana

Cohen Children's Medical Center, Zucker School of Medicine at Hofstra/Northwell, New Hyde Park, New York, United States

Background Initial non-invasive management of RDS and selective surfactant leads to less BPD than routine intubation, but "early" surfactant leads to better outcomes than "late". Therefore, it is important that clinicians standardize practices to optimize noninvasive ventilation, without compromising early surfactant delivery when indicated. In preliminary data, we found that all infants receiving ≥ 40% FiO2 for > 1 hr ultimately required intubation and surfactant. However, efforts to

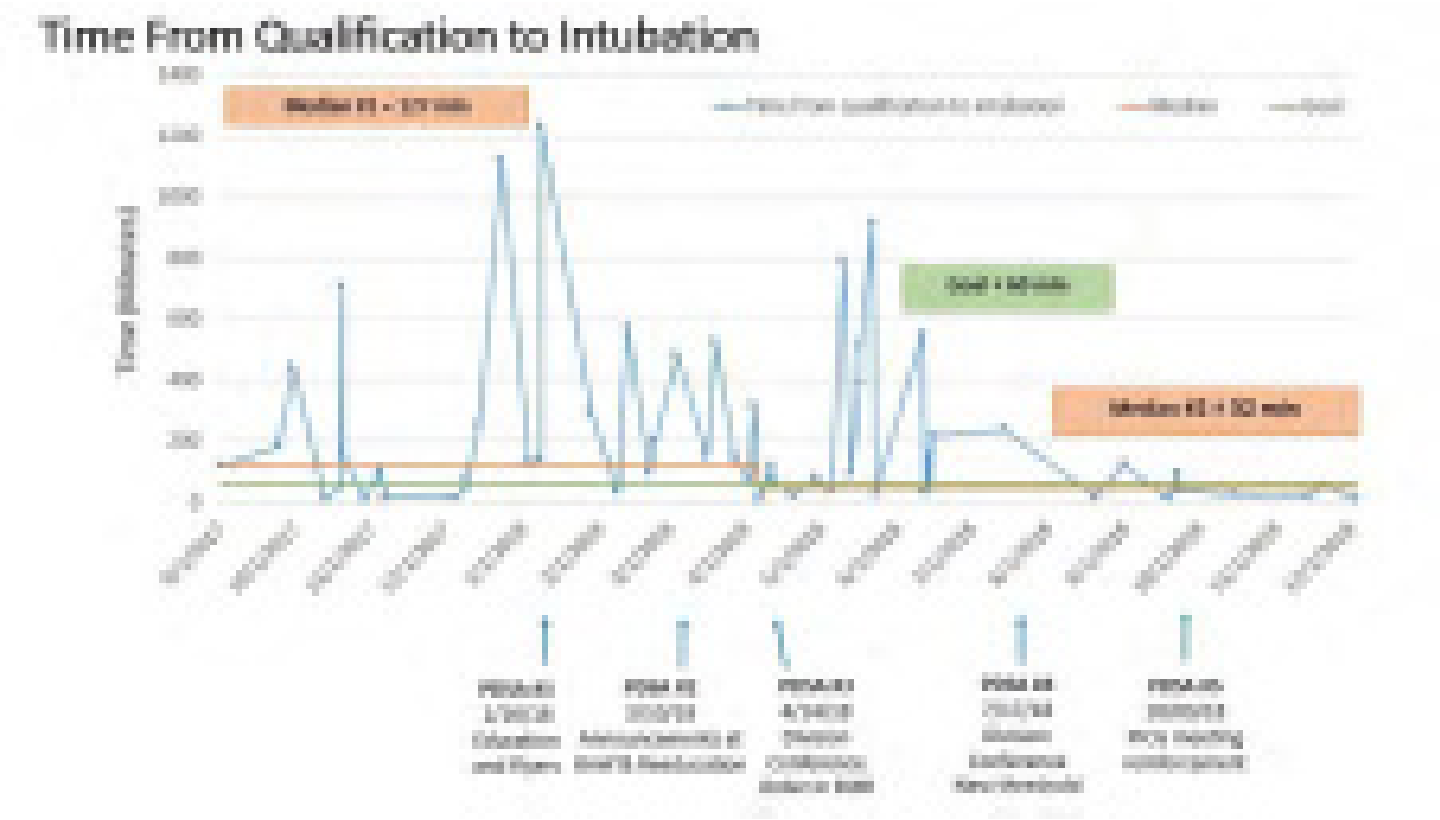
maintain non-invasive ventilation led to significant delays for 63% of them, which may have contributed to preventable lung injury.

Objective In infants ≤ 1500 g and/or ≤ 32 wks gestation and < 48 hr of age, from 12/1/17-12/1/18, the SMART aims were: Intubate for surfactant within 1 hr of qualification (target 80%)
Administer surfactant within 1 hr of intubation (target 90%)

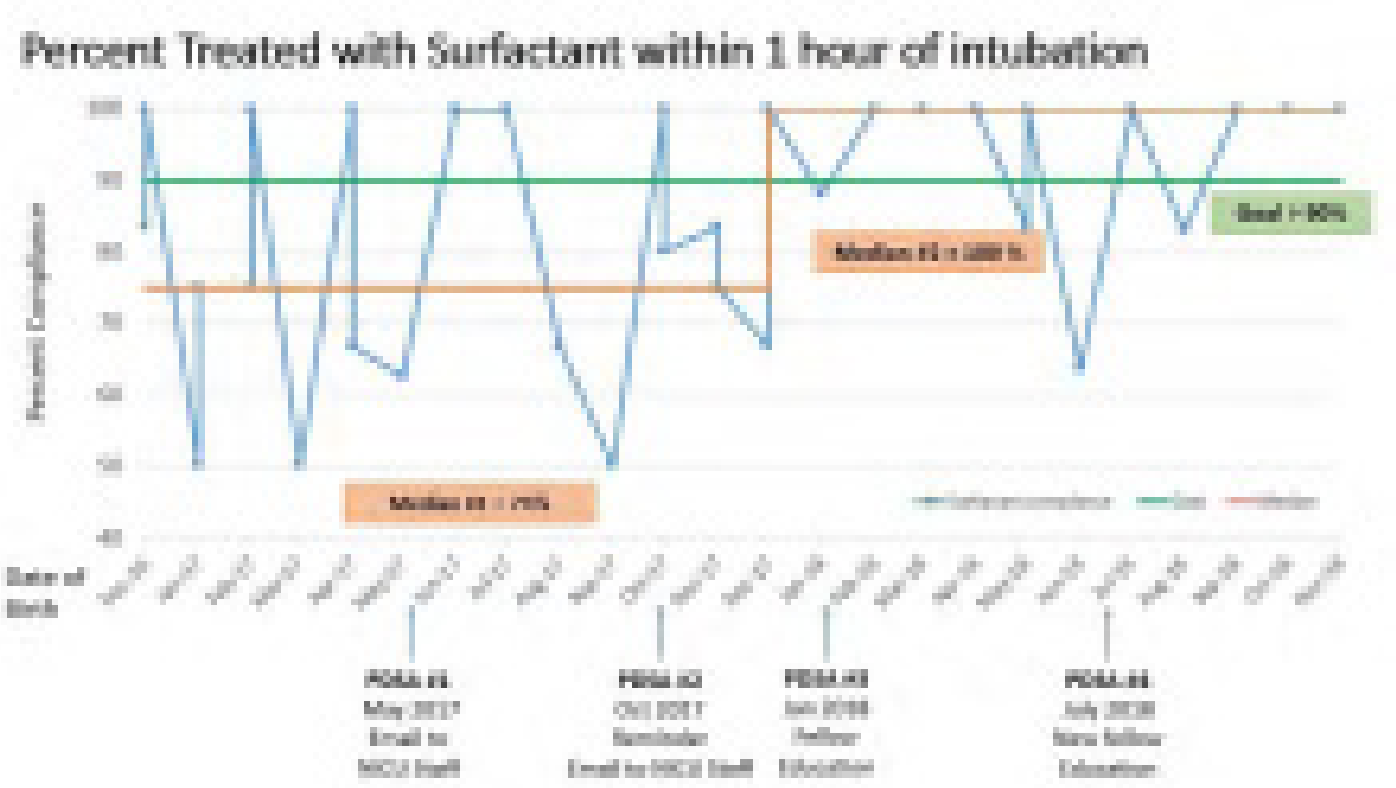
Design/Methods Qualification (need for intubation/surfactant) was initially defined as FiO2 > 40% for > 1 hr or $PaCO_2 \geq 65$ x 2, and later adjusted to $F_iO_2 > 60\%$ for > 3 hrs for infants > 28 weeks gestation. Several cycles of change are displayed in annotated run charts Fig. 1 (time to intubation) and Fig. 2 (time to surfactant). Asymmetric disease, tube malposition, and air leak were assessed as balancing measures.

Results Median time from qualification to intubation decreased from 127 to 52 min (Fig. 1) after PDSA Cycle 3 (division conference and EMR order). Alteration of the qualification criteria in response to feedback and evidence (PDSA 4) significantly improved the consistency of performance. The median achievement of surfactant within 1 hr of intubation improved from 75% to 100% after PDSA Cycle 3 (fellow education) (Fig. 2). Intermittent fall-outs persist, usually related to delays in obtaining a chest x-ray. There were no episodes of tube malposition, asymmetric lung disease, or air leak.

Conclusion(s) We achieved the SMART aims of intubation within 1 hr of qualification, and of administering surfactant within 1 hr of intubation. Lessons have emerged from these experiences in changing core therapeutic approaches in NICU. First, focusing and reinforcing the message to the group most directly involved (e.g., fellows for intubation) is more effective than general education. Second, flexibility within the bounds of evidence (e.g., adjustment of qualification criteria) is important when attempting to alter fundamental practices by experienced clinicians.



<u>PDSA Cycle 1 (1/16/18 – 3/9/18)</u>: Presentation at division conference and e-mails.
<u>PDSA Cycle 2 (3/10/18 – 4/13/18)</u>: Announcements at nursing briefs, posters, and ongoing teaching for fellows.
<u>PDSA Cycle 3 (4/14/18 – 7/16/18)</u>: Literature review and our own current data presented at Division Conference, and order in the EHR to remind nurse to notify MD if $FiO_2 > 40\%$.
<u>PDSA Cycle 4 (7/17/18 – 8/17/18):</u> Adjustment of intubation criteria in response to faculty feedback and current literature. Re-education for fellows/attendings. Small group discussion with new fellows.
<u>PDSA Cycle 5 (10/9/18)</u>: Presentation at PICG meeting regarding adherence to the BPD bundle and timely intubation, especially at change of shift. Monthly reminders to the medical team.



PDSA Cycle 1 (May 2017): E-mail distribution ("high-importance") to NICU medical staff.
PDSA Cycle 2 (Oct 2017): Follow-up e-mail, with distribution expanded to nursing leadership.
PDSA Cycle 3 (Dec 2017 - Jan 2018): Two live sessions for fellows, and wall hangings in the fellow's office and NICU lounge.
PDSA Cycle 4 (July 2018): New fellow education and email reminders to medical team.

Abstract: 161
Suspected Sepsis in the NICU: Leveraging Staff Perceptions of Delays in Antibiotic Administration to Drive Improvement
Leigh M. Finnegan[2], Mary C. Harris[1], Sarah Coggins[1], Melissa Schmatz[1], Marissa Tremoglie-Barkowski[1], Lakshmi Srinivasan[1]
[1]Children's Hospital of Philadelphia, Philadelphia, Pennsylvania, United States, [2]Perelman School of Medicine at the University of Pennsylvania, Philadelphia, Pennsylvania, United States

Background Sepsis is a significant cause of morbidity and mortality among infants in the neonatal intensive care unit (NICU). Adult and pediatric data have demonstrated the benefit of rapid antibiotic administration, but little emphasis has been placed on timely antibiotic delivery in infants. As part of a project to improve time to antibiotics (TTA) in infants with suspected sepsis, we surveyed staff about reasons for delay in therapy.
Objective Using survey data, we examined perceived causes of antibiotic delay in infants evaluated for suspected sepsis in the NICU and assessed staff perceptions over time, as awareness increased about the importance of TTA.
Design/Methods Retrospective study of anonymous survey data from bedside nurses and frontline providers (nurse practitioners, physician assistants, trainees and neonatologists) in the Children's Hospital of Philadelphia NICU. We analyzed data from workups in which TTA was >60 minutes during 2 time periods: Epoch 1 (Dec '14-Oct '15, corresponding with initiation of QI efforts) and Epoch 2 (Nov '15-Apr '17, intensification of QI interventions) (Table 1). Analysis included summary statistics and Chi square and Fisher's exact tests.
Results At onset, most staff were unaware of delays in TTA; however, awareness significantly improved from Epoch 1 to Epoch 2 ($p<0.01$, table 2). Median TTA improved from 114 (Dec '14) to 50 minutes (Apr '17). In Epoch 2, factors most commonly implicated in delays included: difficulty obtaining cultures or intravenous access, delays in antibiotic delivery, competing priorities, and timing of workup (Table 3). Inadequate communication was infrequently cited in surveys (<1%);

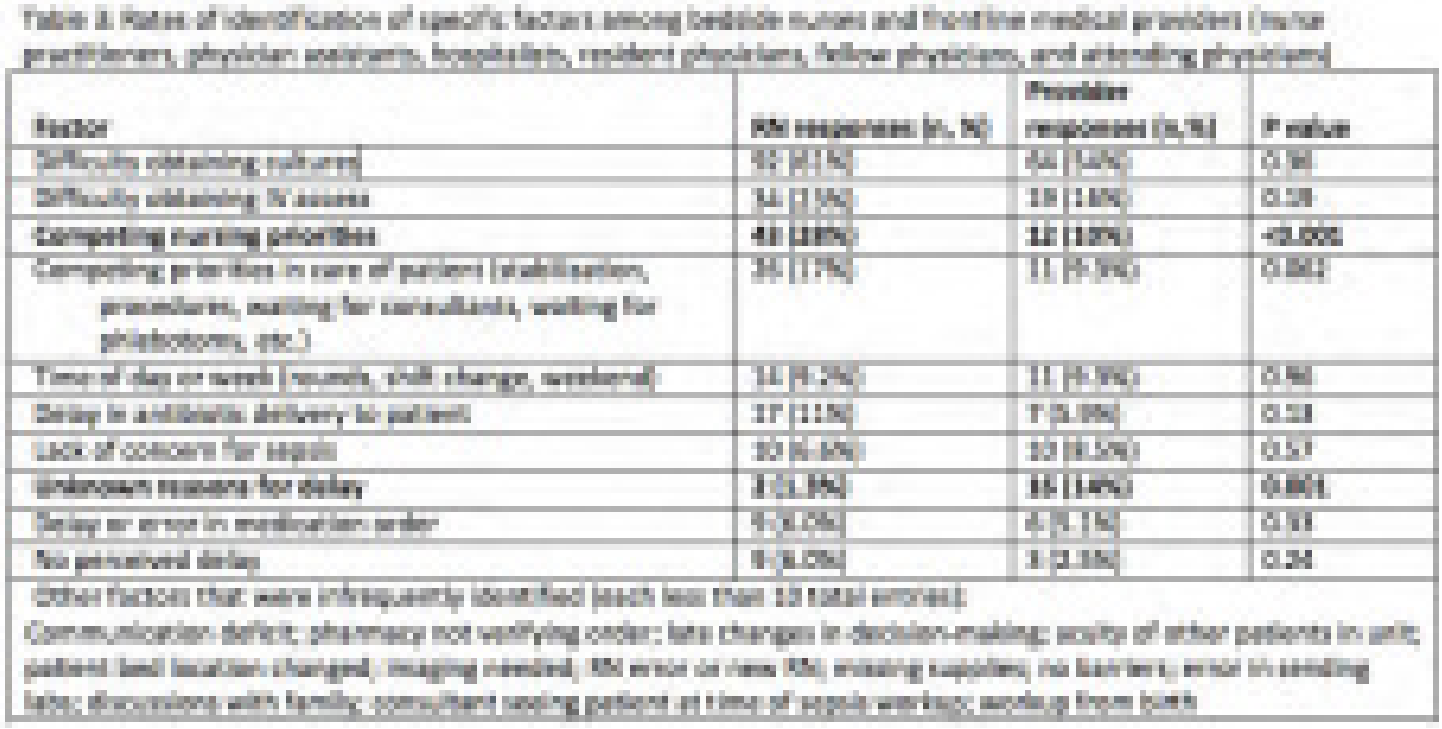
however, among 50 cases in which providers and nurses independently submitted surveys for the same episode, we noted discordance in identified factors in 58%, suggesting important communication deficits between nurses and frontline providers. Nurses more often reported competing priorities, while providers were more likely to be unaware of reasons for delay. Conclusion(s) Surveying staff at critical junctures can identify interventions to drive improvements in care. As staff awareness improved, surveys provided insight into key drivers of delays in antibiotic administration. Communication deficits, though widely prevalent, were an important blind spot for staff. Using targeted interventions, we have developed a culture of teamwork and communication to improve antibiotic delivery in the NICU.

Table 1: Sample questions from surveys administered in Epoch 1 and Epoch 2

Epoch 1 survey	Epoch 2 survey
Did the team perceive any delays in antibiotic administration? Select yes or no. Did any of the following occur? (Check all that apply) • No STAT ordering of antibiotics • Incorrect antibiotics or dosages ordered • Unable to obtain sufficient IV access • Limited IV access • Incompatibility of antibiotics with other medications • Delay of medication delivery to the unit • Other delays. If yes, please list.	Overall, what were the barriers to administering antibiotics within 60 minutes? (Check all that apply) • Difficulty obtaining IV access • Difficulty accessing existing line • Difficulty obtaining urine culture • Difficulty obtaining blood culture • Delay in antibiotic order (eg. incorrect order, not ordered STAT) • Pharmacy not verifying order • Delay in receiving antibiotics to unit • Competing nursing priorities • Lack of provider concern • Other comments

Table 2: Difference in awareness of antibiotic delay across Epochs 1 and 2

	Epoch 1	Epoch 2
No perceived delay or cause of delay unknown	165 (90%)	50 (11%)
Delay perceived or cause identified	19 (10%)	141 (89%)
Total	184	191



Plenary Lecture: The Role of the National Institute for Children's Health Quality (NICHQ) in Improving Children's Health Outcomes

Scott Berns
National Institute for Children's Health Quality, Boston, Massachusetts, United States

Abstract: 162

The Eyes Have It

Leila Posch, Paul A. Offit
Pediatric Infectious Diseases, The Children's Hospital of Philadelphia, Philadelphia, Pennsylvania, United States

History (including chief complaint, history of present illness and relevant past and family medical history) A 14 year old male with history of beta thalassemia major status post a gene-modified autologous stem cell transplant presents with 14 days of daily fevers of 39.4°-40°C (103-104°F). He had mild dry cough and fatigue, now improving. He denies weight loss, adenopathy, night sweats, pain, rash, neurologic, or gastrointestinal symptoms. He has had no antimicrobial therapy.

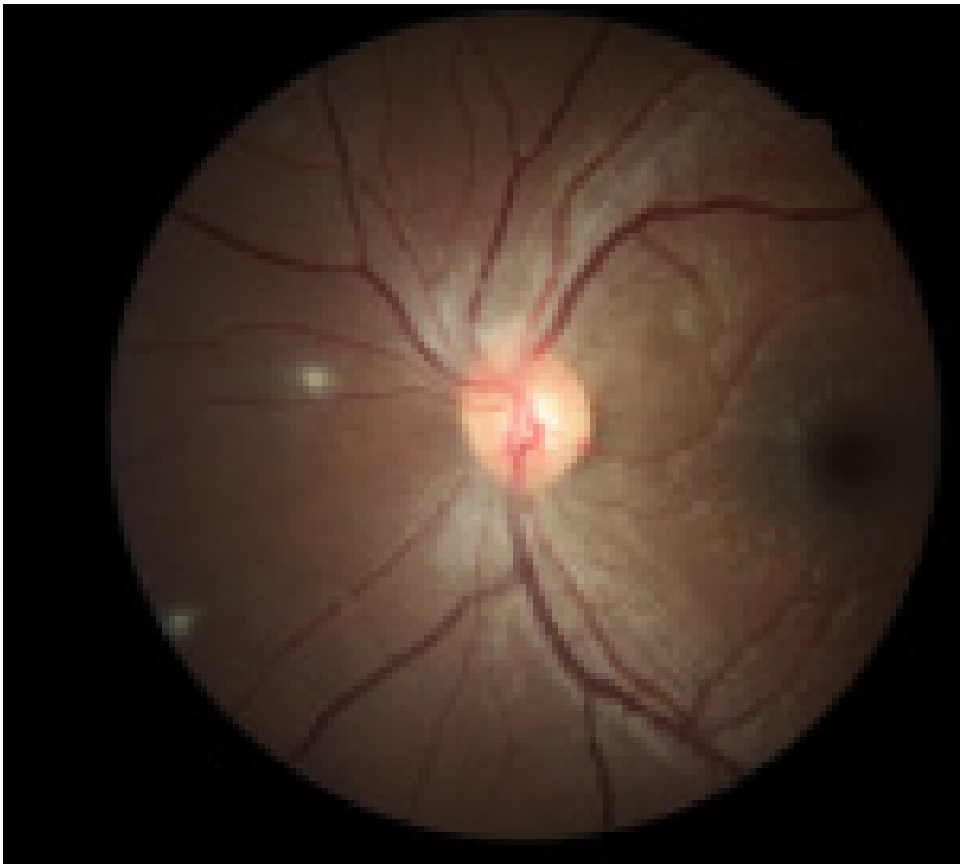
Medical history includes transfusion-dependent beta thalassemia major for which he underwent gene-modified autologous stem cell transplant 21 months prior. He has reconstituted his immune system. He had latent tuberculosis infection diagnosed 6 years prior with positive tuberculin skin test and negative chest x-ray and was treated with 9 months of isoniazid. His sister was also treated for latent TB infection. Parents are originally from Myanmar, but the patient was born in a refugee camp in Thailand. He immigrated to the United States 7 years ago and lives in an urban northeastern US city. He can recall no animal, food, or water exposures. No recent travel or visitors.

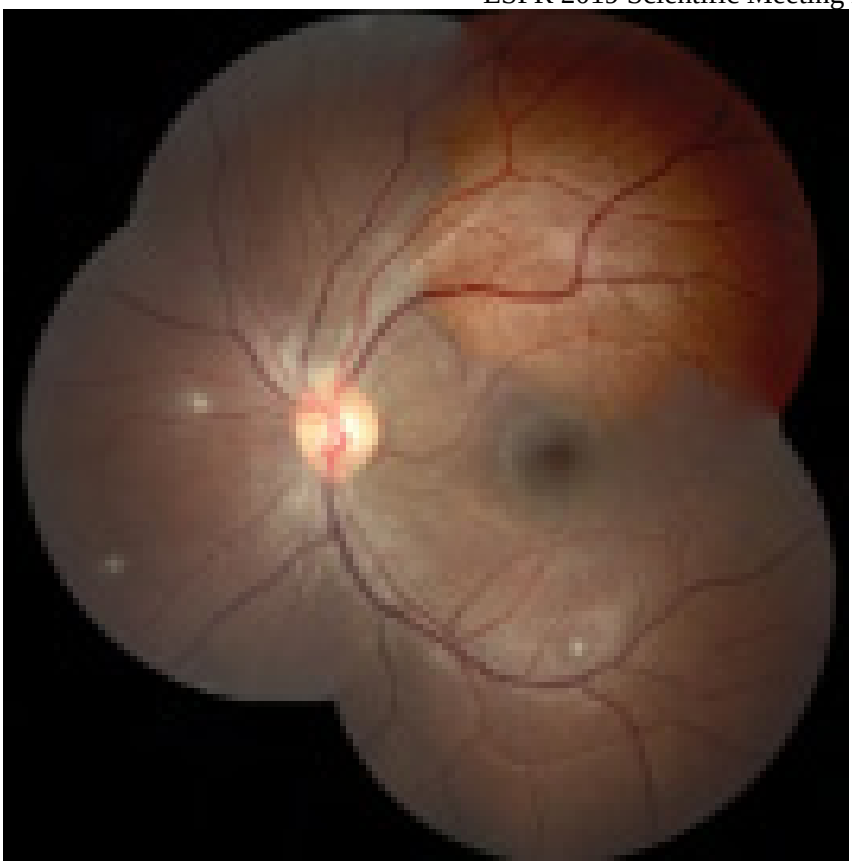
Physical examination findings (including vital signs) His temperature was 39.4°C (103°F), heart rate 107, respiratory rate 20, blood pressure 96/55, and oxygen saturation of 98%. He had normal HEENT, pulmonary, cardiovascular, genitourinary, musculoskeletal, skin, and neurologic exams. Abdominal exam was notable for hepatomegaly with liver palpable about 1-2 centimeters below the costal margin and a palpable spleen tip (both baseline). No lymphadenopathy.

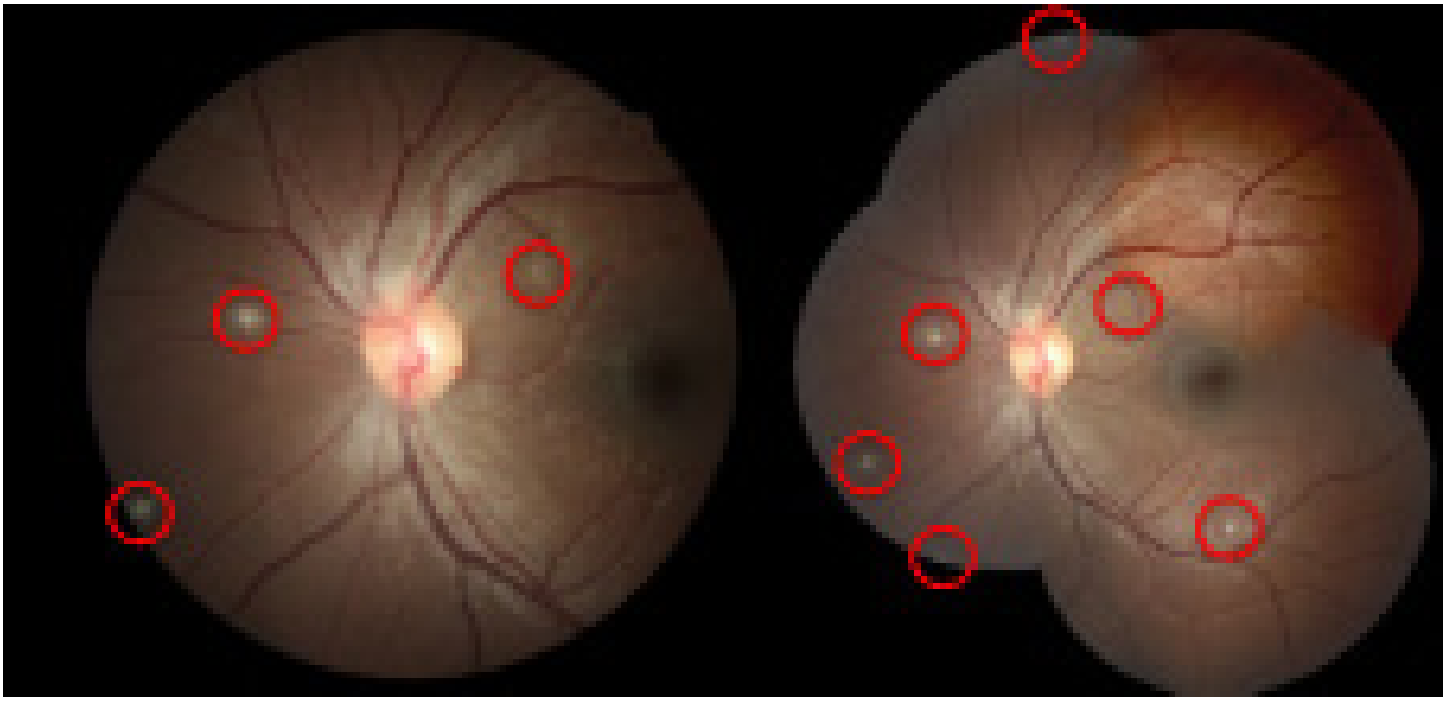
Laboratory or Diagnostic imaging or Procedures White blood cell count was 6.5 K/µL (ref 3.8-9.8 K/uL), hemoglobin 7.8 g/dL (ref 13.0-16.0 g/dL; his baseline 10-11), and platelets 260 K/µL (ref 150-400 K/uL). Differential was 80% neutrophils, 11% lymphocytes, and 4% atypical lymphocytes. His c-reactive protein was 4.2 mg/dL (ref 0.0-0.9 mg/dL) and his erythrocyte sedimentation rate was greater than 130 mm/hr (ref 0-20 mm/hr). He had normal electrolytes and liver panel and two negative peripheral blood cultures. Computed tomography of the chest/abdomen/pelvis showed stable hepatosplenomegaly. Magnetic resonance imaging of the brain was unrevealing.

Final Diagnosis Retinal exam showed multiple punctate white subretinal lesions consistent with chorioretinitis.

Serum *Bartonella henselae* serology resulted as immunoglobulin M titer of less than 1:16 (Ref: less than 1:16=negative) and an immunoglobulin G titer of 1:1024 (Ref: 1:256 or greater= positive). The patient had pet a kitten about 1-2 weeks prior to becoming ill but did not recall a scratch. He was diagnosed with *Bartonella* infection with retinitis, was treated with doxycycline, and the fevers and retinal lesions resolved.







Abstract: 163
Importantace of an infectious disease history
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History (including chief complaint, history of present illness and relevant past and family medical history) A previously healthy 9 year old female presents with to an outside hopital with episode of bright red hematemesis following a seven day history of fevers, headaches, and progressive fatigue. Seven days prior to admision she has fever to Tmax 102. 6 days ago she presented to her PMD with UA, Lyme, rapid strep negative. 4 days ago she had "slapped cheek rash" started on azithromycin. 1 day ago mother reported excessive fatugue. On day of admission she had episode of bright red emsis. Shortly after she presented to the OSH ED she had clinical deteriortion with rapid onset of profound hypotension and respiratory failure. She was urgently transferred to the CHOP PICU, started on vasoactive medications and broad spectrum antibiotics. One week prior to the onset of her fevers she and her family were on vacation in their cottage in Upstate New York in a wooded area. There she had swam in a fresh water lake, she went on hikes with family, she obtained a new puppy, and she visited a local farm where she touched cows, sheep, and chicken at a petting zoo.
Physical examination findings (including vital signs) Temperature 40.3, HR: 138, RR-18, BP 101/45, Sp02-97%. General appearince: critically ill, edemataous, intubated, and sedated. ENT: mucus membranes tacky, Respiratory: intubated with good aeration throughout, clear to ausculation, Cardovascular: tachycardic, prolonged capillary refill, hypotensive. Abdominal: soft, distended, no heptosplenomegaly. Skin: scattered petechiae, erythematous rash on her neck. Neurologic: sediated. Remainer of physical examination was normal.
Laboratory or Diagnostic imaging or Procedures Inital laboratories were consistent with hemophagocytic lymphisitocytosis with cytopenias, hypofibrinogenemia, elevated ferritin. WBC 4.1 x10^3/uL Hemoglobin 8.0mg/dL, platelets 137 x10^3/uL. Differential 6% bands, 54% segmented neutrophils, 37% lymphocytes, 3% monocytes. Fibrinogen 112 mg/dL, 15,100 ng/mL. LDH 8154 IU/L, CRP 8.0 mg/dL, AST-1201, ALT-279, ALK Phos-247. Absolute NK cells 37 mc/L, Bone marrow with hemophagocytosis. Given recent travel and animal exposures secondary causes of HLH were investiaged testing sent for RMSF, Anaplasmosis, Ehrlichiosis, Babesia, Brucellosis, Leptospirosis, Mycoplasma, Legionella. Given concurrent hepatitis also sent testing for Hepatitis A, B, EBV/CMV, Adenovirus, Parovirus
Final Diagnosis Ehrlichia chaffeensis Induced Hemophagocytic Lymphohistiocytosis. Positive Ehrlichia chaffeensis PCR and serology IgG <1:64. Ehrlichia treated with 10 days of doxycycline. She underwent treatment for HLH per oncology protocol with dexamethasone, anakinra, etoposide and completed one month of therapy.

Abstract: 164
Premature infant with a rare diagnosis
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Pediatrics, University at Buffalo, Buffalo, New York, United States

History (including chief complaint, history of present illness and relevant past and family medical history) A preterm male infant was delivered at 32 2/7 weeks by emergent c-section due to category II fetal tracing and placental abruption after preterm premature rupture of membranes for 12 days. He required face mask CPAP with PEEP of 5 and inspired oxygen of 0.21-0.40 due to respiratory distress. On admission to NICU, he was placed on non-invasive ventilation and required intubation subsequently due to respiratory failure. Prenatal care of his mother (28 years, G5P3013 black) had been transferred to regional perinatal center for short (<1%ile) and bowed long bones with abnormalities of bone mineralization in the fetus based on 26 weeks ultrasound. Results from amniocentesis were pending. Prenatal labs were negative except positive GBS culture. Family history was negative for inherited disorders and miscarriages.
Though ventilated initially, he was placed on a brace for immobilizing his head and spine and improved with a specific therapy, extubated to non-invasive ventilation by 6 weeks of life and tolerated tube feeds. Following deterioration from sepsis at 3 months of age with hypoxic respiratory failure, he succumbed to severe refractory pulmonary hypertension.
Physical examination findings (including vital signs) Vital signs: respiratory rate 66/min, heart rate 140/min, blood pressures normal in all extremities and temperature:36.5°C. Birth weight:37%ile, head circumeference:10%ile and length:8%ile. Physical exam (Figure 1): shortening and bowing in all extremities (more prominent in upper than lower). Calvarium was felt only over a small area of frontal aspect of the head. Respiratory distress with tachypnea, retractions and crackles bilaterally. No murmur
Laboratory or Diagnostic imaging or Procedures Chest radiograph suggestive of retained fetal lung fluid. Skeletal survey(Figure 2): extensive metaphyseal abnormalities, bowing of long bones and poor ossification of bones. Pertinent blood investigations are shown in Table A. Echocardiogram (Echo) at 3 months: severe pulmonary hypertension
Final Diagnosis Based on prenatal ultrasound, physical exam, lab evidence of very low alkaline phosphatase and genetic testing from amniocentesis, he was diagnosed with perinatal severe hypophosphatasia (HPP). On Day#5 of life, he was started on enzyme replacement therapy (ERT) with asfotase alfa after consulting endocrinology and metabolic/genetics that led to improved ossification (Figure 2h vs. 2g). Due to fragile nature of his bones, echo had been deferred earlier. We conclude that it's prudent to obtain an echo earlier and periodically in infants with HPP who are on prolonged ventilation (even if non-invasive) to screen for pulmonary hypertension

Table A

Laboratory test in Serum	Result in patient	Normal range
Alkaline Phosphatase	8 U/L	150-420 U/L
Total Calcium	12.1 mg/dl	8.5-10.5 mg/dl
Ionized Calcium	7.1 mg/dl	4.4-5.4 mg/dl
Vitamin B 6	1450 mcg/L	< 46 mcg/L
25 hydroxy Vitamin D	12 ng/ml	>30 ng/ml

Table A: Pertinant laboratory investigations on infant performed in first week of life.

Infant on day#5 of life

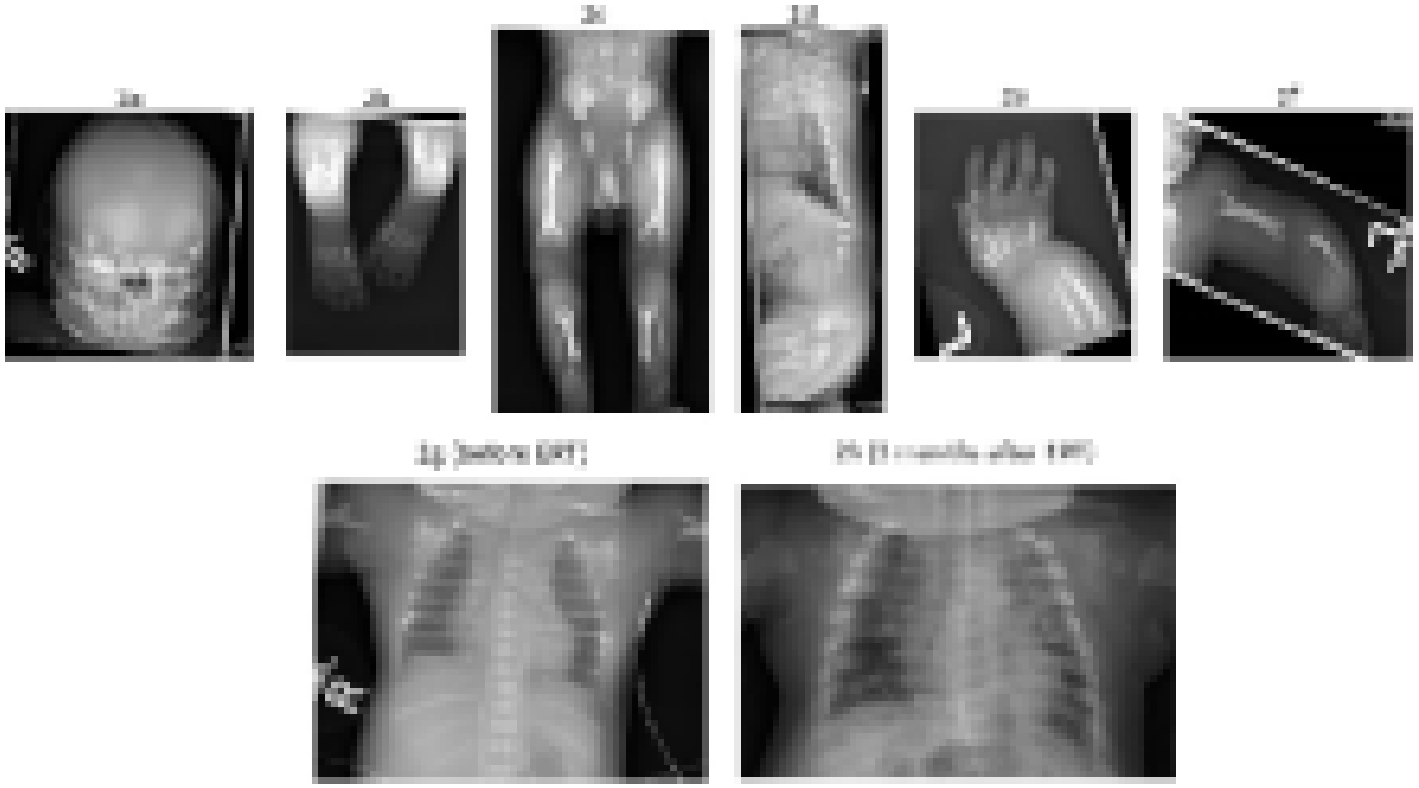

Figure 2: Skeletal survey: 2a to 2g demonstrating poor mineralization with bowing of long bones.
2a: Skull Xray AP view
2b: X-ray bioth feet
2c: X-ray Pelvis and both lower extremities AP view
2d: X-ray Lateral view of spine
2e: X-ray Hand
2f: X-ray upper extremity
2g: Chest X-ray at birth
2h: Chest X-ray at 3 months of life

Mentor of the Year Lecture: Coming Up with the Wrong Answer...What Now?
Hallam Hurt
Children's Hospital of Philadelphia, Philadelphia, Pennsylvania, United States

Abstract: 165
Onset disruption of the critical period of plasticity in the hippocampus of mice injured by neonatal hypoxia-ischemia.
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Background The plasticity of neural networks is profound early in life, shaped by synaptic activity, and sculpted by the maturation of the GABAergic network. Neural networks stabilize in postnatal life forming perineural nets (PNNs) around interneurons (INs) to close the critical period (CP) of plasticity. In the hippocampus, a crucial region for synaptic plasticity and memory formation, neonatal hypoxia-ischemia (HI) decreases: i) BDNF, a trigger for CP onset; ii) parvalbumin (PV), Kv3.1b and GAD65/67, markers of GABAergic maturation; and iii) PNN formation, a structural stop of the CP. Therapeutic

hypothermia (TH) does not fully prevent these changes.
Objective Thus, we studied whether neonatal HI disturbs the onset of the CP of plasticity in the postnatal hippocampus despite TH.
Design/Methods We induced brain HI in P10 C57BL6 mice with right carotid ligation and 45m of hypoxia (FiO =0.08), followed by normothermia (36°C, NT) or TH (31°C) for 4h with anesthesia-exposed shams as controls. At 24h (P11), 5d (P15), 8d (P18) and 30d (P40) after injury, we assessed in the hippocampal CA1 subfield cell degeneration and immunoreactivity (IR) (IF-IHC) to: i) PSA-NCAM, that antagonizes CP onset; ii) Otx2 and NP2, that engage CP onset; and iii) NogoR and Lynx1, that mediates CP closure. Iba1 and GFAP were used to assess the influence of microglia and astrocytes.
Results PSA-NCAM IR decreased postnatally in sham and hypoxia-alone CA1 hippocampi. After HI, cell loss and death (pyknosis) was extensive in the CA1 pyramidal cell (PC) layer at 24h. PSA-NCAM IR was intense around dying pyramidal cells but appeared less in uninjured PCs. PSA-NCAM IR was not apparent in activated microglia (iba1) or astroglia (GFAP). Although lower than at P11, PSA-NCAM IR was still increased at P18 and P40 and was not attenuated by TH. Neonatal HI also impaired in the CA1: i) the developmental increase in PV, Otx2, and NP2 between P11 and P18, ii) the colocalization of Otx2 and PV at P18 and P40; iii) the accumulation of NP2 in PV+ dendrites at P18 and P40, and iv) the expression of NogoR and Lynx1 in PV+INs at P40. These abnormalities were insensitive to TH. Neonatal HI increased Lynx1 expression in non-PV expressing INs in the oriens layer and TH prevented this event.
Conclusion(s) Neonatal HI appears to disrupt the molecular and structural initiation and consolidation of the CP of plasticity in the hippocampus, perhaps due to the increased expression of PSA modification in NCAM. The upstream events are still under investigation.

Abstract: 166
Comparing neonatal intensive care unit Recordings to the human Intrauterine environment and Biobags in the EXTEND System (CRIB Study)
Joanna J. Parga-Belinkie[1], Ariana Anderson[2], Grace Hwang[3], Kevin Dysart[1], Marcus Davey[3]
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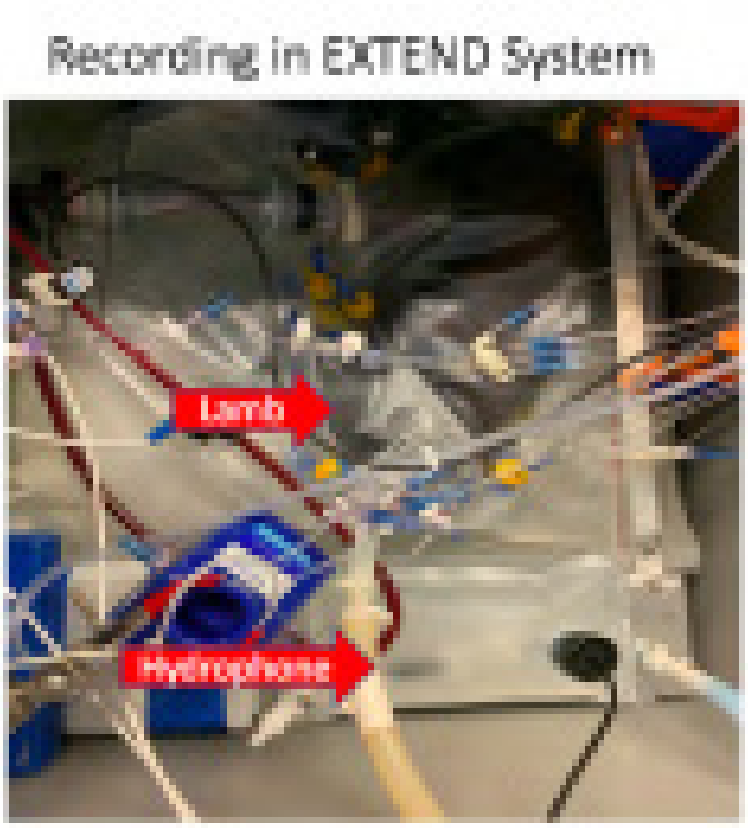
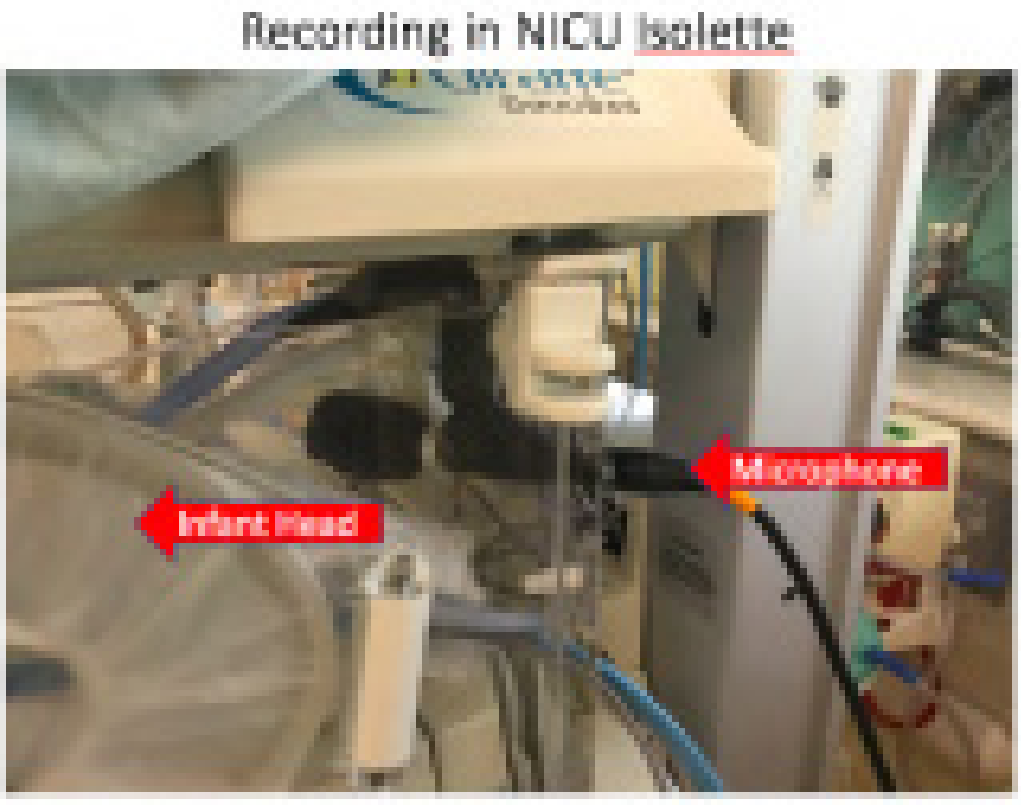
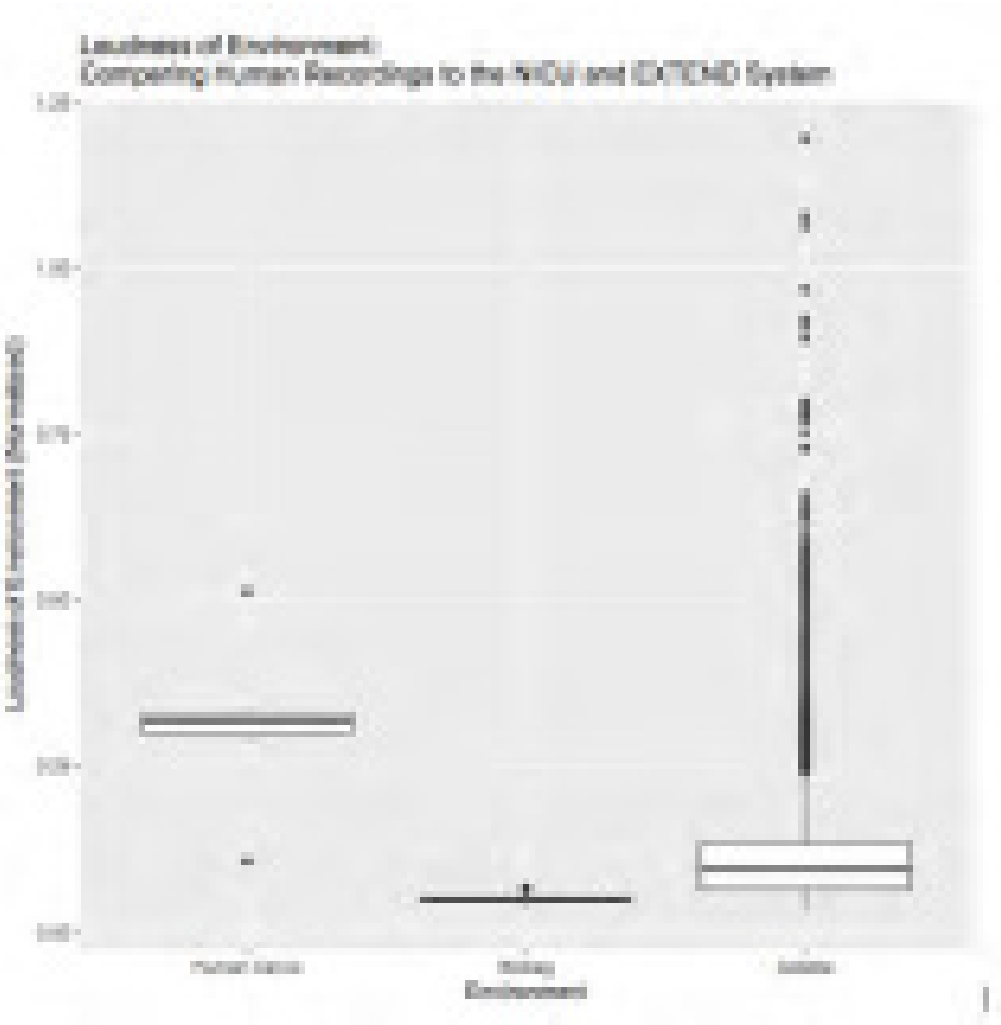
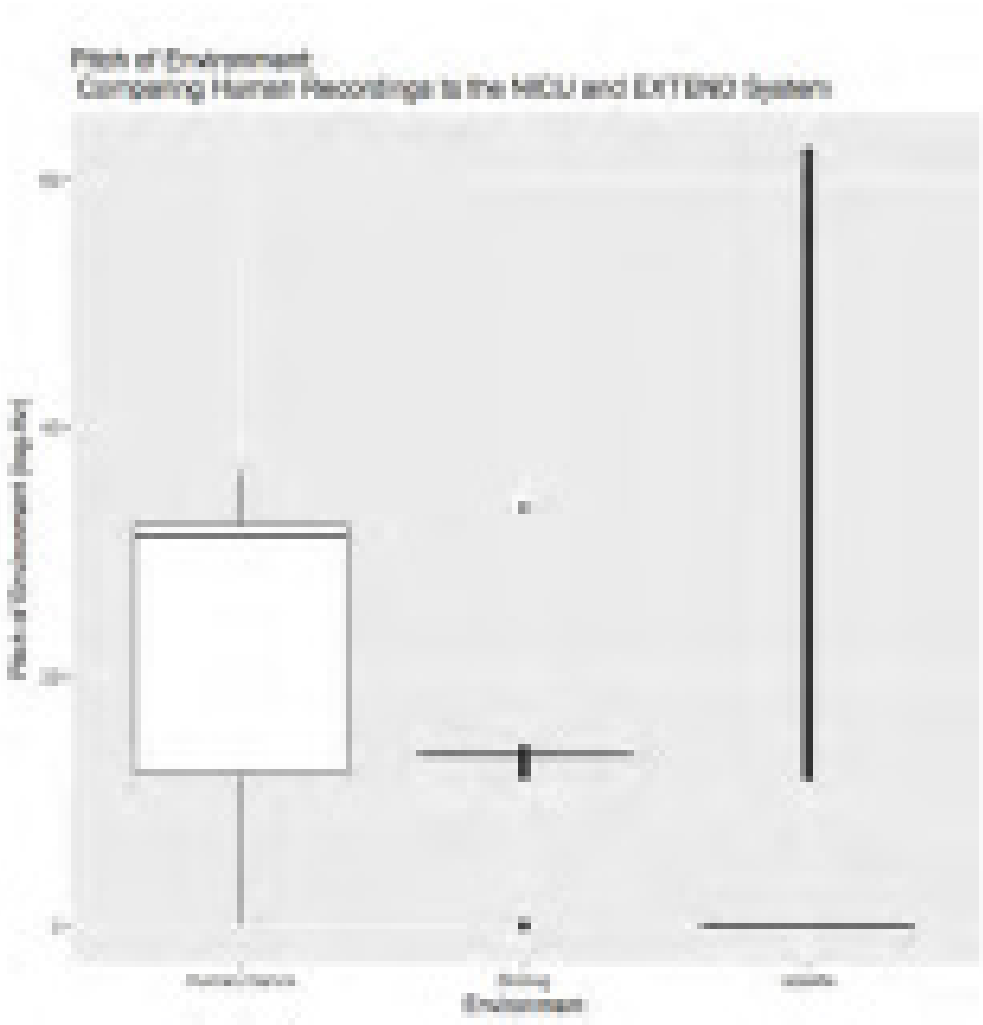
Background The neonatal intensive care unit (NICU) is a different acoustical environment than in-utero. Loud noises are readily appreciated in the NICU by premature infants and can cause harm. Sounds recommendations exist to mitigate the effects of noise, yet levels routinely exceed safe limits in NICUs. The EXTrauterine environment for Neonatal Development (EXTEND system) is meant to mimic the intrauterine environment and may improve the acoustical experience for premature infants.
Objective One: record and analyze the sound environment in isolettes of premature infants in the Children's Hospital of Philadelphia (CHOP) NICU. Two: compare these recordings with those from the cervix of pregnant women during delivery, and fluid-filled biobags of the EXTEND system. We hypothesize sounds from the EXTEND system have properties more closely resembling the human intrauterine environment.
Design/Methods Prospective observational study collecting normative sound data in NICU isolettes and the EXTEND system, and comparing these to intrauterine recordings through the human cervix during delivery. NICU recordings were with microphones. Transcervical intrauterine human and EXTEND system recordings were with hydrophones. OpenSmile was used to compute 62 acoustic features: frequency related parameters, energy/amplitude, and spectral parameters. A 2-sample t-test was used to compare acoustic features between the biobag and NICU (Bonferroni corrected). Secondary analyses compared biobag acoustic features to human recordings to assess what the acoustic profile of the biobag was similar to.
Results Microphones collected 40 hours of NICU sound. Hydrophones collected 4 hours of EXTEND system and 30 seconds of the human intrauterine sounds. The analyses showed the biobag differed from NICU noise for nearly 90% of acoustic parameters ($p<0.05$, multiple comparisons corrected). In contrast, only 18% of the acoustic parameters differed significantly between the biobag and intrauterine recordings. Key acoustic measures such as the log-fundamental frequency (F0), spectral slope in 0-500Hz and 500-1500Hz were significantly closer to acoustics in the in-utero recording than in the NICU.
Conclusion(s) The acoustic profile of the biobag more closely matches the human intrauterine environment than the NICU. This finding has the potential to positively influence preterm infants raised in the EXTEND system. Further study is needed on acoustics and premature infant physiologic and neurodevelopment.


Recording in EXTEND System
Lamb
Hydrophone


Recording in NICU Isolette
Microphone
Infant Head





Abstract: 167

Inhibition of microRNA-451 is associated with mitigation of the cardiopulmonary phenotype and preservation of macrophage migration inhibitory factor signalling in a murine model of bronchopulmonary dysplasia

Margaret A. Gilfillan[1], Pragnya Das[2], Dilip Shah[2], Mohammad Afaque Alam[3], Vineet Bhandari[1]

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Background Macrophage migration inhibitory factor (MIF) has been identified as an important regulator in the pathogenesis of bronchopulmonary dysplasia (BPD). MicroRNA-451 (miR-451) is a known inhibitor of MIF and previous work has shown differential regulation of miR-451 in a BPD model. miR-451 dependent regulation of MIF within the context of BPD has not yet been described.

Objective To evaluate the relationship between miR-451 and the MIF signaling pathway in both an experimental model of BPD and murine lung endothelial cells (MLECs) exposed to hyperoxia.

Design/Methods A miR-451 inhibitor was administered to neonatal mice who were then studied in both room air (RA) and a BPD model (fig 1).The results of lung morphology, right ventricular (RV) ratio to combined left ventricle (LV) and interventricular septal thickness (RV/(LV+IVS), BAL total protein, total and differential cell counts were then compared to those of wild type (WT) mice exposed to the same conditions. Expression of MIF and other downstream signaling proteins was then assessed by Western blot. Protein expression was also studied in MLECs transfected with a miR-451 inhibitor that were either exposed to RA or to 16 hours of hyperoxia

Results Treatment of animals exposed to the BPD model with the miR-451 inhibitor was associated with improved lung

architecture when compared to animals in the WT control BPD group. This was evidenced by significantly (P = 0.016) improved mean chord length ,(54.8 ± 1.5 µm versus 61.4 ± 1.8 µm), significant (P < 0.001) reduced septal thickness; (6.64 ± 0.12 µm versus 10.6 ± 0.36 µm) and significantly (P < 0.001) increased radial alveolar count; (15.74 ± 1.2 versus 12.06 ± 1.4) (fig 2). Mean ratio of RV to (LV + IVS) was also significantly reduced (0.26 ± 0.01 versus 0.33 ± 0.02) (fig 3). Western blot revealed preservation of MIF expression in BPD animals treated with a miR-451 inhibitor and a trend towards preservation of angiopoietin (ang) 1 expression, decreased expression of ang 2 and a more favorable ang 1 to ang 2 ratio (fig 4). A similar pattern of preserved MIF and ang 1 expression was noted in MLECs exposed to hyperoxia that underwent transfection with a miR-451 inhibitor.

Conclusion(s) These findings suggest that miR-451 may act as an important regulator of the MIF signaling pathway in this murine model of BPD and inhibition of miR-451 may have a protective effect on cardio-pulmonary development.

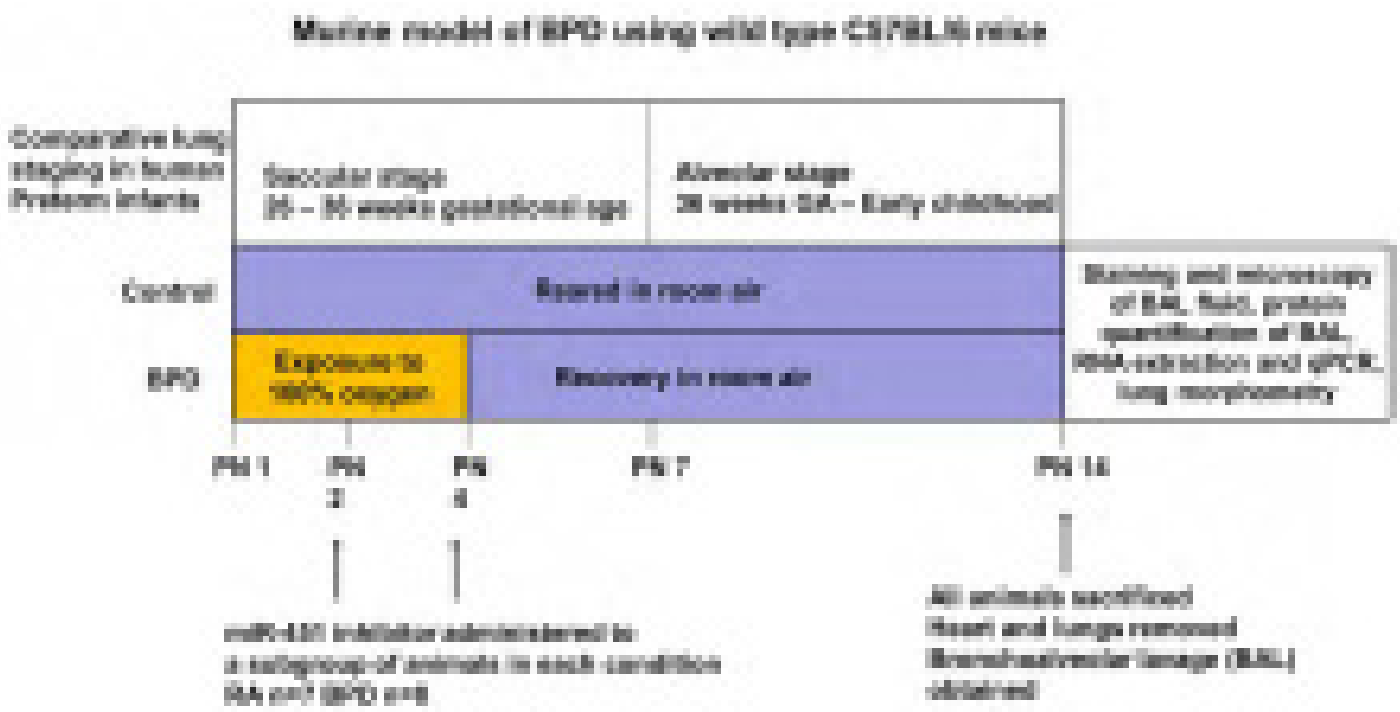

Figure 1: provides a summary of the experimental model we used to study newborn mice in RA and conditions used to induce a BPD phenotype.

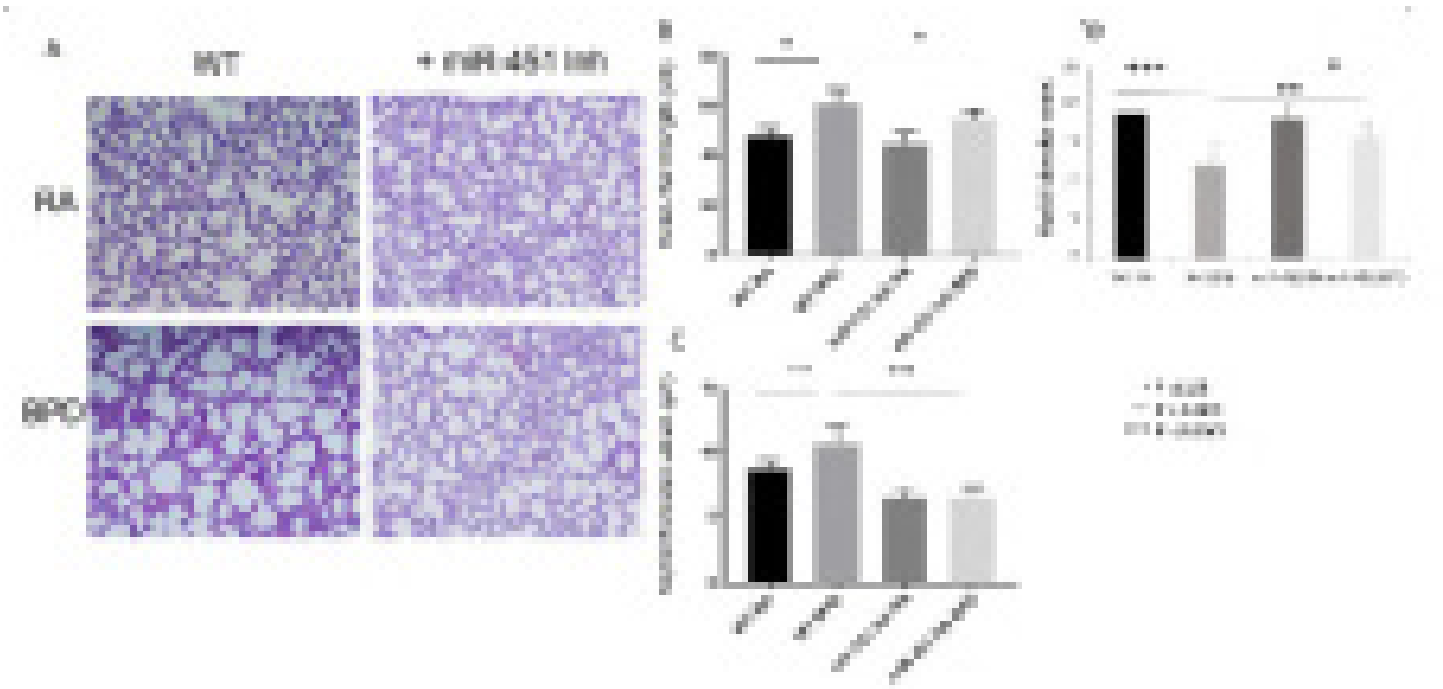

Figure 2. Inhibition of miR-451 is associated with improved measurements of lung morphometry. A Representative images of lung histology (H&E stain) of NB mice exposed to either RA or BPD conditions with or without treatment with a miR-451 inhibitor. B, C, D, Morphometric analyses of lung histology sections of NB mice exposed to either RA or BPD conditions with or without treatment with a miR-451 inhibitor. Alveolar size expressed as chord length and septal thickness. Radial alveolar count was obtained using the method of Emery and Mithal. The figure is representative of 7-8 mice in each group. NB: newborn, WT: wild type, BPD: exposure to 100% oxygen for 4 days followed by recovery in RA for 10 days, RA: exposure to room air for 14 days.

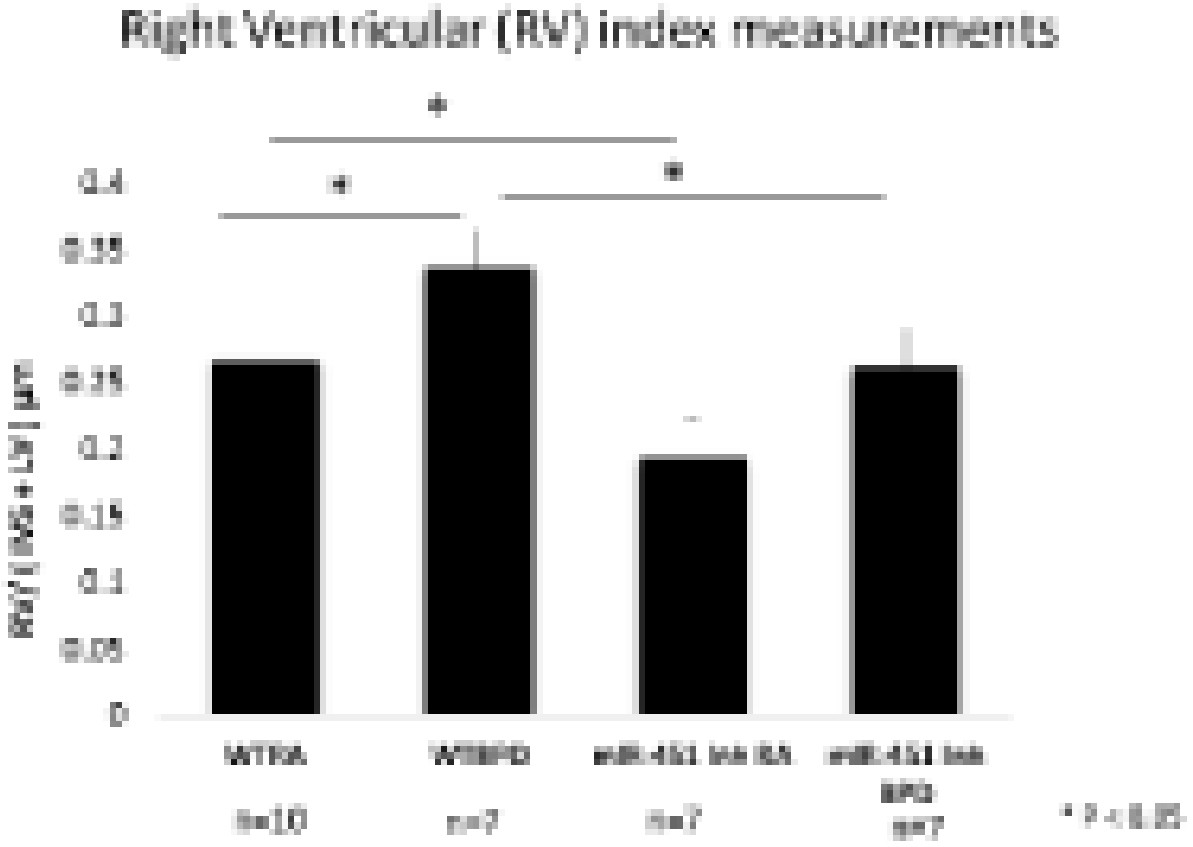

Figure 3. Treatment with a miR-451 inhibitor is associated with preserved ratio of RV to (LV + IVS). RV, LV and IVS thickness measurements were performed by examining single sections of murine heart specimens under the light microscope. RV: Right ventricle, LV: Left ventricle, IVS: interventricular septum. The figure is representative of 7-10 animals in each group.

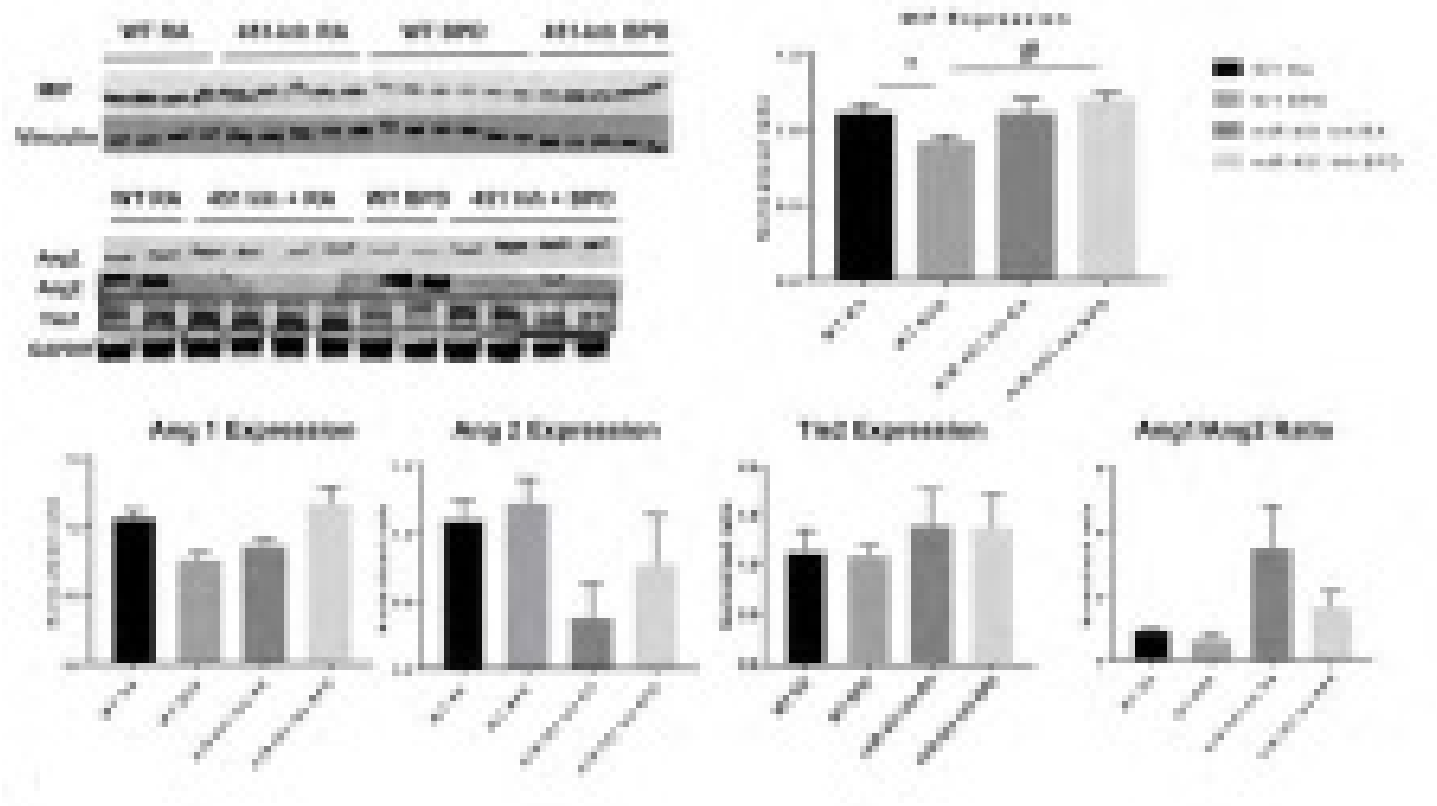

Figure 4 Inhibition of miR-451 is associated with preserved expression of MIF in newborn mice exposed to BPD conditions. A. Expression of MIF, Ang1, Ang 2 and the TIE2 receptor in the lungs of animals exposed to the experimental model was detected by Western blot. B - E Expression of MIF, ang 1, ang 2 and TIE 2 was quantified using densitometry measurements for mice exposed to RA and BPD conditions with and with and without treatment with a miR-451 inhibitor. F Ang 1: Ang 2 ratio measured using densitometry is expressed for each of the experimental groups. MIF: Macrophage migration inhibitory factor, ang 1: angiopoeitin 1, ang 2: angiopoeitin 2.

Abstract: 168

Targeted Timing of Increased Enteral Feeding Volumes Decreases Growth Failure in Premature Infants

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Background Growth failure (GF), or weight <10th percentile, is a common problem in preterm infants discharged from the neonatal intensive care unit (NICU), with nearly 40% of preterm infants discharged with GF nationally. Multiple strategies have been attempted to optimize nutrition and minimize GF in the NICU, but optimal timing and types of intervention to decrease GF rates remain incompletely understood. We identified that the most common timing of GF in preterm infants with birth gestational age (GA) ≤32 weeks occurs between 33 and 36 weeks corrected gestational age (CGA) in our NICU, and initiated a protocol of increased volume feeds for select weeks to improve growth during the NICU hospitalization.
Objective To determine whether a protocol that increases enteral feeding volumes during specific weeks of the NICU hospitalization for preterm infants would decrease rates of GF without increase in NEC or BPD rates.
Design/Methods This is a prospective quality improvement project. We identified infants born ≤32+0 weeks gestation in the University of Massachusetts Memorial Medical Center NICU. We initiated a protocol to increase enteral feeding volume from 160ml/kg/day to 180ml/kg/day during the 31st to 34th weeks CGA in this cohort. Data was analyzed for infants discharged home who were born Appropriate for Gestational Age (AGA) from January 2016 to September 2018; infants that were SGA, born with known chromosomal abnormalities or who died prior to discharge were excluded from this analysis. We extracted weight parameters from the medical records for specified time points (birth, 36 weeks CGA, and at discharge) and plotted on the gender-specific Fenton Growth Curve (2013) to obtain age-corrected percentiles. GF rates at time of discharge were

compared pre and post protocol implementation. NEC and BPD rates were tracked as counter-balancing measures.
Results Our cohort included 136 infants prior to, and 86 infants after the protocol was implemented. There were no significant demographic or clinical differences between the two cohorts (Table 1). GF rates decreased from 21% prior to initiation to 12% since implementation of the volume increase protocol (Figure 1). Rates of NEC and BPD did not increase after protocol implementation (Figure 2,3).
Conclusion(s) Increase in enteral feeding volume during selective weeks from 31 to 34 weeks of the NICU hospitalization can significantly decrease rates of GF in preterm infants, without increase in NEC or BPD rates

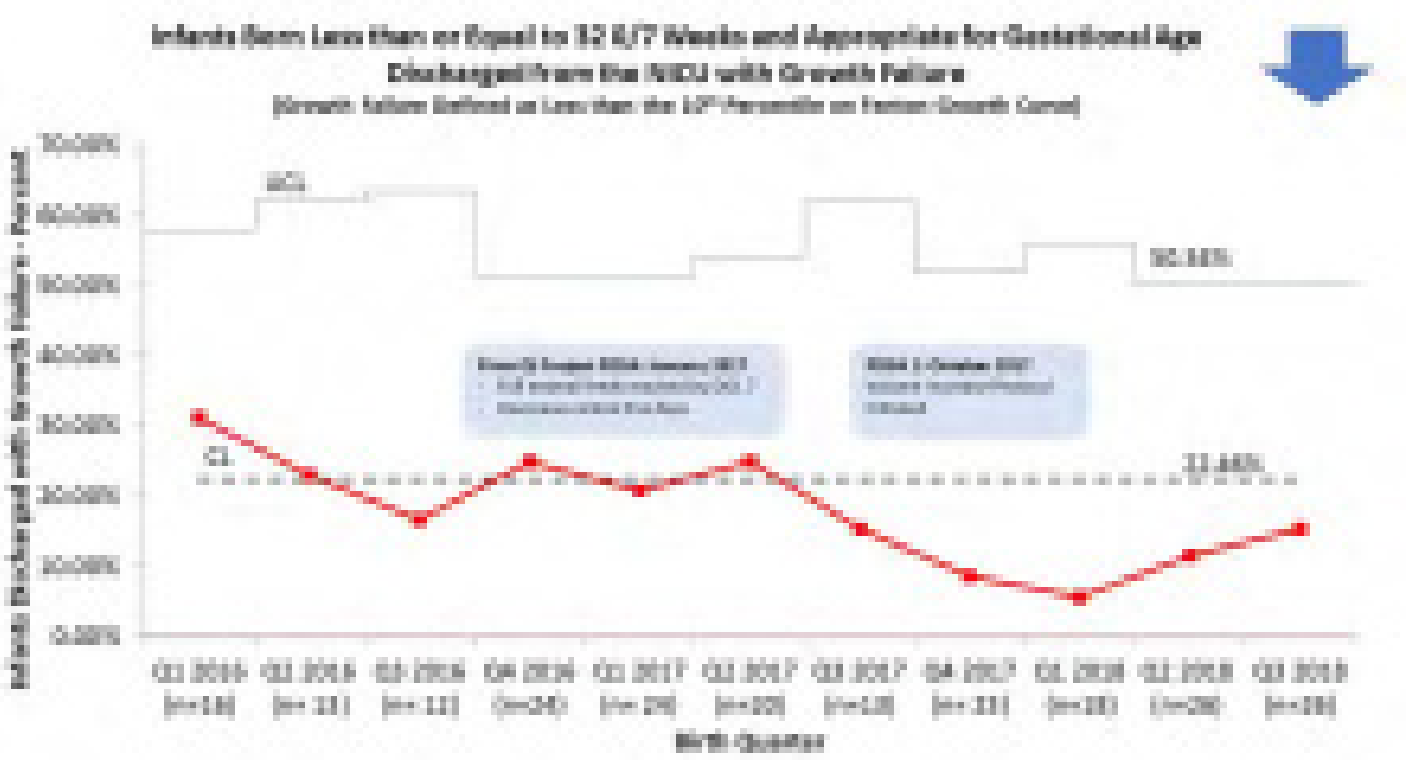

Figure 1: Growth Failure Rates of Infants ≤32+0 Weeks Gestation Over Time from January 2016 to September 2018

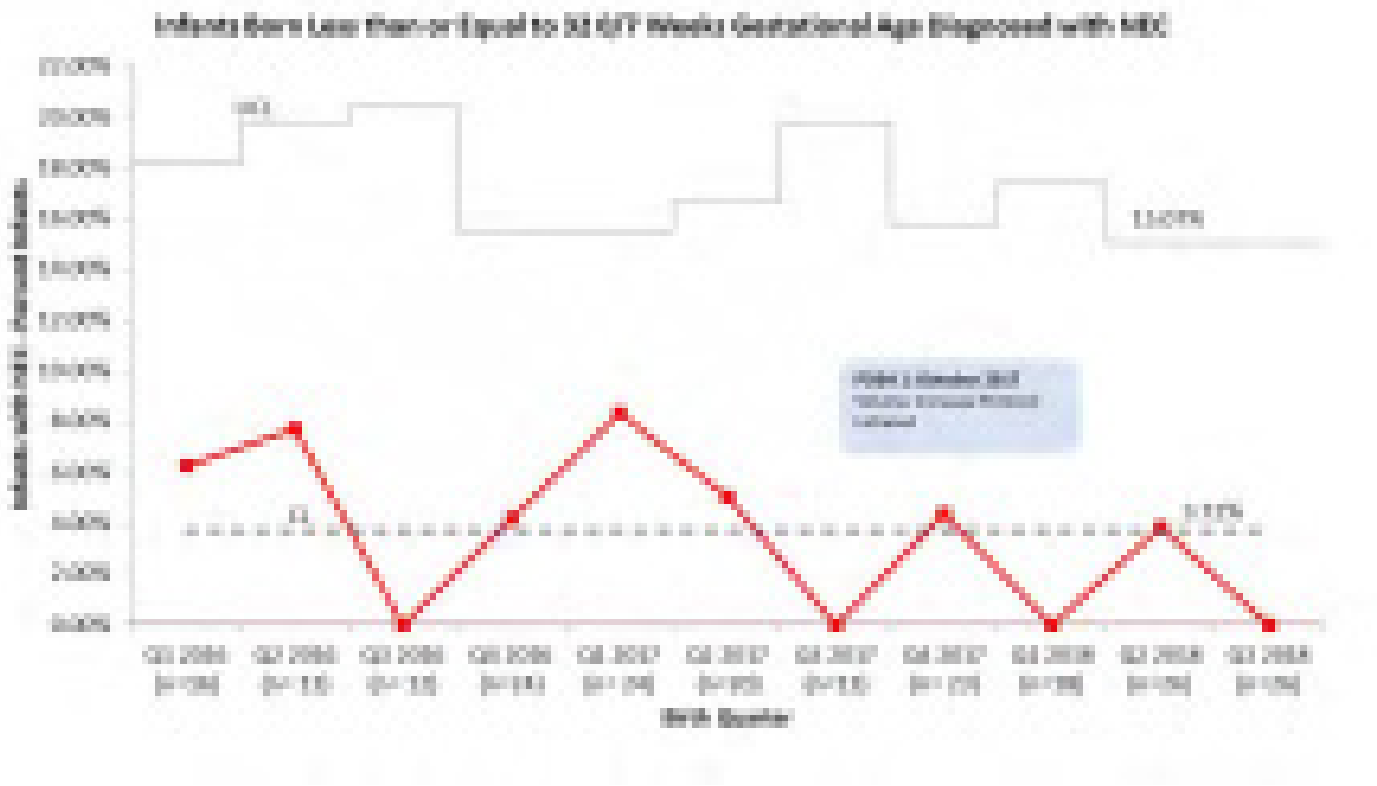

Figure 2: NEC Rates of Infants ≤32+0 Weeks Gestation from Jaunuary 2016 to September 2018

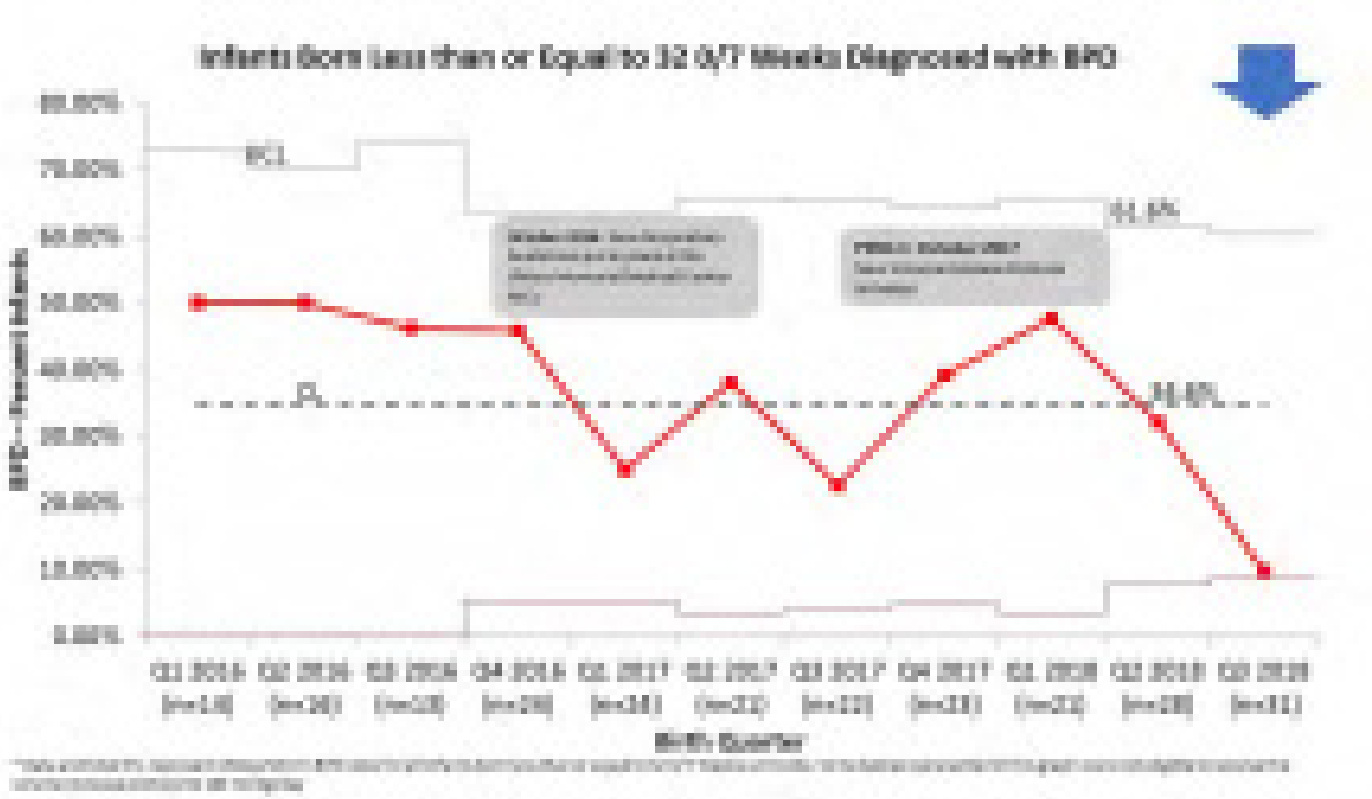

Figure 3: BPD Rates of Infants ≤32+0 Weeks Gestation from January 2016 to September 2018

Table 1: Cohort Characteristics

	Pre-intervention Cohort	Post-intervention Cohort	p-value
GA (mean +/- SD) in weeks	29.0 +/-2.4	29.1 +/-2.2	0.70
<26 weeks	21 (15%)	9 (10%)	
26-27 weeks	16 (12%)	15 (17%)	
28-32 weeks	99 (73%)	62 (72%)	
Birth weight (mean +/- SD)	1248g +/-364	1252g +/-352	0.92
≤750g	14 (10%)	7 (8%)	
751-1000g	22 (16%)	16 (19%)	
1001-1250g	33 (24%)	17 (20%)	
1250 - 1500g	36 (26%)	21 (24%)	
>1500g	31 (23%)	25 (29%)	
Birth weight Z-score (mean +/- SD)	0.08 +/-0.73	0.04 +/-0.71	0.70
<-2	0 (0%)	0 (0%)	

-2 to <-1	9 (7%)	5 (6%)	
≥-1 to ≤1	114 (84%)	72 (84%)	
>1 to 2	12 (9%)	8 (9%)	
>2	1 (1%)	1 (1%)	
Gender (female)	63 (46%)	45 (52%)	0.39
Multiple Gestation	30 (22%)	26 (33%)	
Fed BM during NICU stay	129 (95%)	85 (99%)	
MBM at time of discharge	85 (65%)*	58 (67%)^	
N	136	86	
*N of 132, 4 patients with no data			
^N of 82, 4 patients with no data			

Abstract: 169

Neonatal Proximal Airway Basal Cell Culture as a Potential Model to Study Mechanisms of Lung Injury in Premature Infants

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Background While the majority of Bronchopulmonary Dysplasia (BPD) research focuses on the implications of arrested saccular and alveolar development, it is taken for granted the development of the conducting airways is complete. It is unknown how prematurity affects the structure and function of the proximal airway epithelial cells and how that potentially affects airway inflammation and remodeling.

Basal cells, airway epithelial cell stem cells, are responsible for regeneration and repair. Basal cell regulation and subsequent airway remodeling have been well described in adult chronic lung disease, however these cells have not been studied in preterm neonates due to limitations in collecting cells in a less invasive method and the need for an established in vitro model. Objective 1. Establish proximal airway basal cells can be isolated from nasopharyngeal (NP) aspirates of term and preterm neonates

2. Determine neonatal basal cells can differentiate into airway epithelium populations

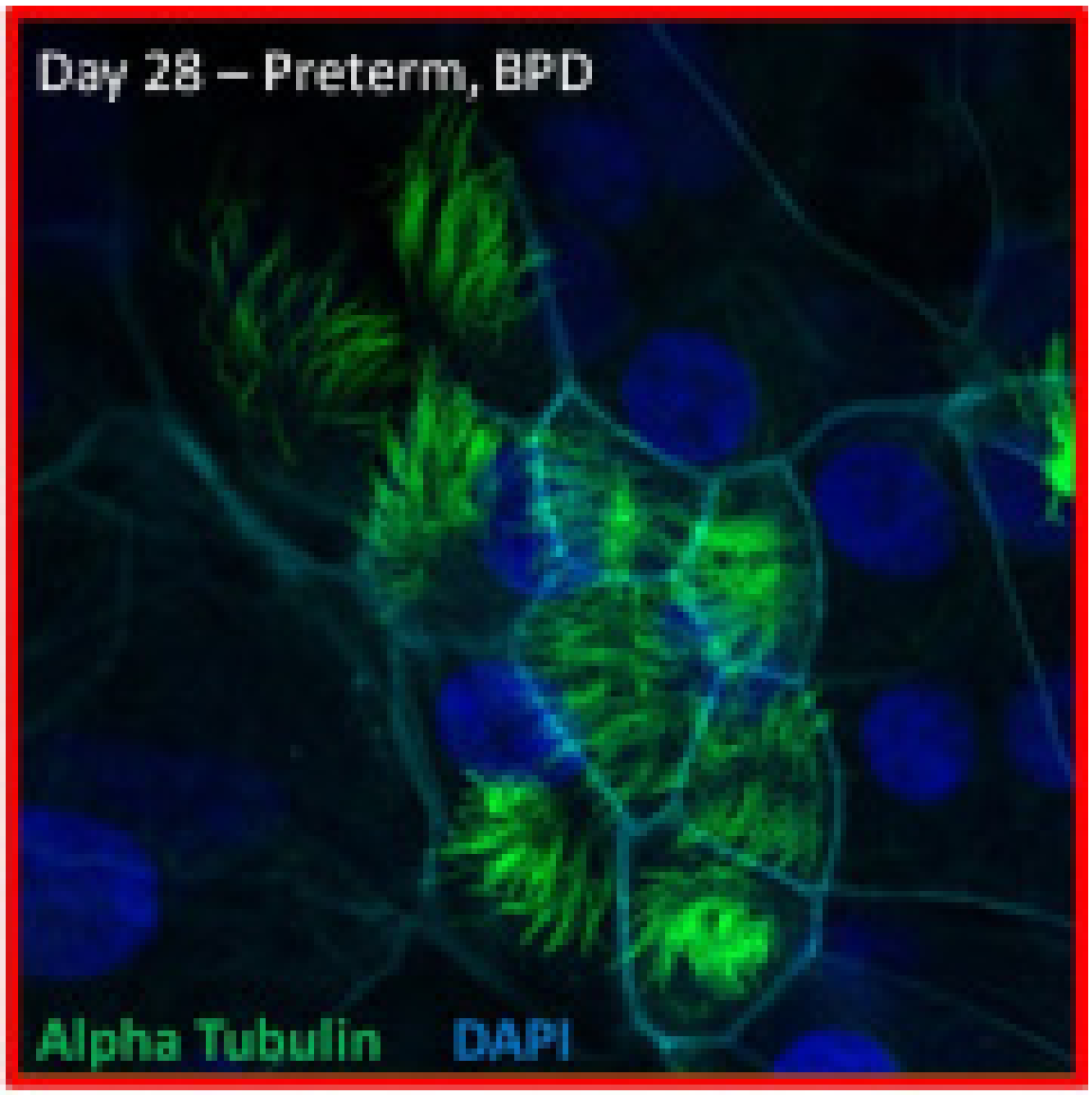
3. Assess for differentiated ciliary function in Air Liquid Interface (ALI) culture

Design/Methods Routine NP aspirates within the first half hour of life in healthy term and preterm infants <32 weeks gestational age were collected at a single center level IV NICU. Aspirates were plated on collagen coated plates with bronchial epithelial cell growth medium, which selects for basal cells. Basal cells were expanded and plated on collagen coated transwell plates for ALI culture. Incubation with human ALI media for 28 days drove differentiation in a polarized configuration, as seen in vivo. Immunoflorescent antibody staining for epithelial cell markers was conducted on Day 0 in ALI and Day 28. A high-speed camera calculated ciliary beat frequency.

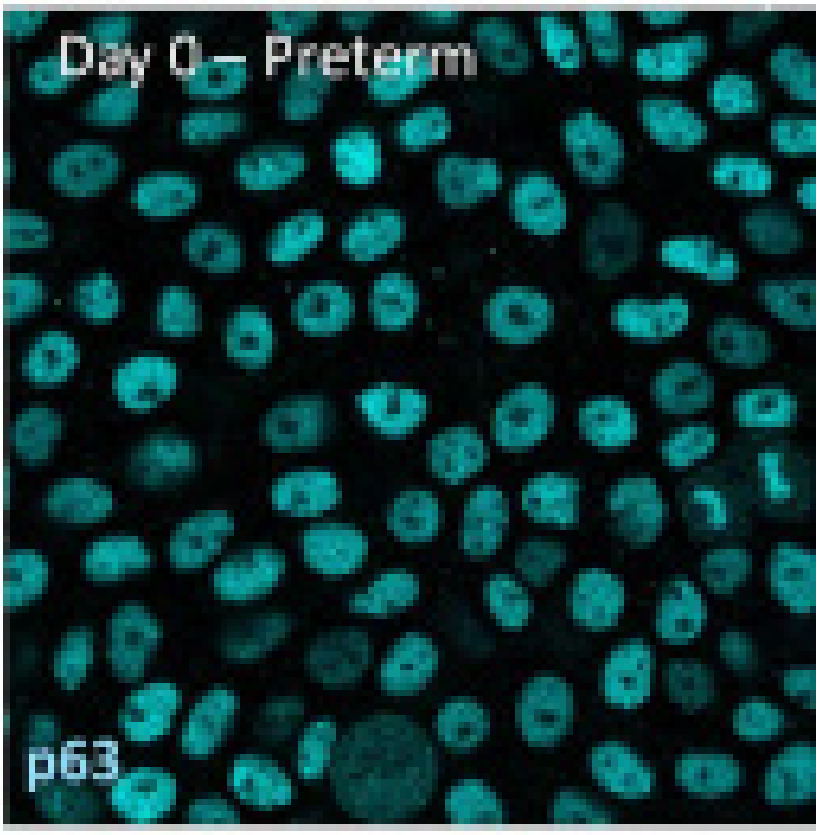
Results Basal cells were isolated in 5 out of 8 (63%) healthy term and 13 out of 16 (81%) preterm infants from nasopharyngeal aspirates. Cells expanded in Day 0 ALI culture were positive for basal cell markers p63, Ker5, Ker8, Notch3, and NKX2.1. Basal cells differentiated by Day 28 ALI culture were positive for goblet cell marker MUC5, and cilia markers a-tubulin, and FoxJ1, but negative for club cell marker CC10. Cilia movement was captured on high speed camera on Day 28 ALI culture.

Conclusion(s) Basal cells collected via NP aspiration can be cultured and differentiated into airway epithelium in both preterm and healthy term neonates. This innovative model opens the field for future studies of evaluating airway remodeling in neonatal lung diseases, including BPD.

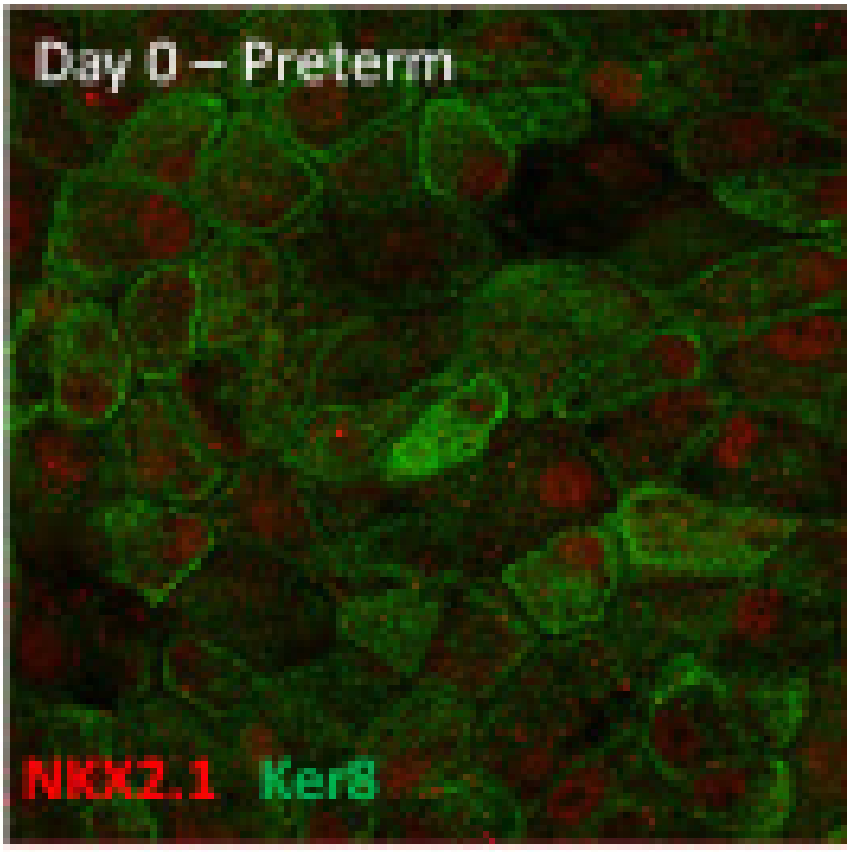
Term Cilia differentiated from Day 28 ALI culture



BPD Preterm Cilia with Alpha Tubulin staining after differentiation in Day 28 ALI culture



Preterm Basal Cell p63 from Preterm Day 0 ALI culture



Preterm Basal cell NKX2.1 and Ker8 from Day 0 ALI culture

Abstract: 170

Randomized Trial of 0.01, 0.03 and 0.1 mg/kg of Epinephrine for Cardiac Arrest by Umbilical Cord Occlusion in Lambs

Deepika Sankaran[1], Praveen Chandrasekharan[1], Sylvia Gugino[1], Carmon Koenigsknecht[1], Justin Helman[1], Jayasree Nair[1], Bobby Mathew[1], Munmun Rawat[1], Payam Vali[2], Lori Nielsen[1], Satyan Lakshminrusimha[2]

[1]Pediatrics, University at Buffalo, Buffalo, New York, United States, [2]Pediatrics, UC Davis, Sacramento, Armed Forces Pacific, United States

Background Current NRP guidelines recommend administration of epinephrine dose (0.01-0.03mg/kg) via low umbilical venous catheter (UVC). There are no pharmacokinetic/efficacy/safety studies comparing various doses of epinephrine via low UVC in neonatal models of cardiac arrest.

Objective We hypothesized that use of 0.03 (high dose) and 0.1 (mega dose) mg/kg of epinephrine would result in higher plasma epinephrine levels with more frequent and rapid return of spontaneous circulation compared to 0.01 mg/kg (low dose). We speculated that mega dose (0.1 mg/kg) would be associated with higher incidence of tachycardia and hypertension after return of spontaneous circulation (ROSC).

Design/Methods Asystole was induced by umbilical cord occlusion in 30 lambs. Lambs were randomized to low (0.01mg/kg) vs. high dose (0.03mg/kg) or high (0.03mg/kg) vs. mega (0.1mg/kg) dose prior to study. Resuscitation was initiated after 5 minutes of asystole. After 5 min of resuscitation as per NRP guidelines, lambs without ROSC received UVC epinephrine. The dose was repeated every 3 min until ROSC. Hemodynamics, blood gases and plasma epinephrine levels were monitored.

Results The characteristics at asystole were similar between the groups (Table 1). Out of 30 lambs with asphyxial arrest, 7 lambs had ROSC prior to epinephrine administration. Of the remaining lambs who received epinephrine: 2/7 in low dose group (28%), 10/12 in high dose group (83%) and 3/4 in mega dose group (75%) achieved ROSC. High dose group achieved higher carotid blood flow compared to the other groups and Mega dose group had higher mean blood pressures and heart rates compared to the other groups (Figures 1 and 2). Mega dose group had significantly higher plasma epinephrine levels compared to other groups (Figure 3).

Conclusion(s) Use of 0.03 mg/kg of epinephrine leads to more frequent return of spontaneous circulation compared to 0.01 mg/kg while resulting in less post-resuscitation tachycardia and hypertension compared to 0.1mg/kg. Recommendation of one dose (0.03mg/kg) of epinephrine by NRP may simplify the algorithm and reduce errors.

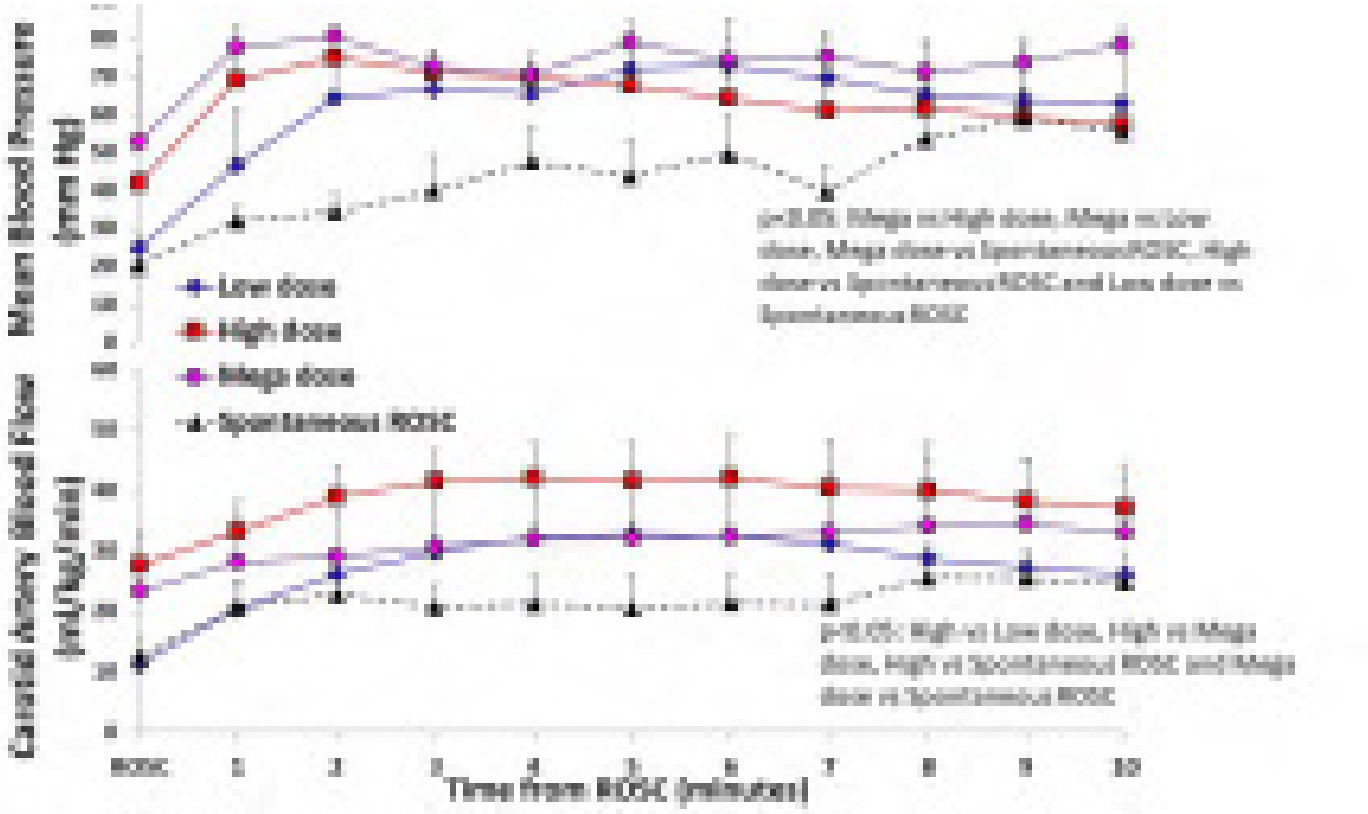


Figure 1: Comparison of Mean Blood Pressure and Carotid Artery Blood Flow between the study groups at every minute after return of spontaneous circulation (ROSC).
p<0.05: statistically significant

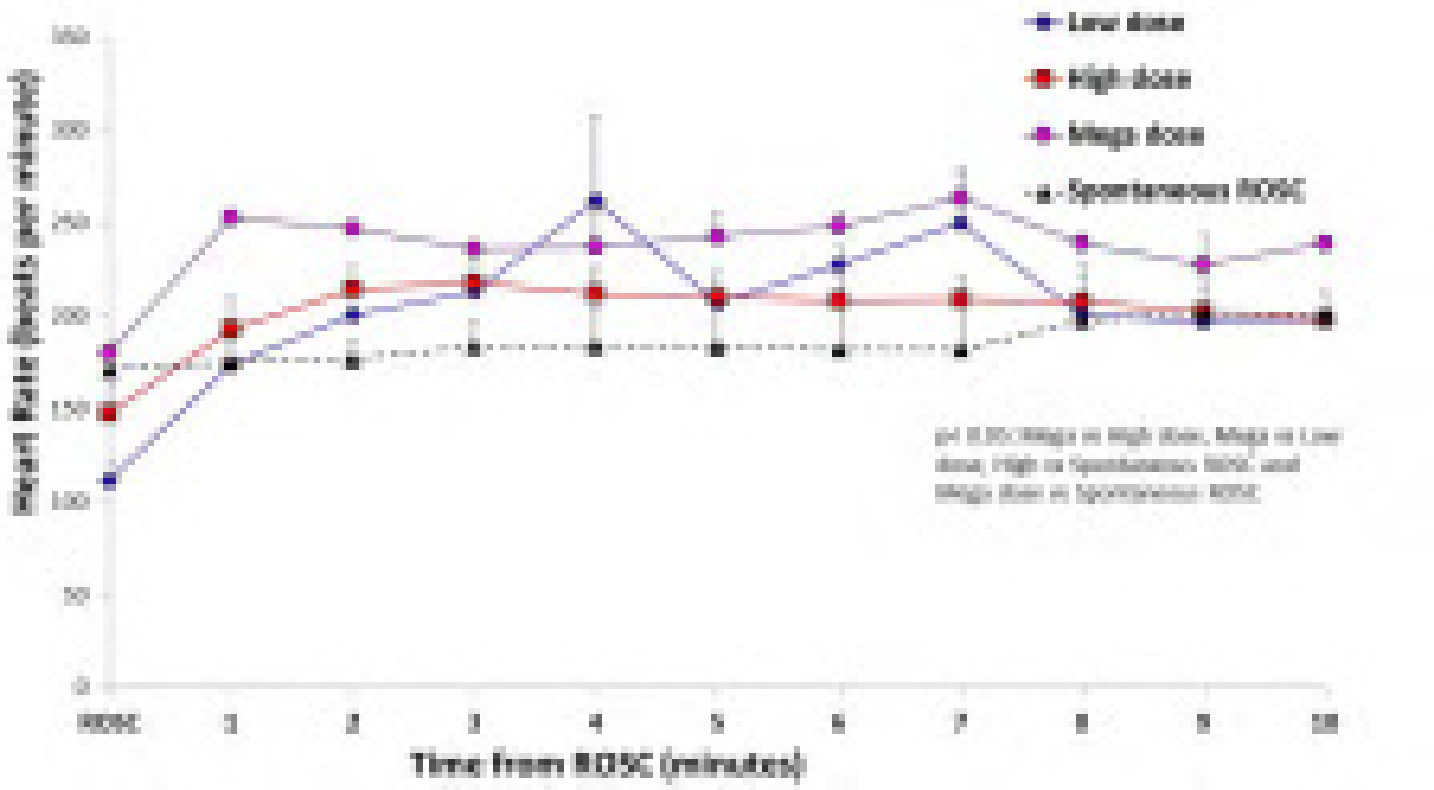


Figure 2: Comparison of Heart rates between the study groups at every minute after return of spontaneous circulation (ROSC).
p<0.05: statistically significant

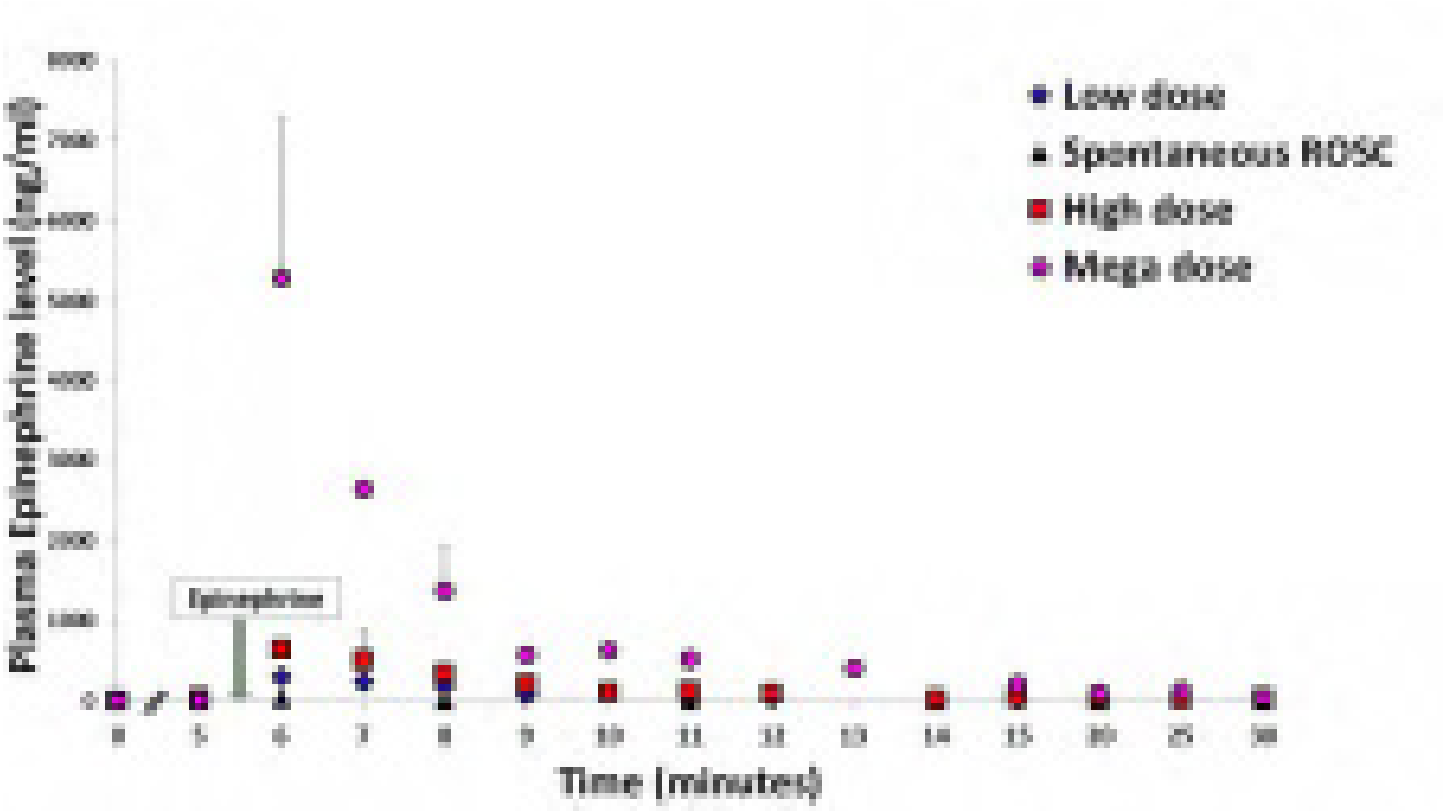


Figure 3: Comparison of Plasma Epinephrine levels between the study groups during resuscitation.
Time 0 is when ventilation was started.
Time 1 is when chest compressions were started and coordinated with ventilation.

Table 1: Comparison of baseline characteristics at asystole and after ROSC between the study groups

Parameter	Spontaneous ROSC	Low dose (0.01 mg/kg)	High dose (0.03 mg/kg)	Mega dose (0.1 mg/kg)
Number of lambs	7	7	12	4
Birth weight (kg)	4.41 (0.72)	4.82 (1.2)	4.06 (1.1)	4.88 (0.8)
Gender	4 females, 3 males	4 females, 3 males	7 females, 5 males	3 females, 1 male
pH at asystole	6.86 (0.08)	6.87 (0.07)	6.85 (0.08)	6.87 (0.09)
pCO2 at asystole (mm Hg)	136 (18)	131 (14)	138 (17)	137 (22)
pO2 at asystole (mm Hg)	5 (4)	7 (6)	8 (5)	8 (4)
Serum lactate at asystole (mmol/L)	12 (3.6)	9 (2)	10 (2.6)	7 (0.5)
Time to asystole from time of occlusion of umbilical cord (minutes)	13.8 (8)	14.6 (3.8)	13.1 (4.2)	15.7 (4.3)
ROSC achieved n (%)	7 (100%)	2 (28%)	10 (83%)†	3 (75%)

Number of epinephrine doses	none	1 dose (n=2) 4 doses, no ROSC (n=5)	1 dose (n=7) 2 doses (n=3) 2 doses, no ROSC (n=1) 4 doses, no ROSC (n=1)	1 dose (n=3) 4 doses, no ROSC (n=1)
ROSC with 1st dose of epinephrine n (%)	N/A	2 (28%)	7 (58%)	3 (75%)
Time to ROSC from the start of ventilation (seconds)	228 (80)*	397 (3)	445 (95)	383 (37)
Time to ROSC from time of epinephrine (seconds)	N/A	47 (17)	73 (51)	55 (26)

Data presented as mean (standard deviation) unless otherwise specified. * p<0.05 † p<0.05 high dose vs. low dose pCO2: partial pressure of carbon-dioxide pO2: partial pressure of oxygen ROSC: return of spontaneous circulation

Abstract: 171
Novel Uterine CD122+ Macrophages Develop Under the Direction of Interferons
Scott Gordon[1], Edward Behrens[2]
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Background Gestation of a well-grown fetus depends on balanced signaling by proinflammatory cytokines to and from uterine immune cells. Complete absence of the proinflammatory cytokine interleukin-15 (IL-15) in mice results in delivery of growth-restricted pups. Conversely, unrestrained expression of IL-15 is associated with fetal loss in mice and humans. Targets and effects of IL-15 at the maternal-fetal interface have yet to be elucidated. IL-15 is thought to activate predominantly killer lymphocytes expressing CD122, which confers responsiveness to IL-15. We provide evidence to shift this paradigm and show that IL-15 signals to "CD122+Macs", novel macrophages that express CD122 and are unique to the decidualized uterus of mice and humans during pregnancy.
Objective To determine the phenotype, gene expression profile, ontogeny, and functional capability of novel decidual CD122+Macs.
Design/Methods Pregnant mice were studied in accordance with guidelines of the Institutional Animal Care and Use Committee. First trimester human deciduae were obtained from deidentified subjects from the Penn Family Planning and Pregnancy Loss Center. Tissues were enzymatically dissociated to obtain immune cells. Expression of cellular proteins was assessed using flow cytometry. Fluorescence-activated cell sorting was used to purify cells of interest for gene expression profiling by microarray. Cell culture and adoptive cell transfer were used to determine ontogeny of CD122+Macs. Signaling and functions of CD122+Macs in response to IL-15 were probed with western blot and ELISA.
Results CD122+Macs are large, vacuolated cells expressing markers of monocyte-derived macrophages. Indeed, monocytes transferred into pregnant mice give rise to decidual CD122+Macs. Genes downstream of interferons (IFNs), classic antiviral cytokines also abundant in pregnancy, distinguish the transcriptome of CD122+Macs from that of other uterine macrophages. IFNs are sufficient to drive development of CD122+Macs *in vitro* in a dose-dependent manner. In support of this notion, the placenta produces more IFNs as gestation progresses, and we show enrichment of CD122+Macs as gestation progresses. After exposure to exogenous IL-15, CD122+Macs activate cascades of canonical IL-15-responsive kinases and transcription factors. We also provide evidence of cells in human first-trimester deciduae that phenocopy murine CD122+Macs.
Conclusion(s) Our data support a model in which IFNs drive development of decidual CD122+Macs, novel effectors of IL-15 signals at the maternal-fetal interface.

Abstract: 172
The developmental course of decorin and biglycan in maternal serum during pregnancy
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Pediatrics, Women & Infants Hospital/Brown University, Providence, Rhode Island, United States

Background Preterm birth is a leading cause of infant morbidity and mortality. Preterm premature rupture of membranes (PPROM), the spontaneous rupture of fetal membranes prior to labor before 37 weeks of gestation, is the underlying cause of approximately one-third of preterm births. Decorin and biglycan are two small leucine-rich proteoglycans known to play a role in the tensile strength of connective tissues and are highly expressed in human fetal membranes, where they impact fetal membrane remodeling and stabilization. We have shown that levels of these proteoglycans are altered in the serum of asymptomatic women who go on to have PPROM. Biglycan is increased and decorin is decreased, compared to matched controls.
Objective To define the developmental course of decorin and biglycan levels in maternal serum during a healthy pregnancy.
Design/Methods Residual serum samples in the Women & Infants Hospital lab were utilized. The electronic medical record (EMR) was used to identify samples belonging to pregnant women for analysis. Serum of women with multiple gestation pregnancies or pregnancy complications (such as preterm labor, chorioamnionitis, known PPROM) were excluded. Week of gestation at time of serum collection was recorded. ELISA assays were used to measure concentrations of decorin and biglycan in the serum. A validation experiment to determine differences in concentration as a function of length of storage was performed and resulted in no significant difference.
Results 143 maternal serum samples were collected and analyzed for decorin and biglycan. Samples spanned gestational ages of 5 weeks to 40 weeks, as well as 3 samples from post-partum women and 3 samples from non-pregnant women as controls. Results for each proteoglycan were fitted to a negative binomial distribution. Decorin decreased by < 1% per week ($p = 0.6$) and biglycan decreased by 2.9% per week ($p = 0.0001$) during the course of pregnancy.
Conclusion(s) We demonstrated the natural course of serum decorin and biglycan levels during pregnancy. Decorin remains unchanged, while biglycan decreases. This study is an important first step in developing a clinically useful serum screening model to predict risk of PPROM in asymptomatic pregnant women.

Abstract: 173
Proteomic analysis of human placenta in spontaneous preterm birth
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Children's Hospital of Philadelphia, Philadephia, Pennsylvania, United States

Background The etiology and mechanisms underlying spontaneous preterm birth (SPTB) are currently unknown. Given the essential role of the placenta in maintaining healthy pregnancy, placental dysfunction may contribute to the development of SPTB.
Objective To characterize the proteome of the human placenta in the setting of SPTB compared to that of term delivery as well as during healthy pregnancies at a similar gestational age.
Design/Methods Human placental biopsies (near cord, fetal side) obtained at time of delivery following spontaneous preterm birth (cases, n=4) or normal labor at term (controls, n=4) were selected from a nested case-control study as part of the prospective March of Dimes (MOD) Preterm Birth Study cohort. Additional non-SPTB second trimester placental biopsies were obtained following elective termination of healthy pregnancies to serve as gestational age controls (n=4, mean gestational age 22 weeks). Untargeted proteomic analysis was performed using liquid chromatography-tandem mass spectrometry through a data independent acquisition approach. Ingenuity Pathway Analysis (IPA, Qiagen Inc) was then used to determine pathways likely to be affected by differences in protein levels between groups.
Results Demographic characteristics of the sample groups are shown (Table). On average, we identified 4,411 protein groups and 57,041 peptides per specimen. Two sample t-test identified 432 proteins that were significantly different between the SPTB and term birth groups ($q<0.05$); these proteins were most highly related to pathways of cell signaling related to cell starvation as well as fatty acid oxidation (Figure 1). 947 proteins were significantly different between the SPTB samples and the second trimester controls ($q<0.05$), with highest affected pathways reflecting those of lipid and glucose metabolism, mitochondrial dysfunction, and acute phase response signaling (Figure 2).
Conclusion(s) The proteomic profile of the human placenta in the setting of SPTB is distinct from that following normal term delivery as well as in mid-gestational controls. Protein differences detected across these small sample groups support a possible role for altered placental metabolism in the development of SPTB.

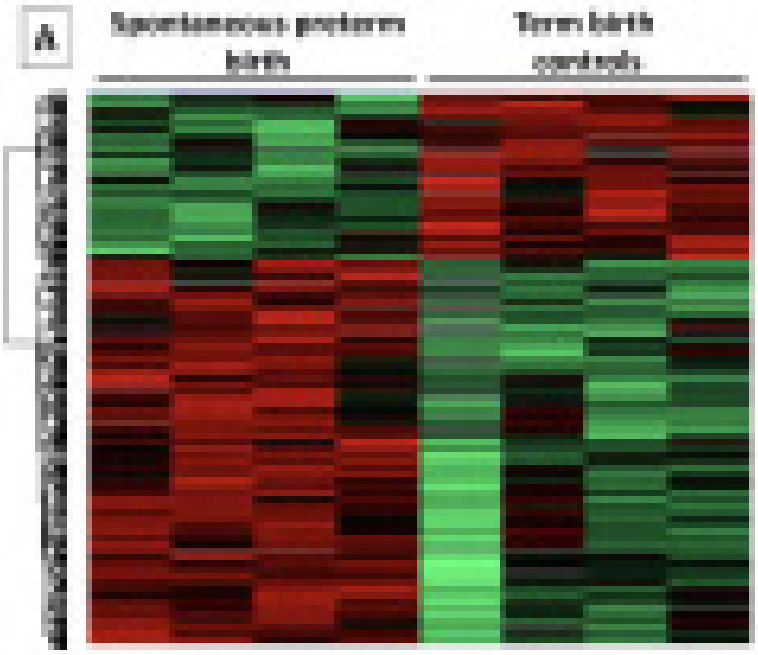
Funded through March of Dimes and The Children’s Hospital of Philadelphia Division of Neonatology

Table: Demographics of SPTB cases and control groups

	Spontaneous preterm birth (n=4)	Term birth controls (n=4)	Second trimester controls (n=4)
GA, mean	25w 3.5d	39w 6d	22w 1d
GA, min	23w 6	39w 2d	19w 0d
GA, max	27w 5d	40w 2d	23w 3d
African American	4/4 (100%)	4/4 (100%)	4/4 (100%)
Maternal BMI, mean	24.9	25.5	23.8
Maternal BMI, min	19.6	22.7	19.6
Maternal BMI, max	27.3	28.6	29.9
Fetal sex, male	2/4 (50%)	2/4 (50%)	Not measured

GA: gestational age

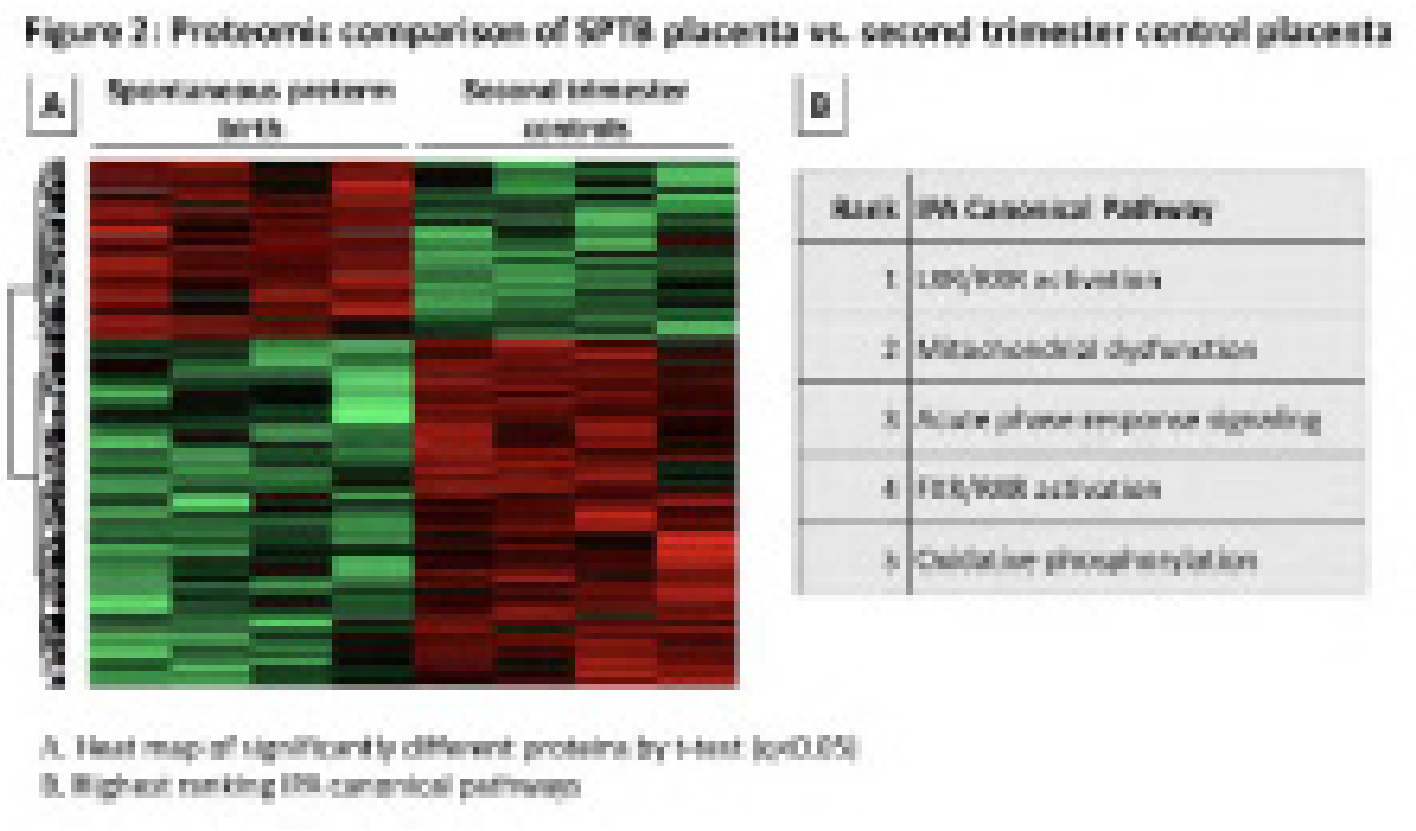
Figure 1: Proteomic comparison of SPTB placenta vs. term birth placenta



B

Rank	IPA Canonical Pathway
1	EIF2 signaling
2	Fatty acid beta-oxidation
3	Regulation of eIF4 and p70S6K signaling
4	mTOR signaling
5	tRNA charging

A. Heat map of significantly different proteins by t-test (p<0.05)
B. Highest ranking IPA canonical pathways



Abstract: 174

Nitric Oxide (NO) Donors Alter Surfactant Protein-D Structure and Inflammatory Function After Ozone Exposure

Omer Choudry[1], Elena Abramova[2], Sheryse Taylor[2], Thomas Hegyi[2], Andrew Gow[2]

[1]Neonatal Perinatal Medicine, Rutgers University/ Robert Wood Johnson University Hospital, Highland Park, New Jersey, United States, [2]Rutgers University/ Robert Wood Johnson University Hospital, New Brunswick, New Jersey, United States

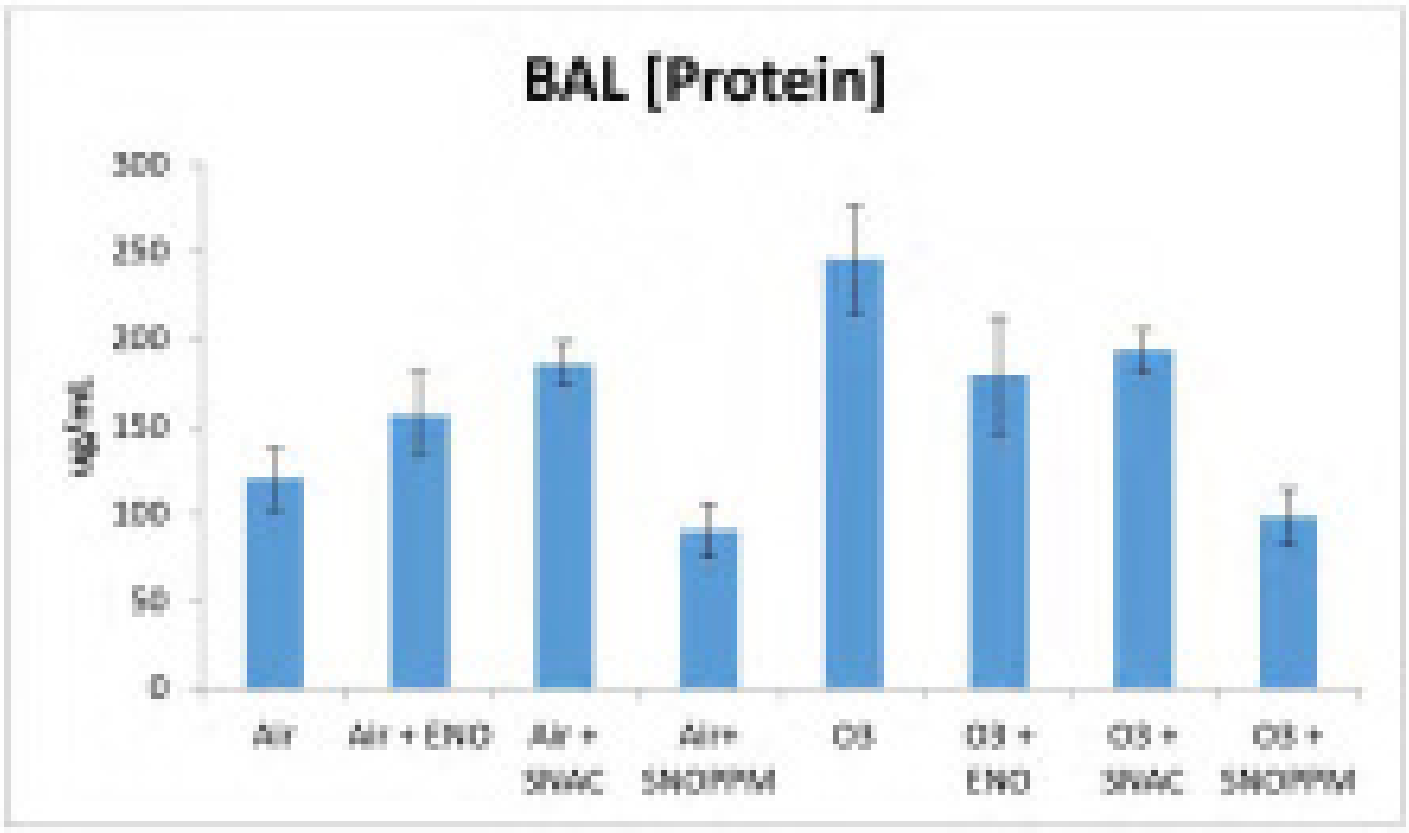
Background Nitric Oxide is an important regulator of many physiological functions. S-nitrosylation, a major pathway of NO bioactivity, results from the addition of NO to the cysteine thiol side chain of a protein (SNOs). Many proteins are targets of S-nitrosylation, which can regulate their function. SNOs have broad anti-inflammatory actions through varied mechanisms and S-nitrosylation regulates mediators of lung inflammation such as SPD. Exposure of SPD to NO forms a structural isomer, SNO-SPD trimers which expose the pro-inflammatory tail domain.

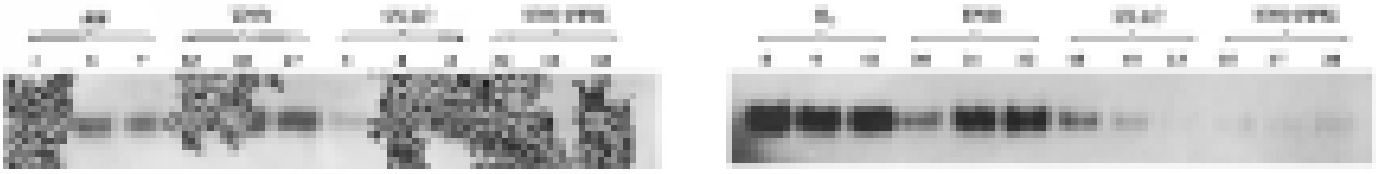
Objective To evaluate the effects of various NO donors on indicators of inflammation in mouse lung following ozone (O_3) exposure, specifically, total protein and SPD levels in bronchoalveolar lavage (BAL) fluid and the assessment of macrophage phenotype.

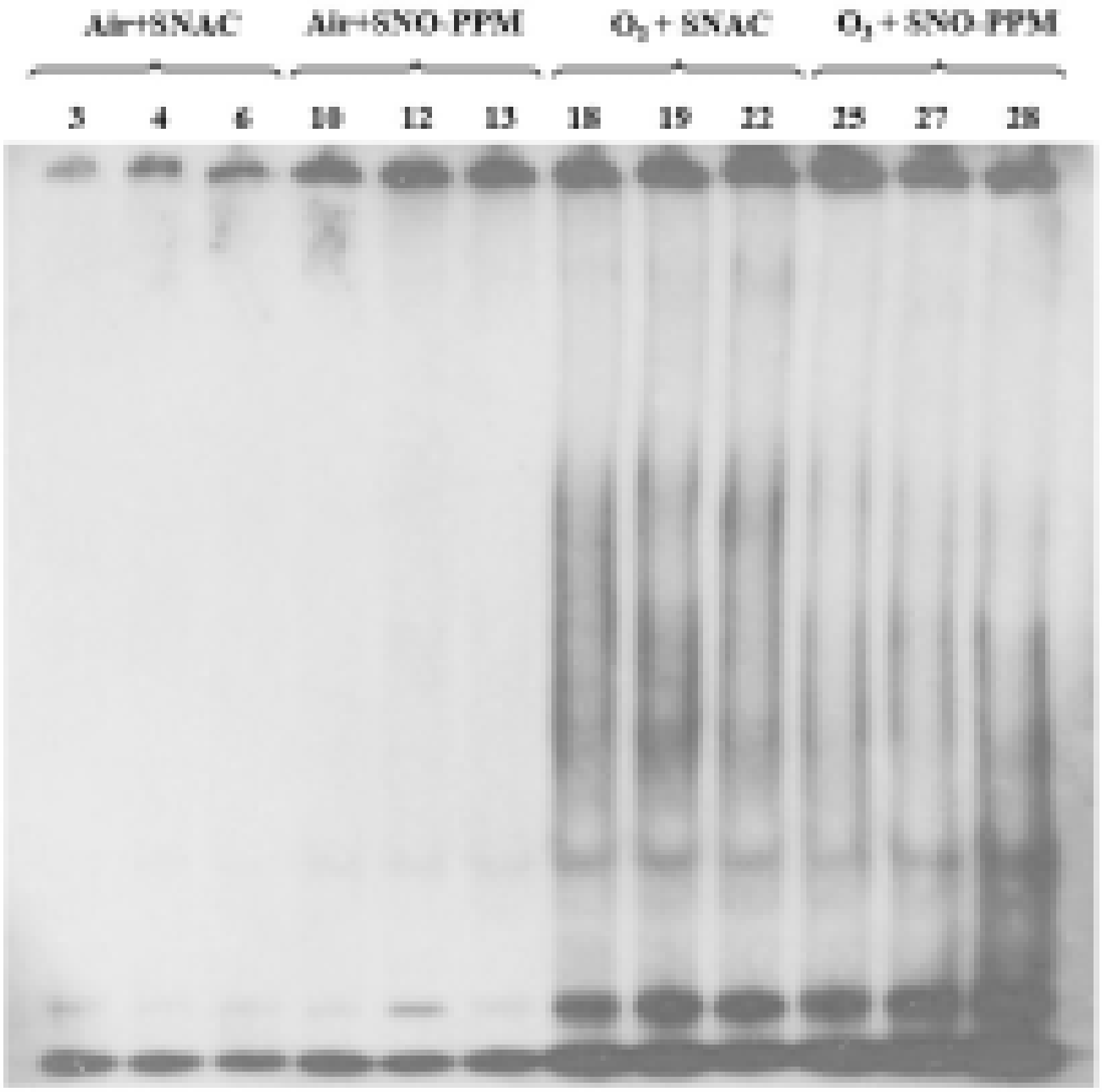
Design/Methods We examined the effects of three different NO donors; ethyl nitrite (ENO), nitrosylated propanamide (SNO-PPM), and nitrosylated N-acetylcysteine (SNAC). Mice were exposed to 0.8 ppm of O_3 or air for 3 hours and then treated intranasally with either 0.0125% ENO (50µL), 50 ng of SNAC or SNOPPM. Mice were sacrificed 48hrs after treatment and lung macrophages were obtained through BAL or processed through lung digestion, followed by magnetic sorting for F4/80+ cells. Macrophages were assessed using flow cytometry to determine phenotype. total protein in the BAL was measured via Bradford assay and compared between all groups. SPD levels were assessed using Western Blotting, and native gel electrophoresis was performed to determine SPD oligomeric disruption.

Results Ozone increases both total protein and SPD levels in BAL when compared to air controls. Increases in total protein were reduced by ENO and SNO-PPM, but not by SNAC, while increases in SPD were ameliorated by all NO donors, most effectively by SNO-PPM. Analysis of SPD molecular size revealed that SNO-PPM was more effective than SNAC in reducing SPD oligomeric disruption. On flow cytometry analysis, ozone induced expression of the pro-inflammatory marker Ly6C in lung macrophages and was reduced by all SNO donors, with SNO-PPM being the most effective.

Conclusion(s) Our studies show that ozone induces pro-inflammatory changes in mouse lung and is ameliorated by SNO donor administration, with SNO-PPM being the most effective.


BAL [Protein]
300
250
200
150
100
50
0
Air
Air + ENO
Air + SNAC
Air+ SNOPPM
O3
O3 + ENO
O3 + SNAC
O3 + SNOPPM





Abstract: 175
PP2A Genetic Variants are Associated with BPD and PDA in ELBW Infants
Alan C. Lu[1], Vanessa Trinh[2], Sharina Rajbhandari[2], Shaili Amatya[2], Morgan Salton[2], Virginia Kaldas[2], Lance Parton[2]
[1]Pediatrics, New York Medical College, Valhalla, New York, United States, [2]Div of Newborn Medicine, Maria Fareri Children's Hosp at Westchester Med Ctr; and, New York Medical College, Valhalla, New York, United States

Background BPD and PDA are significant causes of morbidity and mortality in ELBW infants. Twin, family, and population studies suggest a substantial genetic component to both conditions. Protein phosphatase 2A (PP2A) is a ubiquitously expressed protein phosphatase that regulates many cellular processes, including cell cycle progression, cell signaling, growth, and apoptosis in a myriad of organs. In the lung, PP2A mediates the anti-inflammatory responses to insults such as hypoxia and

cigarette smoke. Decreased activity or levels of PP2A are associated with COPD, asthma, and emphysema. In the cardiovascular system, PP2A regulates the oxidative stress responses and NO production by eNOS. Altered PP2A expression or activity disrupts cardiac contractility and ion channel expression, and results in remodeling via hypertropy and fibrosis. Together, these key functions suggest a potential role for PP2A in the pathogenesis of BPD and PDA.

Objective To determine if SNPs of PP2A are associated with susceptibility to BPD and PDA in ELBW infants.

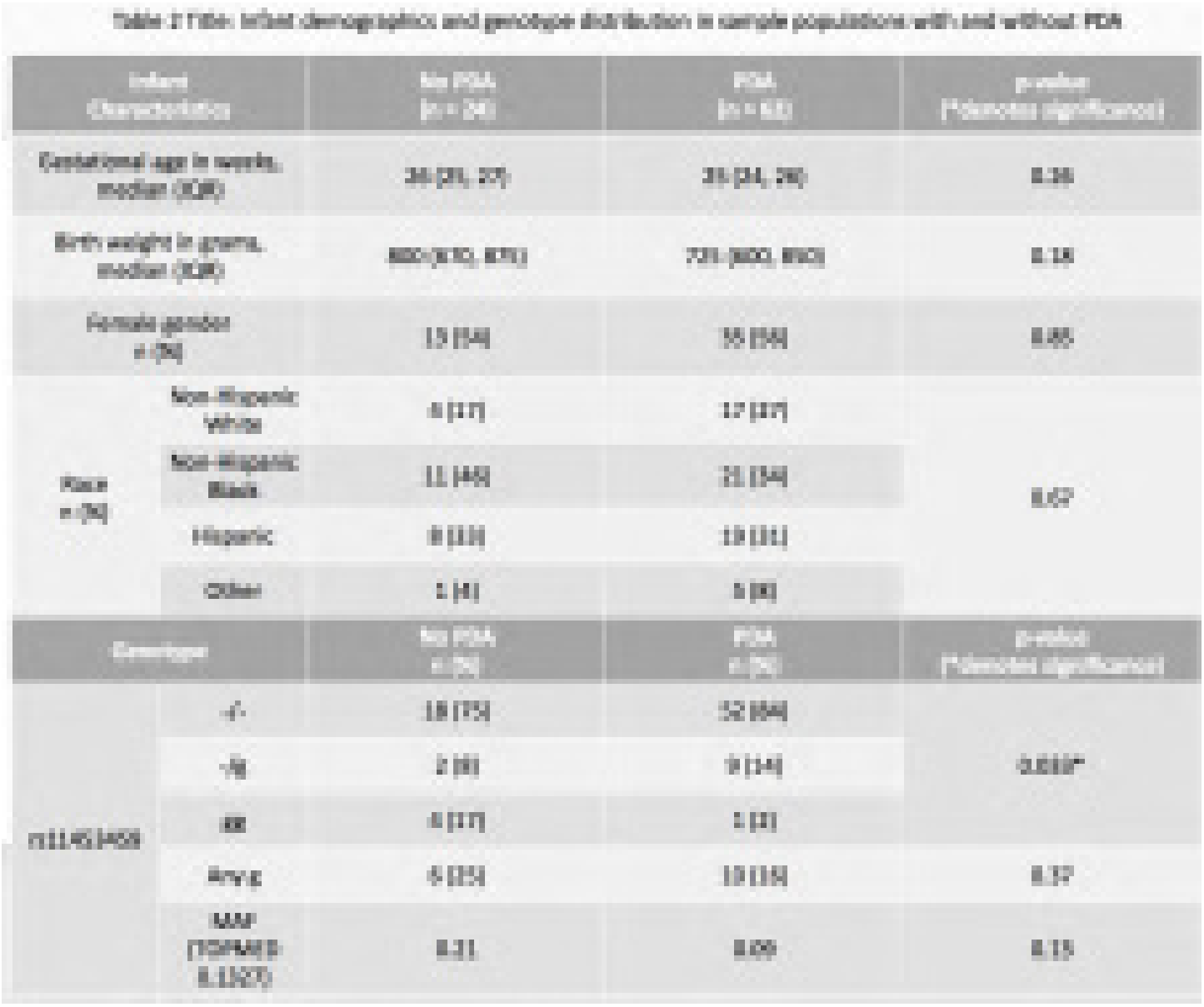
Design/Methods This is an ongoing cohort study enrolling ELBW infants without major congenital or chromosomal anomalies. DNA was collected from infants following parental consent (IRB-approved) using buccal swabs; and, underwent allelic discrimination with specific Taqman probes during RT-PCR for: rs1255722, rs319217, and rs11453459. BPD was defined as the need for supplemental oxygen at 36 weeks PMA. PDA was present if medical or surgical treatment were given. Statistical analyses included chi-square, z-test, t-test, Fisher exact, and Mann-Whitney U test, with $p \leq 0.05$ denoting significance.

Results Infants with BPD had earlier gestational ages and lower birth weights. Other demographic characteristics were comparable (Table 1). rs1255722 had significantly different genotype frequencies for BPD compared to NonBPD, with the minor allele frequency (MAF) being higher in those with BPD. rs11453459 had a significantly different genotype distribution for those with PDA, with the MAF being lower in those with PDA, although this did not reach statistical significance (Table 2).

Conclusion(s) PP2A variants rs1255722 and rs11453459 showed differences in genotype distributions for BPD and PDA, respectively. We speculate that these differences may perturb the pulmonary and vascular responsiveness to inflammation and oxidative stress, as well as perturb cell survival and vascular tone, placing these ELBW infants at altererd risk for BPD and PDA.

Table 1. Title: Infant demographics and genotype distribution in sample populations with and without BPD

Infant Characteristics		No BPD (n = 87)	BPD (n = 224)	p-value (* denotes significance)
Gestational age in weeks, median (interquartile range)		26 (25, 27)	25 (24, 26)	<0.0001*
Birth weight in grams, median (interquartile range)		840 (745, 950)	705 (595, 815)	<0.0001*
Female gender n (%)		49 (56)	92 (38)	0.17
Race n (%)	Non-Hispanic White	18 (20)	28 (27)	0.01
	Non-Hispanic Black	18 (20)	93 (39)	
	Hispanic	19 (22)	36 (34)	
	Other	3 (3)	7 (7)	
Genotype		No BPD n (%)	BPD n (%)	p-value (* denotes significance)
rs1255722	GG	25 (44)	24 (23)	0.018*
	GA	15 (26)	60 (29)	
	AA	17 (30)	58 (48)	
	Any A	32 (56)	88 (77)	0.0062*
	MAF (global 0.4830)	0.43	0.63	0.017*



Abstract: 176

MicroRNA (miR) 195 targets Mitofusin2 (Mfn2) in a mouse model of Bronchopulmonary Dysplasia (BPD)

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Background Premature infants provided with supplemental oxygen are at higher risk for developing a chronic respiratory disease called BPD. BPD occurs in developing lungs resulting in impaired alveolarization, dysregulated vascularization, increased cell death, decreased cell proliferation and increased autophagy. We have shown earlier that hyperoxia exposure leads to induction of autophagy during evolving BPD, but the role of Mfn2 and its upstream regulating miR195 in autophagy has not been explored.

Objective MiRs have recently been implicated in various lung diseases including BPD. From a microarray analysis of several miRs involved in BPD, we found that miR195 was one of the candidates to be involved in the pathogenesis of BPD. It has been reported that Mfn2 is involved in autophagy and we have shown that autophagy is increased in BPD. Further, as miR195 targets Mfn2, the interaction between miR195 and Mfn2 during the progression towards BPD via the autophagy signaling pathway needs to be explored.

Design/Methods Mouse lung epithelial (MLE12) cells and newborn mouse pups were used for hyperoxia studies, both *in*

***vitro* and *in vivo*. For *in vitro* studies, MLE12 cells were exposed to 95% oxygen for different time points (4h, 8h, 16h, 24h) while for *in vivo* experiments, newborn mice (P1) were either exposed to 95% O_2 for 4 to 7 consecutive days to induce acute lung injury (HALI) or exposed to 95% O_2 for 4 consecutive days, and allowed to recover for the subsequent 10 days to induce BPD, following which they were either sacrificed on P14 for the BPD model or P4/P7 for the HALI model. Q-PCR was done to evaluate the expression of miR195, while Western Blotting was done to check the expression of the target protein Mfn2 in room air controls versus hyperoxia-exposed cells/lungs.**

Results MLE12 cells showed a decreased expression of miR195 at 24h of hyperoxia exposure, with a corresponding increase of Mfn2. In the *in vivo* models, there was a significantly decreased expression of miR195 in hyperoxia-exposed P4, P7 and P14 BPD lungs as compared to room air controls, with concomitantly increased Mfn2 protein levels.

Conclusion(s) We conclude that hyperoxia-exposure leads to increased expression of miR195 with a concomitant decrease in Mfn2, in MLE12 cells and developing lungs.

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Prevalence and current trend of lead toxicity over last 8 years in an urban inner-city community in Philadelphia

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Background In 2012, 0.98% of children seen in our inner-city pediatric practice had a lead level of > 10 µg/dL. According to the Philadelphia Department of Public Health report on lead toxicity the rate of elevated blood lead levels ≥ 5 decreased from 11.6% to 4.2% from 2007 to 2017. Among Philadelphia children under the age of 6 years old in 2017, there was a decrease in newly identified children with venous blood lead levels ≥10 µg/dL from 2.2% in 2007 to 0.8% in 2017.

Objective Evaluate the change in prevalence of children with elevated blood lead levels in our patient population compared to citywide prevalence

Design/Methods We conducted a retrospective cross-sectional study of all blood lead levels drawn between January 1, 2015, and October 1, 2018, in children ≤5 years of age at an inner-city, academic, hospital-based pediatric practice. The practice provides care to a high-risk community in Philadelphia where 90% of housing was built pre-1978. Most children followed at the practice are minority (78% African American, 12% Latino) and low income (85% Medicaid, 10% uninsured). Children are routinely screened for lead exposure at 9-12 months and again on or after 24 months of age. If not screened previously, children are screened before their fifth birthday. All levels were drawn in clinic via venipuncture and processed by Labcorp reference laboratory. For those children who had more than one lead test during the study period, only the highest blood lead levels obtained was included in the study

Results Of the 1131 children screened for lead, 14.6 % had levels of 5 and above, 4% had levels 10 and above, and 0.97% had levels above 25. These levels were significantly higher than the levels seen in our population from 2010 – 2012 (Table). Only children less than 12 months of age when tested had levels comparable to those seen in 2012. In addition, these levels are significantly higher than the levels reported for Philadelphia citywide for 2017

Conclusion(s) While the prevalence of lead toxicity in Philadelphia has improved over the last 10 years, there are communities in the city where the prevalence of lead levels continues to rise or remains at high levels. These communities continue to carry high burdens of lead toxicity. Identifying communities at higher risk can inform ongoing prevention efforts

Table 1: Comparison of blood lead levels in study conducted from 2013 to 2017 with current study (2015-2018) in an Urban Inner-city community in Philadelphia

Blood Lead Level	All Children		< 12 Months		12-23 Months		24-35 Months		36-60 Months	
	2013 N=1948	2018 N=1181	2017 N=612	2018 N=385	2017 N=309	2018 N=216	2013 N=789	2018 N=587	2013 N=334	2018 N=133
≥ 10 µg/dL	0.36% (n=13)	3.98% (n=45) p = .01	0.16% (n=1)	8.57% (n=3) **	0.34% (n=3)	7.41% (n=16) p = .03	2.12% (n=15)	4.93% (n=13) p = .07	0.0% (n=0)	7.08% (n=6) p = .01
5-9 µg/dL	8.16% (n=159)	10.61% (n=120) p = .02	2.06% (n=13)	3.08% (n=8) **	9.81% (n=40)	8.80% (n=19) **	11.01% (n=82)	16.01% (n=69) p = .01	11.76% (n=39)	21.21% (n=28) p = .02
≥ 5 µg/dL	9.14% (n=178)	14.58% (n=165) p = .01	2.12% (n=14)	3.58% (n=10) **	18.07% (n=43)	16.20% (n=35) p = .02	13.68% (n=97)	21.82% (n=88) p = .01	11.76% (n=39)	28.21% (n=32) p = .01

** = not significant

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Partnering with Mothers to Improve Outcomes for Substance Exposed Newborns – A Pilot Program

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Background Neonatal abstinence syndrome (NAS) and its traditional treatment (Tx) have longstanding impacts on substance exposed newborns (SENs), their parents and the healthcare system. Pharmacotherapy (PhTx) for NAS may further contribute to potential adverse neurodevelopmental outcomes in SENs, while prolonged hospital length of stay (LOS) negatively impacts mother-infant bonding, breastfeeding (BF) success, healthcare utilization and costs. An alternative strategy is therefore needed
Objective To assess the impact of antenatal EMPOWER and postnatal rooming-in (RI) programs for pregnancies impacted by Opioid Use Disorder (OUD) on the initiation and duration of NAS PhTx, hospital LOS, NICU/CCN admission and LOS, BF initiation and status at discharge (d/c) and d/c to a biologic parent.
Design/Methods This observational study included mothers and their full-term SENs admitted to Baystate Children's Hospital from 01/2015 to 06/2018. Mothers with OUD were referred to EMPOWER, a multidisciplinary antenatal program starting 01/2017. All physiologically stable term SENs and mothers (1) in medication-assisted Tx ≥ 1 month, (2) with negative urine toxicology at delivery and (3) able to provide continuous newborn care, were eligible for RI during NAS observation and Tx. RI required mothers to reside with and care for their newborns 24/7 in a private postpartum room until newborn d/c. Using Wilcoxon rank-sum test and two sample test of proportions, we compared the outcomes to 01/2015 to 12/2016 historical SENs meeting RI eligibility.
Results Of 123 term SENs in 2017/18, 34 had mothers enrolled in EMPOWER, of which 14 (GA 39.1±1.4 weeks, BW 3155.0±365.2 gm) required PhTx and RI during Tx. Of 156 term historical SENs, 73 (GA 39.6±1.2 weeks, BW 3180.5±455.7 gm) received PhTx and were RI eligible. Table 1 and Figures 1-3 display results. Maternal enrollment in EMPOWER significantly decreased the initiation of PhTx. For those requiring PhTx, the EMPOWER/RI vs historical SENs differed significantly for duration of PhTx, NICU/CCN LOS and hospital LOS. EMPOWER/RI significantly decreased admission to the NICU/CCN and increased initiation of BF and continuation at d/c. No difference was observed for d/c to a biologic parent.
Conclusion(s) Benefitting both SENs and the healthcare system, EMPOWER and RI reduced the initiation and duration of PhTx, admission to and LOS in the NICU/CCN, and hospital LOS, while increasing BF initiation and continuation at d/c.

Funded by Health Policy Commission of Massachusetts

Table 1: Impact of EMPOWER and RI on NAS Outcomes

Characteristic	Historical (n=88)	EMPOWER (n=14)	p-Values
Initiated PATx, n (%)	73 (83.1)	13 (68.1)	0.0001*

Characteristic	Historical (n=73)	EMPOWER/RI (n=14)	p-Values
Duration of PATx, Median (IQR), Days	17.0 (8.0)	9.5 (5.8)	< 0.0001‡
Length of Stay, Median (IQR), Days			
Hospital	20.0 (8.0)	13.0 (4.8)	< 0.0001‡
NICU/CCN	18.0 (7.0)	3.0 (3.8)	< 0.0001‡
Admit to NICU/CCN, n (%)	73 (100.0)	8 (57.1)	< 0.0001*
Breastfeeding, n (%)			
Eligible	71 (91.5)	13 (92.9)	0.4082
Of Eligible, BF Initiated	41 (57.7)	12 (92.3)	0.0176*
Of Initiated, BF at Discharge	16 (39.0)	11 (91.7)	0.0013*
Discharged with Parent, n (%)	68 (93.2)	14 (100.0)	0.3131

Abbreviations: IQR, Interquartile Range
* Farrer significantly differs from Historical group (Two Sample Test of Proportions, α = 0.05)
‡ Farrer significantly differs from Historical group (Wilcoxon Rank-Sum Test, α = 0.05)

Figure 1: Impact on Initiation of PhTx

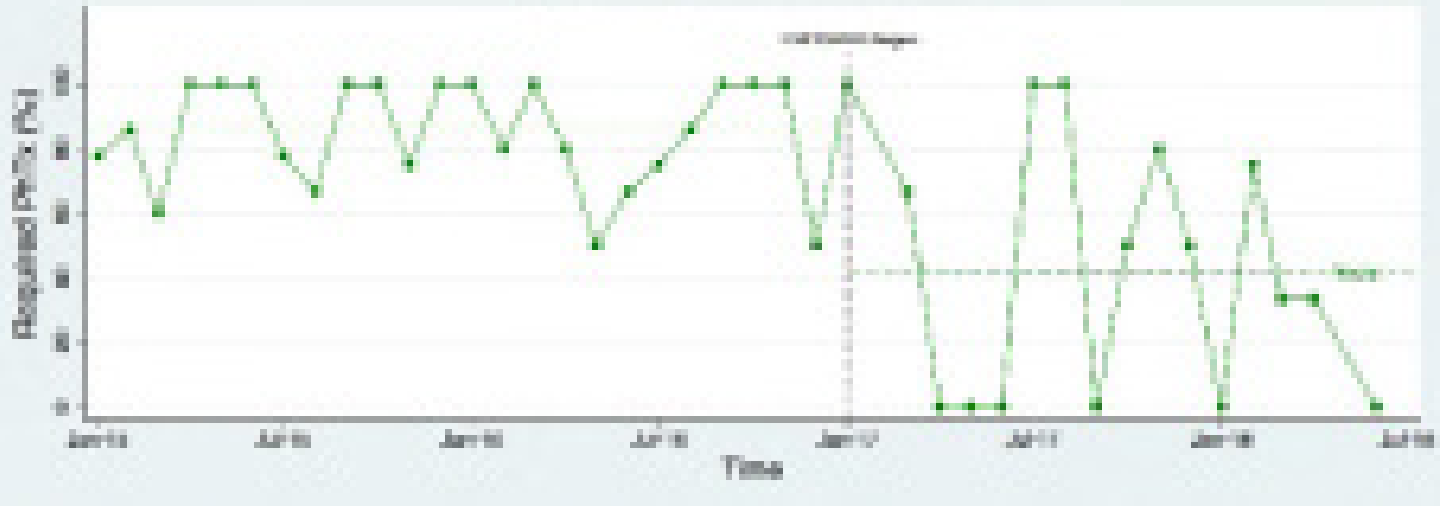


Figure 2: Impact on Hospital LOS, NICU/CCN LOS and Duration of PhTx

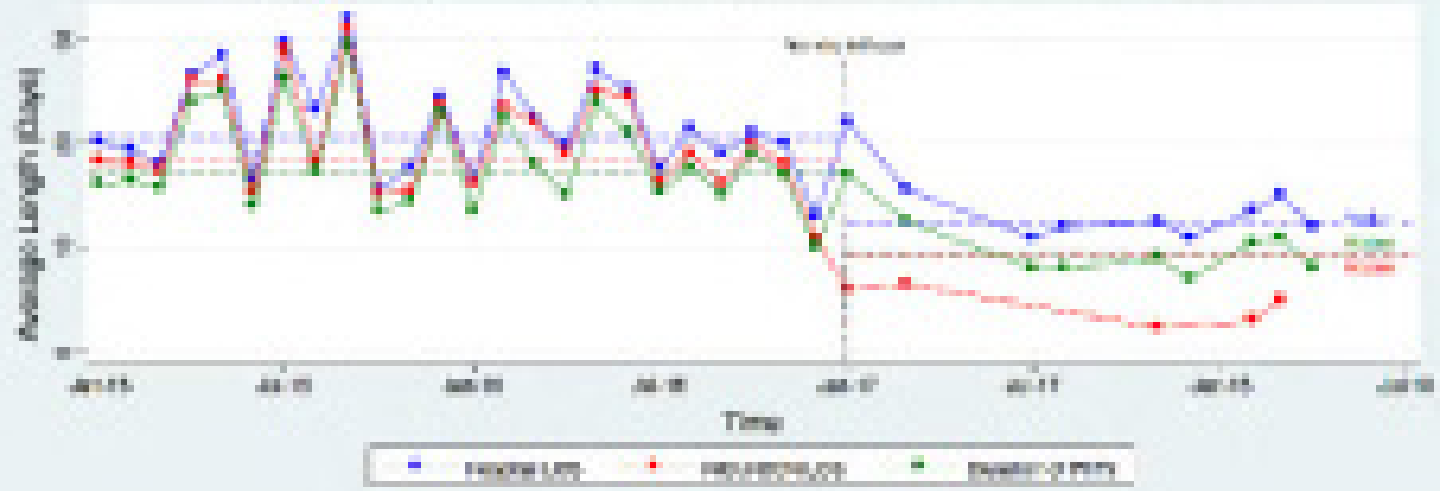
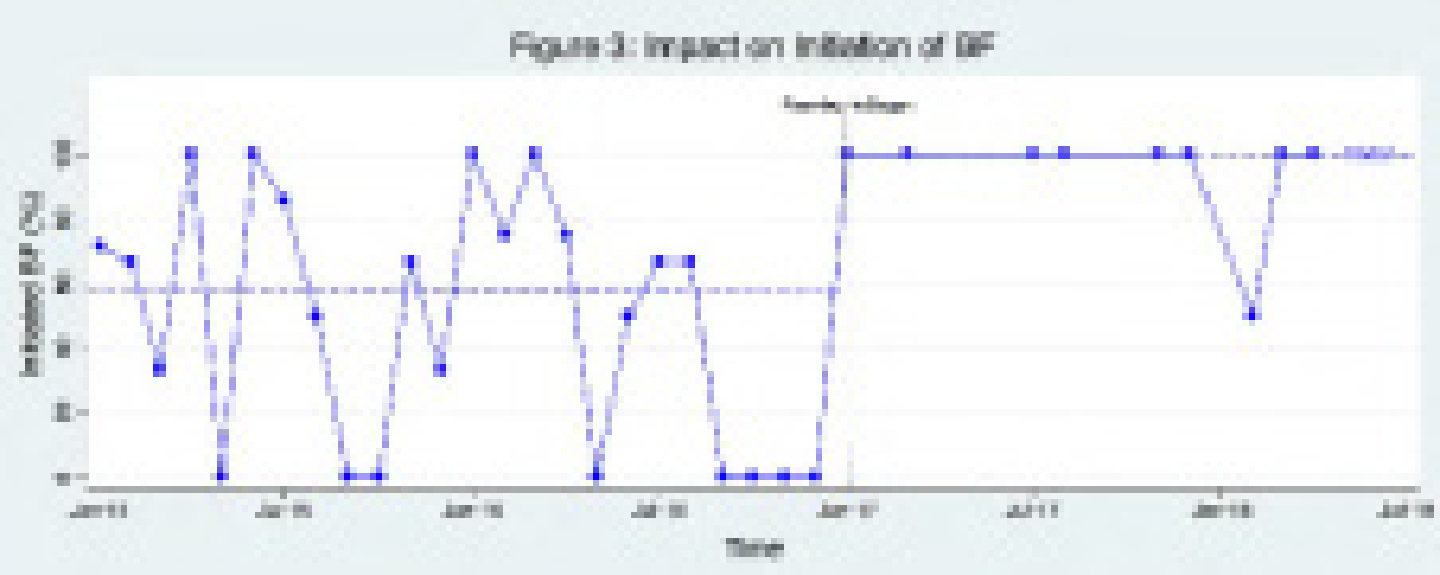


Figure 3: Impact on Initiation of BF



Abstract: 179

Improving the Nutrition of Infants with Bronchiolitis Admitted to the Hospital

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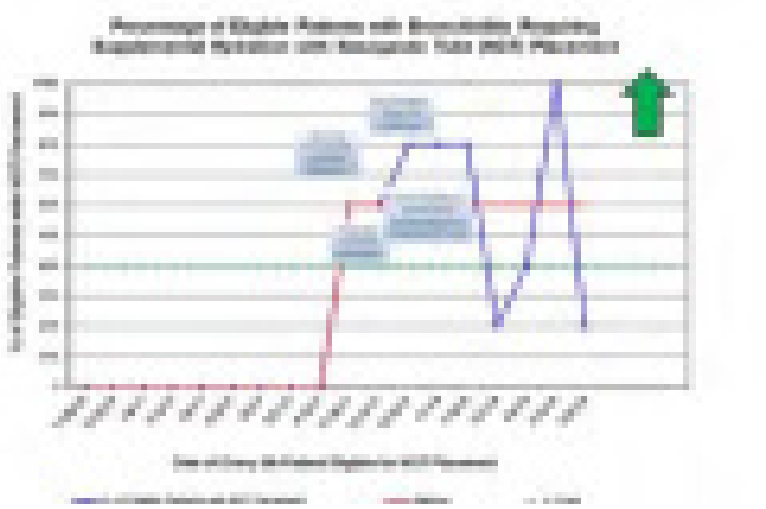
Background Hydration and nutrition are supportive treatments for bronchiolitis. The AAP Clinical Practice Guideline for Bronchiolitis advises nasogastric (NG) or intravenous (IV) fluids when hydration cannot be maintained orally. At our institution IV fluids have been the primary mode of hydration. However, NG tube (NGT) hydration for patients with bronchiolitis is safe and does not increase adverse events or prolong length of stay (LOS).

Objective The aim of our quality improvement initiative was to increase the percentage of patients admitted for bronchiolitis ages 1-24 months who receive NGT hydration from 0 to 40% during the 2017-2018 bronchiolitis season.

Design/Methods We implemented a quality improvement initiative modeled after the work of Srinivasan et al using PDSA cycles to increase utilization of NGT hydration for patients admitted with bronchiolitis. Education sessions were held for ED and Hospital Medicine providers and nurses. Our clinical pathway was revised to encourage NGT hydration. Patients < 35 weeks gestational age, with other chronic, congenital, chromosomal or neuromuscular abnormalities, requirement of > 2L O2 via NC, severe respiratory distress or dehydration, shock, recurrent emesis, or craniofacial anomalies were excluded. The primary outcome was percentage of patients receiving NGT for hydration. Secondary measures included number of IVs placed, IV infiltrates, NGT dislodgement, aspiration events, and LOS. Radiographic confirmation of NGT placement was monitored.

Results The number of patients with NGT hydration increased from a median of 0% in 2016-2017 to 60% in the 2017-2018 bronchiolitis season. 249 patients were admitted with bronchiolitis. 46 met inclusion criteria. 28 had NGT as their primary hydration method. 11 patients had NG and IV (or IV attempts). 17 had radiographic confirmation of NGT placement. 18 patients had IV fluids as their primary hydration method. 2 patients experienced IV infiltration. There were no aspiration events. Mean LOS for bronchiolitis in 2016-2017 was 3.03 days, compared to 2.33 days for patients receiving NGT as their primary hydration method in 2017-2018.

Conclusion(s) We successfully surpassed our goal to increase the use of NGT hydration for patients admitted with bronchiolitis, without an increase in adverse events. Additionally, there was no increase in LOS. Although the majority of NGTs were confirmed radiographically, there was not subsequent increase in pneumonia diagnosis or antibiotic use.



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Abstract: 180

Media Exposure and Adequate Sleep in Children with Autism Spectrum Disorder

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Background Media exposure has been linked to lower than recommended sleep hours. Adequate sleep from 8 to 16 hours according to age, is essential for optimal growth and development, with optimal recommendations set by American Academy of Pediatrics (AAP). Previous AAP media use recommendation was < 2 hours per day among children > 2 years old. The latest AAP recommendations are more flexible without strict limit for children ≥ 6 years of age. However, AAP recommends parent to creat a personalized Family Media Use Plan that would not affect adequate sleep hours. One third of children with Autism Spectrum Disorder (ASD) suffer from sleep disorders and lower sleep hours.

Objective To assess the effect of media exposure on adequate sleep hours in children with ASD and add independent prognostic value to severity of ASD symptoms.

Design/Methods We accessed the 2016 National Survey of Children's Health, which provides data on multiple aspects of lives of US children. Children 3-17 years of age with ASD were selected. Subjects were divided into 2 groups according to number of hours of sleep per day based on AAP. Group (Grp) A (children who slept recommended number of hours) versus those who did not (Grp B). Effect of TV and electronic devices exposure on sleep hours was assessed. Comparison among groups was done via Chi-squared test for categorical variables, and independent T-test for numerical variables. Significance defined at $p =< 0.05$.

Results A total of 1,111 mostly Caucasian subjects with ASD were analyzed, with mean age 11.2 years. Grp A included 669 (63%) and Grp B 412 (37%) subjects. There was no difference by gender, age at ASD diagnosis, receiving behavioral treatment, medication use, level of social skills or difficulty making friends between the 2 groups. Grp A was associated with higher socioeconomic status (p<0.001). Grp B was associated with more severe disease (p<0.001) (Table 1). Grp B had significantly higher usage of media (>2 hours) compared to Grp A (Table 2). There was more media use among mild ASD children compared to moderate/severe (Table 3). On stratification of exposure hours, Grp A was more likely to be exposed to media for <1 hour ($p = 0.026$), compared to Grp B who was more likely to be exposed for >4 hours ($p = 0.016$) (Figure 1 and 2).

Conclusion(s) Children with ASD with <1 hour of media exposure were more likely to sleep recommended number of hours. Media exposure for ≥4 hours was associated with insufficient sleeping hours. Sleeping less than recommended number of hours was associated with more ASD severity.

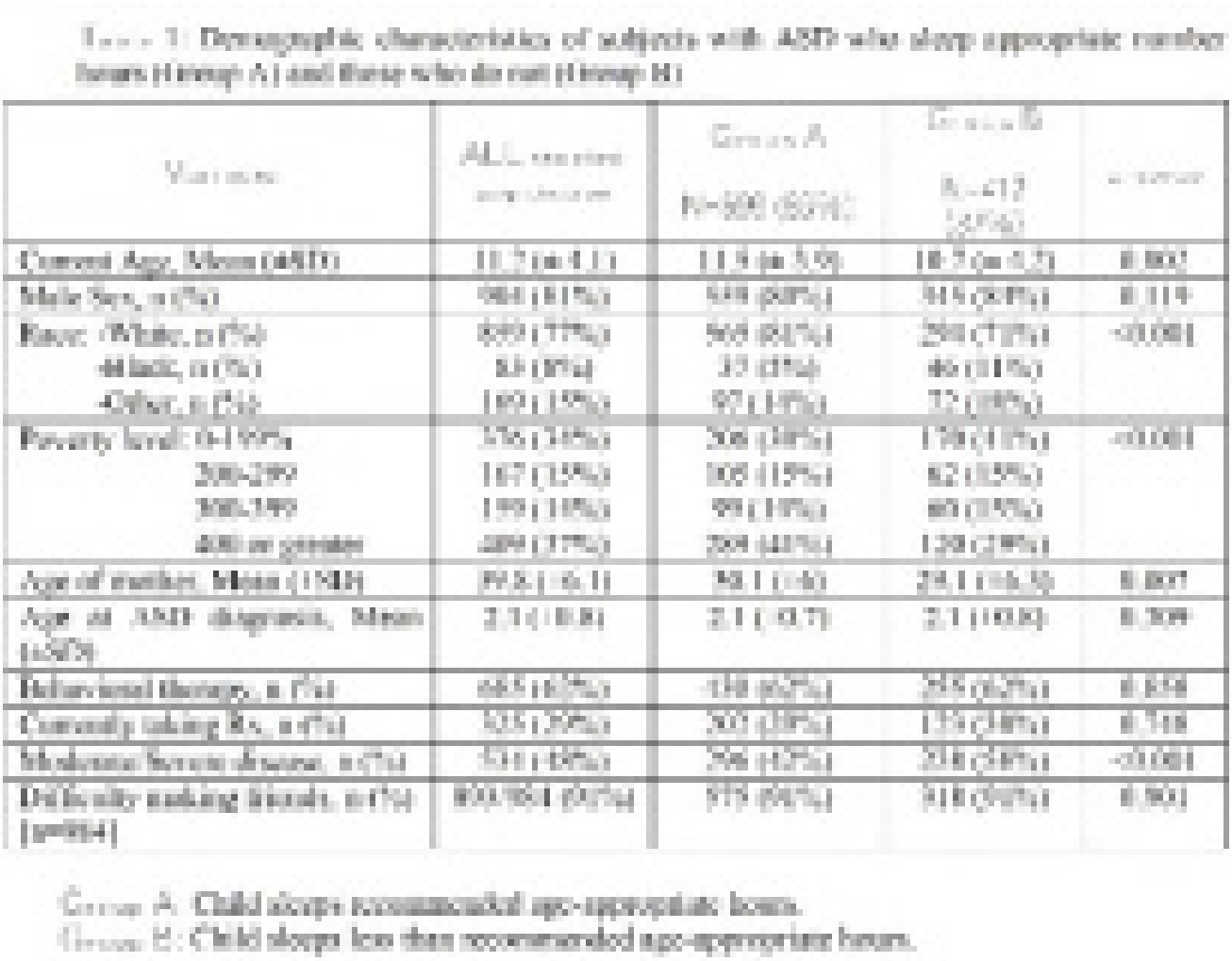


Table 1: Demographic characteristics of subjects with ASD who sleep appropriate number of hours (Group A) and those who do not (Group B)

Variables	ALL (n=1212)	Group A (n=800) (66%)	Group B (n=412) (34%)	p-value
Current Age, Mean (±SD)	11.7 (± 4.1)	11.9 (± 3.9)	10.7 (± 4.2)	0.001
Male Sex, n (%)	984 (81%)	648 (80%)	336 (82%)	0.119
Race: White, n (%)	899 (77%)	568 (81%)	288 (71%)	<0.001
Black, n (%)	85 (8%)	33 (5%)	46 (11%)	
Other, n (%)	169 (15%)	97 (14%)	72 (18%)	
Poverty level: 0-199%	356 (34%)	206 (30%)	150 (41%)	<0.001
200-299	167 (15%)	105 (15%)	62 (17%)	
300-399	199 (18%)	99 (14%)	60 (16%)	
400 or greater	389 (37%)	269 (41%)	120 (26%)	
Age of mother, Mean (±SD)	39.8 (± 6.1)	39.1 (± 6)	41.1 (± 6.3)	0.007
Age at ASD diagnosis, Mean (±SD)	2.1 (± 0.8)	2.1 (± 0.7)	2.1 (± 0.8)	0.309
Behavioral therapy, n (%)	665 (63%)	438 (62%)	265 (63%)	0.858
Currently taking Rx, n (%)	535 (39%)	305 (38%)	174 (38%)	0.718
Moderate/Severe disease, n (%)	531 (48%)	296 (42%)	234 (56%)	<0.001
Difficulty making friends, n (%) [n=984]	808/984 (82%)	519 (80%)	318 (86%)	0.001

Group A: Child sleeps recommended age-appropriate hours.
Group B: Child sleeps less than recommended age-appropriate hours.

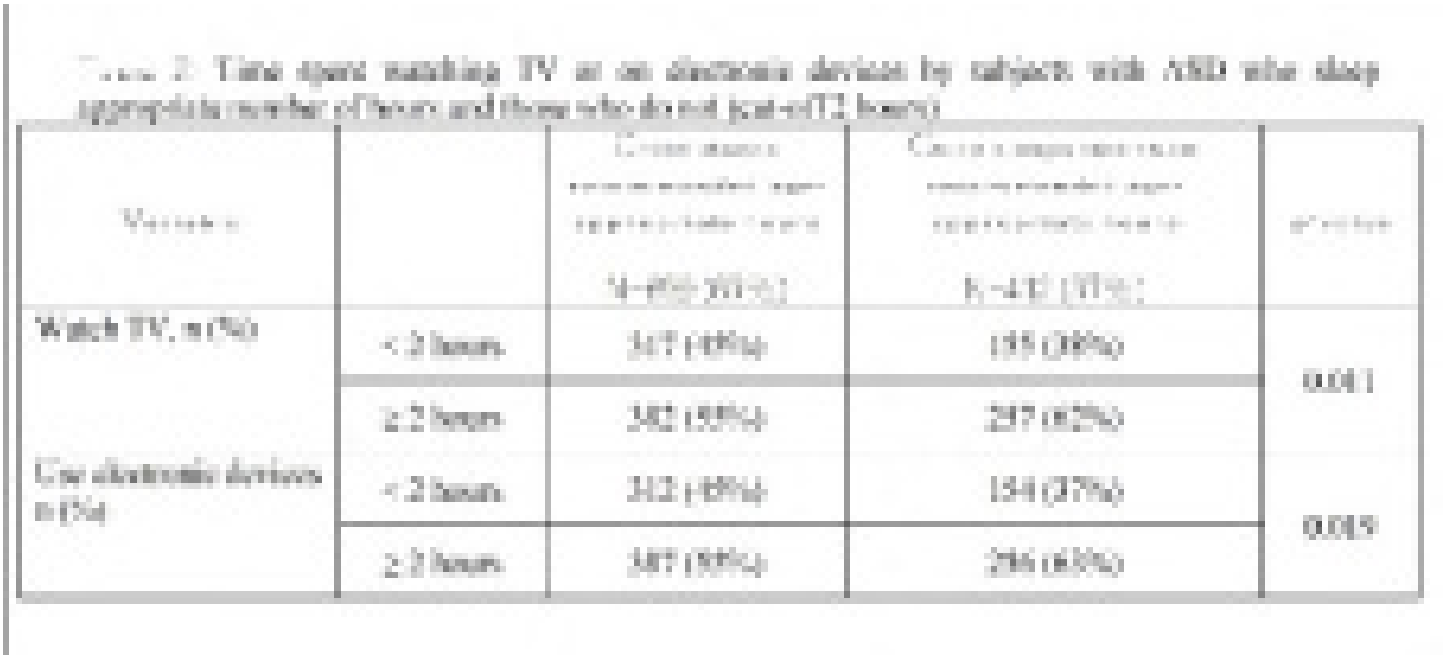


Table 2: Time spent watching TV or using electronic devices by children with ASD who sleep appropriate number of hours and those who do not (cut-off 2 hours)

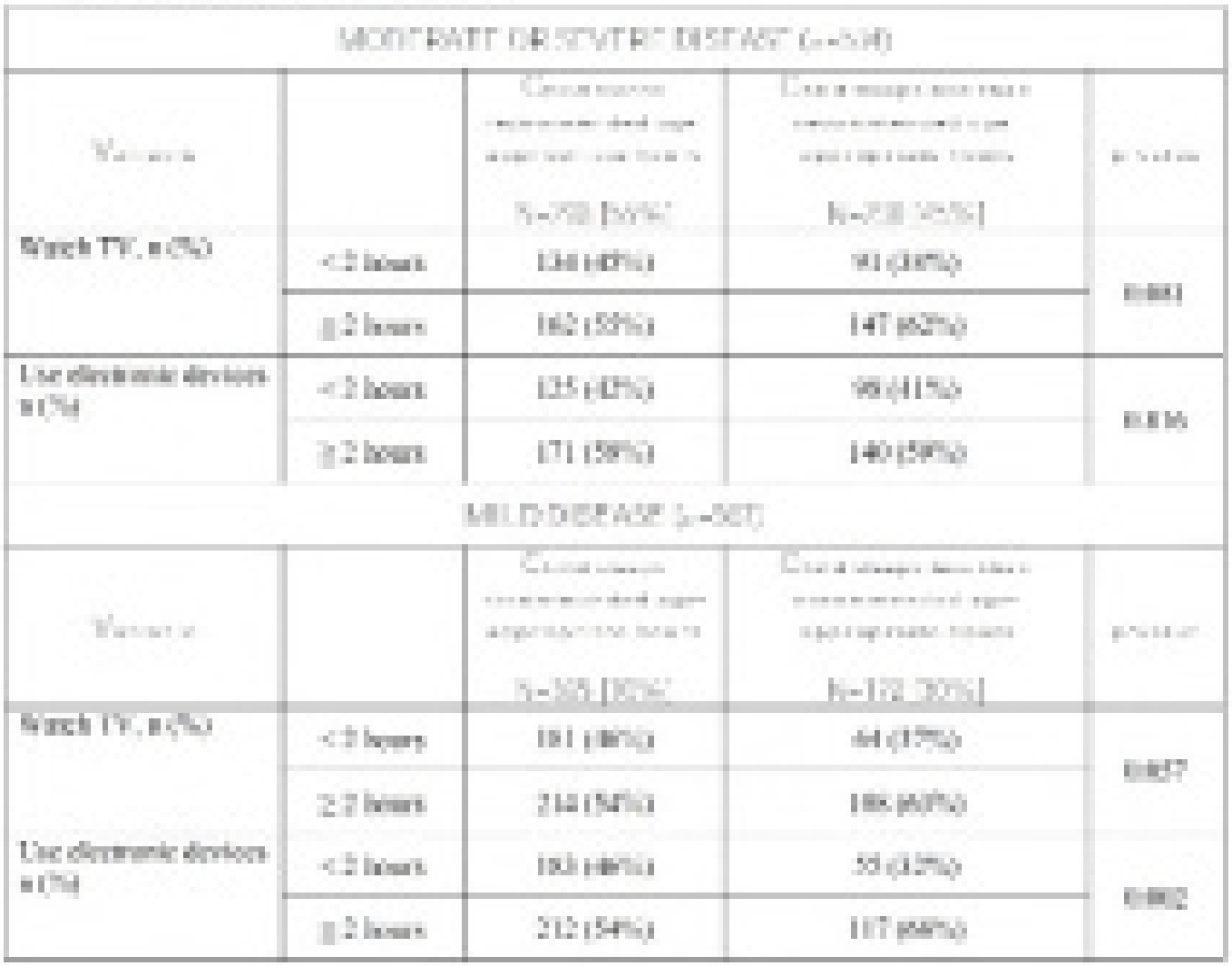
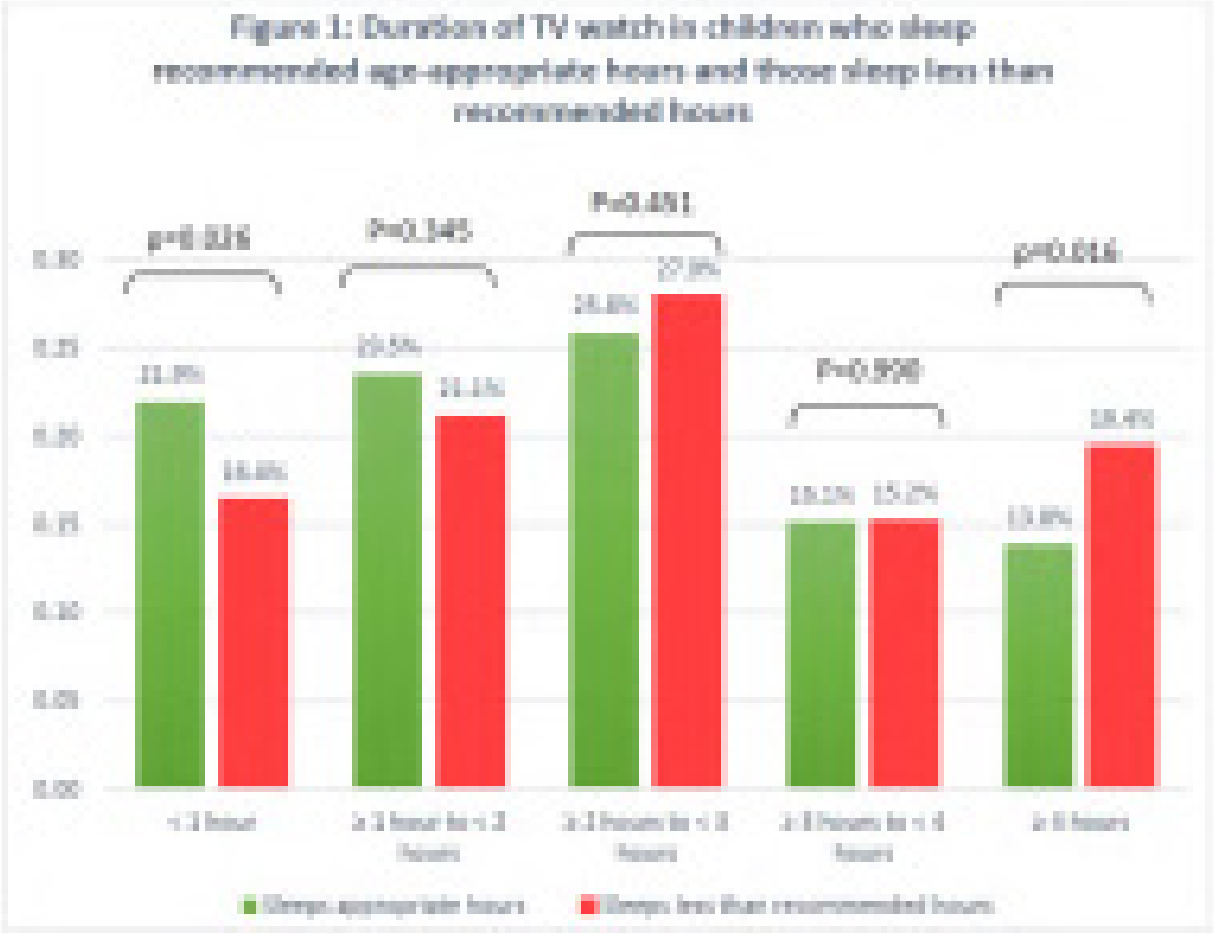
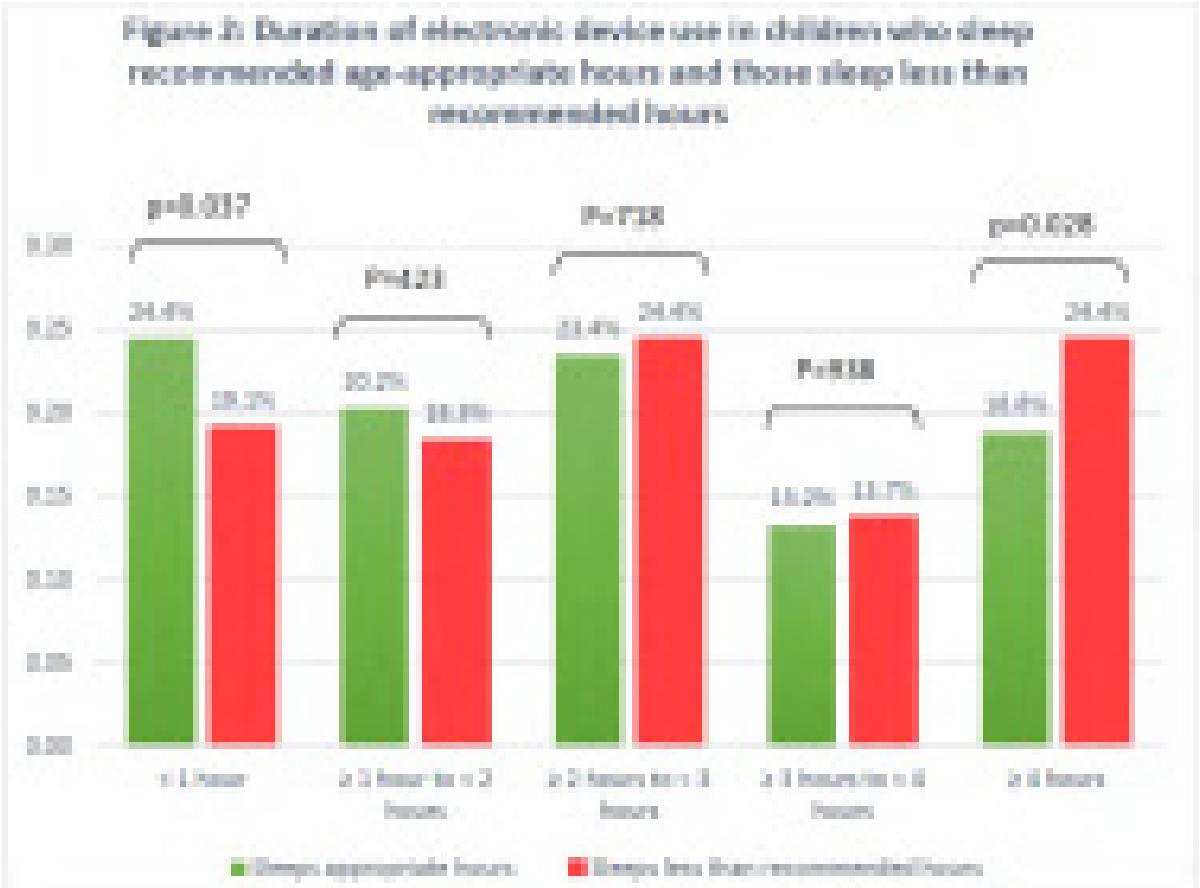


Table 3: Time spent watching TV or using electronic devices (cut-off 2 hours) by children with ASD who sleep appropriate number of hours and those who do not, stratified by disease severity (moderate/severe: n=532, mild: n=567)


p=0.026
P=0.345
P=0.491
P=0.928
p=0.016
11.8%
10.6%
10.5%
11.1%
15.8%
17.8%
10.2%
10.2%
13.8%
18.4%


p=0.017
P=0.21
P=0.718
P=0.18
p=0.028
24.4%
19.2%
20.2%
18.8%
21.4%
24.4%
16.2%
16.7%
18.8%
24.4%

Comparison of hours spent watching TV (Figure 1) or using electronic devices (Figure 2) between children with ASD who sleep appropriate number of hours and those who do not (n=1,111)

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Primary Care Engagement and Acute Care Election

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Background Non-urgent emergency room (ER) use contributes to healthcare system costs and disrupts continuity of care. Factors influencing patient/guardian decision-making in non-urgent settings are poorly understood. By understanding these processes, interventions may be developed to reduce inappropriate ER utilization. A primary care provider (PCP) is a family's medical advisor who guides parent/ guardians in healthcare decisions.

Objective Determine the association of the strength of patient/guardian - PCP relationship and non-urgent ER usage and explore factors associated with non-urgent ER usage.

Design/Methods We recruited 220 parent-child pairs attending an urban hospital-based practice over three months (summer 2018). We administered a survey to collect patient/guardian knowledge of PCP office resources, typical care seeking behavior, and PCP connectedness (PDRQ9, a validated instrument). We performed a 1-year retrospective chart review to evaluate non-urgent visits to the ER. We evaluated the association of PDRQ9 and non-urgent ER usage by Poisson regression.

Results The mean child age was 7.0 ± 5 years. The mean PDRQ9 score was 39.8 ± 7.3. 34.4% of children had at least one non-urgent ER visit. Non-urgent ER visits occurred in 16% of children during clinic hours and in 39% outside of clinic hours. PDRQ9 score was not associated with non-urgent ER use (p=0.46). Lower child age (p<0.001) and decreased time care-giver has brought their child to the PCP practice (p<0.001) were both associated with increased non-urgent ER use. 36.4% reported that their child's PCP's office is where they usually take their child when they are sick. Knowledge of office resources was limited: 19.5% of participants were unaware of walk-in visits, 21.4% for same day sick visits, and 48.6% for night time on-call hours. When prompted with hypothetical acute, non-urgent medical scenarios, in 4/5 scenarios most participants reported that they would take their children to the ER over the choices of seeing or call their PCP.

Conclusion(s) We did not find an association of PCP connectedness (measured by the PDRQ9) with non-urgent ER usage. Many patients/guardians were not aware of the practice's resources. Many families selected ER use as first choice for acute, non-urgent medical scenarios. Additional work is needed to determine interventions to reduce non-urgent ER use. These interventions should target populations with higher levels of non-urgent ER usage, such as parent/guardians of younger children or those with shorter relationships with their PCP practice.

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Quantifying Differences in Blood Pressure by Using Different Blood Pressure Cuff Sizes in Children

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Background Prevalence of hypertension in children has increased over the past several decades. It is crucial that when determining blood pressure (BP) an accurate measurement is obtained. It is known that BP measurements are influenced by cuff size. Quantifying differences in BP between cuff sizes have not been described in children.

Objective To quantify the differences in BP in children when using different cuff sizes.

Design/Methods Prospective case control study of healthy children 4-12 years of age visiting Flushing Hospital Medical Center Ambulatory Care Center from January-November 2018. After obtaining consent, subjects were asked to sit quietly for ten minutes before BP determination. BP was measured by an automated BP device with appropriate cuff as defined by a bladder width 40% of the right arm circumference, followed by BP measurement utilizing one cuff size bigger and one cuff size smaller. All BP measurements were done by a single individual. Data collected include age, gender, ethnicity, body mass index (BMI), arm circumference and BP values obtained with different size cuffs. Patients were divided into four BMI groups (B1: underweight, B2: normal, B3: overweight and B4: obese) and any group with<5 subjects was excluded from the analysis. Data were analyzed using GraphPad Prism 6, Microsoft Excel and ANOVA, p<0.05 was considered significant.

Results A sample of 139 subjects aged 4-12 years consented to participate in the study. The mean age was 7.6±2.5 years, 53% were males and 91% Hispanics. There were 63 (45%) in B1, 58 (42%) in B2, 16 (16%) in B3 and 2 (1%) in B4. The average BP in B1, B2, B3, B4 was 102/64, 106/66, 112/72 and 116/72. There were no patients with hypertension when measured with the appropriate size cuff. The systolic BP was found to be 5 mmHg lower with the larger cuff and 5 mmHg higher with the smaller cuff. There was no statistically significant difference between changes in systolic BP for all ages (p=0.65) and BMI groups (p=0.06). There was no statistically significant difference found in diastolic BP among the different cuff sizes.

Conclusion(s) Systolic BP in children aged 4-12 years was higher by 5 mmHg when measured with a smaller cuff and was lowered by 5 mmHg when measured with a larger cuff. Diastolic BP was not statistically significant for the different cuff sizes.

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Altered Gene Expression in Newborn Rat Lungs Exposed to Intra-Amniotic LPS

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Background Chorioamnionitis (CA) is an infection of the placenta and fetal membranes associated with long-term consequences including an increased risk for allergic disorders, asthma, developmental delay, and cerebral palsy. The exact mechanism of these associations is unclear. Exposure to perinatal infection and inflammation may incite differential gene expression resulting in modulation of the immune and nervous systems. A rat model of CA (intra-amniotic LPS administration) was used to evaluate differential gene expression in lungs.
Objective To evaluate differential gene expression and key pathways involved with exposure to intra-amniotic LPS in newborn rat lungs.
Design/Methods 1μg of LPS (CA) or normal saline (Control) was injected into the amniotic sac of timed pregnant Sprague-Dawley rats on gestational day 20 (E20). The pups were born on E22 and then sacrificed on day of life 7. Each group included 4 pups. Lung tissue was collected, and total RNA was isolated using Qiagen miRNeasy mini kit. Genome-wide microarray screening was performed using Affymetrix Rat Clariom S Gene chip with WT-plus kit. Analysis for the two groups was performed using Transcriptome Array Console and GeneSpring softwares.
Results A total of 523 genes were differentially expressed, 118 upregulated and 405 downregulated, in the LPS group compared to the control (fold change $\geq$ 1.5, p-value $\leq$ 0.05). Key differentially expressed genes are illustrated in Table 1. Two of the key genes found in this study were also altered in human cord blood exposed to CA in our prior studies, AGR2 and ABCC8. Ingenuity Pathway Analysis (IPA) software identified 379 canonical pathways. Top pathways included neuroinflammation signaling, antigen presentation, and B cell development. IPA identified 25 networks, key networks of inflammatory response and immunological disease are shown in Figure 1. IPA identified 70 diseases and functions that were differentially expressed including immune response and disease, neurological development and disease, and respiratory development and disease. Transcriptome Array Console software identified 105 WikiPathways. Key pathways included IL-2, 3, 4, 5, TNF-α, and NF-kB signaling in addition to P53 and apoptosis pathways.
Conclusion(s) Exposure to intra-amniotic LPS induces differential gene expression in key pathways involved in immune regulation and inflammation in newborn rat lungs. Differential gene expression may be a mechanism for the increased risk of BPD, asthma and allergic disorders after exposure to chorioamnionitis.

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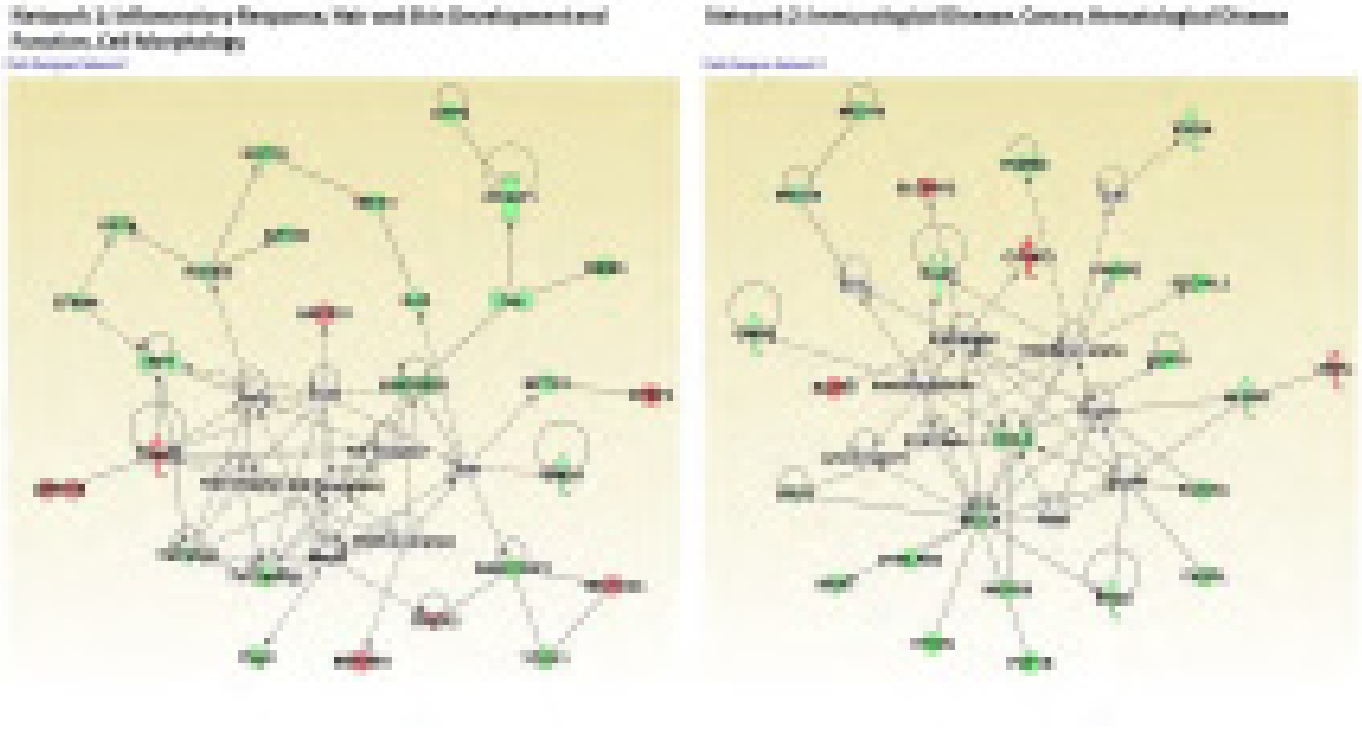
Figure 1. Ingenuity Pathway Analysis Networks



Abstract: 184
Can Neonatal Monocyte Count Predict Chorioamnionitis ?

