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Impact of ADHD Medication on Performance of Chores by Children with ADHD

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Background In many cultures, children begin helping around the house at a young age as a form of socialization. However, studies show that children with ADHD participate less frequently and need more assistance when performing household tasks. Many children with ADHD regularly take medication to manage their symptoms, yet it is unknown if it also improves their household chore (HC) performance.

Objective To investigate if ADHD medication effects are associated with improved HC performance and children's ability to meet parental expectations of HC completion.

Design/Methods An anonymous questionnaire was distributed with assistance from CHADD to parents of children with ADHD to collect information about parental beliefs about the adequacy of their child's HC performance. Metrics evaluating HC performance included: 1) need for assistance; 2) need for reminders; 3) independent completion; and 4) satisfactory completion. Parents were also asked about their child's frequency of meeting expectations with respect to 8 HC, including making the bed, setting the table, and washing dishes. Parent perceptions of the duration of effects of ADHD medication were used to classify those with medication effects lasting past the end of school as children with after-school medication benefits (ASMB). The survey also asked about children's demographic and clinical information. Mann-Whitney U tests examined associations between ASMB and measures of HC performance among children regularly taking medication on weekdays.

Results 565 parents of children with ADHD that regularly take medication on weekdays completed the questionnaire. Demographic information of the sample is available in Table 1. Children with ASMB were significantly more likely than those without ASMB to meet parental expectations for 5 of 8 HC examined (Table 2). Although no differences were noted for need for reminders or assistance with HC, children with ASMB were significantly more likely to be able to independently complete HC (Table 2).

Conclusion(s) For children who regularly take medication to manage their ADHD symptoms, medication which lasts after the end of school is associated with higher ratings across several metrics of HC performance. Improved HC performance may have implications for child development, as evidence suggests that engagement with HCs promotes prosocial behavior, heightens awareness of others' needs, and increases social understanding. Randomized controlled trials are needed to further evaluate the clinical implications of this association.

Table 1. Participant/Household/Child Demographics, Online Survey of Parent/Guardians of Children with ADHD (n=565)

Demographics	n	(%)
Sex of index child		
Male	396	(70.1)
Female	169	(29.9)
ADHD Sub-type		
Combined Subtype	405	(71.7)
Inattentive Subtype	110	(19.5)
Hyperactive/Impulsive Subtype	47	(8.3)
Unsure of Subtype	3	(0.5)
Comorbidities		
Oppositional Defiant Disorder (ODD)	114	(20.2)
Learning disability	32	(5.7)
Psychiatric disorder (other than ODD)	19	(3.4)
Serious medical condition	22	(3.9)
Parent relationship to index child		
Mother	510	(90.3)
Father	35	(6.2)
Other	20	(3.5)
Ethnicity of parent		
Hispanic/Latino	37	(6.5)
Not Hispanic/Latino	500	(88.5)
Prefer not to answer	28	(5.0)
Race of parent		
White	493	(87.3)
Black or African American	17	(3.0)
Other	17	(3.0)
Prefer not to answer	22	(3.9)
Highest education level of parent		
No high school diploma	1	(0.2)
High school graduate	27	(4.8)
Some college, no degree	72	(12.7)
Associate degree (including occupational or academic degrees)	49	(8.7)
Bachelor's degree	195	(34.5)
Graduate degree	219	(38.8)
Prefer not to answer	2	(0.4)
Approximate annual household income		
Less than $20,000	14	(2.5)
$20,000 to $50,000	55	(9.7)
$50,000 to $100,000	131	(23.2)
$100,000 or more	290	(51.3)
Prefer not to answer	70	(12.4)
Not sure	2	(0.4)
Missing	3	(0.5)

Table 2. Associations between Chore Performance and After-School Benefits of ADHD Medication in Children with ADHD on Medication (n=520)

	Mean Rating		
	Children without After-School Medication Benefits[a, b] (n=139)	Children with After-School Medication Benefits[a, b] (n=381)	p value[c]
After-school effect of ADHD medication on:[d]			
Starting chores without reminders	1.59	2.04	**<0.001**
Completing chores independently	1.62	2.23	**<0.001**
Quality of chores	1.61	2.28	**<0.001**
Frequency of child doing chore relative to parent expectations[e]			
Self-care chores:			
Child makes their bed	1.64	1.85	**0.007**
Child cleans their bedroom	1.53	1.70	**0.01**
Family-care chores:			
Child sets or clears the table	2.11	2.24	0.07
Child assists with family meal or snack preparation	2.06	2.19	0.10
Child washes or dries dishes	2.00	2.15	0.06
Child does laundry	1.97	2.16	**0.02**
Child does housecleaning	1.82	2.03	**0.005**
Child takes out the garbage	2.09	2.28	**0.02**
Chore performance metrics[f]			
Child needs assistance for:			
Self-care chores	3.40	3.28	0.14
Family-care chores	3.52	3.45	0.46
Child needs reminders for:			
Self-care chores	4.55	4.40	0.07
Family-care chores	4.51	4.45	0.39
Child independently completes:			
Self-care chores	2.87	3.07	**0.04**
Family-care chores	2.81	3.07	**0.03**
Child satisfactorily completes:			
Self-care chores	2.93	2.95	0.74
Family-care chores	2.89	2.99	0.55

[a] Parent reported that their child's ADHD medication had not yet worn off (i.e., lasted for any time duration greater than 0 hours) after their child returned home on a typical school day.
[b] 45 parents reported that they were not sure if their child has after-school medication benefits.
[c] p-values obtained from the Mann-Whitney U test
[d] Scored using Likert item: (1) No effect, (2) Small effect, (3) Medium effect, (4) Large effect
[e] Scored using Likert item: (1) Much less than expected, (2) Less than expected, (3) As much or more than expected
[f] Scored using Likert item: (1) Very rarely, (2) Rarely, (3) Sometimes, (4) Often, (5) Very often

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A Pilot Study to Establish Self-defined Success and Connectedness to Improve Care Coordination for Families

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Background Children with complex medical conditions, including mental health problems, benefit from care coordination to support their families in promoting optimal healthy development. Families can find it overwhelming to arrange all of the medical care and social services needed for their children. Care coordinators offer powerful advocacy and support to help ease that burden for families and ensure connectedness to appropriate services.
Objective In this pilot study, we sought to define what "connectedness" means for families and enhance that connectedness so that the care coordination goals mutually defined by care coordinators and families are met.
Design/Methods Offering care coordination with a master's level social worker to coordinate and support these families in seeking support, while bridging the gap to providers (school, medical, community) has been our focused intervention. A framework or care coordination tool was developed and is summarized in table 1. Families were enrolled and their goals were identified. Post-care surveys were completed.
Results The connectedness tool was introduced to a total of 60 families between March 2019 and September 2019. Of these 60

families, 3 (5%) refused services. Of the 57 families that participated in using the tool, the subjective data overwhelmingly demonstrated an increased sense of connectedness. Families felt connected, supported, and that their children were better off after receiving care. 56 (98%) of participants who answered the questions reported they felt supported by care coordination. Two (3%) families indicated that they were not better off, with one family noting that they are still in the process of working on their goal. The care coordination team met a wide variety of identified goals. The goals most frequently identified and successfully achieved during this review period were, in descending order: psychiatry referral, education advocacy, coordination with DCF, referral for outpatient therapy, and discharge planning.
Conclusion(s) Care coordination can meet many diverse goals of referred families, and these results help to broaden our understanding of what it means for participating families to feel connected.

Table 1. Evaluation Metrics

Variable	Measure	Rationale
Connectedness	Individual goal-setting; Service utilization tracking	Connectedness to services/supports is different for each family, it can range from transportation support and housing stability, to primary care connection and mental health services.
Success	Individual goal-setting; Post care survey	Success is a measure that is best based on individualized family goals and the families' own self-report of goal completion.
Health improvement	Post care survey	Post care coordination survey that assesses if patients and families feel better-off than they did before receiving services

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Relationship between Vitamin D and Hemoglobin A1c in Type 1 Diabetes Mellitus
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Background
Studies have described different roles of vitamin D in the pathophysiology of type 1 diabetes mellitus (DM). Vitamin D is related to insulin function and sensitivity, but the clinical significance is not yet proven. Almost half of the adolescents with Type 1 DM diabetes are at risk of deficiency or insufficiency of vitamin D. Majority of the studies exploring the relationship between vitamin D and DM were done in type 2 DM. Most of those studies showed an inverse relationship between vitamin D level and insulin resistance. There are few studies conducted in children and adolescents with type 1 DM that looked at the association of vitamin D with glycemic control (HbA1C). Results were controversial, mixed between null and inverse association.
Objective
To assess the relationship between vitamin D level and HbA1c in children and adolescents with type 1 DM.
Design/Methods
The data were retrospectively collected from electronic medical records of children and adolescents age 2-21 years with a physician-given diagnosis of type 1 DM at the Pediatric Endocrinology clinic. HbA1c level was compared among patients with vitamin D deficiency (<20 ng/ml), insufficiency (21-29 ng/ml), and sufficiency (>30 ng/ml) and compared to changes of vitamin D level after 6-12 months. Other comparison variables include age, sex, body mass index (BMI), and Tanner stages. Patients on medications (other than insulin) that can affect glucose level or insulin function or with no available data were excluded.
Results To date, 34 patients met the selection criteria. Age ranged from 9 to 21 years with a mean age = 13.97 ± 3.45; 61.8% (n=21) were male. Race/ethnicity showed 39% (n=13) African American, 21.2% (n=7) Latino, 39.4% (n=13) other. At baseline, 35.3% (n=12) had vitamin D deficiency, 35.3% (n=12) had insufficiency and 29.4% (n=10) had sufficient level. Change scores were computed for vitamin D and HbA1c for patients who had two scores 6-12 months apart. Pearson Correlation analysis showed that the