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Background It is well established that the presence of histological chorioamnionitis (HCA) significantly increases neonatal morbidity/mortality. It was observed that infants with HCA had significantly higher serum levels of lysozyme, which is released during monocyte and macrophage activation. However, limited studies examined the association between HCA and neonatal absolute monocyte count (AMC).
Objective The aim of this study is to examine the association between AMC in the first 24 hours of life and chorioamnionitis proven by histopathological examination of the placenta.
Design/Methods Retrospective case control study of all infants admitted to neonatal intensive care unit (NICU) at Brookdale Hospital, New York, with gestational age (GA) ≤36 weeks, from Jan 2014 to May 2018. Placentas of infants were reviewed by single blinded pathologist for evidence of HCA. HCA was considered in the presence of any of the following: 1) At least ten polymorphonuclear leukocytes (PMNL) in the chorion and amnion, 2) Funisitis (defined as the presence of PMNL in Wharton's jelly or umbilical vessel walls), and 3) Vasculitis (if PMNL were found in the chorionic or umbilical blood vessel wall).

Comparison of laboratory data was done between HCA and non-HCA groups of infants and tested for significance by using Mann Whitney, or T test as applicable.
Results Demographic data of the study population are shown in table 1.

Among 1,795 infants admitted during the study period, 388 (22%) had GA ≤ 36 weeks (mean GA 32.3 ± 3.4). Of 388 eligible infants, 153 (39%) had HCA.

Comparison of laboratory parameters between HCA and non-HCA group is illustrated in table 2. AMC at 24 hours of life was significantly higher in HCA group (1.8±0.55) compared to non-HCA group (1.3±0.35), p<0.001. HCA group had significantly higher WBC (p=0.001) and CRP (p=0.007) at 24 hours of life.
In infants ≤ 32 weeks of age (n=126), 70 of them (56%) had HCA. AMC at birth and at 24 hours of life was significantly higher in HCA group (1.2±0.6 and 1.9±0.6) compared to non-HCA group (0.9±0.4 and 1.1±0.35) respectively, p<0.037. (Table 3)
Conclusion(s) Our study suggests that preterm infants with higher 24-hour values of AMC, WBC and CRP may have increased chance of chorioamnionitis proven by placental pathology. These laboratory parameters can support clinical assessment and management of infants with suspected chorioamnionitis until pathology report is available.

Table 1: Demographic:

Parameter	
Gestational age, Mean (±SD)	[illegible]
Birth weight in grams, Mean (±SD)	[illegible]
Sex, n (%)	Male: 324 (50%)
	Female: 184 (50%)
Race, n (%)	Black: 310 (80%)
	Hispanic: 27 (7%)
	White or Caucasian: 8 (2%)
	Other: 14 (9%)

Table 1

Table 2: Comparison of Laboratory Parameters Between Chorioamnionitis and Non-Chorioamnionitis Groups, in Neonates ≤ 36 Weeks (n=388)

Laboratory finding	Chorioamnionitis (n=153, 39%)	Non- chorioamnionitis (n = 235, 61%)	P value
WBC-1, Mean (±SD) *	11.9 (±5.3)	11.6 (±4.7)	0.939
WBC-2, Mean (±SD) **	16.3 (±8.9)	13.1 (±5.4)	0.001
Neutrophils-1, Mean (±SD) *	9.9 (±4.0)	9.1 (±3.2)	0.418
Neutrophils-2, Mean (±SD) **	8.6 (±5.3)	7.4 (±4.5)	0.334
Monocyte 1, Mean (±SD) *	1.2 (±0.5)	1.0 (±0.2)	0.436
Monocyte 2, Mean (±SD) **	1.8 (±0.9)	1.3 (±0.8)	<0.001
CRP 1, Median (IQR) *	0.8 (0.5-1.2)	0.7 (0.5-1.0)	0.057
CRP 2, Median (IQR) **	1.2 (0.7-1.8)	0.9 (0.6-1.3)	0.007

Abbreviations: SD= standard deviation, IQR=interquartile ratio

1* = at birth

2** = at 24 hours of life

Table 2

Table 3: Comparison of Laboratory Parameters Between Chorioamnionitis and Non-Chorioamnionitis Group, In Neonates ≤ 32 Weeks (n=120)

Laboratory finding	Chorioamnionitis (n=70, 56%)	Non- chorioamnionitis (n = 56, 44%)	P value
WBC-1, Mean (±SD) *	13.7 (±3.8)	9.1 (±3.3)	0.006
WBC-2, Mean (±SD) **	17.5 (±5.5)	10.6 (±4.7)	<0.001
Neutrophils-1, Mean (±SD) *	5.1 (±2.5)	3.4 (±1.8)	0.012
Neutrophils-2, Mean (±SD) **	9.7 (±4.1)	5.7 (±2.3)	0.001
Monocyte 1, Mean (±SD) *	1.2 (±0.6)	0.9 (±0.4)	0.036
Monocyte 2, Mean (±SD) **	1.9 (±0.8)	1.1 (±0.8)	<0.001
CRP 1, Mean (±SD) *	0.8 (0.5-1.1)	0.6 (0.5-0.9)	0.135
CRP 2, Mean (±SD) **	1.2 (0.5-2.4)	1.1 (0.63-1.8)	0.369

1* = at birth

2** = at 24 hours of life

Table 3

Abstract: 185

ADDITION OF PENTOXIFYLLINE TO ANTIBIOTICS INHIBITS TNF PRODUCTION IN BLOOD AND LUNG AND ENHANCES IL-10 IN BLOOD AND LIVER OF NEONATAL MICE WITH ESCHERICHIA COLI SEPSIS

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Background Neonatal sepsis is associated with an inflammatory response that contributes to multiple adverse outcomes including organ injury. Pentoxifylline (PTX), a phosphodiesterase inhibitor which suppresses pro-inflammatory cytokine production, is a candidate adjunctive therapy for newborn sepsis that has demonstrated promise in small clinical studies. However, the anti-inflammatory efficacy of PTX in peripheral organs and the effect of timing of PTX treatment in relation to sepsis remain unknown.

Objective We aimed to compare the effects of early vs delayed PTX and/or gentamicin (GENT) on pro- and anti-inflammatory cytokines in blood and organs (lung, liver) of newborn mice intravenously infected with *E. coli*.

Design/Methods Newborn C57BL/6J mice (<24H old) were injected via the external jugular route with bioluminescent *E. coli* K1 (strain A192PP-lux; Witcomb et al., *Infect Immun* 2015;83:4528) 10^5 colony forming units (CFUs)/g body weight. Adequacy of intravenous injections was validated using *in vivo* imaging and Evans blue dye, wherein successful injections were associated with increased recovery of *E. coli* CFUs and magnitude of TNF production in blood and tissues. Pups were treated with GENT, PTX, (GENT+PTX) or saline control 1.5H (early) or 4H (delayed) after sepsis initiation, and euthanized after an additional 4H. CFUs and cytokines were measured from blood and homogenized tissue. Comparisons employed t-tests.
Results *E. coli* induced high (>10^3 pg TNF/ml) concentrations of pro-inflammatory cytokines in blood and tissues of infected mice. As expected, GENT significantly decreased CFUs in blood and tissues. Early (GENT+PTX) but not GENT or PTX alone inhibited TNF production in blood and lung, whereas early GENT inhibited IL-6 in blood, lung and liver and IL-1β in lung tissue. In contrast, delayed PTX compared to saline control enhanced production of IL-10 in blood, and (GENT+PTX) compared to GENT alone enhanced IL-10 in blood and liver. Pro-inflammatory cytokines were no longer inhibited by delayed GENT and/or PTX. Importantly, addition of PTX did not increase CFUs in blood and tissues.
Conclusion(s) Early PTX treatment inhibited TNF in blood and organs in murine neonatal *E. coli* sepsis, while delayed PTX enhanced IL-10 production. This shift towards an anti-inflammatory response was achieved without concomitant increase of bacterial burden, suggesting that adjunctive PTX to antibiotics for newborn sepsis might be safe and beneficial.

Abstract: 186
Cord Blood Immune Biomarkers in Preterm and Term Neonates with "Culture Negative Sepsis"
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Background Culture positive early onset sepsis (EOS) rates have declined. However, despite having a negative blood culture, a subset of neonates continues receiving antibiotic treatment, based on clinical assessment of sickness (culture negative sepsis).
Objective The objective of this study was to determine whether the immune signatures in cord blood of neonates who received culture negative sepsis treatment with 7 day course of antibiotics were different than those neonates whose antibiotics were discontinued after 48 hours with clinical stability.
Design/Methods Cord blood was kept at -80 °C until use. Maternal and neonatal data was extracted from medical records. Cord blood samples were matched by GA (Preterm [P] and Term [T]) and by duration of antibiotic treatment (2 days [2d] or for culture negative sepsis, 7 days [7d]). P-2d, P-7d, T-7d and T-2d with maternal fever (T-2d-f), were compared to control group; T-2d. Total RNA was extracted and qPCR analysis was performed for immune markers including chemokine ligand-3 (CCL3), chemokine receptor type-5 (CCR5), B-cell lymphoma like protein (BCL2L1), transferrin receptor-1 (TFRC).
Results 6 Preterm (P) and 12 Term (T) cord blood samples were matched by GA and by duration of antibiotic treatment (n=3-4 in each group). Of these, 68% were term (37-40 weeks) and 31% were preterm (31-35 weeks). In our limited sample size, we detected distinct immune signatures in P-2d group with upregulation of myeloid marker CCL3 and CCR5 and anti-apoptotic BCL2L1, compared to T-2d. In addition, T-2d-f group had a significant increase in BCL2L1. Importantly, PT-7d and T-7d groups had significantly increased TFRC compared to T-2d. None of the preterm placentas displayed histological chorioamnionitis. CRP, I/T ratios, monocytes and NRBCs were similar between P and T peripheral blood.
Conclusion(s) We showed that cord blood of preterm neonates in whom sepsis was ruled out (P-2d) still displayed inflammatory immune signatures, CCL3, a marker for M1 inflammatory macrophages and CCR5 its binding chemokine. However, cord blood of preterm neonates who received 7 day treatment for culture negative sepsis displayed a significant increase in TFRC, a marker abundant in alternatively activated M2 macrophages, similar to T-7d. Shift of M1 to M2 macrophages and upregulation of TFRC in the P-7d group who were treated for suspected clinical sepsis may suggest an attempt to resolve inflammation. We suggest that TFRC can be used as a novel biomarker to detect immune cell reprogramming in preterm newborns.

Abstract: 187
Financial impact of antibiotic stewardship for management of early onset neonatal sepsis (EONS) in a level II NICU
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Background Most level II NICUs has previously relied upon admissions for sepsis evaluation of infants exposed to suspected Triple-I (intrauterine inflammation, infection) for significant portion of their census, while concurrently providing emergency stabilization for critically ill infants. Recent clinical studies and COFN & ACOG have recommended a screening tool to minimize NICU admissions of these infants. The revenue reduction from these 'lost' admissions may impact the ability of

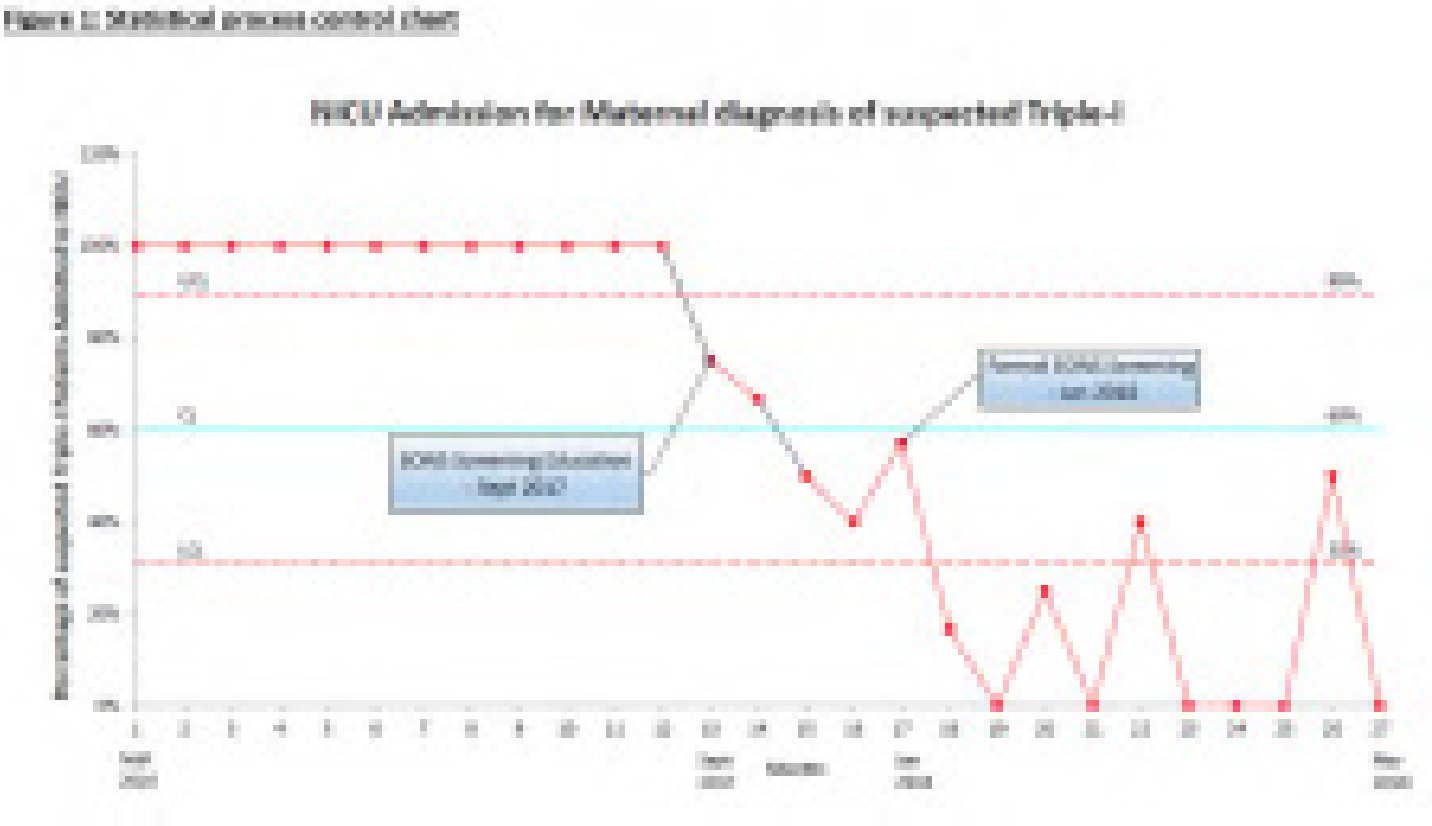
small NICUs from staffing for critical deliveries.

Objective To determine the financial impact of a quality improvement (QI) project to optimize antibiotic utilization and NICU admission secondary to suspected Triple-I

Design/Methods A QI project was conducted at a level II NICU for infants born at ≥34 weeks of GA with suspected Triple-I. CDC guideline for sepsis evaluation was followed until Aug 2017 and retrospective data was collected from Sept 2016 to Aug 2017 (phase I). Initial education to adopt the new EONS guidelines provided from Sept-Dec 2017 (transitional phase). A new formal EONS guideline was implemented in Jan 2018 with data collection from Jan-Nov 2018 (phase II). Monthly comparison of data was described on a statistical process control chart and financial data was estimated based on the standard charges for our NICU.

Results During phase I, 100% of the infants (28/28) born with suspected Triple-I were admitted to NICU and given antibiotics irrespective of their clinical status, 58% received antibiotics (11/19) during transitional phase and only 23% (9/39) in phase II. The number of CBCs decreased from 1.54 to 0.33, and blood cultures from 1 to 0.46 per infant born with suspected Triple- I. Historically, sepsis evaluation for suspected Triple-I comprised 24.8% of NICU admissions for infants ≥34 weeks GA, which decreased to 10.8% after implementation of new EONS guidelines. None of these infants developed significant clinical illness or had a culture proven sepsis. A total of 38 NICU admissions were avoided during transitional phase & phase II, which significantly reduced the overall charges by >$350,000 for this small NICU.

Conclusion(s) Implementation of new EONS guidelines significantly reduced the number of lab tests, antibiotic utilization and NICU admissions. As clinical advancement in medical practice reduces patient census in level II NICUs, a change in revenue model will be necessary to sustain these NICUs staffing so they can respond appropriately to acute delivery emergencies should they occur.



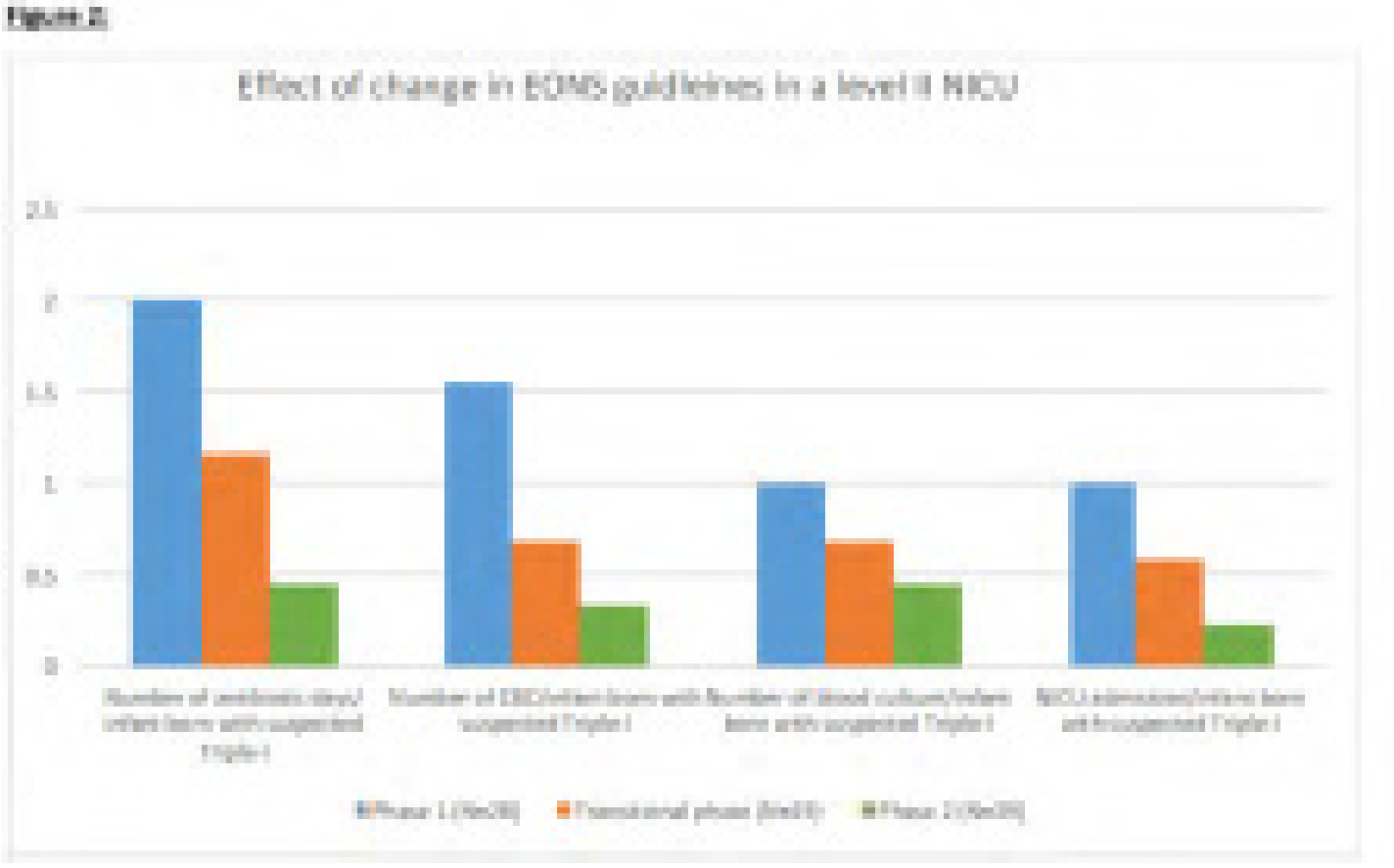
Statistical Process Control Chart

Table 1: EONS management for infants born with maternal chorioamnionitis or suspected Triple-I

	Phase I	Transitional phase	Phase II
Number of infants born with suspected Triple-I	(N=28)	(N=17)	(N=17)
Number of infants admitted to NICU for sepsis evaluation	28 (100%)	12 (58%)	9 (53%)*
Total number of antibiotic days	56	22	18
Number of antibiotic days/infant born with suspected Triple-I	2	1.83	0.45*
Total number of cbc performed	42	12	12
Number of CBC/infant born with suspected Triple-I	1.50	0.60	0.35*
Total number of Blood Culture performed	28	15	18
Number of blood culture/infant born with suspected Triple-I	1	0.60	0.45*
Total number of NICU admission (all weights)	210	60	30
% of NICU admission for c/b sepsis (<2K) vs number of GA	(<28w)	20/35	1/18*

*p value <0.05 comparing phase I to phase II

Comparison of EONS management data before and after implementation of new guidelines



Effect of EONS management guidelines implementation in level II NICU

Abstract: 188

Is a Modified Early-Onset Sepsis Risk Calculator an Efficient Tool for the Management of Neonates Born to Mothers with Chorioamnionitis?

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Background The COFN recently published new recommendations for a framework of evidence-based approaches to sepsis risk assessment, in which infants can be stratified by the level of risk for early-onset sepsis (EOS). The Kaiser EOS calculator is an example of a multivariate approach for risk assessment and it is being increasingly used in an attempt to limit antibiotic use in these neonates. However, the calculator is designed to estimate the risk of EOS in all neonates ≥34 weeks gestation by using a lower baseline incidence for EOS. The risk of EOS is, however, many folds higher in the subsets of neonates exposed to chorioamnionitis. We have previously reported that the use of the Kaiser Permanente EOS calculator in this population is likely to miss infants with EOS. Recently, the EOS calculator was modified to estimate the risk of sepsis using a higher baseline sepsis incidence.

Objective Our objective was to validate the recently modified calculator with a higher baseline incidence in chorioamnionitis exposed neonates.

Design/Methods This is a retrospective study of chorioamnionitis exposed neonates born ≥35 weeks gestation with a known EOS incidence of 4.3/1000 live births. The risk and management categories were calculated using the calculator with an incidence of 4/1000 live births. The results were compared with a previous analysis of the same cohort that used an EOS incidence of 0.5/1000 live births.

Results The EOS calculator recommends at least a blood culture in 781/818 (95.5%) and empiric antibiotics in 499/818 (61%) of chorioamnionitis exposed neonates when using an EOS incidence of 4/1000 live births. This captures 5/5 neonates (100%) with EOS. When using a baseline EOS incidence of 0.5/1000 live births, the calculator recommends at least a blood culture in only 265/818 (32.4%) and empiric antibiotics in only 192/818 (23.5%) of neonates, but fails to recommend empiric antibiotics in 2/5 (40%) of neonates with EOS.

Conclusion(s) When using an EOS risk of 4/1000 live briths, the calculator recommends empiric antibiotics in all neonates with EOS. However, this change also leads to a three-fold increase in the use of empiric antibiotics and an evaluation with blood culture in almost all infants exposed to chorioamnionitis. The modified EOS risk calculator may not efficiently reduce the evaluation for sepsis in a subset of neonates exposed to chorioamnionitis.

Comparison of management recommendations using two baseline EOS incidences (n = 818)

	Baseline EOS Incidence (0.5/1000)	Baseline EOS Incidence (4/1000)	p value
Risk of EOS at birth (per 1000) (Med IQR)	0.87 (0.51-1.56)	7.16 (4.23-12.73)	<0.0001
Risk of EOS after clinical examination (per 1000) (Med IQR)	0.51 (0.25-2.42)	4.19 (2.07-20.31)	<0.0001
Blood culture and empiric antibiotics (%)	192 (23.5)	499 (61)	0.0001
Blood culture and vital signs every 4 hours (%)	73 (8.9)	282 (34.5)	0.0001
Blood culture ± empiric antibiotics (%)	265 (32.4)	781 (95.5)	0.0001
Strongly consider antibiotics (%)	0 (0)	0 (0)	
No blood culture, no antibiotics, vital signs every 4 hours (%)	202 (24.7)	36 (4.4)	0.0001
No blood culture, no antibiotics, no vital signs every 4 hours (%)	351 (42.9)	1 (0.001)	0.0001
Recommend blood culture ± empiric antibiotics in infants with culture positive EOS	3/5 (60)	5/5 (100)	0.44

Abstract: 189

Circadian Control of Influenza A Infection in Adults Exposed to Neonatal Hyperoxia

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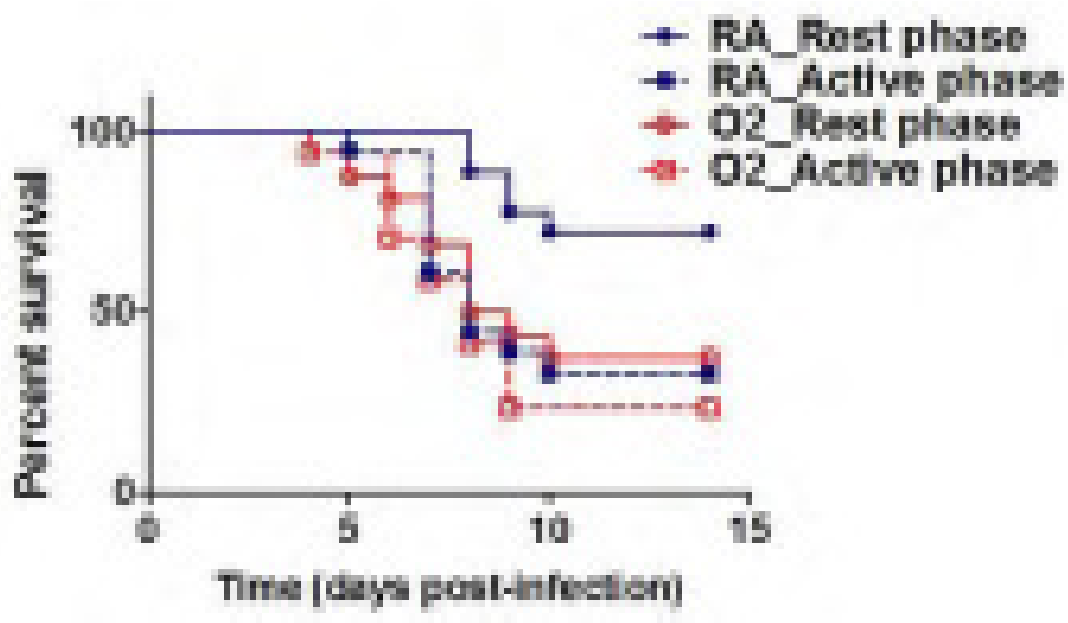
Background Hyperoxia is a major risk factor for prematurity related lung disease or bronchopulmonary dysplasia (BPD). Children with BPD continue to be more susceptible to respiratory infections like influenza, much later in life. The mechanisms underlying this are not well understood. We have previously shown that circadian rhythms determine the severity from Influenza A virus (IAV) infection in mice. Circadian rhythms are oscillations in various physiological processes with a 24 hour period that help us adapt to the environment. Mice infected at the beginning of their rest phase (6am) had better survival and less weight loss than those infected at the beginning of their active phase (6pm). We hypothesized that development of circadian rhythms is disrupted by neonatal hyperoxia and this results in increased severity and loss of temporal gating of influenza infection in adulthood.

Objective We aimed to determine if neonatal hyperoxia exposure in mice disrupts the circadian-regulated time of day difference in outcomes and inflammation in adults exposed to IAV.

Design/Methods Towards this aim, C57Bl6 pups were exposed to either >90% oxygen postnatal days 0-5 or room air (RA). Post exposure, all pups were recovered in room air; at 8-10wks of age mice from both groups were infected with IAV (35 PFU of PR8) at 6am or 6pm. Lung, spleen, blood serum, and bronchoalveolar lavage (BAL) were harvested at days 1, 4, and 8 post-infection (p.i).

Results We found that unlike the RA group, those exposed to hyperoxia as neonates not only had no time of day difference in outcomes, but also that higher severity comparable to the 6pm group (Figure 1). Further this effect was independent of the rate of viral replication, instead, this was associated with a hyper-inflammatory state as evidenced by increased inflammatory monocytes in the hyperoxia exposed groups.

Conclusion(s) We conclude that circadian rhythms may prove to be yet another avenue through which early life exposure to hyperoxia continues to lead to worse inflammation later in life. Targeting these novel pathways may result in new therapeutic candidates.



Abstract: 190

Resuscitation with an intact cord- Are Chest Compressions Effective?

Jayasree Nair[1], Sylvia Gugino[1], Carmon Koenigsknecht[1], Justin Helman[1], Praveen Chandrasekharan[1], Munmun Rawat[1], Deepika Sankaran[1], Vikash Agrawal[1], Satyan Lakshminrusimha[2]

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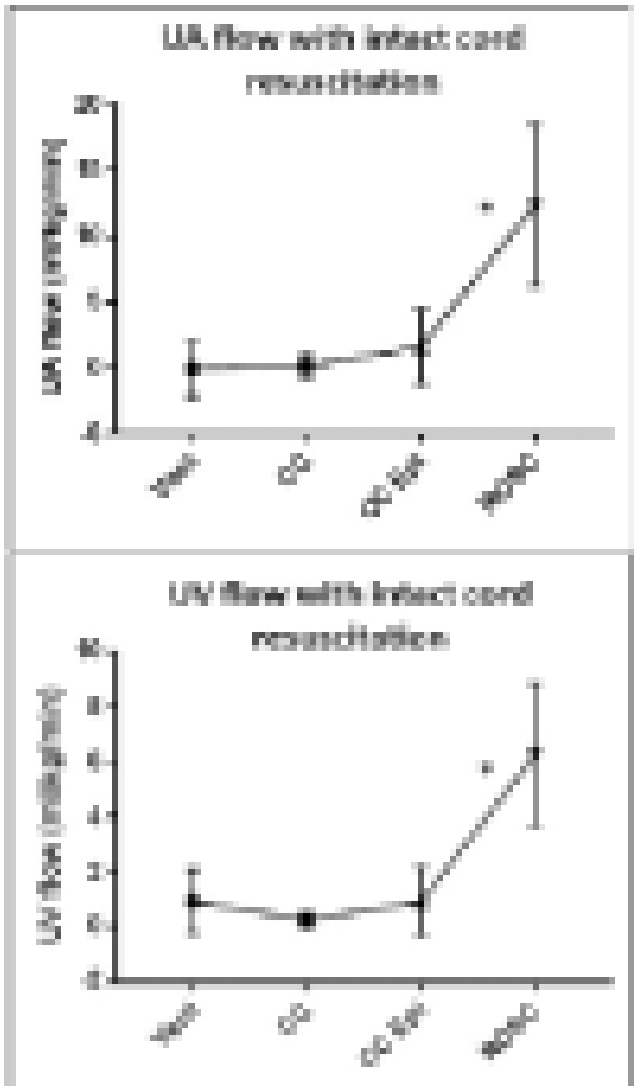
Background Resuscitation with positive pressure ventilation (PPV) with an intact cord results in improved hemodynamic transition after return of spontaneous circulation (ROSC) in near-term lambs with asphyxia without cardiac arrest (Polglase et al. Arch Dis 2017). In our prior studies in asystolic lambs, delayed cord clamping (DCC) increased diastolic and mean blood pressures (BP) following ROSC (Davidson et al PAS2017). A clinical trial evaluating DCC in neonates requiring resuscitation is currently enrolling patients. However, effectiveness of chest compressions (CC) with an intact cord in a model of asphyxial arrest is not known.

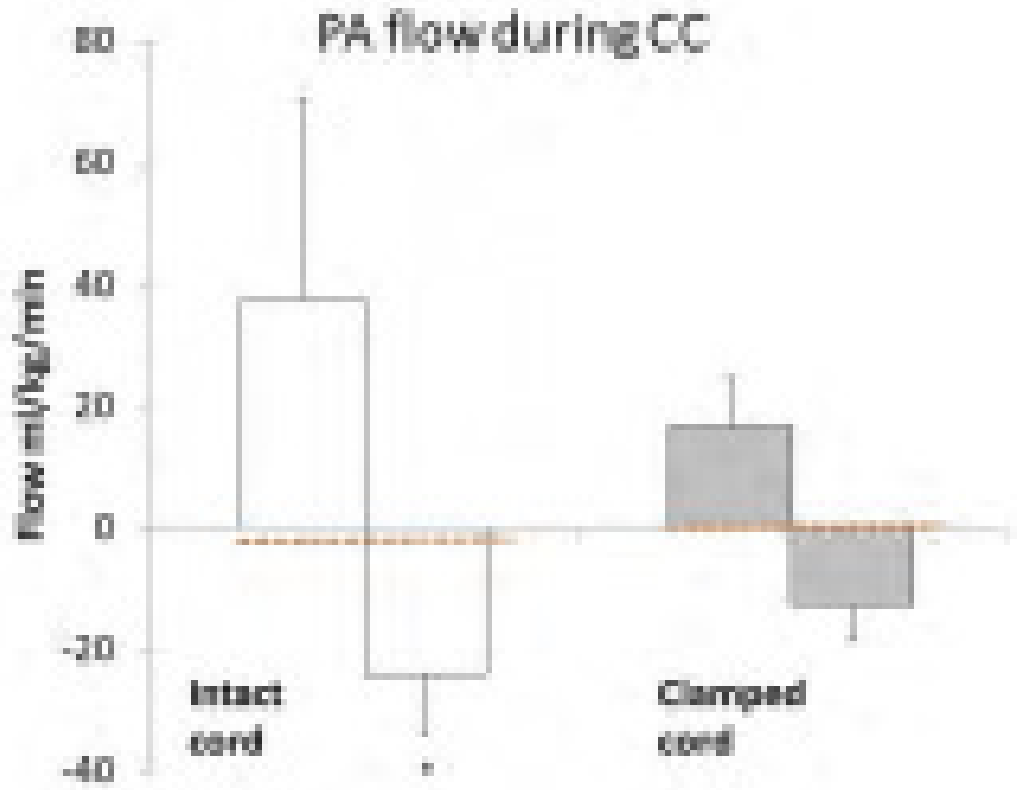
Objective To compare systemic and pulmonary hemodynamics during PPV and CC after asphyxial cardiac arrest with an intact umbilical cord (Intact cord) vs standard cord clamping (clamped cord)

Design/Methods 9 near-term lambs at 141d gestation were partially exteriorized and instrumented in utero with right carotid and jugular venous lines and left carotid (CA), left pulmonary (PA) and ductal flow probes. After a period of stability, cardiac arrest was induced by umbilical cord occlusion. Lambs were randomized into intact cord (n=5: cord clamped after 5min) and clamped cord (n=4: cord clamped within 30 sec). After 2 min of asystole, resuscitation was initiated according to NRP guidelines. Hemodynamic parameters were continuously collected and analyzed between the 2 groups from delivery to ROSC.

Results Baseline characteristics of lambs in both the groups were similar (Table 1). Umbilical flows in the intact cord group remained low during PPV and CC, but rose significantly after ROSC (Fig 1). Systemic BP (systolic and diastolic) and CA flow achieved during PPV, chest compressions and immediately after ROSC were not decreased by resuscitation with an intact cord. Maximum and minimum PA flows were higher with an intact cord during CC compared to clamped cord (Fig 2). Following ROSC, PA flow remained higher in lambs with intact cord.

Conclusion(s) In resuscitation with and intact cord, the low-resistance placental circuit is part of the circulation. In spite of the presence of this low resistance circuit, systemic BP and CA flow were not lower in this group compared to those with a clamped cord. However, resuscitation with an intact cord may enhance antegrade and retrograde pulmonary blood flow. Effective umbilical flows during resuscitation with an intact cord are only noted after ROSC suggesting a longer 5 min period of DCC may be required to provide benefits of placental transfusion in asphyxial arrest.


UA flow with intact cord resuscitation
UA flow (ml/kg/min)
UV flow with intact cord resuscitation
UV flow (ml/kg/min)



Baseline Characteristics

	Intact cord (n=5)	Clamped cord (n=4)
Weight (kg)	4.05 ± 0.8	3.8 ± 0.8
Multiples (Twin/Triplet)	3/5 (60%)	3/4 (75%)
Systolic BP (mmHg)	56 ± 4	62 ± 8
Carotid Mean Flow(ml/kg/min)	23 ± 2.9	21.4 ± 7
PA Mean Flow (ml/kg/min)	11.1 ± 12	31 ± 29
Ductal Mean Flow (ml/kg/min)	91 ± 50.8	113 ± 74
pH	7.26 ± 0.02	7.27 ± 0.07
pCO2 (mmHg)	64.9 ± 6.7	55 ± 10.6

p=NS by Mann whitney U

Abstract: 191

Sustained Inflation Reduces Pulmonary Blood Flow During Resuscitation with an Intact Cord

Jayasree Nair[1], Sylvia Gugino[1], Carmon Koenigsknecht[1], Justin Helman[1], Praveen Chandrasekharan[1], Munmun Rawat[1], Deepika Sankaran[1], Vikash Agrawal[1], Satyan Lakshminrusimha[2]

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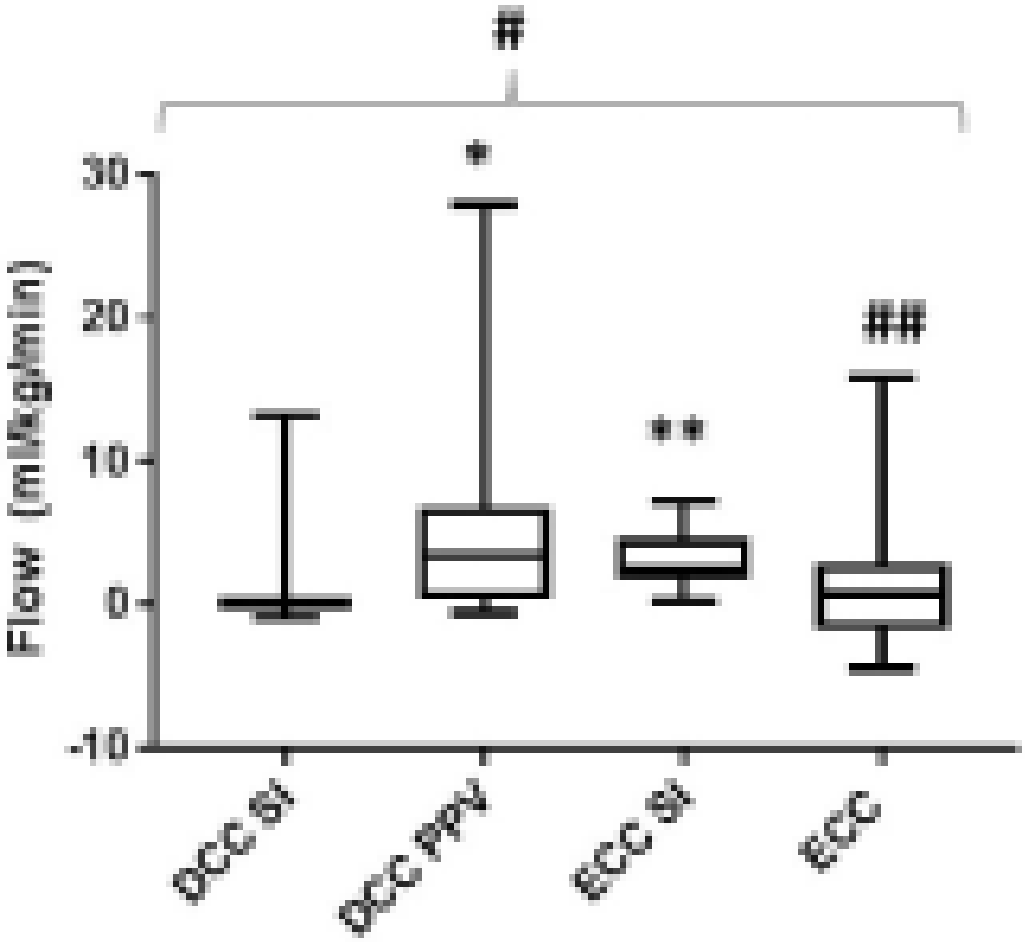
Background Delaying cord clamping until after onset of ventilation in asphyxiated near-term lambs improved hemodynamic parameters (Polgase et al, Arch Dis 2017). Both positive pressure ventilation (PPV) and sustained inflation (SI) are being investigated as initial ventilation strategies. A single SI of 30s improved circulatory recovery and lung compliance in resuscitation of near term asphyxiated lambs (Klingenberg et al, Arch Dis 2013). Ventilation of the lungs and increasing pulmonary blood flow are essential steps during resuscitation.

Objective To determine the effect of ventilation (SI or PPV) with early (ECC) or delayed cord clamping (DCC) on resuscitation parameters in asphyxiated near-term lambs. We hypothesized that SI with DCC would result in improved hemodynamic outcomes (carotid (CA) and pulmonary (PA) blood flows)

Design/Methods In this randomized study, 21 near-term (141d) lambs were instrumented with flow probes placed around left CA, left PA, one umbilical artery (UA) and vein (UV). Asphyxia was induced by cord occlusion until mean blood pressure (BP) was ≤22 mmHg. Lambs were randomized prior to delivery to DCC for 60 sec (n=11) and ECC-cord clamped immediately (n=10). They were further randomized to receive PPV (DCC-V, n=5), (ECC, n=5) or a 30 sec SI breath (DCC-SI, n=6), (ECC-SI, n=5). Physiological measurements were recorded using Biopac software during 30 sec of SI or PPV. Time taken to achieve baseline fetal CA flow, heart rate >100/min, and a mean BP of 40 mmHg were primary outcomes. Changes in UA, UV, PA, and CA flow during initial ventilation were analyzed. Groups were compared using Mann whitney U test and Kruskal Wallis test for one way variance using Graphpad Prism.

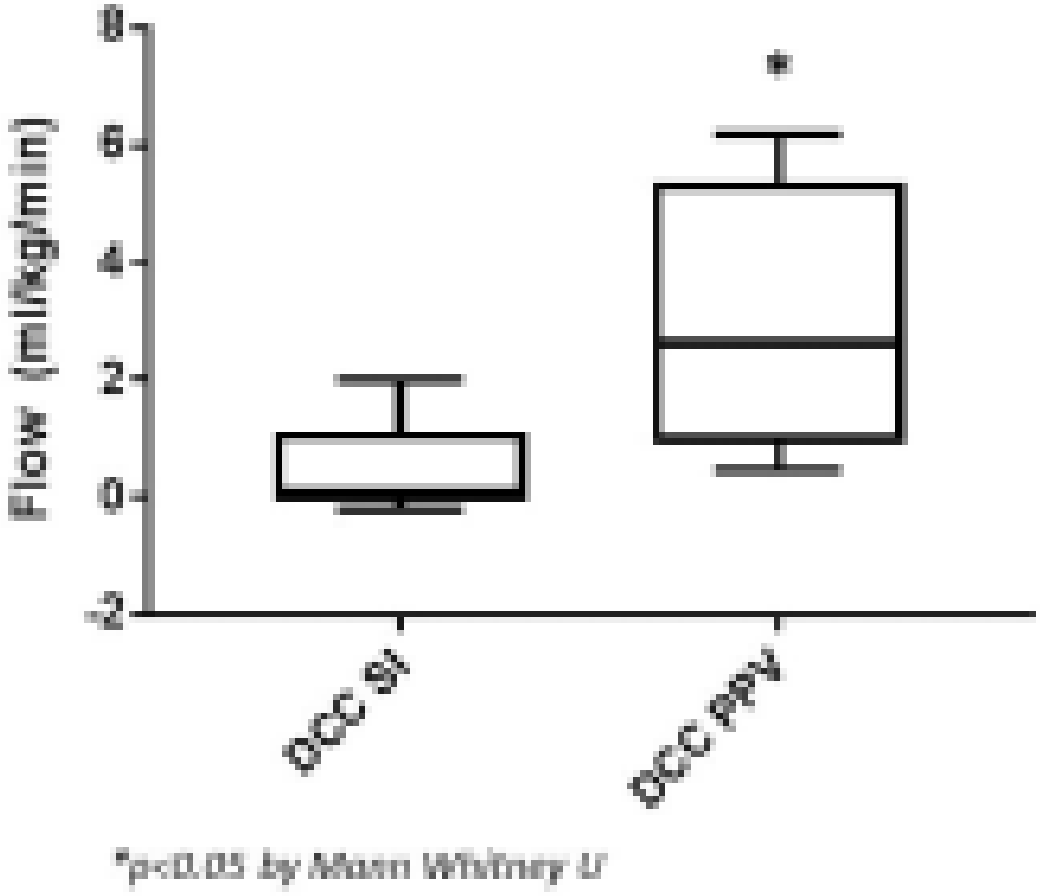
Results Airway pressures in both SI groups were significantly higher than the PPV groups. CA flow and systemic BP were similar between groups during the intervention (Table 1). Resuscitation with an intact cord and PPV increased PA flow compared to ECC. However, SI significantly decreased UV flow and PA flow in DCC lambs. (Fig 1 and 2). Study groups were comparable in primary outcomes (Table 2)

Conclusion(s) During PPV, DCC offers significant benefit with increased umbilical venous return, cardiac preload and PA flow compared to PPV. This benefit is negated by SI possibly due to reduced umbilical venous return and higher pulmonary vascular resistance. Clinical studies evaluating resuscitation with an intact cord are ongoing and may provide additional information on the interaction between airway pressure and placental transfusion.



*p<0.01 vs DCC SI
**p<0.01 vs DCC SI
p<0.05 vs ECC
#p<0.01 by Kruskal Wallis one way analysis of variance between all 4 groups

PA flows in study groups



Umbilical venous flow with DCC

Table 1: Airway pressure and hemodynamic parameters

	DCC SI	DCC V	ECC SI	ECC	p by Kruskal Wallis
Airway pressure (cm H20	34.57± 3.3	20.16±5.8	37.17 ± 2.76	19.28 ± 5.7	<0.01*
CA flow (mean±SD) ml/kg/min	11.1±8.4	4.9 ± 3.1	5.6 ± 6.3	12.5 ± 10.4	ns
PA flow (mean±SD) ml/kg/min	1.7±3.9	5 ± 5.6	2.9 ± 1.7	1.7 ± 4.7	<0.01*
Mean BP (mean±SD) mm Hg	22±9	21 ± 8	20 ± 4	25 ± 12	ns

Table 2: Primary outcomes

	DCC SI (n=6)	DCC V (n=5)	ECC SI (n=5)	ECC (n=5)
Weight (kg)	4.14 ± 0.8	3.6 ± 0.38	3.45 ± 0.27	3.66 ± 0.4
Lambs with asystole (n)	3	2	3	2

Time to reach baseline Ca flow (sec)	200 ± 117	246 ± 213	202 ± 79	115 ± 111
Time to HR>100 (sec)	195 ± 111	243 ± 190	176 ± 99	149 ± 91
Time to mean BP>40 mmHg(sec)	190 ± 106	281 ± 200	219 ± 78	204 ± 169

p=ns by ANOVA

Abstract: 192

Epinephrine vs. Vasopressin in an Ovine Model of Cardiac Arrest – Differences in Return of Spontaneous Circulation, Pharmacokinetics and Vasoreactivity

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Background Current neonatal resuscitation guidelines recommend use of epinephrine. Vasopressin (0.4U/kg- 0.00075 mg/kg) was observed to be more effective than epinephrine (0.03mg/kg) in <3d old piglets with cardiac arrest. There are no studies comparing vasopressin with epinephrine administered by low UV catheter in perinatal arrest.

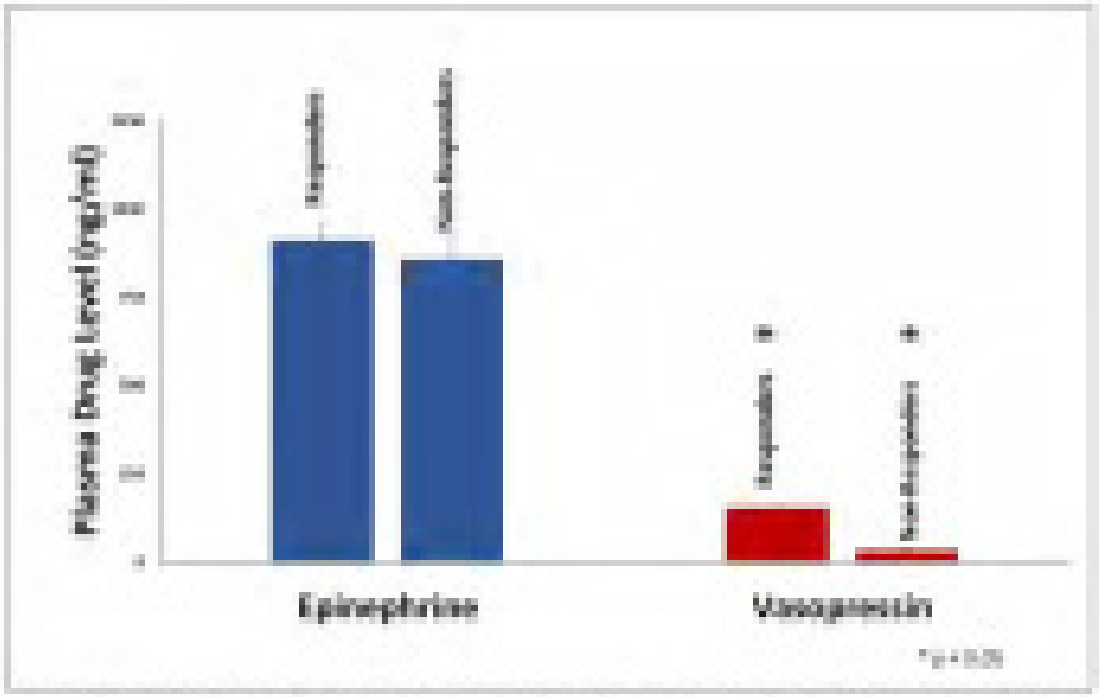
Objective To compare the effect of therapeutic doses of epinephrine and vasopressin on the incidence and time to return of spontaneous circulation (ROSC), plasma drug levels and vasoreactivity in a lamb model of cardiac arrest induced by umbilical cord occlusion.

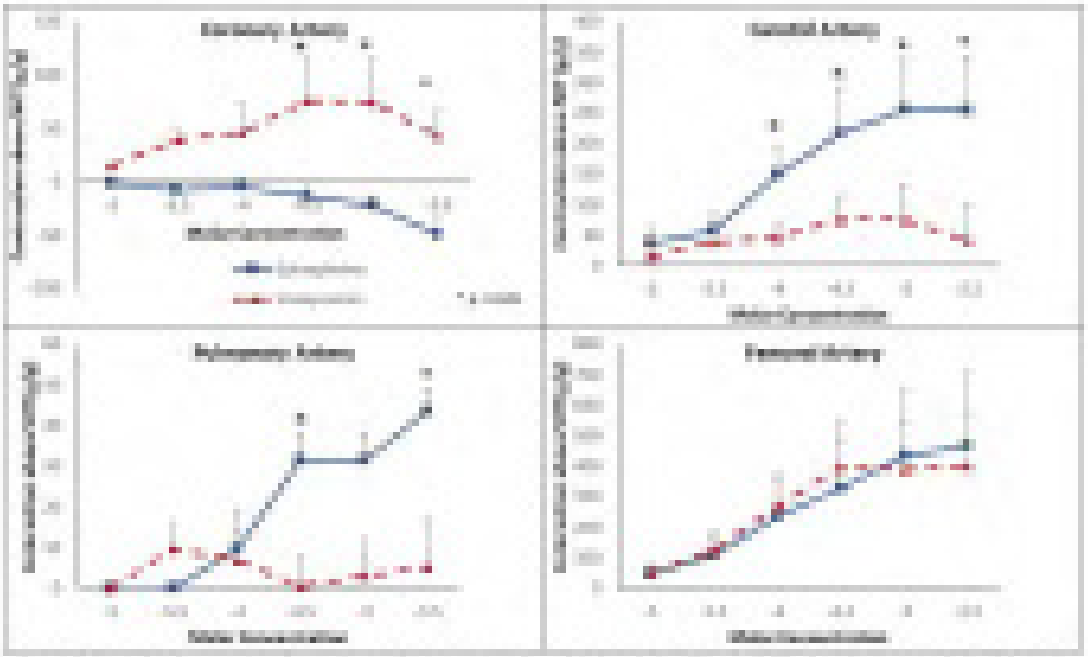
Design/Methods In this prospective randomized blinded study, 27 term fetal lambs were asphyxiated by umbilical cord occlusion resulting in severe asphyxia leading to cardiac arrest. If ROSC was not achieved after positive pressure ventilation and chest compressions, epinephrine or vasopressin was administered. Blood gases, hemodynamic parameters and plasma drug levels were obtained. Coronary, femoral, carotid and pulmonary vessel rings were obtained from a different set of asphyxiated lambs and response to increasing concentration of vasopressin and epinephrine in a vessel bath were recorded as gram/gram (g/g).

Results Eight lambs achieved ROSC prior to medication. In epinephrine group, 7 out of 10 lambs achieved ROSC in 8±2min whereas with vasopressin, 3 out of 9 lambs achieved ROSC in 13±6min. Plasma vasopressin levels in non-responders were much lower (33±3ng/ml) than responders (85±8ng/ml) after the first dose. No difference in plasma epinephrine levels was seen between non-responders (741±474 ng/ml) and responders (768±434ng/ml). (Figure 1)

Vasopressin caused coronary vasoconstriction (37±44 g/g) whereas epinephrine dilated coronary arterial rings (-16±12 g/g, p=0.0008). Vasoconstriction response to epinephrine was higher in carotid (162±64 vs 49±52 g/g, p=0.02) and pulmonary arterial rings (19±6 vs 4±9g/g, p=0.01) compared to vasopressin. There was no difference in femoral vasoconstriction. (Figure 2)

Conclusion(s) Vasopressin resulted in lower and slower incidence of ROSC most likely secondary to achieving lower plasma levels and constricting effect on coronaries limiting coronary perfusion. Carotid and pulmonary vasoconstriction with epinephrine requires further investigation as epinephrine use during resuscitation is associated with severe HIE and PPHN. Clinical studies with neurodevelopmental follow-up of epinephrine use during neonatal resuscitation are warranted.





Abstract: 193
Relationship between Secretory-IgA-microbiota Complexes and Intestinal Permeability in Premature Infants

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Background Previous work from our laboratories have shown that 1) exclusive breastmilk feeding is associated with specific microbiota strains and more rapid maturation in intestinal barrier function in preterm infants; and 2) secteroty IgA (SIgA)-microbiota complexes regulate the intestinal epithelial inflammatory response; but the effect of SIgA-microbiota complexes on intestinal permeability (IP) is unknown. Breast milk-derived SIgA (1) is the sole source of SIgA in newborns; (2) is in higher concentration in preterm than term breast milk; and (3) induces the infant's gut SIgA production.
Objective To test our central hypothesis that breast-milk derived SIgA regulates IP by complexing with intestinal microbiota with varying functional affinity (levels of SIgA coating per bacterium), we analyzed bacteria-SIgA complexes*ex vivo* and *in vitro* in stool samples from preterm infants.
Design/Methods Bacteria were isolated from 9 stools from a cohort of preterm infants <33 wk gestation who had IP measured by the "gold-standard" urinary Lactulose/Rhamnose (La/Rh) ratio test at 3 timepoints during the first 2 weeks of life. A La/Rh ratio >0.05 was considered indicative of increased IP. Briefly, bacteria-SIgA complexes were detected *ex vivo* or after bacteria cultivation *in vitro* under anaerobic conditions and immunostaining with BAC-Light and serially diluted SIgA purified from pooled human colostrum and goat FITC anti-human IgA. Flow cytometry was utilized to characterize SIgA coating per bacterium. The mean fluorescence intensity (MFI) was fitted to a 4-parameter logistic curve to the data and affinity was calculated.
Results *Ex vivo* analyses showed that the percentages of microbiota-SIgA complexes varied among the stool samples with different IP (Figs. 1A & B). Interestingly, increases in the MFI, which measure the receptor level per bacteria, were directly related to the increases in the IP, with highest expression in the dim population (staining that is slightly increased compared to the negative control). In agreement with these results, *in vitro* analyses showed that a high SIgA affinity was toward microbiota from stool samples associated with high IP (Fig. 2A) with a significant correlation between IP and SIgA affinity (p=0.0014) (Fig. 2B) as determined by the Pearson correlation test.
Conclusion(s) Our results support an association between the SIgA binding affinity to the microbiota and impaired intestinal barrier in preterm infants, suggesting SIgA affinity contributes to intestinal barrier function in preterms.

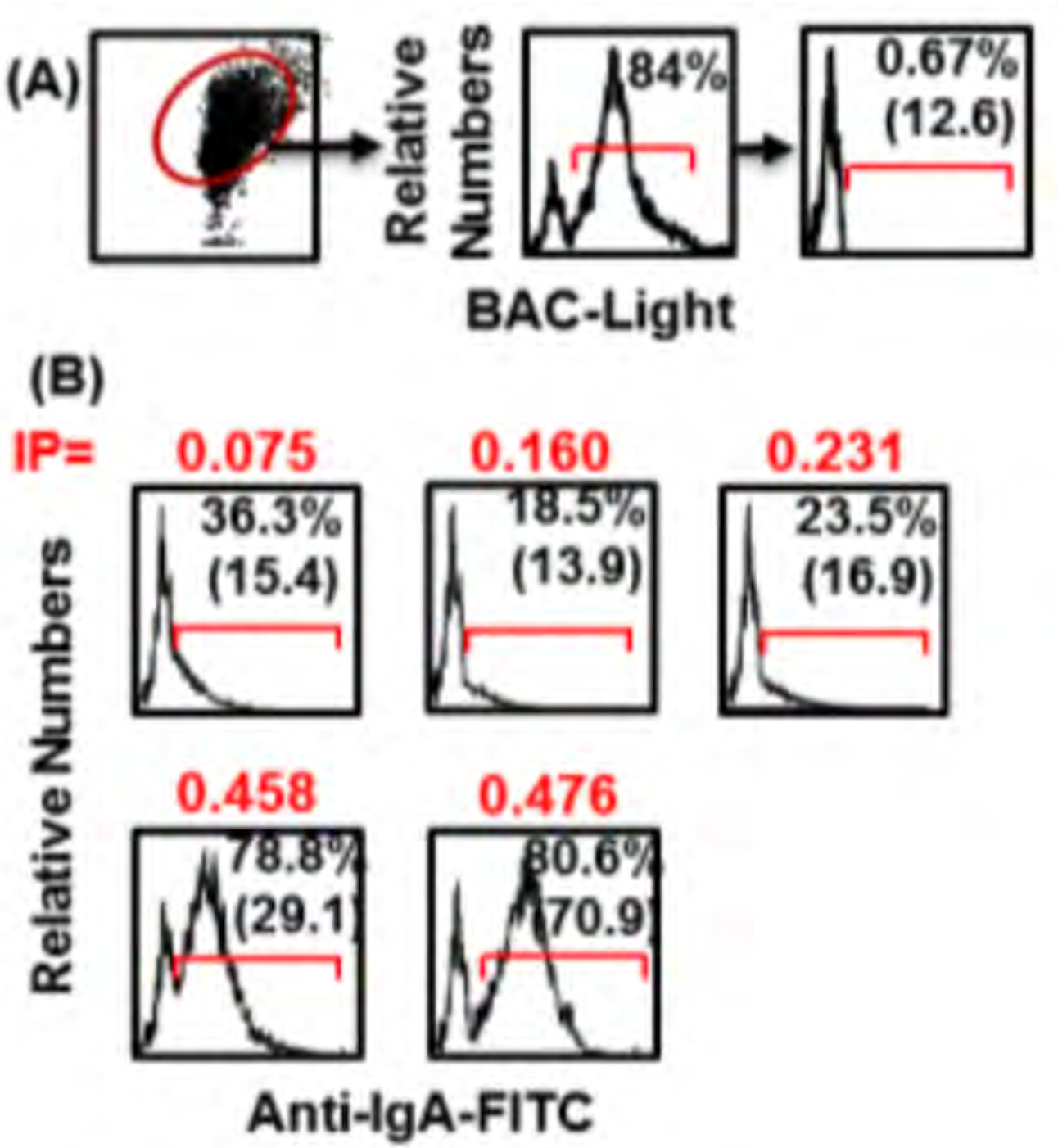

Figure 1. ***Ex vivo*** **detection of Microbiota-SIgA complexes in preterm stool samples with different IP. (A) Gating strategy for microbiotia-SIgA complex analyses & background level of unstained sample and (B)** ***ex vivo*** **analyses of microbiota-SIgA complex formation in stools of preterms measured by flow cytometry using BAC-Light and goat FITC anti-human IgA polyclonal antibodies. Numbers correspond to the %positive cells followed by mean fluorescence intensity (MFI) in parenthesis.**

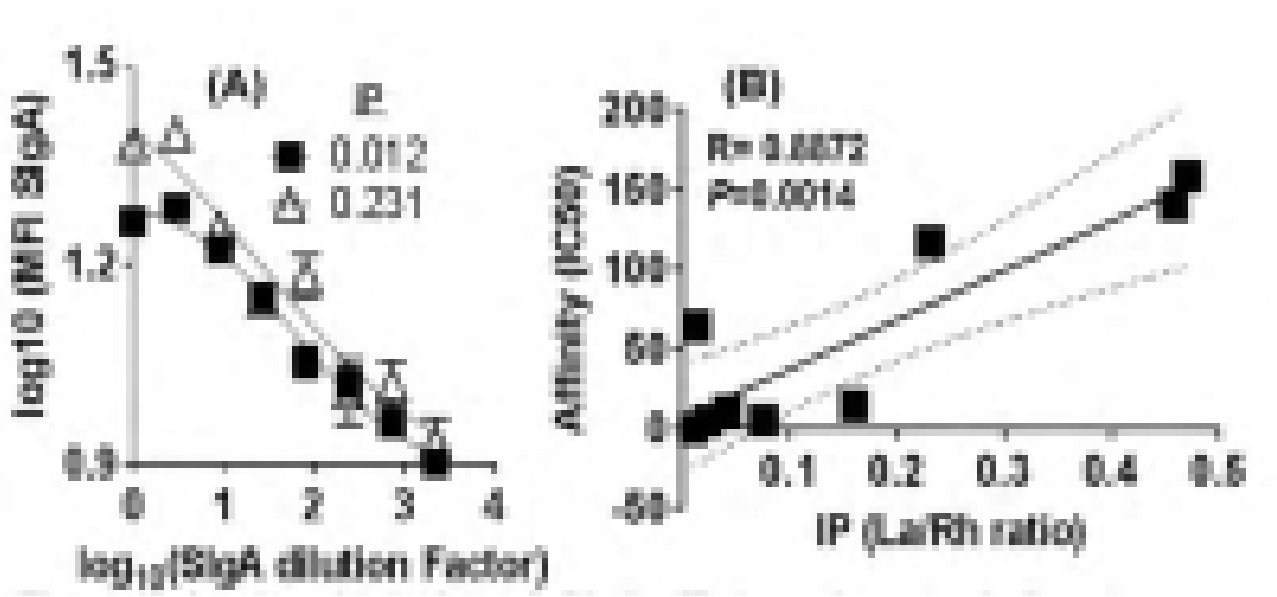

Figure 2. ***In vitro*** **detection of SIgA affinity using preterm stool samples with different IP. (A) Anaerobic culturing was used to grow microbiota from stools of preterms. BAC-Light and serially diluted SIgA purified from pooled human clostrum, and goat FITC anti-human IgA polyclonal antibodies were used to stain the cultivatable bacteria. Affinity calculations were based on the equation: $logE_{50}$-((LOG_{10}((Bmax-Kd)/(Kd-Bmin))/hill-slope)). (B) Correlation between IP evaluated by the Lactose/Rhamnose (La/Rh ratio) test and SIgA affinity. Data representative of 9 stool samples.**

Abstract: 194
Does maternal incarceration harm infants with Neonatal Abstinence Syndrome?
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Background Opioid use among prison inmates is increasing in the US, and in some states pregnant women abusing opioids have been charged and imprisoned under child abuse laws. Infants with intrauterine opioid exposure born to incarcerated mothers (IM) represent a vulnerable and understudied subset of infants at risk for Neonatal Abstinence Syndrome (NAS). At present, it is unknown whether maternal incarceration impacts LOS for infants with NAS.
Objective We hypothesize that infants of IM have longer hospitalizations for NAS compared to infants of non-incarcerated mothers (NIM).
Design/Methods We performed a retrospective cohort study of infants with NAS born at a single community hospital from 20112017, which provides all obstetric care for Connecticut's only women's prison. Infants were excluded if they were born at <35 weeks, had significant comorbidities, or data were incomplete. All opioidexposed infants were cared for in the newborn nursery and assessed by Finnegan Scores for signs of NAS with a minimum observation length of 5 days. Infants receiving pharmacologic treatment were transferred to the hospital's Level III NICU and received morphine as a 1 line agent and phenobarbital as a 2 line agent if unable to wean off morphine. The primary outcome, LOS, was compared between infants born to IM vs. infants born to NIM using Poisson regression.
Results 209 infants were identified, 166 were included in the analysis, with 28 born to IM, 138 to NIM. Infant and maternal characteristics were similar between groups, with NIM being mostly Caucasian and a few notable differences in substance use (Tables 1 and 2). In addition to IM/NIM, variables associated with LOS at p<0.10 (Table 3) were considered in the regression. Adjusted mean LOS was longer among female infants (p<0.0001) and infants born to IM (p=0.009), which in turn was significantly moderated by use of phenobarbital and morphine (Figure 3). While LOS increased when morphine, phenobarbital, or both were used, betweengroup differences became dramatic when either phenobarbital or phenobarbital with morphine was used.
Conclusion(s) Infants with NAS born to IM had longer LOS than infants with NAS born to NIM. This was impacted by the infants' treatment for NAS. Maternal incarceration prevents a mother from staying with her newborn for the duration of

NASrelated hospitalization and entails suboptimal supportive care. Maternal incarceration represents an important variable to consider in future public health, advocacy, quality improvement, and ethical work for infants with NAS.

Table 1: Infant Characteristics

Characteristic	Non-incarcerated (N=138)	Incarcerated (N =20)	P value
Males, n (%)	76 (55)	15 (50)	0.88
Birth weight, kg	3.14 ± 0.57	3.14 ± 0.52	0.95
5 min. Apgar	8.79 ± 1.01	8.75 ± 0.99	0.79
Gestational Age, wk	38.86 ± 1.58	38.91 ± 1.76	0.89
Breast milk at d/c, n [%]	51 (37)	1 (3.5%)	<0.001**

Characterstics of infants born to incarcerated mothers vs. non-incarcerated mothers

Table 2: Maternal Characteristics

Characteristic	Non-incarcerated (N=138)	Incarcerated (N =28)	P value
Age, y	27.99 ± 4.83	29.46± 5.07	0.14
Race, n (%)			0.002*
White, Non-Hispanic	123 (94)	15 (68)	
Black	4 (3)	4 (18)	
Hispanic	4 (3)	3 (13.6)	
Gravida	5.28 ± 1.87	5.96 ± 2.56	0.19
C-section, n (%)	58 (42)	10 (37)	0.54
Tobacco, n (%)	84 (61)	17 (63)	0.99
Alcohol Use, n (%)	3 (2.2)	4 (14.3)	0.018*
Poly-pharmacy, n (%)	46 (33.6)	13 (46.4)	0.2
Benzodiazepine, n (%)	10 (7.3)	6 (21.4)	0.032*
Illicit Drug Use, n (%)	31 (22.5)	11 (39.3)	0.06
Methadone, n (%)	88 (63)	26 (93)	0.002*
Buprenorphine, n (%)	21 (15)	1 (4)	0.13
Suboxone, n (%)	6 (4)	0 (0)	0.59

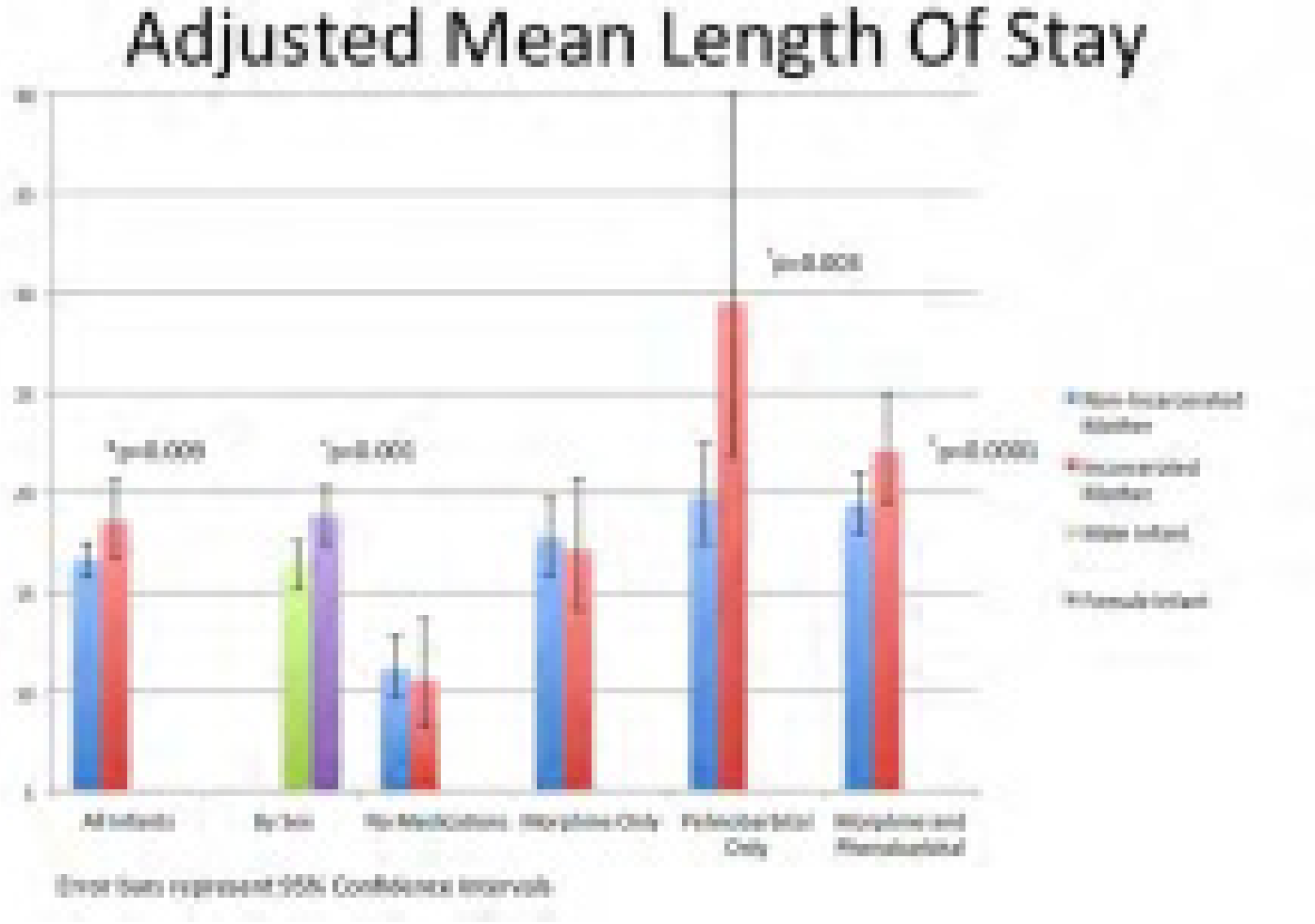
Characteristics of incarcerated vs. non-incarcerated mothers

Table 3: Unadjusted Associations with LOS

Variable	Yes, median (IQR)	No, median (IQR)	P value
Incarcerated Mother	21.5 (7.5-29)	19 (7-27)	0.144
Gender, Male	17 (7-27)	21 (7-28)	0.08*
Breastfeeding	8.5 (6-23.5)	22 (9-29)	0.0001*
Morphine	25 (20-29)	7 (5-9)	0.0001*
Phenobarbital	26 (22-32)	7 (5.5-14)	0.0001*
Maternal Methadone	22 (8-29)	12.5 (5-21)	0.0001*
Maternal Buprenorphine	21 (7-27)	9.5 (5-21)	0.02*
Naïve weight change, kg/d†	r=0.89		<0.0001*
Gestational age†	r=0.13		0.08*

†Pearson Correlation

Variables associated with LOS with p<0.10 incoporated into Poisson regression.



Adjusted mean LOS for all infants, by sex, and by treatment category.

Abstract: 194A

Factors Associated with Use, Survival and Neurodevelopment Outcome Following Inhaled Nitric Oxide Exposure in Extremely Preterm Infants

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Background NIH (2011) and American Thoracic Society (2014) guidelines recommend judicious and targeted use of inhaled nitric oxide (iNO) in premature neonates with pulmonary hypoplasia. Pulmonary hypoplasia is commonly due to prolonged, premature rupture of membranes (PPROM). Antenatal betamethasone may potentiate the response to iNO.

Objective We hypothesized that preterm infants ≤1000g and ≤27 weeks gestation with PPROM≥ 120 hours and had a complete

course of antenatal steroids will have better outcomes following exposure to iNO. We also hypothesized that publication of 2011 NIH guidelines decreased the use of iNO within the Neonatal Research Network (NRN) centers.

Design/Methods We analyzed data from ELBW infants from NRN exposed to iNO in the first 4 weeks after birth from 2007 to 2014. Propensity score modeling was used to identify factors associated with iNO exposure. In addition, the outcome models also adjusted for factors associated with survival at discharge and neurodevelopment at 18-26 months. Neurodevelopmental impairment (NDI) was defined as described previously (Younge et al. NEJM 2017).

Results Among 10,278 ELBW infants, 834 (8.1%) were exposed to iNO out of which, 425 (51%) received iNO in the first postnatal week. The use of iNO in ELBW infants did not change appreciably between 2007 and 2014 (figure 1). Low birth weight, male gender, non-African-American race, Apgar score <4 at 1 min, PPROM, ANS, and O > 31% on Day 1 were all associated with iNO exposure (Table 1). Following exposure to iNO, ANS and PPROM were not significantly associated with increased survival or decreased NDI (table 2). Only birth weight ≥720 g and female gender were associated with a higher chance of survival without NDI at 18 -26 months. There was no difference in iNO exposure between small for gestational age infants (19.5% vs. 18.2%) and others. Limitation: We did not record the diagnosis of pulmonary hypertension by echo or pulmonary hypoplasia in these ELBW infants.

Conclusion(s) Use of iNO in ELBW remains mostly unchanged in NRN centers despite NIH recommendation. PPROM>5 days was not associated with improved survival or neurodevelopmental outcome. Factors associated with improved outcome among all preterm infants such as higher birth weight and female gender were associated with improved survival at discharge and intact survival at follow-up following iNO exposure.

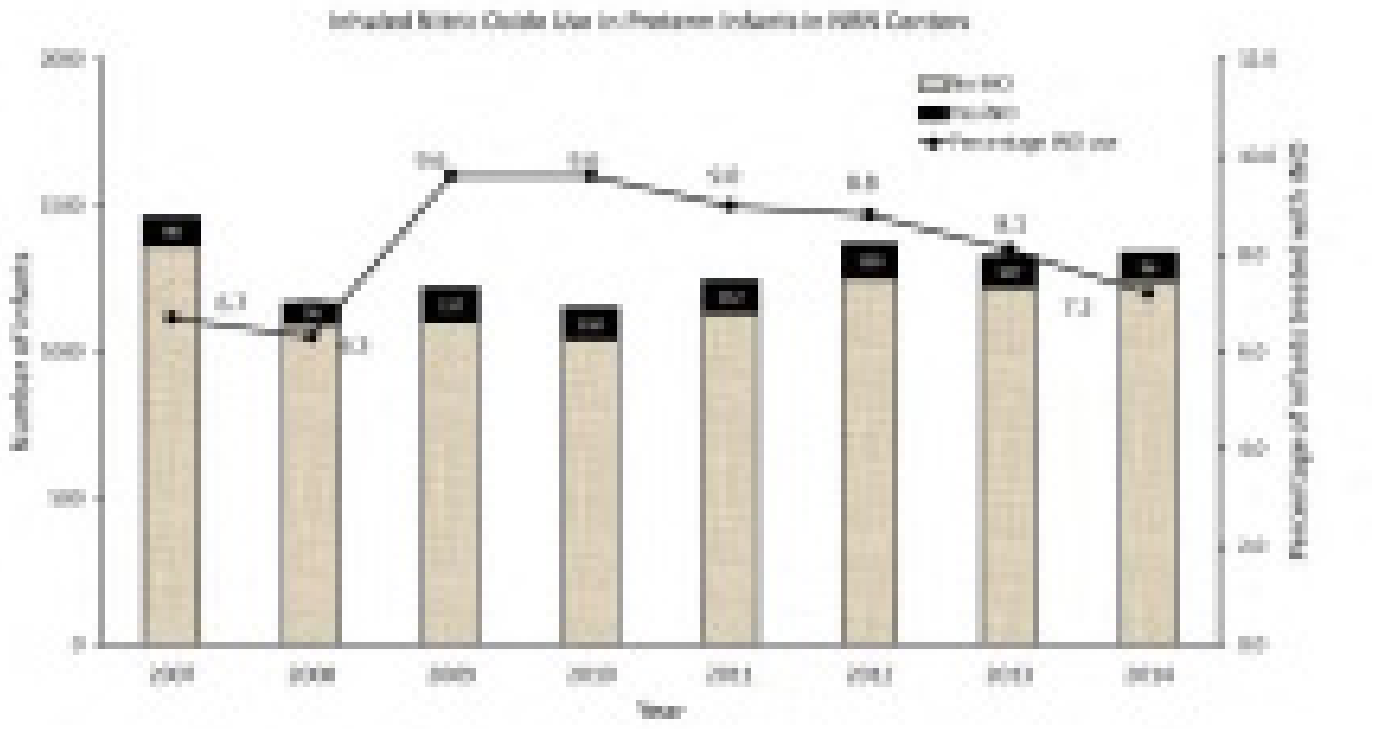

Figure 1: Trends in use of iNO before and after 2011 in the NRN centers that were part of NRN from 2007 to 2014.

Table 1: Risk factors for exposure to iNO in the first 28 days of life in all ELBW infants using propensity modeling

Parameters	Exposed to iNO	Not exposed to iNO	P - value	Adjusted odds ratio	95% Wald (Confidence Limits)	
Birth weight (<720 gram) (avg±SD)	674.4 ± 156.2	767.1 ± 149.7	<0.001	2.654	2.254	3.125

Male n (%)	444/834 (53.2)	4470/9441 (47.3)	0.04	1.274	1.091	1.487
Non – African American infants n (%)	567/834 (67.9)	5585/9444 (59.1)	0.0012	1.327	1.074	1.639
Chorioamnionitis n (%)	164/822 (20.0)	1209/9402 (12.9)	0.0089	1.396	1.014	1.923
Apgar <4 at 1st minute n (%)	519/832 (62.4)	4256/9386 (45.3)	0.004	1.657	1.175	2.335
PROM >120 hours n (%)	194/832 (23.3)	1727/9197 (18.8)	<0.0001	1.787	1.489	2.144
Antenatal steroids n (%)	584/825 (70.8)	6330/9387 (67.4)	0.02	1.238	1.035	1.480
FIO_2 level >0.21 vs. 0.21 on day 1	92.8¶		<0.0001	1.324	1.039	1.689
FIO_2 level >0.30 vs. 0.30 on day 1			<0.0001	2.541	2.057	3.138
Center variation	461.8¶		<0.0001	Differs with each center		

The numbers in the brackets represent percentages. ¶ Wald chi-square estimates

Table 2: Factors improving survival or neurodevelopmental outcome at follow up with inhaled nitric oxide exposure

Effect	Wald chi-square	P-value	Adjusted odds ratio	95% confidence interval	
Complete course of antenatal steroids	2.0	0.07	1.417	0.882	2.276
Birth weight ≥ 720 g*	7.9	<0.0001	1.961	1.229	3.127
Female gender*	11.6	<0.0001	2.153	1.385	3.348
PPROM >5 days	0.04	0.1799	1.000	0.999	1.001

***denotes statistical significance. ANS & PPROM were force included in the model which were not significant**

Abstract: 195
Racial Differences in Young Adult Resilience and Associations with Low Birth Weight
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Background Resilience to stress may mediate the development of poor mental and physical health outcomes. Given that adverse maternal psychosocial environments are believed to contribute to racial disparities in birth outcomes, disparities in resilience between racial/ethnic groups might amplify these effects. The existence of such disparities and their potential effect on birth outcomes is unknown.
Objective Describe differences in resilience by race and ethnicity, and associations between resilience and low birth weight (LBW).
Design/Methods We constructed a retrospective cohort of 5774 young adults surveyed repeatedly as part of The National Longitudinal Study of Adolescent to Adult Health (Add Health). Wave 4 questions which mirrored items on the Connor-Davidson Resilience Scale 10 were pulled. Factor analysis was performed on participants' responses to these questions to

construct an Add Health-based resilience scale. Racial differences in resilience scores were measured via bivariate and multivariate analyses after adjusting for education, household income, age and BMI. Multivariate regression models explored the association between resilience, as measured by tertiles, and LBW after adjusting for maternal socioeconomic status, age, BMI, smoking/alcohol history and prenatal care.

Results Non-Hispanic American Indians (NHAIs) had the lowest resilience scores across all races (Table 1). In poisson regression models, NHAIs and NH Asians had lower resilience scores compared to NH Whites (Table 2). When these models were sequentially adjusted for covariates, NH Blacks had higher resilience scores than NHWs (IRR 1.04, 95% CI 1.02-1.07) while NHAI and NHAs scores remained lower than NHWs. Women with resilience scores in the mid or high tertiles were progressively less likely to deliver a LBW infant (Table 3). These findings persisted in multivariable analyses (aOR 0.72, 95% CI 0.53-0.97 for highest tertile in full model). Finally, NH Black women had a 2-fold higher risk of LBW compared to other racial/ethnic groups if they were in the low resilience tertile (aOR 2.03, 95% CI 1.34-3.09). There was no such worsening effect for NHBs at the mid and higher resilience tertiles.

Conclusion(s) Resilience scores were lowest among NHAI. Resilience may act as a buffer against risk of LBW, particularly among NHBs. Alternatively, low resilience may be an indicator of the psychosocial environment most associated with the phenotype of LBW. Increasing resilience among at-risk women may prove a useful public health strategy to decrease LBW rates.

Table 1. Differences in Resilience by Race/Ethnicity

Race/Ethnicity	Sample Size	Mean Resilience Scores (SD)
Non-Hispanic White (NHW)	1854	14.3 (5.0)
Non-Hispanic Black (NHB)	691	14.4 (5.1)
Non-Hispanic American Indian (NHAI)*	88	13.0 (4.8)
Non-Hispanic Asian (NHA)	362	13.7 (4.9)
Non-Hispanic Other (NHO)	43	15.0 (5.0)
Hispanic	994	14.4 (5.0)

*NHAI mean score lower than NHW (p=0.002), NHB (p=0.001), NHO (0.006) & Hispanic subjects (p=0.001). All p-values are Bonferroni corrected.

Differences in Resilience by Race/Ethnicity

Table 2. Results from poisson regression models for the effects of race/ethnicity on resilience score

Race/Ethnicity	Model 1 Unadjusted	Model 2 Adjusted for education & household income	Model 3 Adjusted for education, household income, age & BMI
	Incidence rate ratios (IRR) and 95% Confidence Intervals		
Non-Hispanic Black (NHB)	1.01 (0.99-1.04)	**1.05 (1.02-1.07)**	**1.04 (1.02-1.07)**
Non-Hispanic American Indian (NHAI)	**0.93 (0.86-0.99)**	**0.94 (0.89-0.99)**	**0.94 (0.89-0.99)**
Non-Hispanic Asian (NHA)	**0.94 (0.92-0.97)**	**0.92 (0.89-0.95)**	**0.92 (0.89-0.94)**
Non-Hispanic Other (NHO)	1.03 (0.99-1.14)	1.02 (0.92-1.13)	1.02 (0.92-1.13)
Hispanic	1.01 (0.97-1.05)	1.03 (1.00-1.06)	**1.03 (1.00-1.06)**

Non-Hispanic Whites were the reference category. All models clustered by high school where participants were initially recruited and surveyed. Significant findings are bolded.

Effects of Race/Ethnicity on Resilience Score

Table 3. Results from logistic regression models for the effects of resilience score tertile on low birth weight

Resilience Score Category	Model 1 Unadjusted	Model 2 Adjusted for education, household income & age	Model 3 Adjusted for education, household income, age, BMI, smoking/alcohol use, & prenatal care
	Odds ratios, adjusted odds ratios and 95% Confidence intervals		
Medium resilience scores	**0.73 (0.60-0.89)**	**0.77 (0.62-0.96)**	**0.76(0.62-0.93)**
High resilience scores	**0.66 (0.49-0.90)**	**0.71 (0.53-0.95)**	**0.73(0.53-0.99)**

Lowest resilience score tertile was the reference category. All models clustered by high school where participants were initially recruited and surveyed. Significant findings are bolded.

Effects of resilience score tertile on low birth weight

Abstract: 196

Family Perspectives on Accessing Community Resources to Mitigate Toxic Stress

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Background Research supports the benefits of strengthening families to mitigate the impact of toxic stress on children. Resource-poor families have limited access to the diverse resources critical to enhancing their resiliency. However, sparse research has assessed families' perspectives on their access to community-based programs and services.
Objective This study examines the perspectives of caregivers of young children in an urban, underserved population on access to community-based interventions for toxic stress.
Design/Methods We recruited adult caregivers of children age five years or less at a Women, Infants, and Children clinic in Hartford, Connecticut from October 2018 to December 2018. Caregivers completed an anonymous survey including basic demographics, whether they had been referred to services and supports, and whether or not they successfully linked to the service. Likert scales measured caregivers' perceived benefits and barriers to accessing resources.
Results We solicited 58 caregivers to participate, of whom 54 met inclusion criteria and 49 completed the survey (85%). Participants were predominantly women (92%). The majority had a high school education (53%), were Hispanic (63%) and received public insurance (96%). Fewer than half of participants reported ever receiving a referral to community supports or services (43%) . Of those reporting referrals, 86% noted actual linkage to resources, although 33% acknowledged prematurely discontinuing services. Caregivers rated affordable housing the top service priority (35%). For all respondents, mean benefit score (66, SD 18) exceeded mean barrier score (39, SD 20). Those reporting linkage had a higher mean benefit score (73, unpaired t-test, $p < 0.05$) with no difference in mean barrier score (40). Improvement in child's health (mean 77, scale 0-100) was the highest rated perceived benefit. Leaving work early (mean 50, scale 0-100) and finding an interpreter (mean 50) were the greatest barriers.
Conclusion(s) Low-income, urban caregivers perceived greater benefits than barriers to accessing community services. However, most caregivers did not report referral to services. Those reporting referral also reported linkage, although support was often prematurely discontinued. Barriers to referrals included securing time off from work and lack of interpreter services. Implications for policy include strengthening providers' referral capacity and addressing barriers to access.

Demographics

	%	N
Age <30 years	75	37
Female	92	45
Number of children under 18 years		
1	53	26
2	33	16
3+	14	7
Number of adults in the home		
1	22	11
2	39	19
3+	39	20
Education		
Less than high school	18	9
High school graduate	47	23
Some college	27	13
Bachelors degree or higher	8	4
Race / ethnicity		
White / Non-Hispanic	10	5
Hispanic	63	31
Black	25	12

Other	4	2
Primary language		
English	63	31
Spanish	31	15
Other	6	3
Public insurance	96	47
Employed	51	25
Child with primary care provider	92	45
Child with special needs	10	5

Family Stability

	%	N
In the next 6 months, likely to have the same job	30	15
In the next 6 months, likely to live in the same house / apartment	70	34
In the next 6 months, likely to live in the same area	53	26
In the next 6 months, likely to have continued access to a car	30	15
In the next 6 months, likely to have access to childcare if needed to go somewhere urgently	53	26
Food security screen negative	60	29

Abstract: 197

Evaluating the Availability of Naloxone and the Accuracy of Information Provided by Pharmacy Employees Regarding Naloxone Dispensing Protocol

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Background Opioid use in the U.S. has soared over the past 2 decades, with overdose death rates tripling among children and teens. In response to this epidemic, all 50 states have modified their laws to increase access to naloxone (NLX). In many states, a "standing order" allows pharmacies to dispense NLX without a prescription from a provider. Additionally, the majority of states now also allow NLX to be dispensed to family members or friends of opioid users ("third-party prescriptions"). However, it is unclear to what extent pharmacies nationally adhere to these legal provisions. Although an investigative journalist reported in the New York Times that many pharmacies in New York City were incorrectly telling consumers they needed a prescription for NLX, no study to date has examined if this is a widespread issue.

Objective To evaluate the accuracy of information provided by pharmacy employees regarding the requirements to purchase NLX and to assess the availability of NLX.

Design/Methods A semi-structured questionnaire was developed focusing on whether the pharmacy currently had NLX in stock and what restrictions or requirements are in place with respect to purchasing NLX. Chain and non-chain pharmacies in the 10 states with the highest number of opioid overdose deaths in 2016 were contacted. For each state, a stratified sampling approach was utilized to ensure a comparable distribution with respect to pharmacy chain (CVS, Walgreens, and Walmart) and population density. For inclusion, pharmacies had to participate in their state's "standing order" program. Responses were compared to each specific state's NLX laws to evaluate response accuracy.

Results 120 pharmacies were included in the analysis (Table 1). Overall, 21.0% of pharmacies did not have either the injectable or spray form of NLX in stock, and only 11.8% carried both (Table 2). While the majority of pharmacy workers

correctly indicated that NLX can be purchased for a friend (88.3%) and without a prescription (87.2%), only 51.0% correctly communicated that there is no minimum age required to buy NLX (Table 3).
Conclusion(s) In this multi-state analysis, many pharmacies do not carry Naloxone, and pharmacy staff are often not fully informed about dispensing regulations, especially regarding minors accessing NLX for themselves or others. Given that almost 9,000 children and teens have died from an opioid overdose since 1999, pharmacy staff need to be better informed about NLX dispensing regulations.

Table 1. Pharmacy Characteristics (N = 120)

	N
Pharmacy	
CVS	33
Walgreens	33
Walmart	33
Non-Chain	21
Geographic Area	
Rural	61
Urban	59
Occupation of Respondent	
Pharmacist	91
Pharmacist Technician	29
State	
California	12
Florida	8
Illinois	10
Maryland	13
Massachusetts	13
Michigan	10
New York	11
Ohio	22
Pennsylvania	12
Washington	9

Table 2. Immediate In-Store Availability of Naloxone (N = 119)

Pharmacy Characteristics	Naloxone Product Immediately Available in Store			
	Neither Spray nor Injector (%)	Spray Only (%)	Injector Only (%)	Both Spray and Injector (%)
Chain Pharmacies	15.4	65.3	3.8	15.5
• CVS	45.5	48.5	0.0	6.1
• Walgreens	9.4	62.5	6.3	21.9
• Walmart	3.8	84.8	0.0	12.1
Non-Chain Pharmacies	28.6	66.7	0.0	4.8
Urban Pharmacy	22.4	62.1	1.7	15.8
Rural Pharmacy	15.7	68.9	1.6	9.8
Overall	**21.0**	**65.5**	**1.7**	**11.8**

Table 3. Accuracy of Responses to Questions Regarding Naloxone Purchase Requirements

Pharmacy Characteristics	Question		
	"Do I need a prescription?"*	"Can I buy naloxone for a friend?"**	"Is there an age requirement to buy naloxone?"***
	% Correct	% Correct	% Correct
Chain	88.8	89.0	51.2
- CVS	86.2	87.5	46.2
- Walgreens	84.4	83.1	51.7
- Walmart	96.3	88.2	88.2
Non-Chain	73.8	85.7	46.7
Pharmacist	86.2	88.2	48.7
Pharmacy Tech	98.9	88.9	60.0
Urban	87.8	87.5	58.3
Rural	87.3	89.1	44.0
Overall	**87.2**	**88.3**	**51.0**

* For all states included in analysis, the correct answer is "no"
** For all states included in analysis, the correct answer is "yes"
*** For states included in the analysis, the laws either explicitly states there is no age requirement, include no age limit in the dispensing protocol; state that it is up to the discretion of the pharmacist.

Abstract: 198
Urine heavy metals in pregnancy and the newborn period
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Background
Certain heavy metals are known to have potential adverse effects during pregnancy, to the newborn and in childhood development. However, little is known about how levels of these metals during pregnancy correlate with levels at delivery and in the newborn.
Objective To assess urinary levels of arsenic, cadmium and lead during and immediately after pregnancy and in the newborn.
Design/Methods Mothers were recruited prenatally in the longitudinal cohort study at Inova "The 1st 1000 Days of Life and Beyond" study. Urine was collected from Mothers prenatally in the 2nd trimester, and within 2 days of delivery; urine was collected from the infant within 2 days of life. Exposure to the heavy metals was assessed via atomic absorption spectrophotometry.
Results 277 urine samples from 94 Mother-newborn dyads were analyzed (90 prenatal samples, 93 delivery samples, 94 newborn samples). Mean gestational age was 38 weeks (range 34-41 weeks).

Arsenic was detected in all urine samples (mean prenatal=13.4 (0.5-141) µg/l, mean delivery=10.7 (0.6-237) µg/l,mean

newborn=4.8 (0.5-31) µg/l). High levels of urine arsenic (>50 µg/l) were detected in 6 prenatal and 5 maternal delivery samples but in no newborn samples. A weak positive correlation (r=0.46) was found between delivery and newborn levels.

Cadmium was detected in 49% of prenatal samples, 54% of maternal delivery samples and 76% of newborn samples. Only 2 samples prenatally were considered to have a high cadmium level (>0.77 µg/l); 1 maternal sample and 1 newborn sample from a Mother-newborn dyad had a high level however this Mother had normal prenatal levels. No correlation was seen between prenatal, delivery and newborn levels. No correlation was seen between cadmium levels and birthweight.

Lead was detected in all urine samples (mean prenatal=0.5 (0.2-0.7) µg/l, mean delivery=1.1 (0.2-60)/l, mean newborn=42.7 (0.4-8.7)µg/l). 2 newborns samples and 1 maternal delivery sample, not from the same dyads, and 0 prenatal samples were considered to have high lead levels (>7 µg/l) and there was no correlation seen between prenatal, delivery and newborn levels. Conclusion(s) Although exposure to certain heavy metals during pregnancy is known to have adverse on the fetus and in early childhood development, there was surprisingly little correlation between urine heavy metal levels of arsenic, cadmium and lead between the Mother prenatally and at delivery and levels in their newborn. In this longitudinal study the relative effects of maternal and newborn levels on neurodevelopmental outcomes of the child will be assessed.

Abstract: 199

Do parental electronic cigarette or marijuana users identify as smokers?

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Background Electronic cigarette (ecig) and marijuana use is rising. However, little is known about parental use and associated identity as a smoker/lifestyle behaviors.

Objective To compare associated identification as a smoker and lifestyle behaviors (exercise, illicit drugs or alcohol) in relation to parental use of ecigs, marijuana, and tobacco.

Design/Methods This is a cross-sectional survey of consenting English/Spanish speaking parents ≥18 yrs of live singletons. Questions were adapted from pre-validated surveys (Pregnancy Risk Assessment Monitoring System; Population Assessment of Tobacco & Health). Subjects were categorized into 5 groups: ecig use only (EC), marijuana use only (MJ), tobacco products only (TP), multi-substance users (MS; marijuana, ecig &/or tobacco), & non-users (NU; neither ecig, tobacco nor marijuana). Outcomes included self-identification as a non-smoker, exercise (≥3 days/week), alcohol consumption, & substance use. Statistical analyses used x^2, Fisher's Exact test, ANOVA, & logistic regression adjusting for race/ethnicity, age, gender, education, & number of adverse life events (eg partner incarceration, job loss, & homelessness).

Results There were 1139 respondents (77% moms & 23% dads) of which 3% (38) MJ, 1% (17) EC, 10% (115) TP, 11% (125) MS & 74% (844) NU. MS had fewer Hispanic and more White parents compared with other groups ($p<0.01$). TP & NU were on average older than EC & MS ($p<0.01$). EC were less likely to attend college & NU were more often married ($p's<0.01$). In adjusted models, EC & MJ had higher odds of identifying as non-smokers compared with TP (EC OR 7.54, 95% CI: 2.4-24.0; MJ OR 4.8, 95% CI: 2.1-11.0) & MS (EC OR 25.53, 95% CI: 7.2-90.0; MJ OR 16.3, 95% CI: 6.3-42.3). EC & MJ had similar odds of self-identification as non-smokers. EC had higher odds of exercise in relation to TP (OR 3.33, 95% CI: 1.1-9.9) & MS (OR 3.92, 95% CI: 1.3-11.7) whereas EC vs. MJ did not differ. MJ had higher odds of alcohol use than EC (OR 4.08, 95% CI: 1.03-16.1) & NU (OR 3.7, 95% CI: 1.6-8.7), but similar to TP & MS. There were no illicit drug users in EC or NU.

Conclusion(s) In our cohort, EC & MJ did not self-identify as smokers, & EC had higher rates of exercise and less alcohol use. We speculate that ecig & marijuana users may consider these as healthier alternatives to tobacco. Clinicians should consider specifically screening for parental use of ecigs & marijuana, as assessing for only tobacco may underrepresent firsthand and secondary family exposures.

Abstract: 200

Parent stress in relation to use of bedside telehealth

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Background Telehealth technologies have become increasingly prevalent in all healthcare settings. Though such innovations hold enormous potential for increasing connectedness, little is known about their impact on parent stress levels in the Neonatal Intensive Care Unit (NICU), where parental depression and anxiety levels are high.

Objective We sought to determine the relationship between use of bedside web cameras and stress levels of parents in the NICU.

Design/Methods A validated survey, the Parental Stress Scale (PSS) NICU was administered to parents of babies admitted to our NICU. Parents were also asked if they used the bedside camera. Stress levels were analyzed according to whether parents used the camera. Univariable association between camera use and 4 scores reflecting sights and sounds, appearance of baby, relationships, and experiences with staff where the scores are the percentage of questions in each scale that were answered as very or extremely stressful were assessed with the Wilcoxon rank sum test.

Results A total of 114 parents completed the PSS NICU while their babies were hospitalized at Day 7-10 of admission. Parents reported high levels of stress associated with being separated from their babies, with their babies appearing to be in pain, and with feeling helpless to protect or help their babies (table 1). Of the 48 parents who reported whether or not they used the bedside camera, 44% (21/48) utilized the bedside camera. Parents who reported using the camera also reported lower levels of stress in three domains assessed by the PSS NICU (table 2) - the sights and sounds of the unit, the appearance of the baby, and their relationship with the infant and parental role. There was no association between use of the bedside camera and levels of reported stress related to a fourth domain - staff behaviors and communication. Parents who used the camera reported significantly less stress related to being separated from their babies then those who did not use the camera, with 22% of parents who used the bedside camera reporting that separation from their baby was very or extremely stressful in comparison to 63% of parents who did not use the camera (p=.005).

Conclusion(s) Bedside web camera interventions may hold potential for reducing parent stress relating to NICU hospitalization. Units may wish to consider inclusion of such interventions in order to increase family-centeredness of care. Our findings suggest a need for further study of this promising technology and its impact on parental depression, anxiety, sleep disturbances, and fatigue.

Abstract: 201

Comparison of Infant Obesity Survey Distribution through Amazon's Mechanical Turk and Traditional Single-Site Survey Distribution

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Background Amazon's Mechanical Turk (MTurk) platform can be used as a survey distribution tool that connects researchers to a nationally representative respondent pool. While some studies have shown that MTurk provides data that is reflective of the current U.S. population, it may be less effective than traditional survey recruitment methods for certain research topics.
Objective To compare the respondent demographics and results of a survey on adult opinions regarding healthy infant bodyweight and "baby fat" (BF) distributed on both MTurk and in a pediatric waiting room (PWR).
Design/Methods A survey was distributed to 100 respondents in a PWR and 100 valid respondents on MTurk (148 total MTurk responses; 48 invalid or "spam" responses eliminated). Respondents were shown randomized arrays of 5 images of male and female infants ranging from underweight to obese (Figure 1) and asked to identify which infant they saw to be the "*healthiest*", "*happiest*", "*best cared for*", and "*least healthy.*" Respondents were also asked questions gauging their opinions on pediatric obesity and BF. 2-sample t-tests and Chi-squared analyses were used to compare the distribution methods.
Results For MTurk responses, 33 states were represented. The proportions of male and female respondents were significantly different between MTurk and the PWR (Female: 55% vs. 70%, respectively; p <0.001) (Table 1). Compared to the PWR, there were more Caucasian respondents on MTurk (79% vs. 43%, p <0.001) and fewer Hispanic respondents (3% vs. 19%, p < 0.001). For MTurk, 69% of respondents had an income below $75,000, while only 23% of PWR respondents were in this income bracket (p <0.001). When asked which infants looked *happiest* and *best cared for*, the respondents on MTurk were more likely to choose larger infant images than those in the PWR (Table 2). MTurk and PWR respondents also had significantly different answers for 4 out of 6 obesity opinion questions (Table 3).
Conclusion(s) The demographics and responses of respondents recruited through MTurk and the PWR were significantly different. While MTurk provided better geographic, income and gender representation than the PWR, it also greatly under-sampled Hispanics, Asians, and Blacks when compared to the PWR and U.S. census demographics (18.1%, 5.8%, 13.4%, respectively) and contained numerous "spam" responses that equated to half the valid sample size. Therefore, researchers should be hesitant when substituting MTurk for more traditional survey distribution methods.

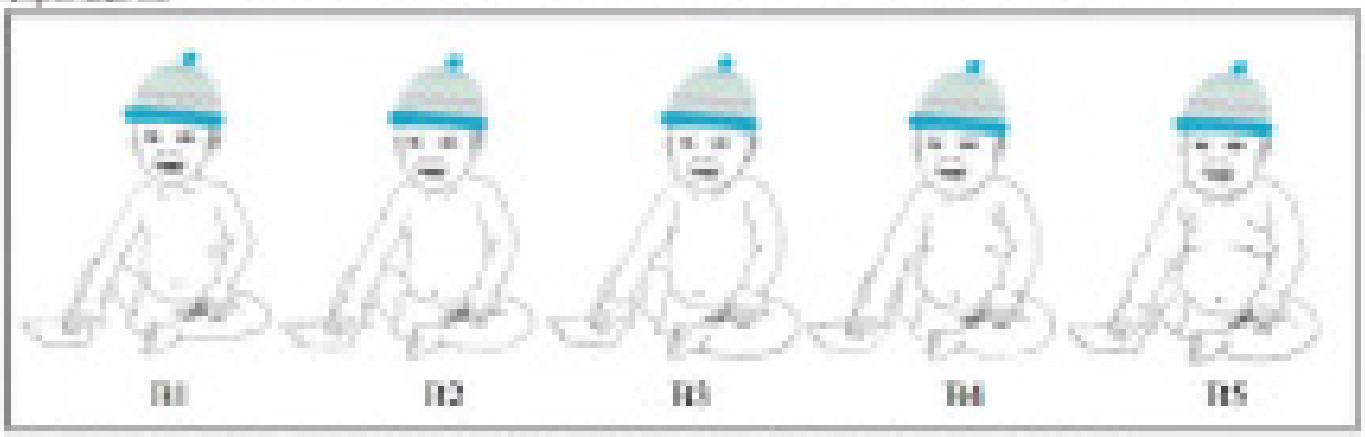

Table 1: Demographic characteristics of survey respondents from MTurk and pediatric waiting room (PWR).

	MTurk (n = 100)	PWR (n = 100)
Gender		
Male	45%	27%
Female	55%	70%
Other	0%	3%
Race		
Caucasian	79%*	43%*
Asian	3%	7%
Black	8%	31%
Hispanic/Latino	3%*	19%*
Mixed	3%	9%
Other	3%	11%
Average Age		
	35.01 years	42.13 years
Income Level		
Less than $20,000	7%	3%
$20,000 - $34,999	13%	3%
$35,000 - $49,999	15%	7%
$50,000 - $74,999	34%	10%
$75,000 - $99,999	16%	7%
$100,000 - $249,000	10%	38%
$250,000 - $499,999	1%	10%
More than $500,000	2%	1%
N/A	2%	21%

* Indicates significance at $p < 0.05$ using Chi-Squared analysis.

Table 2: Comparison of MTurk and pediatric waiting room (PWR) respondents' image selection responses to infant body size questions for male and female infants combined.

	MTurk Mean	PWR Mean	2-sample t-test p-value*
"Which of these boys/girls appears to be healthiest?"	2.98	3.03	0.13
"Which of these boys/girls appears to be happiest?"	3.23	3.00	<0.01**
"Which of these boys/girls appears to be best cared for?"	3.08	2.87	<0.01**
"Which of these boys/girls appears to be most healthy?"	2.16	2.44	0.06

*Infant image responses were numbered from 1 (fit-underweight) to 5 (fit-obese) and two-sample t-tests were performed to compare MTurk and PWR responses.
** Indicates significance at p = 0.05.

Table 3: Comparison of MTurk and pediatric waiting room (PWR) respondents' opinions on "baby fat", infant obesity and childhood obesity.

Question	MTurk Mean	PWR Mean	2-sample t-test p-value*
It is important for babies to have "baby fat".	2.910	2.840	0.13
A baby without "baby fat" is unhealthy.	3.09	3.58	0.035**
The more "baby fat" a baby has, the better cared for the child is.	3.28	2.58	<0.001**
It is possible for babies to have too much "baby fat".	3.28	3.57	<0.001**
It is possible to be overweight and healthy.	4.35	3.88	0.013**
Childhood obesity is a major issue in the US for many children.	5.90	5.86	0.73

*Likert scale responses were numbered from 1 (Strongly Disagree) to 7 (Strongly Agree) and 2-sample t-tests were performed to compare MTurk and PWR responses.
** Indicates significance at p = 0.05.

Abstract: 202

Differences between Mothers' and Fathers' Perception of Infant Weight Status and Opinions Regarding Childhood Obesity

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Background While most studies focus on the role of mothers in infant care, research has shown that fathers' involvement in infant care can significantly aid infant development. A study examining 85 obesity interventions reported that fathers comprised only 6% of parent participants, with even lower representation in infant obesity interventions (Davison et al. 2018). Therefore, it is critical to study and understand both mothers' and fathers' perception of healthy infant body weight to create more effective interventions.

Objective To assess if there are significant differences between mothers' and fathers' opinions regarding healthy infant weight and infant obesity.

Design/Methods Five similar gender-neutral images of a 6-month-old baby were created, differing only with respect to body fat (Figure 1). One set of images was described as "male" and another set as "female"; these images were identical other than hat color (blue vs. pink). Parents in a pediatric waiting room were shown randomized image arrays (Figure 2) and asked to identify which infant they saw to be the "*healthiest*", "*happiest*", "*best cared for*", and "*least healthy*", and also which infants were "*most likely to be able to grow up healthy*". Respondents were also asked questions gauging their opinions regarding infant obesity and "baby fat". Two-sample t-tests were used to compare the responses of males and females.

Results The 100 respondents were 70% female, 27% male, and 3% chose not to respond. For both male and female infants, mothers were significantly more likely to choose the two larger infants (B4,B5) as *healthiest* ($p = 0.023$), *happiest* ($p = 0.012$) and *best cared for* ($p < 0.01$) than fathers (Tables 1, 2). Mothers were also more likely to view the B1 infant as least healthy ($p = 0.044$). Additionally, the average age at which respondents would be concerned about a child being overweight and when to intervene was higher for mothers (7.21 and 7.1 years respectively) than for fathers (5.26 and 5.44 years respectively).

Conclusion(s) Mothers and fathers held significantly different views on healthy infant body weight, with mothers indicating that heavier infants were *healthiest, happiest* and *best cared for*. Mothers also expressed they would be concerned or intervene with an obese child almost two years later than would fathers. Given the small sample size, these results are notable and highlight the need for repeat studies to better understand and include the perspectives of fathers to improve infant obesity interventions.

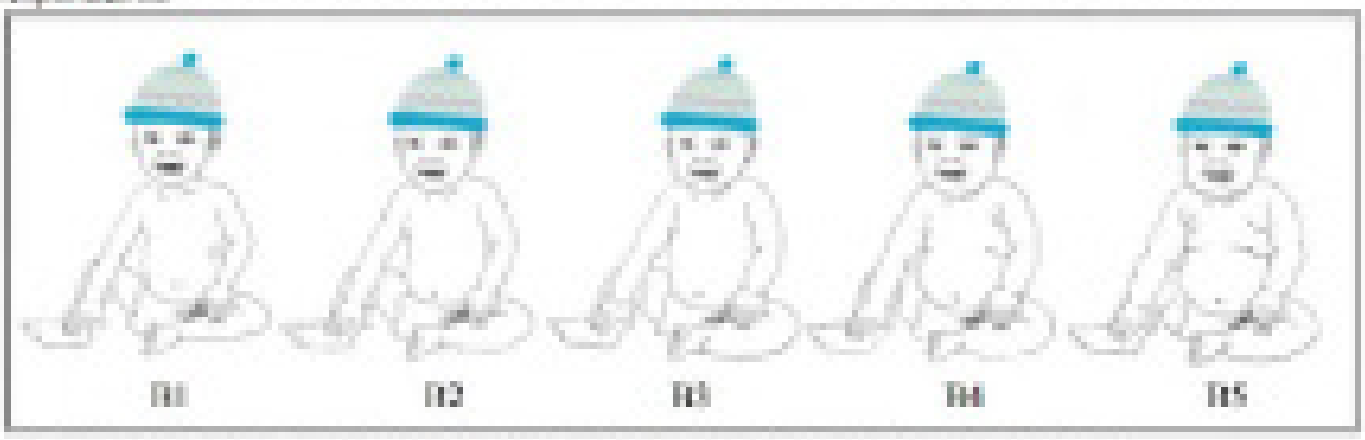
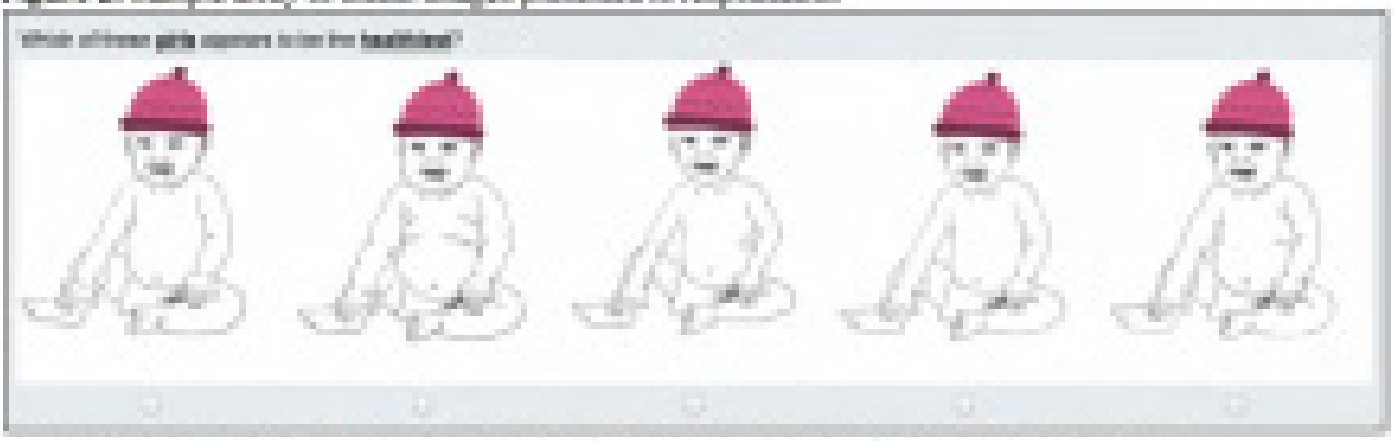


Figure 2: Sample array of infant images presented to respondents.*



*The sequence of images in the array was randomized for each question and for all subjects.

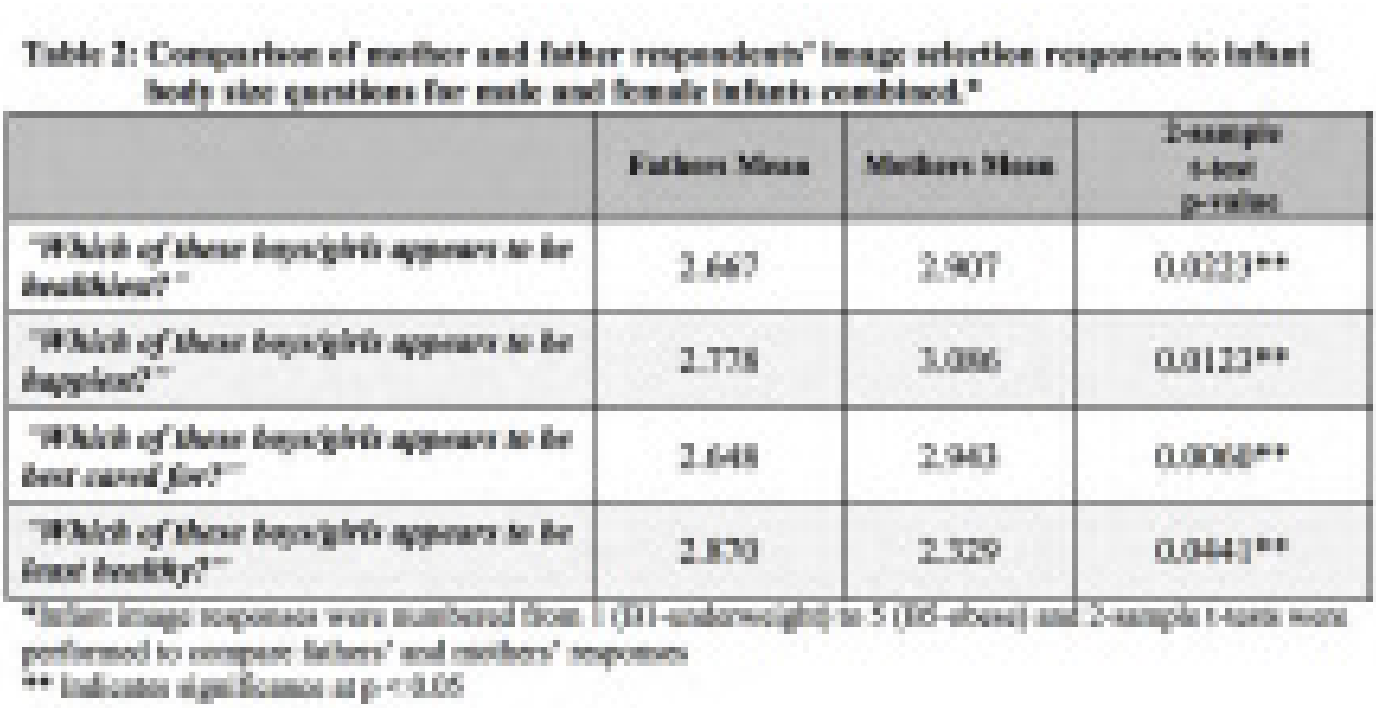


Table 2: Comparison of mother and father respondents' image selection responses to infant body size questions for male and female infants combined.*

	Fathers Mean	Mothers Mean	2-sample t-test p-value
"Which of these boys/girls appears to be healthiest?"	2.667	2.907	0.0233**
"Which of these boys/girls appears to be happiest?"	2.778	3.086	0.0123**
"Which of these boys/girls appears to be most cared for?"	2.648	2.940	0.0068**
"Which of these boys/girls appears to be most healthy?"	2.870	2.329	0.0441**

*Infant image responses were numbered from 1 (01-underweight) to 5 (05-obese) and 2-sample t-tests were performed to compare fathers' and mothers' responses
** Indicates significance at p < 0.05

Abstract: 203
Why are children drinking too much cow's milk? Identifying gaps in caregiver education.
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Background Consumption of more than 24 oz of cow's milk is a risk factor for iron deficiency anemia. There is limited data on the extent to which children overconsume cow's milk (defined as more than 24 oz daily) and what factors are associated with milk overconsumption.
Objective To quantify consumption of cow's milk by 2 – 4 year old children attending urban pediatric practices and explore which sociodemographic factors were associated with overconsumption of cow's milk.
Design/Methods A convenience sample of caregivers of children 2 – 4 years of age attending two general pediatric practices was surveyed. Exclusion criteria were caregiver inability to complete the survey in English or Spanish and child not consuming cow's milk. The 18-item survey included demographic factors, socioeconomic status, caregiver knowledge of nutrition guidelines regarding cow's milk consumption, and beliefs about benefits of cow's milk. Group comparisons were made using the Chi-square test and Fisher's exact test. The study was deemed IRB exempt by the institution.
Results 153 surveys met inclusion criteria. Participants were 31.1% African American, 25.0% white, 8.3% Asian, 16.7% mixed, 15.9% other and 3.0% American Indian or Alaska Native; 47.7% self-identified as Hispanic. 59.1% were Medicaid recipients, 37.3% were WIC recipients, and 22.5% were food insecure as determined by the 2 question Hager food insecurity screen. 80% of WIC beneficiaries knew the cow's milk consumption guidelines, compared to 57.3% of non-WIC caregivers (p= 0.005). In contrast, receipt of Medicaid and food insecurity had no association with this knowledge (p = 0.27 and 0.39, respectively). 49.1% of WIC beneficiaries believed more milk is better for a child's health, compared to 22.8% of non-WIC caregivers (p= 0.001).Caregivers who had this belief were more likely to have children who overconsume milk (p = 0.002). Children overconsumed milk at a similar frequency despite caregiver WIC status (16.4% vs. 12.6% for WIC beneficiaries and non-WIC beneficiaries, respectively; p = 0.53).
Conclusion(s) Despite WIC beneficiaries' superior knowledge of cow's milk consumption guidelines, they were more likely to believe that more milk is better for their children, and their children overconsumed cow's milk to a similar degree as children of non-WIC caregivers. This gap between knowledge and practice presents the opportunity to educate families of potential risks associated with cow's milk overconsumption.

Abstract: 204
Parental Blog Opinions on the Implementation of Gluten Free Diets for Children
Tyler Italiano, David Jimenez, Ruth Milanaik

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Background Gluten is a protein contained in certain grains that causes erosion of the small intestines in Celiac Disease (CD) patients. While physician recommended gluten-free diets (GFDs) are important for those with CD or an Insensitivity/Allergy (I/A), many parents believe elimination of gluten from their children's diets may be effective in managing other conditions including Attention Deficit Hyperactivity Disorder (ADHD) and Autism (ASD). This may, in part, be due to the influence of GFD information on the internet. To date, no study has investigated the reasons and extent to which popular parenting blog sites promote GFDs for children.
Objective To examine parent discussions of GFDs for children as available on publicly accessible online parenting blogs.
Design/Methods Popular parenting blog sites were reviewed for posts containing the keywords "gluten" or "gluten-free." Posts were included if the authors were parents using or considering GFDs for their children. Posts were categorized by the reason for the diet and as favorable, unfavorable, or neutral. They were then assessed for the age of the child and involvement of a physician.
Results Of the 80 posts analyzed, the following reasons were cited: CD (11.25%), I/A (26.25%), ASD (15%), ADHD (2.5%), Behavior (13.75%), Healthier Lifestyle (21.25%), and Other (10%). A majority of posts (56.25%) had a favorable view of GFDs, with neutral and unfavorable accounting for 33.75% and 10% respectively. No posts citing CD as the reason were unfavorable. The reasons for GFDs varied greatly between age groups (Figure 1). The most popular reasons cited by parents for Toddlers and Preschoolers were healthier lifestyle (35%) and behavior (29%) respectively. Posts discussing medically necessary GFDs (CD or I/A) were significantly more likely ($p = 0.002$) to cite the involvement of a physician than posts discussing any other reason for a GFD (Table 1).
Conclusion(s) The American Academy of Pediatrics recommends physician involvement in restrictive diets. Our study showed that less than half of parental posts discussing GFDs were for either CD or I/A. Parents implementing GFDs for other reasons were significantly less likely to do so with physician involvement. Therefore, it is crucial that physicians take the initiative by inquiring as to if parents are implementing any kind of elimination diet to ensure that their child's nutritional requirements are not compromised. Future studies should examine popular use of other elimination diets and their medical relevance.

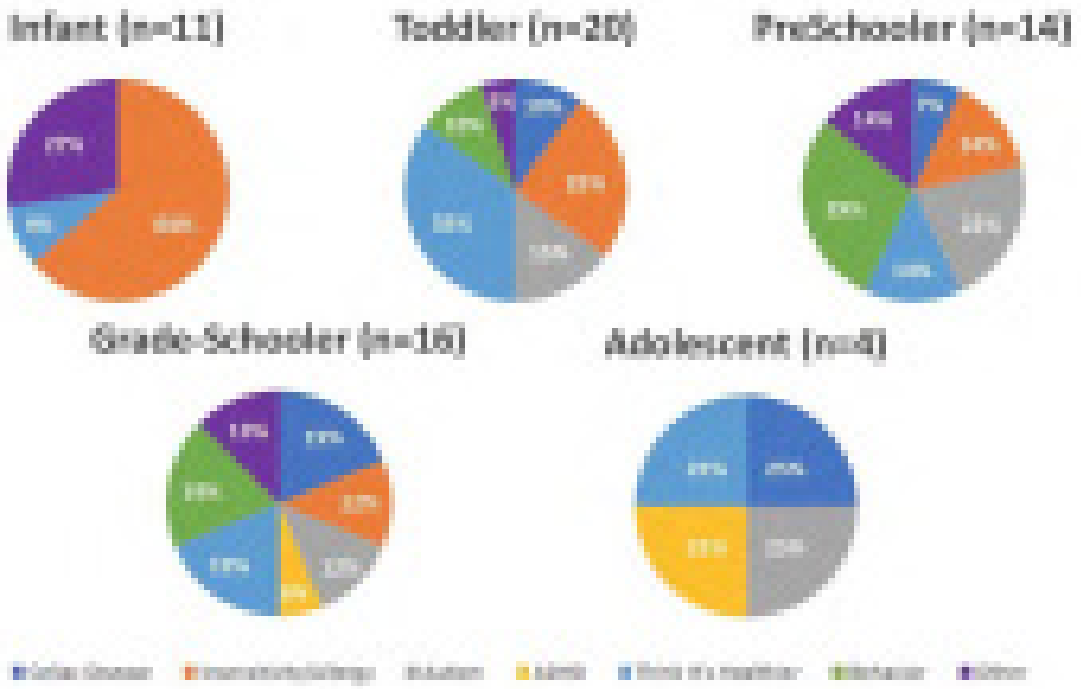
Infant (n=11)
Toddler (n=20)
PreSchooler (n=14)
Grade-Schooler (n=16)
Adolescent (n=4)

Table 1: Physician Involvement in Medically Necessary CEDs and Other Reasons

Category	Cited Physician (%)	Did Not Cite Physician (%)	Chi-square	p-value
Medically Necessary (CED or Rx)	15 (88.2)	17 (56.7)	9.22	0.002
Other Reasons (USB, DWD, Behavior Think It's Healthier, or Other)	3 (11.8)	13 (43.3)		

Abstract: 205

Impact of Caregiver's Perception over Weight Status on Physical Activity of Adolescents

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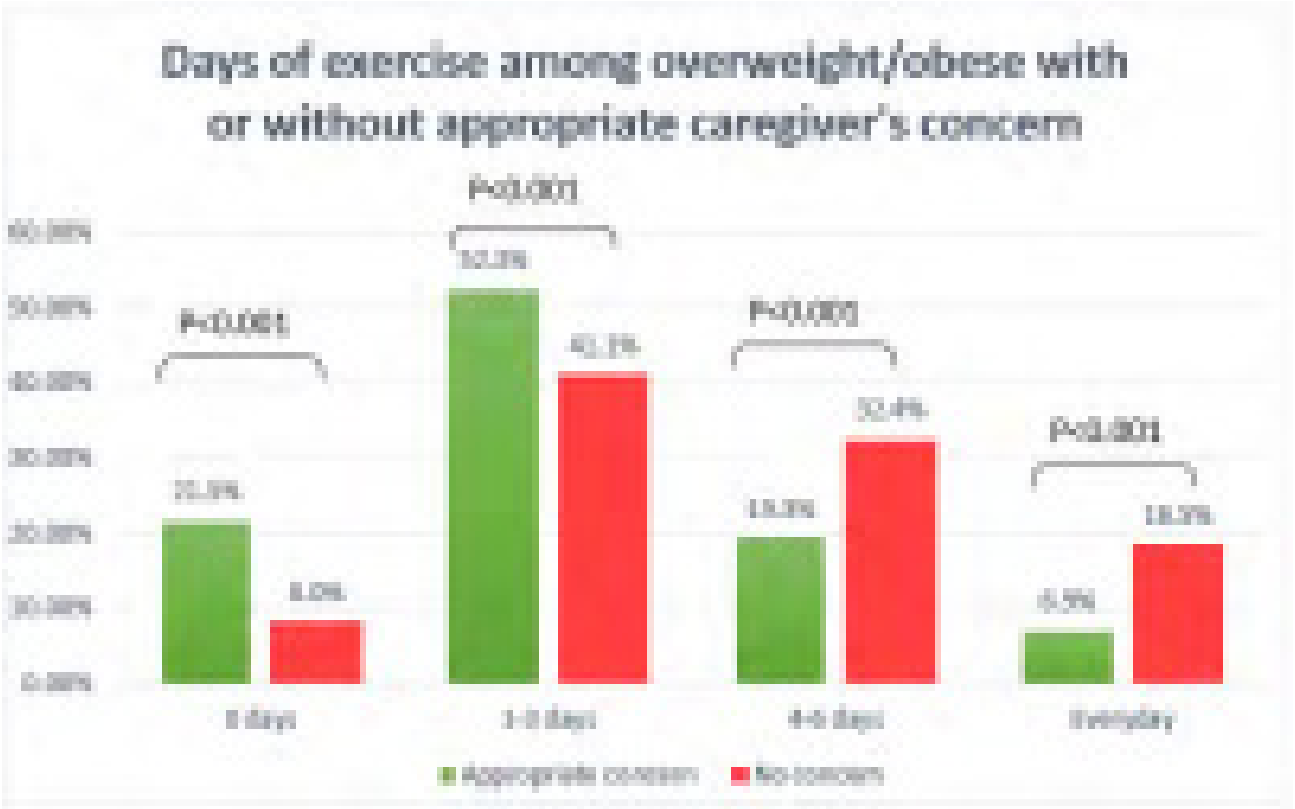
Background Youth with Overweight (OW) and Obesity (O) are at increased risk of serious social and medical problems. Lack of appropriate exercise had been related to OW/O. Youth should exercise at least 1 hour/ day of moderate to intense physical activity (PA) according to the latest guidelines. Parents have a unique influence on the health behaviors of children and their involvement is critical in children activities aiming to reduce OW/O.

Objective To assess the association between caregivers' appropriate concern about their children's OW/O and the amount of appropriate PA in adolescents aged 12-17 years.

Design/Methods A descriptive secondary analysis was done among 6401 number of youth aged 12–17 years who had OW/O from the 2016 National Survey of Children's Health (NSCH) that is a cross-sectional survey of 50,212 children aged 0-17 years focused on the health and wellbeing. NSCH collected parent-reported information on child's height, weight, amount of PA and parental concern about youth's weight. Children were categorized into OW (BMI $\geq 85^{th} \leq 95^{th}$) and O (BMI $\geq 95^{th}$). PA for at least 60 minutes daily was categorized into 0 days, 1-3 days, 4-6 days, and every day. Demographic characteristics and amount of PA in OW/O whose nutritional status (NS) were Correctly Perceived (CP) were compared with those whose NS were Incorrectly Perceived/underestimated (IP) by caregivers, using Chi–squared ($\chi 2$) test for categorical variables, and Student's t-test for continuous variables. A two-tailed level (p-value) was set at 0.05 level for significance.

Results Among 6401 subjects, OW is 53% and O is 47%. Only 37% (2362) were CP. A larger proportion of children reported ≤ 3 days of PA in CP group compared to IP group (73.8% vs 49.1 %, p = <0.01) (table 2). OW/O that were IP were more likely to have appropriate PA than those that were CP (Table 2, 3). Being female, O, having a single mother, having at least 1/27 health conditions or having health conditions affecting PA were more likely to be CP by caregivers (Table 1). Differences were still significant after correcting these variables. Additionally, sub-analysis of exercise days by OW or O groups revealed similar results as well (table 3).

Conclusion(s) While most caregivers of O youth were concerned about their children's weight, most caregivers of OW were not concerned. Adolescents whose caregivers had appropriate concern were less likely to have appropriate PA. Caregivers may be more concerned about youth weight status when the child is less physically active.



Comparison in Amount of Exercise Among Overweight/Obese Children Whose Caregivers Correctly and Incorrectly (Underestimate) Perceived Their Child's Weight (n=6401)

Table 1. Demographic Characteristics of Obese/Overweight Children with Comparison Between Those Whose Caregivers Had Correct Perception and Those with Incorrect Perception/Underestimation of Their Weight (Too High) (n=6401)

Variable	All studied population	Children CP* by caregivers regarding abnormal weight n=2362 (37%)	Children IP** about their weight n=4039 (63%)	p-value
Current Age, Mean (±SD)	13.6 (± 2.3)	13.9 (± 2.3)	13.5 (± 2.3)	0.094
Male Sex, n (%)	3555 (56%)	1133 (48%)	2422 (60%)	<0.001
Race				
Hispanic	860 (13.4%)	326 (13.8%)	534 (13.2%)	0.925
White, non-Hispanic	4333 (67.7%)	1593 (67.4%)	2740 (67.8%)	
Black, non-Hispanic	492 (7.7%)	182 (7.7%)	310 (7.7%)	
Other	716 (11.2%)	261 (11.0%)	455 (11.3%)	
Poverty level				
0-199%	735 (11.5%)	287 (12.2%)	448 (11.1%)	0.535
200-299 %	1166 (18.2%)	437 (18.5%)	729 (18.0%)	
300-399 %	2125 (33.2%)	778 (32.9%)	1347 (33.3%)	
400 or greater %	2375 (37.1%)	860 (36.4%)	1515 (37.5%)	
Highest level of education				
High school	1147 (18%)	419 (18%)	728 (18%)	0.653
More than high school	4981 (78%)	1852(79%)	3129 (78%)	
Primary household language				
English	5959 (94%)	2186 (94%)	3773 (94%)	0.617
Other than English	382 (6%)	145 (6%)	237 (6%)	
Single mother	1117 (18%)	463 (20%)	654 (16%)	<0.001
Having one or more of 27 health conditions ***	3539 (55.3%)	1498 (63%)	2041 (51%)	<0.001
Health condition affecting daily activities consistently or to some extent	1600 (25%)	827 (35%)	773 (20%)	<0.001
Overweight (85th-94th percentile)	3391 (53%)	709 (30%)	2682 (66%)	<0.001
Obese (95th percentile and above)	3010 (47%)	1653 (70%)	1357 (34%)	

***CP = Correctly Perceived, **IP = Incorrectly Perceived ***allergies, arthritis, asthma, blood disorders, brain injury/concussion/head injury, cerebral palsy, cystic fibrosis, diabetes, Down Syndrome, epilepsy or seizure disorder, genetic or inherited condition, heart condition, headaches, Tourette Syndrome, anxiety problems, depression, behavioral and conduct problem, substance abuse disorder, developmental delay, intellectual disability, speech or other language disorder, learning disability, other mental health condition, Autism or Autism Spectrum Disorder, Attention Deficit Disorder or Attention-Deficit/Hyperactivity Disorder (ADD or ADHD), hearing problems, and vision problems.**

Table 2: Comparison in Amount of Exercise Among Overweight/Obese Children Whose Caregivers Correctly and Incorrectly (Underestimate) Perceived Their Child's Weight (n=6401)

Variable	Children CP* by caregivers regarding abnormal weight n=2362 (37%)	Children IP** by caregivers regarding their weight n=4039 (63%)	p-value
0 days	509 (21.5%)	325 (8.0%)	<0.001
1-3 days	1236 (52.3%)	1660 (41.1%)	<0.001
4-6 days	455 (19.3%)	1307 (32.4%)	<0.001
Everyday	162 (6.9%)	747 (18.5%)	<0.001

*** CP = Correctly Perceived, **IP = Incorrectly Perceived**

Table 3: Comparison in Duration of Exercise Among Children Who Receive and Do Not Receive Caregiver's Appropriate Concern on Their Weight, Stratified by BMI Category (n=6401)

Variable	Children who receive appropriate concern n=2362 (37%)	Children who do not receive appropriate concern n= 4039 (63%)	p-value
Overweight (85th-94th%), n=3474 (53%)			
0 day	129 (18.2%)	215 (8.0%)	<0.001
1-3 days	377 (53.2%)	1090 (40.6%)	<0.001
4-6 days	154 (21.7%)	892 (33.3%)	<0.001
Everyday	49 (6.9%)	485 (18.1%)	<0.001
Obese (95th and above), n=3101 (47%)			
0 day	380 (23.0%)	110 (8.1%)	<0.001
1-3 days	859 (52.0%)	570 (42.0%)	<0.001
4-6 days	301 (18.2%)	415 (30.6%)	<0.001
Everyday	113 (6.8%)	262 (19.3%)	<0.001

Abstract: 206

Typecasting Obesity: Depiction of Different Body Types in Live-Action and Cartoon Children's Television Programming

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Background Television (TV) shows often establish unhealthy standards for body image in children and adolescents. Even though children can more easily compare themselves to characters in live-action programs than to characters in cartoons, a lack of body type diversity and stigmatizing depictions of obesity in both forms of television can be especially problematic for a young audience. This social stigma may contribute to discrimination and bias towards overweight individuals, which can lead to low-self esteem, poor mental health, and disordered eating.

Objective To compare the representation and depiction of different body types in live-action and cartoon children's television programs.

Design/Methods 3 episodes each from 48 TV shows broadcasted on PBS, Disney Channel, and Nickelodeon were randomly

selected for analysis. Researchers watched the 3 episodes and recorded all unhealthy and healthy eating incidents for each character that had at least one speaking turn. Researchers then recorded the weight status, race, gender, and character role of each character and analyzed via chi-squared tests. Inter-rater reliability was also established (κ = 0.77).
Results Of the 1193 characters analyzed, 16.93% of all characters were overweight or obese (OW), with 14.48% of live-action characters (LAC) and 18.92% of cartoon characters (CC) identified as OW. Hispanic CC (20.37%) were more often depicted as OW than both White CC (17.45%) and Hispanic LAC (11.90%) (Table 1). Compared to non-OW characters, both OW-CC and LAC were more likely to be portrayed as antagonists or antagonist supporters (p=0.026) and less likely to be portrayed as protagonists or protagonist supporters (p = 0.004). OW-CC were also more often depicted as antagonist supporters (31.58%) and protagonist supporters (15.86%) than were OW-LAC (Table 2). There were no significant differences in eating incidences.
Conclusion(s) Overweight/Obese characters in both cartoons and live-action shows were significantly more likely to be stigmatized as antagonists or antagonist supporters. Additionally, OW-CC were especially more likely to be Hispanic and supporting characters than OW-LAC. These results demonstrate that OW characters on children's programming, especially cartoons, continue to be typecast as negative and supporting characters, which may perpetuate negative stereotypes regarding obese individuals. The American Academy of Pediatrics should work with TV networks to improve the quality of OW representation in both cartoons and live-action shows.

Abstract: 207
A quality improvement initiative to improve breast milk exposure to premature infants: a single center experience within a state-wide collaborative.
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Background Provision of mother's own milk (MOM) is critical to optimizing health outcomes for preterm infants. In 2015, the Neonatal Quality Improvement Collaborative of Massachusetts (NeoQIC) established a 4-year multi-site QI initiative to increase the provision of MOM among very-low-birth-weight (VLBW) infants within Massachusetts. Baystate Children's Hospital (BCH), one of the 8 participating sites, houses a 55-bed Level III NICU located in western Massachusetts.

Objective To increase the provision of any MOM at NICU discharge by ≥ 12% from baseline of all surviving VLBW infants at BCH.

Design/Methods After joining the NeoQIC Human Milk Collaborative, a multidisciplinary BCH Human Milk Task Force was created. Baseline data was collected and key driver diagram was constructed. The first PDSA cycles focused on reducing time to first pump to < 6 hours through collaboration with Labor & Delivery to create an Early Expression Task Force, increased pump availability to all new mothers, and increased nursing and parent education. The next PDSA cycles focused on discussing importance of MOM during prenatal consultations and on improving skin-to-skin (STS) contact through mandatory education of staff and increased parental awareness through education and crib cards.

Results Among 241 surviving VLBW infants born between year 2015 - 2018 with mean gestational age of 28.1 (±2.7) weeks and mean birth weight 1017 (± 294) grams, there were improvements in rates of early milk expression (43% → 82%) and improvements in breast milk prenatal consultation (48% → 93%). However, there was no improvement in our primary outcome of MOM at discharge (rates remained stable at 50-60%). Additionally, there was no improvement in STS contact and there were no changes in our balancing measures of late onset infections, NEC and growth. There were notable racial/ethnic disparities with Hispanic and non-Hispanic Black mothers providing significantly less MOM at discharge compared to non-Hispanic White mothers despite similar initiation rates. Our overall results mirrored those detected for the entire network.

Conclusion(s) As participants in a statewide collaborative, BCH has made notable improvements in discussing MOM during prenatal consultation and in early MOM expression, yet there have been no gains in improving MOM-feeding for VLBW infants at NICU discharge. Our current focus is improving maintenance of supply and addressing racial/ethnic disparities through breastfeeding peer counselors.

Abstract: 208

Early Targeted Neonatal Screening for Congenital CMV – A Quality Improvement (QI) Initiative

Sunil Krishna[1], Sheri L. Nemerofsky[1], Abieyuwa Iyare[1], Mahindra Ramdhanie[2], Michel Nassar[2], Suhas Nafday[1]
[1]Division of Neonatology, Children's Hospital at Montefiore, Bronx, New York, United States, [2]Montefiore Medical Center, Bronx, New York, United States

Background Congenital CMV infection is the leading cause of non-hereditary sensorineural hearing loss and developmental delay in children. Antiviral therapy started in the neonatal period leads to improved hearing and neurological outcomes. In spite of the significant benefits, there are no guidelines for universal CMV screening nationally. Hence an early targeted neonatal CMV screening was initiated in our institution.
Objective The aim of this QI initiative was to improve CMV testing in eligible infants by 25% from the baseline data (23.4%).
Design/Methods A multidisciplinary team monitored our QI cohort born at the Children's Hospital at Montefiore, between January 1, 2018, and December 31, 2018. Process measures were screening of CMV as per our screening algorithm and eligibility criteria (Fig. 1), staff education in daily huddles, education of nurses about proper salivary CMV sample collection/transport for CMV PCR and coordination with audiology team to get a timely list of failed hearing screens. Plan-Do-Study-Act (PDSA) cycles, run charts displaying monthly data in real-time (Fig. 2) and Ishikawa diagrams were used to brainstorm variability and implement process changes. Infants with congenital abnormalities of the ear or genetic conditions leading to hearing loss were excluded. Outcome measures comprised of a goal to improve CMV screening by 25 % from baseline data, collected from a pilot study in 2016. Balancing measures included the possibility of over screening for CMV.
Results Baseline data for CMV screening in eligible infants was 23.4%. As of November 30, 2018, there were 5369 full term and preterm newborns, of which 813 newborns were eligible for screening. Of the eligible cohort, 383 (47.1%) infants received CMV screening. The commonest reason for CMV screening was being small for gestational age (55%) followed by newborns with a failed hearing screen (27%). After multiple PDSA cycles, we were able to improve median CMV screening rates to 78 % (Fig. 2). Four infants had positive screening results for congenital CMV, out of which two of the infants were screened due to a failed hearing test. All four infants received appropriate treatment.
Conclusion(s) Our QI measures were successful in significantly increasing targeted CMV screening for newborns. We conclude that continued efforts at early targeted CMV screening will improve outcomes in this vulnerable population. Further data will provide an impetus for universal newborn CMV screening.

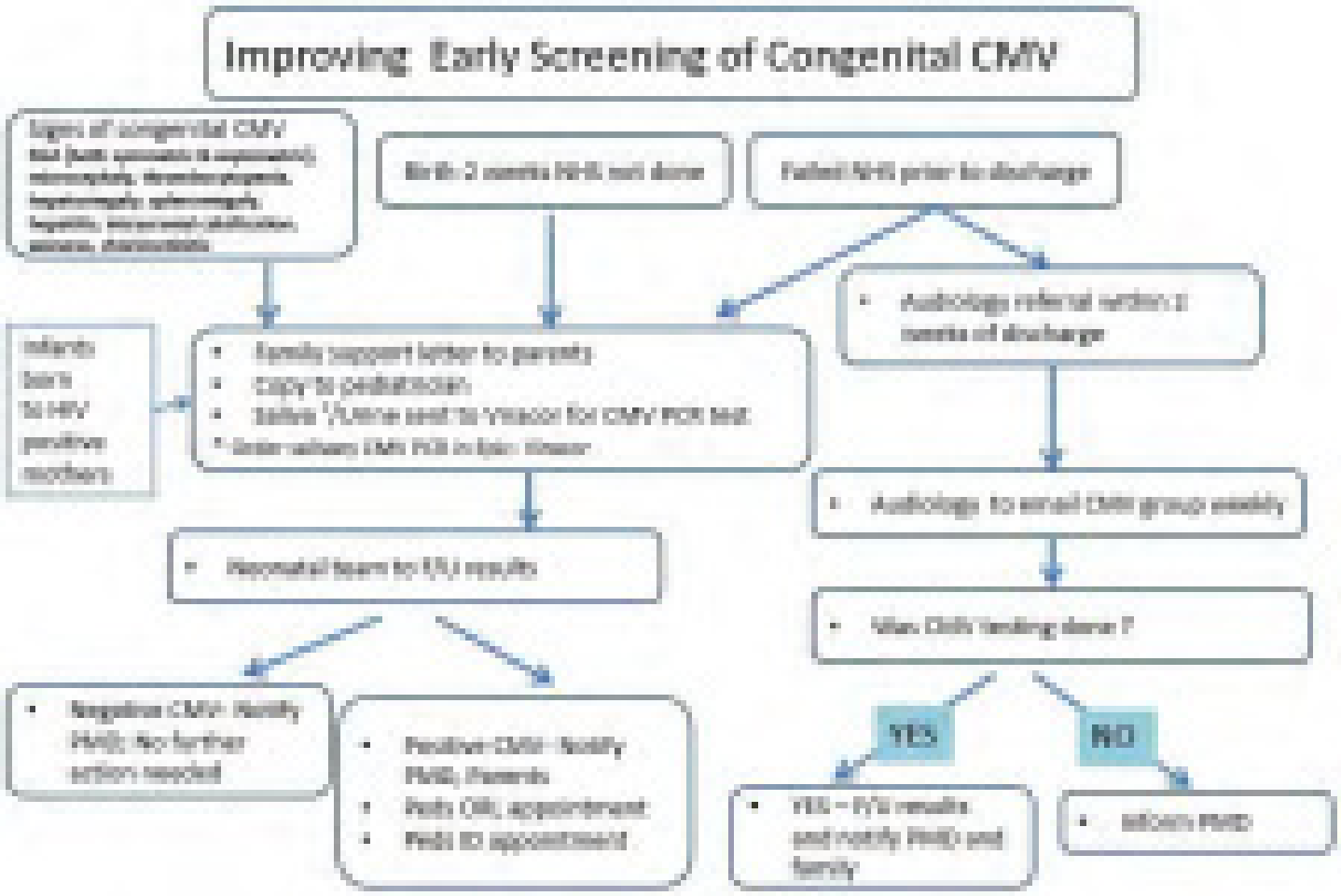
Improving: Early Screening of Congenital CMV
Audiology referral within 2 weeks of discharge
Family support letter to parents
copy to pediatrician
Audiology to email CMV group weekly
Neonatal team to f/u results
YES
NO

Fig. 1

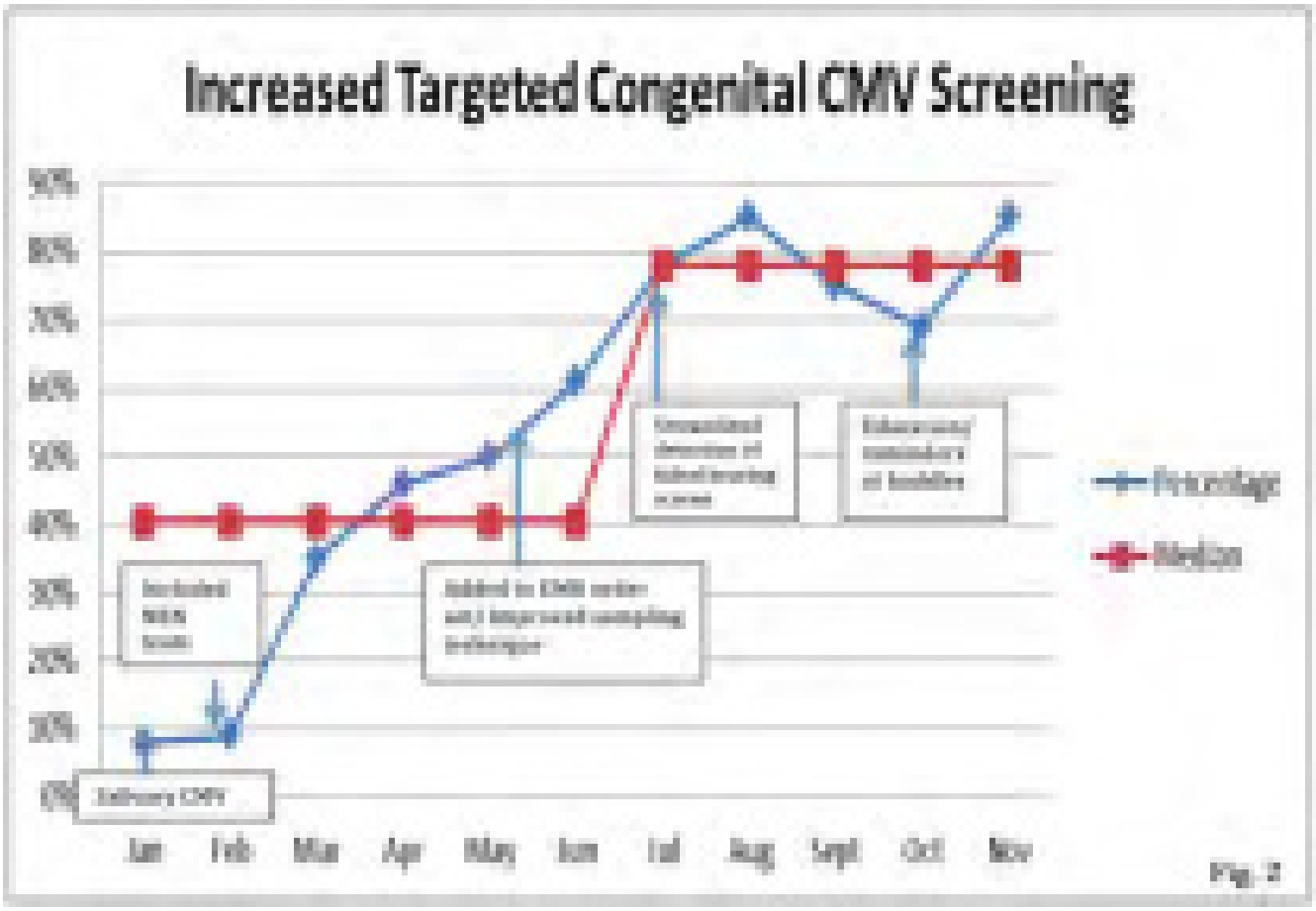

Fig. 2

Abstract: 209

Introduction of a human donor milk program at a tertiary care institution.

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Background Necrotizing enterocolitis (NEC) is associated with preterm births occuring in 11% of infants, born at less than 1500 grams. Of these 30% require surgical treatment, with a mortality rate of ~50%. Studies show that NEC can be decreased with an exclusive human milk diet in this population. Use of an exclusive human milk diet has also shown decreased rates of late-onset sepsis, retinopathy of prematurity, and improved neurodevelopmental outcomes. It is recommended that all preterm infants receive human milk, versus premature infant formula. In this population mother's own milk is often not available, thus the option of pasteurized human donor milk (PHDM) should be considered.

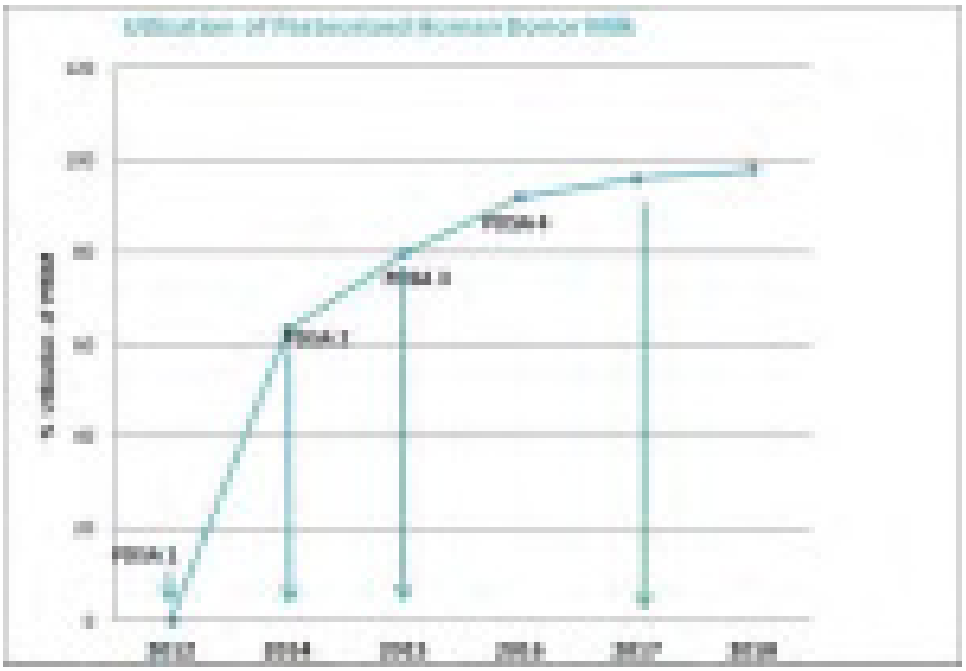
Objective To introduce pasteurized human milk for preterm infants at Bellevue Hospital NICU, an NYC Regional Perinatal Center.

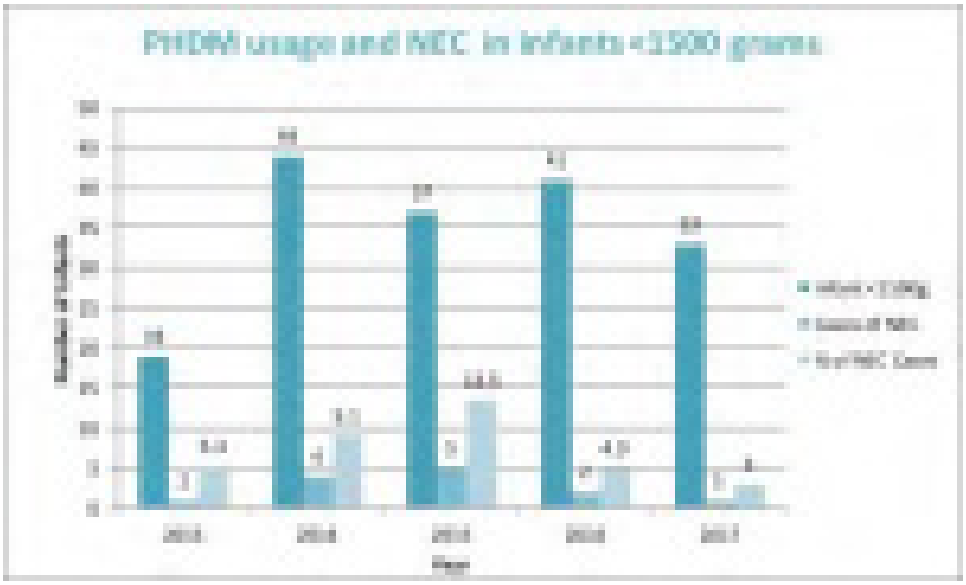
Design/Methods A PDSA cycle was established in 2012 reporting the benifits and safety of using PHDM as an alternative, when mothers own milk is unavailable. Second cycle in 2014 focused on estabilishment of guidlines, staff education and estabilishment of PAR levels. In 2015, the units saw an increase in the births of multiples and preterm infants <1500g, who required appropriate supplementation with and increase in demand for human milk. Staff education and appropriate utilization continues through 2016. Our 4th cycle involved statistical analysis for PHDM and NEC while developing guidelines for the use of PDHM for term and late term infants versus formula.

Results After the initiation of PHDM at Bellevue Hospital in 2015 the use of PHDM amongst inborn preterm infants, increased 30% over the PDSA cycles (Figure 1). There has been increased awareness surrounding PHDM with more parents inquiring

about availability during perinatal consultations. In Low birth weight infants there was a decreased in occurrence of NEC, 13.5% in 2015 to of infants <1500 grams being affected in 2015, to 4.9% and 3% in 2016 and 2017 rspectively, when we had 1 infant with NEC out of 33 infants born at <1500g (Figure 2).

Conclusion(s) Through a series of PDSA cycles at Bellevue Hospital, we became one of the first NYC HHC facility to succesfully implement the use of PHDM, with a corresponding decrease in NEC after implementation. In addition to establishing guidelines for used of PHDM in late preterm and term infants, we plan to evaluate the rates of late onset sepsis, retinopathy of prematurity and neurodevelopmental outcomes in infants who received and exclusive human milk diet versus formula fed.





Abstract: 210

IMPLEMENTING RESPIRATORY SCORE FOR PEDIATRIC ASTHMA ASSESSMENT:A QUALITY IMPROVEMENT INITIATIVE

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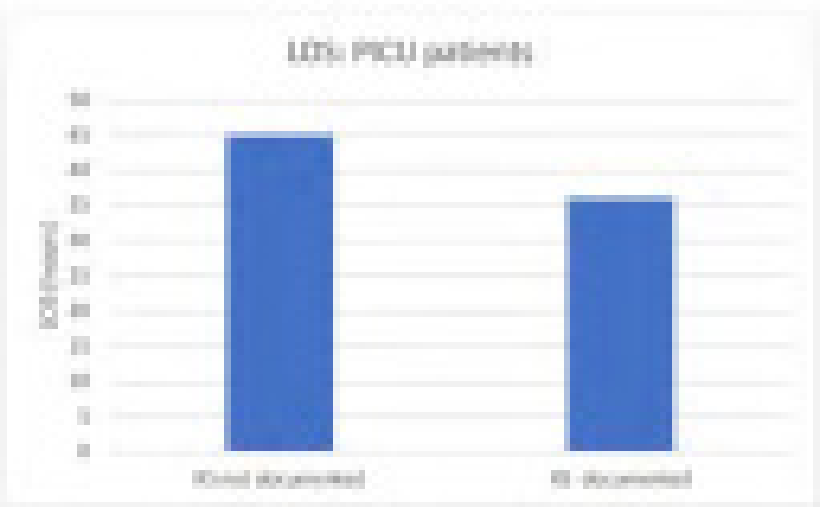
Background Asthma is the most common chronic illness in children.It accounts for 155,000 hospitalizations annually.Respiratory score (RS) is generally used as an objective way to assess severity and measure response to treatment during asthma exacerbations.The use of the RS may optimize patient care, length of stay(LOS) in the ED.It was noted that patients with low asthma scores may be safely managed on non-critical care units with low risk for clinical deterioration.
Objective This study aims to use QI methodology to implement use of RS in a community hospital & to improve assessment of asthma exacerbation & improve communication amongst team members.
Design/Methods The study included children 2-18 years of age with ICD-10 code for asthma.Concurrently, we sought to determine if implementation of the RS would reduce LOS & bronchodilator use.
Groups were assigned based on Seattle Children's Hospital guidelines:mild was defined as RS 1-4,moderate as RS 5-8,severe respiratory compromise as RS 9-12 (Table-1).Patients with asthma exacerbation who met criteria from June 2016 - May 2017 were analyzed.4 PDSA cycles were conducted.
Results 1 year pre-implementation data revealed a baseline of 0% for documentation of RS in patients who were admitted with asthma exacerbation.RS assessment & documentation improved to 55% after 1st cycle and then >80% over the next 3 cycles.During the end of PDSA Cycle 4, a rate of 84% was documented in EMR.(Figure1)
Our secondary goal noted that, patients in groups with RS 4-8 & 9-12 had a significantly longer average LOS in comparison with patients with RS 1-4 ($p<0.002$).In our study, implementation of RS and its use was related to reduced LOS.Implementation of the RS led to decreased LOS by 9 hours in patients who were admitted to the PICU.(Figure2)
Residents were able to correctly use the RS.It was shown that patients scored between RS 1 - 4 had shorter LOS, required less frequent use of nebulized albuterol.Patients who scored 5 - 8 required continuous albuterol, administration of magnesium sulfate with longer hospital stays.Patients who scored 9 -12 needed more intensive care and required PICU admission. Based on this, a patient's admission RS could help residents to predict the level of care required.
Conclusion(s) Implementation of a RS helped in consistency of assessment of a child presenting with asthma exacerbation. QI methodology was effective in improving documentation of the RS. The use of the RS may help safely distribute patients with asthma exacerbation to a lower or higher level of care.

Figure 1: Implementation of respiratory score



Length of Stay- PICU patients

Table 1

	0 point	1 point	2 points	3 points
Respiratory Rate 2 - 3 years 4 - 5 years 6 - 12 years >12 years		< 34 <30 <26 <23	35- 39 31-35 27-30 24-27	>40 >36 >31 >28
Retractions	None	subcostal or intercostal	2 of the following: subcostal, intercostal, substernal or nasal flaring(infant)	3 of the following: subcostal, intercostal, substernal or nasal flaring(infant)
Dyspnea (2-4 yrs)	Normal feeding, vocalization and play	1 of the following: decreased appetite, increased coughing after play, hyperactivity	2 of the following: decreased appetite, increased coughing after play, hyperactivity	3 of the following: decreased appetite, increased coughing after play, hyperactivity
> 4 yrs	Counts > or equal 10 in one breath	Counts to 7-9 in one breath	Counts 4-6 in one breath	Counts to < or equal 3 in one breath
Auscultation	Normal breathing. No wheezing.	End-expiratory wheezing only	Expiratory wheeze only (greater than end-expiratory wheeze)	Inspiratory and expiratory wheeze or diminished breath sounds or both.

Abstract: 211

Reducing Time to Administration of Birth Dose of IV Gentamicin in the Neonatal ICU

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Background Early onset neonatal sepsis is associated with high morbidity and mortality, especially in preterm infants. Delays in administration of antibiotics if bacterial sepsis is confirmed may result in adverse outcomes. Baseline data in our NICU showed that the mean time to administration of the birth dose of IV gentamicin in cases of presumed neonatal sepsis was 113 minutes after order entry, with only 27.5% of neonates receiving it in < 90 minutes.

Objective To increase the mean percentage of neonates receiving the birth dose of IV gentamicin for suspected sepsis within 90 minutes of order entry from baseline of 27.5% (May – August 2018) to > 50% by December 31, 2018.

Design/Methods We established a multidisciplinary team of physicians, nurses, pharmacists, and quality improvement specialists to scrutinize our admission process and identify barriers preventing prompt administration of antibiotics to our neonates. Quality improvement cycles included educating providers to order admission antibiotics "STAT" instead of "routine", streamlining pharmacy workflow patterns for preparing and delivering STAT antibiotics, and encouraging timely establishment of intravenous access to minimize delays in medication administration. The percentage of doses ordered STAT was used as a process measure to study the impact on the proportion of IV gentamicin doses administered within 90 minutes of order entry.
Results We measured percent of instances when the birth dose of IV gentamicin was administered within the designated timeframe during the intervention period (September – December 2018) on a bi-monthly basis. The percentage of neonates with suspected sepsis receiving the birth dose of IV gentamicin within 90 minutes of order entry rose from a baseline average of 27.5% to 59% during the intervention period. This was accompanied by a concomitant increase in percentage of doses ordered STAT from baseline average of 20% to 52% after intervention. Variation in practice resulted from limitations of the provider computerized order entry system to automatically default to STAT for admission antibiotic orders.
Conclusion(s) An in-depth analysis of our admission process, coupled with improvement cycles targeting physician order entry behaviors, pharmacy workflow, and culture supporting timely administration of antibiotics allowed us to significantly improve antibiotic delivery time in neonates with suspected sepsis in our NICU.

Abstract: 212
SAFER Care: Improving Discharge Communication at a Tertiary Care Children's Hospital
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Background 1 in 5 pediatric patients suffer from preventable medical errors or adverse events related to hospital discharge. Current literature lacks definitive evidence on how to effectively standardize and implement discharge processes to reduce risks and improve outcomes in an urban, high-risk pediatric population.
Objective To investigate if a multi-modal quality improvement intervention increases caregiver knowledge of 7 key discharge instructions after discharge from a hospital medicine team.
Design/Methods We used the Model for Improvement and an inter-professional team to develop, implement and test interventions to improve discharge communication at a tertiary care children's hospital. We created the SAFER Care acronym (Fig. 1) to encourage standard, comprehensive discharge communication. Plan-Do-Study-Act cycles included diagnosis-specific electronic medical record "smart phrases", educational initiatives for trainees and nurses, discharge worksheets for families, deliberate practice, data feedback, and SAFER Care signage. We aimed for a convenience sample of 10-15 caregivers/week during the pre-intervention period, and 5 caregivers/week during the post-intervention period. Caregivers were surveyed by phone within 1-4 days of discharge (Fig. 2) to assess effectiveness of interventions. Data were collected from December 2017 to March 2019. Our primary outcome is the percentage of caregivers accurately responding all questions related to discharge care, comparing pre and post intervention periods. Data were plotted on a run chart using Nelson Rules, and interrupted time series analysis (ITSA) was calculated.
Results Pre-intervention data (175 caregivers) show that only 35% of caregivers accurately respond all 7 key discharge questions. Preliminary post-intervention data (185 caregivers) show 60% of caregivers accurately respond all 7 key discharge questions, a statistically significant change of 25% based on Nelson Rules (Figure 3). There was no difference in caregiver response accuracy in patients discharged over the weekend versus weekday (56% vs 55%). ITSA analysis suggests a statistically significant increase in percentage of caregivers accurately responding all discharge care questions by approximately 15% (p=0.03).
Conclusion(s) An inter-professional team successfully devised multi-modal interventions to improve the quality of discharge communication and significantly increased parental knowledge of discharge instructions in a high-risk, low health literacy population.

FIGURE 1. SAFER CARE ACRONYM

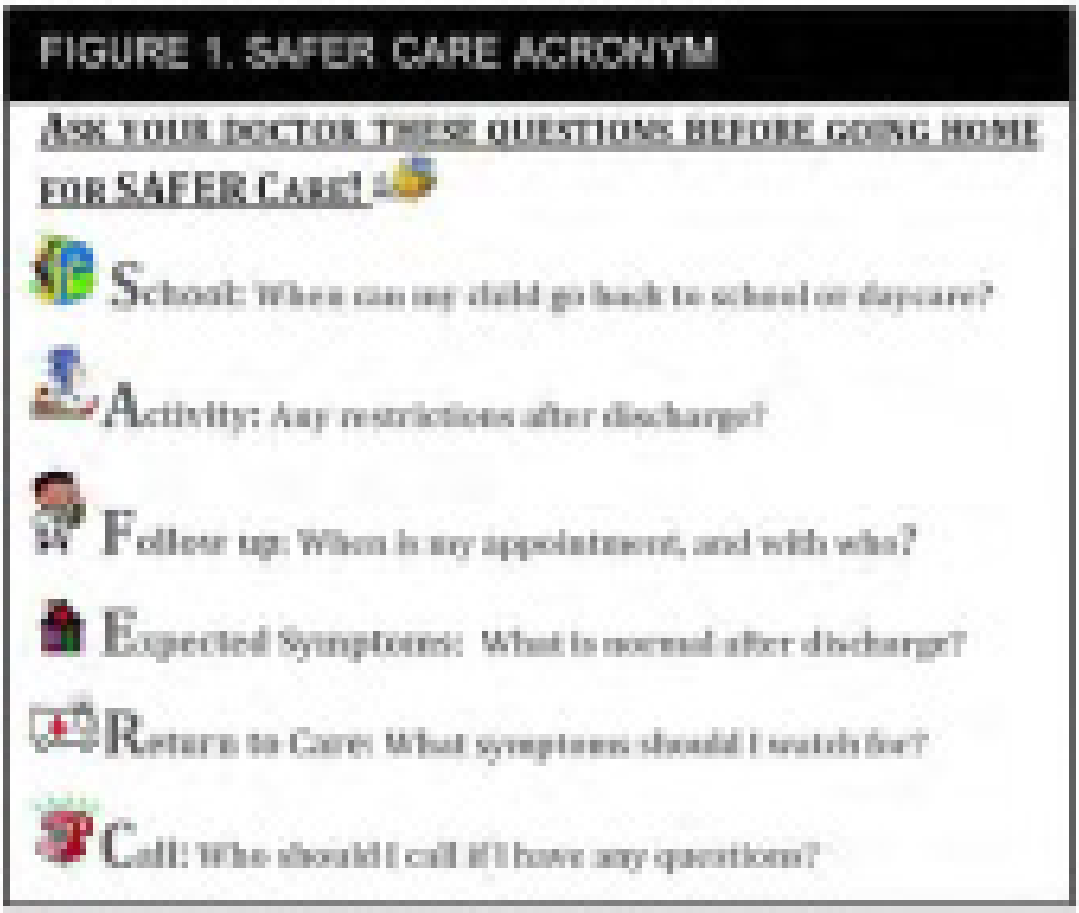
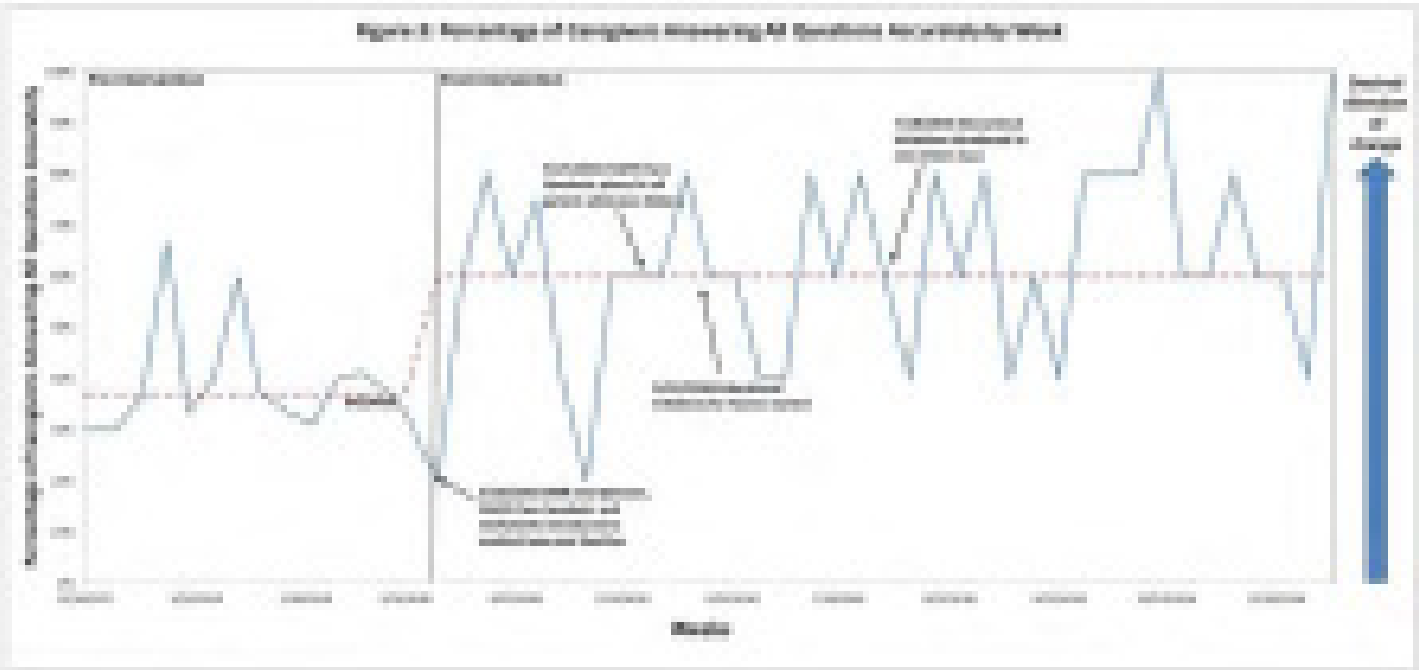


FIGURE 2. SAFER Care Questionnaire

1. What symptoms did your doctor or nurse tell you to look out for that would make you call a health care provider immediately?
2. Who would you call if you have any questions about your child after discharge from the hospital?
3. What is a normal symptom that your child might continue to have after discharge from the hospital? This is something your provider might have told you to expect after going home.
4. When can your child return to school or daycare?
5. Are there any activity restrictions for your child after discharge?
6. Did you have a follow up appointment scheduled for you before discharge from the hospital?
7. When is it, and with what kind of doctor?

Questionnaire administered via phone to caregivers of patients discharged from Pediatric Hospital Medicine team.



Runchart of Percentage of Caregivers Answering all Questions Accurately, by week.

Abstract: 213

Early Childhood Digital Media Use: Inverse Associations with Sleep Time Consistency and Sleep Duration

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Background Erratic or inadequate sleep in early childhood can have negative physical and psychological health consequences. The prevalence of digital media usage (DMU) has precipitated concern about young children's sleep behaviors. The AAP recommends that young children's DMU be limited and supervised by an adult. In 2016, the CDC introduced two items into its National Survey of Children's Health (NSCH) regarding young children's sleeping behaviors: sleep time consistency (STC) and sleep duration (SD). The newly-revised NSCH offers a unique opportunity to assess the impact of DMU on young children' sleep behaviors.

Objective To assess STC and SD as a function of DMU in a large nationally representative sample of 1-5 year old children.

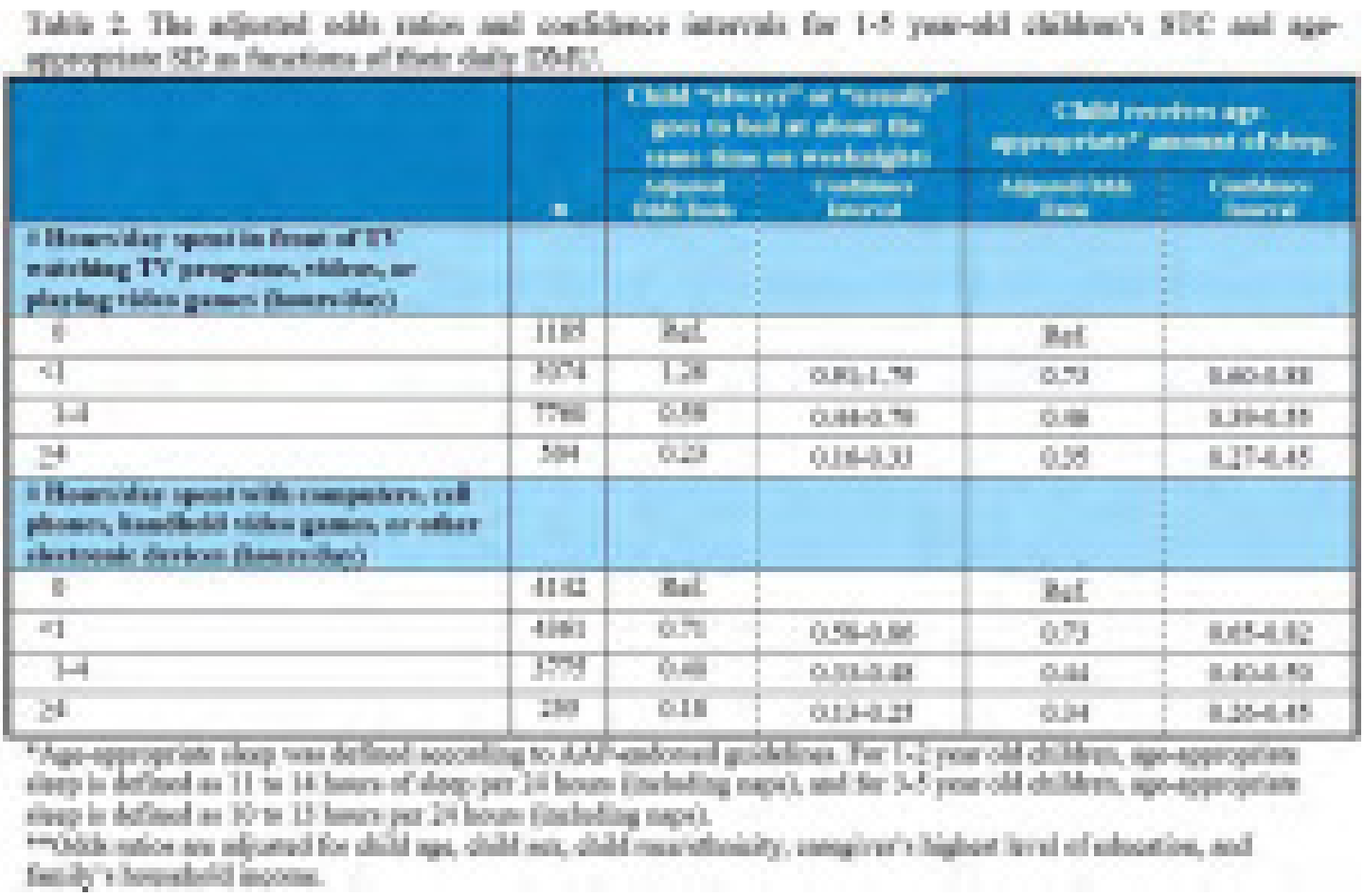
Design/Methods The 2016 NSCH asked 2 questions about daily DMU: about how much time does this child spend watching TV, videos, or playing video games and on electronic devices when not engaging in schoolwork? STC and SD were each assessed by the following item: "*How often does this child go to bed at about the same time on weeknights?*" DMU characteristics of the sample were determined. Adjusted odds ratios and confidence intervals for early childhood STC and SD were then calculated using a logistic regression.

Results The 2016 NSCH included 12,642 children ages 1-5 years of age, and survey results were adjusted and weighted to reflect the demographic composition of the US. 66% of children ages 1-5 exceeded the recommended 1-hour limit on DMU. Table 1 shows the demographic characteristics of the sample for DMU. Table 2 shows the adjusted odds ratios and confidence intervals for STC and SD as a function of DMU. Children who spent ≥1 hour/day viewing either television screens or mobile devices experienced lower odds of STC and adequate SD. Notably, children had a 19% decreased odds of sleeping an age-appropriate amount and a 26% decreased odds of sleeping at a consistent time each weeknight for each additional hour they spent with *any* form of digital media.

Conclusion(s) One or more hours of daily DMU was significantly associated with a lack of consistent sleep time and inadequate sleep duration. Each additional hour of DMU notably decreased the odds of healthy childhood sleeping behaviors. These findings indicate a need for the AAP to revise its current DMU guidelines to clearly reflect that 1-5-year-old children's *composite* screen time be <1 hour/day and for pediatricians to more strongly inform parents of DMU's negative impacts on young children's sleeping patterns and health.

Table 1. Demographic characteristics of children aged 1-5 years in the NHANES sample by weighted percentages of EBRI.

Characteristic	n	Weighted % Digital Media Usage							
		Does not use at least 3 DU watching TV programs, videos, or playing video games/uses a PC				Does not use video equipment, software, handheld video games, or online educational activities/uses a PC			
		0	1-2	3-4	>4	0	1-2	3-4	>4
Age (years)									
1-3	3667	11.5	25.9	57.2	5.4	45.9	28.6	20.3	5.9
4-5	3035	4.4	19.2	70.9	6.5	18.8	33.3	40.2	7.7
Sex									
Female	3540	8.4	22.7	62.2	6.7	34.2	29.4	30.5	5.9
Male	3893	8.9	24.9	62.2	4.0	29.7	32	34.1	4.2
Race/Ethnicity									
Hispanic	3181	5.4	21.9	66.4	5.6	32.1	25.6	36.9	5.6
White non-Hispanic	3827	10.8	24.7	62.4	2.4	28.7	34.8	27	3.8
Black non-Hispanic	893	9.9	29.8	49.2	11.1	40.4	24.7	29.1	5.9
Multi-racial, other non-Hispanic	1775	10	22.4	59.9	7.8	28.7	27.9	37.8	5.6
Caregiver's highest level of education									
Graduated high school or less	3127	8.1	29.8	60.9	9.2	32.8	25.4	37.2	4.7
More education than high school	10952	8.8	23.7	63	4.6	32.8	33.5	32.9	1.9
Household income by poverty levels									
<135%	3324	7.8	29.7	60.9	9.6	35.9	26.8	28.9	8.4
135 % -349%	4099	8	23.8	65.5	4.7	32.6	30.1	34.5	2.8
>=350%	3338	10.5	20.1	58.4	3.1	32.9	40.2	25.7	1.4



Abstract: 214

Digital Media Use versus Non-Digital Family Interaction: Associations with Early Childhood Flourishing

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Background In 2016, the AAP recommended digital media usage (DMU) by young children (YC) be very limited and always with adult supervision. The Centers for Disease Control's National Survey of Children's Health (NSCH) provides an opportunity to evaluate the impact of DMU in a nationally representative sample of YC and contrast it with non-digital family interactions (N-DFI). In 2011, the CDC introduced "flourishing" (FL) as a derived composite measure in its NSCH, and has since revised this measure in the 2016 NSCH.

Objective To assess FL as a function of DMU and N-DFI in a large nationally representative sample of US children 1 to 5 years of age.

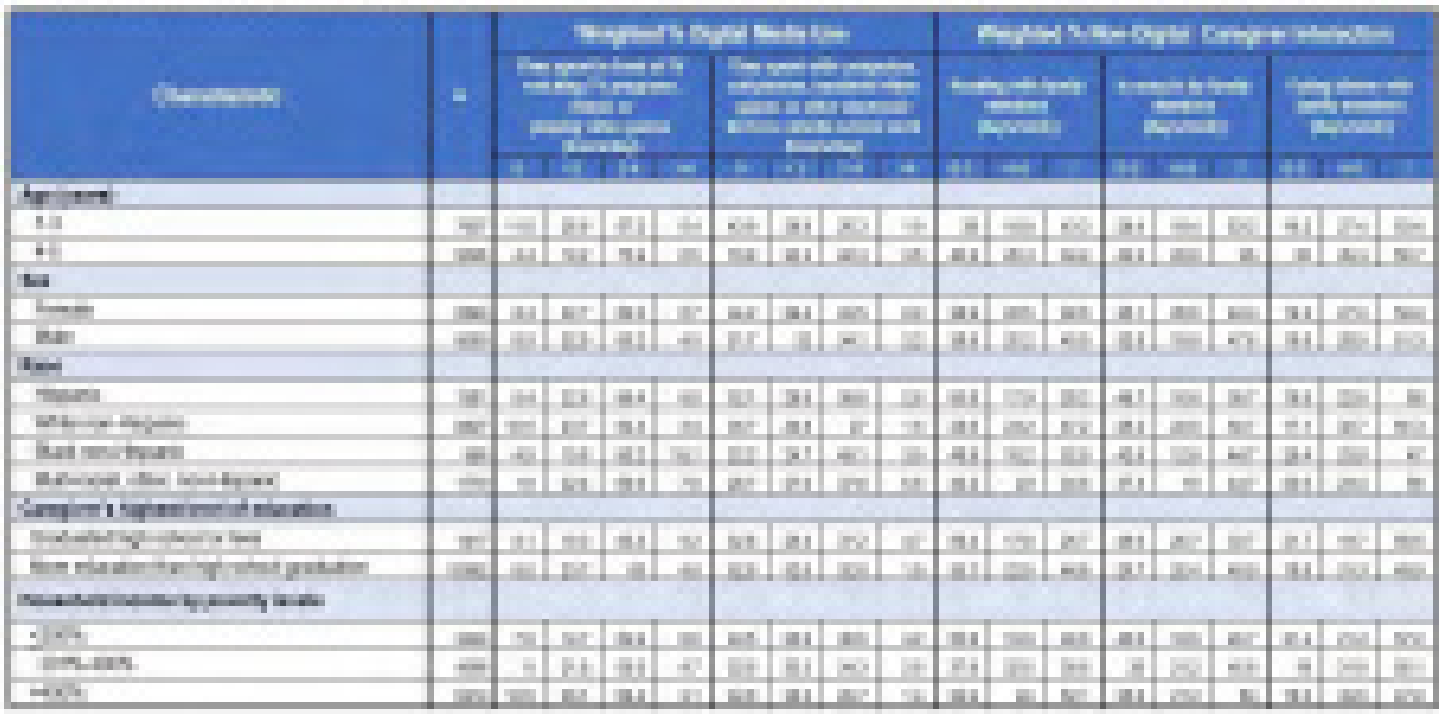
Design/Methods The 2016 NSCH included 2 questions about daily DMU regarding time spent watching TV, videos, or playing video games and time spent on electronics, doing non-school activities. N-DFI was assessed with 3 questions – frequency of family members: eating meals together, reading to child, or telling stories/singing songs to child. Children ≤5 years were identified as FL if caregivers responded "*Definitely True*" to questions about whether the child is affectionate, recovers quickly from setbacks, eager to learn, and smiles/laughs a lot. Demographic correlates of DMU and N-DFI of the sample were determined. Adjusted odds ratios and confidence intervals for early childhood FL were calculated based on children's typical DMU and N-DFI.

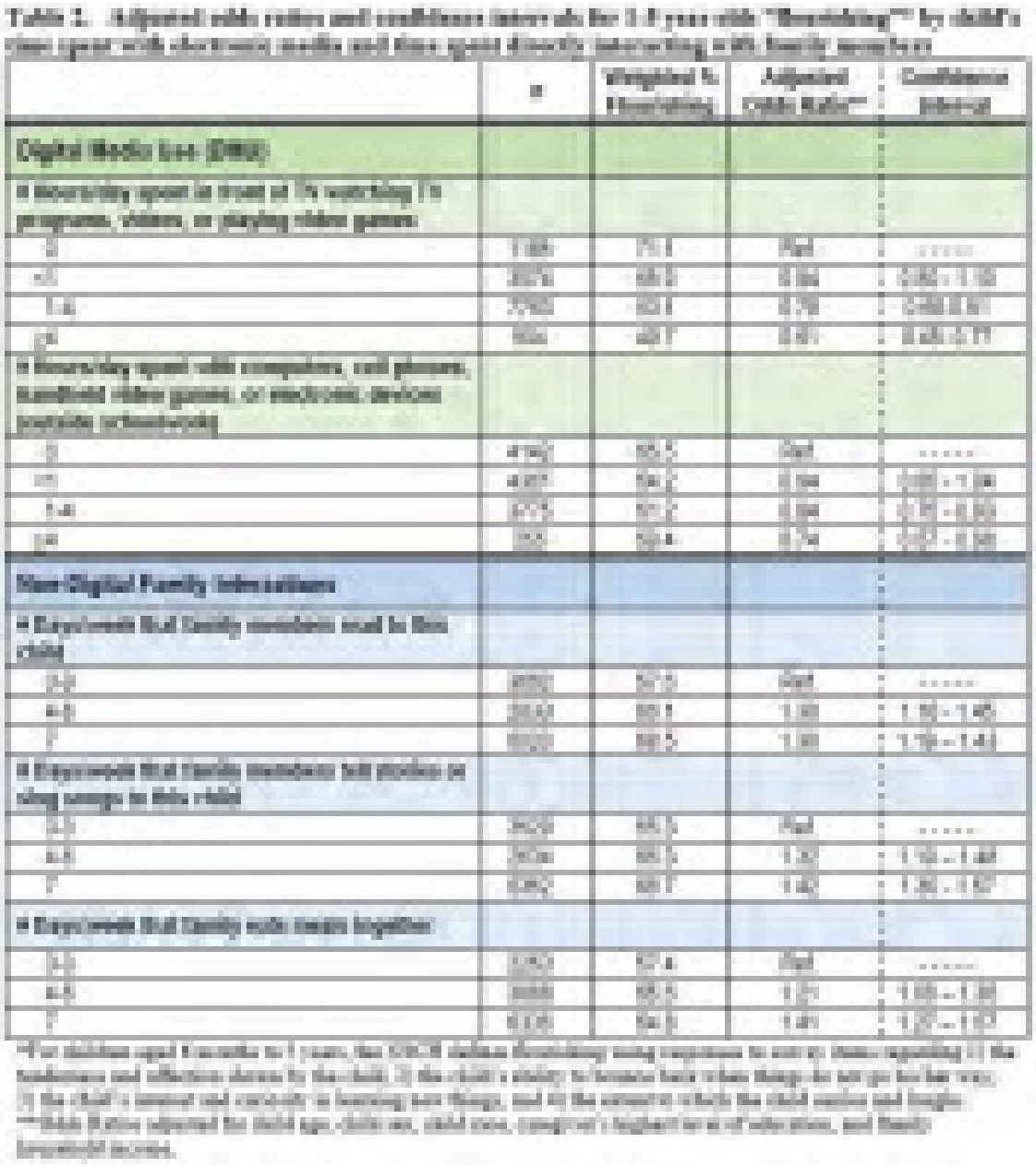
Results The 2016 NSCH included 12,642 children aged 1-5 years. Survey results were adjusted and weighted to reflect US demographic composition. Overall, 66% of children ages 3-5 exceeded the recommended 1-hour DMU limit. Demographic characteristics of the sample for DMU and N-DFI are shown in Table 1. The adjusted odds ratios and confidence intervals for early childhood FL are in shown Table 2. DMU of ≥1 hour/day significantly decreased YC's odds of FL, whereas ≥4 days/week of any form of N-DFI significantly improved their odds of FL. Notably, each additional hour of *any* screen time decreased

children's odds of FL by 8.89%.

Conclusion(s) Among 1-5 year-old children, those with more than 1 hour of daily DMU experienced lower likelihood of CDC-defined FL. Conversely, N-DFI for 4 or more days/week shows positive associations with childhood FL. These findings indicate that the AAP should revise its DMU guidelines to stress the necessity of limiting children's use of any form of electronic media to one hour/day reflect the consequences of multiple forms of electronic media on children's healthy psychological and emotional development.

Table 1. Demographic characteristics of the children aged 1-5 years in the NHCS 2016 sample by the weighted percentages of electronic media usage and by the weighted percentages of direct communication among 1-5 year-old children and direct family communication.





Abstract: 215

Talking Tech: Examining Online Parental Discussions Surrounding Children and Media Usage for AAP Compliance

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Background The American Academy of Pediatrics (AAP) recently updated the recommendations for young children's media use. These recommendations include avoiding screen media other than video-chatting for children under 18 months, co-viewing media with children ages 5 and under, and limiting screen use to 1 hour a day for children ages 2-5. While the AAP is an important resource, research indicates that parents primarily seek information from other sources, including the Internet. Specifically, parents may turn to online parenting blogs, where they can receive informal advice from other caregivers. It is unknown whether the information parents receive on these blog sites is consistent with the AAP's media usage guidelines. Objective To analyze the information regarding children and media usage on publicly accessible parenting blog sites. Design/Methods Popular parenting blog sites were analyzed. The original posts (OP) were identified by searching for technology-related keywords such as "screen time," "media," "television," and "laptop." The OPs were included if the author

discussed technology in the context of children ages 5 and under. The OP and the corresponding comments were then analyzed to determine whether they included anecdotes or recommendations that conflicted with AAP guidelines. A chi-squared test was used to examine the relationship between the comments' overall AAP-compliance and the OPs AAP-compliance.
Results A total of 3,010 posts from 96 separate discussions were analyzed. The majority (68.8%) of the OPs analyzed contained a personal anecdote that conflicted with AAP guidelines and the majority (56.98%) contained a set of comments that were primarily (more than half) inconsistent with AAP guidelines. OPs with information that conflicted with AAP guidelines were significantly more likely to contain a set of comments that conflicted with AAP guidelines (p=.016).
Conclusion(s) The AAP has provided recommendations to guide children's interactions with various forms of media. However, our study indicates that the majority of the advice that parents receive through parenting blogs, a common information source, conflicts with the AAP's recommendations. Thus, it is crucial that pediatricians warn parents about the risks of following recommendations given on informal blog discussions. Additionally, the AAP should consider establishing a stronger internet presence to increase the reach of their evidence-based anticipatory guidance to caregivers who turn to the web for parenting advice.

Abstract: 216
Don't Be Reckless, Take Off The Necklace! Examining Perceptions of Amber Teething Jewelry on Parenting Blogs
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Background Amber teething necklaces and jewelry products are popular but dangerous items that are marketed to parents and caregivers seeking to relieve infant teething pain and reduce inflammation. While both the Food and Drug Administration (FDA) and the American Academy of Pediatrics (AAP) strongly warn against their usage due to the serious risk of injury and death from choking and strangulation posed by these products, teething jewelry may continue to be misused, due in part to the circulation of medically inaccurate information via the internet. To date, no study has investigated the extent to which posts on popular online parenting blogs promote the use of teething jewelry among infants.
Objective To examine perceptions regarding the use of infant amber teething jewelry as discussed on publicly accessible online parenting blogs.
Design/Methods Parenting blogs, identified by a Google search of "parenting blog/forum," were reviewed for posts containing the keywords "amber teething jewelry." Posts were categorized as promoting or opposing teething jewelry usage among infants and were assessed for whether anecdotal or research evidence, if any, was given as justification for their use. Posts were also evaluated on whether they mentioned safety concerns and if they offered any alternative ways to treat teething pain.
Results In total, 100 parenting blogs were examined, 62 of which published posts discussing amber teething jewelry (n_e=62). Of these, 46 promoted infant teething jewelry products with 82% (38) offering anecdotal evidence and 18% (8) providing no evidence to justify their use with infants. No scientific evidence was put forth to support teething jewelry usage. Of blogs promoting amber teething jewelry, 65% (30) did not identify any safety concerns regarding their usage. Overall, 68% (42) offered no alternative methods of addressing infant teething pain.
Conclusion(s) The internet is a major source of parenting advice for many families. Yet, medical information posted online can be inaccurate and potentially unsafe. Despite many blog posts highlighting the purported benefits of amber teething jewelry among infants through anecdotal evidence, there is no scientific support for the therapeutic efficacy of these products. As amber teething jewelry continues to be marketed and sold online, it is essential that clinicians and organizations such as the AAP counter digital misinformation and help families access more reliable sources of parenting advice in order to better protect their children.

Abstract: 217
Assessment of Wellbeing and Physical Activity among Residents
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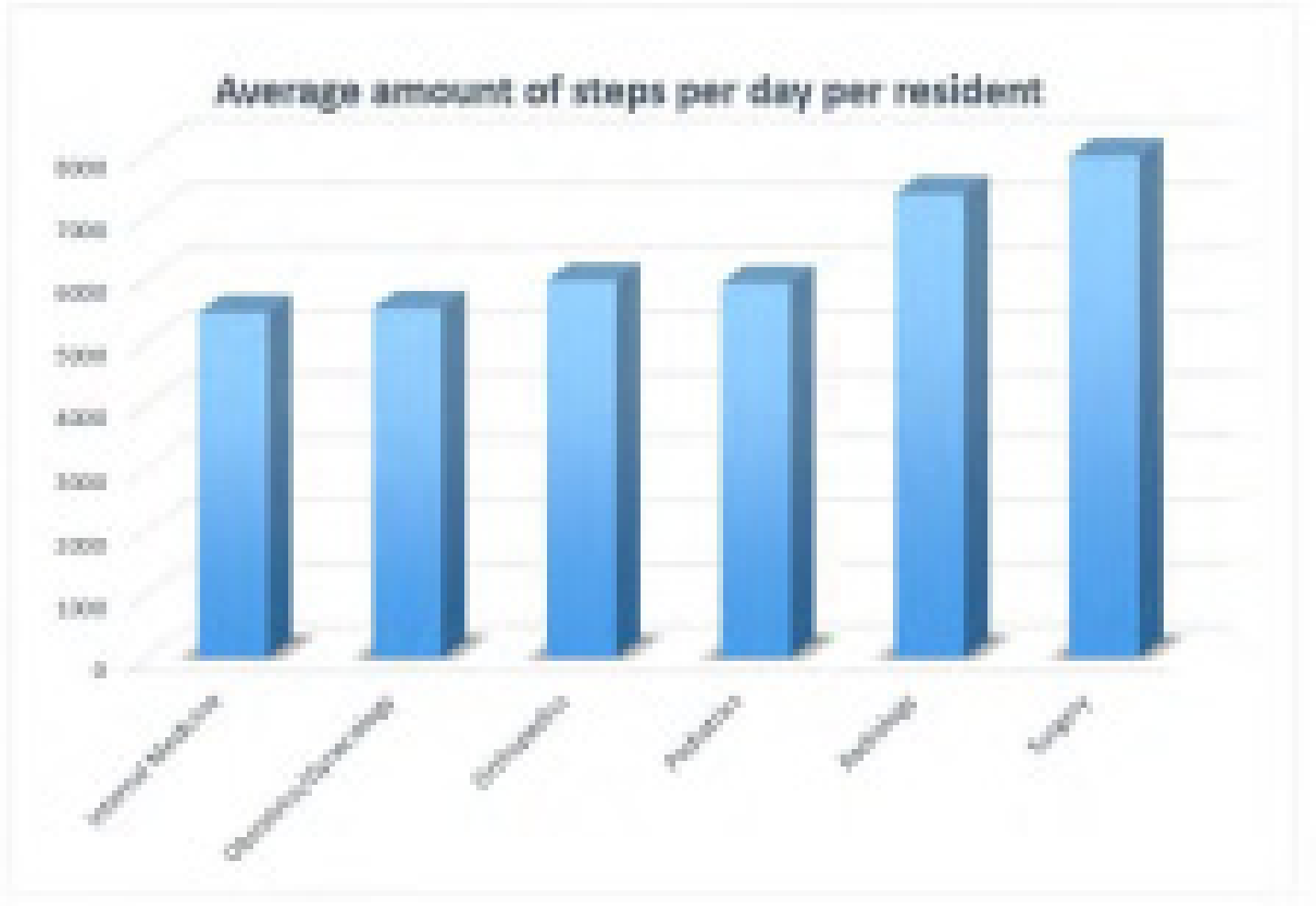
Background Burnout is common among residents, occurring in 40-75% of trainees across multiple disciplines. Studies demonstrate that regular physical activity correlates with improved sense of well-being, increased empathy, decreased burnout and increased career satisfaction. Evidence suggest that the level of physical activity of physicians can be correlated directly with physician counselling patterns
Objective Evaluate if residents are meeting CDC recommendations on physical activity standards for adults. Secondary objectives:assess resident's wellbeing with Physician Well Being Index (PWBI) questionnaire and to examine whether residents' PWBI is associated with their activity level
Design/Methods This prospective observational study was conducted at Monmouth Medical Center and included categorical residents from the following residency programs: Dentistry, Internal Medicine, Obstetrics and Gynecology, Orthopedic

Surgery, Pediatrics, Radiology and Surgery. Residents completed pre-participation questionnaire and PWBI questionnaire. All residents were provided a wearable physical activity tracker. The data was collected over the 3 months period

Results 83 residents participated in the study: 6 from Dentistry, 27 from Internal Medicine, 14 from Obstetrics and Gynecology, 8 from Orthopedic Surgery, 15 from Pediatrics, 4 from Radiology, and 9 from Surgery. Results of pre-participation questionnaire showed that 96% of residents believed that physical activity improves wellness, 77% counsel patients on physical activity, and 59% counsel patients on intensity of physical activity. 28% participants were identified as having risk of burnout using PWBI. Total of 45 residents (54%) uploaded their activity data during the study period. The average amount of steps by month per resident presented on Figure 1. Step counts of residents in Internal Medicine, Pediatrics, Orthopedics, & Obstetrics and Gynecology were similar, and averaged 5817 steps/day. The average amount of steps by residents in Radiology was 7345 steps/day and in Surgery was 7937 steps/day (Figure 2). However, it did not reach statistical significance in comparison with other specialties. There was weak negative correlation between PWBI and physical activity (r =-0.03)

Conclusion(s) Residents among multiple specialties in this study are not achieving CDC recommendations regarding physical activity level. More than a quarter of residents were identified as having risk of burnout using PWBI. Additional interventions designed to improve residents' physical activity and wellbeing should be encouraged



Abstract: 218

Developmental Aids for Premature Infants (DAPI Study): United States Usage

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Background Premature neonates develop in the hospital without the in-utero sensory milieu. Neonatal intensive care units (NICUs) have guidelines to regulate their environment and provide appropriate sensory experiences based on physiology and theory. These recommendations cover a range of sensory/developmental care practices, and vary considerably among NICUs. An understanding of what sensory interventions are provided in NICUs across the United States is helpful in determining what can promote infant development.

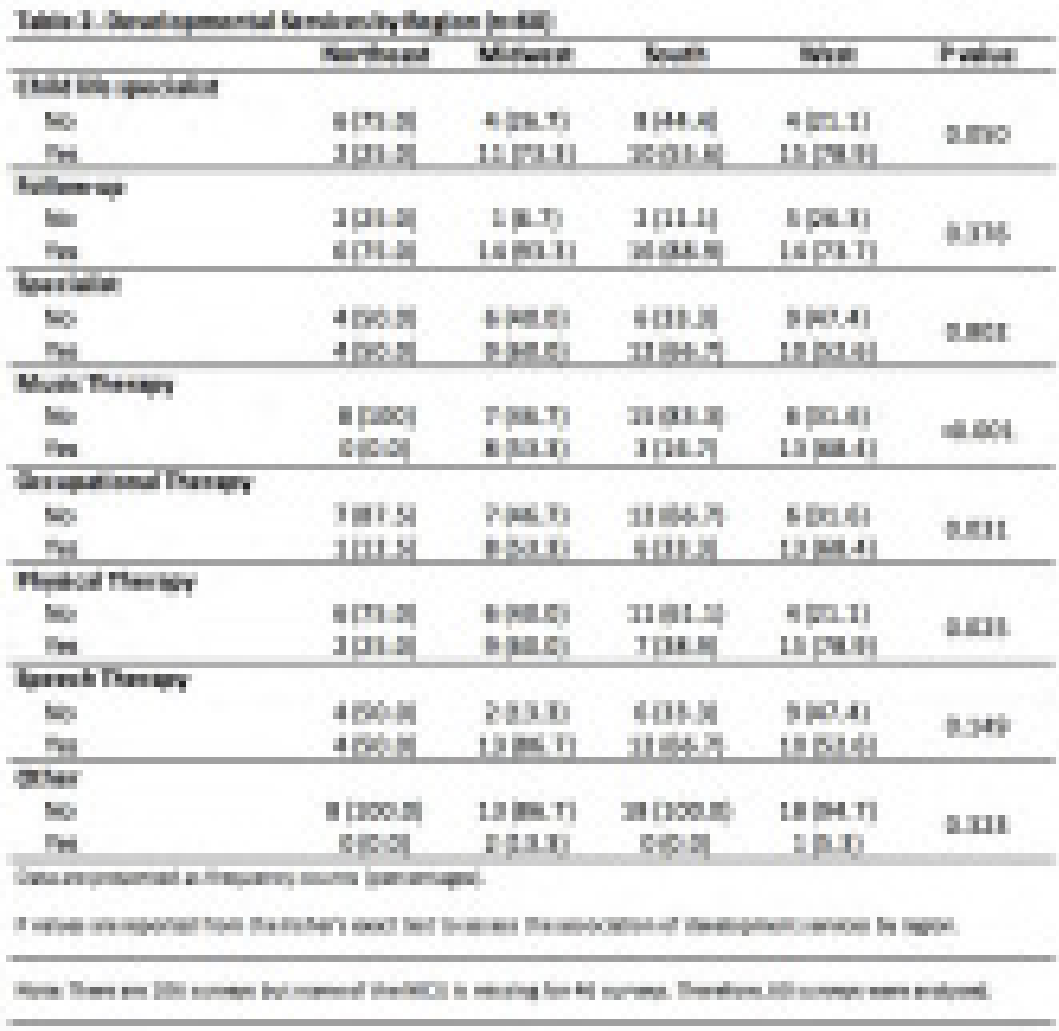
Objective To investigate the types of environmental/sensory aids used with premature infants, and to assess variation of care across the United States (US).

Design/Methods A qualitative cross-sectional survey of NICU providers in the US. Assuming 983 US NICUs, a sample size of 106 was required for a margin of error of 9% with a confidence interval of 95%. The survey asked about interventions in eight major areas of sensory care: tactile, kinesthetic, positioning, vestibular, auditory, olfactory, visual, and mixed exposures.

Results There were 106 responses with the average number of 103 beds/unit (range 6-187). The majority of respondents were neonatal nurses (29%) and nurse practitioners (22%). Most were level III (42%) or IV (57%). All provided specific tactile exposures, positioning, and visual exposures. Exposures to olfactory stimuli was lowest (78%). Level IV units utilized more forms of therapy compared to Level II&III units ($p<0.05$). All (100%) of units utilized kangaroo care. The use of z-flow positioning aids, crocheted octopuses, vibratory devices, maternal voice recordings, sound machines, black & white target

cards, mirrors and mobiles were higher in level IV units. ($p<0.05$). Only dim light use was more frequent in level II&III units. (Table 1). Statistically significant regional differences (n=60) were noted in the types of specialists involved– child life ($p=0.05$), music therapy ($p <0.001$), occupational and physical therapy ($p = 0.031$ and 0.025, respectively), with greater number of services in the west. (Table 2). NICUs most commonly banned swings, noise machines, and plush/stuffed toys.
Conclusion(s) Variation exists in sensory exposures across US NICUs. There is limited evidence-based data regarding the benefits of specific sensory aids. Evidence based use of skin-to-skin contact was 100% across units. However, implementation of other evidenced-based practices (i.e. massage) were not as high. More is needed to investigate how sensory aids are chosen and used, and what benefits they offer premature infants.

Table 1. Summary Statistics for Occupational Exposures by NICU Acuity				
	Level II & III	**Level IV**	**Total**	**P-value**
Tactile Exposures				
Holding				
No	0 (0.0)	3 (1.7)	3 (0.9)	0.09
Yes	46 (100.0)	99 (98.3)	285 (99.1)	
Kangaroo care				
Yes	46 (100.0)	82 (100.0)	128 (100.0)	-
Massage				
No	11 (23.1)	20 (19.8)	31 (20.2)	0.523
Yes	34 (73.9)	81 (80.2)	54 (79.8)	
Kinesthetic Exposures				
Unrestricted Movement				
No	33 (71.7)	44 (73.3)	77 (72.6)	0.99
Yes	13 (28.3)	16 (26.7)	29 (27.4)	
PICU				
No	7 (15.2)	3 (5.0)	10 (9.4)	0.008
Yes	39 (84.8)	57 (95.0)	96 (90.6)	
Movement Facilitation				
No	31 (67.4)	37 (61.7)	68 (64.2)	0.683
Yes	15 (32.6)	23 (38.3)	38 (35.8)	
Equipment for Positioning				
Elbow				
No	13 (47.8)	5 (15.8)	31 (29.2)	<0.001
Yes	24 (52.2)	51 (85.0)	75 (70.8)	
Gel Pillow				
No	21 (45.7)	30 (50.0)	51 (48.1)	0.698
Yes	25 (54.3)	30 (50.0)	55 (51.9)	
Sandy Bumper				
No	21 (45.7)	37 (61.7)	58 (54.7)	0.128
Yes	25 (54.3)	23 (38.3)	48 (45.3)	
Crocheted Octopus				
No	41 (89.1)	43 (71.7)	84 (79.2)	0.033
Yes	5 (10.9)	17 (28.3)	22 (20.8)	
Vestibular Exposures				
Rocking Hammock				
No	11 (23.9)	18 (30.0)	30 (28.3)	0.828
Yes	34 (73.9)	41 (70.0)	76 (71.7)	
Infant Swings				
No	30 (65.2)	29 (48.3)	59 (55.7)	0.173
Yes	16 (34.8)	31 (51.7)	47 (44.3)	
Vibratory Devices				
No	41 (89.1)	40 (66.7)	81 (76.4)	0.981
Yes	5 (10.9)	20 (33.3)	25 (23.6)	
Auditory Exposures				
Music				
No	18 (39.1)	13 (21.7)	31 (29.2)	0.056
Yes	28 (60.9)	47 (78.3)	75 (70.8)	



Abstract: 219

Association of Provider Guideline Adherence and Care Factors with Decreased Pharmacotherapy for Neonatal Opioid Withdrawal Syndrome (NOWS)

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Background Rising opioid abuse in the U.S. has resulted in an increased incidence of neonatal opioid withdrawal syndrome (NOWS). NOWS is characterized by hyperactivity of the CNS, GI, respiratory, and autonomic nervous system with wide variability in the incidence and need for pharmacotherapy intervention. Current NOWS guidelines for care involve use of non-pharmacotherapy and the Finnegan score to determine timing for initiation and weaning of pharmacotherapy. At Children's Hospital of Richmond several quality improvements in NOWS included: standardized provider guidelines in NICU and NBN, Finnegan score nursing training for objective competency, single room NICU and NBN rooming in, human milk feeding, skin to skin care and "Cuddler" Program for NOWS infants. The aim of this quality initiative was to determine provider adherence to NOWS guidelines for care including adherence to use of non-pharmacological interventions and medication initiation and weaning protocol.

Objective To determine provider adherence to NOWS treatment guidelines and its association with decreased pharmacotherapy need and length of hospitalization (LOS). We hypothesized that adherence to guidelines would be associated with decreased pharmacotherapy need and LOS.

Design/Methods A retrospective chart review of NOWS infants >34 weeks gestation admitted to CHOR from 1/1/ 2017-12/31/2018 was used to determine clinical therapy and outcomes, Finnegan scores, maternal history, non-pharmacologic therapy and parent visitation.

Results A total of 76 NOWS infants (50 in NBN and 26 in NICU), were identified of which 20 (26.3%) received methadone treatment. The average LOS for those receiving methadone was 24 ±9 days compared with 7 ±5 days for those who did not. There was no difference in provider adherence to NOWS guidelines regarding treatment initiation and patient discharge, Table 1. Non-pharmacologic care that included swaddling, holding, environmental control and non-nutritive sucking was documented in 100% of NICU infants. Parent visitation ≥ 50% of the length of hospitalization was independently associated in decreasing pharmacotherapy and LOS from 16 ±12 days to 9 ±8 days, p<0.005.

Conclusion(s) There was no difference in NOWS guideline adherence at all NOWS care sites. Family visitation was associated with reduced pharmacotherapy and LOS. Further evaluations are needed to investigate specific family infant interactions during visitation to identify factors associated with NOWS therapy reductions and LOS.

Table 1	NICU (N=26)	NBN (N=50)	Total (N=76)
Received Methadone RX- N(%)	9 (35%)	11 (22%)	20 (26%)
Length of Methadone RX - Days ±SD	18 ±11	18 ±9	18 ±10
Avg LOS w/ RX - Days ±SD [range]	25 ±9 [14,44]	24 ±8 [12,39]	24 ±9 [12,44]
Appropriate start of RX N(%)	7 (78%)	10 (91%)	17 (85%)
Appropriate discharge N(%)	8 (89%)	10 (91%)	18 (90%)

Abstract: 220

A Comparison of Eat Sleep Console to Finnegan score in Neonatal Opioid Withdrawal Syndrome (NOWS)

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Background Rising opioid abuse in the U.S. has resulted in increased rates of neonatal opioid withdrawal syndrome (NOWS) incidence as a consequence of fetal exposure. NOWS is characterized by hyperactivity of the CNS, GI system, respiratory system and autonomic nervous system. There is variability in the incidence and treatment of NOWS across medical centers with some centers identifying up to 50-80% of opioid-exposed neonates requiring pharmacotherapy intervention. Up to 6 diagnostic scores have been published from 1975-2009 with the Finnegan Score system being the most widely used across US, including our institution. A more recent tool, the Eat, Sleep, Console Score System (ESC) based on neonatal physiologic functions has been associated with reductions in both length of stay, and decreased use of pharmacotherapy.
Objective To identify NOWS treatment need with the Finnegan Score as compared to the Eat, Sleep, Console Score as an opportunity to decrease NOWS length of hospitalization. We hypothesized that use of the ESC tool would be associated with decreased pharmacologic treatment need and improved outcomes for infants with NOWS, as measured by decreased length of stay.
Design/Methods We performed a retrospective chart review of infants >34 weeks gestation who received NOWS scoring in the year of 2017. Finnegan scores were collected and assigned Eat, Sleep, Console score was applied for each infant based on clinical criteria.
Results A total of 76 infants (50 in NBN and 26 in NICU), included of which 20 (26.3%) received methadone treatment. Non-pharmacologic care important to decrease pharmacologic treatment, included swaddling, holding, environmental control and non-nutritive sucking and was documented in infants. There was disagreement between ESC and the Finnegan score tools among 25/76 (32.9%) of cases in which current ESC assignment recommending therapy in 20/25 (80%) while the Finnegan recommended therapy in 5/25 (5%).
Conclusion(s) There is significant variability in the assignment of ESC and Finnegan Score Tools based on infant physiologic responses with NOWS, with ESC scores associated with identification of a greater number of infants in need of therapeutic intervention than the Finnegan Score tool. Initiation of the ESC score tool requires provider/staff education and competency in score evaluation and assignment to avoid potential over treatment of infants with NOWS symptomatology.

Abstract: 221
Association between Thrombocytopenia and Retinopathy of prematurity
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Background Retinopathy of prematurity (ROP) remains an important cause of childhood blindness despite significant advances in the neonatal treatment of premature infants. Few retrospective studies have showed an association between thrombocytopenia and type 1 ROP.
Objective To determine whether there is an association between the presence of thrombocytopenia and ROP in preterm infants born < 32 weeks gestational age (GA).
Design/Methods Retrospective case control study of preterm infants born < 32 weeks GA from January 2014 to October 2018 at Brookdale Hospital in Brooklyn, NY. Study population consisted of two groups: infants with any stage ROP as cases and infants with no ROP as controls. ROP was classified as Type 1 and Type 2. (See table 1). Thrombocytopenia was defined as a serum platelet level of <150,000/mL. Platelet counts of cases and controls were retrieved on a weekly basis from birth through postmenstrual age (PMA), and compared at different time periods from PMA weeks 24-27, PMA weeks 28-31, PMA weeks 32-35 and PMA weeks 36-39 time periods. Cases were matched with 34 controls (1:1 ratio) with gestational age of ± 2 weeks and birth weight of ± 200 gm being the matching criteria. Data was analyzed using SPSS (Statistical Package for Social Sciences) software. Mean (±standard deviation) or frequencies were used for descriptive statistics. Comparison between ROP and control groups was done using Chi–squared ($\chi 2$) test or Fisher's Exact Test for categorical variables, and Student's t-test for continuous variables.
Results There were 148 infants of < 32 weeks admitted during the study period. After exclusion criteria, ROP was seen in 34 infants (23%) (figure 1). Demographic and clinical characteristics with comparison between cases and control groups are shown in Table 2. Infants with ROP had significantly lower gestational age (26.9 ± 1.8 weeks) versus (28.2 ±1.5 weeks) in non ROP group, ($p < 0.001$). There was no significant difference between the two groups in sepsis incidence ($p = 0.79$), occurrence of necrotizing enterocolitis ($p = 0.74$) and use of caffeine; ($p > 0.05$). Proportions of infants with thrombocytopenia at different PMA are shown in figure 2. Incidence of thrombocytopenia in infants with ROP was significantly higher compared to controls at PMA 24-27 weeks (69% vs. 25%, respectively; $p= 0.042$).
Conclusion(s) Thrombocytopenia at PMA 24-27 weeks was associated with development of ROP. Thrombocytopenia later than 27 weeks PMA did not show association in our study and would require a larger sample size to delineate the relation.

TABLE:

ROP Classification

Type 1 ROP	Type 2 ROP
Zone 1 ROP with plus disease	Zone 1, Stage 1 or 2 ROP without plus disease
Zone 1, Stage 3 ROP without plus disease	Zone 2, Stage 3 ROP without plus disease
Zone 2, Stage 2 or 3 ROP with plus disease	

Reference: International Committee for the Classification of Retinopathy of Prematurity. The International Classification of ROP revisited. Arch Ophthalmol 2005; 123:991.

Table 1

Table 2: Demographic and clinical characteristics between ROP and control groups (N=68)

Characteristic	With ROP (n=34; 50%)	Without ROP (n=34; 50%)	*p*-value
GA, mean±SD	26.9 ± 1.8	28.2 ± 1.5	<0.001
Birth weight (g), mean±SD	985 ±221	1044±258	<0.001
NEC, n (%)	5 (15%)	6 (18%)	0.742
Sepsis, n (%)	22 (65%)	23 (68%)	0.795
Caffeine used, n (%)	31(91)	31(94)	1.000

Abbreviations: ROP = retinopathy of prematurity, SD = standard deviation, GA = gestational age

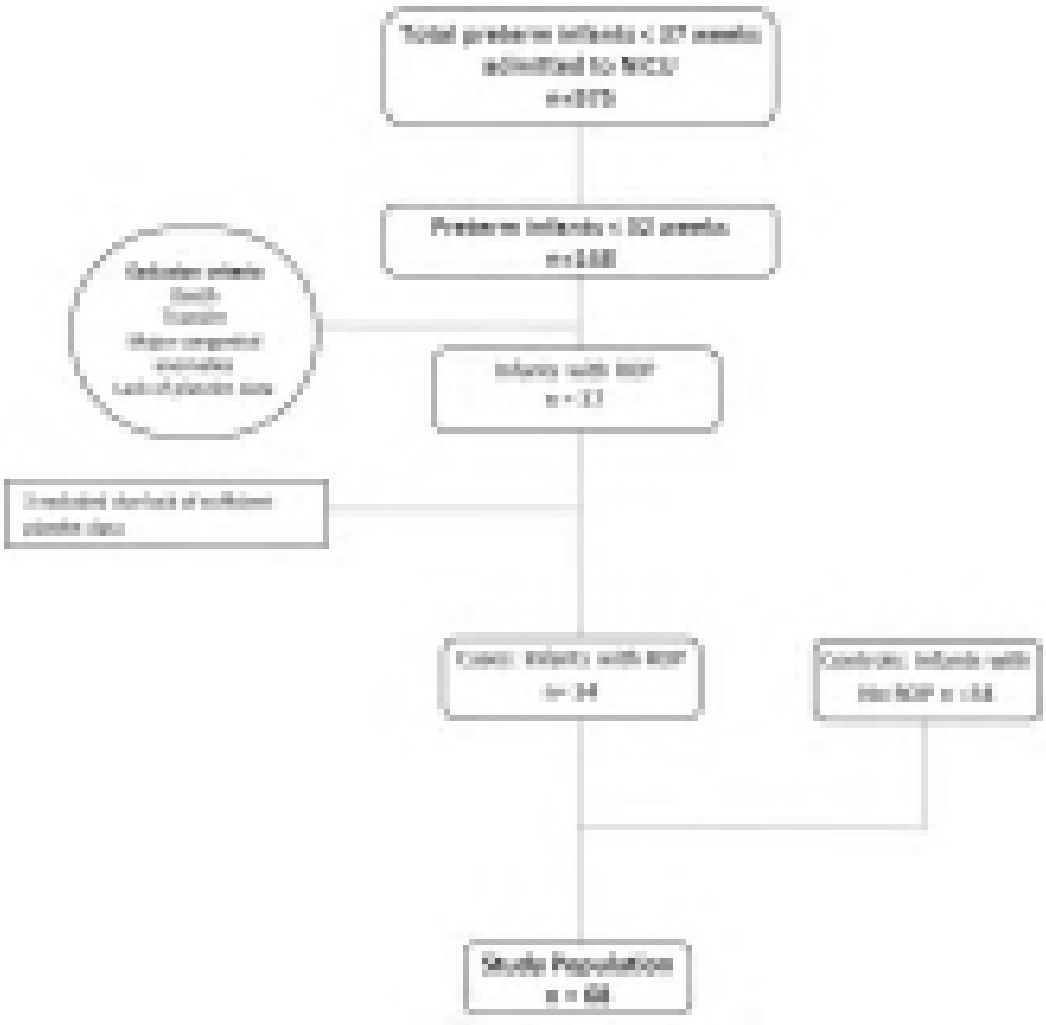
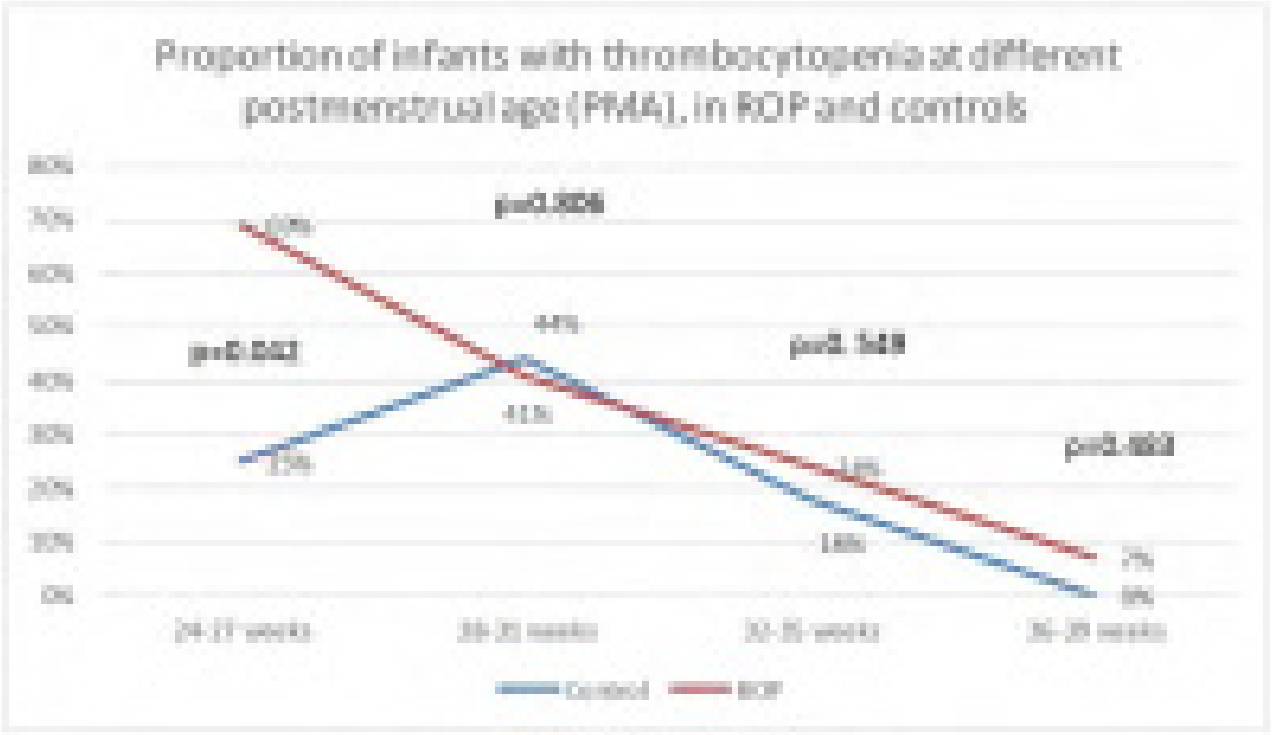


Figure 1

Figure 2: Comparison in presence of thrombocytopenia between ROP and controls at different postmenstrual age (PMA), n=68.



PMA at platelet level	ROP Cases (n=34; 90%)	Controls (n=34; 58%)	p-value
24-27 weeks, n/N (%)	20/29 (69%)	2/8 (25%)	0.042
28-31 weeks, n/N (%)	14/34 (41%)	15/34 (44%)	0.806
32-35 weeks, n/N (%)	8/34 (24%)	6/34 (18%)	0. 549
36-39 weeks, n/N (%)	1/14 (7%)	0/15 (0%)	0.485

Abbreviations: n=number of infants with thrombocytopenia (<150)
N=total number of infants with PLT count at that PMA

Figure 2

Abstract: 222
Do Neonatal Factors Modify Estimated Transcutaneous Bilirubin Level ?
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Background Transcutaneous bilirubin level (TCB, mg/dl) measurement, having good correlation with serum bilirubin level (SB, mg/dl) is commonly utilized as a non-invasive pre-SB screening procedure. TCB estimates interstitial bilirubin unlike SB. With increasing dependence on TCB screening, information must be sought about its accuracy, fallacies and clinical conditions in which its correlation with SB is diminished.

Objective 1) To identify clinical factors adversely affecting prediction of SB by TCB 2) To determine sensitivity (SN), specificity (SP), positive predictive value (PPV) , negative predictive value (NPV) and the receiver operating characteristic (ROC) area underneath the curve (AUC) for TCB in an ethnically diverse multiracial mega polis population.

Design/Methods Design: restroapective. Population: ll Infants admitted to NBN during a designated study period who underwent TCB testing for clinical or pre discharge jaundice, followed within 2 hours by SB evaluation. Variables: Standard neonatal data, difference between TCB and SB (△TSB, TCB-SB) Statistical procedures: 1) Pearson's correlation co-efficient for TCB and SB. 2) Relation of △TSB with neonatal variables via Univariate and multivariate linear regression analyses 3) Calculating SN, SP, PPV and NPV for TCB and ROC analyzed for TCB adjusted for variables statistically significant in the multivariate linear regression analysis for △TSB.

Results TCB correlated with SB (number of subjects=350; r=0.82, p<0.001). Table 1 shows characteristics of study population. M (SD) of △TSB was -0.01 (1.92) mg/dl. 73.7% had △TSB< 0.9 and 87.1% < 2 mg/dl (Fig 1). Lower chronological age (days, p<0.001) and black race (p<0.001) were associated with increased, while positive direct Coombs test (p=0.004) and receipt of phototherapy (p<0.001) with decreased △TSB (table 2). △TSB differed across race/ethnicity lines (p<0.001) as per least significant difference post-hoc testing. △TSB (M, SD) for Black (1.2, 0.74) n=57) was > White (-0.2, 2.8, p<0.001), Hispanics (-0.3, 1.85, p<0.001) and Asians (0.1, 1.1, p 0.02). Using SB as gold standard, TCB had SN=0.71, SP=0.87, PPV=0.66 and NPV=0.89. The ROC adjusting for significant predictors of △TSB had AUC=0.89 (Fig 2).

Conclusion(s) SB is more precisely predicted by TCB in immune mediated hemolysis and in infants on phototherapy. TCB overestimates SB in those who are of lower chronological age and black ethnicity. Interstitial bilirubin estimated by TSB accurately predicted serum bilirubin in our prediction model

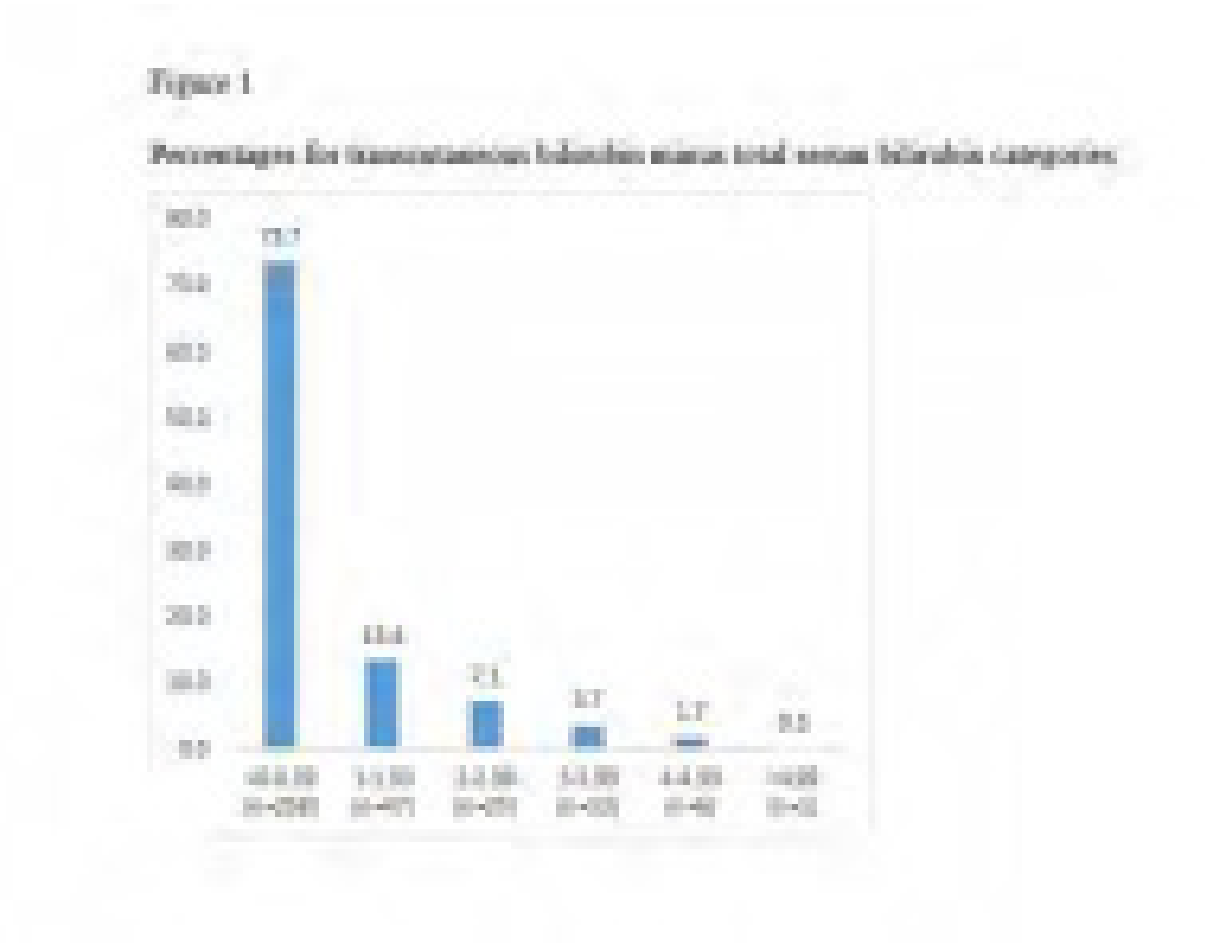

Figure 1. Percentages of infants according to TCB-SB categories

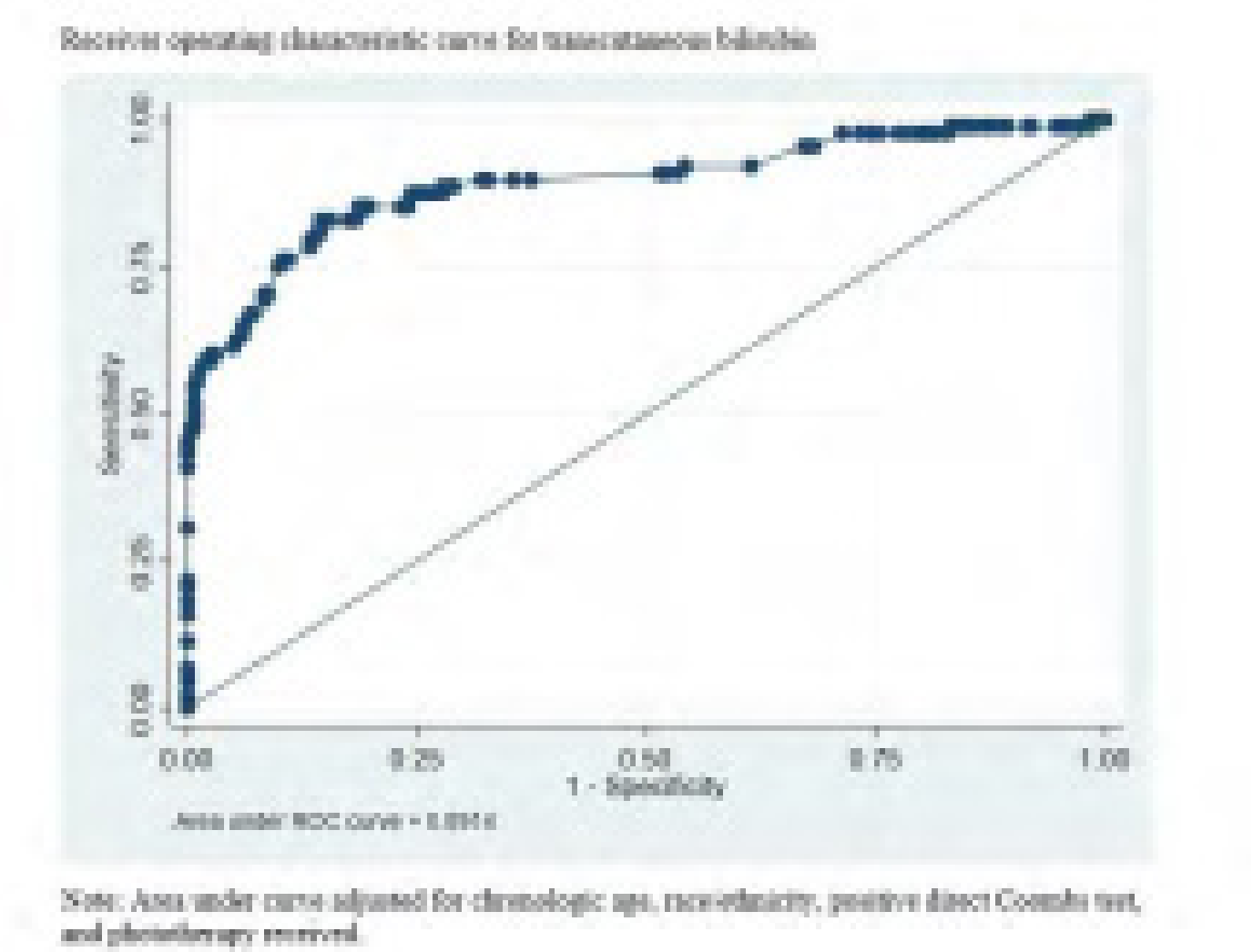

Figure 2. Receiver operating characteristic curve for transcutaneous bilirubin
Area under curve adjusted for chronologic age, race/ethnicity, positive direct Coombs test, and phototherapy received.

Descriptive Statistics of the Sample of Neonates

Variable	M (SD)	Frequency (Percentage)
Chronologic age (days)	3.5 (2.41)	
Gestational age (weeks)	37.8 (2.02)	
Sex (male)		182 (52.0)
Race/ethnicity White Black Hispanic		-- 56 (16.0) 57 (16.3) 204 (58.3)

Asian Other		19 (5.4) 14 (4.0)
Birth weight (grams)	3,082.7 (578.88)	
Direct Coombs test (positive)		67 (19.1)
Phototherapy (received)		101 (28.9)
Transcutaneous bilirubin (mg/dL)	10.1 (3.19)	
Total serum bilirubin (mg/dL)	10.1 (3.23)	
TCB-SB (mg/dL)	-0.01 (1.92)	

Note: M=mean, SD=standard deviation

Linear regression analyses for transcutaneous bilirubin minus total serum bilirubin

Variable	Univariate B (SE)	p-value	Multivariate B (SE)	p-value
Chronologic age (days)	0.56 (0.20)	0.01	-1.74 (0.36)	<0.001
Gestational age (weeks)	0.02 (0.05)	0.63	--	--
Sex (male)	-0.02 (0.21)	0.93	--	--
Race/ethnicity White Black Hispanic Asian Other	Reference 1.35 (0.35) -0.19 (0.28) 0.26 (0.49) 0.42 (0.55)	-- <0.001 0.49 0.60 0.45	Reference 1.32 (0.33) -0.17 (0.26) 0.24 (0.47) 0.36 (0.52)	-- <0.001 0.53 0.61 0.49
Birth weight	4.76 x 10-5 (<0.001)	0.79	--	--
Direct Coombs test (positive)	-0.51 (0.26)	0.051	-0.72 (0.25)	0.004
Phototherapy (received)	-0.92 (0.22)	<0.001	-0.84 (0.21)	<0.001
Intercept	--	--	1.02 (0.30)	0.001

Note: B=unstandardized beta, SE=standard error

Abstract: 223
Does Very Early Postnatal Microbial Nasopharyngeal Colonization in Neonates (EPNNPC) Protect Against Respiratory Disorders in Sick Term Newborn Infants
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Background Early microbial colonization of newborn infants (EMC) plays crucial role in immune maturation processes. The upper respiratory tract (URT) harbors most abundant and variant microbial population after gastrointestinal system (GI). While neonatal GI microbial colonization is widely researched, there is minimal information on EPNNPC. EMC of URT may impact neonatal morbidities in term infants admitted in NICU.
Objective To investigate the contribution, if any, of EPNNPC in sick term infants symptomatic at birth. For this we studied the immediate postnatal bacterial profile and clinical implications of EPNNPC in term neonates admitted to NICU, and the

maternal- neonatal factors contributing to it.
Design/Methods Design retrospective chart review Population: all term (>37,0/7 weeks of GA) neonates admitted to the NICU during 2017 for diseases, such as TTN, hypoglycemia, temp instability, presumed sepsis, observation for low Apgar scores or maternal fever. Procedure: nasopharyngeal cultures obtained within first 5-30 minutes of life. Data: Maternal: age, weight, mode of delivery, fever, medications, duration of rupture of membrane (ROM), infection serologies Neonatal: gestational age (GA), birth weight, use of antibiotics, need for respiratory support, apnea, bradycardia, hypotension, CBC differential, inflammatory markers. Statistics: t, Chi Square &Fisher's exact tests. ANOVA.
Results A total of 141 neonates were eligible out of which 73(52 %) were colonized. The microorganism isolated were: Staphylococcus epidermidis (22, 30%) alpha hemolytic streptococcus (15, 21%) group B streptococcus (11, 15%) and others (major E coli, klebsiella; 25, 34%). Mean (SD) of GA was 38.8(1.2). Table 1 shows clinically/statistically significant univariate comparisons. Duration of ROM was higher in NPC+ infants, whereas, respiratory support requirement and maternal GBS colonization were lower. Out of 73 colonized babies 33 (45%) had ROM >18 hours. In multivariate analysis ROM duration was associated with very EPNNPC (OR 1.5; 95% CI 1.02-1.09, p 0.005, table2).
Conclusion(s) EPNNPC is associated with duration of rupture of membrane and dependently reduces occurences of respiratory disorders and respiratory support requirement in sick term neonates. More than half of term neonates in NICU get colonized in nasopharynx within first 30 minutes of life. This report documents the timing of earliest NP colonization in sick term neonates.

Table:1 Summary of univariate analysis of NPC in term sick neonates. Data presented as m (SD) & n (%) as applicable.

Variable	NPC(-) (n=68)	NPC(+) (n=73)	p-value
GBS positive mother	24(35.3)	57(15.1)	0.21
Maternal receipt of antibiotics	40(58.8)	41(56.2)	0.75
Neonates requiring CPAP	14(20.6)	6(8.2)	0.03
Neonates requiring any respiratory support	19(27.9)	9(12.3)	0.02
Duration of rupture of membranes (hrs)	10.31(10.3)	15.55(10.0)	0.005
Neonatal receipt of antibiotics	57(83.8)	65(89)	0.36

Table 2 Multivariate logistic regression analysis

Variable	OR	95% CI Lower	Upper CI	p-value
Neonates requiring any respiratory support	0.38	0.06	2.20	0.28
Neonates requiring CPAP	0.46	0.07	3.09	0.43
GBS positive mother	0.68	0.37	1.28	0.24
Duration of rupture of membranes (hrs)	1.05	1.01	1.09	0.005

Abstract: 224
Comparison of Traditional Finnegan Neonatal Abstinence Scoring (FNAS) Tool with MOTHER NAS Scale
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[1]Pediatrics, Einstein Medical Center Philadelphia, Philadelphia, Pennsylvania, United States, [2]Einstein Medical Center Philadelphia, Philadelphia, Pennsylvania, United States

Background The FNAS tool is the most frequently used scale to assess for neonatal drug withdrawal. Concerns with the traditional FNAS tool is its length and the variability in the scoring due to subjective assessments of some of the items. The

Maternal Opioid Treatment: Human Experimental Research (MOTHER) NAS scale is a modified shortened version of the FNAS tool that has shown high correlation with the Finnegan scale.
Objective To assess interrater reliability scoring between the FNAS tool and the MOTHER NAS Scale.
Design/Methods As part of a multi-stage QI project, we re-educated all staff on the FNAS tool and on the MOTHER NAS scale. The MOTHER NAS scale consists of 19 items compared to FNAS tool with 31 items. Differences with the MOTHER NAS scale include the removal of the redundancies and the addition of two new items. Staff nurses were educated on a multifaceted strategy: (1) Interobserver reliability was used to validate the staff correct utilization of both tools; (2) Infants were scored utilizing both tools at the same time; (3) Staff added the infants' areas of concerns during hand-off of care. Interrater reliability included two nurses scoring the infant simultaneously. Each nurse was observed a minimum of 3-5 times with a unit expert during the assessment.
Results We conducted 650 simultaneous observations using both FNAS tool and MOTHER NAS scales over a 6-month period on a cohort of 19 infants. Infants' mean gestational age was 38.1 ± 2.2 weeks. The number of infants treated was 12 (63%). To determine the agreement between FNAS tool and MOTHER NAS scales we used Kendall's W coefficient of concordance. There was significant agreement between the two scales ($p < 0.001$) though their degree of unanimity is moderate to low (0.433). The FNAS scores were on average 1 point higher than the MOTHER NAS scores (FNAS 5.16 ± 2.36 vs MOTHER scale 4.0 ± 2.22). This one-point average difference likely accounts for their relatively low unanimity, though their significant agreement and similar standard deviations may allow for them to be used interchangeably. The staff also perceived the MOTHER NAS scale to be less subjective and shorter.
Conclusion(s) The MOTHER NAS scale is shorter and a reliable alternative to the traditional FNAS tool. The MOTHER NAS scale may be more acceptable to staff assessing infants for neonatal withdrawal due to its simplicity and ease of use.

Abstract: 225
Demystifying "Culture-negative sepsis": Reasons for prolonged antibiotic administration in the Neonatal Intensive Care Unit
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Background Despite its frequent non-specific, ambiguous presentation, sepsis is a common cause of neonatal morbidity and mortality. While culture proven sepsis is diagnosed by the presence of a positive blood culture, clinicians may diagnose "culture-negative sepsis" despite negative blood culture results and administer prolonged antibiotic therapy. Antibiotic overuse in infants is associated with adverse short and long term outcomes, including death. Better characterization of reasons for antibiotic use in the neonatal intensive care unit (NICU) is critical to identify meaningful antibiotic stewardship strategies.
Objective To determine incidence and reasons for prolonged antibiotic administration in infants with negative blood culture results in a quaternary NICU.
Design/Methods We analyzed medical records of patients in the NICU at the Children's Hospital of Philadelphia from July '17-June '18 who had negative blood cultures and received ≥5 days of antibiotics. Data collection included demographics, clinical and laboratory data, medications, as well as underlying diagnoses.
Results Among 653 sepsis evaluations during the study period, we identified 76 episodes (11 %) in 68 patients, where antibiotic treatment was prolonged ≥5 days. The most common reasons for treatment included concerns for intra-abdominal, respiratory or other localized infections (Figure 1). Twenty-one episodes of "culture-negative sepsis" (28 % among cohort with antibiotics ≥5 d, 3% among entire cohort) did not have a focal infectious source. In this group, factors leading to prolonged treatment included critically-ill status, complex chronic underlying disease and presence of indwelling devices among other risk factors (Table 1). Patients with presumed culture-negative early-onset sepsis were more likely to receive prolonged treatment without consultation of the infectious disease team.
Conclusion(s) Although it is challenging to limit the initiation of antibiotics in infants with rule out sepsis or "sepsis-like illness" in complex quaternary NICUs, minimizing antibiotic use can be achieved by timely discontinuation when blood culture results are negative. A robust antimicrobial stewardship program can identify valid reasons for prolonged antibiotic administration, but also suggest approaches to minimize unnecessary antibiotic exposure, especially in early onset sepsis and complex chronic conditions.

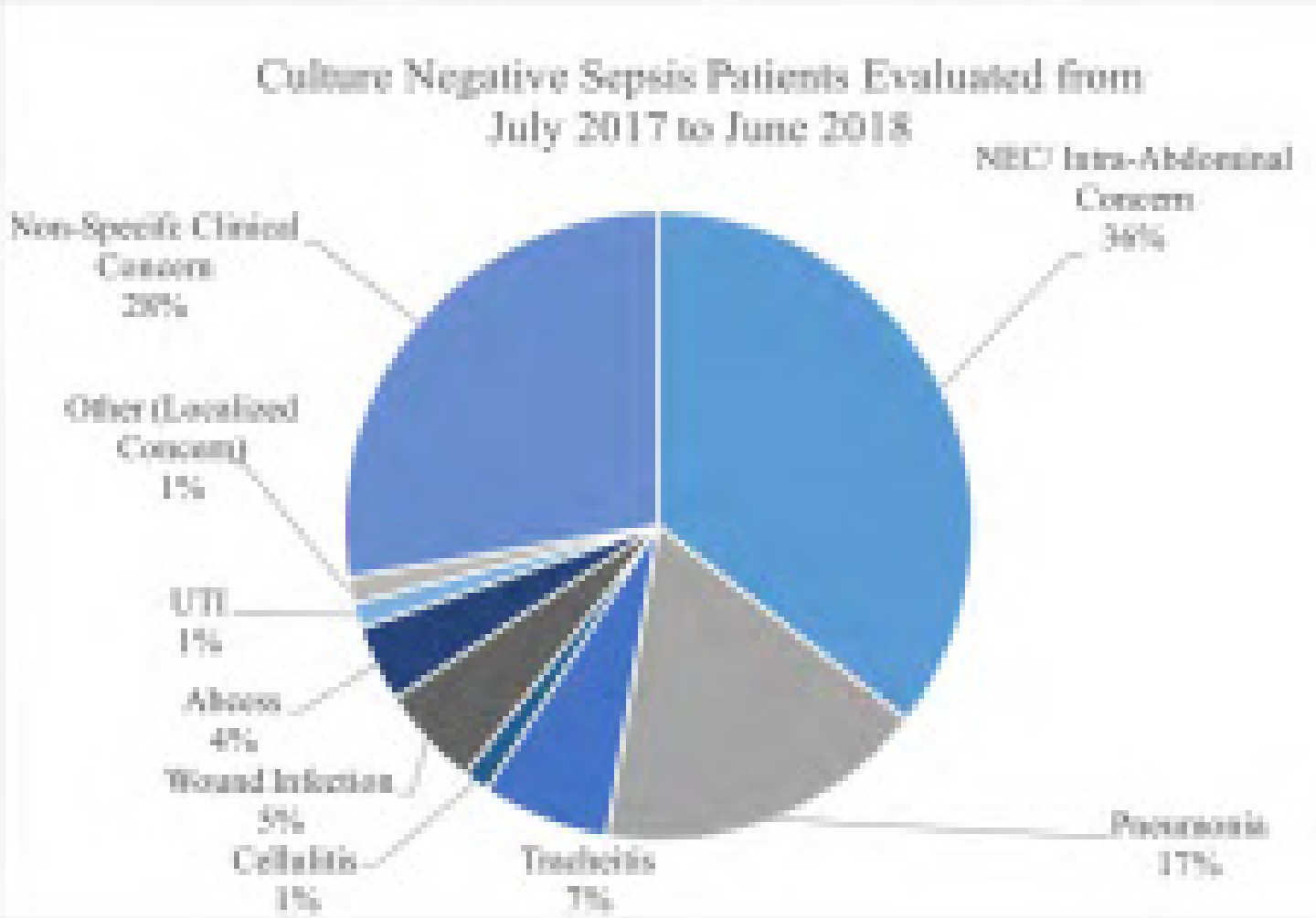

Figure 1: A comprehensive breakdown of sepsis source for patients treated with at least 5 days of antibiotics and negative blood cultures.

Table 1: Characteristics of 21 patients treated for "culture-negative sepsis" without focal source

Characteristic	Details
Gestational age (weeks), median, range	37 weeks (24 to 41 weeks)
Postnatal age (days), median, range	4 days (0 to 255 days)
Early onset sepsis, n (%)	12 (57%)
Invasive ventilation, n (%)	16 (76%)
Inotropic Therapy, n (%)	12 (57%)
Presence of Central line, n (%)	16 (76%)
Infectious Disease Consultation/Antibiotic Stewardship Approval, n (%)	11 (52%)
Days on Antibiotics, median, range	7 days (5 to 14 days)

Abstract: 226

Continuing enteral nutrition in newborns admitted with hypoglycemia – Effects on time to stabilization of blood sugar and length of stay

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Background Neonatal hypoglycemia is one of the most common reasons for infants' admissions to the NICU. Feeding approaches at the initiation of the IV dextrose fluid therapy vary between practices; one approach advocates for no feeds until the blood glucose levels are stable to avoid hormonal excursion. The other approach recommends continuing the feeding schedule while starting the IV dextrose fluid. There is however no evidence in the literature to support either approach.

Objective To compare differences in blood glucose levels, frequency of low blood glucose levels after stabilization and length of stay between babies who were fed and the ones who were kept NPO at the time of initiation of IV dextrose therapy.

Design/Methods We performed an observational retrospective chart review of the newborn infants with the diagnosis of neonatal hypoglycemia who were admitted to Neonatal intensive care units at both Women and Children's Hospital of Buffalo and Millard Fillmore suburban hospital for IV dextrose therapy in the period between January 2015 to July 2018. Infants were categorized according to the feeding approach followed at the initiation of IV dextrose fluid therapy to either fed infants or NPO infant. Outcome measures of length of Neonatal Intensive Care unit stay and duration of IV dextrose fluid therapy were used to compare the effect of both approaches.

Results There was no difference between the two groups in the baseline characteristics (Maternal age, race, mode of delivery, APGAR score at 5 minutes, birth weight, gestational age, cord pH, maternal diabetes status and insulin use, growth according to the gestational age or blood glucose level on admission) table 1. BG levels were higher at 30min and 1 hour after admission in the fed group Figure 1. The infants who were fed at the time of initiation of the IV dextrose fluid therapy had shorter duration of IV fluid therapy and shorter NICU stays compared to the infants who were made NPO 5.87 days±1.4 vs. 4.9 days± 1.4, respectively, table 2.

Conclusion(s) In our cohort, continuation of the feeding schedule in infants with hypoglycemia who required IV dextrose fluid therapy resulted in shorter duration of IV dextrose fluid therapy and shorter NICU length of stays compared to NPO approach. We recommend resuming the feeding schedule of infants with hypoglycemia during IV dextrose therapy.

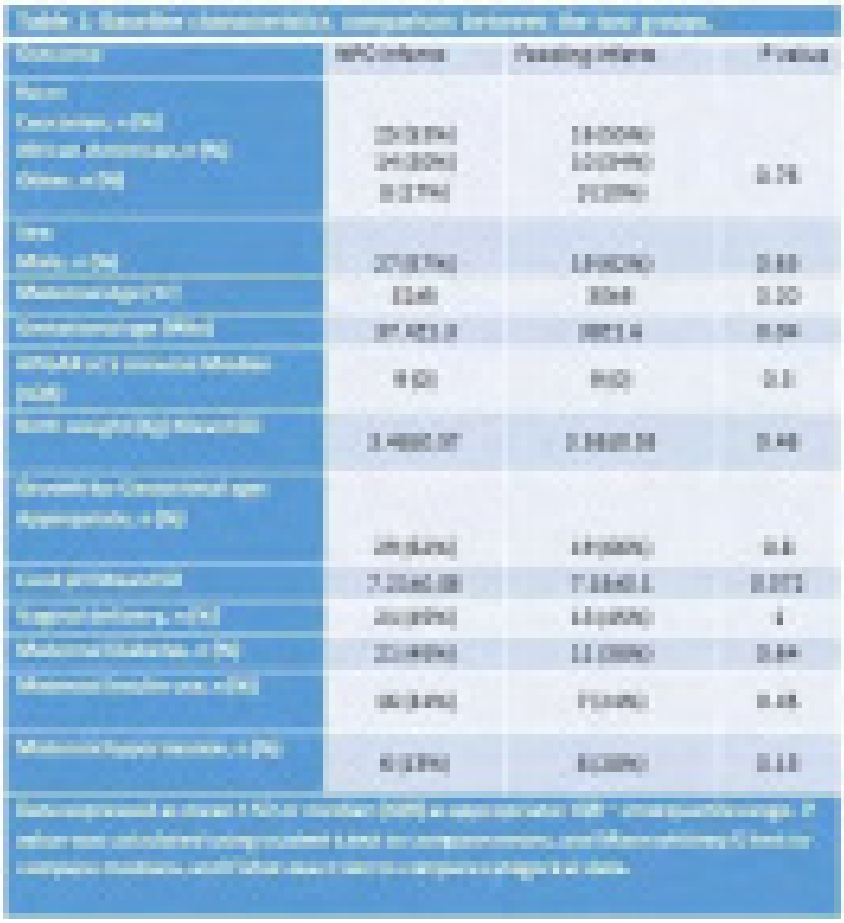

Table 1

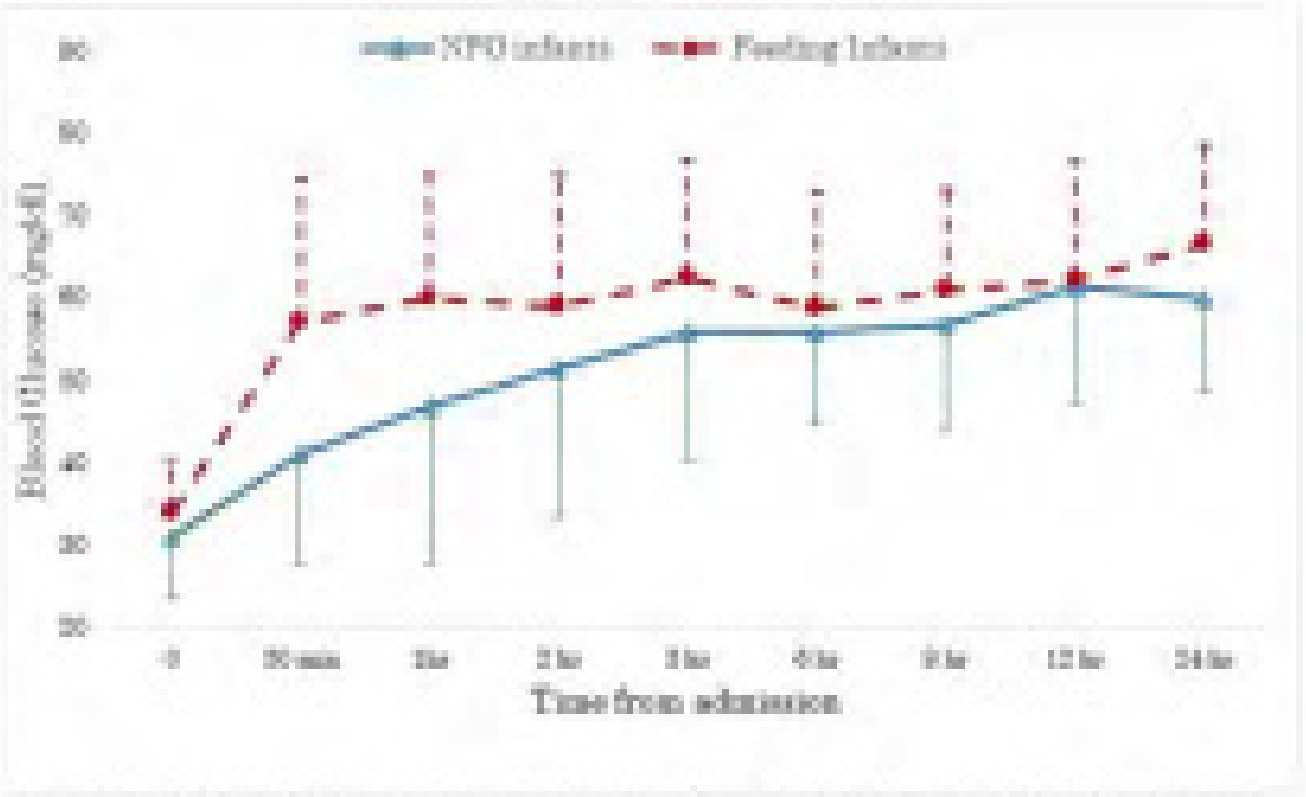

Figure 1

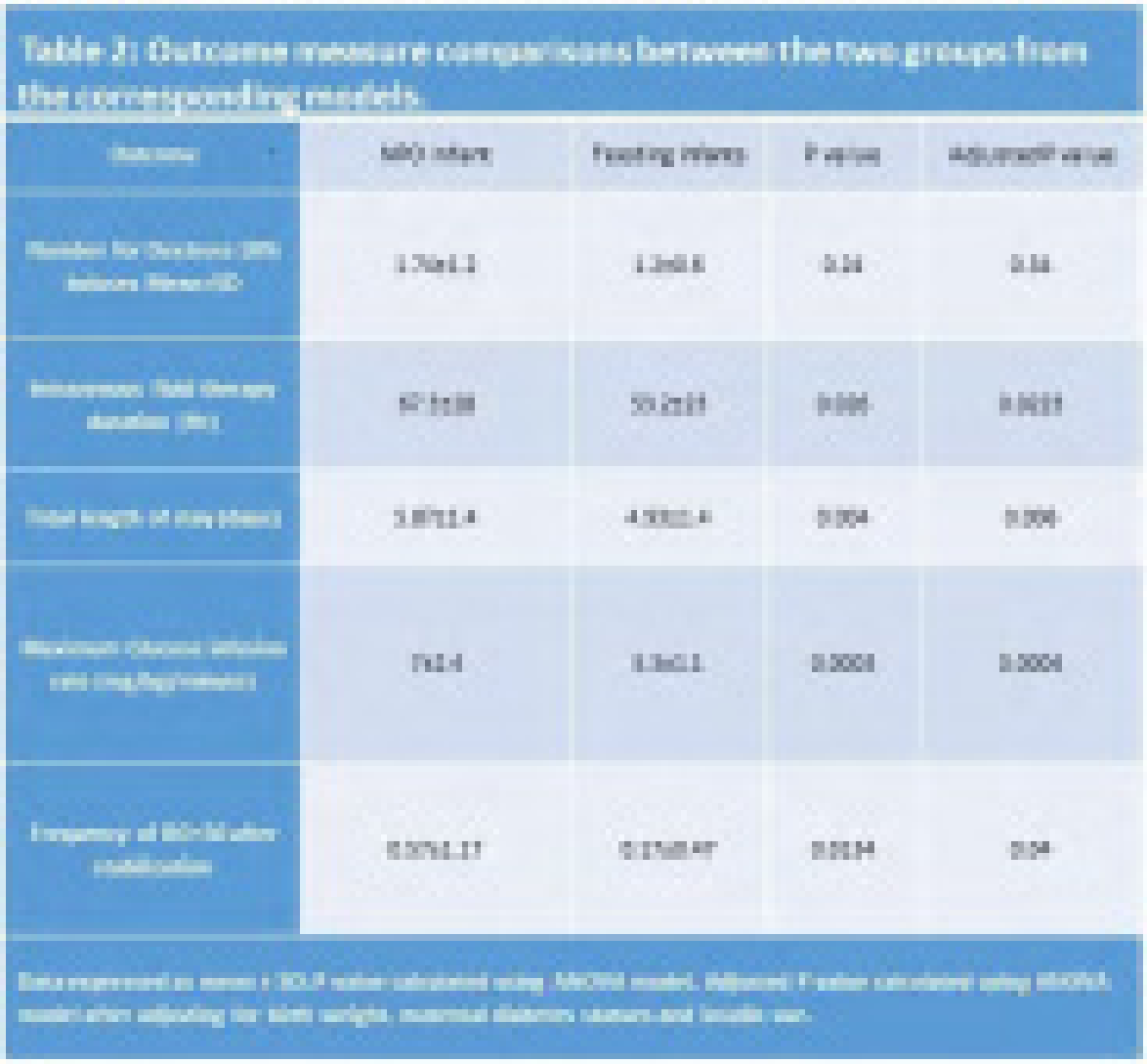

Table 2: Outcome measure comparisons between the two groups from the corresponding models.

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Abstract: 227

Association between enteral zinc supplementation and change in growth trajectory among preterm infants receiving tertiary neonatal intensive care

Francesca Romero, Sara DeMauro, Michael Padula, Heather Bodenstab, Toni Pert, Emily Bingham, Matthew Devine, Ursula Nawab, Erik A. Jensen

Children's Hospital of Philadelphia, Philadelphia, Pennsylvania, United States

Background Zinc deficiency in infancy is associated with growth failure. There is limited literature on the effect of zinc supplementation on growth of preterm infants receiving neonatal intensive care, particularly in higher income countries.
Objective To describe changes in anthropometrics (weight, length, and head circumference) between 30 days before and 30 days after the initiation of enteral zinc supplementation in preterm infants.
Design/Methods This is a retrospective cohort study of preterm infants (gestational age < 37 weeks) cared for in the Newborn/Infant Intensive Care Unit (N/IICU) at Children's Hospital of Philadelphia (CHOP) who received enteral zinc gluconate supplementation for at least 30 days. Data were abstracted from existing medical records. All available growth measurements recorded during the 60-day study period were included in the analysis. We performed restricted maximum likelihood mixed effects linear spline analysis using longitudinal weight, length, and head circumference measurements as the outcome variables and a knot on the day of zinc initiation. The primary predictor variable was treatment day extending 30 days before and 30 days after initiation of zinc.
Results The sample included 62 preterm infants who received enteral zinc between 4/2015-6/2018 (Table 1). The cohort was on

average extremely premature (25.8+/-2.2 weeks gestation) and the majority (69%) had severe bronchopulmonary dysplasia. Enteral zinc was initiated at 46.6 +/-7.6 weeks postmenstrual age. Zinc supplementation was associated with an additional gain of 0.81 cm (95% CI 0.42-1.23) in length, on average, during the first month of therapy compared to the month prior to therapy. This correlates to a rise of approximately 6 percentile points on the Fenton growth chart (e.g. 3rd percentile to the 9th percentile). There were no significant associations between zinc and weight gain or head growth.
Conclusion(s) In this cohort of critically ill preterm infants, zinc supplementation was associated with improved linear growth trajectory. Zinc supplementation may be beneficial for the growth of preterm infants receiving neonatal intensive care in a higher income country. Further studies are needed to investigate the efficacy of zinc supplementation on improving preterm growth.

Table 1. [illegible]

Characteristic	Value
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Table 2. [illegible]

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Abstract: 228
Validation of the Hypoglycemia Scoring System: A Tool to Identify Infants of Diabetic Mothers Who Will Not Require Intravenous Dextrose Infusions
Mohammed A. Ibrahim, JOSEPH D. DECRISTOFARO, Wei Hou, Echezona Maduekwe
Stony Brook Childrens Hospital, Middle Island, New York, United States

Background Neonatal hypoglycemia (NH) is common with incidence of 66% in those with risk factors and is a leading cause NICU admissions. Although NH is easily treatable, delays in identification and treatment may cause significant long-term neurodevelopmental sequalae. Hypoglycemia scoring system (HSS) developed at the University of Rochester, New York, provides an objective measure to differentiate asymptomatic infant of diabetic mother (IDM) ≥35 weeks gestational age (GA) who will need intravenous dextrose infusion (IDI) from those who will not. The HSS was developed for neonates but has not

been validated. We therefore, aimed to validate the HSS in IDM.
Objective To evaluate the reliability of the HSS in the identification of IDM ≥35 weeks GA who will not require IDI post-delivery. We hypothesize that the HSS will clearly identify asymptomatic IDM ≥35 weeks GA who will not need IDI post-delivery.
Design/Methods A retrospective review of hypoglycemic IDM ≥35 weeks GA admitted to Stony Brook Children's hospital newborn nursery and neonatal intensive care unit between 1 January 2015 and 31 December 2017 without congenital anomalies. The study was approved by the Institutional Review Board. The HSS includes maternal age, maternal pre-delivery glucose, neonatal weight, and neonatal glucose within 1 hour of life. A total score of 0-1 identifies infants unlikely to need post-delivery IDI, and a score of 2-5 those at high risk for IDI. 65 subjects were needed for a sensitivity of 95% with 15% margin of error and a specificity of ≥80% to demonstrate 0.05 alpha level. Unpaired t-test and multiple logistic regression were used for analysis.
Results 65 neonates with mean (± SD) GA 38 weeks (±3 days), and mean birth weight 3200 (±100) grams were included in the study. Twenty-four infants scored 0-1, and forty-one scored 2-5 with female to male ratio of 1.03:1. The hypoglycemia score area under the receiver operating characteristic curve was 0.977. The positive predictive and negative predictive values were 0.49 and 0.88 respectively. There were increased odds of scoring 2-5 with females (95% CI 1.23-24.4, p=0.03), delivery by C-section (95% CI 1.02-1.85, p=0.047), and an increase in maternal pre-delivery glucose (95% CI 1.01-1.11, p=0.02).
Conclusion(s) The HSS can reliably identify IDM who are unlikely to need IDI for post-delivery care. Neonates with total score of 2-5 within 1 hour of delivery should be monitored closely for hypoglycemia as they are more likely to need IDI.

Abstract: 229
Correlates of Change in Weight Z-Score from Birth to Hospital Discharge for Very Preterm Infants
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Background
In 2006, a landmark study demonstrated improved neurodevelopment in very preterm infants (VPIs) with highest quartile of growth. Recent studies examine the weight z-score pattern for VPIs but have limited description of the associated nutrition patterns.
Objective To investigate the factors associated with hospital weight z-score change among VPIs of adequate health to have had hospital discharge (HD) by term age, focusing on first postnatal month nutrition and growth as primary predictors.
Design/Methods
This study included infants born between 22 and 34 weeks of postmenstrual age (PMA), during 6/1/2016- 5/31/2018, with discharge ≤ 40 weeks' PMA. The data came from a NICU clinical nutrition database. Fenton z-scores were calculated for birth, postnatal day 14, and discharge growth outcomes. Change in weight z-score through hospitalization was regressed on predictors of interest and was compared
between infants on maternal milk vs. not at 22-28 days of life using inverse probability matching. The highest and lowest quartiles of growth (HQG: change weight z-score > -0.57 and LQG: change weight z-score < -1.34) also were compared.
Results
Significant high/moderate correlates of change in weight z-score were gestational age (GA) at birth, birth weight (BW) z-score, growth velocity, day 14 weight z-score, change in length and head circumference zscores, and TPN days (Table 1). The findings were similar for the comparison of HQG and LQG (Table 2), with fewer days to return to BW among HQG than LQG (6 vs. 11 days, p<0.001). Nutritional practices were also different between the quartiles, with HQG having fewer days on TPN, smaller proportion on maternal milk throughout the first month or 1 week donor milk, and higher proportion with ≥24 kcal/oz feeds in the 1 week (Table 3). Controlling for selection bias, maternal milk at 22-28 days positively affected change in weight zscore, albeit not reaching statistical significance.
Conclusion(s)
The change in weight z-score from birth to HD is significantly correlated with birth characteristics, early growth and nutritional support in VPIs. While patterns of weight z-scores over time are useful guides for physical growth progression in this population of infants, nutritional practices, especially early on after birth, can have significant impact on the growth outcomes.

Table 1: Correlations with Change in Weight Z-score

Variable	Correlation Coefficient	p-value
GA at birth	0.42	<0.0001

BW z-score	-0.45	<0.0001
HD z-score	0.18	0.01
Growth velocity	0.62	<0.0001
Day 14 z-score	-0.26	0.0002
Day 14 change in z-score	0.60	<0.0001
Birth length z-score	-0.27	<0.0001
HD length z-score	0.01	0.9
Length change in z-score	0.36	<0.0001
Birth head circumference z-score	-0.28	<0.0001
HD head circumference z-score	0.12	0.08
Head circumference change in z-score	0.47	<0.0001
TPN days	-0.35	<0.0001

Table 2: Significant Differences Between the Highest (HQG) and Lowest (LQG) Quartiles of Change in Weight Z-score

Variable mean (standard deviation)	HQG	LQG	p-value
Birth GA (weeks)	31.3 (2.0)	29.2 (2.2)	<0.001
HD GA (weeks)	36.8 (1.2)	37.3 (1.3)	0.038
Length of Stay (days)	38.3 (18.6)	56.9 (21.9)	<0.001
Birth weight (grams)	1428 (358)	1372 (390)	0.45
Day 14 weight (grams)	1612 (397)	1399 (394)	0.008
HD weight (grams)	2432 (445)	2451 (372)	0.81
Birth weight z-score	-0.67 (0.8)	0.53 (0.89)	<0.001
Day 14 weight z-score	-1.14 (0.7)	-0.55 (0.66)	<0.001
Discharge weight z-score	-0.96 (0.87)	-1.26 (0.88)	0.09
Change weight z-score	-0.29 (0.24)	-1.79 (0.41)	<0.001
Growth velocity (grams/day)	25.99 (3.9)	18.06 (4.59)	<0.001
Return to birth weight (days)	5.55 (3.95)	10.61 (6.26)	<0.001

HD- hospital discharge

Table 3: Nutritional Differences Between the Highest (HQG) and Lowest (LQG) Quartiles of Change in Weight Z-score

Variable, number (%)	HQG	LQG	p-value
Maternal milk day 1-7	42 (82%)	50 (98%)	0.008
Maternal milk day 8-14	41 (80%)	50 (98%)	0.004
Maternal milk day 22-28	35 (76%)	46 (96%)	0.006

Donor milk day 1-7	12 (24%)	27 (53%)	0.002
Donor milk day 8-14	9 (18%)	12 (24%)	0.46
Donor milk day 22-28	1 (2%)	7 (15%)	0.06
Caloric density ≥ 24 kcal/oz day 1-7	32 (63%)	12 (24%)	<0.001
Mean (SD) TPN days	7.37 (4.35)	11.63 (6.41)	<0.001

Abstract: 230

Differences in the oral microbiome by delivery mode

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Background The developing neonatal microbiota, especially in the gut, is integral to future health status and plays an important role in diseases and immune responses. There are known differences in the gut microbiome, and later adverse health outcomes, between children born by Cesarean Section (C-Section) and vaginal delivery. The oral microbiome may trigger some of the gut microbiome development and this may differ between delivery mode.

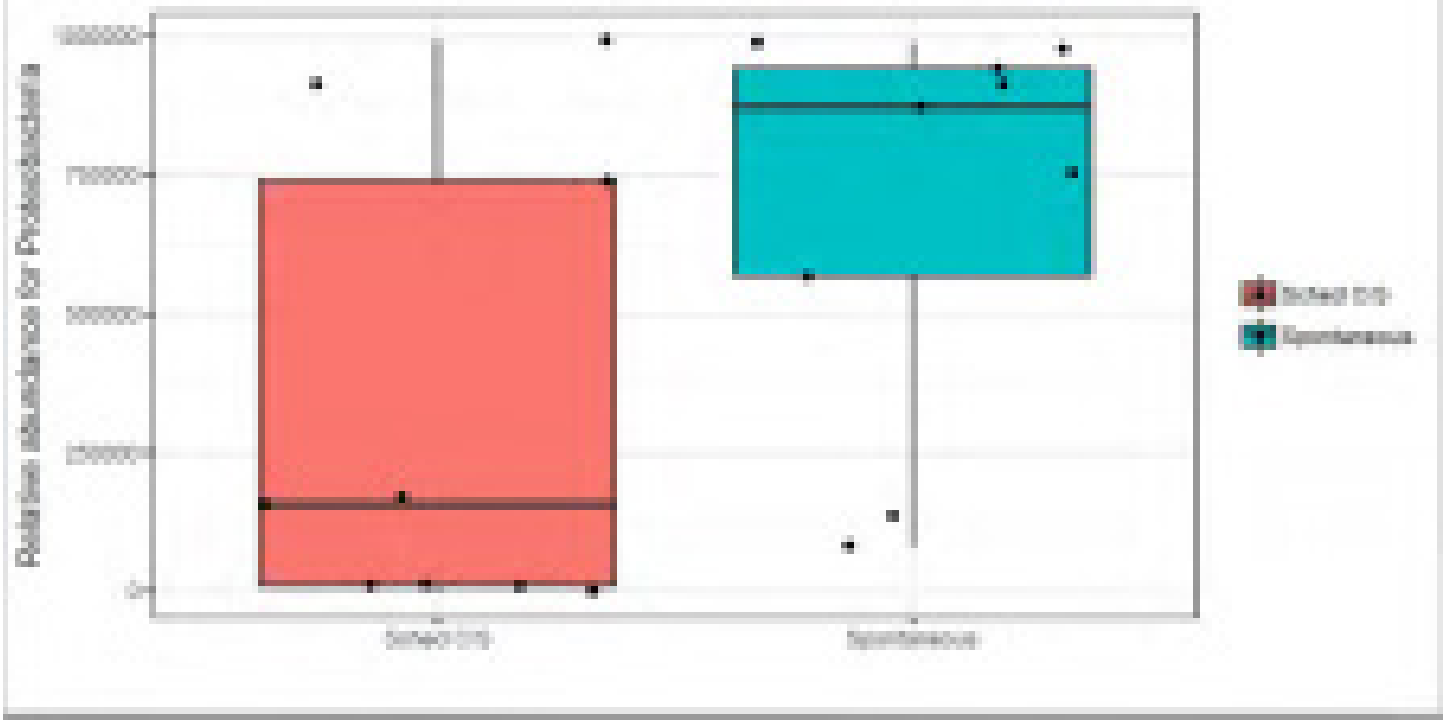
Objective To compare the oral microbiota of newborns delivered vaginally and by scheduled C-Section.

Design/Methods Saliva samples were collected from newborns within the first 2 days of life enrolled in the Inova Translational Medicine Institute Preterm birth study. DNA was extracted and 16S rRNA sequencing was performed on the Illumina MiSeq platform. The Qiime 1.9 package was used to map the sequenced reads into Operational Taxonomic Units (OTUs) using the open reference method, followed by data analysis using the R pakcage phyloseq 1.25.

Results Saliva samples from 20 newborns were included; all were full term. After rarefaction at 2,218, 2 samples were filtered out. Of the remaining 18 samples 9 (50%) were from newborns delivered vaginally and 50% via scheduled C-Section delivery. The mean gestational age was 38.94 (sd=0.73). Higher Proteobacteria (Figure 1) and lower Firmicutes levels were detected in in C-Section samples compared with samples from vaginal delivery which trended towards significance (p=0.1). Further, the highest difference at genus level between the two groups was Achromobacter (higher in the C-Section samples, unadjusted p value >0.05). No significant difference was detected in alpha diversity measures, although the samples from vaginally delivered newborns had a higher mean Observed number of OTU, Shannon, and Fisher diversity, and C-section samples had higher mean Simpson diversity. There was no significant difference in beta (Unweighted Unifrac) diversity between delivery mode.

Conclusion(s)

The differentially abundant taxa that trended towards significance between the two delivery modes are of interest. Proteobacteria, which was higher in C-section samples, is a microbial signature of dysbiosis and the genus Achromobacter has been associated with infection in those with an impaired immune or respiratory system. Further exploration is warranted with larger sample sizes.



Comparison of the relative abundance for proteobacteria between C-section and Spontaneous delivery

Abstract: 231
Does the Height of Gastroesophageal Reflux Correlate with Cardiorespiratory Symptoms?
Michael T. Favara, Katie Ramdial, Jay Greenspan, Zubair h. Aghai
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Background Gastroesophageal reflux (GER) is a common occurrence in infants. While generally benign, it can cause significant morbidity and can prolong hospital stay. It has been thought that the height of GER episodes, particularly into the pharynx, can be the cause of cardiorespiratory events including apnea, bradycardia, or desaturations. Multichannel intraluminal impedance with pH probe (MII-pH) is considered the gold standard for the evaluation of GER, as it can detect both acidic and non-acidic reflux as well as height of refluxate.
Objective To determine if the height of refluxate was associated with cardiorespiratory symptoms.
Design/Methods This is a retrospective data analysis of all infants who underwent MII-pH probe evaluation at Thomas Jefferson University Hospital from October 2009 to August 2018. Infants were referred for impedance studies by the primary team based on high clinical suspicion for pathologic GER. The impedance studies were reviewed and nursing documentation of cardiorespiratory events during the MII-pH study were then correlated with GER. Events were considered to be related to reflux if they occurred within two minutes of GER. The height of refluxate was measured and was classified as either being low, mid, or high based on refluxate reaching the two most distal probes, two middle probes, or two most proximal probes, respectively.
Results 163 infants underwent MII-pH evaluation during the study period. Cardiorespiratory events while undergoing impedance study were identified by nursing staff in 70 infants. Demographic results are shown in Table 1. A total of 3110 reflux episodes occurred (low 8.6%, mid 35.2%, and high 56.2%) and there were 401 apnea, bradycardia, or desaturation events during MII-pH probe evaluation. Only 64 reflux episodes (2.1%) were related to cardiorespiratory events. There was no significant difference in the number of GER episodes associated with cardiorespiratory events in low, mid and high GER groups (Table 2).
Conclusion(s) The correlation between GER episodes and cardiorespiratory events is low. The height of refluxate does not appear to correlate with an increased frequency of cardiorespiratory events. High GER does not increase the frequency of cardiorespiratory events.

Demographics.

	Infants with Reported Cardiorespiratory Events (n = 70)
Birth weight ± SD (g)	1576 ± 900
Gestational age (GA) ± SD (weeks)	31 ± 4.9
Corrected GA at study ± SD (weeks)	39.4 ± 3.6
Male gender (%)	41 (59%)
Black race (%)	35 (50%)
Reflux medication during study (%)	3 (4%)
Caffeine during study (%)	1 (1%)
Duration of study ± SD (hours)	21.8 ± 2.9

Data expressed in mean ± standard deviation.

Height of reflux and relation to cardiorespiratory events.

	Low GER	Mid GER	High GER
Number of Episodes (%)	269 (8.6%)	1094 (35.2%)	1747 (56.2%)
Related to Cardiorespiratory Events (%)	7 (2.6%)	25 (2.3%)	32 (1.8%)

Abstract: 232
CBC and CRP in neonates born to mothers with clinical and histological chorioamnionitis.
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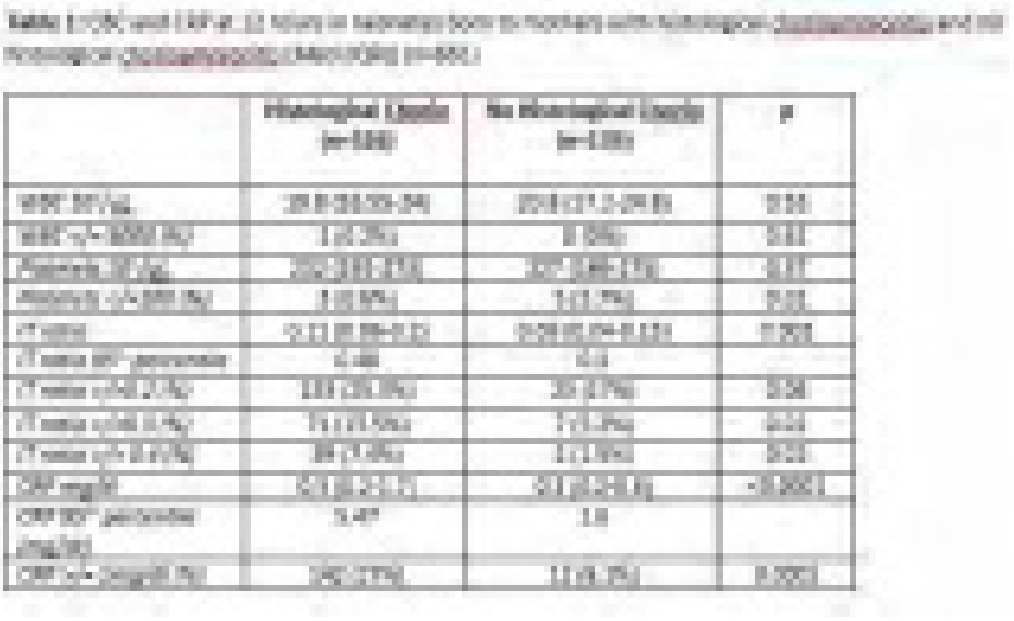
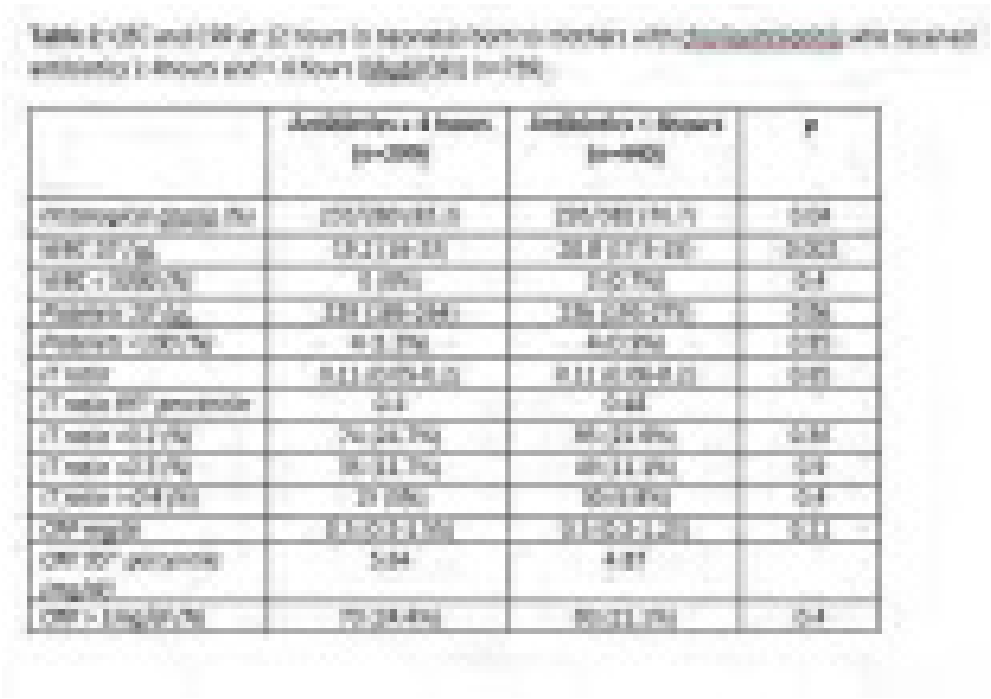
Thomas Jefferson University, Philadelphia, Pennsylvania, United States

Background Chorioamnionitis is a common complication of pregnancy and a major risk factor for neonatal early onset sepsis (EOS). The diagnosis of clinical chorioamnionitis is often made by maternal fever. However, prolonged labor and epidural anesthesia can also cause maternal fever. Screening CBC and CRP is routinely performed in neonates born to mothers with clinical chorioamnionitis. However, there is limited data on comparing CBC and CRP in infants born to mothers with clinical and histological chorioamnionitis and impact of prolonged maternal antibiotics on these markers of EOS.
Objective To evaluate the impact of exposure to histologic chorioamnionitis and duration of maternal antibiotic therapy on screening inflammatory markers in neonates.
Design/Methods This is a retrospective review of women who delivered at ≥35 weeks' gestation between 2/2011-3/2017 and were diagnosed with clinical chorioamnionitis. The diagnosis of histological chorioamnionitis was made after reviewing the placental pathology reports. The CBC and CRP was performed at 12 hours of age. The primary outcome was values of screening complete blood count (CBC) and C-reactive protein (CRP) in neonates born to mothers with histologic chorioamnionitis versus those without. The secondary outcome was differences in CBC and CRP values in neonates exposed to different durations of intrapartum antibiotics
Results There were 742 infants in the cohort whose mothers were diagnosed with clinical chorioamnionitis. Placental pathology was available in 661 infants (89.1%) and antibiotic data was available in 739 (99.6%) of infants. Of mothers diagnosed with clinical chorioamnionitis for whom placental pathology was available, 526 out of 661 (79.6%) had histological chorioamnionitis. Infants with histologic chorioamnionitis had higher I/T ratio and higher CRP values when compared to infants without histologic chorioamnionitis. Additionally, duration of intrapartum antibiotics (>4 hours vs <4 hours) did not affect I/T ratio or CRP values, though total WBC count was lower with prolonged intrapartum antibiotic exposure.
Conclusion(s) In our cohort, almost 80% of mothers diagnosed with clinical chorioamnionitis also had histological chorioamnionitis. Histologic chorioamnionitis demonstrate higher I/T and CRP screening values than infants without

histologic chorioamnionitis. Prolonged maternal antibiotic use does not change the I/T and CRP in neonates born to mothers with clinical chorioamnionitis.





Abstract: 233

CRP Value in Newborns ≤72 Hours of Age: A Descriptive Study

David M. Rub[1], Miren Dhudasia[2], Karen Marie Puopolo[2], Sagori Mukhopadhyay[2]

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Background C-Reactive protein (CRP) is commonly used to guide management of infants at risk for early-onset sepsis (EOS). Although single CRP values have low sensitivity for identifying infants with EOS, increasing values and specifically values ≥100 mg/L are reported to have greater specificity and often lead to prolonged antibiotic therapy.

Objective To determine the proportion of extremely high CRP values (≥100 mg/L) associated with a diagnosis of EOS and

describe distribution of CRP values obtained in infants ≤72 hours of age without EOS.

Design/Methods Retrospective cohort study of newborns admitted from 2009-2014 to two neonatal intensive care units (NICU) and one well baby nursery (WBN). All CRP values obtained at ≤72 hours of age were included. Charts of infants with values ≥100 mg/L were manually reviewed during the first 3 days of age and assessed for delivery characteristics, primary diagnosis and interventions. EOS was defined as blood or cerebrospinal fluid culture obtained ≤ 72 hours of age and growing a pathogenic species.

Results Of 39,997 eligible infants, at least one CRP test was obtained ≤72 hours of age for >70% of infants ever admitted to the NICU and 21% admitted to WBN (Figure 1). Among those with a test, 2148/9058 (24%) NICU admissions and 370/5848 (6%) in WBN had at least one value >10mg/L (Table 1) and included 34/41 EOS cases. Excluding all infants with EOS, median CRP value increased with age in all study categories with a right skewed distribution across all study categories (Figure 2). Of the 104/14907 (0.7%) infants with a CRP value ≥100 mg/L, 103 were started on antibiotics and EOS was confirmed in 10 (9.6%). Regardless of culture results, many infants required intensive care in form of respiratory support (67%) and hemodynamic support (23%). Infants initially well-appearing infants who were started on antibiotics only due to the high CRP constituted 30% of the cohort including one infants with EOS.

Conclusion(s) Infants with CRP value ≥100 mg/L were enriched with EOS cases but ~90% of these infants did not have positive cultures and were associated with a myriad of conditions that could account for the high values. Initiation antibiotics in high risk infants with extremely high CRP value may be reasonable, however the merit of prolonged therapy remained unclear. CRP values overall show a skewed distribution with abnormal results in 17% of tested infants and <1% confirmed as an EOS case. Understanding the determinants of CRP value may assist with interpretation and its use in management of newborns.

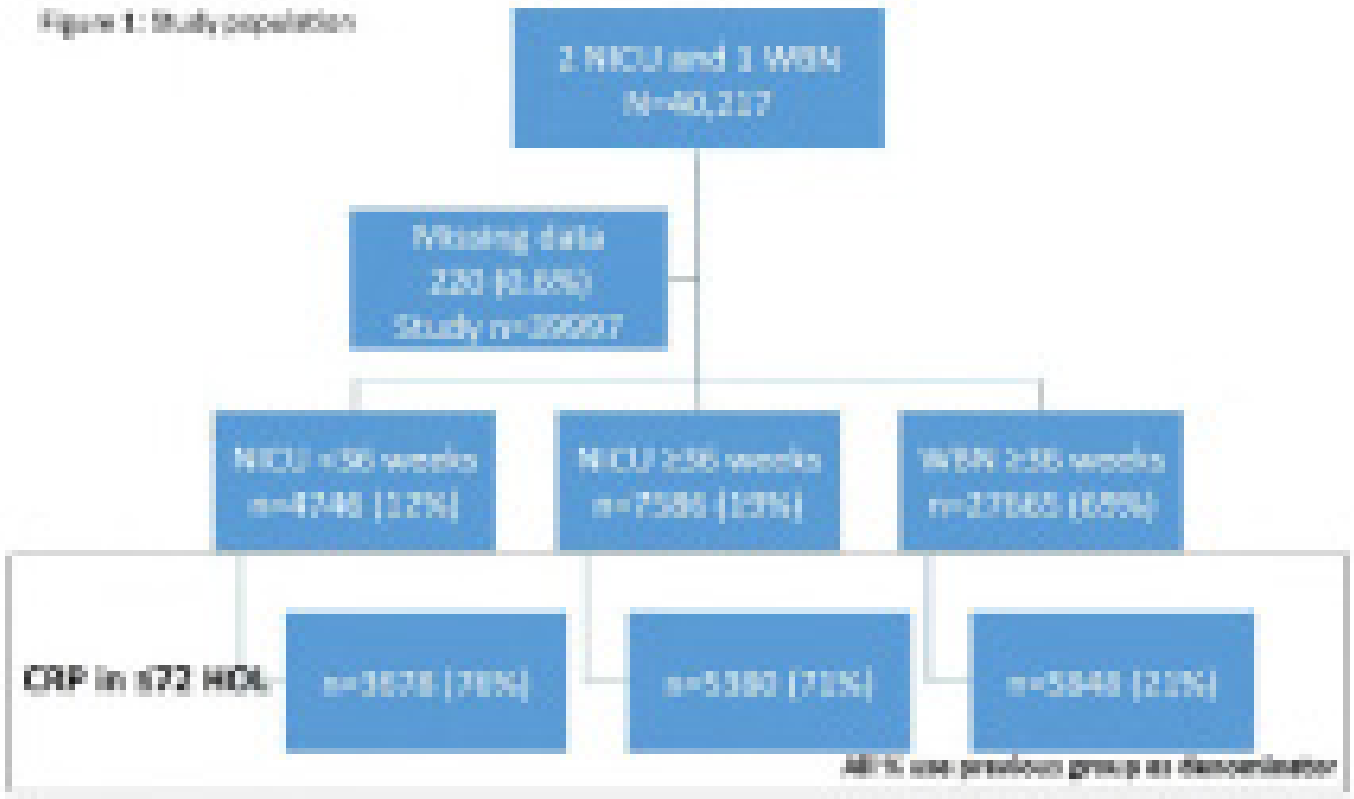

Figure 1: Study population

Table 1: Proportion of infants across gestations with the highest CRP value obtained in 72 hours by categories of CRP value

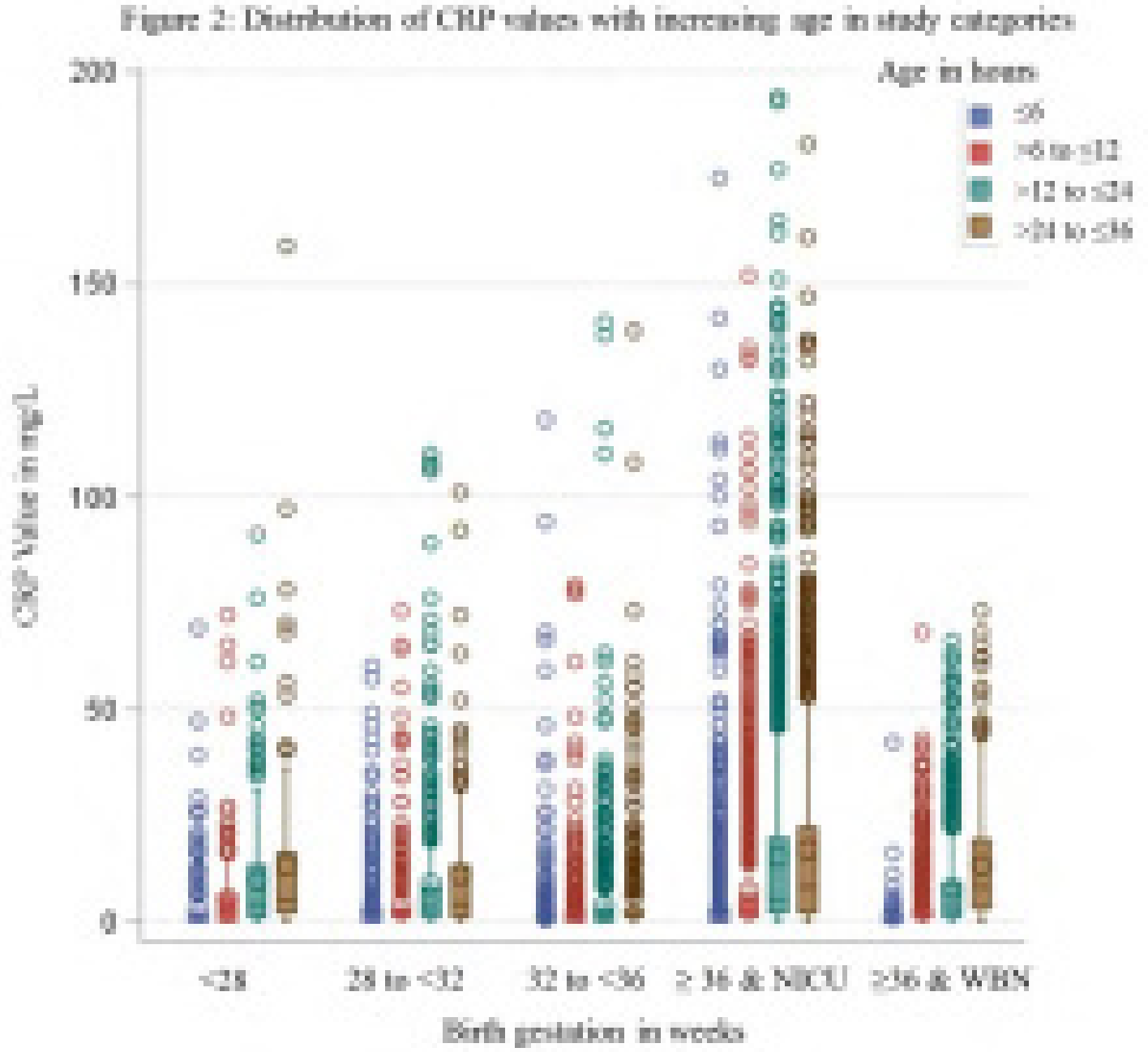

Figure 2: Distribution of CRP values with increasing age in study categories (restricted to 36 hours)

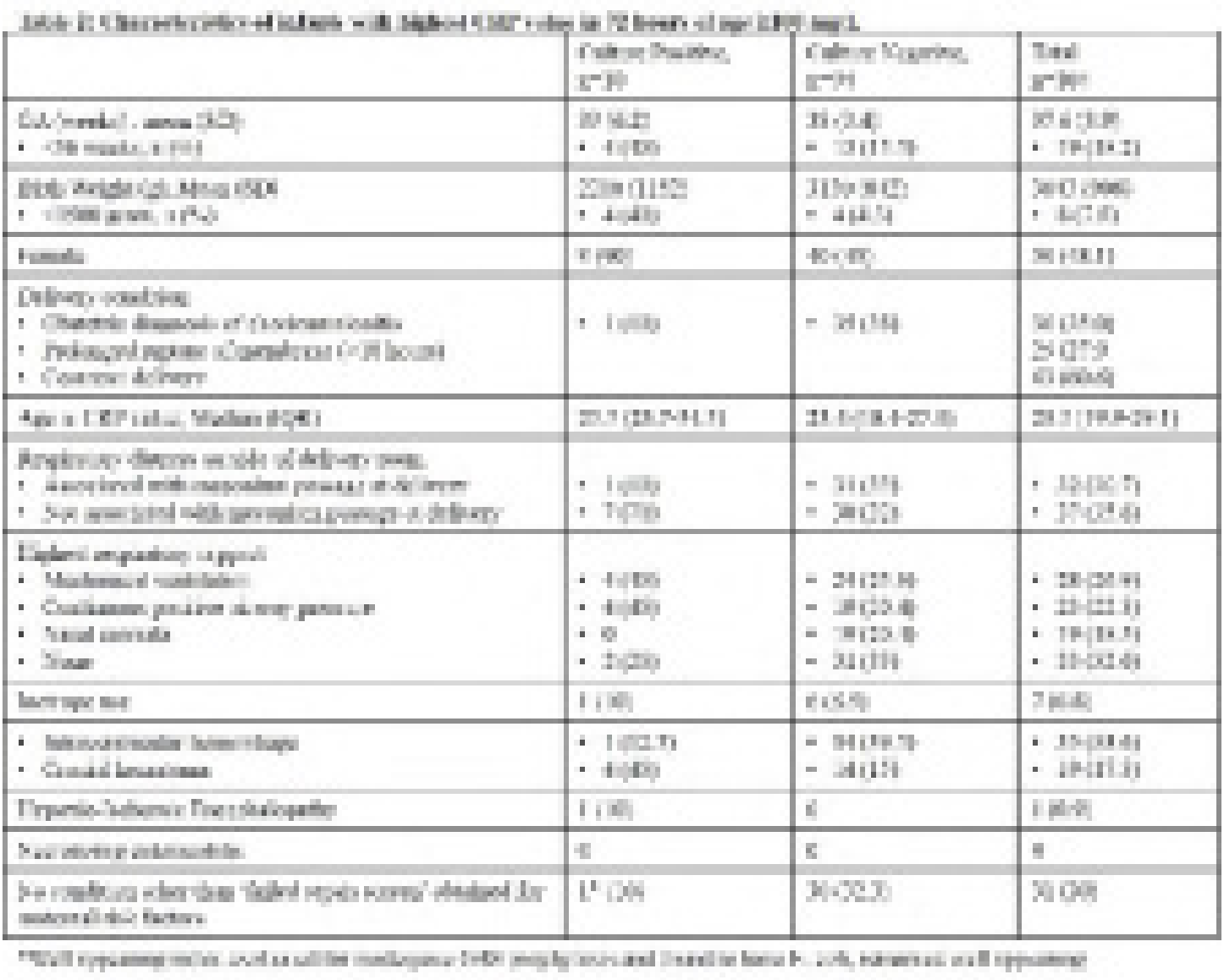

Table 2: Characteristics of infants with highest CRP value in 72 hours of age ≥100 mg/L

Abstract: 234

Comparison of Neonatal Early Onset Sepsis Calculator Recommendation with Clinical and Laboratory Assessment in African American predominant underserved community

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Background Use of neonatal early onset sepsis (EOS) calculator (Cal), a multivariate risk assessment tool devised by Kaiser Permanente Division of Research may reduce laboratory evaluation and antibiotic (AB) administration without apparent adverse effects. African American (AA) neonates have higher rates of EOS but, race is not an independent predictor in Cal multivariable analyses.

Objective To compare Cal vs. clinical/laboratory parameters (lab) as screening tools for EOS detection and AB recommendation in AA predominant underserved community.

Design/Methods Retrospective study of neonates born at ≥34 week-gestation admitted to neonatal intensive care unit from Jan

2016 to Dec 2017 who received AB within 72 hours (h) of life. Maternal risk factors and neonatal clinical presentation at 24 h of life were used to obtain Cal recommendation. Study population was stratified into 3 groups (Figure 1): Group A, neonates who received AB based on clinical and lab; Group B, neonates whom Cal recommended AB; Group C, neonates whom Cal did not recommend AB. Comparison of white blood cell count (WBC), platelet count (PLT), immature to total neutrophil ratio (I:T), C-reactive protein (CRP) at birth and at second set of labs that range 12-65 h of birth, positive blood culture, AB treatment and histopathological chorioamnionitis (CA) were assessed using Chi-squared test for categorical variables or Mann-Whitney test for numerical variables. Sensitivity (St), specificity (Sp), positive (PPV) and negative predictive values (NPV) for abnormal lab and Cal recommendation of AB were obtained using positive blood culture as standard.
Results Demographic characteristics are shown in Table 1. Eighty percent of neonates were AA. A total of 471 neonates received AB. Cal recommended AB in 302 neonates (64%). Table 2 compares characteristics of the 3 groups. There was no significant difference in WBC, PLT, I:T, CRP and CA among groups. Only 7 (1.5%) had positive blood culture. Of 7, Cal recommended AB in 6. Table 3 compares Cal recommendation vs. CRP in EOS. St and NPV for Cal recommendation for AB were 85.7% and 99.4% respectively while St and NPV for abnormal CRP at 12-65 h of birth were both 100%.
Conclusion(s) Usage of Cal could decrease unnecessary administration of AB in the NICU. However, screening neonates for EOS using only Cal could miss culture positive EOS. Adding CRP at 12-65 h of birth may improve detection of culture positive EOS in communities with higher EOS rates.

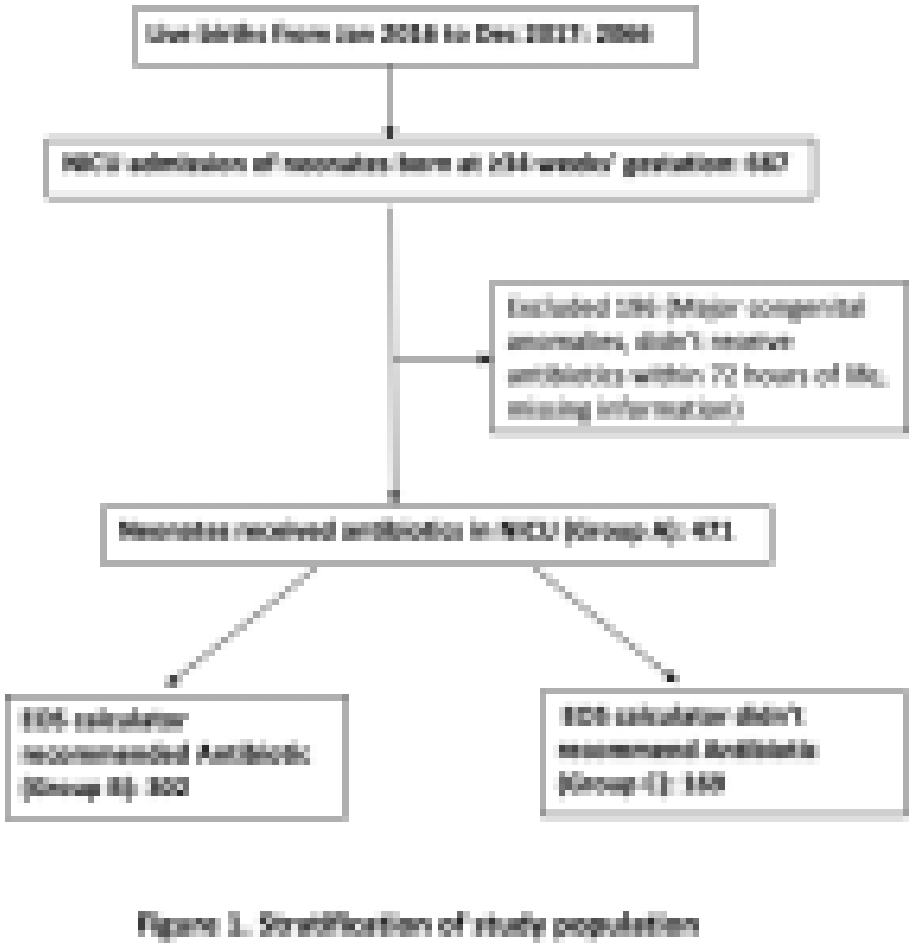

Figure 1. Stratification of study population

Table 2: Comparison of lab parameters among neonates who received antibiotic (Group A), whom EOS calculator recommended antibiotic (Group B) and whom EOS calculator didn't recommend antibiotic (Group C)

Characteristics	Group A (n = 471)	Group B (n=302)	Group C (n = 169)	P value
Abnormal WBC 1, n (%)	35/425 (8.2%)	25/287 (8.7%)	10/138 (7.2%)	0.876
Abnormal PLT 1, n (%)	12/421 (2.9%)	8/286 (2.8%)	4/138 (3%)	0.995
Abnormal I:T 1, n (%)	4/386 (1.0%)	2/260 (0.8%)	2/126 (1.6%)	0.758
Abnormal CRP 1, n (%)	83/399 (20.8%)	56/273 (20.5%)	27/126 (21.4%)	0.978
Abnormal WBC 2, n (%)	28/461 (6.1%)	20/294 (6.8%)	8/167 (4.8%)	0.685
Abnormal PLT 2, n (%)	7/446 (1.6%)	6/283 (2.1%)	1/163 (0.6%)	0.468
Abnormal I:T 2, n (%)	2/442 (0.5%)	1/283 (0.4%)	1/159 (0.6%)	0.918
Abnormal CRP 2, n (%)	282/463 (60.9%)	185/296 (62.5%)	97/167 (58.0%)	0.646
Positive blood culture, n (%)	7/471 (1.5%)	6/302 (2%)	1/169 (0.6%)	0.487
Histopathological chorioamnionitis (n=454), n (%)	136/339 (40.1%)	100/231 (43.3%)	36/108 (33.3%)	0.219
AB duration, median (IQR)	104 (60-109)	107 (70-109)	94 (51-108)	0.007* 0.206**

Abbreviations: n, number of subjects; 1, median time interval of one hour (range 0-12, IQR 1-2) from birth; 2, median time interval of 25 hours (range 12-65, IQR 24-28) from birth; Abnormal WBC, white blood cell <8000/microliter and >30,000/microliter; Abnormal I:T , immature: total neutrophil ratio ≥0.2; Abnormal PLT, platelet count <100,000/microliter; Abnormal CRP, C-reactive protein level >1 mg/dL ; *=comparing Group B and Group C; **=comparing Group A and Group B

Table 3: Sensitivity, Specificity, PPV, NPV, LR+, LR- for identifying blood culture positive EOS using CRP and EOS calculator recommendation (n=471)

	Positive culture	Negative culture		Positive culture	Negative culture
Abnormal CRP 2	7	275	Cal recommended AB	6	296
Normal CRP 2	0	189	Cal didn't recommend AB	1	168
Sensitivity, (95% CI)	100 % (59-100)		Sensitivity, (95% CI)	85.7 % (42.1-99.6)	
Specificity, (95% CI)	40.7 % (36.2-45.4)		Specificity, (95% CI)	36.2 % (31.8-40.8)	
PPV, (95% CI)	2.5 % (2.3-2.7)		PPV, (95% CI)	1.99 % (1.46-2.69)	
NPV, (95% CI)	100 %		NPV, (95% CI)	99.4 % (96.5-99.9)	

LR+, (95% CI)	1.69 (1.56-1.82)	LR+, (95% CI)	1.34 (0.99-1.83)
LR-, (95% CI)	0.0	LR-, (95% CI)	0.39 (0.06-2.43)

Abbreviations: n, number of subjects; EOS, neonatal early onset sepsis; Abnormal CRP, C-reactive protein level >1 mg/dL; Normal CRP, C-reactive protein level equal or less than 1 mg/dL; 2, median time interval of 25 hours (range 12-65, IQR 24-28) from birth; Cal, EOS calculator; AB, antibiotic; PPV, positive predictive value; NPV, negative predictive value; LR+, positive likelihood ratio; LR-, negative likelihood ratio

Table 1: Demographic and clinical data

Characteristics	Numbers (n=471 except as indicated)
Maternal Race, n (%)	African American: 375 (80%) Hispanic 27 (6%) Asian 9 (2%) Other 60 (12%)
Gestational age in weeks, Median (IQR)	38.9 (37.1-39.7)
Maternal Group B streptococci colonization, n (%)	Positive: 107 (23%) Unknown: 113 (24%) Negative: 251 (53%)
Duration of rupture of Membranes in hours, Median (IQR)	2 (0-8)
Mother received intrapartum antibiotic >4 hours, n (%)	163 (35%)
Delivery by C-Section, n (%)	230 (49%)
Birth weight in grams, Median (IQR)	3033 (2639-3458)
Positive blood culture	7 (3.3/1000 live births)
Chorioamnionitis on histopathology (n=339), n (%)	136 (29%)
Duration of antibiotic treatment, hours, Median (IQR)	104 (60-109)

Abstract: 235

Coloring to Reduce Stress Among Advanced Practice Providers in the Neonatal Intensive Care Unit

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Background Stress among healthcare providers can have detrimental effects to providers and patients. High levels of stress lead to decreased job satisfaction, high turnover, burnout, and negative patient outcomes. Furthermore, staff working in the neonatal intensive care unit (NICU) experience high levels of stress related to an intense work environment and patient acuity. Many techniques for reducing stress have been described, but limited studies have examined adult coloring as a specific stress reduction technique in healthcare among neonatal advanced practice providers (APPs).

Objective To determine the feasibility of completing scheduled breaks away from patient care in a 98-bed level IV quaternary NICU in a children's hospital and to examine the utility of coloring as a stress reduction technique compared to a scheduled break without coloring.

Design/Methods This was a randomized 2x2 crossover design pilot study. Participants (n=20) completed two 15-minute sessions: one scheduled break from patient care and one break with coloring. Perceived stress scales (10-item scale modified

for NICU APPs) were completed before and after each session. Data were analyzed using a Wilcoxon signed-rank test for non-parametric matched pairs, assessing scores before and after each session, as well as the magnitude of change between groups. Anticipation versus expectation of coloring as a stress reducer among participants was assessed.

Results All participants were able to complete prescribed sessions. Eighty percent were <40 years of age while 50% had > 5 years of NICU experience. Sixty percent were physician assistants with the remainder being neonatal nurse practitioners. There was a statistically significant decrease in perceived stress scores in the coloring group ($p < 0.02$). (Fig 1& 2) Mean magnitude of reductions in perceived stress scores were 2.5 ± 4.6 for coloring vs 1.3 ± 2.6 for scheduled break only, ($p = 0.08$). (Fig 3) Of note, a greater decrease was seen in perceived stress scores of participants answering "No" to "Do you anticipate coloring will reduce your stress?" compared to participants answering "Yes". (Fig 4)

Conclusion(s) Coloring is a novel, practical technique to decrease stress among NICU APPs. Stress reduction in the workplace may lead to decreased burnout, ultimately improving patient outcomes. Overall, coloring sessions were surprisingly well received by APPS. Next steps involve planning an appropriately powered study to determine if coloring is a useful technique for stress reduction among NICU providers.

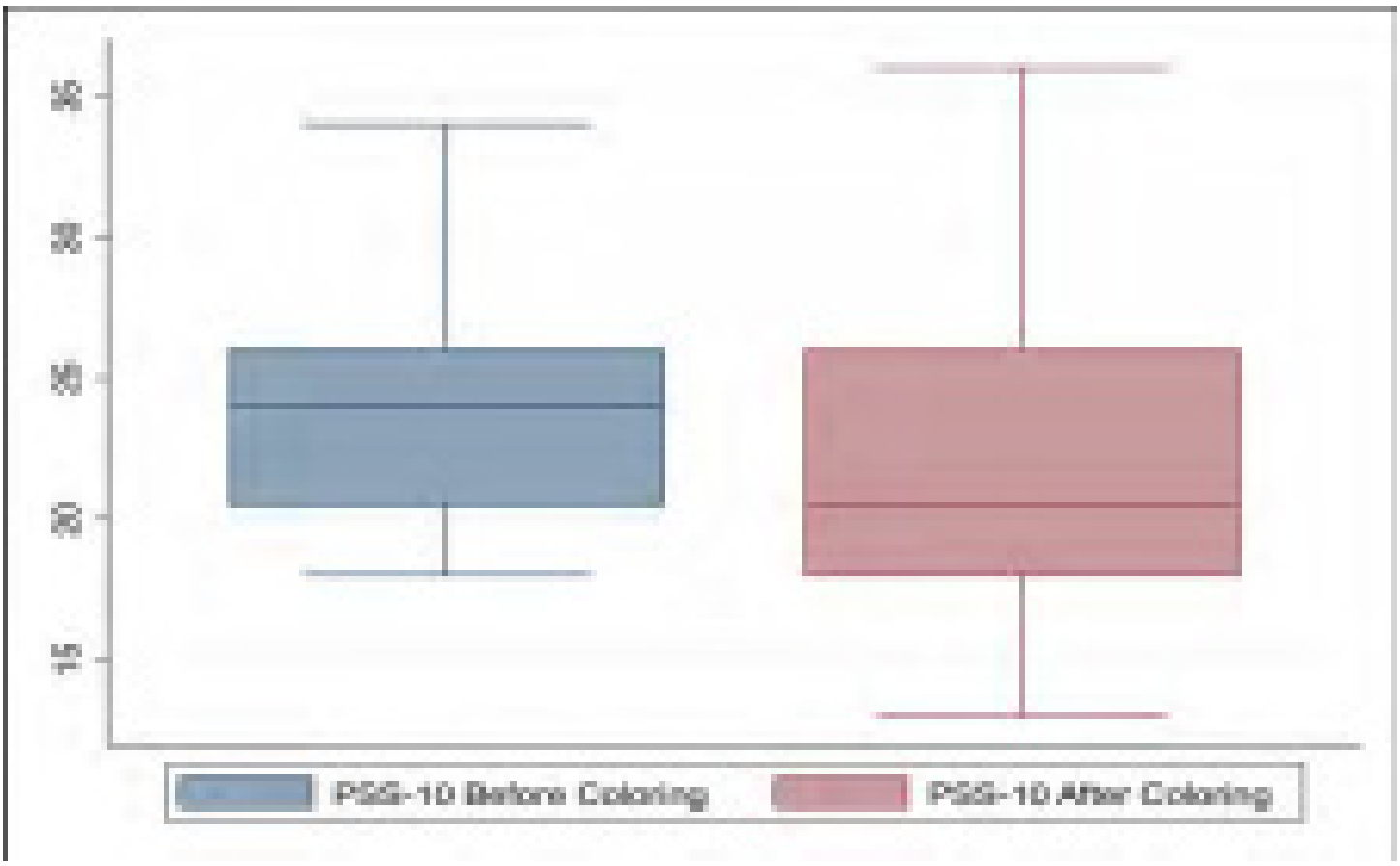

Figure 1 Perceived Stress before and after a break with coloring Coloring group scores

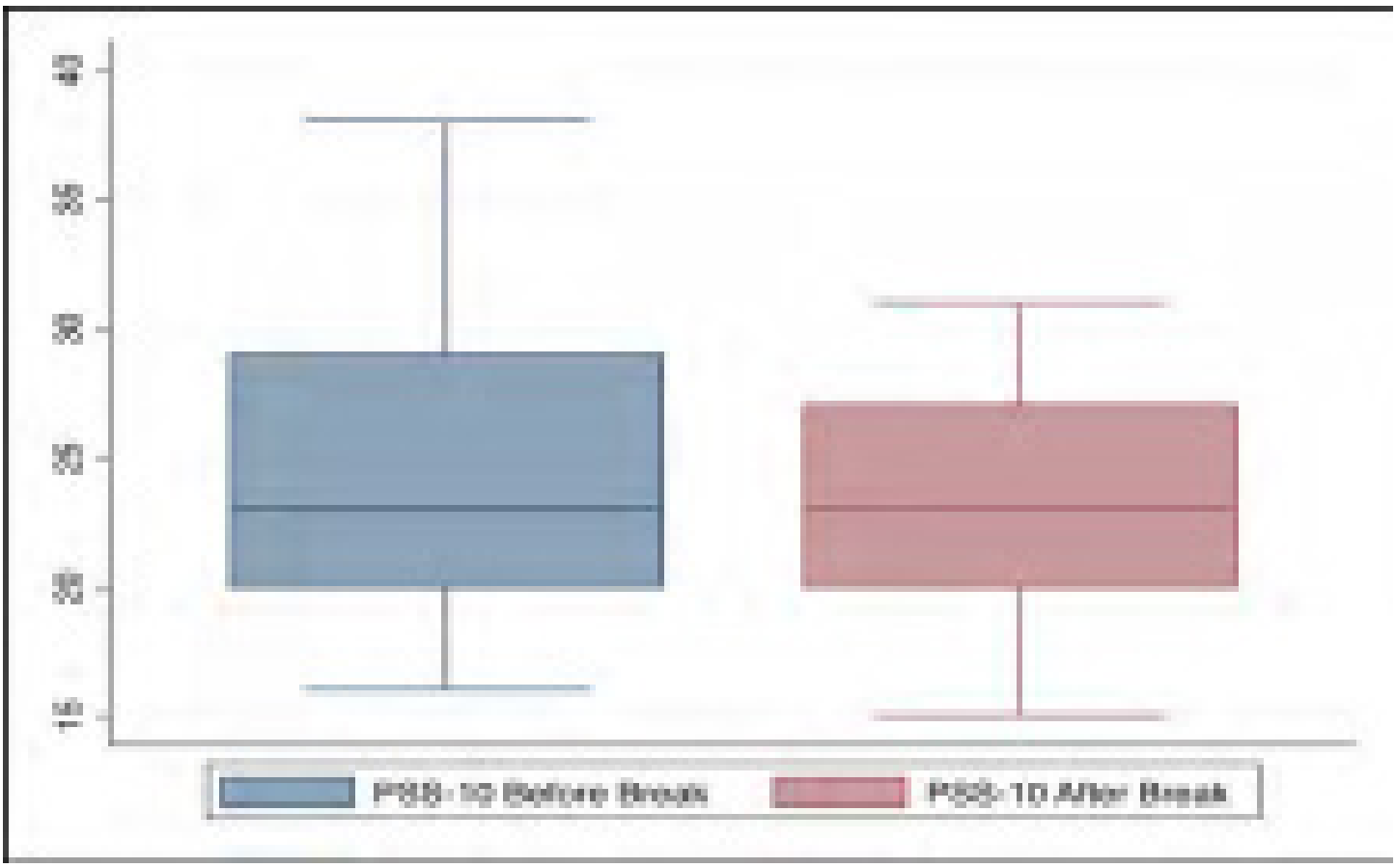

Figure 2 Perceived Stress Before and After a Break Without Coloring Breakgroup scores

Variable	Mean	Std. Dev.	Min	Max
Coloring Group	2.55	4.689	-8	12
Break Group	1.4	3.857	-9	8

Figure 3 Magnitude of change of Scores

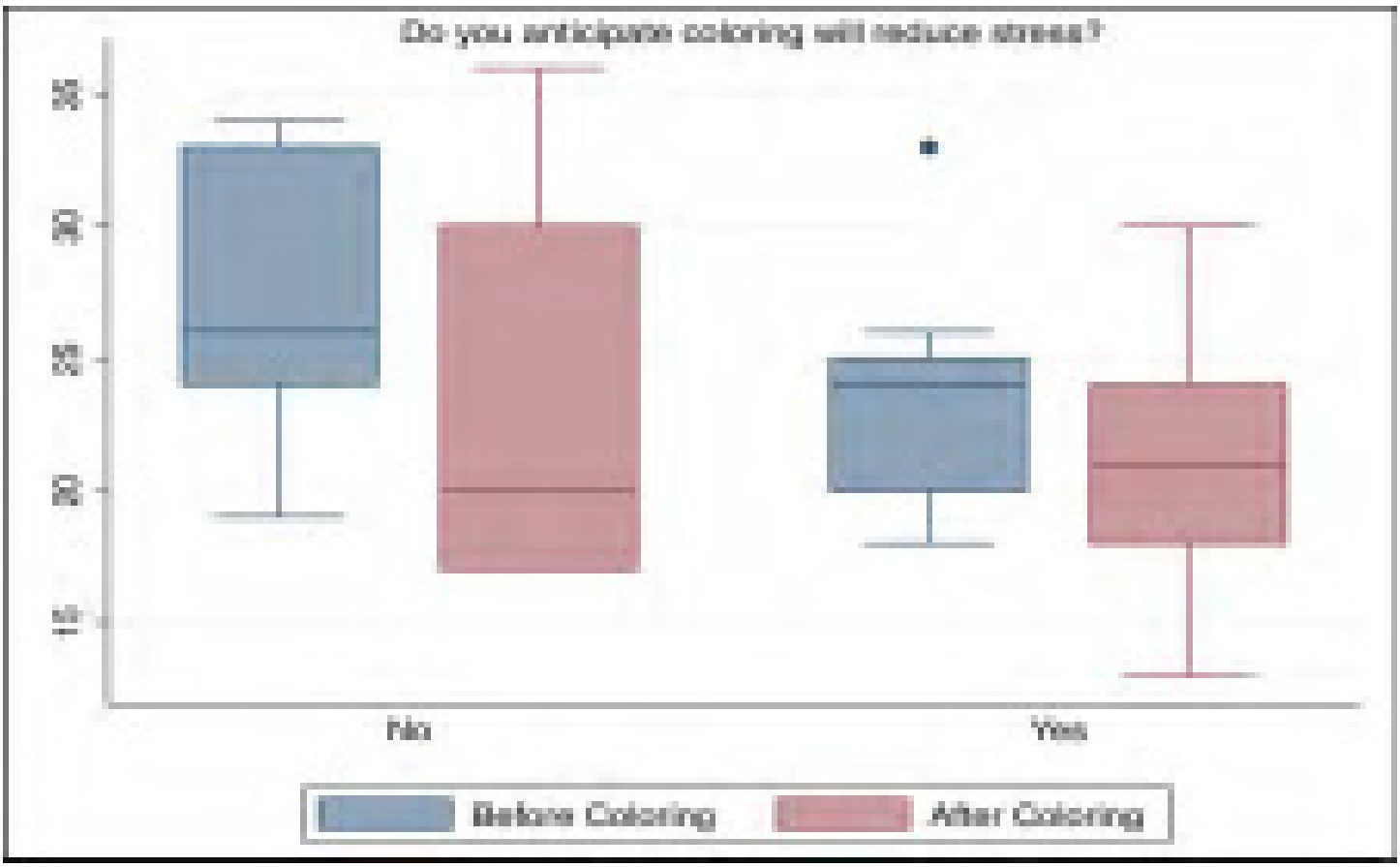

Figure 4 Anticipation of Coloring Scores Scores for participants who felt that coloring would reduce stress and those who felt that coloring would not reduce stress

Abstract: 236

Duration of Labor, Mode of Delivery and Hearing Screen in Term and Postterm Newborns

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Background Newborn hearing screen prior to nursery discharge is mandatory in NYS since October 2001. Newborns are screened using Otoacoustic Emission (OAE) method and retested using Auditory Brainstem Response (ABR) method if the newborn fails initial OAE. Studies comparing OAE with mode of delivery in newborns showed higher failure rates after cesarean section delivery. There are limited data regarding duration of labor, mode of delivery and hearing screen in term and postterm newborns.

Objective To explore any relationship between duration of labor, mode of delivery, time of hearing screen in newborns ≥36 weeks.

Design/Methods Retrospective chart review of well newborns ≥36 weeks delivered in Flushing Hospital Medical Center between July 2014 and July 2016. Exclusion criteria included gestational age (GA) <36weeks, neonatal intensive care unit admission and having risk factors for hearing loss. Data collected included multiple pregnancy, amniotic fluid index (AFI), duration of labor (DOL), mode of delivery, GA, birthweight (BW), gender, and hours of life at initial hearing test (HOL). Data were analyzed using SPSS software, Mann-Whitney U test, Fischer-exact/chi-square test and odds ratio, p <0.05 was considered significant.

Results Of 2660 charts reviewed, 2624 met inclusion criteria, 51.3% were males, 99% singleton, 99.8% term and 31.9% were delivered by cesarean section. Total of 90 (3.4%) newborns failed initial OAE, 23/90 (25%) also failed the final ABR. Those who passed and failed OAE were compared for BW, HOL, DOL and AFI in Table 1. For every HOL increase at OAE, the

odds of having a passed OAE increase as well (OR 0.976, 95%CI 0.967-0.986), p <0.001. This model is significant explaining 2.4% in the variation of the OAE results, p< 0.001.

Conclusion(s) The older the newborn at initial screening, the higher the likelihood of passing OAE. Gender, mode of delivery, DOL, GA, BW and AFI did not affect OAE screen.

Abstract: 237

Breast is Best? The Influence of Breast Feeding Campaigns on NICU Mothers who Exclusively Breastfeed Compared to Mothers Who Are Unable

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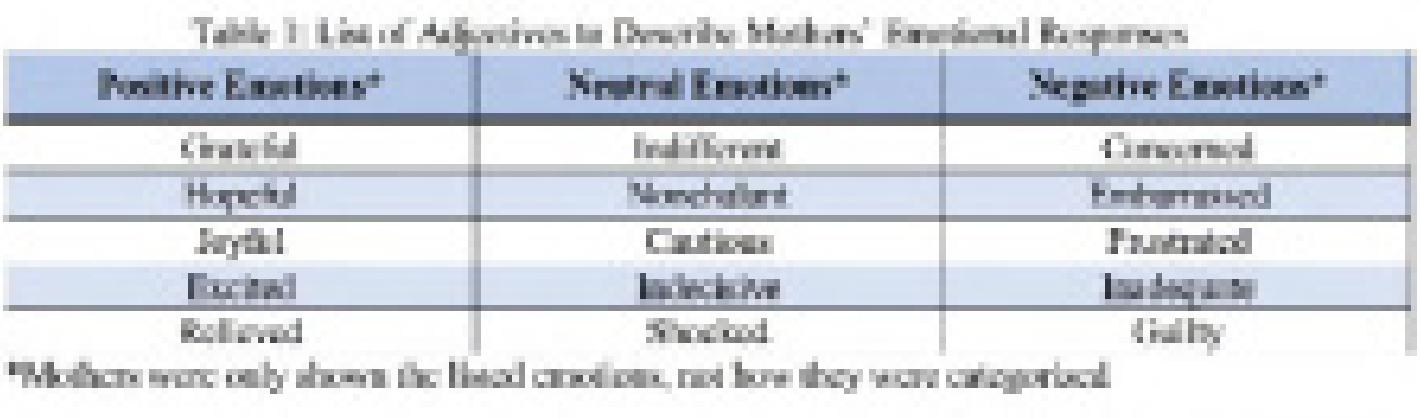
Background Breast milk has many benefits, especially for Neonatal Intensive Care Unit (NICU) infants. The slogan "breast is best" has increasingly become a household phrase as pro-breastfeeding organizations tout the numerous benefits of breast milk. Unfortunately, many mothers are unable to provide enough milk to exclusively breastfeed (EBF) their NICU infant. As a result, it is possible that the encouragement to breastfeed may turn into a pressure that negatively impacts these mothers. To date, little research has been conducted examining the emotional response of mothers of NICU infants to their ability to EBF and its relationship to "breast is best."

Objective To assess how NICU mothers feel about their abilities to EBF and how breastfeeding campaigns influence their emotional response.

Design/Methods An anonymous survey was given to mothers of NICU infants during NICU Follow Up visits for two large level 3/4 NICUs. In addition to demographic questions, the survey asked if respondents were able to EBF and to rate their overall emotion about EBF on a scale of 0-Extremely Negative to 100-Extremely Positive. They then chose 3 of 15 adjectives that best categorized their emotional response (Table 1). Finally, they were asked to rate (5-point Likert scale) whether the "Breast is Best" campaign influenced their emotional responses and their overall emotion about the "Breast is Best" campaign on the scale of 0-100. Those who were unable to EBF were further asked if they felt pressured to attempt to EBF.

Results A total of 50 respondents (44% white) completed the survey, of which 56% (n=28) were able to EBF. On average, mothers who were able to EBF rated their overall emotion 89.1, while mothers who were unable had significantly lower emotion ratings (53.8, *p<.001*). EBF mothers felt more positive on average about "Breast is Best" (mean=77.4 vs. mean=64.0) (Table 2). Of the women unable to EBF, 63.6% (n=14) felt pressured to continue providing breast milk. Overall, mothers rated the influence of "Breast is Best" on their emotion responses as relatively high (mean=3.82 out of 5).

Conclusion(s) While mothers with infants in the NICU rated the effectiveness of the "Breast is Best" campaign highly, NICU mothers who were unable to exclusively breastfeed showed significantly lower overall emotional positivity and reported feeling pressured to succeed. NICU staff must be mindful of the pressures of EBF and provide emotional support to mothers who may be struggling.



Positive Emotions*	Neutral Emotions*	Negative Emotions*
Grateful	Indifferent	Concerned
Hopeful	Nonchalant	Embarrassed
Joyful	Cautious	Frustrated
Excited	Indecisive	Inadequate
Relieved	Shocked	Guilty

*Mothers were only shown the listed emotions, not how they were categorized

List of Adjectives to Describe Mothers' Emotional Responses

	Mothers Able to EBF	Mothers Unable to EBF
Overall Emotion Rating	89.1*	53.8*
Adjective Most Often Chosen	Grateful (n=18)	Frustrated (n=11)
Influence of "Breast is Best"	3.82	3.81
"Breast is Best" Emotion Rating	77.4	64.0

*Statistically significant difference, $p<.001$

Response Differences across Ability to Exclusively Breastfeed NICU Graduate

Abstract: 238

Risk factors for Maternal Stress and Positive Postpartum Depression Screening (PPD) in the Neonatal Intensive Care Unit (NICU)

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Background Postpartum depression is a common complication of childbirth, with higher rates reported in mothers of NICU hospitalized infants. NICU mothers report higher rates of postpartum stress. However, within neonatal care risk factors for positive PPD screening & their relationship to elevated self-reported stress levels is not well-characterized.
Objective To determine infant/maternal factors associated with maternal positive PPD screen and NICU parental stress.
Design/Methods Prospective study of mothers of infants conducted between 21-30 days of their infant's life while still hospitalized in the NICU. Mothers completed the Edinburgh Postpartum Depression scale (EPDS) and the Parental Stressor Scale: NICU- which includes potential modifiers of parental stress. A positive PPD screen was defined as a score of $\geq$10 on the EPDS. Demographic data obtained included marital status (married vs. unmarried), insurance status (Medicaid vs. private), self-reported race & number of discharge medications. Data was analyzed with chi-squared, Fisher's exact, Kruskal-Wallis, Mann-Whitney u, linear regression, and logistic regression.
Results Data for 90 mothers of 110 eligible mothers was analyzed. Mean gestational age (GA) and birthweight (BW) of infants in the cohort were (Mean$\pm$Std. Dev.) 30 wks $\pm$1 day & 1579 g $\pm$ 111g. Among respondents, 20% (18/90) had a positive PPD screen. In bivariate analysis rates of maternal marital status, Medicaid status, and race did not differ between mothers who screened positive and those that did not. Further, no difference in infant BW, GA, & number of discharge medications was observed in mothers with a positive PPD screen. Parental stress score was associated with a positive PPD screen after adjusting for BW and race ($p<0.001$). Adjusting for BW, Hispanic race was associated with lower PSS than White race (Coef -19.5; 95% CI -34.9 - -4.2). Positive PPD screening was associated with each of the three domains of parental stress (neonatal factors, environmental factors & parental role; p's<0.003).

Conclusion(s) Cumulatively and within each domain parental stress score correlates with a positive PPD screen. Of factors examined, Hispanic race negatively correlates with a positive maternal depression screen. Reducing modifiable factors which contribute to parental stress, and improving maternal-neonatal interaction may reduce the incidence of positive PPD screening.

Abstract: 239

Do Extremely Preterm Infants Needs Screening for Retinopathy of Prematurity Earlier Than 31 Weeks Post Menstrual Age?

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Background The guidelines for screening of retinopathy of prematurity (ROP) have been revised by the American Academy of Pediatrics (AAP) as recently as 2018. The guidelines recommend that the first screening for ROP be performed at 31 weeks postmenstrual age (PMA) in premature infants born ≤27 weeks' gestation. These changes were made in response to findings that the onset of serious ROP better correlates with PMA than with chronologic age, and that the development of severe ROP takes longer in the more premature infant. At our institutions, ROP screening is initiated at 4 weeks chronological age for extremely premature infants, earlier than that recommended by the AAP. The ophthalmic examination for ROP is a stressful one for a fragile neonate and can have deleterious effects on their well-being.
Objective To determine the utility of screening all extremely preterm infants for ROP earlier than AAP suggested guidelines.
Design/Methods This is a retrospective data analysis from two tertiary neonatal intensive care units. We included preterm infants (<27 weeks gestation) born between June 2006 and June 2018 and survived until first eye examination. Infants transferred for the treatment of ROP were excluded. The eye examination findings and PMA for laser therapy were extracted from the database.
Results The study included 550 infants with a mean gestational age at birth of 25.1 weeks (SD = 1.2 weeks) and mean birth weight of 758g (SD = 323g). There were a total of 1,310 ophthalmologic examinations, and 676/1,310 (51.6%) of the examinations were performed prior to 31 weeks PMA. None of the infants screened prior to 31 weeks PMA met criteria for laser therapy. 87/550 infants (15.7%) ultimately required laser therapy, none prior to 32 weeks PMA. The median PMA for laser therapy was 35 weeks (range 32-46 weeks).
Conclusion(s) In our large, dual-center population of infants born prior to 27 weeks gestation, no infants were found to have severe ROP prior to 31 weeks PMA. Our data support the most recent AAP recommendations of initiating ROP screening at 31 weeks postmenstrual age (PMA) for infants born ≤27 weeks gestation, and suggest the potential to reduce the number of retinal exams without compromising clinical outcomes.

Eye examination findings at various postmenstrual ages

	PMA 27w (37)	PMA 28w (115)	PMA 29w (183)	PMA 30w (341)	PMA 31w (262)	PMA 32w (372)
Immature/No ROP	37	111	173	310	217	249
Fully Mature	0	0	0	0	0	2
ROP Stage 1	0	4	10	28	33	87
ROP Stage 2	0	0	0	3	9	23
ROP Stage 3	0	0	0	0	3	11
Plus Disease	0	0	0	0	0	12
Meeting Criteria for Laser	0	0	0	0	0	13

PMA of Laser Therapy at Various Gestational Ages

Gestational Age At Birth (weeks)	Number of Infants	Number Requiring Laser Therapy (%)	PMA of laser (med, range)
22	5	1 (20)	35
23	50	21 (42)	35 (32-40)
24	123	28 (22.8)	34 (32-46)
25	156	16 (10.2)	34 (32-38)
26	216	21 (9.7)	35 (32-39)
Total	550	87 (15.8)	35 (32-46)

Abstract: 240

Development and Ananlysis of An Abrreviated MOTHER-Finnegan Score (MFNAS) for The Neonatal Abstinence Syndrome (NAS).

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Background The 21-item Finnegan Neonatal Abstinence Scale (FNAS-21) is commonly used for assessing disease severity in infants with NAS. The sum of three scores ≥24 (average ≥8), or single score ≥12 are commonly used thresholds for initiating or intensifying therapy. Standardized scoring and adherence to treatment protocols improves outcomes for NAS regardless of pharmacological agent used. The 19-item MOTHER FNAS Scale (MFNAS-19) previously used in the MOTHER, BBORN and other clinical trials is used as standard of care at Thomas Jefferson University Hospital (TJUH). Three to four hourly FNAS assessments are a time-consuming component of nursing care needed for infants with NAS. Attempts to shorten the FNAS (sFNAS) using a variety of statistical methods have produced versions with high Pearson's correlation coefficients but unsatisfactory performance for matching the FNAS scores ≥8 and ≥12 often used in decision making at TJUH.

Objective Our goal was to develop a short version of the MOTHER-FNAS (sMFNAS) with performance characteristics comparable to the full MFNAS

Design/Methods Retrospective analysis of 134,170 FNAS-19 scores for 775 infants ≥36 weeks gestation treated for NAS at Thomas Jefferson University Hospital from August 8, 2007 to May 5, 2015 (NCT01671410) retrieved from the electronic database. Infants were randomly divided into training (n = 407) and validation (n = 373) sets. Recursive partitioning was used to identify the most important items of MFNAS-19 scores in the training set for predicting scores ≥ 8, ≥ 12; or both. Four candidate short scales were developed using logistic regression to compute optimal coefficients that were then tested in the validation set.

Results Four shortened score candidates were evaluated, MFNAS-4, MFNAS-7, MFNAS-9 and MFNAS-11. The 9 or 11 element shortened scales retained >90% sensitivity and specificity of the full 19 element MOTHER Finnegan score, however the MFNAS-11 had the best performance for predicting scores of both ≥ 8 or ≥ 12 . Performance of 9 or 11 element shortened scales to predict a MOTHER Finnegan score ≥ 8 or ≥ 12 did not differ by postnatal age from 1 to ≥ 5 weeks.

Conclusion(s) Shortened Finnegan scoring instruments were identified that retained much of the predictive power of the 19 element full MOTHER Finnegan score. There were no significant changes in the sensitivity with postnatal age, supporting the current practice of utilizing a single scoring tool regardless of post-natal age.

Overall performance of candidate short NAS scales in the validation set.

	Threshold for			95% confidence limit			95% confidence limit		TPE
Scale	mFNAS	sFNAS	Sensitivity	Lower	Upper	Specificity	Lower	Upper	
sFNAS-4	≥ 8	≥ 3	0.80	0.80	0.81	0.83	0.83	0.84	0.172
	≥ 12	≥ 4	0.88	0.86	0.89	0.92	0.92	0.93	0.077

sFNAS-7	≥ 8	≥ 5	0.82	0.81	0.82	0.93	0.93	0.93	0.093
	≥ 12	≥ 6	0.97	0.96	0.98	0.91	0.90	0.91	0.093
sFNAS-9	≥ 8	≥ 5	0.91	0.91	0.92	0.91	0.90	0.91	0.092
	≥ 12	≥ 7	0.97	0.96	0.98	0.95	0.95	0.95	0.051
sFNAS-11	≥ 8	≥ 7	0.91	0.90	0.91	0.94	0.94	0.94	0.064
	≥ 12	≥ 9	0.99	0.98	0.99	0.95	0.95	0.95	0.051

mFNAS = MOTHER-Finnegan NAS-19 score, sFNAS = shortened mFNAS score, TPE = Total Prediction Error

Elements of evaluated shortened Finnegan NAS (sFNAS) scores.

Number of scored elements	sFNAS-4	sFNAS-7	sFNAS-9	sFNAS-11
Crying	X	X	X	X
Poor feeding	X	X	X	X
Loose Stools		X	X	X
Sleep		X	X	X
Tachypnea	X	X	X	X
Tremors: Undisturbed			X	X
Tremors: Disturbed				X
Vomiting			X	X
Increased Muscle Tone		X	X	X
Fever > 99.2 F		X	X	X
Excessive Irritability	X			X
Excoriation				
Nasal Stuffiness				
Sweating				
Sneezing (>4 successive)				
Moro Reflex				
Generalized Seizure				
Frequent Yawning				
Failure to thrive				
Score range	0 - 10	0 - 15	0 – 19	0 - 24

Empty box indicates that variable was not included in optimal tree for sFNAS.

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Depression and anxiety in fathers of infants at discharge from the neonatal intensive care unit (NICU).

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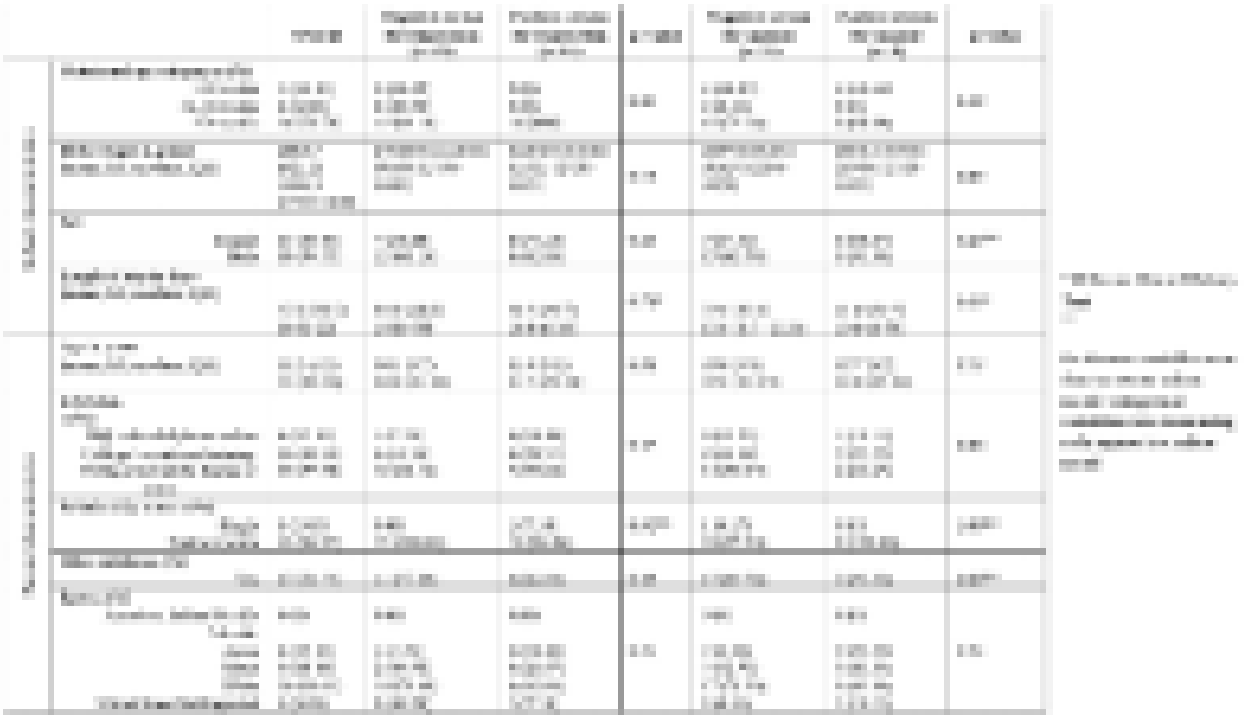
Background Neonates born prematurely or with complications require specialized care in the Neonatal Intensive Care Unit (NICU). This experience can be traumatizing for parents as they are separated abruptly from their newborn and are left to bond with their infant in an artificial environment, leaving them at greater risk of psychological distress and adverse mental health. Maternal depression has been studied at length, but little is known about the effects of the NICU hospitalization on fathers' mental health and even less about psychological distress during the period of transition from hospital to home.
Objective To determine the point prevalence of fathers who screened positive for depression or anxiety symptoms at discharge from a Level IV NICU, and to describe their characteristics.
Design/Methods Data was collected from fathers of infants at the time of discharge as part of a larger randomised control trial evaluating the impact of peer support after NICU discharge on the mental health of parents. The Center for Epidemiologic Studies depression scale (CES-D 10) short form was used to assess for depressive symptoms and the State Trait anxiety scale (STAI) was used to assess for symptoms of anxiety. Demographic data for both infants and fathers was obtained by questionnaire.
Results Of the 33 fathers enrolled in the study, 42% had elevated CED-S scores (≥ 10) and 27% had elevated anxiety scores (>40) (Table 1). All fathers who suffered from depressive symptoms had term infants (>37 weeks) ($p<0.05$). There was no difference in infant sex, length of NICU stay, paternal age, marital status, or level of education between those with positive and negative depression screens. Similarly, fathers with elevated anxiety scores had mostly term infants (88%) but this was not statistically significant. Fathers with > 1 child at home trended towards less anxiety symptoms ($p=0.06$) at discharge. All other factors did not reach statistical significance.
Conclusion(s) Depression and anxiety symptoms were seen predominantly in fathers of term infants at NICU discharge at very high rates compared to the general population of male adults. This finding highlights the extreme psychological distress faced by fathers of NICU infants. Targeted mental health screening and services should be provided to both parents in the NICU and post- discharge.



Abstract: 242

Early Antibiotic Exposure in Neonates Admitted with Respiratory Distress and Later Childhood Illness

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Background Early-onset sepsis(EOS) evaluation and empiric antibiotics are common interventions for neonates with respiratory distress at birth. Significant adverse effects of antimicrobials have prompted reflection on whether their use is appropriate for all newborns with respiratory pathology. Early antibiotic exposure has been associated with increased risks of late-onset sepsis, NEC and mortality in the short term; and childhood diseases such as asthma and T1DM in the long term. An antimicrobial stewardship protocol was established for this population in 2016, resulting in a 59% decrease in antibiotic use upon admission(presentation, PAS 2018).

Objective Our objective was to evaluate whether early antimicrobial exposure was associated with an increased risk of wheeze, asthma and obesity in childhood, and if the incidence of these diseases decreased after initiation of antibiotic stewardship.

Design/Methods We conducted a retrospective analysis of infants admitted to the NICU with respiratory distress at birth from January 2013 to February 2018. Neonates were stratified based on whether they received empiric antibiotics for presumed EOS. We collected follow-up data to determine if patients developed wheeze, asthma or obesity. We evaluated whether the incidence of these conditions decreased after antibiotic stewardship in 2016. Descriptive statistics and Fischer's exact test were used to identify possible associations between early antibiotic exposure and childhood illness.

Results Thus far we have collected data for 133 patients. 52(39%) patients were born prior to our protocol, with 81(61%) born after. 83(61%) newborns received antibiotics and 50(39%) did not. Patients treated with antibiotics had a statistically insignificant increase in asthma and wheeze, but were significantly more likely to develop obesity(p=0.025). Prior to

intervention, asthma and wheeze were less likely to develop as compared to after stewardship; this was not significant. Obesity was significantly more likely to develop in patients born before stewardship(p=0.045). More follow-up data is needed, data collection and analysis are ongoing.
Conclusion(s) Adverse effects of early antibiotic use has raised concern for overuse in neonates with respiratory distress. Long-term follow-up of our cohort revealed a statistically significant increase in obesity for patients treated with early antibiotics and those managed prior to antimicrobial stewardship. Evaluation of larger numbers of these patients at follow-up is needed during this time.

Incidence of Childhood Illness Based on Exposure to Early Antibiotics

*p<0.05	Wheeze (N)	Asthma (N)	Obesity (N)
Early Antibiotics N=83	12 (14%)	6 (7%)	18 * (22%)
No Antibiotics N=50	5 (10%)	2 (4%)	2 * (4%)

Incidence of Childhood Illness Pre and Post Antimicrobial Stewardship Intervention

*p<0.05	Wheeze (N)	Asthma (N)	Obesity (N)
Pre Intervention N=52	5 (10%)	1 (2%)	14* (27%)
Post Intervention N=81	12 (15%)	7 (9%)	6* (7%)

Abstract: 243
Does an Educational Intervention Alter Burnout in NICU Providers?
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Background Burnout, a syndrome of emotional exhaustion (EE), depersonalization, and reduced personal accomplishment, is increasingly common in healthcare providers, but has not been well described in Neonatal Intensive Care Unit (NICU) staff. EE, as measured by the Maslach Burnout Inventory (MBI), correlates highly with overall burnout. The practice of mindfulness can reduce EE and stress.
Objective Assess burnout in NICU staff before and after an educational intervention about burnout and mindfulness skills.
Design/Methods Consenting staff at a large Level III NICU completed an online survey including: the MBI, Perceived Stress Scale (PSS), Brief COPE Survey (COPE), a depression screening tool (PHQ-2), and questions to assess burnout knowledge, use of paid time off (PTO), and turnover intention. For 3 mos, each discipline's staff meeting included brief scripted education about burnout and three mindfulness skills, and group practice of one of the skills. At 1 and 3 mos post intervention, surveys were repeated and also assessed self-reported staff meeting attendance and use of skills. NICU acuity, census, and nursing staffing were measured. Data was analyzed using a Mixed Linear Model.
Results Of eligible NICU staff, 49% (108/220) completed the initial survey and 31% completed the 3 mos post intervention survey (Table 1). Baseline EE score in all providers was 23.3; when MBI profiles were analyzed along the burnout-engagement continuum, 52% reported being Burned Out, Over Extended, or Ineffective (Table 2). Age <40 yrs was associated with being Burned Out compared to age ≥40 yrs (OR 3.33 CI [1.12-9.89]). Respondents who were Burned Out were more likely to report turnover intent (OR 3.73 CI [2.49-4.98]). There were no significant differences in EE or MBI profiles among those who completed pre and post surveys (Table 3). In a repeated measures mixed linear model analysis, nurses and neonatologists had lower EE compared to other staff (p=0.008). Higher EE was associated with younger age (p=0.009), higher PSS (p=0.000), more use of PTO (p=0.023), and higher turnover intention (p=0.000). PHQ-2 and NICU acuity were not significantly

associated with EE.

Conclusion(s) Burnout in our NICU staff is common, especially in those <40 yrs, with a higher PSS, and is associated with more turnover intention and PTO use. Nurses and neonatologists had lower EE compared to other staff. A brief educational intervention was not associated with a change in burnout as measured by the MBI. Further investigation is needed to identify effective interventions for at risk groups.

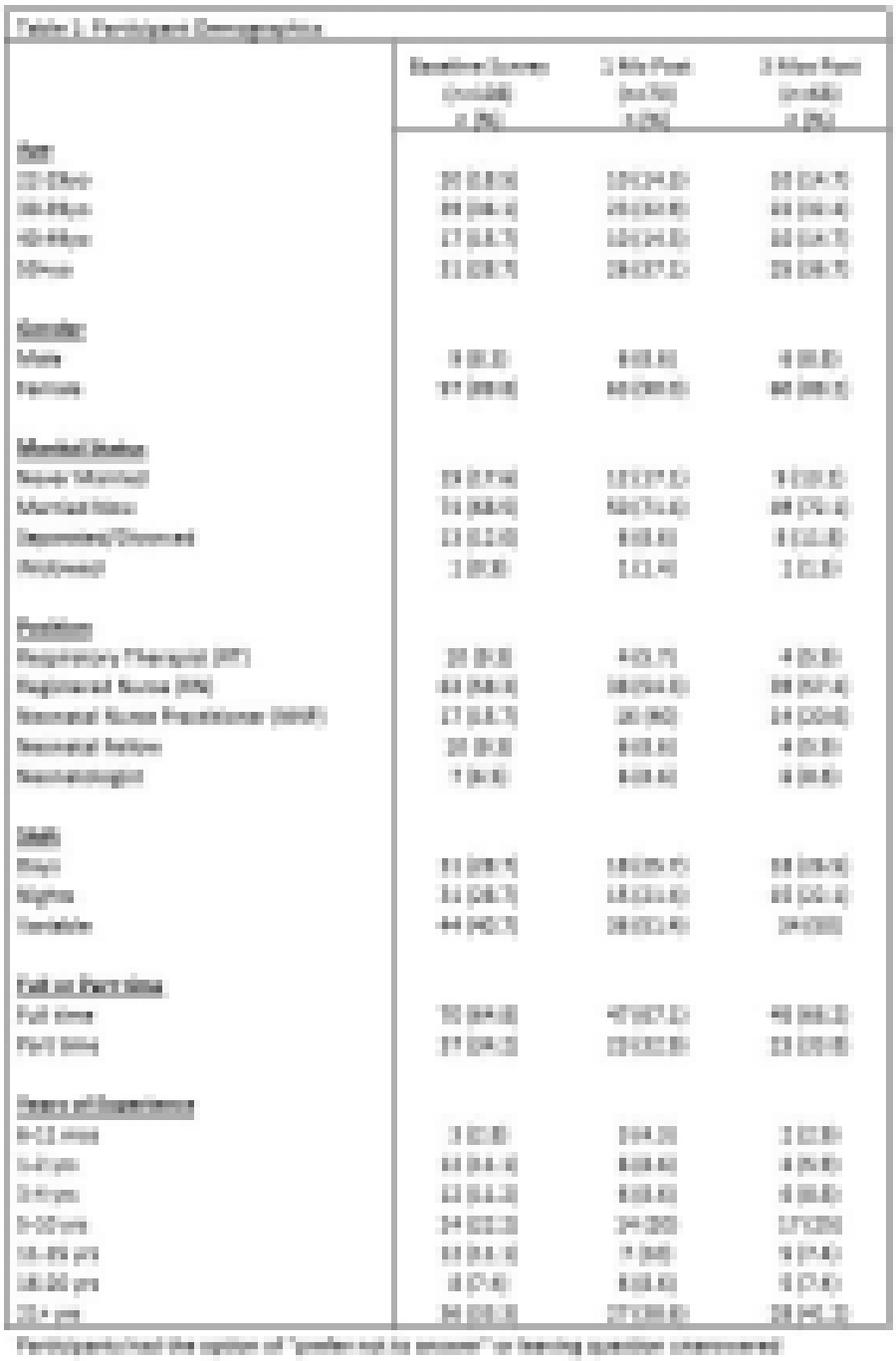

Table 1: Participant Demographics

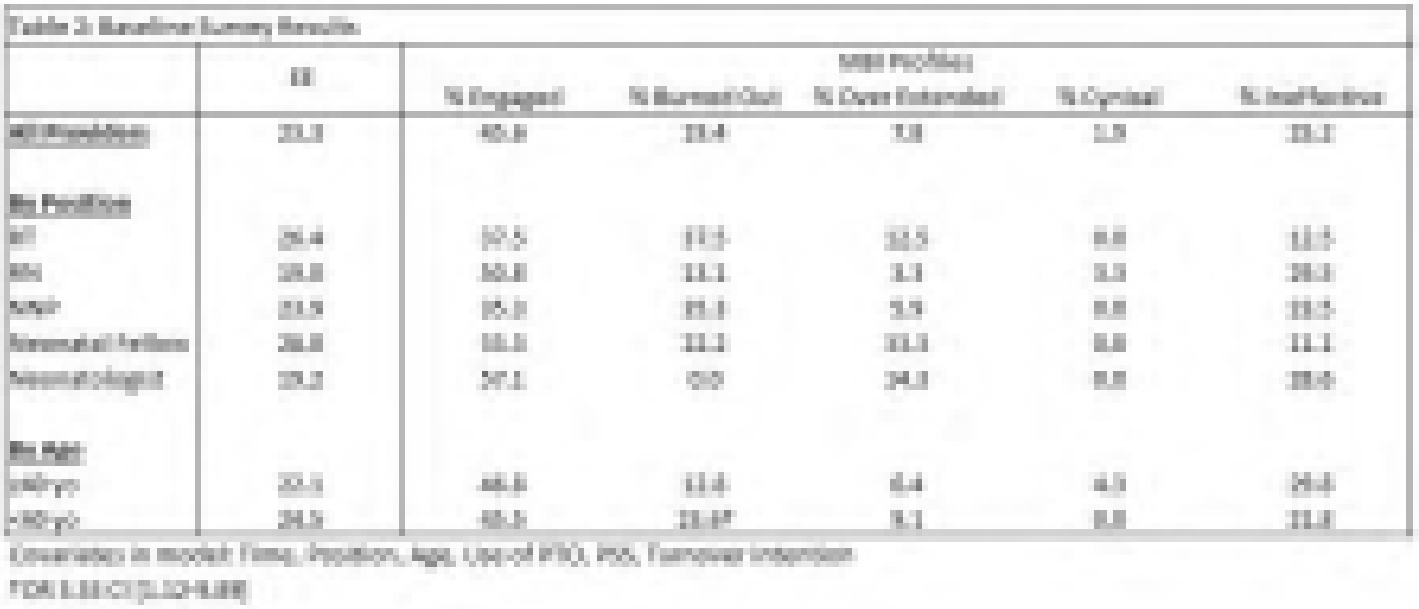

Table 2: Baseline Survey Results

Table 3: Post Intervention Survey Results

Abstract: 244
Effect Of Packed Red Blood Cell Transfusion On Oxygen Requirement In Neonates
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Background Despite efforts to minimize blood loss, NICU patients frequently develop anemia which is believed to be associated with decreased oxygen carrying capacity and therefore increased oxygen requirements. As a result, blood transfusions are given in the belief that increasing the hematocrit may lead to better oxygenation and decreased oxygen requirements. But because neonates are transfused with adult blood which has hemoglobin with a lower oxygen affinity, there may possibly be an increase in oxygen requirement to maintain the same hemoglobin oxygen saturation due to the decreased oxygen affinity of adult hemoglobin.
Objective To determine the effect of blood transfusion on measures of oxygenation in neonates requiring mechanical ventilation
Design/Methods We reviewed the medical records of infants who received a blood transfusion for anemia while receiving mechanical ventilation in our NICU from December 2016 to February 2018. All infants received packed red blood cells 15-20mL/kg. We collected and analyzed data on measures of oxygenation including fraction of inspired oxygen (FiO_2), oxygen saturation (SpO_2), arterial oxygen saturation (SaO_2), arterial oxygen tension (PaO_2), SpO_2-SaO_2difference, SaO_2/PaO_2 ratio,

SpO2/FiO2 ratio, PaO_2/FiO_2 ratio, arterial to alveolar oxygen ratio(a-A) and alveolar to arterial (A-a) oxygen gradient ($AaDO_2$) at 6h prior to the transfusion and at 24h, 48h, 72h post-transfusion.

Results There were 51 infants with 69 blood transfusion events included in the study. Mean GA was 31±7wk and birth weight 1927±1290g. Mean post-natal age at transfusion was 5.8±4.6d. Hematocrit levels increased post transfusion. There was a significant increase in SpO_2 and PaO_2/FiO_2 ratio without a significant change in FiO_2. The SpO_2/FiO_2 and SaO_2/FiO_2 ratios did not change post transfusion,

Conclusion(s) Hematocrit values increased after blood transfusion as expected. We observed a significant increase in SpO_2 and PaO_2/FiO_2 ratio without a significant change in FiO_2. Furthermore the SpO_2/FiO_2 and SaO_2/FiO_2 ratios did not change post transfusion, suggesting that transfusion with adult blood did not change the total oxygen affinity of the blood as expected. We were able to demonstrate a temporal increase in oxygenation after blood transfusion as indicated by increase in SpO_2, SaO_2 although there was no significant change in $AaDO_2$ and a-A ratio. It is possible that this effect will be magnified if the starting hematocrit was lower resulting in a bigger change in hematocrit and oxygenation after transfusion.

Effect Of Packed Red Blood Cell Transfusion On Oxygen Requirement In Neonates.

	Before Transfusion	24h Post	48h Post	72h Post
Hematocrit (%)	31.2±4.2	42.5±3.8*	41.3±4*	40.3±5*
FiO2 (%)	50.4±25	52.7±26	52.9±26	54.7±28
SpO2 (%)	93±5	96±2*	97±2*	97±2*
SaO2 (%)	80.5±13	88±12*	90±8*	86±11*
PaO2/FiO2 ratio	166.7±85	191±91*	182±79*	168±74
SpO2/FiO2 ratio	250.6±107	249.72±113	249.2±115	243.1±113
SaO2/FiO2 Ratio	215±96	222.7±99	222.7±96	215.4±93
Median pH	7.27	7.30	7.33	7.32
PaCO2	48±8.6	43.4±7.8	47.8±14	43.4±8.4
A-aDO2 Median (Range)	56.12 (5.2-132.6)	63.4(7.2-149.4)	59.7(4.2-130.1)	64.96 (16.3-128.9)

Abstract: 245

A Single Regional Perinatal Center's Experience with the 7th edition NRP Recommendations for Meconium Stained Amniotic Fluid

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Background Meconium aspiration syndrome (MAS) is a leading cause of morbidity and mortality in full term infants. Of the infants born through meconium stained amniotic fluid (MSAF), 3-12% develop MAS. In 2015, the neonatal resuscitation program (NRP) revised its recommendations to no longer performing routine intubation and suctioning below the vocal cords for non-vigorous infants born through MSAF.

Objective The primary objective of this study was to investigate whether there was a change in the incidence and severity of MAS at our institution following implementation of 7th edition NRP recommendations. The secondary objective was to assess delivery room personnel attitudes to this change as well as their self-reported compliance.

Design/Methods We performed a retrospective chart review of all live born, non-vigorous, full term (≥37 weeks gestation) infants born through MSAF at New York University Langone Health Center (NYULHC) over a two year period from January 2016 to December 2017. The first year assessed infants resuscitated using 6th edition recommendations and the second year, infants resuscitated with 7th edition recommendations. To assess our secondary objective we conducted an anonymous cross sectional survey of delivery room personnel assessing their knowledge of and attitude towards the new NRP recommendations.

Results A total of 274 patients met criteria for study inclusion. Fewer patients (32%) were admitted to the NICU in 2017 following the change in NRP guidelines compared to 46% in 2016, p=0.016. The incidence of MAS was also reduced following

the change, with 17% of infants born through MSAF developing MAS in 2017 compared to 29% in 2016, p=0.02. There was no significant difference in the severity of MAS between the two eras. Most (94%) of our survey respondents reported at least some familiarity with the recommendation updates and most (80%) correctly answered questions regarding the management updates. The vast majority of respondents (96%) reported compliance with the updated recommendations.
Conclusion(s) After implementation of the 7th edition NRP recommendations, the incidence of MAS and NICU admission rates for non-vigorous infants born through MSAF at our institution decreased though severity of disease in those who developed MAS remained unchanged. We also found that the majority of our delivery room personnel were familiar with and knowledgeable about the updated recommendations and complied with change in practice.

Abstract: 246
Performance and Outcome of Ventilation Corrective Steps in the Delivery Room
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Background Positive pressure ventilation (PPV) is the cornerstone of neonatal resuscitation but is technically challenging to perform. Mask leak and obstruction are common impediments. NRP guidelines recommend a sequential "MRSOPA" approach to correct ineffective PPV, but the performance and outcome of these steps during delivery room (DR) resuscitation is not well defined.
Objective To characterize the approach to MRSOPA maneuvers and the impact of these interventions on the DR resuscitation of preterm infants.
Design/Methods Prospective observational study of preterm infants <33 weeks gestation who received PPV during DR resuscitation. Data were collected from video recordings, including vital sign monitor output. A respiratory function monitor (RFM) measured exhaled tidal volumes (Vte) of PPV inflations delivered through a facemask, but these data were not visible to providers during resuscitation. The RFM was discontinued after intubation, transitioning to CPAP prongs, or weaning to room air. MRSOPA maneuvers were identified from the video and RFM recordings and categorized as 1) Mask/Reposition, 2) Suction/Open mouth, 3) Increase pressure, or 4) Alternative airway, either singly or in combination. Vte and clinical heart rate (HR) were assessed for epochs of the 10 PPV inflations before and after each MRSOPA maneuver. Data are reported using standard summary statistics.
Results There were 30 preterm infants who received PPV during the study period (Table 1). There were 41 MRSOPA interventions identified (Table 2). The number of MRSOPA maneuvers performed per resuscitation ranged from 0 to 7. The median duration of MRSOPA interventions was 15 seconds (IQR 7-29, range 1-70). The HR was <100 before corrective steps in 31 (76%) of MRSOPA interventions. Of these, HR rose >100 in 14 (48%) after the MRSOPA interventions. Mask leak was identified in 37% of pre-MRSOPA PPV epochs, and obstruction was present in 15% of pre-MRSOPA epochs. The impact of MRSOPA maneuvers on leak and obstruction are shown in Table 3. The mean Vte was <4mL/kg before corrective steps in 37% of MRSOPA interventions. The impact of the MRSOPA maneuvers on mean Vte are shown in Table 4.
Conclusion(s) The frequency, sequence, and combination of MRSOPA maneuvers performed during DR resuscitation are variable. MRSOPA maneuvers led to improved HR or Vte in some cases, but in others cases led to less effective or excessive Vte during PPV. Clinical assessment alone may be insufficient to guide ventilation corrective steps during DR resuscitation.

Table 1: Infant Characteristics

	No of infants (%), n=30
Male, %	17 (57%)
Birth weight, g, mean±SD	886±393
Gestation, weeks, mean±SD	27±3
Cesarean section, %	23 (77%)
Complete steroids, %	19 (63%)
1-minute Apgar, median (IQR)	2 (1-4)
5-minute Apgar, median (IQR)	6 (5-8)

Table 2: Type and Combination of MRSOPA Maneuvers Performed

	No. of Maneuvers (%) (n=41)
MR + SO	10 (24%)
MR + SO + P	8 (20%)
SO	6 (15%)
P + A	5 (12%)
MR	3 (7%)
P	3 (7%)
MR + SO + P + A	3 (7%)
MR + A	1 (2%)
SO + P	1 (2%)
MR + SO + A	1 (2%)

*MR=Mask/Reposition, SO=Suction/Open Mouth, P=Increase pressure, A=Alternative airway [intubation]

Table 3: Impact of MRSOPA maneuver on PPV Inflations: Leak and Obstruction

Outcome if Leak Present before MRSOPA maneuver (n=15)	
Leak Improved	10 (67%)
Leak Created or Worsened	3 (20%)
No change	2 (13%)
Outcome if Obstruction Present before MRSOPA maneuver (n=6)	
Obstruction Improved	1 (17%)
Obstruction Worsened	1 (17%)
No change	4 (67%)

*Leak defined as >30% mask leak in > 50% PPV inflations within an epoch. Obstruction was defined as Vte <0.9ml/kg in > 50% PPV inflations within an epoch

Table 3: Impact of MRSOPA maneuver on PPV Inflations: Leak and Obstruction

Table 4: Impact of MRSOPA Maneuvers on PPV Inflations: Exhaled Tidal Volume

		Mean Vte after MRSOPA maneuver			
		Vte <4ml/kg	Vte 4-8ml/kg	Vte >8ml/kg	N/A*
Mean Vte before MRSOPA maneuver	Vte <4ml/kg	8	6	1	1
	Vte 4-8ml/kg	4	12	5	1
	Vte >8ml/kg	0	2	0	1

*PPV discontinued after MRSOPA maneuver (n=3)

Table 4: Impact of MRSOPA Maneuvers on PPV Inflations: Exhaled Tidal Volume

Abstract: 247

Comparison of Neonatal Intubation Practice and Outcomes between the Neonatal Intensive Care Unit and the Delivery Room

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[1]Neonatology, Children's Hospital of Philadelphia , Philadelphia, Pennsylvania, United States, [2]Penn State Hershey Medical Center/Penn State College of Medicine, Hershey, Pennsylvania, United States, [3]Yale, New Haven, Connecticut, United States, [4]Dartmouth College, Hanover, New Hampshire, United States, [5]Children's Hospital of Philadelphia, Philadelphia, Pennsylvania, United States

Background Neonatal tracheal intubation (TI) is a high-risk procedure performed in neonatal intensive care units (NICU) and delivery rooms (DR). Characteristics associated with success and safety may vary between the NICU and DR, and the impact of setting on neonatal TI outcomes is not well characterized.

Objective To define variation in neonatal TI practice between settings and to identify the association between setting and neonatal TI success and safety.

Design/Methods Retrospective cohort study using prospectively collected data in the multi-center National Emergency Airway Registry for Neonates (NEAR4NEOS). We included TI performed by NICU providers with conventional or video laryngoscopes at centers with ≥20 TI in both the NICU and DR from 10/2014 to 9/2017. TI setting (NICU vs. DR) was the exposure of interest. Outcomes were 1st attempt success, course success (success by 4th attempt using the original approach to

TI), adverse TI associated events (TIAEs), severe desaturation (20% decrease in SpO_2), and bradycardia (lowest HR<100 if starting HR≥120). With univariable analysis we compared TI characteristics and outcomes by setting. Factors that were significant in univariable analysis (p <0.05) were included in a logistic regression model, with adjustment to the standard errors for clustering by center, to identify the independent impact of setting on TI outcomes.

Results 9 centers contributed 3145 TI encounters (2279 NICU, 866 DR). All baseline characteristics were significantly different between settings (Table 1). Univariable analysis (Table 2) revealed no difference in 1st attempt success or TIAEs. Course success was significantly more common in DR. Severe desaturation and bradycardia were significantly more common in NICU TI. In multivariable analysis, DR was associated with a higher adjusted odds of course success (1.48, 95% CI 1.06-2.08). DR was also associated with lower aOR of desaturation (0.55, 95% CI 0.33-0.93) and bradycardia (0.43, 95% CI 0.26-0.69). Setting was not associated with differences in first attempt success or TIAEs (Table 3).

Conclusion(s) Significant differences in patient, provider, and practice characteristics exist between TIs performed in the NICU and the DR. After controlling for important baseline characteristics, DR setting is associated with increased odds of course success and lower odds of desaturation and bradycardia. These results suggest that TIs performed in these different settings should potentially be thought of and treated as distinct procedures.

Table 1. Patient, Provider, & Practice Characteristics of Neonatal Intubation, by Setting

Patient Characteristics	NICU (N=2279)	DR (N=866)	P Value
Weight at intubation, grams: median (IQR)	1650 (958, 2847)	3247 (2755, 3788)	<0.001
GA at birth, weeks: median (IQR)	28 (25, 34)	39 (36, 39)	<0.001
Postnatal age, days: median (IQR)	19 (1, 47)	N/A	
Indication,* n (%)			
Ventilation Failure	821 (36%)	109 (13%)	<0.001
Oxygen Failure	892 (39%)	189 (22%)	<0.001
Surfactant administration	588 (25%)	291 (34%)	<0.001
First airway provider: n (%)			<0.001
NP/PA/Hospitalist	1824 (80%)	310 (36%)	
Neonatal Fellow	324 (14%)	431 (50%)	
Pediatric Resident	321 (14%)	25 (3%)	
Neonatal Attending	130 (6%)	41 (5%)	
RRT	63 (3%)	11 (1%)	
Other	37 (2%)	8 (1%)	
Video laryngoscope: n (%)	826 (21%)	104 (12%)	<0.001
Nasal Approach: n (%)	74 (3%)	5 (1%)	<0.001
Stylet: n (%)	1449 (64%)	626 (72%)	<0.001
Premedication,** n (%)			<0.001
None	866 (38%)	774 (89%)	
Sedation	382 (17%)	29 (3%)	
Sedation + Paralytic	1026 (45%)	71 (8%)	

NICU= neonatal intensive care unit, DR= delivery room, GA = gestation age, IQR= interquartile range, NP= nurse practitioner, PA= physician assistant, RRT= registered respiratory therapist

*More than one indication can be selected for a given encounter, only 3 most common indications listed

**Paralysis alone in <1%

Table 2: Univariable Analysis of Intubation Outcomes, by Setting

Outcome	NICU (N=1279)	DR (N=866)	P Value
First Attempt Success; n (%)	591 (46%)	402 (46%)	0.97
Course Success;* n (%)	1243 (98%)	845 (97%)	0.005
Number of attempts; median (IQR)	2 (1,2)	2 (1,2)	0.45
Any TIAE; n (%)	449 (35%)	167 (19%)	0.68
Severe TIAE;** n (%)	134 (10%)	40 (5%)	0.66
Severe desaturation;*** n (%)	1073 (49%) N=2204	184 (28%) N=652	<0.001
Bradycardia;**** n (%)	868 (29%) N=2867	94 (20%) N=461	<0.001

TIAE= tracheal intubation adverse event

*Defined as successful intubation by 4th attempt

**Cardiac arrest, cardiac compressions <1 minute, esophageal intubation with delayed recognition, emesis with aspiration, hypotension requiring treatment, laryngospasm, pneumothorax/pneumomediastinum, airway injury

***Defined as ≥20% decrease, reported only for patients with SpO2 data available

****Defined as HR<100 if starting HR≥120

Table 3: Multivariable Analysis of Intubation Outcomes, by Setting*

Outcome	aOR (95% CI) DR, compared to NICU	P Value
First Attempt Success	1.00 (0.78-1.27)	1.00
Course Success	1.48 (1.06-2.08)	0.02
Any TIAE	0.77 (0.59-1.00)	0.05
Severe TIAE	0.72 (0.46-1.15)	0.18
Severe desaturation	0.55 (0.33-0.93)	0.03
Bradycardia	0.43 (0.28-0.68)	0.001

aOR= adjusted odds ratio, CI= confidence interval

* After adjustment for weight at intubation, stylet, approach, device, pre-medication, indication, provider, and center

Abstract: 248

Comparing Non-Invasive Respiratory Modalities in Treatment of Transient Tachypnea in Late Preterm and Term Neonates

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Background Transient tachypnea of the newborn (TTN) is a parenchymal lung disorder due to delayed resorption and clearance of fetal alveolar fluid resulting in pulmonary edema, poor lung compliance and atelectasis. Respiratory support is either high flow nasal cannula (HFNC), continuous positive airway pressure (CPAP) or bubble continuous positive airway pressure (BCPAP). There are no studies comparing HFNC, CPAP and BCPAP in management of TTN in late preterm (LP) and term neonates.

Objective To determine differences in HFNC, CPAP, BCPAP in treatment of TTN as measured by duration of ventilation and length of stay (LOS).

Design/Methods Retrospective chart review of LP and term neonates born in Flushing Hospital Medical Center from 2012 to 2018 with diagnosis of TTN by chest radiograph and required HFNC (G1), CPAP (G2) or BCPAP (G3). Exclusion criteria

included neonates with gestational age (GA) <34 weeks or >42 weeks, respiratory distress due to sepsis, pneumonia or cardiac condition. Data collected include GA, infant of diabetic mother (IDM), negative blood culture by 48 hours, mode of ventilation chosen upon admission, duration of ventilator support and LOS. Data were analyzed using SPSS software, odds-ratio, p<0.05 was considered significant.
Results Of 400 charts reviewed, 225 met exclusion criteria. Of remaining 175, 55% were male and 80% were term. G1 69/175 (40%) received HFNC, G2 102/175 (58%) CPAP and G3 4/175 (2%) BCPAP. Regression analysis of type of noninvasive mechanical ventilation predicting duration of mechanical ventilation G1 vs G2, t=0.88, p=0.38 and LOS t=0.18, p=0.86. LP vs term neonates t=8.92, p<.01, IDM 32/175 (18%) t=2.18, p=.03 and negative blood culture by 48 hours 76/175 (43%), t=2.18, p=0.03 were independent predictors of LOS.
Conclusion(s) In our small sample, different modes of non-invasive respiratory support (HFNC and CPAP) for managing TTN were equal for length of respiratory support and LOS in both LP and term. There were not enough neonates on BCPAP to be included in our analysis.

Abstract: 249
11 year Retrospective Review of Infants Requiring Tracheostomy in the NICU at a Regional Perinatal Center
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Background Tracheostomy has allowed for improved care and facilitated home discharge for many neonates. This has led to increase in neonates surviving with comorbidities, including congenital anomalies, bronchopulmonary dysplasia (BPD), pulmonary hypertension and subglottic stenosis. There has been an increase in number of neonates requiring tracheostomy despite innovations in ventilation, use of surfactant and improved extrauterine growth.
Objective Our aim was to review the chronologic characteristics of term and preterm neonates admitted to neonatal intensive care unit (NICU) in a Regional Perinatal Center (RPC) over a 11 year period which may be associated with requirement of tracheostomy.
Design/Methods This retrospective medical record review included all inborn and outborn neonates who underwent tracheostomy in the NICU in a RPC from 1/1/2007 to 12/31/2017. Data collected included gestational age, birth weight, gender, place of birth, ventilator days prior to tracheostomy, history of antenatal steroids and use of surfactant, presence of comorbidities and outcome measures: length of stay and survival until discharge.
Results 72 infants underwent tracheostomy during this period (Table 1). Over the 11 year period, there was a trend towards more patients requiring tracheostomy secondary to BPD from 2012 onwards, compared to more patients with congenital anomalies requiring tracheostomy until 2011(Figure 1). 34 neonates had congenital anomalies and data for the remaining 38 without anomalies was analyzed. Median gestational age was 25.8 weeks (interquartile range 24.8-26.5) and birth weight was 765 grams (683-915). Neonates without anomalies were divided into 2 groups based on the year of tracheostomy placement: Epoch 1 from 2007 to 2011 and Epoch 2 from 2012 to 2017. Number of days on ventilator prior to tracheostomy, length of stay and survival until discharge were similar between the 2 epochs (Table 2). Epoch 2 had significantly higher number of days on high frequency ventilaton compared to Epoch 1(35±32 versus 9±12 days). Factors associated with requirement of tracheostomy in infants without anomalies included BPD, subglottic stenosis, tracheobronchomalacia and vocal cord paralysis (Figure 2).
Conclusion(s) The number of days on high frequency ventilation increased in this cohort of patients in Epoch 2. Despite advances in ventilation and therapies, more infants required tracheostomy. BPD, subglottic stenosis, tracheobronchomalacia and vocal cord paralysis were associated with requirement of tracheostomy.

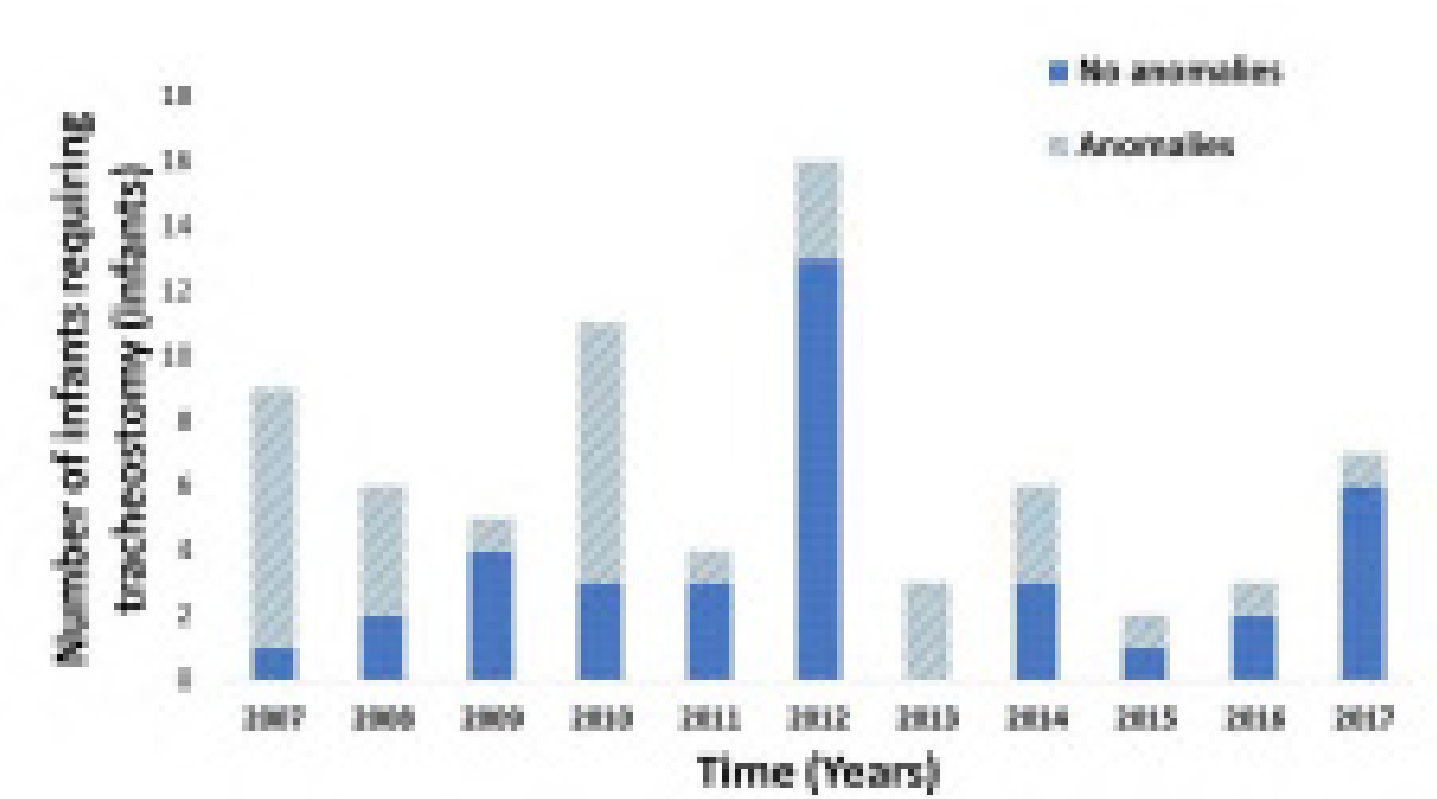
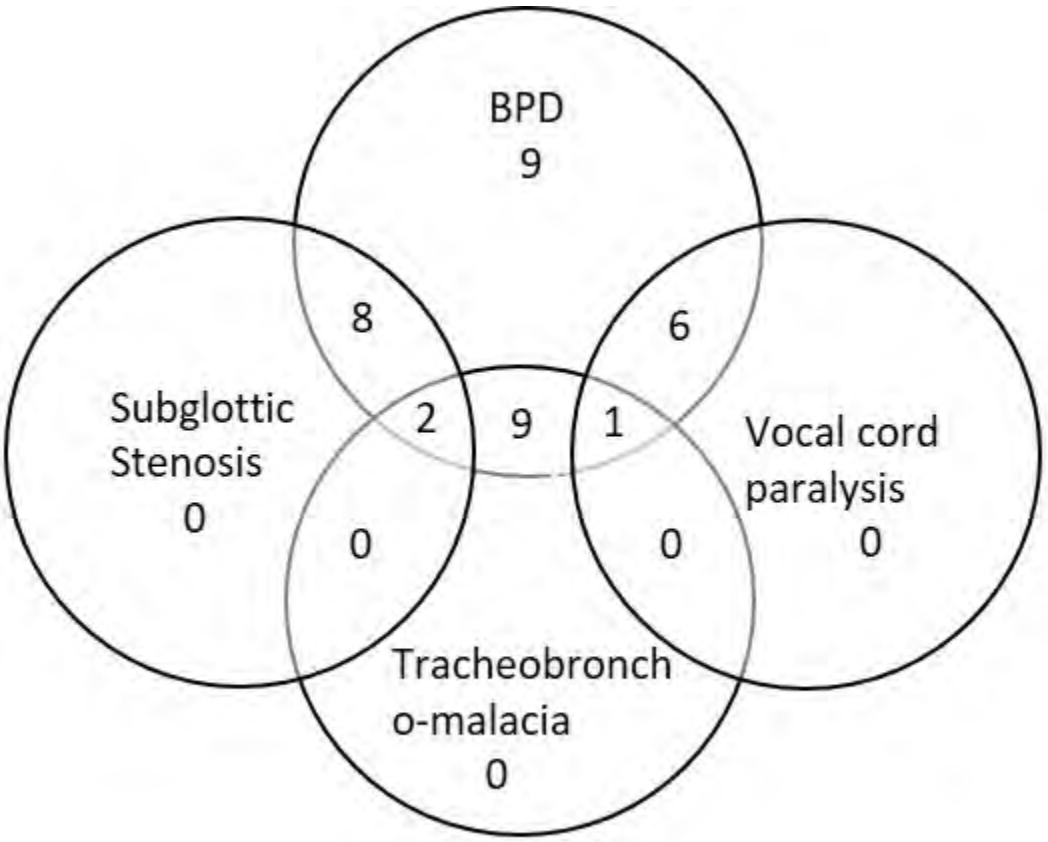


Figure 1: Distribution of patients with anomalies and no anomalies requiring tracheostomy over the years from 2007 to 2017, represented as a bar diagram



Venn diagram demonstrating the various factors associated with tracheostomy (in 35 among 38 patients with no anomalies)
Of the remnaining patientsL 2 had hypoxic-ischemic encephalopathy and 1 developed heart block)
BPD: Bronchopulmonary dysplasia

Table 1: Patient characteristics of all infants requiring tracheostomy from 2007 to 2017

Parameter	No anomalies	Anomalies
Number of infants	38	34
Gestational age at birth (weeks)	25.8 (24.8-26.5)	38.1 (35-39)
Birth weight (grams)	765 (683-915)	2901 (2101-3530)
Age at admission (days)	0 (0-70)	0 (0-1)
Gender	Male: 20 (51.3%) Female: 18 (48.7%)	Male: 17 (50%) Female: 17 (50%)
Place of birth	Inborn: 20 (52.6%) Outborn: 18 (47.4%)	Inborn: 16 (47%) Outborn: 18 (53%)
Length of NICU stay (days)	144 (74-211)	100 (58-162)
Number of days on ventilator before tracheostomy (days)	102 (76-116)	18 (4-52)
Number of attempts at intubation during NICU stay (attempts)	8 (4-13)	2 (1-4)

Gestational age at tracheostomy (weeks)	43.3 (40.8-46.7)	44.1 (41.7-46.7)
Age at tracheostomy (days)	127 (101-154)	45 (23-68)

Data represented as median (interquartile ranges). Gender and place of birth represented as number of infants (percentage)

Table 2: Comparison of patient characteristics, length of stay and survival until discharge between Epoch 1 and Epoch 2.

Parameter	Epoch 1 (2007-2011) n=13	Epoch 2 (2012-2017) n=25	p value
Gestational age at birth (weeks)	26 (25-26)	25 (24-26)	0.64
Birth weight (grams)	754 (538-880)	775 (710-925)	0.23
Gender	Male: 6 (46%) Female: 7 (54%)	Male: 14 (56%) Female: 11 (44%)	0.56
Place of birth	Inborn: 6 (46%) Outborn: 7 (54%)	Inborn: 14 (56%) Outborn: 11 (44%)	0.56
Received antenatal steroids: number (%)	At least 1 dose: 12 (92%) Complete course: 9 (69%)	At least 1 dose: 18 (72%) Complete course: 12 (48%)	0.12
Received surfactant: number (%)	Number of patients: 13 (100%) Number of doses: 1 (1-2)	Number of patients: 21 (84%) Number of doses: 1 (1-2)	0.65
Number of days on ventilator prior to tracheostomy (days)	99 (68-118)	102 (90-114)	0.45
Age at tracheostomy (days)	131 (111-167)	123 (99-142)	0.12
Gestational age at tracheostomy (weeks)	43 (40-50)	43 (41-46)	0.10
Number of attempts at intubation during NICU stay (attempts)	8 (6-12)	11 (4-16)	0.44
Number of days on high frequency ventilation prior to tracheostomy (days)	1 (0-13)	32 (2-60)	0.008*
Length of NICU stay (days)	155 (110-200)	116 (69-218)	0.81
Number of infants who survived until discharge from NICU: number (%)	11 (84.6%)	18 (72%)	0.38
Comorbities: Number of infants with the comorbidity (%)	ROP: 11 (85%) IVH grade 3 or 4/ventriculomegaly: 3 (23%) Gastroesophageal reflux: 12 (92%) Requirement of gastrostomy tube: 9 (69%) Surgical NEC: 1 (7.7%) Pulmonary hypertension: 3 (23%)	ROP: 16 (64%) IVH grade 3 or 4/ventriculomegaly: 5 (20%) Gastroesophageal reflux: 12 (60%) Requirement of gastrostomy tube: 19 (76%) Surgical NEC: 0 (0%) Pulmonary hypertension: 10 (40%)	0.18 0.82 0.007* 0.65 0.62 0.29

Data represented as median (interquartile range) unless otherwise specified. ROP: retinopathy of prematurity; IVH: intra-ventricular hemorrhage ; NEC: necrotizing enterocolitis * p value <0.05

Abstract: 250

Enhanced Nasal CPAP Carbon Dioxide Clearance using an In-Line High Frequency Oscillator in a Premature Infant Lung Model

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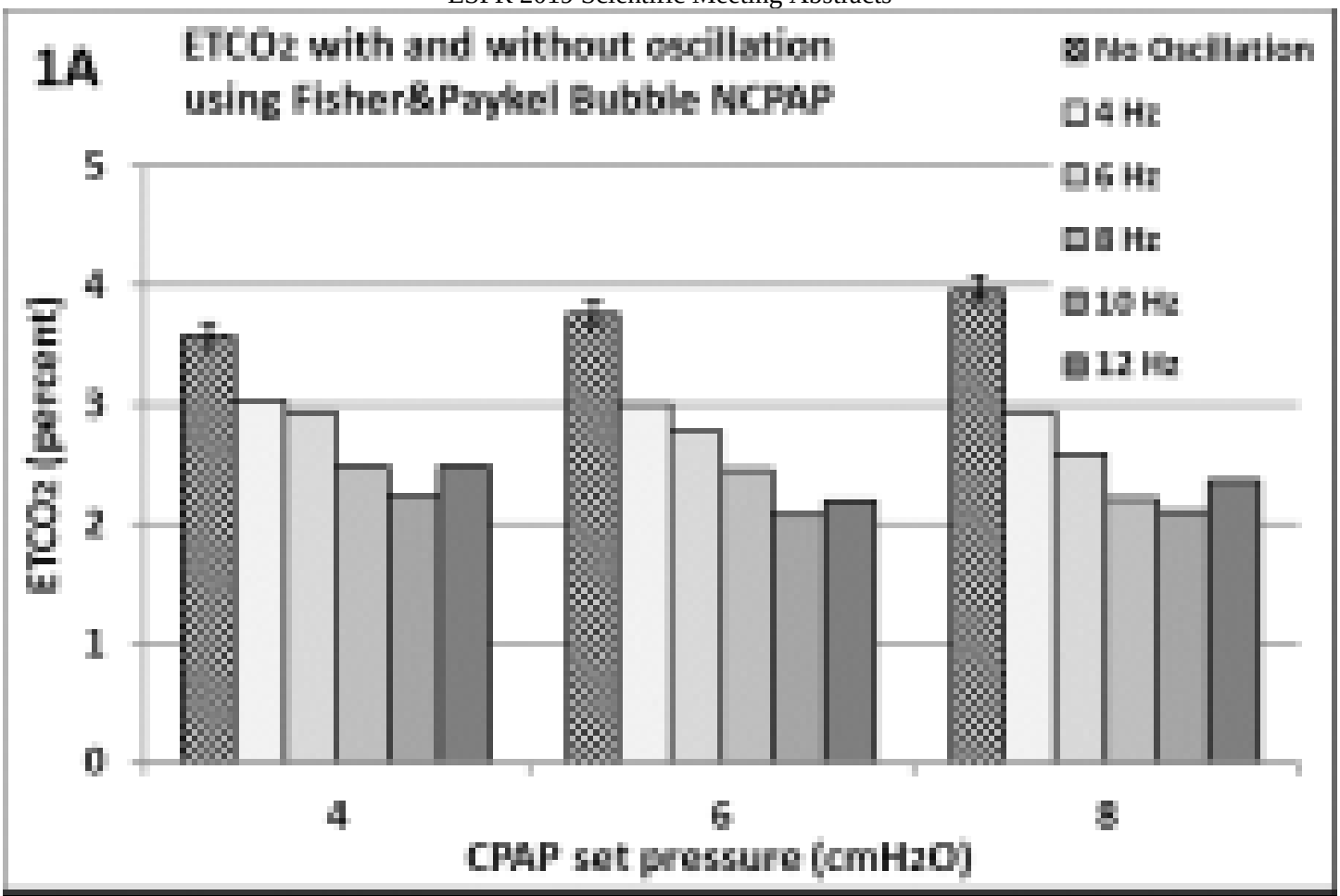
Background High frequency oscillatory ventilation has been shown to improve CO_2 clearance in premature infants. In a previous in-vitro lung model we demonstrated that superimposing oscillations of 4-10 Hz on the supply flow of a high flow nasal cannula system significantly improved CO_2 washout. The effect of oscillation on CO_2 clearance using a Nasal CPAP (NCPAP) system has yet to be studied.

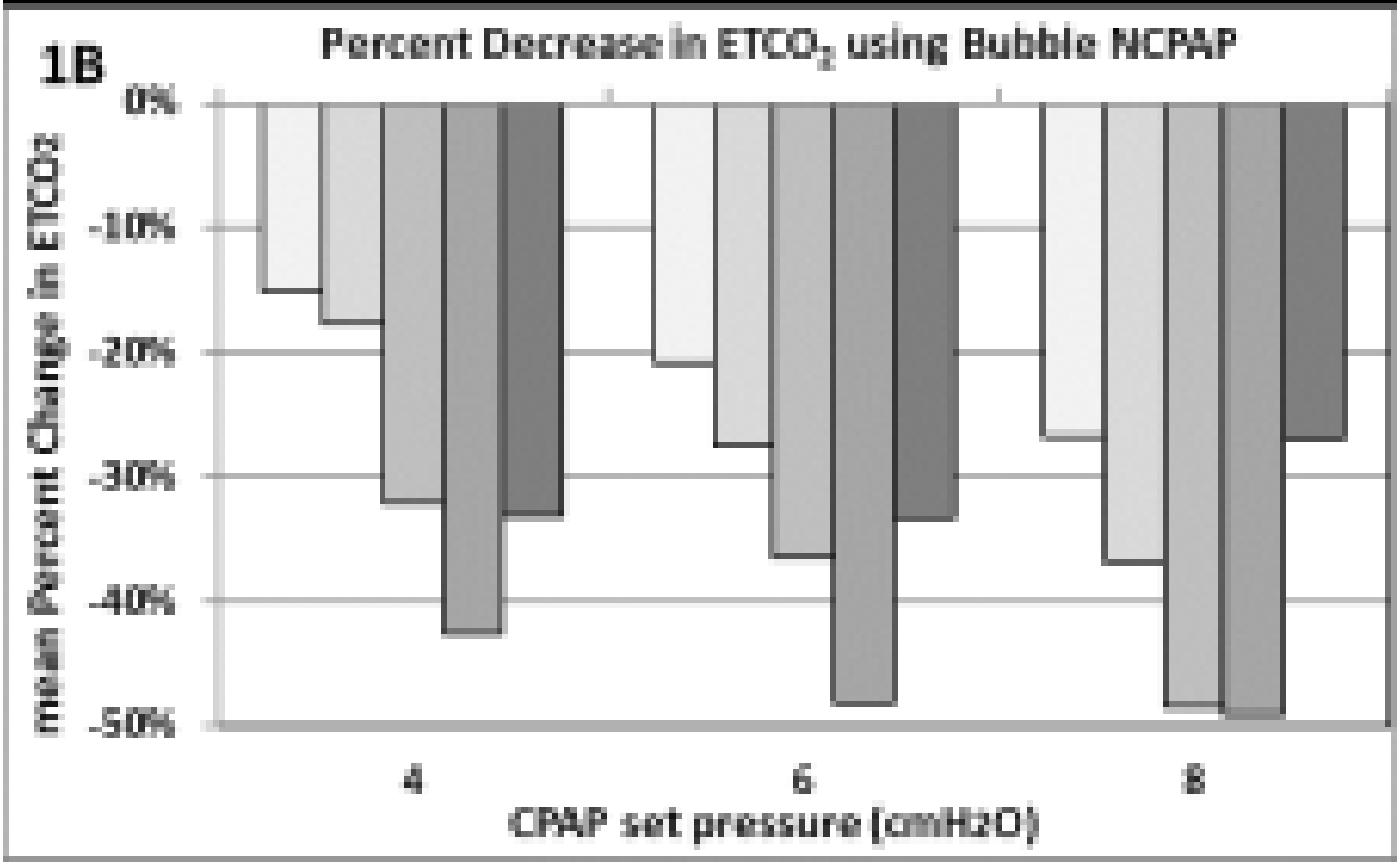
Objective To determine the effect of superimposing oscillations onto NCPAP on end-tidal carbon dioxide ($ETCO_2$) levels in a premature infant lung model.

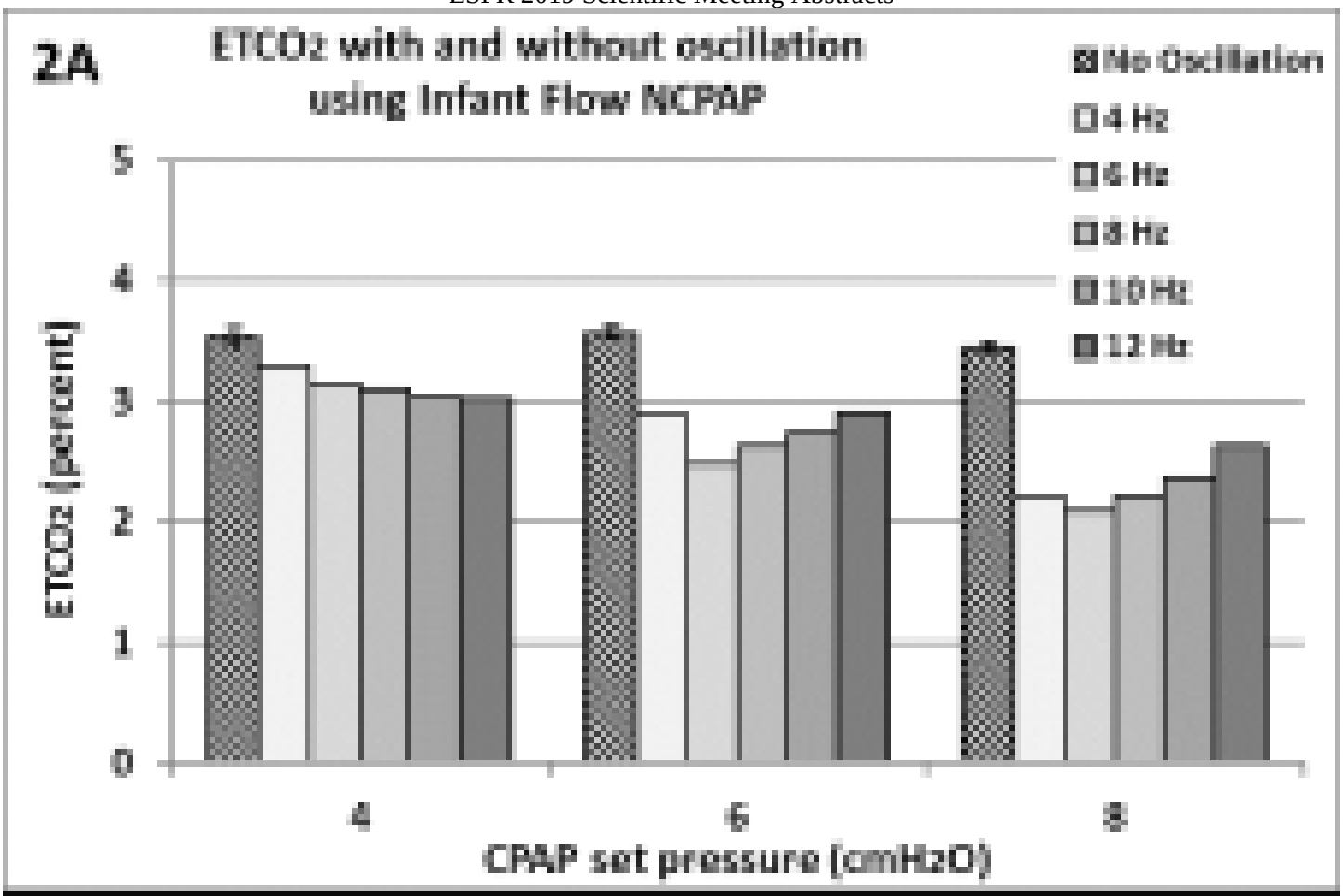
Design/Methods A premature infant lung simulator consisting of a 40 mL silicone bellows with a compliance of 1 mL/cmH_2O was connected to a simulated premature infant upper airway (3.5 mm nares diameter). Total model airway resistance was 32.4 cmH_2O/(L/s) and total instrumented dead space was 4 mL. The model lung was placed in a rigid chamber connected to a computer controlled piston to simulate spontaneous breathing at a constant tidal volume of 6.0 ml. Leak-free NCPAP was applied using either Fisher&Paykel Bubble CPAP (BCPAP) (BC163 interface with BC3520 nasal prongs, supply flow 7 L/min); or a CareFusion Infant Flow LP nCPAP generator (IFCPAP) set with size XS nasal prongs. Oscillation was achieved by interrupting the supply gas by a 3-way solenoid valve operating at 4, 6, 8, 10 or 12 Hz with a 20% on-off duty cycle. 100% CO_2 was continuously injected into the bellows at a constant rate of 12.0 mL/min. After $ETCO_2$ equilibration using non-oscillated supply, the solenoid valve was switched to oscillation mode and $ETCO_2$ was again allowed to equilibrate. $ETCO_2$ was measured at CPAP set pressures of 4, 6 & 8 cmH_2O at 60 breaths/min.