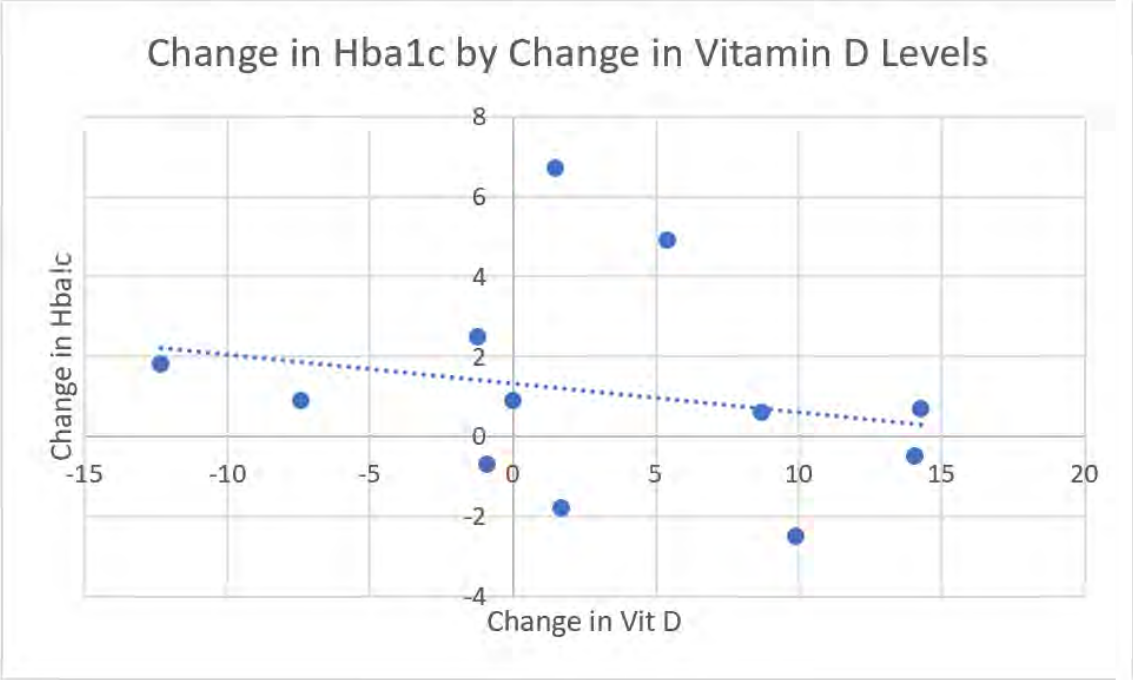
relationship between higher vitamin D levels and lower HbA1c scores was in the expected direction but not statistically significant (r= - .233, p=.486). This relationship remained constant when BMI was controlled for. Limitations of the study include small sample size
Conclusion(s) Vitamin D level is not associated with HbA1c level in children and adolescents with type 1 DM and change of vitamin D level status is not associated with a change in HbA1C. Larger studies are needed to validate these findings.

Table 1

Mean and Standard Deviations for Vitamin D and HbA1c

	Time 1		Follow-up	
	Mean (SD)	n	Mean (SD)	n
Vitamin D Level	24.65(8.50)	34	29.50(8.57)	13
HbA1c	10.02(2.95)	34	10.55 (2.24)	16

Figure 1



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Hypercalcemia and Nephrocalcinosis as Presenting Symptoms of Neonatal Distal Renal Tubular Acidosis
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Background The endocrine evaluation of neonatal hypercalcemia includes systematically assessing for subcutaneous fat necrosis, excessive vitamin D or calcium intake, hyperparathyroidism, Williams Syndrome and *CYP24A1* mutations.
Objective Here we describe an uncommon cause of neonatal hypercalcemia and nephrocalcinosis in an infant with acidosis.

Design/Methods Data was abstracted from the electronic medical record.
Results A 26-day-old boy presented to an emergency department with emesis, failure to thrive and decreased activity was found to have severe symptomatic hypercalcemia (calcium = 15.9 mg/dL). He was born at term following an uncomplicated pregnancy and delivery, and his weight had fallen from 3.88 kg at birth to 3.76 kg. Laboratory studies demonstrated the following serum concentrations: sodium 150 mmol/L; potassium 3.4 mmol/L; chloride 124 mmol/L; carbon dioxide 13 mmol/L; creatinine 0.43 mg/dL; phosphorus 4.0 mg/dL; magnesium 1.8 mg/dL; parathyroid hormone < 3.0 pg/mL; 25-hydroxyvitamin D 42.7 ng/mL; 1,25 dihydroxyvitamin D 11.5 pg/mL. Renal ultrasound demonstrated bilateral medullary nephrocalcinosis. His calcium level normalized with hydration, calcitonin and reduced calcium intake, but he developed worsening electrolyte abnormalities with significant acidosis, hyperchloremia and hypokalemia. Urinalysis showed a specific gravity of 1.004, pH of 8.0 and no blood or protein. The urine calcium to creatinine ratio was 0.84, and the urine anion gap (Na+ +K+-Cl−) was + 23.8 mmol/L. There was concern for distal renal tubular acidosis given a non-anion gap metabolic acidosis with alkaline urine and an elevated urine anion gap which was inappropriate in the setting of his acidemia. Potassium citrate therapy was initiated and the dose was titrated. Once acidosis corrected, the calcitonin was able to be stopped without recurrence of hypercalcemia. Genetic testing confirmed biallelic mutations in *ATP6V0A4*, consistent with autosomal recessive distal renal tubular acidosis (RTA).
Conclusion(s) Distal RTA, although a rare cause, should be considered in the differential diagnosis for infants with hypercalcemia and nephrocalcinosis. Early recognition and management of acidosis can lead to resolution of hypercalcemia. This is particularly important in infants where the degree of hypercalcemia may be severe and other electrolyte abnormalities may initially be variable as a result of frequent emesis and fluid resuscitation.

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Poor Type 1 Diabetes Control 1 Year Post Diagnosis is Associated with Lower Socioeconomic Status
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Background Poor glycemic control, manifested as chronic hyperglycemia, is the primary cause of the morbidity and mortality in Type 1 Diabetes (T1D), resulting in serious complications including early death, stroke, kidney failure, and blindness. It is therefore useful to determine who is at high risk of having poorly controlled T1D in order to maximally reduce and prevent complications through focused intensive interventions.
Objective To determine the association between socioeconomic status (SES) and control of type 1 diabetes mellitus (T1DM) 1-year post diagnosis.
Design/Methods We retrospectively analyzed records of patients with T1DM followed at the Diabetes Center at the Children's Hospital of Philadelphia from January 2009 to December 2018. Included subjects were <19 years old, positive for at least one diabetes-related autoantibody, and had a hemoglobin A1c (HgbA1c) recorded 10-15 months post diagnosis. Socioeconomic status (SES) was defined by census block according to the 2013 US census bureau's median household income community data. Linear regression evaluated the association between SES and T1DM control.
Results 1,373 patients met inclusion criteria; 45% (n=620) female, 17% (n=232) African American, 72% (n=1,000) Caucasian. Median age at diagnosis was 10.4 years (IQR 7.0-13.4). The median household income was $75,213 (IQR $56,294, $96,528). In multivariate analysis, median household income within census tract of patient's residence was independently associated with 12 month diabetes control as measured by HgA1c after controlling for sex, race, age, gender and insurance type (p=0.001). Higher HgbA1c is seen in those in lower SES communities. This association was seen in all age groups, 0-5 years (p=0.011), 5-13 years (p=0.001) and >13 years (p=0.020).
Conclusion(s) Community SES defined by census track median household income is associated with T1DM control 1 year after diagnosis. These findings can be used to identify at risk patients and implement strategies including increased support in targeted low SES communities.