Results $ETCO_2$ levels with no oscillation and with oscillations of 4, 6, 8, 10 and 12 Hz at set NCPAP pressures of 4, 6 & 8 cmH_2O are shown in Figure 1A for BCPAP and in Figure 2A for IFCPAP device. Oscillation resulted in decreased $ETCO_2$ levels compared to non-oscillated baseline levels at all CPAP settings and tested oscillation frequencies as shown in Figures 1B and 2B. Optimum observed oscillatory frequency was 10 Hz for BCPAP and 6 Hz for IFCPAP at 6 and 8 cmH_2O.

Conclusion(s) In this in-vitro premature infant lung model, oscillation of the NCPAP supply gas using an in-line flow interrupter device was associated with improved CO_2 clearance as compared to non-oscillated NCPAP. This simple modification to NCPAP delivery devices may prove to be a useful enhancement of this mode of non-invasive respiratory support.


1A
ETCO2 with and without oscillation using Fisher&Paykel Bubble NCPAP
No Oscillation
4 Hz
6 Hz
8 Hz
10 Hz
12 Hz
ETCO2 (percent)
0
1
2
3
4
5
4
6
8
CPAP set pressure (cmH2O)


1B
Percent Decrease in ETCO2 using Bubble NCPAP
mean Percent Change in ETCO2
0%
-10%
-20%
-30%
-40%
-50%
4
6
8
CPAP set pressure (cmH2O)


2A
ETCO2 with and without oscillation using Infant Flow NCPAP
No Oscillation
4 Hz
6 Hz
8 Hz
10 Hz
12 Hz
ETCO2 (percent)
0
1
2
3
4
5
4
6
8
CPAP set pressure (cmH2O)

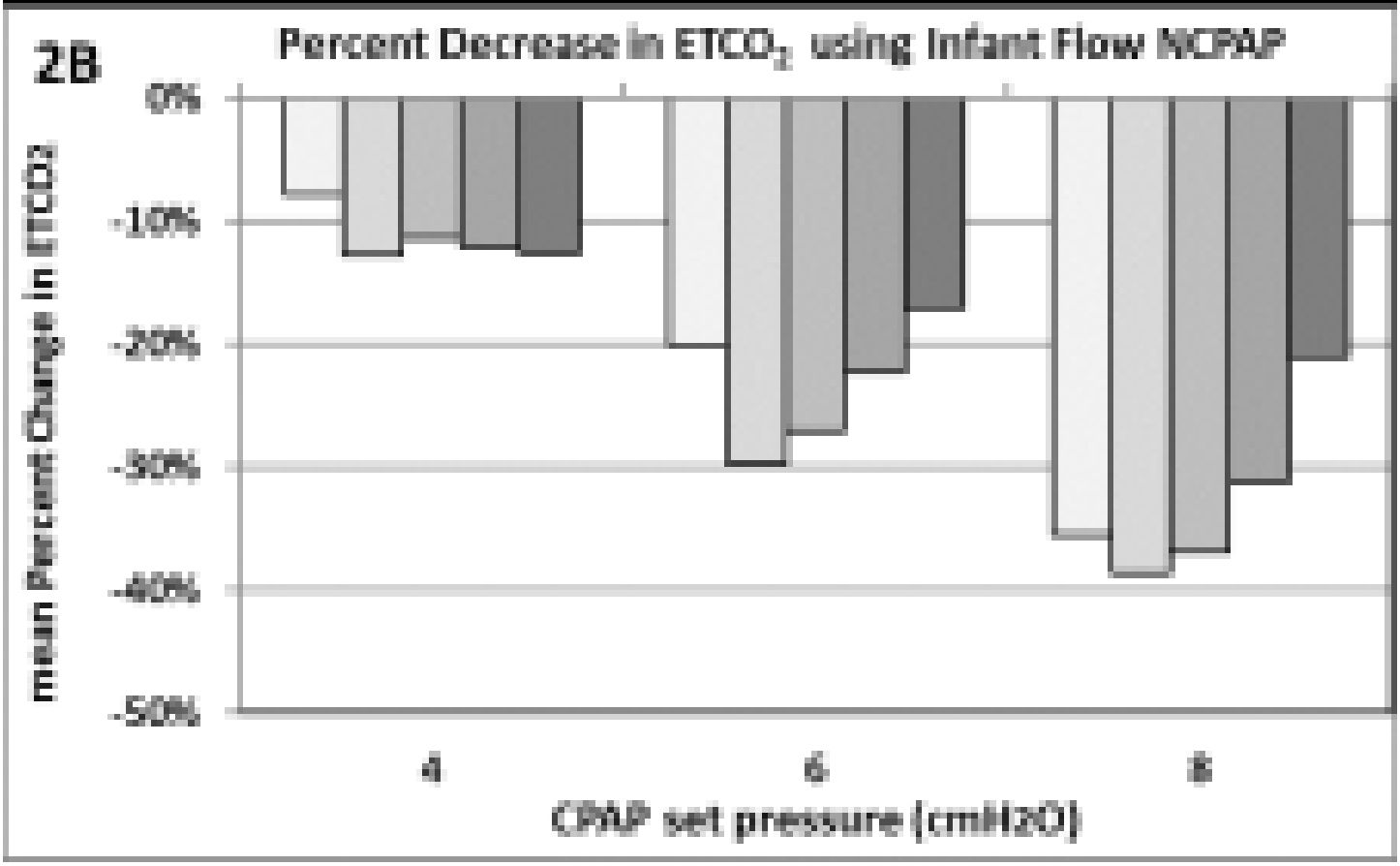

2B
Percent Decrease in ETCO2 using Infant Flow NCPAP
mean Percent Change in ETCO2
0%
-10%
-20%
-30%
-40%
-50%
4
6
8
CPAP set pressure (cmH2O)

Figure 2.

Abstract: 251

Bedside assessment of work of breathing (WOB) indices in infants with respiratory insufficiency during high flow nasal cannula (HFNC) treatment

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Background Heated high flow nasal cannula (HFNC) is a commonly used form of noninvasive respiratory support. The flow rate is often selected per provider's preference or judgement. A bedside system and treatment algorithm incorporating work of breathing (WOB) indices at specific flow rates may help guide optimal flow rate selection. Matching optimum flow for an individual patient at a specific time point may improve clinical efficacy and safety of HFNC treatment.

Objective The objective of this study is to (1) determine whether altering HFNC flow rates affect WOB indices in preterm infants with respiratory insufficiency; and (2) evaluate the efficacy of a WOB -flow rate algorithm.

Design/Methods This was a prospective, observational study of infants (27- 37 weeks CGA and >4days PNA) stable on HFNC. Phase angle, a WOB index representing relative asynchrony between the thoracic and abdominal excursions, was noninvasively measured by respiratory inductive plethysmography (RIP). A phase angle range of 40-180 represents increasing thoracoabdominal asynchrony and increased WOB. An algorithm for adjusting HFNC flow rate based on the phase angle was tested (Fig 1). A high-resolution pulse oximeter with a 2 second sample rate collected oxygen saturation data throughout the study.

Results The analysis includes data from 18/ 30 proposed infants (Table 1). The mean initial phase angle was 86 +/- 28 (SD) deg. The majority of patients (58%) demonstrated improved phase angles from baseline at the end of the algorithm adjustment period but this change did not meet statistical significance. A mixed linear analysis did not demonstrate a relationship between HFNC flow rate and WOB indices. The tested weaning algorithm did not demonstrate a clinically beneficial improvement in WOB indices (Fig 2)

Conclusion(s) The use of RIP is feasible in the preterm infant and provides real-time bedside data which may be beneficial. The tested WOB-Flow rate algorithm, although trending toward improved WOB indices, did not demonstrate a clinically significant improvement. In infants with mild-moderate respiratory insufficiency, it is possible that the tested algorithm between HFNC flow rate adjustments and WOB indices require a longer stability period beyond the 5-10 min adjustment studied. Further research, including a larger patient population, oxygen stability outcomes (ongoing analysis), and longer flow adjustment periods may help determine a more optimum clinical WOB-HFNC Flow adjustment algorithm.

Variables	Result (N=10)
Male, n(%)	10, 55.6
Black, n(%)	8, 44.4
PDA, n(%)	7, 38.9
IVH, n(%)	4, 22.2
BPD, n(%)	8, 44.4
GA, weeks, mean (SD)	28.83 (2.197)
BW, grams, mean (SD)	1108 (389)
NIV at time of study, grams, mean (SD)	1444.44 (452)
FiO2 at time of study, mean (SD)	31.67 (4.716)
OSI at time of study, weeks, mean (SD)	12.25 (3.58)

Table 1. Demographics

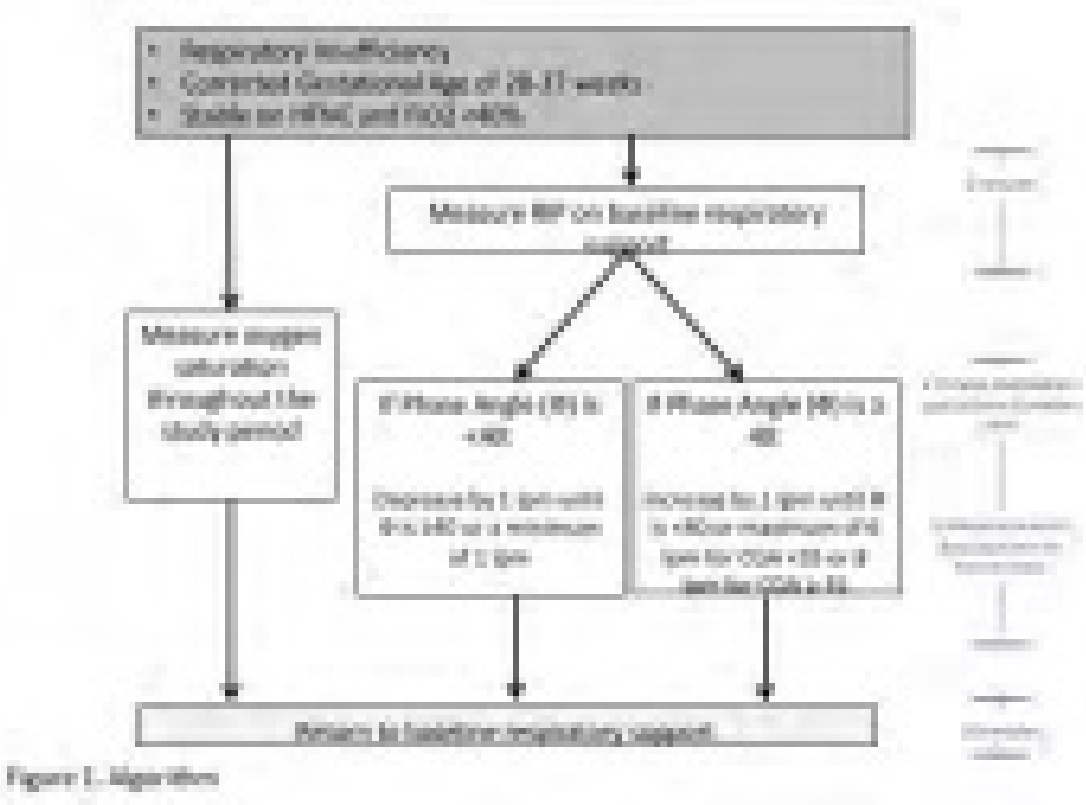

Figure 1. Algorithm

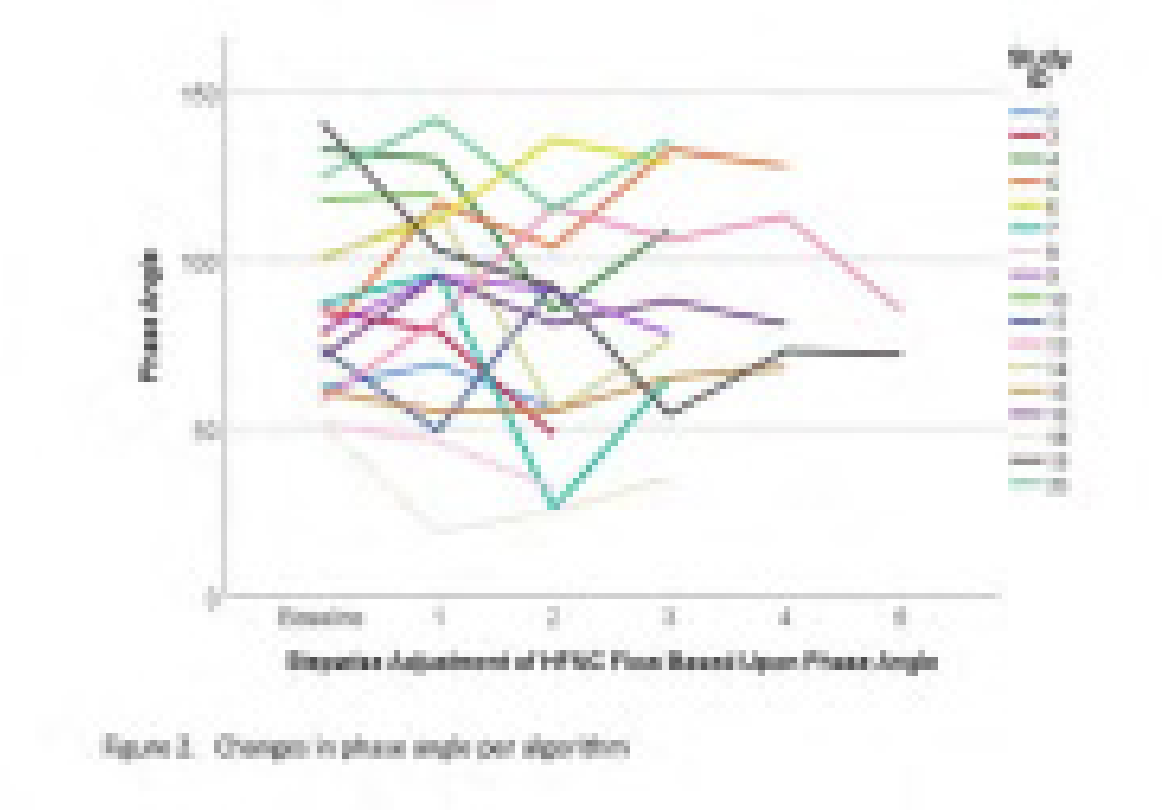

Figure 2. Phase Angle Change

Abstract: 252
Does Oral Feeding While on Continuous Positive Airway Pressure Increase BPD in Preterm Infants <32 Weeks?
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Background The maturation of suck, swallow and breathing co-ordination occurs around 32-34 weeks post menstrual age (PMA) in preterm infants. It is a common practice in many NICUs to start transitioning these infants from enteral tube feeding to oral feeding at around 34 weeks PMA. A majority of preterm infants will still require some form of respiratory support at 34 weeks PMA. At NYU Winthrop Hospital, the practice of feeding infants orally while on nasal continuous positive airway pressure (nCPAP) was discontinued in July 2015, after a study done by our group (PMID: 28055023) demonstrated tracheal aspiration in infants fed orally while on nCPAP.
Objective The primary objective was to determine whether infants who were fed orally while on nCPAP (Group 1- From 1/2014 to 7/2015) were at increased risk of developing BPD when compared to infants who were not fed orally while on nCPAP (Group 2- From 8/2015 to 3/2017). Secondary objectives were to compare time to achieve full oral feeding and length of stay between the two groups.
Design/Methods In this ongoing retrospective pre-post analysis, data was collected and outcomes of infants born < 32 $^{0/7}$ weeks of gestation at NYU Winthrop Hospital compared before and after the practice change of discontinuing oral feeding while infants were on nCPAP. Group 1 (n=31) consisted of preterm infants ≥ 34 weeks PMA, who were started on oral feedings while they still required nCPAP. Group 2 (n=31) consisted of preterm infants ≥ 34 weeks PMA, who were not fed orally while on nCPAP. There were no major respiratory management practice changes during the study period. The chi-square test or Fisher's exact test were used for categorical variables as deemed appropriate, and the Mann-Whitney test was used for continuous data to compare these two groups.
Results The two groups were not significantly different in terms of gestational age and birth weight (Table 1). Group 1 had higher number of multiple births and more female infants (Table 1). Infants in Group 1 spent significantly a longer duration on nCPAP (p= 0.002) and required a longer duration to achieve full oral feeding ability (p= 0.026) (Table 2). Severe BPD was significantly higher in group 1 (p= 0.005) while overall BPD was not significantly different between the two groups (Table 3).

Conclusion(s) Oral feeding while on nCPAP contributes to increased respiratory morbidity in preterm infants as well as longer duration to achieve full oral feeding. We recommend caution when initiating oral feedings for preterm infants on nCPAP.

Characteristic*	Group 1	Group 2	P value
Gestational age (weeks)	27.3±2.3 (27.0)	27.5±2.1 (27.5)	0.6319
Birth weight (grams)	959.4±284.1 (780)	959.5±334.5 (873)	0.2578
Male Gender n (%)	12 (38.7%)	20 (64.5%)	**0.0420**
Race n (%)			
Caucasian	19 (61.3%)	19 (61.3%)	
African American	6 (19.4%)	6 (19.4%)	1.0000
Hispanic	5 (16.1%)	4 (12.9%)	
Asian/Other	1 (3.2%)	2 (6.4%)	
Antenatal steroids n (%)	30 (96.8%)	31 (100.0%)	0.3154
Resuscitation after birth n (%)	19 (61.3%)	16 (51.6%)	0.4422
Cesarean n (%)	25 (80.7%)	20 (64.6%)	0.2554
Multiple births n (%)	11 (35.5%)	4 (12.9%)	0.0379
Surfactant use n (%)	23 (74.2%)	23 (74.2%)	1.0000
Caffeine use n (%)	31 (100.0%)	31 (100.0%)	.3868
Postnatal steroids n (%)	6 (19.4%)	5 (16.1%)	0.7396
Survival to discharge n (%)	31 (100.0%)	31 (100.0%)	.3868

*Continuous measures reported as mean ± standard deviation (median).
Categorical variables reported as frequency (percent).

Table 1. Maternal and Perinatal Characteristics of infants in the two groups

Characteristic*	Group 1	Group 2	P value
Days on CPAP after 34 weeks (days)	34.9±14.8 (28)	13.9±9.2 (9)	**0.0019**
Time to achieve full PO feeds (days)	18.2±9.5 (16.5)	13.9±9.0 (12)	**0.0256**
Length of stay (days)	28 (18, 304)	31 (21, 38)	0.3347

*Continuous measures reported as mean ± standard deviation (median). Length of stay reported as median (95% confidence interval)

Table 2. Clinical outcomes of infants in the two groups

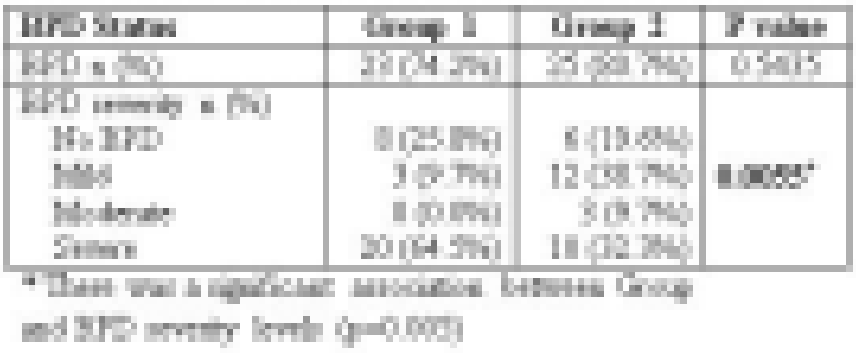

Table 3. Primary outcome of BPD and its severity in the two groups

Abstract: 253
Can NICU workflow improve without paper continuity books?
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Background NICU patient population usually has a prolonged length of stay, and easy access to months of significant past events is crucial. Traditionally, NICUs keep a paper trail via continuity books for this. Our 64-bed NICU at the Children's hospital has used continuity books for record keeping & rounds for almost 2 decades. Documentation in this book is in addition to documenting clinical data in *Neodata* (neonatal data system for notes), and also includes copying lab data from *PowerChart* (Electronic Health Record). This double documentation has led to provider dissatisfaction and extra paperwork in our NICU.
Objective To improve provider satisfaction and improve NICU workflow by optimizing Neodata and discontinuing paper continuity books.
Design/Methods Qualitative study with PDSA cycle conducted in 64-beds NICU with Pediatric residents, Neonatology fellows & faculty and mid level providers. Alterations were planned and made in *Neodata* documentation for easier information flow prior to discontinuing continuity book. Extensive education sessions were done for each of the above groups in July & August 2018. Pre-change surveys were sent to the above groups (n=83) and 50 responses were received.
Further *Neodata* improvements were made based on the responses. The change was implemented on August 20th 2018 wherein the continuity book was removed. The same group was sent a post-change survey 6 weeks later. 38 responses were received. Chi-square tests performed on pre& post survey responses.
Results Overall, work satisfaction improved in the NICU. For day shift, work satisfaction improved from 12% respondents to among 52% respondents (p = 0.007). For the night shift, it improved from among 11% to 79% of the respondents (p = 0.001) (fig. 1). Post change, 83% respondents thought that presenting from *Neodata* was better. 97% thought that all information was accessible through Neodata. 78% respondents thought the documentation time was reduced post change. The median hours spent on documentation during day shift reduced from 7.25 hours to 5.5 hours and the documentation duration on night shift reduced from 6 to 4 hours for the core group of neonatal mid-level providers (fig 2).
Conclusion(s) Provider satisfaction and documentation hours improved in our NICU by optimizing Neodata and discontinuing the paper continuity book without losing access to pertinent medical information.

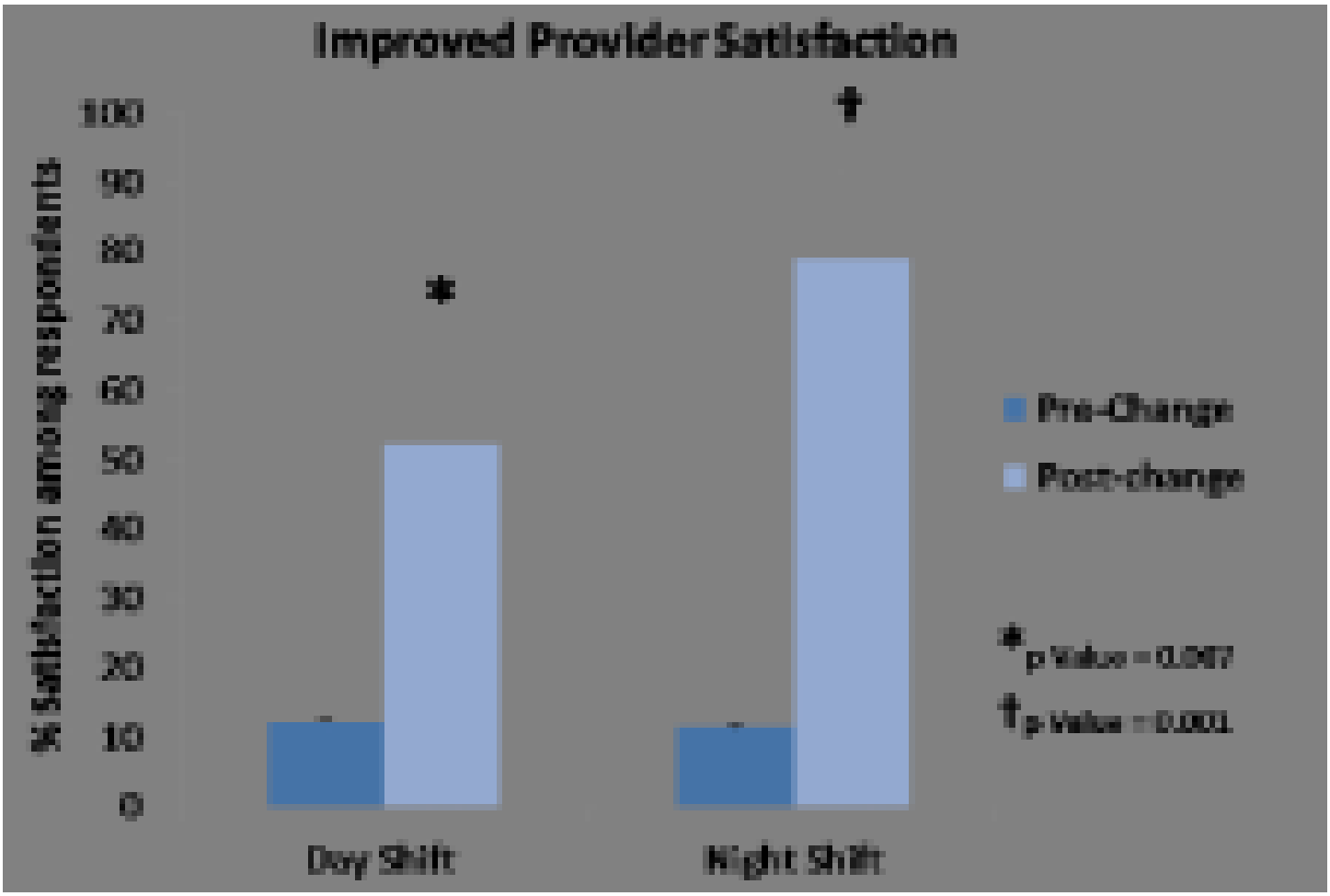

Fig. 1. Satisfaction among respondents for day shift and night shift. * p = 0.007 compared to pre-change in day shift and †p = 0.001 compared to pre-change in night shift.

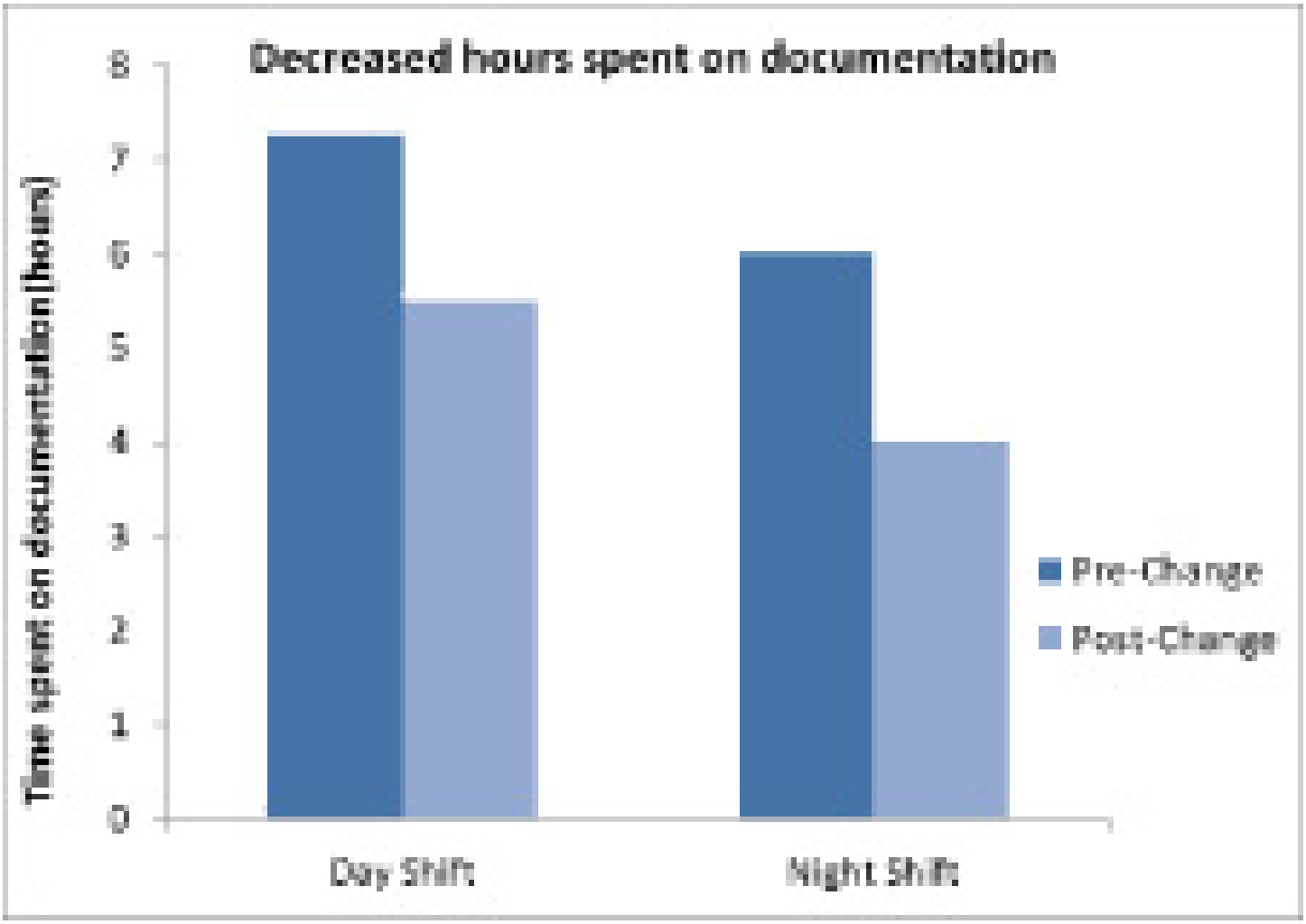

Fig. 2. Time spent on documentation for day shift and night shift. For day shift, median hours reduced from 7.25 hr to 5.5 hr and for night shift, from 6 hr to 4 hr.

Abstract: 254

Assessing the Barriers and Influences on Provider Behavior Towards the Use of Premedication for Endotracheal Intubation in the Neonatal Intensive Care Unit

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Background Recent literature demonstrates that premedication use including paralytics decreases adverse events and improves intubation success rates. Despite recommendation by the AAP, use of premedication remains variable nationally. Barriers to the adoption of routine premedication for neonatal intubation (NI) has not been studied.

Objective To determine the barriers and influences on premedication utilization for NI in a single center tertiary care academic neonatal intensive care unit (NICU).

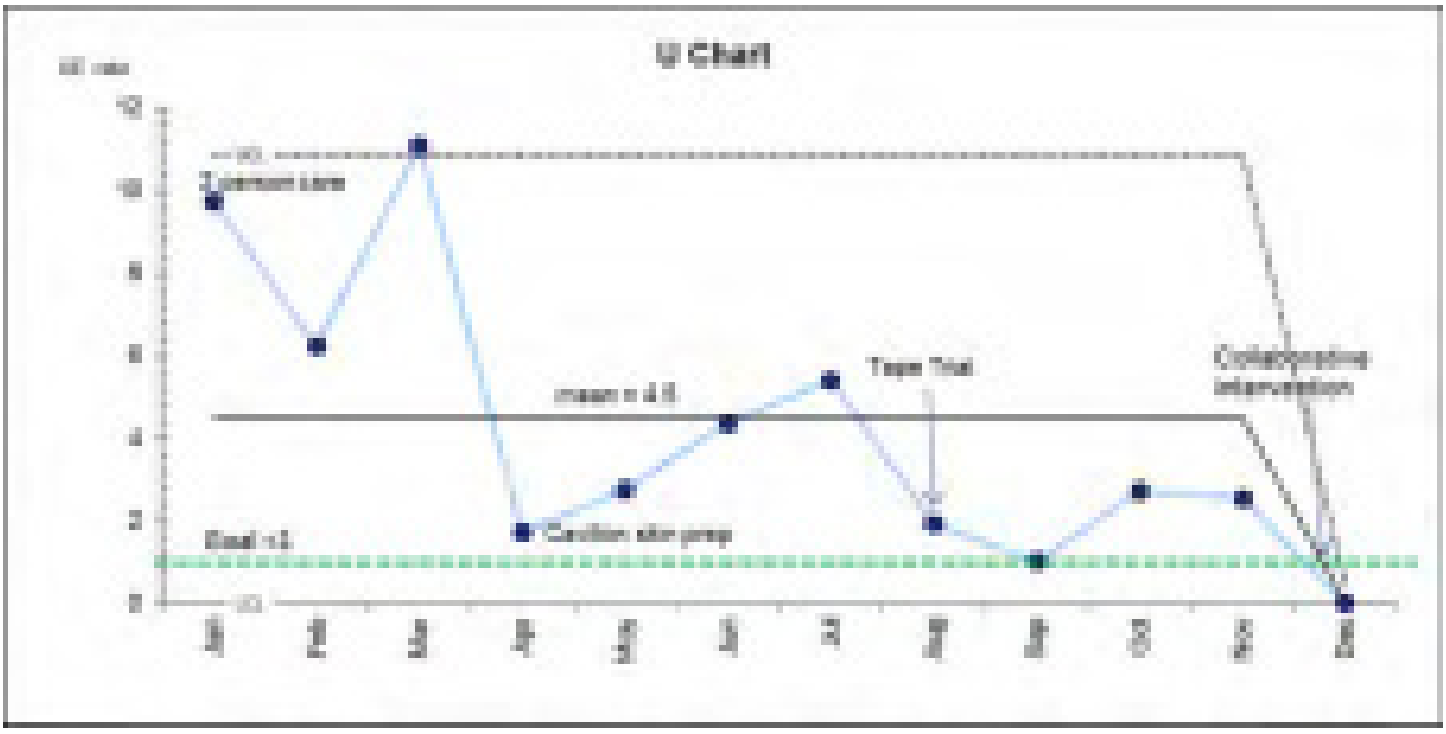
Design/Methods A cross-sectional, electronic logic-based questionnaire was distributed to all neonatal caregivers from November 2018-December 2018 at a single level IV academic NICU. Baseline rates of premedication use for NI are lower than national rates. The questionnaire was based upon the validated Theoretical Domains Framework (TDF) which was developed by expert consensus to identify influences on health professionals' behavior in 12 domains related to the implementation of evidence-based recommendations.

Results 68 questionnaires were returned as of 12/27/18 from neonatal physicians (attendings n=15, fellows n=8), advanced

practice providers (n=12), nurses (n=23), and respiratory therapists (n=10), with a total average NICU experience of 15.5 years. 88% of caregivers felt it was their professional responsibility to use premedication. 75% received training on using premedication but 36% reported low or neutral confidence with using premedication. 59% reported very little knowledge of the medical literature regarding the use and benefits of premedication. Social influences frequently affected all caregivers regarding their decision to use of premedication, including feelings of push back from other team members and fear of the consequences of using premedication (failure of establishing an airway in an apneic patient and medication side effects). Environmental barriers, including lack of IV access and time constraints for obtaining premedication quickly, were frequently noted as reasons premedication was not utilized.
Conclusion(s) Using the TDF, barriers and influences on provider behavior towards premedication use include a knowledge gap of recent medical literature, lack of confidence, social pressure, and environmental influences. Future efforts will focus on addressing the identified areas through quality improvement methodologies and educational interventions to improve outcomes for patients requiring NI.

Abstract: 255
Collaborative Journey to Reduce Unintended Extubations (UE) in the Very Low Birth Weight infant
Miheret Yitayew[1], Nayef Chahin[1], Russell Moores[1], Jennifer L. Reed[3], Lisa Shaver[4], Lamia Soghier[2], Michelande Ridore[2], Mauro A. Salas[2], Cherise Wilson[2], Billie L. Short[2], Karen D. Hendricks-Munoz[1]
[1]Neonatology, Children's Hospital of Richmond at Virginia Commonwealth University and Virginia Commonwealth University School of Medicine, Richmond, Virginia, United States, [2]Neonatology, Children's National Medical Center, Washington DC, District of Columbia, United States, [3]Respiratory Therapy, Virginia Commonwealth University health System and Children's Hospital of Richmond at VCU, Richmond, Virginia, United States, [4]Nursing, Children's Hospital of Richmond at VCU and Virginia Commonwealth University School of Nursing, Richmond, Virginia, United States

Background Unintended extubations (UE) are a widely recognized risk associated with increased morbidity, including airway trauma, need for
resuscitation and intraventricular hemmorhage in the very low birth weight (VLBW) infant <1500 gms. Over the past years, the Children's Hospital of Richmond at VCU level IV Regional NICU, with a large delivery room birth population of VLBW infants, utilized various methods to decrease UE. These included:2 provider care systems with repositioning, X-ray cassettes that avoid repositioning and a variety of endotracheal tube (ET) taping and tube holding methods without achieving a goal of <1UE/100 ventilator days. In continued
efforts to address UE for the VLBW infant, we collaborated with the Children's National Medical Center (CNMC) NICU Division of Neonatology Team leaders and adapted their ET taping methodology for the VLBW population. We hypothesized that the CNMC standardized ETtaping method and system associated with a low UE prevalence, could be adapted with success to the high
VLBW volume delivery population at CHOR with reduction in unintended extubations.
Objective To reduce UE through a collaborative inter-institutional ET Quality Improvement initiative
Design/Methods A collaborative QI group was formed with both academic health systems, including neonatologists, nurses and respiratory therapy specialists to target training in the CNMC UE system. The team focused on standardization of ET securing methods that included new ET methodology,
education of respiratory therapists, nurses, and medical staff, simulated sessions as well as maintenance and monitoring protocols with implementation of new method on 11/13/2018
Results There were 81 infants born at <1500 gms included in this analysis with mean gestational age of 27 ± 2.8 SD weeks and mean birth weight of 1015 ± 300 SD grams. Unintended extubation rate was defined as the number of UE per 100 ventilator days. Implementation of the CNMC Taping Method and System resulted in a reduction in UE, from a mean of 4.5/100 days to almost 100% reduction and lowest reduction in UE within 1 month for the VLBW infant, Figure1
Conclusion(s) Adaptation of a successful standardized ET taping methodology can be effectively introduced at an academic regional NICU, with a large
population of VLBW infants and busy delivery room service, through crossinstitutional team collaboration. Ongoing efforts are underway to sustain the reduction in UE identified as we target zero in the NICU setting with a large delivery population of VLBW infant



Abstract: 256

Correlation of Preterm Infant Salivary Cortisol Levels with Scores on the Neonatal Infant Stressor Scale

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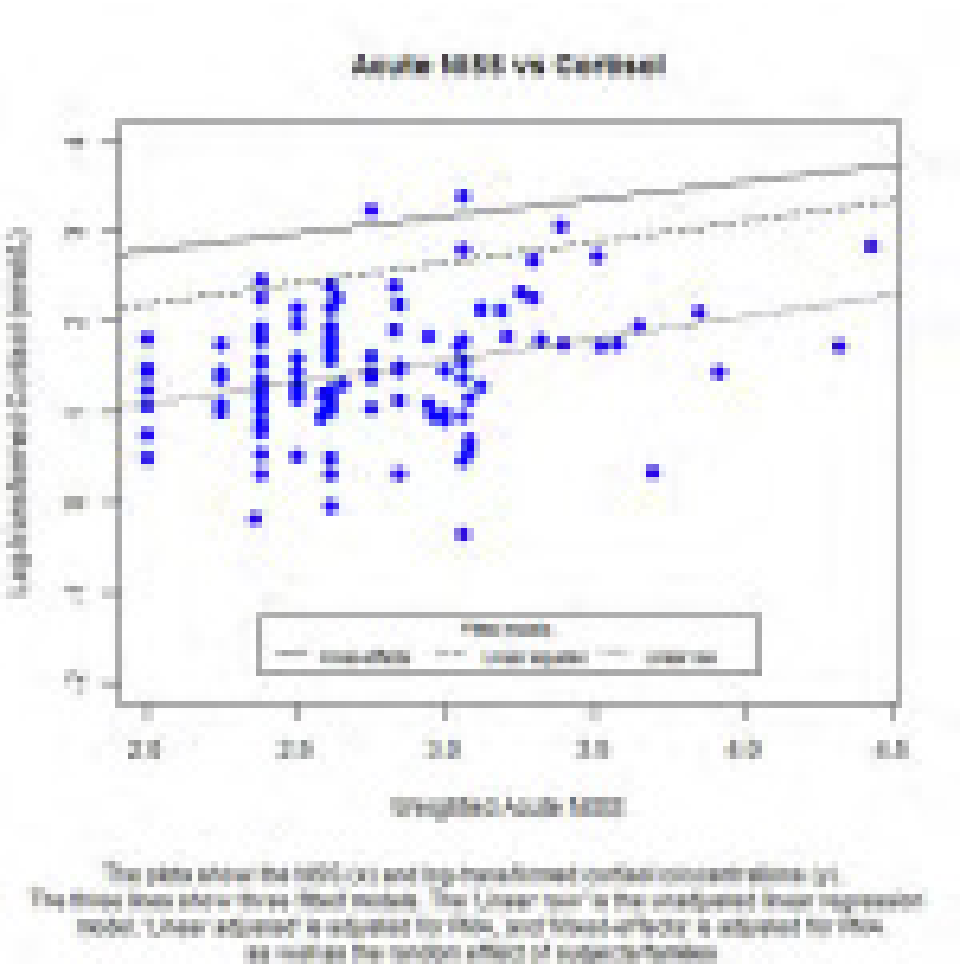
Background Repeated stress during the early period of infant development is hypothesized to produce long-lasting effects on cognitive, behavioral, and somatic development. Despite efforts to nurture preterm infant development during the life-saving birth hospitalization, the neonatal intensive care unit (NICU) is a stressful environment. Variation in cortisol levels reflects multiple stressors during the neonatal period, potentially impacting development of immature hypothalamic, pituitary and adrenal axes.

Objective Assessing the stress response of neonates to noxious stimuli can be challenging. The Neonatal Infant Stressor Scale (NISS) is one tool used to quantify neonatal stress for clinical and research purposes. The scale consists of 35 acute items and 19 chronic items that are thought to capture stressful events that were chosen by NICU caregiver estimation of stressful events during the NICU hospitalization and. To our knowledge, scores on the NISS have not previously been compared to physiologic biomarkers of infant stress

Design/Methods In this study, we compared acute and chronic NISS scores to an accepted biomarker of infant stress response, salivary cortisol, in a cohort premature infants born 28-0/7 - 32- 6/7 weeks gestation through the course of the NICU hospitalization.

Results In preliminary analysis, we examined 143 salivary specimens from 68 patients. Using a Pearson correlation analysis and mixed-effects model we concluded that both acute and chronic NISS scores were significantly correlated with salivary cortisol (P-values <0.001). The mixed-effects model with random coefficients for infant and family revealed significant association between the weighted acute NISS score and salivary cortisol levels (adjusted β= 0.41, P-value= 0.02). No significant associations were found between the weighted chronic NISS score and the salivary cortisol levels (adjusted β=0.88, P-value= 0.13). However, the association between the weighted chronic NISS score and cortisol levels was statistically significant with adjustment for lagged days of salivary cortisol collection (adjusted β=0.88, P-value=0.04).

Conclusion(s) Our results suggest that the Neonatal Infant Stressor Scale may provide an accurate noninvasive measure of neonatal stress. NISS scores may be used to monitor and reduce stress levels for premature infants.



Abstract: 257
Cold Liquid Feedings Improve Feeding Coordination in Preterm Infants
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Background Our recently published pilot study showed that cold liquids reduced airway compromise in dysphagic preterm infants when fed five swallows of cold liquid barium (4-9°C) under fluoroscopy, when compared to room temperature barium (20-25°C) (PMID:29435661). This study proved positive effects after a brief feeding; however, further investigation regarding the effectiveness and safety of a full duration feeding is needed before this technique can be recommended. Many preterm infants diagnosed with dysphagia initially present with an uncoordinated feeding pattern at bedside.
Objective We hypothesize that thermal stimulation from cold milk full feeding (20 minutes feeding) will provide an effective and safe therapeutic option to improve feeding coordination in preterm infants.
Design/Methods The inclusion criteria include VLBW infants with *post-menstrual age* (*PMA*) of > 35 weeks at the time of the study, receiving no respiratory support, tolerating at least 50% of their enteral feeding orally and have an uncoordinated feeding pattern at bedside. The study employed a quantitative, quasi-experimental, within-subject design, with randomization of two conditions (20 minutes room temperature feeding vs. a cold temperature feeding). Objective and subjective measures of feeding performance were compared in both groups using two bedside oral feeding assessment tools, 1) Oral Feeding scale (OFS) and 2) Infant-Driven Feeding Scales (IDFS). All subjective measures were taken in 5-minute intervals to improve reliability. Short-term safety measures (axillary, core body temperature, gastric content temperature, vital signs) were obtained to identify indicators for the development of cold stress.
Results VLBW infants (n=10) with a disorganized feeding pattern were included in this study. The mean gestational age at birth and PMA at the time of the study were 32 weeks and 35 4/7 weeks respectively. There was no difference in OFS levels in both groups. However IDFS scores for the entire feeding showed significant improvement with cold milk (Table). No significant differences were observed for the safety measures in both groups.

Conclusion(s) These findings support the usefulness and short-term safety of cold milk to improve the feeding performance of preterm infants by reducing the severity of uncoordinated feeding patterns.

T-Test for IDFS Scores for Each 3- Minute Interval and Total Feeding

	Room Temperature Liquid		Cold Temperature Liquid		
Interval	M	SD	M	SD	p-value
1st	3.2	0.4	3.1	0.7	NS
2nd	3.0	1.2	2.8	1.1	NS
3rd	2.2	1.9	1.9	1.7	NS
4th	0.7	1.5	0.7	1.2	NS
Total	3.4	0.5	3.1	0.7	0.017*

Note. M, mean; SD, standard deviation

*Derived via Wilcoxon signed rank test due to non-normative data.

Table 1 shows improved feeding quality score when fed cold liquid feedings compared to room temperature feedings measured using Infant Driven Feeding scale (IDFS).
Scores are assessed from 1 to 5 (1: Strong, rhythmical suck-swallow-breathe coordination throughout feeding; 2: Mostly coordinated. Fatigued with progression; 3: Consistent suck but had difficulty coordinating the swallowing or breathing, may have notable loss off fluid, or difficulty in self-pacing; 4: Weak/inconsistent suck-swallow-breathe coordination with little to no rhythm; 5: Unable to coordinate suck-swallow-breathe despite pacing). Lower scores imply a more mature (coordinated) feeding performance.

Abstract: 258
In vitro comparison of the temperatures of refrigerated, room temperature and warmed formula at point of delivery into the newborn
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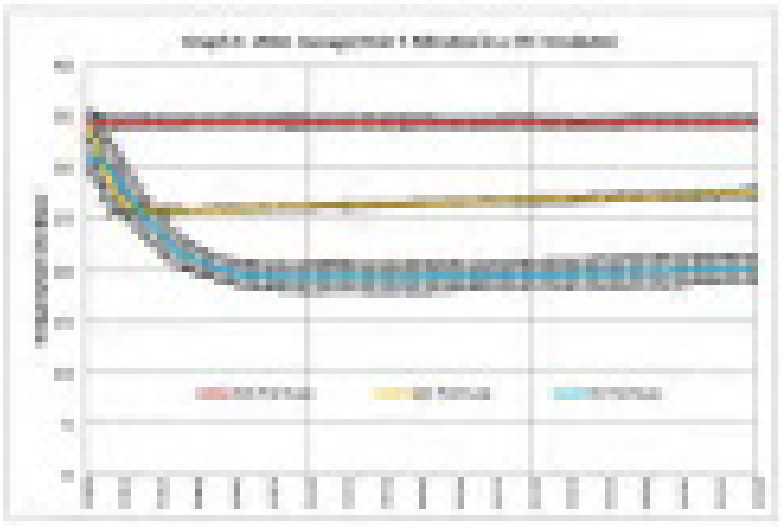
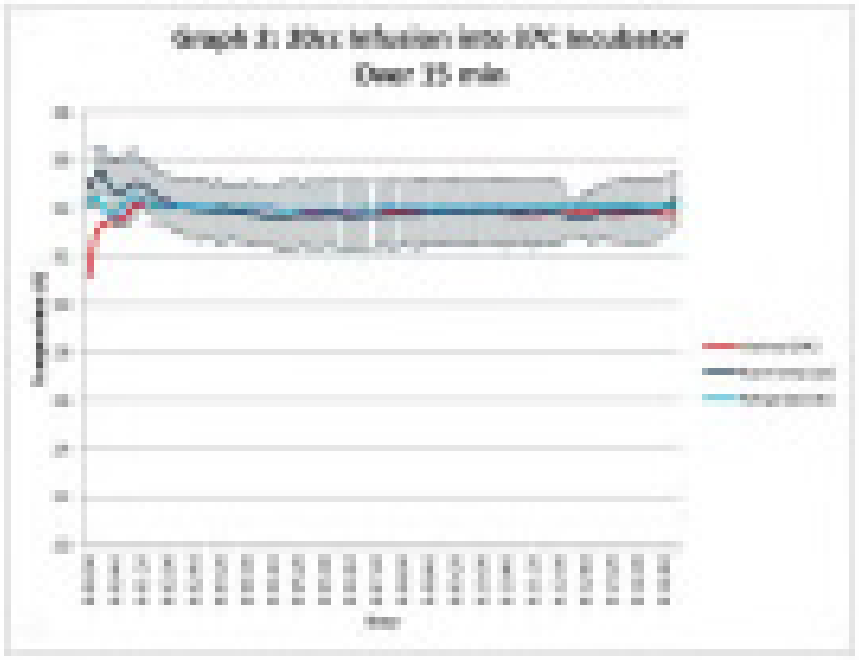
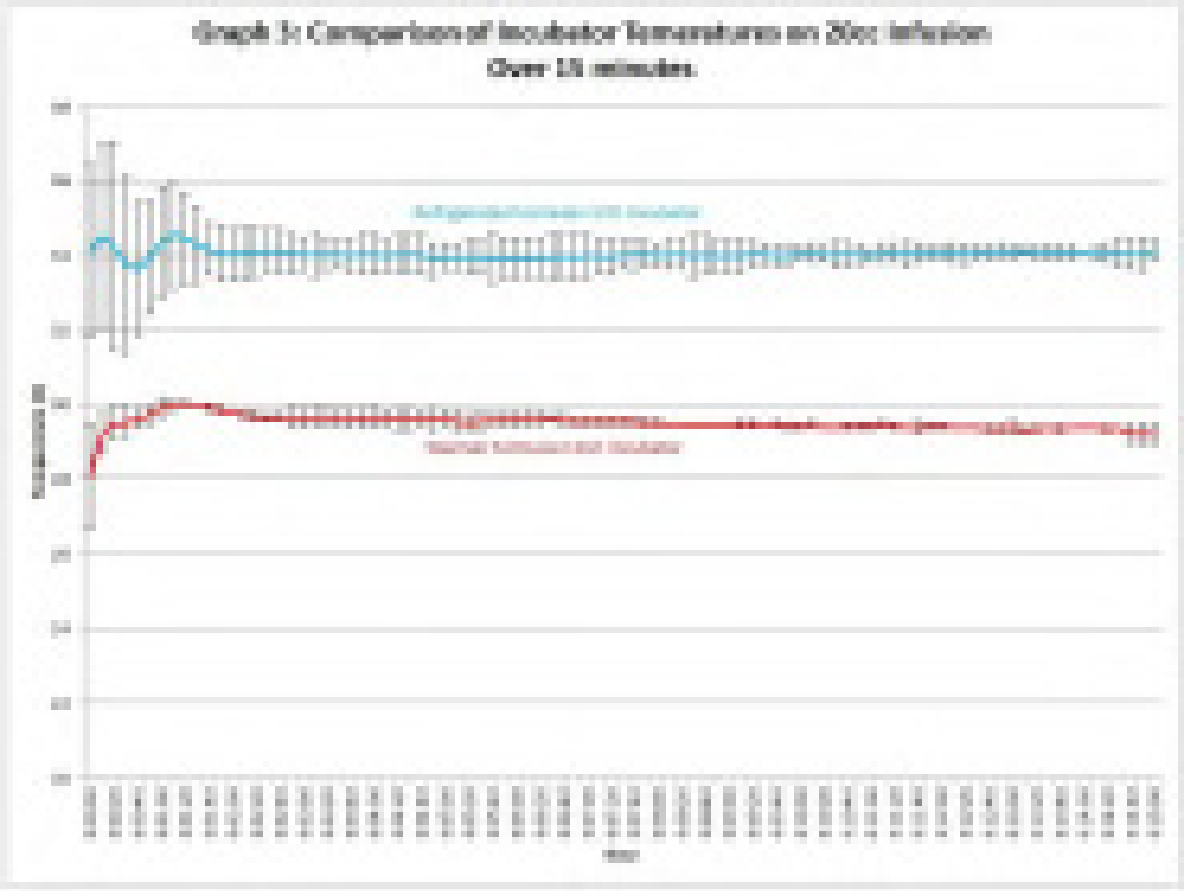
Background Premature newborns are fed with expressed breast milk or formula (EBM/FOR) delivered by syringe pump via an orogastric tube. The EBM/FOR is often warmed with commercially available milk warmers.
Objective We hypothesized that, depending upon the rate of flow, heat exchange between the tubing carrying the EBM/FOR and the atmosphere would cause the temperature of the feed to approach that of the surrounding environment.
Design/Methods For this study, formula was used. A syringe was oriented to mimic best practice configuration in our unit; with tubing entering the incubator 62cm from its attachment to the syringe. Infusions of 20ml were carried out over 3, 15 and 30 minutes. Incubator temperature was either 31 or 37°C. A thermocoupler was threaded into the feeding tube which allowed measurement of formula temperature at point of entry (TPOE) into a baby. We compared (ANOVA) the effects of the source of the formula in the syringe being refrigerated (cold), room temp (RT) or warmed formula at various flow rates and incubator temperatures.
Results At the conclusion of the 3 min infusion mimicking OGT gavage feeding by gravity, into either a 31°C or 37°C incubator, there was a significant ($p<0.001$) difference in the three formula sources' TPOE for cold, RT and warmed formula. For the 15 min infusion into a 31°C incubator, there was a significant ($p=0.001$) but small difference in TPOE, with 28.3±0.2°C for the cold formula and 29.2±0.2°C for the warmed formula. For the 15 min infusion into a 37°C incubator, there was a no significant difference in TPOE for the three formula sources either 1/3 of the way through ($p=0.15$) or at the conclusion of the

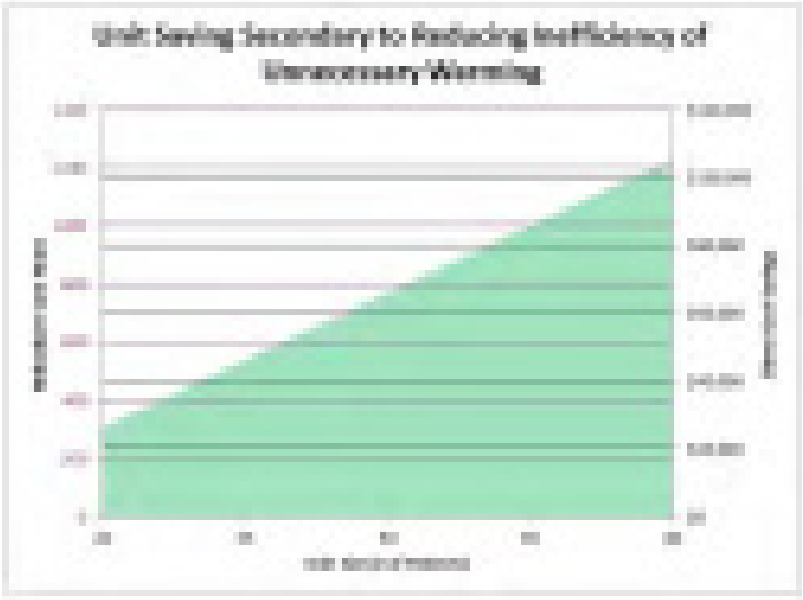
infusion (p=0.7). Similarly, for 30 min infusion into the 37°C incubator there was not a significant difference in the TPOE at either a third (p=0.2) or the conclusion (p=0.3).

Conclusion(s) These results suggest that for gavage feeding, the temperature of the source will significantly effect the temperature of formula delivered. However, in slower infusions, differences are largely insignificant or functionally similar (1°C). If there is benefit to warmed milk, an issue not addressed here, warming milk is appropriate for gavage feedings but unnecessary for slow infusions. Therefore, time and money spent warming represents provider inefficiency that forces time away from bedside and unneeded expenditures on bottle warmers and their accessories; expenditures with savings we estimate to $60,000 and 730 nursing hours for an average 50 crib unit






Graph 3: Comparison of Incubator Temperatures on 20cc Infusion
Over 15 minutes



Abstract: 259

Blood Drawn for Research in Preterm Infants Did Not Impact Total Blood Drawn or Transfusion Need

Molly Clarke[1], Evelyn Obregon[2], Camilia R. Martin[2], Ivan Frantz[3]

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Background We wished to determine how blood drawn for a research study impacts total blood drawn and transfusion needs in premature infants. We compared blood drawn and transfusions in a group of infants enrolled in a study to those in a control group who qualified for the study but whose parents declined consent.

Objective

Design/Methods We identified 89 infants born between 24 and 28 weeks gestation admitted to the Beth Israel Deaconess Medical Center Neonatal Intensive Care Unit from January 2013 to July 2016. Thirty-five were enrolled in the study and 54 met eligibility criteria but were not enrolled. We extracted clinical and demographic information, all blood tests drawn, and all transfusions given during the first 28 days of life. The volume of each blood draw was estimated to equal the minimum amount required by the lab for each specific test. The study required obtaining 2.0-2.8 mL blood, equal to about 3 mL/kg on average or 4% of the infants' blood volume to be drawn over the first four weeks of life. We used t-tests to compare means and bivariate analyses to compare groups.

Results The two groups were well-matched for gender, race, weight, hematocrit and severity of illness (SNAPPE II score) (Table 1). There were no significant differences in the volume of blood drawn each week or in total between the groups (Table 2). The volume of blood drawn for research was approximately 10% of the total drawn. There were no differences in hematocrit or transfusion volume between the two groups (Table 2). The number of transfusions was significantly correlated with the volume of blood drawn in both groups (Image 1).

Conclusion(s) The weekly volume of blood drawn for our patients fell within the range reported previously and was not significantly impacted by study participation. Need for transfusion was related to blood drawn and was not different in the study and control infants. Our results provide reassurance to investigators that these quantities of blood drawn for research purposes should not have clinical impact.

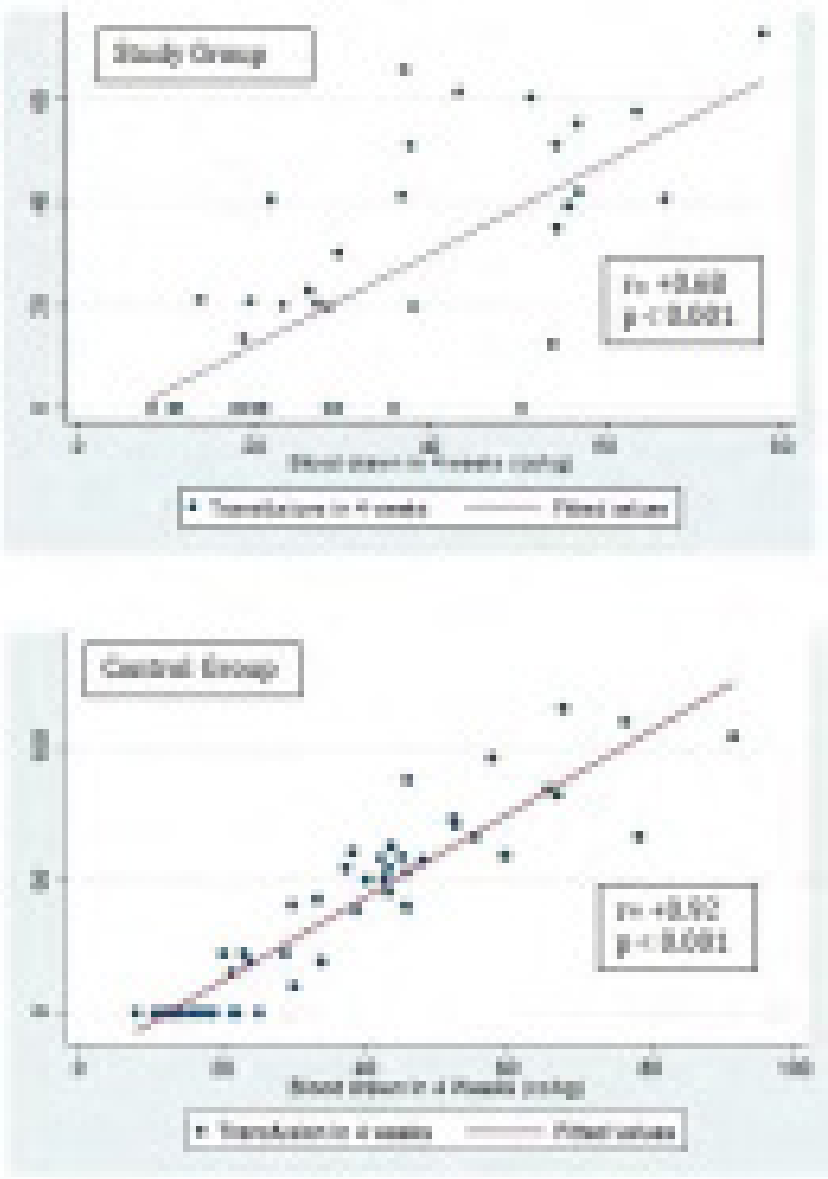
	Study Group n= 35	Control Group n= 54
Female (%)	18 (51.4)	23 (42.5)
Race/Ethnicity (%)		
White non-Hispanic	9 (26)	16 (30)
Black non-Hispanic	5 (14)	11 (20)
Hispanic	3 (9)	7 (13)
Asian	3 (9)	4 (7)
Other/Unknown	15 (43)	16 (30)
Birth weight, grs. (mean, SD)	829.4 ± 37	820.7 ± 25.5
AGA (%)	26 (74)	49 (90)
SGA	6 (17)	5 (9)
LGA	3 (9)	-
Weight week 2, kg (mean, SD)	0.82 ± 0.3	0.79 ± 0.2
Weight week 3	0.92 ± 0.03	0.90 ± 0.02
Weight week 4	1.04 ± 0.04	1.02 ± 0.03
SNAPPE II at birth (mean, SD)	29.7 ± 18.4	26.9 ± 14.2
SNAPPE II at week 2	20.3 ± 15.7	17.8 ± 13.5
SNAPPE II at week 3	19.9 ± 15.8	18 ± 14.5
SNAPPE II at week 4	19.2 ± 15.8	16.6 ±12.7
Sepsis (%)	3 (9)	9 (17)
IVH (%)	5 (14)	15 (28)
CLD (%)	26 (74)	41 (76)

Demographic Information

	Study Group n= 88	Control Group n= 58	P
Blood Drawn* (mean , SD)			
Week 1	19.7 ± 11.41	18.17 ± 8.51	0.47
Week 2	8.14 ± 4.9	8.68 ± 6.17	0.56
Week 3	4.51 ± 3.4	5.42 ± 5.75	0.40
Week 4	3.2 ± 2.0	3.7 ± 3.9	0.42
Total	35.5 ± 18.04	36.06 ± 20.25	0.90
Hematocrit (mean, SD)			
At birth	44.5 ± 7.2	44.6 ± 7.6	0.95
Week 2	35.9 ± 4.15	36 ± 4.7	0.95
Week 3	36.5 ± 0.3	34.1 ± 6.8	0.64
Week 4	34.6 ± 5.4	35.1 ± 5.9	0.81
Transfusions (mean, SD)	2.62 ± 2.38	3.6 ± 3.3	0.12
Volume Transfused* (mean, SD)			
Week 1	9.8 ± 11.9	13.3 ± 14.8	0.25
Week 2	8.3 ± 11.08	9.5 ± 12.82	0.63
Week 3	4.85 ± 9.12	8.17 ± 11.75	0.16
Week 4	3.2 ± 8.34	6.38 ± 10.48	0.13
Total	26.2 ± 33.4	36.06 ± 20.25	0.09

*unit: cc/kg

Mean Weekly Blood Drawn and Transfused in the First Four Weeks of Life



Relationship Between Volume of Blood Drawn and Volume of Transfusions

Abstract: 260
Kangaroo care: Health care personnel's perception 50 years later in a regional perinatal center.
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Background Developed initially in 1970's in Bagota, Columbia, Kangaroo care (KC) is a process of initiating early and continuous skin-to-skin contact between the newborn and caregiver. KC has shown to reduce mortality and morbidity in preterm infants, improve breastfeeding rates and early discharge from health facilities. However, implementation of KC has been inconsistent across different health systems due to lack of knowledge, understanding, availability and training of health care workers.
Objective To evaluate the knowledge, attitudes, frequency and perceived barriers to KC among the providers in the neonatal intensive care unit (NICU) of our Regional perinatal center (RPC) using a survey.
Design/Methods An 18 question anonymous survey with a combination of dichotomous, multiple choice and rating scale

questions assessing the (Part 1) knowledge and benefits of KC, (Part 2) attitudes and barriers of KC and (Part 3) frequency of practice of KC in the NICU at our RPC was created. (Figure 1).160 surveys were distributed via email to (Group 1) Physicians: neonatologists, neonatology fellows and pediatrics residents (Group 2) Mid-level providers: nurse practitioners and physician assistants and (Group 3) NICU nurses.

Results Response rate was 66% (106). Characteristics of participants is shown in table 1. Part 1 of the survey pertaining to knowledge and benefits of KC was answered correctly by 87% of the staff. We found wide variation among the 3 groups in part 2 of the survey. 100% of mid-level providers felt comfortable with talking about KC with families while only 71% physicians and 85% nurses felt comfortable (p=0.04). Fear of accidental endotracheal tube dislodgement was a major barrier. 66% of staff lacked comfort with helping an intubated preterm infant with KC but 88% felt comfortable with helping a stable infant on minimal respiratory support. 55% of the staff reported not receiving adequate training to help with KC and 95% staff agreed to watch the educational video for KC. Approximately 86% of staff had helped a parent engage in KC for only less than 5 times over the previous month and 24% had never helped a family member participate in KC. Figure 2

Conclusion(s) Perceived barriers to implementing KC by staff included inadequate education, lack of experience, infant safety and to some extend lack of time. The results of this questionnaire helped us guide our education strategies in order to improve kangaroo care rate in our NICU as a quality improvement project in line with a baby friendly initiative.

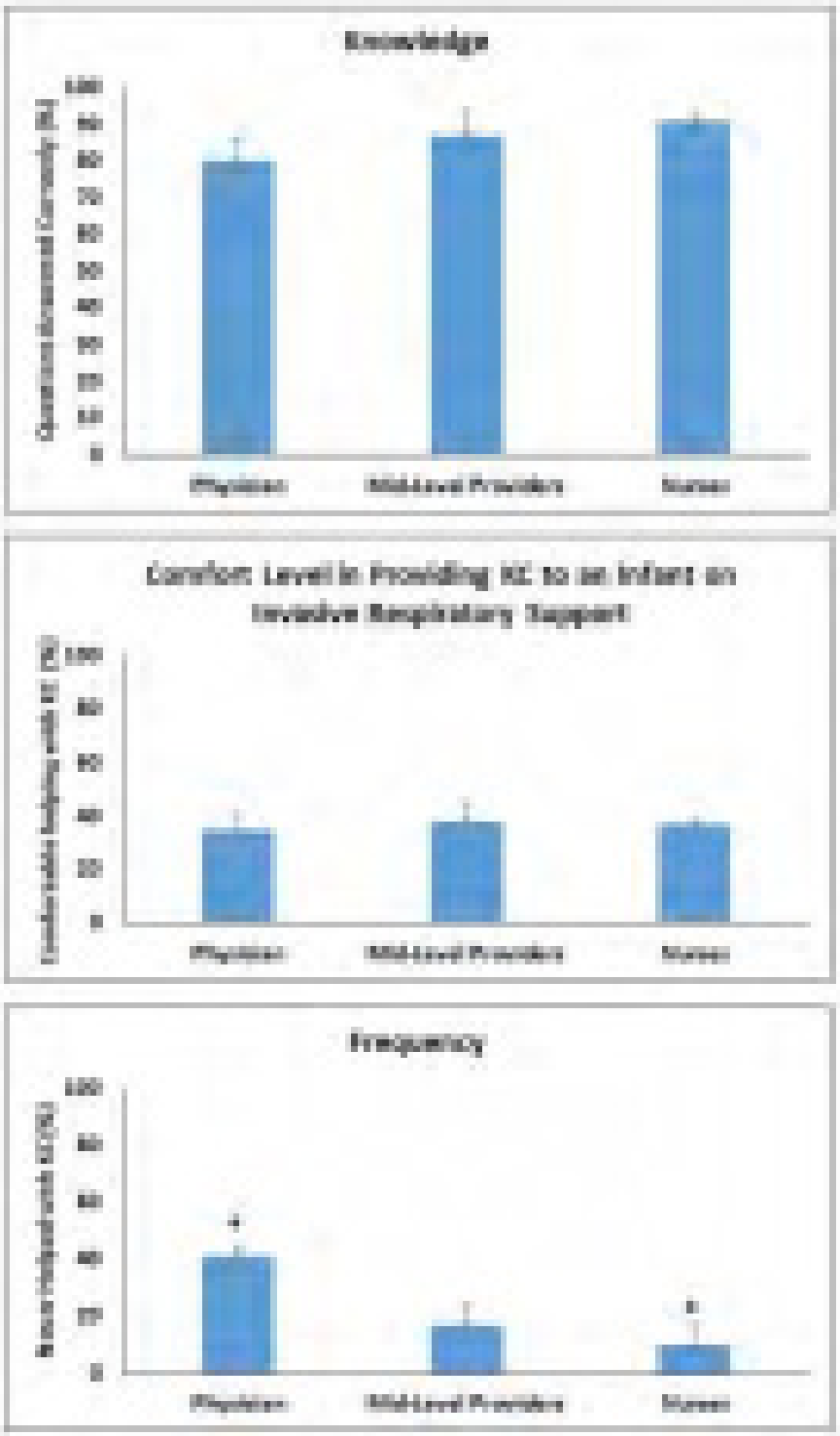

Figure 2: Differences among the physicians, mid-level providers and NICU nurses in knowledge about kangaroo care (KC), comfort level in providing KC to an incubated infant and never assisting a parent with KC.
* p<0.05

Characteristics of Participants

	Group 1	Group 2	Group 3
Participants	Physician: Neonatologist, Neonatology Fellows, Pediatric Residents	Advanced Practitioners: Nurse Practitioners, Physician Assistants	Neonatology Nurses
Total n (%)	32 (30)	8 (7.5) *	66 (62.3) *
Gender (Female %)	14 (44)	8 (100)	64 (97)
Years of Experience (<5 years - %)	25 (78) *	2 (25) *	24 (36)

*** p=<0.05**

Abstract: 261

Application of Physiologically-Based Pharmacokinetic Modeling and Simulation to Predict Gentamicin Exposure in Preterm Neonates

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[1]Division of Pharmaceutical Sciences Arnold & Marie Schwartz College of Pharmacy, Long island University, Brooklyn, New York, United States, [2]Division of Neonatology, NYU Winthrop Hospital, Mineola, New York, United States, [3]Department of Pediatrics, NYU Winthrop Hospital, Mineola, New York, United States

Background Physiologically-based pharmacokinetic (PBPK) modeling is a promising tool to support dose and dosing regimen decisions in preterm neonates that ensure medication safety and efficacy in this vulnerable patient population. Current guidelines recommend obtaining a plasma gentamicin trough 30 minutes prior to the next scheduled dose, with a target trough of ≤ 1.

Objective 1. To develop a PBPK model for gentamicin (GTM) in preterm infants

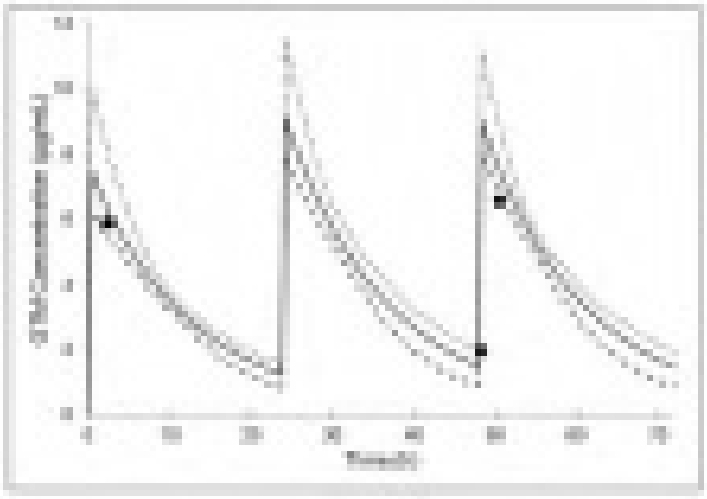
2. To simulate systemic GTM exposure in virtual patients using our hospital's dosing guidelines (based on post-menstrual age (PMA) and post-natal age (PNA))

Design/Methods PBPK modeling was performed using the Simcyp Simulator (Version 17, Certara, Sheffield, UK) which includes a Preterm Patient Population (PMA 26 weeks +). The GTM model was verified by comparing predicted systemic exposure metrics (C_{max}, C_{min}) to published clinical data. The model was then used to perform virtual clinical trial simulations (n= 100/trial) for different patient cohorts (stratified by PMA and PNA) based on institutional dosing guidelines. From these simulations, the safety of the dosing regimens (defined as % of subjects with C_{min} < 1 ug/ml) were assessed. PBPK model results were compared to data (60 GTM treatment events) obtained from preterm babies treated at NYU-Winthrop Hospital.

Results The PBPK model for GTM was successfully verified against published data (Figure 1). Model simulations identified dosing regimens associated with increased safety risk (incidence of elevated GTM trough levels, Table 1) in different patient cohorts. However, in one cohort (preterm infants 30-34 weeks and >8 days old) the model simulation was significantly higher than the clinical observation.

Conclusion(s) PBPK modeling represents a potentially useful framework that can provide practitioners with a scientific rationale for dosage regimen selection in preterm neonates, thereby promoting safe and effective therapeutic interventions in this patient population. The model developed in this study can simulate the GTM plasma concentration-time profile in preterm infants as young as 26 weeks PMA. Further work is needed to confirm current dosing guidelines and/or design alternative dosing schemes that can decrease the risk of elevated gentamicin trough concentrations in preterm patients.

Figure 1. Gentamicin Model Verification – Preterm Population



Fit of PBPK Model Predicted (solid line) and observed (o) GTM concentrations in preterm infants (n =9, GA 34 weeks, PNA = 6 days) treated with 4 mg/kg Q24 hr.
The dashed lines represent the 95th/5th percentiles for model predictions.
(Reference: Anders Pediatrics 34:1071-1080, 1997)

Comparison of PBPK Model Predicted and Clinically Observed GTM Median C_{min} and C_{max}

Parameter[2]	Observed (median)[2]	Predicted (median)	Fold Error
C_{min} (ug/ml)	1.09	1.28	1.08
C_{max} (ug/ml)	6.86	5.74	0.84

[1]Based on GTM dose 3 mg/kg Q 24hr in preterm neonates (n = 49, GA 28-34 weeks)
[2]Reference: Pharmacotherapy 25:884-891, 2005

Risk Assessment of GTM Dosing Regimens in Preterm Infants (Model Predictions vs. Clinical Observations)

PMA (PNA)	Dosing Regimen	Risk Assessment (% of Patients with C_{min}>1	
		Model Prediction	Clinical Observation
≤ 29 weeks (0-7 days)	5 mg/kg Q 48 hr	25%	22%[1]
≤ 29 weeks (8-28 days)	4 mg/kg Q 36 hr	49%	40%[1]
30-34 weeks (0-7 days)	4.5 mg/kg Q 36 hr	15%	7%
30-34 weeks (>8 days)	4 mg/kg Q 24 hr	76%	17%
≥ 35 weeks (0-7 days)	4 mg/kg Q 24 hr	58%	56%
≥ 35 weeks (> 8 days)	4 mg/kg Q 24 hr	35%	29%

1 includes events with GA > 26 weeks

Abstract: 262

Parental Vaccine Hesitancy & Refusal in the NICU: A Survey of Neonatologists

Ariel Inker[1], Courtney Briggs-Steinberg[2], David Aboudi[1], Heather Brumberg[1], Shetal Shah[1]
[1]Pediatrics/ Neonatology, Maria Fareri Children's Hospital/ New York Medical College, Valhalla, New York, United States, [2]Pediatrics/ Neonatology, Staten Island University Hospital, Staten Islan, New York, United States

Background Parental vaccine hesitancy and/or refusal may contribute to immunization delay in the NICU. Yet, the frequency of requests for immunization delay/refusal & neonatologist responses are not well characterized.
Objective To assess neonatologist experiences with parental vaccine refusal/requests to spread out the 2 month (m) series in NICU patients.
Design/Methods A pre-validated survey was distributed to the American Academy of Pediatrics Section on Neonatal-Perinatal Medicine from 5/18-6/18 assessing NICU vaccination practices & experiences. Neonatologists experiencing a high volume (≥10%) of either parental immunization refusal/delay were compared by neonatologist's years of experience, geographic region, level of NICU acuity, insurance status of NICU infants, & strength of physician agreement with parents to delay/refuse immunization. These factors were used in a logistic regression model to identify risk factors associated with a neonatologist experiencing a high volume of parental requests to either spread out/refuse vaccinations.
Results Of 290 responses, 94% provide 2-m immunizations in the NICU. By discharge, 95% of neonatologists stated some parents refused ≥1 vaccine during the NICU stay; 21% reported ≥10% of parents refused. 84% experienced a parental request to spread out 2m immunizations, with 25% reporting ≥10% of parents making this request. A greater percentage of privately insured patients & greater agreement with parental vaccinations requests were associated with a high volume of parental requests to spread out immunizations. The most commonly cited reasons for parental requests were concerns over "short-term effects of vaccines (85%)" & "general worries about vaccines without a specific concern (73%)." 17% of neonatologists reported spending >20 minutes counseling vaccine-hesitant parents.

Neonatologists who experienced a high volume (≥10%) of parental requests to spread out vaccination were more likely to practice in a NICU with >50% privately insured patients (OR 2.4 95% CI 1.1-5.4). >20yrs NICU experience & moderate-strong physician disagreement with parents who made these requests were associated with fewer parental requests to spread out immunization (OR 0.43 95%CI 0.19-0.99 and OR 0.28 95% CI 0.11-0.63 respectively). No differences in geography or Level of NICU care were observed.
Conclusion(s) Virtually all neonatologists encounter vaccination refusal or requests to spread out vaccination, with physicians practicing in NICUs with a majority of privately insured patients experiencing more requests.

Abstract: 263

Variability in General and Caregiver Immunization Practices in the NICU: A Survey of Neonatologists

Ariel Inker[1], Courtney Briggs-Steinberg[2], David Aboudi[1], Heather Brumberg[1], Shetal Shah[1]
[1]Pediatrics/ Neonatology, Maria Fareri Children's Hospital/ New York Medical College, Valhalla, New York, United States, [2]Pediatrics/ Neonatology, Staten Island University Hospital, Staten Island, New York, United States

Background Preterm infants are more susceptible to vaccine-preventable disease. The American Academy of Pediatrics (AAP) recommends immunization of preterm infants at the same chronologic age as term neonates; however, NICU hospitalization is a risk factor for immunization delay. Tetanus, Diphtheria & acellular pertussis (Tdap) and influenza (flu) vaccines are endorsed for caregivers of newborns. Yet data on NICU immunization practices are not well defined.
Objective To evaluate the scope of infant & caregiver vaccination practices in the NICU.
Design/Methods A pre-validated survey was distributed to the AAP Section on Neonatal-Perinatal Medicine from 5/18-6/18 assessing NICU patient & caregiver vaccination practices. Administration of infant flu, Hepatitis B, rotavirus, & standard 2-month immunizations were compared by respondents' gender, years of practice, insurance payer-mix in their unit, NICU acuity level, geographic region and presence of a formal vaccination policy in their hospital. Caregiver Tdap, Flu & Pneumococcal Polysaccharide 23-Valent (PPSV23) were similarly compared. Chi-sqaure and Fisher's Exact Tests were used for analysis.
Results Of 290 responses, only 14% administer rotavirus vaccination consistent with the 2010 AAP recommendation & 31% provide flu vaccine to patients. In bivariate analysis, female gender & a formal hospital immunization policy were associated with increased NICU-based rotavirus immunization (p's<0.05). Compared to other regions of the US, NICUs in the geographic South were less likely to administer infant flu vaccines (p<0.01). For eligible infants, 28% of neonatologists administer Hepatitis B vaccine at birth. No differences existed in how the 2-month immunization series was administered (1 vaccine/day vs. all vaccines in same day).

Of the 34% of respondents who provide caregiver vaccines, 42% offer them only to parents. Tdap & flu vaccine were the most commonly administered caregiver vaccines. Only 3% administer parental PPSV23. Caregiver vaccinations were least likely to

be administered by Level IV NICUs ($p<0.05$). Rates of caregiver immunization in the South and Midwest were lower than the rest of the county ($p<0.003$ for both). Caregiver vaccinations were commonly administered in an offsite clinic (36%) or other site (34%) rather than the NICU.
Conclusion(s) Variation in NICU immunization & newborn caregiver vaccination practices exist, particularly related to infant rotavirus & flu vaccine.

Abstract: 264
Rotavirus Vaccination of Hospitalized Neonatal Intensive Care Unit (NICU) Infants is Not Associated with Increased Adverse Events Compared to Standard 2-Month Immunizations in Infants with Intestinal Pathology
Courtney Briggs-Steinberg[1], David Aboudi[2], Gabrielle Hodson[2], Shetal Shah[2]
[1]Neonatology, Staten Island University Hospital- Northwell Health, Staten Island, New York, United States, [2]Neonatology, Maria Fareri Children's Hospital -- New York Medical College, Valhalla, New York, United States

Background Immunization in the NICU can be associated with adverse events such as apnea, bradycardia and feeding intolerance. Previous work demonstrated oral pentavalent rotavirus vaccine (RV5) is well tolerated in NICU-hospitalized premature infants (<36 weeks gestation) when administered at routine chronologic age (42-104 days of life). However, the tolerance of RV5 administration at chronologic age in infants with a history of intestinal disease is not well studied.
Objective To determine if the rate of adverse events after routine RV5 immunization of NICU-hospitalized premature infants with intestinal pathology differs compared to tolerance of the standard 2-month series.
Design/Methods Retrospective cohort study from August 2015- December 2017 in a Level IV NICU and immunized with both RV5 and 2-month series were evaluated for changes in feeding, stooling pattern, sepsis evaluations, fever, emesis, and apneic and bradycardic events 7 days before and after vaccination. RV5 was administered during hospitalization between 42-104 days of life and at least 7 days apart from the 2-month shot series. Intestinal pathology was defined as history of necrotizing enterocolitis, intestinal perforation, or bowel atresia/malformation. Wilcoxon Signed Rank Test and McNemar's Test were used for all paired analysis.
Results 39 premature neonates with intestinal pathology received RV5 and the 2-month shot series during the study period. The mean birth weight was 1006g with a mean gestational age of 27- 4/7 weeks. Mean day of life of RV5 receipt was 64 days vs 66 days for 2-month shot series.
No differences in apneic and bradycardic events with and without stimulation, stool frequency, stools classified as loose, or episodes of emesis within 1, 3, or 7 days after RV5 administration were observed. RV5 vaccination was not associated with an increase in clinically significant adverse events including fever, sepsis evaluations, increase in respiratory support, or feeding intolerance when compared to after the 2-month shot series.
Conclusion(s) RV5 is well tolerated in premature infants with intestinal pathology and does not result in clinically significant adverse events when administered at routine chronologic age in NICU-hospitalized infants when compared to the 2-month shot series.

Abstract: 265
Text message plan and baseline usage of families enrolled in a text message influenza vaccine reminder study: An AAP Pediatric Research in Office Settings (PROS) Study
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Background Text-messaging has been investigated as a low-cost, accessible way to provide vaccine reminders, as most individuals in the U.S. own a cell phone with few differences across demographic groups. However, little is known about patterns of text-message plan type and use in populations participating in research involving text messaging.
Objective To examine text message plan and baseline usage of families enrolled in a text message influenza vaccine reminder study.
Design/Methods In the NIH-funded Flu2Text study conducted during the 2017-18 and 2018-19 influenza seasons, families of children needing a 2nd influenza vaccine dose in a season were recruited in primary care offices at the time of their 1st dose. Practices (n=49) were from the AAP PROS practice-based research network (Northeast [32.7%], South [32.7%], Midwest [18.4%], and West [16.3%]). A survey administered after enrollment included "What type of text message plan do you currently have" (limited vs. unlimited # of text messages/month), and "How often do you send and/or receive text messages?" (at least once a day; at least once a week but not every day; at least once a month but not every week; occasionally but not every week; never). Standardized proportions (adjusted for child and caregiver demographics) for plan type and texting

frequency were calculated using logistic regressions.
Results Responses were collected from 1,018 participants (72.4% of enrolled). Mean parent age was 32 (range 16–57 years), and 96.9% of children were <3 years old. Most (94.0%) families were English speaking, with participant diversity comparable to the U.S. population (Table 1).

Most but not all (93.4%) participants had an unlimited texting plan and texted daily (92.9%). Caregivers whose children were Asian were less likely to have an unlimited text messaging plan. Caregivers who were Spanish-speaking, or whose children were Asian or Black were less likely to text daily (Table 2). Nearly three-quarters (71.2%) of participants had received some form of text message from their doctor's office, most commonly appointment reminders (98.5%), prescription (28.6%), vaccine reminders (10.4%), laboratory notifications (11.5%), or school forms (5.8%).
Conclusion(s) There were significant differences by some family characteristics in terms of text message plan type and use. However, even those who did not have unlimited texting and/or did not text daily did enroll in a text message vaccine reminder study.

Table 1: Demographic and Text Message Related Characteristics of the Study Population	
	% [N]
Child Ethnicity	
Hispanic or Latino	17.6 [179]
Not Hispanic or Latino	82.4 [839]
Child Race	
White	67.5 [874]
Black	13.0 [132]
Asian	4.7 [47]
Other	15.0 [153]
Child Age	
Less Than 1 Year Old	98.9 [966]
Between 1-5 Years Old	1.1 [11]
Child Health	
Excellent/Very Good	93.1 [948]
Good/Fair	6.7 [68]
Child Insurance Type	
Uninsured	1.0 [10]
Public Insurance	34.3 [349]
Commercial Insurance	64.7 [658]
Caregiver Education	
Less than High School	5.1 [54]
High School	18.2 [193]
Some College or Above	76.4 [797]
Caregiver Age	
Less than 30 Years Old	33.9 [359]
Between 30-39 Years Old	58.5 [564]
Age 40 and Over	7.6 [76]
Caregiver Language	
English	94.0 [957]
Spanish	6.0 [61]
Texting Plan Type	
Limited Number of Texts Per Month	8.6 [87]
Unlimited Number of Texts Per Month	91.4 [947]
Texting Frequency	
Send/Receive Texts Everyday	92.3 [913]
Send/Receive Texts Less Than Everyday	7.6 [75]
Send/Receive Texts Never	0.1 [1]
Influenza Season	
Season 1 2017-18	35.3 [357]
Season 2 2018-19	74.8 [754]

Table 3: Relationship Between Demographic Factors and Text Message Plan Type and Usage

	Unlimited Number of Texts Each Month		Send and/or Receive Text Message Daily	
	Adjusted[a] % (N)	Risk Difference (95% CI)	Adjusted[a] % (N)	Risk Difference (95% CI)
Child Ethnicity				
Hispanic or Latino	91.3 (154)	-1.8 (-8.3, 2.6)	85.3 (151)	-3.6 (-9.6, 3.5)
Not Hispanic or Latino	94.1 (793)	—	92.7 (781)	—
Child Race				
White	91.8 (535)	—	95.1 (545)	—
Black	91.5 (112)	-1.1 (-8.3, 4.1)	85.3 (105)	-11.9 (-19.4, -4.4)
Asian	75.4 (58)	-16.2 (-27.4, -5.0)	68.9 (53)	-26.5 (-40.8, -12.5)
Other	96.1 (147)	2.9 (-0.8, 5.8)	91.3 (137)	-4.1 (-8.7, 0.5)
Child Age				
<1 Years Old	91.2 (921)	—	91.8 (904)	—
1-4 years Old	87.5 (28)	-5.8 (-19.2, 4.1)	92.4 (26)	0.5 (-7.1, 8.2)
Child Health				
Excellent/Very Good	91.8 (880)	—	92.4 (874)	—
Good/Fair	91.8 (69)	-1.7 (-9.7, 6.2)	85.8 (70)	-6.6 (-14.3, 1.1)
Child Insurance Type				
Uninsured	69.5 (9)	-4.5 (-23.7, 24.8)	38.6 (8)	-0.3 (-17.2, 15.4)
Public Insurance	91.8 (553)	-1.3 (-5.4, 2.6)	92.8 (559)	1.9 (-2.3, 5.7)
Commercial Insurance	94.2 (420)	—	90.9 (414)	—
Caregiver' Education				
Less than High School	89.2 (46)	-5.9 (-24.5, 3.7)	95.3 (44)	-1.6 (-8.7, 5.5)
High School	91.9 (153)	-3.2 (-9.7, 3.3)	89.6 (144)	-6.1 (-9.6, 1.3)
Some College or Above	94.2 (751)	—	92.7 (741)	—
Caregiver Language				
English	94.4 (903)	—	93.0 (889)	—
Spanish	83.8 (44)	-10.7 (-22.8, 1.4)	79.6 (41)	-13.4 (-26.1, -0.6)
Influenza Season				
Season 1 2017-18	97.0 (748)	—	95.8 (739)	—
Season 2 2018-19	91.4 (699)	-6.8 (-7.5, -5.8)	91.3 (695)	-1.9 (-3.1, -1.2)

[a] Most (88%, n=890) caregivers were mothers

Abstract: 266

Vaccine Hesitancy and Influenza Beliefs Among Parents of Children Requiring a 2nd Dose of Influenza Vaccine in a Season: An AAP Pediatric Research in Office Settings (PROS) Study

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Background To receive adequate protection against influenza, many children 6 months - 8 years old need 2 doses of influenza vaccine in a season. Only half of those receiving a first dose receive a second.
Objective To assess vaccine hesitancy and influenza disease and vaccine beliefs among caregivers of children who received the 1st of the 2 required influenza vaccine doses.
Design/Methods As part of the NIH-funded Flu2Text national study conducted during the 2017-2018 season, a telephone survey collected demographic information of caregivers (age, English proficiency, education, relationship to a child) and the participating child (age, gender, race, ethnicity, insurance type, health status) [Table 1]. Each child received the 1st dose of influenza vaccine, needed a 2nd dose that season, and was enrolled in a study of text message influenza vaccine reminders. Caregivers completed a validated measure of vaccine hesitancy (PACV-5) [Table 2] and a series of questions to evaluate their knowledge about influenza infection and vaccine. We assessed the association of caregiver and child demographic characteristics with vaccine hesitancy and influenza beliefs. The standardized (adjusted) proportion of caregivers endorsing each outcome was calculated using logistic regression.
Results Analyses included responses from 256 participants from 36 AAP PROS primary care network practices across 24 states [Table 1]. 11.7% of caregivers had moderate or high vaccine hesitancy. A high proportion of caregivers held the following inaccurate beliefs: "flu is just a bad cold" (40.2%); child will be protected with "only one flu shot" (93.8%); "flu shot causes the flu" (57%); children cannot "die from the flu" (68%) [Table 2]. In a multivariable model including the demographic characteristics above, only lower English ability was a significant predictor of vaccine hesitancy (p=.01) [Table 3]. No one variable consistently predicted inaccurate influenza disease and vaccine beliefs across all outcomes.
Conclusion(s) Even caregivers whose children receive the first dose of influenza vaccine may be vaccine hesitant and have inaccurate beliefs regarding influenza vaccine and disease. These results underscore the importance for the clinical team to broadly address inaccurate perceptions and promote vaccination even after caregivers agree to the first dose.

Table 1[1]: Study Population Demographic Characteristics

	% (n)
Caregiver English Proficiency	
Excellent English	91.8 (236)
Less Than Excellent	8.2 (21)
Caregiver Education	
High School or Less	23.7 (61)
Some College or Above	76.3 (196)
Caregiver Age	
<30 years old	25.8 (66)
31-39	64.2 (165)
40+	8.9 (23)
Relationship to the Child	
Mother	84.0 (216)
Other	16.0 (41)
Child Age	
6 - 23 months	91.8 (236)
2 - 6 years	8.2 (21)
Child Gender	
Male	52.1(134)
Female	47.9 (123)
Child Insurance Type	
Government/Uninsured	30.4 (78)
Commercial	69.6 (179)
Child Race	
White	68.5 (176)
Black	10.5 (27)
Asian	3.9 (10)
Other	17.1 (44)
Child Ethnicity	
Hispanic/Latino/Spanish	16.0 (41)
Non- Hispanic/Latino/Spanish	84.0 (216)
Child Health	
Excellent	79.8 (205)
Less Than Excellent	20.2 (52)

[1]. Total Sample (n=257). One participant was excluded from the multivariable logistic regression analysis due to missing data.

Table 2: Study Population Vaccine Hesitancy and Inaccurate Beliefs about Influenza Disease and Vaccine

	% (n)[a]
PMCV-3[b] [5-10]: Moderate or High vaccine hesitancy	11.7 (30)
"Flu is just a bad cold"[c]	40.2 (103)
"Flu shot can cause the flu"[c]	57.0 (146)
Children cannot "die from the flu"[c]	68.0 (174)
Your child will be protected with "only 1 flu shot this season"[c]	93.8 (240)

[a] - Total Sample (n=256)

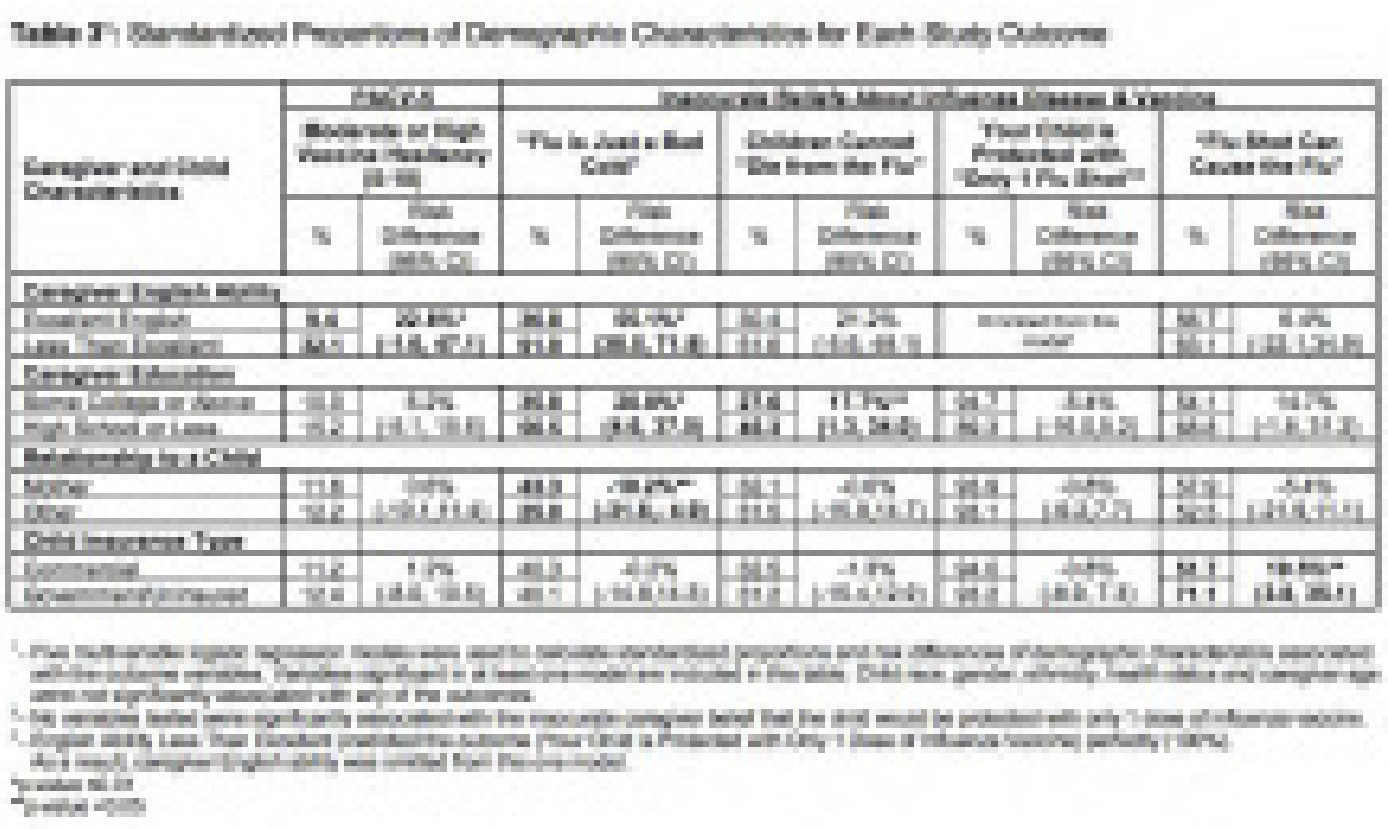
[b] - PMCV-3 responses were measured with a 5-point Likert scale. Based on guidance from the PMCV developers, responses were collapsed into 3 categories. The PMCV-3 is comprised of the following questions:

- "I trust the information I receive about shots."
- "It is better for my child to develop immunity by getting sick than to get a shot."
- "It is better for children to get fewer shots at the same time."
- "Children get more shots than are good for them."
- "Overall, how hesitant about childhood shots would you consider yourself to be?"

Reference: Gilkey, G., Allen, R., Amin, A., Rose, P. St., Bednarczyk, R. A., & Omer, S. B. (2016). Comparative analysis of the Parent Attitudes about Childhood Vaccines (PACV) short scale and the five categories of vaccine acceptance identified by Gust et al. Vaccine, 34(41), 4964-4968.

[c] – The only belief considered accurate was "Strongly Disagree". All other responses (Strongly Agree, Somewhat Agree, Somewhat Disagree, Strongly Disagree, & Don't Know) were summarized under inaccurate beliefs.

[c] – The only belief considered accurate was "Very Unprotected." All other responses (Very Protected, Somewhat Protected, Somewhat Unprotected, Very Unprotected, Don't Know) were summarized under inaccurate beliefs.



Abstract: 267

Influenza Vaccine Visits are an Underutilized Avenue for Increasing Human Papilloma Virus Vaccination Rates: An AAP Pediatric Research in Office Settings (PROS) National Primary Care Research Network Study

Mary Kate Kelly[1], Abigail Breck[2], Robert Grundmeier[1], Alisa J. Stephens-Shields[3], Russell Localio[3], Laura Shone[4], Margaret Wright[4], Jennifer Steffes[4], Christina Albertin[5], Sharon G. Humiston[6], Cynthia Rand[5], Dianna E. Abney[4], Greta McFarland[4], Peter Szilagyi[2], Alexander Fiks[1]

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Background Despite proven benefits, vaccination rates for HPV remain substantially lower than for other adolescent immunizations. Missed opportunities (MOs) at primary care visits contribute to low HPV vaccine coverage. Although influenza vaccination is administered often at clinician and nurse-only visits, little is known about MOs for HPV during these visits.

Objective To examine the extent to which influenza vaccine visits are being utilized to administer the HPV vaccine.

Design/Methods As part of the NIH-funded STOP HPV trial, we extracted electronic health record (EHR) data from 37 practices across 19 states recruited from the AAP PROS national pediatric primary care network. We extracted all office visits from 2015-2018 in which the influenza vaccine was administered to HPV vaccine-eligible 11 to 17-year-olds. Among those visits, MOs were defined as the proportion in which an HPV vaccine was due but not given. MOs were examined overall and separately by visit type, patient sex and age, and HPV dose due. A log-linear model, clustered by practice, examined the association of visit type, patient characteristics, and HPV dose with MOs.

Results A total of 46,073 HPV-eligible influenza vaccine visits among 34,401 patients (median age: 12 yr., 46% female) were analyzed [Table]. Over half (58%) of these HPV vaccination opportunities were missed, and MO rates varied by practice (median: 58%, range: 22%-81%). MOs were far more common at visits during which an initial versus subsequent HPV vaccine dose was due (70% vs. 30%). MOs were also higher at acute/chronic and nurse visits versus preventive visits (74% and 77% vs. 39%). MOs were similar in males and females and slightly higher among younger versus older patients. In the multivariate model, MOs were significantly higher for initial versus subsequent doses (RR: 2.46, 95% CI: 2.22-2.73) and at acute/chronic (RR: 2.03 95% CI: 1.87-2.21) and nurse (RR: 2.08, 95% CI: 1.90-2.29) visits compared to preventive visits.

Conclusion(s) MOs for HPV vaccination during visits where influenza vaccine is given are frequent, particularly during acute/chronic or nurse-only visits and for the initial HPV vaccine. These MOs are also common for subsequent HPV doses, when vaccine hesitancy is less likely. Efforts to increase simultaneous administration of HPV and influenza vaccines are warranted.

Missed Opportunities for HPV Vaccination at Visits where Influenza Vaccine was Administered at 37 Practices in 10 States

	Initial HPV Dose		Subsequent HPV Doses		Any HPV Dose	
	% MO	N (visits)	% MO	N (visits)	% MO	N (visits)
Overall	69.7%	32,604	30.3%	13,569	58.1%	46,073
Visit type						
Preventive	49.3%	16,837	9.0%	5,733	39.1%	22,540
Acute/Chronic	89.1%	5,331	46.7%	2,820	74.4%	8,151
Nurse	92.8%	10,336	45.1%	5,046	77.2%	15,382
Sex						
Male	69.6%	17,448	30.1%	7,268	58.2%	24,716
Female	69.8%	15,056	30.4%	6,301	58.0%	21,356
Age						
11 - 12 years	69.3%	19,667	32.4%	5,157	61.6%	24,874
13 - 17 years	70.3%	12,817	28.6%	8,382	55.6%	21,199

Abstract: 268

Parental Support for Healthy Behaviors and Prior Emergency Department Visits are Associated with Increased Influenza Vaccine Uptake

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Background Influenza causes significant morbidity and mortality in children. Even though vaccination remains the best available tool for preventing infection, uptake rates are still low.

Objective To identify factors associated with influenza vaccine uptake among children from Eastern Brooklyn, NY.

Design/Methods This cross-sectional study surveyed caregivers of children who received routine medical care at Brookdale Medical Center pediatric ambulatory clinics from June 2017 to February 2018. Participants were asked to complete a questionnaire that self-reported influenza vaccine uptake in the past 12 months, unstable housing (i.e. moved in past 12 months), food security (i.e. worried food would run out before they got money to buy more and not able to afford to eat balanced meals), support for healthy behaviors (i.e. physical activity, healthy eating, dental care and influenza vaccine) and sociodemographic factors (i.e. child's age, household income, parent's birthplace, education, etc.) Missed health supervision visits and emergency department (ED) visits in the past 12 months, as well as comorbidities, were retrieved from electronic medical records (EMR). Multiple logistic regression analyses were performed to determine the factors associated with influenza vaccine uptake.

Results Two hundred and sixty eight caregivers participated in the survey, which showed that 173 (64.55%) children received influenza vaccine and 132 (49.25%) had comorbidities. EMR review revealed that 106 (39.55%) missed appointments and 139 (51.97%) visited the ED in the past 12 months. Children who received influenza vaccine had comorbidities (71.97% vs. 28.03%, p = 0.01) and parental support for healthy behaviors (83.48% vs. 16.52%, p < 0.01). Results from regression analysis showed support for healthy behaviors (aOR = 4.97, 95% CI: 2.53, 10.35), comorbidities (aOR = 2.34, 95% CI: 1.13, 4.84) and prior ED visits (aOR = 2.42, 95% CI: 1.14, 5.16) were associated with increased influenza vaccine uptake. In contrast, missed appointments (aOR = 0.368, 95% CI: 0.17, 0.78) and US-born parents (aOR = 0.44 95% CI: 0.21, 0.92) were associated with decreased uptake.

Conclusion(s) Parental support for healthy behaviors, comorbidities and prior ED visits help increase influenza vaccine uptake, whereas US-born parents and missed appointments decrease it. Encouraging the practice of healthy behaviors and attending appointments may improve influenza vaccine uptake rates.

Abstract: 269

Refined Carrier Frequencies of Citrin Deficiency in Various Populations

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Background Citrin deficiency (CD) is an autosomal recessive urea cycle disorder which can present as neonatal intrahepatic cholestasis during infancy, failure to thrive with aversion to carbohydrate-rich foods during childhood, or citrullinemia type II with hyperammonemia during adulthood. It is caused by variants in the *SLC25A13* gene that encodes a calcium-dependent mitochondrial aspartate/glutamate carrier. Previously, the majority of patients had been reported from Asian populations, particularly from Japan with an estimated carrier frequency of 1/69. Recently, an increasing number of CD cases have been reported from non-Asian countries, suggesting that CD is a pan-ethic disease. To date, accurate carrier frequencies of CD have not been well characterized.

Objective To understand more refined carrier frequencies of CD in populations with various ethnic backgrounds using currently available genomic sequencing databases.

Design/Methods We reviewed minor allele frequencies (MAFs) of pathogenic *SLC25A13* variants in samples of various populations using large-scale genomic databases including one private (BioMe at Mount Sinai Medical Center) and three publicly available databases (the Genome Aggregation Database [gnomAD], Human Genetic Variation Database version 1.0 [HGVD] and integrative Japanese Genome Variation Database [iJGVD]). Carrier frequencies were calculated based on Hardy-Weinberg equilibrium.

Results 71 pathogenic or likely pathogenic variants including 65 loss-of-function and 6 missense variants were detected from more than 30,000 and 116,000 individuals in BioMe and gnomAD, respectively. The estimated carrier frequency of CD in each population was 1/62-126 in Asian, 1/266 in Ashkenazi Jewish, 1/680-790 in European, 1/966-998 in Hispanic, 1/467-1,060 in African-American, and 1/411-1,458 in the others. In the Japanese population, ten variants were predicted to be pathogenic in 1,208 and 3,554 individuals from HGVD and iJGVD. Updated estimates of carrier frequency in the Japanese population were 1/35-42. Each population had a unique variant profile with a newly identified founder variant, p.T446P, in the Ashkenazi Jewish population.

Conclusion(s) The frequencies of *SLC25A13* pathogenic variants are variable between the populations with a unique variant profile. The newly estimated CD carrier frequency in the Japanese population was higher than that of previously reported. It is possible that many individuals with CD are still undiagnosed in Japan. Ethnic background can be an important factor for diagnosing CD.

Abstract: 270

Partial Turner Syndrome with partial chromosome 9q duplication: case report and phenotype analysis

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Background X-autosome translocations have been reported to occur in about 1/30,000 live births. We describe the case of an unbalanced translocation resulting in partial Xp deletion along with a large partial 9q duplication. To our knowledge only one case of a patient with a similar translocation has been reported in the literature.

Objective

Design/Methods A female was born at 34 weeks gestation with a unique phenotype including microcephaly, chin angled inward toward the lower alveolar ridge, broad nasal tip, synophrys, high arched palate, squared off helices and long thin feet. Additional findings included coarctation of the aorta, hypoplastic bicuspid and stenotic aortic valve, ASD, VSD, PDA, horseshoe kidney, cerebellar vermis hypoplasia, borderline conus medullaris, refractory vomiting in the absence of gastrointestinal malformations, and poor growth (figure 1).

Results Microarray results revealed a ~48.1 Mb duplication of chromosome 9q (9q22.2q34.3) and a ~56.5 Mb deletion of chromosome Xp (Xp22.33p11.21), indicating a large, unbalanced chromosomal translocation. The patient died at 6 months of age due to ischemic bowel secondary to superior mesenteric artery thrombosis. The patient died at 6 months of age due to ischemic bowel secondary to superior mesenteric artery thrombosis.

Conclusion(s) This is one of the few cases describing partial monosomy X with partial trisomy 9q, encompassing both phenotypic characteristics of Turner syndrome (cardiac defects, horseshoe kidney) and 9q duplication (arachnodactyly, microcephaly, micrognathia, high arched palate, poor growth and synophrys). Unique features include her broad nasal ridge

and prominent chin, low conus medullaris and cerebellar vermis hypoplasia. Some genes located in the duplicated area of chromosome 9 may explain these findings, including *SET* (responsible for neural crest cells and pharyngeal arch 1) and *PTCH1* in chromosome 9q22.3, reported in association with short stature and developmental delay. *SHOX* gene located in the X chromosome may also be implicated in her poor growth.

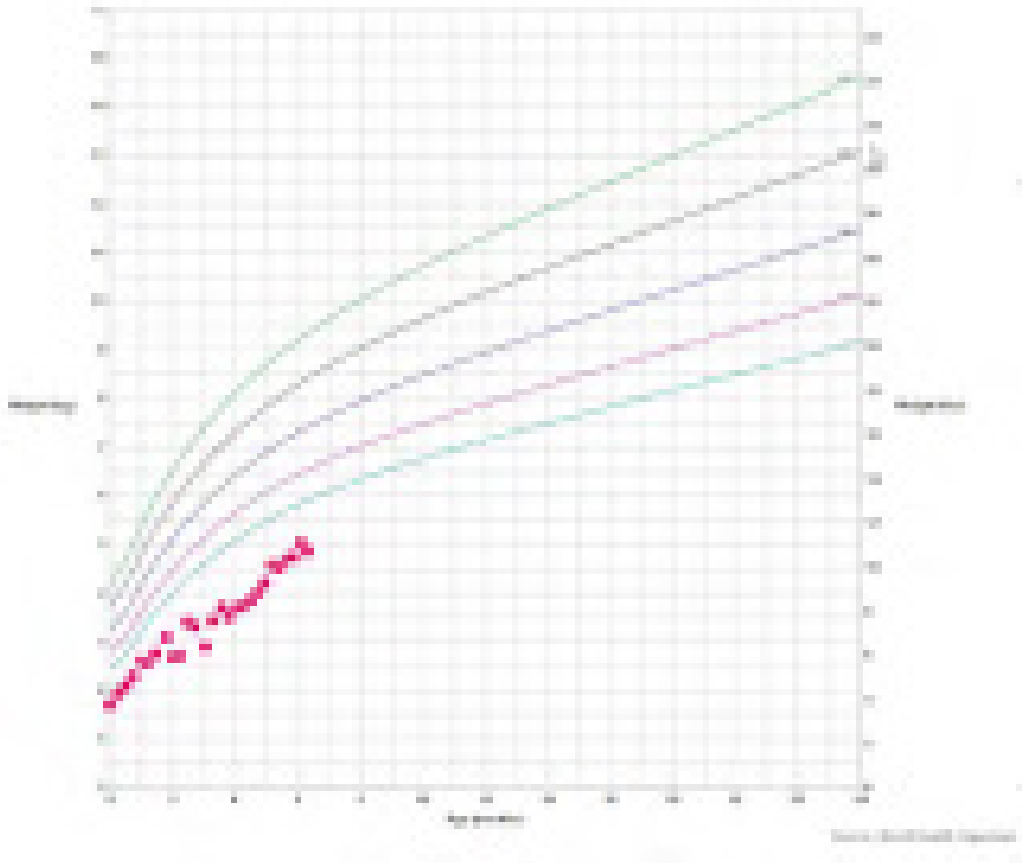

Figure 1. Growth chart of the patient showing weight <1st percentile despite initiation of duodenal and gastric feeds.

Abstract: 271

The use of 10x genomics to study the effect on progenitor cells after delayed cord clamping and oxygen exposure in a preterm ovine model - A pilot study

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Background Delayed or physiological cord clamping in preterm neonates has the potential benefits of fewer blood transfusions, lower risk of intraventricular hemorrhage and necrotizing enterocolitis. The benefit is attributed to additional placental blood flow that occurs during the delivery. Transfer of red cell volume has been extensively studied. The effect of physiological cord clamping on progenitor cell transfer has not been evaluated.

Objective To evaluate the effect of delayed cord clamping (DCC) on circulating progenitor cells in a preterm ovine model before and after 1 hour of transition using single-cell genomics.

Design/Methods A preterm ovine model (127-128 d) was delivered after 5 minutes of DCC and ventilated with titrating oxygen to maintain saturations (90 98%) for 4 hours. The blood samples were collected before birth and 1 hour after stabilization. The samples were spun and peripheral blood mononuclear cells isolated for analysis. Following 10x Chromium library preparation and subsequent Illumina sequencing, the resulting reads were analyzed using the 10x Genomics Cell Ranger. Quantification of transcript abundance is performed using the cell ranger count function, against the NCBI Ovis Aries genome build. The resulting count matrix is then supplied to the R package Seurat for further analysis. The data is filtered, normalized and quantified. Samples are then analyzed together using the canonical correlation, which performs cell-to-cell alignments, before visualization using t-distributed stochastic neighbor embedding (t-SNE) plot.

Results From one preterm ovine model, we identified various clusters of cells before and 1 hour after the transition (Figure 1). Seven clusters containing 760 differentially expressed genes were identified (Figure 1). Cells with similar transcriptomic signatures after genomic alignment and quantification were clustered together as shown (Figure 2). Figure 3 shows upregulated genes associated with the inflammatory response (log fold change avg >1, p<0.0001). Figure 4 shows down-regulation of gene expressions associated with cell stability (log fold change avg, -0.5, p<0.0001).

Conclusion(s) Our preliminary data suggest that 10x genomics is an innovative and powerful tool to study the effect of preterm birth on circulating progenitor cells. In the future, we intend to study the effect of cord milking along with oxygen exposure to study its effect on the transition in preterm birth.

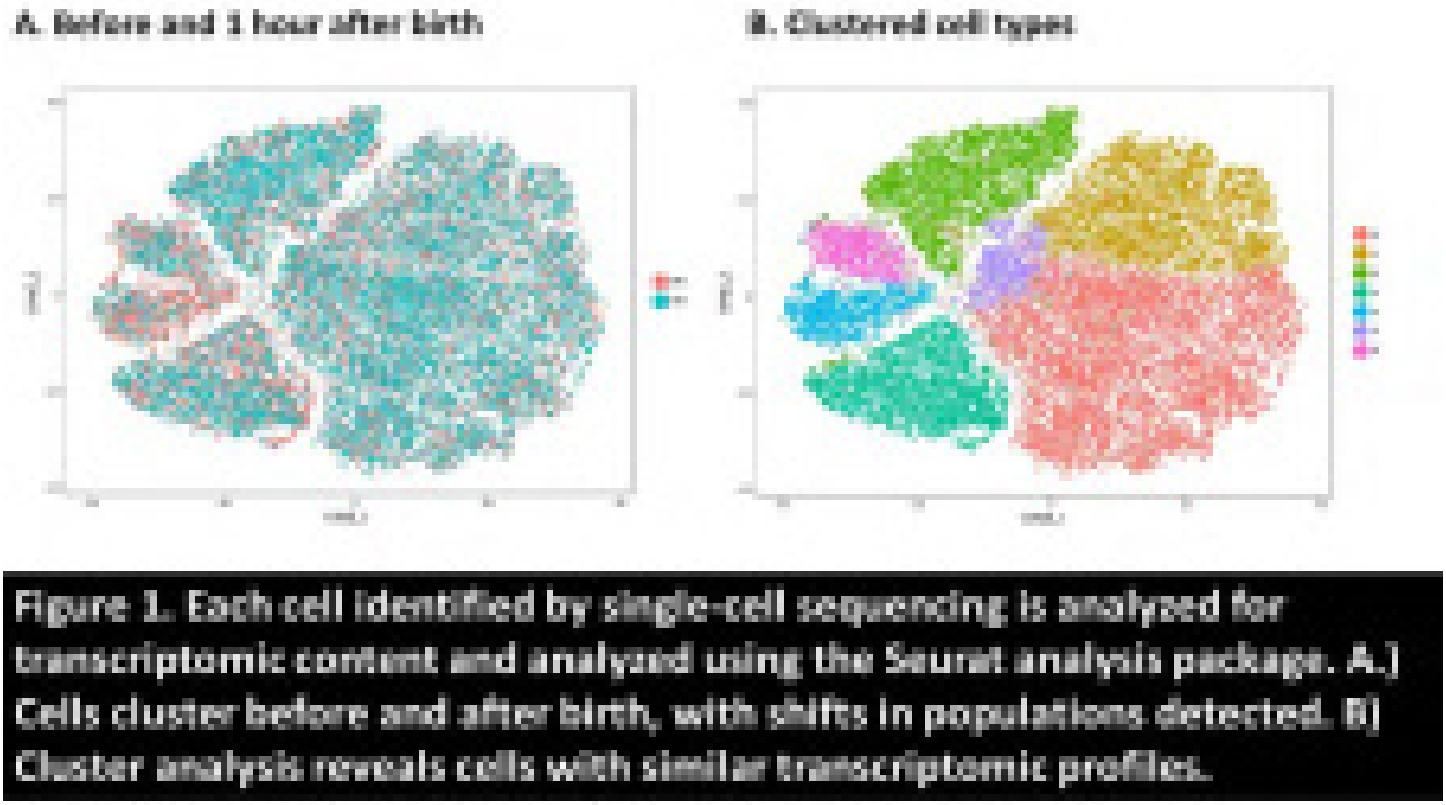

Figure 1. Each cell identified by single-cell sequencing is analyzed for transcriptomic content and analyzed using the Seurat analysis package. A.) Cells cluster before and after birth, with shifts in populations detected. B) Cluster analysis reveals cells with similar transcriptomic profiles.

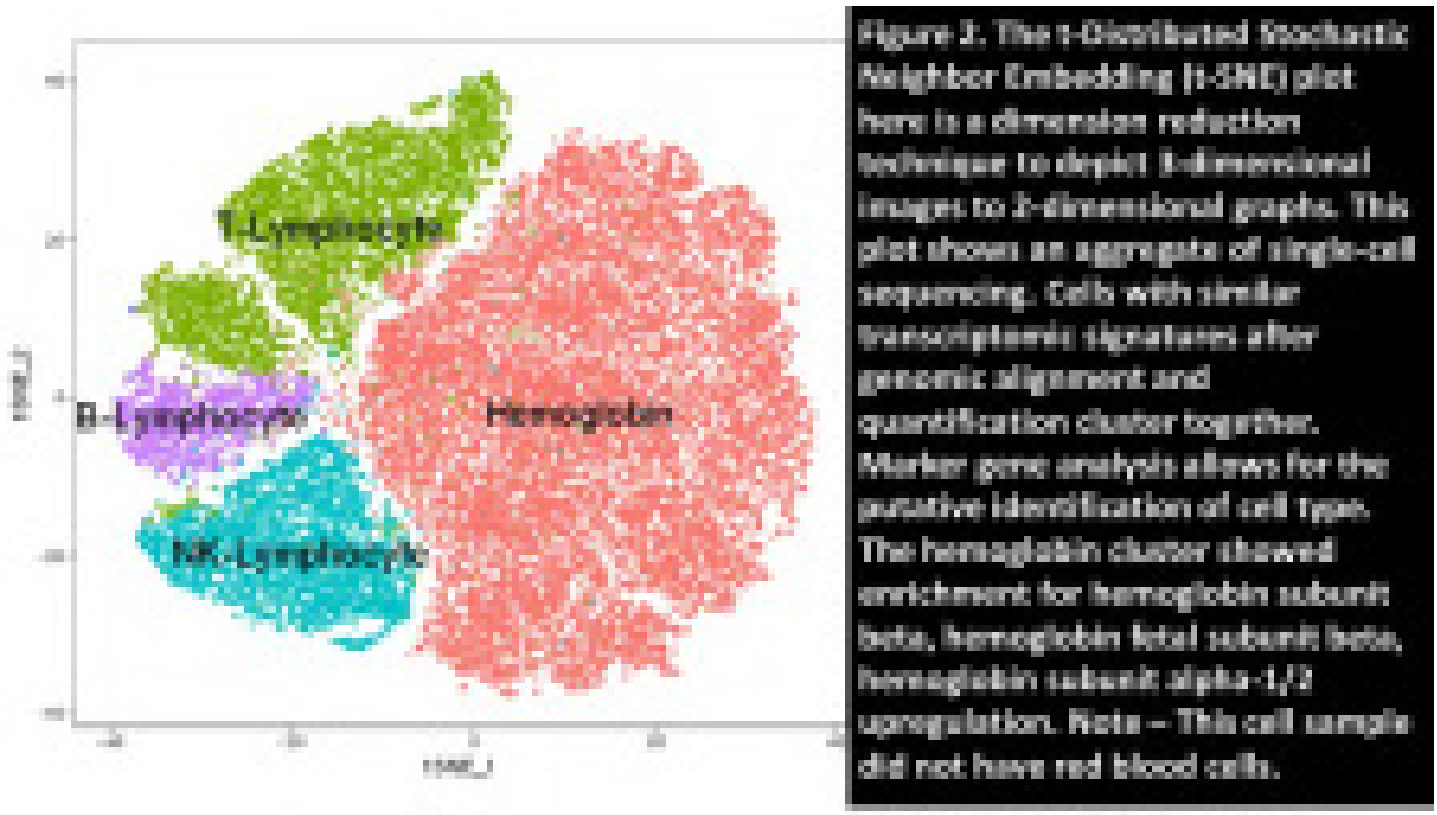

Figure 2. The t-Distributed Stochastic Neighbor Embedding (t-SNE) plot here is a dimension reduction technique to depict 3-dimensional images to 2-dimensional graphs. This plot shows an aggregate of single-cell sequencing. Cells with similar transcriptomic signatures after genomic alignment and quantification cluster together. Marker gene analysis allows for the putative identification of cell type. The hemoglobin cluster showed enrichment for hemoglobin subunit beta, hemoglobin fetal subunit beta, hemoglobin subunit alpha-1/2 upregulation. Note – This cell sample did not have red blood cells.

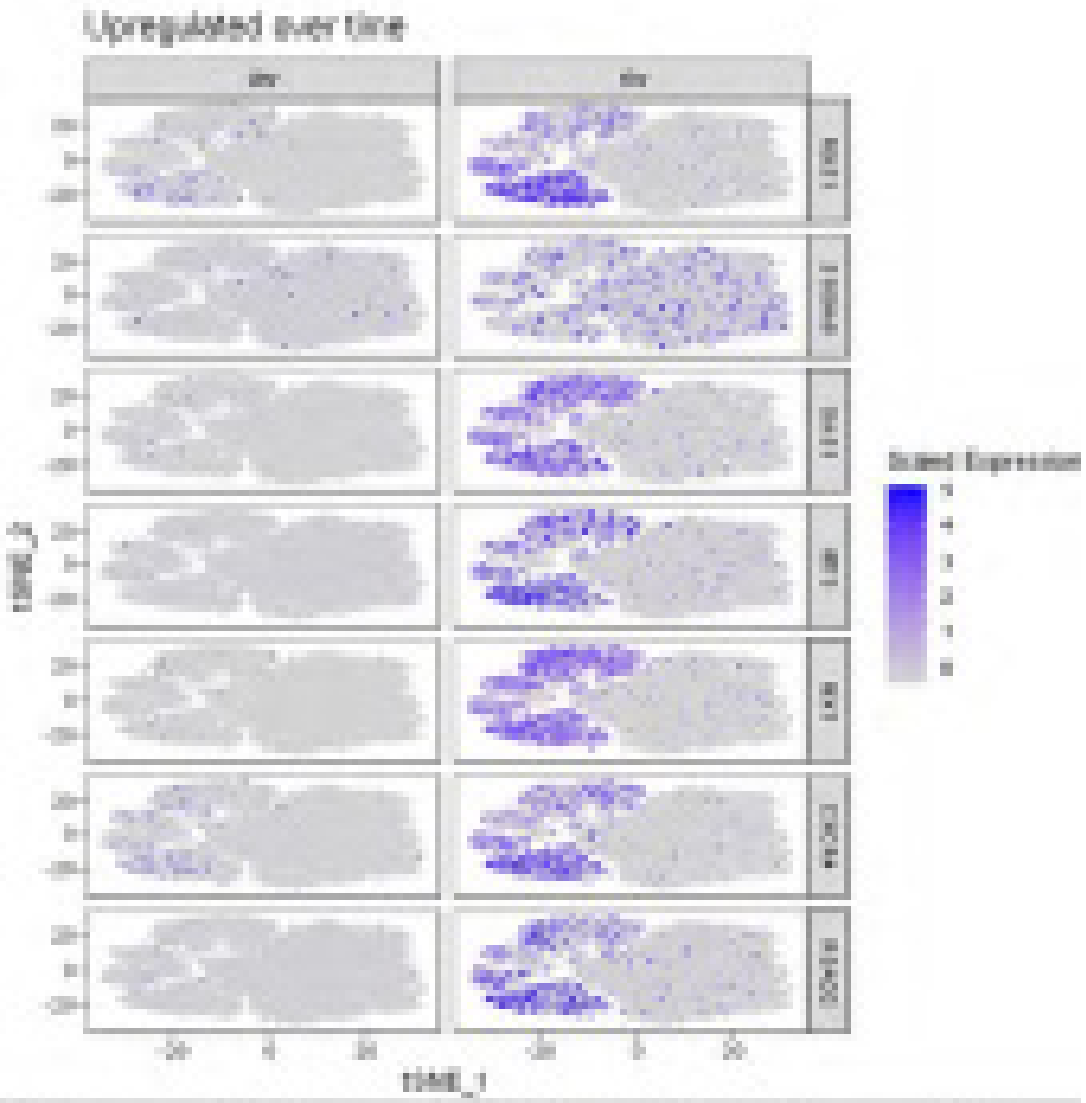

Figure 3. The t-SNE plot shows the differential expression of RGS1, S100A8, OAS1, IFIT3, MX1, CXCR4 and RSAD2 before and after transition. This inflammatory/immune response could be secondary to mechanical ventilation/oxygen exposure as well as instrumentation.

Figure 3. The t-SNE plot shows the differential expression of RGS1, S100A8, OAS1, IFIT3, MX1, CXCR4 and RSAD2 before and after transition. This inflammatory/immune response could be secondary to mechanical ventilation/oxygen exposure as well as instrumentation.

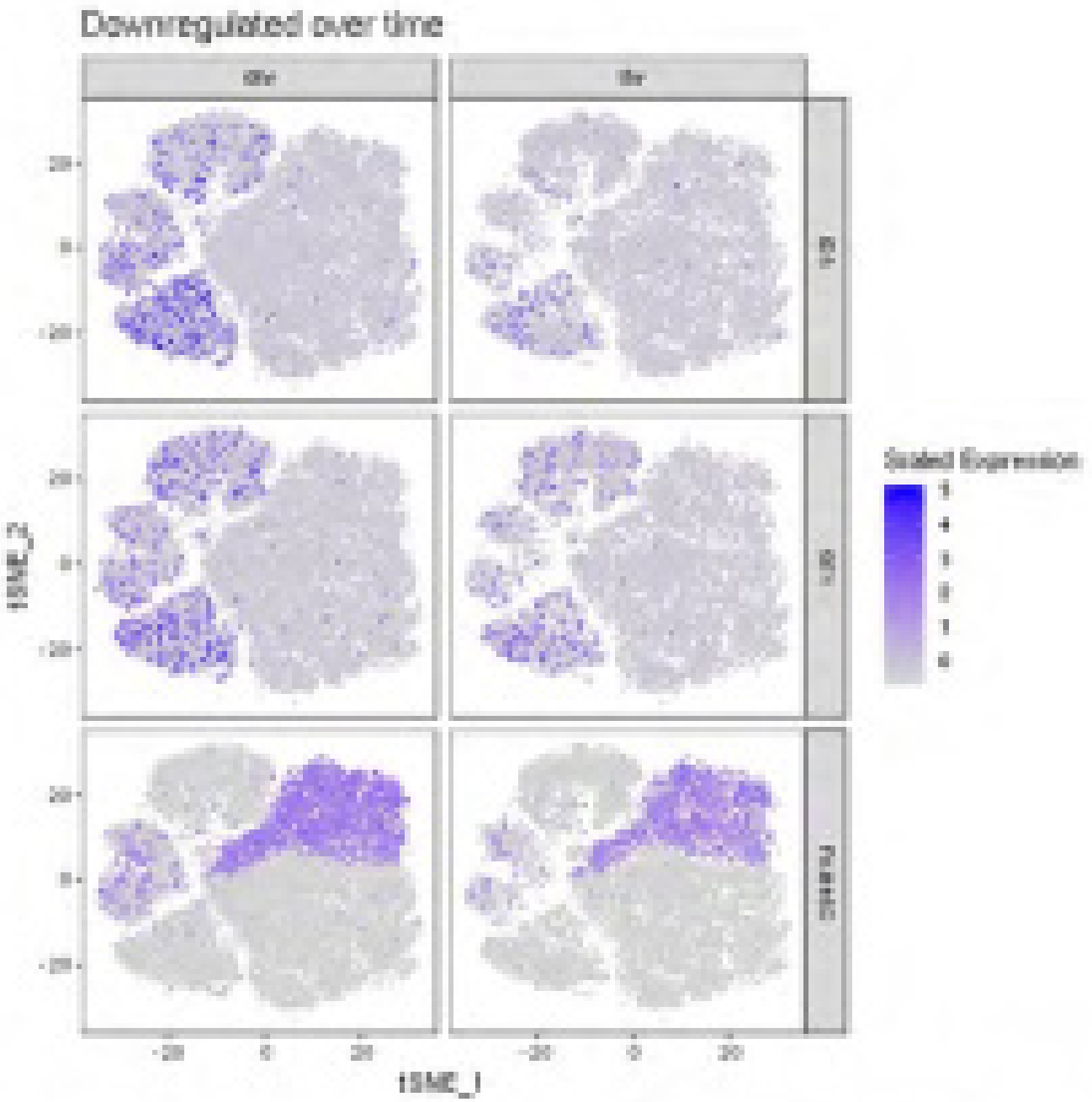

Figure 4. The t-SNE plot shows the differential expression of ID3, SIT1, FAM46C aka TENT5C before and after transition. These are associated with cell stability and the downregulation maybe secondary to prematurity.

Figure 4. The t-SNE plot shows the differential expression of ID3, SIT1, FAM46C aka TENT5C before and after transition. These are associated with cell stability and the downregulation maybe secondary to prematurity.

Abstract: 272

Are SERPIN Genetic Variants Associated with BPD in ELBW Infants?

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Background Bronchopulmonary dysplasia (BPD) is a major pulmonary morbidity in extremely low birth weight (ELBW) infants. An imbalance between neutrophil elastase and its inhibitors has been suggested to be a contributor to BPD. Serine elastase inhibitor (SERPIN) B1 is an inhibitor of neutrophil elastase. SERPINB1 was detected in lung tissue and bronchoalveolar lavage fluid in the baboon model of BPD. Recent studies suggest that SERPINB1 could protect the airways by regulating the excess protease released during the inflammation seen with infections, particularly pulmonary diseases. Genetic variants [single nucleotide polymorphisms (SNPs)] of the SERPIN gene have been associated with COPD and functional effects on pulmonary function testing. In this pilot study, we seek to determine the association of SERPIN SNPs with BPD in ELBW infants.

Objective We investigated the hypothesis that SERPIN gene variants-rs316339, rs840088, rs7562213, and rs759646-are associated with susceptibility to BPD in ELBW infants.

Design/Methods DNA from buccal swabs of ELBW infants whose parents gave informed consent were collected, isolated, and analyzed with RT-PCR using specific TaqMan probes for rs316339, rs840088, rs7562213, and rs759646. BPD was defined as oxygen dependence at 36 weeks postmenstrual age. Statistical tests including chi-square, t-test, and z-test were performed, with $p < 0.05$ denoting significance.

Results While there were statistically significant differences in birth weights and gestational ages between the BPD and NoBPD groups, the SERPIN variants tested were not found to be statistically different between these two groups.

Conclusion(s) In this pilot study, there were no significant associations between BPD and four SERPIN variants in ELBW infants. We speculate that a larger sample size (estimated to be N=146) would be needed to demonstrate such an association.

Table 1: Comparison of demographic characteristics in the study groups with and without BPD.

		No BPD (n = 21)	BPD (n = 62)	P-value
GA (median, IQR)		26 (25,27)	25 (24,26)	0.024 *
BW (median, IQR)		780 (710, 943)	703 (583, 845)	0.013 *
Race n (%)	Non-Hispanic White	3 (14)	14 (23)	0.84
	Non-Hispanic Black	9 (41)	22 (37)	
	Hispanic	8 (36)	18 (30)	
	Other	2 (9)	6 (9)	
Gender n (%)	Male	13 (59)	37 (45)	0.38
	Female	8 (48)	33 (55)	

Table 2: Comparison of SNP genotype distribution in the study groups with and without BPD.

Genotype	[illegible]	No BPD	BPD	P value
	GG	[illegible]	[illegible]	0.9
	GA	[illegible]	[illegible]	
	AA	[illegible]	[illegible]	
	[illegible]	No BPD	BPD	P value
	AA	[illegible]	[illegible]	0.3
	AG	[illegible]	[illegible]	
	GG	[illegible]	[illegible]	
	rs2562213	No BPD	BPD	P value
	GG	[illegible]	[illegible]	0.7
	GA	[illegible]	[illegible]	
	AA	[illegible]	[illegible]	
	[illegible]	No BPD	BPD	P value
	CC	[illegible]	[illegible]	0.9
	CT	[illegible]	[illegible]	
	TT	[illegible]	[illegible]	

Abstract: 273

A content analysis of parental perspectives on diagnosis and prognosis of NICU graduates with cerebral palsy

Katherine Guttmann[1], John Flibotte[1], Sara DeMauro[1], Holli Seitz[2]

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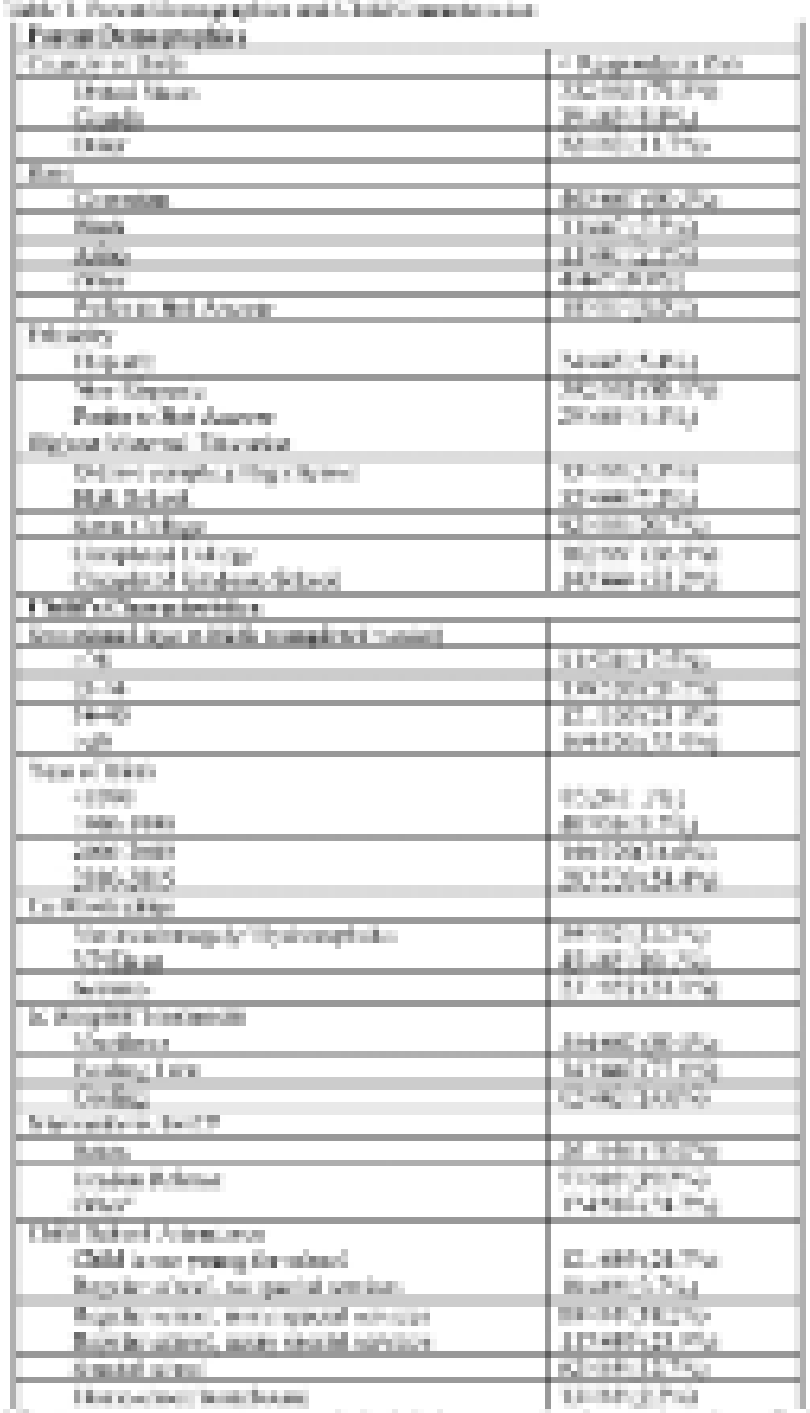
Background Cerebral palsy (CP) is a group of conditions impacting movement and muscle coordination due to early neurologic injury related to preterm birth or other perinatal events that may lead to admission to the Neonatal Intensive Care Unit (NICU). Brain imaging is often obtained to assess for injury. Little is known about parents' perceptions of prognostic discussions that follow and may include projections of future abilities and CP.

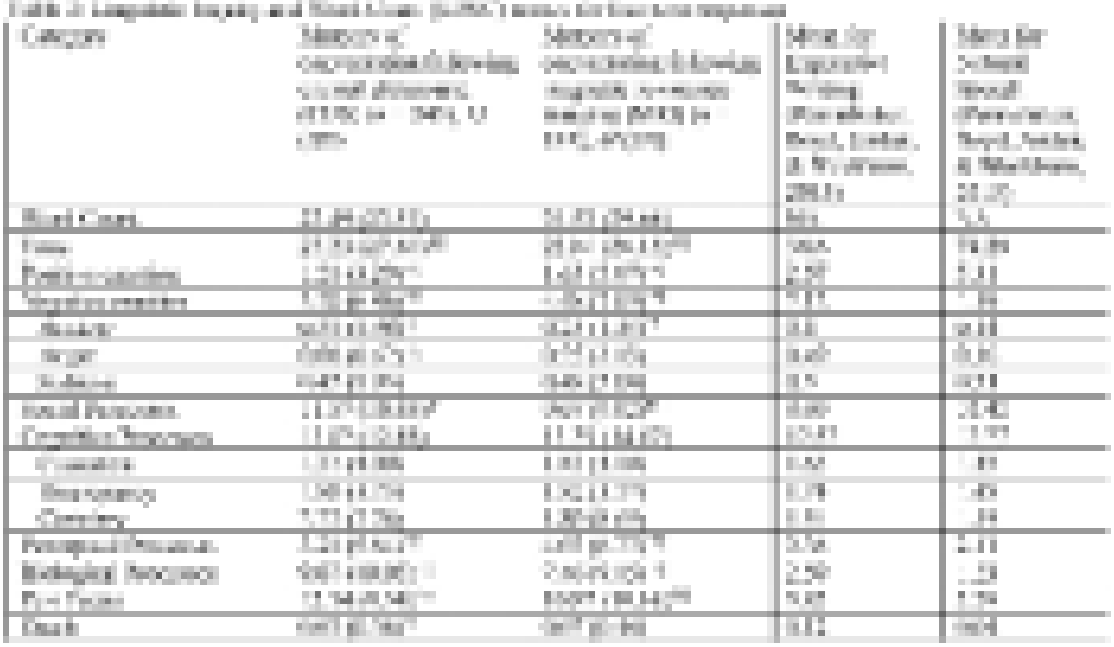
Objective To describe how parents of former NICU patients perceive discussions relating to neurologic prognosis following magnetic resonance imaging (MRI) and cranial ultrasound (CUS).

Design/Methods We circulated a validated survey to parent members of a CP support network to assess their memories of prognostic discussions after neuroimaging in the NICU. We predefined eligibility criteria to include parents of children who were diagnosed with CP and required NICU care after birth. We used Linguistic Inquiry and Word Count (LIWC) to analyze free-text responses and manually coded responses for key themes adapted from previously published work. Responses were coded independently by two coders, and disagreements were settled by a third coder.

Results 520 parents met eligibility criteria and responded over 4 months in 2015. Most respondents were white (91%) and college educated (57%) (Table 1). 245 and 185 parents responded to prompts regarding recollections of discussions following CUS and MRI, respectively. The most prevalent themes identified across responses included outcome, uncertainty, and hope/hopelessness. Parents also described weakness in communication and poor information-giving. Themes were similar across responses related to CUS and MRI (Table 2). Percent agreement between two independent coders ranged from 87.4 to 100%. Automated analysis with LIWC showed that responses following CUS and MRI were negative in emotional tone (Table 3). Responses included more negative emotion words and more focus on the past than expressive writing. Language use did not differ between groups (CUS vs. MRI), though 38% (118/312) of respondents were in both groups.

Conclusion(s) Parents recall prognostic discussions in the NICU about their children who develop CP as carrying a negative tone. Some parents report weakness in communication with poor information giving by providers. Prospective work to evaluate the impact of these perceptions on therapeutic relationships and to develop communication interventions to align parental priorities with provider approach is necessary.





Abstract: 274

Expedited Acute Pediatric Primary Care Visits in an Urban, High Volume Practice

Taraneh Behin[1], Shalona Merceir[1], Ekaterina Nekrasova[2], Maura Powell[3], Dana Srodes[1], Stephanie Mayne[2], Mary Kate Kelly[2], Lisa Biggs[2], Alexander Fiks[2]

[1]South Philadelphia Primary Care, The Children's Hospital of Philadelphia, Philadlephia, Pennsylvania, United States, [2]General Pediatrics, The Children's Hospital of Philadelphia, Philadlephia, Pennsylvania, United States, [3]Office of Clinical Quality Improvement, The Children's Hospital of Philadelphia, Philadelphia, Pennsylvania, United States

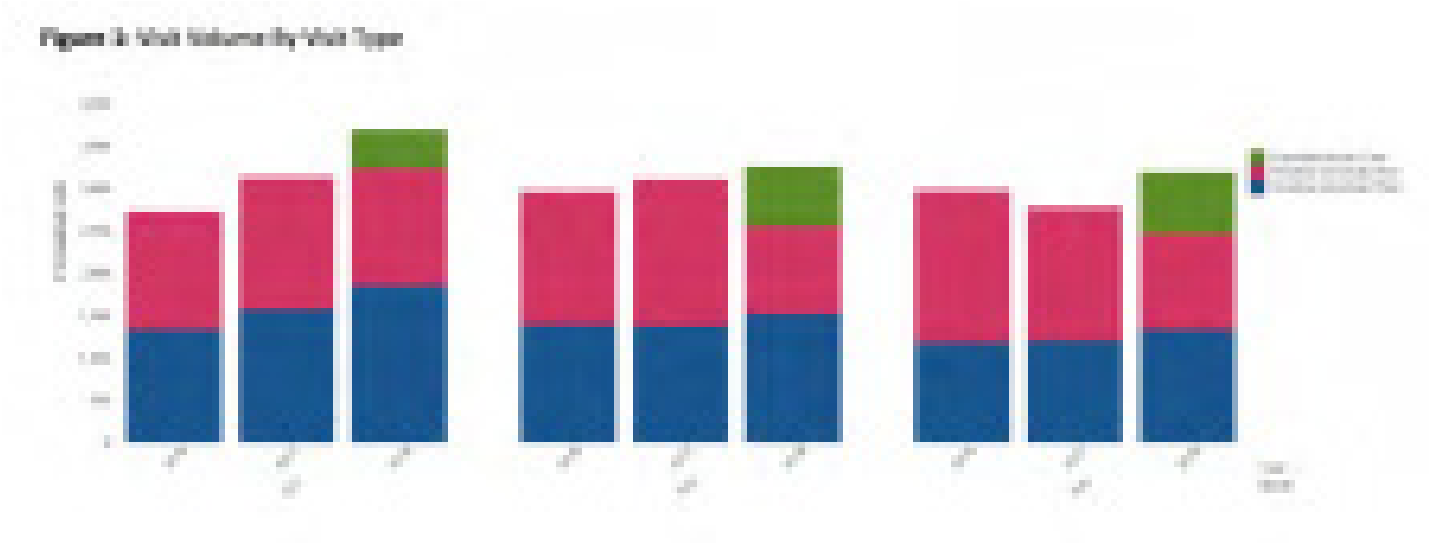
Background During sick visit season, large volumes of triage phone calls consume nurse time and delay responses to families of ill children. Innovation in care delivery systems may address these challenges.

Objective To test expedited delivery of acute visits in a high volume, urban pediatric primary care clinic to increase patient access to care and improve the efficiency of nurse triage.

Design/Methods In a large, urban pediatric primary care office, we tested expedited delivery of acute care visits using PDSA (plan-do-study-act) cycles to improve processes. No additional staff were hired. To determine if a patient was eligible for an expedited appointment, schedulers answered phone calls and asked scripted questions. Children under 6 months of age, medically complex patients, those with difficulty breathing, wheezing or chest pain and parents who wanted a nurse consult received usual telephone nurse triage. Patients who received expedited scheduling were triaged by nurses on arrival at the office. Data from the first 3 months were extracted from the electronic health record to measure overall visit volume by visit type (sick, well, expedited acute care), number of nurse triage encounters, wait time from check-in to rooming, and no-show rate. Chi-square or t-tests assessed the significance of differences between groups.

Results Since the launch, 1,897 expedited acute care visits occurred (79% in English, 9% Spanish, and 12% Other (16 other languages)). Expedited visit volume per month rose by 61% from 450 visits in October to 723 visits in December [Figure 1], and increased significantly by month as a proportion of sick ($p<0.001$) and all visits ($p<0.001$) during this period. Compared to 2016 and 2017, the overall monthly visit volume at the practice also expanded [Figure 1]. On average, routine sick and expedited visits had similar wait times: mean 11.4 min routine sick versus 12 min expedited acute visit ($p=0.99$). The volume of telephone nurse triage decreased 12%, 39% and 18%, respectively, in October, November and December compared to the same month in 2017 [Figure 2]. The no-show rate for expedited acute visits was 6%, half of the rate (12%) for routinely scheduled visits during the same period ($p<0.001$).

Conclusion(s) Results suggest that expedited acute primary care in an urban, multicultural, high-volume office is feasible, supports growth in visit volume and may lessen the need for telephone nurse triage, allowing for increased direct patient care.



Abstract: 275
There is Something in the Water
Sinduja Lakkunarajah, Tarshona Stevens, Brittany Ebbing, Laena Frechett, Rebecca Miller, Nicole Infurno
Pediatrics, jacobi Medical Center, Bronx, New York, United States

History (including chief complaint, history of present illness and relevant past and family medical history) 19 y/o Jamaican man with no PMH presents to the ER with abdominal pain and tactile fever for 5 days. He arrived from Jamaica 14 days ago and symptoms began seven days prior to admission with diffuse twisting, unbearable, 10/10 abdominal pain after eating. He denies other GI symptoms. 5 days prior to admission, he reports a tactile fever with 2-3 episodes of diarrhea and headache. He denies any changes in vision or photophobia. "Pain killers" helped both his headache and his abdominal pain.
Four days prior to admission, he had a witnessed fainting episode after getting up from his couch. He felt hot, sweaty, and dizzy right before fainting and denied any LOC or abnormal movements but had 1 episode of NBNB emesis. He was taken to the ER where his work-up for syncope was negative and discharged home after a PO challenge. The next four days, he continued to have NBNB emesis, diarrhea with tactile fever, malaise, headache and poor PO intake. He also complains of yellow eyes and reports "super yellow" urine.
The day prior to his second ER visit, he noted that he legs started to feel weak and that his back was aching but did not interfere with ADLs. ROS negative except as mentioned above. Of note he reports swimming in Somerset Falls in Portland, Jamaica on August 12, 10 days prior to symptom onset.
Physical examination findings (including vital signs) Vitals: 99.7 | HR 104 | RR 20 | BP 102/67 | 98% RA
PE: tired, dry MM, non toxic appearing, warm to touch, not diaphoretic, sclera icteric, post pahrynx erythematous with few petechiae, tonsils 3+ no exudates, dry cracked lips, yellow mucosa, anterior cervical LAD, mild ttp in the epigastric/ LUQ without guarding/ rebound, no HSM, neuro WNL
Laboratory or Diagnostic imaging or Procedures CBC: 12.13>13.1/38.8<118, MCV 87.2 66% segs, 5% bands, 11% lymphs, 18% monos, 0% eos, 0% basos
CMP: 135/3.9/95/24/24/4.9<106, Ca 9.2, TProt 6.9, Alb 4.0, TBili 13.7, ALP 138, AST 90, ALT 61
DBili 12.9
Hep A, B and C negative
HIV: NR
C3: 169.5
C4: 34.6
CRP: 47.2
CK: 787
Acetaminophen: <5.0
GGT: 203
LDH: 237
Amylase: 138
Lipase: 50

UA: dark yellow, cloudy, 500 glucose, large bili, trace ketones, spec grav 1.020, moderate blood, pH 5.0, protein >300, urobili 1.0, trace leuk est, 0-6 WBC, 7-20 RBC, no bacteria, 1-10 EC, many fatty casts
Urine Cr: 72
Urine Protein: >600
Urine Na: 67 FeNa 3.4%
Urine K: 66
Parasite screen: absent
Repeat CMP (8/30/18): 136/3.7/98/22.2/52/8.3<101, Ca 8.7, TProt 6.0, Alb 3.2, TBili 13.8, ALP 121, AST 59, ALT 52
Final Diagnosis
Leptospirosis
Lepto Serology: positive

Abstract: 276
A Peculiar Case of Pediatric Recurrent Abdominal Pain
Kei Wong, James Dodington
Pediatric Emergency Medicine, Yale University School of Medicine, New Haven, Connecticut, United States

History (including chief complaint, history of present illness and relevant past and family medical history) A 16-year-old male without significant past medical history presented to the pediatric emergency department (PED) with right mid-abdominal pain of 2 days, associated with nausea, loss of appetite, and diarrhea. Patient denied vomiting, dysuria, fever, URI symptoms, or history of trauma. Past surgical history was significant for laparoscopic appendectomy, by patient and mother's report, at outside hospital without operative complications. One year later, the patient developed an intraabdominal abscess in the lower abdomen, and subsequently underwent laparoscopic wash out and intravenous antibiotics. He was discharged home without further complaints, and has been doing well until day of presentation.
Physical examination findings (including vital signs) On exam, vital signs were: T 36.8 °C, BP 106/53, HR 70, RR 18, SpO2 100% RA. Patient was non-toxic appearing, but in discomfort secondary due to pain. Physical examination revealed exquisite abdominal tenderness in the right lower quadrant and suprapubic region. No rebound or guarding. Negative Murphy's sign. The testicular examination and remainder of the physical examination were normal.
Laboratory or Diagnostic imaging or Procedures Pertinent laboratory investigations included leukocyte counts of 12.9 x1000/μL, neutrophilia of 85.4%, and an elevated C-reactive peptide to 46.9 mg/L. Comprehensive metabolic panel including lipase was unremarkable. An ultrasound of the right lower quadrant was unable to visualized any clear evidence of collection or abscess.

After consulting with pediatric surgery team, contrast-enhanced CT of abdomen and pelvis was performed and demonstrated thickening of the right lateral conal fascia, with stranding of the pericecal fat, as well as an oblong hyper-enhancing structure extending superolaterally from the cecal tip near the presumed appendicectomy clip (Figure 1 & 2). The findings were suspicious for stump appendicitis.

Patient was taken to OR for laparoscopic surgery after he received intravenous fluid and antibiotics in the PED. Surgical exploration revealed an inflamed retrocecal appendix with perforation, adhered to the retroperitoneum and cecum. The entire appendix visualized without a staple line, and no evidence of intra-abdominal abscess seen. Patient was discharged on postoperative day 4 and reported good recovery at follow-up appointment.

On review of medical record, pathology of initial laparoscopy did not definitively reported appendiceal tissue. During subsequent hospitalization for intraabdominal abscess, no appendix or appendiceal stump was identified during surgical washout.
Final Diagnosis Recurrent perforated appendicitis

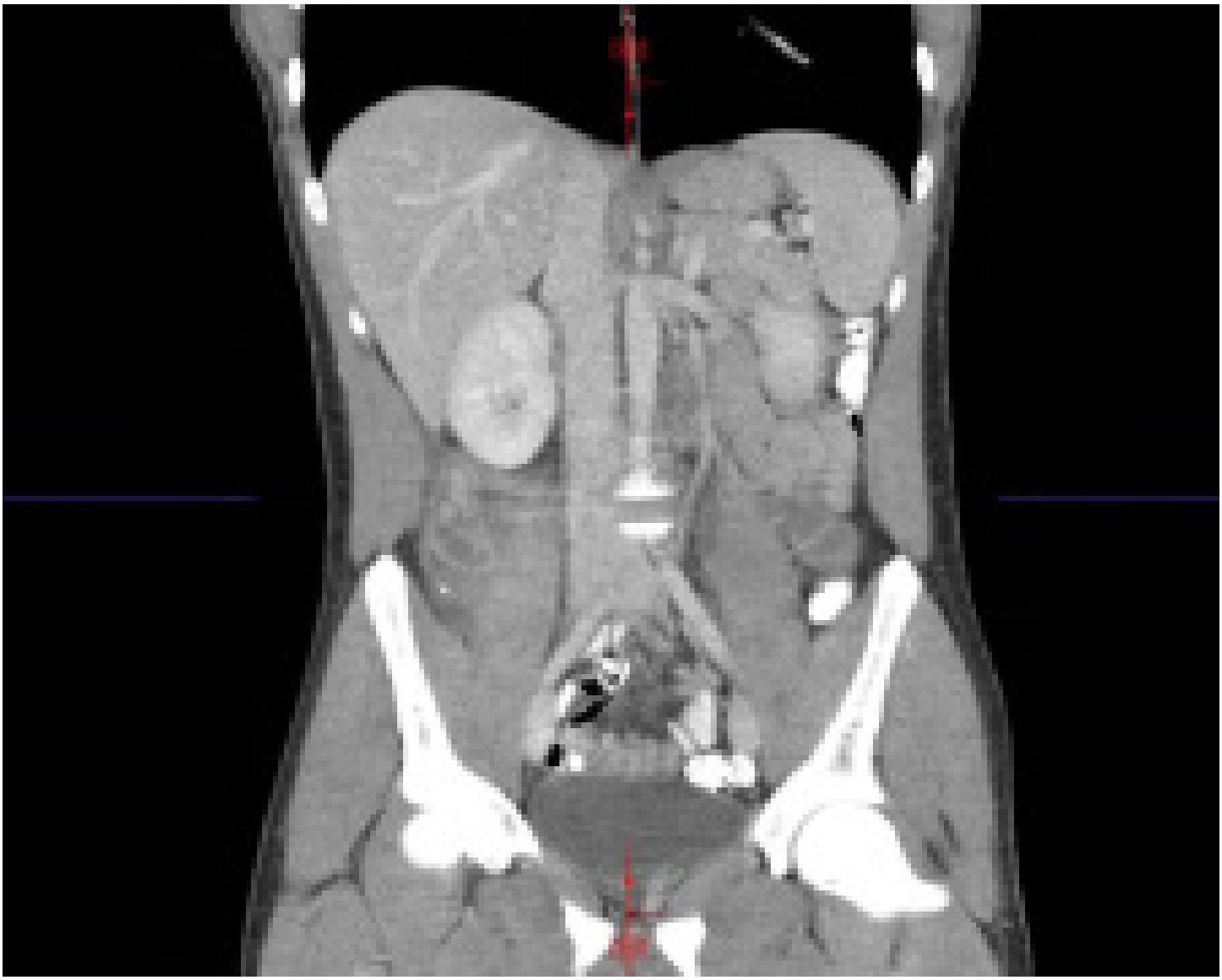


Figure 1: CT of abdomen and pelvis with IV Contrast- Coronal View

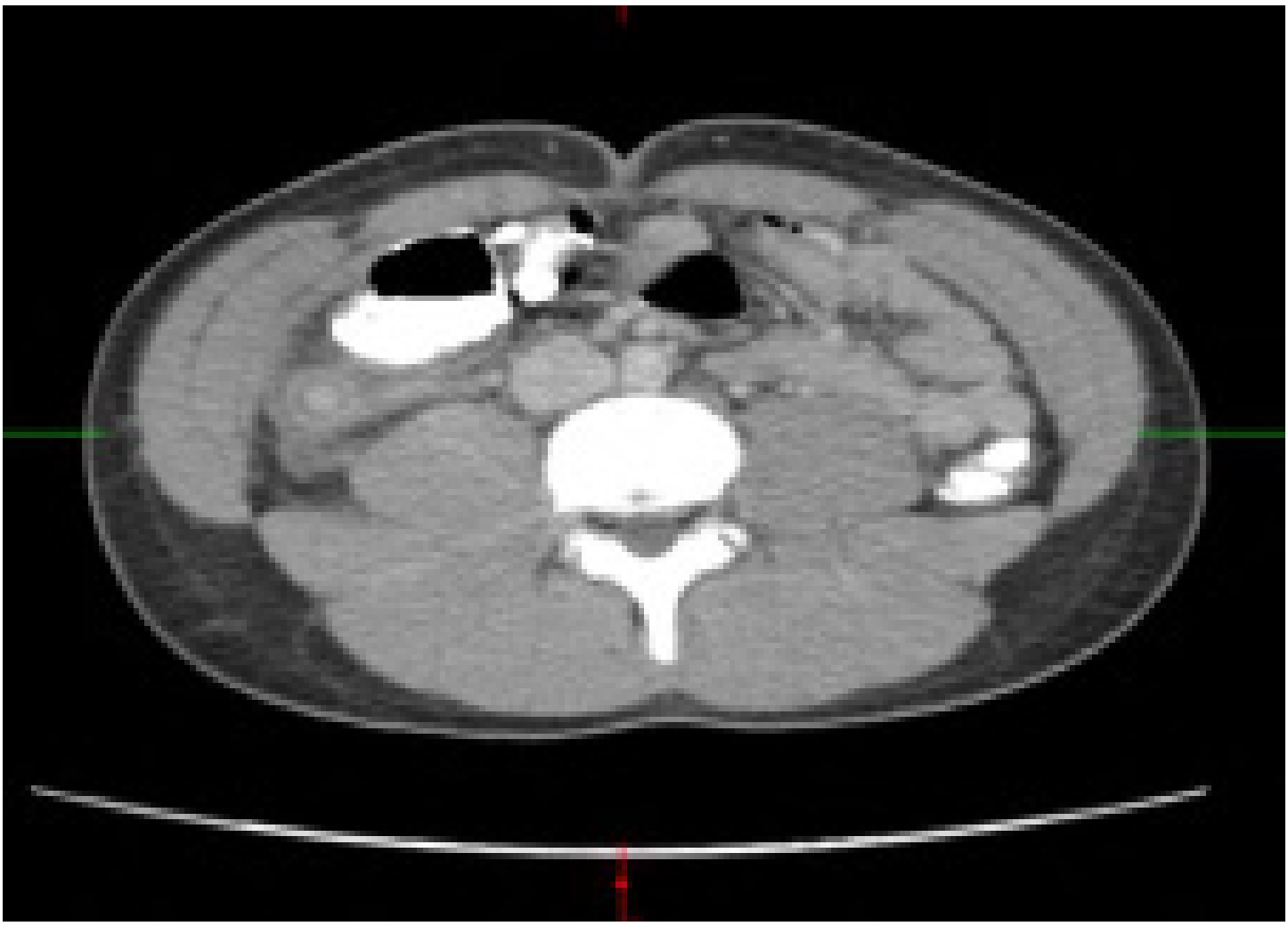


Figure 2: CT of abdomen and pelvis with IV Contrast -Transverse View

Abstract: 277

Neonatal compartment syndrome and further evaluation considerations

Keriann M. Schulkers[1], Peter J. Apel[2]

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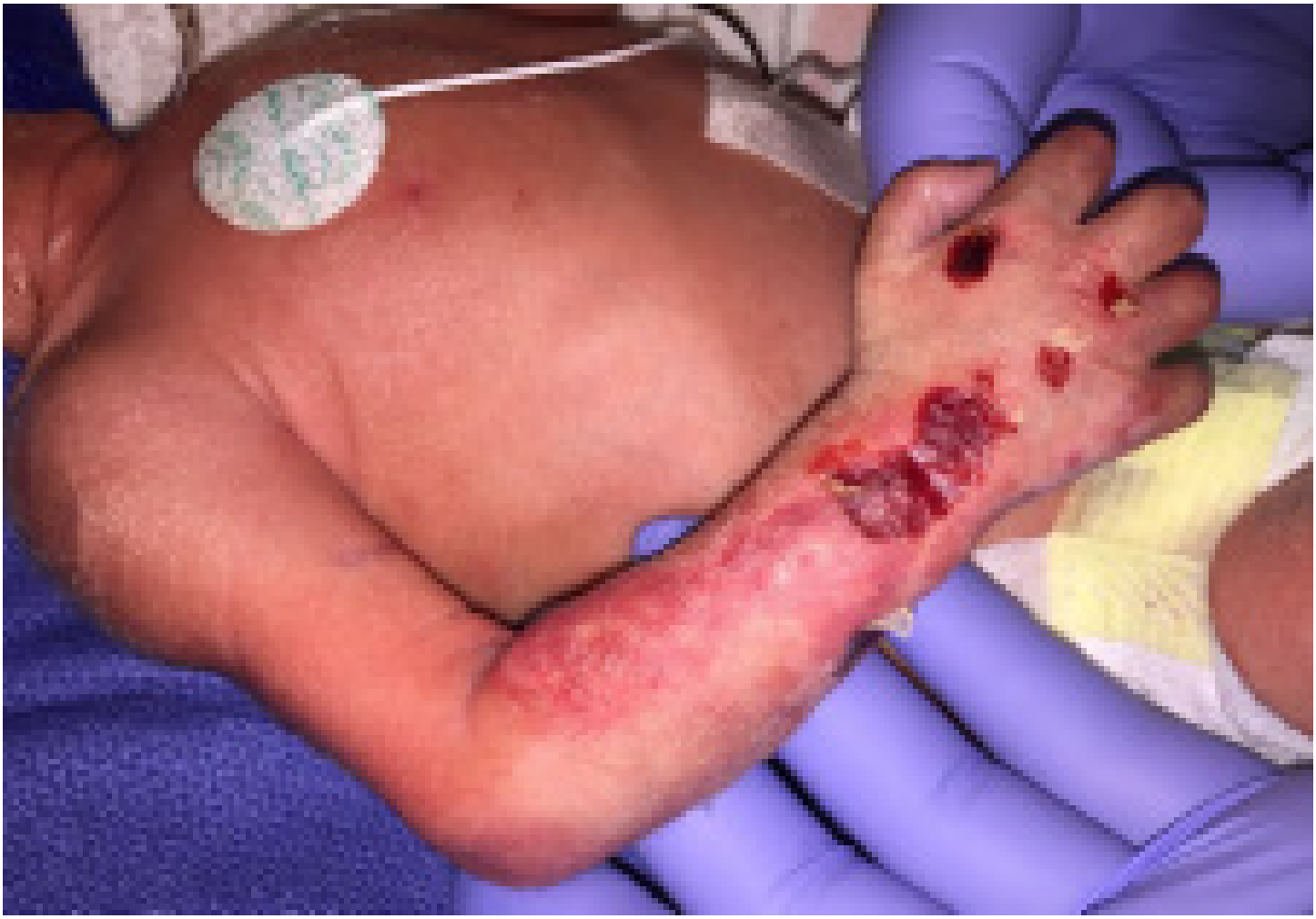
History (including chief complaint, history of present illness and relevant past and family medical history) A 36-year-old primigravida woman delivered via C-section at 31 weeks and 5 days due to a non-reactive fetal stress test and a biophysical profile of 4 out of 8. The baby boy presented with a type A nuchal cord, and 1 and 5 minute Apgar scores of 6 and 9. He had a birth weight of 2066 grams, head circumference of 31.5 cm, and length of 46 cm (all >97%tile). Pregnancy was complicated by poorly controlled gestational diabetes, for which the mother was taking Glyburide. The remaining prenatal and birth history were unremarkable.

Physical examination findings (including vital signs) The infant was wrapped in plastic and placed on a warming pad. PPV was initially given due to a heart rate <100 beats per minute, followed by placement on CPAP. At this time, the infant was noted to have significant desquamation and ischemic patches on several areas of his right dorsal and radial forearm. The cyanosis extended from his finger tips to his proximal forearm and no spontaneous movement of the extremity was observed. His hand was resting in the intrinsic minus position and the fingers were unable to be fully extended. The right brachial and radial pulses were not palpable. The remainder of the physical exam was unremarkable.

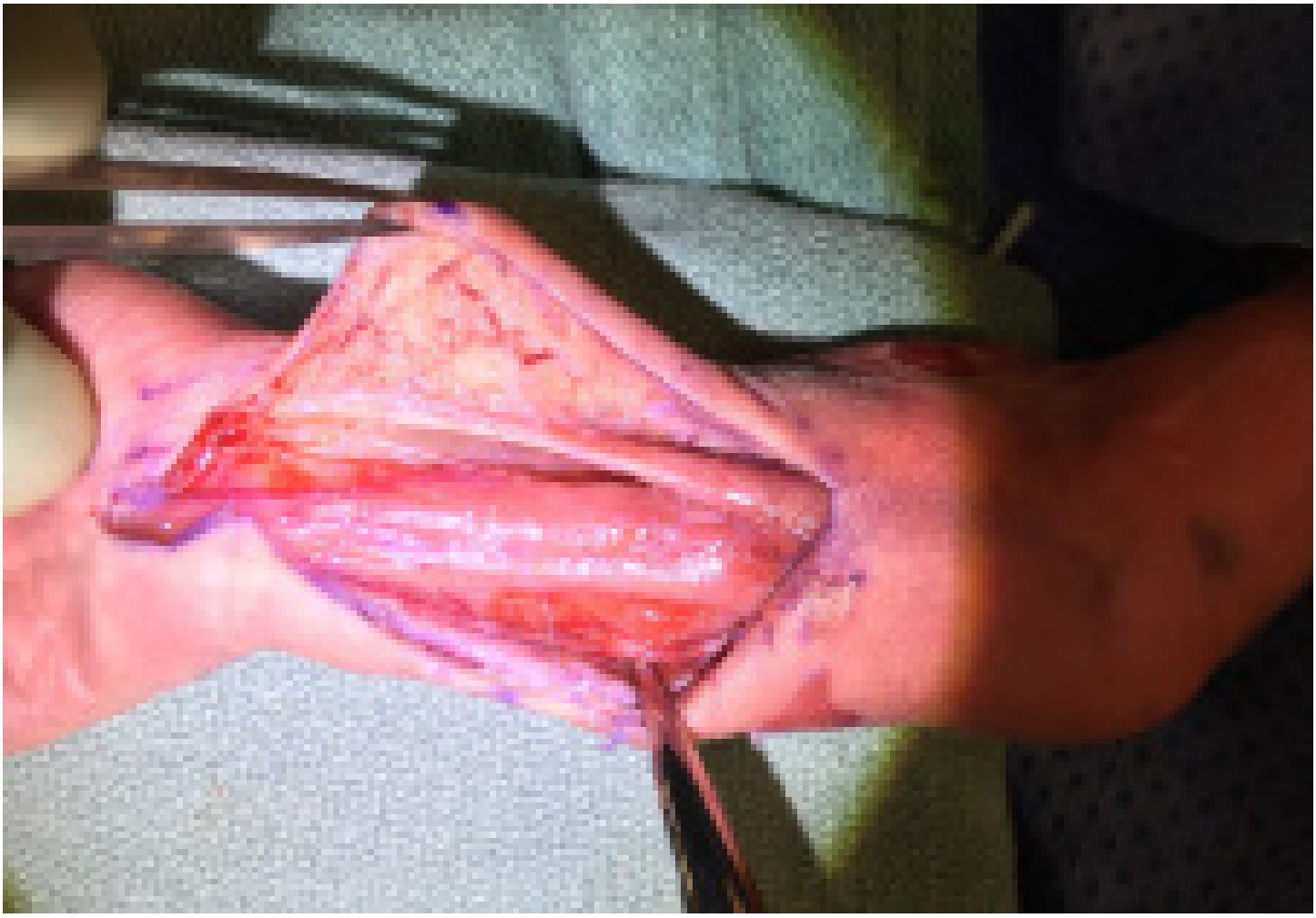
Laboratory or Diagnostic imaging or Procedures Extremity color duplex ultrasound confirmed an arterial thrombosis that

extended from his axillary to brachial artery bifurcation, with extensive collaterals formed. Lab workup showed hypoglycemia and thrombocytopenia. Neonatal compartment syndrome was diagnosed, and he was treated with an urgent right forearm 4-compartment decompression fasciotomy and carpal tunnel release on day one of life with rapid reperfusion. Post-surgery, the cardiac echo showed a patent foramen ovale and patent ductus arteriosus. A cranial ultrasound revealed suspected early ischemic or hemorrhagic changes along the right anterior and posterior watersheds.

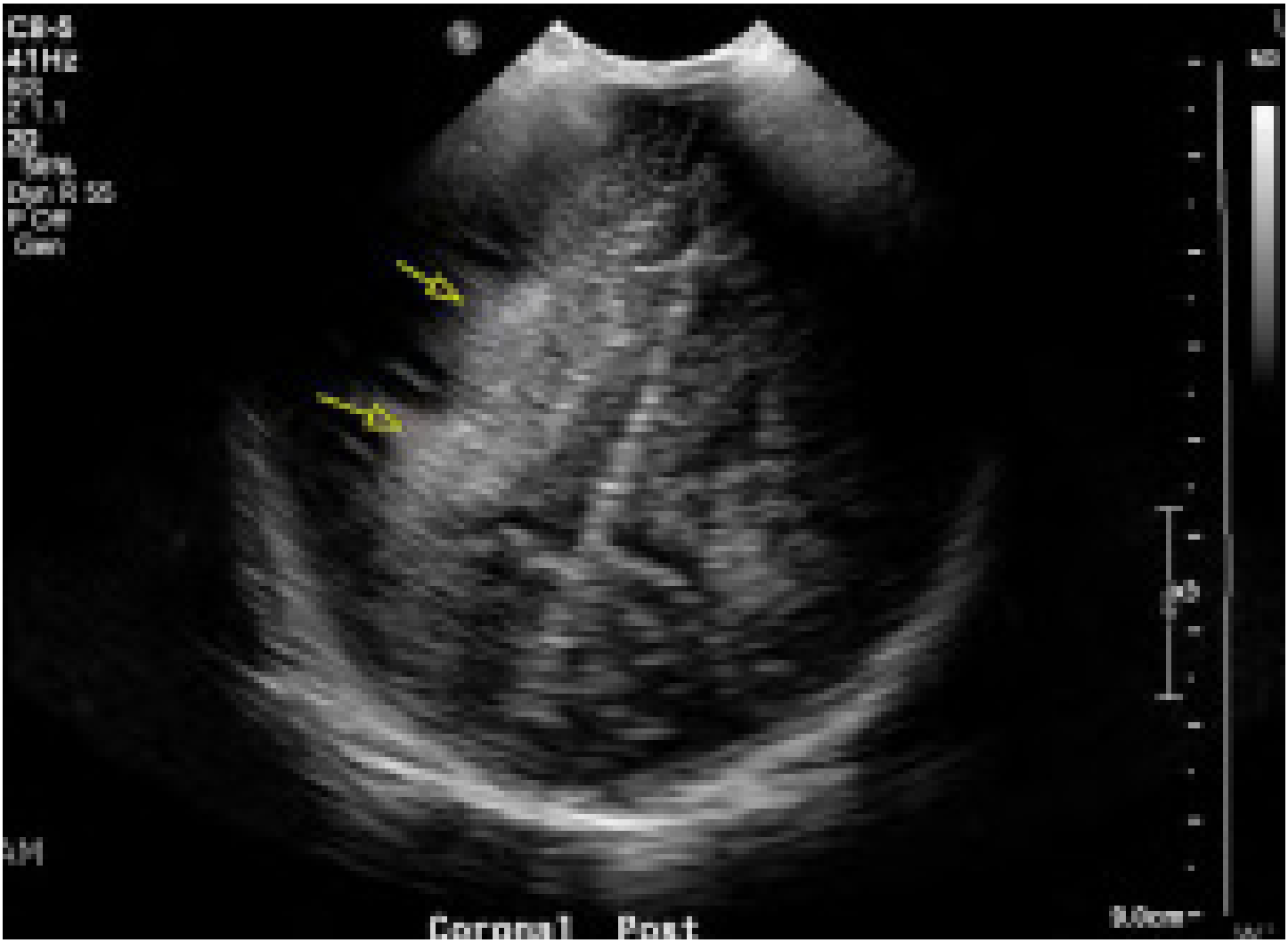
Final Diagnosis This patient was followed closely by several specialists (including orthopedic surgery and neurology) and was diagnosed at a later age with right hemiplegic cerebral palsy. In the majority of cases of neonatal compartment syndrome in the literature, neuroimaging studies do not appear to be typically performed. There are only a few reported cases of simultaneous neonatal compartment syndrome and cerebral lesions, none of which have been associated with cerebral palsy. In neonates with compartment syndrome, it is important to perform a thorough neurological evaluation to assess for cerebral lesions and allow for prompt early treatment and close follow-up.



Right arm. Approximately one hour after delivery.



Compartment release of right forearm, picture taken approximately 15 minutes after release showing immediate reperfusion to surrounding muscles.



Cranial Ultrasound showing suspected early ischemic or hemorrhagic changes along the right anterior and posterior watersheds.

Abstract: 278
Constipation and lower extremity pain in a 6-year-old
Prarthana Parthasarathy, Tresa Ambooken, Zonia Barbosa, Savita Manwani
Pediatrics, Bronx care Health System, Bronx, New York, United States

History (including chief complaint, history of present illness and relevant past and family medical history) A 6-year-old African-American girl presented to pediatric GI clinic with a 1-month history of diffuse abdominal pain, constipation with 3x/week hard blood-tinged stools, and intermittent fever in the range of 100.5ºF – 103.5ºF. She was admitted for dehydration and further evaluation. She had a new onset of 5-day duration of non-traumatic lower extremity pain in the posterior thigh region, left > right, 8/10 in intensity, causing a limp that modestly improved with NSAIDs. Review of systems revealed fatigue, poor appetite, and 15% weight loss over 3 months with a fall from the 90th to 75th percentile for weight and BMI. She had presumed sick contacts at day care, no recent travel and vaccinations were up-to-date.
Past medical history was significant for a history of not passing stool until day 10 of life. Family history was unremarkable except for sickle cell trait.
Physical examination findings (including vital signs) Vital signs on arrival: T: 99.5F, RR 18/min, Pulse 119/min, O2 99% on room air, BP 111/77 mmHg
Physical exam: remarkable for a moderately dehydrated child with diffuse abdominal and left posterior thigh pain on

palpation. No abdominal distention or masses, no cervical lymphadenopathy, no swelling or tenderness of hip or knee joints. Laboratory or Diagnostic imaging or Procedures Lab results ruled out JIA and IBD. There was serologic evidence for past infection with EBV, CMV and Parvovirus. Hemophagocytic lymphohistiocytosis was considered due to fever, bi-cytopenia, elevated ferritin and triglycerides. A mild hepatomegaly noted on CT scan was the only remarkable imaging finding.

Final Diagnosis Acute Lymphoblastic Leukemia

Discussion

Besides constipation, likely incidental in our case, it is prudent to note that in children with leukemia, presentations include abdominal pain in 12% and extremity pain causing limp in 15%. In those cases where abdominal pain is a primary complaint, cause of the pain is most often hepatomegaly (64%) or splenomegaly (61%), although in our case patient did not have any significant organomegaly. In those cases where primary complaint is extremity pain, pain can often be misinterpreted as having a rheumatologic source. Additionally, although rare, patients meeting diagnostic criteria for HLH should be further investigated for malignancy. Non-invasive methods such as peripheral blood flow cytometry has been reported to be >98% accurate in diagnosis of most forms of pediatric leukemia.

This case demonstrates the importance of keeping a broad differential diagnosis when a patient presents with a broad range of symptoms.

CBC	PMD	Outside ER	Day of Admission 1	Day of Admission 2
WBC (4.5-13.5 k/uL)	3.8	6.5	6.5	5.8
Differential				
ANC (1.5-8 k/uL)	756		1170	569.2
Lymphocyte (20-50%)	49		35	84.5
Hemoglobin (12-16 g/dl)	8.4	8.4	8.7	8
Hematocrit (36-40%)	23.4	24.3	24.5	22.9
Platelet count (150-400 k/uL)	151	163	181	156
Reticulocyte count (0.5-1.5%)			1.8	1.7

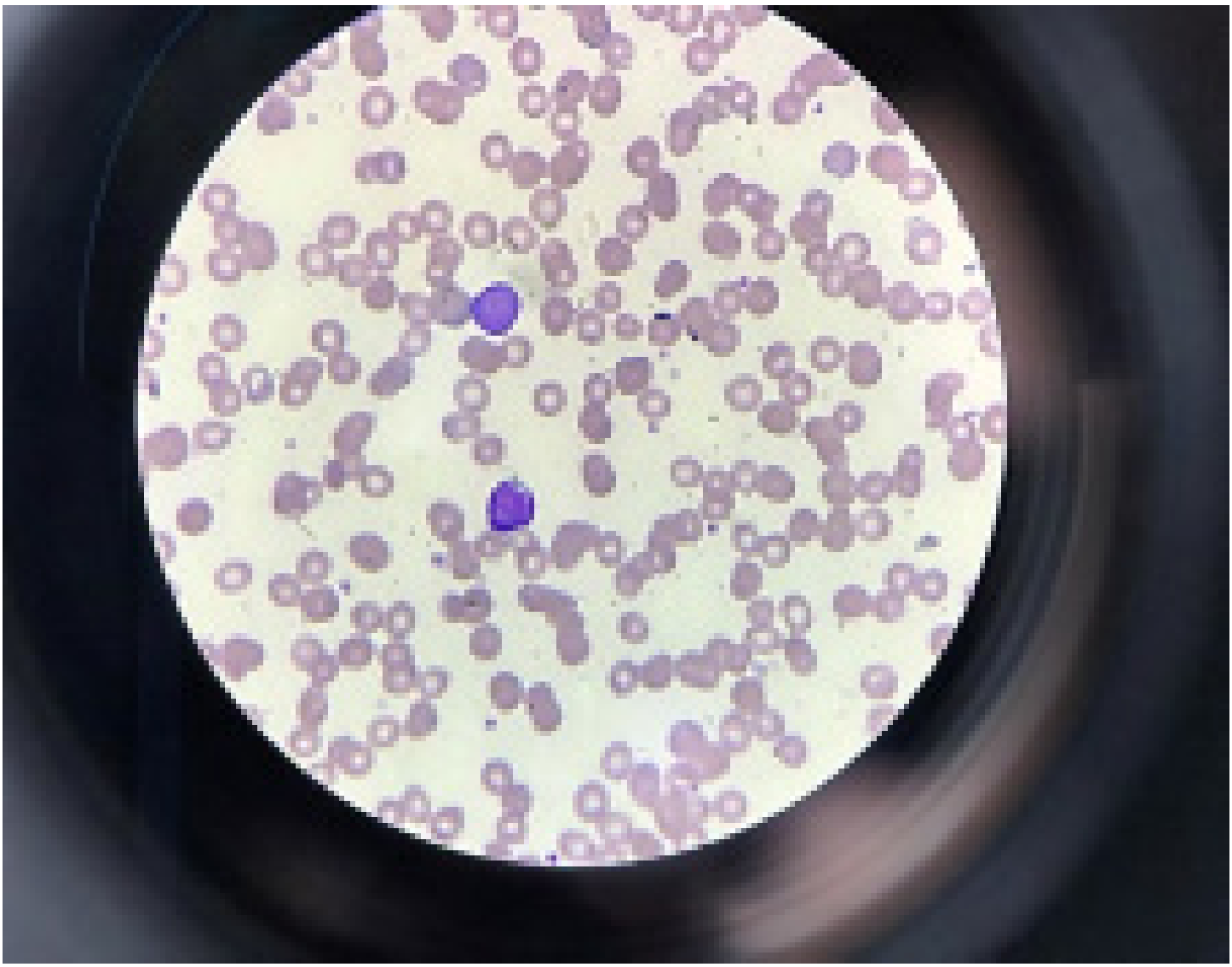
Serial CBCs

Tests	Results
Lead (<5 mcg/dl)	<1
LDH (140-280 u/l)	888
Uric acid (1.8-5.5 mg/dl)	4.1
Haptoglobin (30-200 mg/dl)	488
Iron (60-175 ug/dl)	30
UIBC (113-346 ug/dl)	255
PT/PTT (9.5-13s / 26.1-32.8s)	14.1/34.5
D-dimer (0-230 ng/ml)	5719
Direct Coombs	Negative

Anemia work-up

Test:	Results
Ferritin (13-150 ng/ml)	
Day of Administration 1	5038
Day of Administration 2	1159
Fibrinogen (185-450 mg/dl)	502
Flow cytometry for CD25	7-8% lymphoblasts concerning for pre B-cell ALL

HLH work-up



Lymphoblasts on blood smear with minimal cytoplasm and irregular chromatin

Abstract: 279
A Multidisciplinary Clinical Conundrum
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History (including chief complaint, history of present illness and relevant past and family medical history) A 19 month old male presents to the ED after he was found unresponsive at his day care. He presents with a GCS of 6 & possible seizure activity vs posturing. The patient is subsequently intubated. The day care is contacted and states the patient ate a snack, laid down for a nap and was found unresponsive. Later, the day care states the patient fell off a couch and then developed seizure-like activity. The day care never provides a consistent timeline of symptoms.
There is no past medical history or relevant family history. Review of systems is significant for URI symtpoms and a fall at day care 2 weeks prior.
Physical examination findings (including vital signs) Vital Signs: T 96.8 HR 140 BP 113/71 RR 30 O2 96%
The patient was intubated and sedated. Physical exam was notable for a dense right sided hemiparesis with spontaneous movements of the left side of the body and a healing abrasion to the left temple.

Laboratory or Diagnostic imaging or Procedures Noncontrast head CT (NCHCT) on presentation showed a small subdural hematoma on the left with flattening of the cortical gyri without midline shift, a small subarachnoid hemorrhage within the left parietal lobe, and trace intraventricular blood in the right lateral ventricle. An MRI head confirmed the findings on NCHCT. Repeat imaging was obtained the next day due to worsening right sided weakness. NCHCT showed decreased size of the subdural hemorrhages as well as improved effacement of the gyri. Interval development of a dense vein within the left vertex suggestive of cortical venous thrombosis was noted and then confirmed on MRV. The patient was started on enoxaparin. Repeat MRV 5 days later showed partially recanalized thrombosed cortical veins. However, hyperperfusion of the left hemisphere with increased gyral swelling and signal changes in the underlying white matter in the left hemisphere was noted. MRA obtained was unremarkable.
Video EEG demonstrated a sedated background with severe cortical suppression on the left hemisphere when compared to the right hemisphere, sleep spindles were seen symmetrically, and no epileptic activity was noted. CSF analysis was unremarkable A skeletal survey at presentation and 2 weeks after presentation were both negative. Ophthalmology consult did not demonstrate presence of retinal hemorrhage on dilated eye exam. Liver function tests also were within normal range. Additional laboratory evaluation demonstrated anemia and a prolonged PT/INR due to transient factor 7 deficiency. The additional screening bloodwork was not consistent with an underlying bleeding disorder.
Final Diagnosis Neglect, diffuse cerebral hemispheric event, cortical vein thrombosis

Abstract: 280
Neonatal Methemoglobinemia and Diagnostic Dilemmas
Sudip Sheth[1], Jherna Balany[3], Jennifer Eng[2], Sruthi Polavarapu[1]
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History (including chief complaint, history of present illness and relevant past and family medical history) Maternal and Delivery History:
28-year-old Gravida 2 Para 0 mother, with limited prenatal care, delivered male infant at 37 weeks gestation via spontaneous vaginal delivery. Received epidural anesthesia with ropivacaine. Maternal history of tobacco use and urine drug screen positive for phencyclidine. Infant's birthweight was 2.92kg.

Infant required positive pressure ventilation followed by continuous positive airway pressure (CPAP). Meconium stained amniotic fluid was suctioned from the nose and mouth. Apgar scores 4, 7, 9 at 1, 5,10 minutes respectively.

Hospital Course:
Infant was intubated and given surfactant at 5 hours of life (HOL) due to hypoxia. Infant's blood samples were noted to be dark in hue. Methemoglobin (MetHb) level was incidentally noted to be 18% on blood gases. Infant was transferred to a level IV NICU.

Trend of MetHb is shown in Figure 1. Patient's newborn screen was positive for Glucose-6-phosphate dehydrogenase (G6PD) deficiency, which is a contraindication for the use of methylene blue for treatment. Infant was treated with enteral vitamin C (Figure 1). Infant remained acyanotic for remaining hospital course and vitamin C was not further given due to limited knowledge of adverse effects in neonates. Family history was unremarkable.
Physical examination findings (including vital signs) On admission at level IV NICU, he remained on CPAP with physical exam findings of perioral cyanosis and acrocyanosis of hands and feet. Infant had +2 pulses and remaining exam was unremarkable.

Vital signs:
Heart rate 129/min
Respiratory rate 33/min
Blood pressure 66/46 mmHg
SpO2 95% on CPAP at FiO2 0.5
Weight: 2.88kg
Laboratory or Diagnostic imaging or Procedures Echocardiogram: Mild persistent pulmonary hypertension
Blood culture: negative
Newborn screen: G6PD deficiency
RBC enzyme panel: confirmed decreased G6PD activity
Hemoglobin (Hb) electrophoresis: 18% HbA and 82% HbF
Cytochrome b5 reductase (CBR) level: < 2.6U/g Hb on DOL; 4.4U/g Hb on DOL 78 (CBR levels do not reach adult levels until

12 months of age; Reference values for ≥ 12 months old child is 6.6-13.3U/g Hb)
Pyruvate kinase deficiency testing: negative
Head ultrasound and brain magnetic resonance image: unremarkable
Final Diagnosis Neonatal Methemoglobinemia. CBR level will need to be repeated after 1 year of age to determine if it is acquired vs. congenital. Maternal exposure to ropivacaine may be a risk factor for transient methemoglobinemia. Ropivacaine is in the same family of drugs (prilocaine, lidocaine, and bupivacaine) that are reported to cause transient methemoglobinemia. Hemoglobin M disease and Pyruvate Kinase deficiency were ruled out.

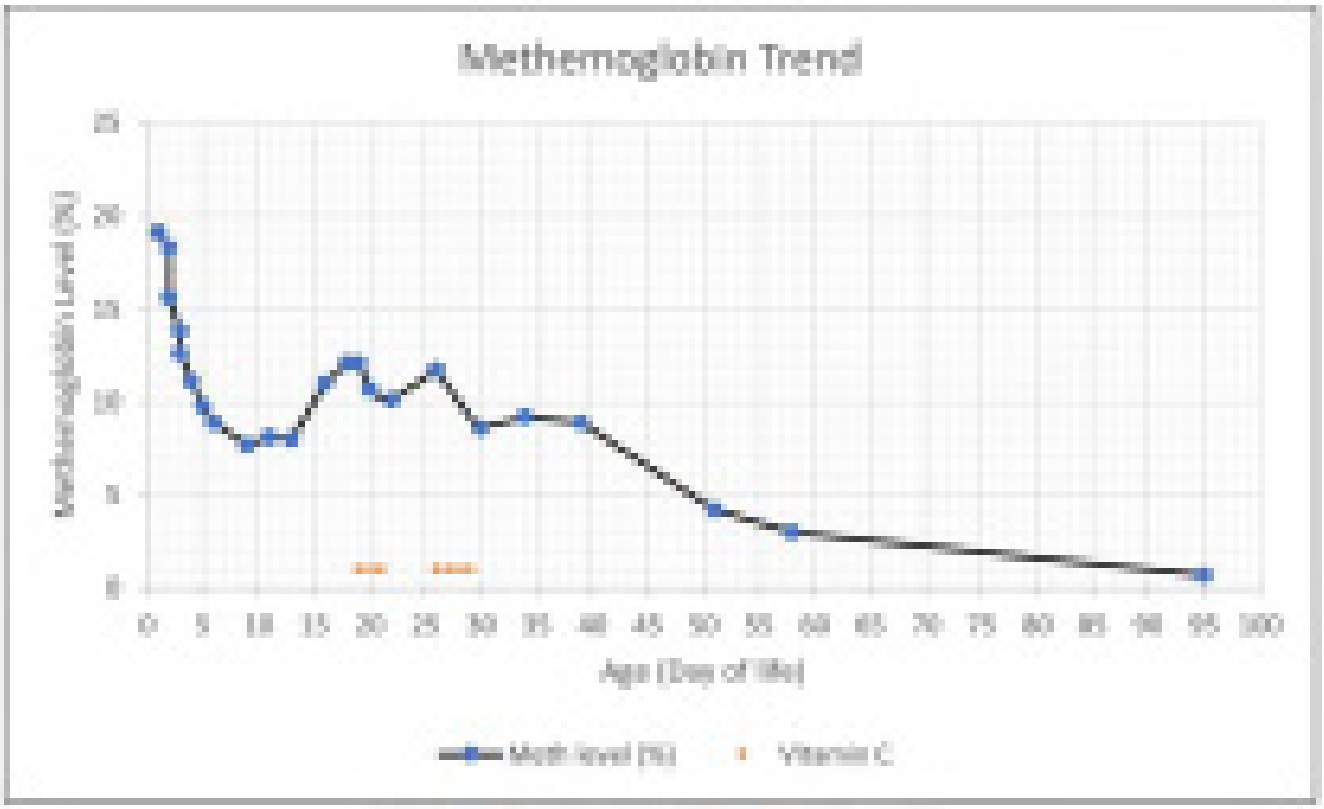

Figure 1: Trend of Methemoglobin levels

Abstract: 281
Case Report: Persistent Fever in a 7-year-old Child
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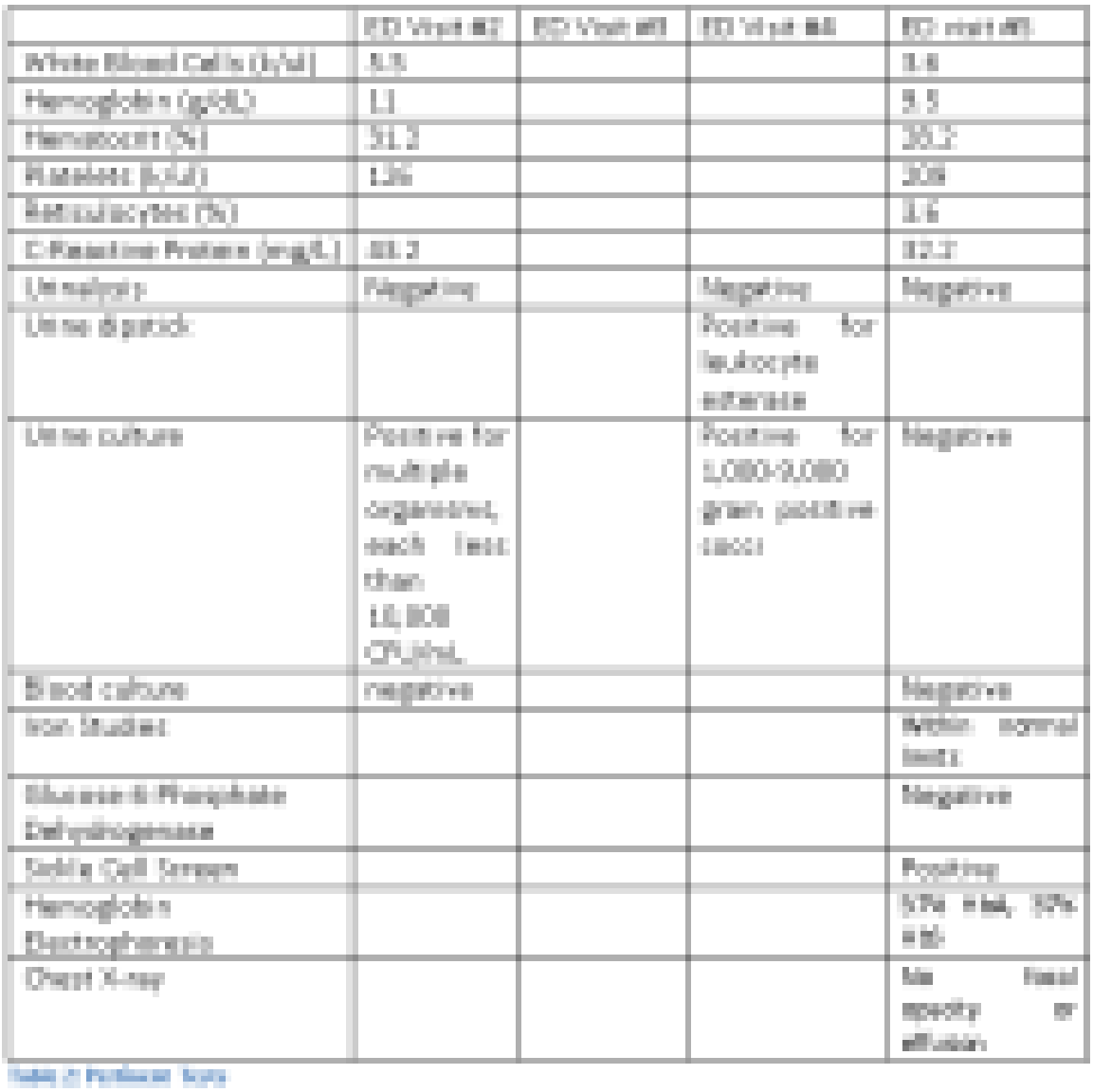
History (including chief complaint, history of present illness and relevant past and family medical history) A 7 year old female presented to the ED with history of intermittent fever for 2 weeks. Fever recurred every 2-3 days, with Tmax 102.9ºF associated with intermittent frontal headache, one episode of non-bilious, non-bloody vomiting, fatigue, and decreased appetite. She had visited the ED 5 times prior over the preceding 2 weeks with similar complaints. She had been seen in the ED 4 days prior with same complaints and sent home with a 7 day course of cephalexin due to urinalysis with positive leukocyte esterase. Fevers persisted despite taking cephalexin as prescribed. There were no known sick contacts and no history of recent travel, and vaccinations were all up to date. Past medical history was significant for Malaria treated 3 years ago, in Nigeria, and mother was unsure whether the patient had sickle cell trait or not. There was no significant past medical history or family history. The patient was born in Nigeria and had immigrated to the US 2 years prior.
In the 5 ED visits over the preceding 2 weeks, the diagnostic steps taken are outlined in table 1.
Physical examination findings (including vital signs) Physical Examination:
Vitals: Temp: 98.6, Pulse 99, Resp Rate 18, BP 110/57, O2 sat 100%
Physical examination on arrival to Pediatric Floor was unremarkable, all within normal limits. No hepatosplenomegaly.
Laboratory or Diagnostic imaging or Procedures See table 2.
Final Diagnosis *Plasmodium ovale* malaria.