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A Rare Case of Autonomously Functioning "Hot" Nodule and Hürthle Cell Adenoma of Thyroid in Pediatrics
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Background Thyroid nodules are less prevalent in young children and adolescents (less than 1% to 1.5%) compared to adults (1-5%) with a rising incidence in adults as they get older. Thyroid nodules tend to be more malignant in children compared to adults. Prevalence of thyroid carcinoma in hot nodule is ranging from 0-4% in adults. Hürthle cell carcinoma accounts for 3-5% of differentiated thyroid carcinoma. Hyperfunctioning Hürthle cell carcinomas are extremely rare but has been described in literature. A hyperfunctioning Hürthle cell adenoma has not been reported in pediatrics.
Objective To report a case of autonomously functioning "hot" nodule with a cytopathology of Hürthle cell adenoma, which is

described for the first time in pediatrics.
Design/Methods A 16-year-old, previously well, female presents with increasing neck mass and fatigue over the past year. Family history was significant for thyroid cancer in the maternal great aunt, and a neck mass in biological mother, information on this was limited as she was adopted. On examination, she had tachycardia, normal blood pressure, a large non-tender firm anterior neck mass left to midline, hyperreflexia of both knees and tremor of outstretched hands.
Results Thyroid function tests revealed suppressed thyrotropin (TSH) and elevated free thyroxine (FT4) levels, consistent with hyperthyroidism. Thyroid ultrasound demonstrated a large 3.3 x 2.9 x 4.9 cm mixed solid and multicystic left thyroid lobe mass with a hypervascular solid component, smooth margins, without internal calcification. Fine Needle Aspiration (FNA) revealed Bethesda category II, consistent with a benign follicular nodule. I-123 uptake and scan showed that a solitary autonomously functioning nodule replaced most of the left thyroid lobe, with a markedly elevated uptake (39.3% at 2 hours and 62.6% at 24 hours). Pathology on left hemithyroidectomy with partial isthmusectomy, demonstrated 4.9 x 3.4 x 2.7 cm well demarcated mass with central cystic change and blood clot. Cytopathology revealed a Hürthle cell adenoma with focal biopsy site changes without definite capsular or vascular invasion. Hyperthyroidism resolved with surgery.
Conclusion(s) Hyperfunctioning Hürthle cell tumors are rare in literature. To our knowledge this is the first report in literature describing an autonomous functioning “hot” nodule and Hürthle cell adenoma of the thyroid in an adolescent.

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Pediatric Growth Parameters in Inflammatory Bowel Disease at Endocrine Referral
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Background Pediatric inflammatory bowel disease (IBD), Crohn’s Disease (CD) and Ulcerative Colitis (UC), have been associated with poor linear growth ultimately leading to poor final stature and quality of life. IBD remission is imperative to ensure appropriate growth acceleration and puberty. Patients are often referred to endocrinology for evaluation of poor growth, despite no approved intervention. Growth hormone therapy remains controversial with variable success. It is unclear, however, what factors in addition to IBD predispose children to worse growth and eventually suboptimal height outcomes.
Objective The aim of our study is to evaluate possible negative predictors that impact growth in children diagnosed with IBD.
Design/Methods We retrospectively studied medical records of 14 IBD patients referred to pediatric endocrinology for growrh concerns. Patient height, weight and BMI at time of diagnosis were compared to measurement at initial endocrine evaluation. In addition, growth velocity (GV), bone age, insulin-like growth factor 1 (IGF-1) levels and difference in predicted adult height (PAH) and mid-parental target height were reviewed. PAH was estimated using the Bayley-Pinneau method; target height was calculated using parental heights.
Results At initial endocrine visit ages were 8-15 years (10 males and 4 females). 50% of patients had delayed bone ages. Height measured was on average -0.85 SD; however, 28% of the patients had a height less than -2 SD. Average SD at initial endocrine visit for weight and BMI were -0.72 and -0.12 SD, respectively. Average PAH calculated based on initial bone age was 1.02 SD lower than calculated mid-parental target height, but this was not significant. The average follow-up height SD was not significantly different (-0.83), although 28% of patients continued to measure less than -2 SD for height, despite IBD treatment. 29% of patents were on rhGH at the time of endocrine follow-up. Average SDs for weight, BMI and growth velocity were -0.43, +0.25 and -0.15 respectively. As expected, serum IGF-1 correlates with BMI SD (R=0.5). BMI at follow-up positively correlates with GV (R=0.66).
Conclusion(s) Patients diagnosed with IBD despite mode of treatment appear to be at a disadvantage for growth. Parameters such as improvement of BMI and IGF-1 levels appear to suggest a better height prognosis. In our practice, a minority of patients were treated with rhGH. Whether treatment of IBD is sufficient to sustain normal growth vs intervention such as rhGH could better final outcomes remains to be studied.

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An “Outpatient Pediatrics and Advocacy” Elective: Qualitative Analysis of Student Reflections and Focus Groups
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Background Pediatric training in medical schools typically focuses on healthcare delivery in inpatient and tertiary care settings. Thus, medical school graduates often enter residency training with a significant gap in core Pediatric skills including delivery of primary care and understanding the impact of social determinants of health (SDH). At Drexel University College of Medicine, the “Outpatient Pediatrics and Advocacy” elective was developed to provide an ambulatory-based sub-internship experience with a focus on SDH for students interested in Pediatrics and/or primary care.
Objective Determine common themes emerging from students’ individual reflections and focus groups to inform clinical skill acquisition and rotation impact.

Design/Methods Data obtained from reflective writing assignments and focus groups was analyzed using grounded theory. NVIVO qualitative data analysis software was used to identify themes and subthemes within transcripts from focus groups and student reflections. Codes were chosen by identifying the most common themes across qualitative responses and coded according to frequency. To track total codes, a frequency chart was made to identify prevalent themes.

Results A total of 30 students were included in this pilot study representing 4 focus groups in academic year cohorts and 45 additional documents in the form of student reflections. 26 themes were identified and coded according to qualitative responses. The theme with the largest number of references overall was “awareness of resources,” followed by “improved clinical skills,” “communication skills,” and “awareness of social determinants of health.” Other prevalent themes included “healthcare revelations,” “providing non-medical support,” and “awareness of the limitations of resources for underserved communities.”

Across focus groups, the most common theme reported was “awareness of resources,” followed closely by “increased communication skills,” “discovered special interest,” “lasting impact of program,” and “interest in patient advocacy.”

Across students’ written reflections, the highest reported theme was “improved clinical skills,” followed by “awareness of resources,” “importance of interdisciplinary fields of health,” and “awareness of social determinants of health.”

Conclusion(s) Analysis of student reflections and focus groups suggest improved clinical and communication skills. Students’ increase in resource and SDH awareness should improve their delivery of care in residency training and beyond.

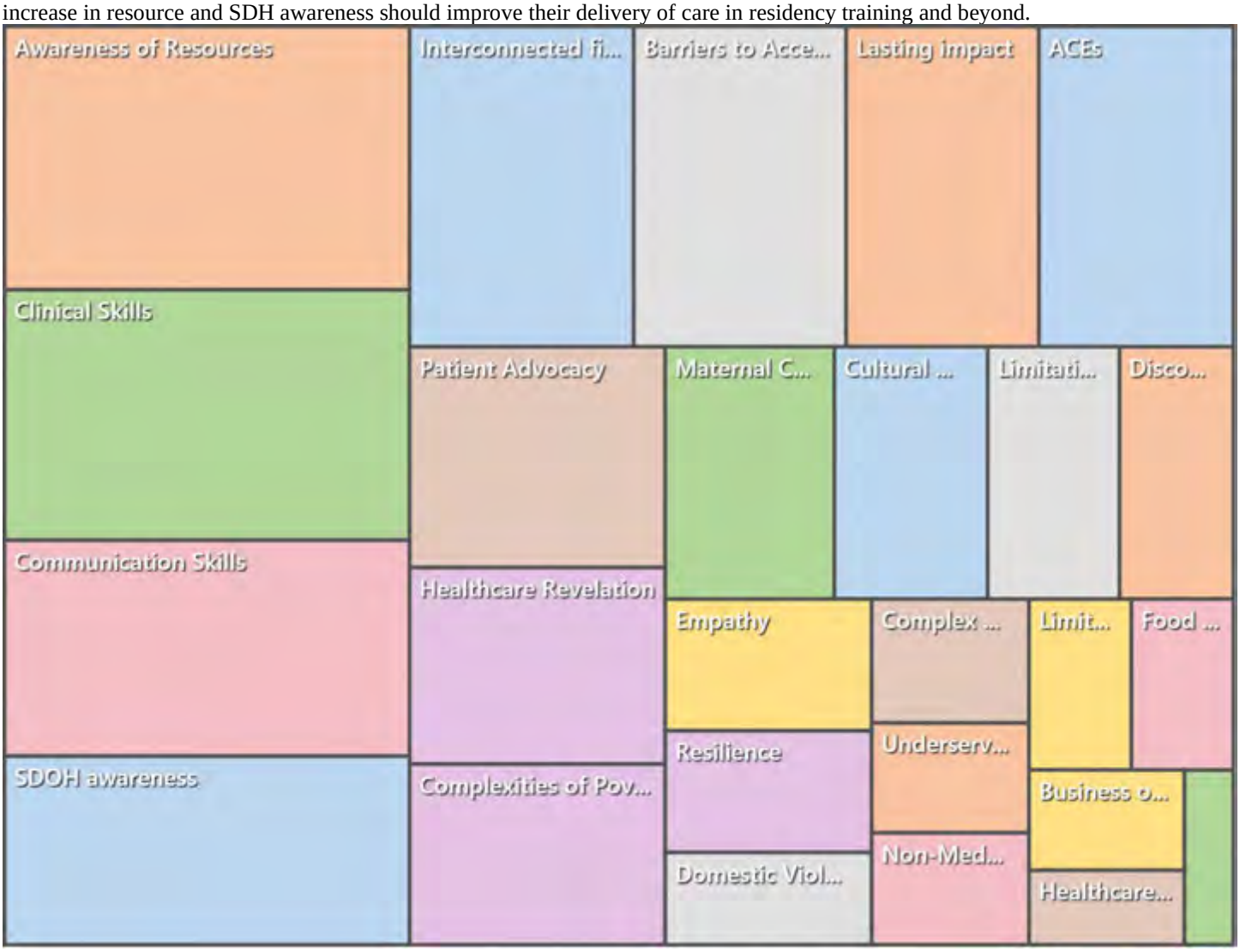

Figure 1: Hierarchy Chart showing theme prevalence

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Validating Pediatric Resident Self-Assessment of Basic Neonatal Resuscitation Skills