Patients initially infected with *P. vivax* and *P. ovale* may suffer relapse after months or even years of being asymptomatic. The relapses occur due to reactivation of dormant liver forms (hypnozoites) when they are released into systemic circulation. The presence of hypnozoites in the liver is not associated with clinical symptoms. These latent parasites cannot be detected by diagnostic tests. Typical malaria treatment regimens, such as mefloquine, atovaquone-proguanil, or artemether-lumefantrine do not eradicate hypnozoites. Treatment to eradicate dormant parasite liver forms (hypnozoites) with primaquine should follow treatment of the first attack. Determining the malaria species is important and may not be done in resource-limited settings that lack access to trained laboratory technicians or molecular testing. Relapse due to *P. ovale* is relatively rare. In this case, the child had fevers 2 years after departure from a malaria endemic region. Due to the long period that had elapsed since residence in a malaria-endemic region, malaria was not initially considered in the differential diagnosis of fever. In addition, this patient had sickle cell trait, which is thought to be protective against malaria mortality.

ED Visit Number	Complaints	Tests	Interventions
#1 (Day 1 of illness)	Fever for 1 day	none	Discharged with ibuprofen
#2 (Day 3 of illness)	Fever for 3 days, 1 episode of vomiting	CBC, blood culture, urinalysis, urine culture, and CRP	Ibuprofen, normal saline bolus, ondansetron, and IV ceftriaxone at 50mg/kg
#3 (Day 6 of illness)	Fever controlled with ibuprofen	none	discontinuation of ceftriaxone at 50mg/kg
#4 (Day 8 of illness)	Continuing fever	Urinalysis, urine culture, and urine dipstick	dipstick was positive for leukocyte esterase; patient was discharged with prescription for cephalexin 50mg/kg PO TID for 7 days.
#5 (Day 12 of illness)	Continuing fever, headache, abdominal pain associated with eating	CBC, CMP, CRP, blood culture, urine culture, and UA were collected, and Chest X-ray was done	Admit to Inpatient Floor for further evaluation

Table 1: Interval Febrile Visits



Abstract: 282

Unique case of precocious puberty with multiple pituitary hormone deficiencies (MPHD) in a female with a suprasellar dermoid cyst

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History (including chief complaint, history of present illness and relevant past and family medical history) The patient was a previous healthy girl who presented at 6years 8months of age with two months of intermittent headaches and vomiting. Her family history was non-contributory.

Physical examination findings (including vital signs) Patient had initial vital signs of: Heart rate: 87/minute, Blood pressure: 102/58 mm Hg, Respiratory rate: 23/minute, Temperature: 36.4 degree celsius, Weight: 17.4kg (5th percentile), Height: 112.5cm (10th percentile), appropriate for family, Body mass index: 13.75 kg/m2

Her physical examination was normal for head, chest, heart, abdomen, extremities as well as neurological evaluation. She was pre-pubertal with Tanner I breasts and absent pubic hair. Ophthalmological examination showed bilateral optic nerve edema with no visual field defects.

Laboratory or Diagnostic imaging or Procedures She underwent an MRI brain which showed a 2.7x2.1x4.3 cm fat containing, minimally enhancing mass within the suprasellar region and third ventricle with severe hydrocephalus. She then had an

external ventricular drain placement followed by complete mass resection via craniotomy. Pathology reports confirmed a dermoid cyst. See Image (Laboratory evaluation) for hormone evaluation.
Final Diagnosis Post-operatively, the patient developed persistent diabetes insipidus. She was also diagnosed and treated for central hypothyroidism and adrenal insufficiency. Three months post-operatively, she developed thelarche which progressed to Tanner III breasts. Central precocious puberty was confirmed by pubertal levels of early morning gonadotropin and estradiol (see Image- Laboratory evaluation). She also grew rapidly at an annualized growth rate of 12 cm/year over 6 months post-surgery.

Dermoid cysts are rare intracranial tumors usually diagnosed in adults. Premature gonadotropin activation in the setting of MPHD has not been described in patients with dermoid cysts. Tumors and surgery in the suprasellar region are associated with pituitary hormone deficiencies including hypogonadotropic hypogonadism. MPHD with precocious puberty has rarely been described in literature, more commonly with intracranial radiotherapy. We hypothesize that pituitary stalk manipulation following surgery could result in defect in pituitary hormone production with selective disinhibition of the gonadotropin and prolactin pathways, as with our patient. Physicians must be aware of the rare association of precocious puberty with MPHD in patients with suprasellar tumors, especially post operatively. Continued evaluation for pubertal development in these patients is important.

TABLE 1

	PITUITARY HORMONE EVALUATION	
	PRE-OPERATIVE	POST-OPERATIVE, prior to medications
IGF-1 ng/mL [43-350]	67	75
Free T4 ng/dL [0.6-1.5]	1.48	0.72
TSH uIU/ml [0.4-4.2]	0.689	Not available
8am CORTISOL mcg/dL [6.7-23.6]	23	2
FSH mIU/mL [1-8.2]	Not available	2.2
LH mIU/mL [0.02-8.3]	Not available	1
ESTRADIOL pg/mL [<10]	Not available	27
PROLACTIN ng/mL [1.4-24]	4.2	89.5

Post-operative hormones drawn at 4am. IGF-1 = Insulin like growth factor 1; Free T4 = Free Thyroxine; TSH= Thyroid stimulating hormone; FSH = Follicle stimulating hormone; LH = Luteinizing hormone

Abstract: 283

Pediatric Nontyphoidal Salmonella Pancreatitis: A Case Report

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History (including chief complaint, history of present illness and relevant past and family medical history) A 14-year-old female with history of intermittent asthma presented to the emergency room with abdominal pain, vomiting, diarrhea and blood in stool. She reported having eaten steak on the previous night before her symptoms started. She reported that her symptoms started 3 days prior to admission including headache, nausea, vomiting, dizziness, later she had multiple episodes of watery diarrhea with cramping abdominal pain that radiated to the back. She reported lower abdominal pain squeezing and stabbing quality, 8/10 intensity. She had 2 episodes of non-bloody, non-bilious vomiting. She noticed blood in stool 1 day prior to admission, and on day of admission she noticed blood in stool with every episode diarrhea. She denied smoking or drinking alcohol, or using illicit drugs.
Gyn history: Last menstrual period on day of admission.
Physical examination findings (including vital signs) Afebrile with vital signs within normal limits.
General: Well-developed, well-nourished, not in acute distress.
Abdomen: soft, non-distended, normoactive bowel sounds. Tenderness to palpation at suprapubic area. No masses or organomegaly. No grey-turner or Cullen's sign.
Rectal: No visible anal fissure, normal anal sphincter.
Laboratory or Diagnostic imaging or Procedures Fecal occult blood test, stool culture and ova and parasites were ordered. Hemoglobin was trended to assess for signs of active bleeding. Pediatric gastroenterologist had high suspicion for bacterial gastroenteritis in the setting of menses, however in the setting of pain that was radiating to the back they recommended obtaining: Cryptosporidium, giardia, amylase, c-reactive protein, erythrocyte sedimentation rate, lipase, thyroid function tests, helicobacter pylori stool antigen, prothrombin time/partial thromboplastin time. Daily lipase trended up: 761, 1611, 1737, 2151, 2465 and amylase trending up: 115, 198, 229. C-reactive protein was elevated to 2.9 and trended down to 1.4. Abdominal ultrasound demonstrated normal pancreas, gall bladder, and liver.
Final Diagnosis After results of increasing lipase with associated abdominal pain, patient was started on 1.5 maintenance of IV fluids with the diagnosis of pancreatitis. On the 2nd night of admission, she had 3 episodes of soft transitioning to watery diarrhea. On the 3rd day of admission, she began to complain of epigastric sensation of "tightness" exacerbated with palpation. On 4th day of admission, stool culture returned positive for nontyphoid Salmonella (sensitive to most antibiotics except for ampicillin). Patient was given diagnosis of pancreatitis caused by salmonella infection.

Abstract: 284

Polyarthritis and polyarthralgia in a 14 year old Female.

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History (including chief complaint, history of present illness and relevant past and family medical history) A 14 -year old female presented with 3 days history of bilateral hand swelling and pain.The pain initially began in her right ankle, then the right knee and her right shoulder. She also developed redness and swelling overlying the dorsum of her right hand as well as the palmar aspect of her left ring finger.
There was history of sore throat a week prior to onset of musculoskeletal symptoms which was untreated. She denied history of trauma, bites, skin rash, fever or diarrhea. Family history was significant for rheumatoid arthritis in her maternal grandmother. She reported sexual activity with a male partner but denied history of sexually transmitted Infections.
Physical examination findings (including vital signs) See image
Laboratory or Diagnostic imaging or Procedures See image.
Final Diagnosis Diagnosis:- Disseminated gonococcal infection with serologic evidence of post-streptococcal infection.

The patient presented with polyarthralgia and arthritis with clinical serological evidence of a prior streptococcal infection and microbiologic evidence of gonorrhea. Majority of patients with disseminated gonococcal infection (DGI) have laboratory evidence of infection in the genital tract, rectum, or pharynx despite no symptoms related to those sites. The diagnosis of DGI was presumptive because gonorrhea was isolated only from the urine of the patient, although synovial or skin fluid specimens were not sent for testing. However, DGI is not typically associated with positive synovial fluid cultures, and blood culture is negative in most cases. The patient was subsequently treated with IV ceftriaxone for DGI, azithromycin to cover for chlamydia and was discharged home on amoxicillin to treat Group A Streptococcus for a duration of 10 days with advice to follow up with her primary care physician for a complete seven day course of IV ceftriaxone. There was complete resolution of symptoms six days after the onset of symptoms at the rheumatologist follow-up appointment.
DGI is a common cause of morbidity in sexually active adolescents and there should be a low threshold for clinical suspicion of

DGI in any patient presenting with symptoms of polyarthralgia or tenosynovitis even without rash or other systemic complaints. A patient can be inappropriately treated for rash or tenosynovitis if DGI is not suspected as in our patient. This increases the health care cost and can lead to complications due to delayed diagnosis and treatment.

Conclusion:-

Identifying the cause of poly-articular joint pain can be difficult because of the extensive diagnostic options. Hence,a thorough history and a complete physical examination are essential.

Physical examination: Patient appeared fatigued but not in obvious distress. Examination of the left hand was remarkable for swelling and erythema over the left 3rd and 4th proximal interphalangeal joints with restriction of active and passive range of motion with the following vital signs shown below.

Vital signs	Patients value
Temperature	98.6 degrees Fahrenheit.
Pulse rate	96 beats/minute
Respiratory rate	16 cycles/minute
Blood pressure	120/70 mmHg

Laboratory & Imaging Tests	Patients value	Reference ranges
White blood cell count	10,800	4.5 – 13.0 k /ul
Erythrocyte sedimentation rate (ESR)	94.0	0-10 mm/hour
C-reactive protein (CRP)	68.06	< 5 mg /dl
Complement C3	207.0	90- 180 mg/dl
Complement C4	38.0	16.0 -47.0 mg/dl
Rheumatoid factor	14.4	< 14.0 IU/ml
Anti-deoxyribonuclease B (DNase B)	821	<378 IU /ml
Anti-streptolysin O antibodies	511	<250 IU/ml
Nucleic acid amplification testing for gonorrhea (urine)	Positive	Negative
Hand X-ray	Soft tissue swelling	No fracture or dislocation
Electrocardiogram (EKG)	Normal sinus rhythm, No evidence of PR interval prolongation	Normal sinus rhythm

Abstract: 285

Abnormal Lower Extremity Movements in Full-Term Newborn

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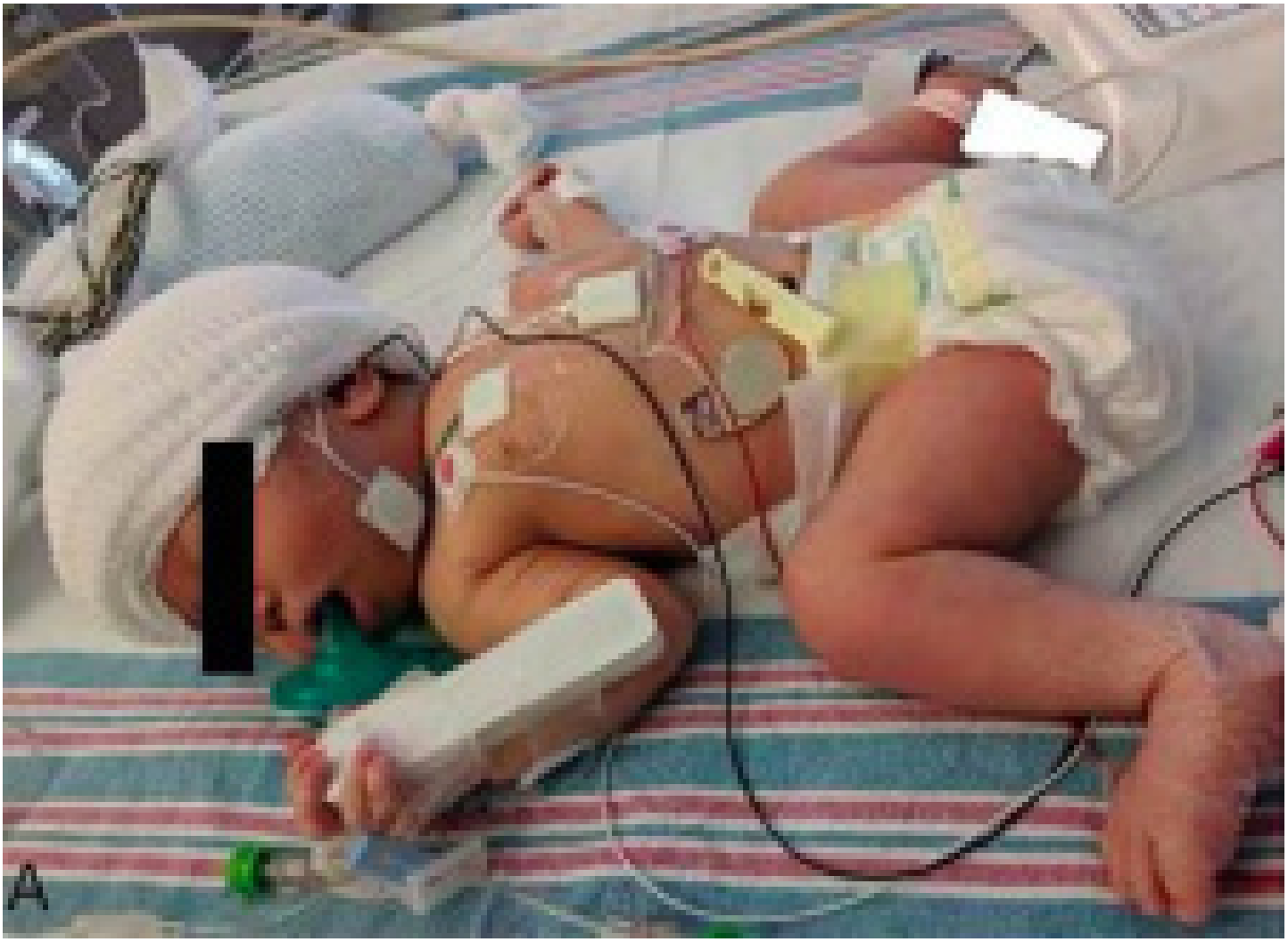
History (including chief complaint, history of present illness and relevant past and family medical history) Female infant was born via scheduled C/S for breech presentation following uncomplicated pregnancy with negative serologies. Delivery was uneventful with birth weight of 3408g and Apgar scores of 8 and 9. On day of life one, the parents observed rhythmic twitching of the left lower extremity that did not cease when the extremity was held. A video recording demonstrated >30

seconds of sustained myoclonic jerks and fasciculation of the quadriceps area of the left lower extremity with no other perceived movements or clinical changes. The parents denied any known family history of seizures, metabolic disease, bleeding or pro-thrombotic disorders.

Physical examination findings (including vital signs) Vital signs were unremarkable. Neurological exam revealed an appropriate level of activity, no abnormalities of cranial nerves, mild central hypotonia with normal peripheral tone, symmetric Moro reflex, and strong suck. Lower extremity reflexes were brisk with possible cross adductor reflex. Physical exam was notable only for external rotation of bilateral hips with negative Galeazzi sign and positive Barlow test bilaterally. The Ortolani test was only positive after Barlow maneuver. Her hips rested in flexion and wide abduction to 90 degrees and the hips were unable to be fully extended. Knees would passively extend when hips were extended, but no active knee extension was seen with the hip in flexed position. There was moderate atrophy of quadriceps compared to hamstrings.

Laboratory or Diagnostic imaging or Procedures Electrolytes, CBC and head ultrasound were unremarkable. Infectious workup revealed WBC 14.1, IT ratio 0.1 with 8% bandemia, and C-reactive protein of 0.19 mg/dL. Lumbar puncture was normal, with negative HSV PCR and encephalitis panel. Blood and CSF cultures were negative, and the infant received a 48 hr course of ampicillin and gentamicin. Dynamic bilateral hip sonogram was read as normal with no hip dislocation or subluxation seen. Right and left alpha angles were sixty degrees. Femoral head coverage was 50% bilaterally. Continuous video EEG recording using a standard 10-20 system of electrode placement was obtained for 48 hrs, with normal background for age and no abnormal activity. Multiple episodes of the unilateral lower extremity movements were captured during EEG. A Brain MRI was also normal.

Final Diagnosis Diagnosis was femoral and obturator nerve palsy secondary to frank breech positioning in utero. Lower extremity nerve palsy in the newborn is rare but it is important to consider on a differential for muscle weakness or fasciculation. In this case, complete resolution was seen by 3 weeks of age.



Abstract: 286

An Unusual Presentation of a Large Cardiac Mass

Alexandru Firan[1], Mitchell Cohen[4], Lucas Collazo[4], Amir Dangol[2], Melany Atkins[3]

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History (including chief complaint, history of present illness and relevant past and family medical history) An 11 year old male without past medical history presented to his pediatrician with a cough for 10 days. He had no fever or other URI symptoms. He was active in soccer without exertional fatigue, chest pain, or palpitations. There was no family history of sudden cardiac death, unexplained syncope, or cardiomyopathy

Physical examination findings (including vital signs) Blood pressure upon ED presentation was 98/57. Heart rate was 96. Temperature was 99.3. Respiratory rate was 20. SpO2 was 99. His physical exam was unremarkable, with regular rate and rhythm noted (though subsequent cardiology appointment noted slight displacement of the point of maximal impulse). No peripheral edema. Crackles were noted in the right lower lung.

Laboratory or Diagnostic imaging or Procedures Chest xray was done, which revealed a right upper lung subcentimeter calcified granuloma, as well as cardiomegaly. He was subsequently referred to cardiology. Electrocardiogram revealed inverted T waves in the lateral leads. Cardiac echo revealed left ventricular posterior and lateral wall hypertrophy, with no impact on systolic function. Cardiac MRI revealed a 10.3cm infiltrating, avidly enhancing mass of the left ventricle extending from the apex to the base and invading the anterolateral and inferolateral left jugular myocardium. Given the location and infiltrative nature of the mass, an open biopsy was performed.

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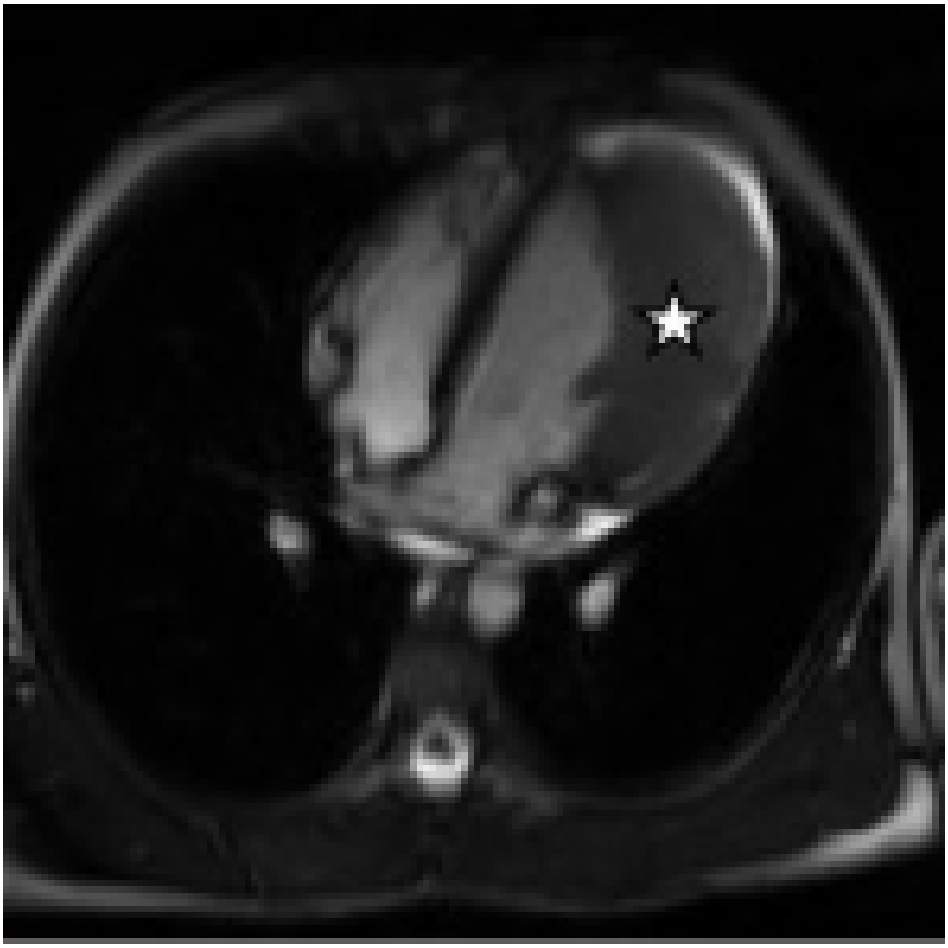
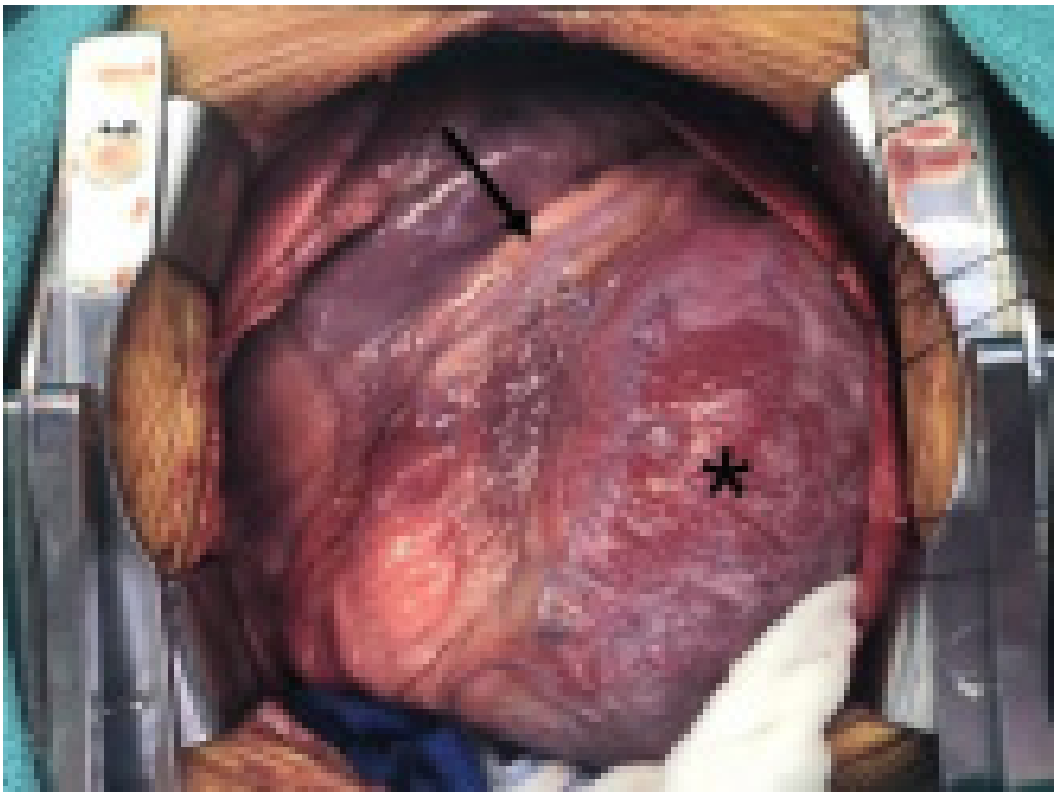
Final Diagnosis Biopsy results revealed a very vascular capillary hemangioma. Given the infiltrative nature of the tumor and no discernible tissue planes, the tumor could not be resected. His post-operative course was unremarkable. Conservative medical management was initiated with propranolol and aspirin. Follow-up stress test 4 weeks post-surgery was normal without ventricular ectopy. In summary, this case represents a rare presentation of an already rare pediatric cardiac tumor. The size of this tumor is believed to be the largest cardiac hemangioma seen in a pre-teen patient.



Horizontal long axis image from a SSFP sequence demonstrating the infiltrative T2 hypointense mass involving the lateral wall and apex marked by the star symbol. The mass lesion demonstrated peripheral hypervascularity after contrast administration with avid persistent enhancement with delayed imaging



Operative picture of the patient's heart. The patient's head is towards the top of the picture. The asterisk depicts the tumor. The arrow points to the left anterior descending artery

Abstract: 287
Hardened Erythema in a Neonate
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History (including chief complaint, history of present illness and relevant past and family medical history) Male child was born at 39 4/7 weeks to a 32 y/o G2P0 mother with negative prenatal labs. The prenatal tracing showed absent variability and recurrent late decelerations. A stat caesarian-section was performed and infant emerged limp, cyanotic, and apneic with heart rate<100 bpm. Apgar scores were 2, 5, 6 and 8 at one, five, ten and fifteen minutes respectively.
Infant was resuscitated and brought to NICU. Umbilical cord blood gas showed pH of 6.89 with an incalculable bicarbonate and base deficit. After placement of central umbilical catheters, whole body cooling was initiated based on protocol due to metabolic acidosis, elevated lactate, abnormal liver function tests, abnormal coagulation panel and thrombocytopenia. Infant was classified as Sarnat stage two with mild hypotonia, decreased activity, and decreased Moro reflex on exam. Infant completed total body cooling on day of life 3 and was rewarmed overnight into day 4.
Physical examination findings (including vital signs) After improved physical exam and placement on body cooling, infant had vital signs within normal limits for neonate including heart rate of 129bpm, temperature 97.7F, respiratory rate 50 breaths/min, and blood pressure 96/56 mmHg. On day of life 5, following re-warming, he was noted to develop erythema and hardness of the subcutaneous layer of skin over the back and shoulders.
Laboratory or Diagnostic imaging or Procedures On day of life 9, infant was noticed to have first elevated calcium level measuring 11.2mg/dL, up from 10.2mg/dL two days prior. Renal ultrasound was obtained which was within normal limits. Calcium level remained stable from 10-11mg/dL until DOL23 when calcium elevated to 11.8mg/dL. Endocrinology was consulted at this time and additional labs obtained including parathyroid hormone (appropriately suppressed), vitamin D

levels, urine creatinine/urine calcium, all within normal limits. Mother began supplementing infant with low-calcium specific formula and discontinued all prenatal vitamins. Calcium peaked on day of life 27, reaching 13.2mg/dL, at which time intravenous hydration and oral furosemide, 2 mg/kg/dose, twice a day, was started. On day of life 30, with calcium levels steady at 13mg/dL, prednisolone 2mg/kg/day and intravenous fluid with sodium bicarbonate were initiated. Furosemide was discontinued on day of life 32 and steroids continued following taper. Infant was discharged on day of life 50 from general pediatrics unit with down-trending and stable calcium levels, continuing on steroid taper as outpatient.

Final Diagnosis Subcutaneous Fat Necrosis and Secondary Hypercalcemia as Complications of Therapeutic Whole-Body Cooling in a Neonate

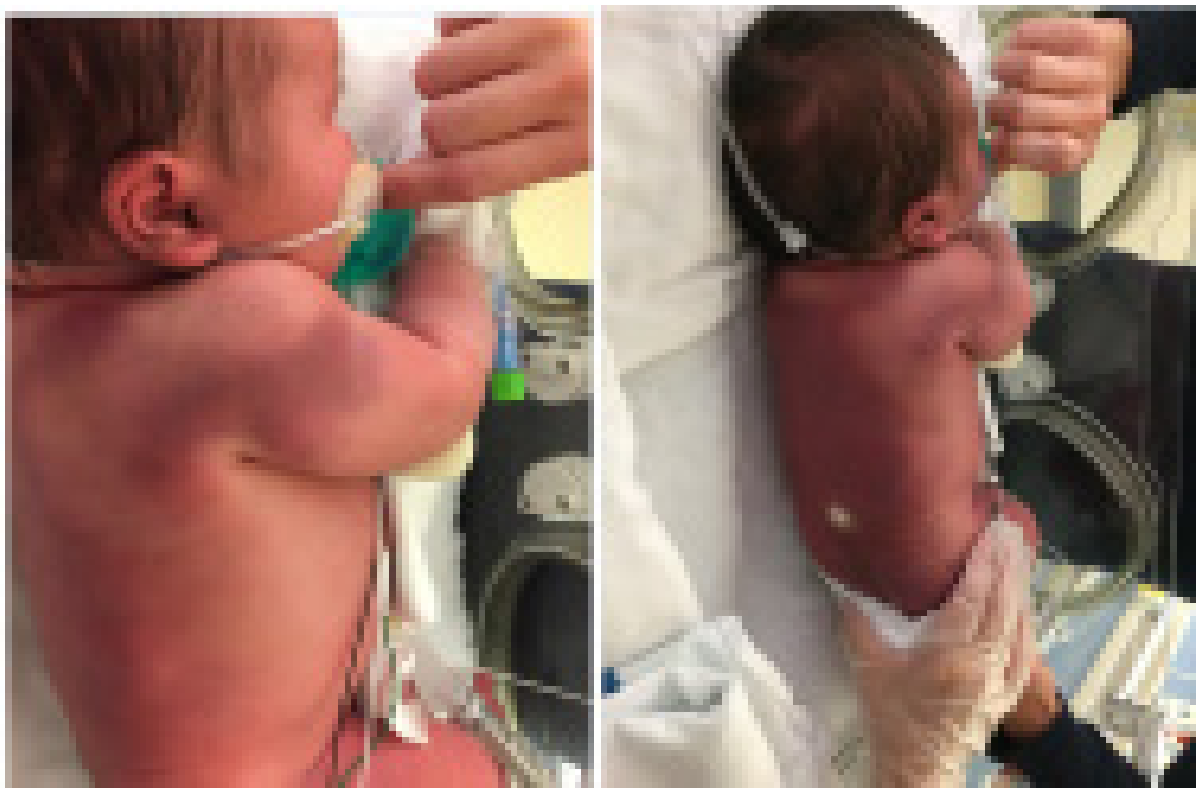


Figure 1: Subcutaneous fat necrosis on the infant, on day of life 4 - 5, with violaceous, tender, indurated nodules over the shoulders, back, buttocks and thighs.

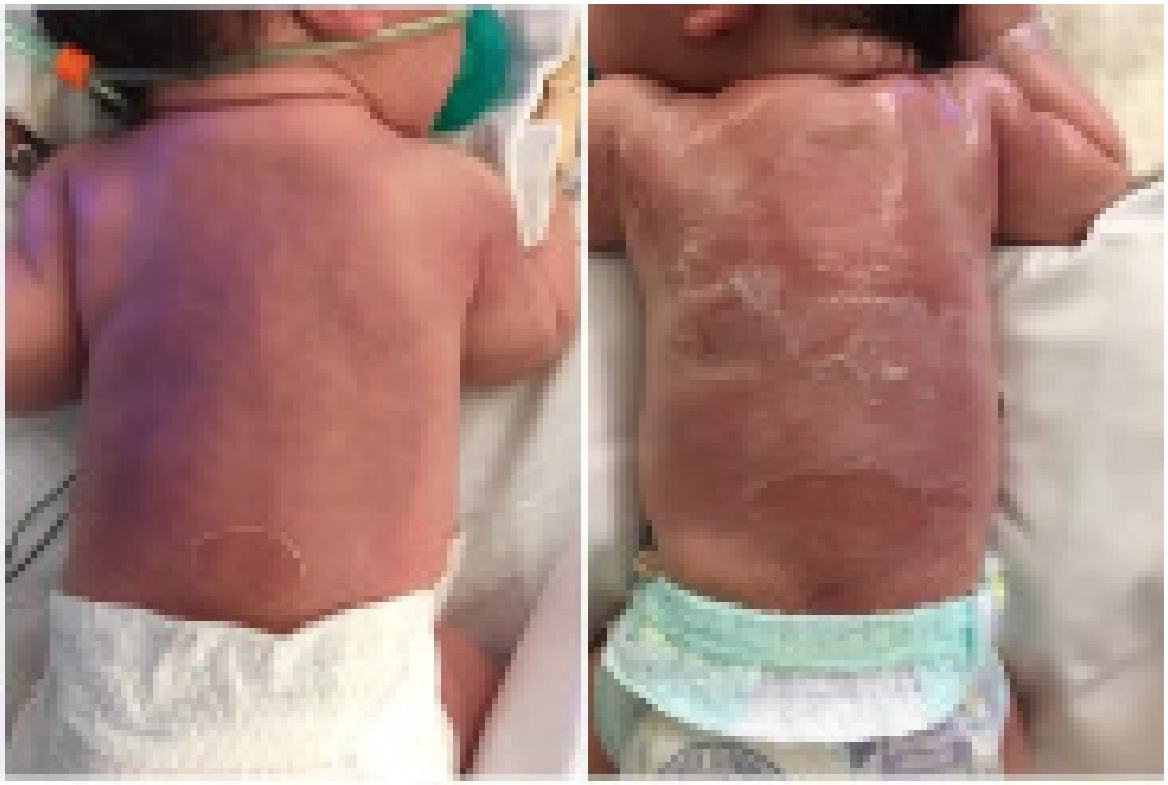


Figure 2: Subcutaneous fat necrosis on the infant, on day of life 9, with erythematous to violaceous, tender, indurated nodules with denuding of the skin over the shoulders, back, buttocks and thighs.

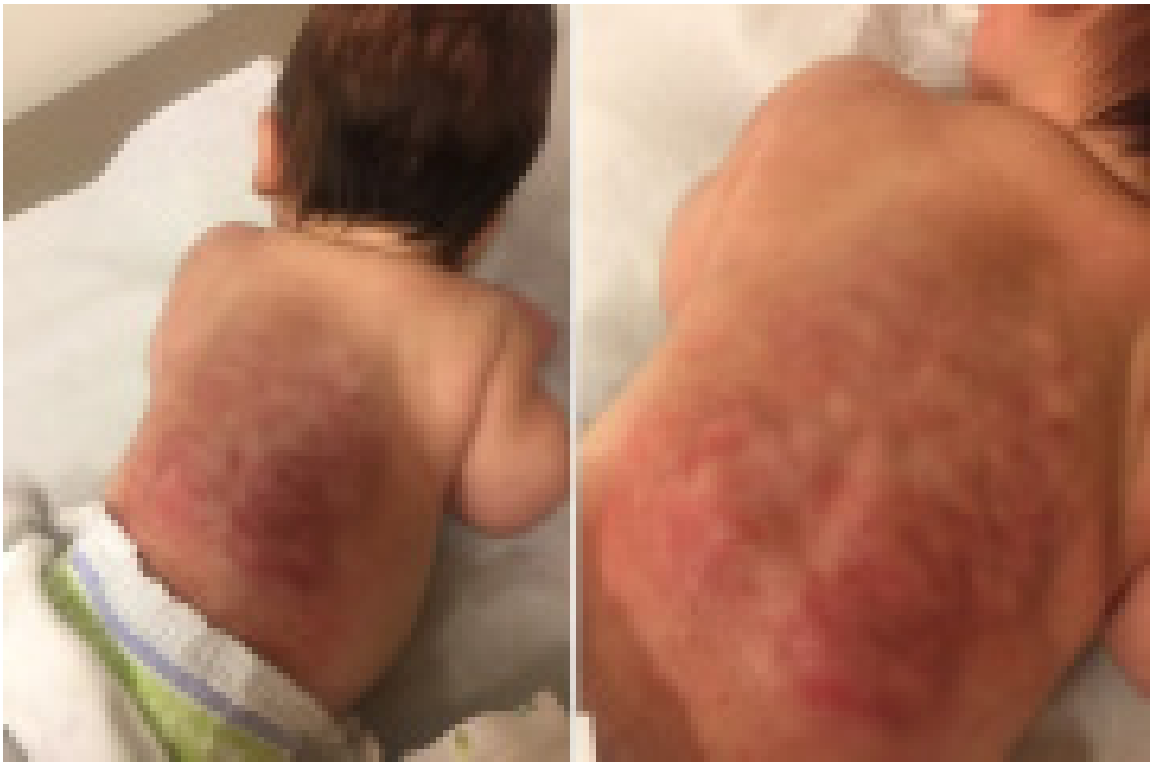


Figure 4: Subcutaneous fat necrosis on the infant, on day of life 54, with improvd erythematous to violaceous, tender, fluctuant nodules of the skin over the shoulders, back, buttocks and thighs.

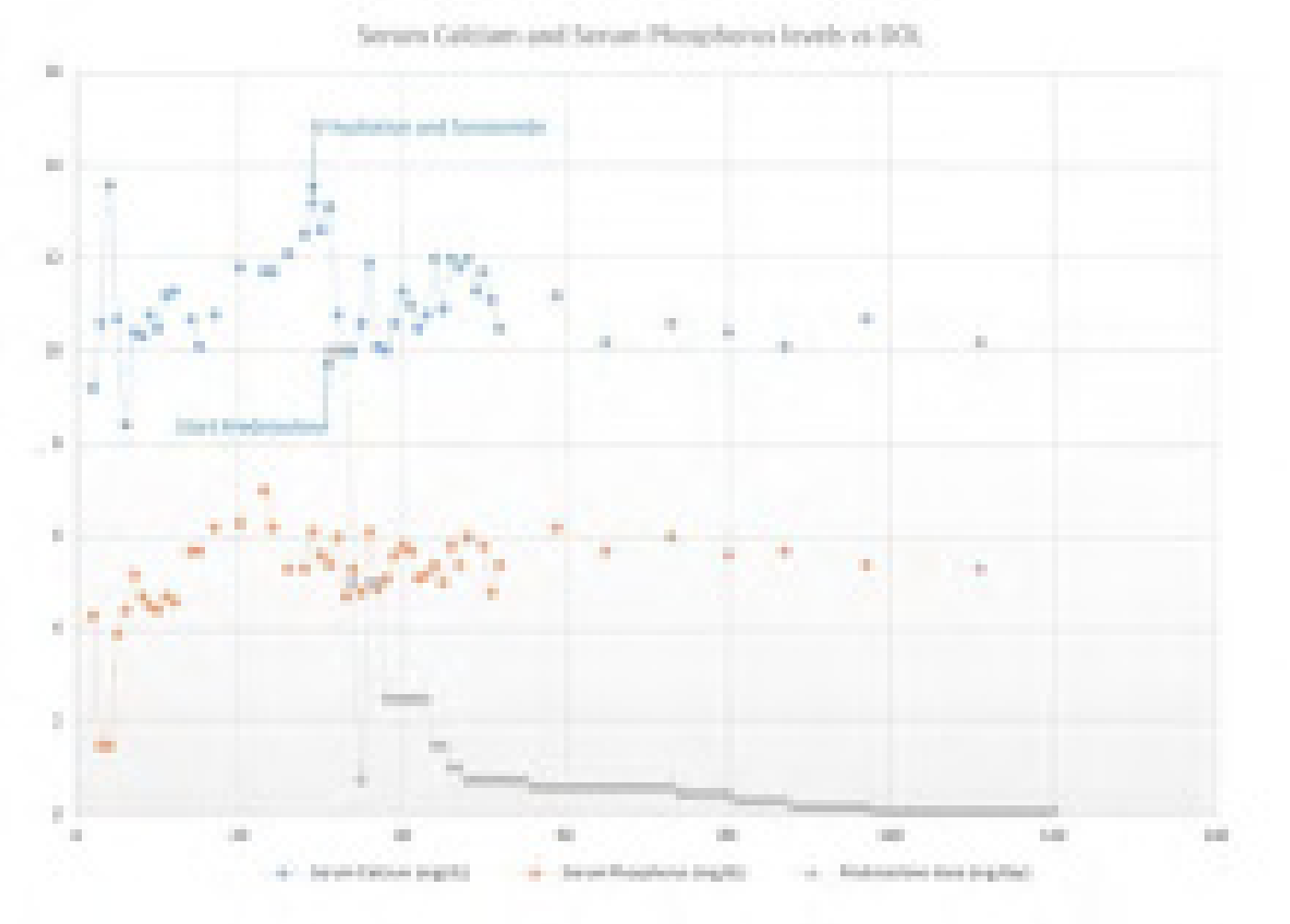


Figure 4. Timeline showing evolution of peak serium and phosphorus levels after birth. Graph shows peak serum calcium and the responsiveness to treatment with intravenous fluid, furosemide, and prednisolone.

Abstract: 288
Fever of Unknown Origin in 12 Year-Old Male
Thomas P. Conway, Asif Noor
Pediatrics, NYU Winthrop Hospital, Astoria, New York, United States

History (including chief complaint, history of present illness and relevant past and family medical history) A previously healthy 12 year-old-boy was admitted in July with fevers (tmax 103ºF) for 3 weeks associated with headaches. The patient was initially treated with amoxicillin for otitis media 2 weeks prior and evaluated by pediatric infectious diseases 1 week prior to admission. Outpatient work up at 2 weeks was remarkable for only mildly elevated white blood cell count. He was admitted to the hospital a week later for 5 days and diagnosed with aseptic meningitis and discharged on hospital day 7. He was readmitted 3 days later due to urinary retention and return of fevers. There was neither recent travel nor toxic or known infectious exposures
Physical examination findings (including vital signs) Vitals: temperature of 98.1ºF; heart rate 93 beats/min, blood pressure 111/72 Torr, and capillary refill <2 seconds. On 1st hospitalization pertinent findings included photophobia with intact extraocular movements and no papilledema. He had limited flexion of neck. On 2nd hospitalization, he developed decreased sensation over right thigh, lower hyperreflexia and clonus of right ankle

Laboratory or Diagnostic imaging or Procedures Initial serum WBC 18.4 x 10^9 L with 88% neutrophils. ESR 98 mm, C-reactive protein 0.36 mg/dL. Serum chemistries all within normal limits. Malaria stain was negative. 1st CSF showed WBC 67 with 64% lymphocytes and 23% polys, with normal protein and glucose. CSF studies including bacterial and fungal cultures, multiplex PCR including Herpes, Lyme and West Nile were negative. Blood and urine cultures returned negative. Initial brain MRI showed demonstrated meningeal inflammation without focality.

On readmission, due to suprapubic pain, repeat brain MRI showed worsening sulci signal enhancement and spinal MRI was obtained which showed a signal abnormality in the cord at the C5 level. 2nd CSF showed pleocytosis to 94 WBC with increase in protein (48) and normal glucose. Infectious CSF studies for viral (including arboviruses) returned negative, myelin basic protein was raised to 131 ng/ml. Due to worsening gait instability, waning mental status, he was started on intravenous immunoglobulin and high dose corticosteroids with complete resolution of symptoms over 2 weeks. Repeat MRI was performed 5 months after discharge and within normal limits.

Final Diagnosis Final diagnosis was acute disseminating encephalomyelitis (ADEM) presenting as fever of unknown origin.

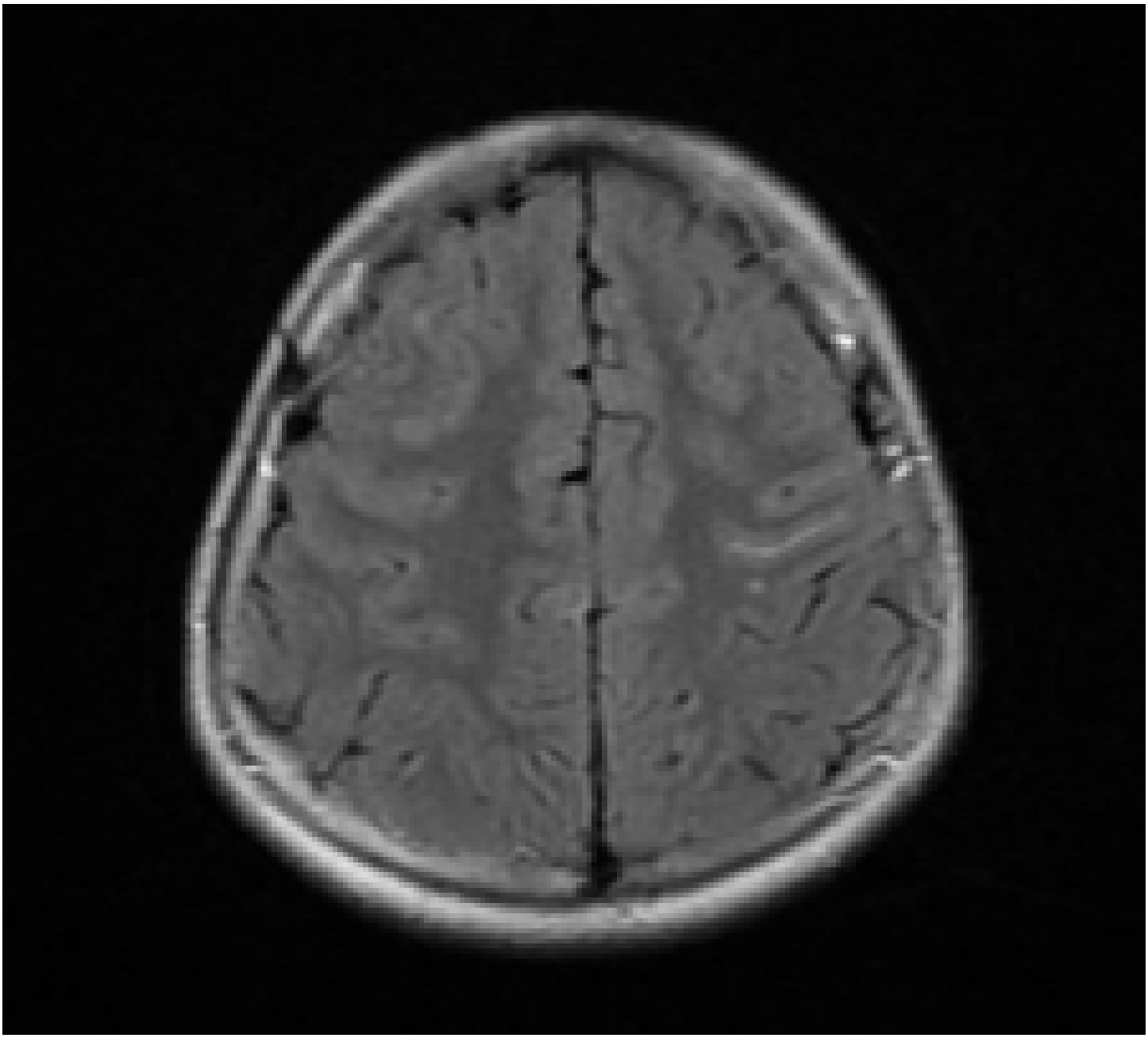


Figure 1. Brain MRI, axial FLAIR, from initial hospital admission, day 1, showing mild signal abnormality in some cerebral sulci, clinically consistent with meningitis.

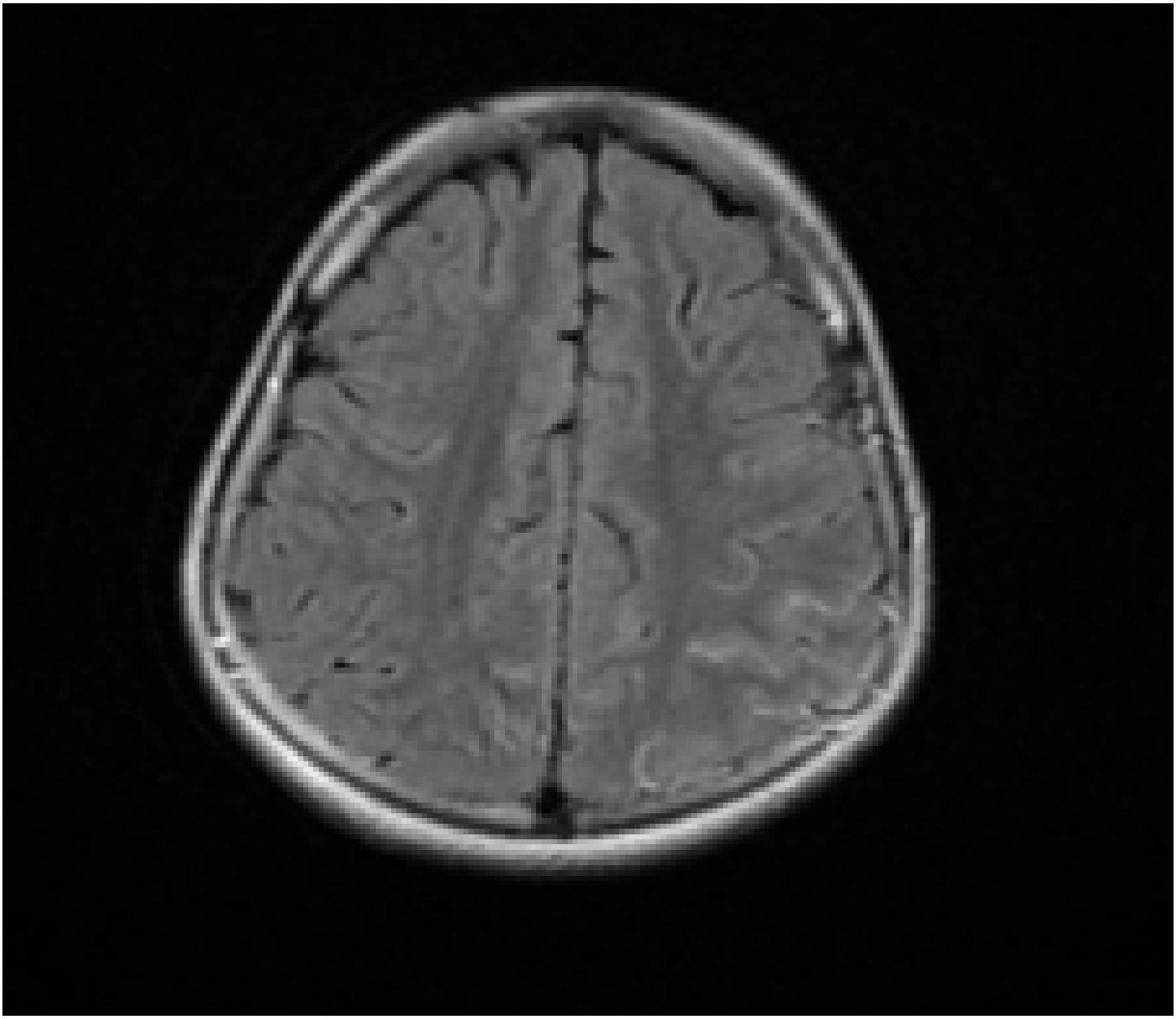


Figure 2. Brain MRI, axial FLAIR, from readmission to inpatient unit, showing worsening signal enhancement of the cerebral sulci.

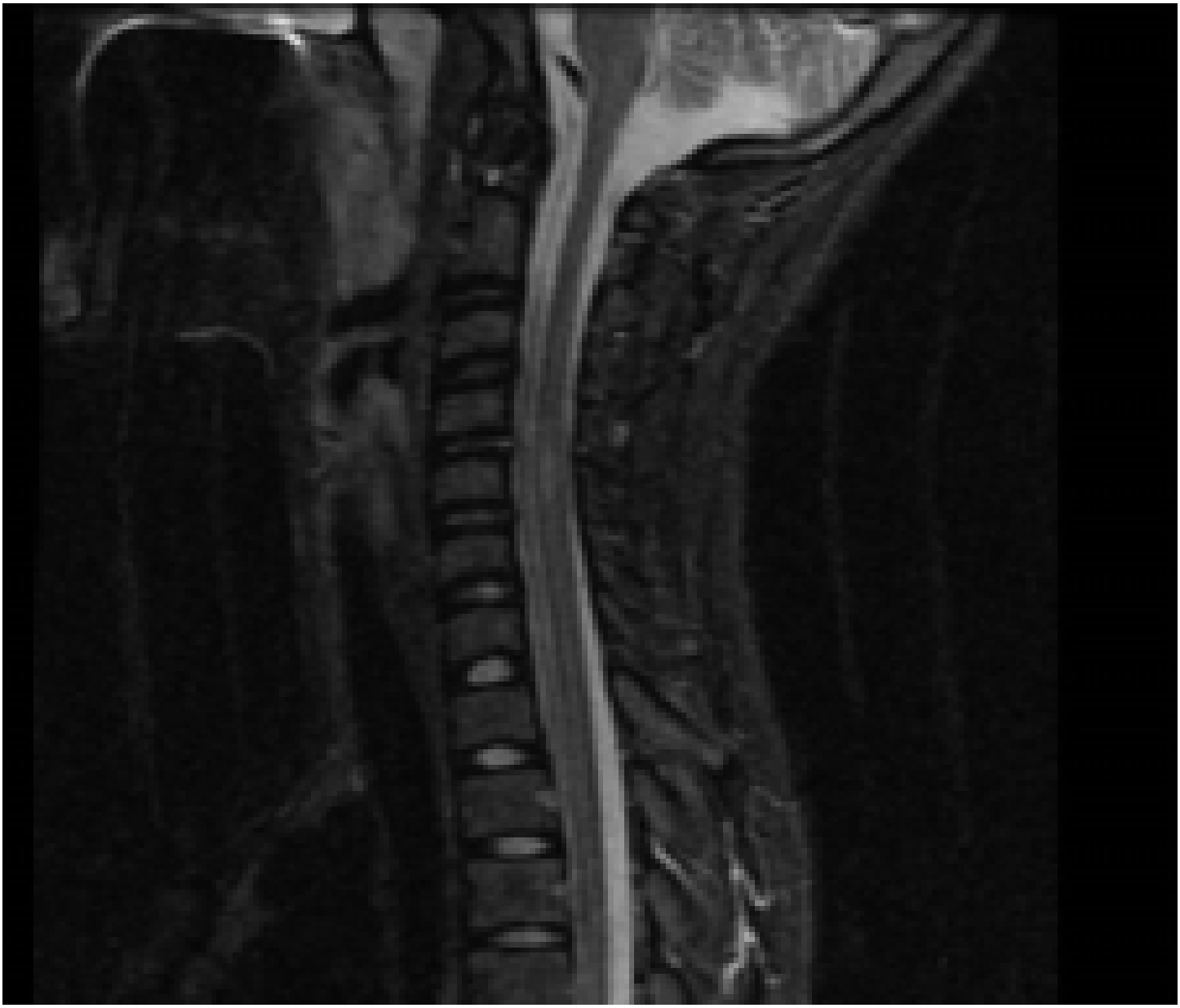


Figure 3. MRI of cervical spine, sagittal STIR sequence, from hospital readmission, showing small focus of nonenhancing signal abnormality in the cord at the C5 level. Findings were consistent with demyelinating process.

Abstract: 289
Acute back pain with progressing antalgic gait
Jeffrey Nafash
Pediatrics, Rutgers Robert Wood Johnson School of Medicine, New Brunswick, New Jersey, United States

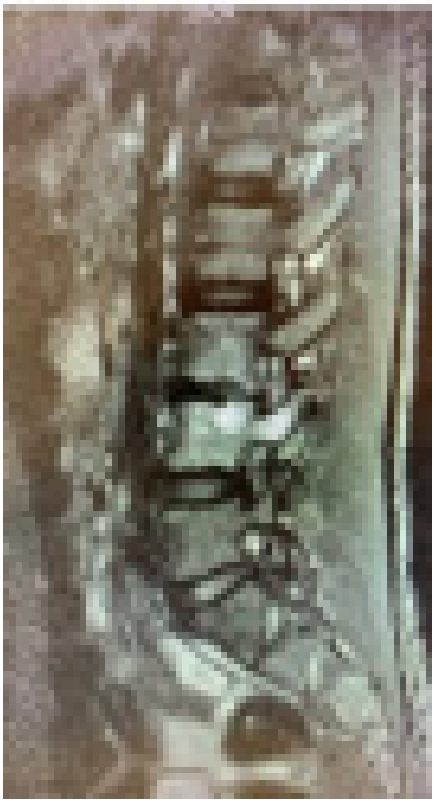
History (including chief complaint, history of present illness and relevant past and family medical history) JC is a 13-year-old Hispanic male with no significant past medical history who presented for evaluation of 3 weeks of progressively worsening migratory back and hip pain.

The patient stated that the pain was of sudden onset about 3 weeks ago, starting in his right hip with radiation to his lower back, right thigh, and left hip. The pain is "lightning"-type pain that is worse with movement, sitting, and moving from a lying

position. His most comfortable position is laying flat on his back. The pain was intermittent, but now it is constant. There was minimal relief with acetaminophen or naproxen. 10/10. His gait has changed over this period of time as well, where he appears to be limping, as if not wanting to bear weight on his right side. He is not able to bend forward as he used to or carry anything due to the pain. Denies that anything like this has ever happened before. Denies any recent episodes of trauma, only activity is karate which he had stopped from a few months prior to this acute episode. Patient has not attended school for 2 weeks.

This pain is associated with tactile fevers and chills. His clothes appear to fit more loosely and he has a poor appetite. Review of symptoms normal including denying numbness or tingling in his arms and legs, or feeling weak in his legs.

Family denies any recent travel or visitors from out of the country. No one in the family works in the healthcare industry. Never before tested for tuberculosis, and no one in the family exposed to or ever with tuberculosis diagnosis. No known family history of arthritis, or autoimmune conditions. No childhood illnesses reports
Physical examination findings (including vital signs) Temperature: 98.9 Heart Rate 122 BP 114/53 RR 20 Oxygen Saturation 97% on room air
Weight 47.1kg (55th centile) Height 165.1cm (75th centile)
General Appearance: alert and awake, lying flat on the stretcher, no movement due to pain.
Exam normal except:
MSK: tenderness to palpation over the right hip joint anteriorly. No spinal or paraspinal tenderness along the entire length of the spine. Unable to bend forward greater than 20 degrees. Full ROM of the UE/LE. No edema appreciated in any joints.
Gait: Antalgic gait with feet shuffling with knee bending and forward flexion of the lumbar spine
Neuro: Lower extremity strength 5/5 with intact sensation bilaterally.
Laboratory or Diagnostic imaging or Procedures Lab results:
CRP 4.94 ESR 27 LDH 346 Uric Acid 3.8 CPK 118
BMP 137/3.4/100/22.6/10/0.7<113
AST 24 ALT 16 ALP 125 TB 0.6 Alb 3.9 TP 7.4 Ca 8.8
CBC 8.7>11.7/34.4<273 N 73.7% L 20.2% M 5.6% E 0.2% B 0.3%
UA – no protein
Lyme Antibodies– nonreactive
Final Diagnosis Acute Vertebral Osteomyelitis

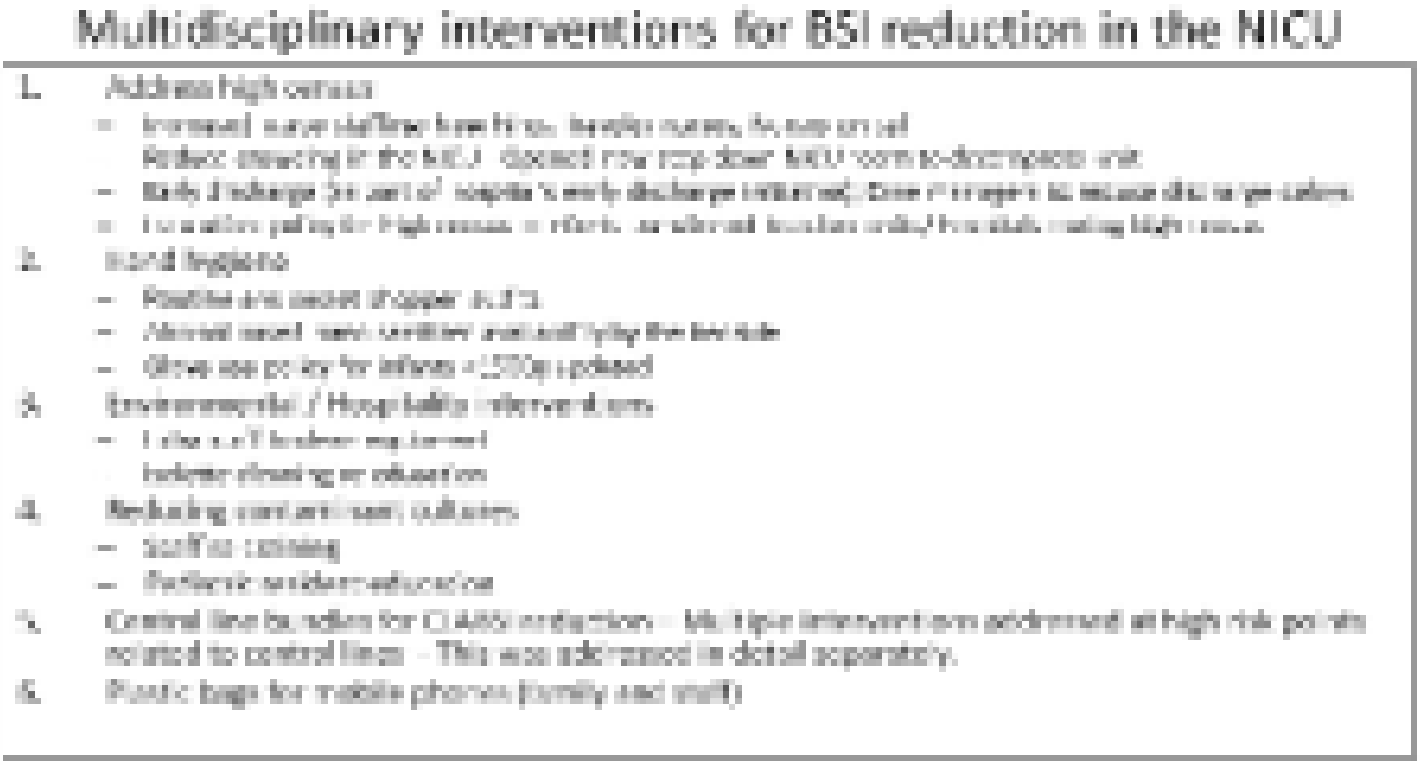


Abstract: 290

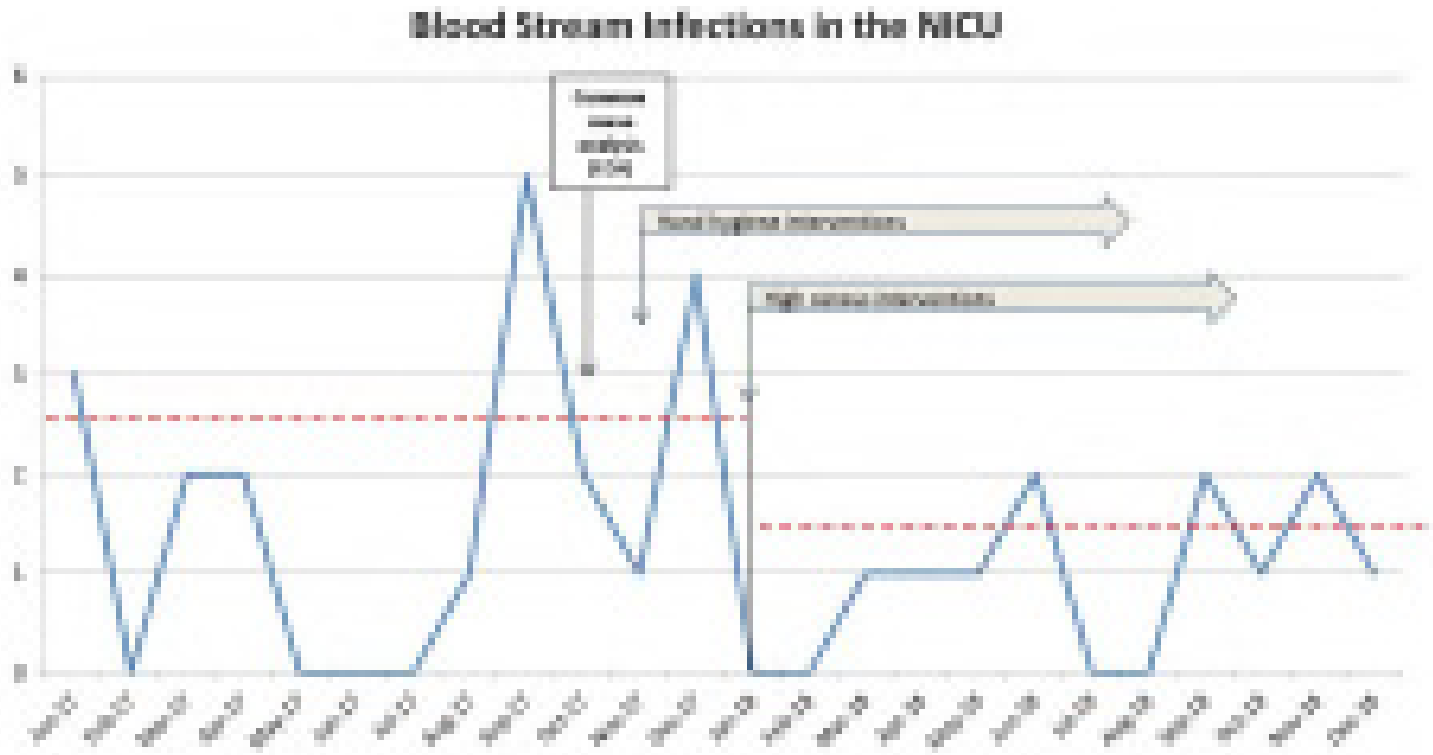
Decreasing primary bloodstream infections in the NICU using a multidisciplinary approach through common cause analysis

Ranjith Kamity, Maureen Kim, Maria Lyn Quintos-Alagheband
Pediatrics, NYU Winthrop Hospital, Mineola, New York, United States

Background Health Care-Associated Bloodstream Infections in newborns (BSI) are a major cause of morbidity and mortality in neonatal units world-wide. While much emphasis has been placed on Central line associated blood stream infections (CLABSI), BSIs irrespective of central lines continue to occur. This requires a broader approach in addition to the interventions designed to reduce CLABSI. Monitoring and following this data in real-time is a common challenge in many units. While there are multiple ways to track this data, the Joint Commission's Perinatal care (PC-04) criteria are widely used. Much of this is reported using software analytics tools, and is usually unavailable to the frontline staff. Even when available, data reported based on month of infants' discharge instead of month of occurrence is inadequate for tracking short term improvements in real-time. In addition, some institutions use data sampling, thus making it difficult to identify deficiencies contributing to BSIs in the NICU. This is ever more important in busy NICUs such as ours with space limitations and increased risk of infections during periods of higher census.
Objective Our SMART aim was to reduce total BSIs in our NICU from 2.59% (2017) to <1.5% by Dec 2018, with a stretch goal of zero infections.
Design/Methods Joint Commission PC-04 definitions were used for defining BSI and reported in the month of occurrence. Total patient days were used as denominator and the BSI rate was represented as a percentage (infections/ 100 patient days). A common cause analysis (CCA) was done to identify common causes among BSIs in our NICU. A multidisciplinary team was convened with stakeholders including physicians, nurses, nurse educators, managers, respiratory therapists and environmental (hospitality) workers. A Key Driver diagram was devised listing high risk items. High census and birthweight <1500g were identified as the most common factors. Selected interventions were gradually rolled out (Fig 1).
Results There was a 45% reduction in BSIs in our NICU in 2018 with a rate of 1.44% (n=11 cases), down from 2.59% (n=20 cases) in 2017 (Fig 2). Patient days were not significantly different among birth weight groups.
Conclusion(s) A multidisciplinary effort was used to decrease the rate of BSIs in our NICU. We recommend using real-time BSI data for rapid feedback to tailor process improvements.Performing a CCA is a useful strategy to identify key drivers and target interventions for BSI reduction.



Selected list of interventions aimed at reducing blood stream infections in the NICU. In addition, CLABSI reduction initiatives include multiple interventions aimed at central line safety.

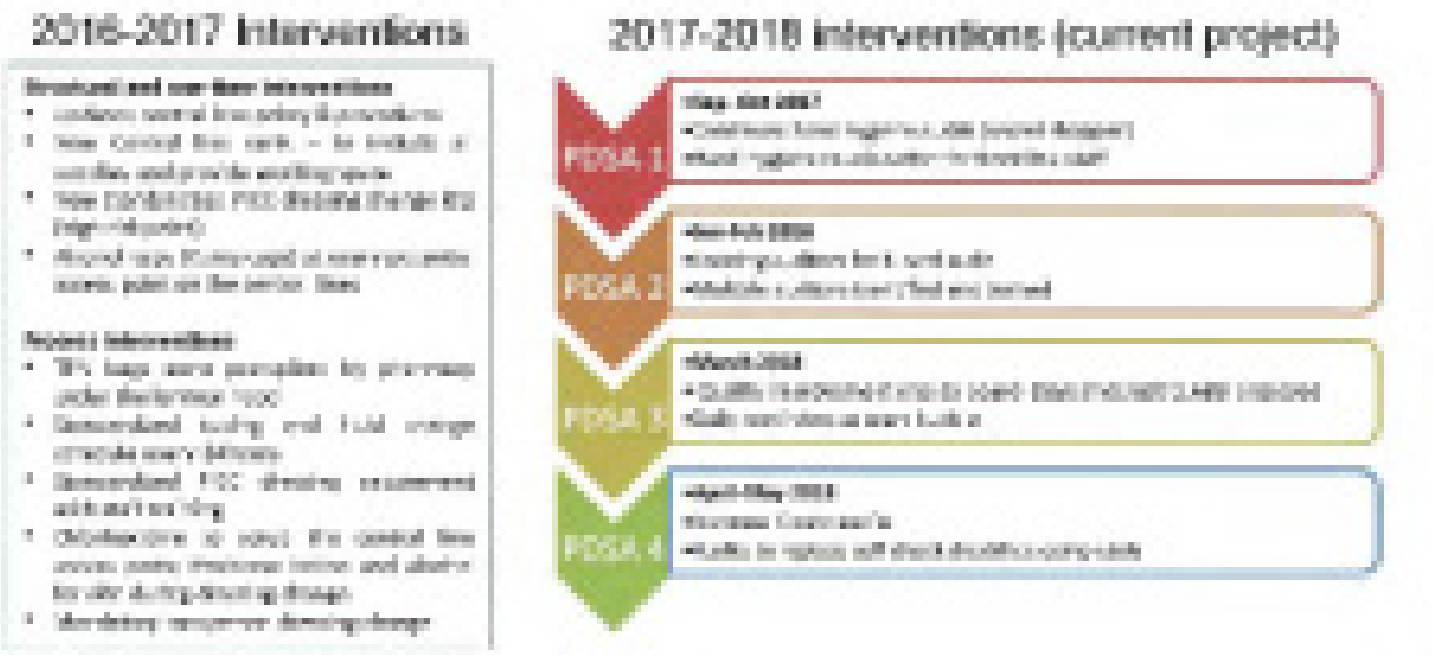


Run chart of total BSI in the NICU from 2017 to 2018 showing reduction in number of monthly infections. Dotted line represents BSI rate for the year.

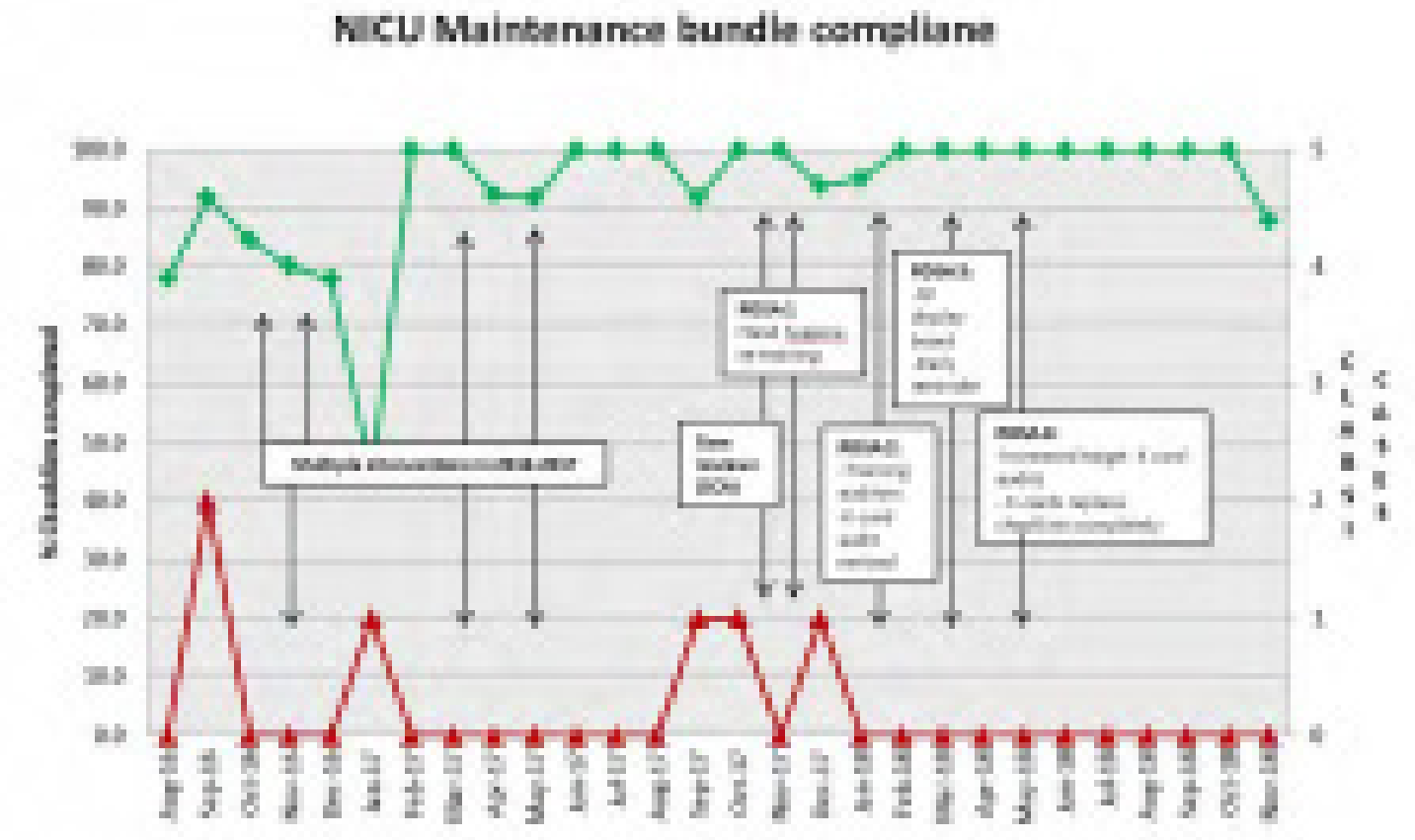
Abstract: 291
Frontline engagement with improved audit process linked to reduced central line associated blood stream infections in the NICU
Ranjith Kamity, Maria Lyn Quintos-Alagheband
Pediatrics, NYU Winthrop Hospital, Mineola, New York, United States

Background Despite strong evidence supporting the use of standardized central line bundles to reduce Central line associated Blood stream infections (CLABSI) in neonates, it continues to be one of the largest contributors for patient morbidity and mortality as well as healthcare costs in the NICUs world-wide. Multiple interventions were put in place in our NICU in 2016-2017 by a series of PDSA cycles, including structural/ one-time interventions to reduce CLABSI. Our biggest improvement in maintenance bundle compliance was noted after Kamishibai card (K-card) audits were started in Q2, 2017 with improved frontline engagement. However, an abrupt reduction in number of audits followed massive staffing changes and key personnel departures in Q3 of 2017. This was followed by an increase in incidence of CLABSI in our NICU during Q4 of 2017 with a 2017 rate of 2.03/1000 line days. A multidisciplinary team of physicians, nurses, nurse educators, nurse managers, nurse practitioners and infection prevention nurses reviewed all CLABSI cases for common causes. A secret shopper hand hygiene audit in Aug 2017 showed compliance at 40%. A drift in compliance to central line processes was identified.
Objective Our global aim was to reduce CLABSI rate in the NICU to <1/1000 line days, with a stretch goal of zero. The SMART aim was to improve process reliability for central line maintenance bundles using direct observed audits in the NICU from 90% to >95% by Dec 31, 2018.
Design/Methods To increase and sustain the reliability of our maintenance bundles, the Key driver diagram was revised and selected interventions were rolled out in a series of PDSA cycles starting from Q4, 2017 as shown in figure 2.
Results No new CLABSI cases occured since Dec 2017 until Nov 2018. Hand hygiene compliance improved to 100%. Maintenance bundle compliance improved from 90% in Aug 2017 and sustained at 100% since Feb 2018, with a recent dip in Nov 2018 (Fig 2). The failed audits revealed knowledge gaps with new staff which were addressed in real-time.
Conclusion(s) Our global aim has been achieved to date with zero infections in the first 3 quarters of 2018. We continue to strive to improve process compliance to >95% consistently by engaging frontline staff. Our project showed sustained

improvement in process compliance after the audit process was standardized, independent of specific personnel. We conclude that increased vigilance is required, especially after brief improvements due to drift in practices and staffing changes.



Interventions prior to the start of current cycle shown on the left. Current PDSA activities are shown on the right.



Outcome data showing *zero cases* of CLABSI in our NICU since Dec 2017 (red line). Maintenance bundle compliance improved to 100% since Feb 2018 (green line). Interventions are annotated.

Abstract: 292

Targeted Intervention to Improve Compliance with the American Academy of Pediatrics (AAP) Recommendations for Hepatitis B Vaccination in a Level IV Referral-based Neonatal Intensive Care Unit (NICU).

Sudip Sheth[1], Suzanne M. Touch[2]

[1]Neonatal Perinatal Medicine, St. Christopher's Hospital for Children, Philadelphia, Pennsylvania, United States, [2]Pediatrics, Drexel University College of Medicine, Philadelphia, Pennsylvania, United States

Background Hepatitis B vaccination is strongly recommended by Center for Disease Control for every neonate born in the United States. In addition, the AAP recently modified recommendations for administration in August 2017. In light of these issues, we sought to improve compliance with the hepatitis B vaccine administration recommendations per the AAP in our NICU as a quality improvement initiative.

Objective To improve the compliance of hepatitis B vaccination to > 80% in a level IV referral-based NICU.

Design/Methods The study was conducted at St. Christopher's Hospital for Children, infants were included in this evaluation if they were due for their initial hepatitis B vaccination after transfer to our NICU. Pre-interventional data was collected for infants due for their initial vaccine between May 1, 2018 and August 20, 2018 by review of the electronic medical record EMR), which established the baseline rate of compliance with the AAP recommendations for vaccine administration. After which a series of targeted interventions were implemented through two PDSA cycles (to date) and compliance rates have been tracked by ongoing review of the EMR. Infants were excluded if they were back-transferred to their birth hospital or died prior to the time they were due for their initial hepatitis B vaccination.

Results Data are represented as a P Chart (Figure 1) and rules for special cause variation were applied. Included are the 31% of infants admitted during the study period who were due for their initial hepatitis B vaccination while receiving care at our hospital.

Conclusion(s) Although we have not yet reached our goal of 80% compliance with the AAP recommendations for hepatitis B vaccine administration, there has been a steady increase in compliance with each intervention rising from the pre-intervention average compliance of 20%, to 33.33% after the first PDSA cycle, and further increasing to 72.73% after the second PDSA cycle. Future directions to further improve compliance include the following: establishing 'triggers' in the EMR when vaccinations are due, obtaining consent for vaccinations on admission, ongoing education of the multidisciplinary care team of the timing of vaccinations, as well as ongoing reminders. Such targeted quality improvement initiatives may play an important role in the implementation of guideline modifications.

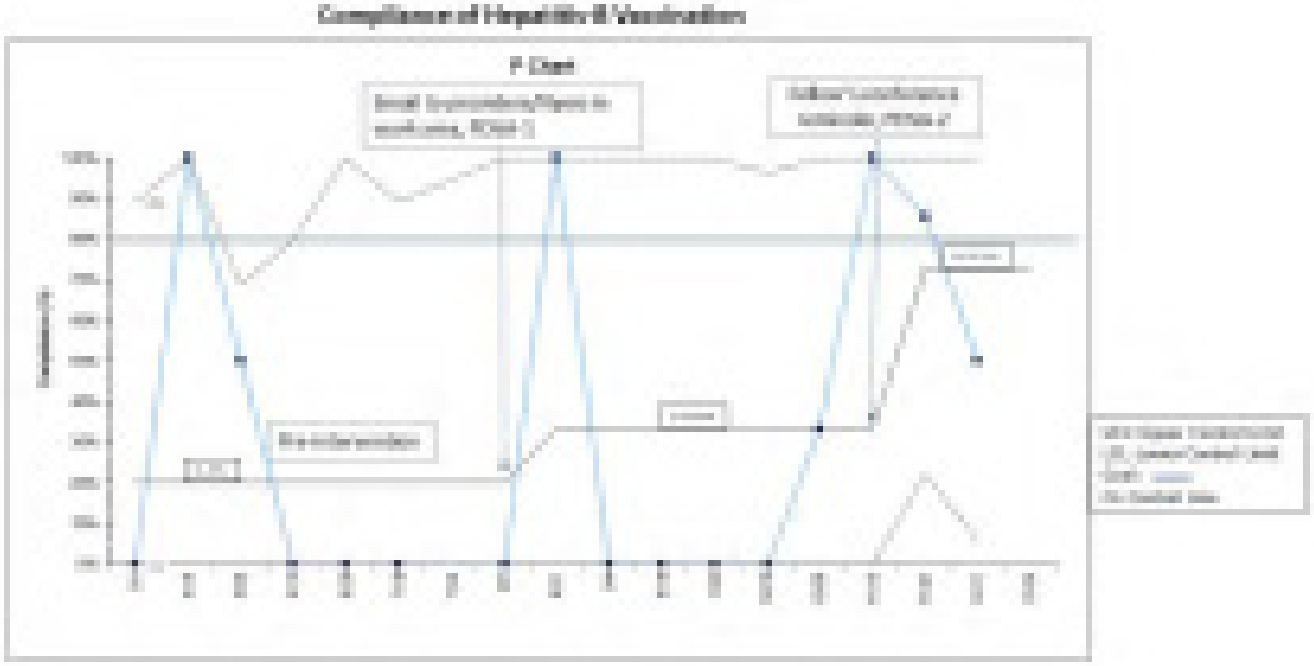


Figure 1

Abstract: 293

Antibiotic Prescription Order Panels Improve Compliance with Clinical Pathways and Reduce Prescription Errors in the Emergency Department

Crista Cerrone[2], Kathryn E. Kasmire[3], Eric Hoppa[1]

[1]Connecticut Children's Medical Center/University of Connecticut School of Medicine, Hartford, Connecticut, United States, [2]Nationwide Children's Hospital, Columbus, Ohio, United States, [3]Penn State Health, Milton S. Hershey Medical Center, Hershey, Pennsylvania, United States

Background Clinical pathways standardize the evaluation and management of common conditions in the pediatric emergency department (ED). Prescription errors are common in the ED despite optimization of the electronic health record (EHR). In our ED there is considerable variance from clinical pathway recommendations for outpatient antibiotic therapy including errors in antibiotic selection, dosing, frequency, and duration.

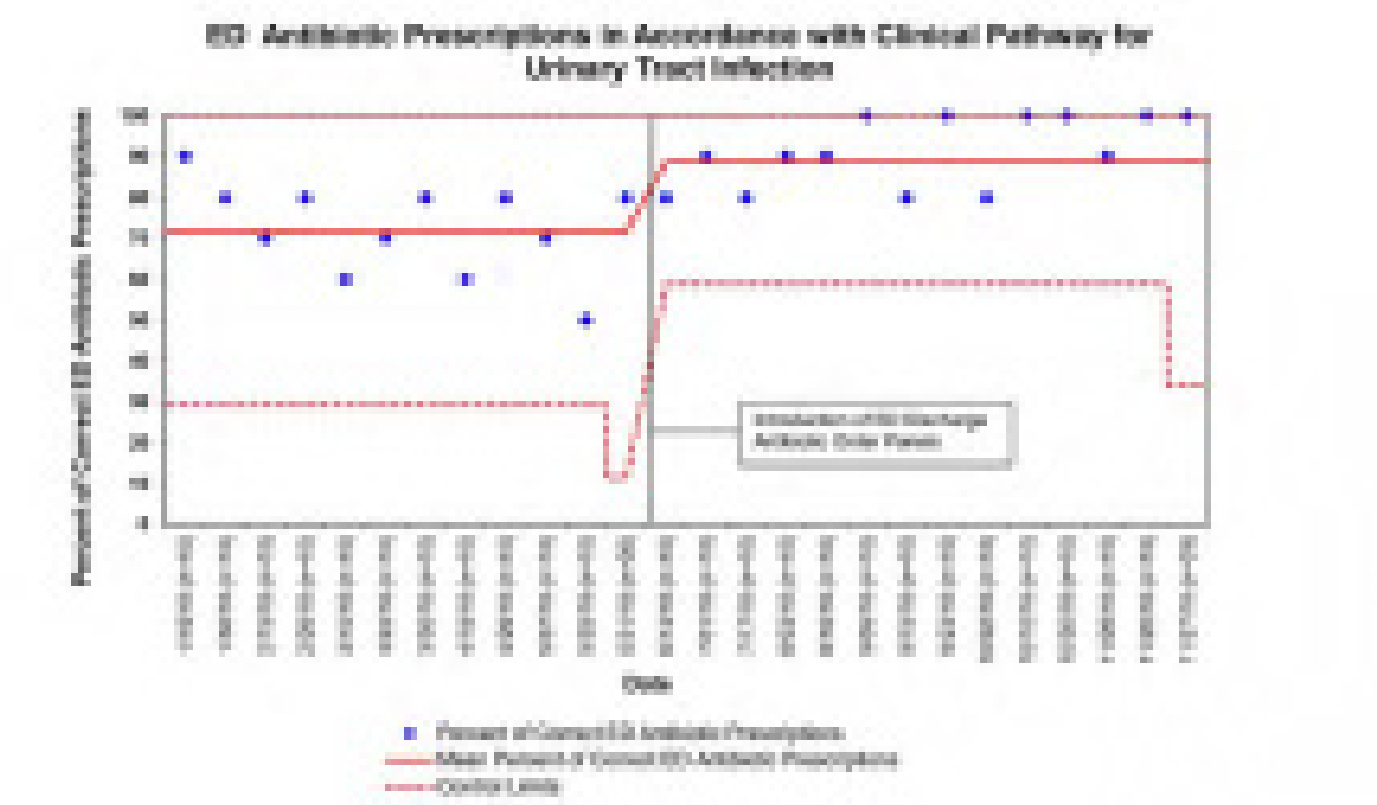
Objective Determine if implementation of antibiotic prescription order panels for the management of urinary tract infection (UTI) and skin/soft tissue infection (SSTI) improve pathway compliance and decrease prescription errors.

Design/Methods Electronic antibiotic prescription order panels modeling antibiotic choice, dose, frequency, and duration from institutional clinical pathways for UTI and SSTI were created with the input of key stakeholders. We used Plan-Do-Study-Act ramps to test and revise the order panels and complete end user education. We reviewed prescription variance from the clinical pathways for UTI and SSTI retrospectively for 5 months prior to implementation and prospectively for 6 months after implementation. Patients meeting criteria for the UTI or SSTI pathway discharged from the ED with an antibiotic prescription were included in analysis. Our primary outcome was percentage of patients treated with appropriate antibiotic, dose, frequency, and duration according to pathway. Secondary outcomes included the number and types of prescription errors.

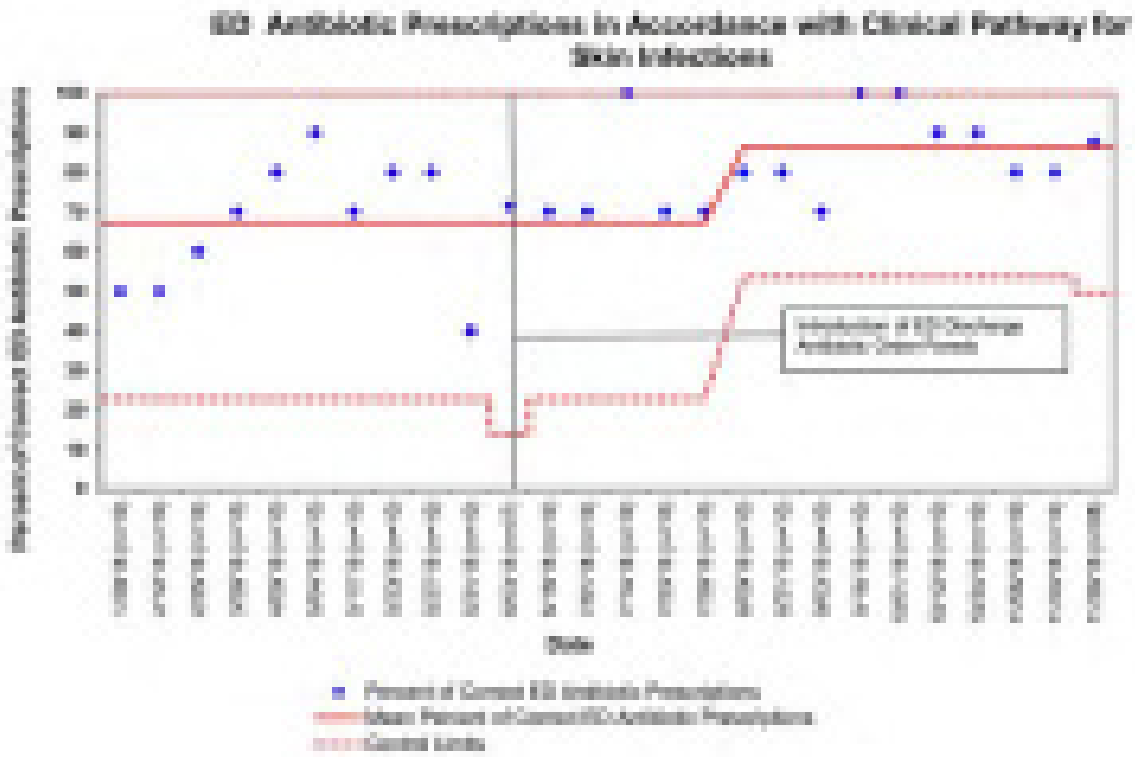
Results With implementation of the antibiotic prescription order panels the mean percentage of prescriptions in accordance with the UTI pathway improved from a baseline of 71.8% to 88.8% (Figure 1). Similarly, compliance with the SSTI pathway improved from 67.3% to 86.3% (Figure 2). For both pathways at baseline 30.2% (67/222) prescriptions had at least one error. The most common baseline errors were wrong dosing interval 65.2% (45/72) and incorrect antibiotic 16.7% (12/72). After implementation of the order panels the prescription error rate decreased to 13.2% (37/281). Post-intervention the most

common errors were wrong dosing interval 70.3% (26/37) and incorrect antibiotic 18.9% (7/37).

Conclusion(s) Implementation of electronic antibiotic prescription order panels in the ED improves compliance with antibiotic therapy found in institutional pathways and decreases prescription errors. Building aids into the EHR directing providers to the order panels may lead to further improvement.



Statistical process control chart with prescriptions for UTI in compliance with the clinical pathway before and after introduction of the discharge antibiotic order panels.



Statistical process control chart with prescriptions for SSTI in compliance with the clinical pathway before and after introduction of the discharge antibiotic order panels.

Abstract: 294
A Quality Improvement Project To Increase Compliance In The Provision Of Asthma Home Management Plan Of Care Documentation.
Mofolasayo M. Adeniyi, Cynthia Angeles, Lin Lin Kin
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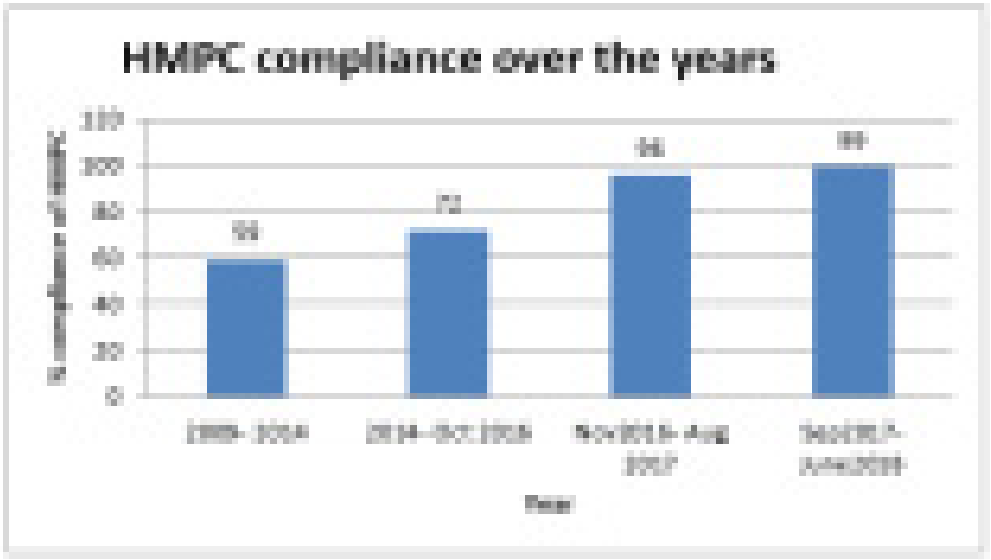
Background Asthma is a major cause of morbidity and hospitalization, with a prevalence of 12.5% in children under the age of 18. The Joint Commission (JC) and the Children's Asthma Care (CAC) advisory committee recommend that pediatric inpatient asthma management should include the provision of the Home Management Plan of Care (HMPC) document prior to or at the time of discharge. HMPC documents have been shown to improve asthma management and quality of life, as well as reduce number of missed days at school
Objective To assess and increase the compliance of the provision of HMPC among health care providers in the pediatric inpatient unit of an urban inner-city hospital.
Design/Methods An internal benchmark of 90% compliance in HMPC was set. Inclusion criteria were patients between the ages of 2 and 17 years discharged from the pediatric in-patient unit with a principal diagnosis of asthma. Exclusion criteria were patients enrolled in clinical trials, age less than 2 years or 18 years and older, and hospital stay exceeding 120 days. Retrospective chart review was conducted from 2009 to 2018. HMPC was considered complete if it included all five sections: dose, method and timing of rescue medications, use of controllers and follow-up appointment information.
Results From 2009 to 2018, 2642 patients were discharged with a primary diagnosis of asthma. Initial compliance in HMPC documentation was 59%. From 2009 to October 2016, compliance had increased to 72% which was mostly attributed to behavior-based interventions. From October 2016 to August 2017, compliance had increased to 96% which was mostly attributed to EMR based modifications. By the end of the 16th PDSA cycle, the overall compliance was 99%.
Conclusion(s) Resident training increased compliance rates of HMPC documentation, however utilization of EMR modifications with hard stops further yielded sustained increase.

EMR based interventions may result in sustained improvement in clinical practice among health workers, compared to education and behavior-based interventions alone.

Table 1. Interventions implemented prior to and across Six PDSA cycles.

Year	Intervention
2009	HMPC made into paper chart document prior to patients discharge.
2014	1.Migration of HMPC to electronic medical record. 2.Education of residents at the beginning of each inpatient rotation. 3. Regular email reminders sent to residents regarding checklist of tasks prior to patient discharge. 4. Performance and reporting of "Plan Do Study Act" PDSA every quarter of the year, which began in June 2014.
2016	Creation of a hard stop in the electronic medical record (EMR) to ensure all 5 sections of the HMPC are complete prior to placement of a discharge order.
2017	Creation of HMPC in patients preferred language.

Graph 1. Illustrating HMPC compliance over the years.



Abstract: 295

Does universal UDS in pregnant women improve early identification of infants at risk for NAS?

Twiza C. Mambwe[1], Seleshi Demissie[2], Suzanne Nonnenmacher[3], Dana Kaplan[1], Jonathan Blau[1], Vinisha Singhi[1]

[1]Pediatrics, Staten Island University Hospital, Staten Island, New York, United States, [2]Research, Staten Island University Hospital, Staten Island, New York, United States, [3]Laboratory Medicine, Staten Island University Hospital, Staten Island, New York, United States

Background The rise of the opioid epidemic, has downstream effects on infants born to mothers using substances during pregnancy, placing these infants at risk for developing neonatal abstinence syndrome (NAS)[1]. These infants are at further risk for adverse neurological outcomes, abuse and hospital readmissions[2,3]. Early knowledge of in utero opioid exposure allows for prompt intervention. No consensus/guidelines on universal urine drug screens (UDS) for pregnant women exists in the literature[4, 5]. Many hospitals do targeted UDS which can unfairly target low-income women[5]. Universal UDS may catch a larger cohort of mothers who would otherwise not meet criteria for targeted UDS[6]
Objective Identify infants at risk for NAS based on maternal UDS results to provide timely medical/social interventions.
Design/Methods Universal UDS was implemented in the labor and delivery unit (L&D) at our institution starting April 2018. Data was evaluated from April 2018 to December 2018 for universal screening and January 2017 to December 2017 for targeted. All mothers in L&D provide assent for urine collection at the time of admission. The urine is screened for a panel of drugs of abuse, excluding THC/Cannabis, and confirmatory testing with GC/MS is obtained. Children born to mothers with a positive UDS, known opioid use, or mothers who refuse testing, are admitted to the High-Risk nursery for NAS observation and social work is consulted. Meconium is obtained and sent for toxicology as well. UDS, meconium results, NAS scores, historical and demographic information were collected, analyzed and compared to data where targeted screen was utilized
Results Since implementation of universal UDS, there have been 2200 births with 16 infants admitted for NAS scoring. Of the 16 infants, 11 had mothers with positive UDS. 18% (2) of the mothers with a positive UDS had no history of drug use and one of these infants developed NAS. The incidence of NAS was noted to be higher in infants identified through universal screening group vs. targeted screening (3600 births), 0.45% vs. 0.22% respectively (p = 0.12).
Conclusion(s) Since implementation of universal UDS, more infants at risk for NAS have been identified that with the use of targeted screening. While our results may not be statistically significant, they demonstrate great clinical significance given the increased level of risk of all forms of child maltreatment to drug endangered children. The limitation of our data is a small 'N'; a result of a short timeframe for data collection

Abstract: 296
Common Practice for Behavioral Health Screening in Pediatric Primary Care Settings
Joseph A. Menand[1], Mario Cruz[2]
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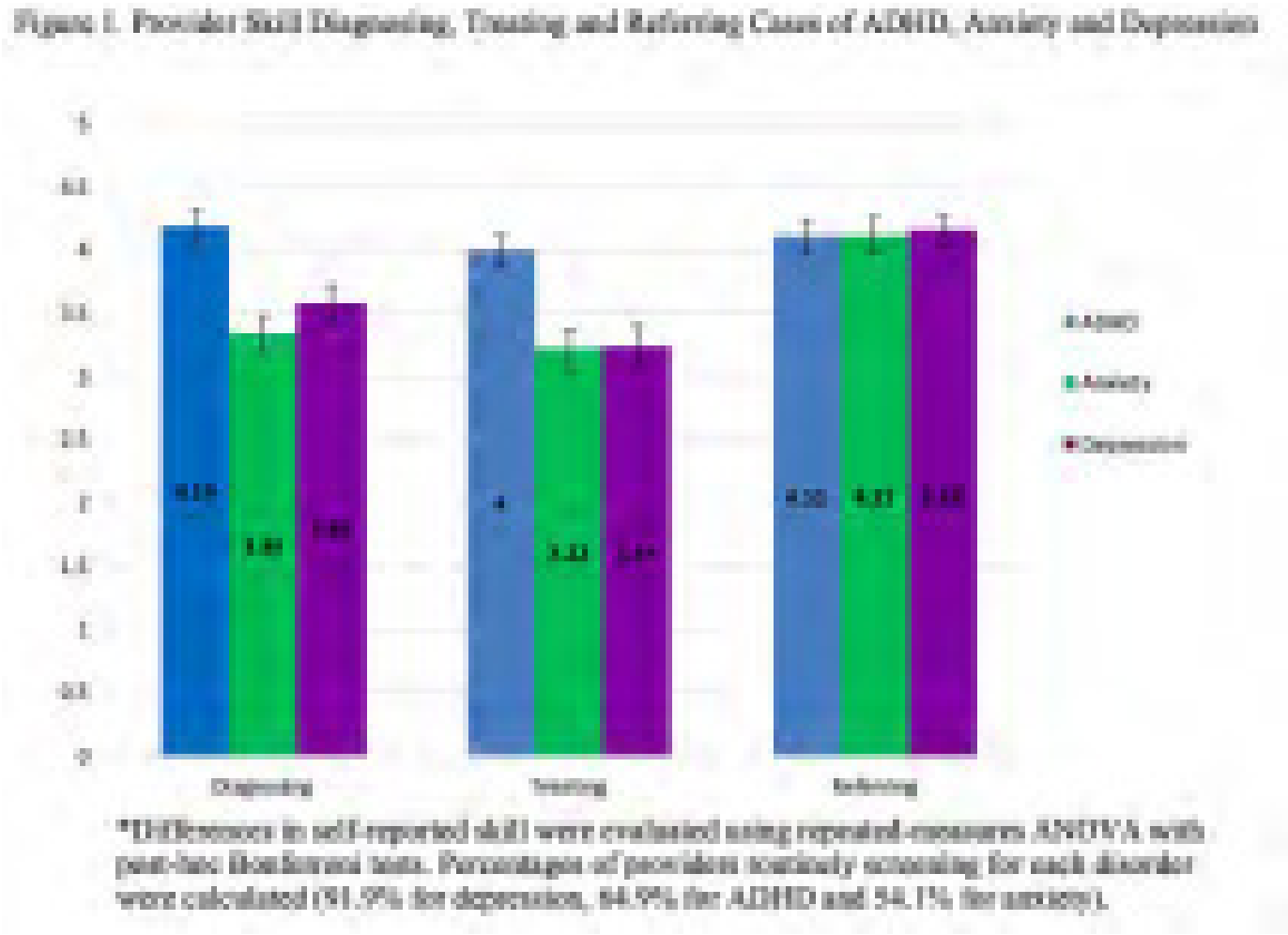
Background Mental health disorders in the United States are highly prevalent, affecting 14-20% of children yearly. Only 25-35% of these children receive treatment after an average six-plus year delay from symptom onset. Current recommendations suggest primary care providers (PCP) manage mental health conditions, specifically depression, however, PCPs are often wary, citing a lack of time, training and resources.
Objective To evaluate pediatric and adolescent PCP's self-reported skill diagnosing and managing ADHD, anxiety and depression, as well as common clinical practices (e.g. choice in screening tool, behavioral or pharmacologic intervention, etc.) and perceived barriers to care.
Design/Methods A web-based self-report survey assessing PCP knowledge/skill in diagnosing, treating and referring each disorder on a 5-point Likert scale was developed and distributed to PCPs via email. Providers were also asked to report screening rates, choices in screening tools, potential pharmacologic and behavioral interventions and referral practices.
Results Providers (N=37) indicated significantly greater skill in diagnosing ADHD (M=4.19, SD=0.75) when compared to anxiety (M=3.33, SD=0.86, $p < 0.001$) and depression (M=3.58, SD=0.87, $p < 0.001$). Providers also reported greater skill in diagnosing depression when compared to anxiety (p = 0.018). Providers also indicated significantly greater skill in treating cases of ADHD (M=4.0, SD=0.782) when compared to depression (M=3.22, SD=0.97, $p < 0.001$) or anxiety (M=3.24, SD=0.98, $p < 0.001$). No other significant differences were found between providers reported skills.
Conclusion(s) Providers were most likely to routinely screen patients for depression indicating that current guidelines are having an effect on PCPs management of mental health disorders. Given the large extent to which anxiety and other mental health disorders onset in childhood and adolescence, preliminary results suggest current recommendations expand to include routine screening for ADHD and anxiety disorders. With continued data collection, interesting relationships may be discovered between provider's choice in screening tools, first line treatments, referral practive, provider's perceived skill and clinical practice. These future results may aid in the development of specific strategies to address barriers to care in these specific areas. Limitations to this study include an inability to asses response rate and, to date, a limited number of responses.



Abstract: 297

Bronchiolitis Hospitalization Association with Delivery Method and Birth Season

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Background Bronchiolitis is the most common diagnosis for infant hospitalization. Impaired immunity has been implicated as one of the causes of bronchiolitis. Caesarian section birth reduces exposure to the maternal vaginal microbiome which may impair subsequent infant immunity.

Objective We sought to evaluate the association between scheduled Caesarian birth and hospitalization for bronchiolitis.
Design/Methods This was a retrospective study utilizing the Clalit Health Services Database that covers over 50% of the Israeli population with an annual attrition rate less than 1%. We created a cohort of all infants born from 2008-2010 in Clalit Hospitals. We extracted demographic and clinical characteristics at birth as well as bronchiolitis admissions in the first two years of life. A multivariable logistic regression model was generated with demographic and birth characteristics as predictors and bronchiolitis admission as the primary binary outcome. Primary interactions between predictors were assessed; when present models were stratified. We repeated the analysis using machine learning gradient boosted decision trees.
Results There were 124,526 infants born the time period studied and 5,102 (4.1%) were admitted for bronchiolitis. Delivery method and birth season were independently associated with bronchiolitis hospitalization. Our model found an interaction between birth season and birth delivery method. In a stratified model by birth season, the odds ratio (OR) for bronchiolitis hospitalization after scheduled Caesarian section as compared to spontaneous vaginal delivery were 1.28 (97.5% Confidence Interval (CI): 1.11-1.48), 1.40 (97.5% CI: 1.15-1.71), 1.46 (97.5% CI: 1.25-1.70), and 1.14 (97.55% CI: 1.00-1.29), for winter, spring, summer, and fall birth dates, respectively. Analysis with gradient boosted decision trees confirmed these findings and

multiple features derived from birth month emerged as important predictors.
Conclusion(s) When compared to spontaneous vaginal delivery, scheduled Caesarian section birth is associated with an increased odds of bronchiolitis admission in the first two years of life, and the effect size differs by birth season. This data supports the hypothesis that lack of exposure to the vaginal microbiome may be associated with bronchiolitis hospitalization for infants. Clinicians should consider this data when scheduling elective Caesarian section.

Abstract: 298
Demographic Characteristics of Firearm-owning Households with Young Children
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Background Over 5000 children in the United States receive emergency room treatment for gun-related injuries each year and over 1000 children die annually from gun-related injuries Nearly 1500 children under18 years old in 2015 died from firearm injuries, with most deaths occurring in their own homes. The current gun literature has analyzed prevalence, storage techniques, and views of all homes with guns. However, few studies evaluate gun ownership in homes with young children and associated demographic characteristics.
Objective To investigate the prevalence of gun-ownership in homes with young children in Northern Virginia and associated demographic characteristics.
Design/Methods Our retrospective cohort study sample enrolled in an ongoing childhood longitudinal cohort genomic study at a major tertiary hospital in Northern Virginia. Babies born at the hospital are followed from birth until a goal of 18 years of age. Parents complete surveys every 6 months and had to have completed the 42 month postpartum survey, where gun ownership was assessed, to be included in our study. The comparison between the characteristics of households that owned a gun and those that did not was analyzed using a logistic regression approach.
Results 722 families were included. 120 (16.6%) families reported having a firearm in the house. Mothers born in the U.S and likewise fathers born in the U.S were more likely to own a gun at home compared to those born outside of the US (p value- 0.0004, OR 4.516, CI 1.946-10.480 and p value-0.0001, OR 5.005, CI 2.186- 11.459 respectively). Hispanic mothers and Hispanic fathers were less likely to own a gun at home (p value 0.0019, OR 0.132, CI 0.037- 0.473 and p value 0.0218, OR 0.348, CI 0.141 -0.858). Additionally, white fathers were more likely to own a firearm at home compared to non-white fathers (p value 0.0110, OR 3.179, CI 1.303-7.756). However, when comparing white vs non-white mothers, there was no association between mother race and gun ownership (p- value 0.2761, OR 1.486, CI 0.728- 3.033).
Conclusion(s) The data shows statistically significant associations between parental ethnicity and country of origin for households of young children with firearms. Statistically significant factors associated with increased gun carriage in homes can help identify children at risk for potential harm by firearms in the home. Thus, these findings may help develop targeted interventions in the hospital and clinic settings as well in the broader community and policy arenas to prevent and reduce childhood injuries by firearms.

Abstract: 299

Comparison of Body Measures, Lifestyle Behaviors, and Behavior Change Determinants in Male and Female Adolescents in a Pilot Diabetes Prevention Study

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Background The current literature lacks sufficient studies on sex differences in youth diet and physical activity behaviors and the determinants of these behaviors.

Objective To compare body measures, lifestyle behaviors, and behavioral determinants among male and female overweight/obese adolescents recruited for a diabetes prevention program for ethnic minority adolescents from a low income urban community.

Design/Methods We screened 149 overweight/obese adolescents (BMI>85th percentile) for pre-diabetes and obtained body measurements and administered a health and lifestyle survey. We analyzed clinical and survey data using descriptive statistics and bivariate analyses (chi-square and t-tests).

Results Survey data were available from 92 females and 57 males ages 13-19 years (32% Black, 69% Hispanic). There were no differences in demographic characteristics (race/ethnicity, age, and level of parent education) between males and females. Average BMI z score (1.91 in females vs. 1.99 in males, p=0.340) and waist circumference (96 cm in females vs. 98 cm in males, p=0.609) did not vary significantly by sex, but percent body fat measured by bioimpedance was relatively higher in females than males (42% vs. 32%), based on published percentage body fat percentiles by sex and age. Significant sex differences in behavioral determinants are presented in Table 1. Compared to boys, girls had poorer self-perceived health status, reported less success with weight loss, and worried more about getting diabetes. Girls were less confident in their ability to eat healthy foods when hungry after school or when bored, and to exercise when feeling bad about their bodies. Girls also had more perceived barriers to healthy eating and active living, less positive social influences toward a healthy lifestyle, and more negative emotions and poorer body image compared to boys. Dietary and physical activity patterns differed between the two groups. Girls generally had less healthy behaviors with some exceptions as noted in Table 2.

Conclusion(s) Examination of body measures, diet and physical activity behaviors, and determinants of these behaviors in this sample of overweight/obese teens found that girls were prone to less healthy behaviors and had relatively higher body fat percentage based on published sex-specific norms. Future research will further examine sex differences in weight related behaviors and effectiveness of diabetes prevention programs among male and female adolescents.

Abstract: 300

Connecticut Detergent Ingestions and Socioeconomic Status

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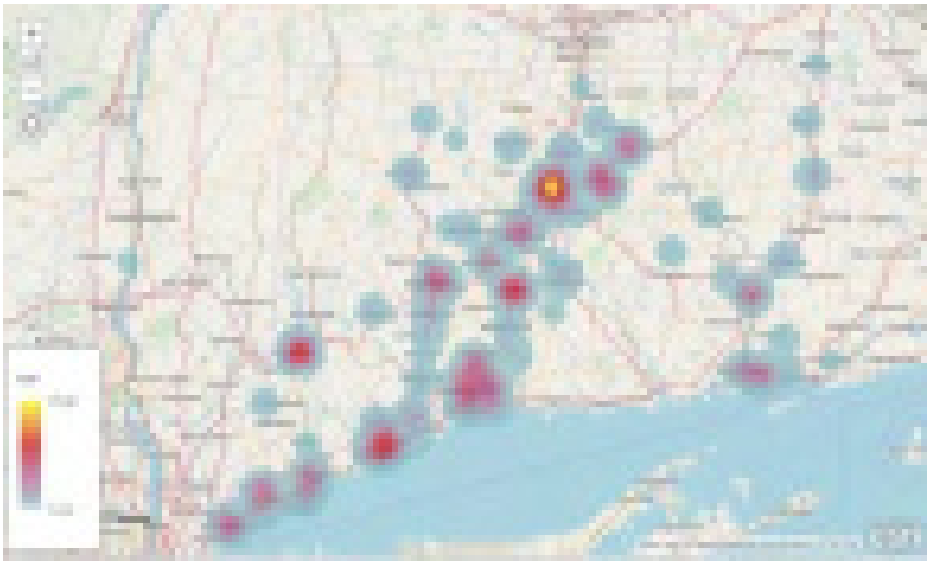
Background Detergent ingestions began markedly increasing in 2012 with the introduction of laundry detergent pods. The pods contain highly concentrated alkaline solutions that cause significant harm when young children are accidentally exposed. Detergent pods, both laundry and dishwasher, are also much more expensive than traditional liquid detergents. In general, pods are about 66% more expensive per load than liquid detergent for laundry, and pods are100% more expensive than liquid dishwashing detergents.

Objective To evaluate the relationship between detergent exposures in young children and socioeconomic status.

Design/Methods The Connecticut Injury Surveillance System was used to identify emergency department visits for toxic effects of detergents during the period 2012-2017 in children aged birth to 6 years. Zip codes for the location of exposures were used to categorize each exposure into a 2016 District Regional Group (DRG). DRG classifications, A to I (highest to lowest) are based on median household income, parental education, occupation, family structure, poverty, home language and district enrollment. Geomaping and t-tests were performed to analyze the relationship between DRGs and frequency of detergent exposures.

Results There were 279 total detergent exposures; 268 were from Connecticut, and 11 from New York. The 268 exposures represented 116 (43%) girls, 152 (57%) boys, majority 3 years or younger (89%), the number of exposures/year were highest in 2013, 2014 and 2015 (see table). The highest total number of exposures were in the highest population centers (see table). The ratio of exposures to proportion of school children/1000 in each DRG was also significant (p=0.02) with higher proportion

of exposures in poorer DRGs.
Conclusion(s) Detergent exposures peaked after the introduction of detergent pods in Connecticut and appear to be decreasing. Both the highest number and highest proportion of exposures were in DRGs with the poorest families. This suggests that the challenges faced by families living in high poverty districts had a stronger impact on detergent exposures that the additional cost of the detergents themselves.



Age (years)	0	28			DRG	Total number, (rate/1000 school children)
	1	115			A	5 (0.10)
	2	75			B	6 (0.07)
	3	21			C	24 (0.26)
	4	13			D	10 (0.22)
	5	12			E	6 (0.03)
	6	4			F	37 (1.00)
Sex	Girls	116 (43%)			G	52 (0.75)
	Boys	152 (67%)			H	28 (1.27)
Years	2012	43			I	100 (1.14)
	2013	65				
	2014	47				
	2015	53				
	2016	32				
	2017	28				

Abstract: 301
Addressing Food Insecurity in the Pediatric Emergency Department

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Background Food insecurity (FI), defined as lack of consistent access to affordable, nutritious food for an active, healthy life, is associated with adverse health outcomes and increased health care utilization in children. Despite nutrition assistance programs and local food pantries, FI prevalence is higher in Baltimore (1 in 4 children) compared to the national average (1 in 6). The American Academy of Pediatrics (AAP) recommends that all pediatricians screen for FI. Many vulnerable families who lack access to a medical home utilize the pediatric emergency department (PED), making PED a critical access point to address FI.
Objective 1) To determine the prevalence of FI in families who present to an academic, urban PED in Baltimore, Maryland; 2) To evaluate the impact of a food pantry within the PED, and 3) to evaluate the effectiveness of providing households that screen positive for FI with a list of community food resources.
Design/Methods In this mixed-methods study, caregivers of PED patients were screened for FI with AAP 'Hunger Vital Sign', 10/12/18-11/12/18. Non-English speaking caregivers, patients without caregivers present, and households previously screened were excluded. All caregivers who screened positive for FI received a list of community resources (e.g. WIC, food stamps, food pantries). Using block randomization, 1 in 10 households with FI received non-perishable groceries: 2 meals and snacks for a family of 4. 2-4 weeks after the PED visit, a post-interventional telephone survey assessed the impact of these food resources. Content analysis identified themes describing the impact of FI screening and the food pantry in the PED.
Results Of the 436 eligible households screened, 149 (34%) screened positive for FI and received handouts on community resources;16 received groceries (Figure 1). Demographics are found in Table 1. Of the 57% of households who completed the post-intervention survey, 15% connected with referred community resources and 100% who received groceries utilized them. Themes regarding the food pantry centered around its helpfulness and acceptance by children; themes of community resource handouts included difficulty with access, or lack of necessity (Table 2).
Conclusion(s) FI screening confirms a high prevalence of FI amongst PED patients highlighting the importance of implementing this screening tool in the hospital setting. Post-interventional survey suggests that a hospital-based preventative food pantry may benefit patients and their families since there are barriers to accessing community resources.

Table 1: Demographic Characteristics

Food insecurity (FI) Screening	N (%)
Positive FI	149 (34%)
Negative FI	283 (66%)
Gender of patient	N (%)
Male	213 (49%)
Female	221 (51%)
Average age of patient	Years (range)
	7.4 (0.01 - 17.9)
Average # of people in a household	N (range)
	4 (2-12)
Has medical home	N (%)
	424 (98%)
Race/Ethnicity	N (%)
American Indian or Alaskan Native	1 (0.2%)
White	131 (30.2%)
Asian	11 (2.5%)
Black or African American	287 (67%)
Native Hawaiian or Pacific Islander	0 (0%)
Latino or Spanish	13 (3%)
Other or mixed	30 (6.9%)
Don't know	0 (0%)
Refused	1 (0.2%)
Benefits received prior to intervention	N (%)*
WIC	121 (28%)
SNAP	197 (45%)
Afterschool Nutrition Program	18 (4.1%)
Summer Nutrition Program	12 (2.8%)
Food bank or pantry	26 (6%)
None	183 (42%)
Other	16 (3.7%)
Unknown	2 (0.5%)

* Patients may be lost to follow up for SNAP given each household can receive benefits from multiple households

Table 2: Themes and Illustrative Quotes of Impact of FI Screening and Food Pantry

On the Impact of Groceries from the FCD food Pantry:
Theme 1: Families found groceries were helpful
"It was good to get stuff at that time, you know, it was the end of the month, so we needed in... I [need to get] paid to ... go grocery shopping."
"Yes I think my son was a little embarrassed but I really needed the help... he was like 'mom we really need food'. I'm like 'yes'...you know you try to keep your kids from stuff like that."
"At this time I was kind of low on food and I hadn't made it to the market so that kind of helped me out."
Theme 2: Children generally accepted the food from the grocery bags
"[The kids] took all the cereal and all the fruit. And they took it to their rooms so it was eaten"
"Some of it we used and some of it we didn't really use because she [child] didn't like it but most of it we used because it was like essential things"

On the Impact of Handouts Given to Families Identified with Food Insecurity:
Theme 1: Many families had difficulty in accessing the community resources.
"I'm working two jobs, once I leave one job I have to get another job and it's kind of hectic"
"A lot of the resources you have to get a little bit of help, they make you walk a mile just to get a little bit of help"
"I just haven't had time to stop to make the phone calls. And I know most of them close at a certain time."
Theme 2: Those who already had nutritional resources found these useful, and didn't feel a need for using resources on the handout
"There's a church that I go to if I'm running low on food or anything, like the food stamps that's not sufficient, and I need something."

Abstract: 302

Differences in Resilience among Hispanic Women and Associations with Low Birth Weight: Beyond the Hispanic Paradox

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Background Low birth weight (LBW) rates among Hispanic women have been described as paradoxical as their rates are lower than non-Hispanic black women (despite similar socioeconomic and health care access barriers) and similar to rates among non-Hispanic white women. The etiology of this paradox may reflect the heterogeneity among Hispanic women by differing familial culture of origin, which may result in differences in socioeconomic status (SES), education, or resilience.

Objective Describe differences in resilience by culture of origin among Hispanic women and assess for a relationship between resilience and LBW in this group.

Design/Methods We constructed a retrospective cohort of 592 Hispanic women surveyed repeatedly as part of The National Longitudinal Study of Adolescent to Adult Health (Add Health). Wave 4 questions were used to create an Add-Health resilience scale via factor analysis. Differences in resilience, SES, and LBW were measured among women of different Hispanic backgrounds. Regression models explored the relationship between resilience and LBW in this sample after adjusting for education and household income.

Results Hispanic women who identified as Cuban had the highest resilience scores, with an average score of 16.3 (SD 5.5), out of a max possible score of 29 (Table 1). Their scores were significantly higher than Puerto Rican (13.0, SD 4.8) and Central/South American women's scores (13.3, SD 4.9) (Bonferroni corrected p-values 0.001 and 0.008, respectively). In multivariate models, Cubans were 1.8x more likely to be in a higher resilience category compared to the Mexican women reference group (Table 1). Cuban women also had the highest proportion of LBW births (14.5%) compared to the other

Hispanic subgroups (Table 2), though differences were not statistically different in bivariate or multivariate analyses. The odds of LBW appeared to decrease as level of resilience increased, but these findings did not reach statistical significance (Table 3).

Conclusion(s) In this sample of Hispanic women, Cuban women appeared to be more resilient than similarly aged Hispanic women of Mexican, Chicano, Puerto Rican or Central/South American background. This suggests that resilience may be culturally-mediated. However, increased resilience may not necessarily be protective with respect to LBW. Further work to delineate the relationship between resilience and adverse birth outcomes must consider the variety of cultural backgrounds within Hispanic communities.

Table 1. Differences in Resilience by Hispanic Cultural Origin

Hispanic Subgroup	Sample Size	Mean Resilience Scores (SD)*	Odds of Higher Resilience† (aOR, 95% CI)
Mexican	303	14.5 (4.7)	Ref
Chicano	38	14.2 (5.5)	1.01 (0.58-1.74)
Cuban	76	16.3 (5.5)	**1.79 (1.32-2.42)**
Puerto Rican	67	13.3 (4.9)	1.01 (0.62-1.63)
Central/South American	54	13.0 (4.8)	1.01 (0.65-1.57)
Other Hispanic	54	13.8 (5.4)	0.64 (0.39-1.07)

*Chi square p-value = 0.001

†Model clustered by high school where participants were initially recruited and surveyed. Adjusted for household income and maternal education. Significant results are bolded.

Differences in Resilience by Hispanic Cultural Origin

Table 2. Differences in Low Birth Weight (LBW) by Hispanic Cultural Origin

Hispanic Subgroup	Low Birth Weight* (% of all births)	Adjusted Odds of LBW† (aOR, 95% CI)
Mexican	10.6%	Ref
Chicana	10.5%	0.83 (0.33-2.12)
Cuban	14.5%	1.40 (0.69-2.83)
Puerto Rican	11.9%	1.10 (0.48-2.51)
Central/South American	13.0%	1.46 (0.75-2.86)
Other Hispanic	3.7%	0.36 (0.07-1.75)

*Chi square p-value = 0.533

† Model clustered by high school where participants were initially recruited and surveyed. Adjusted for household income and maternal education.

Differences in Low Birth Weight (LBW) by Hispanic Cultural Origin

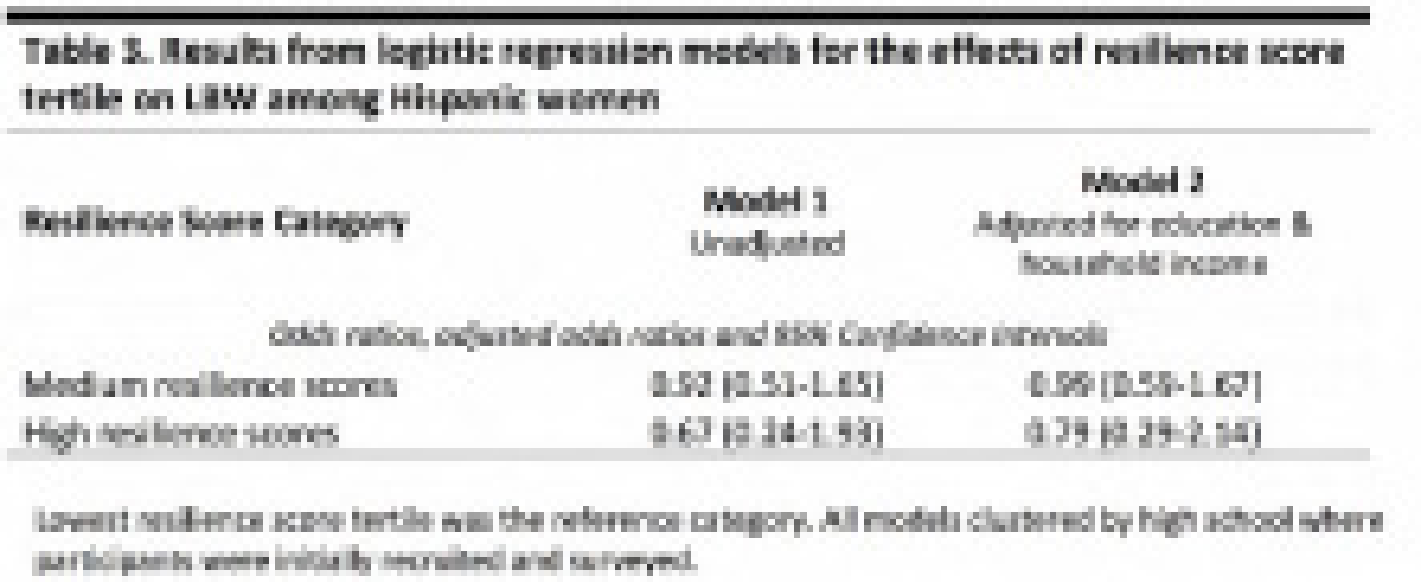

Table 3. Results from logistic regression models for the effects of resilience score tertile on LBW among Hispanic women

Resilience Score Category	Model 1 Unadjusted	Model 2 Adjusted for education & household income
	Odds ratios, adjusted odds ratios and 95% Confidence intervals	
Medium resilience scores	0.92 (0.51-1.65)	0.99 (0.55-1.82)
High resilience scores	0.67 (0.34-1.33)	0.79 (0.39-1.61)

Lowest resilience score tertile was the reference category. All models clustered by high school where participants were initially recruited and surveyed.

Effect of resilience score tertile on LBW in Hispanic Women

Abstract: 303

Higher utilization of social services is associated with higher language scores in children from deeply impoverished families

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Background Data suggest that there is a negative relationship between familial socioeconomic status and health and developmental outcomes in children. Less is known about how provision of social services mitigates these effects.

Objective To study the relationship between familial utilization of social services and language development during the first year of life.

Design/Methods These data were collected as a part of a larger longitudinal study examining the association between socioeconomic status and child development. Infants and their mothers were recruited at 6-, 9- or 12-months of age from English or Spanish speaking families from the New York metropolitan area. Each infants' language skills were assessed using the standardized Preschool Language Scale, and mothers provided information about basic demographics, parental education, income, family size, and utilization of the following social services: WIC, food stamps, Medicaid and public housing. This analysis was limited to 30 infants whose families qualified for all social services.

Multiple linear regressions were used to investigate the relationship between number of social services utilized and language skills, controlling for maternal education, child age, and family poverty as measured by income-to-needs (ITN) ratios, defined as family income divided by the family-size specific federal poverty level. A model investigating the moderating role of family poverty on the relationship between social services utilization and language skills was also assessed (Figure 1).

Results The majority of infants in this analysis were 12 months old and from Hispanic families (Table 1). The number of social services utilized was not a significant predictor of language skills. However, the number of social services utilized interacted with the ITN ratio to predict expressive language (interaction variable: β=-0.37, p=0.024, model: R^2=0.50, F=4.74, p=0.004), suggesting that depth of poverty moderated the relationship between social services utilization and language. Probing this relationship, we found that families in deep poverty had the strongest positive relationship between number of services utilized and children's language scores (R^2=0.40, p=0.02) (Figure 2).

Conclusion(s) For infants from families in deep poverty, we found a positive relationship between number of social services utilized and language skills.

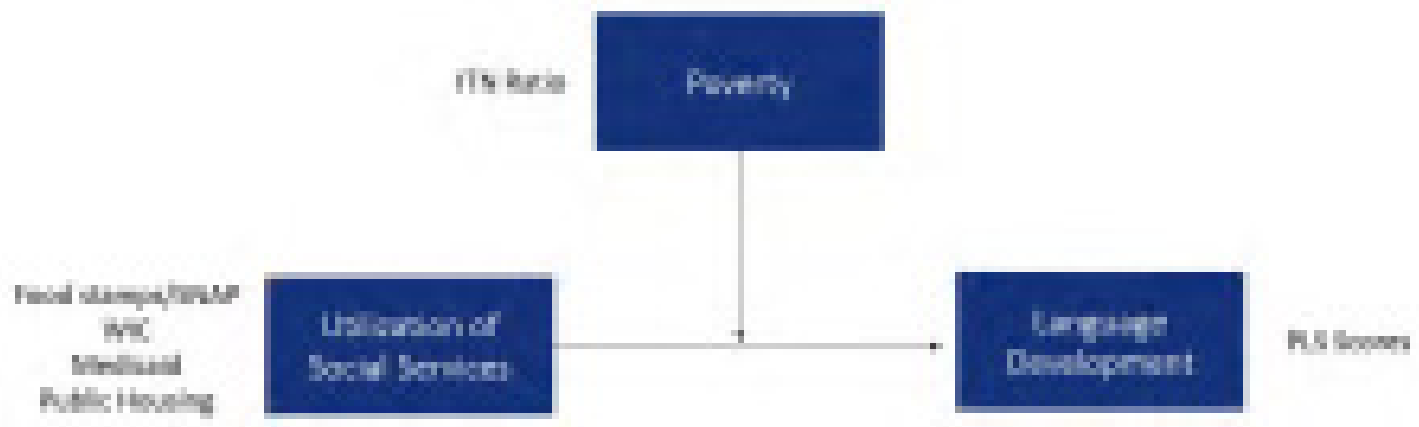

Figure 1. Proposed Moderation Model

Characteristic		N=30
Child Age	6 months	5 (17%)
	9 months	9 (30%)
	12 months	16 (53%)
Maternal Education	High school or less	22 (73%)
	More than high school	8 (27%)
Child Race	Black	12 (40%)
	White	1 (3%)
	Other	8 (27%)
	Unknown	9 (30%)
Child Ethnicity	Hispanic	16 (53%)
	Not Hispanic	9 (30%)
	Unknown	5 (17%)
Family Size	Mean (SD)	4.6 (2.1)
Annual Income	Mean (SD)	$16,746 ($10,457)
ITN Ratio	Mean (SD)	0.62 (0.37)

Table 1. Baseline Characteristics

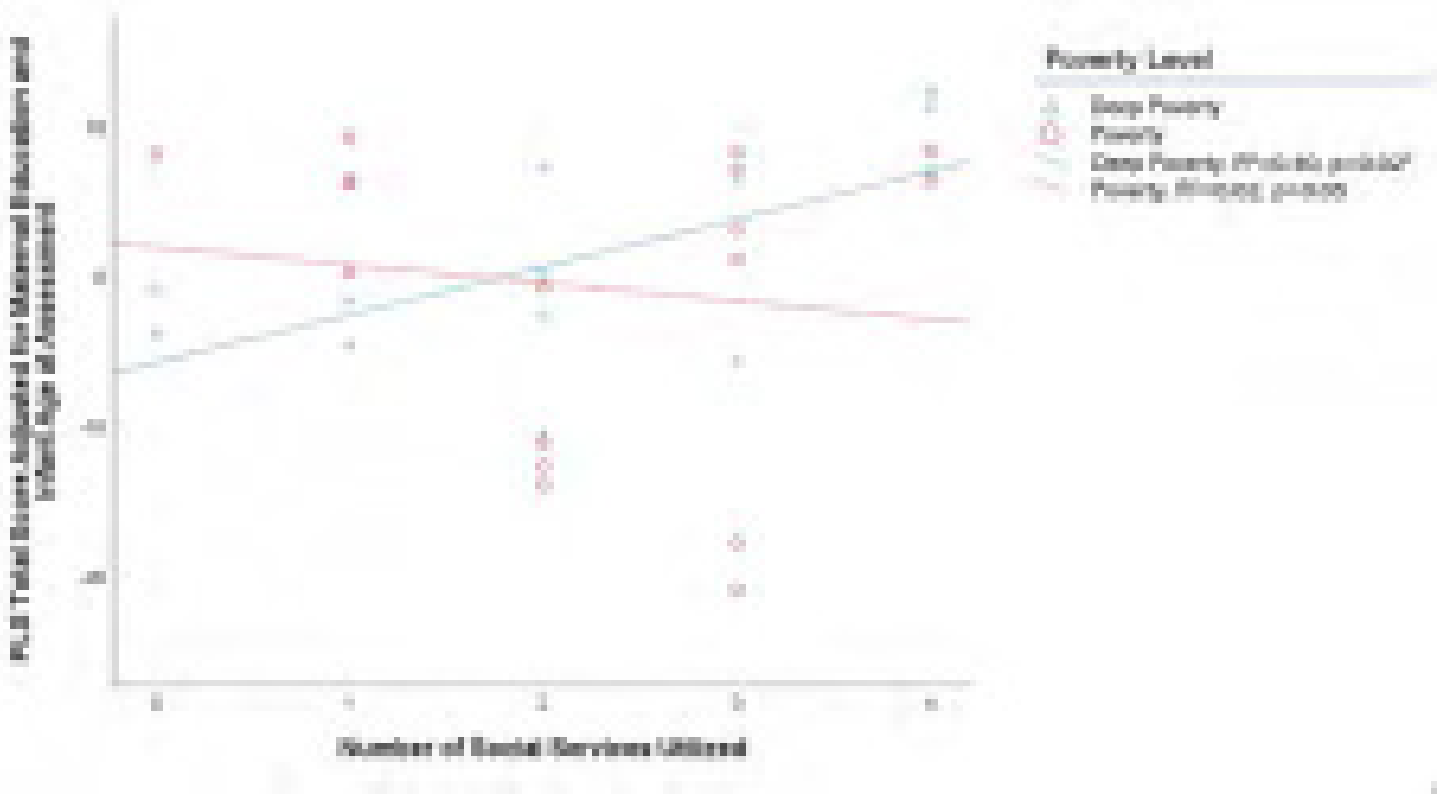

Figure 2. Number of Services Utilized vs. Children's Language Scores Stratified by Poverty Categories

Abstract: 304

To Treat or Not to Treat: New Diagnosis of Lupus in a Bacteremic Patient

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Background Systemic Lupus Erythematosus (SLE) is a chronic, widespread, inflammatory disease of unknown etiology. SLE affects between 5,000 and 10,000 children in the United States. Girls outnumber boys (8:1) and there is racial disparity, with the highest incidence of disease in children of Asian ethnicity. SLE typically presents with fever, hematologic, mucocutaneous, musculoskeletal or renal abnormalities. It is less common for SLE to present as invasive bacterial infection (IBI), but such cases can be fatal.

Objective To report the clinical course and difficult management decisions in the care of a pediatric patient with IBI and previously undiagnosed SLE.

Design/Methods Case report

Results We report the case of an 11-year-old previously healthy Nepali female presenting with three days of fever, cough, and respiratory distress. She was admitted to the ICU with large, right sided lobar pneumonia (Fig.1), hypotension, and concerns for sepsis. Workup revealed *streptococcal pneumoniae* bacteremia, pancytopenia, hematuria, proteinuria and AKI. HUS and DIC were ruled out. Hypocomplementemia, high ANA titer and positive ds-DNA antibody were detected. Her course was complicated by persistent oxygen requirement, progressive, bilateral pulmonary effusions (Fig.2), unremitting fevers to >103, large volume diarrhea, and edema with hypoalbuminemia. Despite proper antibiotic therapy and supportive care, respiratory symptoms were unrelenting, raising concern for superimposed lupus pneumonitis. As markers of infection improved, the decision was made to begin pulse dose methylprednisolone. Renal biopsy was deferred due to concerns for intubation risk and infectious complications. After 24 hours of steroid therapy, pulmonary and GI symptoms showed marked improvement. She ultimately underwent renal biopsy which showed class IV-G(A) lupus nephritis. The patient was discharged home on oral prednisone, hydroxychloroquine and mycophenolate.

Conclusion(s) It is uncommon for SLE patients to have IBIs at presentation, though this occurs more frequently in patients with Class IV lupus nephritis, due to the association of profound hypocomplementemia. At presentation, these children can be severely ill, and the literature is limited on the best management strategy. We highlight the necessity of a multidisciplinary approach to care, and the importance of considering both clinical and laboratory data prior to the initiation of systemic steroid therapy in lupus nephritis patients with severe invasive bacterial disease.

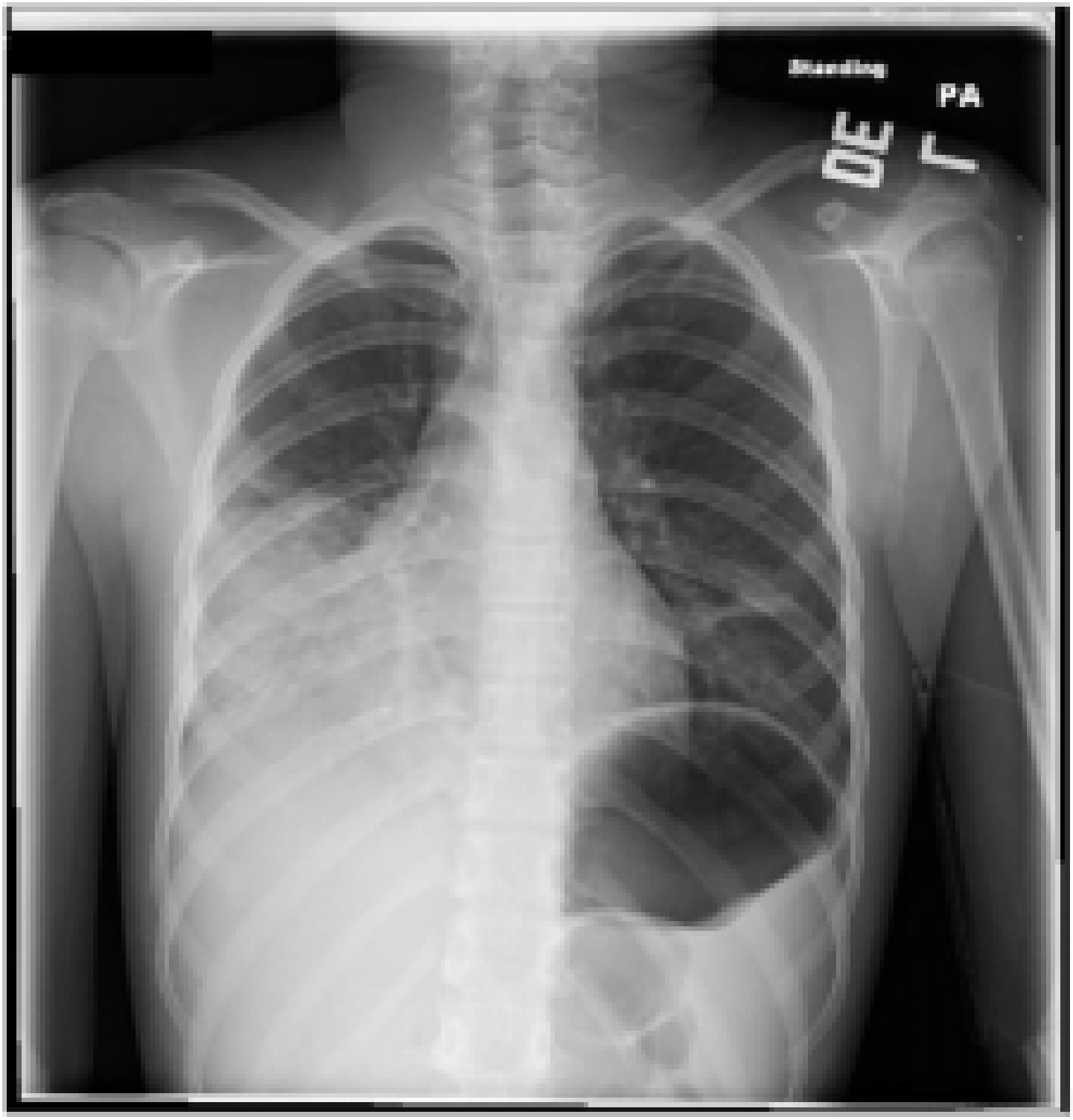

Figure 1. Initial upright chest radiograph upon presentation to the emergency department, showing prominent right middle lobe airspace disease with mild airspace disease in the right upper and lower lobes.

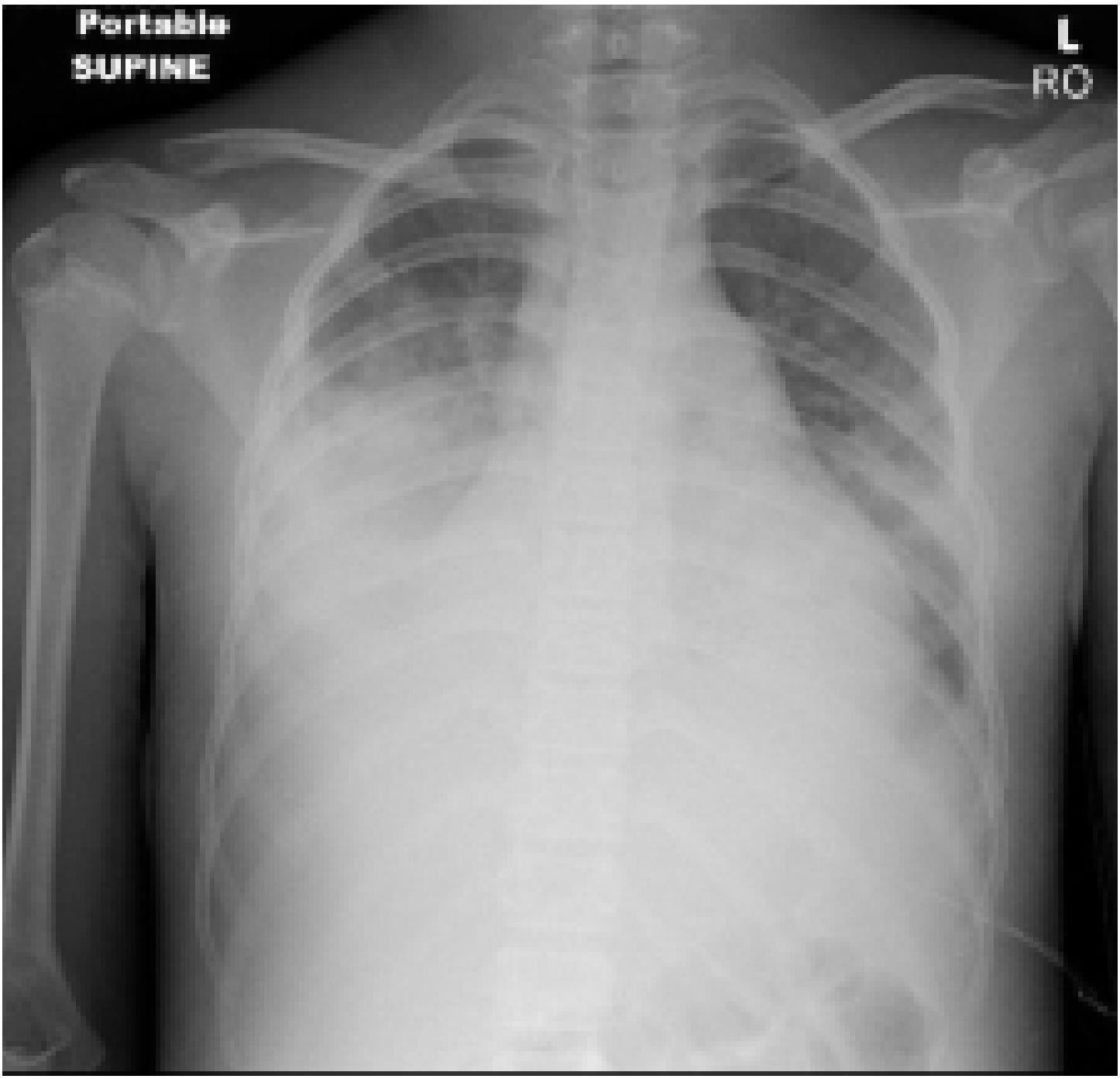

Figure 2. Portable supine chest radiograph on the fourth day of admission, showing progressed, right greater than left, bibasilar opacities and bilateral pleural effusions.

Abstract: 305
Association between mode of delivery and severity of RSV bronchiolitis in hospitalized children under 24 months of age
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Background

Respiratory syncytial virus (RSV) is one of the most common causes of bronchiolitis among infants and young children. Previous studies have found that children delivered by cesarean section (CS) have an increased risk of developing asthma. It has been suggested that altered microbiome in these children may affect immune system development and contribute to the development of respiratory symptoms. This hypothesis has prompted researchers to find an association between the severity of RSV bronchiolitis and the route of delivery. Kristensen et al. found that delivery by CS was associated with severity of RSV bronchiolitis resulting in an increased risk of hospitalization and suggested that this may be mediated by aberrant gut microbiota found in children delivered by CS. Hendaus et al. found no association between the route of delivery and RSV bronchiolitis severity.

Objective

To determine whether delivery by CS is associated with an increased risk of developing severe RSV bronchiolitis among children under 24 months of age

Design/Methods

This retrospective study was conducted at Monmouth Medical Center and included patients aged between 0 and 24 months who were hospitalized due to RSV bronchiolitis between January 2013 and December 2017.

Results

313 children with RSV bronchiolitis were included. 35% children were born by CS and 65% by vaginal delivery (P=0.0001). The length of stay in hospital for children delivered by CS was longer than that for children delivered vaginally, although this difference was not statistically significant. There was no difference in the frequency of use of supplemental oxygen between the two groups. There was also no difference in hospitalization to the pediatric intensive care unit or the pediatric floor between two groups. Compared to children delivered vaginally, children delivered by CS in our study were more likely to be premature, and have more underlying conditions. However, we found no difference in the severity of RSV bronchiolitis between the two groups. Some of the children were administered palivizumab and it is possible that these children had a less complicated disease course. As children delivered by elective CS have less exposure to maternal vaginal flora, we examined the association between duration of ROM and severity of RSV bronchiolitis. However, no correlation was observed.

Conclusion(s)

Compared to vaginal delivery, delivery by CS was not associated with an increased severity of RSV bronchiolitis among children under 24 months of age.

Characteristic of children hospitalized with RSV bronchiolitis by mode of delivery

Variable	Vaginal delivery no.(%)	Cesarean Section no.(%)	P value
Number of admissions	203 (65%)	110 (35%)	0.0001
Age on admission (months)	6.3±5.8	6.2±5.6	0.8
Male	118 (58%)	60 (55%)	0.5
Older sibling in the family	148 (73%)	89 (80%)	0.14
Family history of asthma	29 (10%)	23 (22%)	0.14
Gestational age (weeks)	38.7±1.6	36.2±4.1	0.00001
Pregnancy complications	18 (9%)	31 (28%)	0.00003
Length of stay	1.8±1.4	2.2±2.0	0.06
Supplemental oxygen	94 (46%)	52 (47%)	0.8
PICU admission	25 (12%)	17 (15%)	0.4

Abstract: 306

Improving hand hygiene compliance in the neonatal intensive care unit of a hospital.

gouri c. scheurmann[1], Tonya Lemonious[1], Oscar Gomez[1], Nair Jayasree[1], Roberto Diaz[2]

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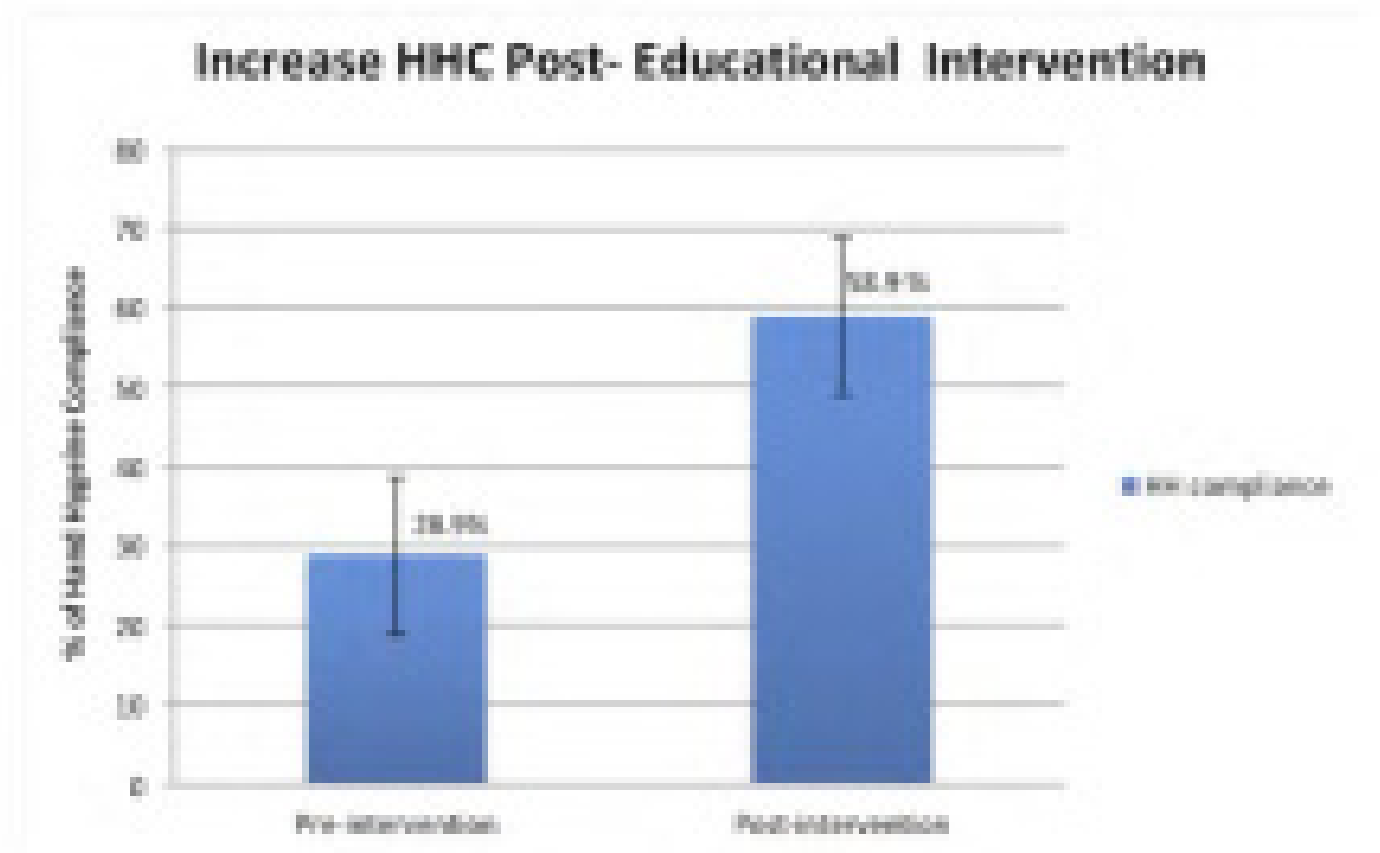
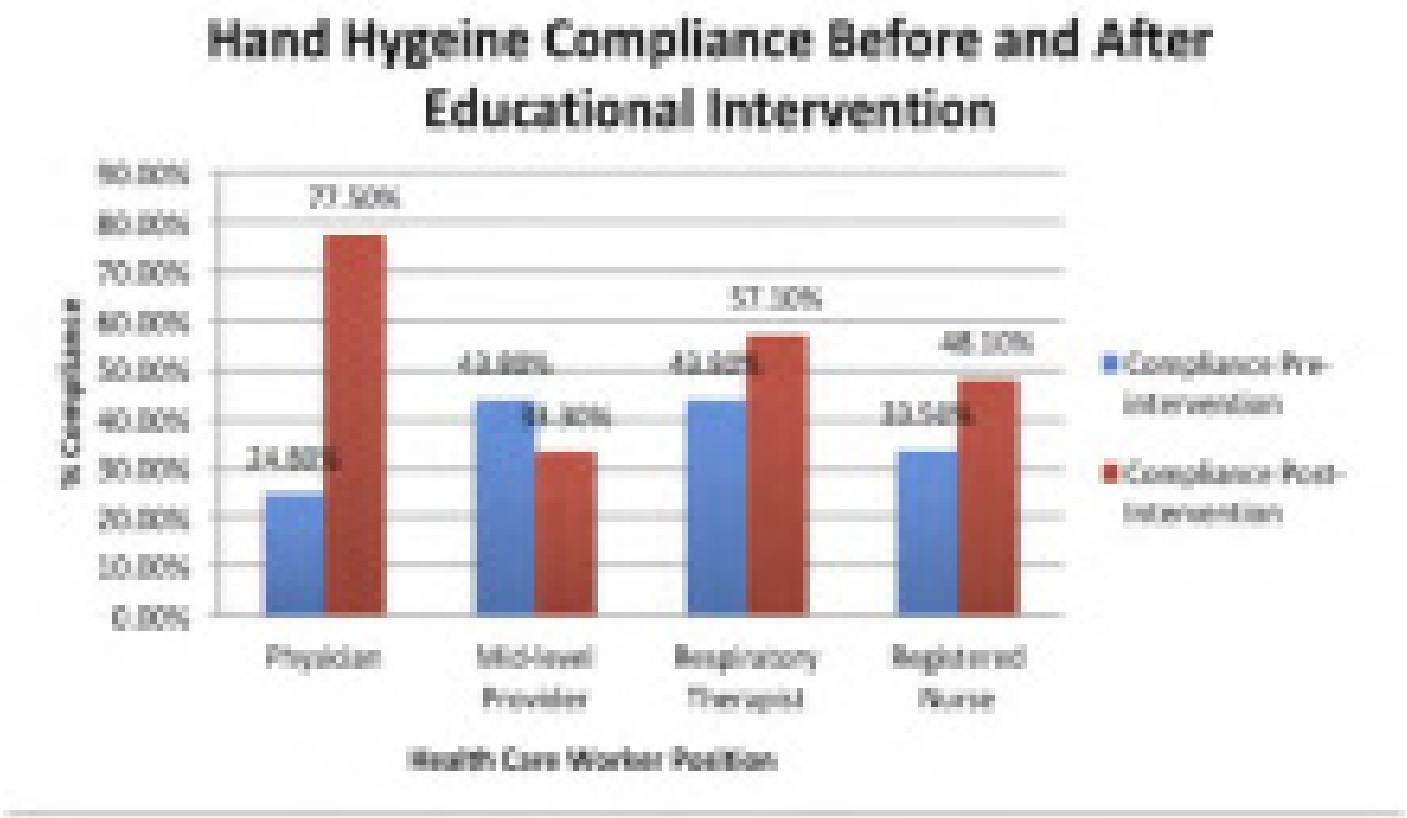
Background Poor Hand hygiene compliance (HHC) among health care workers is directly associated with high hospital acquired infections (HAI) worldwide. In 2011, the Centers for Disease Control and Prevention (CDC) reported 721,800 HAI per year in the United States among acute care hospitals and 75,000 associated patient deaths.
Objective The objective of this quality improvement study was to evaluate hand hygiene educational interventions on HHC among health care workers (HCW) in the Oishei Children's Hospital (OCH) neonatal intensive care unit (NICU).
Design/Methods This was a quality improvement project for increasing HHC at OCH NICU using the Plan-Do-Study-Act design. This study was exempt from IRB review as it did not involve study subjects.

The HCW staff included a multidisciplinary team of respiratory therapists, nurse practitioners, staff nurses, attending physicians, resident physicians, fellows, radiology technicians, child life staff, social workers, discharge planners, formula lab technicians, housekeeping staff, among others.

The study consisted of recording HHC of HCW entering and leaving patient rooms before and after educational intervention. The data collection instrument allowed recording of type of HCW, date, and HHC during day or night shifts. The instrument was completed by non-identified observers. No personal identifiers were collected in the study. The study implemented an educational intervention to all HCW based on CDC educational tools.
Results Surveillance included a total of 580 observations, 381 were pre-intervention and 199 post-intervention. HHC increased from 110 HCW (28.9%) pre-intervention to 117 (58.9%) post-intervention. The difference in HHC was statistically significant (p-value: 0.0025). HCW including Physician, Respiratory Therapist and registered nurses increased HHC post-intervention.
Conclusion(s) HHC Educational interventions among HCW NICU staff is associated with significant improvement in HHC. The educational intervention on HHC benefits NICU staff members and may contribute to a decrease of HAI in the NICU


Increase HHC Post- Educational Intervention
% of Hand Hygiene Compliance
0
10
20
30
40
50
60
70
80
28.9%
58.9%
Pre-intervention
Post-intervention


Hand Hygeine Compliance Before and After Educational Intervention
77.50%
57.10%
48.10%
Compliance Pre-intervention
Compliance Post-intervention
Physician
Mid-level Provider
Respiratory Therapist
Registered Nurse
Health Care Worker Position

Abstract: 307

Impact of reduced MRSA surveillance in a low prevalence Level IV Neonatal Intensive Care Unit

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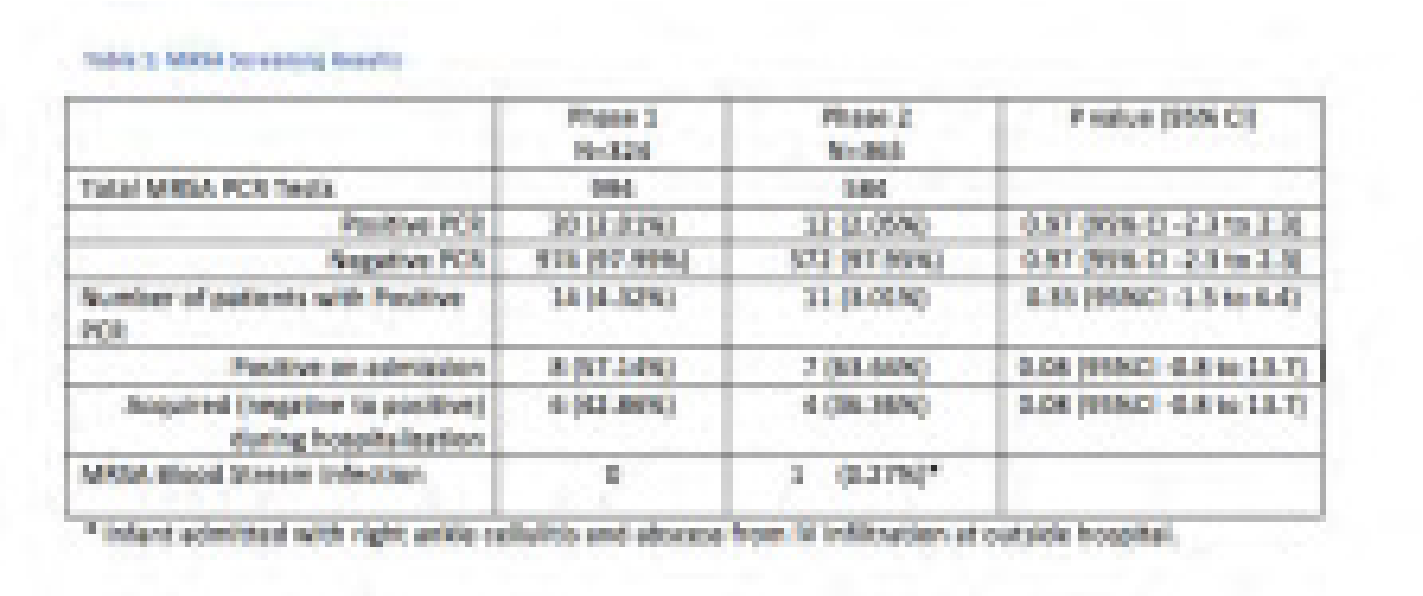
Background MRSA infection in neonates is associated with significant morbidity, mortality and hospital cost. Multiple studies have shown that these infections are often preceded by colonization but no consensus has been established for MRSA surveillance. Published comparisons of the accuracy and value of different surveillance protocols are lacking.

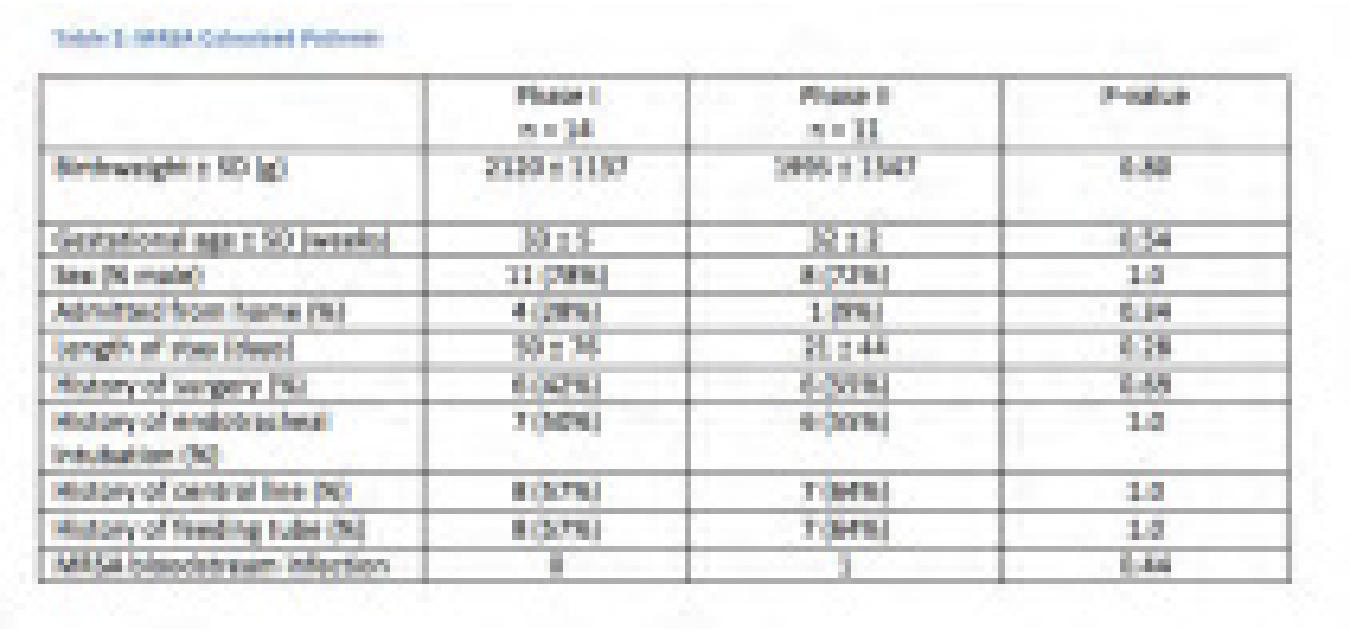
Objective To compare the prevalence of MRSA colonization, acquisition, and infection during two different MRSA screening practices and to evaluate the value of MRSA screening.

Design/Methods This is a retrospective data analysis of infants who underwent MRSA screening at a level IV NICU with all outborn neonates. A weekly surveillance PCR was obtained from nares between July 2016 and June 2017 (phase I), and only on admission and discharge between July 2017 and June 2018 (phase II). Patients with positive PCR were placed under contact precautions, but no decolonization was performed. Chi square test was performed to compare the two phases of screening, and student's t-test and fisher's exact test were used to compare the characteristics of MRSA colonized infants.

Results A total of 689 infants underwent MRSA screening during the study period; 324 infants had weekly MRSA surveillance and 365 infants had screening at admission and discharge. There was no statistically significant difference in MRSA colonization rate (4.3% vs 3.0%) or MRSA colonization acquisition (negative to positive, 1.8% vs 1.0%) between the phases (Table 1). Among MRSA colonized patients, nearly 60% were colonized on admission. Nearly 40% acquired MRSA colonization during hospitalization, none of which developed MRSA infection prior to discharge. There were no statistically significant differences in demographics or clinical characteristics among MRSA colonized patients in the two groups (Table 2). Considering the charge of $260 per MRSA screen at our institute, the change of practice decreased the overall surveillance-related charges by $106,600 in phase II.

Conclusion(s) In a Level IV NICU with relatively low MRSA prevalence, the change in MRSA screening practice from weekly surveillance to admission and discharge screening demonstrated no difference in MRSA acquisition or infection. The change of practice decreased the cost of surveillance significantly without a demonstrated impact on MRSA infection rate. Future study is needed to evaluate the utility of MRSA screening, decolonization and isolation practices in low prevalence NICUs, and to identify and standardize optimal MRSA surveillance protocols.





Abstract: 308

Neonatal Abstinence Syndrome (NAS) Outcomes After Implementation of New Treatment Protocol in the NICU

Nazli Kuter[1], Dorothy Wyatt[2], Sharon L. Sauer[2], Maryann Malloy[2], Agnes Salvador[1]

[1]Pediatrics, Einstein Medical Center Philadelphia, Philadelphia, Pennsylvania, United States, [2]Einstein Medical Center Philadelphia, Philadelphia, Pennsylvania, United States

Background To date there is no single NAS treatment protocol that has been proven superior. We implemented the following changes in our pharmacologic and nonpharmacologic treatment: (1) change of initial morphine sulfate (MS) dose from standard (0.1 mg/kg/dose) to symptom-based; (2) more structured weaning protocol; (3) implementation of infant cuddling volunteer program which allowed infants to be held when parents or nurses are not available.

Objective To assess outcomes of infants treated for NAS after implementation of new treatment protocol.

Design/Methods We conducted a retrospective chart review of drug exposed newborns admitted to NICU between 4/2016 and 3/2018 (Baseline) and 4/2018 and 10/2018 (New Treatment Protocol). We excluded infants ≤32 weeks gestation and those exposed only to marijuana, cocaine, or both. We abstracted maternal and infant demographics, drug exposure, maternal urine drug screen (UDS), infant UDS and meconium drug screen (MDS). Infants were monitored for withdrawal using the Finnegan Neonatal Abstinence Scoring Tool. Three consecutive scores ≥ 8 triggered pharmacotherapies. Outcomes of pharmacologically treated infants focused on length of MS treatment (start day to last day of MS), length of treatment (birth to end of treatment plus 2 days of observation), and length of stay (birth to discharge including days on hold for social or other medical issues).

Results During the study period, 111 drug exposed infants were admitted to NICU; 97 met inclusion criteria. Mean maternal age, gestational age and birth weight were not statistically significant between the Baseline and the New Treatment Protocol groups. Multiple drug exposure was common in our study population. There were significantly more short-acting opiate drug users in the Baseline group compared to the New Treatment Protocol group (P=0.05). Positive maternal UDS, infant UDS and MDS were similar in both groups. We decreased length of MS treatment and length of stay each by an average of 8 days with implementation of the new treatment protocol. (Table1: Infant Outcomes)

Conclusion(s) A novel treatment protocol which consists of symptom-based initial morphine sulfate treatment, a more structured weaning protocol, and a non-pharmacologic therapy of "infant cuddling" was effective in reducing the length of treatment and length of hospital stay in infants with NAS in our NICU.

Table 1. Infant Outcomes

	Baseline (N=67)	New Treatment Protocol (N=30)	p
Non-pharmacotherapy	20 (29.9%)	12 (40%)	
Pharmacotherapy	47 (70.1)	18 (60%)	0.48
MS	32	10	0.27
Phenobarbital	4	2	1.00
MS + Phenobarbital	11	6	0.77
Day of life MS started	2.9 ± 1.9	2.8 ± 1.0	0.85
Length MS Tx (days)	27.7 ± 13.4	19.9 ± 9.8	0.04
Length of treatment (days)	27.4 ± 8.0	22 ± 9.6	0.05
Length of stay (days)	32.1 ± 14.0	34.4 ± 10.4	0.04

Table 1. Infant Outcomes

Abstract: 309

Outcomes of Controlled Hypothermia versus Combined Controlled Hypothermia with Extracorporeal Membrane Oxygenation in Neonates: A Tertiary Center`s Experience

Swosti Joshi[1], Bayan Abdallah[2], Vilmaris Quinones Cardona[1], OGECHUKWU Menkiti[1]

[1]Pediatrics (Neonatology), St. Christopher`s hospital for Children, Philadelphia, Pennsylvania, United States, [2]Pediatrics, Albert Einstein Medical Center, Philadelphia, Pennsylvania, United States

Background Controlled hypothermia (CH) is neuroprotective in term and near-term infants with moderate to severe hypoxic ischemic encephalopathy (HIE). Extracorporeal membrane oxygenation (ECMO) remains the treatment of choice for persistent pulmonary hypertension of the newborn (PPHN) refractory to medical treatment. CH and ECMO can directly affect hemostasis by altering platelet function and/or coagulation cascade enzymes activity. CH with ECMO (CH/ECMO) is a rescue therapy in infants with HIE and refractory PPHN, however, the evidence is conflicting. While some studies have found CH/ECMO to be relatively safe, others have shown an increase in coagulopathy and no changes in outcomes at 2 years.

Objective To compare the neurological, cardiovascular, renal, hematological indices and short-term outcomes in neonates who received CH versus CH/ECMO.

Design/Methods Single-center retrospective review between 01/01/2010 and 05/31/2018 of neonates undergoing CH and CH/ECMO.

Results Thirty-seven patients were included. Both groups had similar clinical characteristics (Table 1) except for a higher initial oxygenation index (OI; mean of 20.52 vs 8.49, p=0.005) and need for multiple inotropes (83% vs 20%, p=0.001) in CH/ECMO group. Although initial coagulation profiles of both groups were similar, the CH/ECMO group required more blood product transfusions. Four patients (16%) in the CH group suffered moderate to severe coagulopathy vs 5 (40%) in CH/ECMO group (p=0.08). Two cases in the CH group and 3 in CH/ECMO group had intracranial hemorrhage (ICH). Although both groups had one patient each with ICH and pulmonary hypertension, only the CH/ECMO group revealed a patient with fulminant pulmonary hemorrhage.

There were no differences between groups for mortality or functional status at discharge among survivors (Table 2). Multivariable analysis revealed platelet level was an independent factor associated with bleeding complication during CH [OR: -0.33 (-0.005-0.00) 95% CI, p=0.035].

Conclusion(s) CH /ECMO was deployed in HIE cases with refractory PPHN as suggested by elevated OI and need for multiple inotropes.We found no difference between groups in mortality or degree of end-organ injury . Those requiring CH/ECMO had lengthier hospital stay, likely correlating to severity of illness necessitating ECMO. Careful monitoring and aggressive

management of platelet levels and coagulation profile in neonates undergoing CH or CH/ECMO can help mediate bleeding complications.

Characteristics of neonates

	Controlled hypothermia with ECMO N=12	Controlled hypothermia N=25	p-value
Birth weight , mean (SD), Grams	3297.75 (640.42)	3391.88 (609.02)	0.66
Gestational age, mean (SD), weeks	39.36 (1.51)	39.39 (1.41)	0.95
Gender , male, n (%)	7 (58)	16 (64)	0.73
1- Minute APGAR score , median (range)	2 (1- 4)	2 (1- 4)	
5- Minute APGAR score , median (range)	4.5 (1- 7)	4 (1- 9)	
Initial Ph, mean (SD)	6.92 (0.14)	6.94 (0.21)	0.76
Initial PCo2 , mean (SD) , mm Hg	77.35 (25.3)	67.25 (34.06)	0.37
Initial base deficit , mean (SD)	15.79 (4.66)	14.66 (8.81)	0.83
Lactate <24 hours, mean (SD)	4.97 (2.45)	7.83 (4.99)	0.71
Need of multiple inotropes, n (%)	10 (83)	5 (20)	0.001
Oxygenation index, mean (SD)	20.52 (15.01)	8.49 (7.57)	0.005

Neonatal outcomes

	Controlled hypothermia with ECMO N=12	Controlled hypothermia only N=25	p-values
Initial Alanine transferase , mean (SD), units/L	36.75 (22.55)	73.08 (119.73)	0.3
Initial aspartate transferase , mean (SD), units/L	130.16 (92.53)	161.16 (165.03)	0.55
Troponin <4 hours of life, mean (SD), (ng/ml)	0.10 (0.08)	0.18 (0.24)	0.27
Troponin at 24 hrs mean (SD), (ng/ml)	0.34 (0.05)	0.25 (0.07)	0.70
Creatinine mean (SD), (mg/dl)	0.73 (0.17)	0.69 (0.21)	0.57
Major bleeding complications , n (%)	5 (40)	4 (16)	0.08
Platelet , mean (SD), 10e3cells/mcL	160.75 (48.54)	166.44 (68.80)	0.79
Prothrombin time, mean (SD), seconds	20.98 (8.54)	26.45 (15.13)	0.35
Partial Prothrombin , mean (SD), seconds	67.65 (29.68)	69.00 (70.14)	0.94
INR, mean (SD)	1.82 (1.03)	2.02 (1.40)	0.67
Fibrinogen , mean (SD), mg/dl	210.20 (55.16)	169.26 (88.90)	0.16

Number of Platelet in 72 hours of cooling , mean (SD	3.5 (1.16)	0.4 (0.91)	0.0001
Red blood cells transfusion in 72 hours of cooling , mean (SD	3.63 (2.01)	0.36 (0.75)	0.001
Plasma transfusion in 72 hours of cooling, mean (SD	3.91 (2.71)	0.6 (0.86)	0.0001
Ventilator days, mean (SD)	15.33 (8.02)	4.24 (6.90)	0.001
Length of stay, mean (SD),days	43.58 (25.19)	20.36 (16.15)	0.0019
G-tube at discharge, n(%)	1 (4)	3 (25)	0.05

Abstract: 310

Are Physicians Helping with the Donor Human Milk Shortage?: Physicians' Self-reported Knowledge of Breast Milk Donation and Practices Recommending

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Background Low rates of breast milk donation to milk banks (MBs) limit the supply of donor breast milk (DBM) in NICUs, where preterm/ill infants depend on its many protective properties. A previous study demonstrated that many women with an oversupply of breast milk (OBM) prefer to donate informally "mother-to mother" (IMS), a practice that is discouraged by the American Academy of Pediatrics (AAP). Neonatologists and primary care pediatricians (PCPs) directly interact with breastfeeding mothers and can encourage them to consider safer breast milk donation practices by donating to MBs. However, little research has examined the practices of these physicians in recommending donation to MBs.

Objective To study the self-rated knowledge of PCPs and neonatologists on the processes of breast milk donation (MB and IMS) and their habits regarding recommending donation.

Design/Methods An anonymous survey was emailed to 250 AAP-registered PCPs and 250 AAP-registered neonatologists nationwide. Respondents were asked to self-rate their knowledge of the MB and IMS donation processes on 5-point Likert scales (1-Not knowledgeable at all to 5-Extremely knowledgeable) and to rate how often they provide information about MB donation when counseling women with an OBM on a 5-point Likert scale (1-Never to 5-Always). Respondents were further asked if they had ever heard of IMS, followed by demographic questions.

Results A total of 105 responses met the inclusion criteria (21% response rate, n=33 PCPs, n=72 neonatologists) and were analyzed (39.0% male, 74.3% white). Almost half (48.6%, n=51) of physicians stated that they were "extremely knowledgeable" or "knowledgeable" about the MB donation process. Comparatively, only 22.9% (n=24) of physicians were "extremely knowledgeable" or "knowledgeable" about the IMS process, with 17.1% (n=18) reporting that they had never heard of the practice. When counseling women with an OBM, only a third (31.4%, n=33) of physicians provided information about MB donation at least half of the time.

Conclusion(s) Despite the majority of respondents stating that they were knowledgeable about the MB donation process, few reported discussing this process with mothers who had an OBM. Healthcare professionals have unique and important bonds with lactating mothers. By having readily-available information on milk banks and disseminating this to mothers with an OBM, physicians can contribute to increasing the supply of vital DBM in MBs.

Table 1: Physician Respondents' Self-Rated Knowledge of the Milk Bank and Informal Donation Processes

	Milk Bank Donation Process	Informal Donation Process
Extremely knowledgeable	17.1% (n=18)	8.6% (n=9)
Very knowledgeable	31.4% (n=33)	14.3% (n=15)
Moderately knowledgeable	25.7% (n=27)	32.4% (n=34)
Slightly knowledgeable	19.1% (n=20)	26.7% (n=28)
Not knowledgeable at all	6.7% (n=7)	18.1% (n=19)

Physician Respondents' Self-Rated Knowledge of the Milk Bank and Informal Donation Processes

Table 2: Physician Respondents' Self-Rated Frequency of Providing Patients That Have an Oversupply of Breast Milk with Information about Milk Bank Donation

	Count
Always	7.6% (n=8)
Most of the time	17.1% (n=18)
About half the time	6.7% (n=7)
Sometimes	31.4% (n=33)
Never	37.1% (n=39)

Physician Respondents' Self-Rated Frequency of Providing Patients That Have an Oversupply of Breast Milk with Information about Milk Bank Donation

Abstract: 311
Evaluating the Efficacy of a Hypoglycemia Guideline in Preventing NICU Admissions.
Jaimie Parambil, Kate A. Tauber, Michael J. Horgan
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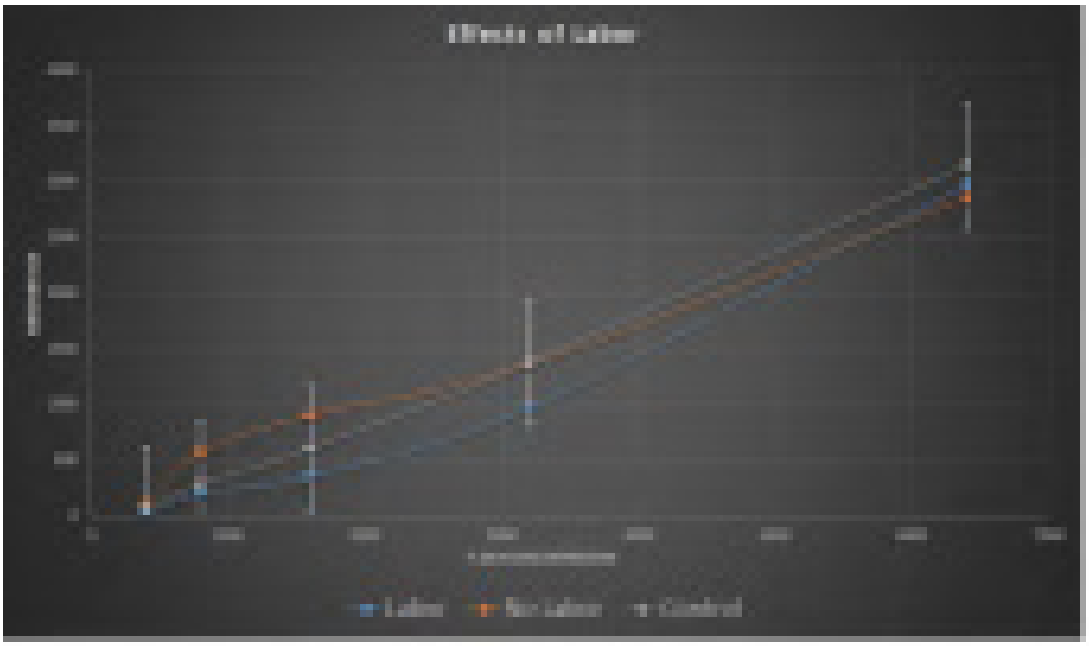
Background Hypoglycemia is often seen in infants of diabetic mothers (IDM), infants who are late-preterm, and infants who are small for gestational age (SGA). Profound hypoglycemia can cause significant morbidities. Infants with hypoglycemia are typically admitted to the NICU for IV glucose. Recently, guidelines involving oral glucose gel administration in newborn nurseries have shown promise in the management of neonatal hypoglycemia and preventing NICU admission.

Objective To determine if the implementation of a hypoglycemia guideline using glucose gel for high risk infants in our newborn nursery would decrease the rate of NICU admissions.
Design/Methods IRB approved chart review of neonates diagnosed with hypoglycemia (defined as <40mg/dL per AAP guidelines) in the newborn nursery. A guideline was developed with input from NICU, newborn nursery, and nutrition personnel. Implementation and education of the guideline was done from 1/2017-6/2017. Data was collected on neonates during a 6 month period before (7/2016-12/2016) and 6 months after (7/2017-12/2017) the implementation period. NICU admission was only counted when this was the sole reason for admission.
Results There were 24 infants with hypoglycemia in the pre-protocol time period, of those 15 (63%) were admitted to the NICU for treatment. After the hypoglycemia protocol was implemented there were 28 babies identified of which 18 (65%) were admitted to the NICU for treatment. Of the 18 infants admitted, only 7 (39%) had the protocol followed. 15 of those 28 infants were late preterm (35 0/7-36 6/7 weeks GA at birth) and of those infants 8 were admitted (53%) and only 2 (25%) had the protocol followed. 5 of the 28 infants were SGA and 3 of those (60%) were admitted with 2 (66%) not following the protocol.
Conclusion(s) The implementation of a hypoglycemia guideline in our newborn nursery did not reduce the rate of NICU admissions for our high-risk infants likely because the protocol was rarely followed. These results highlight the importance of utilizing the PDSA methodology to evaluate process changes. As a result of this data, the current guideline is being revised with additional instructions on the importance of timing of initial feed, what to feed after initial low glucose level (breastmilk or formula), and when to call the NICU.

Abstract: 312
GLUCOCORTICOID BINDING IN NEWBORN INFANTS
sadia haleem[1], Arun kashyap[1], Adaora G. Madubuko[1], michael giuliano[2], Steven Ghanny[2]
[1]rutgers , Hartsdale, New York, United States, [2]hackensack, Hackensack, New Jersey, United States

Background Glucocorticoid plays an essential role in the developing fetus from cellular growth to organ maturation, most importantly in lung maturation by increasing surfactant production and release. For effective therapeutic action, the proper binding must occur with glucocorticoid (GC) receptor. Glucocorticoid receptor (GR) functioning changes throughout development, especially during the transition to extrauterine life.
Objective To compare glucocorticoid sensitivity in newborn infants born to mothers after course labor compared to infants delivered by scheduled birth by using a Fluorescein labeled dexamethasone (F-Dex) monocyte binding assay.
Design/Methods This is a single center study using an innovative Monocytes Fluorescein labeled Dexamethasone Binding Assay (F-dex). Twelve cord blood samples were collected from newborn infants born to mothers in labor 37-40 weeks with and without pregnancy complications of maternal diabetes, hypertension, and maternal infections. F- dex binding were compared with the group of 30 infants37-40 weeks who were delivered with elective C-section, without above complications that served as controls. Different concentrations of F-dex solutions were used to characterized dose-dependent effects.

Results The results of our preliminary study are seen in the Figure and graph below. These results have shown no significant difference in dexamethasone binding on GR between neonates born after labor when compared to neonates born after scheduled C-section.
Conclusion(s) Fetal adrenal function during pregnancy has an important role in the transition to extrauterine life. Neonatal GC level from vaginal delivery has been shown to be higher than those from cesarean section demonstrating the fetal adrenal contribution to the initiation of labor. Gestational age also impacts GC surge as infants 36 weeks or less shows lower cortisol level indicating the development of adrenal maturity.
We speculate that there is variance in glucocorticoid binding to GR receptor in an infant born after labor in comparison with scheduled birth. it is possible that an increase in sample size will warrant us to demonstrate that binding.
Our aim is to use this assay to continue our current study on a larger set of neonatal population and compare the results. In the future, we are planning to compare GR binding between term and preterm neonates in labor, this will help us determine appropriate steroid dosing and better lung outcomes in these patients.



P Dilation in ml	Mean in Neonate Cohort in Labor (n=32)	Standard Deviation in Neonate Cohort in Labor	Standar d Error of the Mean in Neonate Cohort in Labor	Mean in Neonat e Cohort not in Labor (n=30)	Standard Deviation in Neonate Cohort not in Labor	Standar d Error of the mean in Neonate not in Labor	P Value
6800	2978.99	1467.96	382.93	2865.82	1378.54	375.79	0.408.06
3200	983.43	468.86	125.38	1370.40	657.46	135.09	0.02877
1600	868.117	233.64	60.03	910.87	609.19	121.81	0.38895
800	208.62	146.02	38.02	573.33	1187.14	237.43	0.1277
400	44.72	58.35	9.15	103.97	220.62	44.09	0.3564

Abstract: 313
Health disparities affecting infants from racial/ethnic minority backgrounds: a retrospective single center experience.

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Background The vulnerability of infants from minority racial/ethnic backgrounds is well established. Such inequities have been described across large geographic territories, as well as both between and within hospitals. Infants born to black mothers have higher infant mortality rates and are more likely to be born at younger gestational ages and smaller birthweights. They suffer disproportionately from several severe neonatal morbidities.
Objective This aim of this study is to describe within-hospital differences in outcomes for infants born to mothers from racial/ethnic minority backgrounds in a single, urban, regional perinatal center (Columbia University Medical Center, or 'CUMC').
Design/Methods The primary outcome was neonatal mortality prior to hospital discharge; the population comprised all inborn infants from 2000-2017. A database was created linking the NICU log (a CUMC NICU admission database), CUMC's Vermont Oxford Network information (a NICU metrics and outcomes database), the New York City electronic birth certificate demographic data for eligible infants' families, and CUMC obstetric data. Race/ethnicity was based on parental self-report for the electronic birth certificate and was classified into census categories. For 2000-2007, 'Hispanic" was used as a distinct race; after 2007 it is a distinct ethnicity due to New York City birth certificate changes. Therefore, data for these two periods (2000-2007; 2007-2017) was analyzed separately. This report pertains to the earlier (2000-2007) period.
Results There are disparities in neonatal mortality related to race-ethnicity for infants born at CUMC during the first study period (2000-2017). Infants born to white and black mothers had similar mortality rates (12 and 13 per 1000 live births respectively; Figure 1). There were differences by race/ethnicity in neonatal mortality for infants of very low birth weight (Figure 2) and in birth-weight specific mortality (Figure 3). Infants born to Hispanic mothers had significantly lower neonatal mortality (6 per 1000 live births) though this differed based on maternal country of origin (Figure 4).
Conclusion(s) There are within-hospital differences related to race/ethnicity at CUMC. Interestingly, these both align with and depart from previously documented disparities in neonatal morality, and with data capturing neonatal mortality in New York City as a whole. These differences are likely multifactorial in etiology, and analyses are ongoing to better characterize contributing factors.

FIGURE 1

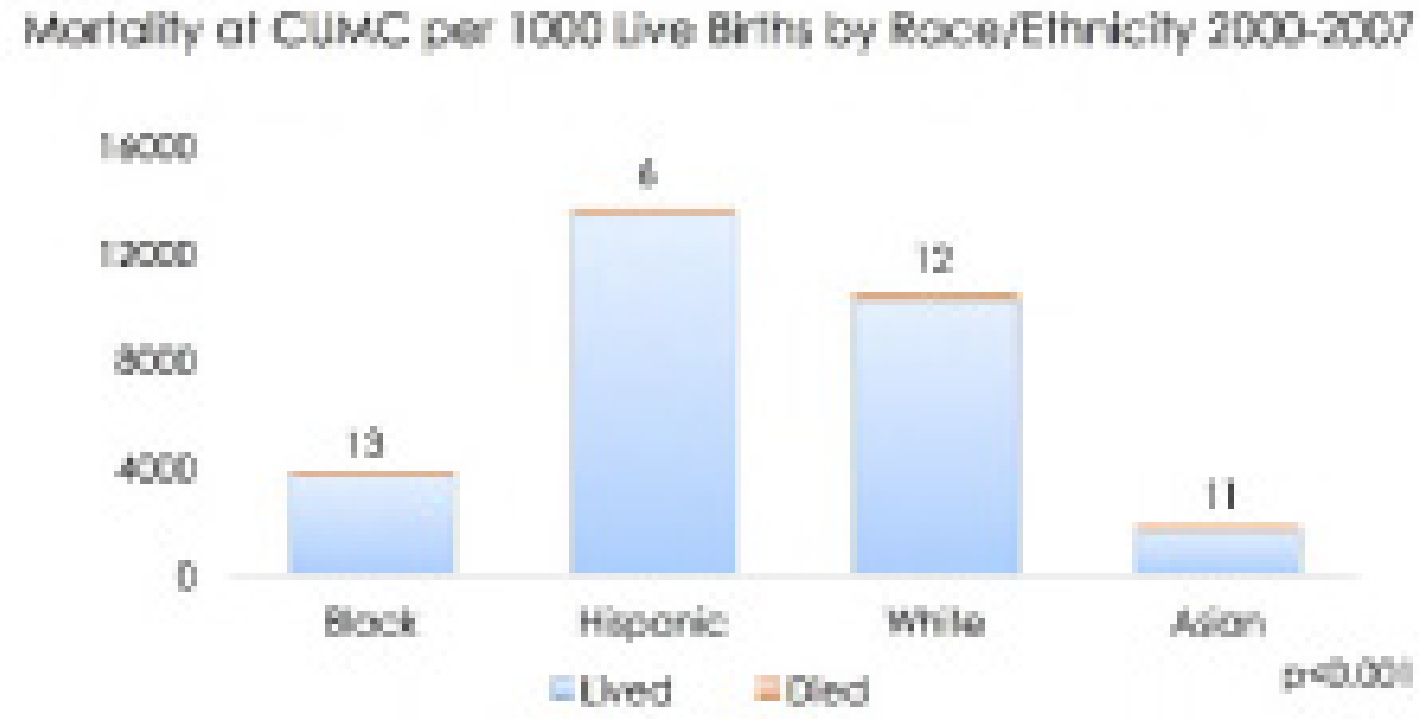


FIGURE 2

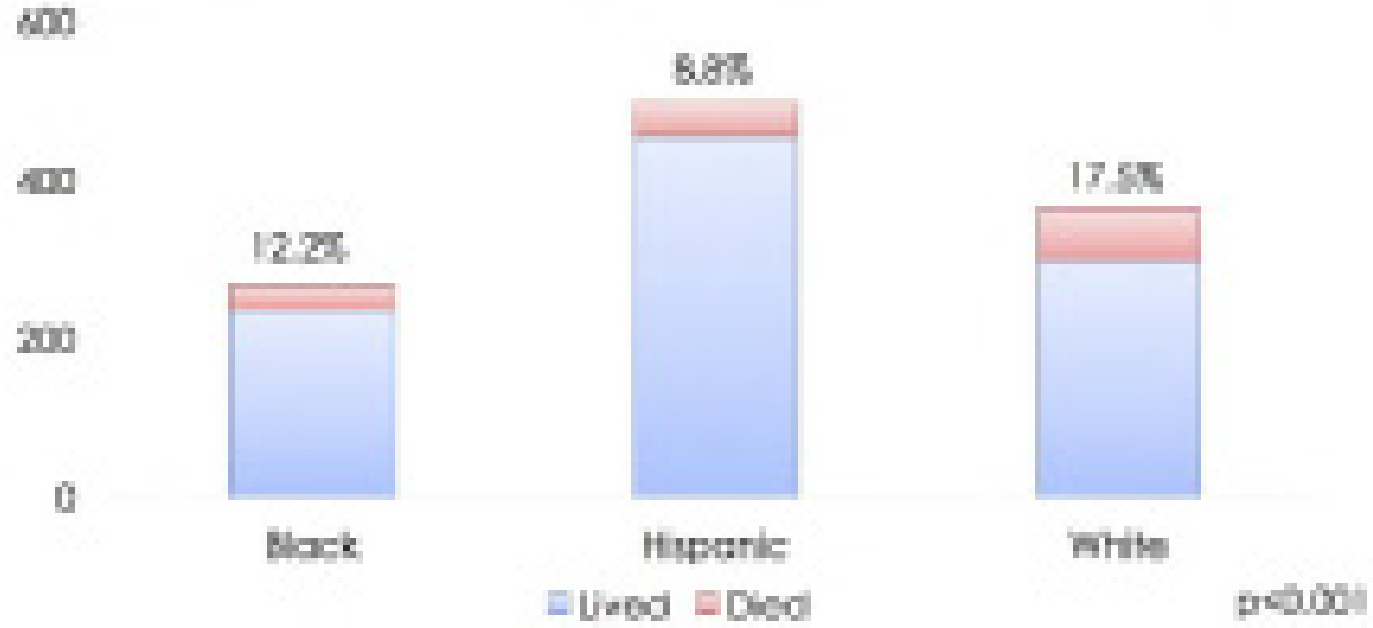


FIGURE 3

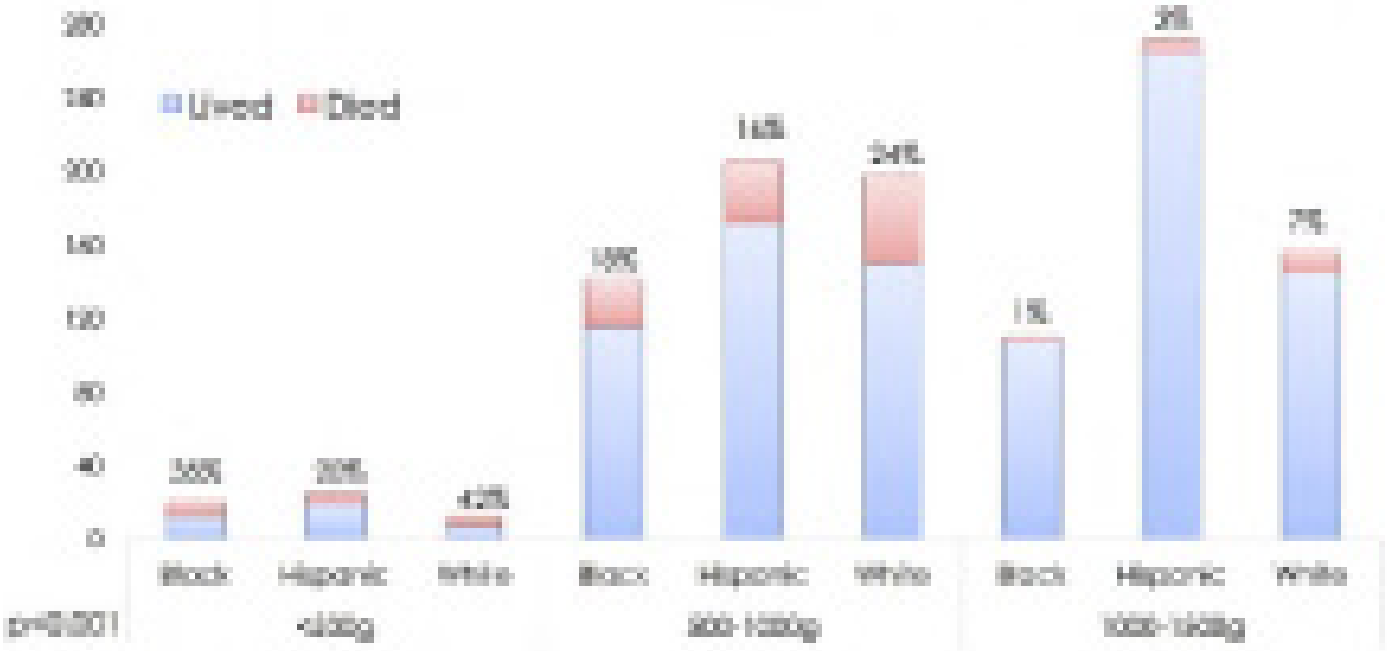
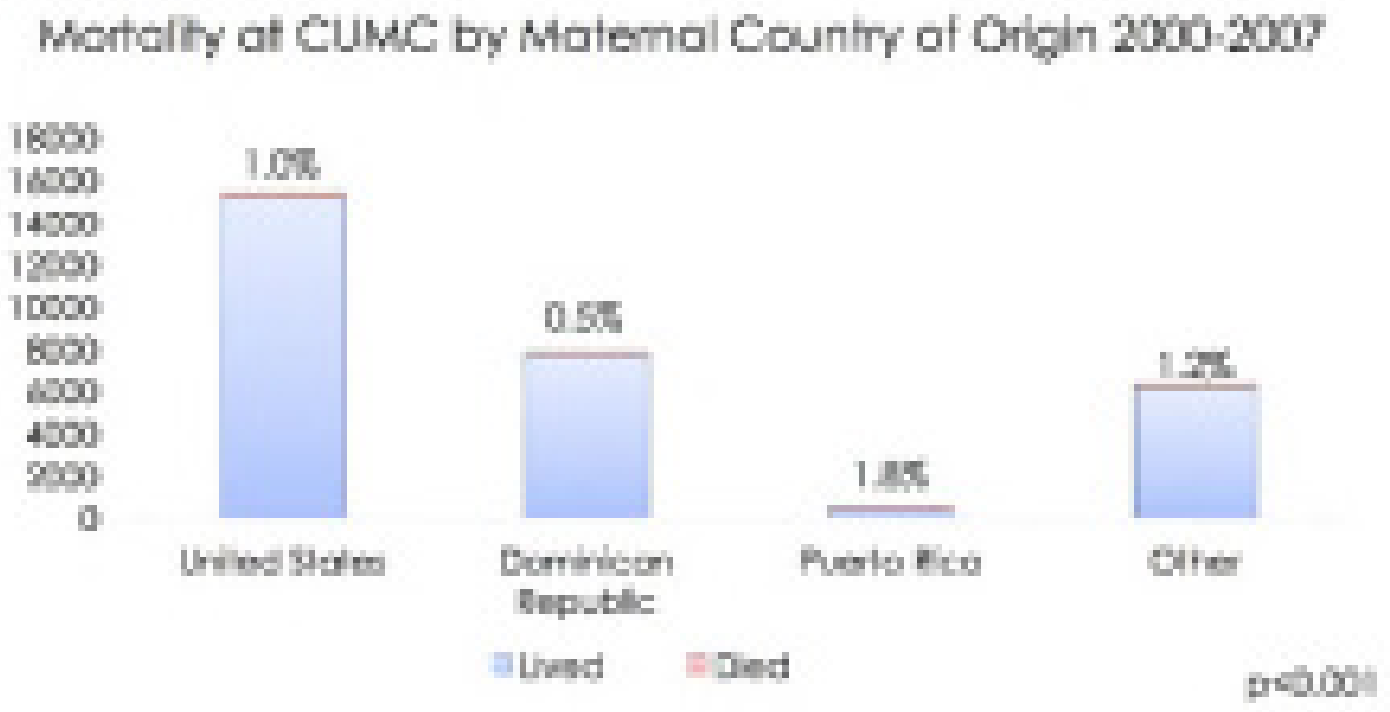


FIGURE 4



Abstract: 314

Neonatal opioid withdrawal syndrome- Should we focus on prevention?