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Background There are no current studies validating resident self-assessment of competence in neonatal resuscitation skills.
Objective To determine whether residents are accurate in self-assessment of basic delivery room (DR) resuscitation and bag mask ventilation (BMV) skills by comparing self-assessed skill performance with assessment by independent observers.
Design/Methods This was a prospective observational study with repeated measures. Participants included pediatric residents completing newborn nursery and NICU rotations. Residents were Neonatal Resuscitation Program (NRP) certified at the start of residency. Observers were experienced NRP-certified neonatologists, DR hospitalists, advanced practice NICU providers and senior NICU fellows. Following each hands-on DR encounter, residents and observers independently completed written assessments evaluating resident performance. To avoid skewing results due to variable attendance at multiple deliveries, one paired assessment was randomly selected for each resident and was used to calculate sensitivity and specificity of self-assessment for detecting correct versus incorrect skill performance. All delivery room encounters were used in multivariable analysis to identify factors associated with accurate self-assessment, adjusted for repeated measures.
Results There were 81 paired assessments of performance by 27 residents. Residents competently performed and identified correct versus incorrect performance of initial NRP steps. When DR encounters required recognizing the need for BMV, performing BMV, and taking steps to correct ineffective BMV, competency and sensitivity decreased. Residents were less able to perform these steps competently and to recognize correct versus incorrect performance. Assessment areas focusing on improvement in ventilation as a response to BMV showed higher competency and specificity (Table). In multivariate analysis, we did not detect a difference in self-assessment of performance by gender, level of training, or resident choice of acute versus primary care career training track.
Conclusion(s) In this single-center study, residents were accurate in their self-assessment of basic steps for NRP skills. Residents' competency and ability to self-identify correct performance decreased as they were required to identify the need for and attempt to perform BMV and corrective steps to promote effective ventilation. A multicenter study of residents in training and graduating residents is warranted to further define these findings.

Table 1. Analysis of Pediatric Residents' Self-Assessment of NRP Skill Performance

Question		Responses	Competency	Prevalence of incorrect resident performance as assessed by observer	Sensitivity	Specificity	False-Negative	False-Positive	Agreement
1	Initial steps	27	1	0	NA	1	0	0	1
2		27	1	0	NA	0.963	0	0.037	0.963
3		24	0.833	0.167	1	1	0	0	1
4	Need for BMV	24	0.875	0.125	0	1	0.125	0	0.875
5		23	0.913	0.087	0	0.905	0.087	0.095	0.826
6		15	0.867	0.133	0	0.923	0.133	0.077	0.8
7	MRSOPA*	13	0.615	0.385	0	0.625	0.385	0.375	0.385
8		12	0.667	0.333	0.25	0.875	0.25	0.125	0.667
9		10	0.9	0.1	0	0.667	0.1	0.333	0.6
10		9	0	1	0.778	NA	0.222	NA	0.778
11		9	0	1	0.889	NA	0.111	NA	0.889
12	Response to BMV	11	0.455	0.545	0.167	1	0.455	0	0.545
13		11	0.909	0.091	0	0.9	0.091	0.1	0.818

* MRSOPA = corrective steps for ventilation

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Residents' Education on Firearms Safety Counseling: Current Status, Perceived Barriers, and Suggested Resources

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Background Firearm (FA) related deaths & injuries are national public health crises. FA is the leading cause of death among black children & teens. FA safety counseling has positive impact on increasing gun safety at home. It is crucial for Residents in training (RES) to learn skills of counseling with regards to this topic.
Objective To assess the availability & content of FA safety training in different specialties, as well as perceived barriers & strategies to improve it.
Design/Methods Cross sectional survey at Brookdale Hospital, NY including RES from all specialties. Questionnaire based on literature review was sent using "SurveyMonkey". Comparison of responses among subgroups of RES was done using Chi–squared or Fisher's exact test.
Results Of 244 RES, 134 (55%) responded to survey [51% males, 34% from pediatrics (PED) (Table 1-A)]. Nearly all RES agree that gun violence is a problem in their community (96%). Unavailability of FA safety training in residency programs was reported in 66% (less in PED vs. non-PED, Table 2). Overall, only few RES felt confident to counsel about FA (14%). Majority of respondents (67%)

were interested in receiving additional education (more in PED vs. non-PED). Methods of FA training in the RES' programs as well as topics covered are shown in Table 1-B (PED reported more CME/grand rounds and less case based scenarios / or standardize patient, table 2).
RES were similarly interested in receiving education in FA safety counseling, independent of the PGY level (Table 3). There was no difference in perceived barriers, except that PGY1 were more likely to "worry about upsetting families if asked about FA" (Table 3). Also, PGY1 were less likely to choose "workshops" & "grand rounds" as resources to increase FA education.
US graduates (USG) & non-USG had same perception on barriers to FA safety counseling and resources to increase FA safety education. Similarly, there was no difference on responses to these questions between RES raised in North America vs. those that did not. In contrast, RES who are non USG, or those raised iwithout FA at home were more likely to agree with gun violence being a problem in the community & interested in receiving FA safety education (Table 4-A,B).
Conclusion(s) Regardless of subspecialty, majority of RES reported no FA safety education received during their training. PED RES were more likely to indicate interest in training, which they thought it is their program's responsibility. Only few RES felt comfortable & confident counseling on FA safety.

Table 1-A: Demographic characteristics of residents included in the study (n=134)

Characteristic	n (%)	n (%)
Gender	Female 65 (49%)	Male 69 (51%)
Age group:	25-34 years: 93 (69%)	≥35 years: 41 (31%)
Graduate school:	US graduate 28 (21%)	International 106 (79%)
Grew up in a home with firearms or own firearm at home	Yes: 23 (17%)	No: 111 (83%)
Raised in:	North America 50 (37%) Asia 52 (39%) Africa 17 (12%) Europe 8 (6%) South America 5 (4%) Caribbean 2 (1%)	
Specialty:	Pediatrics 45 (34%) Dentistry 12 (9%) Emergency 18 (13%) General Surgery 10 (7%) Medicine 33 (25%) Psychiatry 16 (12%)	
Year of residency:	PGY1: 46 (34%) PGY2: 30 (22%) PGY3: 52 (39%) PGY4: 6 (4%)	

Table 1-B: Overall answers to general questions as well as current methods of training and topics covered in that (n=134)

Question	n (%)
Gun violence is a problem in the community where I practice	129 (96%)
Our Program doesn't have any firearm safety training	88 (66%)
Feel comfortable asking about presence or exposure to firearms.	31 (23%)
Feel confident in ability to counsel about firearm injury prevention	19 (14%)
Interested in receiving additional education in this area	90 (67%)
Methods of firearm safety training in your program:	
• Classroom lectures on firearm safety counseling	20 (15%)
• Small/large group discussions on firearm safety	7 (5%)
• Case based scenarios / or Standardize patient (SP) simulation	9 (7%)
• Residents attend CME or grand rounds on firearm safety education	14 (10%)
• Discussions with attending on firearm safety Education	8 (6%)
• Web based curriculum	8 (6%)
Topics covered in your program training on Firearms Safety Counselling:	
• Knowledge regarding the risk of having a gun in the home	25 (19%)
• Knowledge regarding making the storage of guns in the home safer	17 (13%)
• How to discuss firearm issues and what information to give	11 (8%)
• Recognize barriers and challenges when providing firearm counseling	10 (8%)
• Advising parents to limit viewing of gun violence in the media	10 (8%)
• How to become an advocate for laws that restrict gun availability	8 (6%)
• Firearms safety anticipatory guidance	13 (10%)

Table 1-A: Demographic characteristics of residents included in the study.