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Background Opioid use during pregnancy has increased significantly between 1999 and 2014 (JAMA 2018). Influence of maternal and epidemiological risk factors on incidence and outcomes in neonatal opioid withdrawal syndrome (NOWS) remains unknown. Identifying such factors could help in targeting preventive interventions to decrease the incidence and improve the outcomes in NOWS.

Objective We hypothesized that maternal and epidemiological risk factors influence incidence and outcomes of NOWS. Our primary objective was to determine if maternal zone of residence affected admission to neonatal intensive care unit (NICU) with NOWS. Our secondary objective was to determine if maternal and environmental risk factors affected length of stay (LOS).

Design/Methods We reviewed medical records of term infants ≥37 weeks admitted to the NICU at a Regional Perinatal Center (RPC) from 1/1/2002 to 12/31/2017 with NOWS. Data collected included date of birth, birth weight, gestational age(GA), gender, type of medical insurance, and maternal information including maternal age, medical/psychiatric problems, obstetric history, history of opioid use (prescribed or non-prescribed), marital status and zone of residence (masked with randomly assigned letters). The outcome measures were birth weight and LOS.

Results Out of 424 neonates, 228 (54%) were born to mothers on non-prescribed opioids and 196 (46%) to mothers on prescribed opioids. Higher frequency of admissions due to NOWS were noted from specific zones in Western New York out of 77 masked zones, despite having similar total NICU admissions from all causes (figures 1 and 2, $p<0.001$). Birth weight was significantly lower for infants born to mothers on non-prescribed opioids (3.03±0.5 vs. 3.15±0.5 kg, $p=0.015$). Maternal age, season of birth, GA and opioid use (prescribed vs. non-prescribed) did not influence LOS (table 1). LOS decreased significantly since 2014 ($p=0.03$) coinciding with a change in management from methadone to morphine and improved NOWS scoring practices. More mothers were on Medicaid (an indicator of lower socioeconomic status) in the non-prescribed group compared to the prescribed group ($p=0.01$).

Conclusion(s) Mothers on non-prescribed opioids were on medicaid and had infants with lower birth weights compared to those who were on prescribed opioids. Increased frequency of admissions due to NOWS from certain areas is a lead that

provides the opportunity for focusing on implementing preventive strategies at the community level that may potentially help to decrease incidence and improve outcome in NOWS.

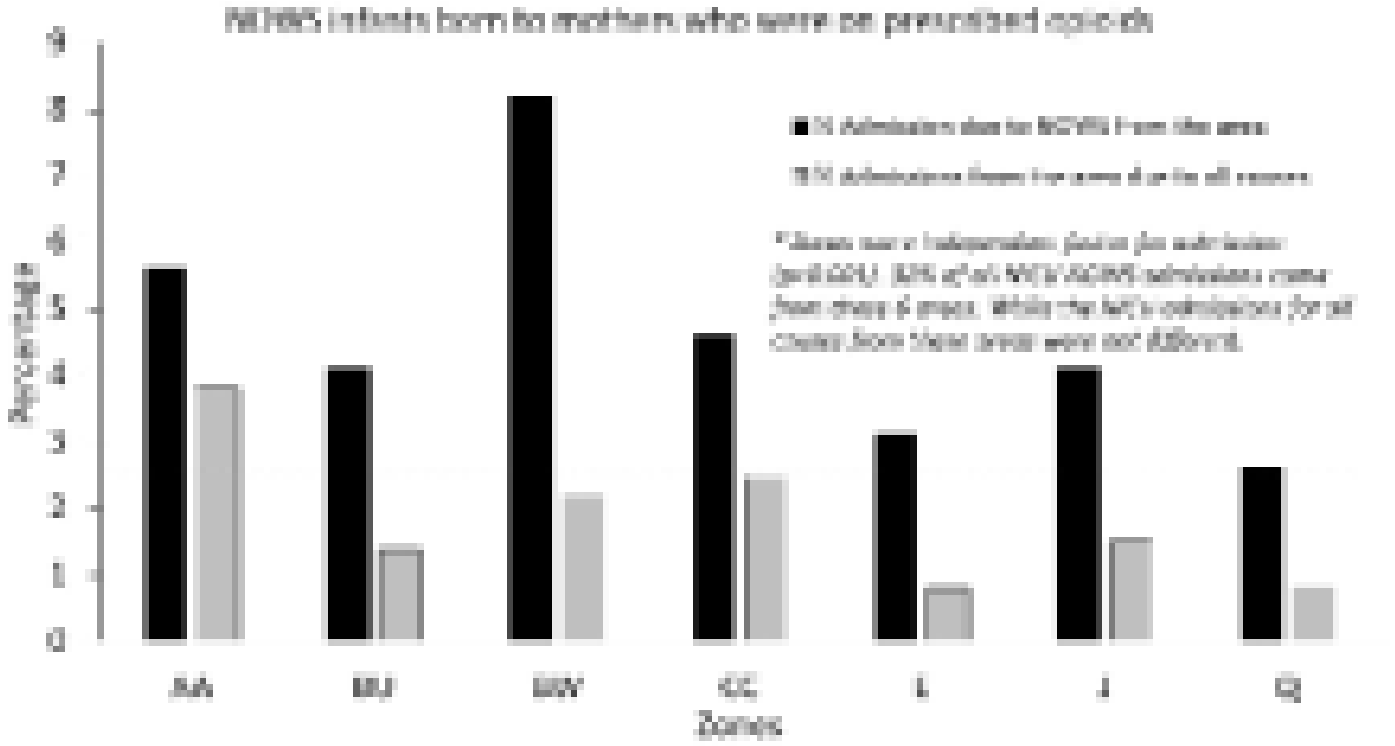

Figure 1: Higher frequency of admissions due to NOWS noted from certain zones in Western New York among infants born to mothers on precribed opioids.
AA, BU, BW, CC, E, J and Q represent masked zones in Western New York

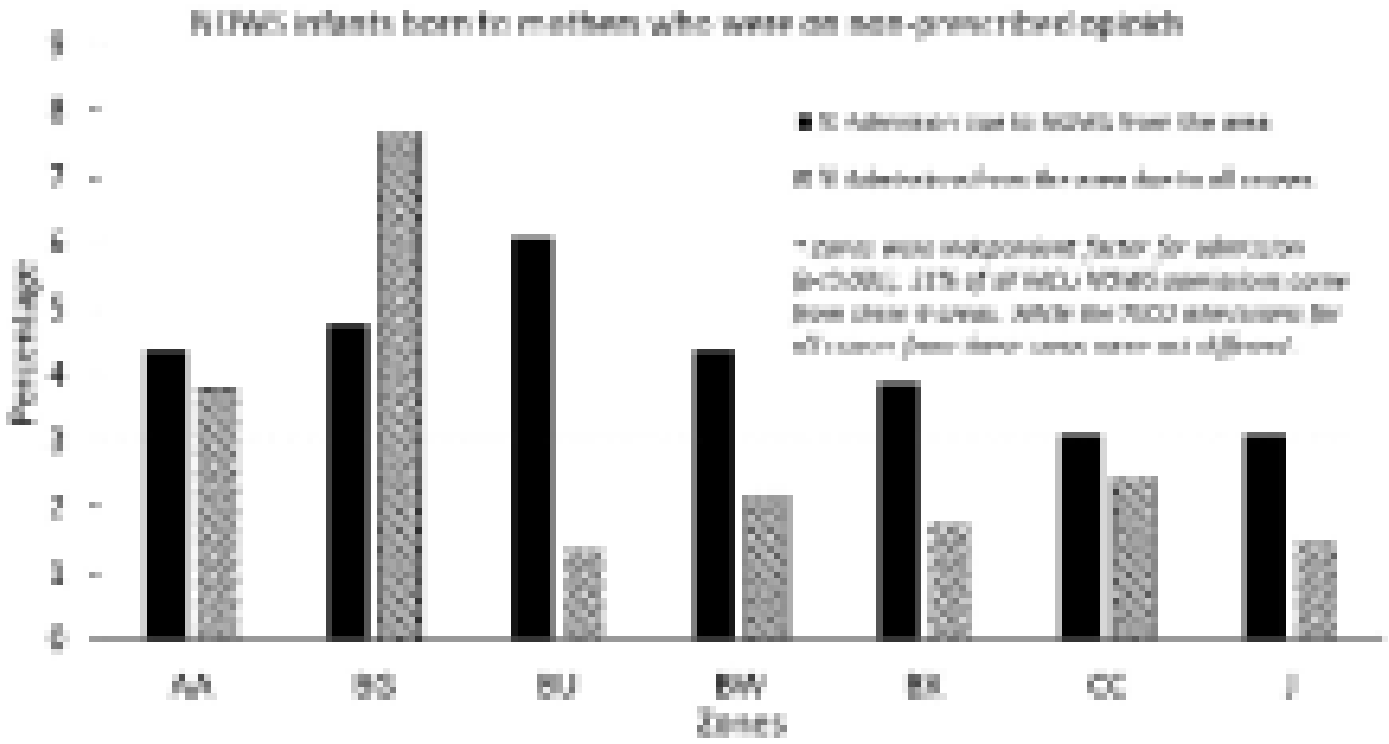

Figure 2: Higher frequency of admissions due to NOWS noted from certain zones in Western New York among infants born to mothers on non-prescribed opioids.
AA, BG, BU, BW, BX, CC and J represent masked zones in Western New York

Table 1: Comparison of characteristics between neonates born to mothers on opioids that were not-prescribed and prescribed respectively

Parameter	Mother on non-prescribed opioid (n=228)	Mother on prescribed opioid (n=196)	p value
Newborn's gestational age (weeks)	38.6 (1.1)	38.7 (1.2)	0.21
Newborn's birth weight (kg)	3.03 (0.5)	3.15 (0.5)	0.015*
Gender of newborn	Male: 120 (52.6%) Female: 108 (47.4%)	Male: 111 (56.6%) Female: 85 (43.4%)	0.4
Place of birth (Inborn vs Outborn)	Inborn: 87 (38%) Outborn: 141 (62%)	Inborn: 59 (30%) Outborn: 137 (70%)	0.08
Season of birth (winter vs summer months)	Winter: 111 (48.7%) Summer: 117 (51.3%)	Winter: 96 (48.9%) Summer: 100 (51.1%)	0.45
Maternal age group (number of mothers in each age group)	<20 years: 19 (8.33%) 21-25 years: 70 (30.7%) 26-30 years: 71 (31.14%) 31-35 years: 51 (22.4%)	<20 years: 12 (6.12%) 21-25 years: 64 (32.65%) 26-30 years: 62 (31.63%) 31-35 years: 42 (21.42%)	0.98

	36-40 years: 15 (6.6%) >41 years: 2 (0.87%)	36-40 years: 11 (5.61%) >41 years: 5 (2.55%)	
Maternal marital status	Married: 32 (14%) Unmarried: 187 (82%) Divorced/ separated: 8 (3.5%) Widowed: 1 (0.4%)	Married: 36 (18.4%) Unmarried: 156 (79.5%) Divorced/ separated: 2 (0.01%) Widowed: 2 (0.01%)	0.22
Maternal health insurance	Medicaid: 71 (31.1%) Other insurance: 157 (68.9%)	Medicaid: 38 (19.4%) Other insurance: 158 (80.6%)	0.01*
Number of mothers with depression	84 (36.8%)	74 (37.7%)	0.84
Number of mothers with pregnancy losses	≥1 loss: 115 (50.4%) ≥2 losses: 54 (23.7%)	≥1 loss: 105 (53.5%) ≥2 losses: 60 (30.6%)	0.5 0.1
Neonatal length of stay (days)	23 (25)	20 (20)	0.22

Abstract: 315
Liquid Barrier Film for the Protection of Preterm Infants' Skin
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Background
Skin maturation, a complex dynamic process that starts at birth, is essential for preterm infants who are at risk of skin breakdown. Liquid barrier films are advocated to mitigate injury from epidermal stripping and irritant dermatitis.
Objective To evaluate the effects of a liquid barrier film forming acrylate skin protectant (Cavilon ™No Sting Barrier Film, 3 M Health Care, St. Paul, MN) to minimize irritation, breakdown, and to facilitate skin development as measured by transepidermal water loss (TEWL), surface pH, hydration, and skin condition.
Design/Methods 22 neonates, 24 to 31 weeks gestational age with birth weights 590 to 1530 grams, were enrolled during the first 3 days of life. Cavilon™ was applied to the left side of each participant's chest, abdomen and thigh every other day with the right side serving as control. Measurements of TEWL, surface pH, and hydration, and Skin Condition Score (SCS) (values assigned for erythema, dryness, and skin breakdown; highest scores indicating more injury) were taken on Days 1, 3, 7 and 14 (Derma Lab® USB instrument, Cortex Technology, Hadsund, Denmark). Two independent reviewers assigned a Skin Condition Score. Results were statistically significant at $p<0.05$.
Results Treated infants had greater Skin Condition Score at all body sites and values increased with time ($p < 0.05$).
TEWL at all sites was greater in the more immature infants (<28 vs ≥ 28 weeks gestation). There is an inverse relationship between TEWL and isolette humidity/temperature. Cavilon™ application did not affect TEWL.
Independent of gestation, skin pH increased over time ($p < 0.05$) and was unrelated to film barrier application.
Hydration status was decreased with liquid film barrier application and over time ($p < 0.05$).
Conclusion(s) The Skin Condition Scores indicate worsening of skin integrity on the treated side raising the concern of altered and/or delayed stratum corneum maturation. Hydration also was hindered on treated areas of skin. We speculate that film barrier application may delay physiologic maturation. Therefore, these data support the use of "spot-specific" applications with 48-72 hr. intervals and sparing of intact, device-free skin to allow maturation.

Abstract: 316
Effect of Phototherapy on the Incidence and Severity of Patent Ductus Arteriosus in Premature Infants
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Background A recent meta-analyses of non-blinded randomized clinical trials (RCT) demonstrates that phototherapy (PT) for unconjugated hyperbilirubinemia may increase the incidence of patent ductus arteriosus (PDA) in premature infants due to photorelaxation of the ductus arteriosus. However, a blinded RCT has not been performed.

Objective To evaluate if chest shielding (CS) during PT is associated with decreased incidence and or severity of PDA in premature infants. Our secondary objective was to evaluate if CS during PT is associated with decreased incidence of PDA associated morbidities and whether CS increases the duration of PT or increases the peak total serum bilirubin concentration.

Design/Methods A double-blind RCT was performed to evaluate the effect of CS on the incidence and severity (assessed by the need of >2 courses of Indomethacin or need of ligation) of PDA in infants ≤ 29 weeks gestational age (GA) or ≤ 1000 grams at birth. Infants with ductal dependent heart defects, on nitric oxide, congenital malformation, chromosomal disorders or those who didn't require phototherapy or were started on prophylactic phototherapy were excluded. Infants were randomized either to CS with aluminum foil (to block PT, intervention group) or to CS without aluminum foil (control group) in a 1:1 ratio. Infants were monitored daily during the study period for clinical signs of a PDA which was defined by a systolic heart murmur and presence of 2 out of 3 signs (widened pulse pressure, metabolic acidosis with a base deficit >6 or oxygen requirement >30%). An echocardiogram prior to starting PT was attempted. All infants had an echocardiogram within three days of discontinuing the last course of PT.

Results A 140 infants were enrolled with 68 infants in the intervention group and 72 infants in the control group. There were no significant differences in the baseline demographics between the two groups except maternal chronic hypertension (Table 1). Infants in the intervention and control group had similar rates of symptomatic PDA (OR: 1.09; 95% CI:0.37-3.18), PDA on echo (OR: 0.86; 95% CI: 0.39-1.87), need for >2 courses of indomethacin or ligation (OR: 1.36; 95% CI: 0.4-4.5) and duration of PT (OR: 1.12; 95% CI: 0.66-3.91) (Table 2). Infants < 27 weeks GA had similar findings (Table 3).

Conclusion(s) Our findings suggest that chest shielding during PT is not associated with a decrease in the incidence and or severity of PDA in infants ≤ 29 weeks GA or ≤ 1000 grams at birth. There were also no adverse effects of CS during PT.

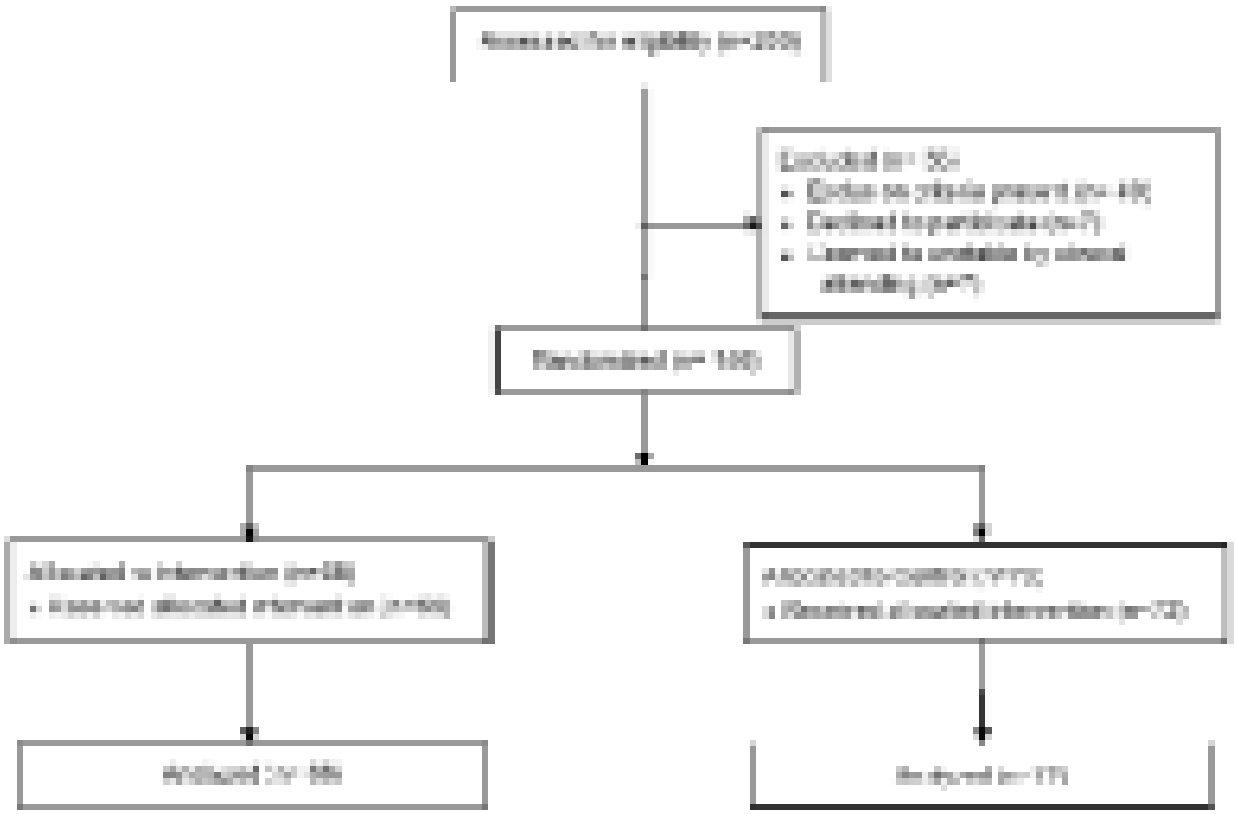

Table 1 Baseline Characteristics of Study Population (N = 112)

	[illegible]	[illegible]	[illegible]
Birthweight, mean (SD), grams	[illegible]	[illegible]	[illegible]
Gestational age, mean (SD), wk	[illegible]	[illegible]	[illegible]
Outborn, %	[illegible]	[illegible]	[illegible]
Race, % White Black Asian Other	[illegible] [illegible] [illegible] [illegible]	[illegible] [illegible] [illegible] [illegible]	[illegible]
Gender, % Male	[illegible]	[illegible]	[illegible]
Ethnicity, % [illegible]	[illegible]	[illegible]	[illegible]
Apgar score at 5 minutes of life, mean (SD)	[illegible]	[illegible]	[illegible]
[illegible], %	[illegible]	[illegible]	[illegible]
Chorioamnionitis, %	[illegible]	[illegible]	[illegible]
Chronic hypertension, %[a]	[illegible]	[illegible]	[illegible]
Umbilical artery catheter, %	[illegible]	[illegible]	[illegible]
Mother on diuretics, %	[illegible]	[illegible]	[illegible]
Exposure to corticosteroids, %	[illegible]	[illegible]	[illegible]
Antenatal steroids, %	[illegible]	[illegible]	[illegible]
C-section, %	[illegible]	[illegible]	[illegible]
Informed consent for [illegible], %	[illegible]	[illegible]	[illegible]
RDS, %	[illegible]	[illegible]	[illegible]
Ventilated, %	[illegible]	[illegible]	[illegible]
CRIB-2 score, mean (SD)	[illegible]	[illegible]	[illegible]
Day of life of methylxanthine started, mean (SD)	[illegible]	[illegible]	[illegible]
Days of antibiotics prior to starting methylxanthine, mean (SD)	[illegible]	[illegible]	[illegible]
Total fluid intake (including medications), median (IQR)	[illegible]	[illegible]	[illegible]
Dopamine prior to starting methylxanthine, %	[illegible]	[illegible]	[illegible]
Dobutamine prior to starting methylxanthine, %	[illegible]	[illegible]	[illegible]
Hydrocortisone prior to starting methylxanthine, %	[illegible]	[illegible]	[illegible]
Diuretics, %	[illegible]	[illegible]	[illegible]

Abbreviations: SD, standard deviation; wk, weeks; IVH, intraventricular hemorrhage; RDS, respiratory distress syndrome; CRIB, clinical risk index for babies; P, determined by t-test; Chi-square, Fisher's exact test or Wilcoxon rank test

Table 2 Association between Chest Shielding during Phototherapy and Neonatal Outcomes

	Chest Shield with Abdominal Foil (Intervention) Group (n = 68)	Chest Shield Without Abdominal Foil (Control) Group (n = 72)	OR (95% CI)*
Primary Outcome, %			
Symptomatic PDA	26	26	1.00 (0.37-2.72)
Secondary Outcome			
PDA on echo, %	25	22.2	0.99 (0.39-1.97)
PDA requiring medical treatment with acetaminophen, %	22.5	12.5	2.00 (0.66-6.42)
PDA surgical ligation, %	1.2	9.7	1.36 (0.4-4.5)
Duration of phototherapy, mean (SD) hours	56.8 (28.1)	63.2 (44)	1.12 (0.68-3.91)
Peak total serum bilirubin, mean (SD) mg/dl	7.8 (2.2)	7.4 (2.5)	0.92 (0.4-1.85)
ROP stage 2 and greater, % Laser treatment, %	22.5 8.8	15.9 8.9	0.62 (0.26-1.51) 0.77 (0.22-2.68)
NEC, %	1.5	22.2	1.67 (0.74-4.11)
CLD at 36 weeks PMA, % Severe CLD (FIO2> 30%), %	51.4 4.4	61.3 11.1	0.99 (0.51-1.92) 2.7 (0.68-15.96)
Death, %	3.8	9.9	1.19 (0.30-4.64)

Abbreviations: OR, unadjusted odds ratio; CI, confidence interval; PDA, patent ductus arteriosus; Echo, echocardiogram; mg/dl, milligram/ deciliter; ROP, retinopathy of prematurity; NEC, necrotizing enterocolitis; CLD, chronic lung disease; PMA, post menstrual age; FIO2, fraction of inspired oxygen

Table 3. Association between Chest Drain during IPT and Neonatal Outcomes for Infants <37 weeks Gestation at Age

	[illegible]	[illegible]	[illegible]
Primary Outcome, %			
[illegible]	29.8	45.7	[illegible]
Secondary Outcome			
PDA (all cases), %	33.3	38.1	[illegible]
PDA requiring medical treatment with indomethacin, %	29.2	21	[illegible]
PDA surgical ligation, %	13.6	17.3	[illegible]
Duration of ventilation, mean (SD), days	31.2 (33.1)	40.7 (38.8)	[illegible]
Pneumothorax, n (days from [illegible])	8.8 (8.8)	8.6 (3.3)	[illegible]
[illegible]	26.1 18.2	39.6 31.7	[illegible]
NEC, %	13.3	35.4	[illegible]
CLD at 36 weeks PMA, %	53.1	67.3	[illegible]
Severe CLD (FiO2> 30%), %	8.1	11.7	[illegible]
Death, %	13.6	14.7	[illegible]

[illegible]

Bolus, administering gram, english, milligram / deciliter, NICE, nasal prongs, PDA, patent ductus arteriosus, PMA, postmenstrual age, PPCA, transition of [illegible]

Abstract: 317

nicT cells: A potential new target for fetal and neonatal inflammatory disease

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Background Human umbilical cord blood T-lymphocytes display a higher expression of naïve cell surface markers. Upon stimulation they have been shown to release less pro-inflammatory cytokines compared to matched cells in adults. Despite this, T cell activation continues to be associated with a range of morbidities, from preterm delivery to chorioamnionitis. This contradiction is most likely due to the complexity of the neonatal immunological environment, and potentially unidentified immune cell subsets. Here, we report the discovery of a unique population of T cells: neonatal inflammatory cytotoxic T (nicT) cells, present in the umbilical artery of infants which express a transcriptional profile primed for a rapid inflammatory response to stimuli.

Objective To further explore the phenotype and function of nicT cells, including the identification of unique surface markers and cytokine production upon activation.

Design/Methods Lymphocytes were isolated by gradient centrifugation from whole blood collected from the umbilical artery and vein of infants delivered by elective uncomplicated cesarean section. Immuno-phenotyping by flow cytometry was performed to distinguish nicT cells from conventional T cells. nicT cells and conventional T-cells were stimulated to compare cytokine production.

Results Compared to conventional lymphocytes isolated from the same cord samples, nicT cells rapidly release a large amount of pro-inflammatory cytokines upon activation. Furthermore, these cells are present at roughly 10-fold higher levels in the umbilical artery versus the umbilical vein, suggesting they either become placenta-resident or change dramatically during placental passage. Finally, we have identified a unique surface marker profile which will be used to sort the cells for RNA-sequencing.

Conclusion(s) Our discovery of nicT cells provides important new insight into fetal and neonatal immunobiology. Due to their inflammatory phenotype and localization, these cells may play a previously unidentified role in disorders such as pre-term delivery, preeclampsia, and the fetal morbidity/mortalities associated with placental inflammation. They may also be involved in the control of infection or host immune responses to non-replicating antigens. Further study will assess their potential as diagnostic and/or therapeutic targets, as well as their ability to serve as a biomarker for inflammatory and infectious neonatal diseases.

Abstract: 318

Incidence of urinary tract infections in late onset sepsis evaluations in the low birth weight population

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Background Urinary tract infections (UTI) remain a common cause of morbidity and mortality among neonates with overall risk increasing with decreasing birth weight. Blood cultures have remained the definitive diagnostic tool for late onset sepsis (LOS). Guidelines for performing urine cultures routinely as a part of LOS work ups have remained unclear, with limited literature on the subject. UTI may be undiagnosed unless urine cultures are performed as part of LOS evaluations.

Objective 1) To retrospectively evaluate the incidence of UTI in LOS sepsis evaluations in the low birth weight (LBW) population.

2) To prospectively evaluate the compliance of the NICU health care team in performing urine cultures as a part of LOS evaluations, following an educational intervention.

Design/Methods A retrospective chart review was conducted for all infants with BW < 2500g between the years 2011 to 2018, who were admitted to the NICU. Charts are being evaluated to determine whether patients had an LOS evaluation, and if so whether urine cultures were sent. An educational intervention, in the form of posters and handouts, was conducted with NICU providers in 2017 urging providers to ensure urine cultures are sent as part of all LOS evaluations. A prospective chart review is being conducted in the same population to monitor the compliance of NICU staff in performing these urine cultures.

Results The charts of these 927 eligible infants are being evaluated. These neonates were stratified into three groups based on BW. Group A contained 782 LBW infants (BW 1500-2500g). Group B contained 73 VLBW neonates (BW 1000-1500g), while Group C contained 72 ELBW infants (BW < 1000g). For each LOS evaluation performed, we are noting whether solely a blood culture, or both urine and blood cultures were sent. The incidence of positive urine cultures is being determined, before and after the educational intervention. We aim to determine the incidence of UTI in this population.

Conclusion(s) UTIs are not infrequent in LBW infants. Urine cultures done as a part of LOS work ups are necessary to promptly identify UTIs, and hence initiate timely treatment and evaluation for genitourinary tract anomalies.

Abstract: 319

Neurodevelopmental follow-up in premature infants at Baystate Medical Center: how do we compare?

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Background Extremely low birth weight (ELBW; <1kg) infants are at an increased risk of developing cognitive, motor, and language impairments, and developmental follow-up is imperative. Baystate Medical Center (BMC), which houses a level III NICU in Springfield, MA, has a relatively new NICU Follow-Up Clinic, but little is known about our overall rate of follow-up and developmental scores.
Objective Evaluate the neurodevelopmental follow-up rate and Bayley Scales of Infant Development-III (BSID-III) test scores for BMC's ELBW infants with birth year 2014 - 2015. This data was then compared to 1) the New England Follow-Up Network (NEFUN; a new network of 8 centers in New England); and to 2) the Vermont Oxford Network (VON; a follow-up project involving 49 VON U.S. members).
Design/Methods ELBW or gestational age < 28 0/7 week infants who survived until discharge were eligible. Follow-up was classified as having a BSID-III evaluation at 18-24 months corrected age. Each domain has a mean composite score of 100 ± 15. A score <70 indicates significant delay and <85 indicates at least mild to moderate delay. Infants' composite scores were organized by score ranges: <70, 70 - 85, and >85. Descriptive statistics were tabulated and compared to the larger samples (with same eligibilities) within the NEFUN and VON follow-up projects using chi-squared analysis (significance level < 0.05).
Results Of the eligible infants at BMC (n=78), follow-up rate was 35%. The median BSID-III composite score for cognitive, language, and motor were 89, 88, 93, respectively. Within NEFUN (n=578), follow-up rate was 50% (15% greater rate than BMC; p < 0.05). Within VON (n=7,608) follow-up rate was 43% overall, which was not statistically different from BMC. At our center, rates of composite scores <70 were as follows: cognition 3.7%, language 11.1%, and motor 19.2%. Rates of composite scores 70-85 were cognition 25.9%, language 25.9%, and motor 7.7%. There were no significant differences when compared to NEFUN and VON composite score ranges.
Conclusion(s) BMC's ELBW follow-up rates are low, but are in line with other centers across the US. Follow up rates in other countries are much higher (70-90%). BMC's overall developmental outcomes are in line with larger networks with scores that fall <1 SD below the mean; however these outcomes are skewed by overall low follow-up rates. Neonatal follow-up programs, including ours at BMC, need to exert more resources to improve attendance in order to optimize infant developmental outcomes.

Abstract: 320

Implementation of Histogram-Integrated SpO2 Monitoring to improve target oxygen saturation

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Background Maintaining oxygen saturation within a narrow target range by regulating the inspired oxygen concentration is an important part of the NICU nursing care. SpO2 (peripheral capillary oxygen saturation) level fluctuations below and above the target range contribute to morbidities in the preterm infants. It has been reported that some preterm infants spend only half of the time within a specified SpO2 target range. Our Level III NICU has implemented specific guidelines about parameters within which SpO2 levels should be maintained in all infants on supplemental oxygen. We recently obtained SpO2 histogram monitoring capability, which is a method to visualize the percentage of time infants spend within specific oxygen saturation range. Our random audits using histogram-integrated SpO2 monitoring over a period of 4 weeks (April 1st-April 30th) determined that only 10% of infants on supplemental oxygen were within targeted range (90-95%) ≥ 60% of the time.
Objective 1) Increase the percentage of infants in target-range SpO2 (specified as 90-95% for ≥ 60% of the time over a 12-hour period) to 20% by December 2018 with a stretch goal of 50%.
2) Improve nursing compliance documenting and discussing SpO2 histogram.
Design/Methods From July 2018-September 2018, created documentation sheets and tracking tool to record histogram-derived metrics, provided extensive nursing/physician education related to accessing histogram on bedside monitor and how to utilize the data clinically. Subsequently, SpO2 12-hour histogram data collected twice daily (7am and 7pm) were recorded by the bedside nurses for 4 consecutive weeks.
Results An improvement in the percentage of infants in the target range ≥ 60% of time while on supplemental oxygen increased from 10% to 38% overall. Specifically, day shift improved from 15% to 42% and night shift from 11% to 38% over 4 weeks. Figure 1 represents pre and post-intervention data by shift and overall. Nurses have incorporated histogram data into workflow during nursing handovers with an overall compliance of 70%.
Conclusion(s) Use of the SpO2 histograms has been associated with significant improvement in number of infants on supplemental oxygen in achieving and maintaining the target oxygen saturation. There is also a trend to improvement in the nursing compliance with histogram documentation and usage during nursing handovers.

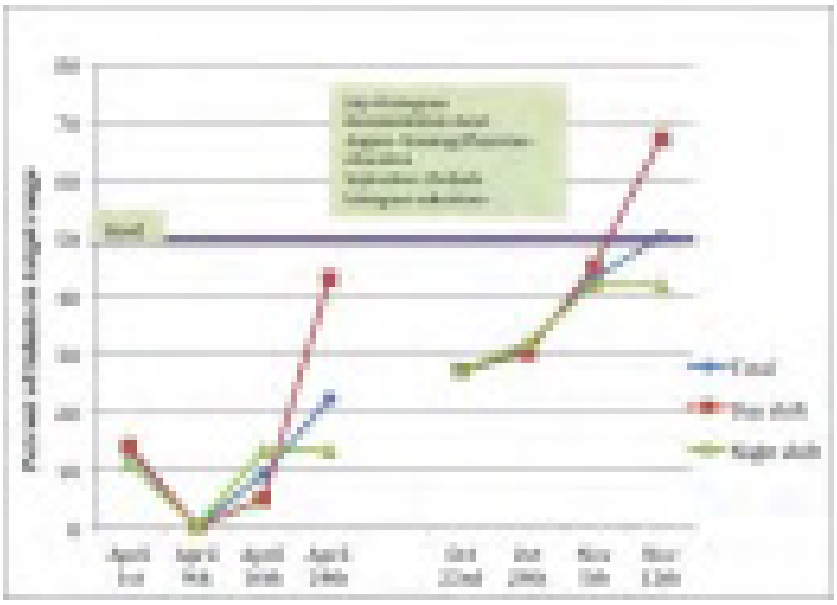

Figure 1: Representing percent of infant with oxygen saturation in target range ≥ 60% of time pre and post-intervention

Abstract: 321

Missed opportunity to prevent BPD? Respiratory support and corticosteroid use rates in very preterm infants stratified by BPD severity according to the NICHD Neonatal Research Network definition

Samantha Steeman[1], Sara DeMauro[1], Nicolas A. Bamat[1], Kevin Dysart[1], Zubair h. Aghai[2], Alison Cook[3], Jay Greenspan[2], Erik A. Jensen[1]

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Background Rates of bronchopulmonary dysplasia (BPD) have not declined over the past 2-3 decades and may be increasing. Among the therapies shown to prevent BPD, corticosteroids are the most controversial. However, based on the available trial data, the risk-benefit balance favors the use of low-dose corticosteroids after the first week of life in infants at high risk for developing BPD.

Objective To characterize respiratory support and corticosteroid use patterns in very preterm infants, stratified by BPD severity, defined according to the NICHD Neonatal Research Network (NRN) definition.

Design/Methods Retrospective cohort study using data collected prospectively for the Optum Neonatal Database. Study infants were born <30 weeks' gestation between 1/2010-10/2014 and survived to 36 weeks PMA. BPD severity was classified at 36 weeks PMA according to treatment with the following respiratory support: No BPD, no support; Grade 1, low flow nasal cannula; Grade 2, non-invasive positive airway pressure; Grade 3, invasive mechanical ventilation.

Results Of 3473 infants born <30 weeks gestation, 2682 (77%) survived to 36 weeks PMA and were assessed. The majority of study infants (74%), including over 50% who did not develop BPD, were treated with surfactant and invasive mechanical ventilation in the first 24 hours of life (Table). Rates of mechanical ventilation at 7 days of age fell to 18% among infants who were breathing in room air at 36 weeks PMA. In contrast, mechanical ventilation rates were ≥50% throughout the first month of life among infants who developed grade 2 or grade 3 BPD (Figure). Despite the prolonged use of high-level respiratory support in these infants, <20% were treated with systemic corticosteroids for a respiratory indication during the first 6 weeks of life. By 36 weeks PMA, only 21% of infants who developed BPD had received corticosteroids.

Conclusion(s) Greater than half of all very preterm infants who developed BPD according to the NICHD NRN definition continued to receive non-invasive positive airway pressure or invasive mechanical ventilation at 6 weeks of age. However, the vast majority were not treated with corticosteroids during this time period, despite a risk-benefit ratio that likely favored steroid use for BPD prevention in many of these infants.

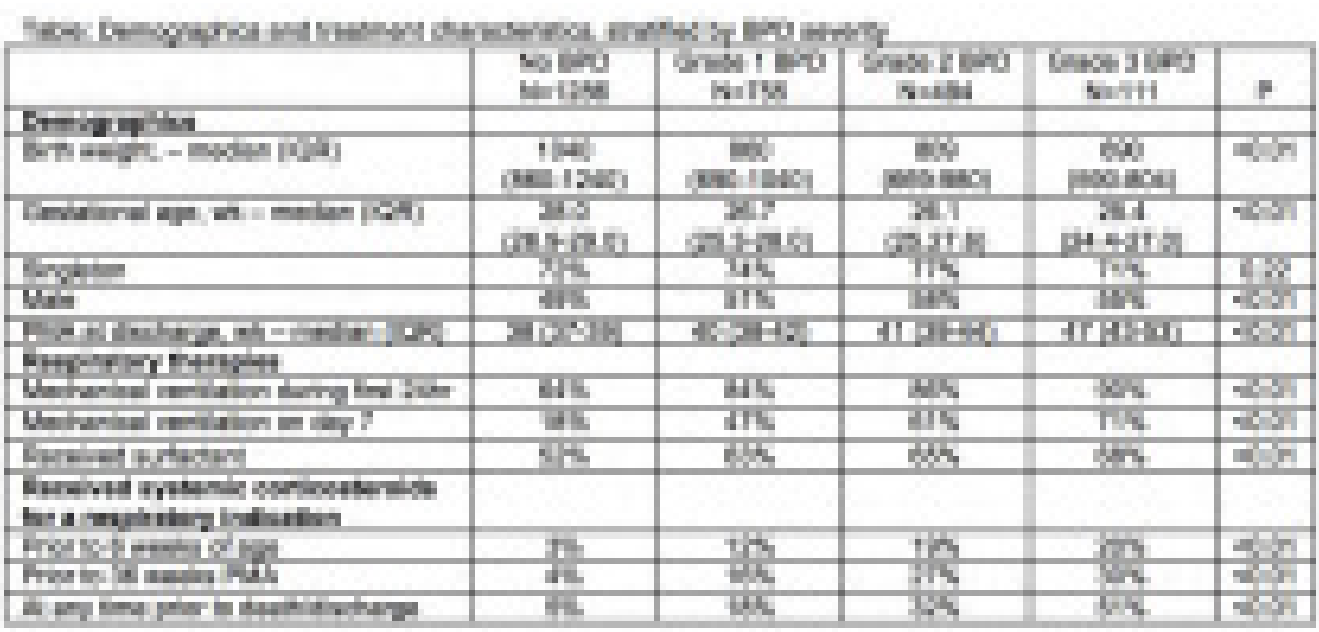

Table: Demographics and treatment characteristics, stratified by BPD severity

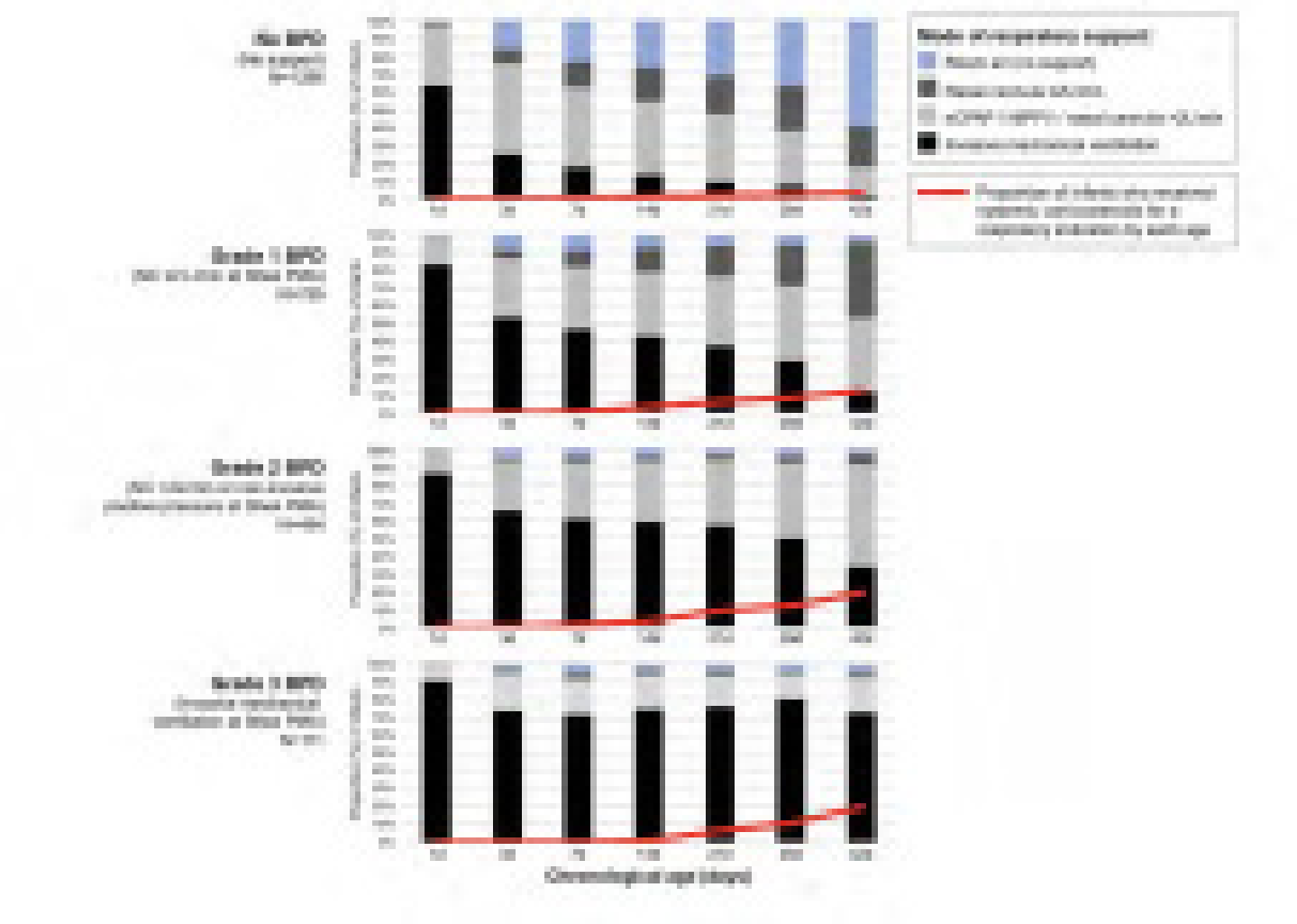

Figure. Respiratory support and corticosteroid treatment rates over the first 6 weeks of life in very preterm infants, stratified by BPD severity assessed at 36 weeks PMA.

Abstract: 322

High Frequency Oscillatory High Flow Nasal Cannula in a Premature Infant Lung Model: Full vs. Half Amplitude Oscillatory Flow

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Background In a previous in-vitro lung model we showed that superimposing oscillations of 4-10 Hz on the supply flow of a humidified high flow nasal cannula (HFNC) system significantly improved CO_2 washout. This model used a square-wave fully interrupted flow to provide the oscillations. However, the effect of oscillatory amplitude on delivered airway pressure and CO_2 clearance was not reported.

Objective To determine the effect of full vs. half-amplitude oscillatory HFNC on delivered airway pressure and CO_2 clearance in a premature infant lung model.

Design/Methods A premature infant lung simulator consisting of a 40 mL silicone bellows with a compliance of 1.0 mL/cmH_2O was connected to a 3D-printed replica of an upper airway from a 28 wk premature infant with airway resistance of 22 cmH_2O/(L/s). Total model resistance was 73 cmH_2O/(L/s) and total instrumented dead space was 3.5 mL. The model lung was placed in a rigid chamber connected to a computer controlled piston to simulate spontaneous breathing at a constant tidal

volume of 6.0 ml and respiratory rate of 60 breaths/min. A Fisher&Paykel Neonatal (3.0mm OD) nasal cannula was used with prongs fixed at 1/2 nares diameter. Oscillation was achieved by interrupting the HFNC supply flow by passing it through a 3-way solenoid valve operating at 4, 6, 8 or 10 Hz with a 50% on-off duty cycle. One-half flow interruption was achieved using a bypass circuit to limit the oscillatory flow troughs to one-half of the maximum amplitude. 100% CO_2 was injected into the bellows at a constant 12.0 mL/min. After End-Tidal CO_2 ($ETCO_2$) equilibration using non-oscillated flow, the solenoid valve was switched to oscillation mode and $ETCO_2$ was allowed to again equilibrate. $ETCO_2$ and airway pressures were measured at HFNC set flows of 2, 4 ,6 and 8 L/min.

Results Equilibrated mean values of $ETCO_2$ and delivered airway pressure excursions during no oscillation vs. full and half-amplitude oscillation are shown in Figures 1 and 2 respectively. Differences due to oscillation frequency were negligible and values shown are averaged over 4-10 Hz. Full vs. half-amplitude oscillatory flow resulted in negligible differences in both $ETCO_2$ and delivered oscillatory airway pressure excursions.

Conclusion(s) Based on these results, varying high frequency oscillatory amplitude applied to HFNC has a negligible effect on delivered airway pressure. Therefore, we speculate a minimal effect on lung volume. Clinical trials are required to further evaluate this potential therapy.

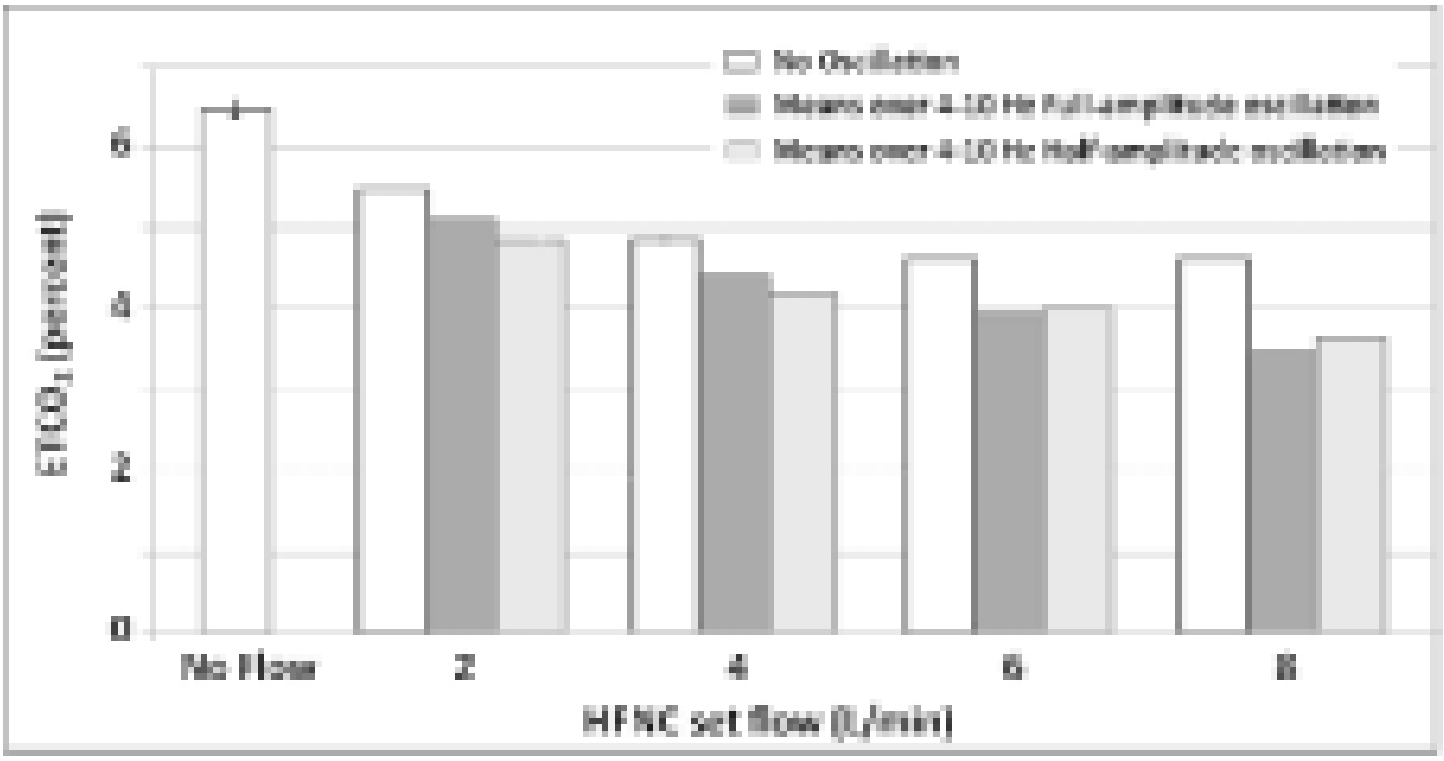

Figure 1. Baseline (no oscillation) vs Full and Half-amplitude oscillation: effect on $ETCO_2$ at HFNC set flows of 2, 4, 6 and 8 L/min.

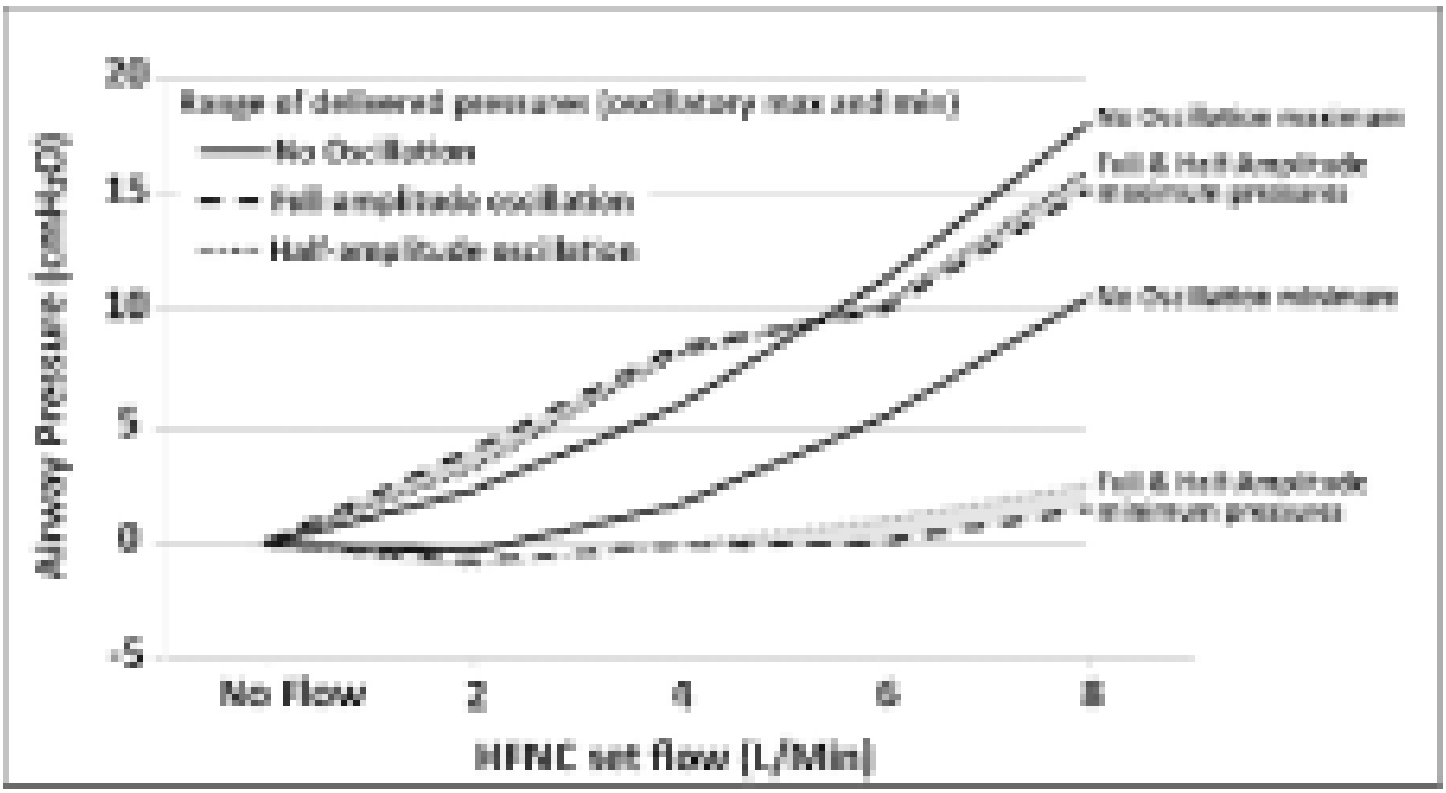

Figure 2. Delivered maximum and minimum pressure excursions with no oscillation compared with high frequency oscillation at both Full and Half-amplitude oscillation.

Abstract: 323

Effects of Lung Compliance and Respiratory Rate on Oscillatory High Flow Nasal Cannula in a Premature Infant Lung Model

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Background In a previous in-vitro lung model we showed that superimposing oscillations of 4-10 Hz on the supply flow of a humidified high flow nasal cannula (HFNC) system significantly improved CO_2 washout. This model was set to a compliance of 1.0 mL/cmH_2O and respiratory rate (RR) of 60 breaths/min. However, in premature infants, both lung compliance and RR are variable and depend on the maturity and health of the infant lung.

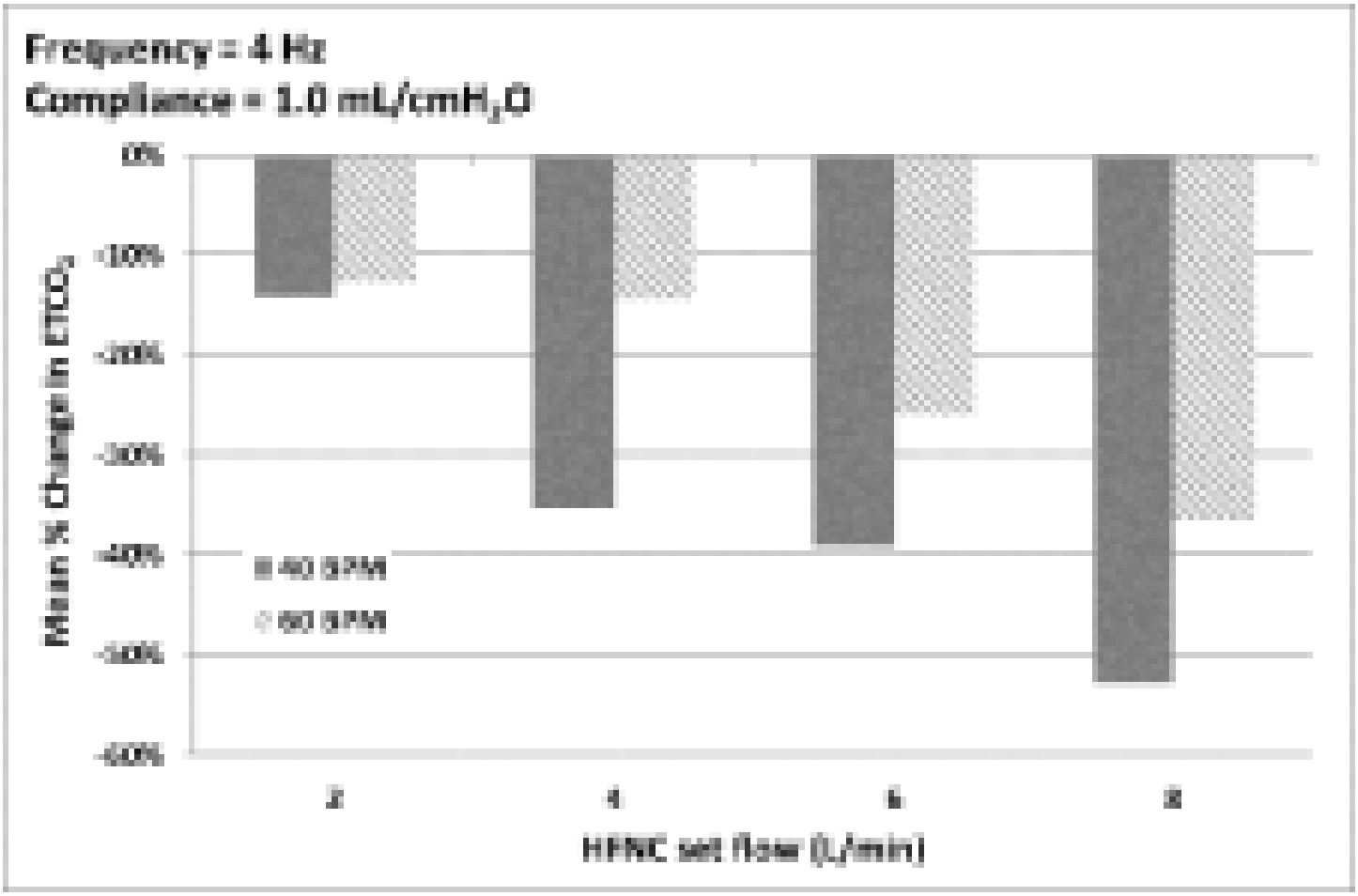
Objective To determine the effect of lung compliance and respiratory rate on the ability of Oscillatory HFNC to decrease End-Tidal CO_2 ($ETCO_2$) in a premature infant lung model.

Design/Methods A premature infant lung simulator consisting of a 40mL silicone bellows with a compliance of 0.5 and 1.0 mL/cmH_2O was connected to a 3D-printed replica of an upper airway from a 28wk premature infant with airway resistance of 22 cmH_2O/(L/s). Total model resistance was 73 cmH_2O/(L/s) and total instrumented dead space was 3.5 mL. The model lung was placed in a rigid chamber connected to a computer controlled piston to simulate spontaneous breathing at a constant tidal volume of 6.0 mL. A Fisher&Paykel Neonatal Oxygen Therapy (3.0mm OD) nasal cannula was used with prongs fixed at 1/2 nares diameter. Oscillation was achieved by passing the HFNC supply flow through a 3-way solenoid valve operating at 4, 6, 8 or 10 Hz with a 50% on-off duty cycle. 100% CO_2 was continuously injected into the bellows at a constant rate of 12.0 mL/min. After $ETCO_2$ equilibration, using non-oscillated supply flow, the solenoid valve was switched to oscillation mode and $ETCO_2$ was allowed to again equilibrate. $ETCO_2$ was measured at HFNC set flows of 2, 4, 6 and 8 L/min at a RR of 40 and 60 breaths/min for both model lung compliances.

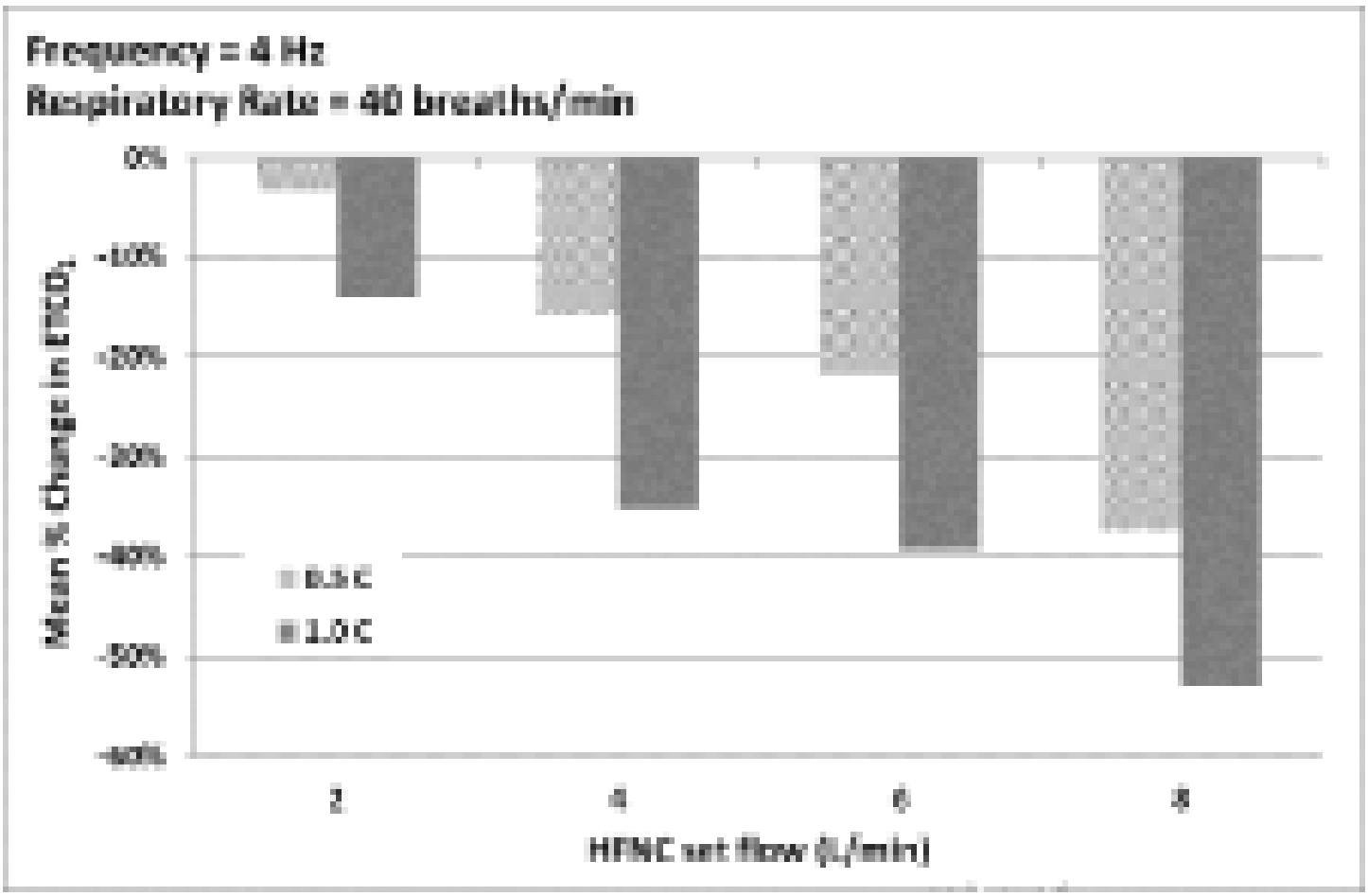
Results The relationship between percent change (%Δ) in $ETCO_2$ and respiratory rate (40 and 60 breaths/min) at a compliance of 1.0 mL/cmH_2O and frequency of 4 Hz is shown in Figure 1. The relationship between %Δ$ETCO_2$ and compliance (0.5 and 1.0mL/cmH_2O) at a RR of 40 Breaths/min and frequency of 4 Hz is shown in Figure 2. Maximum

%ΔETCO$_2$ occurred at a compliance of 1.0 mL/cmH$_2$O and RR of 40 breaths/min. The relationship between %ΔETCO$_2$ and RR or compliance was similar for 2, 6 and 8 Hz frequencies (not shown).

Conclusion(s) In a premature infant lung model, there is consistent evidence of improved CO$_2$ clearance when super-imposing oscillations onto HFNC. This effect increases with increasing compliance, and decreases with increasing respiratory rate.



Percent Change in ETCO$_2$ for HFNC flows = 2, 4, 6 and 8 L/min and RRs = 40 and 60 Breaths/Min at Compliance = 1.0 mL/cmH$_2$O and Frequency = 4 Hz.



Percent Change in $ETCO_2$ for HFNC flows = 2, 4, 6 and 8 L/min and Compliances = 0.5 and 1.0 mL/cmH_2O at RR = 40 Breaths/min and Frequency = 4 Hz.

Abstract: 324
Impact of Flow Disruptions in the Delivery Room
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Background We currently do not know how to optimize the delivery room (DR) to best support provider's performance during neonatal resuscitation. Flow disruptions (FD) are defined as "deviations from the progression of care that compromise safety and efficiency of a specific process," and have been associated with errors and adverse outcomes in other high acuity clinical settings. We hypothesized that FD are associated with worse short-term patient outcomes during neonatal resuscitation.
Objective To identify and classify FD during neonatal resuscitation. To determine the association between number and type of FD during neonatal resuscitation and achievement of target oxygen saturation values at 5 and 10 minutes.
Design/Methods This was a prospective observational study of video recordings of neonates <32 weeks gestational age who received respiratory support during DR resuscitation. FD were classified using Wiegmann's modified FD Tool (Table 1). Clinical outcomes included achievement of target oxygen saturation at 5 (primary) and 10 (secondary) minutes. We used descriptive statistics to report the frequency, type, and impact of FD. We assessed the association between patient and resuscitation characteristics and number of FD using Poisson regression. We used logistic regression to assess the association between FD and clinical outcomes, adjusting for patient gestational age and training level of team leader.
Results We assessed 32 resuscitations from 10/2017-7/2018. Table 2 shows patient and provider characteristics. Target oxygen saturations were achieved in 40.6% (5 minute) and 75% (10 minute) of resuscitations. A mean of 52.6 FD (SD 17.9) occurred

per resuscitation. Low impact and extraneous interruptions were the most common FD (Table 3). We found no association between any patient or resuscitation characteristic and the number of FD. FD were associated with a trend towards decreased odds of achieving target saturation at 5 (aOR 0.92, 95% CI 0.79-1.06) and 10 minutes (aOR 0.94, 95% CI 0.84-1.05) when adjusting for gestational age and team leader. However, specific domains of FD, such as training and technical skills, demonstrated a trend toward higher odds of achieving target saturations.

Conclusion(s) FD are common during DR resuscitation and are associated with a trend towards worse short term patient outcomes. Measuring FD is a promising tool to assess systematic impediments in the delivery room. The use of FD may have the potential to facilitate identification of targeted interventions to improve performance and clinical outcomes during neonatal resuscitation.

Table 1: Wiegmann's Modified Flow Disruption Tool

Flow Disruption Category	Definition
Communication	Disruptions that involve the verbal transfer of information between at least two team members.
Coordination	Disruptions that involve the interaction with some piece of equipment as well as at least one other team member or disruptions where multiple team members are engaged in tasks that hinder one another
Extraneous Interruptions	Disruptions occurring during the resuscitation that do not directly pertain to the treatment of the patient and result in disruptions of resuscitation flow
Equipment, Technology, & Layout	Malfunctions of technologic equipment or delays secondary to layout or equipment design/performance resulting in resuscitation delays
Resource-based Issues	Failure to progress to the next stage of the resuscitation because of a lack of resources available at the resuscitation table
Training	Training or supervision that hinders the natural progression of the resuscitation
Technical Skill	Skill-based or decision (thinking) error, including poorly executed tasks, omitted steps, or misinterpretation of relevant information

Table 2: Patient and Provider Characteristics

Characteristics:	N=32
Patient Gestational Age Weeks, Median [IQR]	28.1 [25.2-30.7]
Patient Birth Weight grams: Mean (SD)	995.6 (413.4)
Weekday resuscitation; n (%)	26 (81.3%)
Daytime resuscitation; n (%)	21 (65%)
Team Notification ≥ 5 minutes prior to birth; n (%)	31 (96.9%)
Role of initial team leader; n (%)	
Fellow	19 (59.4%)
Attending	12 (37.5%)
NP/PA	1 (3.1%)
Change in Leader During Resuscitation; n (%)	7 (21.9%)
Attending primarily works at study site; n (%)	16 (55.2%) N=29
Type of support during resuscitation;* n (%)	
CPAP	29 (90.6%)
PPV	28 (87.5%)
Intubation Attempt	9 (28.1%)
Successful Intubation	7 (21.9%)
Chest Compressions	0
Epinephrine	0

IQR= Interquartile Range, SD= Standard Deviation, NP= Nurse Practitioner, PA= Physician Assistant, CPAP= Continuous Positive Airway Pressure, PPV=Positive Pressure Ventilation
*Select all levels of support used during the resuscitation, more than one possible

Table 3: Classification and Impact of FD per Resuscitation

Flow Disruptions	Per Resuscitation
Total; Mean (SD)	52.6 (17.9)
Category of Flow Disruption	
Extraneous; Mean (SD)	19.5 (7.8)
Equipment & Layout; Mean (SD)	13.9 (6.3)
Communication; Median [IQR]	9.5 [5-14]
Coordination; Mean (SD)	4.1 (2.3)
Resource; Mean (SD)	2.3 (1.9)
Training; Median [IQR]	0 [0-1]
Technical Skill; Median [IQR]	1 [0.5-2]
Impact of Flow Disruption	
High Impact; Median [IQR]	1 [0-3.5]
Medium Impact; Mean (SD)	4.6 (3.5)
Low Impact; Mean (SD)	44.8 (13.8)

FD= Flow Disruptions, SD= standard deviation, IQR= interquartile range

Table 4: Adjusted Odds Ratio of Achieving Target Saturation by FD Category*

Target Saturation at 5 minutes		
Category of FD	**aOR (95% CI)**	**p-value**
Total	0.92 (0.79-1.06)	0.20
Extraneous	0.82 (0.61-1.12)	0.21
Equipment & Layout	0.91 (0.72-1.14)	0.41
Communication	0.98 (0.81-1.19)	0.86
Coordination	0.63 (0.34-1.17)	0.14
Resource	0.94 (0.43-2.04)	0.88
Training	1.24 (0.54-2.83)	0.61
Technical Skill	4.82 (0.87-26.55)	0.07
Target Saturation at 10 minutes		
Category of FD	**aOR (95% CI)**	**p-value**
Total	0.94 (0.84-1.05)	0.28
Extraneous	0.98 (0.82-1.16)	0.79
Equipment & Layout	0.93 (0.78-1.13)	0.48
Communication	0.93 (0.78-1.11)	0.43
Coordination	0.89 (0.59-1.32)	0.83
Resource	0.56 (0.26-1.21)	0.14
Training	2.13 (0.45-10.62)	0.36
Technical Skill	0.82 (0.38-1.77)	0.62

FD= Flow Disruptions, aOR= adjusted odds ratio, CI= confidence interval
*Adjusted for gestational age and training level of team leader

Abstract: 325

Initiating Resuscitation Before Umbilical Cord Clamping in Infants with Congenital Diaphragmatic Hernia: The Maternal Experience.

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Background Congenital diaphragmatic hernia (CDH) is a congenital anomaly associated with significant morbidity and mortality. The traditional approach to resuscitating babies with CDH involves immediate cord clamping followed by intubation apart from the mother. Mothers' experiences of seeing their babies intubated at close range prior to umbilical cord clamping (UCC) is not known.

Objective We sought to assess mothers' perspectives on intubation prior to UCC for infants with CDH and to identify factors that impact maternal stress during the procedure.

Design/Methods We surveyed 15 mothers of infants with CDH enrolled in a trial of intubation prior to UCC and conducted semi-structured key informant interviews with 8 participants.Questions were generated from studies designed to assess parents' experiences of resuscitation before UCC for preterm infants. Participants were surveyed and interviewed within the first month post-partum. Interview transcripts were imported into ATLAS.ti 7 and analyzed using coding and analytical memos by an experienced qualitative researcher. Analytical notes, query tools, code reports, and network views were developed to highlight key themes and relationships in the data.

Results Most participants were white, multiparous (table 1) and reported positive experiences with intubation prior to UCC (figure 1). Key themes included the importance of preparation for viewing intubation, need for reassurance during intubation,

and the value of staff and family support (table 2). Of 4 mothers with vaginal deliveries, 3 chose to watch intubation; these mothers appreciated the opportunity to observe the intubation. Eleven mothers underwent c/s and were unable to watch their babies being intubated. If faced with this experience again, 9 of 15 mothers would prefer to see intubation. Participants found security in the procedure and noted it to be "beneficial." Participants did not report negative emotional after effects from witnessing the intubation. Being close during intubation had no impact on personal stress levels for 7 of 13 mothers and 5 of 13 said it made them less stressed.

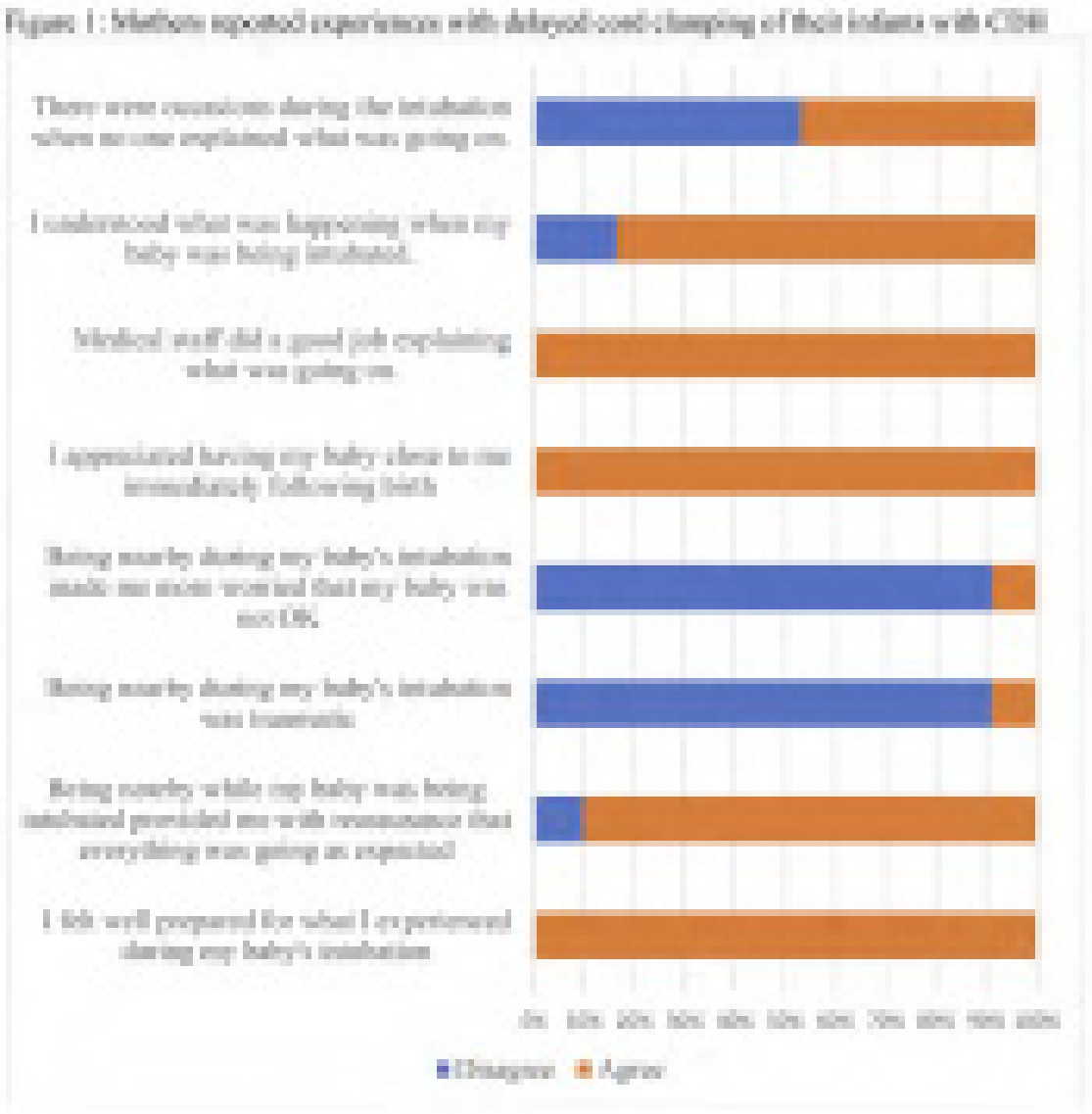
Conclusion(s) Mothers reported positive experiences of intubation prior to UCC for infants with CDH. To minimize maternal stress, providers should consider offering the option for parents to watch their babies being intubated with preparation before and explanation during the procedure. These findings may have implications for intubation of infants in general and not just prior to UCC.

Table 1: Maternal data and infant characteristics

Maternal demographics	
Race/ethnicity	
White (not Hispanic/Latino)	11 (73%)
White (Hispanic/Latino)	1 (7%)
Black (not Hispanic/Latino)	1 (7%)
Asian	1 (7%)
Other (Hispanic/Latino)	1 (7%)
Parity	
Nulliparous	5 (33%)
Multiparous	10 (67%)
Type of birth	
Vaginal	4 (27%)
Cesarean	11 (73%)
Infant characteristics and birth related data	
Male sex	11 (73%)
Birth weight, grams (SD)	3341 (543)
Gestational age at birth, mean (SD)	39.7 (0.4)
5-minute Apgar score, median (IQR)	9 (8-9)
NICU	6/15 (40%)
Duration in minutes between birth and cord clamp median (IQR)	1.23 (0.28-1.86), 2.36)
Completed BCG immunization	14/14 (100%)

Table 2: Key themes and sample quotes

Theme	Sample quote
Preparing parents with information prior to intubation is important	"I probably – that really helped, I think, was my – just got me ready to see [during the] explanation ahead of time. … I think being prepared ahead of time didn't make it seem as scary."
Parents would have rather them the medical team during intubation	"I do wish I would have heard a little bit more of explaining while they were doing it."
Parents prefer having the option to watch intubation	"I just wanted to watch. I just wanted to make sure she was OK."
Moms report a sense of security during DCS', feeling they are supporting their baby through intubation	"I think it felt relief because then I at least knew he was getting some support from me while the process was going on."
Competent compassionate staff, access to psychologist and family are valuable resources	"I've been so impressed with the staff here … to me has been so much support and so many resources."


There were occasions during the intubation when no one explained what was going on.
I understood what was happening when my baby was being intubated.
Medical staff did a good job explaining what was going on.
I appreciated having my baby close to me immediately following birth
Being nearby during my baby's intubation made me more worried that my baby was not OK.
Being nearby during my baby's intubation was traumatic
Being nearby while my baby was being intubated provided me with reassurance that everything was going as expected
I felt well prepared for what I experienced during my baby's intubation
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Disagree
Agree

Abstract: 326

Moral Distress in a level IV NICU

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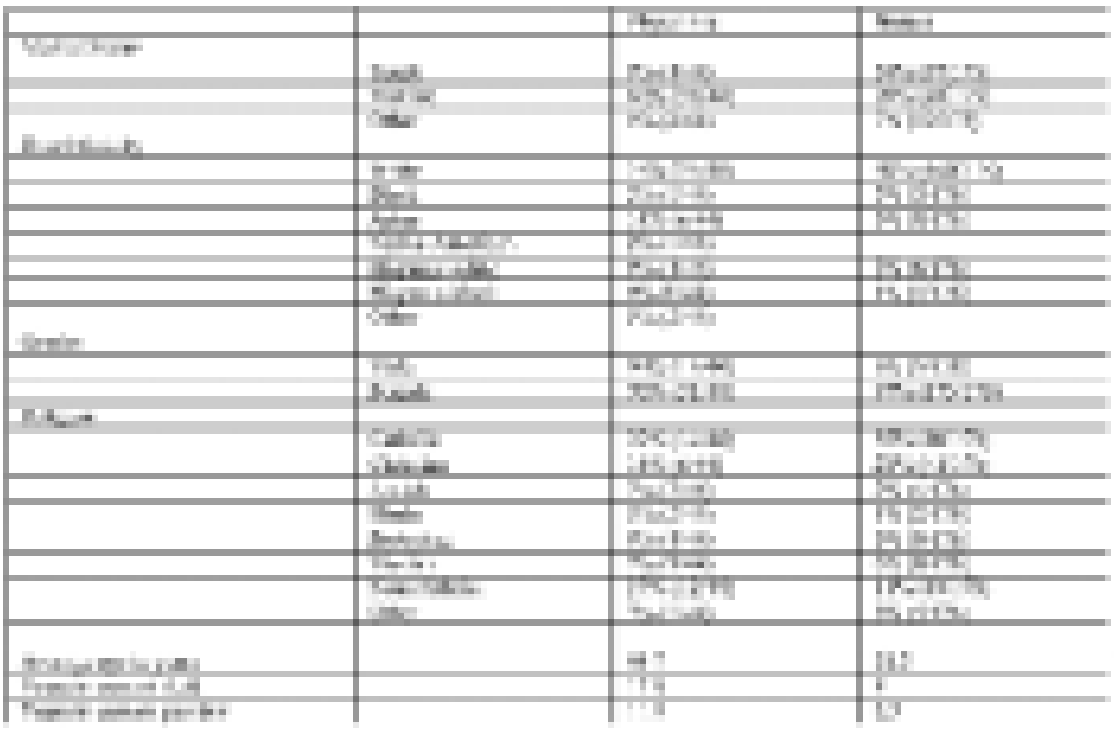
Background Moral distress is the phenomenon that results from holding a belief about the appropriate moral action under a given circumstance and yet being constrained against acting in accordance with that belief. Moral distress is thought to be common in the Neonatal Intensive Care Unit (NICU) but has not been formally studied in a level IV unit.

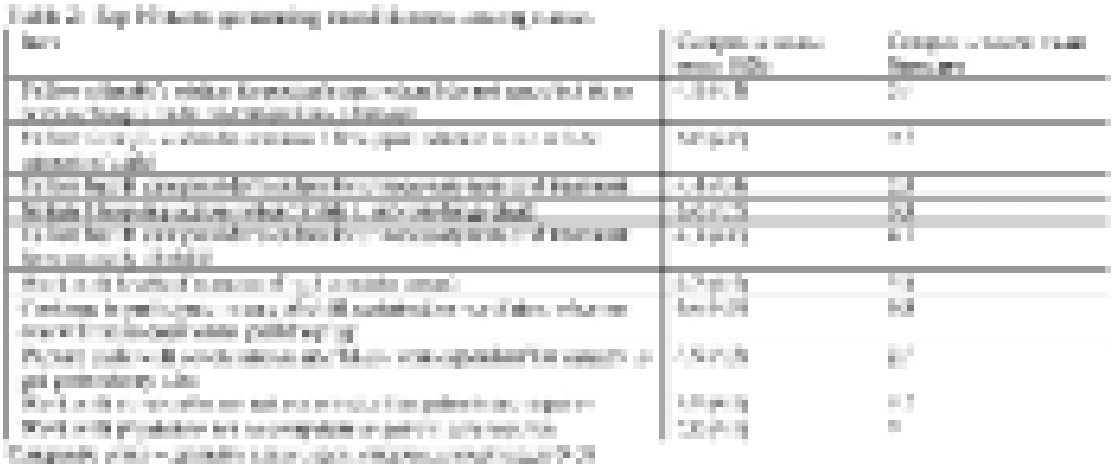
Objective We sought to determine the baseline prevalence of moral distress among physicians and nurses in our level IV NICU and to characterize components of moral distress among nurses.

Design/Methods We distributed two validated instruments; the Moral Distress Scale (MDS) and the Moral Distress Thermometer (MDT) to nurses in our NICU over a one-year period. The MDT was also circulated to physicians. Additional survey questions were taken from a previous study designed to assess levels of moral distress in a level III NICU.

Results The majority of nurses participating in our study were white (90%) and Catholic (55%). Physicians were similarly distributed though there was more racial and religious diversity among doctors (table 1). Baseline levels of moral distress (measured on a scale of 1-10) in our unit were not significantly different than those previously described in the literature with physicians reporting an average score of 1.45 (+/- 2.23) and nurses reporting an average score of 2.23 (+/-1.82) (lit 2.7 +/- 2.4). Nurses reported the highest levels of moral distress relating to following a families' wishes to continue life support when it is not in the best interest of the child and continuing to participate in the care of a child sustained on a ventilator when no one will make the decision to withdraw care (table 2). 48% of nurses and 92% of physicians previously participated in support groups and/or debriefing sessions to deal with moral distress or disturbing clinical situations. Of those who participated in such groups, 88% found them to be helpful with nurses being more likely to find such sessions helpful than physicians.

Conclusion(s) Baseline levels of moral distress in our unit were not significantly different than those published in the literature and were most often related to pursuing aggressive care of patients with which respondents disagreed. Support groups and debriefing sessions appear to be helpful in mitigating moral distress and therefore may be useful interventions for staff in the NICU.





Abstract: 327

Growth Retardation in Infants with Neonatal Abstinence Syndrome Admitted to the Neonatal Intensive Care Unit.

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Background The incidence of neonatal abstinence syndrome (NAS) has increased substantially over the past several years. Recent literature suggests that chronic opioid use during pregnancy was associated with smaller head circumference at birth. Infants with NAS may be at increased risk for growth failure due to a withdrawal-induced hypermetabolic state.

Objective To investigate if infants with NAS who are admitted to the neonatal intensive care unit (NICU) have decreased growth parameters between birth and discharge.

Design/Methods This is a retrospective data analysis of all term and late-preterm (≥ 35 weeks gestation) neonates who were diagnosed with NAS and admitted at a single center NICU in Philadelphia, Pennsylvania between September 2006 and May 2018. Demographics and clinical characteristics of infants were collected. Growth parameters (weight, length, and head circumference [HC]) were measured at birth and at discharge. Z-scores and percentiles were calculated using the Fenton growth calculator. Infants were fed standard term formula or breast milk. Statistical analysis was performed using t-test, Mann Whitney U test, chi-squared, and Fischer exact test, as appropriate. A p-value of <0.05 was considered statistically significant.

Results A total of 864 infants ≥35 weeks were admitted for NAS during the study period. The median (IQR) length of NICU stay was 32 (21-48) days. The growth parameters at birth and at discharge are shown in Table 1. The HC at birth was < 10^{th} percentile in 28% of infants. At birth, the median percentiles were 30% for weight, 23% for head circumference, and 37% for length; these numbers decreased significantly (p<0.001) to 12%, 6.5%, and 13%, respectively (Figure 1). There were similar decreases in Z-score for weight, head circumference, and length. The proportion of infants falling below both the 3^{rd} and 10^{th} percentile increased significantly in all parameters between birth and discharge. The number of infants with HC below the 3^{rd} percentile increased from 11% at birth to 29% at discharge.

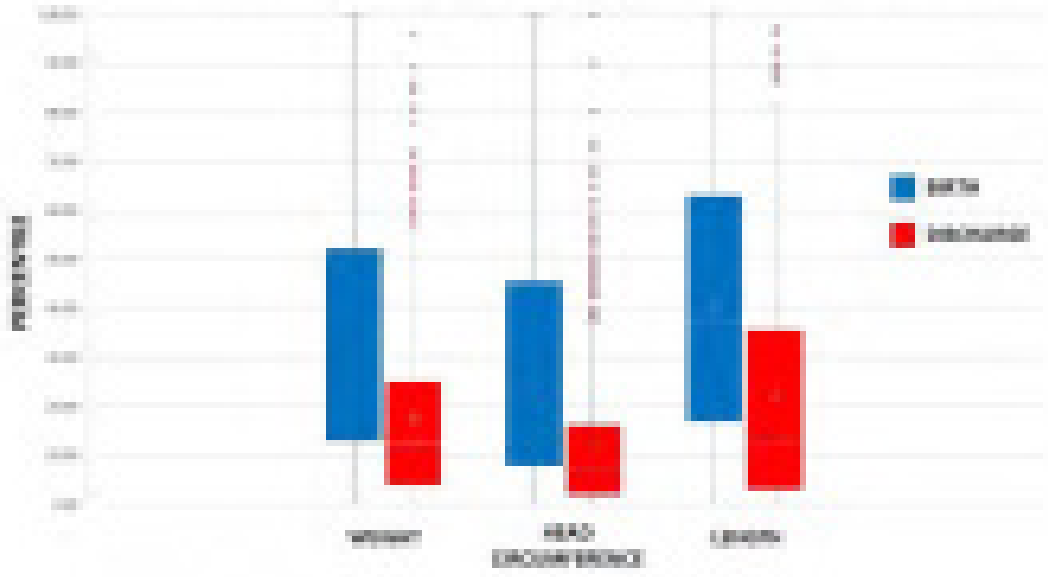
Conclusion(s) Infants with neonatal abstinence syndrome are smaller at the time of birth. These infants have significant growth retardation in all growth parameters including HC throughout hospital stay in the NICU. A long-term neurodevelopmental follow-up study will discern the impact of smaller head size in infants with NAS. Greater attention needs to be paid to neonatal nutrition in those infants with NAS admitted to the NICU.

Table 1. Growth parameters at birth and at discharge in infants treated for NAS.

	At Birth	At Discharge	p-value
Weight (kg)	3.30 (3.01, 3.57)	3.08 (2.74, 3.33)	<0.001
Weight gain (g/day)	34 (23.9, 43.1)		
Weight Percentile	30 (13, 52)	12 (4, 25)	<0.001
Weight Z-score	-0.52 (-1.12, 0.04)	-1.19 (-1.78, -0.68)	<0.001
Number of infants >10th Percentile	164 (39%)	109 (26%)	<0.001
Number of infants <3rd Percentile	48 (7%)	126 (18%)	<0.001
Head Circumference (cm)	35 (33, 36)	33.5 (34, 37)	<0.001
HC Percentile	31 (8, 58)	8.5 (2, 38)	<0.001
HC Z-score	-0.51 (-1.39, -0.06)	-1.51 (-2.08, -0.87)	<0.001
HC Number of infants <10th Percentile	241 (58%)	307 (74%)	<0.001
HC Number of infants <3rd Percentile	91 (11%)	254 (39%)	<0.001
Length (cm)	48.3 (47, 50)	52 (48.5, 54)	<0.001
Length Percentile	37 (17, 61)	11 (3, 31)	<0.001
Length Z-score	-0.33 (-0.97, 0.33)	-1.34 (-1.91, -0.47)	<0.001
Number of infants <10th Percentile	332 (17%)	179 (44%)	<0.001
Number of infants <3rd Percentile	48 (7%)	208 (50%)	<0.001

Data expressed in median and interquartile range. A p-value <0.05 is considered significant.

Figure 1. Growth parameters at birth and at discharge in infants with NAS.



Percentiles based on Fenton growth curve between birth (blue) and discharge (red) in infants with NAS.

Abstract: 328

Iatrogenic Neonatal Abstinence Syndrome in the NICU: opportunities for improvement

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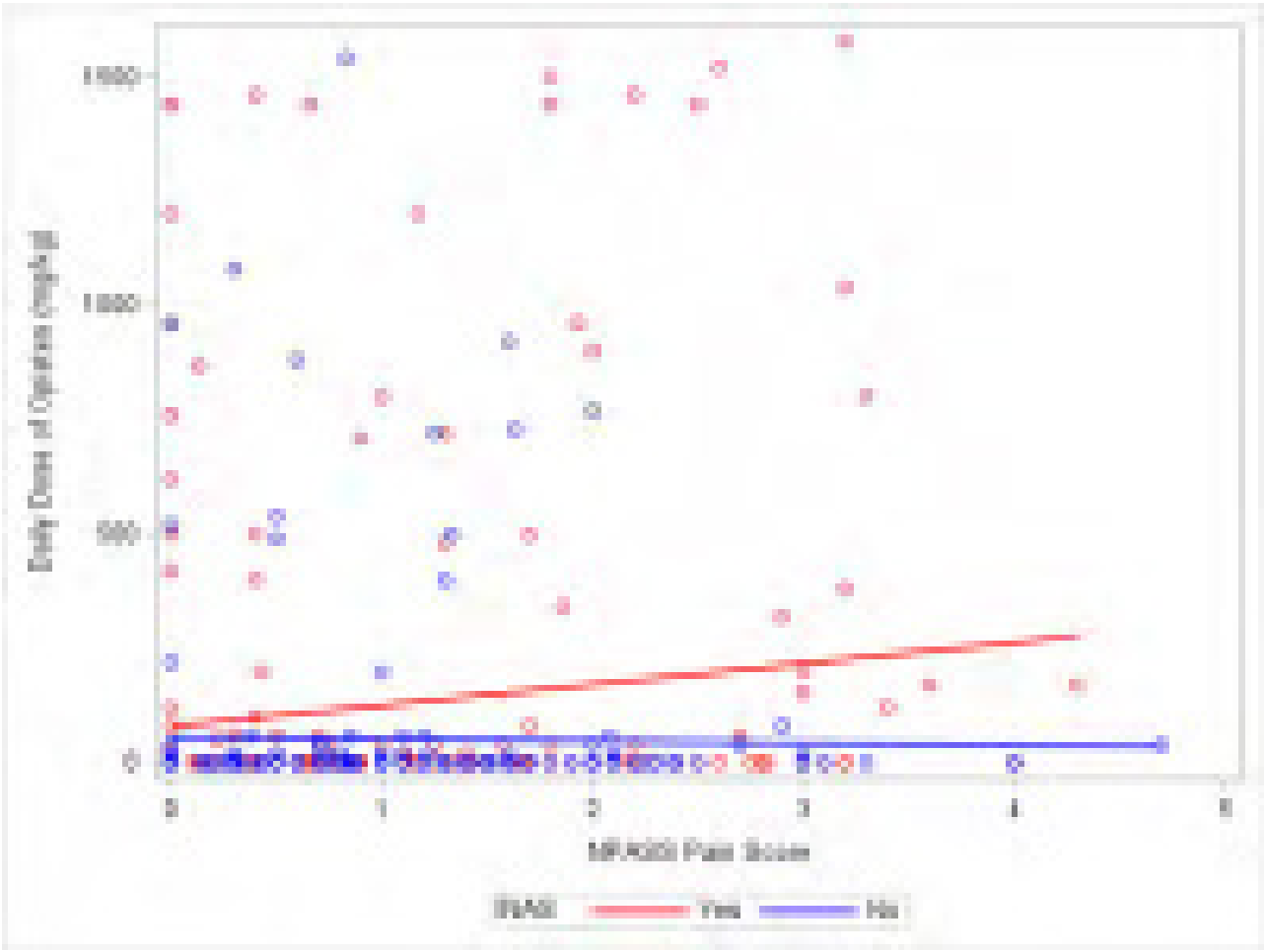
Background Medication use to alleviate pain and stress in neonates is accepted, but treatment regimens vary. Prolonged use of opiates/sedatives in neonates increases the risk of developing iatrogenic Neonatal Abstinence Syndrome (INAS), with potential adverse consequences.

Objective Determine incidence of INAS in term infants exposed to opiates/sedatives in the NICU and identify factors associated with administration of these medications. Hypothesis: There is significant variability in opiate/sedative use in neonates despite the use of pain and sedation scoring systems (NPASS).

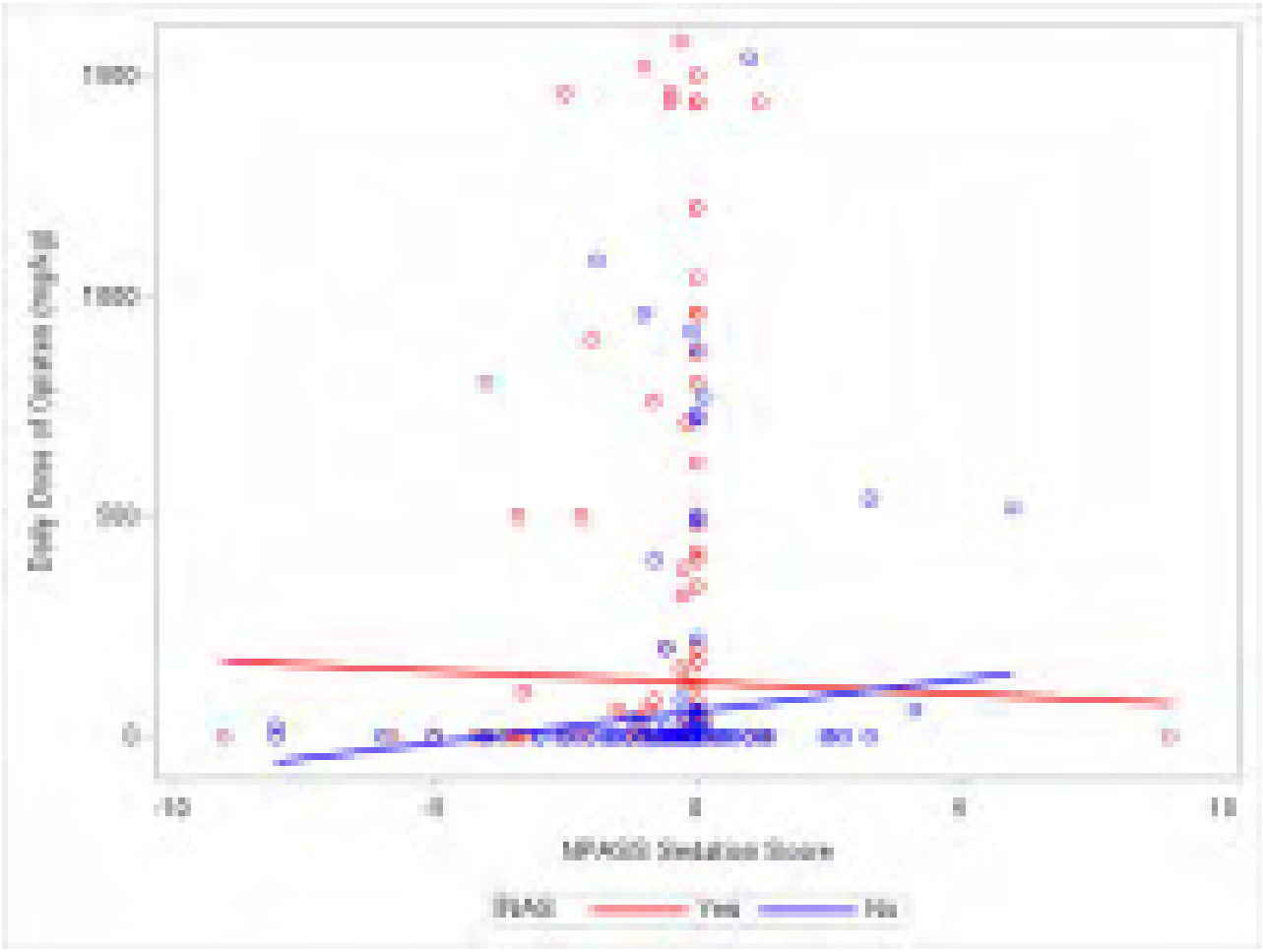
Design/Methods This was a retrospective chart review of term infants admitted to Georgetown NICU from Jan 2014–Dec 2016, with length of stay (LOS) ≥ 7 days, treated with opiates/sedatives for > 1 day. Infants with NAS due to prenatal drug exposure excluded. Opiate (morphine, fentanyl; converted to morphine equivalents using morphine: opiate equivalence ratio of 20:1) and sedative (benzodiazepine) exposure was correlated with average NPASS and maximum FiO2 each day. Patients with INAS were identified by weaning of medications over > 1 day or NAS diagnosis in the medical record. Wilcoxon rank sum test and t-test used on continuous variables stated as means/standard deviations; Chi Square/Fisher exact test on categorical variables (frequency, percentage).Pearson/Spearman correlation applied to continuous variables. Significant p – values a= 0.05.

Results INAS was diagnosed in 22 of 70 infants (31.4%) (Table 1); 10 infants with INAS received opiates alone and 12 received opiates and midazolam. Seven percent of surgical patients had INAS, compared with 57% of infants with persistent pulmonary hypertension (PPHN). Infants with INAS had prolonged respiratory support, longer time to reach full feeds and increased LOS. NPASS (484 scores) correlated well with opiate exposure (p <0.001), but Figs 1 and 2 show significant variation in opiate doses given for the same NPASS. Although there was correlation between daily FiO2 and opiate exposure (p <0.001), Fig 3 shows significant variation in doses given and infants continued to receive high doses of opiates even when FiO2 was < 0.6.

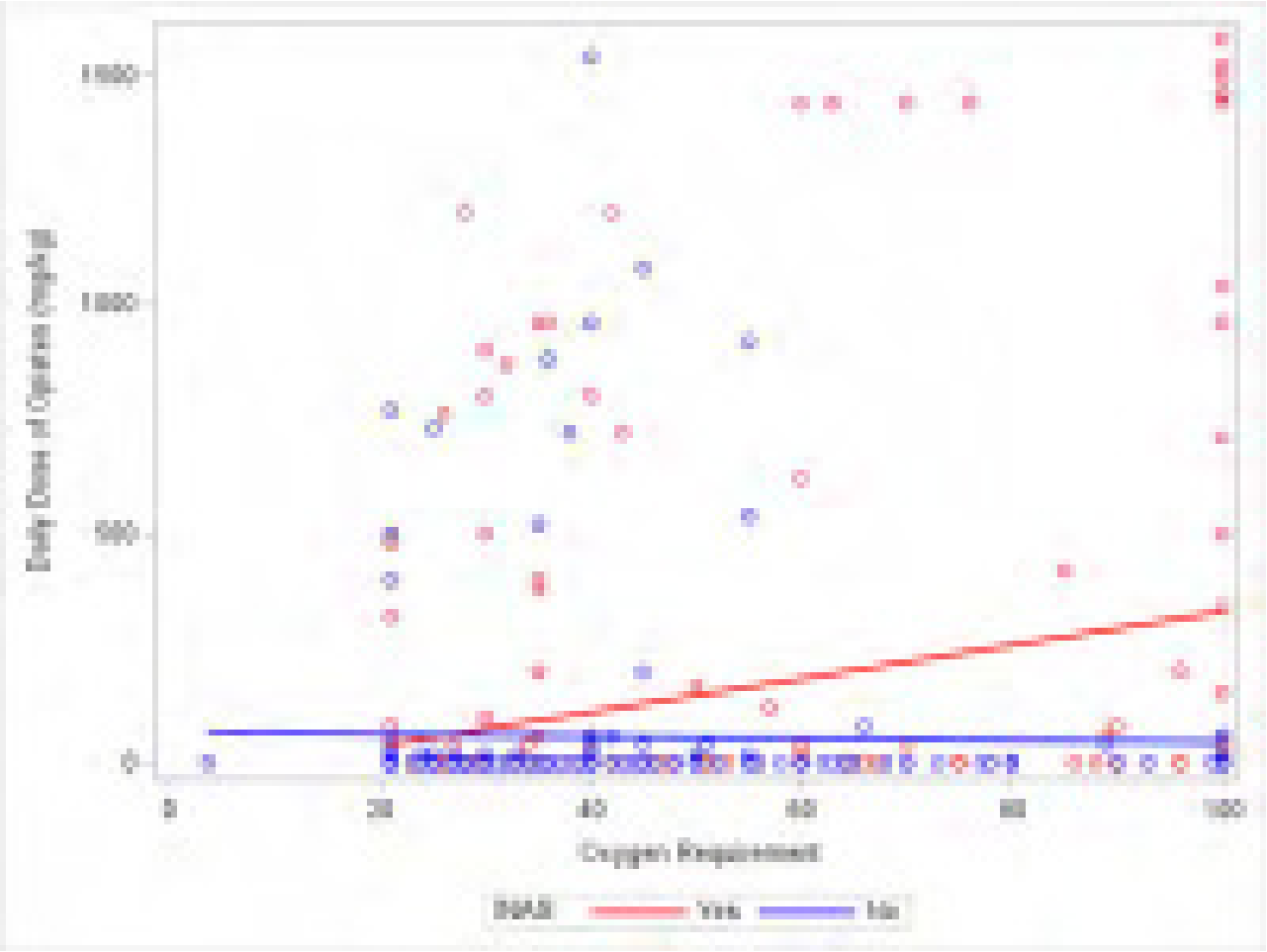
Conclusion(s) INAS occurred in 30% of infants exposed to opiates/sedatives, with increased risk in infants with PPHN. There was wide variation in the opiate dosage. High doses of opiates were administered even when FiO2 was ≤0.6, indicating improving status. This may be a time point to consider weaning medications. Alternatives to opiates for sedating infants with PPHN should be considered.



Correlation between NPASS pain scores and average daily dose of opiates.



Correlation between NPASS sedation scores and average daily dose of opiates.



Correlation between daily maximum oxygen requirement and average daily dose of opiates.

Table 1: Demographics and Medication Exposure

	INAS (22)	No INAS (48)	P-value
Birth weight	3380 (636)	3248 (556)	0.38
Gestational Age	39.5 (1.3)	39.2 (1.2)	0.41
Length of stay	26.6 (18.7)	15.2 (9.3)	<0.0001
Days to reach full feeds	5.8 (2.7)	4.4 (1.8)	0.04
Days on respiratory support	10.5 (6.6)	4.92 (2.5)	0.0001
Diagnoses			
Persistent pulmonary hypertension (PPHN)	13	10	
Surgery	1	14	
Whole Body Cooling	0	23	
Pneumonia	1	0	
Meconium Aspiration Syndrome	1	1	

Sepsis	1	0	
Extracorporeal Membrane Oxygenation (ECMO)	3	0	
Pneumothorax	1	0	
Other	1	0	
Opiates/Sedatives			
Daily dose of morphine/fentanyl in morphine equivalents (mg/kg)	106.6 (187)	42.4 (150)	0.006
Cumulative dose morphine/fentanyl in morphine equivalents (mg/kg)	1513 (2945)	246 (865)	<0.0001
Daily dose of midazolam (mg/kg)	0.35 (0.23)	0.16 (0.14)	0.11
Accumulated dose of midazolam (mg/kg)	2.64 (3.58)	0.19 (0.15)	0.02
Duration of exposure to analgesics/sedatives	17.0 (9.7)	4.0 (1.9)	<0.0001

INAS: iatrogenic neonatal abstinence syndrome

Abstract: 329
NICU Provider Attitudes Regarding Neonatal Organ Donation
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Background Nearly 2000 children await organs in the US. Determination of brain death is rare in neonates. Thus, the AAP endorses donation after circulatory determination of death (DCDD) as a measure to help supply meet demand. Despite this recommendation, neonatal organ donation is infrequent.
Objective This qualitative study aimed to examine perspectives of multidisciplinary NICU providers regarding neonatal organ donation.
Design/Methods We conducted semi-structured interviews with neonatal providers including attendings, fellows, nurse practitioners, and nurses. The interview was developed after literature review, revised with a focus group, and piloted before use. Purposive sampling was utilized to identify a heterogeneous cohort with regard to provider role and experience. Researchers transcribed and manually coded audio-recorded interviews. Analysis occurred concurrently with recruitment, and emerging categories were used to refine interview questions. Recruitment continued until the achievement of theoretical saturation to avoid repetitive data collection. Hospital policies regarding organ donation were examined and a retrospective chart review of interactions with the local organ procurement organization (OPO) over the past 10 years was performed to triangulate data and increase validity.
Results Thirteen providers were approached and 7 consented to participate; as declination occurred by way of non-response to email, reasons were unknown. Seven themes emerged (Table 1): knowledge (limited, more education desired), perceived family experience (need to balance significant perceived benefits and risks), providers' own experiences (all but 1 were organ donors, minimal clinical experience), feelings (supportive with ambivalence), protocol (concerns and confusion regarding current practice, hopes and stipulations for future) and counseling (end of life, organ donation). Hospital policies exist defining thresholds for referral to the OPO, including prior to withdrawal of life-sustaining treatment; procedure for DCDD; and diagnosis of pediatric brain death. Chart review (n=265) demonstrated that 96% of OPO referrals occurred after patients died, negating the possibility of organ donation.
Conclusion(s) Lack of provider awareness, uncertainty regarding hospital policies, and late OPO referrals contribute to the rarity of neonatal organ donation. Given the support voiced by providers, addressing knowledge gaps and ethical trepidation through targeted provider education will likely increase recognition and occurrence of this potentially life-saving practice.

Themes, Categories and Representative Quotes from Interviews

Theme	Category	Sample Quote
Knowledge	Accurate	*The little bit I do know about organ donation is that you should leave it to Living Legacy to have those conversations.*

	Inaccurate	*It's a difficult thing to be relevant in the neonatal population, because there is no criteria for brain death in the neonatal period.*
	Perceived Lack	*I actually don't know which organs… I actually don't know much about the specific difference in the designations between circulatory and neurologic death and what that means in terms of organ donation.*
	Education Desired	*I think in large part my honest answer is more education. And then practice. I think practice makes everything easier. Maybe this is something we can Sim[ulate]? I mean, I actually think it would be great to watch someone from Living Legacy do it.*
	Media Influence	*You see on social media the video of the parent hearing their kids' heart beating in someone else's chest, and how moving that is.*
Perceived Family Experience	Emotional Benefits	*Benefits for them may be that they have the ability to think that a part of their child is still living in the world. And so that, although it's a sadness for them, their sacrifice may be to help someone else.*
	Risk for Distress	*But I feel like the big response I get when I bring up autopsy is "I don't want anyone to cut my baby."…and I guess, you know, you are still getting that. You're still cutting someone's baby.*
	Parental Choice	*I think, who knows, if it were my kid, I would…probably still want to move forward with a, an attempt at donating, but wouldn't stand in judgment of a family who didn't, you know? I don't see it as black and white, as being like…how could you not? I would definitely understand someone not wanting to take that risk, or go through that.*
	Time	*I think if it dragged on, you know, a week, or longer, I think staff would start to feel like…is this humane? Is this, you know at what point do we have to just let this baby fully go, let their family really grieve.*
	Baby	*I mean, it definitely doesn't feel good to do invasive, painful procedures on…someone's body who we could just otherwise sort of let go… more peacefully.*
	Balance of Risks and Benefits	*I don't know… it's hard, because you don't want to put a grieving family in any more pain. But in the same token, these organs are so desperately needed, it's hard to say, well, your two hours holding your baby are worth more than the organs that are gonna save 5 other people's lives.*
Own Experience	Personal	*Also, I had a family member who is in need of a lung transplant, so that also kinda paints me in one direction. Because I know she's young, and she has this entire life to look forward to, and it was actually one of the things that really pushed me toward making sure I was listed as an organ donor.*
	Professional	*Just going through medical school, I may have heard of a case that was going on, like on our general surgery rotation…not as a healthcare provider where I was the provider, or in the case.*
Feelings	Personal	Positive *Oh, very strongly, that if it's a possibility, that it's … clearly it's life-saving, so if somebody needs an organ, or they're able to give an organ for a patient or family member that's not gonna survive anyway, I think that would be a wonderful thing.*

		Ambivalent *You know, in all honesty, would I recommend it? (reluctantly) Yes. Do I get that people couldn't do it? Also yes. You know, I think, uh, if you're brain dead, and you've got that time, and it's just kind of, could extend on indefinitely…then you have that grieving time. And I think that is the only part that I question about circulatory death. I like to think that, if it was someone who I loved tomorrow, that I would be able to be like, yup, do it! But I don't know! I don't know. Because I definitely think there is something to be said about that time that you spend. So. Yeah, my gut wants to be like, yup, totally, everybody should do it, but I'm like...ehhhh, it sounds like it would be something that would be really hard to do.*
	Professional	Positive *In my minimal experience, it feels like a good, positive thing, that people are able to do, and that the need is so huge, that the drawbacks of maybe sort of prolonging the end of life, and artificially doing testing and things like that, that the benefits sort of outweigh that in my mind.* Ambivalent *And I was sort of taken by…there's this huge amount of sort of humanity, and sadness, and emotion in the room, and once the heart stopped, and the clock started running, how quickly it was like…the family was out, the lights were on, there were a hundred surgeons, just tearing this body apart. You know, you're not doing much with it afterwards. It was just… this brutality, but also kind of…the technological amazingness of it.*
	Impact on Staff	*Some people are probably gonna feel like they're part of something bigger, like they cared for this baby…sometimes we care for these babies for so long, and they just pass. I think for some people, it might mean that their work is at least going towards somebody else's life?* *I think they'd…understandably staff would feel a little bit more, I don't think it'd be as much of a common yes as donation after neurological death would be for staff. I think there'd be more staff with more gray feelings about the process. I don't know if many would feel adamantly opposed? But I can definitely see a greater number having concerns about the process, or feeling a little bit more…tormented about the ethics of it.*
Protocol	Gaps in Current	*Here...it might be because now I'm the attending, so I'm not making those calls, so I don't have those conversations, but it just seems a little bit more amorphous. And maybe because I'm a little bit more separated from it, because maybe the fellows are making those calls more to Living Legacy. I hope.*
	Hopes for Future	*I'm all for protocols and policies to standardize care. Yeah, I think that'd be amazing, having something…I mean pediatrics, and within that Neonatology, is SO different from adult care on so many levels, I think it needs its own policy and protocol. You can't really apply adult physiology, much less… ethics…it's just so different in the baby world.*
Counseling	End of Life	*If the family's made a decision, we have a lot of conversations with families about what other families have done in their position, and that whatever they choose is fine.*

	Donation	*I think it's something that parents need to be fully informed of, that, you know, look, the alternative is, you can sit here in a relatively comfortable, quiet, darkened room, and you can hold your baby for…10 hours if you want to, and take as many pictures, and dress them up, and bathe them, and you know, process it in a different way. I think you just have to be clear with parents, that that's one option, and that the other is a, in some ways less peaceful, but there are benefits to it too. And, as always, giving…parents information, and options, and then being OK with either choice.*

Abstract: 330

NICU Provider Perspectives on Neonatal Organ Donation

Abigail Aghion[1], Brenda Hussey-Gardner[1], Pamela Donohue[2], Alison J. Falck[1]

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Background Nearly 2000 children await organs in the US. As donation after neurologic determination of death (DNDD) is rare in neonates, the AAP supports donation after circulatory determination of death (DCDD) as a measure to help supply meet demand. Despite this endorsement, neonatal DCDD occurs infrequently.

Objective We surveyed NICU providers in order to assess their knowledge and attitudes regarding organ donation.

Design/Methods An anonymous online 40 question survey was distributed at 6 regional academic NICUs to 813 NICU providers including neonatologists, fellows, nurses, neonatal nurse practitioners (NNPs), physician assistants (PAs), social workers, and chaplains. We used descriptive statistics to summarize numeric responses and univariate ANOVA to compare responses between provider groups.

Results Response rate was 210/813 (26%); demographics are shown in Table 1. Practice experience ranged from <1 to >10 years and did not differ among provider groups. Most providers had no prior clinical (70%) or personal (91%) experience with organ donation. As compared to nurses, ordering providers (physicians, NNPs, PAs) were more experienced with organ donation (p=<0.0001). Half of all providers agreed that there is a moral obligation to donate organs. Few providers correctly answered factual questions, including number of patients on the waitlist (20%) and the process of DCDD (29%). Neonatologists were more likely to answer these questions correctly (p= 0.031). Although 63% of providers reported understanding the difference between DCDD and DNDD, <50% correctly answered factual questions about DCDD. Many providers (70%) reported not understanding criteria for neonatal organ donation. The majority of neonatal providers lacked confidence in their general knowledge about organ donation (76%) and specifically DCDD (88%). Confidence was highest among neonatologists (p=0.016), providers with clinical experience in organ donation (p=<0.0001), and providers who correctly identified qualification criteria for DNDD (p 0.003). Nearly all providers agreed that 1) DNDD and DCDD are acceptable (91%, 93%), 2) organ donation can positively impact a grieving family, (97%), 3) evaluation for DCDD should occur prior to planned withdrawal of life-sustaining treatment (89%) and 4) providers are obligated to discuss organ donation with families of potential candidates (91%).

Conclusion(s) Organ donation was supported by providers, but knowledge was limited. Provider education is needed to increase awareness of the potential for organ donation in this specialized population.

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Table 1: Survey Demographics

Abstract: 331

Effects of Enhanced Nutrition on Length of Stay of 34 Week Infants in the NICU

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Background Late preterm infants, especially at 34 weeks gestation, have increased lengths of stay (LOS) when compared to more mature infants, likely due to increased morbidities and need for nutrition support. We hypothesized that LOS is associated with enriched nutrition support in the NICU.

Objective The aim of this study was to identify factors contributing to LOS and initiation of enriched nutrition in 34 week late preterm infants.

Design/Methods A retrospective chart review was performed on all appropriate-for-gestational age preterm infants (n=118) born at 34 weeks gestation and admitted to our NICUs in 2017, a year when there was no standard practice guideline on nutrition support for 34 week infants. Enriched nutrition was defined as milks other than unfortified human milk or term formula. We collected data on demographics, milk type and composition, intake, mode of feeding, and parameters at birth, discharge, and at 6 months (Fenton and WHO percentiles and z-scores). Morbidities were categorized as durations of respiratory support, intravenous fluids and/or parenteral nutrition, and nasogastric tube feedings.

Results Of 118 study infants, 32 (27%) received enriched nutrition. Infants receiving enriched nutrition had lower mean birth weight (2156 ± 258 vs 2349 ± 251 g, $p < 0.001$) and higher mean LOS (11.3 ± 4.7 vs 7.9 ± 3.0 days, $p < 0.001$) when compared to non-enriched infants. Of note, infants receiving enriched nutrition had greater median weight gain in the NICU than those not receiving enhanced nutrition (0 vs -12.9 g/day, $p < 0.001$). We observed a significant positive relationship between LOS and the age at which enriched nutrition was initiated ($r = 0.55$, $p < 0.001$), so that infants receiving enriched nutrition later had increased LOS. The hours of respiratory support ($r = 0.39$), parenteral fluids ($r = 0.43$), and tube-feedings ($r = 0.62$) were significantly associated with LOS (each $p < 0.001$), but not with the timing or duration of enriched nutrition.

Conclusion(s) Without a specific feeding guideline for late preterm infants, clinicians utilized enriched nutrition at some time during the hospital stay for only 27% of infants, often those with lower birth weights. The relationship between LOS and time of initiating enriched nutrition in 34 week infants suggests that earlier provision of enriched nutrition could facilitate an earlier discharge. We speculate that early enhanced nutrition support also would improve weight gain. These data support the need for a standard nutrition support guideline in late preterm infants.

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Impact of A Simulation Enhanced Curriculum for Use of Point of Care Ultrasound (POCUS) for Umbilical Line Placement Confirmation by Novice NICU Clinicians.

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Background Although POCUS effectively reduces the time and number of x-rays required to confirm umbilical catheter placement, the amount of training required for NICU providers to competently employ this procedural tool is unknown.

Objective To test the hypothesis that addition of simulation training to a structured curriculum will improve the procedural competency for NICU providers to confirm umbilical line placement with POCUS.

Design/Methods NICU providers (7 attendings, 10 fellows, and 16 neonatal nurse practitioners) without prior POCUS experience were randomized to either a standard curriculum with 2 hands-on supervised scanning sessions or one enhanced with simulation training using an ultrasound model. Participants completed 10 POCUS scans reviewed by a radiologist blind to group assignment. Competency for catheter tip placement interpretation in agreement with radiologist was determined using learning curve-cumulative summation (LC-CUSUM, with acceptable failure rate of 20%) and differences in success rates determined by Chi-square test.

Results A total of 13/32 (41%) of participants completed 10 scans each (7 controls, 6 simulation) with 1 in each group attaining competency. The simulation group had higher catheter confirmation rates (84% vs 75%, p=0.001). Catheter confirmation was more likely in infants <2 kg than those >2 kg (90% vs 74%, p=0.01). Catheter confirmation rates (76% vs 83% vs 78%) (p= 0.48), tip localization (45% vs 39% vs 23%) (p=0.58), and image interpretation (58% vs 64% vs 48%) (p=0.19) did not significantly differ among provider groups. Providers with more than 10 years of NICU experience had higher success rates (70%) for correctly interpreting ultrasound images compared to those with 5-10 years (38%) and < 5 years of experience

(58%) (p=0.01), but NICU experience did not affect rates of catheter confirmation and tip localization.
Conclusion(s) A simulation enhanced POCUS curriculum may improve procedural learning, but >10 scans may be needed for competency. NICU experience may be beneficial for interpreting images but not as helpful for catheter identity.

Abstract: 333
Longitudinal Experience with Airway Emergencies in a Large Children's Hospital
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Background Children's hospitals and referral delivery centers face challenging airway management in neonates and infants with oral or neck masses, macroglossia, micrognathia, or other abnormalities. Unexpected airway emergencies also arise frequently in neonatal intensive care units. We developed a Neonatal-Infant Emergency Airway Program to facilitate rapid intervention of airway emergencies, with an oversight committee to review all incidents.
Objective To optimize critical care team responses, communication, equipment usage and outcomes during airway emergencies. Secondly, to review all airway emergencies with a hospital-wide multidisciplinary airway oversite committee.
Design/Methods Our Neonatal-Infant Airway Safety Program included a dedicated airway response team (ENT, Anesthesia, NICU staff and respiratory therapists), airway emergency pager system, critical airway cart, specialized laryngoscopes, bronchoscopes, and a surgical tracheostomy tray. After each event, an Emergency Tracking Form (Fig. 1) was used to record response times, communication, equipment utilization and outcomes.
Results Here, we present our longitudinal experience with this program. Airway emergency responses increased from an average of 15 events/yr in 2008-2011 to 40 events/yr from 2015-2017 (Fig. 2A). Importantly, a rapid mean response time was maintained (6±5.1min for 2008-2011 vs 6±5.3min for 2015-2017, mean±SD, Fig. 2B). Specialized neonatal infant airway equipment was at bedside for all incidents, including standard intubation equipment, video laryngoscopes, Benjamin scopes, and fiberoptic bronchoscopes. Intubations were performed by Neonatology, ENT and Anesthesia teams. Multidisciplinary communication and familiarity substantially, if subjectively, improved. Few (3%) emergency situations required intubation in the operating room. There were 2 deaths and 1 emergent surgical airway placed in the past 3 years. All airway emergencies were reviewed by the oversite committee and all safety issues were addressed.
Conclusion(s) In sum, our Neonatal-Infant Emergency Airway Program, with readily available subspecialists and equipment, resulted in good outcomes and rapid resolution of challenging situations. Event review by an oversight committee was essential to ensure preventable adverse outcomes were remedied. Our experience will be useful for pediatric institutions caring for similar patients.

Clinical Airway Emergency Response Tracking Sheet

Figure 1. The Neonatal Emergency Airway Tracking Sheet used to document events.

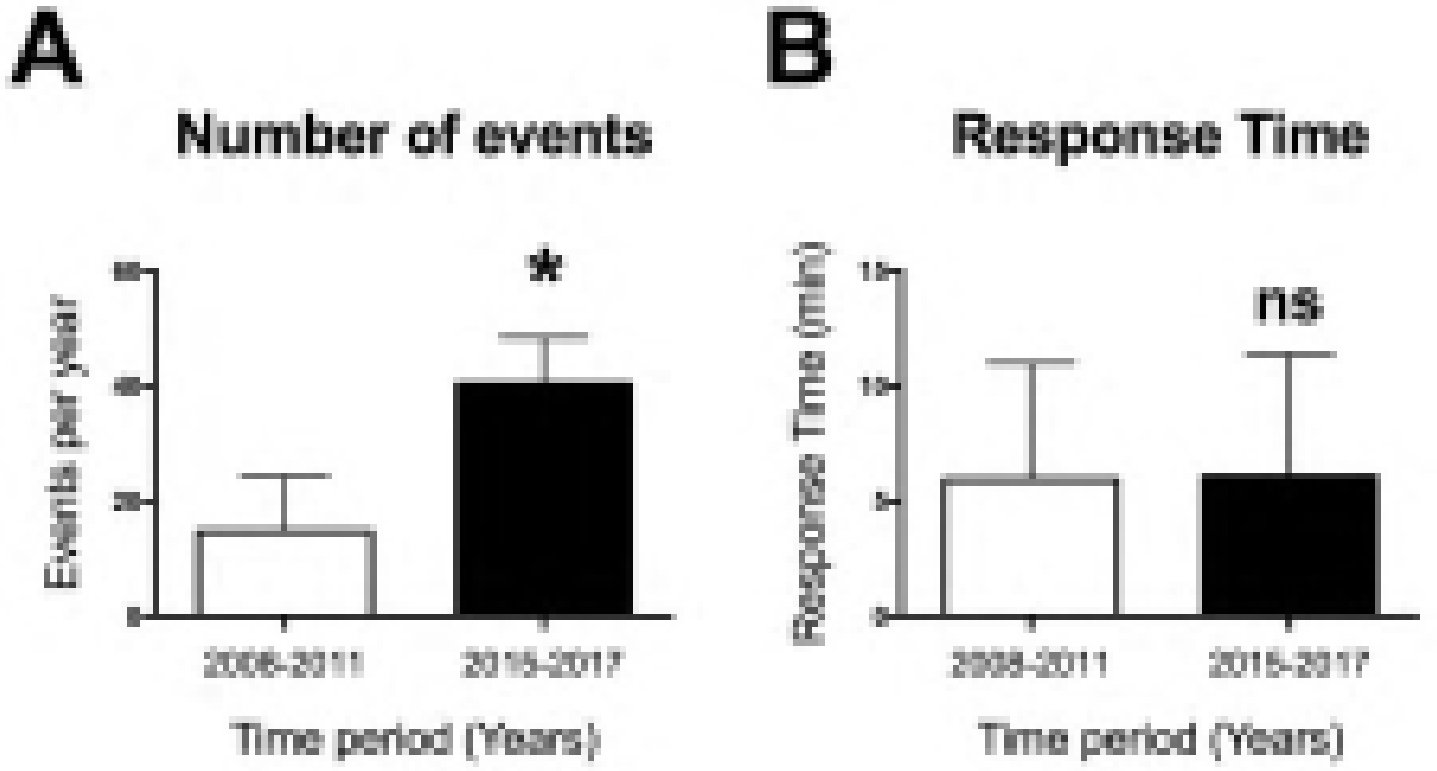

Figure 2. Since Neonatal-Infant Emergency Airway Program establishment, (A) use of the program has grown, as evidenced by increased number of events per year, while (B) rapid response time for subspecialty personnel (e.g. ENT and Anesthesia teams) has been maintained. *p<0.05. ns, not significant.

Abstract: 334
Optimism bias and neonatal decision making.
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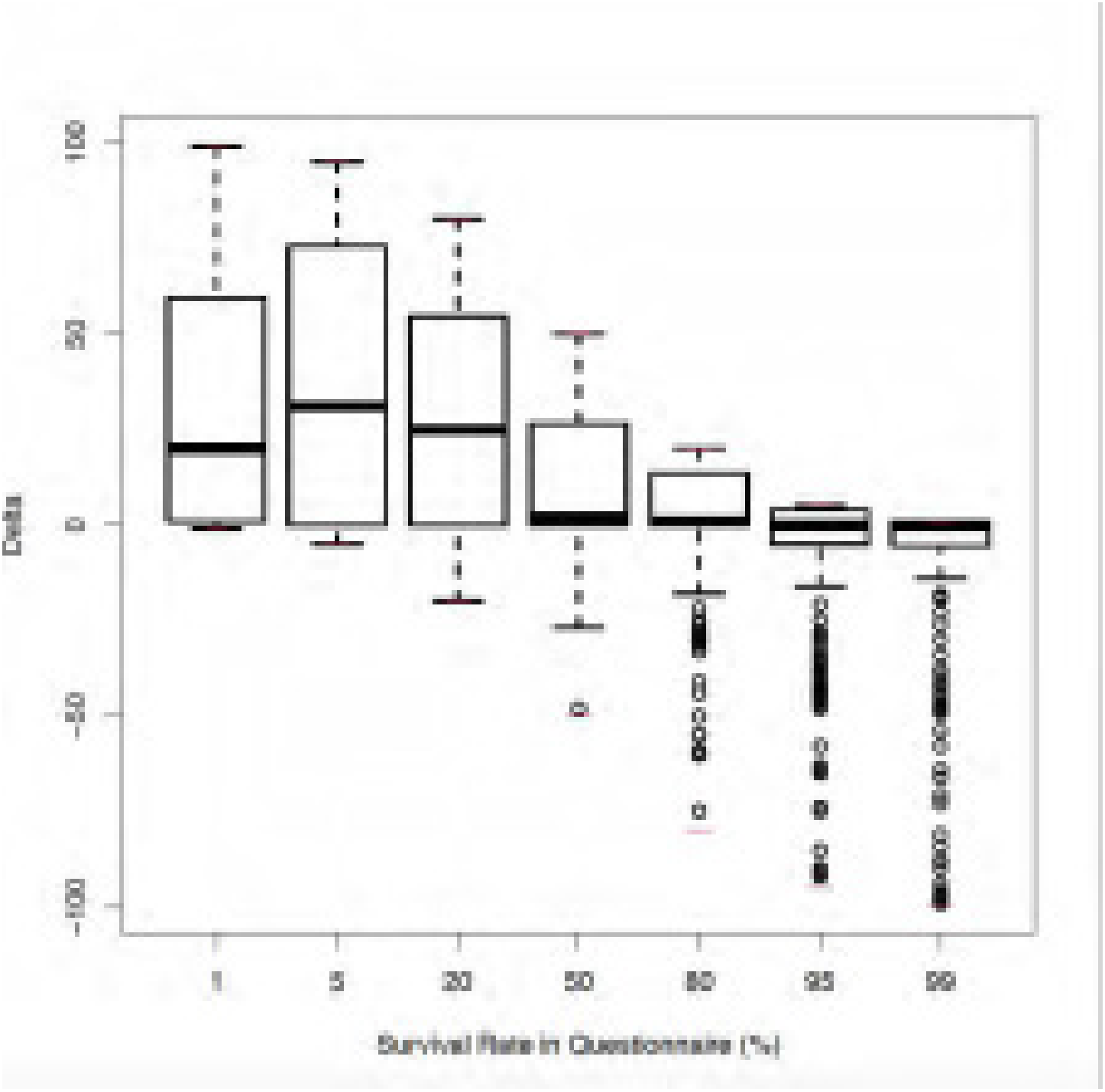
Background Hope influences parents' decisions about neonatal health care. Optimism bias involves overestimating of the probability of positive outcomes and underestimating that of negative ones (Weinstein 1980). Widely observed in other settings, it has recently been reported in surrogates' prognostic judgments (Zier et al 2012).
Objective To explore whether optimism bias exists in parents' perceptions of neonatal risks.
Design/Methods An anonymous group of parents completed an online survey asking both quantitative and qualitative questions about a hypothetical vignette of a critically ill extremely premature infant. Participants assessed risks in both verbal and numerical terms. They were asked to explain any answers that differed from those described in the vignette, which had either a poor or a favorable prognosis. Box-plot analysis (Fig. 1) and Wilcoxon rank testing (Table 1) analyzed numerical judgments. Frequency histograms, McNemar testing and generalized estimation equations analyzed verbal prompts. "Reasons" were double-coded along predetermined themes based on a literature review. 'Optimistic' attributes were determined through logistic regression analysis.
Results 633/2005 (32%) invitations sent to an online group of participants registered with qualitrics.com were accepted of which 242 met inclusion criteria (parent, English speaking, > 18 years of age), of whom 210 (87%) completed their surveys. Both numerical and verbal risk judgments were significantly more likely to be higher than the stated risk for poor prognoses than for favorable ones. Such optimistic prognoses were more likely for single and African American participants and for those with faith in physicians, than for the comparison groups. Reasons given for such optimistic prognoses included religion (22.5%), unconditional hope (31%), beliefs consistent with exceptional infant characteristics (10 %), trust in physicians (7.5 %), previous experiences (6.8%) and emotions (4.8%). 17% cited reasons not included in the predetermined themes.

Conclusion(s) Participants were more likely to perceive neonatal risks as higher than the stated prognosis when that prognosis was poor, rather than favorable for both numerical and verbal descriptors of risk. If found in clinical practice, such an optimism bias could contribute to discordant views between parents and physicians. Implications of optimism bias in neonatal decision-making warrant further investigation.

1. Delta = Answer - true survival rate is different from 0.

True survival rate	P-value
1%	<0.001
5%	<0.001
20%	<0.001
50%	<0.001
80%	0.007
95%	0.013
99%	<0.001

A Wilcoxon rank signed test was used to test whether the median of delta is different from 0.



Abstract: 335

Parental perspectives on the post-partum bonding experience after NICU transfer to a referral hospital

Yvonne Yui[1], Tessie W. October[2]

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Background Transfer of a newborn to an outlying intensive care unit immediately post-partum while the mother remains at the delivery hospital is a stressful experience that interrupts the critical bonding period. Although early separation has been shown to impact mother-child attachment, little is known regarding parent-perceived barriers to maternal-infant bonding

under these circumstances.

Objective Describe parent and hospital-initiated interventions to improve maternal-infant bonding after immediate post-partum separation.

Design/Methods Semi-structured interviews were conducted with English-speaking mothers whose newborn was transferred to the NICU while mothers remained hospitalized at delivery hospitals. Demographic and clinical characteristics were obtained through chart review. Interviews were performed within two weeks of birth, audio recorded and transcribed. Thematic analysis was performed.

Results In this ongoing study, 12 parents are enrolled to date. Half were emergent transfers, and median time mothers spent with their newborns prior to transfer was 15 minutes (range 0.6-240 minutes). We identified 7 themes of parent interventions to improve bonding: touching, pumping, photos, sound, scent, video, and family visits. Four themes of hospital interventions emerged: early discharge, time with baby, mementos, and enhanced communication. Medical barriers to bonding included technology, baby fragility, mom's health and limited time. Hospital barriers included lack of resources, rules limiting parent participation and communication challenges. Family barriers included lack of resources and knowledge and distance. Parents found additional interventions feasible and promising once introduced to them.

Conclusion(s) Parents identified multiple barriers to maternal-infant bonding and suggested several parent-focused and hospital-focused interventions to enhance bonding. Strategies that address the parent-identified barriers can be used by families and the medical team to help parents plan and promote bonding during separation from their newborns.

Table 1: Demographic & Clinical Characteristics

Demographics	N (%)
Parent type	
Mother	7 (58%)
Mother & father	5 (42%)
Ethnicity	
Non-Hispanic/Latino	9 (75%)
Hispanic/Latino	3 (25%)
Race	
Caucasian	6 (50%)
Black/African American	3 (25%)
Other[1]	3 (25%)
First-time parent	6 (50%)
Distance from delivery hospital (Median, IQR)	5.1 (4 miles (3.9, 9.6)
Clinical Characteristics	**Median (range)**
Age (days) at transfer	4 (3-4)
Gestation at birth (weeks)	38 (33-42)
Birth weight (grams)	3718 (1370-5940)
Apgar at 1 minute	9 (5-9)
Apgar at 5 minutes	9 (3-9)
Time spent with newborn prior to transfer (min)	15 (0.4-240)
	Number (%)
Cesarean section	10 (83%)
Emergency transfer	6 (50%)
Intrapartal monitoring	3 (25%)
Postnatal diagnoses	
Transient tachypnea of newborn	4 (33%)
Hypoxic ischemic encephalopathy	1 (17%)
Other[2]	6 (50%)

[1] Asian (1), self-identified other (2)
[2] Gastroschisis, tracheoesophageal fistula, imperforate anus, metabolic acidosis, meconium aspiration syndrome, PPHN, cleft palate, VACTERL

Figure 1: Popularity of Proposed Bonding Interventions Among Parents

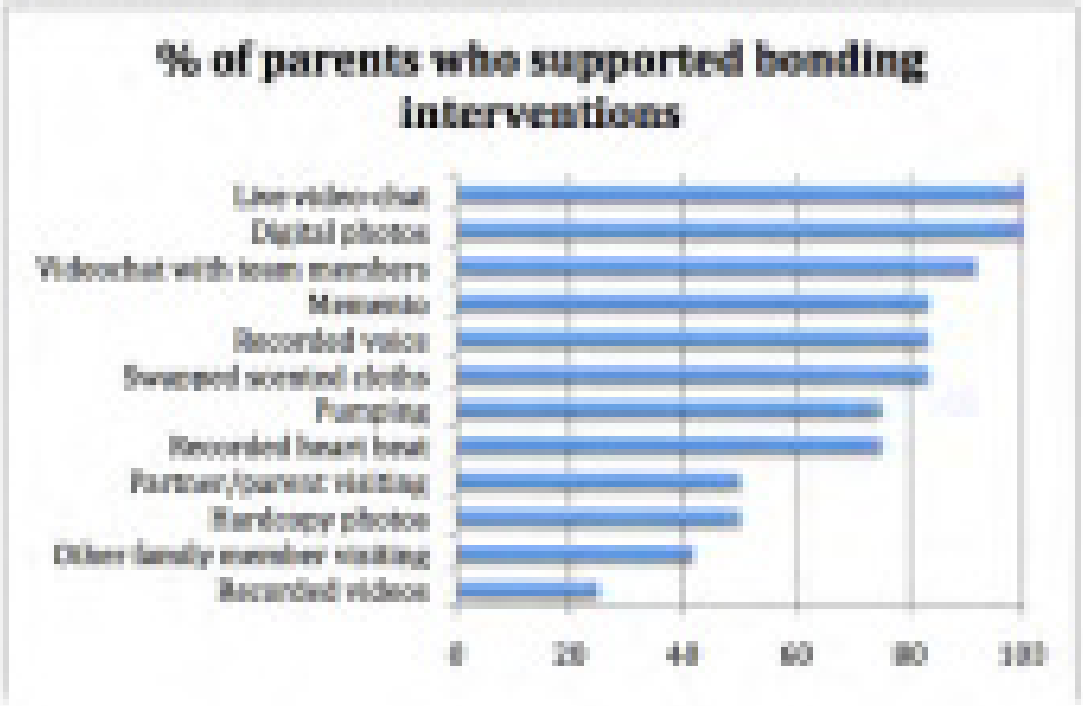

Table 2: Themes of Parent and Hospital Interventions to Promote Bonding

Interventions Promoting Bonding	Sample quote
Parent Interventions	
Touching	"That's a special part of bonding with your child. When your child first came out, it's holding your baby. For you not to hold your baby, that's hurting. Like, that's real live hurting."
Pumping	"The breastfeeding connection was a very strong connection. So that was kind of the thing that I grabbed on to as my, my bonding and then when I did start expressing some of the colostrum, that felt very important, and the thing I could give to him I sent over."
Photos	"That was perfect. Like, that's all I needed," was the pictures and the Face Time. As long as I could see her, know that she was alright, that she's in good hands."
Sound	"That [second voice/heart beat] would be better because that would stimulate her, you know to let her know that she is not by herself, even when she can't really see you. But she would think you're there by your voice."
Scent	"Oh, the smell. It smells great. So yeah, that piece of it ended up being my anchor that I hung on to."
Video	"I was able to Face Time from the NICU on site and then again once I got up here, and then when one of the neurologists came to talk, I had him talk to both of us... it makes a huge difference."
Family visiting	"Having my mother around, our voices are similar, and it was a thing that was comforting to me when she was able at UW even to go into the NICU and talk with him, that it felt like it was a part of me, in a she way was there with him. And then when she came over here, again, just to have some piece of me that was here. That was a part of his experience."
Hospital Interventions	
Early discharge	"Usually they would have kept me until Sunday. But they went ahead and discharged me on Saturday because I was recovering okay."
Time with baby	"They let me bond with him in the OR right after holding him. And then en route from the labor and delivery to my room, are stopped by the nursery. And then the ambulance crew, he was brought inside my room before transfer."
Mementos	"Dad brought back a little kid from the NICU at UW. So I had a little kid with me from the very beginning that had been on him and smelled like him."
Condition information	"They DON'T want to limit to call my bed phone. That was, that was good. I was able to look up and call whenever to check on her. And of course I did, a lot."

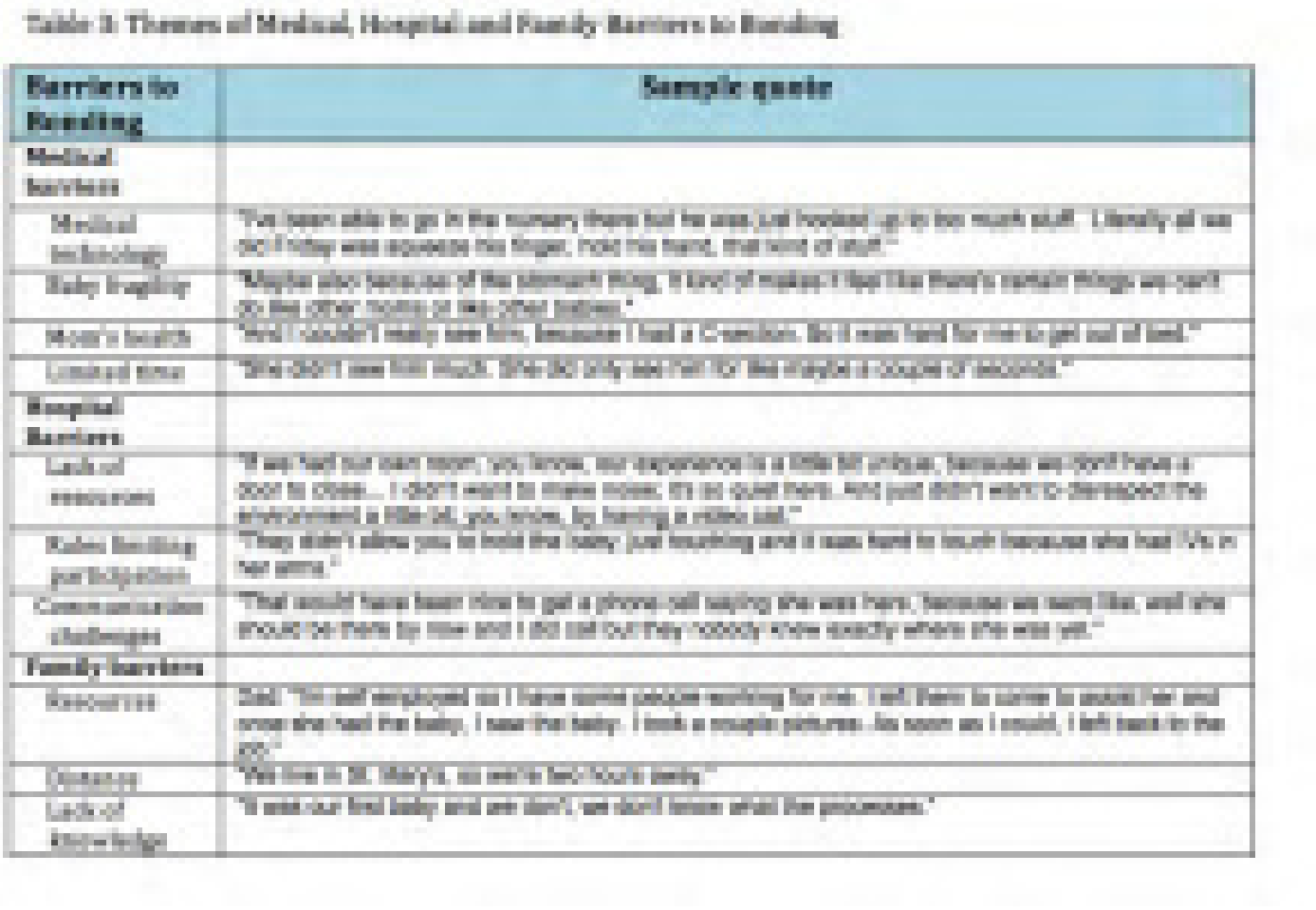

Table 3: Themes of Medical, Hospital and Family Barriers to Bonding

Barriers to Bonding	Sample quote
Medical barriers	
Medical technology	"I've been able to go in the nursery there but he was just hooked up to too much stuff. Literally all we do [ ] they was squeeze his finger, hold his hand, that kind of stuff."
Baby Bragging	"Maybe also because of the stomach thing, it kind of makes it feel like there's certain things we can't do like other moms or like other babies."
Mom's health	"And I couldn't really see him, because I had a C-section. So it was hard for me to get out of bed."
Limited time	"She don't see him much. She do only see him for like maybe a couple of seconds."
Hospital Barriers	
Lack of resources	"If we had our own room, you know, our experience is a little bit unique, because we don't have a door to close... I don't want to make noise, it's so quiet here. And just didn't want to disrespect the environment a little bit, you know, by having a video call."
Rules limiting participation	"They didn't allow you to hold the baby just touching and it was hard to touch because she had IVs in her arms."
Communication challenges	"That would have been nice to get a phone call saying she was here, because we were like, well she should be here by now and I did call out they nobody knew exactly where she was yet."
Family barriers	
Resources	Said, "I'm self employed so I have some people working for me. I left them to come to assist her and once she had the baby, I saw the baby. I took a couple pictures. As soon as I could, I left back to the city."
Distance	"We live in St. Mary's, so we're two hours away."
Lack of knowledge	"It was our first baby and we didn't, we don't know what the processes."

Abstract: 336

Screening Children for Mental Health Issues in the Pediatric Emergency Department: Who is at Highest Risk for Not Being Screened?

Steven Rogers[1], Jasmine Patel[2], Danielle J. Chenard[1], Kevin Borrup[1], Maua H. Mosha[1], Glenn Flores[1]

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Background Over half of behavioral-health issues begin in childhood, and suicide is the second leading cause of deaths in adolescents. A substantial proportion of youth seen in the pediatric emergency department (PED) are at high-risk for mental health (MH) problems so there is a critical need to screen PED patients for MH disorders. Not enough is known about which children are at highest risk of not being screened for MH issues in the PED.

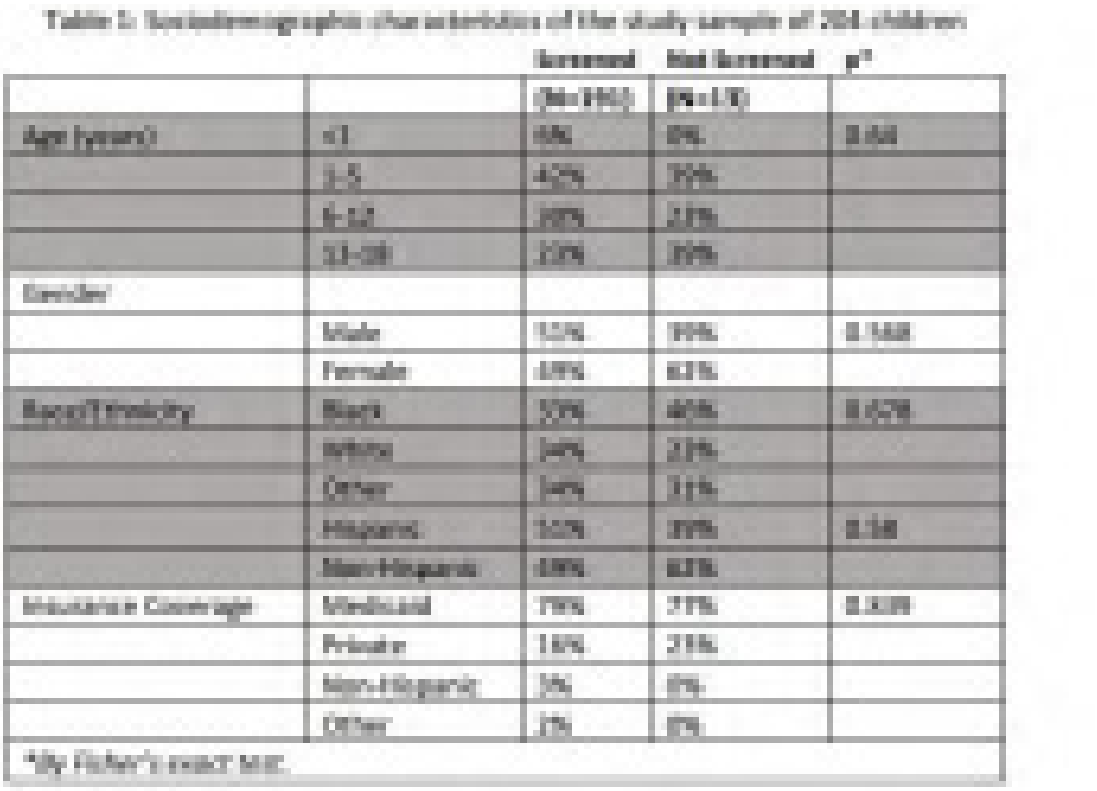
Objective To identify characteristics of children at highest risk of not being screened for MH disorders in the PED.

Design/Methods This retrospective cohort study evaluated a random sample of all PED visits to an urban children's hospital in 2017. The sample was randomly chosen to match the general population in the PED, based on age, gender, race/ethnicity, and insurance status. Children were eligible for inclusion if they were 0 to 18 years old. Exclusion criteria included critically ill and comatose children. PED patients are evaluated using a triage methodology, including a brief MH screen administered by nurses which assesses for MH concerns, including depression, suicide risk, homicide risk, and abuse. A retrospective chart review was performed to collect socio-demographic characteristics and chief complaints, which were categorized as respiratory, behavioral, gastrointestinal, injury, pain, sickness, abuse, and other. Fisher's exact test was used for intergroup comparisons of MH screening rates.

Results The study sample consisted of 204 subjects; two-thirds were racial/ethnic minority, a plurality were 1-4 years old, and about 80% had Medicaid coverage (Table 1). MH screening was completed for 94% of subjects; 7% of those screened were positive. No significant socio-demographic differences were noted in MH screening rates. Screening rates of 100% were noted for children with behavioral, abuse, and other chief complaint categories. Children presenting with a chief complaint of pain were significantly more likely to not be screened for MH issues, at 84% (*P*=0.02; Fig. 1).

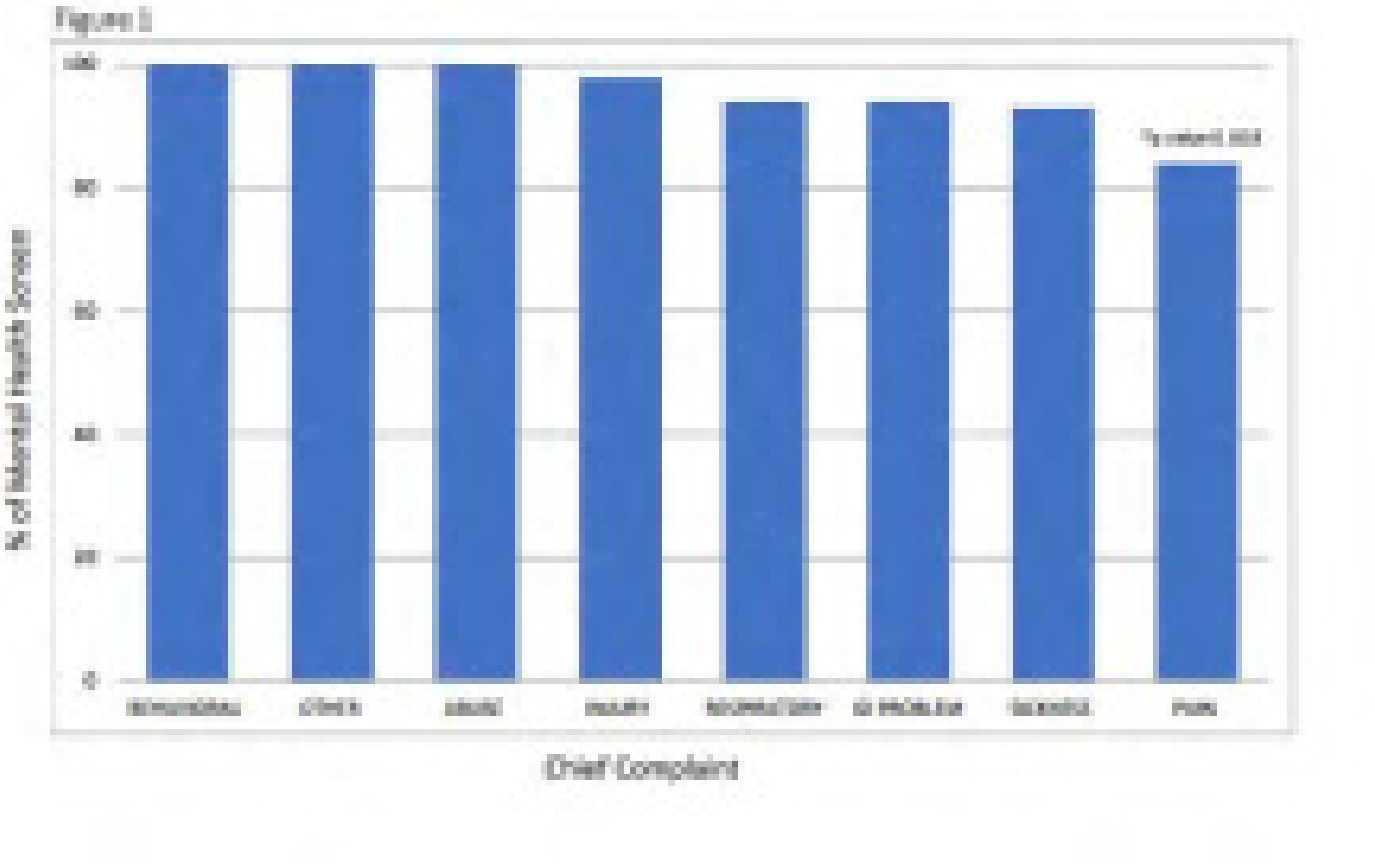
Conclusion(s) PED MH screening rates of 100% are achievable for children presenting with behavioral problems, child abuse,

and other chief complaints. Youth with a chief complaint of pain are at significantly highest risk for not being screened. Focusing improvement efforts on MH screening of children presenting with pain might result in better overall screening rates and fewer missed MH diagnoses.



		Screened	Not Screened	p*
		(N=195)	(N=13)	
Age (years)	<1	6%	8%	0.68
	1-5	42%	39%	
	6-12	28%	23%	
	13-18	23%	39%	
Gender				
	Male	52%	39%	0.368
	Female	48%	62%	
Race/Ethnicity	Black	59%	46%	0.628
	White	24%	23%	
	Other	24%	31%	
	Hispanic	52%	39%	0.38
	Non-Hispanic	48%	62%	
Insurance Coverage	Medicaid	78%	77%	0.639
	Private	16%	23%	
	Non-Hispanic	3%	0%	
	Other	2%	0%	

*By Fisher's exact test.



Abstract: 337

Parents' Perception of Patient Education Materials

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Background Providing anticipatory guidance and health education is central to pediatric health supervision visits. Printed patient education materials are superior to verbal counseling but should consider the recipients' education level and health literacy. With implementation of electronic medical records, patients are given printed end of visit instructions that include patient education materials. Little is known about parental perceptions of these materials.
Objective To evaluate parents' perception of patient education materials in a pediatric primary care clinic.
Design/Methods This cross-sectional study surveyed a convenience sample of English-speaking parents of children ages 2 months to 13 years returning for a well child visit to our primary care clinic in an academic center serving an urban underserved, minority population. Parents completed an 11-item paper questionnaire that assessed perception of usefulness, ease of understanding, and delivery preference. The questionnaire was completed at the start of the visit based on recall of patient education materials received at the previous visit. Patient education materials are provided during check out and are 3 printed pages of age-appropriate information about development, nutrition, safety, recommended vaccines, and screening tests, at 6th grade reading level by the Flesch-Kincaid Scale.
Results Most (64/75) parents had completed high school or some college education; 52% had 3 or more children, and their average age was 29.7 years (SD= 9 years). Most (78%) parents recalled receiving patient education materials at the previous visit, and of those, 72% (48/67) had read the materials. Of those that read the patient education materials 77% (48/62) felt they were useful. Parental perception of usefulness was not associated with parental age, number of children or level of education. Nearly 30% of parents with less than a college education answered "not sure" when asked if the materials were easy to understand. 83% of parents expressed a desire to continue receiving patient education materials at future visits, and 67% of parents would prefer to receive these materials electronically through the patient portal.

Conclusion(s) In an urban underserved minority population, the majority of parents received and read the patient education materials and found them to be useful. Enhancements to patient education materials need to consider the literacy level of the patient population. Patient portals appear to be a promising venue for the delivery of patient education materials.

Abstract: 338

Productive Utilization of Pediatric Clinic Waiting Room Time for Promoting Early Literacy (EL) & Positive Interactions (PI) in Early Childhood

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Background Cortical neurons increase by 23-30% between birth & 3 months of age, & to 60-78% by 3 years, which is 90% of adult brain. Skills acquired during these years promote more complex ones in future. This acquisition process is influenced by family-social interactions. PI & EL are shown to enhance brain development. By 4 years of age, children from college educated families hear 30 million more words than low-income children. This "30 million word gap," may affect language development, cognitive processing, self-regulation skills, & academic achievements (Hart, et al). In this initiative we introduced parents to a basic educational interaction program about EL & PI; & to value of engaging children in verbal/social interactions early on. We engaged medical students (MS) in the project in order to productively utilize their pediatrics rotation time in developing clinical/communication skills.

Objective 1) To leverage parents' time spent in clinic waiting room by providing education about EL & PI 2) To train and sensitize MS in importance of EL & PI in child's development 3) To expose MS to clinical and socioeconomic aspects of pediatrics via a hands on approach.

Design/Methods Pilot Project.

Population: Parent-child unit waiting in clinic, MS rotating through Pediatrics

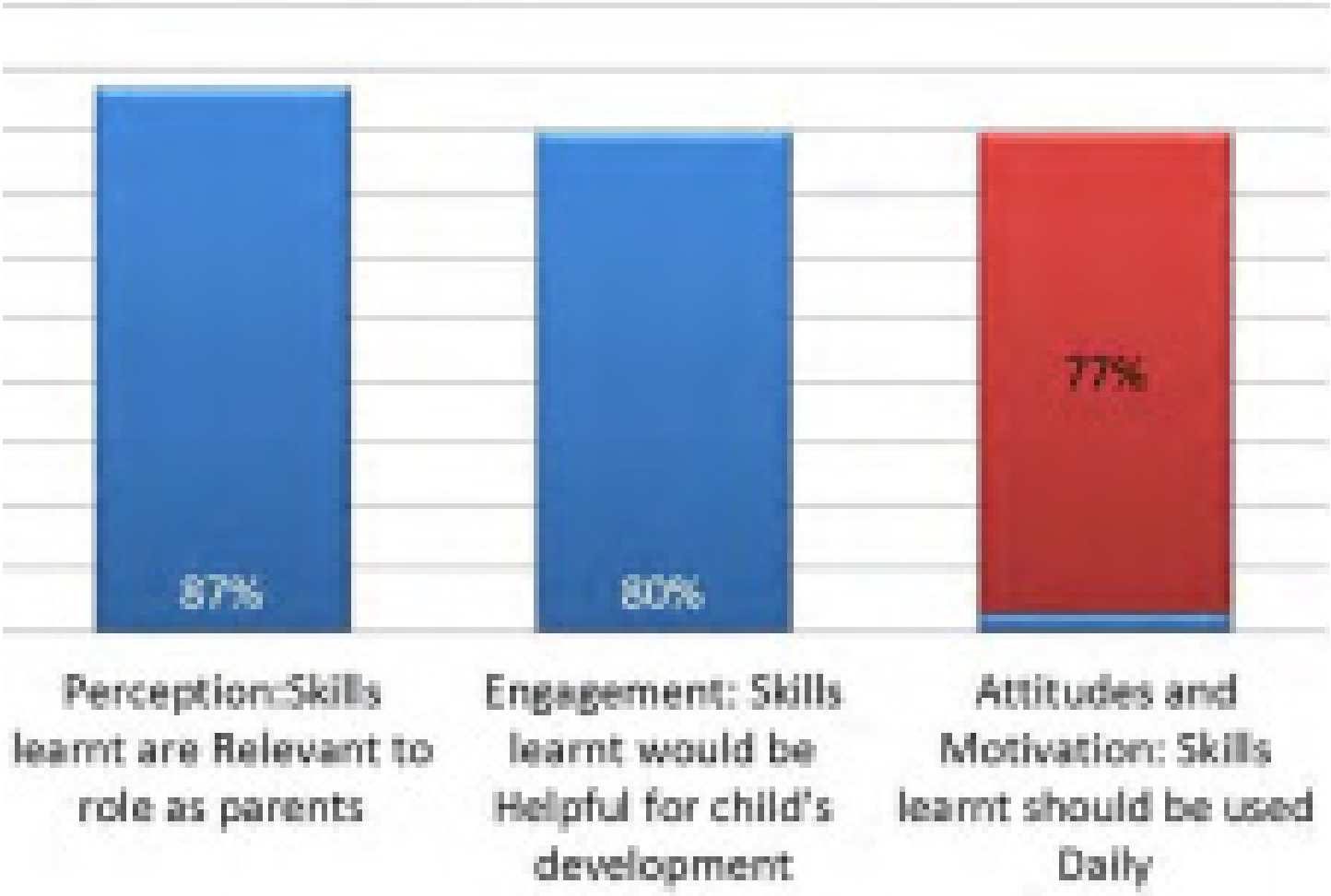
Procedure: MS- post a 30 minute interactive training-, engaged with parent-child units to model age appropriate PI & EL skills via discussion & information handouts.

Outcomes: 1) Parental survey to assess attitudes, perceptions and practices regarding PI & EL and response to initiative. 2) Pre- and post- survey of MS with questionnaires/ scoring system to test their relevant medical knowledge

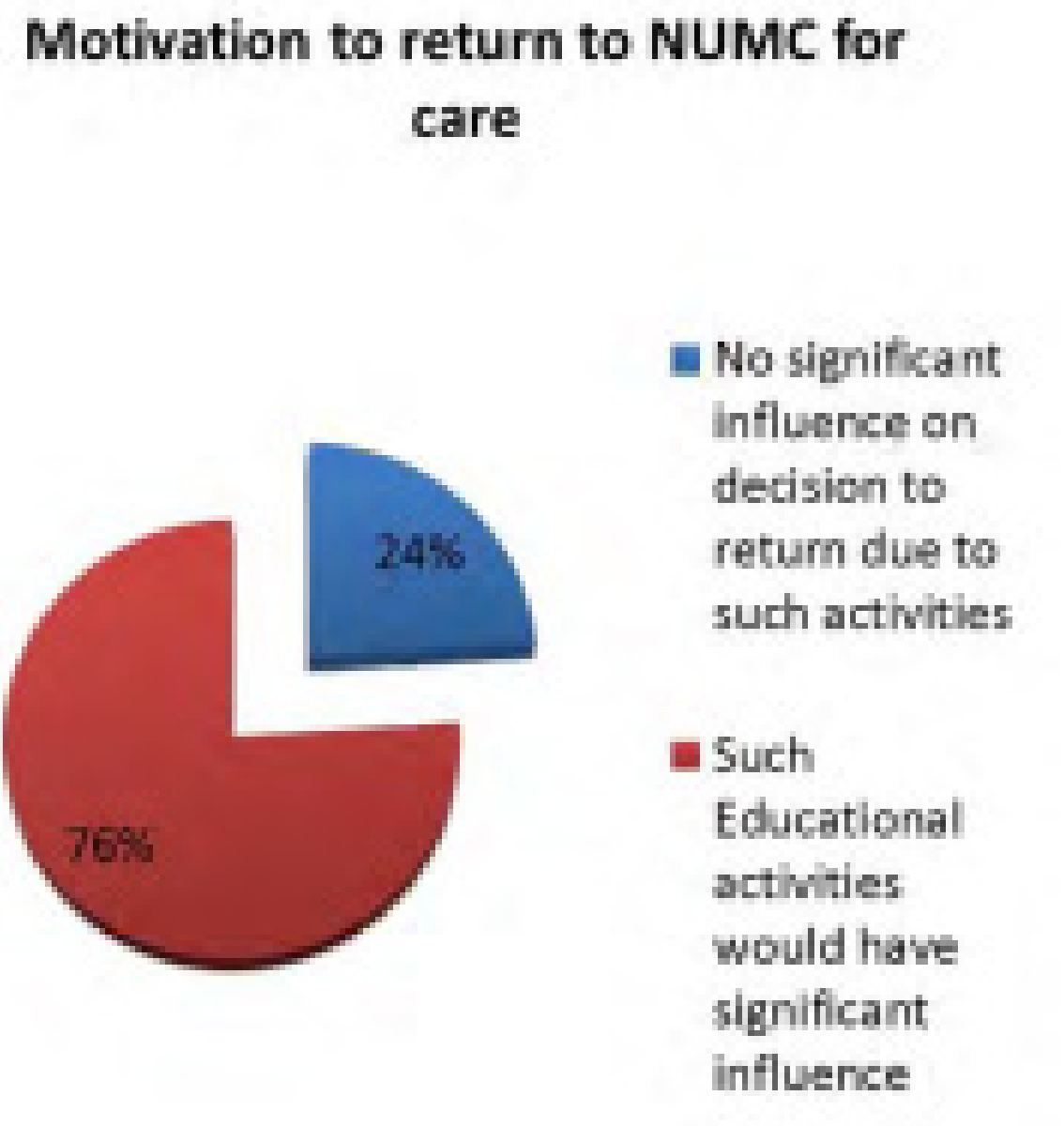
Results Results: During a 2 week study period, 15 MS engaged with 60 parents-children units.

Parents found the activity relevant to their role as parents (fig 1). 76% felt it increased their motivation to return to clinic (Fig 2). 66% parents were < school graduate, & had poor knowledge of PI &EL.Post activity knowledge mean score of MS increased from 47% to 71%, with greatest improvement in knowledge of child brain development. (Fig 3)

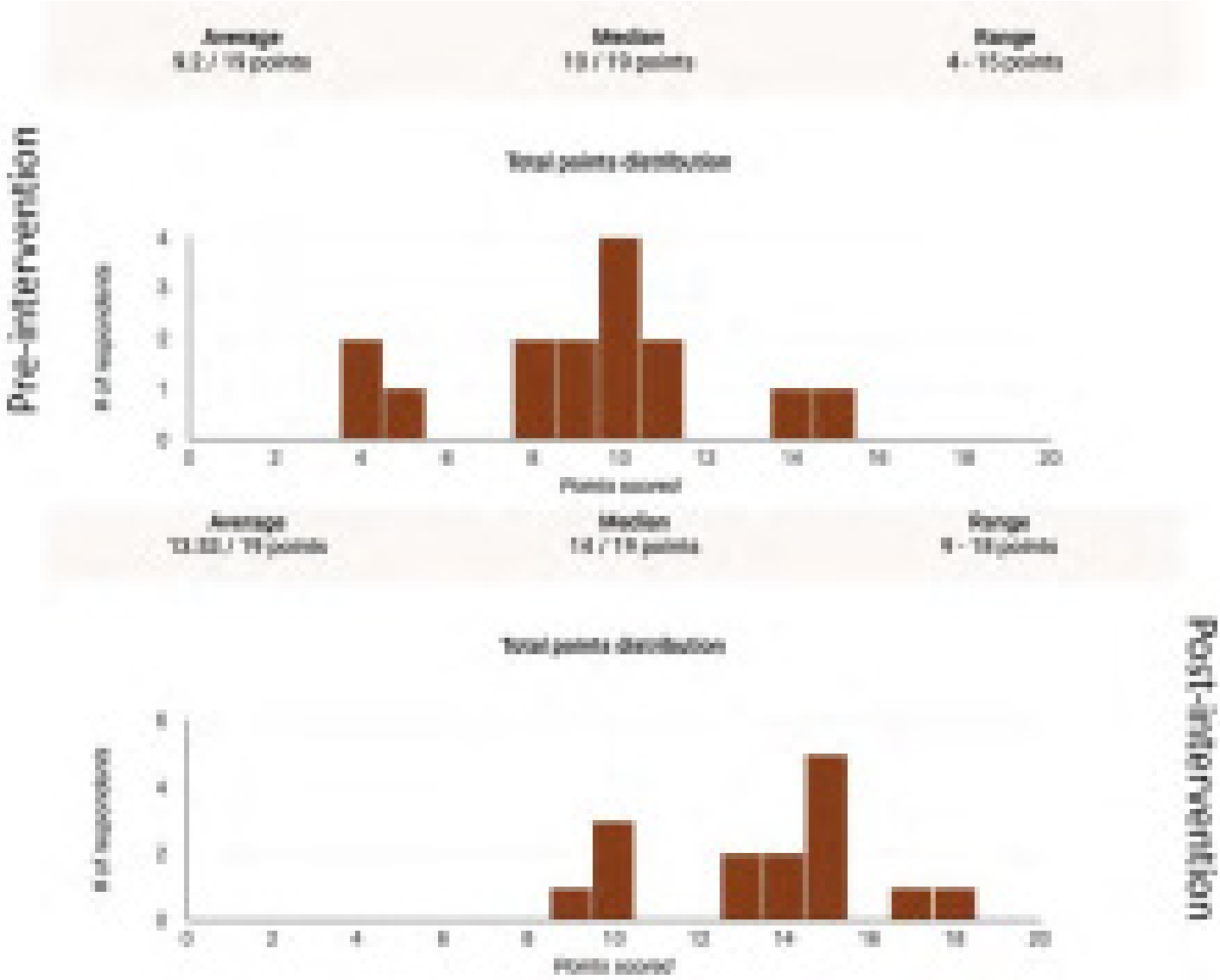
Conclusion(s) In this pilot project, parents' showed positive perception & high appreciation for demonstrating strategies to improve their child's development during clinic wait time. It motivated them to return to clinic for continued care. It enhanced medical knowledge and communications skills of MS via active participation in patient care



Parental response to intervention



Parental willingness to return to clinic for subsequent visits



Resuts of pre and post intervention questionnaire for medical students

Abstract: 339

Timeliness of Immunization in CenteringParenting® and Individual Well Baby Care in a Low Income Minority Community

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Background CenteringParenting® is an innovative, dyad model of group well baby care. Little is known on the impact of CenteringParenting® on immunization timeliness among children in low income minority communities.

Objective To assess the timeliness of immunization in patients participating in CenteringParenting® vs. traditional Individual well baby care in a low income, minority community.

Design/Methods We conducted a retrospective cohort study at a pediatric academic practice in an urban, low income, minority community. A convenience sample of parents of newborns were offered participation in Centering or traditional well baby care, based on appointment availability. In Centering, a cohort of 6-8 infant/mother dyads and a provider meet for 2-hour long group well baby visits during the first 2 years of life. The study population includes all infants seen October 2014 - June 2017 who had at least 2 well baby visits and all their well baby visits were either in Centering or in Individual care. Outcome measures include timeliness of ACIP recommended immunizations for the combination 5-vaccine series (HepB,

DTaP, polio, Hib, PCV) by 7 months and the combination 7-vaccine series (HepB, DTaP, polio, Hib, PCV, MMR, varicella) by 25 months of age.

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Results The study population included 883 children (Centering n=192, Individual care n=691). Patient demographics significantly differed in ethnicity (African American: Centering 81%, Individual care 69%, p=0.016); public insurance rates were similar (Centering 92%, Individual care 90%). Compared to infants in Individual care, infants on Centering were significantly more likely to received timely immunizations by 7 months (Centering 85%, Individual care 69%) and by 25 months of age (Centering 97%, Individual care 83%). Infants on Centering were 2.6 times more likely to be up to date with immunizations by 7 months of age (p=<0.001) and 6.2 times more likely to be up to date by 25 months of age than infants in Individual care (p=0.045). Timeliness of immunization was not associated with ethnicity or public insurance.
Conclusion(s) In a low income, minority community, infants participating in the CenteringParenting® model of group well baby care were significantly more likely to receive recommended immunizations in a timely manner by 7 and 25 months of age. Larger, controlled studies are needed to further assess the benefits of CenteringParenting® as an alternative model of well child care.

Abstract: 340
Primary care providers views on care of the opioid-exposed infant
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Background An increasing population of infants in the United States has intrauterine opioid exposure. Literature regarding the ongoing primary care needs of opioid-exposed infants after hospital discharge is scant. Primary care providers are a vital source of knowledge of the challenges faced in providing ongoing care to these infants.
Objective
Design/Methods This was the first phase of a modified Delphi method study to elicit consensus from a sample of primary care providers within a children's health system spanning three states (Delaware, Pennsylvania, Florida). A survey of six open-ended questions with additional demographic questions was developed by a team with expertise in clinical care and qualitative research. Questions asked survey respondents to list and describe 1) needs and challenges of infants with intrauterine opioid exposure; 2) needs and challenges for their families; 3) challenges as a provider caring for this population; 4) common resources currently utilized; 5) current gaps in resources or knowledge; and 6) other commentary. The survey was emailed to respondents during a six week period with a total of three email reminders with responses collected into a REDCap database. The open-ended questions were coded by two independent coders, with discrepancies resolved by consensus and reviewed by a third study team member. Codes were grouped into common themes related to needs and challenges and to resources.
Results We collected 58 (41.7%) responses out of 139 providers surveyed. Physicians accounted for the majority (74%) of the respondents and most (62%) were from suburban practices. Common themes arose across the responses to the needs and challenges of infants, families, and providers. These themes encompassed 1) withdrawal symptoms and treatment of withdrawal symptoms, 2) healthcare related issues, 3) social needs, and 4) issues related to the parent/child dyad (Table 1). Responses frequently included concerns about the infant's medical care and follow-up, the custody of the infant, as well as parenting skills and caregiver support. Multiple areas were identified as opportunities to improve resources, within both healthcare and community settings (Table 1).
Conclusion(s) The survey of primary care providers on care of the intrauterine opioid-exposed infant yields common themes that can inform recommendations for care of this population and targeting resources. In the second phase of this study, we will distribute these themes to providers for prioritization.

Abstract: 341

Home Visiting Program for NICU Graduates: Feasibility and Potential for Impact

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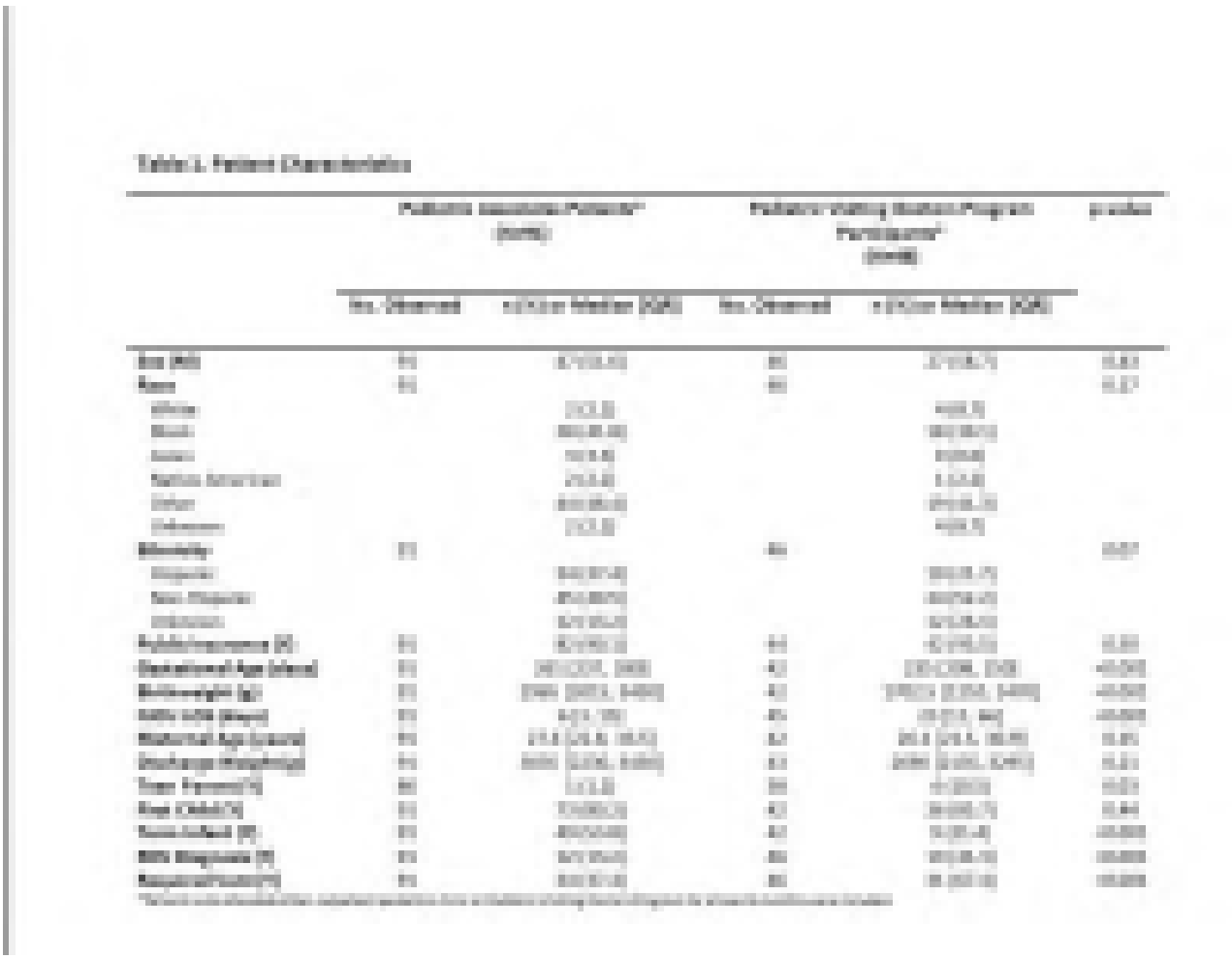
Background The number of infants admitted to the neonatal intensive care unit (NICU) has been steadily increasing in all birth weight categories. Home visiting services have long been an integral part of caring for high-risk children and families with limited resources. There is little data on the effectiveness of home visiting programs on post- NICU health outcomes within the first year of life. The Mount Sinai Pediatric Visiting Doctors (PVD) program was started in 2013 to care for high risk children including those who are post NICU admission. The program provides primary care at home for the first 6 months upon discharge from the NICU with a team consisting of a pediatrician and care coordinator or social worker.
Objective Our study compares the characteristics and acute care utilization of the PVD program participants with those of a hospital-based outpatient clinic.
Design/Methods We conducted a retrospective cohort study of infants born between 7/2013 and 12/2016 who were enrolled in PVD during their NICU admission. Date were also obtained on infants residing in the PVD catchment area zipcodes, who were patients in the hospital's pediatric clinic practice, born at the hospital during the same time frame, and had a minimum 72-hour NICU stay. Wilcoxon rank-sum, Chi-square, and Fisher Exact tests were used to assess between group differences. Logistic regression and generalized linear models were used to adjust for factors that differed between the two groups.
Results We identified 46 PVD participants who completed the program and 91 infants from the hospital-based clinic with at least 6 months of post-NICU clinic visits for comparison. Mean maternal age was 26.1 and 27.6 in the PVD and non-PVD group (p=0.15). About 80% of PVD participants were born prematurely compared to only half of the non-PVD group (p<0.001). PVD program completers received a median of 5 home visits over 6 months post NICU discharge. More PVD participants had at least one hospitalization in the 6 months post NICU discharge (26.1% vs 8.8% p=0.11), compared to the non-PVD group but the difference was not significant. There were no differences in ED visits or ICU admissions. PVD program participants were more likely to attend development clinic compared to the non-PVD group (58.7% vs 12.1%, p=0.001).
Conclusion(s) Physician led clinic-based home visiting services is a feasible way of providing clinical care to this population. More research is needed on medical and psychosocial risk factors that impact the efficacy of these programs on reducing acute care usage.



Abstract: 342

Utility of Procalcitonin in Acute Febrile Illness in Children and Adolescents in an Urban Community Hospital

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Background Severe sepsis and septic shock are life threatening conditions affecting all age groups. Procalcitonin (PCT) is a serum marker to determine the presence of a serious bacterial infection and to guide antibiotic therapy. Its routine use in pediatric age group remains unclear.
Objective To assess whether PCT <0.5 ng/ml was associated with decreased length of stay (LOS) and decreased use of antibiotics in children and adolescents aged 2 months to 21 years.

Design/Methods Retrospective chart review of all children and adolescents aged 2 months to 21 years admitted to Jamaica Hospital Medical Center from August 2017 to August 2018 with fever >100.4 F and PCT drawn. Exclusion criteria included immunodeficiencies, oncological, autoimmune and rheumatological conditions and respiratory distress. Data collected included demographics (age, gender, ethnicity), vital signs, PCT level, C-reactive protein (CRP), white blood cell (WBC) count, platelet count and culture results at the time of acute febrile illness, duration of antibiotic use and length of stay (LOS). Patients were divided into two groups, G1 with PCT <0.5 ng/ml and G2 with PCT ≥0.5 ng/ml. Data were analyzed using GraphPad Prism, percentages, student t-test, Mann-Whitney U test and chi-square, p≤0.05 was considered significant.

Results Of 100 charts reviewed, 35 met exclusion criteria. Of remaining 65, there were 31 (48%) in G1 and 34 (52%) in G2. G1 and G2 were compared for gender (58% vs 82% male) and ethnicity (45% vs 38% Hispanic). There were statistically significant differences between G1 and G2 for median heart rate (HR) z-score (1.78 vs 3.23), p=0.005, median temperature

(101.8ºF vs 103.0ºF), p=0.016, median CRP (3.6 vs 5.9), p=0.017 and median days on antibiotics (2.8 vs 8.0), p=0.050. There were no significant differences in median age for G1 and G2 (6 2/12 years vs 2 3/12 years), p=0.067, WBC count, platelet count, culture reports and LOS, p>0.05.

Conclusion(s) In our small sample, PCT <0.5 ng/ml was associated with less antibiotic usage while LOS was not affected. PCT appears to be a useful tool to guide clinicians to delay antibiotics in febrile children older than 2 months of age.

Abstract: 343
BONDING WITH BOOKS IN THE NICU
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Background Reach out and Read©, has identified reading as the most important contributor to school readiness. In the neonatal intensive care unit (NICU), infants are at risk for poor parental bonding which can predispose them to adverse neurodevelopmental outcomes. Reading in the NICU setting allows parents to perform a normal parenting role and facilitates bonding in this unique setting.
Objective Our objective was to increase the reporting of reading by 25% post discharge by encouraging the parents to read to their infants in the NICU.
Design/Methods Parents at our level III NICU were recruited into a preintervention group -PrIG (no books in NICU) and post intervention group -PoIG (books in NICU). Inclusion criteria was parents of infants admitted for >7 days in the NICU. All parents received a postpartum bonding survey at time of discharge and a Stim Q© survey (a measurement of the cognitive home environment) via phone interviews at 2,4,6 and 9 months. Results are compared between groups.
Results 30 parents were recruited in the PrIG. 19 parents have been enrolled in the PoIG.
13/30 PrIG and 11/19 PoIG completed 2m post discharge follow up and 8/30 PrIG and 9/19 PoIG 4m post discharge follow-up. Average Stim Q©scores at 2m in PrIG were 4.2(range 0-11) and 2.3 (range 0-9) in the PoIG but at 4m the average Stim Q scores were 4.6(range 0-15) and 6.3(range 0-13) for PrIG and PoIG, respectively. There was a 30% increase between the groups at 4m post discharge and a greater increase in the PoIG from 2m to 4m post discharge follow-up.

Conclusion(s) By making books available to parents and inviting them to read to their infant may influence parents' habit to continue the activity after the infant's discharge. An infant discharged from the NICU has many medical needs that can distract parents from performing "normal" parenting activities. In a study by Lariviere, parents that did not read to their infants while admitted to the NICU wish they knew they could had read to their infants and thought it would have helped them feel more attached. These same parents also reported reading less than the parents that started reading to their infants while admitted to the NICU. This study demonstrated that learned behavior can become habitual and has an increased probability of continuing after the infant is discharged.

Abstract: 344
Brief Motivational Interviewing to Decrease Sugar Sweetened Beverage Consumption in Obese Children
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Background Obesity is a growing health epidemic that is estimated to affect 17% of the pediatric population. Development of obesity is a complex disease process and can lead to multiple co-morbidities such as insulin resistance, hypertension, nonalcoholic fatty liver disease, obstructive sleep apnea and premature death. The consumption of sugar sweetened beverages (SSBs) has been demonstrated to contribute to the development of obesity and has therefore been the focus of potential interventions targeting dietary behaviors such as SSB consumption. Motivational interviewing (MI) has also been part of obesity treatment programs and is suggested as an initial approach to the treatment of obesity in pediatric primary care settings. However, limited data exists on the effects of brief MI and SSB consumption.
Objective To use motivational interviewing as an intervention during routine pediatric primary care visits to decrease SSB-intake.
Design/Methods Data was collected on children 2 to 17 years old presenting with overweight/obesity between April 1, 2018 to October 20, 2018 during routine well child and follow-up visits at an urban university affiliated primary care clinic. Validated SSB intake questions at 3 different clinic sites were administered. Patients who received brief MI regarding SSBs were compared to controls.
Results 61 patients were included in the study: 39 ((64%) were assigned to the intervention group and 22 (36%) to the control group. The mean age of the intervention group was 9.28± 3.8 years (mean ± SD) and 9.36±3.4 years for the control group

(p>0.05). There was no significant difference between male and female distribution in the two groups but with significantly more subjects identified as "Black/African American" in the intervention group 46.2% vs 13.6% in the control group. The BMI of the intervention group was significantly lower at baseline compared to the control group (96.9±2.6 vs 98.0±1.7). There was no significant difference in BMI by gender. Overall, there was no significant change in intake of SSBs at baseline or follow up between the intervention and control group.
Conclusion(s) In this brief intervention, no significant change was seen in SSB intake in children who received motivational interviewing. Studies are needed to refine motivational interviewing and to evaluate interventions with a larger sample size.

Abstract: 345
Perception and Knowledge of Breastfeeding Among Mothers in an Urban Multiethnic Community Hospital
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Background The American Academy of Pediatrics recommends exclusive breastfeeding (BF) for the first six months of the baby's life and continued for one year or longer. Decision to BF is affected by cultural, religious and financial reasons. By understanding barriers, providing education and identifying misperceptions in our urban multicultural community, BF rates and BF extension rates can be addressed.
Objective To explore perception and knowledge of BF in an urban multiethnic community hospital.

Design/Methods Descriptive cross sectional study of BF at Flushing Hospital Medical Center from Sept to Nov 2018. Questionnaire in English, Spanish and Chinese were given to mothers in post-partum unit before discharge for voluntary completion. Questions included demographics (age, gravida, education level, marital status, occupation, average family income), five questions on knowledge and five questions on perception. Data were analyzed using percentages and compared.

Results Of 128 completed surveys, 34% were Hispanic, 31% Asian, 12% Caucasian, 4% African American and 19% other. Maternal age was 20-30 years in 48%, 31-40 years in 48%, primigravida in 38%, married in 69% and employed in 49%. Average family income <$40,000 was in 68%. Almost all received prenatal care (92%) and BF was discussed in prenatal visits in 89%. More mothers planned to BF and formula feed (64%) than exclusively BF (39%). Of BF mothers, 51% plan to BF for 6 months, 17% for one year and 23% for two years. Reasons for stopping BF were to return to school and work in 40%. Sources of information on BF included family (88%) and doctor/nurse (59%). Primary reason to use formula was to ensure weight gain in 56%. Awareness of lactation support group in 34% and specialist in 51%. Knowledge of benefits of BF (less infection) was known in 70%. Increase in breast size with BF was believed by 60% of mothers. Positive attitude toward BF was in 72% of fathers.

Conclusion(s) Majority of mothers received prenatal care, discussed BF throughout pregnancy, was aware of benefits and lactation specialist. More mothers plan to BF and formula feed than to exclusively BF. Most fathers have a positive attitude toward BF. Healthcare providers as primary source of information can improve and can affect BF rates and BF extension rates.

Abstract: 346
E-books use among young children in a low-income community
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Background Early introduction to books and reading are critical to the development of literacy skills in children. Currently, children are using electronic devices with increasing frequency. Electronic books are an area of emerging discussion and have the potential to impact children's learning in both positive and negative ways. Little is known about parental opinion and preferences with the use of electronic books (e-books) for young children.

Objective To investigate the patterns of e-books use in young children in an urban, low-income, minority community.

Design/Methods We conducted a cross-sectional study of parents of children age one to five years seen June to December 2018 at a pediatric practice in an academic center that serves an urban, low-income, minority community. The survey asked parents about their children's exposure to and experience with electronic devices, print books and e-books, how they accessed

e-books and level of interaction when reading e-books with their children.

Results 89 parents completed the survey: child's mean age was 38 months (SD 16), 50% males, 70% African American, 20% Hispanic, 53% of parents had high school degree or less, 47% had at least some college education, 85% public health insurance. Electronic devices were used by 88% of the children; phones and tablets were the most commonly used. In order of decreasing frequency, children used their devices to watch videos (72%), play games (66%), watch TV shows (60%), listen to music (57%) and read e-books (39%). Among e-book users, parents rated print books at 4.3/5 and e-books at 3.8/5. E-books were downloaded free or accessed through apps (Youtube, Amazon, Disney, ABC mouse). Parents preferred interactive e-books over PDF-based books (70% vs. 30%). Parents read e-books with children always/often 50% of the time, sometimes 27% and rarely/never 23% of the time. Most parents expressed an interest in learning more about e-books.

Conclusion(s) In a low-income, minority community with high percentage of mobile device use, less than half of the young children were exposed to e-books and few parents read e-books with their children. Print books were preferred over e-books. Given the ubiquitous use of electronic devices, pediatricians could take an active role in helping parents identify adequate resources for e-book use and promote continued interaction while reading e-books with young children.

Abstract: 347

Formalized NICU Orientation To Enhance Knowledge Retention And Confidence In Pediatric Interns

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Background Many trainees entering a Pediatric Residency have had no exposure to the Neonatal Intensive Care Unit. A thorough orientation is important for both resident education and patient safety. A review of the literature demonstrated no articles addressing the issue of NICU orientation. A needs assessment was created and distributed to Pediatric residents at Tufts Medical Center in 2017 which identified a need for more formalized NICU resident orientation and a preference to the systems used in the NICU over clinical topics.

Objective To create an IRB approved intern orientation curriculum that focuses on the systems within the NICU along with medical knowledge retention and confidence in common neonatal conditions.

Design/Methods Control data was collected from Pediatric interns from January - June 2018 via an online knowledge assessment and confidence survey. Based on the needs assessment an orientation curriculum was created and implemented in July 2018. It included videos, a pocket card with NICU specific "pearls", and a face-to-face orientation of NICU specific systems (EMR, clinical practice protocols, paper documentation). This was completed prior to the intern's monthly rotation. The same knowledge assessment and confidence survey was given to the intervention group. Consent was implied upon completion of the knowledge assessment and confidence survey.

Results Control participant response rate for the knowledge assessment was 100% and 83% pre and post rotation and confidence survey response rate was 66% pre and post rotation. Average knowledge score was 73% and 88% pre and post rotation with 50% of respondents showing improvement. Confidence survey averages were 1.9/5 and 2.4/5 pre and post rotation across all topics. Intervention participant response rate was 100% for both knowldege assessment and confidence survey. Average knowledge score was 75% and 87% pre and post rotation with all respondents showing improvement. Confidence survey averages were 1.5/5 and 2.3/5 pre and post rotation across all topics.

Conclusion(s) All the respondents have shown improvement in knowledge and gained confidence after their rotation but scores are almost identical in control and intervention groups. We are currently completing the intervention phase of the study.

The way of the NICU

Respiratory:

- Intubation: Miller blade, size 00 or 0 for premature, size 1 for late preterm or term
- ETT: 2.5 for BW < 1000-1250 g
  3.0 for BW 1250 -2000 g
  3.5 for BW > 2000 g
- Goal Sats: < 32 weeks: 88-93%
  > 32 weeks: 92-95%

FEN:

- Fluids: DOL 0: D10W or plain TPN. No electrolytes!
  - > 34 weeks: 60ml/kg/day
  - Most preterm : 80 ml/kg/day
  - ELBW (<26 weeks): 100ml/kg/day
- Na requirements (meq/kg/day):
  0-24hrs: none 24-48 hrs: 1-3 >48hrs: 2-4
- K requirements (meq/kg/day):
  0-24hrs: none 24-48 hrs: 0-2 >48hrs: 1-3
- Protein requirements (gm/kg/day): preterm: 3-4 term: 2-3
- GIR = $\frac{(D\%)(\text{rate ml/hr})(0.167)}{\text{Weight (kg)}}$ Goal: 4-8 mg/kg/min
- UOP = total ml ÷ wt(kg) ÷ number of hrs Goal: >1ml/kg/hr
- Intake = total ml ÷ wt(kg)
- Cal/kg/day= $\frac{(\text{total ml} \div \text{wt in kg}) \text{ X (kcal of milk)}}{30}$ Goal: 100-120 Cal/kg/day
- Hypoglycemia: bolus of D10W at 2ml/kg
- Vit D: start when full feeds reached of 400IU/day
- Iron: start when full feeds reached and at least 2 weeks of age, at 2 - 4 mg/kg/day

Hematology:
Phototherapy in premature infants:

Gestational Age	Phototherapy Level	Exchange Level
<28 0/7	5-6	11-14
28 0/7 - 29 6/7	6-8	12-14
30 0/7 - 31 6/7	8-10	13-16
32 0/7 - 33 6/7	10-12	15-18
34 0/7 - 34 6/7	12-14	17-19

HCM:
HUS screening: All infants born ≤ 32 0/7 wks or < 1500g or other high risk infants at DOL 1- 3 for very sick preterm infants, routinely at DOL 7-10, DOL 30, and term corrected or prior to discharge.
ROP screening: All infants born ≤ 30 0/7 wks or < 1500g or other high risk infants
NBS: initial at 24-72 hours of life, then 2 wks, 1 month, and monthly after until time of discharge
Hep B: at ≥ 2 kg or 30 days of life

Access:
UVC insertion depth: (BW x 3) + 9 / 2 + 1
UAC insertion depth: (BW x 3) + 9

Abstract: 348

Impact of Undergraduate Research Assistant Program (URAP)

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Background The Undergraduate Research Assistant Program (URAP) is a for-credit Honors undergraduate research course at UConn. URAP started in 2008 and is conducted both spring and fall semesters with 8-12 students per semester. Students gain expertise in conducting clinical research with an emphasis on the basic science concepts related to these studies. They actively participate in ongoing clinical research projects through enrollment, chart audits, and follow-up phone calls. Select students champion or conduct their own studies and write abstracts related to faculty led studies. There is little published on the impact of this type of course.

Objective To evaluate the impact of URAP on student research activities during and after the course, terminal degrees, career decisions, and subsequent research activities.

Design/Methods This is a descriptive, cross-sectional, survey study & retrospective review of URAP first author presentations. A voluntary response sampling method was used via an email distributed anonymous link for a Qualtrics survey to all former URAP students from 2008 through Fall 2018. Items included demographics, perceived course impact, subsequent terminal degrees, during & post-course research participation. All studies with URAP participation were queried to determine URAP first authorships.

Results 215 students have taken the course, & 67 completed survey with 42% male, 58% female, 65% White, 33% Asian. Survey results included: 73% reported URAP was much more valuable than most undergraduate courses, 76% said that URAP made them much more prepared to reach their career goals after graduation (Table 1). 58% are planning or currently attending graduate school with 55% pursuing MD/DO & 12% for master's degrees in a health care field (Table 2). First-author URAP includes 3 peer-reviewed publications, 18 platform, & 38 poster presentations at regional & national medical meetings. Including local presentations, 28% of all URAP students presented research during participation in this course.

Conclusion(s) URAP appears to attract highly motivated undergraduate students who actively participated & presented clinical research. The students highly valued the URAP course reporting it was more valuable than other courses. Over 80% of students indicated their first abstract submission was through this class. The majority reported obtaining or are in the process of completing advanced degrees. Many short answer comments had a prominent theme valuing patient contact & independent research opportunities which impacted their career goals in health care.

Table 1. Gender breakdown of perceived course impact

		What is your gender identity?		
		Male	Female	Total
How does the course in the MSc program compare to the undergraduate course you completed previously?	The most valuable undergraduate course	8	11	19
	Much more valuable than most courses	12	11	23
	More valuable than most courses	9	11	20
	Prefer not to answer	0	1	1
	Total	29	34	63
What (if any) were the most valuable aspects of the overall experience?	The opportunity to pursue individual projects	20	21	41
	The opportunity to work with attendings and residents on research projects	26	27	53
	Patient contact	11	11	22
	Learning how to write abstracts/ specific aims	13	18	31
	Learning how to give a PowerPoint talk	10	11	21
	The opportunity to attend and present at academic conferences	17	9	26
	Shadowing physicians	20	24	44
	Championing a study	14	16	30
	Teaching other students	8	10	18
	Learning about research procedures, the IRB and informed consent	23	24	47
	Total	29	34	63
Have you been more successful in the following areas as a result of the MSc program? (Check all that apply)	Somewhat more prepared	5	10	15
	No change	1	1	2
	Much more prepared	24	17	41
	Extremely more prepared	3	11	14
	Total	33	40	73

Survey reported perceived course impact and most value aspects of the course.