Table 1-B: Overall answers to general questions as well as current methods of training and topics covered in firearms safety education

Table 2: Comparison in responses to firearm safety survey among residents in pediatrics vs others (n=134)

	Non-Peds residents n=89	Peds residents n=45	*p*-value
Gun violence is a problem in the community where I practice	84 (94%)	45 (100%)	0.168
Our Program doesn't have any firearm safety training	60 (67%)	28 (62%)	0.550
Interested in receiving additional education in this area	50 (56%)	**40 (89%)**	<0.001*
Residents' attitudes and beliefs with regards to firearm safety education: Residents answered as STRONGLY or SOMEWHAT AGREE with the following			
There is a need for residents' education on firearm injury prevention.	67 (76%)	**41 (91%)**	0.036*
Residency program has the responsibility to train residents on counselling patients/families about firearms safety/risks.	54 (60%)	**45 (100%)**	<0.001*
Residency program having formal assessment on firearms counselling.	46 (52%)	**37 (82%)**	0.001*
Residents' confidence and perception of competence: Respondents answered as EXTREMELY or VERY to the following:			
Had adequate training during residency on firearm safety counseling.	4 (5%)	5 (12%)	0.132
Observed physicians successfully counseling parents and youth in firearm injury prevention in real life clinical or practice environments.	6 (7%)	4 (9%)	0.629
Feel comfortable asking about presence or exposure to firearms.	23 (26%)	8 (19%)	0.375
Feel confident to counsel about firearm injury prevention.	11 (12%)	8 (19%)	0.310
Methods of firearm safety training in programs			
Classroom lectures on firearm safety counseling	16 (18%)	9 (20%)	0.163
Small/large group discussions on firearm safety	6 (7%)	1 (2%)	0.423
Case based scenarios / or Standardize patient (SP) simulation			
Residents attend CME or grand rounds on firearm safety education	4 (5%)	**10 (22%)**	0.002*
Discussions with attending on firearm safety Education	5 (6%)	3 (7%)	0.809
Web based curriculum	6 (7%)	2 (4%)	0.596
Topics covered in firearms safety counselling training			
Knowledge regarding the risk of having a gun in the home	17 (19%)	8 (18%)	0.853
Knowledge regarding making the storage of guns in the home safer	10 (11%)	7 (16%)	0.478
How to discuss firearm issues and what information to give	8 (9%)	3 (7%)	0.644
Recognize barriers and challenges when providing firearm counseling	7 (8%)	3 (7%)	0.803
Advising parents to limit viewing of gun violence in the media	7 (8%)	3 (7%)	0.803
How to become an advocate for laws that restrict gun availability	6 (7%)	2 (4%)	0.596
Firearms safety anticipatory guidance	9 (10%)	4 (9%)	0.821
Perceived barriers to firearm safety training			
Lack of time to discuss firearm safety during patient encounter	**41 (46%)**	9 (20%)	0.003*
Perception that firearms safety is lower priority compared to other topics	**31 (35%)**	3 (7%)	<0.001*
I worry that I will upset families if I ask about firearms in the home	26 (29%)	18 (40%)	0.209
Lack of confidence in ability to provide firearm safety counseling	**20 (23%)**	2 (4%)	<0.001*
Lack of knowledge needed to provide firearm safety counseling	**23 (26%)**	4 (9%)	<0.001*
Lack of trained personnel on firearm safety counseling	26 (29%)	12 (27%)	0.757
Firearms safety training is not requirement of Residency Review Committee	**18 (20%)**	2 (4%)	0.015*
It is not emphasized in the in-training examination	15 (17%)	13 (29%)	0.106
Resources, if available, do you think can increase the firearm safety education in residency program?			
Protected time for residents to learn firearm safety counseling	39 (44%)	**30 (67%)**	0.012*
Video/Audio training programs	**37 (42%)**	7 (16%)	0.002*
Availability of patient education materials in ambulatory clinics/ED	40 (45%)	24 (53%)	0.358
Web curriculum on firearm safety counseling	32 (36%)	18 (40%)	0.648
Availability of trained instructors on firearm safety	30 (34%)	**24 (53%)**	0.029*
Attending workshop on firearm safety	29 (33%)	9 (20%)	0.127
Annual grand rounds on firearm safety and small group discussions	**29 (33%)**	6 (13%)	0.017*

* statistically significant

Table 2:- Comparison in responses to firearm safety survey among residents in pediatrics vs other specialties.

Table 3: Comparison in responses to firearm safety survey among PGY1 residents vs other years (n=134)

	PGY2,3,4 residents n=88	PGY1 residents n=46	*p*-value
Gun violence is a problem in the community where I practice	84 (96%)	45 (98%)	0.492
Interested in receiving additional education in this area	61 (69%)	29 (63%)	0.463
Residents' attitudes and beliefs with regards to firearm safety education: Residents answered as STRONGLY or SOMEWHAT AGREE with the following			
There is a need for residents' education on firearm injury prevention.	70 (81%)	38 (83%)	0.763
Residency program has the responsibility to train residents on counselling patients/families about firearms safety/risks.	67 (76%)	31 (67%)	0.278
Residency program having formal assessment on firearms counselling.	57 (65%)	26 (57%)	0.350
Residents' Confidence and perception of competence: Respondents answered as EXTREMELY or VERY to the following:			
Had adequate training during residency on firearm safety counseling.	7 (8%)	2 (4%)	0.401
Observed physicians successfully counseling parents and youth in firearm injury prevention in real life clinical or practice environments.	8 (9%)	2 (4%)	0.313
Feel comfortable asking about presence or exposure to firearms.	21 (24%)	10 (23%)	0.830
Feel confident to counsel about firearm injury prevention.	8 (9%)	6 (13%)	0.544
Perceived barriers to firearm safety training			
Lack of time to discuss firearm safety during patient encounter	35 (40%)	15 (33%)	0.416
Perception that firearms safety is lower priority compared to other topics	22 (25%)	12 (26%)	0.891
I worry that I will upset families if I ask about firearms in the home	23 (26%)	**21 (46%)**	**0.022***
Lack of confidence in ability to provide firearm safety counseling	14 (16%)	8 (17%)	0.797
Lack of knowledge needed to provide firearm safety counseling	17 (19%)	10 (22%)	0.946
Lack of trained personnel on firearm safety counseling	27 (31%)	11 (24%)	0.409
Firearms safety training is not requirement of Residency Review Committee	14 (16%)	6 (13%)	0.658
It is not emphasized in the in-training examination	18 (21%)	10 (22%)	0.862
Perception of the health care provider that firearms safety is lower priority compared to other anticipatory guidance and safety topics	22 (25%)	12 (26%)	0.891
Resources, if available, do you think can increase the firearm safety education in residency program?			
Protected time for residents to learn firearm safety counseling	48 (55%)	21 (46%)	0.328
Video/Audio training programs	31 (35%)	13 (28%)	0.415
Availability of patient education materials in ambulatory clinics/ED	46 (52%)	18 (39%)	0.148
Web curriculum on firearm safety counseling	37(42%)	13 (28%)	0.117
Availability of trained instructors on firearm safety	34 (39%)	20 (44%)	0.587
Attending workshop on firearm safety	**30 (34%)**	8 (17%)	0.042*
Annual grand rounds on firearm safety and small group discussions	**29 (33%)**	6 (13%)	0.013*

* statistically significant

Table 3:- Comparison in responses to firearm safety survey among PGY1 residents vs others.

Table 4-A: Comparison in responses to firearm safety survey among US graduates (USG) vs non-USG (n=134)

	Non-USG n=106	USG n=28	*p*-value
Gun violence is a problem in the community where I practice	**104 (98%)**	25 (89%)	0.028*
Interested in receiving additional education in this area	**76 (72%)**	14 (50%)	0.030*
Residents' attitudes and beliefs with regards to firearm safety education: Residents answered as STRONGLY or SOMEWHAT AGREE with the following			
There is a need for residents' education on firearm injury prevention.	**89 (85%)**	19 (68%)	0.042*
Residency program has the responsibility to train residents on counselling patients/families about firearms safety/risks.	**84 (79%)**	14(50%)	0.005*
Residency program having formal assessment on firearms counselling.	**72 (68%)**	11(39%)	0.006*
Residents' Confidence and perception of competence: Respondents answered as EXTREMELY or VERY to the following:			
Had adequate training during residency on firearm safety counseling.	9 (9%)	0 (0%)	0.105
Observed physicians successfully counseling parents and youth in firearm injury prevention in real life clinical or practice environments.	8 (8%)	2 (7%)	0.932
Feel comfortable asking about presence or exposure to firearms.	22 (21%)	9 (33%)	0.194
Feel confident to counsel about firearm injury prevention.	14 (14%)	5 (18%)	0.570

Table 4-B: Comparison in responses to firearm safety survey among residents raised with firearms at home vs those without firearm at home (n=134)

	No firearm at home n=111	Firearm at home n=23	*p*-value
1. Gun violence is a problem in the community where I practice	**110 (99%)**	19 (82%)	<0.001*
5. Interested in receiving additional education in this area	**79 (71%)**	11 (48%)	0.030*
Residents' attitudes and beliefs with regards to firearm safety education: Residents answered as STRONGLY or SOMEWHAT AGREE with the following			
There is a need for residents' education on firearm injury prevention.	**93 (85%)**	15 (65%)	0.031*
Residency program has the responsibility to train residents on counselling patients/families about firearms safety/risks.	**86 (78%)**	12 (52%)	0.008*
Residency program having formal assessment on firearms counselling.	71 (64%)	12(52%)	0.289
Residents' Confidence and perception of competence: Respondents answered as EXTREMELY or VERY to the following:			
Had adequate training during residency on firearm safety counseling.	8 (8%)	1 (4%)	0.598
Observed physicians successfully counseling parents and youth in firearm injury prevention in real life clinical or practice environments.	8 (7%)	2 (9%)	0.814
Feel comfortable asking about presence or exposure to firearms.	22 (20%)	**9 (41%)**	0.039*
Feel confident to counsel about firearm injury prevention.	12 (11%)	**7 (30%)**	0.017*

* statistically significant

Table 4-A: Comparison in responses to firearm safety survey among US graduates (USG) vs no USG.
Table 4-B: Comparison in responses to firearm safety survey among residents raised with firearms at home vs those without firearm at home.

Abstract: 226
Use of Practice Based Learning Modules to Teach Primary Care Preventative Measures in Pediatric Residency
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Background Residents often feel uncomfortable with identifying developmental milestones, vaccine schedules, and preventive screenings. The objective of this study was to assess the understanding and comfort level of these topics at health supervision visits before and after participating in practice based learning modules (PBLs).
Objective Assess the understanding and comfort level of pediatrics residents with developmental milestones, vaccine schedules and preventive screenings at health supervision visit before and after participating in practice based learning modules (PBLs)
Design/Methods Pediatrics residents participated in PBLs during their ambulatory clinics where they examined their practices and reflected on the appropriate use of developmental milestone assessments, vaccine schedules and preventive care screenings. We asked residents to complete pre-intervention and post-intervention surveys to assess whether the PBLs improved their knowledge and comfort level in regards to these topics. We also compared ITE data from before and after implementation of PBLs.
Results Analysis of the surveys demonstrated a statistically significant improvement in residents' comfort in choosing routine and special vaccine schedules as well as routine lab screenings. There was no significant difference in residents' comfort with assessing developmental milestones. ITE scores were evaluated and demonstrated a statistically significant improvement from 2018 to 2019, however these scores could not be matched to resident surveys, and thus this improvement is limited in its interpretation.
Conclusion(s) The PBLs improved residents' comfort with routine and special vaccine schedules as well as routine lab screenings but did not demonstrate improvement in comfort with developmental milestones. Given the small sample size, we plan to increase the time allotted to complete PBLs. In the future, we would also work with the education office to match ITE scores with PBL survey data in a de-identified manner.

	Participants
Type of Resident:	
Categorical Pediatrics	13 (87%)
Medicine/Pediatrics Combined	2 (13%)
Year of Training:	
PGY 1	8 (53%)
PGY 2	3 (20%)
PGY 3	3 (20%)
PGY 4	1 (7%)
Area of practice (pre-intervention):	
Hospitalist	2 (13%)
Primary pediatrics	4 (27%)
Subspecialty	8 (53%)
Other/Undecided	1 (7%)

Table 1. Participant Demographics

	Resident Comfort Pre-PBL (n=15) Mean score (SD)	Resident Comfort Post-PBL (n=15) Mean score (SD)	P-value
Developmental milestones	3.9 (1.6)	4.5 (1.6)	0.2091
Vaccine schedules	3.6 (1.7)	4.3 (1.5)	**0.0217**
Special vaccine schedules	2.5 (1.1)	3.2 (1.4)	**0.0104**
Lab screening	4.1 (2.1)	4.7 (1.6)	**0.0335**

Table 2. Mean (SD) survey responses of resident comfort before and after participating in the problem based learning modules. Analysis performed using paired T-test.

	Characteristics of ITE score cohort
Type of Resident	
Categorical Pediatrics	29 (71%)
Medicine/Pediatrics Combined	12 (29%)
Current Year of Training	
PGY2	19 (46%)
PGY3	15 (37%)
PGY4+	7 (17%)

Table 3. Pediatric and combined Medicine/Pediatric Resident demographics who took the ITE in 2018 and 2019.

	2018 N=41 Mean (SD)	2019 N=41 Mean (SD)	Mean difference (SD) 2018 to 2019	95% CI	P-value
ITE scores: All PGY Years	161 (22)	167 (16)	+6 (14)	+2 to + 11	**0.0072**
PP/W score: All PGY Years	8.7 (1.7)	8.7 (1.8)	0.01 (2)	-0.1 to +0.7	0.8485
ITE score: By PGY Year					
Current PGY 2	145 (15)	160 (18)			**<0.0001**
Current PGY 3	173 (14)	171 (13)			0.603
Current PGY 4+	177 (23)	177 (14)			0.936
PP/W score: By PGY Year					
Current PGY 2	8.5 (1.9)	7.9 (1.8)			0.209
Current PGY 3	8.9 (1.6)	9.5 (1.6)			0.361
Current PGY 4+	9.0 (1.0)	9.0 (0.0)			0.999

Table 4. Paired Resident overall ITE scores and preventative pediatrics/wellness subsection (PP/W) in 2018 compared to 2019. Performed a paired T-test using SAS 9.3 (Cary, NC).

Abstract: 227

Magnetic Resonance Imaging as a Tool to Evaluate the Extent of Brain Injury in Term and Preterm Ovine Models of Asphyxia

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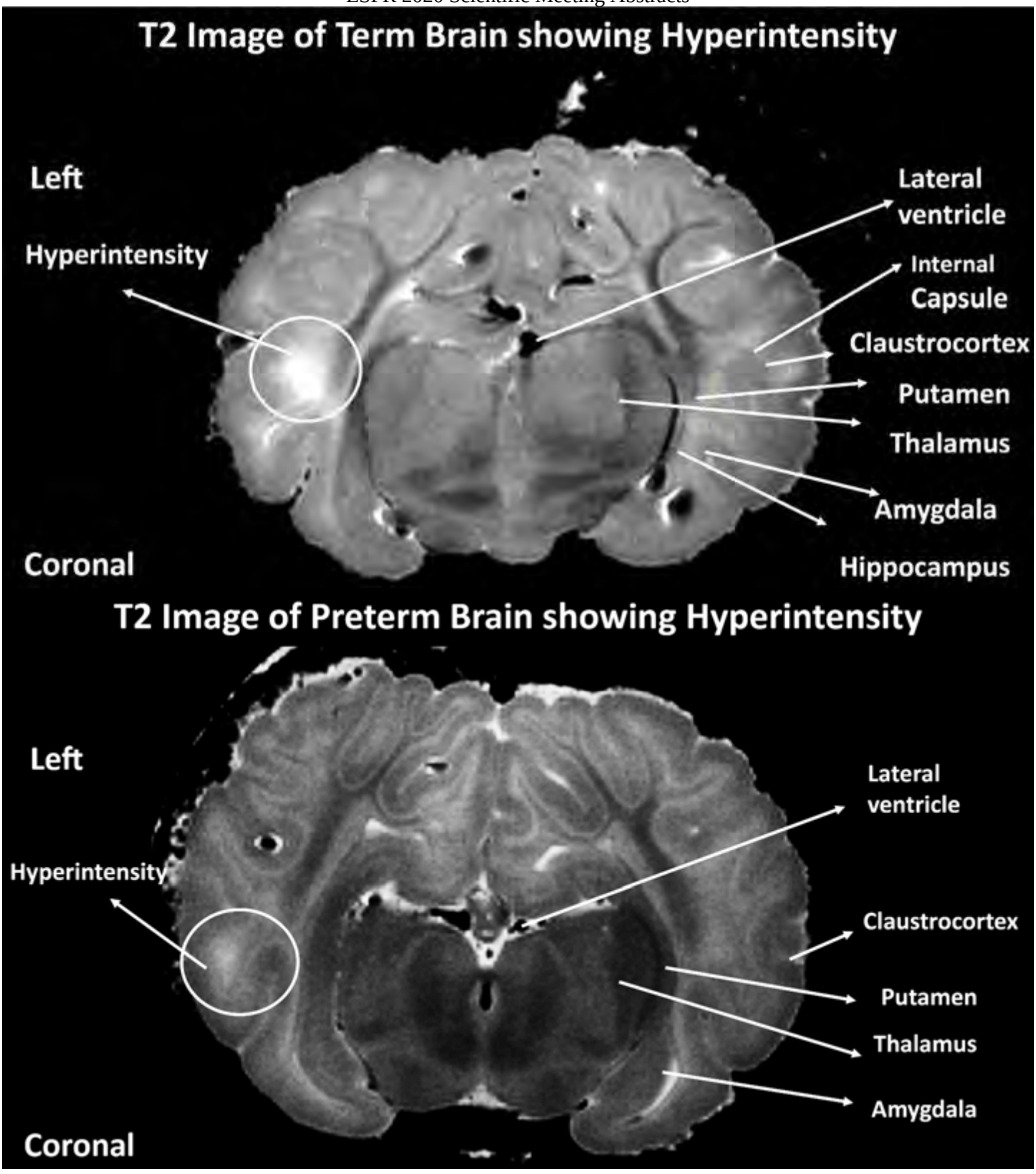
Background Birth asphyxia often leads to hypoxic-ischemic encephalopathy (HIE) in a newborn that could present with a wide spectrum of disabilities later in life. Whole-body or selective head hypothermia post asphyxial related injury in near term & term infants with moderate to severe HIE has been therapeutic in preventing reperfusion injury, thus leading to better outcomes. Evidence suggests that Magnetic Resonance Imagining (MRI) of the brain could correlate the extent of the ischemic injury but caution should be excised in predicting the extent of asphyxia.