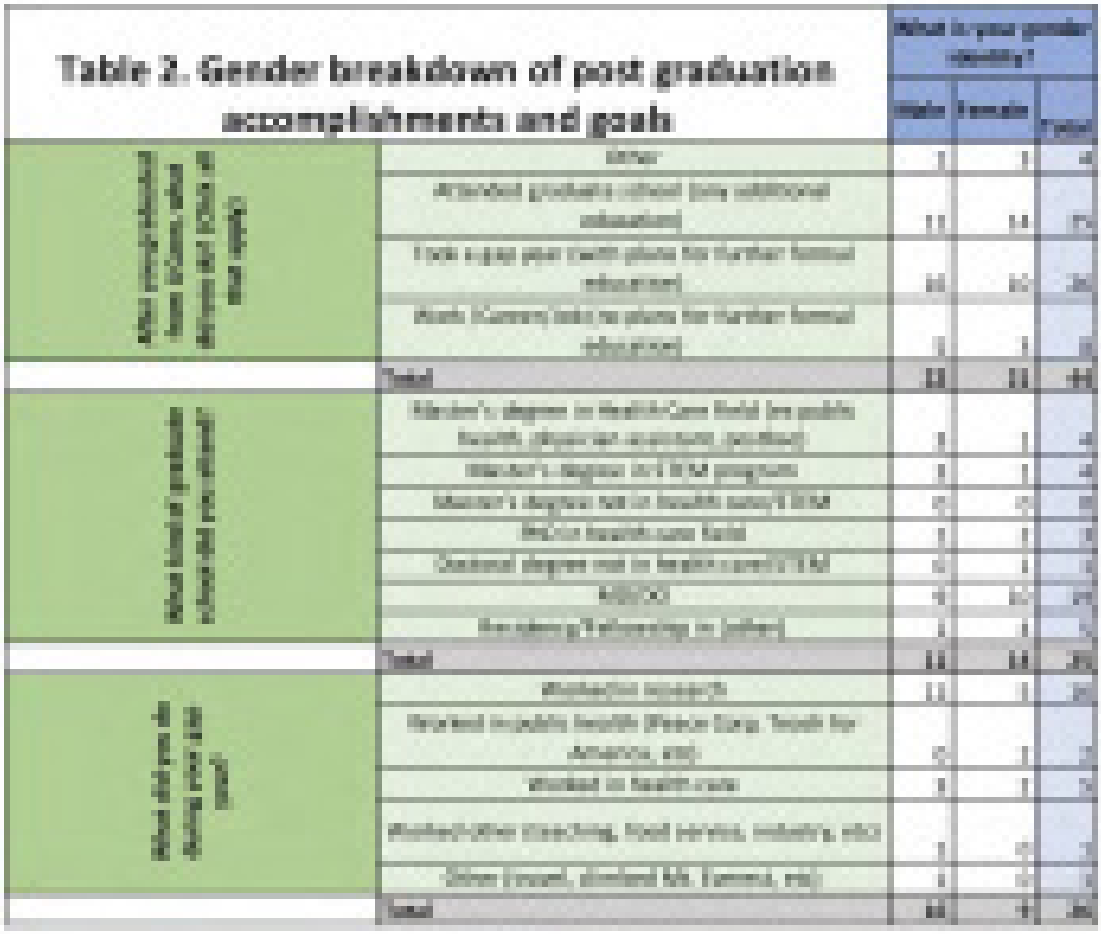

Table 2. Gender breakdown of post graduation accomplishments and goals

Survey reported current activities post graduation and goals.

Abstract: 349

Pediatric Resident Preparedness for Neonatal Intensive Care Unit (NICU) Disasters: A Mixed Methods Design

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Background NICU disaster preparedness is essential to safely care for neonates during a crisis. Pediatric residents in the NICU are essential personnel who can play critical roles in a disaster response. However, they are seldom considered in disaster protocols and disaster preparedness research.

Objective To assess pediatric residents' preparedness, their potential roles during two NICU disaster scenarios, and determine their training needs.

Design/Methods Semi-structured interviews with 10 senior pediatric trainees were used to create response choices for a survey (mixed-methods design). Questions addressed resident roles and responsibilities during NICU crises (evacuation and surge), current preparedness, prior experience and perceived training needs. Survey results were used to confirm themes from

interviews.
Results Central interview themes included: 1) lack of prior disaster training, 2) unpreparedness for evacuation or surge, 3) importance of disaster training, 4) insufficient knowledge of NICU disaster protocols, and 5) primary role of residents as system facilitators e.g. performing clerical work. Of the 37 senior pediatric residents invited to participate in the survey, 30 responded (81%) (57% full completion). The survey confirmed that all residents (100%) did not have prior NICU disaster training and most did not feel prepared for either evacuation (88%) or surge scenarios (82%) due to unfamiliarity with content and location of disaster protocols (100%). Potential resident roles included: recruiting other residents (35%), clerical work (26%), and any role assigned by supervisor (21%). Residents agreed that education on NICU disaster protocols (100% evacuation, 91% surge) would make them feel more prepared and most wanted to receive training (90%). Residents believed that a multipronged approach during NICU rotations (53%), in the form of multidisciplinary simulations (89%), a NICU disaster handbook (78%) and a description of residents' roles (72%) should be used. Most were willing to respond to a hospital disaster (84%) but did not know their specific role (96%).
Conclusion(s) Pediatric residents' views on NICU disaster preparedness are quite universal and are not limited to residents who self-selected to be interviewed. Residents lacked experience but were enthusiastic to receive training and participate in disaster response. Educating residents should include NICU disaster protocols and multidisciplinary simulations during NICU rotations to allow them to contribute fully to any disaster response.

Table 1: Survey responses to questions regarding NICU Emergency Preparedness

	Strongly Disagree/Slightly Disagree	Neither Agree nor Disagree	Slightly Agree/ Strongly Agree
I feel prepared to participate in an EVACUATION scenario.	22 (88%)	1 (4%)	2 (8%)
I feel prepared to participate in a SURGE scenario.	19 (82%)	2 (9%)	2 (9%)
I am familiar with the NICU evacuation plan.	24 (100%)	0 (0%)	0 (0%)
I know where to find the NICU evacuation plan.	23 (100%)	0 (0%)	0 (0%)
I am familiar with the NICU surge plan.	23 (100%)	0 (0%)	0 (0%)
I know where to find the NICU surge protocol.	23 (100%)	0 (0%)	0 (0%)
Are you willing to respond to a hospital disaster scenario (e.g. surge management or emergency evacuation)?	3 (16%)	N/A	16 (84%)
I know my role in a NICU evacuation or surge.	22 (96%)	0 (0%)	1 (4%)

Table 2: Factors affecting Pediatric Resident NICU Emergency Preparedness

Top 3 Answers	Evacuation	Surge
Inhibiting Factors (n) %	Don't know evacuation protocol (20) 91%	Don't know surge protocol (19) 95%
	Don't know my role (20) 91%	Don't know my role (18) 90%
	Insufficient training/skills (20) 91%	Insufficient training/skills (18) 90%
Facilitating factors (n) %	Education about evacuation protocols (25) 100%	Education about surge protocols (20) 91%

	Team member with NICU evacuation experience (22) 88%	Sufficient staff or a protocol for staff reinforcement (18) 82%
	Disaster preparedness planning discussions (21) 84%	Team member with NICU surge management experience (17) 77%

Abstract: 350
Thyroid storm in a 4-year-old
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Background Thyroid storm is a rare complication of thyrotoxicosis associated with a high level of mortality. Graves' disease is the most common cause of thyrotoxicosis in adults and pediatrics, but with a far lower incidence (up to 80 *versus* <1 per 100,000/year, respectively) in childhood. The incidence of Graves' disease increases with age over childhood, and is very uncommon < 5 years-of-age. In adult populations, frequency of thyroid storm in those with thyrotoxicosis is 1%, but given the rarity in childhood, it is described largely in case reports.
Objective
Design/Methods NA
Results A 4-year-old female with speech delay presented with fever, congestion, vomiting and diarrhea for 1 day. Prior to presentation, she had a 10-month history of poor weight gain, hyperactivity and diarrhea. She was found to be hypertensive (157/122 mmHg), tachycardic (198 bpm) and febrile (39.6°C). Clinical exam revealed a thin (BMI z-score -7.76 SDs), agitated pre-pubertal child with bounding pulses, increased work of breathing, proptosis, moderate goiter, significant pectus excavatum and a large hyperpigmented macule on left arm. TSH <0.01 mU/L and free T4 7.7 ng/dL. Presentation met thyroid storm criteria per Japan Thyroid Association and Burch/Warofsky. She was treated with intravenous fluids, methimazole, propranolol and corticosteroids. Viral cultures (adenovirus, influenza A and B, RSV), blood culture, blood gas and a chest x-ray were obtained and were normal. Echocardiography with mild mitral valve regurgitation. Normal screening for adrenal insufficiency, diabetes, and McCune-Albright. Close monitoring for risk of re-feeding syndrome. TSH receptor-stimulating antibodies were positive. With persisting fevers (>39°C), tachycardia, frequent stools and respiratory symptoms medical therapy was maximized with good clinical and biochemical effect. On day 11 of hospitalization fevers recurred, and a left lower lobe pneumonia was discovered and treated. With continued normalization of thyroid function and symptoms, weight gain and significant improvement in behavior and speech understandability and utilization occurred.
Conclusion(s) This patient is the youngest identified in the literature with an initial presentation of Graves' disease with thyroid storm. Thyroid storm is frequently associated with an inciting event, including surgery and illness. In a young child, symptoms of thyrotoxicosis can be overlooked given its rarity and its ability to mimic more common pediatric illnesses. This potential delay in diagnosis may have significant implications for growth, development and severity of presentation.

Abstract: 351
Biochemical and temporal profiling of chemotherapy associated hypoglycemia
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Background Hypoglycemia is a side effect of chemotherapy, most frequently associated with 6-Mercaptopurine (6MP). Aspariginase (ASP) associated hypoglycemia has been reported, but the frequency and presentation are not defined. Objective Biochemical and temporal profiling of hypoglycemia in 2 children with acute lymphoblastic leukemia (ALL). Design/Methods Patient 1 was diagnosed at 14-months with high-risk mixed-phenotype KMT2A rearranged ALL, treatment per Children's Oncology Group (COG) Protocol AALL1131. He developed hypoglycemia (blood glucose <50 mg/dL) day of therapy (DOT) 18. Periods of severe fasting and fed hypoglycemia persisted throughout his course and required therapeutic cornstarch 3 times daily, he tolerated a decreased frequency during maintenance.

Pt. 2 was diagnosed at 6-years with high-risk B cell ALL, treatment per COG AALL08B1. Hyperglycemia, on dexamethasone, required insulin DOT 3-12. Hypoglycemia began DOT 8 and persisted despite discontinuation of insulin, most profoundly DOT 16-19. She had euglycemia, until the following pattern recurred monthly throughout maintenance: (1) hyperglycemia,

requiring insulin on 5-day prednisone pulses, followed by (2) hypoglycemia, requiring therapeutic cornstarch, for the remaining 25-days.

Results For both patients, we identified a repeating pattern of cyclic severe hypoglycemia onset 4-16 days after PEG-ASP, and lasting 9-13 days (pegylated, peak 24 hours, half-life IV 30 hours) and prior to any treatment with 6MP. Repeated biochemical testing, for Pt. 1, demonstrated hyperinsulinemic hypoglycemia associated with PEG-ASP therapy. Due to a reaction, Pt. 2 was transitioned from PEG-ASP to erwinia-ASP (half-life IV 7.5 hours), without identified glucose abnormalities.

Hypoglycemia occurred, for both patients, with PEG-ASP alone as well as with concurrent 6-MP. When low dose 6-MP (60 mg/m2/day) was administered without concurrent PEG-ASP there was minimal to no need for cornstarch therapy. Higher dose 6MP (75 mg/m2/day), during maintenance phase without PEG-ASP, was associated with ketotic hypoglycemia, requiring only evening cornstarch. Genetic testing is pending.

Conclusion(s) Chemotherapy associated hypoglycemia in children can be due to multiple agents. Our cases propose PEG-ASP associated hypoglycemia has a delayed onset of hyperinsulinemic hypoglycemia. Future studies defining the temporal pattern and associated risk factors for chemotherapy associated hypoglycemia in children may improve identification, with potential repercussions for therapeutic and neurologic outcomes.

Abstract: 352

Not one, but two causes of hyperinsulinism in an infant with persistent hypoglycemia

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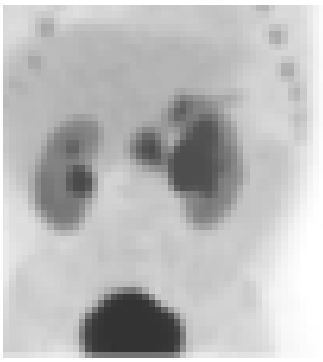
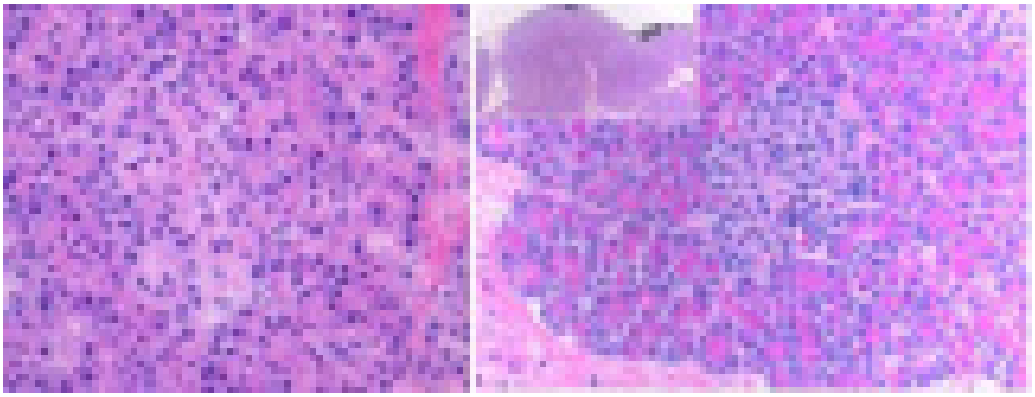
Background Congenital hyperinsulinism (HI) is the most common cause of persistent hypoglycemia in children. HI can be secondary to perinatal factors, due to mutations in genes implicated in the regulation of insulin secretion, or it can be syndromic. Beckwith-Wiedemann syndrome (BWS) is the most frequent cause of syndromic HI.
Objective
Design/Methods Data were abstracted from the electronic medical record.
Results A 7 month old, full term, male with history of neonatal abstinence syndrome, presented with a hypoglycemic seizure and was found to have persistent hypoglycemia. Diagnostic evaluation revealed an elevated insulin (1.47 uIU/mL), suppressed betahydroxybutyrate (0.6 mmol/L) and a positive glycemic response to glucagon during hypoglycemia (47 mg/dL), all consistent with HI. Glucose requirement was high at 16 mg/kg/min, despite maximal therapy with diazoxide and later octreotide. Genetic testing performed on peripheral DNA was negative for disease-causing mutations in the 10 commonly tested HI genes. An ^{18}FDOPA PET/CT revealed increased uptake in the body of the pancreas. Histologic evaluation of frozen biopsies taken during surgery showed rare borderline islet cell nucleomegaly in the tail and body of the pancreas, more prominent in the distal pancreas, but no focal lesion. A 45% partial pancreatectomy to remove the body and tail of the pancreas was performed. Tissue from the affected part of the pancreas was sent for DNA analysis, which revealed a likely pathogenic variant in *GCK* (c.209-11T>A). Additional genetic testing on blood, skin, and pancreas samples showed loss of methylation at imprinting control region 2 consistent with BWS. Histological appearance was more consistent with diffuse HI than the pattern typically seen in BWS. Post-operatively, diazoxide was restarted. He was weaned off dextrose support and was able to fast overnight with glucoses > 70 mg/dL.
Conclusion(s) This case highlights the importance of a comprehensive approach to the evaluation of infants with HI to determine the mechanism of disease. Genetic analyses of peripheral blood and pancreatic tissue should be performed when possible, as disease-causing mutations may be germline, somatic, or mosaic. Once testing for BWS or a specific mutation yields a result, the rest of the testing should still be completed. This is particularly important when considering treatment options. GCK-HI is often not responsive to diazoxide and we believe that our patient became more responsive to diazoxide once his pancreatic tissue with the GCK mutation was removed.



18 F-DOPA PET/CT demonstrating uptake in the pancreatic head (likely physiologic) and uptake in the mid pancreatic body. Findings suggestive of focal lesion in the pancreatic body.



Histology demonstrating rare borderline islet cell nucleomegaly in the tail and body of the pancreas. The islet cell nucleomegaly appears more prominent in the area of the pancreatic body. No focal lesion identified.

Abstract: 353

Gonadal function following conservative gonadal surgery in two cases of ovotesticular DSD

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Background Ovotesticular Disorder of Sexual Development (DSD) is the occurrence of testicular and ovarian tissue in the same person.[1] Conservative surgery with preservation of gonadal tissue congruent to the gender of rearing has been proposed but outcomes are sparse.[1,2]

Objective These two cases of ovotesticular DSD in non-ambiguous males show the variability in presentation and support the feasibility of conservative therapy along with the need for endocrine monitoring.

Design/Methods Case 1 is a 17-year-old male with a history of hypospadias repair at 6 months who presented with right testicular swelling after a straddle injury. Case 2 is a 15-year-old male who presented with gynecomastia and was found to have a testicular mass.

Results In case 1, gonadal exploration revealed a right ovotestis. The ovarian component was removed. The patient then presented with left testicular swelling. On exploration, he had a left ovotestis with no uterus or fallopian tubes. The ovarian component was again removed. Biopsies of the testicular tissue in both sides showed leydig cells but no spermatogenesis. Genetics showed 46, XX karyotype, SRY negative. No abnormalities in SOX3, SOX9, NROB1. Whole exome sequencing negative. Labs (table 1) have had continued normal testosterone concentrations with elevated FSH and rising LH values.

In case 2, exploration of the left hemiscrotum revealed a left hemiuterus and ovary, which were both removed. On the right, an ovotestis was found, and the ovarian component was removed. Biopsy of the testicular tissue showed sertoli cell only seminiferous tubules and sparse leydig cells. Initial labs (table 2) had elevated estrogen and low testosterone levels. Post-operatively, estrogen levels declined, serum testosterone rose in the low-normal range and LH/FSH levels increased. Karyotype with mosaicism 46 XX/47XXY.

Conclusion(s) These cases, in addition to prior case series in the literature, support management with conservative surgery, even in adolescence.[1,2] Though these cases, and others, have been reported in urologic journals, the long term endocrine follow up has not been clearly documented.[1,2,3] Following removal of the ovarian component, both patients have maintained testosterone levels. Still, these cases support the need for monitoring, as both patients have elevated gonadotropins, indicating likely future need for testosterone replacement.[2] Additionally, while both patients had estrogen effects in adolescence, they highlight variability of presentation.

Table 1

Time	Preoperative (right side)	Immediately Post-operative (left side)	Four months post-operative (left side)
Testosterone (ng/dL)	63 (308-320)	456 (208-620)	468 (180-620)
Luteinizing Hormone (mIU/mL)	2.9 (3-10)	6.7 (0.4-7)	8.9 (3.4-7)
Follicle Stimulating Hormone (mIU/mL)		13 (2-9.2)	14 (2-9.2)
Inhibin B (pg/mL)		33 (30-475)	32 (30-475)
Anti-Mullerian Hormone (pg/mL)		15.60 (3.09-30.86)	17.3 (3.09-30.86)

Hormone levels from Case 1: Normal ranges are presented within the parentheses

Table 2

Date	Pre-operative	Immediately Post-operative	4 months Post-operative	18 months Post-operative
Testosterone (ng/dL)	125 (350-970) Repeat: 73 (110-975)	384 (110-975)	358 (110-975)	383 (110-975)
Luteinizing Hormone (mIU/mL)	1.5 (3-10)		12.02 (0.86-4.77)	17.05 (0.68-4.77)
Follicle Stimulating Hormone (mIU/mL)	3.3 (0-13.1)		26.05 (0.85-6.74)	32.1 (0.85-6.74)
Inhibin B (pg/mL)			34 (34-355)	<30 (34-355)
Estrogen (pg/mL)	272.3 (60-190)	162 (60-190)	316.5 (60-190)	146.3 (60-190)
Estradiol (pg/mL)	72 (18-38)			20 (<5-31)

Hormone levels from Case 2: Normal ranges are presented within the parentheses

Abstract: 354

Novel MYRF mutation associated with ambiguous genitalia and normal gonadal function: a case report

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Background Differences of sex development (DSD) encompass a group of congenital conditions with a variety of features and pathophysiology, associated with atypical development of chromosomal, gonadal or anatomic sex. Myelin regulatory factor (MYRF) is a transcription factor involved in myelin production. *MYRF* is highly expressed in many human tissues. Loss of function heterozygous variants of *MYRF* have been recently described in 3 individuals with cardiac and urogenital abnormalities, and *MYRF* has been proposed as a cause of DSD. Their endocrine evaluation has not been previously described. Objective Describe the endocrine function of a 46XY boy with atypical genitalia and a novel *MYRF* mutation. Design/Methods Whole exome sequencing (WES) and review of medical records.

Results Patient was born vaginally at 36 weeks; birthweight was 7 lbs; pregnancy was complicated by polyhydramnios. Prenatal US had determined that mother was carrying a female. Patient was noted to have atypical genitalia at birth, with bilateral undescended, nonpalpable testes and penoscrotal hypospadias with chordee. Karyotype was 46XY; SRY positive. Serum testosterone (post HCG stimulation and during mini-puberty of infancy) was normal at 260 and 316 ng/dL, respectively. Serum anti-mullerian hormone (AMH) and gonadotropin levels after birth and during mini-puberty were also normal, indicating normal Leydig and Sertoli cell function. Serum cortisol and adrenal androgens, including 17-hydroxyprogesterone, androstenedione, DHEA and 17-OH Pregnenolone, were normal for age. Further endocrine evaluation showed no pituitary hormone deficiencies or hypothyroidism. The patient underwent 2 stage hypospadias repair and bilateral orchiopexy at 9 and 16 months old, respectively. Patient has been followed by Ophthalmology for amblyopia and hyperopia, and by Cardiology for trivial mitral valve prolapse with trivial regurgitation. He has autism and feeding difficulties. WES revealed a pathogenic variant at c.789dupC:p.Ser264GlnfsX74 in exon 6 of *MYRF* predicted to cause a loss of normal protein function.
Conclusion(s) This case provides further evidence about the role of *MYRF* in the development of external genitalia in 46XY individuals. In our patient, testosterone biosynthesis and gonadal function was intact in the neonatal period, suggesting that *MYRF* is not involved in gonadal differentiation but rather causes atypical genitalia by affecting local genital embryonic development. Further studies in other affected individuals are needed to confirm these findings.

Abstract: 355
Treatment of Type 2 Diabetes Mellitus and Hypertriglyceridemia with Pioglitazone in a Survivor of Childhood Cancer
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Background Childhood cancer survivors (CCS) treated with total body irradiation (TBI) are at an increased risk of developing insulin resistance, type 2 diabetes mellitus (T2DM), and dyslipidemia. Exposure to cytotoxic therapy in childhood may decrease the number of adipocytes leading to adipocyte hypertrophy in later life, which has been shown to correlate with insulin resistance. Therefore, metabolic derangements in CCS may benefit from interventions aimed at the adipocyte.
Objective
Design/Methods Clinical data were abstracted from the electronic medical record of this patient.
Results A 20-year old girl with a history of stage IV neuroblastoma at age 3 years developed T2DM in the setting of hypertriglyceridemia and low body mass index. Her previously established endocrine co-morbidities included growth hormone deficiency, hypothyroidism, and primary ovarian failure.

Her neuroblastoma was treated by surgical resection, stem cell transplant, chemotherapy, abdominal radiation, and TBI. She underwent routine screening for hyperglycemia. At age 15 her HgA1c was 6.6% with a normal 2 hour OGTT: glucose 94 fasting, 154 at 1 hour, and 110 at 2 hours. At age 19, dyslipidemia was identified: triglycerides (TG) 528mg/dL, total cholesterol 159 mg/dL, HDL 29 mg/dL. After age 15, her Hg A1c decreased until age 20 when her Hg A1c increased again to 6.6%. At this time, she was underweight with BMI 17.4 kg/m^2 and her OGTT was abnormal with glucose 107 fasting, 208 at 1 hour and 191 at 2 hours. Her fasting insulin level was 52.7 uIU/mL, insulin Ab < 5 uU/mL, GAD-65 Ab < 5 U/mL, and TG 408 mg/dL. Metformin was trialed but soon discontinued due to side effects. A DEXA scan showed a Z score of 0.4 in the lumbar spine, -1.1 in the hip, and 39% total body fat. Pioglitazone was then started at 15mg and subsequently increased to 30mg per day. Within 6 months, her HgA1c decreased to 6.2% and TG to 283 mg/dL. On treatment with pioglitazone, TG and HgA1c were 286 and 6.2% at age 21, 311 and 6.5% at age 22, and most recently 240 and 6.1% at age 23.
Conclusion(s) In this patient who developed T2DM and hypertriglyceridemia after TBI, treatment with pioglitazone lowered her Hg A1c and TG levels. We postulate that our patient's improvement in TG level was due to pioglitazone's direct action on adipocyte function; and suggest that pioglitazone should be further studied as a treatment for both diabetes and dyslipidemia in survivors of childhood cancer treated with TBI.

Abstract: 356
Two Distinct Pancreatic Focal Lesions in a Patient with KATP Congenital Hyperinsulinism
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Background Congenital hyperinsulinism (HI) is a genetic disorder that causes severe hypoglycemia due to inappropriate insulin secretion. The most common form of HI is due to inactivating mutations in the ATP-gated potassium channels (K_{ATP}HI). There are two distinct histological forms of K_{ATP}HI: diffuse, in which all pancreatic ß-cells are affected, and focal, in

which only a small area of the pancreas is affected. A single recessive paternally inherited mutation in the K_{ATP} channel genes has a 94% positive predictive value for focal HI, which can be cured by excision of the focal lesion guided by preoperative fluorine-18-l-dihydroxyphenylalanine positron emission tomography (18-F-DOPA PET). We describe a case of K_{ATP}HI with two distinct pancreatic focal lesions.

Objective

Design/Methods Data were abstracted from the electronic medical record.

Results A 3.55kg male born at 38 2/7 weeks gestation presented shortly after birth with a plasma glucose (PG) of 28 mg/dL requiring a glucose infusion rate of 15 mg/kg/min to maintain euglycemia. A critical sample supported the diagnosis of HI: PG 37 mg/dL, betahydroxybutyrate 0.19 mmol/L, and insulin 17 uIU/mL. Maximum dose diazoxide was trialed without benefit. Genetic testing revealed a single heterozygous paternally-inherited recessive splice site mutation in *ABCC8* (c.3992-9 G>A). 18-F-DOPA PET showed a focal lesion in the inferior aspect of the pancreatic head extending into the uncinate process. Intraoperatively, after a lesion was removed with clean margins from the inferior head, the surgeon palpated and excised a second firm lesion in the pancreatic body. Analysis of DNA from each lesion revealed loss of heterozygosity (LOH) of distinct chromosomal regions: 11p15.5p11.2 in the head lesion and 11p15.5p13 in the body lesion, confirming that the two lesions resulted from distinct genetic events. After recovery from the 20% pancreatectomy, he was discharged on no treatments.

Conclusion(s) Few cases of HI with multiple focal lesions have been reported. From our series of 246 patients with focal lesions, this is the second case with multiple lesions and the only one with two discrete lesions in the pancreas. DNA analysis of the tissue confirmed that the two lesions were the result of distinct LOH events in the setting of a paternally-inherited recessive *ABCC8* mutation. This case illustrates the importance of a multidisciplinary and personalized approach to the management of infants with HI.

Abstract: 357

Episodic Hypertension – A Pediatric case of a cortisol and DOC-producing Adrenal adenoma

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Background Pediatric hypertension is a growing health problem with a current prevalence of 3.5%, yet only a small portion (prevalence 0.05-6%) of secondary hypertension is due to hormonal excess. Adrenal tumors affect 3-10% of the population, but are rare in pediatrics.

Objective Hypokalemic hypertension due to tumor production of mineralocorticoids other than aldosterone is rare in adult populations and has not been described in pediatrics.

Design/Methods A 16-year-old obese female with intermittent hypertension, depression and anxiety for 2 years, presented with chest pain, palpitations, headache and fatigue to an emergency room. She was found to have tachycardia and hypertension, with an incidental finding of a left adrenal mass on CT-angiography of the chest. Prior to this presentation, her hypertension was evaluated by nephrology and cardiology with findings of
hypokalemia, low renin and aldosterone, normal plasma fractionated metanephrines, renal ultrasound/doppler, EKG and 2D-ECHO. Presumptive diagnosis was made of episodic hypertension due to anxiety and managed by diet and counseling.

Results Following transfer, her chest pain resolved and she was generally normotensive, with infrequent hypertensive episodes (peak 150/80). MRI abdomen demonstrated a 7 cm left adrenal mass. Biochemical evaluation (see table) is consistent with an adrenal cortex origin with glucocorticoid and mineralocorticoid excess, including elevated deoxycorticosterone (DOC), suppressed aldosterone, abnormal dexamethasone suppression of cortisol, negative evaluations for pheochromocytoma and cardiac pathology. She was treated with lisinopril and peri-operatively with stress dose hydrocortisone for left adrenalectomy. Surgical pathology demonstrates tumor of 8 cm and 164 grams, consistent with a benign adrenal adenoma. Post-operatively, lisinopril was discontinued and hydrocortisone was weaned to physiologic dose with adrenal function monitoring. Adrenal biochemistry panel returned to normal. Renin, aldosterone, ACTH and AM cortisol were improving but still low at 8 weeks follow-up.

Conclusion(s) We have presented a case of a benign adrenal adenoma producing cortisol and DOC leading to hypokalemic hypertension. DOC is an aldosterone precursor and a potent mineralocorticoid. A patient with a mineralocorticoid and glucocorticoid secreting mass may demonstrate vague symptoms due to the mixtures of hormones and potential intermittent secretion. This is very rare in the pediatric population; to our knowledge, this is the first case reported in children.

LABORATORY	PRE SURGERY Low dose Dexa suppression	POST SURGERY		REFERENCE RANGE
Cortisol – AM	3.1	1 week	10 weeks	mcg/dl
		2	1.7	
OVERNIGHT HYPERTENSIVE EPISODE				
Plasma Metanephrine	<20			0.57 pg/ml
Plasma Normetanephrine	94			0.198 pg/ml
Aldosterone	<1			0.05 ng/dl
Renin	0.11			0.24 to 1.82 ng/ml/hr
24 HOUR URINE COLLECTION				
Cortisol, 24H Ur	14.9			4.0 - 50 mcg/24 hr
Metanephrine	47			44 - 350 mcg /24 hr
Normetanephrine	243			65 - 681 mcg/24 hr
Total Meta + Normeta	290			109 - 1031 mcg/24 hr
Epinephrine	<2.0			<2.0 mcg/L
Norepinephrine	23			15 - 80 mcg/24 hr
Total Fract	23			15 - 80 mcg/24 hr
Dopamine	287			65 - 400 mcg/24 hr
Creatinine Urine total	966			700 - 1800 mg/24 hr
CAH Steroid Panel				
		2 weeks		
17-Hydroxyprogesterone	388	32		4 - 287 ng/dl
11-Deoxycortisol	1000	<15		4 - 220 ng/dl
17-Hydroxypregnenolone	1021	<15		4 - 787 ng/dl
18-Hydroxycorticosterone	<30	<15		4 - 248 ng/dl
Cortisone	1.11	0.88		0.3 - 0.9 mcg/dl
Androstenedione	300	14		10 - 170 ng/dl
Corticosterone	161	18		4 - 1400 ng/dl
Cortisol	8.6	22.6		3.4 - 17.3 mcg/dl
DHEA, Unconjugated	67	<15		10 - 1150 ng/dl
Glucocorticosteroid (GCG)	800	<15		4 - 35 ng/dl
Pregnenolone	300	<15		12 - 206 ng/dl
Progesterone	1.2	0.2		4 - 28.8 ng/dl
Testosterone, Total	70	<10		4 - 82 ng/dl

LABORATORY	PRE SURGERY	POST SURGERY			REFERENCE RANGE
		2 weeks	6 weeks	3 months	
Plasma Renin	0.07	0.10	0.17	0.03	0.03 to 3.63 ng/ml/hr
Aldosterone	<2	<2	3	3	(Tarnow-stage IV) 4 – 31 ng/dL
ACTH	7	<5	5		0-52 pg/ml
Serum Potassium (K)	3.3	4.5	4	3.9	3.6 – 5.1 mmol/L
HVA Urine Random	5.1		3.2		1.5 – 5.5 mg/g creat
VMA Urine Random	5.3		5		1.5 – 5.5 mg/g creat

Abstract: 358

Is Cetirizine A Risk Factor for Drug Induced Methemoglobinemia?

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History (including chief complaint, history of present illness and relevant past and family medical history) 18 year old African American female with a past history of anxiety and depression developed acute abdominal pain. Patient had self-reported ingestion of 10-16 10mg tablets of cetirizine for relief of pain and was brought to the ED by her father after admitting to ingestion. In the ED, vital signs were normal. Arterial blood oxygen saturation (SaO_2) was 94% on room air. She was anxious and tremulous but in no respiratory distress. Laboratory results are presented below. On admission to PICU cyanosis was noted on extremities and tongue. Pulse oximetry on forehead was 85% and 75% on left hand. SaO_2 did not improve with 4L/minute of 100% oxygen via nasal cannula. Arterial blood gas revealed dark red appearance of blood and methemoglobin level of 38%. Diagnosis of methemaglobinemia was made and patient responded to treatment with methylene blue and vitamin C. Basic workup for underlying cause was non contributory.

Physical examination findings (including vital signs) Vital signs HR 74 RR 14 B/P 116/64 Temp 99.3 O2 Sat 84% on room air and 4 liters O2

General: no acute distress

Skin: normal

HEENT: Normal except for tongue with cyanosis

Neck: Supple, no masses

Heart: Normal S1&S2, RRR, no murmur

Lungs: Good air entry bilaterally, no wheezes, crackles or rhonchi

Abdomen: Normal bowel sounds, non distended, non tender, no hepatosplenomegaly

Extremities: Normal except for upper and lower extremities with cyanosis

Genitalia: Normal female, Tanner V

Neuro: non focal examination, normal tone

Laboratory or Diagnostic imaging or Procedures Salycylate <1.7

Acetaminophen level: 2.8

Urine drug screen and pregnancy test: Negative

Chemistry: Serum electrolytes and liver function tests were normal. Significant abnormal values were: bicarbonate 19 mmol/L, lactate 1.5 mmol/L, total bilirubin =1.9 mg/d and creatinine 1.2 mg/dL.

Hematology: all normal. Hematocrit declined from 38.3% on admission to 33.1 % before discharge.

Hemoglobin electrophoresis: Hb A 95.9%, HB A2 3.1%, Hb F 1.0%

G6PD - 100% change in 30 minutes

Urine analysis was significant for moderate bilirubin and urobilinogen 4.0.

Arterial blood gas : pH 7.45 pCO2 21.1 pO2 82.4, HCO3 14.6; carboxyhemoglobin 0; methemoglobin: 38%,; oxyhemoglobin 61.3%

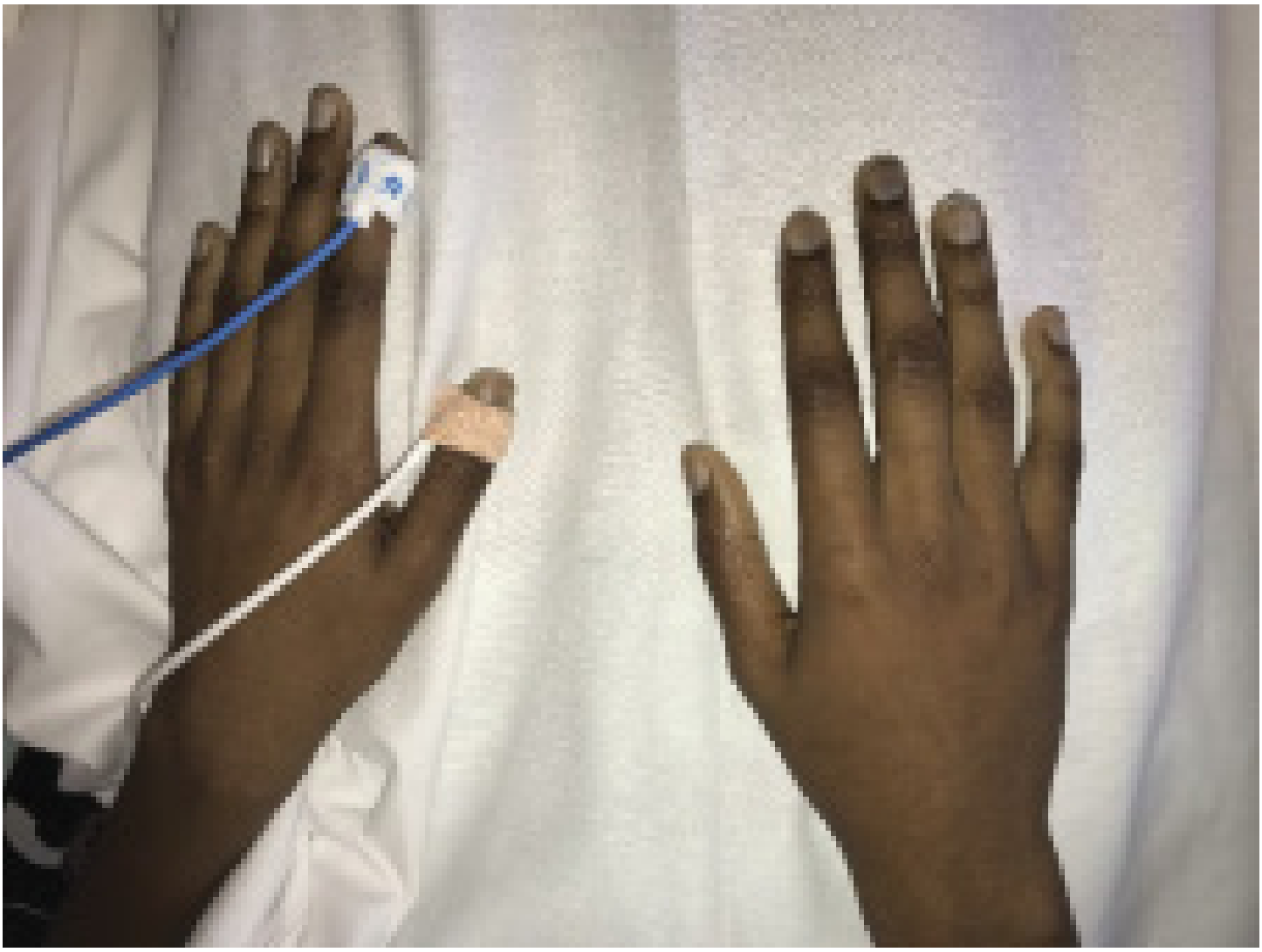
Sulfhemoglobin: Negative

Methemoglobin reductase: normal

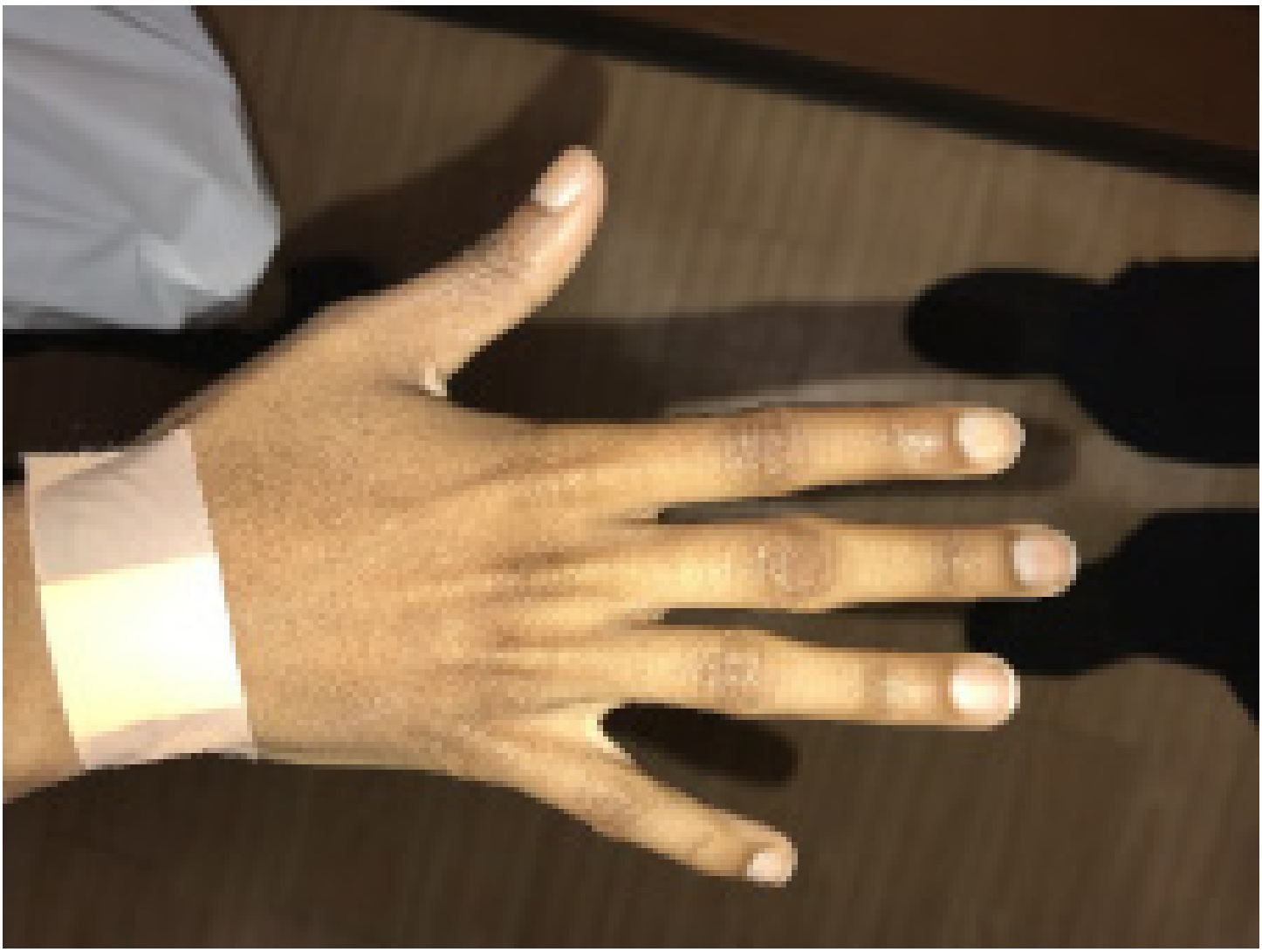
Final Diagnosis Diagnosis: Methemaglobinemia secondary to acute excessive ingestion of cetirizine

Comments: To our knowledge cetirizine has not been documented to cause methemoglobinemia.

The medication may be considered for inclusion in the list of drugs as a risk factor for methemoglinnemia and monitored for this complication in conditions of excessive ingestion.



Patients hands with cyanosis upon admission



Patients hands on day of discharge

Abstract: 359
Mesenteric Hematoma in Context of Recurrent Intussusception
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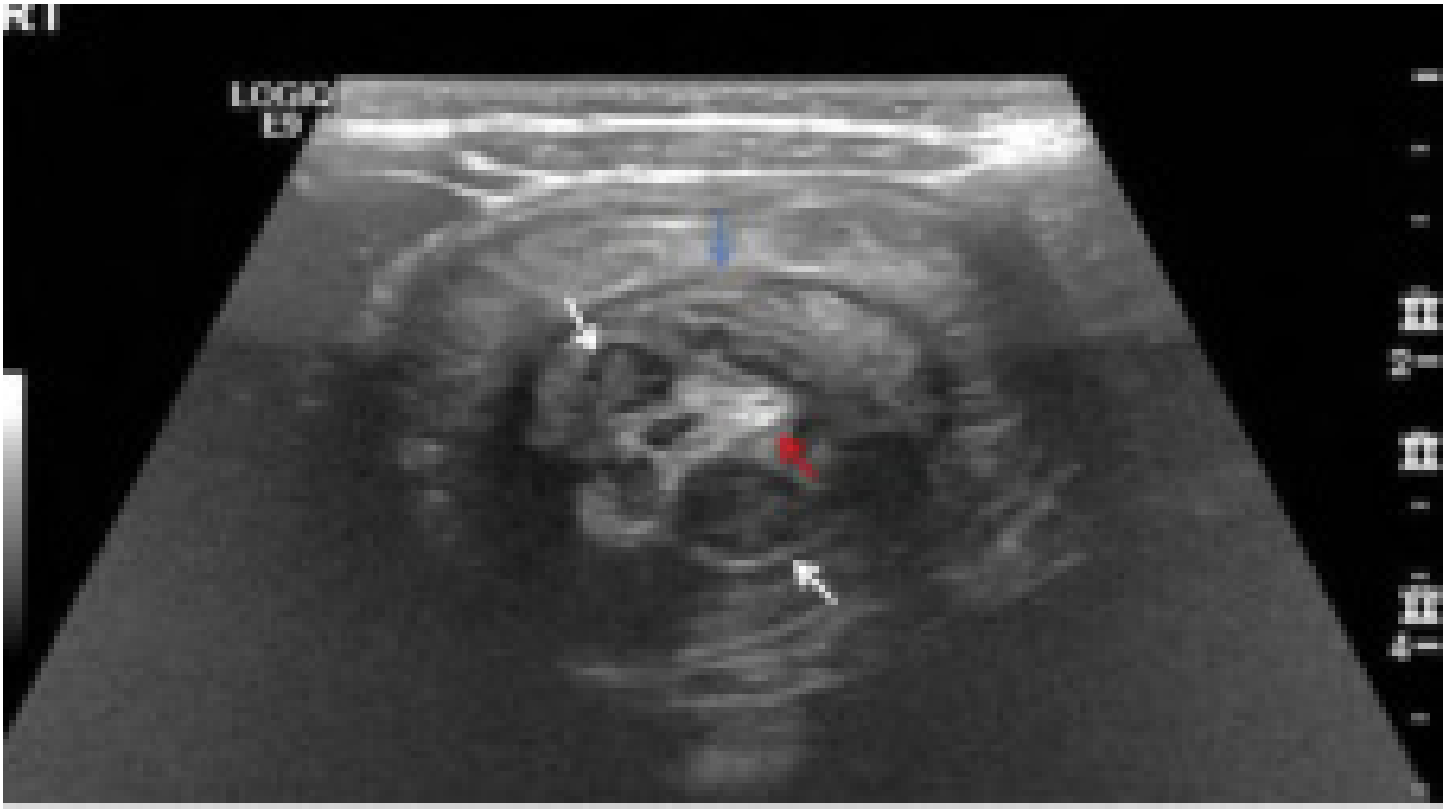
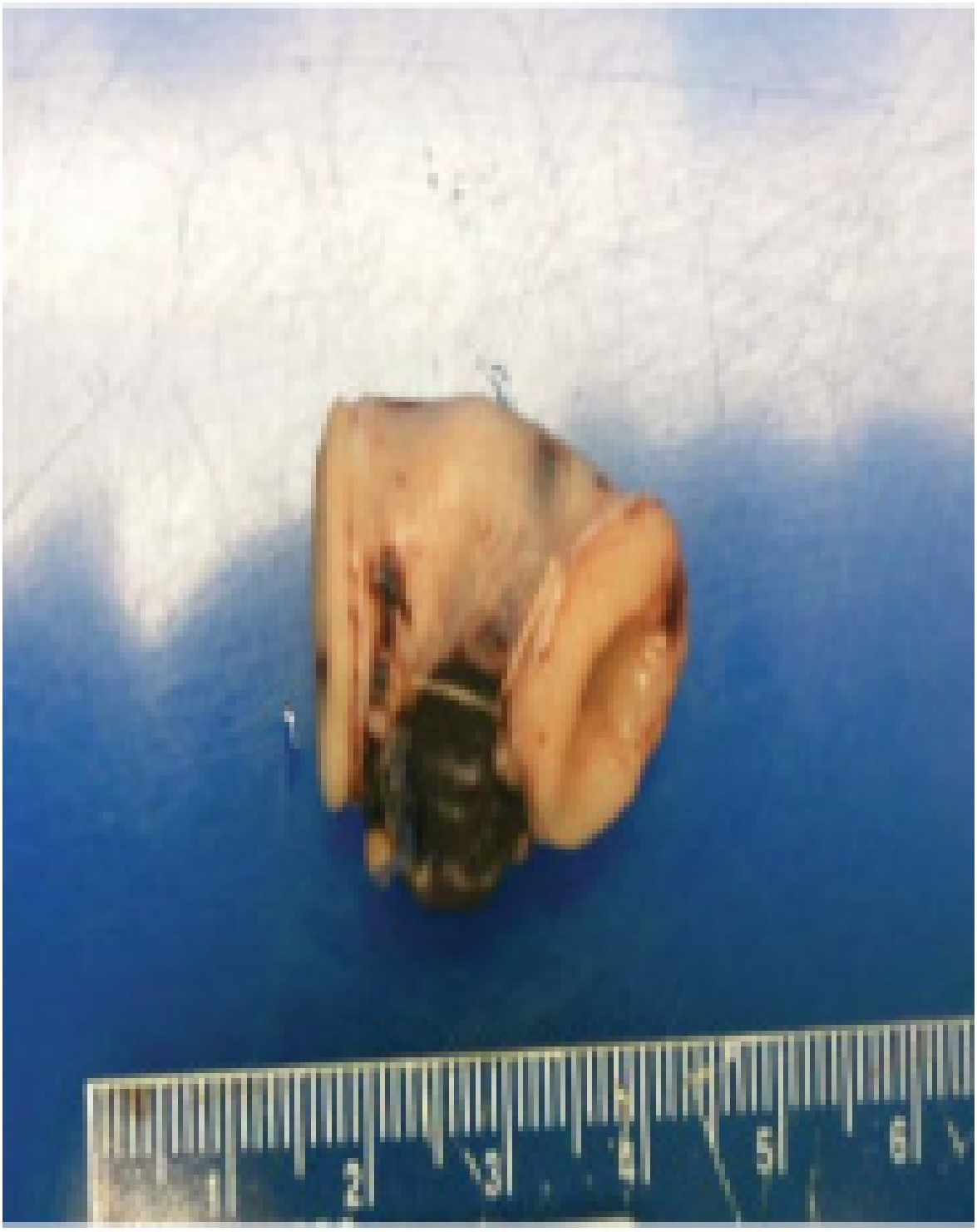
History (including chief complaint, history of present illness and relevant past and family medical history) 2 y.o female with no significant pmhx presented to the ED with a 2 day history of diarrhea, 1 day history of abdominal pain, and 2 episodes of green gelatinous stools mixed with bright red blood. No other systemic symptoms.

ROS:
+: abdominal pain, diarrhea, bloody stool
-: cough, congestion, vomiting, fever, rash, UTI symptoms
PMHx, PSHx, FHx: negative
Meds & allergies: negative
Vaccines: UTD
Developmental: Child on target in developmental assessment, verbal skills assessed to that of a 4 year old.
Social: lives at home with mother and older brother

Physical examination findings (including vital signs) Vital signs WNL
General: child is awake, alert, NAD
HEENT: TM WNL, Pharynx WNL, PERRLA
Cardiac: RRR
Respiratory: CTA b/l
Abdomen: soft, non-tender, non-distended. No palpable organomegaly, +BS in all quadrants
Neuro: AAO x3, FROM
Skin: no lesions
Lymph: no palpable lymphadenopathy
Laboratory or Diagnostic imaging or Procedures US positive for intussusception. Successful reduction with air enema. Patient had 4 recurrences of intussusception, successfully reduced. Pediatric surgery consulted. Child taken to OR for diagnostic laparotomy. The appendix and cecum thick and inflamed. No intussusception at time of surgery. Approximately 10-15 cm from the ileo-cecal valve, a 1cm lesion was encountered in the mesentery, noted to impinge on the bowel described as a hematoma vs. vascular anomaly. Specimen resected and sent to pathology.
The child abuse pediatric team notified due to the presence of a mesenteric hematoma of unknown origin. No hx of trauma was provided. Skeletal survey, CT abdo/pelvis with contrast, and coagulation studies revealed no additional injuries.
Pathological exam of the specimen revealed an unoriented segment of bowel, 2.2 cm long and up to 1.5 cm in diameter. There was a circumscribed, dark red nodule, 0.8 cm diameter, in the scant mesentery included with and adjacent to the bowel. Serosa showed focal small hemorrhages, the wall was without lesions including hemorrhage, the mucosa was tan with few punctate hemorrhages and a small submucosal hemorrhage. Histologic exam revealed a recent hematoma in the mesentery, as well as small submucosal hemorrhage. There was no lesion, vascular malformation, inflammation, or neoplasm.
Final Diagnosis The development of a mesenteric hematoma resulting from repeat intussusception has not been documented. Pathology results make this association the most likely diagnosis. The consideration for nonaccidental abdominal trauma resulting in the mesenteric hematoma was appropriate initially given her clinical findings and the previously known differential diagnosis of mesenteric hematomas.



Sonographic image of the right lower quadrant containing small bowel (blue arrow), mesenteric fat (red arrow), and mesenteric lymph nodes (white arrows).

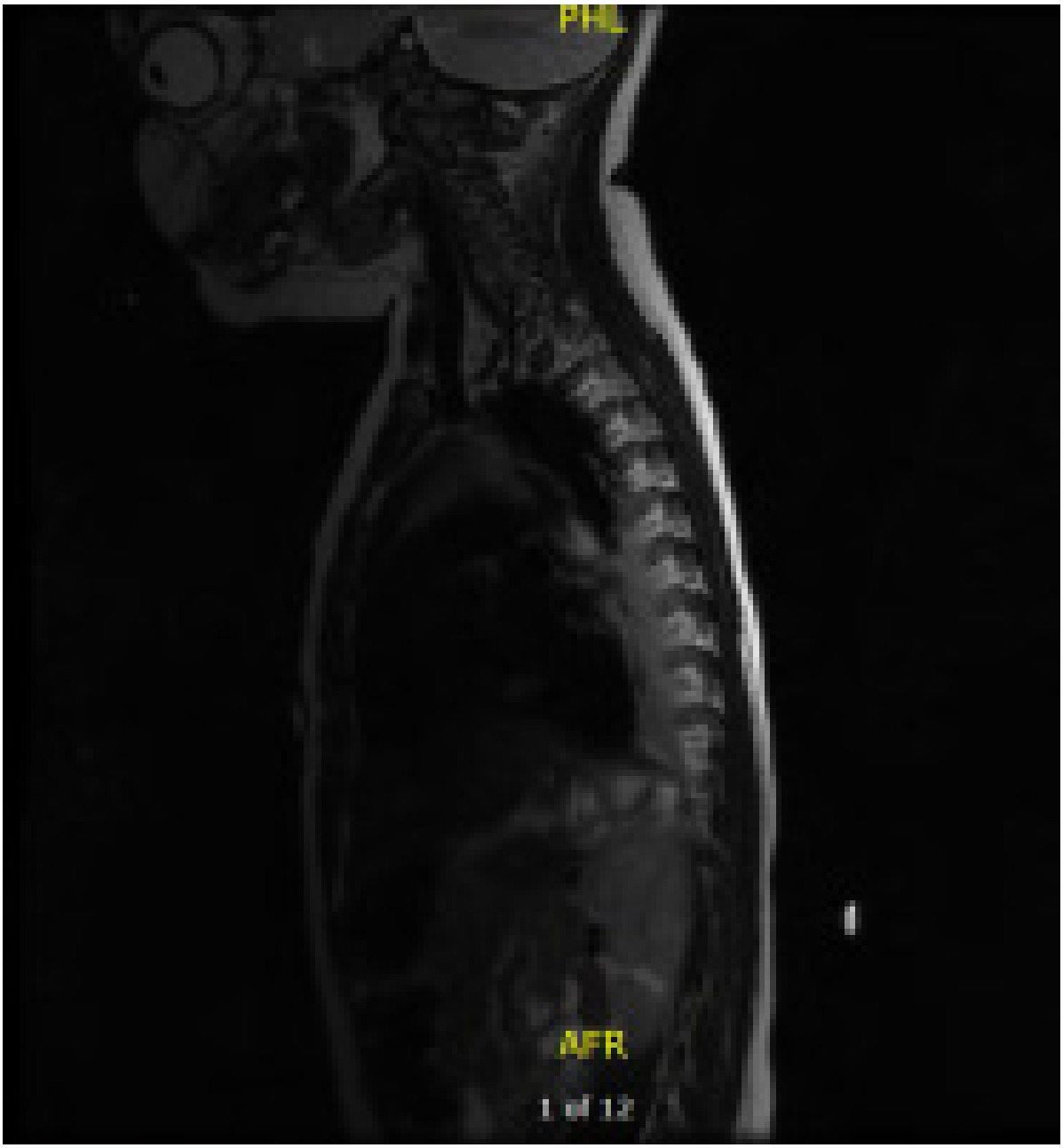


Round hemorrhagic area in the mesentery approximately one centimeter in diameter consistent with a hematoma impinging upon the bowel.

Abstract: 360
Tales from Terrible Toddlerhood: A Concerning Case of Altered Mental Status
Sharmila Jai Kumar, Shalini Shah

Pediatrics, University of Massachusetts Medical School, Shrewsbury, Massachusetts, United States

History (including chief complaint, history of present illness and relevant past and family medical history) CC: Unresponsive
HPI: A 15 month old girl presented to our facility with concerns of altered mental status and unresponsiveness. She was in her usual state of health until day of admission when she awoke at 0200 feeling warm. Her mother checked a temperature (~99) and gave Tylenol, after which she fell asleep until 0640 when she awoke and had one episode of non-bloody, non-bilious emesis. She was observed to be limp and unresponsive. Her eyes were open and staring straight ahead without deviation and she was not responding to her mother's voice or touch. She did not change color, become stiff or show any rhythmic movements of her body.
ROS: Has has intermittent colds, most recently 2-3 weeks prior to presentation, associated with nasal congestion. No recent fever, head trauma, neck stiffness, drooling, skin color changes, rash, bruises, cough, WOB, cyanosis, diarrhea, vomiting, or jerking, abnormal movements. No recent travel or sick contacts. No ingestion. No tick or insect bites.
Past Medical History
BIRTH: Born full-term via NSVD to a G1P1 mother; uncomplicated pregnancy and delivery, no history of neonatal problems
MEDICAL: No known medical conditions, prior hospitalizations or surgeries. No allergies. Fully immunized.
DEVELOPMENT: Spoke at 1 year, walked at 12 months
Physical examination findings (including vital signs) VS: T: 35.6,HR 97,RR 30
GEN: Ill-appearing, lethargic, intubated, sedated, intermittently crying on stimulation
HEENT: PERRL, pupils 4mm bilaterally and reactive, EOMI, symmetric face, oropharynx benign
Heart: RRR, normal S1/S2, no M/R/G
Lungs: Shallow breaths, tachypnea, poor air movement b/l
Abdomen: +BS, soft, non-tender
Neuro: Facial movements limited but appear symmetric. Tone decreased x 4 with depressed reflexes 1/4 in all limbs. Downgoing toes. No clonus. No abnormal movements. Withdraws both feet to stimulation. No withdrawal of UE to stimulation, no spontaneous movement of UE. There is some spontaneous movement of lower extremities with gravity; sternal rub did not illicit any reaction.
Laboratory or Diagnostic imaging or Procedures Labs including CBC, CMP, VBG, NH4, APAP/salicylate levels, UA, urine toxicology screen were normal
Blood, Urine, CSF cultures sent with no growth
CSF Studies including autoimmune (NMO, anti-NMDA receptor antibodies) and infectious panels negative
Initial CXR negative and head CT negative for acute hemorrhagic process or mass
Spot EEG with diffuse nonspecific slowing
Brain MRI without intracranial abnormality
Final Diagnosis Acute Transverse Myelitis



Spine MRI w/wo contrast with increased signal intensity continuous from the lower medulla to T9, and notable edema of spinal cord expanding C2-C7.

Abstract: 361
A 22-month old boy with a 3-day history of fever and cough
William R. Otto
Pediatrics, Division of Infectious Diseases, Children's Hospital of Philadelphia, Philadelphia, Pennsylvania, United States

History (including chief complaint, history of present illness and relevant past and family medical history) A 22-month-old unimmunized boy presented to the emergency department (ED) after he developed a fever to 105°F at home. He was well appearing but fussy. No obvious focus of infection was found on examination. A chest x-ray was unremarkable. A complete blood count showed leukocytosis with neutrophil predominance, but no other abnormalities. Blood and urine cultures were obtained. He improved with anti-pyretics and was ultimately discharged.

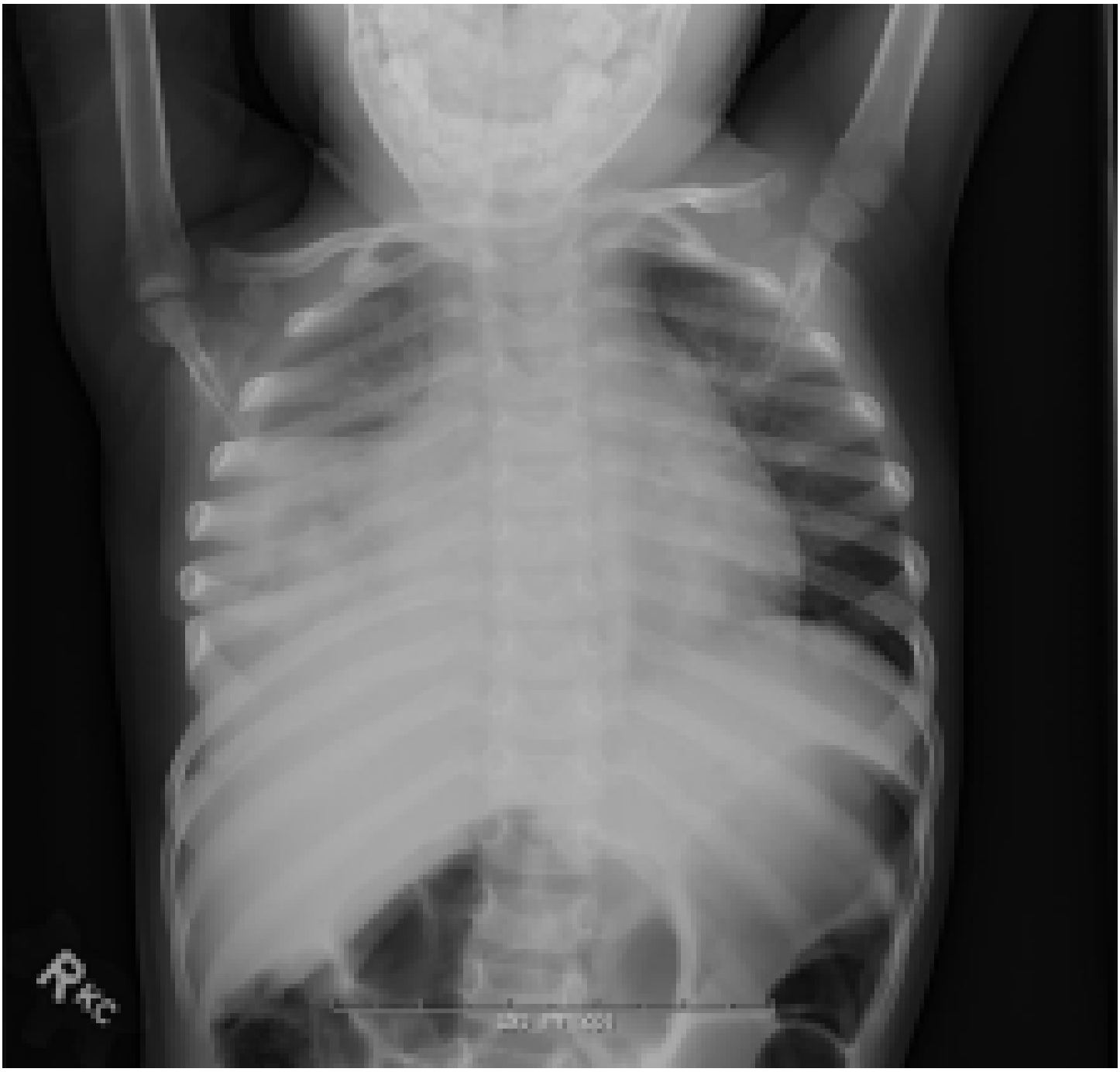
He had a follow-up appointment with his pediatrician 2 days later. At that visit, his mother reported he had improved after the ED visit, but became increasingly fussy with more trouble breathing. His pediatrician referred him to the ED due to his respiratory distress. There, he was febrile and tachycardic. A chest x-ray showed a right lower lobe opacification with a pleural effusion. Lab testing was performed, ceftriaxone and clindamycin were started, and he was admitted.

His past medical history was unremarkable. He had no surgical history. The family history was unremarkable and revealed no history of immunodeficiency. The patient lived with his parents and attended day care.

After admission, he remained febrile and developed worsening respiratory distress, ultimately requiring intubation. Chest imaging showed a worsening pleural effusion, and he underwent thoracentesis. Lab testing was performed, and the diagnosis was made.
Physical examination findings (including vital signs) Temp. 37C, HR 148, BP 102/63 mmHg, RR 40, SpO2 95%
General: young boy in bed, tired and ill-appearing
ENT: tympanic membranes clear, mild congestion, nasal flaring, dry mucus membranes
Cardiac: regular rate and rhythm with normal heart tones, no murmur, capillary refill 3 seconds
Chest: decreased breath sounds at the right base, no crackles; moderate retractions
Abdomen: slightly distended, but soft and non-tender; no organomegaly
Extremities: no swelling or tenderness
Neuro: alert, responsive to exam, moved all limbs
Skin: no rash or skin lesions
Laboratory or Diagnostic imaging or Procedures Admission labs:
- WBC count of 16,200 (6.2% bands), hemoglobin of 11.3 mg/dL, platelet count of 388,000
- BMP unremarkable, including BUN of 9 mg/dL and creatinine of 0.2 mg/dL

Labs on Day #3:
- WBC count of 19,700, hemoglobin of 2.6 mg/dL, platelet count of 5,000
- BMP significant for BUN of 114 mg/dL and creatinine of 3.5 mg/dL
- LDH 14,861 U/L
- Direct Coombs test positive
Final Diagnosis Culture of the pleural fluid grew colonies of *Streptococcus pneumoniae* (serotype 19A).

The final diagnosis was *Streptococcus pneumoniae*–associated hemolytic uremic syndrome.



Abstract: 362
Heroin ingestion in a 22 month old child: A Case Report
Shilpa Hari, Sara Ali, Dana Kaplan
Pediatrics, Staten Island University Hospital, Staten Island, New York, United States

History (including chief complaint, history of present illness and relevant past and family medical history) A 22 month old female was found unresponsive by her mother who then called EMS and initially provided a history that the patient choked on a french fry, vomited and subsequently became "sleepy". When EMS arrived, she was pale, unresponsive, with irregular and slow respirations that required oxygen via bag mask. Upon arrival to the ED, the patient's initial vitals were; respirations of 8, heart rate of 140 and blood pressure of 120/76. The mother denied the presence of drugs at home, however she then stated she is in a MMT program. She disclosed that she takes the methadone in a beverage bottle that was placed on the kitchen counter

and said she did not witness an ingestion by the patient. After this information was obtained, the ED staff administered Narcan which the patient responded well to, but immediately after, she had multiple episodes of vomiting and developed respiratory distress during the peri-intubation period.
Physical examination findings (including vital signs) The patient was sedated and intubated with oxygen saturations in the 80's and then transferred to the PICU. Her physical exam was significant for reactive pupils, limited neurologic exam with response to pain, and spontaneous movement of all limbs. She had spontaneous respirations and coarse breath sounds bilaterally.
Laboratory or Diagnostic imaging or Procedures Arterial blood gas showed a pH of 7.15, CO2 of 72 and O2 of 50. Acetaminophen, salicyclate, alcohol and phenobarbital levels were negative. Urine culture and blood culture were negative. Chest x-ray showed increasing right upper lobe and retrocardiac opacity confirming aspiration pneumonia. Non-contrast CT head showed concern for diminished grey –white differentiation. MRI brain was subsequently performed which yielded a normal result.
Urine toxicology showed positive results for opiates and negative results for methadone. Subsequent confirmatory testing showed high levels of morphine 13300ng/ml and codeine 625ng/ml. A test for 6-acetylymorphine (6-AM), the direct metabolite for heroin, showed a level of 335ng/ml with the cutoff being at 10ng/ml.
Final Diagnosis The final diagnosis was ingestion of heroin.Child Protective Services (CPS) was notified and NYPD, when searching the home, found heroin as well as drug paraphernalia which further solidified the diagnosis.

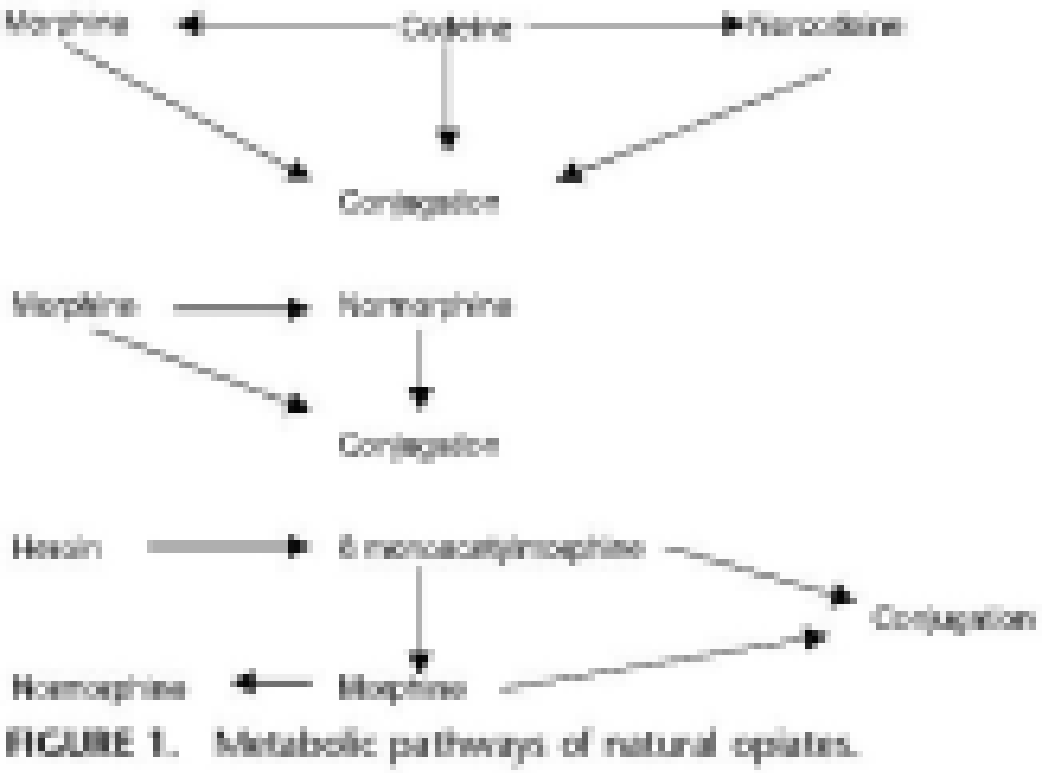


FIGURE 1. Metabolic pathways of natural opiates.

Metabolic pathways of natural opiates

Abstract: 363
A Case of Neonatal End Stage Renal Disease: A Novel WT1 Gene Mutation
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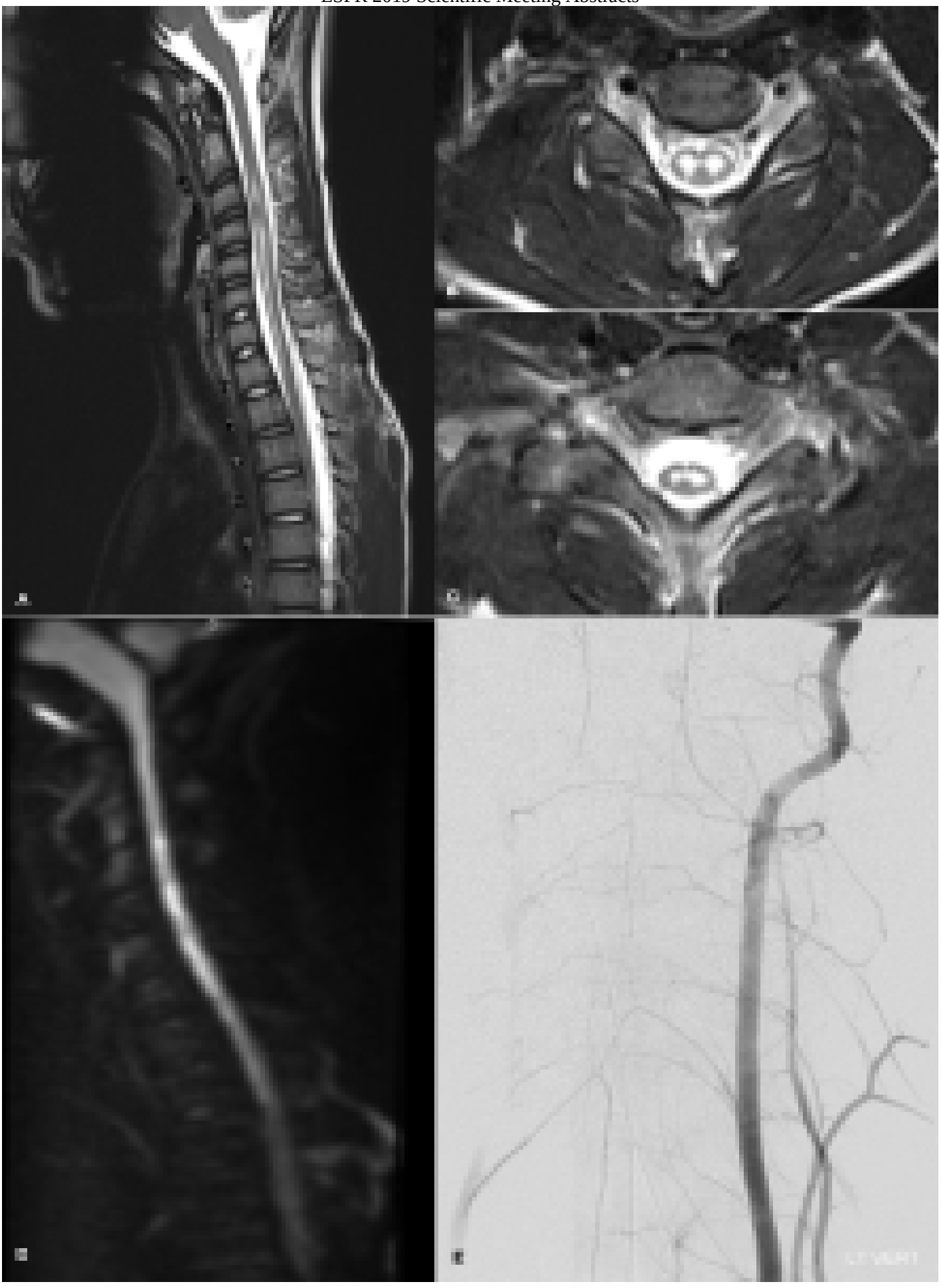
Pediatrics , Columbia- New York Presbyterian , Long Island City, New York, United States

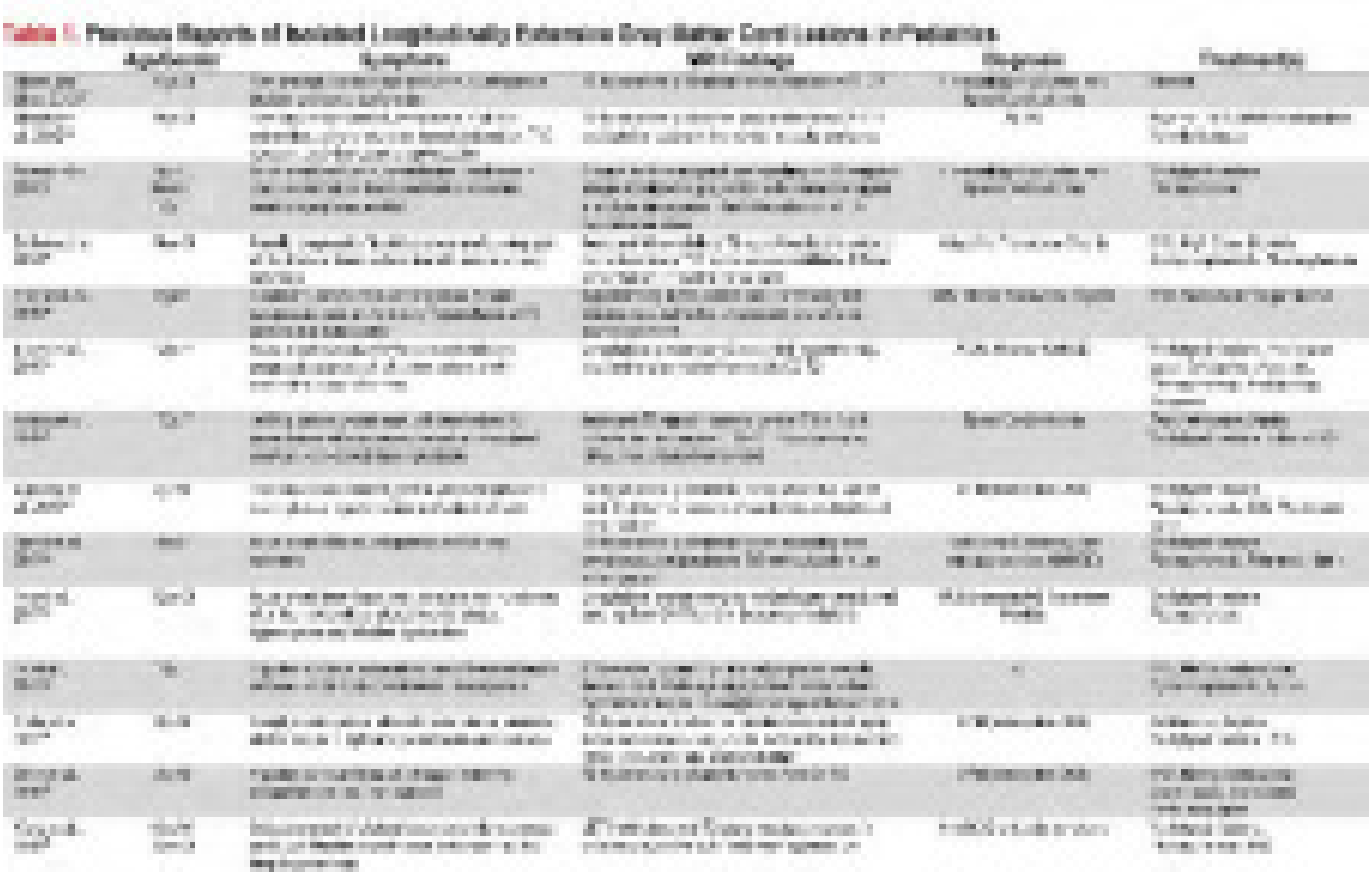
Background End stage renal disease (ESRD) requiring dialysis in the neonatal period is rare with a reported incidence of 0.32 cases per 100,000 live births. Of these neonates, <2% of patients have congenital nephrotic syndrome (NS). Several mutations of the WT1 gene have been described in the literature and have associations with known syndromes; however, a condition caused by the deletion in the proximal end of intron 8/9 of the WT1 gene has never been described.
Objective

Design/Methods N/A
Results Case Description: We present a case of a female infant born at 35 4/7 weeks gestation to a 25-year-old primagravida. Two days prior to delivery, new onset oligohydramnios and concern for fetal polycystic kidney disease was seen on ultrasound. After birth, the infant was intubated for poor respiratory effort without pulmonary hypoplasia on x-ray. Renal ultrasound showed echogenic kidneys, but normal-sized, without cysts, and normal renal dopplers. Urinalysis revealed >1,000 mg protein, and urine protein to creatinine ratio was 75 mg/mg. Echocardiogram showed biventricular hypertrophy and severe pulmonary hypertension (HTN). The infant was hypertensive at birth, and within a week of life was on maximum amlodipine dose as well as esmolol therapy. Meanwhile, despite diuretic administration, she became anuric by the second week of life. Her serum creatinine peaked at 8 mg/dL. A peritoneal dialysis (PD) catheter was placed on day of life (DOL) 12, and PD was indicated one week later. Her course was complicated by wound dehiscence and peritonitis. Additionally, she developed persistent chylous ascites after starting feeds on DOL 27. At one month of age, whole exome sequencing revealed a likely pathological variant found in the WT1 gene. The mutation is a de novo, autosomal dominant mutation due to a deletion in the intron 8/9 (c. 1354+4delT).
Conclusion(s) The infant was diagnosed with ESRD and congenital NS type 4 in the setting of a WT1 mutation; however, this particular mutation has never been described in the literature. Congenital NS typically progresses to ESRD in early childhood; thus, it is curious that our patient developed ESRD so early in life. The patient's biventricular hypertrophy, pulmonary HTN, oligohydramnios, and systemic HTN at birth are suggestive of in utero development of renal failure. Cardiac manifestations as a primary manifestation of this mutation rather than as a consequence of renal failure cannot be excluded. Similarly, the cause of her chylous ascites in association with this mutation remains unknown.

Abstract: 364
A Longitudinally Extensive Spinal Cord Lesion Restricted to Gray Matter in an Adolescent Male
Danielle Golub[1], Faith Williams[2], Taylor Wong[1], Nishanth Iyengar[1], Hannah Jolley[1], Sakinah Sabadiah[1], David Rhee[1], Gabrielle Gold von-Simson[1]
[1]NYU School of Medicine, New York, New York, United States, [2]Washington University School of Medicine, Saint Louis, Missouri, United States

Background Longitudinally extensive spinal cord lesions (LECL) restricted to gray matter in children are poorly understood. Timely diagnosis and intervention are essential to minimizing neurological sequelae.
Objective We present the case of a 13-year-old male with LECL restricted to the anterior horns.
Design/Methods A 13-year-old male without significant history or recent trauma presented with subacute quadriparesis following a coughing episode. Neurological exam revealed diffuse hypotonia, persistent quadriparesis, urinary retention, and diminished sensation at the C4-L2 levels. MRI showed a non-enhancing, T2-hyperintense central cord lesion strictly involving the gray matter from C2-T2 (Fig 1A-C) with diffusion restriction (Fig 1D). He was initially thought to have a spinal cord infarct, but angiogram showed no vascular pathology (Fig 1E). Workup was negative for infection, making an acute inflammatory myelitis the most likely etiology. After five days of high-dose steroids and plasmapheresis he made significant gains in strength, sensation, and balance.
Results Management of gray matter LECL in pediatrics is a complex but critical task. Previous reports are summarized in Table 1. Gray matter-restricted LECL closely resembles spinal infarct, taking on the "owl's eye" appearance on axial T2 MRI. Studies comparing imaging in early neuromyelitis optica spectrum disorders (NMOSD) and spinal infarct find that the "owl's eye" sign routinely complicates diagnosis. However, NMOSD lesions typically enhance, are centrally located, are not known to restrict to the anterior horns. Other potential diagnoses included multiple sclerosis and systemic lupus erythematosus, but our patient did not meet criteria for either. Management was directed by existing evidence for acute flaccid myelitis (AFM) and acute disseminated encephalomyelitis (ADEM). Much like our patient, AFM presents with flaccid limb weakness following a viral prodrome and MRI findings of gray matter LECL with a predilection for the cervical spine. However, a causative viral agent in our patient was not identified. Although rare, cases of ADEM presenting as gray matter-restricted spinal cord lesions have been reported. Furthermore, our patient significantly improved after methylprednisolone and plasmapheresis combination therapy for which synergistic effects in ADEM are described.
Conclusion(s) This case highlights quality clinical reasoning with respect to the elusive nature of diagnosis, nuances in neuroimaging, and multifocal treatment strategies in pediatric LECL.





Abstract: 365

Massive fecal impaction masquerading as septic hip

Carolina Saldarriaga[1], Stephen Kim[3], Ian Mills[3], Suchitra Hourigan[2]

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Background Fecal impaction (FI) is rare and life threatening in pediatric patients. The diagnosis can be challenging and it is occasionally misdiagnosed as an orthopedic or urologic condition. Given a high mortality rate of 28%, it is crucial to promptly identify FI in non-verbal patients. There is scant data regarding clinical presentation, potential complications and outcomes in pediatric patients. We describe a patient with FI that was initially misdiagnosed as septic joint.

Objective

Design/Methods We present a case of a 15 year old male with autism spectrum disorder that presented to the Emergency Department with limping and fever. Physical exam showed a marked abdominal distention and diffuse tenderness to palpation. There was also tenderness to palpation and to passive range of motion of his right hip. Labs showed elevated inflammatory markers (CRP 24mg/L, ESR 51mm/hr). He was transferred with a presumptive diagnosis of septic hip.

Results Abdominal CT scan (figure 1 and 2) was performed to rule out appendicitis. Imaging yielded bilateral hydronephrosis and hydroureters and a massively dilated rectum and sigmoid colon with impacted fecal matter measuring 28cm x 16cm. Additionally, he was found to have right sided pyelonephritis secondary to urinary obstruction. He was taken to the OR for surgical disimpaction. Following surgery his limping resolved. He was treated for pyelonephritis with ceftriaxone and defervesced within 48h.

Conclusion(s) Orthopedic complaints are one of the rare presentations of fecal impaction and should be considered in non verbal children. Failure to identify fecal impaction can lead to unnecessary imaging, sedation, additional procedures and delay in diagnosis thus increasing the risk of fatal outcomes.

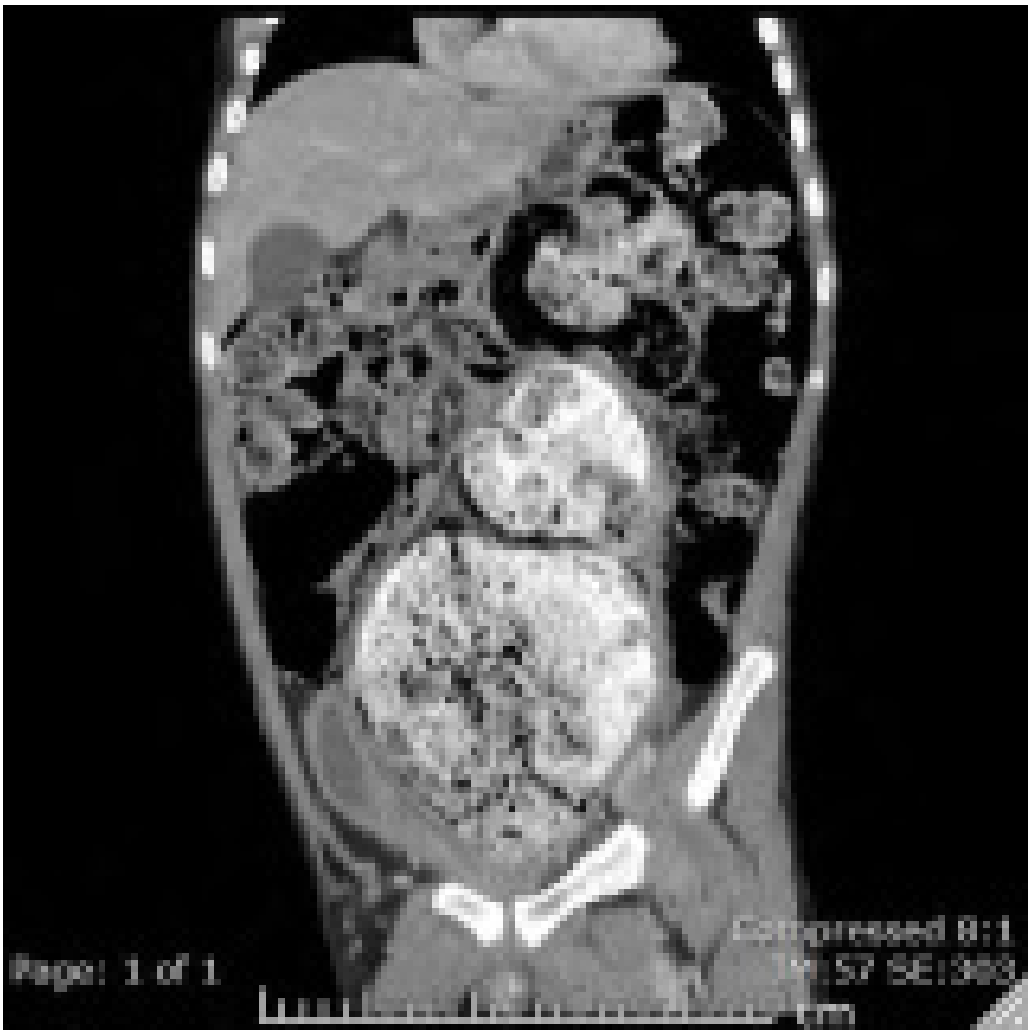


Figure 1. Contrast enhanced CT scan of the abdomen showing dilation of rectum and sigmoid colon due to fecal impaction.The bladder appears compressed and displaced to the right.

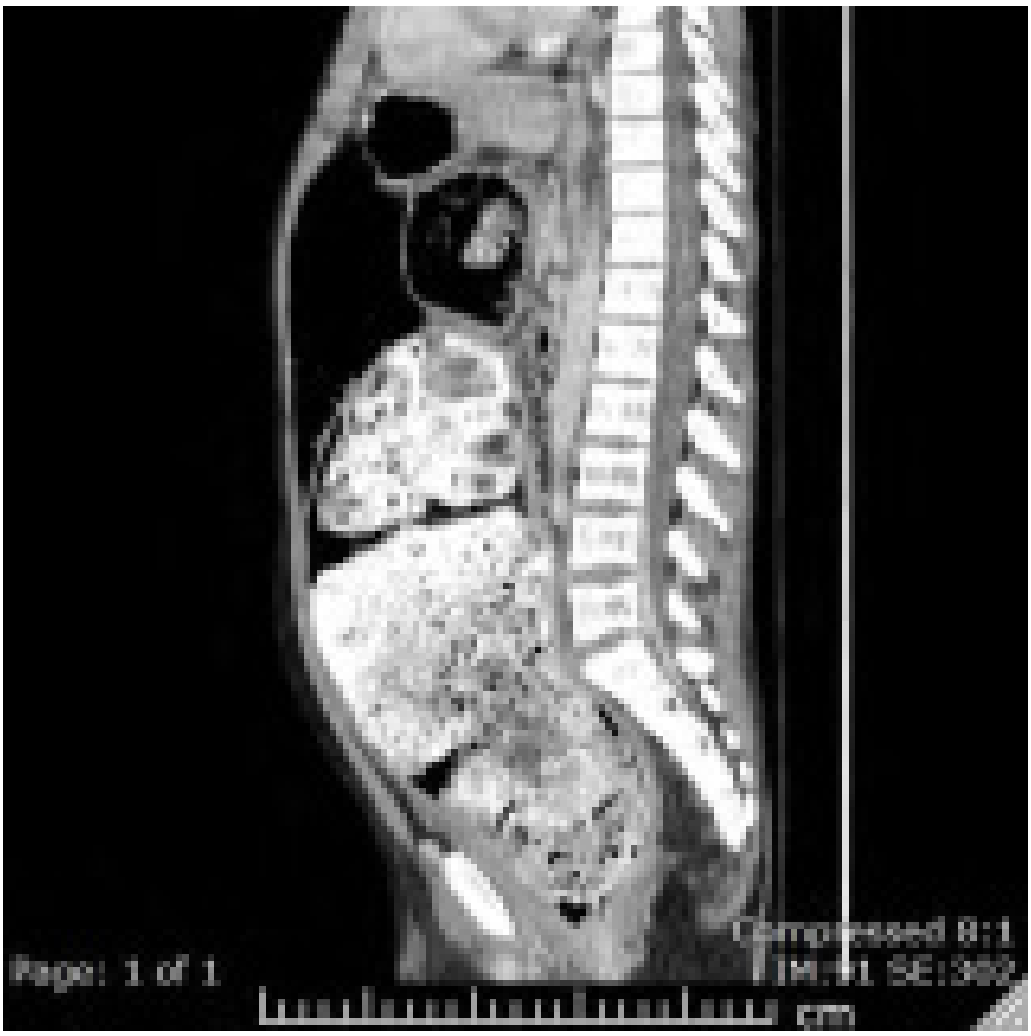


Figure 2. Distended rectum and sigmoid colon due to massive fecal impaction measuring 16 cm x 28 cm with thickening of the colonic wall.

Abstract: 366

Vecuronium-induced Pseudohypernatremia: A Case Report

Eloise Salmon[1], Sarah Welsh[2], Derick Lim[3], Tracey Polsky[3], Jennifer Hewlett[4], Donald Boyer[5], Ulf Beier[1]

[1]Nephrology, Children's Hospital of Philadelphia, Philadelphia , Pennsylvania, United States, [2]Critical Care Medicine, Hasbro Children's Hospital, Providence, Rhode Island, United States, [3]Pathology and Laboratory Medicine, Children's Hospital of Philadelphia, Philadelphia, Pennsylvania, United States, [4]Pharmacy Services, Children's Hospital of Phialdelphia, Philadelphia, Pennsylvania, United States, [5]Critical Care Medicine, Children's Hospital of Philadelphia, Philadelphia, Pennsylvania, United States

Background An infant with autosomal recessive polycystic kidney disease (ARPKD) received continuous renal replacement therapy (CRRT) from DOL 119 to DOL 190, prior to transitioning to peritoneal dialysis (PD). While on CRRT, laboratory studies became notable for rising sodium levels starting DOL 170, with values as high as the 160s on routine basic metabolic panel (BMP). Enteral feeding regimen had remained stable on fortified formula, the infant received no sodium chloride supplementation prior to initiation of PD, and all CRRT bags had standard sodium concentration of 140 mEq/L. Medications included sildenafil, treprostinil, vecuronium, ketamine, and norepinephrine. Interestingly, there was significant discrepancy between the sodium levels on blood gases (RAPIDLab 1265, Siemens, Tarrytown, NY) and BMP (Vitros 5600 integrated system, Ortho Clinical Diagnostics, Raritan, NJ), with the sodium level on blood gases (BG) remaining more stably in the 130s. The critical care team had seen this phenomenon previously in the setting of vecuronium and esmolol infusions.

Objective

Design/Methods Clinical data gathered to support an association between vecuronium and pseudohypernatremia (see results below). Vecuronium bromide also added in increasing concentrations to plasma samples availabe in the chemistry lab in an effort to generate a dose-response curve as additional evidence.

Results Graphical trends relating sodium readings to vecuronium infusion rate supported an association (Figure 1). A comparison of simultaneous BMP serum pre- vs. post CRRT filter (Figure 2) showed that post-filter (and vecuronium removal), the sodium measurements returned to normal. We made similar observations in another unrelated patient (Figure 3). Furthermore, our lab could reproduce the same pseudohypernatremia by mixing vecuroium bromide solution with plasma samples (Figure 4).

Conclusion(s) In our clinical lab, sodium levels on BMP and BG are measured using different ion-selective electrodes. In the setting of vecuronium infusion, sodium measurement on BMP became elevated in a dose-dependent fashion, suggesting vecuronium can interfere with the electrode used for BMP.

Our findings point to an important laboratory artifact; clinicians should be aware of this artifact when interpreting serum sodium measurements in intensive care units.

Fig. 1: Vecuronium infusion and Sodium measurements

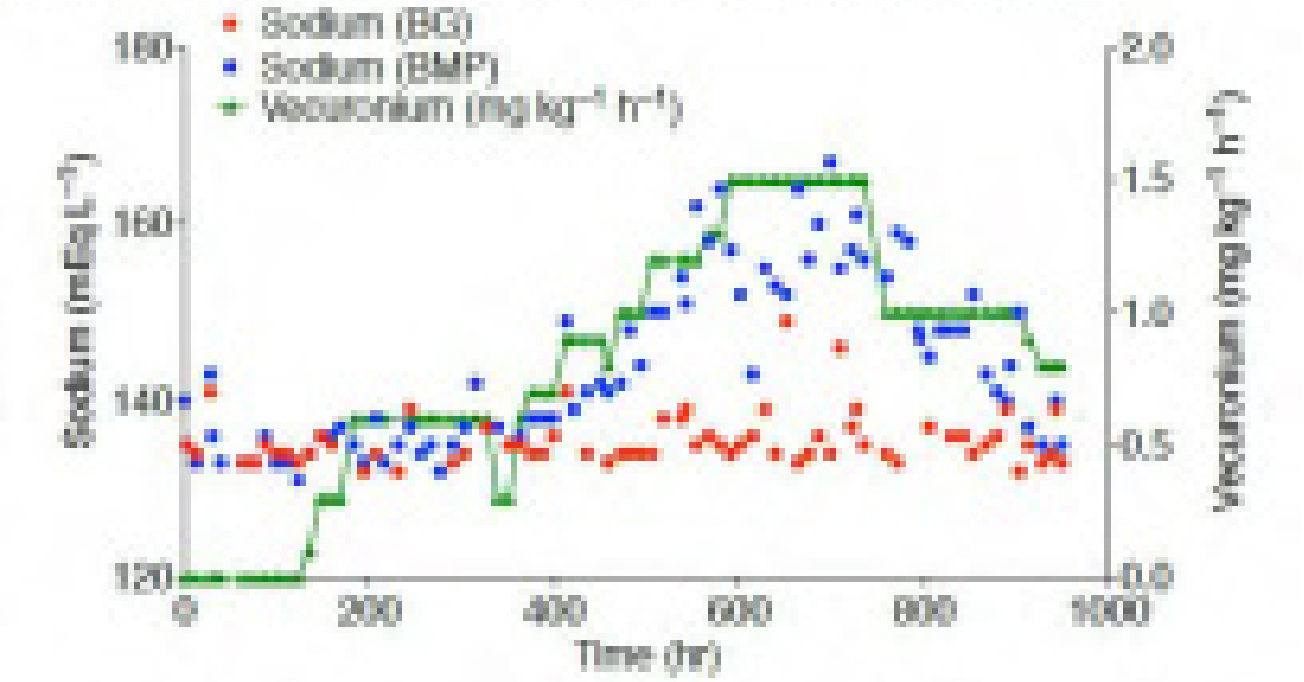
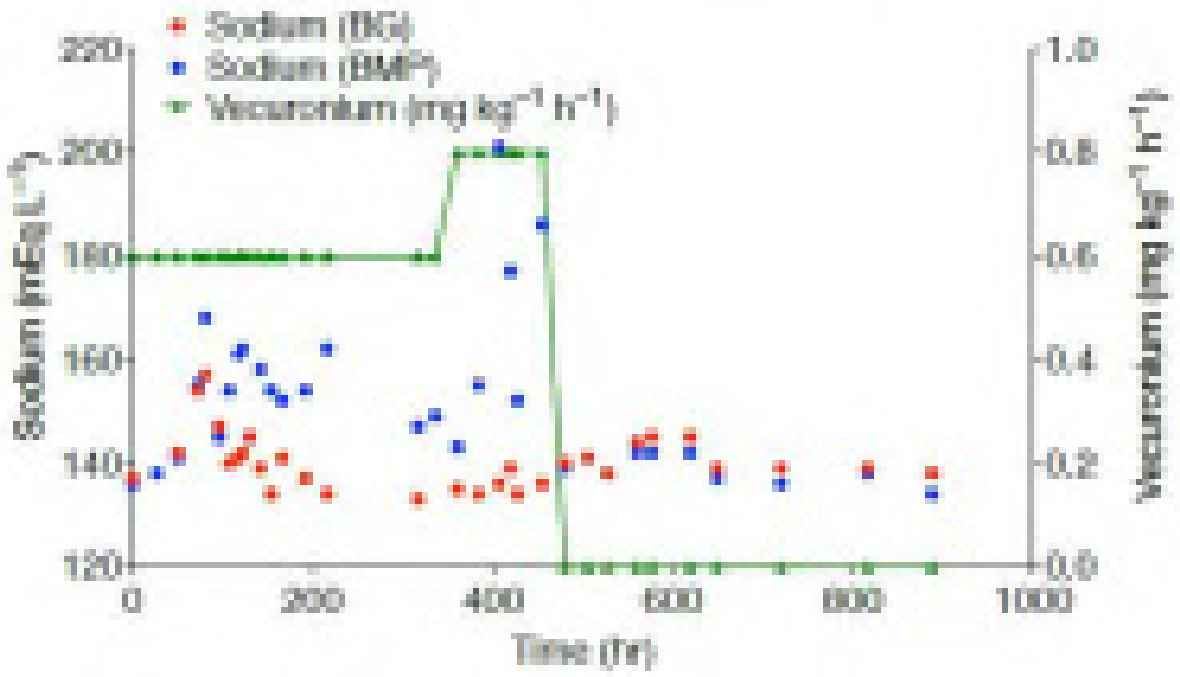
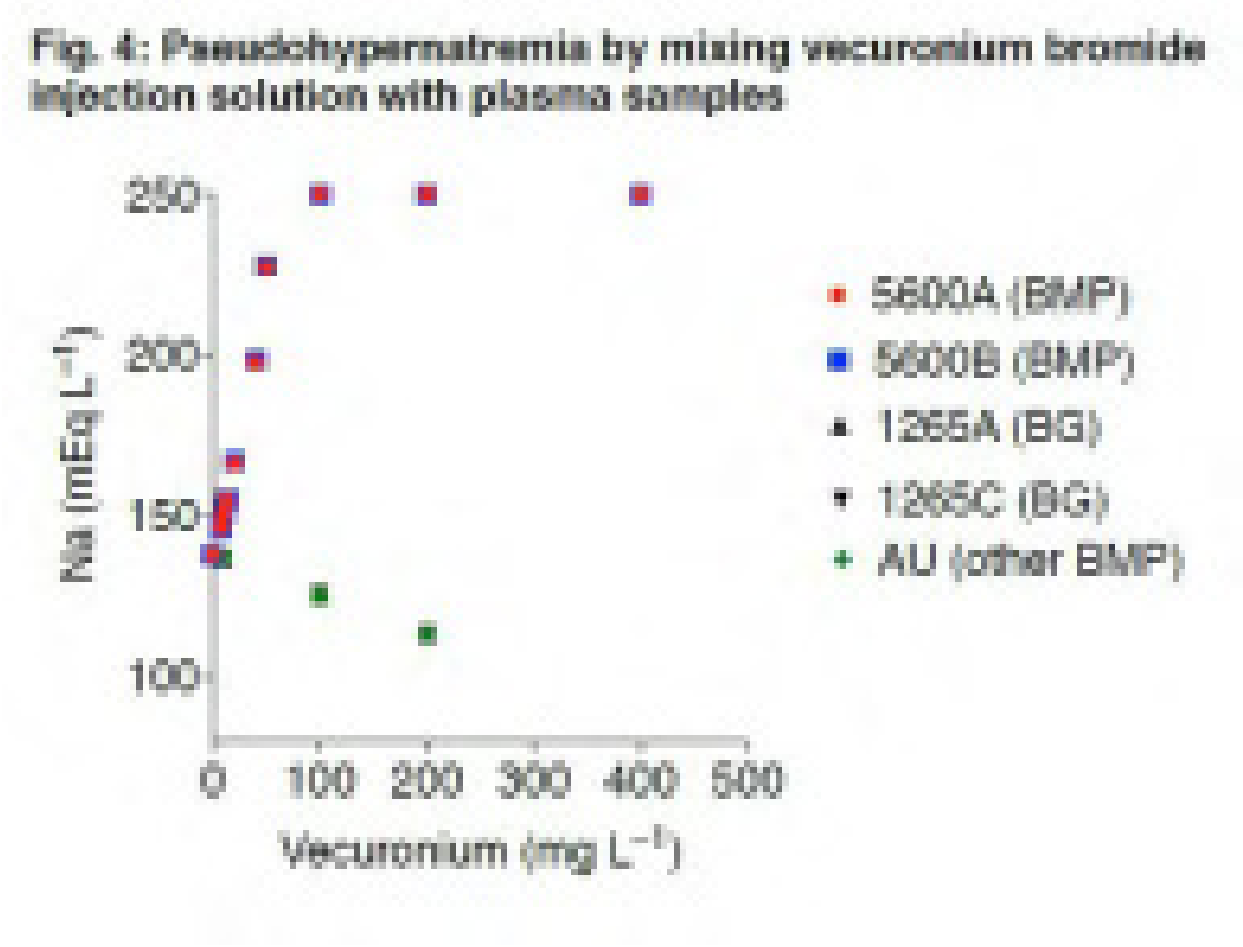


Fig. 2: Circuit sodium without pseudohypematremia

Source	Sodium (mEq L⁻¹)
BMP serum (patient)	135
BMP serum (post-filter)	139

Fig. 3: Second patient with similar vecuronium induced pseudohypernatremia





The Great Debate: Pro - Have Electronic Cigarettes had a Net Health Benefit?
Brian Jenssen
Children's Hospital of Philadelphia, Philadelphia, Pennsylvania, United States

The Great Debate: Con - Have Electroni Cigarettes had a Net Health Benefit?
Sharon McGrath-Morrow
Johns Hopkins, Baltimore, Maryland, United States

Abstract: 367
MicroRNA-34a as a novel regulator of cardiac fibrosis induced by chronic hypoxia
Yisrael T. Lipener[1], Kameshwar Ayyasola[2], Ping Wang[2], Nahla Zaghloul[1], Mohamed Ahmed[1]
[1]Neonatology, Cohen Children's Medical Cneter, New Hyde Park, New York, United States, [2]Feinstein Institute for Medical Research, Manhasset, New York, United States

Background In previous studies we showed that a chronic hypoxic environment can induce cardiac fibrosis in a murine animal model. Overexpression of microRNA-34a has been linked to collagen deposition and cardiac fibrosis. It was shown that an increase in microRNA 34a inhibits the translation of C-Ski, an important nuclear protein involved in inhibiting collagen-I production, via an established TGF-β pathway. In this study we propose that microRNA-34a has a significant role in the pathogenesis of cardiac fibrosis induced by chronic hypoxia and could be a therapeutic target.
Objective To study the interrelation between micoRNA-34a expression and the pathogenesis of cardiac fibrosis induced by chronic hypoxia.
Design/Methods Adult male mice aged 8 to 10 weeks were housed in 10% FiO_2 in a hypoxia chamber for 21 days. Cardiac tissue was collected, microRNA-34a expression was measured by PCR and compared to a room air control matched group. Mouse cardiac fibroblasts cultures were either incubated in hypoxic conditions of 1% FiO_2 or treated with TGF-β (10 ng/dl) and compared with normoxic cells. Cell lysates were studied at 48h and 72h for known fibrotic markers (SNAIL, α-SMA and

Collagen-1), C-SKI and microRNA-34a fold expression. Finally, cardiac fibroblast cultures were treated with antisense microRNA-34a inhibitor, incubated in a hypoxia chamber, and markers expression were analyzed.
Results In in-vivo studies, microRNA-34a expression was significantly increased up to 7-fold in the hypoxic cardiac tissue group compared to normoxic mice. In in-vitro studies, microRNA-34a expression was > 2-fold higher in hypoxic cardiac fibroblast cell cultures compared to normoxic controls. Both the hypoxic treated cell line and TGF-β treated cells showed a significant reduction in C-Ski protein concentration and an increase in all fibrotic markers when compared with normoxic controls (P<0.05). In hypoxic treated tissue cultures treated with the microRNA-34a inhibitor, there was a significant increase in C-Ski concentration in comparison to the hypoxic non-treated cell line (P<0.05). Inhibiting microRNA also resulted in a significant reduction of the fibrotic markers when compared to the non-treated hypoxic cell line (P<0.05).
Conclusion(s) MicroRNA-34a was found to be a major contributor to cardiac fibrosis induced by chronic hypoxia. Inhibiting this molecule may pose a promising therapy to attenuate cardiac fibrosis triggered by chronic hypoxic conditions.

Abstract: 368
Cyclophilin D inhibition rescues hypoxia-induced neonatal cardiomyopathy
Gisela Beutner, Jon-Ryan Burris, Ethan D. Cohen, Min Yee, Michael A. O'Reilly, George A. Porter
Pediatrics, University of Rochester Medical Center, Rochester, New York, United States

Background Inhibition or deletion of cyclophilin D (CyPD) in neonatal myocytes closes the mitochondrial permeability transition pore, decreases mitochondrial reactive oxygen species production, increases myocyte differentiation and cardiac function in the first week of life.
Objective Test the hypothesis that the neonatal cardiomyopathy induced by exposing mice to hypoxia is due to disruption in a CyPD-mitochondrial-ROS-myocyte differentiation axis and can be rescued by inhibition of CyPD.
Design/Methods Wild type mice were exposed to hypoxia (12% oxygen) or room air (RA) from embryonic day 19 to postnatal day (P) 7 with or without daily intraperitoneal injections of vehicle or 10 mg/kg cyclosporin A (CsA) or NIM811, two inhibitors of CyPD. Mice were examined for cardiac function by echocardiography. Hearts were harvested to isolate mitochondria to measure oxygen consumption, electron transport chain enzyme and CyPD enzyme activity, and myocyte differentiation.
Results Neonatal hypoxia caused significantly decreased cardiac ejection fraction (RA: 83.6 +/- 4.8 (s.d.), N=31; hypoxia: 74.4 +/- 7.8, N=31; P<0.0001). Treatment with CsA and NIM811 significantly increased ejection fraction (cyclosporin: 81.4 +/- 8.9, N=14; NIM811: 80.7 +/- 5.7, N=16; P<0.05 to vehicle: 76.0 +/- 5.2, N=16) to levels not significantly different from RA mice. Hypoxia also significantly decreased body weight (P<0.0001), but not heart weight, leading to increased heart weight/body weight ratio (P<0.0001). In contrast, CsA and NIM811 did not increase body weight but prevented increased heart weight compared to hypoxic controls. Initial experiment measuring oxygen consumption with malate/glutamate substrates showed that hypoxia may increase V_0 and decrease the respiratory index (RCI) ratio while treating hypoxic pups with CsA or NIM811 decreased V_0 and increased RCI to levels seen in room air treated mice (N=1-2).
Conclusion(s) Hypoxic exposure at birth causes cardiac hypertrophy, decreases cardiac function, and uncouples cardiac mitochondria, while inhibition of CyPD rescues these effects.

Abstract: 369
Use of Segmental Displacement in the Assessment of Volume and Pressure Overload by Cardiac Magnetic Resonance Imaging in Patients with Repaired Tetralogy of Fallot
Sarah Kollar[1], Olga H. Toro-Salazar[2], Alexandra T. Channing[2], Berthold Klas[3], Maua H. Mosha[4], Steven Walling[5]
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Background Patients following tetralogy of Fallot (TOF) repair often experience right ventricular (RV) volume load due to pulmonary regurgitation and/or residual pulmonary valve (PV) stenosis causing RV pressure overload. This study evaluated left ventricular (LV) global and septal segmental displacement in response to RV volume and/or pressure load and its effect on LV and RV function.
Objective
Design/Methods 103 subjects with post-operative TOF were studied by cardiac magnetic resonance (CMR) imaging and transthoracic echocardiography (TTE) from 2011 to 2016. RV and LV myocardial deformation were quantified using CMR Tissue Tracking (TT) software (2D CPA MR, TomTec, Germany). CMR-TT was used to trace the endocardial border in the long axis, short axis, and RV longitudinal plane. RV and LV global and septal segmental displacement were calculated using

dedicated software, Figure 1. Correlations of LV and RV global and segmental displacement were performed with RV/LV volumetric parameters including: end diastolic volume index (EDVi), end systolic volume index (ESVi), ejection fraction (EF), and mass/volume obtained by CMR, as well as PV peak and mean gradients obtained by TTE.

Results The median LV EF was 56.8 (IQR 53.2-61.7) and RV EF 50.8 (IQR 47.4-56.2). In Figure 2, increase in RV EDVi and degree of pulmonary regurgitation positively correlated with increased negative LV septal displacement (r = -0.25, P = 0.010 and r = -0.28, P = 0.004). Complete reversal of LV septal segmental displacement was associated with RV EDVi of 125.4 ml/m2 (AUC = 0.71, P = 0.0067, Sensitivity 81.8%, and Specificity 52.5%). Pressure overload, indicated by PV gradient did not lead to more negative LV global and septal segmental displacement (r = 0.20, P = 0.044 and r = 0.20, P = 0.038). Increased RV mass/volume correlated with increased PV peak (r = 0.35, P = 0.0004) and mean (r = 0.34, P = 0.006) gradients. Septal segmental shift toward the RV correlated with increased RV EF (r = 0.37, P = 0.0001) and increased global and septal RV longitudinal strain magnitude. Positive RV global and septal segmental displacement was concurrent with shift of LV global and septal displacement into the negative direction (r = -0.60, P = < 0.0001 and r = -0.66, P = < 0.0001).

Conclusion(s) RV end diastolic volume index inversely correlates with LV septal segmental displacement in patients with volume overload. RV pressure load does not appear to affect LV septal segmental displacement.

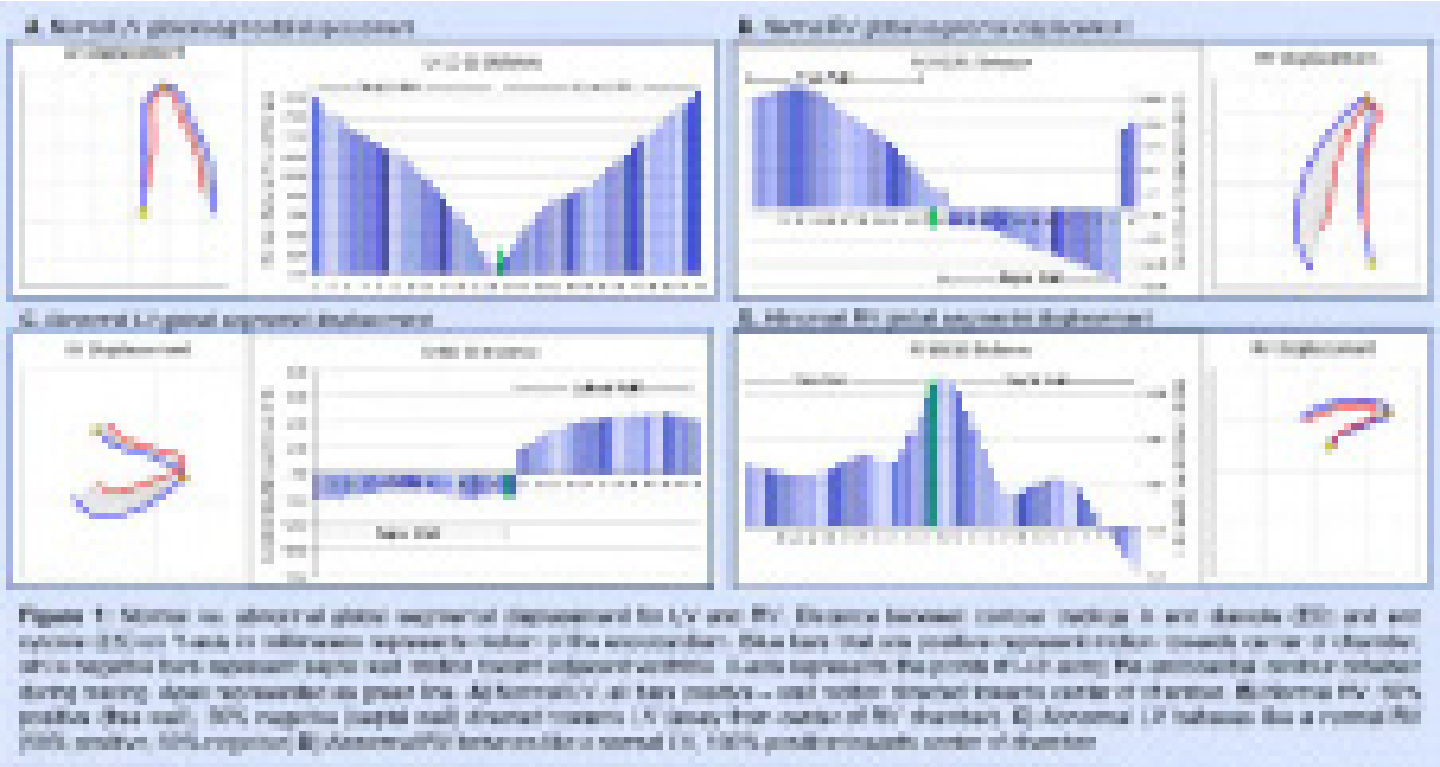

Figure 1: LV and RV Segmental Displacement

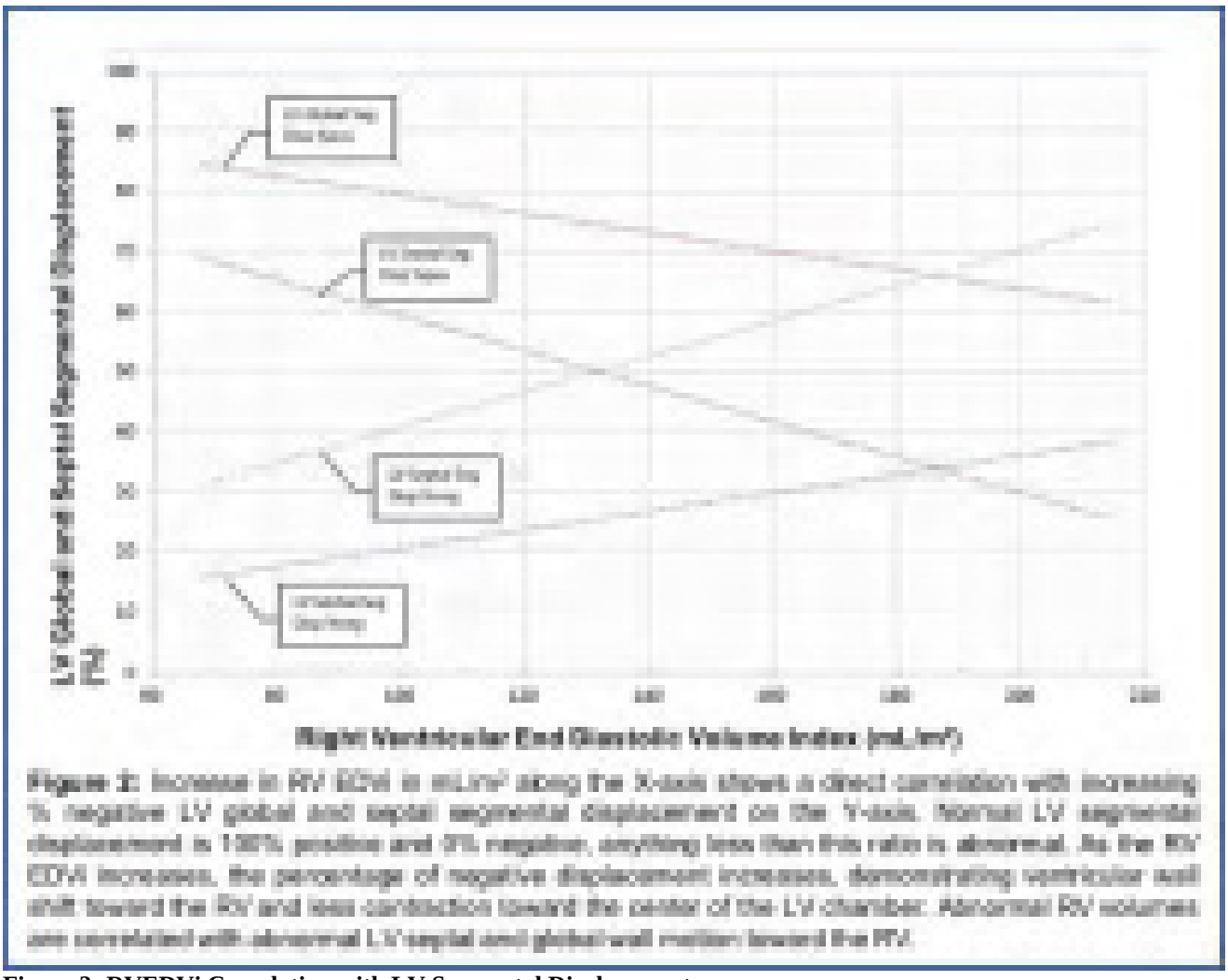

Figure 2: RVEDVi Correlation with LV Segmental Displacement

Abstract: 370
Effect of Intracardiac Mixing on End-Tidal Carbon Dioxide during Post-Operative period in Infants with Congenital Cardiac Disease
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Background During the post-operative management of infants who have undergone repair or palliation for congenital cardiac disease timely and accurate evaluation of ventilatory status is crucial in directing cardiorespiratory care. Continuous end-tidal carbon dioxide ($EtCO_2$) monitoring is frequently utilized as a surrogate for invasive intermittent partial pressure of carbon dioxide in arterial blood ($PaCO_2$) measurements. Intracardiac mixing can potentially alter differences in $EtCO_2$ and $PaCO_2$. Objective The objective of this study is to determine the effect of intracardiac mixing on differences between $EtCO_2$ and $PaCO_2$ measurements during the in post-operative period in infants who have undergone congenital cardiac repair or palliation surgery.
Design/Methods In an ongoing prospective observational study, continuous physiological data monitoring was performed in 7 infants (mean BW= 2230 g; mean gestational age 34.8 weeks) who underwent repair (n= 4) or palliation (n= 3) surgery for congenital cardiac disease in the Infant Cardiac Unit at Columbia University, New York. Upon returning from the operating room, the infants were immediately placed on continuous $EtCO_2$ monitoring. Frequent intermittent (prn) $PaCO_2$ values were obtained from arterial blood gas analysis as part of routine cardiorespiratory care. Simultaneous $EtCO_2$ values were recorded

at the time of every $PaCO_2$ measurement during the first 24 hours post-operatively. Depending on the specific surgical procedure, the presence or absence of postoperative intracardiac mixing was also recorded. Differences between $EtCO_2$ and $PaCO_2$ measurements were then compared between the infants with mixing and non-mixing physiology.
Results A total of 71 simultaneous observations (46 non-mixing physiology and 25 mixing physiology) were compared. Although they were not significantly different, $EtCO_2$ and $PaCO_2$ measurements in non-mixing physiology infants correlated better compared to mixing physiology infants as shown in Figure 1.
Conclusion(s) The results of this study suggest that in infants with congenital cardiac disease $EtCO_2$ measurements reflect $PaCO_2$ measurements more precisely with non-mixing intracardiac physiology compared to mixing physiology during the postoperative period. However, $EtCO_2$ measurements are not accurate proxy of $PaCO_2$ measurements but trending could be utilized in directing cardiorespiratory care.

Abstract: 371
The Efficacy of Intravenous Acetaminophen on Patent Ductus Arteriosus Closure in Preterm Neonates
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Background A hemodynamically significant patent ductus arteriosus (hsPDA) is a common complication in preterm infants. If left untreated, it can result in ventricular overload and congestive heart failure. Acetaminophen has been suggested as an alternative pharmacologic treatment for a hsPDA, but data are limited. Recently, B-type natriuretic peptide (BNP) levels, a marker of ventricular overload, have been used as an objective measure of a closing hsPDA in addition to the standard echocardiographic evaluation. Currently, no one has used BNP levels when evaluating the efficacy of acetaminophen in closing a hsPDA.
Objective A prospective randomized controlled pilot study investigating the safety and efficacy of IV acetaminophen as a treatment option for hsPDAs as compared with IV ibuprofen.
Design/Methods IRB approved, randomized controlled study. Infants <30 weeks gestation, with a hsPDA requiring treatment at ≤ 2 weeks of life were randomized to receive either acetaminophen (15mg/kg IV q6h x3days) or the standard of care ibuprofen (10mg/kg IV on day1, then 5mg/kg IV q24h x2 days). BNP levels were obtained before and after treatment. The PDA size and significance were assessed by echocardiogram and interpreted by a single blinded cardiologist. To monitor for adverse effects, pre-, during, and post-treatment bilirubin (total and direct), AST, ALT, serum creatinine, blood pressures and urine output were collected.
Results Enrollment was slower than expected due to trend towards decreased treatment of PDAs. Nine infants were enrolled and block randomized to the different treatment groups. Three of 4 infants (75%) in the acetaminophen group and 1 of 5 infants (20%) in the ibuprofen group had a decrease in PDA size. Two of the 4 infants in the acetaminophen group required a second course of treatment (ibuprofen per standard treatment) whereas all the infants in the ibuprofen group required a second course. Two of the 9 infants required eventual surgical ligation. There was a trend toward decreased BNP level from pre to post treatment in both groups. There was no significant decrease in FiO2 requirement in either group. No significant adverse events related to treatment occurred in either group.
Conclusion(s) This pilot study suggests that IV acetaminophen is as effective as IV ibuprofen in treating a hsPDA and is safe in the short term. Additional larger randomized controlled trials are needed to further elucidate efficacy and long-term safety.

Funded by The Gerber Foundation. BNP testing materials donated by Quidel.

Abstract: 372

Risk Factors Associated with Perioperative Thrombosis in Infants Undergoing Cardiac Surgery

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Background Congenital heart surgery is often complicated by postoperative thrombosis which can lead to substantial morbidity and mortality(1). The estimated incidence of thrombosis in patients with congenital heart disease is 3-30%, significantly more than other hospitalized children. Cardiac surgical patients less than 1 year of age have an even higher risk of postoperative thrombosis(1). While the etiologies of thrombosis in pediatric cardiac surgery patients are complex, we sought to identify specific risk factors for thrombosis in neonates and infants who are at the highest risk for thrombotic complications.

Objective

Design/Methods After IRB approval, we queried our internal Society of Thoracic Surgery (STS)-Congenital Cardiac Anesthesia (CCAS) database to identify all patients under 12 months of age who underwent cardiac surgery from January 1, 2015 through December 31, 2017. Demographic information, perioperative information, and outcomes, including thrombosis were collected. We identified patients who experienced a thrombotic event during the same hospital stay and confirmed the diagnosis with positive imaging studies. Using Chi-Square test or Wilcoxon rank-sum tests, we compared patients with thrombosis and those without to determine variables that contribute to postoperative thrombosis.

Results The incidence of thrombotic complications was 6.4% (78/1223) in patients under 1 year of age who underwent cardiac surgery with and without CPB at our institution. The most common sites of thrombosis were femoral artery or vein (29% and 27.5%). In the univariate analysis, perioperative risk factors included younger age; lower weight; prior surgery; higher STAT score; cyanosis; longer CPB time; higher hematocrit and higher lactate on CICU arrival (Figure 1). Using a multivariate logistic regression model, younger age, prior surgery, and STAT score 4 or 5 remained independently associated with postoperative thrombosis (Figure 2). Hospital length of stay was significantly longer in patients with thrombosis (45 days [19,85] versus 11 days [5,23]; $p<0.001$).

Conclusion(s) Children under 1 year of age are at increased risk for postoperative thrombotic complications after cardiac surgery. The risk is increased in younger patients, patients with multiple surgeries, and patients with higher risk surgeries. Patients who experience a postoperative thrombotic event have a significantly longer hospital stay.

This study was completed without funding.

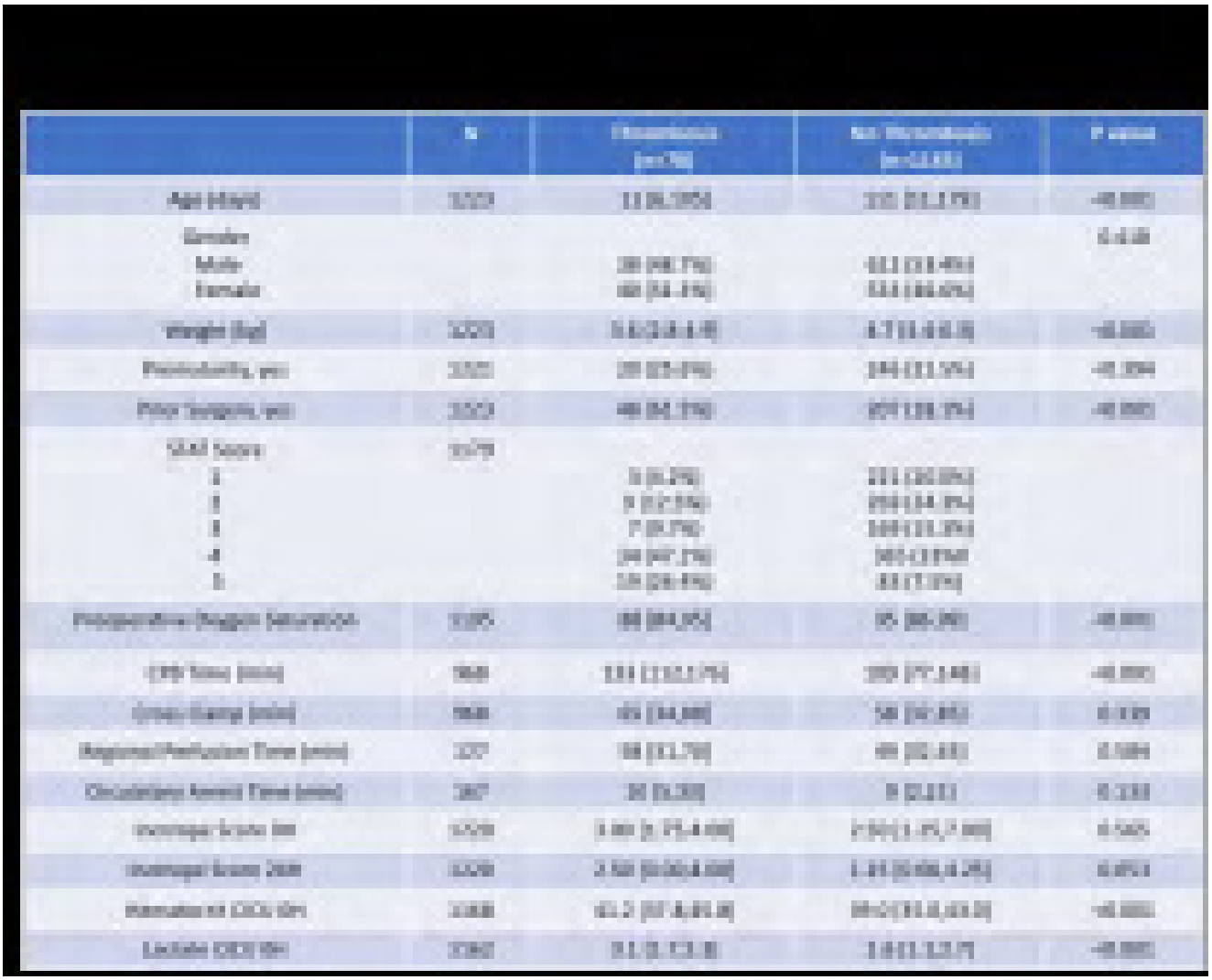
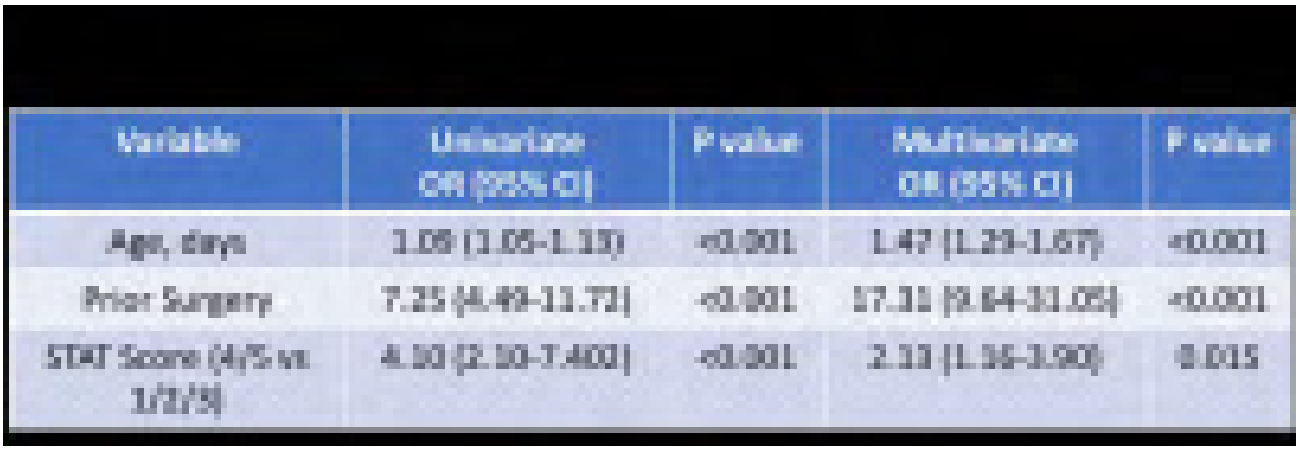


Figure 1. Perioperative variables associated with thrombosis in patients under 1 year of age undergoing cardiac surgery. Groups were compared with Chi-Square tests for categorical variables and Wilcoxon-rank sum test for continuous variables. (Values reported as N% or Median [25th percentile-75th percentile])



Variable	Univariate OR (95% CI)	P value	Multivariate OR (95% CI)	P value
Age, days	1.08 (1.05-1.13)	<0.001	1.47 (1.23-1.67)	<0.001
Prior Surgery	7.25 (4.49-11.72)	<0.001	17.31 (9.84-31.05)	<0.001
STAT Score (4/5 vs 1/2/3)	4.10 (2.10-7.403)	<0.001	2.13 (1.36-3.90)	0.015

Figure 2. Variables from Multivariate Logistic Regression Analysis Associated with Thrombotic Complications in cardiac surgery patients under 1 year of age.

Abstract: 373

Late Treatment of a Patent Ductus Arteriosus with Acetaminophen in Preterm Neonates

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Background Hemodynamically significant patent ductus arteriosus (hsPDA) is seen in preterm infants and can cause significant morbidity and/or mortality. There are limited data on effective pharmacologic treatments beyond 2 weeks of life. Recently, acetaminophen has been proposed as an alternative to ibuprofen for treatment. Echocardiograms are used to determine the effectiveness of a treatment, however, B-type natriuretic peptide (BNP) levels, a marker of ventricular overload, have been proposed as an objective marker of a closing hsPDA. Currently, no one has used BNP levels when evaluating the efficacy of acetaminophen in closing a hsPDA.
Objective To evaluate the efficacy of acetaminophen in closing a hsPDA in preterm infants >2 weeks of age using both echocardiogram and BNP levels.
Design/Methods Case series of 8 infants < 30 weeks gestation at birth who received treatment for a hsPDA with acetaminophen after 2 weeks of age. Infants received 15mg/kg/dose of acetaminophen every 6 hours for a 3-5-day course. A single cardiologist reviewed all echocardiograms to determine PDA size and significance before and after treatment. BNP levels were obtained pre and post treatment. Bilirubin (total and direct), AST, ALT, serum creatinine levels, blood pressures, and urine output were collected to monitor for safety.
Results Seven infants had complete pre/post treatment ECHO data, with 57% having a decrease in PDA size. Five of eight infants (63%) had decreased FiO2 requirement after treatment. BNP data were complete in 4 infants and there was no significant difference between pre and post treatment levels. Of the 8 infants, 2 had a PDA ligation after treatment failure. There were no clinically significant changes in AST, ALT, total and direct bilirubin, or creatinine level after treatment.
Conclusion(s) Given the limited data on successful pharmacologic treatment for a PDA beyond 2 weeks of life, our study suggests acetaminophen as a potentially viable option. Larger studies are required to expand on these findings.

Funded, in part, by Quidel.

Abstract: 374

Evaluation of Effects of Dopamine on Hemodynamics in Hypotensive Preterm Infants with Symptomatic Patent Ductus Arteriosus

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Background Patent ductus arteriosus (PDA) in preterm infants is associated with mortality and increased risk of morbidities such as necrotizing enterocolitis, renal failure and chronic lung disease. Dopamine is an inotropic/vasopressor agent used in circulatory failure in newborns. The differential effects of dopamine in the pulmonary and systemic vascular beds in preterm infants with clinically symptomatic PDA remains uncertain. It is not known whether dopamine improves systemic perfusion in hypotensive preterm infants with symptomatic PDA.
Objective To evaluate the effect of dopamine on systolic and diastolic blood pressures and clinical measures of systemic perfusion in hypotensive preterm infants with PDA.
Design/Methods Retrospective chart review was performed in all preterm infants ≤30 weeks gestation in a regional perinatal center (RPC) between 1/10/2013 and 10/31/2018 who had PDA confirmed with echocardiogram and had received dopamine infusion for at least 2 hours. Data collected included gestational age, birth weight, gender, size of PDA, hemodynamic characteristics for 48 hours before and after dopamine initiation (heart rate, systolic and diastolic blood pressures, inspired oxygen requirement, urine output, blood gas parameters, blood urea nitrogen (BUN) and creatinine levels).
Results During the 5 year study period, there were 24 infants admitted at the RPC who met inclusion criteria. Baseline characteristics of all the infants is shown in Table 1. Both systolic and diastolic blood pressures improved significantly after dopamine initiation (p=0.001 and p=0.01 respectively) (figures 1 and 2). Heart rate was found to increase significantly after starting dopamine (p=0.02). Base deficit improved significantly after initiation of dopamine (p=0.005). There was a trend towards decrease in inspired oxygen requirement and improved urine output after dopamine was initiated. There was no difference in the pH, partial pressure of carbon-dioxide, BUN and creatinine levels after starting treatment with dopamine.
Conclusion(s) In hypotensive preterm infants with symptomatic PDA, dopamine improves both systolic and diastolic blood pressures. Trend towards a decrease in oxygen requirement following dopamine initiation may be a clinical evidence of decreased alveolar congestion from decreased left to right shunting across the PDA. The decrease in base deficit suggests

improvement in systemic perfusion. Dopamine improves systemic hemodynamics in hypotensive preterm infants with symptomatic PDA.

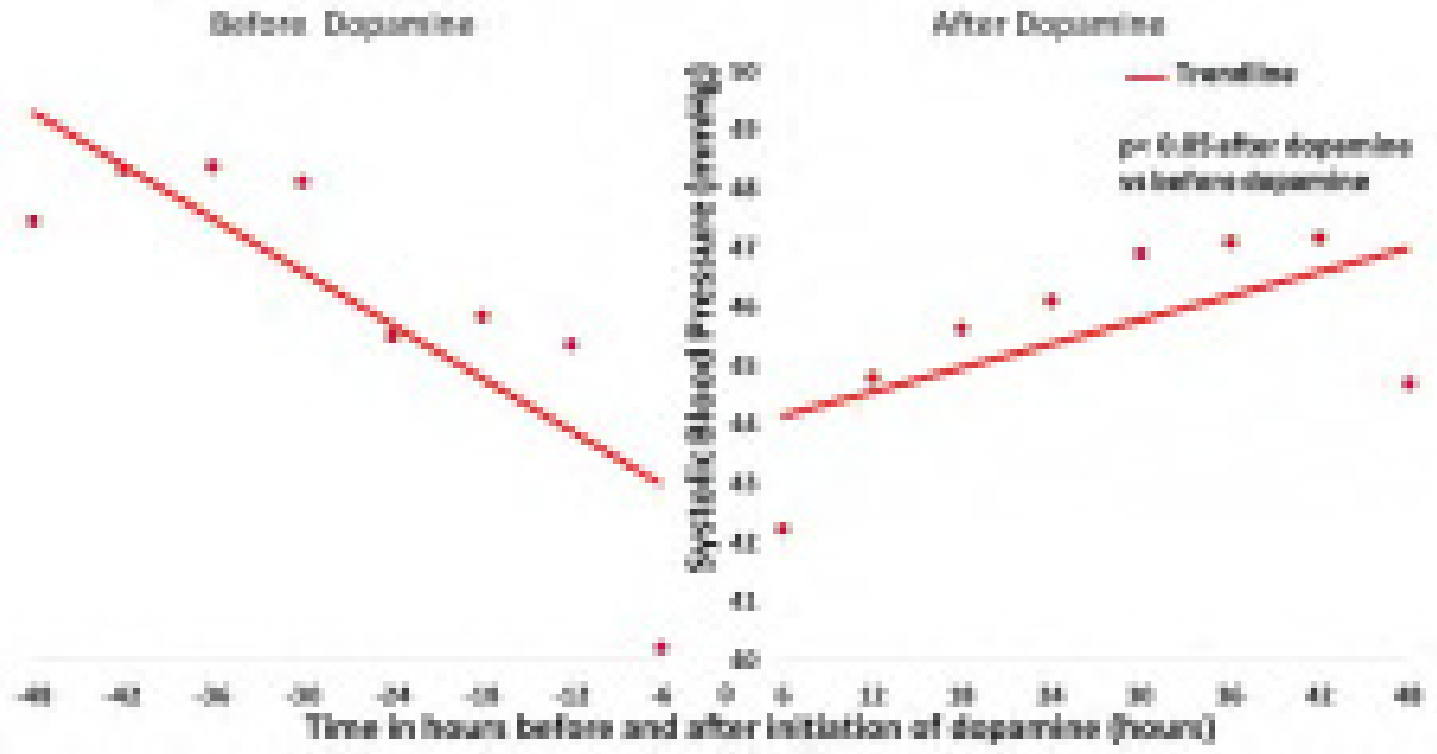

Figure 1: Change in Systolic Blood Pressure with time before and after initiation of Dopamine.
Time 0= time of initiation of dopamine
p=0.001

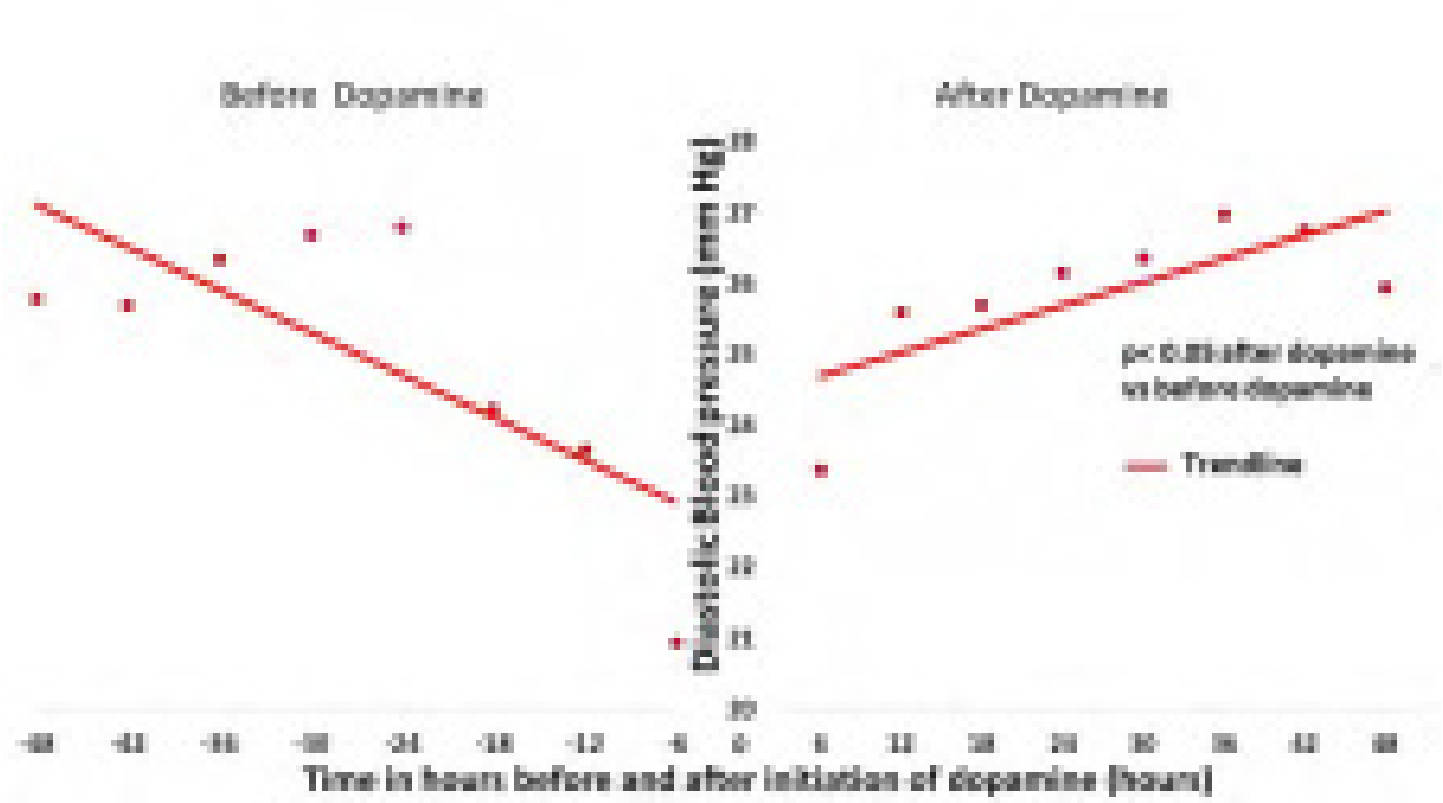

Figure 2: Change in Diastolic Blood Pressure with time before and after initiation of Dopamine.
Time 0= time of initiation of Dopamine
p=0.01

Table 1: Patient Characteristics

Parameter	Number (percentage) or Mean (standard deviation)
Total number of newborns	24
Gestational age (weeks)	24.3 (1.5)
Birth weight (grams)	721 (155)
Gender	Male: 13 (54.2%) Female: 11 (45.8%)
Size of PDA from echocardiogram	Large PDA: 8 (33.3%) Moderate to Large PDA: 3 (12.5%) Moderate PDA: 13 (54.2%)
Age at initiation of dopamine (days)	14 (9)
Indication for dopamine	PDA with suspected sepsis with hypotension: 11 (45.8%) PDA with decreased perfusion and hypotension without sepsis: 13 (54.2%)

Data presented as mean (standard deviation) unless otherwise specified. PDA: Patent Ductus Arteriosus

Abstract: 375

Teaching Physician Recommendations of Non-Evidence-Based GFDs for Neurodevelopmental Disorders and their Influence on Pediatric Residents

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Background The AAP recommends against using gluten free diets (GFDs) for the management of behavioral symptoms of children with Autism Spectrum Disorder (ASD), Attention-Deficit/Hyperactivity Disorder (ADHD) and other behavioral concerns stating there is no evidence that they have any effect on behavior symptoms. However previous research has demonstrated that parents may be implementing GFDs for their children for a variety of behavioral disorders including ADHD and ASD. To date, no study has investigated whether physicians are recommending these extreme restrictive diets to their ADHD and ASD patients and how that influences the pediatric residents that observe them.

Objective To examine the role of teaching physician practices in shaping pediatric resident tendencies to recommend non AAP recommended GFDs for neurodevelopmental disorders (ADHD and ASD).

Design/Methods Through an anonymous, online survey distributed via Chief Residents in teaching hospitals nationwide, residents were asked their likelihood of recommending GFDs for a variety of previously-determined conditions of parental concern on a 5-point Likert scale (1-Very Unlikely to 5-Very Likely) as well as whether the resident had personally witnessed a teaching physician recommend a GFD for the same list of medical conditions.

Results A total of 133 survey responses were analyzed. Overall, 8.3% (n=11) of residents witnessed a teaching physician recommend GFDs for ASD and 3.8% (n=5) of residents witnessed a teaching physician recommend GFDs for ADHD. The odds of a resident recommending a GFD in the future for a given behavioral issue was much higher when residents had witnessed a teaching physician do the same (7.14 for ASD, 1.75 for ADHD) (Table 1).

Conclusion(s) A small but significant portion of teaching physicians continue to recommend GFDs for behavioral concerns despite contrary AAP evidence and recommendations against this practice. Alarmingly, the increase in resident likelihood of recommending GFDs for a non-AAP-approved condition following observation of an attending physician doing so implies that teaching physicians may be misleading their residents through their own non-evidence-based practices. Therefore, it is vital that teaching physicians are aware of their strong influence on residents and use it as an opportunity to instill evidence-based recommendations, rather than perpetuate erroneous information which may significantly affect the lives of their ASD and ADHD patients.

Table 1: Comparative Likelihoods of Residents Recommending Gluten-Free Diets for Behavioral Disorders in relation to Witnessing a Physician Similarly Recommend

Behavioral Disorder	Resident Count Having Witnessed	Likelihood of Future Recommendation Having Witnessed	Likelihood of Future Recommendation Not Having Witnessed	Odds Ratio
Autism Spectrum Disorder	11	2.18	1.62	7.15
Attention-Deficit Hyperactivity Disorder	5	2.00	1.61	1.75

Comparative Likelihoods of Residents Recommending Gluten-Free Diets for Behavioral Disorders in relation to Witnessing a Physician Similarly Recommend

Abstract: 376

Postural control in supine may identify early motor delay in medically fragile preterm infants during natural play

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Background

Infants born preterm who have chronic lung disease are at high risk for motor delay. These delays are often not identified until after the first year of life which misses an important window of time for early intervention when neuroplasticity is at its peak. Early identification of motor delay is important to initiate and guide early, evidence-based treatments. Our team has designed an instrumented infant play gym with the long-term goal of identifying motor impairments during natural play in the first few months of life.

Objective

The objective of this analysis was to determine if postural control, measured by center of pressure (COP) collected from infants lying supine on an instrumented mat, has the potential to distinguish between healthy infants born full term and those born preterm with potential developmental delay.

Design/Methods

Seven healthy infants born full-term and five preterm infants with severe bronchopulmonary dysplasia (BPD) participated in this study. Infants were place supine on a blanket that covered the instrumented mat. A "no toy" condition captured data while the infant lay without any interaction. Several "toy" conditions captured data while one of three novel, colorful toys hung from the frame of the play gym over the infant's chest (to encourage upper extremity play) or legs (to encourage lower extremity play). Trials lasting 100-120 seconds in duration were included in the analysis if the baby was not crying and did not roll. Maximum excursion of the COP was calculated in both the medial-lateral (COPx) and cephalo-caudal (COPy) directions. Larger excursion represents a greater magnitude of movement.

Results Term infants were born at a gestational age of 37 weeks or greater and tested at 4-5 months of age. Preterm infants with BPD were born at 30±4.5 weeks and tested at 5-8 months of age (corrected to 1-5 months after adjusting for prematurity). Infants born full term demonstrated greater COPy excursion (5.05 cm vs. 2.19 cm), but there was no difference in COPx (3.71 cm vs. 3.63 cm). COP excursion did not change, on average, with the presentation of a toy (Figure).

Conclusion(s)

Consistent with related work, this preliminary analysis demonstrates the potential of supine postural control to identify early differences in motor function in infants. Future work will include larger, more homogeneous samples. We will also combine postural control data with other aspects of the instrumented play gym, including toy sensor and video data.

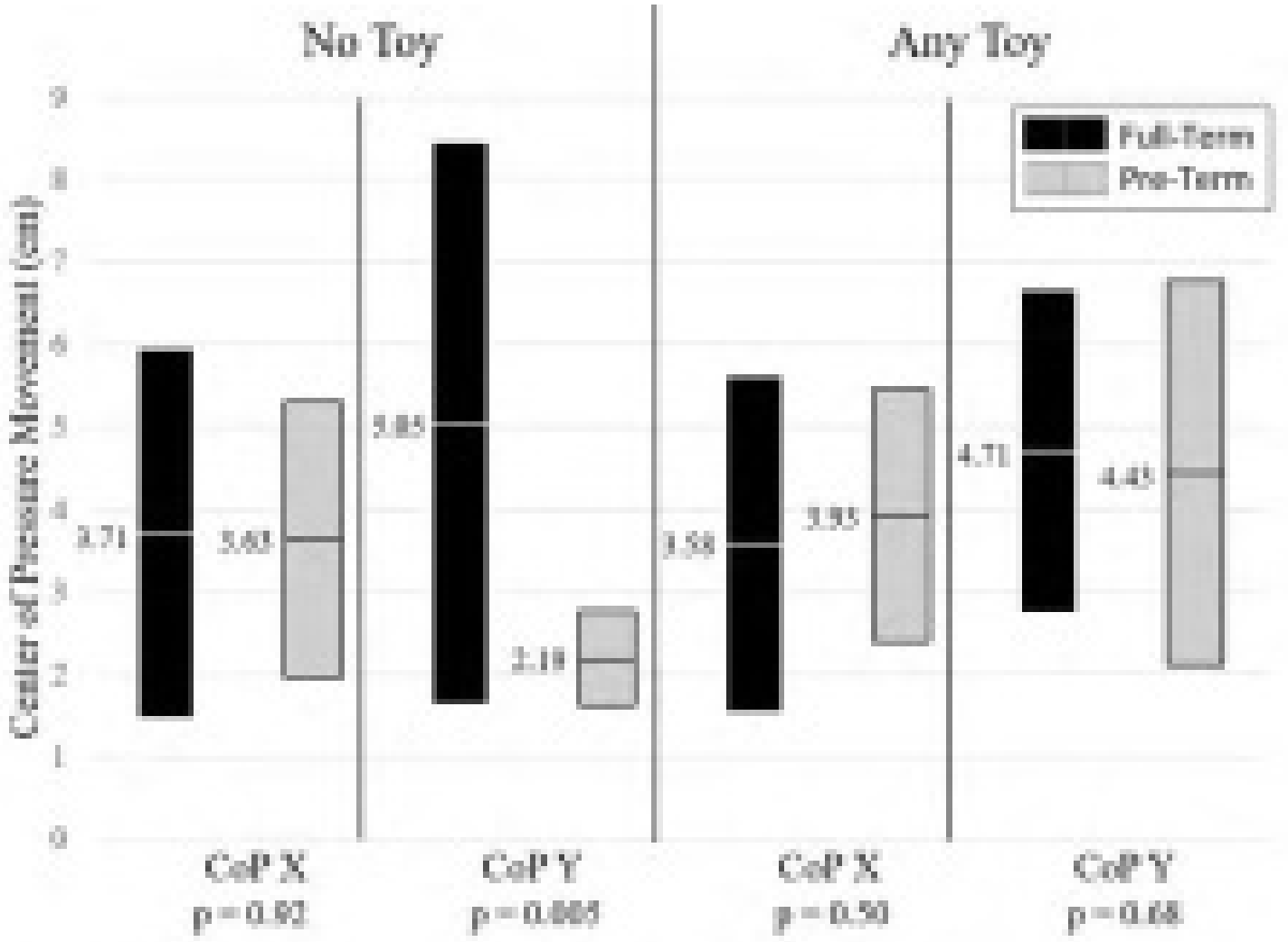

Figure. Center of pressure (COP) excursion in medial-lateral (x) and cephalo-caudal (y) directions during no toy and toy conditions. COPy excursion distinguished between infants born full term (black) and preterm (grey) in the no toy condition.

Abstract: 377

Examining Parental Concerns with Young Children's Media Usage and Citation of AAP Guidelines: What's Covered? What's not?

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Background Technology's constant evolution has presented a challenge to parents who wish to safely manage their children's media usage. The American Academy of Pediatrics (AAP) has published guidelines on young children's media use for over a decade, with the latest update occurring in 2016. However, it is uncertain to what extent the AAP guidelines (AG) address parent's concerns. Online parenting forums provide unique unfiltered insight into parents' opinions and rationale regarding children's media use. To date, no study has evaluated online parenting forums on media use for the extent to which the AG cover the topics of the discussions.

Objective To examine the parental discussions on children's media usage on publicly accessible online parenting forums.

Design/Methods Popular parenting forums were searched using terms such as "technology", "screen time", and "media" for

threads relating to children's media usage. Posts were included if the initial poster was seeking advice for a child under the age of five. Discussions were categorized based on their overall topic. The AG were examined to see if they covered these topics. Individual posts were evaluated for the type of evidence provided.

Results Of the 2795 posts analyzed, the majority were addressed by the AG (78.07%). Parental concerns not addressed by the AG included how to adhere to recommendations when caring for multiple children of various ages, technology's effect on children, how to manage children already considered to be "addicted", and when/what specific devices and applications are appropriate. While the majority of posts were covered by the AG, they rarely cited the AG (1.18%), with anecdotal evidence being cited considerably more (38.96%) (Table 1).

Conclusion(s) The AAP has published and revised their media usage policy for over a decade. However, a considerable portion of parental posts (21.93%) discussed concerns not covered by the AG. Furthermore, only a miniscule portion of parental posts discussing children's media usage actually cited the guidelines (1.18%). The AAP should incorporate these topics and concerns not currently addressed by their media usage policy, while simultaneously increasing the public's awareness of their current recommendations. Furthermore, physicians must begin to consistently reinforce and promote these resources to their patients. Future studies should investigate the extent to which other AAP policies address parents' concerns.

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Abstract: 378

Families', Patients', and Providers' Perspectives on Transitions of Care for Youth with Special Healthcare Needs

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Background Nationwide, 750,000 youth with special healthcare needs (YSHCN) transition from pediatric to adult medical care annually. The transition process can be complex, fragmented and overwhelming. Understanding the perspectives of stakeholders is important in ensuring successful transitions of care.
Objective To explore the perspectives of YSHCN, families and providers on the transitions of care process.
Design/Methods This was a qualitative study in an urban academic medical center that serves a low-income minority community. We conducted separate focus groups for three stakeholder groups: YSHCN and families (n=7), adult medicine providers and staff (social worker, nurses) (n=5), and pediatric medicine providers and staff (n=8). Focus groups were conducted by an independent professional facilitator. Focus group questions were developed based on existing literature through an iterative process with facilitator input. Focus groups were transcribed, authors separately identified themes, and the facilitator cross-referenced themes from each of the three groups.
Results YSHCN and families reported respect, relationship and communication as the most important factors for a "good" transition. Comments from YSHCN and families included "Understand the sacrifice it takes for us to get to appointments;" "Don't give up on us;" and "Help our youth become independent in their health care." Adult providers felt that it was a "must" to receive a concise (at most 3 pages) medical and psychosocial summary prior to seeing YSHCN; and that having clinical guidelines or cheat sheets for specific conditions (ie: Down Syndrome) and assistance with non-medical issues (guardianship, waivers, etc) would be very helpful. Pediatric providers felt that having adult providers to refer YSHCN to, adequate time with patients and families, and beginning the transition process earlier would make the transition process smoother. All agreed that standardized tools and processes, as well as communication and preparedness were necessary components for an ideal transition. Families and providers agreed that having a navigator was a critical component of the transition process.
Conclusion(s) YSHCN, families, providers identified standardized tools and processes, communication and navigation as important factors in the transition process. Understanding stakeholders' perspectives can help to inform the transitions of care processes for YSHCN.

Abstract: 379

Feeding Outcomes Following Infant Tracheostomy

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Background While need for technology-assisted feedings is common among infants who have received tracheostomy, long-term feeding outcomes for this medically complex population have not been well described.
Objective 1) Characterize feeding methods in infants after tracheostomy at time of initial hospital discharge and during follow up
2) Identify factors associated with full oral feeding after infant tracheostomy
Design/Methods We conducted a retrospective review of all infants undergoing tracheostomy prior to one year of age at a single quaternary center over a 12-year period. Statistical comparisons were performed using Pearson's chi-squared test, Fisher's exact test, or Kruskal-Wallis test, as appropriate.
Results 340 eligible infants were discharged after tracheostomy. The majority of infants received at least some feedings through a nasogastric (23%) or gastrostomy tube (67%) at time of discharge, with only 9% exclusively feeding by mouth.

267 infants had at least one year of clinical data after tracheostomy with sufficient documentation of feeding method in follow up. Median follow up time was 3.6 years [IQR 3.4]. All 25 infants discharged on exclusive oral feeds continued to feed independently. In contrast, of 62 infants discharged on nasogastric feedings, 30 (48%) converted to full oral feeding and 21 (34%) underwent surgical feeding tube placement. Of 180 infants discharged on gastrostomy feeds, 39 (22%) achieved exclusive oral feedings.

Feeding methods at both hospital discharge and in follow up varied based on indication for tracheostomy (Table); anatomic diagnoses were associated with higher rates of oral feeding and pulmonary diagnoses were associated with increased gastrostomy feeding (all $p<0.05$). Additionally, younger age at tracheostomy (both chronical and post-conceptional age) and decreased need for respiratory support were associated with better feeding outcomes (all $p<0.05$). Among infants discharged with a feeding tube, those with a neurologic indication for tracheostomy, those discharged with a gastrostomy tube, and those discharged without oral feedings were less likely to convert to exclusive oral feedings during follow up (all $p<0.05$).
Conclusion(s) Prevalence of comorbid feeding dysfunction and gastrostomy tube dependence remain high in early childhood

after infant tracheostomy. Patterns of feeding outcomes shown in this large cohort may help clinicians and families anticipate future feeding needs, potentially leading to improved decision making, coordination of surgical interventions, and appropriate referral to support services.

TABLE: Feeding methods at hospital discharge and follow up by primary indication for tracheostomy

	Feeding method at discharge			Feeding method at follow up*		
	PO only	NG-assisted	GT/GJT-assisted	PO only	NG-assisted	GT/GJT-assisted
All patients	31/340	79/340	229/340	94/267	12/267	161/267
	9.1%	23.2%	67.4%	35.2%	4.5%	60.3%
Pulmonary	8/155	27/155	120/155	35/115	4/115	76/115
	5.1%	17.3%	77.4%	30.4%	3.5%	66.1%
Anatomic	19/134	42/134	72/134	51/114	6/114	57/114
	14.2%	31.3%	53.7%	44.7%	5.3%	50.0%
Neurologic / musculoskeletal	1/20	3/20	16/20	1/15	1/15	13/15
	5.0%	15.0%	80.0%	6.7%	6.7%	86.7%
Cardiac	1/17	4/17	12/17	3/12	1/12	8/12
	5.9%	23.5%	70.6%	25.0%	8.3%	66.7%
Other	2/14	3/14	9/14	4/11	0/11	7/11
	14.3%	21.4%	64.3%	36.4%	0%	63.6%
P-value			0.004			0.00048

*For those with at least 1 year of follow up data after tracheostomy placement and for whom feeding outcome is known.

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Impact of Neighborhood Safety on Bullying in Children with Autism Spectrum Disorder
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Background Bullied children are likely to have poor outcomes in terms of health and behavior, more so in children with autism spectrum disorder (ASD). While various buffers of bullying in children with ASD have been studied, it is unknown whether living in safe neighborhood is protective against bullying.
Objective To assess the relationship between neighborhood safety and bullying in children with ASD
Design/Methods Data from the 2016 National Survey of Children's (NSCH) Health, which provides information on multiple aspects of lives of US children 2-17 years was analyzed. We assessed children 6-17 years with a diagnosis of ASD as given by a healthcare provider and parental perception of whether or not their children were bullied and the safety of their neighborhood.
Subjects who did not respond to these questions were excluded from the analysis.
Neighborhood safety was assessed by whether they agreed or disagreed to the statements, "people in the neighborhood help each other", "people watch out for each other's kids", "we know where to get help if required in the community" and "the child is safe in our neighborhood". We calculated weighted prevalence estimates of bullying in children with and without ASD and used Chi-square tests to compare the rates and various aspects on bullying in these children
Results Of 33,929 eligible children who answered the bullying question, 990 had ASD. Of these 990, 648 (61.9%) were bullied. Of children without ASD (n=32,939), 7,347(21.6%) were bullied. On average, children with ASD were 11.39 years old

(SE=.233). Majority were males (82.5%). Amongst parents of children with ASD, 77% had neighbors watch out for each other's kids, 76% helped each other, 76% children had someone to reach out for help, 97% had safe schools and 46% had community recreation centers.

Bullying was more prevalent among female with ASD (68.6% of females compared with 64.7% of males).

Children with ASD were less likely to be bullied if neighbors watch out for each other's children (p<0.04), neighbors helped each other out (p<0.04), children were safe in school (p<.01) and if they had community recreation centers in their neighborhood (p<.001) (Table1)

Conclusion(s) Children with ASD have higher risk of becoming a victim of bullying. Living in a safe neighborhood seems to be protective against bullying in children with ASD, especially if children have someone to reach out to when needed, people look out for each other's kids and presence of neighborhood resources like community centers and playgrounds.

TABLE 1 Comparison of children with ASD bullying victimization by safety characteristics of the neighborhood where they live

Question	Total number of subjects with ASD responding to the question (n)	Bullied (n=618)	NOT bullied (n=142)	p-value
1. We watch out for each other's children in this neighborhood	971	No 580(72.4%) No 159(27.6%)	Yes 275(83.9%) No 62(16.1%)	0.035
2. People in this neighborhood help each other out	975	No 584(71.6%) No 155(28.4%)	Yes 279(83.2%) No 57(16.8%)	0.036
3. When we encounter difficulties, we know where to go for help in our community	968	No 484(72.3%) No 140(27.7%)	Yes 283(83.0%) No 51(17.0%)	0.056
4. The child is safe in school	969	No 607(94.9%) No 27(5.1%)	Yes 331(99.3%) No 4(1.7%)	0.001
5. In your neighborhood, there is a recreation center, community center or boys' and girls' club	975	Yes 276(36.9%) No 339(63.1%)	Yes 171(68.0%) No 104(48.0%)	0.001

Table 1

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An Exploration of the Influence of Socioeconomic Factors on Academic Perceptions in Urban School-Aged Children

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Background Most research on academic perception in school-aged children has examined intrinsic aspects of education, such as allocation of homework or recess.
Objective The purpose of this research was to explore which elements of children's socioeconomic upbringing has the greatest influence and correlation on their academic attitude in an urban environment.
Design/Methods
The study consisted of an electronic questionnaire survey that included English-speaking, 7-to-18 year-old patients, and their guardians, seeking care in the Connecticut Children's Medical Center emergency department. The questionnaire consisted of a patient and parent portion. The patients responded to questions regarding their academic attitude, and the scores were summed to determine a maximum academic score (MAS); scores ranged from 3-12 and a MAS of ≥11 was considered positive. The MAS scores were correlated to 14 socioeconomic factors using a Pearson-Correlation Coefficient (PCC). Significant differences in sample means of MAS groupings and each of the factors underwent One-Way ANOVA analyses and Tukey post-hoc analyses when appropriate.
Results 502 patients were enrolled; mean age was 12.0 years old (SD 3.1). The patient cohort was 40.6% male, 59.0% female, and 0.4% other; 36.1% identified ethnically as Hispanic/Latino. In terms of race, 57.6% identified as white, 39.6% as non-white/other/mix of races, and 2.8% declined to answer. 306 subjects had a calculated positive MAS. The strongest PCC was between MAS scores and parental expectations that their child will attend college (PCC -0.300 p<0.01). Based on the ANOVA, there were two variables that were statistically most significant (p<0.001): parental expectations that their child a) will graduate high school and b) attend college.
Conclusion(s) The following factors with significant statistical results (p<0.05) are thought to have the greatest influence on shaping academic perception: parental job status, education level, knowledge of grades, expectations that the child will graduate high school and attend college, a child's housing situation (i.e. dwelling-secured, rented, or shared), joint household income and how often parent's check in on school assignments. This pilot study suggests that further research into these factors will lead to a restructuring of outreach/counseling programs that will promote the importance of school and create subsequent academic success.

Table 1: Summary of Pearson-Correlation Coefficients (PCC)

Factor	PCC	PCC p-value
Sibling Status	0.044	0.356
School Education Type	0.006	0.886
Parental Job Status	-0.118	0.008**
Parental Education Level	0.138	0.002**
Parental Marital Status	0.060	0.177
Parental Military Participation	0.043	0.337
Parent Home After School	0.011	0.797
Housing Situation (i.e. Owned, Rented, or Shared Dwellings)	-0.130	0.003**
Parental Expectations of Child Graduating High School	-0.190	<0.001**
Parental Expectations of Child Attending College	-0.300	<0.001**
Parental Expectations of Child Graduating College	-0.084	0.065
Number of Times Parent's Check-In on School Assignments	0.107	0.017*
Parental Knowledge of Child's Grades	-0.164	<0.001**
Joint Household Income	0.131	0.003**

***p-value<0.05 **p-value <0.01**

Table 2: Summary of One-Way ANOVA Analyses

Factor	ANOVA Result
Sibling Status	[1]F(2,443)=1.380, p=0.253
School Education Type	F(1,500)=0.021, p=0.886
Parental Job Status	*F(5,495)=2.632, p=0.016
Parental Education Level	*F(9,492)=2.330, p=0.014
Parental Marital Status	*F(4,497)=3.982, p=0.003
Parental Military Participation	F(1,500)=0.934, p=0.337
Parent Home After School	F(2,499)=0.826, p=0.438
Housing Situation (i.e. Owned, Rented, or Shared Dwelling)	*F(3,498)=4.329, p=0.005
Parental Expectations of Child Graduating High School	*F(1,500)=18.78, p<0.001
Parental Expectations of Child Attending College	*F(1,500)=52.95, p<0.001
Parental Expectations of Child Graduating College	[2]F(2,475)=2.679, p=0.070
Number of Times Parent's Check-in on School Assignments	*F(4,497)=4.038, p=0.003
Parental Knowledge of Child's Grades	*F(4,497)=4.616, p=0.001
Joint Household Income	*F(8,493)=2.539, p=0.010

[1]Out of the 502 subjects, 446 had siblings.
[2]Out of the 502 subjects, 477 parents/guardians selected that they expect their child to attend college, 25 parents/guardians did not have that expectation.
***Indicates a statistically significant (p<0.05) ANOVA results**

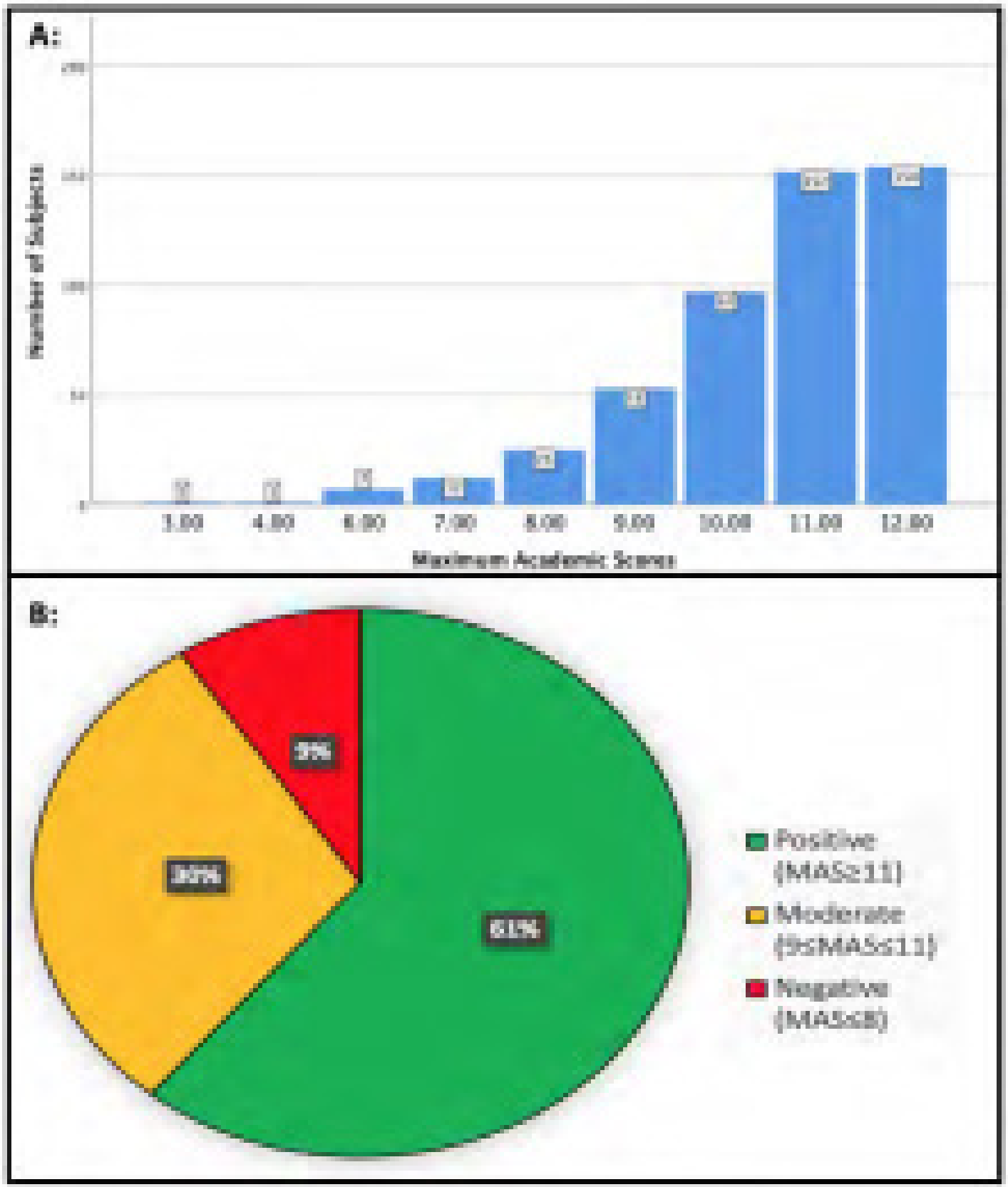

Figure 1: Summary of Maximum Academic Scores (MAS)

***A*-Quantitative histogram depicting the number of subjects within each maximum academic score; *B*-Pie-graph that groups the maximum academic scores into appropriate categorical values of positive, moderate, and negative in order to represent the subjects' academic attitude using a qualitative describer.**

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Weight and BMI in Children with Autism Spectrum Disorder: Changes from Birth to Diagnosis and 1 year follow up

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Background Autism spectrum disorder (ASD) is a neurodevelopmental disability with many affected children exhibit feeding problems and gastrointestinal dysfunction. Studies of weight status in ASD have revealed inconsistent results with some reported high prevalence of underweight, while others reported more overweight and obesity.
Objective To determine the change in weight (wt) and body mass index (BMI) from birth to ASD diagnosis and 1-year follow up (FU).
Design/Methods A retrospective study of children diagnosed with ASD between Jan 2014 to Dec 2017 with FU at developmental clinic, Brookdale Hospital, NY for at least 1 year. Diagnosis of ASD was based on DSM-V criteria. All children received services including speech and occupational therapy. Exclusion criteria included incomplete data or being on medications affecting wt / feeding pattern.
Wt and BMI were retrieved from electronic medical record at birth, time of ASD diagnosis, and at 1-year FU. Age and gender adjusted Z-score and percentile (%ile) were calculated according to CDC recommendations. Median (and interquartile ratio IQR) or mean (±SD) were used for descriptive statistics. Changes in wt Z-scores and wt %iles were analyzed using Wilcoxon Signed Ranks Test, or paired T-test, as appropriate. Correlation between age at diagnosis and change in Z-scores / %iles was tested using Pearson's or Spearman's correlation according to normal distribution.
Results Out of 144 children diagnosed with ASD during the study period, 12 were excluded (being on medications). Table 1 shows demographic characteristics: 99 (75%) male, median age at diagnosis was 4 years (IQR 2.9-5.7). BMI was calculated in 121 children at diagnosis with overweight present in 34 (26%), and obesity in 20 (15%).
There was a significant increase in wt %iles and Z-scores from birth to diagnosis [mean Z-score (±SD) of -0.19 (±1.14) and +0.77 (±1.32) respectively, $p<0.001$], table 2. In contrast, there was no significant difference in wt Z-scores, wt %iles, or BMI %iles from diagnosis to 1-year FU ($p>0.05$). There was no significant correlation between age at diagnosis and change in wt Z-scores / change in wt %iles ($r=0.054$ and 0.057, $p=0.560$ and 0.538, respectively).
Conclusion(s) Our studied ASD children had a significant increase in wt parameters from birth to diagnosis, supporting the evidence of overweight in these children. There was no significant change in wt or BMI parameters at 1-year FU. Further studies looking at correlation between wt change and mealtime behavior are suggested.

Table 1: Baseline characteristics of children diagnosed with ASD at our study, n=132.

Characteristic	**n=132** (unless specified)
Age at diagnoses in years, median (IQR)	4.4 (2.9-5.7)
Male gender, n (%) **Female gender**, n(%)	99 (75%) 33 (25%)
Race	African American: 58 (44%) Hispanic 21 (16%) Caucasian 13 (10%) Other 40 (30%)
Birth weight in kg, mean±SD	3.2 (±0.67)
Weight Z scores at diagnosis, mean±SD	0.77 (±1.32)
Weight percentiles at diagnosis, median (IQR)	75 (53-95)
BMI percentiles at diagnosis, median (IQR), n=121*	77 (42-97)

Overweight, n (%) **Obese**, n (%) [total n=121*]	34/121 (26%) 20/121 (15%)

*** BMI was calculated in 121 children at diagnosis (11 were <2 years of age) Abbreviations: SD= standard deviation, IQR=interquartile ratio, BMI=body mass index**

Table 2: Change in weight and BMI parameters of children diagnosed with ASD at our study, n=132.

GROWTH PARAMETER	n=132	p value
Weight Z-scores at birth, mean±SD	-0.13 (±1.05)	<0.001 [1] 0.490 [2]
Weight Z-scores at diagnosis, mean±SD	0.77 (±1.32)	
Weight Z-scores at 1 year follow up, mean±SD	0.76 (±1.49)	
Weight percentiles at birth, median (IQR)	32 (15-57)	<0.001 [1] 0.223 [2]
Weight percentiles at diagnosis, median (IQR)	75 (53-95)	
Weight percentiles at 1 year follow up, median (IQR)	77 (44-94)	
BMI percentiles at diagnosis, median (IQR), n=121*	78 (42-97)	0.899
BMI percentiles at 1 year follow up, median (IQR), n=121*	79 (44-95)	

Abbreviations: SD= standard deviation, IQR=interquartile ratio, BMI=body mass index. * BMI was calculated in 121 children at diagnosis (11 were <2 years of age) [1]: p value comparing birth and diagnosis [2]: p value=0.014, diagnosis and 1 year follow up

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Virtual Reality as Anxiolysis for Children Undergoing Laceration Repair in the Pediatric Emergency Room: A Pilot Study

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Background Laceration repair is a common Emergency Department (ED) procedure. While procedural pain is effectively treated with topical and injectable agents, managing fear and anxiety during repair is more challenging. Virtual Reality (VR) is a distractive technique that has shown promise in reducing *pain* in children; however, less is known about its efficacy in reducing procedural *anxiety*.

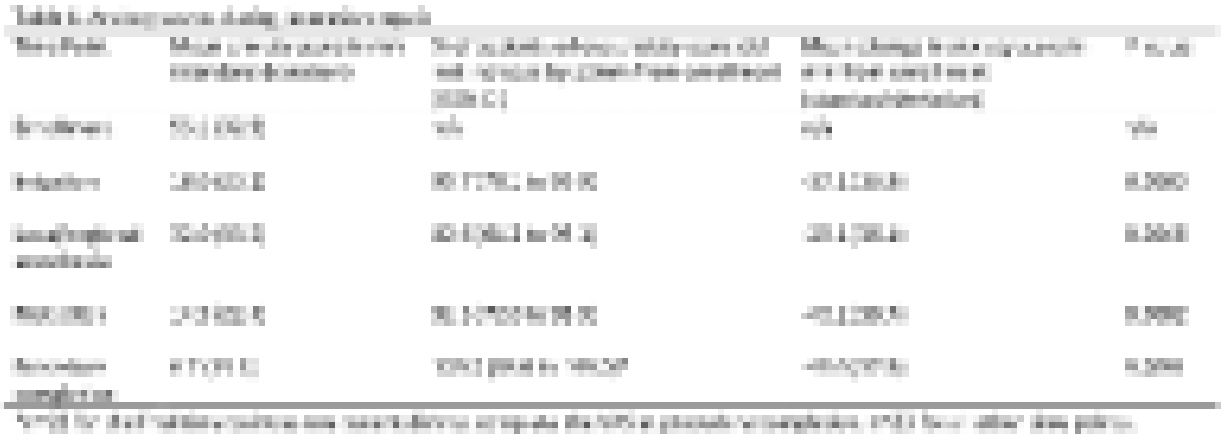
Objective To examine the feasibility of using immersive VR as anxiolysis during laceration repair in the Pediatric ED.

Design/Methods We conducted a non-blinded, observational, pilot/feasibility study in the Pediatric ED of a quaternary care, urban, academic medical center that enrolled a convenience sample of children aged 5-13 years undergoing sutured repair of non-facial lacerations. Subjects played an immersive VR game using the KindVR® platform while undergoing standard laceration repair. Parents assessed their child's anxiety on a 100mm Visual Analog Scale (VAS) at enrollment and at four time points during the procedure (irrigation, local/regional anesthesia, first stitch, and procedure completion). The primary outcome measure was the percentage of children whose anxiety score did not increase by ≥ 20mm from the time of enrollment to the first stitch.

Results To date, 27 patients consented to participate, 23 of whom completed the study. Mean initial anxiety score was 55.1 mm. 21/23 patients (91.3%, 95% CI 72.0%-98.9%) had anxiety scores that did not increase by 20mm or more from enrollment to the first stitch. In fact, 18/23 patients (78.3%, 95% CI 56.3% to 92.5%) demonstrated a *decrease* in anxiety between enrollment and the first stitch. Mean change in anxiety score at first stitch was -40.22mm. This decrease in anxiety scores was statistically significant (p=0.0002). Mean changes in anxiety scores at other time points are shown in Table 1. All laceration repairs were completed successfully. No patients required sedation or restraints. 21/23 providers (91.3%, 95% CI 72.0% to 98.9%) responded that using VR helped them complete the laceration repair. There were no adverse events related to the use

of VR, and the main barriers identified with its use in the ED involved easily correctable technical difficulties with the VR equipment.

Conclusion(s) An immersive VR game is a safe and effective non-pharmacologic distractive technique to reduce procedural anxiety during laceration repair in the Pediatric ED.



Abstract: 384

Can Point-of-Care Ultrasound be Used to Confirm Nasogastric Tube Position?

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Background While chest radiography is currently considered gold standard for nasogastric tube (NG Tube) position confirmation, it carries the burden of ionizing radiation for the pediatric patient. Alternative methods such as auscultation and gastric secretion pH levels are often limited. A few small studies in critical adult or pediatric patients have shown promise of radiographer-performed ultrasound studies, yet no study has been performed in the pediatric emergency department (PED).

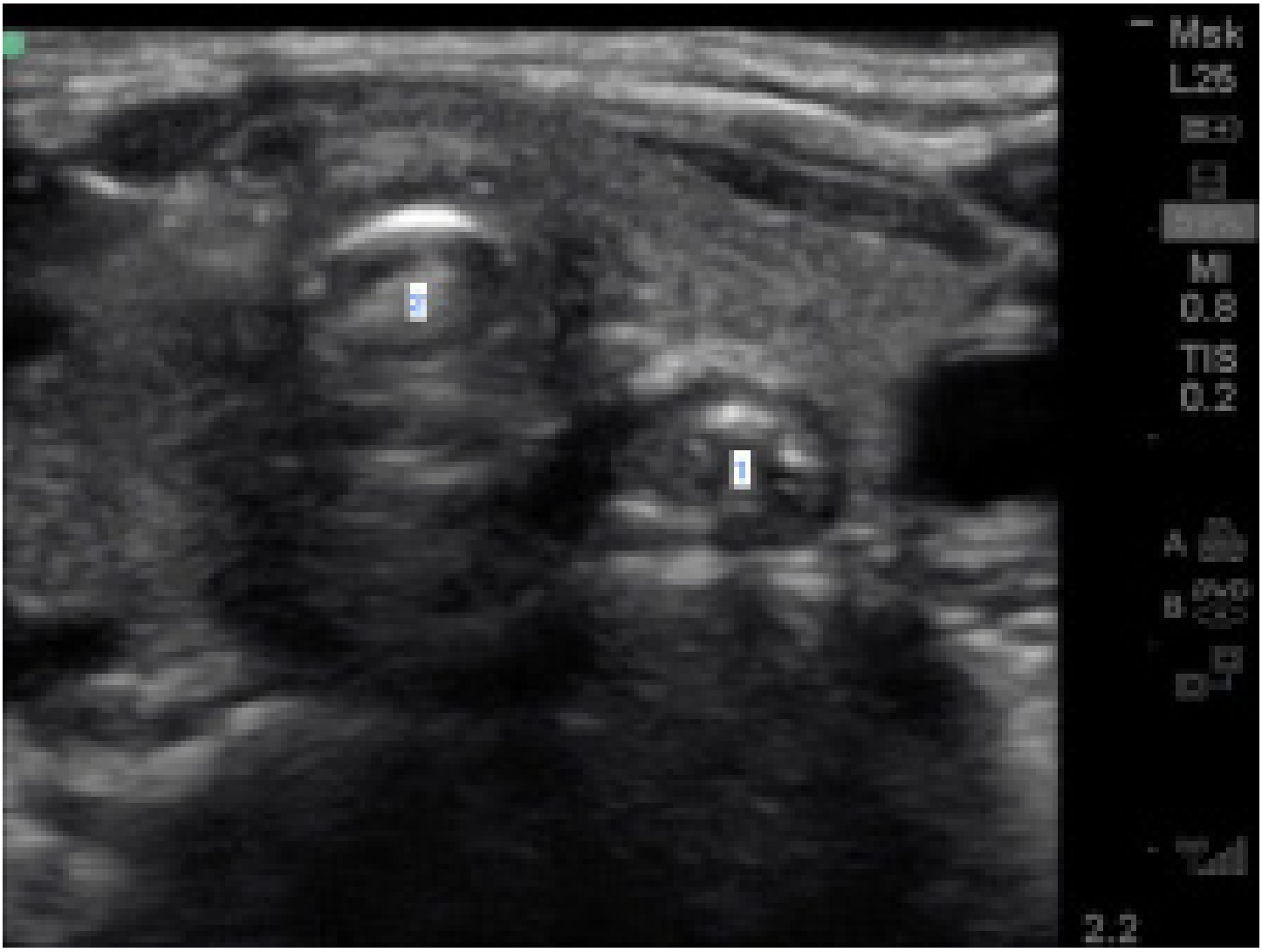
Objective To evaluate a novel approach to confirm NG Tube position through the use of point-of-care ultrasound (POCUS).

Design/Methods We conducted a pilot study through retrospective image review of POCUS studies performed in the PED obtained by one of 6 Pediatric Emergency Medicine (PEM) fellows or the PEM director of ultrasonography. All sonographers received prior hands-on training as well as image review didactics on proper POCUS NG Tube position confirmation and were blinded to radiography results or alternative methods used to confirm NG Tube position. All studies were reviewed for quality assurance. With the SonoSite M Turbo Portable Ultrasound, sonographers confirmed NG Tube position in two views.

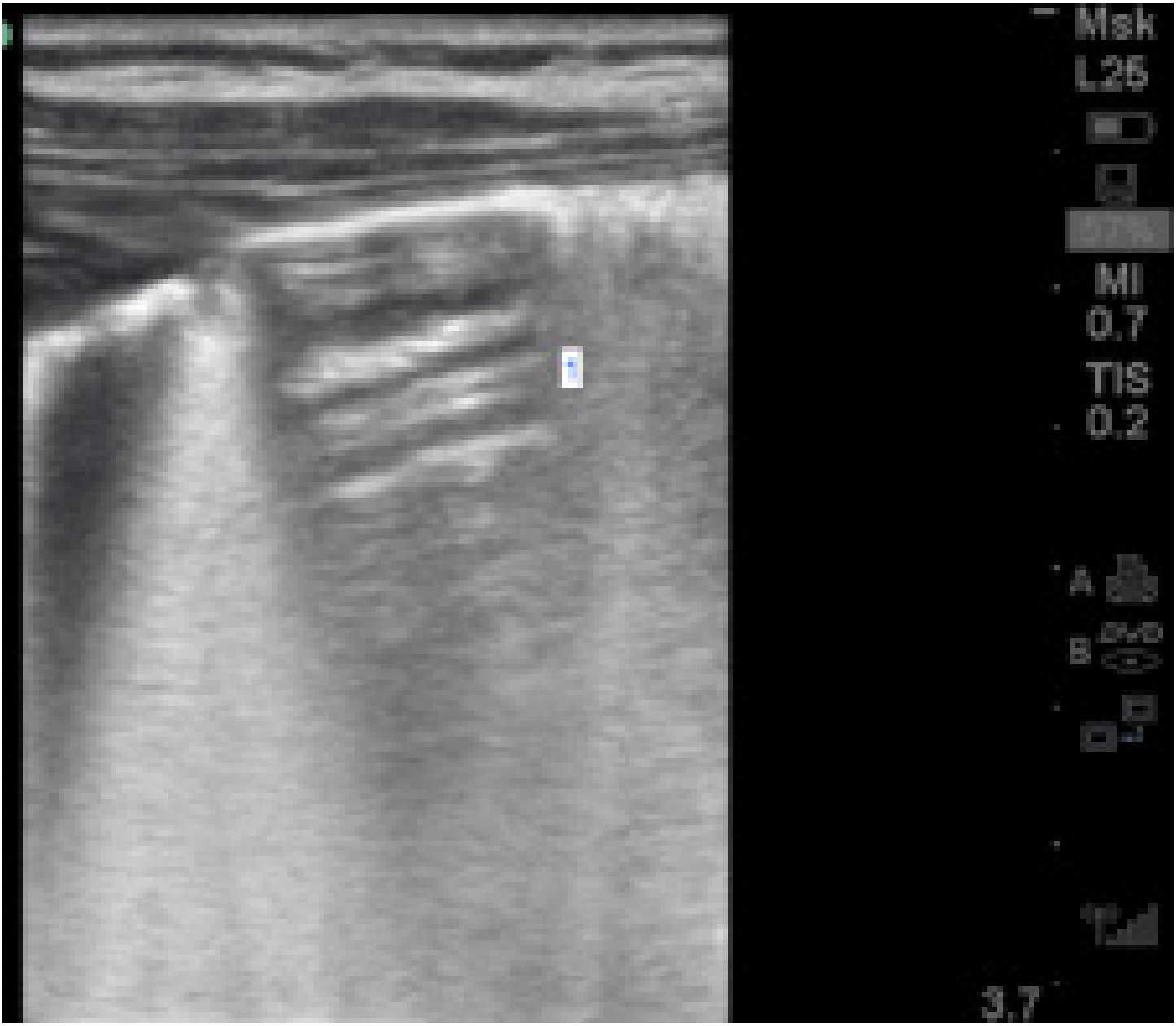
In view 1, a linear transducer in transverse plane over the anterior neck was used to view the NG Tube in the esophagus. In view 2, a linear or curvilinear transducer in sagittal plane over the anterior abdomen was used to view the NG Tube tip in the stomach. If the NG Tube was visualized in both views, the study was considered complete and confirmed proper NG Tube position.

Results A total of 16 studies with median subject age of 3.5 months were enrolled. The NG Tube was visualized in the esophageal view in 14 (87.5%) studies. The NG Tube tip was visualized in the stomach view in 4 (25%) studies. The NG Tube was visualized in both views and therefore considered complete and confirmatory in 4 (25%) studies. All NG Tube positions were confirmed via chest radiography or alternative method.

Conclusion(s) Point-of-care ultrasound provides many opportunities to decrease the burden of ionizing radiation for the pediatric patient but this study illustrates the difficulties of using POCUS for confirmation of nasogastric tube position in the pediatric emergency department. While POCUS confirmation of NG Tube location in the esophagus is quite sensitive, NG Tube tip position in the stomach was not reliably established. Further studies could use different patient positions, transducer locations, or saline injection to better visualize the NG Tube tip in the stomach.



View 1. The number 1 corresponds to the nasogastric tube visualized in the esophagus. The number 2 corresponds to the tracheal rings without a foreign body noted within.



View 2. The number 1 corresponds to the nasogastric tube visualized in the stomach.

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Pediatric and Emergency Medicine Resident Comfort in the Assessment and Treatment of Pediatric Pain

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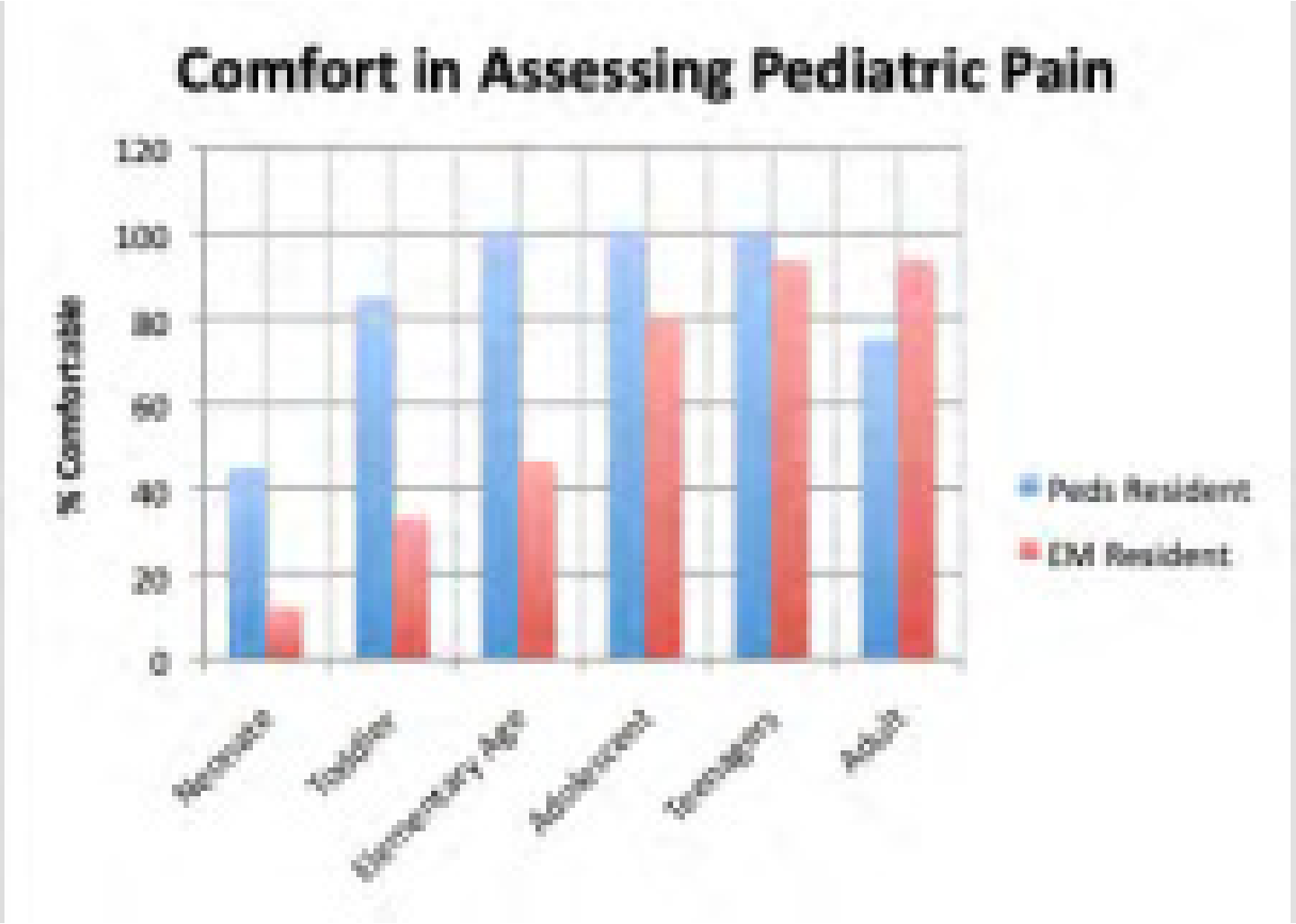
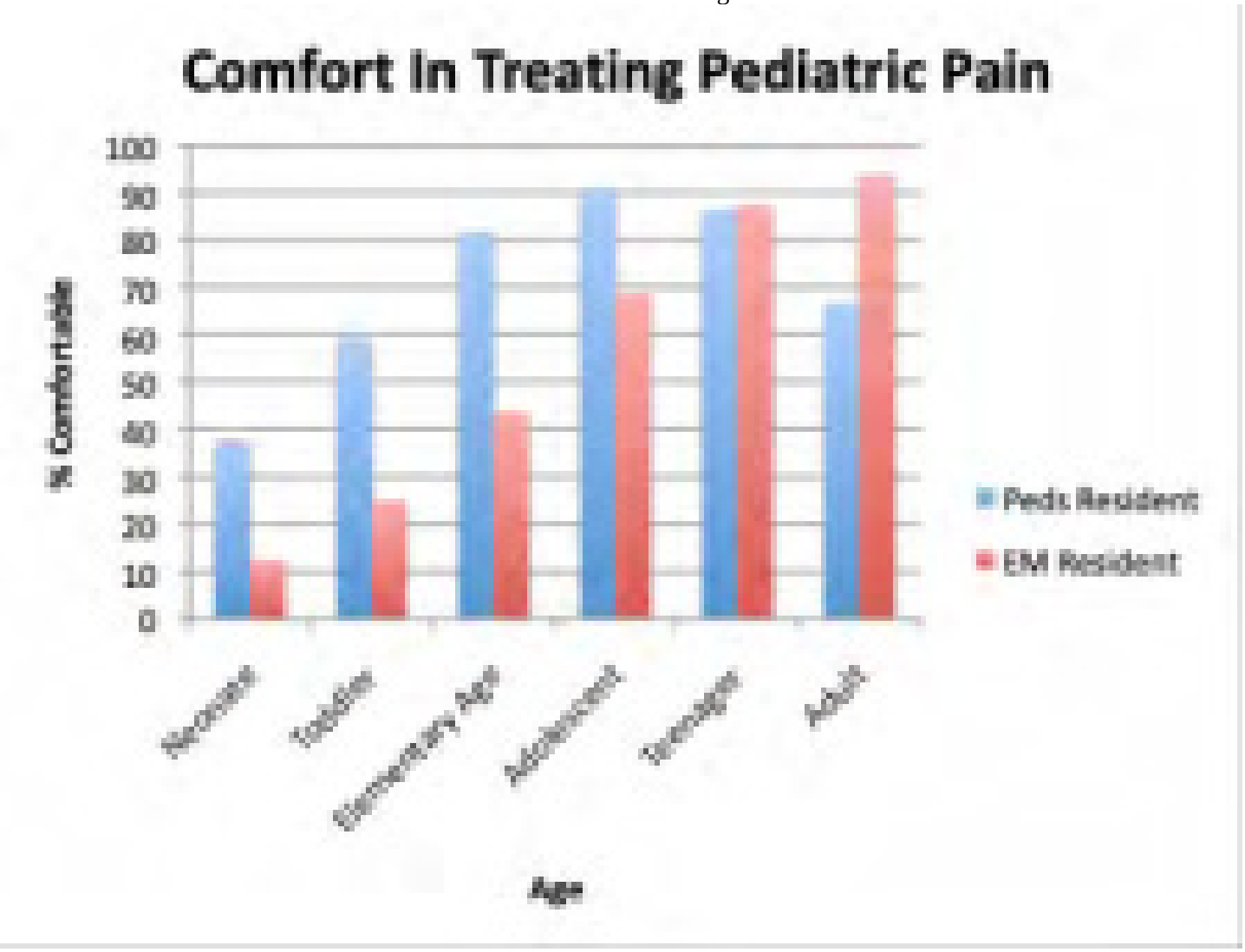
Background Pediatric pain is commonly encountered in the pediatric emergency room and inpatient settings. Prior studies have shown that pediatric pain may not always be adequately assessed or treated. Inadequate pain management can have significant short and long term effects on the patient. Younger age and lack of pain education have been documented as potential challenges for adequate pain assessment and management. Data regarding pediatric and emergency medicine (EM) resident physicians' comfort with pain assessment and treatment is limited. To our knowledge, this is the first study

comparing pediatric and EM residents' comfort in treating and assessing pain across various age groups.
Objective We aimed to assess pediatric and EM residents' comfort with pain assessment and pharmacologic treatments across various age groups.
Design/Methods 16 EM and 24 pediatric residents at a single institution completed an anonymous survey to report comfort with assessment and treatment of pain in pediatric patients of varying age ranges.
Results EM residents reported increased comfort treating and assessing pain with each older age group. Pediatric residents also reported increased comfort in treating pain in older children as compared to younger children. 100% of pediatric residents were comfortable assessing pain in patients of elementary age through teenage years. Both groups of residents were least comfortable assessing and treating pain in infants; 45% of pediatric residents were comfortable assessing and 38% were comfortable treating pain in infants, as compared to 12% of EM residents comfortable treating and assessing pain in infants.