Objective Our objectives were to study the ex-vivo brain injury pattern, post asphyxial injury, using both term and preterm ovine models. We hypothesized that the extent of brain injury pattern would be severe in the term cardiac arrest model compared to a term and preterm bradycardia model.

Design/Methods Lambs were resuscitated post-cardiac arrest or bradycardia (HR <90-60/min). Preterm lambs were resuscitated with an HR<90/min. If resuscitation was successful, the lambs were ventilated for 2-4 hours and sacrificed. The right carotid artery and jugular veins were ligated in all three models. Regardless of resuscitation outcomes, the brain is obtained after formalin perfusion, rinsed with phosphate-buffered saline with sodium azide and scanned in Galden. The T2 images were obtained with 9.4 T (Bruker, Germany) scanner and images analyzed using 3D Slicer (MA, USA). A pediatric radiologist (PG) who was blinded and another

investigator, identified and analyzed the images and the region of interest (ROIs), presented as scalar volume.
Results Sixteen scans were performed (Term complete arrest – 6, term bradycardia -3, preterm bradycardia - 7). The blinded evaluator (PG) could identify the myelination differences between preterm and term lambs. The T2 changes in term and preterm lamb brains were predominantly identified in the left internal capsule and its related structures extending to the cortex (fig 1 & fig 2). The ROIs were significantly different between models: 407.1±214.9 (term cardiac arrest), 237.8±90.1 (term bradycardia) and 107.2±22.3 (preterm bradycardia), $p<0.05$ (fig 3).
Conclusion(s) With the limitation of ex-vivo imaging, our studies show a difference in the pattern of injury based on the degree of asphyxia. We speculate that these injuries could be secondary to reperfusion as it predominantly affects the left side. Our findings suggest that the MRI of the brain could help understand the extent of asphyxial insult.


T2 Image of Term Brain showing Hyperintensity
Left
Hyperintensity
Lateral ventricle
Internal Capsule
Claustrocortex
Putamen
Thalamus
Amygdala
Hippocampus
Coronal
T2 Image of Preterm Brain showing Hyperintensity
Left
Hyperintensity
Lateral ventricle
Claustrocortex
Putamen
Thalamus
Amygdala
Coronal

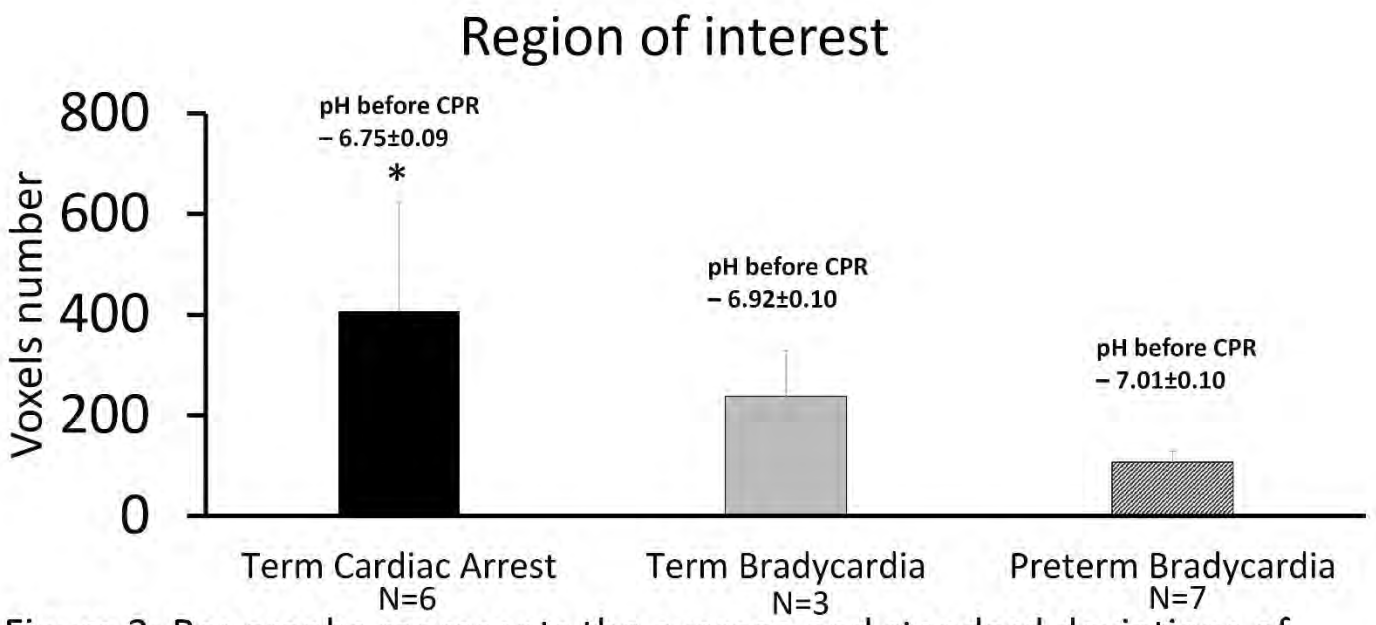


Figure 3: Bar graphs represents the average and standard deviations of intensity changes in T2 MRI brain imaging and the differences between 3 models. *P<0.05 by ANOVA.

Abstract: 228

Cerebral Calcification in de novo SCN2A variant mutation

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Background 37w5d female born to an HSV+ G3P2 29 year old mother presenting with mild dysmorphic features, and seizures. Dysmorphic features included deep-set eyes and cupped ears. The baby had multiple seizures after birth, presenting as bicycling of the upper and lower extremities. A video EEG confirmed seizure activity and encephalopathy.
Objective
Design/Methods Chart review
Results Brain CT and MRI imaging showed several areas of multiple bilateral punctate foci in the basal ganglia representing abnormal calcifications. Infectious disease workup was negative for TORCH infection in blood or CSF. Genetic testing with whole exome confirmed a de novo SCN2A likely pathogenic variant associated with Early Infantile Epileptic Encephalopathy type 11.
Conclusion(s) SCN2A mutations affect sodium channels in the nervous system, and present with epilepsy and autism spectrum disorder. A review of the literature for typical features associated with SCN2A variants does not describe brain calcifications as a typical or even a rare feature. This is a new physical finding that we will describe and discuss.

Abstract: 229

Placental pathology in infants with moderate-severe ischemic encephalopathy compared to control

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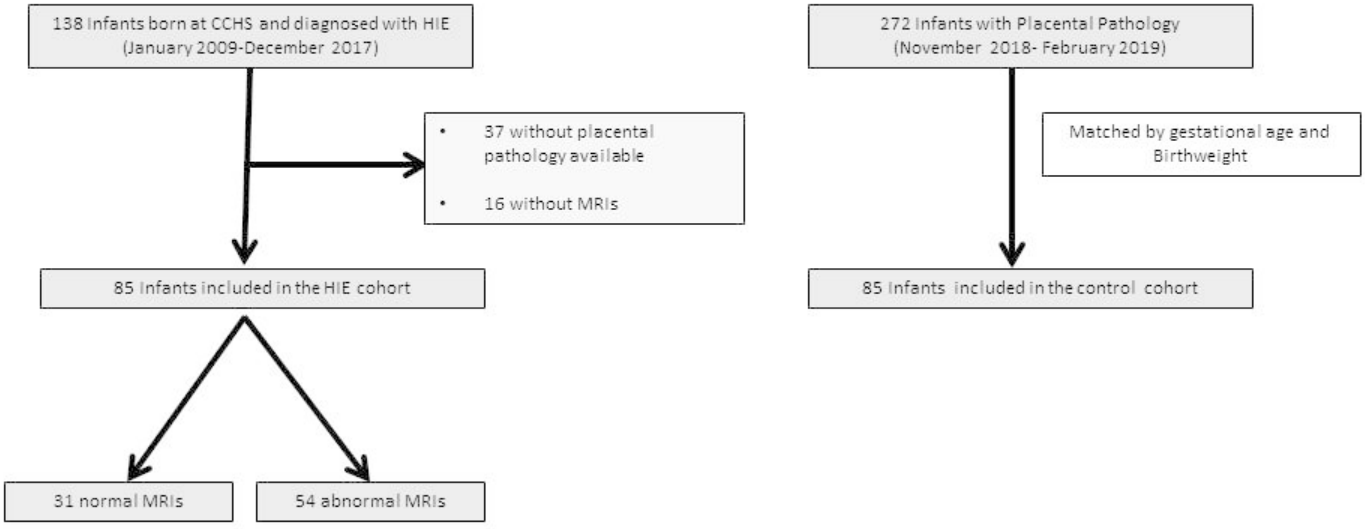
Background Hypoxic Ischemic encephalopathy (HIE) is associated with high mortality and adverse neurodevelopment. Placental disruption may lead to acute or chronic fetal stress. Few studies have compared the placental pathology of infants who underwent therapeutic hypothermia for HIE to a control.
Objective: To compare the placental pathology of infants who received therapeutic hypothermia for moderate and severe HIE to a normal control
Objective To compare the placental pathology of infants who received therapeutic hypothermia for moderate and severe HIE to a normal control