100% of pediatric residents were comfortable treating all ages of patients with acetaminophen and ibuprofen. Over 92% of EM residents were comfortable using acetaminophen and ibuprofen in all age groups. Among narcotics, both EM and pediatric residents were most comfortable with intravenous morphine in all age groups. Pediatric residents were more comfortable using distraction in all pediatric age ranges as compared to EM residents. EM residents were more comfortable using intranasal fentanyl as compared to pediatric residents.
Conclusion(s) Both EM and pediatric residents were least comfortable with assessing and treating pain in younger pediatric patients. Lack of comfort with assessment and treatment of pain in younger children can lead to under-treatment of pain. Further education for residents in both specialties may improve comfort with pain management, especially in younger children.




Comfort In Treating Pediatric Pain
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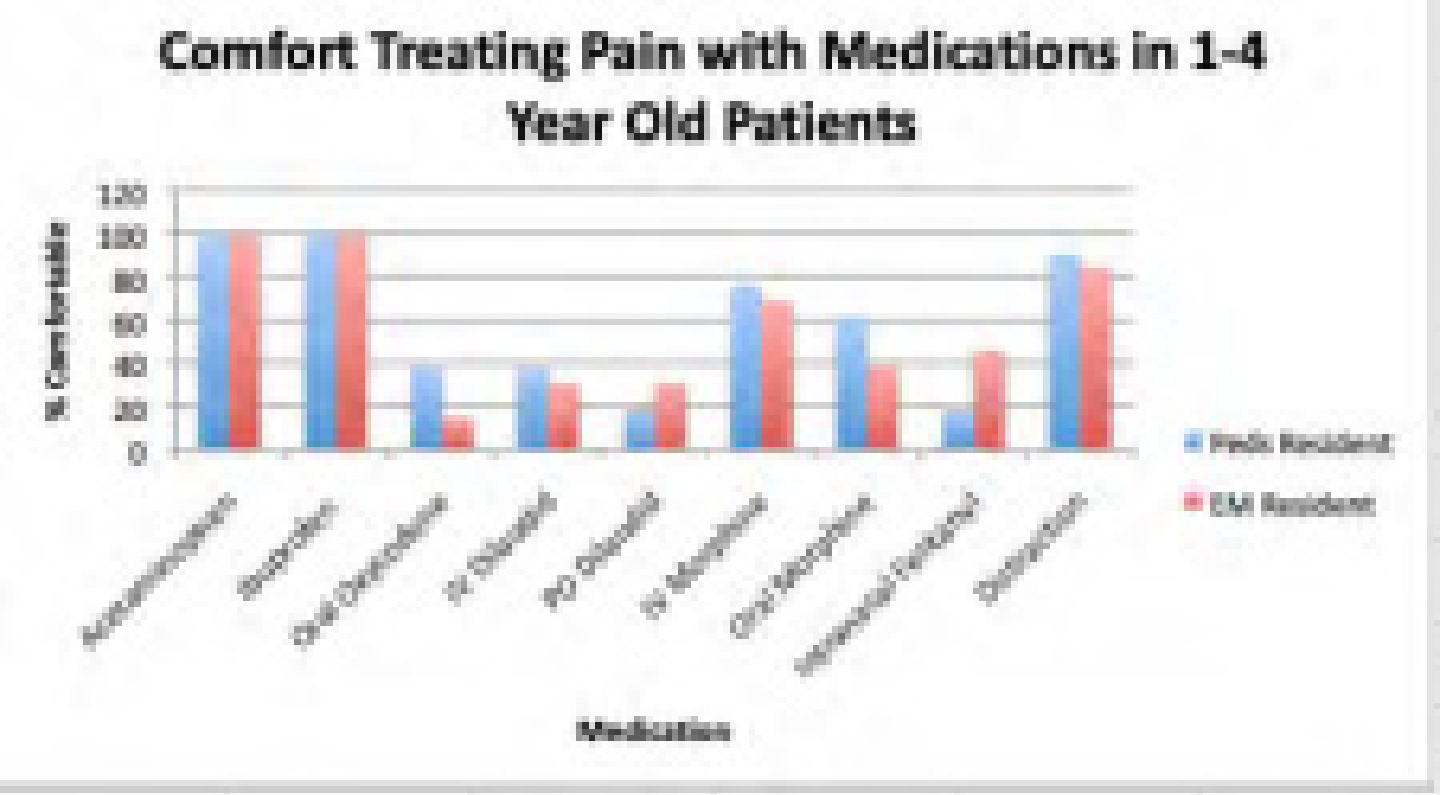
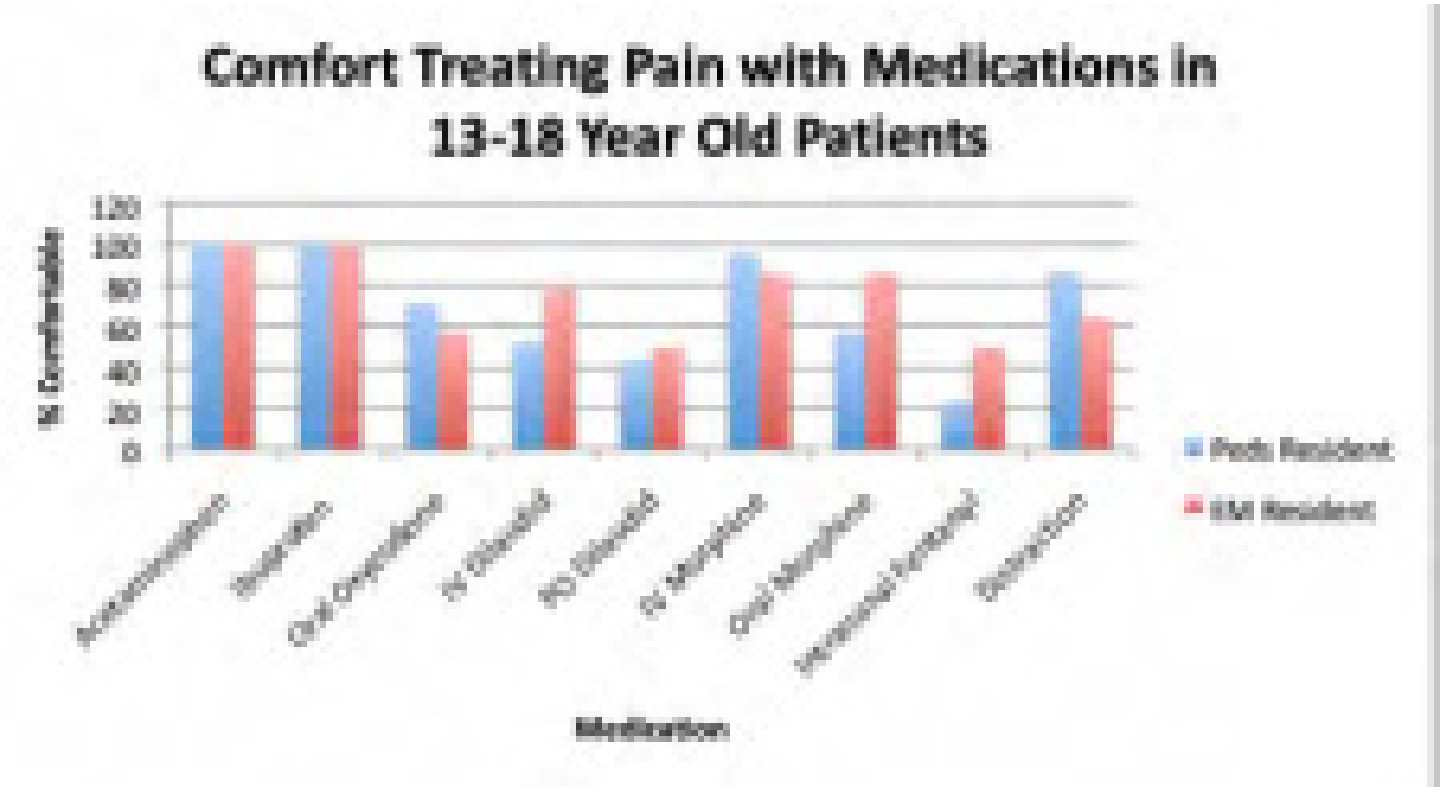
Teenager
Adult
Age
Peds Resident
EM Resident





Abstract: 386

Does crisis prevention training impact the use of seclusion and restraint for pediatric emergency department behavioral health patients?

Jacob Greenberg, Eric Hoppa, Steven Rogers

Connecticut Children's Medical Center, Hartford, Connecticut, United States

Background Acute agitation requiring seclusion or restraint occurs in pediatric emergency departments (PED). Previous studies have demonstrated that providers report limited training for such behavioral emergencies. Our institution implemented a crisis prevention training program for all PED staff from July 2017 to October 2017. To our knowledge, no previous study has described the impact of CP training on seclusion and restraint events in the pediatric emergency department.
Objective To demonstrate that crisis prevention training reduces seclusion and restraint events.
Design/Methods This single center retrospective cohort study includes children admitted to the behavioral health unit of the pediatric emergency department before, during, and after the 4-month crisis prevention training period. Patients admitted to the main emergency department and those with partial chart information were excluded. Frequencies of seclusion and restraint events were summed and portrayed in ratios to account for PED encounter length variability.
Results A decrease in median monthly seclusion and restraint events per patient day is noted after implementation of crisis prevention training (Figure 1). Over the 8-month pre-intervention period, 2606 patients accounted for 3313 encounters which summed to 61964 total patient hours. During this time, 296 seclusion or restraint events occurred in the PED behavioral health unit with 0.11 median monthly events occurring per patient day. During the intervention and post-intervention period, 4122 patients accounted for 4457 encounters which summed to 96701 total patient hours. During this time, 336 seclusion or restraint events occurred in the behavioral health unit with 0.04 median monthly events occurring per patient day. Though the ratio in May 2018 is below the baseline median, the ratios in March, April, and June 2018 appear above the baseline median.
Conclusion(s) This study demonstrates a significant decline in seclusion and restraint events after the implementation of a crisis prevention training program. While the number of patients admitted to the behavioral health unit was increased, the median ratio of seclusion and restraint events per time admitted to the behavioral health unit was decreased after the intervention of crisis prevention training. The higher than baseline ratios seen in March, April, and June 2018 may suggest the need for new staff training and old staff reinforcement programs.

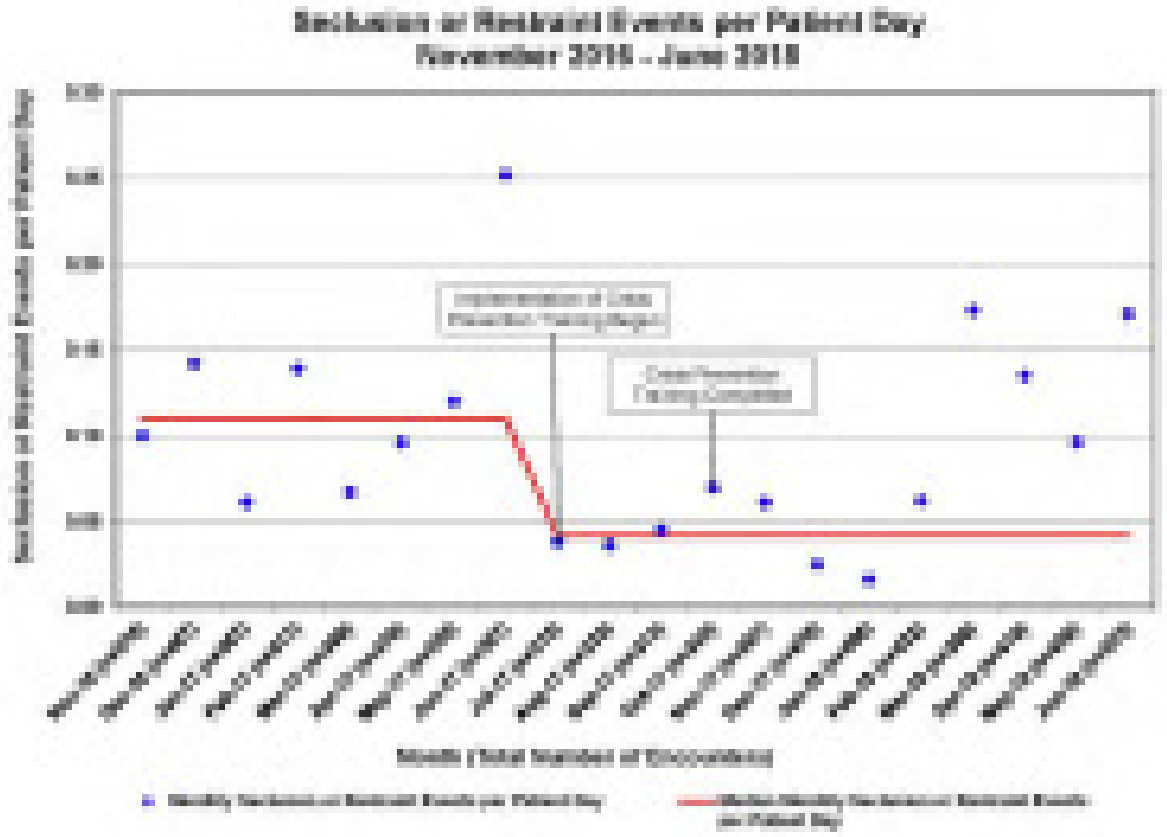


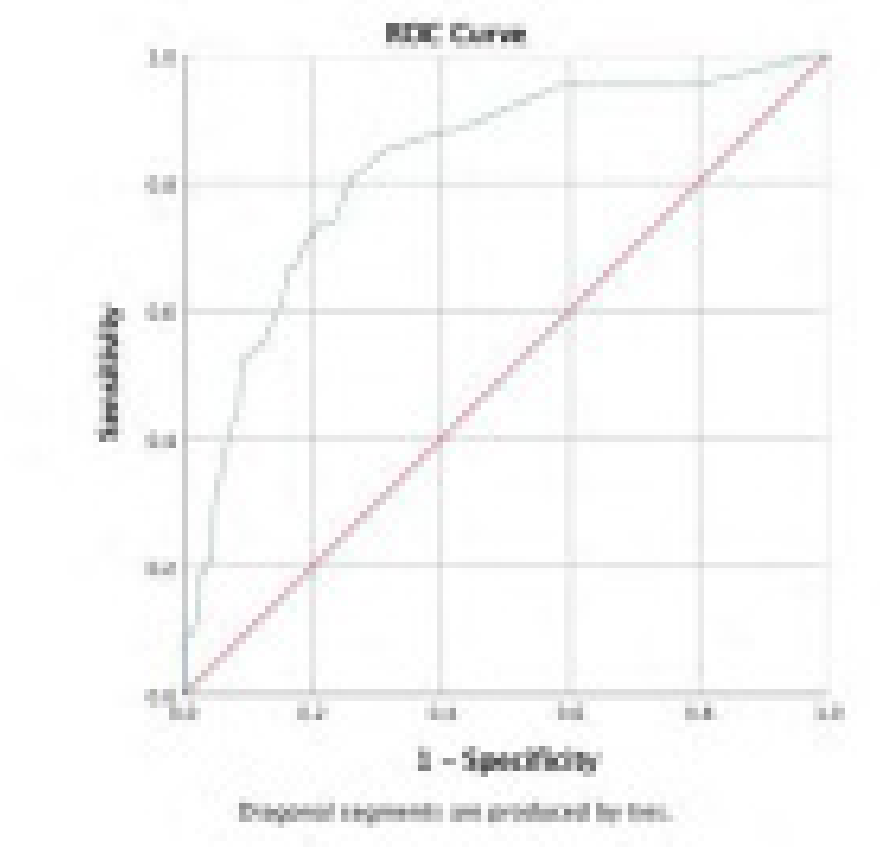
Figure 1.

Abstract: 387
Regression Modeling of Physical Restraint Use: Identifying Potential Racial Disparities in the Emergency Department
Melanie Zheng, Melissa L. Langhan
Yale School of Medicine, New Haven, Connecticut, United States

Background While physical restraint use is often a method of last resort for children with unsafe behaviors, restraint is used in >50% of cases involving aggressive patients. Physical restraint use has been associated with serious complications, such as rhabdomyolysis and asphyxiation, and also can impact psychological health and future healthcare interactions. There has been little research into which patient characteristics are associated with restraint use, and even less so in the pediatric emergency setting.
Objective The objective of this study was to describe physical restraint use in behavioral health patients in a pediatric emergency department (PED), assessing which patient characteristics are associated with utilization.
Design/Methods A retrospective chart review was conducted on all behavioral health visits for the first time in 2017 presenting to an urban, tertiary-care PED. Behavioral health visits were selected based on chief complaint inclusion criteria. Visits with a physical restraint order were analyzed using a logistic regression model with potential parameters of sex, age, race, insurance status, time of PED arrival, psychiatric diagnosis on problem list, medications, and prior family service (DCF) involvement.
Results *A* total of 1124 visits were identified; 60% were white and 26% black. There were 42 cases involving physical restraint

(3.7%). 6.8% of black patients were restrained compared to 2.7% of white patients. Median age for both restrained and unrestrained groups was 12 years. Race (p=0.008), psychotherapeutic (p=0.003), CNS (p<0.001), and autonomic (p=0.036) drug classes, and DCF involvement (p=0.003) were statistically significant in the final model of physical restraint use. Age was included as a clinically significant factor. Black patients were 2.59 (CI: 1.28, 5.26) times more likely to be restrained than their white counterparts in the adjusted analysis.

Conclusion(s) There are significant differences among patients with behavioral health complaints presenting to the ED who are restrained. While medication use and DCF involvement may suggest a population with more severe disease and social stressors, disparities found here may also represent inequality in health care delivery. Racial bias in physical restraint use should be considered and addressed, as its use can be detrimental to patient care, and differential utilization could represent another dimension of healthcare inequity.



Physical Restraint Use vs. Race Cross-tabulation

			Race			
			Black/African American	Asian	Other	White/Caucasian
Physical Restraint Use	N	Count	272	23	126	661
			25.1%	2.1%	11.6%	61.1%
	Y	Count	20	0	4	18
			47.6%	0.0%	9.5%	42.9%
Total		Count	292	23	130	679
			26.0%	2.0%	11.6%	60.4%

p = 0.021. Counts are listed with percentages of the physical restraint use category (Y/N) below.

Summary table of χ2 and Fisher's exact p values of potential variables for crosstabulations vs. physical restraint and vs. race.

	Significance vs. Physical Restraint Use	Significance vs. Race
Sex	**0.082**	0.016
Age (Binned)	0.524	**0.000**
Race	**0.021**	-
Insurance Status	0.071	**0.000**
Time of ED Arrival (Binned)	0.436	0.581
Prior Psych Diagnosis on Problem List	**0.043**	0.059
Any Psychiatric Drug Class on Prescription List	**0.000**	**0.010**
Psychotherapeutic	**0.00**	**0.016**
CNS	**0.00**	**0.065**
Autonomic	**0.001**	**0.028**
Antiparkinson	**0.020**	**0.045**
DCF BPA on EHR	**0.000**	**0.000**

Bolded p values are < 0.10.

Final Logistic Model Regression Parameter Summary

	Sig.	OR	95% C.I. for OR	
			Lower	Upper
Age (Binned)	0.184	0.637	0.327	1.239
Race	0.072			
Asian	0.998	0.000	0.000	
Other	0.314	0.558	0.180	1.735
White/Caucasian	0.008	0.386	0.190	0.783
Psychotherapeutic Drug Class	0.003	3.382	1.503	7.614
CNS Drug Class	0.000	3.851	1.837	8.070
Autonomic Drug Class	0.036	2.195	1.051	4.584
DCF BPA on EHR	0.003	3.416	1.510	7.728
Constant	0.000	0.000		

Final logistic model regression with cutoff of p > 0.20, corroborated with the backwards selection Wald statistic SPSS algorithm. Black/African American is used as the reference group within 'race'.

Abstract: 388

Risk Factors and Exposure to Violence in Pediatric Emergency Department Patients

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Background Violence among adolescents living in urban communities is a significant health problem. In the United States, the leading causes of death in 10 to 19-year-old youths are unintentional injury, suicide and homicide. Screening for current and future violence exposure may identify the highest risk group and provide an opportunity to refer to therapeutic services.

Objective To determine associations between the results of a validated screening tool, Violence Prevention Emergency Tool (VPET), and baseline socioeconomic risk factors.

Design/Methods This was a single-center, prospective observational survey study that included patients ages 8 to 18-years living in an urban setting, who presented to a pediatric emergency department. Eligible patients and their parents/guardians completed their respective questionnaires which included seven items relating to their exposure to violence as a witness, victim and/or perpetrator. The VPET score is calculated by adding the responses from each of the 7 items together, each item is scored from 0 (no times) to 3 (lots of times) with a total range 0 to 21 (highest risk). VPET scores were categorized into low violence-exposure (scores of 0-4) and high violence-exposure groups (scores of 5 and above). The two groups underwent Chi-Square Analysis and were compared to each other for each baseline risk factor.

Results A convenience sample of patients were enrolled from 2016 to 2018 (n = 836); 52% were male participants, 58% identified as Hispanic/Latino, 30% African American, and 9% White. The high exposure group included 207 patients, with a mean age of 12.0 years and an average score of 7.2. The low-exposure group included 625 patients with a mean age of 12.3 years and an average score of 1.7. There is a statistically significant difference in race, gender, and "injury" chief complaint as the reason for the ED visit between the two exposure groups ($p<0.05$). Other socioeconomic factors were not significant including: child attending an after school program, family living situation, parent/guardian education level and parent/guardian work status.

Conclusion(s) Race, gender and chief complaints were independently and significantly associated with youth scoring in the high risk category which parallels findings in other studies. Unpredictably, parent/guardian work status or family living situation did not appear to be related to the youth's reported level of violence exposure using the VPET tool.

Summary of Chi-Square analysis p-values for chosen baseline socioeconomic risk factors.

Abstract: 389

Association between 25-hydroxyvitamin D and Dyslipidemia in Obese African American Children.

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Background A consistent association is observed between increased BMI and low 25-hydroxyvitamin D [25(OH)D]. Furthermore, Vitamin D (VD) deficiency (VDD) is more prevalent among African Americans because pigmentation reduces VD production in the skin. Studies in adults have linked VDD with higher risk for dyslipidemia (DL) but there is a paucity of data in children.

Objective To evaluate if low 25(OH)D level is associated with DL in overweight (OW) and obese African American children.

Design/Methods Cross sectional study of OW and obese 10 to 18 year-old (yo) African Americans evaluated in the General Pediatric, Endocrine and Pediatric Obesity clinics at Brookdale Hospital in Brooklyn, NY from January 2014 to June 2018. Weight categorized into OW (BMI 85th – 94.99th centile), obese (BMI 95th – 98.99th centile) and severely obese (BMI≥99th centile). Lipid profile [Total cholesterol (TC), Triglycerides (TG), LDL, HDL] and 25(OH)D levels obtained during their regular visits were retrieved from the electronic health records. For patients who had similar labs obtained at more than one visit, the first visit was selected. VD level was categorized into 3 groups, VDD (25(OH)D<20ng/mL), Vitamin D insufficiency (VDI:25(OH)D 20-29.9ng/mL) and normal Vitamin D (VDN:25(OH)D ≥30ng/ml). DL was considered with any of the following: TC≥200mg/dL, TG≥130mg/dL, LDL≥130mg/dL or HDL<40mg/dL. Pearson correlation was used to analyze association between 25(OH)D and DL.

Results Data was available in a total of 249 subjects; 68% were females, mean age 13.55 yo (See table 1), 30% were OW, 51% obese and 19% severely obese. VDD was found in 42.5% (n=110), VDI in 46.7% (n=121) and VDN in 10.8% (n=28). There was no significant association between BMI and VD (p=0.318) as shown in table 3. Abnormal TC level was seen in 9.3% (n=24), abnormal TG in 8.5% (n=22), abnormal LDL in 12.7% (n=33) and abnormal HDL in 28.2% (n=73) subjects. No significant association was found between BMI and TC (p=0.14) or TG (p= 0.38). BMI was directly associated with LDL (p=0.046) and inversely with HDL (p=0.01). There was no association between 25(OH)D and TC (p=0.779), TG (p=0.904), LDL (p=0.854) or HDL (p=0.223) as shown in table 2 and figure 1.

Conclusion(s) Majority of obese and OW African American children have abnormal VD levels. There is no association between 25(OH)D and DL. DL may take several years from the beginning of reduction in 25(OH)D. Further longitudinal studies are required to evaluate an association between VDD and dyslipidemia.

Table 1 : Demographics and laboratory characteristics of study participants (n=259)

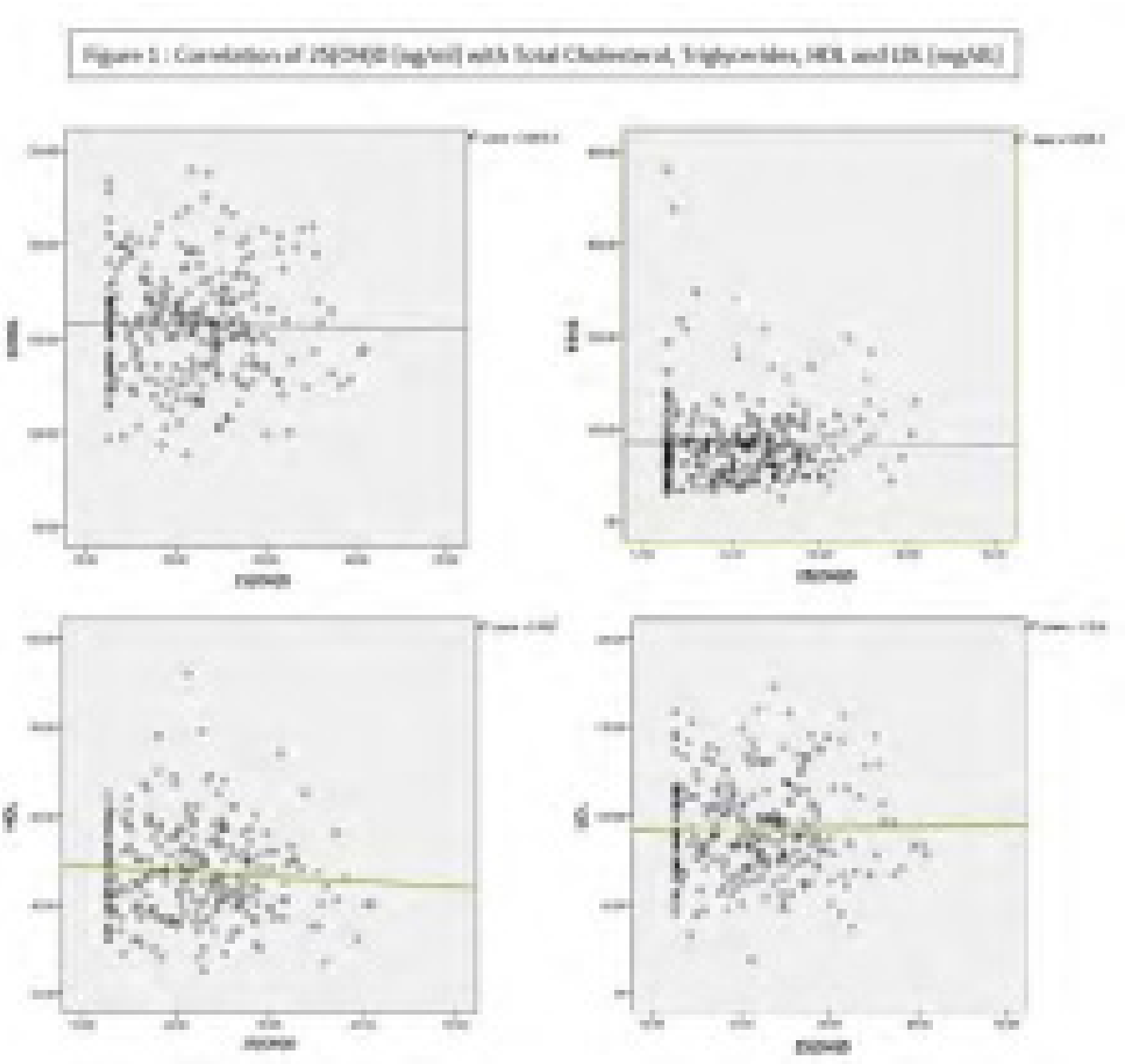
Variable	Mean	Standard Deviation (SD)	Median	Range
Age, years	13.6	2.6	13.0	10.0 - 18.0
Gender (n, %) Males (111, 32%) Females (166, 68%)	NA	NA	NA	NA
Weight, kg	80.9	21.3	79.1	39.1 - 181.2
25(OH)D, ng/ml	21.4	6.7	21.2	12.7 - 40.9
Total cholesterol, mg/dL	156.9	29.7	157.0	88.0 - 239.0
Triglycerides, mg/dL	84.2	44.8	77.0	25.0 - 380.0
LDL, mg/dL	93.8	27.3	89.0	18.0 - 172.0
HDL, mg/dL	47.2	10.3	47.0	25.0 - 92.0

Table 2 : Pearson correlation between 25(OH)D and lipid profile (Total cholesterol, Triglycerides, LDL and HDL)

		Total cholesterol	Triglycerides	LDL	HDL
25(OH)D	Pearson correlation	-0.18	-0.08	0.01	-0.76
	Sig (2 tailed)	0.770	0.904	0.954	0.323

Table 3 : Relationship between BMI and 25(OH)D

BMI		25(OH)D			
		VDN (ng/ml) 25(OH)D > 30	VDI (ng/ml) 25(OH)D 20-29.9	VDD (ng/ml) 25(OH)D < 20	Total
Overweight BMI 85th - 94.99th centile	Total (n)	9	56	93	38
	Percentage (%)	8.9	33.9	33.7	80.5
Obese BMI 95th - 98.99th centile	Total (n)	16	68	58	133
	Percentage (%)	8.3	35.5	30.2	93
Severely obese BMI ≥ 99th centile	Total (n)	3	18	27	48
	Percentage (%)	1.3	7.8	30.6	18.9
Total	Total (n)	28	125	119	259
	Percentage (%)	18.8	46.7	44.5	580
p-value = 0.318					



Abstract: 390

Parents seeking height-related medical care in an endocrine clinic have different motivating factors than parents in primary care and hold high expectations for quality of life benefit with GH therapy

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Background Parents of patients from pediatric primary care clinics are most concerned about treatment characteristics (efficacy and side effects), child health, and psychosocial functioning in deciding whether to seek medical care for a child's short height (Grimberg A et al. Horm Res Pediatr 2015;84(5):338-48). Patients seeking height-related care in endocrine subspecialty clinics differ demographically from the local population.
Objective To determine the factors that motivate parents of endocrine clinic patients to seek medical care for their child's height and compare to those of parents of primary care patients.
Design/Methods Parents of patients at a subspecialty endocrine center (EP) completed a survey assessing their concerns in deciding to seek medical care for their child's height, including identical questions previously asked of primary care parents (PP). Each concern was rated on a 5-point Likert scale.
Results Survey was completed by 166 EP (80% response rate), 46% of whom had a child on growth hormone (GH) therapy and 7% were at their initial endocrine clinic visit. EP group had a greater proportion of children that were white (75% EP vs 41% PP) and privately insured (80% EP vs 58% PP) than the 1820 PP surveyed previously. In both groups, treatment characteristics were rated by the most parents as having a *big or extreme impact* on decision making (65% EP, 58% PP). The second most frequently ranked impactful concern category for EP was comparison of their child to the growth chart or peers (60% EP, 32% PP), but health for PP (54% EP, 56% PP). Regarding expectations of GH therapy, 76% of EP rated GH treatment as potentially improving quality of life (QoL) issues related to their child's short height. Of those who selected *some* or *a lot* of benefit from GH, 88% reported 3 in. or more as the minimum height increase necessary to improve any QoL issues.
Conclusion(s) Comparison between their child's height and peers or growth chart was more likely to impact EP than PP in height-related medical decision making. Although many EP sought GH for QoL benefits, the minimum height increase deemed necessary for benefit was more than mean increases by GH treatment for idiopathic short stature. Clinicians should seek to understand each parent's motivations and expectations and provide information on realistic possible height gains to best support parents in the shared medical decision-making process regarding GH therapy.

Abstract: 391
Milk Fat Epidermal Growth Factor 8 (MFG-E8) in Preterm Infants: Milk and Stool Relationships
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[1]Cohen Children's Medical Center, Lilling Family Neonatal Research Lab, Feinstein Institute for Medical Research, Zucker School of Medicine at Hofstra/Northwell, New Hyde Park, New York, United States, [2]Cohen Children's Medical Center, Northwell Health, New Hyde Park, New York, United States

Background Milk fat globule epidermal growth factor 8 (MFG-E8), a naturally occurring secretory glycoprotein in human milk, suppresses the inflammatory response in the gastrointestinal tract. Human milk MFG-E8 may protect against inflammatory conditions in preterm infants, such as necrotizing enterocolitis, which is an activation of the inflammatory cascade. Although preterm infants usually receive their own mothers' milk, this milk often is fortified with bovine milk-based human milk fortifier (HMF). However, the effect of HMF or other milks fed to preterm infants on MFG-E8 concentrations in milk and stool have not been investigated.
Objective To evaluate the concentrations of MFG-E8 in milks fed to preterm infants and the associations between diet and fecal MFG-E8 concentrations.
Design/Methods Discarded 50 mL human milk samples (n=17) were collected from mothers of infants in the NICU and stored at -20°C along with samples of donor human milk (n=2) and preterm formula (n=1). Samples were centrifuged, the fat layer removed, and the supernatants were analyzed. Fecal samples were collected serially from 11 infants for 30 days after birth. Samples (100 mg) were added to a radioimmunoprecipitation assay buffer with protease and phosphatase inhibitor, and the protein was extracted via centrifugation. The supernatant was stored at -80°C until analyzed. MFG-E8 concentrations in milk and fecal extracts were measured using Human MFG-E8 Quantikine ELISA (R&D Systems, Minneapolis, MN).
Results The MFG-E8 concentrations of unfortified human milk (27 ± 4.2 micrograms/mL) were significantly greater (by 22%) than fortified human milk (21 ± 3.1 micrograms/mL), $p < 0.0002$. Both were greater than the nearly undetectable (below assay lower limit) concentrations analyzed in unfortified donor human milk, fortified donor human milk, or preterm formula. Median fecal MFG-E8 was significantly greater in infants fed mother's own milk (66 micrograms/g stool) than those fed donor milk (2 micrograms/g), formula (2 micrograms/g), or no milk (3 micrograms/g), $P < 0.001$.
Conclusion(s) MFG-E8 concentration was significantly higher in mothers' own milk compared with other milks fed to preterm infants and to the same milk after HMF was added. The 22% decrease after HMF addition may be dilutional. A diet of mother's own milk is associated with a greater fecal content of MFG-E8 not seen when other milks were fed to the preterm infant. The protective effect of MFG-E8 against inflammation may be compromised by diets other than mother's own milk.

Abstract: 392

The murine intestinal microbiome changes in response to Group B Streptococcus (GBS) colonization and predicts invasive disease

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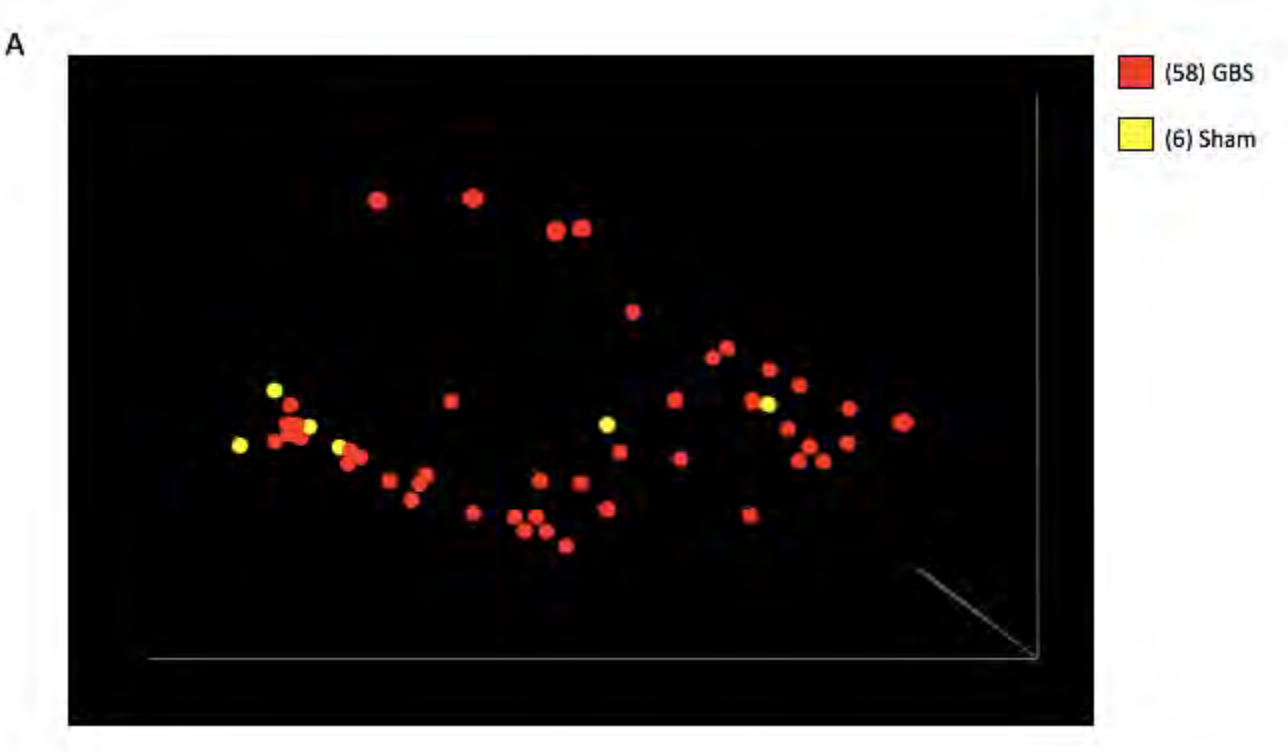
Background Late-onset (LO) disease is the most common clinical presentation of GBS infection during infancy. Gastrointestinal (GI) colonization with GBS is an important precursor to LO disease. We have previously demonstrated that juvenile mice develop sustained GBS colonization following gavage administration of GBS while adult animals are resistant and that GBS intestinal colonization in mice is correlated with the presence of specific microbial communities. We hypothesize that a pathogen-related intestinal dysbiosis precedes invasive disease.

Objective To assess longitudinal changes in the juvenile murine intestinal microbiome in the presence or absence of GBS colonization.

Design/Methods GBS (COH-1, serotype III, ST-17, 5x10^8 CFU/ml) or vehicle control was administered to juvenile (P12) mice via oral gavage. Serial fecal sampling was conducted 24 hours prior to exposure, on post-exposure days 4 and 7, then weekly until GBS was no longer detected culture. The V3 region of the 16S rRNA gene was sequenced using the Illumina MiSeq platform. Operational taxonomic unit (OTU) assignment and microbial community composition analysis were computed using QIIME and STAMP software packages. All samples with ≥ 10,000 reads were included for analysis.

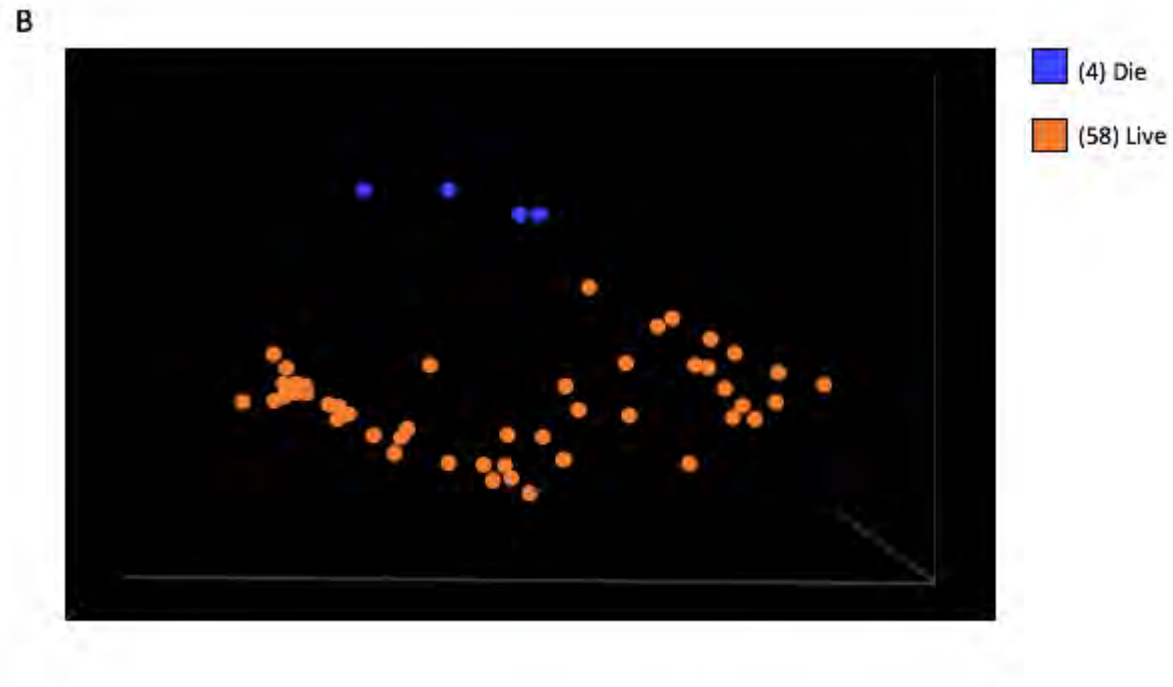
Results Principal component analysis (PCA) demonstrates that the fecal microbiome of mice evolves over time and majority of animals follow a similar trajectory regardless of GBS exposure. Some animals (4) clustered separately on post exposure day 4 (Figure A), subsequently developed invasive disease and died within 72 hours (Figure B). Samples from these animals had significantly higher concentrations of *Enterobacteriaceae* and *Enterococcus* taxa while those that survived had higher concentrations of *Lactobacillus* ($p < 0.003$, false discovery rate P value < 0.05).

Conclusion(s) Most juvenile mice colonized with GBS eventually clear GBS from the GI tract. In animals that developed invasive disease and death, we observed distinct changes in microbiome composition. The presence or absence of select taxa may contribute to the host's ability to restrict GBS to the GI tract. Specific alterations in GI microbiome composition may predict GBS sepsis.



Intestinal microbiome predicts invasive disease and mortality.

Figure A. Principal component analysis based upon operational taxonomic unit (OTU) composition in juvenile mice based on exposure, Sham versus GBS.



Intestinal microbiome predicts invasive disease and mortality.
Figure B. Principal component analysis based upon operational taxonomic unit (OTU) composition in juvenile mice based on mortality.

Abstract: 393
Is a single dose of hepatitis B vaccination enough to restore immunity to children with inflammatory bowel disease on biological therapy?
Alexandru Firan[1], Suruchi Batra[2], Mark Tufano[2], Bernadette Diez[2], Lynn Duffy[2], Suchitra K. Hourigan[2]
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Background Children with Inflammatory Bowel Disease (IBD) are screened for Hepatitis B infection and immunity prior to starting a biologic therapy. The rate of non-immunity amongst these children is high. It is unknown whether a three part Hepatitis B series versus a single booster immunization in IBD patients undergoing biologic therapy is needed to achieve immunity.
Objective To assess the titer response to a three part Hepatitis B series versus single booster immunization in IBD patients undergoing biologic therapy previously found to be non-immune to Hepatitis B.
Design/Methods A prospective randomized un-blinded trial was conducted. Enrolled subjects were randomized to receive a single Hepatitis B vaccine or three part vaccine series. Hepatitis B titers were checked a minimum of two weeks after vaccine administration. Inclusion Criteria: Subjects with a diagnosis of IBD, between the ages of 5 and 23 years, currently being treated with or soon to be treated with a biologic therapy, and found to have a Hepatitis B Surface Antibody less than 10 and Hepatitis Surface Antigen negative. Exclusion Criteria: Subjects found to have Hepatitis B Surface Antibody level greater than 10, Hepatitis Surface Antigen positive, or with history of allergic reaction to vaccine administration.
Results Results: 14 patients were analyzed. 11 had Crohn's Disease and 3 had Ulcerative Colitis. Mean age was 14 years (range 11-18); 12/14 were males. 9 patients were treated with Infliximab, 2 with Adalimumab, 1 with both Infliximab and Adalimumab, 1 with Infliximab, Adalimumab, Ustekinumab, and Vedolizumab, and 1 was not receiving treatment with biologics yet. 14/14 children had a positive titer considered immune (≥10 mIU/mL). The type of biological therapy they received did not affect whether there was a satisfactory immune response. However, those who received the complete series had higher post vaccination antibody levels (mean titer level from single booster=150mIU/mL, mean titer level from 3 shot series = 620mIU/mL; p=0.026)

Conclusion(s) A single Hepatitis B booster vaccine was sufficient to provide immunity to children with IBD. Immunity was not dependent on the type of biologic therapy a patient was receiving.

Abstract: 394

Fear of Hypoglycemia Impacts Quality of Life in Adolescents with Type 1 Diabetes

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Background Fear of hypoglycemia (FOH) has been shown to correlate with adverse glycemic control, reduced quality of life, and reduced physical activity in adults with Type 1 Diabetes (T1D). The effect of FOH on these outcomes in adolescents with T1D has not been fully examined.

Objective To examine the associations between FOH and quality of life (QOL), glycemic control, and physical activity in adolescents with T1D, as well as how the use of diabetes technologies (continuous glucose monitor (CGM) and insulin pump) influences these relationships.

Design/Methods Adolescents with T1D completed questionnaires evaluating FOH (Children's Hypoglycemia Fear Survey, C-HFS), QOL (PedsQL), and physical activity level (Physical Activity Questionnaire-Adolescent). Blood sugar control was estimated from hemoglobin A1c, glucometer, insulin pump and CGM data collected at the diabetes clinic visit closest to survey completion.

Results Seventy-three adolescents (30 male, 43 female) with a median (IQR) age of 16 (15,17) and duration of T1D of 5 (2, 9.5) years completed surveys. Insulin pumps were used by 47 (64%), and CGM by 48 (66%).

FOH showed a strong negative correlation with QOL (r^2=0.33, p<0.001), especially when evaluated with the HFS-Worry subscale (r^2=0.33, p<0.001), which reflects anxiety surrounding hypoglycemia. The HFS-Behavior subscale, which assesses hypoglycemia avoidance behaviors, showed only a weak correlation (r^2=0.08, p=0.02).

FOH was associated with higher mean glucose concentrations (r^2=0.09, p=0.02), but not hemoglobin A1c (r^2=0.02, p=0.2). FOH scores did not differ with CGM use [36 (23, 46.5) with CGM vs. 38.5 (30, 46) without, p=0.4]. However, patients not using CGM did exhibit an association between the FOH and hypoglycemia frequency (r^2=0.24, p=0.02), whereas those using CGM did not (r^2<0.01, p=0.95). Insulin pump use, duration of T1D and physical activity level were not associated with differences in the FOH score.

Conclusion(s) The impact of FOH on the quality of life of adolescents with T1D may be under-recognized. The use of diabetes technologies is not associated with differences in FOH in this population. Although glycemic control appears only marginally associated with FOH, the observed impact of FOH on quality of life suggests that diabetes care teams should incorporate FOH into their counseling and education efforts.

Abstract: 395

Multi-omic analysis of acute response to growth hormone stimulation in pediatric patients

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Background While it is well established that growth hormone (GH) has multiple complex interactions with the immune system, the acute effects of GH at the global molecular scale remain largely unknown. A multi-omic approach offers the opportunity to characterize these effects across a broad molecular landscape.

Objective To characterize the molecular landscape of pediatric patients at baseline (T0) and post 3-hour GH stimulation test (T3) using high throughput data analytics, and to explore potential differences in GH sufficient (GHS) and GH deficient (GHD) patients.

Design/Methods This is a prospective study of pediatric patients with short stature undergoing a 3-hour GH stimulation test (arginine, glucagon). Patients with genetic syndromes, renal failure, recent immunosuppressant use and those born small for gestational age were excluded. Paired blood samples were obtained at T0 and at T3 for transcriptomics, proteomics and metabolomics. Molecular signatures were determined using a linear model adjusting for paired samples, response to GH stimulation, sex, BMI and batch (sign. at FDR <0.1). Integrative functional analysis was performed with the Gene Set Enrichment Analysis (GSEA) and MetaboAnalyst tools.

Results Fifty-four patients were enrolled (39 boys, 15 girls; ages: 5-18 years), of which 22 were GHD (GH peak <10 ng/ml). GHD and GHS groups were not statistically different in age, gender, pubertal status, height standard deviations (SDs), weight SDs, BMI and IGF-1 SDs, but differed in growth velocity (p < 0.05). A total of 3,119 genes, 42 inflammatory proteins and 590

metabolites changed expression significantly with time, regardless of GH status. The majority of significant genes (98%) were upregulated, whereas the majority of significant metabolites (74%) were downregulated. Enriched pathways of significant genes and proteins included activated cytokine, chemokine, interleukin and interferon signaling, and metabolic pathways of cholesterol, fatty acid and insulin response. Concordantly, significant metabolites were enriched for amino acid and lipid metabolic processes.
Conclusion(s) This study provides a molecular systems overview of acute GH stimulation, a broad perspective on immune system activation, metabolic alterations and insulin response, and new research avenues for determining differences between GHD and GHS pediatric patients.

Abstract: 396
Pediatric Hyperglycemic Emergencies Spectrum
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Background Diabetic ketoacidosis (DKA) and hyperglycemic hyperosmolar state (HHS) are the main hyperglycemic emergencies in diabetes mellitus, with distinctive definitions and differences in complications and management. However, both can present in combination; these are called mixed DKA-HHS presentations. Very few reports exist about the frequency of such presentations and complications. Characterizing the patients into the appropriate groups will help optimize appropriate fluid and insulin treatments and prevent complications.
Objective To describe the frequency of DKA, HHS, and mixed DKA-HHS presentations, assess accuracy of diagnosis codes for these 3 groups and explore differences in presentation profiles, such as presence of altered mental status (AMS), hyperosmolarity, length of stay (LOS) and mortality rates, in a pediatric population.
Design/Methods Retrospective cohort study of hyperglycemic emergencies in pediatric patients hospitalized to the pediatric intensive care unit at Brookdale Hospital Medical Center in Brooklyn, NY between Jan 2014 and November 2018. The hyperglycemic emergencies were determined by biochemical criteria and compared to the associated diagnosis code (see Table 1).
Number (%) was used to describe categorical variables, and median (with interquartile ratio IQR) or mean (±SD) were used to describe numerical variables. Comparison was done using Chi–squared ($\chi 2$) test for categorical variables, and Student's t-test or Mann-Whitney test for numerical variables (according to normal distribution).
Results A total of 78 hyperglycemic emergencies were reviewed: : DKA 57 (73%), Mixed DKA-HHS 16 (21%), HHS 5 (6%). Demographic and other baseline characteristics are shown in Table 2. Type 1 diabetes was more prevalent in DKA group, while Type 2 diabetes was more prevalent in HHS group (p=0.005).
Mixed presentations and HHS were incorrectly coded in 87% and 20%, respectively. There were no differences in median HbA1C and BMI among the 3 groups. Comparison in laboratory and clinical characteristics are shown in Table 3. LOS was longer for HHS (p=0.042) and mixed (p=0.03). AMS (p=0.003), hyperosmolarity (p<0.001), acidosis (p<0.003) and ketosis (p<0.001) at presentation were worse for mixed presentations.
Conclusion(s) A mixed DKA-HHS presentation occurred in more than one fifth of the hyperglycemic emergencies, a higher prevalence than previously reported in the pediatric literature. This mixed entity is frequently under-diagnosed. Recognition of mixed DKA-HHS is important because of its severity and the different strategies in management.

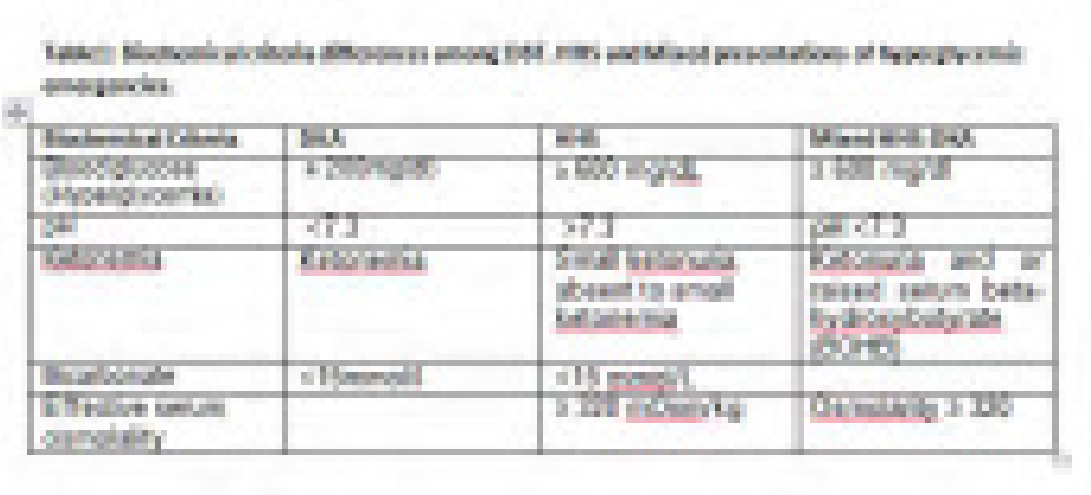

Table 2: Demographic and other baseline characteristics of studied diabetic patients admitted to PICU with DKA/HHS/Mixed (n=78)

Variable	DKA N=57 (73%)	HHS N=5 (6%)	Mixed N=16 (21%)	p-value
Male Sex, n (%)	26 (46%)	5 (100%)	6 (38%)	0.043*
Race: -Black, n (%)	50 (91%)	3 (60%)	14 (88%)	0.233*
-Hispanic, n (%)	4 (7%)	2 (40%)	2 (13%)	
-Other, n (%)	1 (2%)	0 (0%)	0 (0%)	
Current Age, Mean (±SD)	13.4 (± 3.1)	14.4 (± 2.7)	14.1 (±2.3)	0.469* 0.715†
BMI Z score, Mean (±SD)	0.02 (±1.14)	0.66 (±0.90)	-0.21 (±2.44)	0.366* 0.728†
Type: -T1D	54 (95%)	3 (60%)	14 (88%)	0.003*
-T2D	1 (2%)	2 (40%)	1 (6%)	
-Unknown	1 (2%)	0 (0%)	1 (6%)	
HbA1C, Mean (±SD)	13.4 (±2.1)	14.9 (±1.3)	13.6(±1.7)	0.150* 0.70†
Accurate coding, n (%)	56 (98%)	4 (80%)	2 (13%)	<0.001*

1=comparing the 3 groups, 2=comparing DKA and HHS, 3=comparing DKA and Mixed

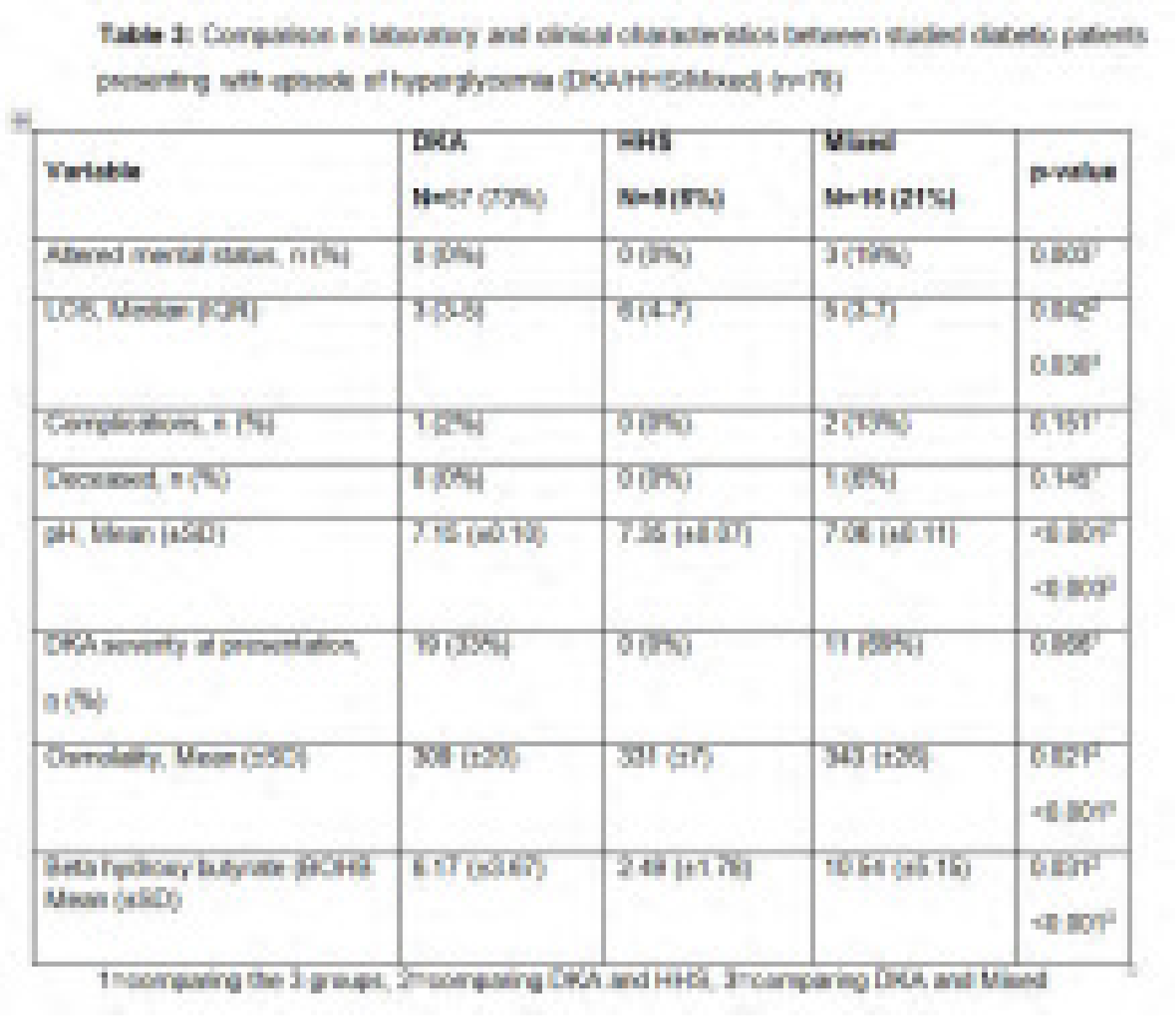

Table 3: Comparison in laboratory and clinical characteristics between studied diabetic patients presenting with episode of hyperglycaemia (DKA/HHS/Mixed) (n=70)

Variable	DKA N=47 (73%)	HHS N=8 (8%)	Mixed N=15 (21%)	p-value
Altered mental status, n (%)	8 (0%)	0 (0%)	3 (19%)	0.003[1]
LOS, Median (IQR)	3 (3-5)	6 (4-7)	5 (3-7)	0.042[2] 0.838[3]
Complications, n (%)	1 (2%)	0 (0%)	2 (13%)	0.151[1]
Deceased, n (%)	0 (0%)	0 (0%)	1 (6%)	0.148[1]
pH, Mean (±SD)	7.15 (±0.13)	7.35 (±0.07)	7.08 (±0.11)	<0.001[1] <0.001[2]
DKA severity at presentation, n (%)	19 (33%)	0 (0%)	11 (69%)	0.002[1]
Osmolality, Mean (±SD)	308 (±20)	301 (±7)	343 (±28)	0.021[2] <0.001[3]
Beta hydroxy butyrate (BOHB) Mean (±SD)	6.17 (±3.67)	2.48 (±1.76)	10.64 (±5.15)	0.031[2] <0.001[3]

1=comparing the 3 groups, 2=comparing DKA and HHS, 3=comparing DKA and Mixed

Abstract: 397

Human fetal mucosal immunity is complex and functional early in second trimester

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Background It has long been postulated that newborns are born with a poorly developed immune system. Consistent with this theory, up to a 1/3 of neonatal deaths are attributed to infectious diseases. Furthermore, newborns have reduced immune responses to vaccines. Yet, most newborns are healthy. Direct human data investigating *in utero* fetal mucosal immune system is sparse.

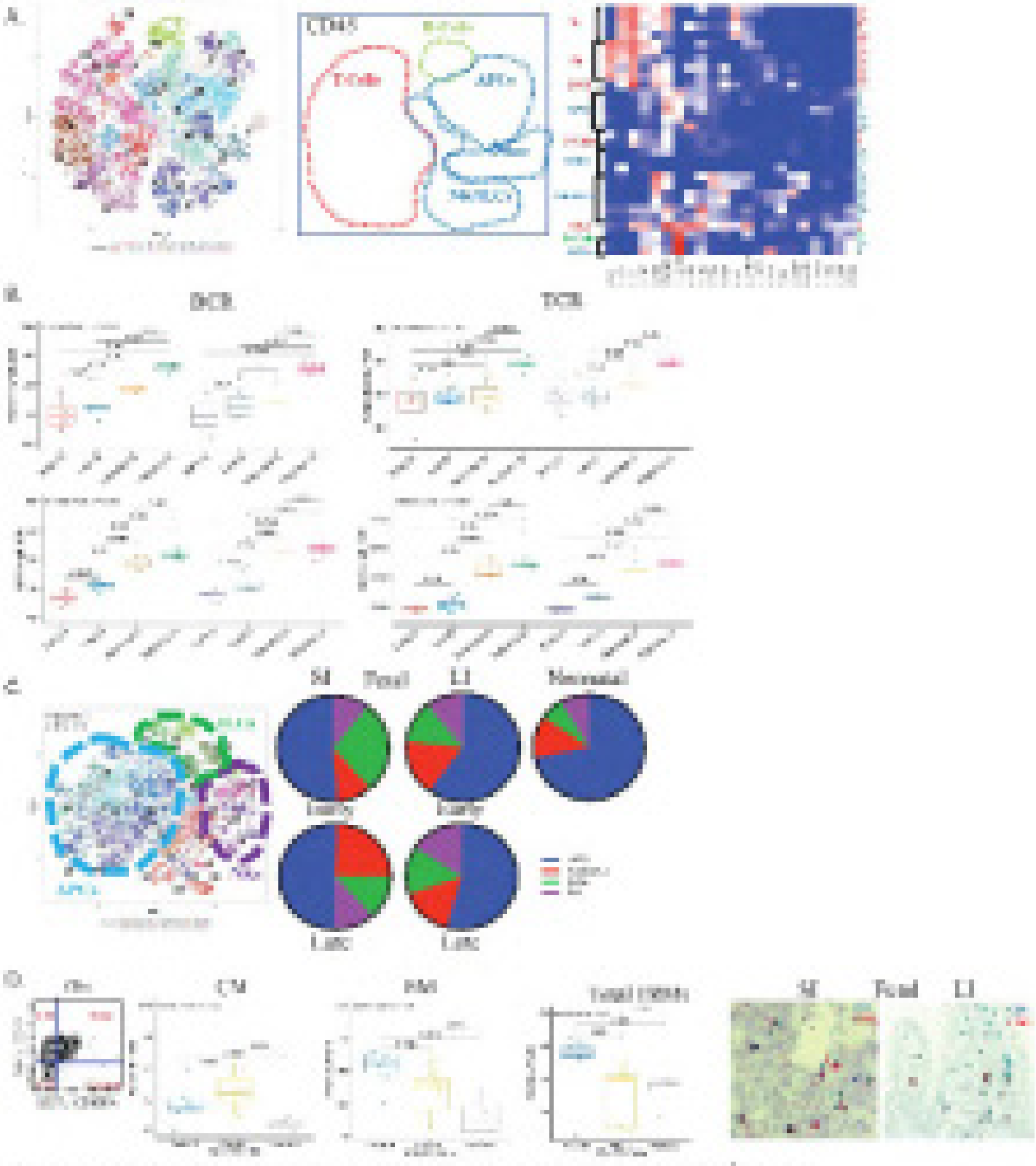
Objective To investigate the complexity of human fetal intestinal immune system in the small (S) and large intestine (LI).

Design/Methods Discarded S/LI samples were obtained from 20 fetuses from 16-23 weeks' gestation (GA) and 5 neonates. Next generation sequencing (NGS) used to sequence T-cell receptor (TCR) and B-cell receptor (BCR) repertoires. Mass cytometry (CyTOF) used to analyze immune populations. Automated and manual clustering algorithms used to define immune complexity.

Results We demonstrate that both the innate and adaptive immune systems are present, complex and functional as early as 16

weeks GA (Fig 1A). BCR and TCR repertoires are as diverse in early second trimester as in full term samples with an increase in CDR3β length and distance-from-germline correlating with advanced GA (Fig 1B). The innate immunity is dominated by antigen presenting cells (50-60% of innate cells depending on GA and location), innate lymphoid cells (12-28%) and natural killer cells (9-15%) (Fig 1C). $CD103^+$DCs, critical in maintaining homeostasis and involved in the recruitment and memory generation of T-cells, are present at 17 weeks GA. There is significant complexity within the B-cell populations. Follicular ($CXCR5^+$) and transitional ($CD38^+/CD24^+$) B-cells are more abundant in the fetal and $CD69^+IgM^+$ B-cell are more abundant in the neonatal tissue. Similarly, there is high complexity in mucosal T-cells, which represent >50% of fetal mucosal immune cells (Fig 1A). The frequencies of T-cells are similar in fetal SI, LI and neonatal tissue. Majority of T-cells present are central and effector memory T-cells. Finally, functional tissue resident memory T-cells are abundant and capable in responding to stimulation by secreting cytokines (Fig1D).

Conclusion(s) Our data provide the foundation for a mucosal immune atlas of second trimester human fetal development and challenge the paradigm that the neonatal mucosal adaptive immune system is immature, suggesting that development occurs significantly earlier than previously reported. It lays the foundation necessary to understand both normal development as well as the pathogenesis of gastrointestinal mucosal diseases.


A
CD45
T cells
APCs
B
BCR
TCR
C
SI
Total
LI
Normal
Ileitis
Lung
Colitis
Colitis
D
Obs
CM
RM
Total (BM)
SI
Total
LI

Abstract: 398

Association between eczema and anemia in young children in a low income minority community

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Background The prevalence of childhood eczema is 13% in the United States and most children (65%) are affected by 18 months of age. A recent large nationwide population survey showed children 1-17 years of age with eczema had 83% higher odds of anemia compared to children without eczema.

Objective To explore the association of eczema with anemia in young children in a low income minority community.

Design/Methods We conducted a cross sectional survey of 18-30 month old children seen at a pediatric primary care network in North Philadelphia (includes 12 community practices and 1 hospital based academic practice) with a CBC. All laboratory samples were obtained by venipuncture and processed by QUEST laboratory. Demographics and diagnostic data were extracted from the electronic medical records. We included diagnoses of atopic dermatitis and eczema with ICD10 code of L20. The diagnosis of eczema was validated by manual chart review. Anemia was defined as hemoglobin <11 mg/dL.

Results The study sample included 923 children: their mean age was 24.4 months, 52% were male, 61% were African American; 92% had public insurance. Nearly one fifth (17.1%) had eczema and the diagnosis was validated in 95%. We found no difference in the mean levels of hemoglobin (Hgb), mean corpuscular volume (MCV), red cell distribution width (RDW) in children with and without eczema (Table 1). One sixth of children with eczema (15.2 %) had anemia compared to 17.5% of children without eczema, but this was not statistically significant.

Conclusion(s) Eczema was not associated with anemia in young children in a low income urban minority community.

Table 1. Children 18 -30 months (N=923)

	Eczema N=157	No eczema N=766
Hgb< 11	24 (15.2%)	134 (17.5%)
Hgb<10.5	9 (5.7%)	54 (7%)
MCV <72	16 (10.1%)	79 (10.3%)
RDW >16	26	130
Hgb (mean)	11.8	11.8
MCV (mean)	78.5	78.8
RDW (mean)	14.7	14.8
Lead >5 (N=863)	8 (5%)	57 (7.5%)

Abstract: 399

Association Between Thyroid Autoimmunity and Joint Hypermobility in Children and Adolescents

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Background Joint Hypermobility (JH) syndrome is a common non inflammatory hereditary connective tissue disorder not attributable to a systemic rheumatologic disease. Autoimmune thyroid disorders include Graves' disease and Hashimoto thyroiditis. There are no studies to determine whether there is an association between JH and thyroid autoimmunity.

Objective To explore the association between JH and autoimmune thyroid disorders.

Design/Methods Case control study comparing Beighton scores in children and adolescents aged 5-18 years with autoimmune thyroid disorders, non autoimmune thyroid disorders and healthy controls visiting Flushing Hospital Medical Center between May and Nov 2018. Exclusion criteria included rheumatological, neurological and psychiatric conditions. All cases and controls were examined by one investigator to determine their Beighton score, one point for dorsiflexion of 5th digit beyond 90°, passively oppose the thumb to the flexor aspect of the forearm, hyperextend the knees beyond 10° and hyperextend the elbows beyond 10° and forward flexion of the trunk with the knees straight so that the palms rest flat on the floor. Beighton

score range 0-9 and a score ≥4 indicate JH. Data collected include age, gender, ethnicity, BMI, family history (FH), thyroid function tests and thyroid autoantibodies. Data were analyzed using SPSS software, ANOVA, percentages and chi square, $p<0.05$ was considered significant.

Results Total of 109 subjects visiting Flushing Hospital Medical Center consented to participate. G1 included 34% with Hashimoto's thyroiditis, G2 21% with non autoimmune hypothyroidism and G3 45% healthy subjects. G1, G2 and G3 were compared for age (median 14.1, 10.4, 10.4 years) F=10.2 p<0.01, gender (54%, 48%, 51% female) F=2.3 p=0.89, BMI >25.0 kg/m^2 (24%, 13%, 18%) F=2.3 p=0.11, ethnicity (46%, 35%, 84% Hispanic), FH of autoimmunity (73%, 35% 12% positive) x^2=33.2 p<0.01 and Beighton score ≥4 (3%, 0, 3%) x^2=1.9 p=0.40. In G1 11% was positive for thyroid peroxidase antibodies only, 35% positive for thyroglobulin antibodies only, 49% positive for both and 5% reverted to negative for both. All subjects were euthyroid at time of testing.

Conclusion(s) In our small sample, prevalence of JH was not increased in children and adolescents with autoimmune thyroid disorders or treated thyroid dysfunction compared to healthy subjects.

Abstract: 400

Effect of Inhaled Nitric Oxide on Three Site Near Infrared Spectroscopy (NIRS) During PRBC Transfusion for Extreme Anemia

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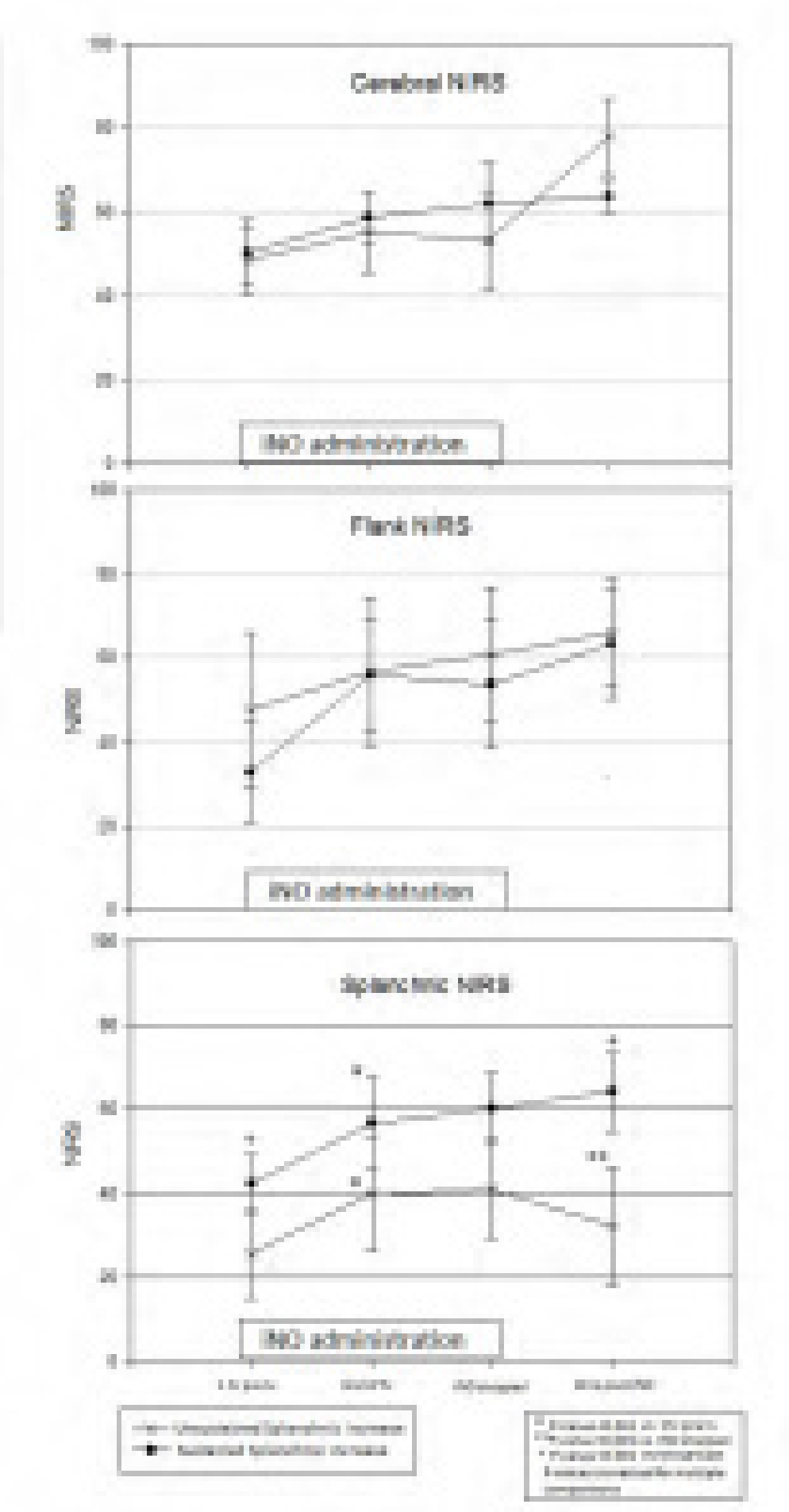
Background Packed red blood cell (PRBC) transfusions (Tx) are associated with acute gut injury in a subset of severely anemic neonatal patients (TRAGI; NeoReviews 16(7): e420, 2015). Since stored PRBCs are deficient in nitric oxide (NO), scavenging endogenous NO in the peripheral microvasculature by NO-depleted RBC or by free hemoglobin from hemolyzed RBCs may lead to vasoconstriction of the dependent microcirculation of intestinal villi resulting in mucosal injury. Administration of inhaled nitric oxide (iNO) increases the rate of nitrosylation of hemoglobin (Hgb) during RBC/Hgb passage through the lung. *We hypothesize* that iNO during PRBC Tx may mitigate the putative adverse vascular effect.

Objective To evaluate the effect of iNO on NIRS before, during, and after PRBC transfusion for extreme anemia.

Design/Methods In 5 neonates (Hct: 23 ± 1; 23%; Retic: 5.6 ± 0.9; 5%, *mean ± sem; median*) on iron, full feeding, and no acute medical problems, we measured cerebral, flank, and splanchnic NIRS as an index of tissue oxygenation. Infants received iNO (20ppm) 1h before, during, and 2h following a PRBC Tx infused over 3h. All infants were made NPO at the start of the Tx.

Results BW and GA ages were 1012 ± 326; 685g, 29 ± 2; 27wks & patients were studied on postnatal day 42 ± 6; 43d. Baseline HR, BP, & RR rate were 160 ± 4; 160/min, 67 ± 4; 67 systolic mmHg, & 60 ± 5; 61/min respectively and did not change significantly after Tx. The average Hct increased by 10.5 ± 0.9; 10.2 points after Tx. NIRS signals were all low relative to normal values at baseline consistent with increased venous O_2 extraction at 53 ± 5; 52%, 45 ± 8; 42%, & 36 ± 5; 40% for CNS, flank & splanchnic regions. NIRS increased at all sites for the entire group at the completion of the Tx by 25% of baseline value ($p < 0.001$; Figure). Increases in both cerebral and flank NIRS remained above pre-Tx levels in all patients even after the discontinuation of iNO. However, splanchnic NIRS dropped by 25% ($p< 0.001$) in 3 of 5 patients to pre-Tx values 3h following discontinuation of iNO (Figure).

Conclusion(s) The divergence in regional NIRS patterns following discontinuation of iNO was unique to the splanchnic site. This suggests that in some extremely anemic infants with low baseline NIRS, iNO may selectively affect the splanchnic vasculature during Tx and thus, help avert splanchnic microvascular injury. A randomized controlled trial is needed to determine whether iNO during PRBC Tx may indeed be beneficial in the prevention of TRAGI.


Cerebral NIRS
INO administration
Flank NIRS
INO administration
Splanchnic NIRS
INO administration

Abstract: 401

COMPASSION FATIGUE (CF), BURNOUT (BO), AND COMPASSION SATISFACTION (CS) IN PEDIATRIC HEMATOLOGY ONCOLOGY PROVIDERS (PHO)

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Background CF is emotional distress caretakers may experience through contact with patients who are suffering. BO is chronic occupational distress due to emotional exhaustion, feelings of depersonalization, and career dissatisfaction. CS is work-related fulfillment obtained through providing care for others.

Objective We aim to determine the prevalence of CF, BO, and CS and identify potential predictors of these phenomena in PHO physicians in the U.S.

Design/Methods A modified CF and Satisfaction Self-Test for Helpers (CFST) and a questionnaire of professional and personal characteristics were distributed anonymously and electronically to a nationwide list of over 2,000 PHO physicians (Table 1). Hierarchical linear regression models for CF, BO, and CS as a function of potential risk factors significant at $P< 0.05$ in bivariate analyses were constructed.

Results The survey response rate was 28%. The prevalence of CF, BO, and CS was 22%, 19.7% and 18.4%, respectively. Distress about a "clinical situation," "administrative burden/academic stress," "personal health," "emotional depletion" and "talking with clergy to cope with work-related stress" were each significant determinants of higher CF scores, whereas CS score and engaging in administrative/QI activities on the day of the survey were associated with lower CF scores in the final six-block regression model (total variance 49% ($F [35, 317] = 8.57$, $P< 0.000$)) (Table 2). Distress about "administrative burden/academic stress" and/or "coworkers," not working on the day of survey, and longest consecutive hours of patient care were each significant determinants of higher BO scores, whereas CS score was a significant determinant of lower BO score in the final model (total variance 2% ($F [37, 251] =7.33$, $P<0.000$)) (Table 3). CF score, BO score, "emotional depletion," distress about the "physical work environment" and "administrative burden/academic stress" were each significant determinants of lower CS scores, whereas "exercise," "socializing," and "talking with life partner" as coping strategies, as well as having nurses/nurse practitioners on the end-of-life care team were associated with higher CS scores in the final model (total variance 56% ($F [36, 287] =10.22$, $P<0.000$)) (Table 4).

Conclusion(s) Identification of predictors may help pinpoint potential interventions to reduce CF and BO while augmenting CS amongst PHO physicians. Awareness of these phenomena and their predictors may improve physician wellbeing and enhance patient care.

Table 1. Modified Compassion Fatigue and Satisfaction Self-Care Test for Helpers

As a pediatric hematology oncology (PHO) provider, you may have found that the compassion you feel for patients and their families affects you in both positive and negative ways. We'd like to get a sense of the rates and the satisfaction you experience as part of your work life. This self-test includes questions about your experiences, both positive and negative, as a PHO clinician. Select the number that honestly reflects how frequently you have experienced these characteristics in the last month or week.

0 never	1 rarely	2 a few times	3 sometimes often	4 often	5 very often

© Compassion Satisfaction and Fatigue Self-Test for Helpers (CSF) adapted by permission from Figley, C.R. (1995). Compassion fatigue: Coping with secondary traumatic stress disorder in those who treat the traumatized. New York: Brunner/Mazel, Inc. For more information see the Publications page at www.proqol.org.

1. I am happy.
2. I find my life satisfying.
3. I have beliefs that sustain me.
4. I feel connected to others.
5. I find that I focus on the things that my patients and their families
6. I have trouble to avoid certain thoughts or feelings that remind me of an upsetting or frightening work-related experience.
7. I find myself avoiding certain activities or situations because they remind me of an upsetting or frightening work-related experience.
8. I have gaps in my memory about upsetting or frightening work-related experiences I have had.
9. I feel connected to others.
10. I feel safe where I am at work.
11. I believe that I have a good balance between my work and my free time.
12. I have difficulty falling or staying asleep.
13. I have outbursts of anger or irritability with little provocation.
14. I am the person I always wanted to be.
15. I startle easily.
16. I have flashbacks connected to work-related experiences. Just I have had.
17. I have good peer support when I need to work through a highly stressful work or patient.
18. I think that I need to "work through" a difficult or traumatic work-related experience that I've had.
19. I think that I need more close friends.
20. I think that there is no one to talk with about highly stressful work or work issues.
21. I have concluded that I work too hard for my own good.
22. Working in the pediatric industries has brought me a great deal of satisfaction.
23. I find it important after working with patients in my PHO practice.
24. I am frightened of things a patient's family has said or done to me.
25. I have happy thoughts about how I help and how I can be helpful to them.
26. I have experienced intrusive thoughts related to especially difficult patient situations.
27. I have suddenly and involuntarily recalled an upsetting or frightening experience while working with a patient or speaking with a family.
28. I am losing sleep over a patient's traumatic experiences.
29. I feel as though I am experiencing the traumatic stress of a patient's family or a coworker.

Table 1. Hierarchical multiple regression of predictors of CF score in PHD physicians.

Predictor variables	Model 1[1]	Model 2	Model 3	Model 4	Model 5	Model 6
Gender	-0.13*	-0.10*	-0.06	-.05	-0.05	-0.04
CF Score		-0.47***	-0.39***	-0.37***	-0.30***	-0.29***
Physical vulnerability			-0.14**	-0.11*	-0.11*	-0.10*
Emotional depletion			-0.27***	-0.16***	-0.17***	-0.13**
CF Negative effects on clinical practice			-0.11*	-0.06	-0.06	-0.06
Work overload (feeling overwhelmed by workload)			-0.03	-0.02	-0.02	-0.01
Value incongruence (Difficult relationships with colleagues)			-0.10**	-0.11**	-0.11**	-0.08**
Unsupportive culture of nursing			-0.09*	-0.06	-0.06	-0.04
Distress about…						
Clinical situations				0.09**	0.08**	0.11***
Physical work environment				0.04	0.04	0.03
Administrative burdens/bureaucratic issues				0.02	0.01	0.03*
Coworkers				0.07*	0.07*	0.06
Personal issues				0.04	0.05*	0.03
Participant's health				0.08**	0.08**	0.09**
Involved with withdrawal of care within the past month				-0.07	-0.08	-0.08
Involved in the non-introduction of life-prolonging therapies in the past month				0.06	0.03	-0.00
Death of a patient in clinical practice				-0.05	-0.06	-0.04
Received COMFORT education/training				0.04	0.02	0.03*
Not used withdrawal activity following treatment clinical event				0.02	0.02	0.01
Coping with work stress' strengths						
Self-care is not a priority					0.04	0.00
Talk with co-workers					0.03	0.03*
Talk with my partner					0.00	0.00
Talk with family members					0.04*	0.03
Talk with clergy					0.01	0.02*
Compassion satisfaction with work/life dimensions					-0.05	-0.02
Workplace exposure on burnout/life dimensions					-0.06	-0.03
Provider is more when withdrawing care					0.02	0.01*
ICU meetings following patient death					0.04	0.03
Previous Early Palliative Care only						0.01
1-15 years in PHD specialty						0.01
16-30 years of current institution						0.01
Training in other areas of medical practice						-0.03
[redacted]						-0.03
[redacted]						-0.06
Upper decile						0.01
R^2	0.02	0.18	0.29	0.44	0.47	0.49
R^2 change	0.02	0.28	0.09	0.20	0.03	0.01
F change	8.95**	140.18***	8.69***	2.68***	3.12**	1.04

[1]Standardized coefficients (Beta) for each predictor in a given model

*p < 0.05; **p < 0.01; ***p < 0.001

Table 1. Hierarchical multiple regression of predictors of BO score in PBC physicians.

Predictor variables	Model 1[1]	Model 2	Model 3	Model 4	Model 5	Model 6
Gender	-0.11	-0.03	-0.02	0.009	-0.014	-0.009
CH Score		-0.43***	-0.39***	-0.41***	-0.39***	-0.38***
Physical exhaustion			0.14**	0.11*	0.09	0.09
Emotional depletion			0.19***	0.17**	0.12*	0.09
I feel I provide to my institution			-0.02	-0.11	-0.08	-0.05
I always get physical symptoms at times of energy			0.16**	0.14*	0.07	0.04
I feel tired when on clinical service			0.10	0.08	0.09	0.09
When I wake in the morning I dread my work			0.15*	0.10*	0.06	0.04
I care for children at my place of worship			0.07	0.05	0.05	0.04
I work without my place of worship			0.11**	0.12**	0.11*	0.10*
I cannot concentrate on my work as well			0.19*	0.09	0.09	0.07
Others who:						
Clinical practice				0.06	0.04	0.04
Physical work environment				0.04	0.03	0.03
Administrative burden/Academic stress				0.11**	0.11*	0.11**
Ownership				0.19***	0.09**	0.09**
Practice injury				0.05	0.04	0.04
Participant's health				0.06	0.07	0.07
Involved with withdrawal of care within the past month				-0.03	-0.05	-0.05
Death of a patient in the past month				-0.03	-0.06	-0.05
Involved withdrawal or therapeutic privilege				0.04	0.03	0.04
No work-related activity following traumatic clinical event				0.01	0.02	0.03
Cope well: work hours/strength:						
Self-care is not a priority					0.06	0.04
Socialize with friends/family					-0.02	-0.009
Exercise/play sports					0.01	0.01
Talk with family members					0.02	0.03
Talk spiritual/clergy					0.07	0.07
Participate in clinical research						0.07
Participate in clinical trials but not introducing life-sustaining treatment						0.06
Therapy delayed following patient death						0.03
Participate Early Palliative Care only						0.03
I feel I am on PBC practice						-0.03
I feel I am at peace with myself						0.03
I believe in the sanctity of life/God/Creator						-0.06
I believe in life/spiritual guidance						-0.06
Training year/Career						-0.07
The training where I received medical school						0.06
Live with 1/2 parent						-0.03
Live alone						0.04
R^2	0.01	0.04	0.10	0.07	0.06	0.06
R^2 change	0.01	0.19	0.16	0.06	0.01	0.01
F change	1.23	100.13***	8.22***	3.06**	1.63	0.66

[1] Standardized coefficients (Beta) for each predictor are presented for each model

*p < 0.05, **p < 0.01, ***p < 0.001

Table 4. Hierarchical multiple regression of predictors of CS score in PHO physicians.

Predictor variables	Model 1[a]	Model 2	Model 3	Model 4	Model 5	Model 6
Gender	-0.11	-0.04	-0.03	-0.05	-0.05	-0.06
CT Score		-0.16*	-0.11	-0.13	-0.13*	-0.10
BM Score		-0.34***	-0.31***	-0.31***	-0.31***	-0.26***
Physical education			-0.09*	-0.08	-0.04	-0.04
Emotional depletion			0.11*	0.12*	0.12*	0.12*
Practice in previous year only			-0.09*	-0.07	-0.07	-0.03
Have received clinical experience with patients with pain			0.02	0.04	0.06*	0.06
Different roles:						
Clinical educator				0.04	0.05*	0.04
Physical medicine specialist				-0.06	-0.06	-0.08*
Role is treating healthcare professionals				-0.06	-0.07*	-0.07**
Consultant				-0.07*	-0.06	-0.06
Private clinician				-0.05	-0.05	-0.03
Professional Coach				0.03	0.04	0.05*
Received CME/CPD on chronic pain				0.04	0.04	0.04
Not used evidence in my following patient decisions				-0.07*	-0.06	-0.06
No work-related activity following treatment clinical event				-0.07*	-0.05	-0.03
Come to talk with patients through:						
Text/Jabber					0.03*	0.03
Clinic/Surgery					0.04	0.04
Reminder with Mobile/Landline					0.05***	0.03**
Talk/come to work a priority					0.04	0.04
Talk with Hospital					0.03**	0.03*
Talk with family members					0.04**	0.04**
Times for CDS: come to/leave PA					0.01	0.01
Times for CDS: come to/leave BM/BP					0.03**	0.03*
Times for CDS: come to/leave Students					0.01	0.01
Times for combination of care includes CDS					-0.01	-0.01
Times for care introduction of care includes CDS					0.03	0.03
Times for care introduction of care includes DBS					-0.004	-0.004
Times for care introduction of care includes CDS					0.02	0.01
CDS came to PHO provider						0.01
Training on other causes of medical issues						-0.03
Training on end-of-life care						0.04
Unable to determine cause of problem						-0.03
Unable to diagnose						0.01
Training does not help distinguish						-0.03
Love them						-0.03
R^2	0.02	0.02	0.03	0.03	0.06	0.09
R^2 change	0.02	0.00	0.01	0.01	0.04	0.03
F change	4.37*	10.56***	4.05**	3.07*	4.81***	3.17*

[a] Standardized coefficients (Beta) for each predictor are presented for each model

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

Abstract: 402

Ferritin-based Iron Supplementation Guideline for Preterm Infants

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Background Preterm infants are at risk for iron deficiency or iatrogenic iron overload; both potentially leading to multi-systemic consequences. Hematocrit (hct) and corrected reticulocyte count (CRC) are commonly used for monitoring, but these markers are inconsistent. Serum ferritin can be utilized as a surrogate marker of iron stores; however, ferritin may be elevated in inflammatory or infectious states. We sought to improve the hematologic parameters of preterm infants by implementing a ferritin-based iron guideline to aid clinical decision-making.

Objective Primary aim was to improve median discharge hct and CRC by 10% from baseline for preterm infants within our unit over a 2-year period. Secondary aims included improving iron initiation and iron dosing at discharge.

Design/Methods A key driver diagram was developed, followed by implementation of a ferritin-based iron guideline (see PDSA1). Based on lack of improvement, this guideline was modified to include an elevated ferritin algorithm (see PDSA2) to eliminate unnecessary iron withholding by screening CRP (a marker of acute inflammation when > 1 mg/dL) and TIBC (a marker of poor iron stores when >400 mcg/dL). Included were all preterm infants < 32 weeks born February 2015 - August 2017. Excluded were deaths before discharge or prolonged NPO status. Compliance was tracked by random audits. Adverse outcomes related to iron therapy and laboratory testing were monitored.

Results After PDSA1 (n=67), median discharge hct failed to improve from baseline; however CRC increased to 2.9%, surpassing our goal with 18% improvement. Iron initiation remained similar but discharge iron dose decreased from 4 to 3mg/kg/day. Iron was withheld in 11 patients due to elevated ferritins. After PDSA2 (n=72), the median discharge hct (29.6%) and CRC (2.9%) remained similar to PDSA 1, while iron initiation (DOL 12) and discharge dose (3.5 mg/kg/day) improved. Only one patient had iron withheld. Of the total number of ferritins checked, 12% were elevated of which most had a normal CRP and TIBC. Admission hct and RBC transfusions were similar from baseline. No complications were noted and compliance improved throughout project duration.

Conclusion(s) Implementation of a ferritin-based iron guideline is plausible and safe in the NICU setting and partially met our primary aim of improving hematologic parameters. While discharge hct did not increase, the discharge CRC improved significantly from baseline despite discharge iron dosing unintentionally declining. Steps are being taken to optimize this iron guideline further.

Figure 1 (PO9A.1): Ferritin-guided iron supplementation guideline for the NICU.

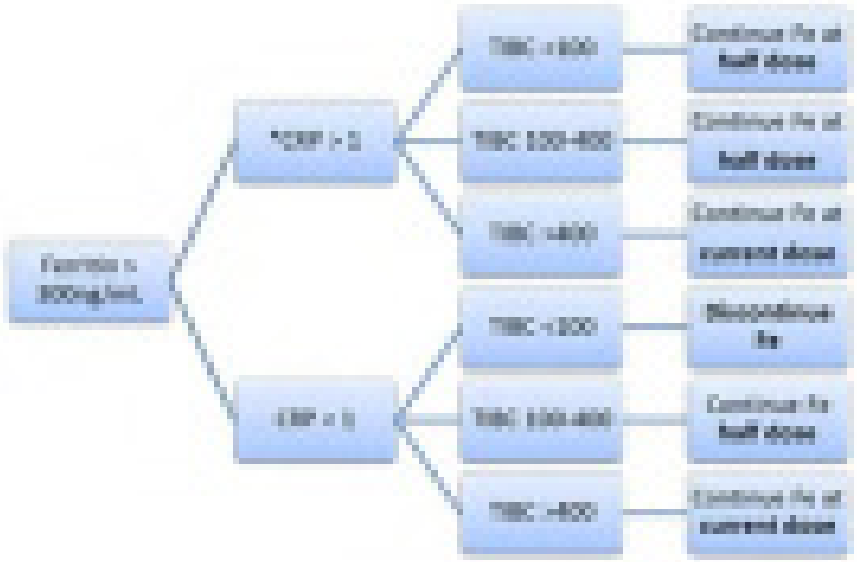

Figure 1 (POSA 2): Modified Ferritin-guided iron supplementation guideline to include an elevated ferritin algorithm to check CRP (marker of acute inflammation when > 1 mg/dL) and TIBC (marker of inadequate iron stores when > 400 mcg/dL) to guide iron dosing.

Abstract: 403

The association between respiratory illnesses and hydroxyurea use in sickle cell disease

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Background The association between respiratory illnesses (RIs) and increased morbidity and mortality in sickle cell disease (SCD) is well established. Asthma has been reported to increase incidence of acute chest syndrome (ACS) and vaso-occlusive crises. Attenuation of airway hyperresponsiveness has been credited to hydroxyurea use (HDU) in SCD, however, its implication in reducing acute asthma exacerbation (AAE) is yet to be proved.

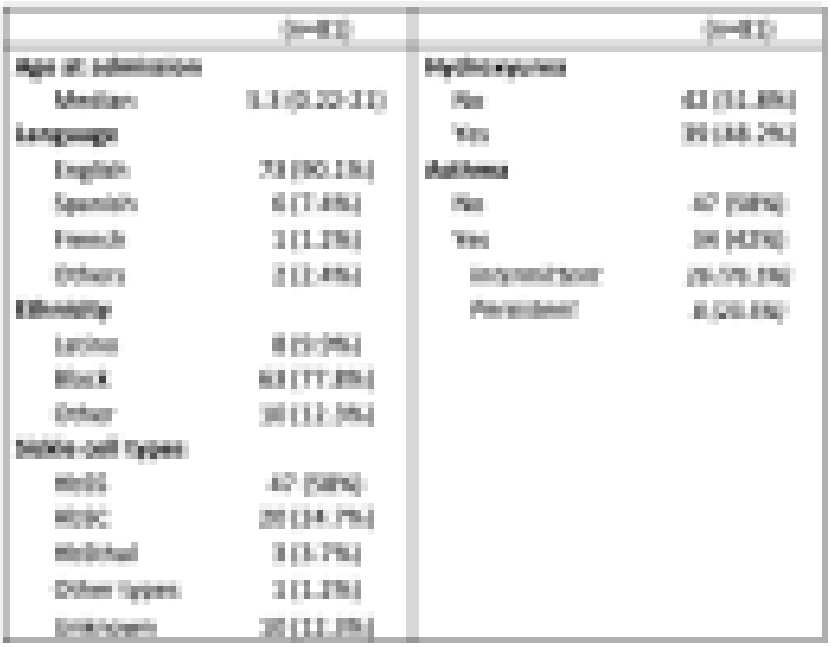
Objective To determine the morbidity of RIs [i.e. ACS, pneumonia, AAE, bronchiolitis, and influenza] and to determine the association between HDU and development of asthma in children with SCD.

Design/Methods We conducted a retrospective chart review of children 0-21 years followed at Bronx-Care Health System for SCD from 2001 to 2018. Sociodemographic variables, SCD type and HDU were collected. Patients were followed for development of RIs, including all visits for each patient. ED and inpatient visits, length of stay, PICU and oxygen requirement were considered. Descriptive analyses and chi-squared test were used to determine the association between HDU and development of asthma, with statistical significance set at 2-sided p-value<0.05.

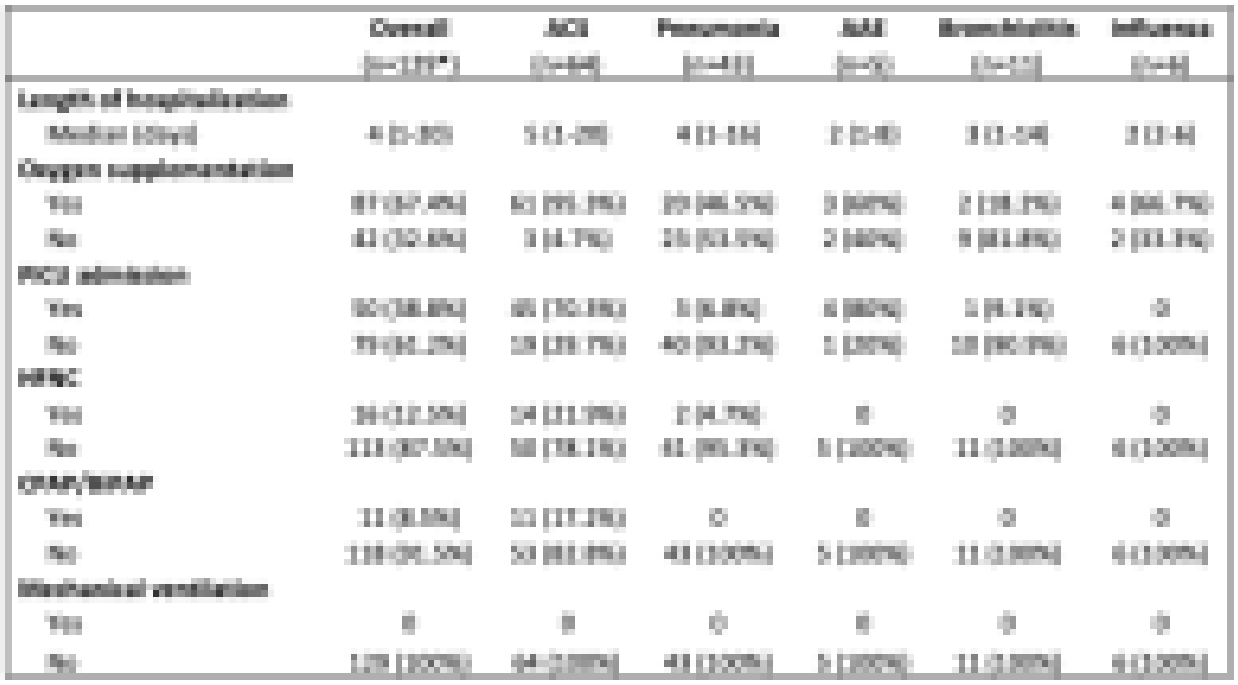
Results There were a total of 94 patients with SCD in the study; 35 had both ED visits and inpatient admissions for RIs, 13 had only ED visits and 46 had only inpatient admissions. There were 62 ED visits and 129 documented inpatient admissions in total. The median age at admission was 5.3 years, 48.2% patients were on hydroxyurea and HbSS (58%) was the most common type (Table 1). ACS (49.6%) and pneumonia (33.3%) were the most common diagnoses with longer hospital stays (5 days and 4 days, respectively) and increased need for oxygen supplementation (95.3% and 46.5%, respectively) (Table 2).

Asthma was present in 42% of SCD patients with RIs. There was no association between HDU and development of asthma (OR 0.96, p 0.92), or with asthma severity (OR 0.84, p 0.74) (Table 3). There also was no difference between HDU and development of asthma and asthma severity in the subgroups of HbSS and HbSC.

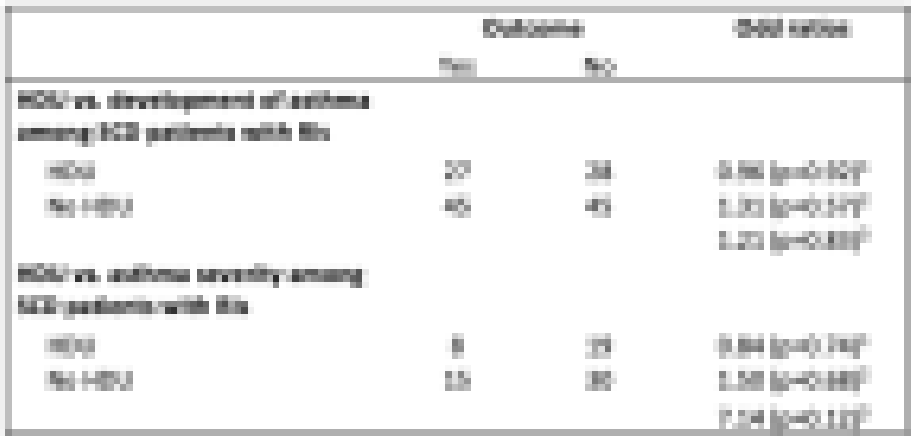
Conclusion(s) The morbidity of RIs among children with SCD was found to be high. Although there was no association between HDU and development of asthma or asthma severity in our study, it cannot be definitively evaluated with limited data on HDU compliance and changing trends of initiating HDU, not necessarily based on severity of SCD. Further studies, possibly using fetal hemoglobin levels as a marker for compliance with hydroxyurea are needed to document an association.



Sociodemographic and clinical characteristics among children with SCDs who had inpatient admissions for respiratory illnesses



Morbidity of inpatient admissions for respiratory illnesses among children with SCDs



Odd ratios of hydroxyurea use and the development of asthma and asthma severity among SCD patients with RIs

Abstract: 404
Using preclinical modeling to understand the mechanisms by which antibody therapy alters immunity against high risk neuroblastoma and effects prolongation of survival
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The Center for Childhood Cancer Research at the Children's Hospital of Philadelphia, Philadelphia, Pennsylvania, United States

Background Neuroblastoma is the most common extracranial solid tumor in children and accounts for ~15% of cancer-related childhood mortalities. Despite recent FDA approval of dinutuximab (a chimeric mAb against GD2, a disialoganglioside that is highly expressed on neuroblasts), 5-year overall survival for high-risk neuroblastoma (HRNB) is <60%, emphasizing the need for improved therapies. It is postulated that dinutuximab engages NK cell Fc receptors and induces antibody-dependent cellular cytotoxicity of GD2-expressing neuroblasts. Consistent with this proposed mechanism of action, we found a large frequency of NK cells in tumors from a preclinical mouse model of HRNB (*TH-MYCN*$^{+/+}$ transgenic mice).
Objective To examine the effects of anti-GD2 mAb therapy in an immunocompetent mouse model of HRNB that closely phenocopies human disease.
Design/Methods TH-MYCN transgenic mice were randomized to 3 groups: saline (PBS; n=15), anti-GD2 (100ugs twice weekly, n=15) and isotype control mAb (100ugs twice weekly, n=15) starting at day 14 of life. Mice were examined daily and euthanized when morbid. Using multiparametric flow cytometry, mid-point (day 35-42) and terminal peripheral blood lymphocytes were compared with terminal disease intratumoral lymphocytes. Tumors were dissected, mechanically and enzymatically dissociated and stained with surface and intracellular mAb staining; peripheral blood lymphocytes were stained with similar mAb panels, and all samples were acquired on a BD FACSVerse and analyzed via FlowJo software.
Results We observed a significant extension of survival with anti-GD2 therapy, with 50% of mice showing long-term survival even after treatment cessation at day 100 of life. Use of anti-GD2 resulted in increased blood frequencies of Ly49H-expressing NK cells, when compared to isotype-matched mAb treatment. Interestingly, we find a concomitant increase in T cells in terminal tumors, although anti-GD2 therapy did not result in a similar increase in NK cells.
Conclusion(s) In this study, we found that anti-GD2 therapy significantly extends the survival of TH-MYCN+/+ transgenic mice. Currently, we are analyzing the effects of therapy on the frequencies, phenotypes, and functions of additional intratumoral lymphocytes and the associated changes in the tumor environment. We hope these studies will shed light on the mechanisms by which anti-GD2 immunotherapy extends survival and help identify additional targets by which to improve HRNB outcomes.

Abstract: 405

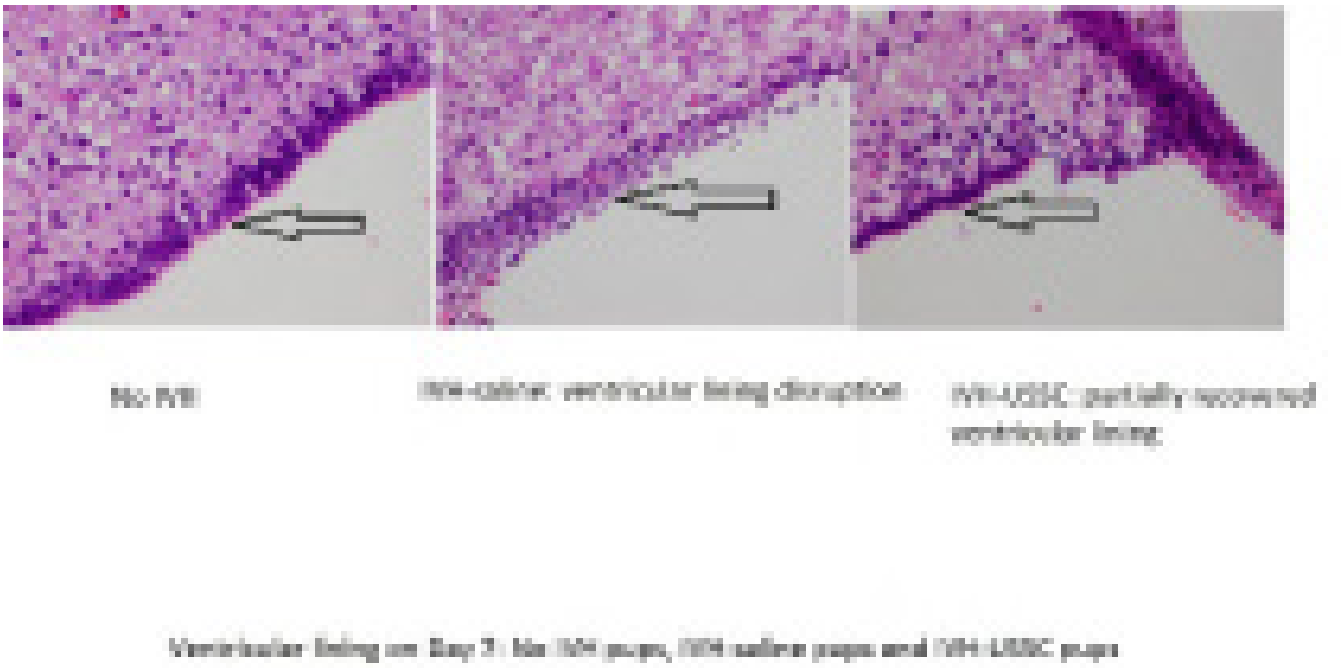
UNRESTRICTED SOMATIC STEM CELL (USSC) ADMINISTRATION REDUCES POSTHEMORRHAGIC HYDROCEPHALUS (PHH) & EXPRESSION OF AQUAPORIN CHANNELS (AQP1& 4) IN A RABBIT MODEL OF INTRAVENTRICULAR HEMORRHAGE (IVH)

Deepti Purohit[1], Dina A. Finkel[1], Yanling Liao[2], George M. Kleinman[3], Furong Hu[1], Shetal Shah[1], Mitchell S. Cairo[4], Edmund F. LaGamma[1], Govindaiah Vinukonda[5]
[1]The Regional Neonatal Center, Division of Newborn Medicine, Department of Pediatrics, New York Medical College, Valhalla, New York, United States, [2]Department of Pediatrics, New York Medical College, Valhalla, New York, United States, [3]Department of Pathology, New York Medical College and Westchester Medical Center, Valhalla, New York, United States, [4]Departments of Medicine, Pathology, Microbiology & Immunology, Cell Biology and Anatomy, New York Medical College, Valhalla, New York, United States, [5]Department of Cell Biology and Anatomy, New York Medical College, Valhalla, New York, United States

Background IVH is a common complication of preterm birth where many infants develop PHH; no effective treatment exists. PHH is associated with sub-ependymal gliosis, fibrosis & disruption of ependymal lining (Karimy, 2017). Altered expression of aquaporin channels AQP1 & AQP4 is associated with PHH due to hypersecretion & reduced absorption of CSF (Verkman, 2017). USSCs derived from human cord blood, have anti-inflammatory, multi-lineage differentiation and regenerative properties that may be advantageous to treat IVH (Liao/Cairo, 2014).
Objective We hypothesize that the intracerebral ventricular (ICV) injection of USSC will result in restored AQPs in the ventricular system of pups with PHH.
Design/Methods We used a glycerol-induced preterm rabbit model of IVH (Chua, 2009). USSCs were manufactured and characterized as previously described (Liao/Cairo, 2018). After ultrasound confirmation of IVH, we injected ICV 2X106 USSCs & measured the ventricle area at the level of mid-septal nucleus on H&E coronal-section images using Image-J. Immunofluorescence of ependymal gliosis & AQP channel expression was also performed. Total mRNA & protein homogenates were used for gene & protein expression.
Results
Cross-sectional ventricular area (table) was significantly higher in the IVH-saline group compared to no-IVH controls at 7 & 14d postnatal age (both p<0.002). USSC administration in IVH pups significantly reduced ventricular volume vs IVH-saline pups by 77% (@ 7 days, p<0.05; n=6). Histopathological evaluation of cell infiltration, ependymal gliosis & cell disruption (figure) was higher in IVH pups but improved in USSC treated IVH pups. Immunoreactivity & mRNA levels of AQP1 were 80% lower in IVH-pups with ventricle enlargement vs no IVH pups (p<0.05, AQP1 mRNA levels). USSC administration

recovered AQP1 mRNA expression in both choroid plexus and ventricle wall. AQP4 expression was unchanged under all conditions. The inflammatory marker, TLR2 was significantly increased in IVH, whereas USSC attenuated this elevation nearly to control animals ($p<0.05$).

Conclusion(s) These findings support the possibility that USSCs: i) exert anti-inflammatory effects by reducing TLR2 , ii) recover AQP1 mRNA levels & iii) can reduce disruption of the ventricular lining. USSCs may be a considered as a cell-based therapeutic candidate for PHH.



H&E image showing ependymal cell lining in No IVH, IVH wth saline and IVH with USSC pups

Ventricle measurements on D7&14 in No IVH, IVH with saline and IVH with USSC groups

Ventricular area (Mean± SEM)	NO IVH	IVH	IVH ICV USSC
Day 7	2.5 ± 0.5	25.8 ± 5.0	6 ± 1.0
Day 14	3 ± 0.1	17.6 ± 2.0	10.6 ± 2.6

Abstract: 406

Early Life Hypotension, Respiratory Acidosis and the Development of IVH in Preterm Infants

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Background

Intraventricular hemorrhage (IVH), vascular rupture within the immature vasculature of the brain, is a common morbidity of preterm infants. Previously we identified significantly lower Mean Arterial Pressure (MAP) during the early hours of life associated with development of severe IVH, defined as grades 3 and 4 based on Papille classification in extremely preterm infants <1250 gms. Changes in pC02 have been associated with risk of PVL and IVH.To further delineate IVH risk, we evaluated the relationship of blood gas parameters, blood pressure changes,early life therapies and IVH occurrence

Objective Identify relationship of blood pressure, blood gas measurement and early life treatment as a factor in IVH risk

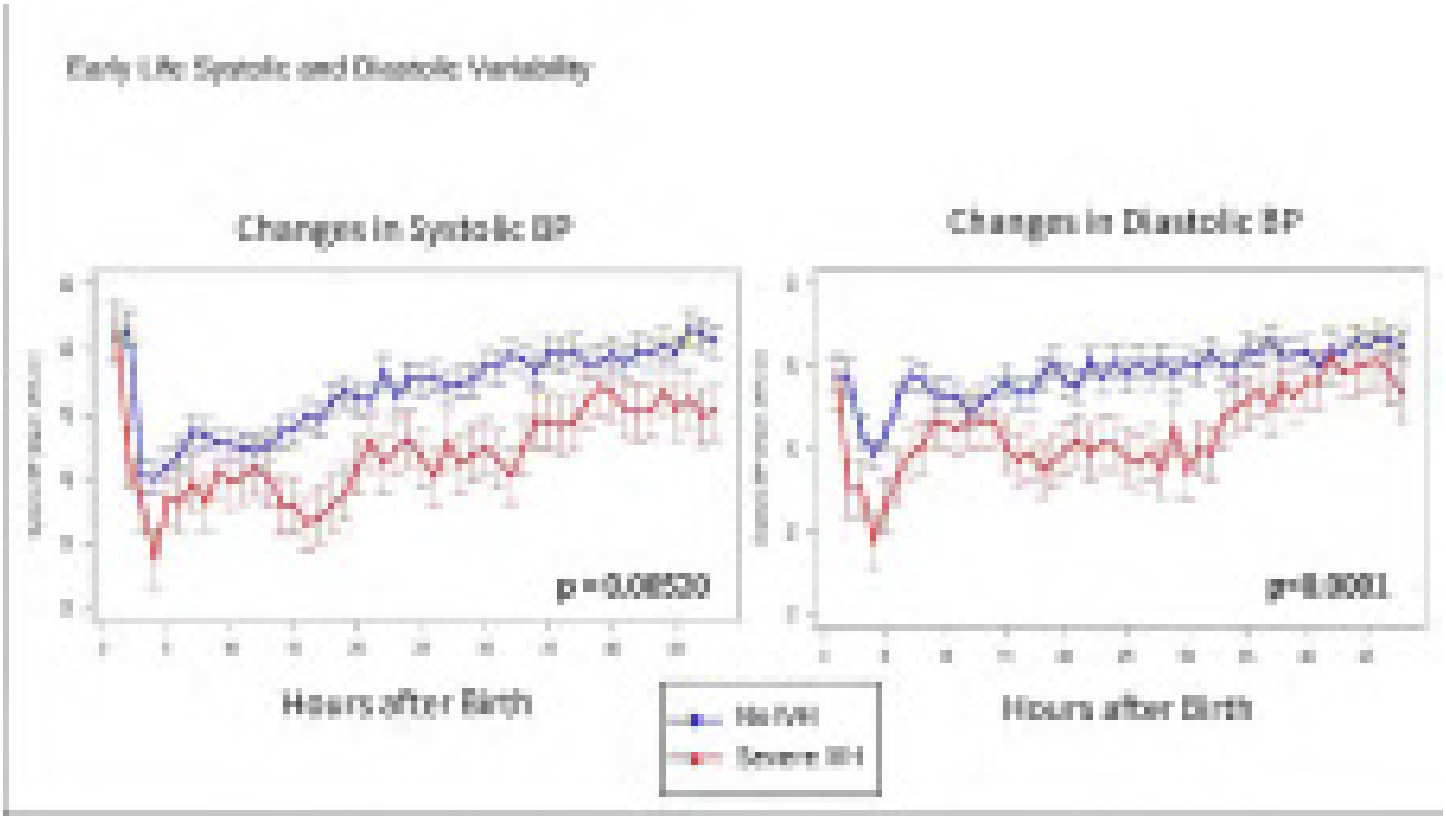
Design/Methods

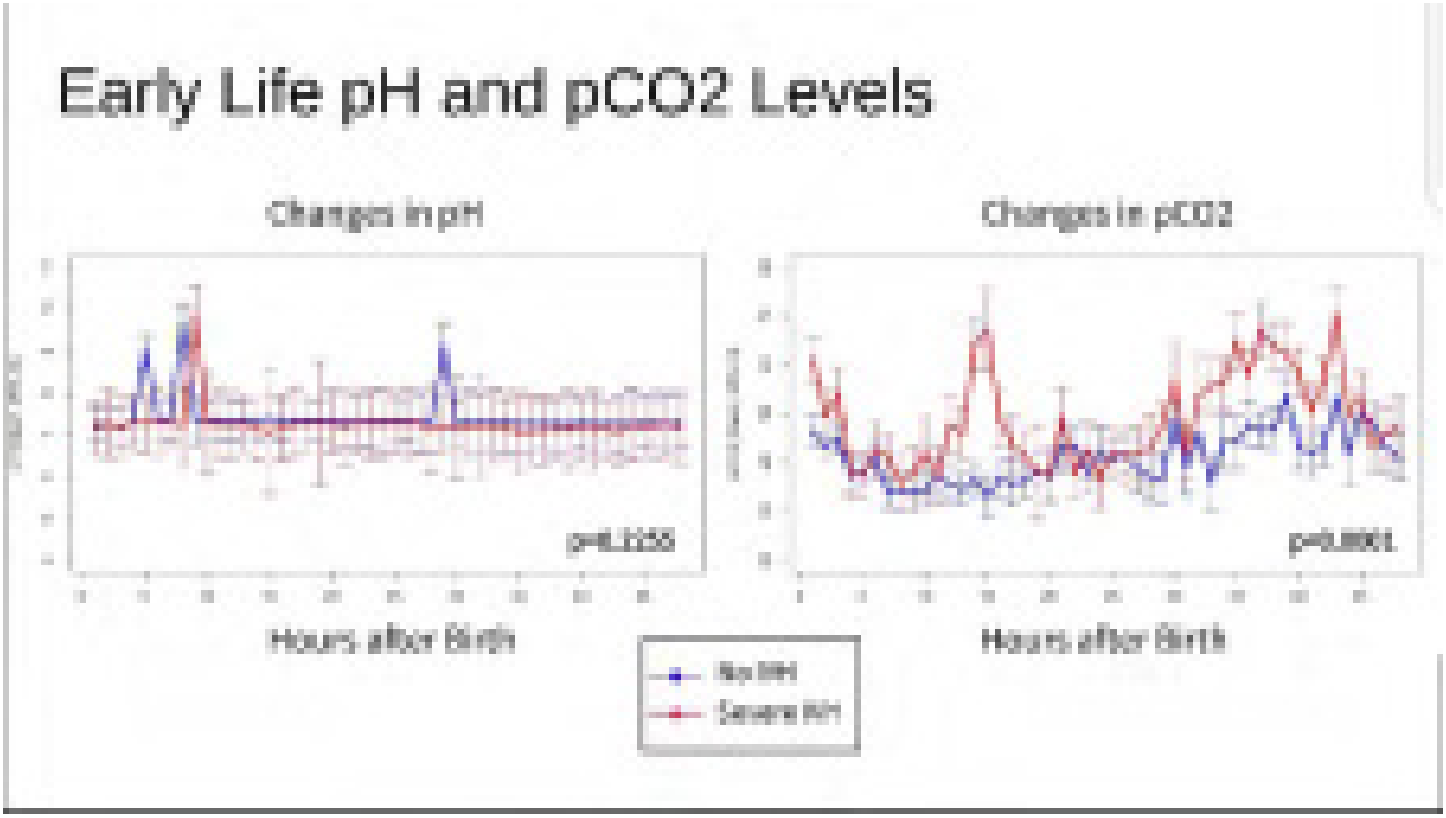
A retrospective chart review of all infants <1250 gms admitted to the NICU at CHoR from 1/1/14 to 12/31/17 was used. Data collected included vitals, treatments, and blood gas results within the first 48 hours of life. Statistical analysis included t-test, chi-square and a mixed linear modelling

Results There were 87 patients of which 20 (22.9%) developed severe IVH. While similar in gender, and race, the patients who developed IVH had significantly lower gestational age and birth weight. In the IVH group there was a significant decrease in MAP, Systolic and Diastolic blood pressures during the hours of life 3-10 and 15-32, p= 0.0052, p=0.0052 and p<0.0001, respectively. Infants who developed IVH were 5X more likely to have a ≤10% drop below their expected normal MAP within the first three hours of life (OR: 95% CI 4.95[1.24, 19.73]) and 4X's more likely to have a ≤25% drop in expected normal MAP at any time within the first eight hours of life (OR: 95% CI 4.13[1.30 , 13.11]). Early life saline treatment and transfusion increased IVH risk, p<0.02 and p<0.0001 respectively. Blood pC02 increased risk of severe IVH,HOL14 mean 38 ± 3 SD in non-IVH compared to mean 67± 13 SD in IVH group, p<0.0001.There were no significant relationship between early temperature, birth hematocrit, Apgar score, or provision of delayed cord clamping and IVH

Conclusion(s)

Development of severe IVH was associated with lower levels of all early life blood pressure parameters MAP, systolic and diastolic blood pressures as well as respiratory acidosis. In infants with severe IVH, mean blood pressures values approximated or were below, the expected gestational age blood pressure values.Fluid treatment with normal saline and/or blood transfusions were also associated with development of IVH within the first 48 hours of life





Abstract: 407

The utility of monitoring cerebral regional oxygen saturation during resuscitation in an asphyxiated preterm lamb model

Praveen Chandrasekharan[1], Carmon Koenigsknecht[1], Sylvia Gugino[1], Justin Helman[1], Deepika Sankaran[1], Munmun Rawat[1], Jayasree Nair[1], Satyan Lakshminrusimha[2]

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Background Optimizing oxygenation in a preterm neonate with perinatal metabolic acidosis is critical during transition. Oxygen saturation measured by pulse oximetry (SpO_2) is currently used to assess oxygenation during resuscitation. A recent clinical trial found that monitoring cerebral regional oxygen saturation ($CrSO_2$) reduced the burden of cerebral hypoxia in preterm neonates (Pichler, J Pediatr 2016). In an asphyxiated preterm neonate with compromised perfusion, monitoring $CrSO_2$ could be a better measure than SpO_2 and may avoid hypoxia/hyperoxia in the delivery room.

Objective Our aim is to determine relationship between $CrSO_2$, SpO_2, and oxygen delivery to the brain in a preterm ovine model with perinatal asphyxia induced by umbilical cord occlusion.

Design/Methods In 13 preterm sheep (127-128 d gestation), asphyxia was induced by umbilical cord occlusion until the heart rate decreased to 90/min. Continuous preductal SpO_2 and $CrSO_2$ were recorded during asphyxia, delivery and resuscitation. The lambs were resuscitated with supplemental O_2 titrated to achieve preductal SpO_2 as per neonatal resuscitation guidelines. Paired $CrSO_2$ and SPO_2 were then compared to measurements of oxygen content obtained from a blood sample (Radiometer ABL 800). Oxygen delivery (OD) was calculated by multiplying arterial oxygen content with carotid blood flow.

Results 163 simultaneous measurements of carotid arterial blood gas, carotid blood flow, $CrSO_2$ and SpO_2 were analyzed. The relationship between OD, $CrSO_2$ & SPO_2 is shown in Fig 1. SPO_2 was compared to $CrSO_2$ (Fig 2) and OD (Fig 3). $CrSO_2$ correlated significantly better with oxygen delivery compared to SpO_2. At "normal" SpO_2 range of 89-92% and 93-96%, there was wide variation in oxygen delivery and $CrSO_2$.

Conclusion(s) There is wide variation in oxygen delivery to the brain during resuscitation. SpO_2 correlates poorly with oxygen delivery. Clinical studies evaluating simultaneous monitoring of SpO_2 and $CrSO_2$ are warranted.

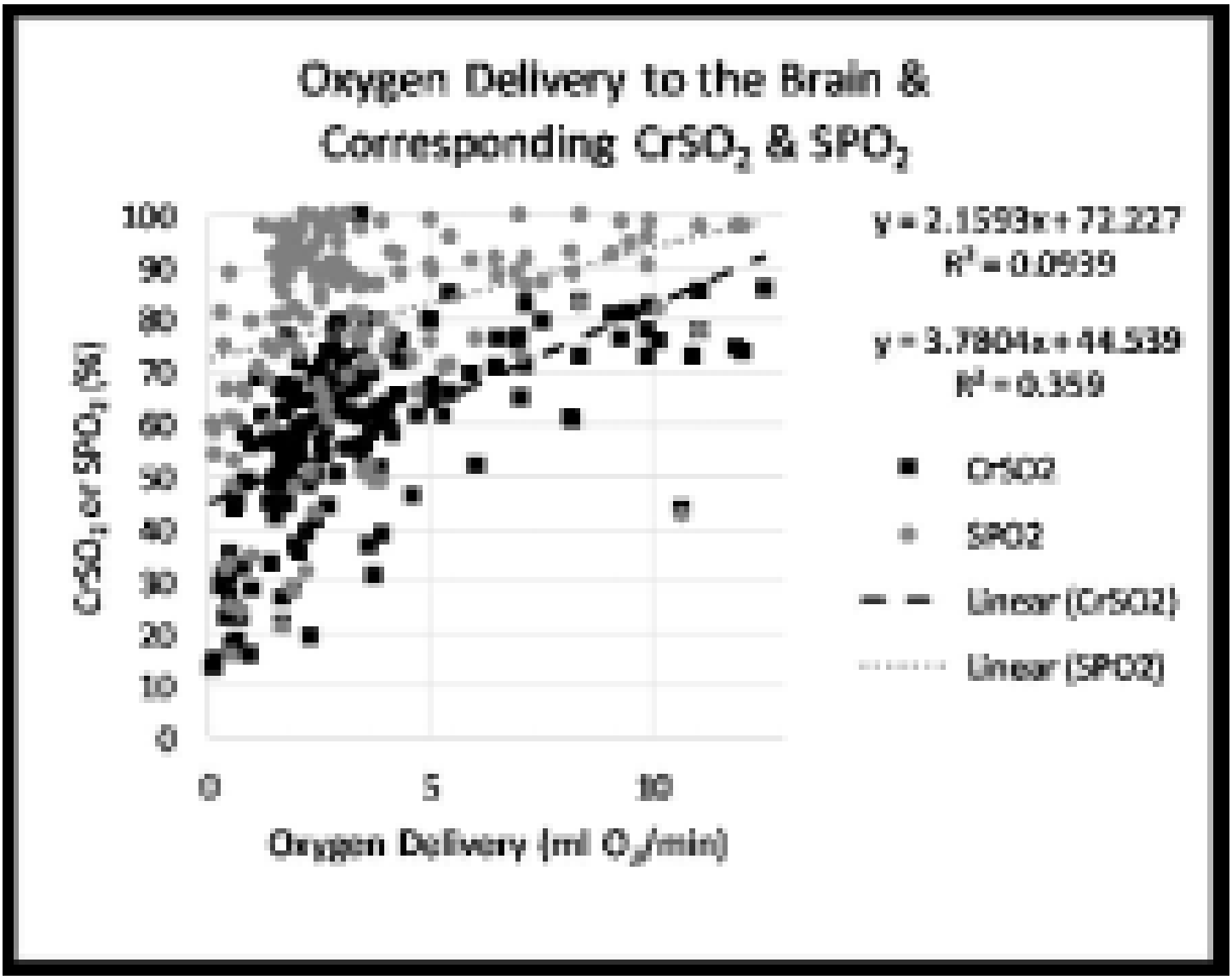

Figure 1) Oxygen delivery (OD) to the brain (ml O /min) is shown on the x-axis and is plotted against $CrSO_2$ (black squares) and SPO_2 (grey circles) (%) on the y-axis. The correlation between OD & $CrSO_2$ is R^2 =0.359. The correlation between OD & SPO_2 is R^2 = 0.0939.

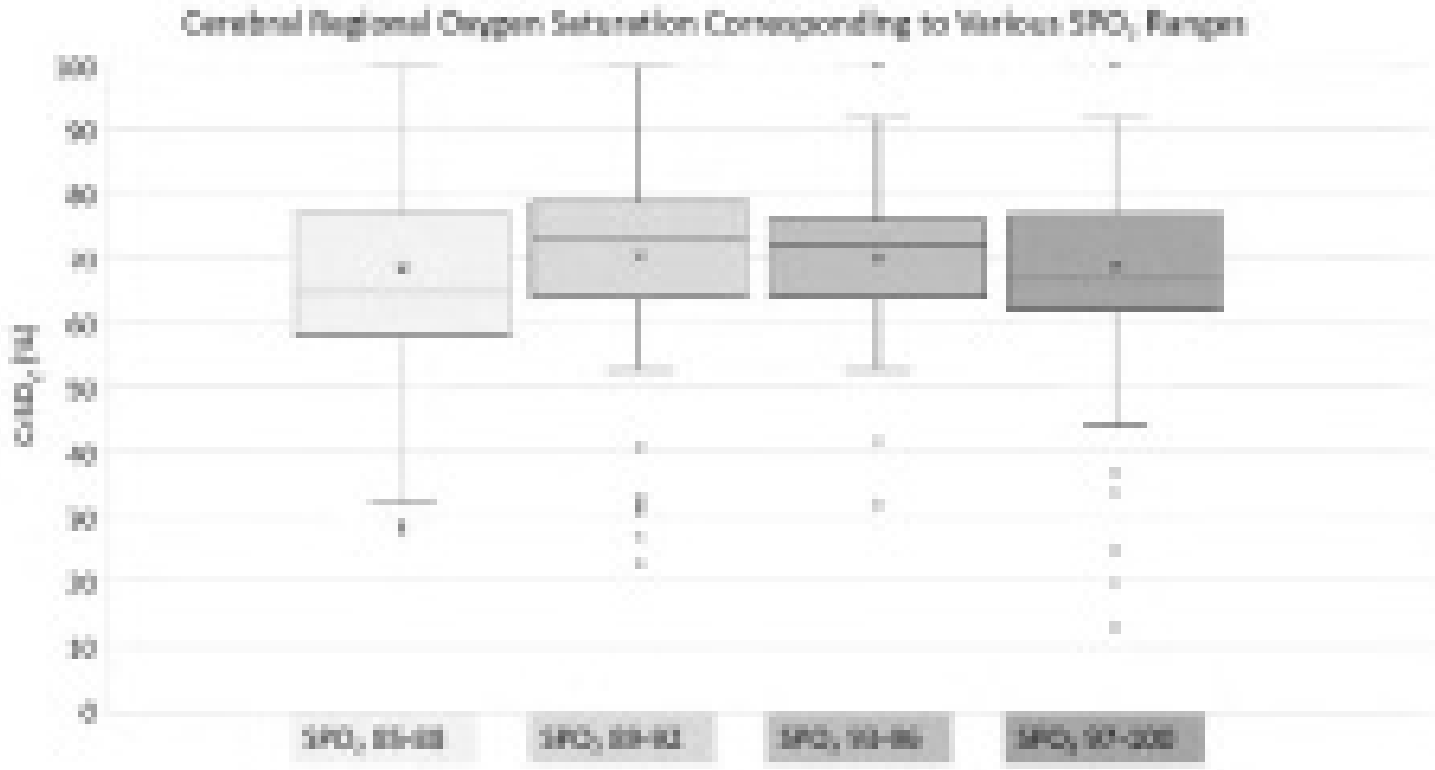

Figure 2) A box & whisker plot of SPO_2 at ranges 85-88, 89-92, 93-96, and 97-100% is shown on the x-axis and is plotted against the corresponding $CrSO_2$ (%) on the y-axis. At "normal" ranges of SPO_2 is there is a wide variation in $CrSO_2$.

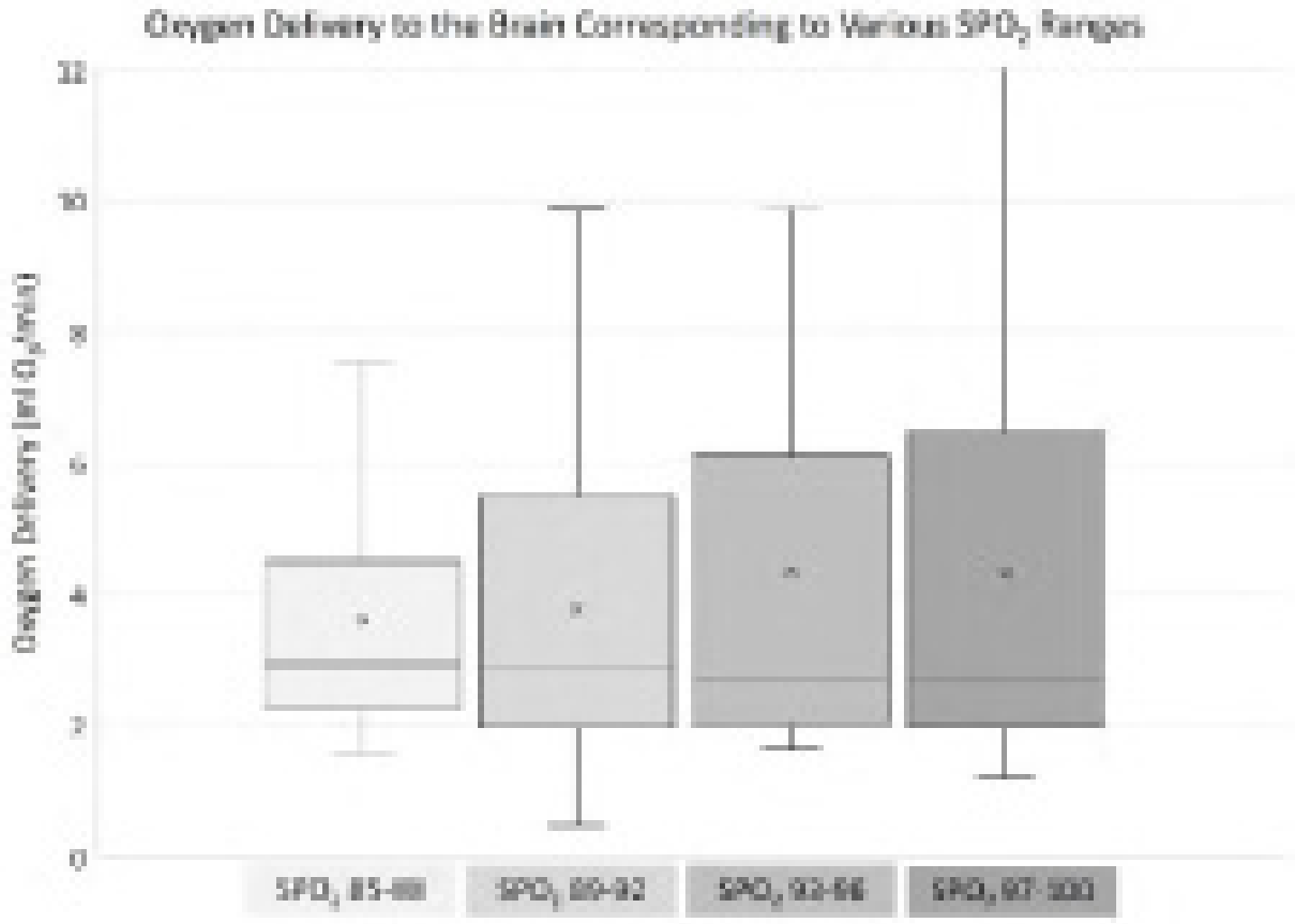

Figure 3) A box & whisker plot of SPO_2 at ranges 85-88, 89-92, 93-96, and 97-100% is shown on the x-axis and is plotted against the corresponding calculated oxygen delivery (OD) (ml O_2 /min) on the y-axis. At "normal" ranges of SPO_2 is there is a wide variation in OD.

Abstract: 408
Subcutaneous Fat Necrosis (SCFN): Potentially life-threating complication of whole-body hypothermia.
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Background Whole body cooling has become standard of care for infants with moderate or severe hypoxic-ischemic encephalopathy (HIE). Side effects from therapeutic hypothermia are uncommon and the benefits of the therapy greatly outweigh the risks. One of the reported side effects is subcutaneous fat necrosis (SCFN). There is paucity of data in the literature about the incidence, risk factors and the outcomes of infants who develop this complication.
Objective To describe the characteristics and outcomes for infants who developed SCFN after the cooling therapy
Design/Methods Retrospective chart review of the infants with the diagnosis of moderate or severe HIE who received therapeutic hypothermia and subsequently developed SCFN. Patients' clinical characteristics, date of onset and location of skin lesion(s) and calcium levels were documented.
Results 181 infants with the diagnosis of moderate or severe HIE who underwent cooling therapy during a 60-year time period (2012-2018) were screened. 14 (7.7%) infants who developed SCFN were reviewed. Patients' characteristics are shown in table

1. Distribution of the skin lesion(s) is shown in figures 1,2. All infants with SCFN presented before 3 weeks of age. Average day of presentation was day 10 of life. Average serum calcium and ionized calcium levels are shown in figure 3. Two infants developed significant hypercalcemia that required medical therapy (Diuretics, Corticosteroids and/or bisphosphonate). Highest calcium level was 20 mg/dl.

Conclusion(s) We conclude from our data that although SCFN is a rare complication of whole body hypothermia treatment, it may represent life threating condition if complicated by severe hypercalcemia. Many infants will have normal calcium levels in the first 2 weeks of life. Pediatricians should be counseled about a detailed skin examination and calcium level monitoring if any concerns.

Table1: Baseline and clinical characteristics of infants with SCFN

ID #	Sex	Race	Birth weight	Gest age	Mode of delivery	Presentation	1 Minute APGAR	5 Minute APGAR	HIE Severity	Age of onset (Days)	Highest Ca level (mg/dl)
1	F	AA	3.76	41	C/S	Vertex	6	9	Moderate	9	18.2
2	M	C	3.6	39	C/S	Vertex	8	9	Moderate	19	20.6
3	M	AA	2.402	35	SVD	Breech			Moderate	8	16.6
4	F	C	3.06	37	SVD	Breech	8	8	Moderate	8	9.6
5	M	C	3.66	38	SVD	Vertex	8	9	Moderate	9	8.9
6	F	C	4.47	40	C/S	Vertex	7	8	Moderate	9	18.4
7	F	AA	3.99	41	C/S	Vertex	8	9	Moderate	12	18.3
8	M	C	4.814	40	C/S	Vertex	6	7	Moderate	9	18.9
9	M	AA	3.73	40	C/S	Vertex	8	9	Moderate	9	19.1
10	F	C	4.34	41	SVD	Vertex	9	9	Severe	13	22
11	F	C	3.906	39	SVD	Vertex	9	9	Moderate	19	19.9
12	F	AA	2.81	39	C/S	Vertex	8	9	Moderate	9	22.4
13	F	C	2.81	37	C/S	Vertex	8	9	Moderate	9	18.2
14	F	AA	3.668	42	SVD	Vertex	8	9	Moderate	13	18.6

Sex: F=Female, M=Male
Race AA=African America, C=Caucasian
Mode of Delivery C/S=Cesarean Section,
SVD= Normal Vaginal Delivery

Table 1

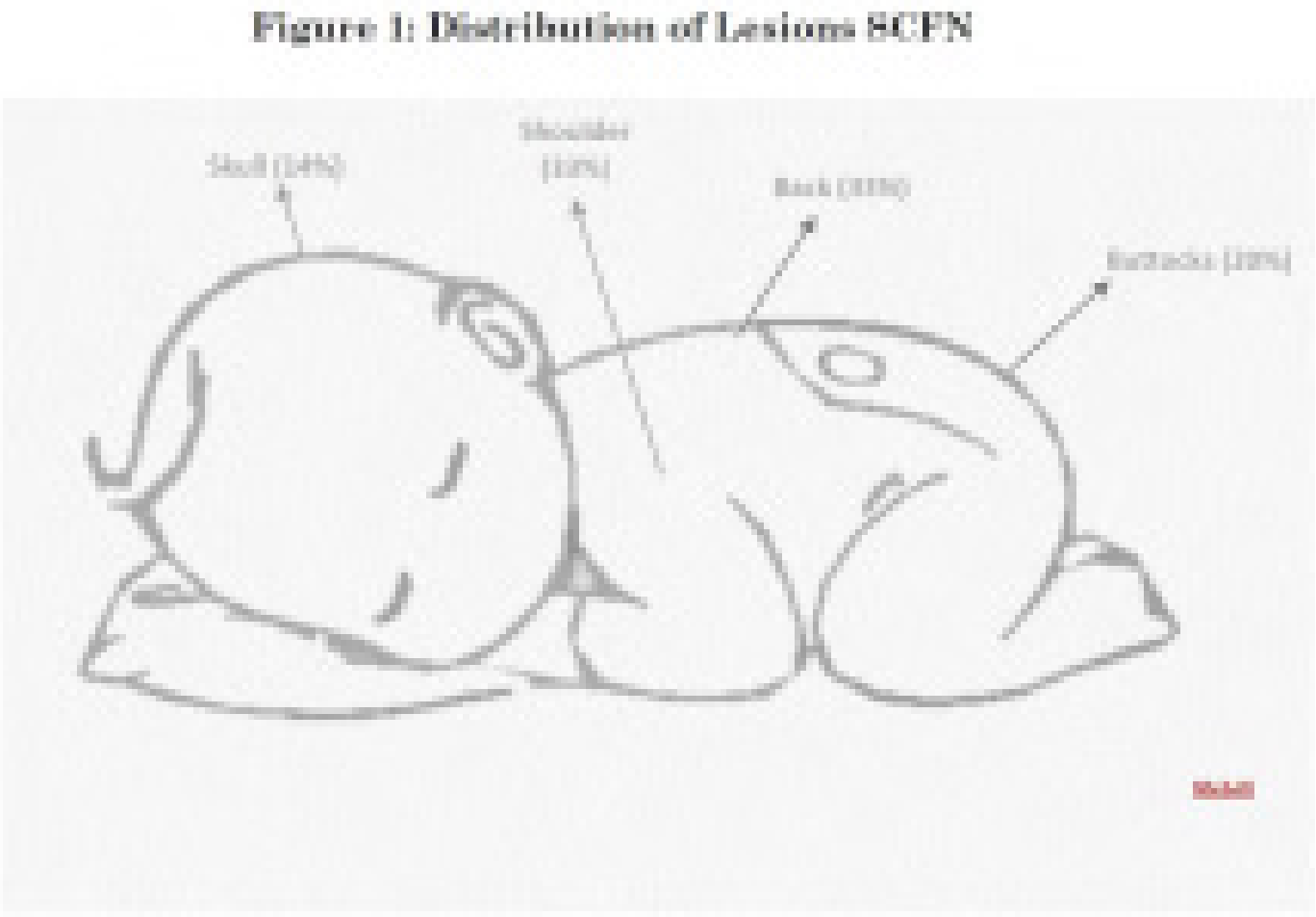
Figure 1: Distribution of Lesions SCFN
Skull (14%)
Shoulder
(10%)
Back (31%)
Buttocks (10%)

Figure 1

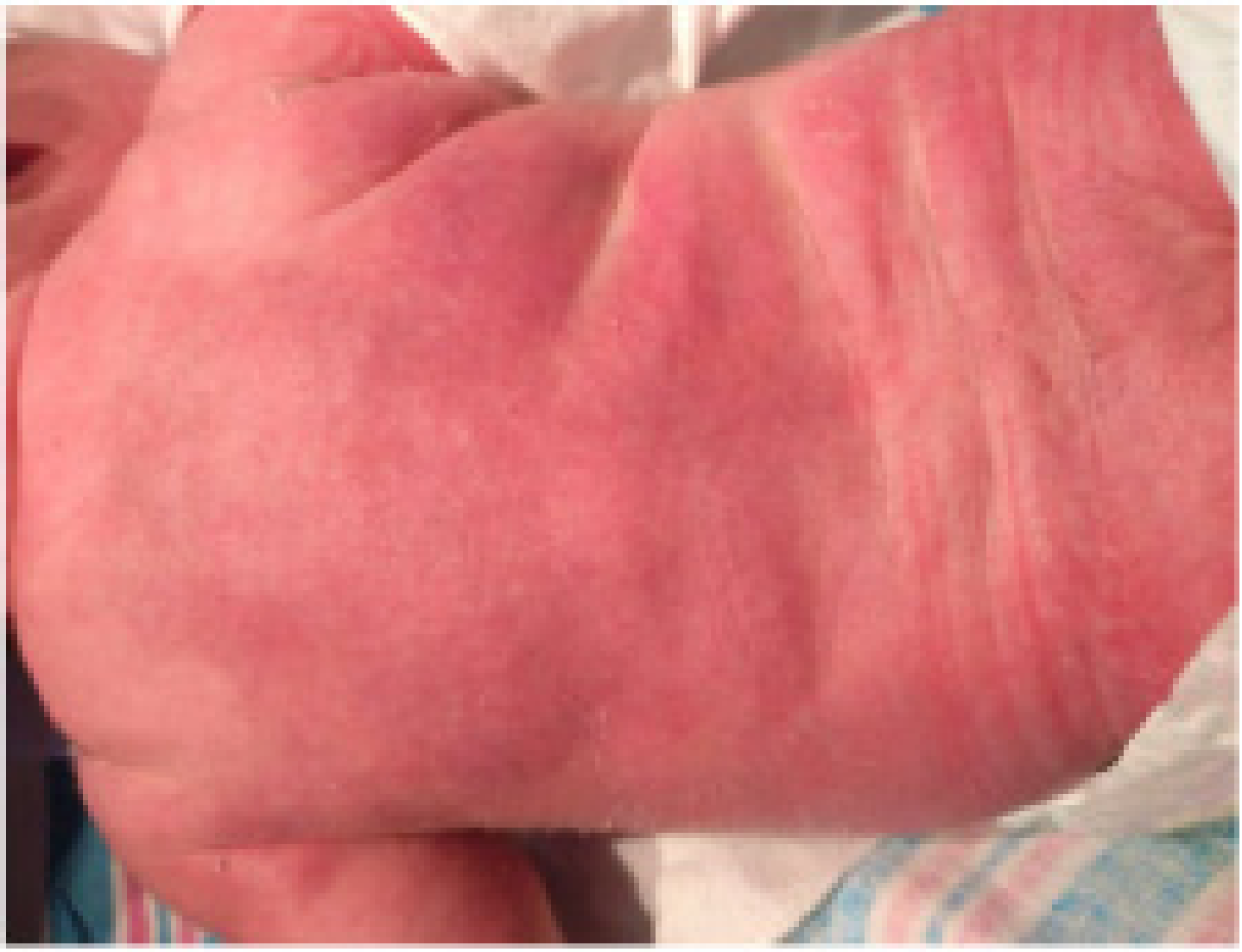

Figure 2: Extensive SCFN of case # 8.

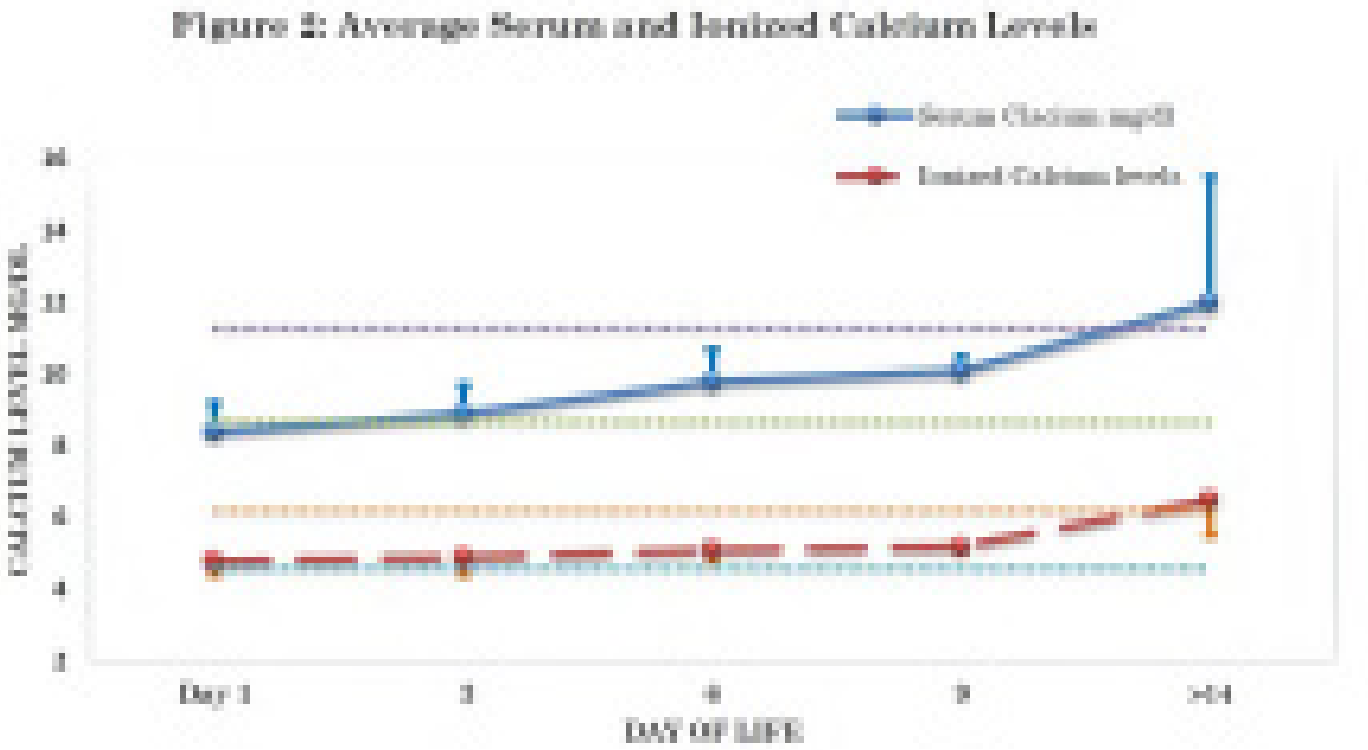

Figure 3: Avarege serum and ionized Calcium levels of infants with SCFN.

Abstract: 409

Epilepsy Outcomes in Newborns with Hypoxic-Ischemic Encephalopathy: Correlation with Sarnat Staging and Seizures in the Neonatal Period

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Background Hypoxic-ischemic encephalopathy (HIE) represents one of the most catastrophic perinatal brain injuries, causing neurodevelopmental deficits and putting patients at risk for developing epilepsy. Therapeutic hypothermia (TH) is the standard of care for moderate and severe HIE. No studies have examined the incidence of epilepsy in newborns with mild, moderate or severe HIE in the post-cooling era.

Objective We compare the incidence of epilepsy at or after 2 years of age in newborns with mild HIE (not cooled) and those with moderate and severe HIE treated with whole body TH.

Design/Methods This is a retrospective review of newborns ≥ 35 weeks admitted with HIE at birth to a regional Level IV NICU performing prolonged continuous video EEG monitoring as per the American Clinical Neurophysiology Society guidelines from 2006 through 2016. The severity of HIE was clinically assessed (modified Sarnat exam) before 6 hours of life. Neonates with an initial mild neurologic exam did not qualify for TH while newborns with an initial moderate or severe neurologic exam were treated with 72 hours of TH according to Children's National cooling pathway. Neonates without neurology follow up at or after 2 years of age were excluded.

Results Of 412 newborns transferred with HIE between 2006 and 2016, 26 mild, 84 moderate and 23 severe HIE neonates were identified according to study criteria *(Figure 1)*. Epilepsy occurred in 15%, 12% and 48% of mild, moderate, and severe HIE, respectively (*Table 1*). Newborns with severe HIE at presentation were more likely to develop epilepsy by 2 years of age ($p<0.05$). There was no difference in epilepsy outcomes in neonates with mild HIE (not cooled) versus moderate HIE (cooled). Seizures in the neonatal period were associated with epilepsy in neonates with moderate HIE and showed a trend in those with severe HIE, but not in those newborns with mild HIE.

Conclusion(s) There is no difference in epilepsy incidence between newborns with mild HIE not treated with TH and moderate

HIE babies that received TH. Severe HIE increased the risk of later epilepsy. Seizures in the newborn with acute HIE significantly increased the risk of later epilepsy within the moderate HIE cohort and showed a trend towards significance in the severe HIE cohort.

Figure 1: Study population and how it is categorized according to HIE severity and the presence of neonatal seizures and epilepsy.

		N	Epilepsy [N]	Incidence [%]	Epilepsy with Seizures p-value	vs Moderate p-value	vs Severe p-value
MILD	Total	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	With Seizures	[redacted]	[redacted]	[redacted]		[redacted]	[redacted]
MODERATE	Total	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	With Seizures	[redacted]	[redacted]	[redacted]			[redacted]
SEVERE	Total	[redacted]	[redacted]	[redacted]	[redacted]		
	With Seizures	[redacted]	[redacted]	[redacted]			

Table 1: Comparison between HIE severities, presence of seizures in the newborn period and epilepsy.

Abstract: 410

PPARγ activation enhances myelination and reduces gliosis in preterm rabbits with intraventricular hemorrhage

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Background Intraventricular hemorrhage (IVH) leads to white matter injury and survivors suffer from cerebral palsy and cognitive deficits. This is attributed to IVH-induced inflammation, oxidative damage, and maturational arrest of oligodendrocyte progenitor cells (OPCs). The peroxisome proliferator-activated receptor γ (PPARγ) is a ligand-dependent transcription factor that inhibits inflammation and oxidative damage, reduces glial activation, and promotes maturation of OPCs.
Objective We hypothesized that activation of PPARγ by rosiglitazone or by gene therapy with Ad-PPARγwould promote myelination and reduce astrogliosis in a rabbit model of IVH.
Design/Methods Premature rabbit kits (E29), delivered by C-section were treated with intraperitoneal glycerol at 4 h age to induce IVH. Head ultrasound was performed at 24 h age to detect the presence of IVH. Intramuscular rosiglitazone was given in a dose of 0.05 mg/kg twice daily for seven days. We compared glycerol-treated kits without IVH, rosiglitazone and vehicle-treated kits with IVH for myelination and astrogliosis. Myelin Basic Protein (MBP) and astrocytes (GFAP) were assessed by western blot analyses and stereological quantification of immunolabeled sections from the corona radiata and corpus callosum. The total and proliferating OPCs were quantified in sections labeled with Olig2, PDGFRα, and Ki67 antibodies. OPC maturation was evaluated by Olig2 and Nkx2.2 labeling. We also compared Ad-PPARγ and Ad-GFP treated kits with IVH for myelination and gliosis.
Results Stereological analyses of MBP immunolabeled sections demonstrated that the volume fractions of MBP were significantly reduced in kits with IVH compared to controls without IVH (P<0.026). More importantly, MBP fractions were higher in rosiglitazone or Ad-PPARγ treated kits with IVH compared to their respective IVH controls (P=0.04 both; n=5 each). Western blot analyses confirmed that rosiglitazone or Ad-PPARγ treatment significantly increased MBP expression (P<0.04; n=5 each). Rosiglitazone or PPARγ treatment also reduced GFAP+ astrocytic arborization compared to controls (P=0.005). Rosiglitazone treatment enhanced OPC maturation (P=0.03), but not the OPC proliferation.
Conclusion(s) Both pharmacological and genetic activation of PPARγ promote myelination and minimize gliosis in preterm rabbits with IVH, which we attribute to increased differentiation of OPCs. We propose that rosiglitazone treatment can improve the neurological outcome of premature infants with IVH.

Abstract: 411

Azithromycin for Children Hospitalized with Asthma Exacerbation: A Randomized Placebo-Controlled Trial

Lindsey C. Douglas[1], Katherine O'Connor[2], Diana S. Lee[1], Clemencia Solorzano[2], Aileen McGinn[3], Gabriella Azzarone[2], Joanne Nazif[2], Ari Friedman[3], Nora Esteban-Cruciani[4], Alyssa Silver[2]
[1]Pediatrics, Mount Sinai Kravis Children's Hospital, New York, New York, United States, [2]The Children's Hospital at Montefiore, Albert Einstein College of Medicine, Bronx, New York, United States, [3]Albert Einstein College of Medicine , Bronx, New York, United States, [4]Einstein Medical Center, Philadelphia, Pennsylvania, United States

Background Azithromycin, a macrolide antibiotic, improves asthma-like symptoms in children in the outpatient setting.
Objective We sought to determine if adding azithromycin to standard therapy would shorten length of stay (LOS) for children hospitalized with asthma exacerbation. Our hypothesis was that azithromycin would reduce a 3-day LOS by 16 hours (0.67 days).
Design/Methods We conducted a randomized, placebo-controlled clinical trial of azithromycin vs. placebo in children 4-12 years old with persistent asthma hospitalized with asthma exacerbation as primary diagnosis at a single, urban, quaternary care center between October 2013 and May 2018. Subjects received a three-day, high dose (10mg/kg/day) course of oral azithromycin or placebo within 12 hours of admission. The primary outcome was hospital LOS analyzed with Mann-Whitney U-test due non-parametric distribution. Chi-square analysis was performed on secondary clinical outcomes: persistence of asthma symptoms, asthma readmission rates, and missed days of school/work at one week and one month telephone follow-up. Secondary adverse outcomes included: gastrointestinal side effects, intensive care unit transfer, and study exit.
Results A total of 159 patients were enrolled, 79 in the placebo group and 80 in the intervention group. Randomization created well-matched groups. (Table 1) Intention-to-treat analysis found no difference in LOS between groups: 1.86 days (Interquartile Range[IQR]: 1.33-2.63) in placebo vs. 1.69 days (IQR: 1.33-2.48) in treatment group (p=0.23). There was also no difference in secondary clinical or adverse outcomes, although the rates of both were low. (Table 2) The study was discontinued after 55 months, prior to reaching the target 214 patients due to feasibility of achieving the enrollment goal. The most common reason for non-enrollment was pre-treatment with antibiotics, including azithromycin. Although terminated early, the study was well powered to detect a difference in LOS when accounting for sample size, effect size, and actual overall LOS. (Table 3)
Conclusion(s) Azithromycin as an add-on therapy for children hospitalized with asthma did not decrease LOS, nor did it

improve other clinical outcomes, including persistence of asthma symptoms, readmission for asthma, or missed days of school/work. Although azithromycin is commonly prescribed for children with asthma, our study did not find that this practice improves clinical outcomes in the inpatient setting.

Table 1. Baseline Characteristics

	Placebo (N=79)	Treatment (N=86)
Demographic Characteristics		
Age, years	7 (5.2-9.4)	7.5 (5.3-9.8)
Female	32 (32.8)	29 (36.3)
Race		
Black or African American	33 (48.5)	40 (50.6)
White	14 (21.2)	11 (13.9)
Other	32 (48.5)	28 (37.3)
Hispanic/Latino	32 (39.8)	32 (38.6)
IgE Processed**	54 (17.84)	61 (30.84)
Asthma And Medical History		
Age first diagnosed with asthma (months)	24 (3.36)	24 (12.48)
Hospital admission in past year	39 (49.4)	42(51.8)
Admitted to PICU ever	19 (24.1)	15(18.8)
Ever on ventilator or intubated	18 (22.8)	20(24.4)
Daily medication for asthma	54 (68.4)	58 (72.5)
Allergy medication now	37 (46.8)	46 (57.5)
Admission Clinical Characteristics		
Days of symptoms prior to admission	2 (1, 3)	2 (1, 3)
Albuterol doses 24h prior to admission	3 (3-6)	4 (2-6)
Primary Physician visit prior to admission	21 (26.6)	8 (10)
Steroids prior to admission	22 (27.8)	16 (20.8)
PICU length of stay (days)***	1.75 (1.2.79)	1.35 (1.2.7)
Season of Enrollment		
January-March	30 (38.0)	20 (32.5)
April-June	8 (10.1)	13 (16.9)
July-September	14 (17.7)	11 (14.3)
October-December	31 (39.2)	32 (37.5)
Viral + by PCR	34 (43.0)	34 (40.0)
Enrolled in PICU on admission	6 (7.6)	3 (3.5)

Categorical variables are counts (%); continuous variables are reported as median (IQR)
*P=0.04 ; P=0.44
**IgE Sufficiency Antibody Score, assessment as a measure of immunocompetence

Table 2. Length of Stay and Secondary Clinical Outcomes

	Placebo (N=79)	Treatment (N=81)	p-value
Primary Outcome			
Length of stay (days)	1.89 (1.33-3.62)	1.60 (1.33-1.88)	0.21
Adverse Outcomes			
Transfer to PICU	1 (1.3)	0 [0]	0.50
Relevel Study	7 (8.9)	2 (2.5)	0.10
Secondary Clinical Outcomes			
1-Week Post-Discharge Follow-Up	(n=77)	(n=77)	
Persistence of symptoms	7 (9.0)	11 (14.3)	0.37
Additional physician visit	30 (39.0)	28 (36.4)	0.83
Additional ED visit	0 (0.0)	1 (1.4)	>0.99
Hospital readmission	1 (1.3)	1 (1.4)	>0.99
Days missed off school for child*	2.5 (2.0)	3.0 (2.0)	0.72
Days missed off work for parent/guardian*	1 (1.4)	1 (2.1)	0.83
Gastrointestinal symptoms 1-week post-discharge	13 (16.9)	15 (20.0)	0.69
1-Month Post-Discharge Follow-Up	(n=72)	(n=67)	
Persistence of symptoms	21 (29.2)	20 (29.9)	0.92
Additional physician visit	7 (9.7)	7 (10.4)	0.77
Additional ED visit	7 (9.7)	6 (7.5)	0.78
Oral steroids	11 (15.3)	8 (12.0)	0.61
Hospital readmission	1 (1.4)	1 (1.5)	>0.99
Days missed off school for child	0 (0-0)	0 (0-0)	0.53
Days missed off work for parent/guardian	0 (0-0)	0 (0-0)	0.73
Gastrointestinal symptoms 1-month post-discharge	10 (13.9)	11 (16.4)	0.74

*Categorical variables reported as number (%); continuous variables reported as median (IQR)

†For 1-week values: school (placebo) (n=68) (treatment). For 1-week values: work (placebo) (n=63) (treatment).

Table 1: Power Analysis

[illegible] vs. Post-Hoc*	Total Sample Size	Power	Length of Stay	Effect Size
[illegible]	224	80%	1 days	24 hours (0.67 days)
Post-Hoc	228	77%	1 days	24 hours (0.67 days)
Post-Hoc	168	>99%	1 days	72 hours (3.17 days)
Post-Hoc	168	80%	1 days	38.4 hours (1.6 days)

*A priori assumptions: LOS: 3 days, Effect size: 8 hours. Post-hoc data: LOS: 2 days. Alpha: 0.05 for all power calculations.

Abstract: 412

Recorded Home Oximetry Decreases Duration of Supplemental Home Oxygen Therapy in Premature Infants with Bronchopulmonary Dysplasia

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Background Thousands of premature infants are discharged from neonatal intensive care units on supplemental home oxygen therapy (HOT) annually. Evidence-based strategies to determine safe timing of discontinuation of HOT have not been described. Recorded home oximetry provides objective data to potentially shorten duration of HOT.

Objective To determine whether utilization of HOT decreases duration of supplemental oxygen in premature infants with bronchopulmonary dysplasia.

Design/Methods This is a prospective multi-center randomized trial. We enrolled premature infants from 9 centers between November 2013 to December 2017, discharged from the neonatal intensive care unit on HOT, who were attending their first outpatient pulmonary clinic visit. Infants were randomized to a standardized outpatient weaning protocol (monthly clinic visits with standardized in-clinic weaning attempts) versus the identical protocol with the addition of recorded home oximetry (RHO) sent between clinic visits. Oximetry was analyzed using a structured algorithm to determine increase, maintain or decrease HOT flow rates. The timing of discontinuation of HOT was determined, as well as adverse events and parent quality of life. We grouped reporting frequency of RHO into categories based on reports per month (none, <=1, <=3, <=5, and > 5. We performed analysis of covariance, using reporting frequency as the independent variable.

Results Our final cohort included 197 infants. Approximately 2/3 of our cohort was male, and mean birth gestational age was 26.9 weeks (+/-2.6 weeks) with mean birthweight 937 grams (+/-443 grams); there were no significant differences in demographic or clinical characteristics between the two arms of the study (Table 1). Mean time to discontinue HOT was shorter in infants randomized to RHO (53 days versus 74 days, p= 0.03). The greater the reporting frequency of RHO, the shorter the duration of home oxygen (Figure 1); for each level of increased reporting, duration of oxygen decreased by 26% (p= 0.0006). The estimated mean duration for ≤3 reports/month was 85 days; for >3 reports/month the mean was 47 days, a reduction of 53% (p<0.0001.) Considering the fragility of this study cohort, there were relatively few significant adverse events in the entire study, with a trend towards less in those randomized to RHO.

Conclusion(s) Utilization of HOT is associated with safer, earlier discontinuation of supplemental oxygen in premature infants with bronchopulmonary dysplasia.

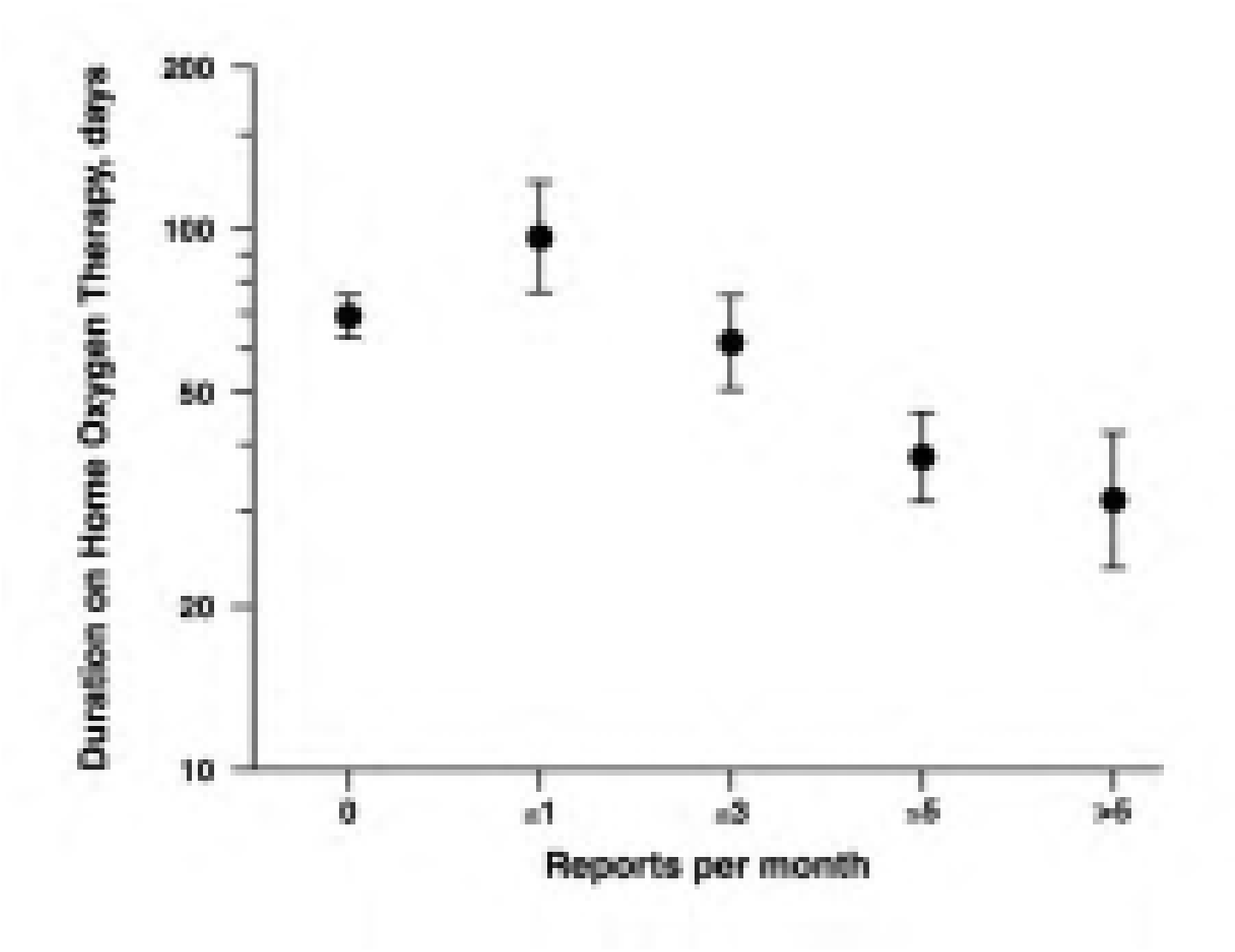

Figure 1: Reporting Frequency of RHO and its Effects on HOT Duration

Cohort Characteristics

	Routine Outpatient Weaning (n=99)	Outpatient Weaning plus RHO (n=97)	
	n (%)	n (%)	p-value
Gender			0.38
Male	58 (59)	64 (66)	
Race			0.50
White	57 (57)	59 (60)	
Black	12 (12)	13 (13)	
Asian	1 (1)	4 (4)	
Other	29 (29)	21 (22)	

Respiratory Support at 36 weeks			0.26
Ventilator	2 (2)	4 (4)	
CPAP/High Flow O2	49 (49)	40 (41)	
Low Flow Nasal Cannula	32 (32)	26 (27)	
Room Air	2 (2)	5 (5)	
Unknown	14 (14)	22 (22)	
Diuretics			0.62
Yes	45 (45)	38 (39)	
No	26 (26)	26 (27)	
Unknown	28 (28)	33 (34)	
	Mean +/-SD	Mean +/- SD	p-value
Birthweight (g)	940 +/- 441	933 +/- 447	0.84
Gestational Age (wks)	26.9 +/- 2.5	27.0 +/- 2.7	0.92
Length of NICU Stay	97 +/- 33	105 +/- 37	0.14

Abstract: 413

Novel development of a PEEP Grid procedure by Respiratory Therapists to determine optimal PEEP for pulmonary mechanics in the severe BPD population

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Background Management of mechanical ventilation for infants with severe bronchopulmonary dysplasia (sBPD) is challenging. The optimal strategy to achieve effective ventilation, oxygenation, and comfort while minimizing ventilator-induced lung injury is unknown. Determining the PEEP that yields the best respiratory system compliance is a method used to achieve these goals in other lung diseases.

Objective Assess the effectiveness of a standardized PEEP Grid procedure for Respiratory Therapists (RTs) to assist the medical team in determining suitable PEEP for an individual patient.

Design/Methods Respiratory system compliance and resistance were measured over a range of PEEP levels. The PEEP Grid procedure was developed with support from Pulmonology and Neonatology and approved by the RT Director. A group of RTs was trained to perform the procedures and a standardized progress note was developed to document the data collected at each tested PEEP level. With IRB approval, a retrospective review of the patients within the Chronic Lung Disease Program for whom a PEEP Grid procedure was performed from October 2016 – October 2018 was conducted. A paired T-test was performed to compare the heart rate (HR), respiratory rate (RR), and FiO_2averaged over the 12 hours prior to the procedure at the clinically chosen PEEP versus those values 12 hours after the PEEP was changed in accordance with the results of the PEEP Grid.

Results Twenty-five patients were identified as having 37 PEEP Grid procedures within the set timeframe (1.48 procedures/patient, range 1-4). Demographic data are displayed in Table 1. As a result of the PEEP Grid, the set PEEP was increased in 12, decreased in 11 and was unchanged in 14 patients. Among patients whose set PEEP was changed, the comparisons of HR, RR, FiO_2, and PEEP are displayed in table 2. There was a statistically significant increase in HR change when set PEEP was decreased. Although not statistically significant, there was a trend toward a reduction in FiO2 and total RR. There were no differences in other physiologic parameters.

Conclusion(s) A PEEP Grid procedure can be performed in infants with sBPD and can assist the medical team in deciding to adjust the set PEEP. Further evaluation with a larger sample size is needed to determine the effectiveness of the procedure.

Table 1. Cohort Characteristics

Variable	[n = 37]
Birth gestational age, median [IQR], wk	28 [26-30]
Birth weight, median [IQR], kg	0.92 [0.83-1.32]
Procedure post-menstrual age, median [IQR], wk	36 [35-40]
Procedure weight, median [IQR], kg	4.10 [3.37-5.53]

Abbreviations: IQR, interquartile range; PMA, post-menstrual age
n = 37: represents the number of procedures not the number of infants

Table 2: Physiologic measures for infants with a change in set PEEP after the PEEP Grid procedure

	Mean	Std Deviation	p value
Analysis of ALL infants that received ANY change in PEEP post procedure			
Variable			(n = 23)
Pre Mean FiO_2	39.00	8.61	
Post Mean FiO_2	37.70	8.18	
Paired Differences	-1.30	5.06	0.229
Pre Mean PEEP	14.93	2.66	
Post Mean PEEP	15.57	1.93	
Paired Differences	0.63	2.93	0.313
Pre Mean HR	147.53	13.00	
Post Mean HR	149.84	11.13	
Paired Differences	2.30	8.08	0.185
Pre Mean RR	37.37	6.70	
Post Mean RR	36.41	7.53	
Paired Differences	-0.96	7.60	0.557
Analysis of ALL infants that received an INCREASE in PEEP post procedure			
Variable			(n = 12)
Pre Mean FiO_2	40.58	9.26	
Post Mean FiO_2	37.83	8.70	
Paired Differences	-2.44	6.13	0.185
Pre Mean PEEP	13.50	1.97	
Post Mean PEEP	16.50	1.88	
Paired Differences	3.00	1.60	<0.001
Pre Mean HR	148.21	14.57	
Post Mean HR	148.02	12.87	
Paired Differences	-0.19	9.65	0.949
Pre Mean RR	38.83	6.72	
Post Mean RR	37.83	8.66	
Paired Differences	-0.79	8.79	0.767
Analysis of ALL infants that received an DECREASE in PEEP post procedure			
Variable			(n = 11)
Pre Mean FiO_2	37.64	8.11	
Post Mean FiO_2	37.77	8.93	
Paired Differences	-0.068	3.44	0.949
Pre Mean PEEP	17.55	1.77	
Post Mean PEEP	15.59	1.97	
Paired Differences	-1.95	1.11	<0.001
Pre Mean HR	145.70	11.47	
Post Mean HR	150.72	9.41	
Paired Differences	5.02	4.60	0.005
Pre Mean RR	36.09	6.72	
Post Mean RR	34.86	6.93	
Paired Differences	-1.14	7.24	0.614

Abstract: 414

Acute Asthma Management with IV Magnesium (IV Mg) in Obese, Overweight and Non-Overweight Inner-City Children and their Length of Stay.

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Background Obese children with asthma have worse morbidity and longer lengths of stay (LOS). Literature suggests providers may underestimate asthma severity in obese patients. However, it is unknown if this affects timing of IV Mg therapy for acute asthma exacerbations in obese (OB), overweight (OW) and non-overweight (NO) children and if time to IV Mg therapy is related to LOS.

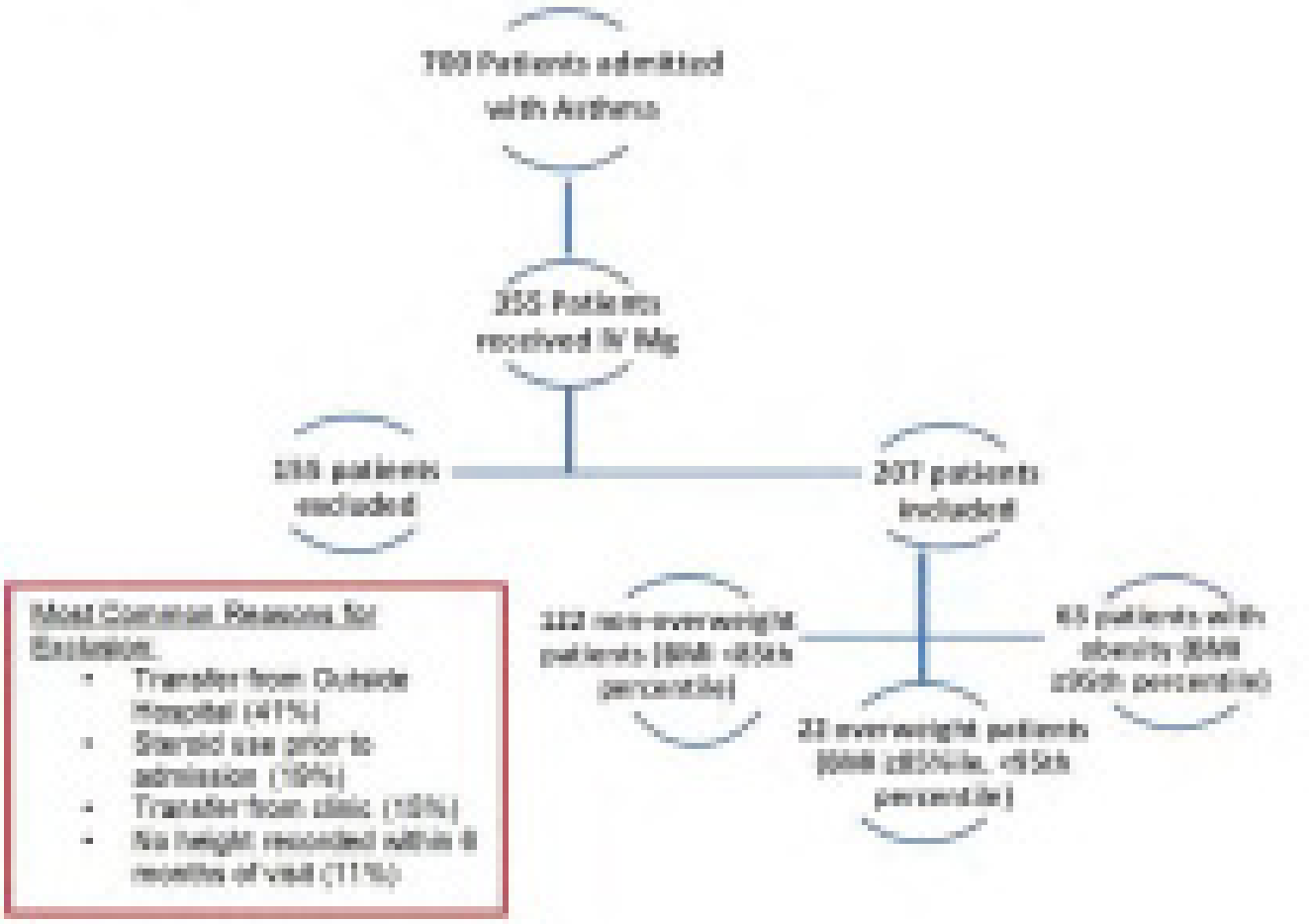
Objective To investigate if delays in timing of IV Mg therapy exist in OB children compared to OW and NO children with asthma and if these delays are associated with longer LOS.

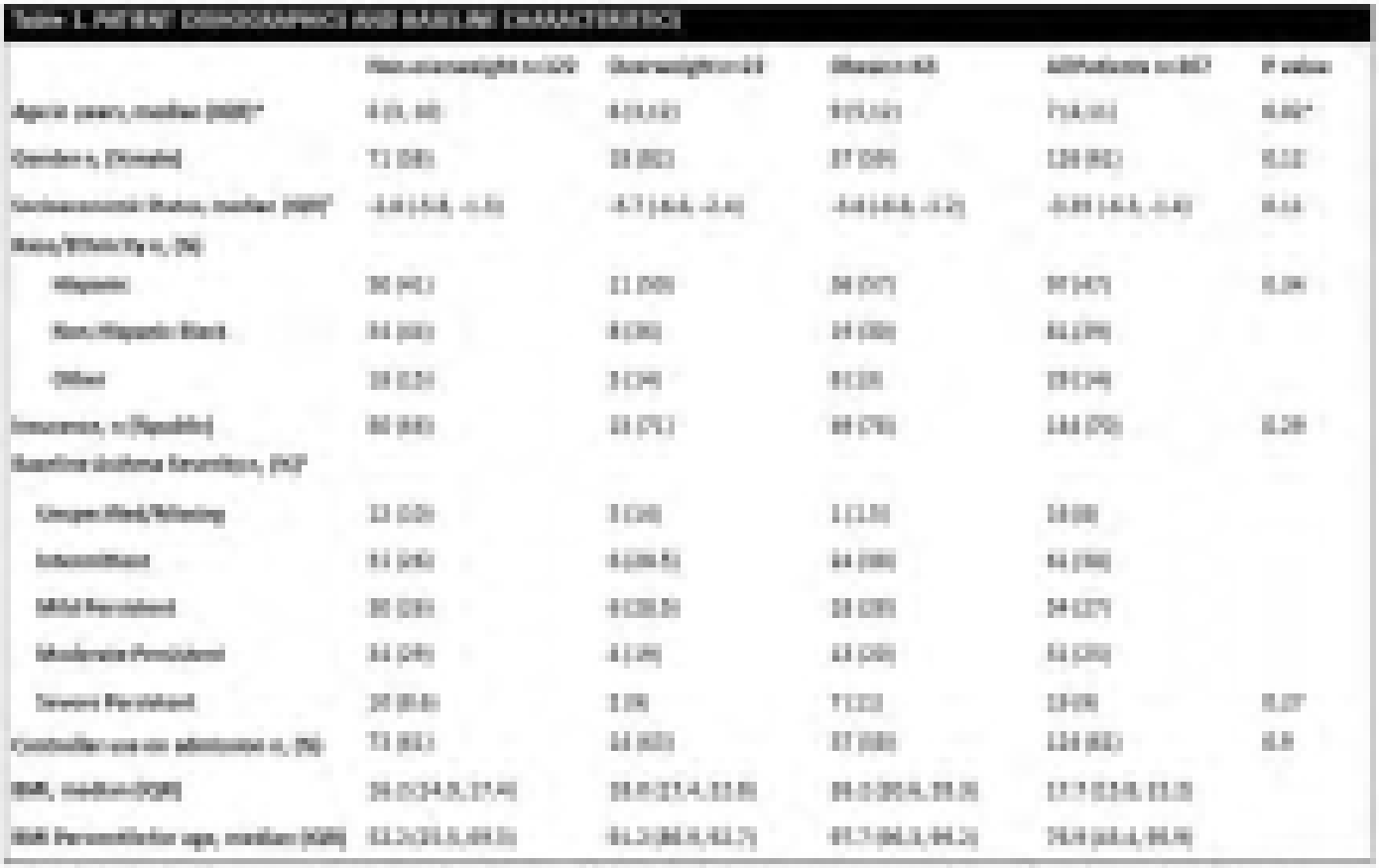
Design/Methods This is a retrospective chart review of acute asthma care at an urban, tertiary care children's hospital with an asthma pathway. We included patients 2-17 years old who received IV Mg within 12 hours of Emergency Department (ED) presentation. Children were excluded if they received oral steroids or care in an outside facility prior to presentation, had other lung diseases or no height recorded. The primary outcome measure was time to IV Mg therapy from ED triage in minutes. Secondary outcomes included LOS, time from triage until albuterol dose weaned to every 4 hours (duration of therapy), and Pediatric Intensive Care Unit (PICU) admission. Continuous variables were analyzed using Kruskal-Wallis or Mann Whitney test and categorical variables analyzed using Chi-Square test or Fisher's exact test, as appropriate. A linear regression model was used to examine the association of clinical or demographic factors to time to IV Mg and LOS.

Results In 2017, 700 patients were admitted with acute asthma and 355 received IV Mg within 12 hours of presentation (51%). Of these, 58% met study criteria (Figure 1), and 41% (85 patients) were OW or OB. Baseline characteristics did not vary by weight status except for age (Table 1). OB were older than OW and NO (9y vs 6y vs 6y, p=0.02). No significant differences were found between OB, OW, and NO in time to IV Mg (134 minutes vs 147 minutes vs 152 minutes, p=0.95), LOS, duration of therapy, or ICU admissions (Table 2). There was no correlation between time to IV Mg and LOS, and linear regression analysis did not find any statistically significant associations between BMI and time to IV Mg.

Conclusion(s) In this sample of inner-city children who received IV Mg as part of an asthma pathway there were no differences in timing of IV Mg or LOS based on BMI category. Further work is needed to examine if adoption of asthma pathways may reduce disparities in LOS between OB and NO patients.

Figure 1.


Most Common Reasons for Exclusion:
• Transfer from Outside Hospital (41%)
• Steroid use prior to admission (19%)
• Transfer from clinic (15%)
• No height recorded within 6 months of visit (11%)



Abstract: 415
CPAP vs. Unsynchronized NIPPV at Equal Mean Airway Pressure (MAP)
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Background Nasal continuous positive airway pressure (NCPAP) and Nasal IPPV (NIPPV) are widely used methods of non-invasive respiratory support with uncertainty about their relative merit. Some studies showed less extubation failure with NIPPV than with NCPAP, but the level of distending pressure differed between the groups. Published studies show that: 1. Unsynchronized NIPPV rarely generates a tidal volume and 2. Higher CPAP (7-9 cmH_2O) led to lower rate of extubation

failure compared to CPAP of 4-6 cmH_2O. Based on these data we hypothesized that the putative advantage of NIPPV over CPAP is due to differences in mean airway pressure (MAP).

Objective To compare NIPPV and CPAP at equivalent MAP and determine if they achieve similar level of support.

Design/Methods This is an ongoing crossover, non-inferiority clinical trial comparing NIPPV and CPAP at equal MAP. Infants of 22-34 wk GA who are stable on non-invasive support (CPAP or NIPPV) with FiO_2 <0.40 and MAP 7-12 cmH_2O for at least 48 h are eligible. Infants are randomized to CPAP or NIPPV for 12 hours and then switched to alternate mode for next 12 hours. The MAP used clinically at baseline is maintained throughout. The primary outcome is bradycardia events (HR<80/min, based on monitor downoad) because this is a common indication for which NIPPV is started. Desaturation events (SPO_2 <88%), oxygenation (pulse oximetry, FiO_2), ventilation ($TcCO_2$ monitoring), respiratory rate (RR) and work of breathing (WOB) estimated by respiratory inductive plethysmography (RIP) are the secondary outcomes. Paired t-test provided mean and 95% CI. Non-inferiority was accepted if the upper limit of the 95% CI was below the non-inferiority margin of 20%.

Results Of 150 babies screened for eligibility, 40 were enrolled with parental consent. The demographics of the enrolled infants are shown in Table 1. The rate of bradycardia was similar (mean difference [MD]= -0.9, 95% CI -2.7 to 0.82, p = 0.28). Desaturation events tended to be more frequent with NIPPV (MD=15.4, 95% CI -1.38 to 32.11, p=0.07) and FiO_2 was higher in the NIPPV group (MD 0.014, 95% CI 0.005 to 0.023, p=0.026).. SPO_2 (MD =0.14, 95% CI -0.29 to 0.56, p =0.51), $TcCO_2$ (MD=0.9, 95% CI -1.7 to 3.49, p = 0.5) and RR (MD=0.57, 95%CI -2.9 to 1.8, p=0.63) were similar. RIP data are not yet available. Table 2 shows details of outcome variables.

Conclusion(s) NIPPV and CPAP, when used at equivalent MAP achieve similar level of support. CPAP can be delivered by inexpensive bubble CPAP apparatus, while NIPPV requires expensive equipment to achieve the same result.

Birth weight (g)	954 ± 490
Gestational age (wk)	26.8 ± 3.1
PMA at enrollment (wk)	32.1 ± 3.4
Study weight (g)	1474 ± 661
Gender (% male)	18/39 (46%)

Table 1. Demographics of enrolled subjects. PMA = postmenstrual age

Variable	CPAP	NIPPV	p-value
$TcCO_2$ (n=34)	53.1 ± 8.6	54.0 ± 10.3	NS
SpO_2 (n=31)	93.0 ± 2.5	93.1 ± 2.5	NS
%time SPO_2<88 (n=31)	11.2 ± 8.8	11.0 ± 9.1	NS
MAP (cmH_2O, n=39)	9.1 ±1.6	9.2 ± 1.5	NS
FiO_2 (n=39)	0.284 ± 0.07	0.296 ± 0.07	0.018
RR (br./min, n=39)	58.3 ± 10.6	57.7 ± 9.0	NS
Brady events (n=36)	4.2 ± 4.8	3.3 ± 3.4	NS
Desat. events (n=36)	111.2 ± 81.4	126.5 ± 94.3	NS

Table 2. Detailed outcome data. Some data from early subjets are missing; the n for each outcome is in parentheses. $TcCO_2$ = transcutaneous PCO_2, SPO_2 = oxygen saturation by pulse oximetry, MAP = mean airway pressure, RR - respiratory rate, brady = bradycardia, desat. = desaturation (SPO_2 <88%)

Abstract: 416
Respiratory care practice change in preterm infants (<32 wks gestation): Impact on BPD outcome using 36wk and 40wk respiratory status.
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Background BPD, a multifactorial disease, results from dysregulated alveolar and pulmonary vascular development partially caused by O_2 and/or invasive ventilation. Non-invasive respiratory support without surfactant has led to less invasive ventilation. But it is not clear if short-term outome (BPD) has been impacted and long-term pulmonary function may be worsened. Correctly defining BPD has been hampered by constantly evolving respiratory practices and patient cohorts, revealing the inadequacy of currently used BPD diagnostic criteria. Recent data suggests that respiratory symptoms at 40 wks post-menstrual age (PMA) may be more prognostic. We need to further understand the best patient cohort of preterm infants that would benefit from surfactant use vs. non-invasive ventilation/no surfactant.
Objective Determine how clinical practice change impacted BPD and how gestational age and patient-specific characteristics can better inform infant selection for non-invasive respiratory care.

Design/Methods After identifying a clinical practice change in one level IV NICU between 2014 to 2015 of using less surfactant but more non-invasive ventilation amongst infants born at < 32 wks gestation, infants were divided into 2 epochs: those born from 2010-2014 vs. 2015-2017 to compare BPD outcomes. Given evolving BPD definitions, infants were identified using the VON definition (FiO_2 at 36 wks PMA), 2001 NIH workshop BPD definition, and the Australian Cohort 40 wk PMA Criteria. Perinatal and postnatal characteristics that may complicate respiratory course were also evaluated.
Results A total of 891 infants born at < 32 wks gestation were included. Surfactant use in delivery room (DR) or after DR was significantly less in epoch 2, especially in infants born at < 28 wks gestation. Demographics were not significantly different between epochs. Maternal and infant characteristics were not different between epochs except for significantly less maternal hypertension and PDA in epoch 2 for 28-32 wk group. BPD incidence (36 and 40 wk PMA defintions) did not change despite less surfactant use in epoch 2, despite a decrease in certain maternal/infant characteristics with potential BPD risk.
Conclusion(s) We identified a practice change from 2010-2014 vs 2015-2017 of using less surfactant/mechanical ventilation, but BPD incidence at 36 wks or 40 wks PMA was not altered. Long-term (2yr pulmonary outcome) for epoch 2, may provide additional insight into beneftis/risks of changing respiratory practices.

Clinical Practice Change - Surfactant Use

	<28 weeks		P-Value	28-32 weeks		P-Value
	Epoch 1 (2010-2014)	Epoch 2 (2015-2017)		Epoch 1 (2010-2014)	Epoch 2 (2015-2017)	
	n=201	n=95		n=370	n=225	
Surfactant given in DR	128 (64)	18 (19)	<0.01	35 (9)	5 (2)	<0.01
Surfactant given after DR	190 (95)	57 (60)	<0.01	168 (51)	75 (33)	<0.01

All data presented as N (%)

Demographics

	<28 weeks		P-Value	28-32 weeks		P-Value
	Epoch 1	Epoch 2		Epoch 1	Epoch 2	
	n = 201	n = 95		n = 370	n = 225	
Gestational Age*	183.5 (8.2)	183.7 (8.1)	>0.9	210.6 (7.8)	211.6 (8.1)	0.3
Birth Wt (kg)*	869.9 (191.1)	873.3 (208.1)	0.9	1337.9 (290.7)	1405.2 (358.8)	0.2
Outborn	33 (16)	11 (12)	0.3	67 (18)	41 (18)	>0.9
Male sex	122 (61)	48 (51)	0.1	191 (52)	127 (56)	0.3

All data presented as N (%) except: * Mean (standard deviation)

Maternal/Infant Characteristics

	<28 weeks		P-Value	28-32 weeks		P-Value
	Epoch 1	Epoch 2		Epoch 1	Epoch 2	

	n = 201	n = 95		n = 370	n = 225	
Chorioamnionitis	67 (33)	26 (27)	0.3	67 (18)	34 (15)	0.4
Maternal Hypertension	40 (20)	14 (15)	0.3	134 (36)	51 (23)	<0.01
Antenatal Steroids	190 (95)	88 (93)	0.4	346 (94)	208 (92)	0.6
C-Section	141 (70)	54 (56)	0.03	245 (66)	149 (66)	>0.9
Multiple Gestation	70 (35)	20 (21)	0.02	108 (29)	75 (33)	0.3
PDA	62 (31)	23 (24)	0.3	38 (10)	7 (3)	<0.01
Early Sepsis	9 (4)	3 (3)	0.6	5 (1)	0	
Pneumothorax	8 (4)	1 (1)	0.2	8 (2)	4 (2)	0.7
NEC	12 (6)	7 (7)	0.6	15 (4)	7 (3)	0.6
Severe IVH	4 (1)	3 (1)	0.8	4 (1)	3 (1)	0.8

All data presented as N (%)

Outcomes - BPD

	<28 weeks		P-Value	28-32 weeks		P-Value
	Epoch 1	Epoch 2		Epoch 1	Epoch 2	
	n = 201	n = 95		n = 370	n = 225	
BPD - 40wk	32 (16)	20 (21)	0.3	5 (1)	5 (2)	0.4
BPD - VON	65 (32)	32 (34)	0.8	14 (4)	7 (3)	0.7
BPD - NIH mild	58 (29)	21 (22)	0.1	23 (6)	4 (2)	0.05
BPD - NIH Mod	22 (11)	5 (5)		5 (1)	1 (<1)	
BPD - NIH Severe	56 (28)	28 (29)		11 (3)	6 (3)	

All data presented as N (%)