Design/Methods Retrospective cohort study including infants ≥36 weeks gestational age (GA) born at a single regional delivery center who underwent therapeutic hypothermia for HIE compared to a control matched by GA and birth weight. Initiation of therapeutic hypothermia was based on a standardized clinical pathway for infants with moderate or severe HIE. MRI was performed in the first week of life. MRI was classified as either normal or abnormal (Weeke J. PedsJan '18) by a pediatric radiologist masked to placental pathology. Statistical analysis included Chi-Square, Independent T-test, and multivariable analysis using binary logistic regression.

Results Study sample included 170 infants; 85 infants in HIE cohort (31 infants with normal and 54 infants with abnormal MRIs) and 85 infants in control cohort (Fig 1). There were no differences in demographic data (Table 1). Placental weight:birth weight ratio was greater in the HIE cohort compared to the control, p=.002 (Fig 2). In a binary logistical regression model, a placental weight:birth weight ratio >75 percentile was associated with increased risk of HIE (OR 3.3, 95% CI, 1.6-7.1). No other placental factors were associated with HIE or abnormal MRI within the HIE cohort (Table 2). A placental birth weight >75 percentile was not associated with an increased risk of abnormal MRI.

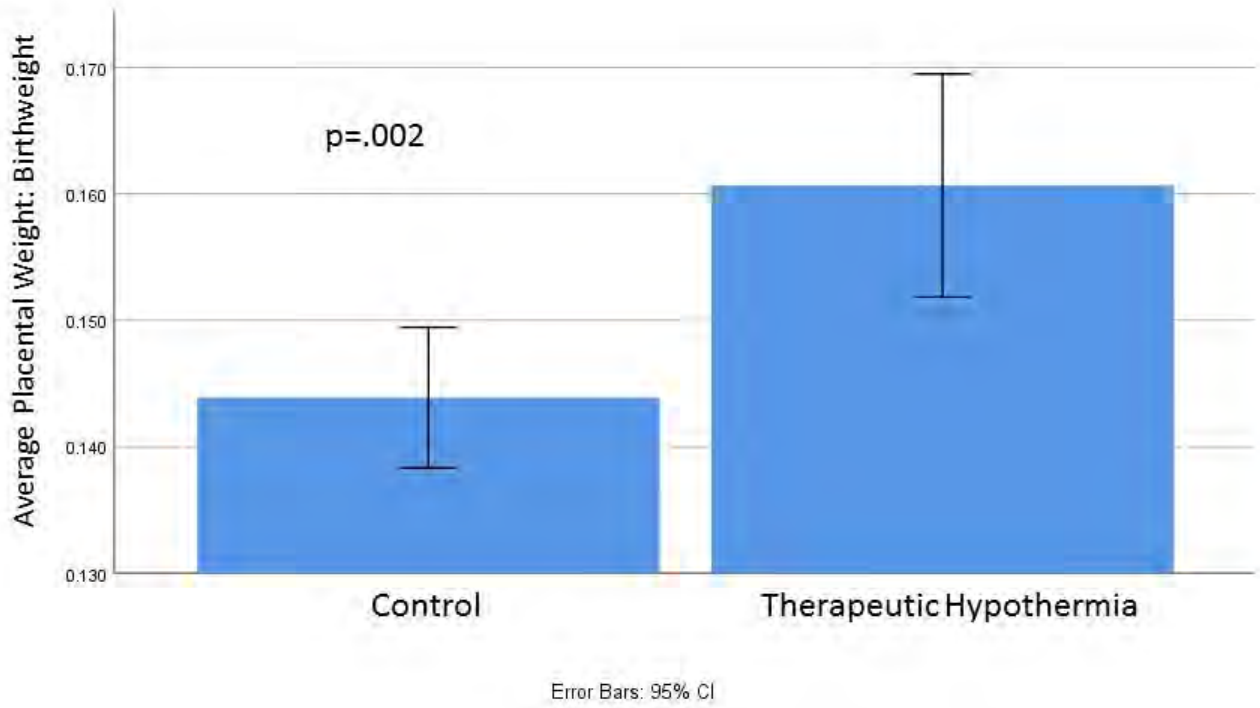
Conclusion(s) Increased placental weight:birth weight ratio is associated with increased odds of moderate or severe HIE. Placental pathology within the HIE cohort is not associated with abnormal MRI. Further investigation is needed to determine whether larger placentas are causal for HIE and predispose some infants to neonatal brain injury



Consort Diagram

	HIE Cohort (n=85)	Control (n=85)	P
Maternal Age, years, mean(± SD)	28.26 (6.3)	29.51 (5.7)	.182
White, n(%)	37 (43)	38 (45)	.659
Birthweight, grams, mean(± SD)	3293 (530)	3290 (523)	.975
Gestational Age, weeks, mean(± SD)	39.0 (1.8)	39.0 (1.6)	.867
Cesarean Section, n(%)	41 (48)	38 (45)	.645
Placental Weight, grams, mean (± SD)	**523 (133)**	**469 (93)**	**.003***
Placental Weight/ BirthWeight	**.161 (.041)**	**.144 (.026)**	**.002***
Placental Score	2.14 (1.58)	1.89 (2.14)	.293
• Infarction, n(%)	11 (13)	13(15)	.560
• Thrombus, n(%)	4(5)	4(5)	1.00
• Abruption, n(%)	3(4)	0(0)	.081
• Meconium Staining, n(%)	32(38)	22(26)	.050
• Chorioamnionitis, n(%)	34(40)	30(35)	.527
• Calcification, n(%)	52(61)	55(65)	.634
• Fibrin, n(%)	21(25)	20(24)	.858

Demographic, Clinical, and Placenta Data for HIE compared to Control Cohort



Placental weight:Birthweight for HIE compared to Control Cohort

	Normal MRI (n=31)	Abnormal MRI (n=54)	P
Birthweight, g, mean(± SD)	3419 (491)	3290 (542)	.095
Gestational Age, weeks, mean(± SD)	**40 (1.2)**	**39.0 (1.81)**	**<.001**
Cesarean Section, n(%)	**22 (71)**	**19 (35)**	**.001**
Placental Weight, grams, mean (± SD)	548 (125)	508 (136)	.183
Placental Weight/ BirthWeight	.161 (.031)	.160 (.046)	.925
Placental Score, median	2.1 (1.7)	2.1(1.5)	.886

Clinical and Placental Data for Normal versus Abnormal MRI findings for infants in the HIE cohort.

Abstract: 230

Expression of Tight Junction Protein Zonula Occludens-1 and Cerebral Edema in the Hypoxic Piglet Brain.

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Background Asphyxia often causes cerebral edema, which can lead to death or poor neurological outcomes. The cerebral microvascular response and blood-brain barrier (BBB) breakdown contribute to the hypoxia-induced brain injury. Previously, it has been shown in the ovine fetus that cerebral ischemia and reperfusion for 72 hours can increase BBB permeability and decrease tight junction (TJ) protein expression, especially of plasma membrane-associated protein zonula occludens (ZO)-1.
Objective We tested the hypothesis that disruption of TJ proteins induces cerebral edema in the hypoxic piglet brain.
Design/Methods Anesthetized ventilated newborn male piglets (3-5 days old) were maintained with normoxic FiO_2 0.21 x4hrs (Nx), or subjected to hypoxia FiO_2 0.07 x1hr then euthanized (Hx) or returned to FiO_2 0.21 x4hrs at normal body temperatures (Hx reoxygenated), then the brain was harvested. Cerebral water content was determined as wet-dry/dry wt of samples of cerebral cortex (CC) before and after incubation x72hrs at 90°C and compared to normal controls. ATP and lactate levels were measure biochemically in samples of CC to determine cerebral energy status. ZO-1 protein expression in the membrane fraction of cerebral cortex was determined by Western blot and expressed as normalized ratio to an internal control sample obtained from a normal piglet.
Results Hypoxia resulted in significant hypoxemia, hypotension, acidosis and cerebral energy failure (Table1). Cerebral water content (gH_2O/g dry tissue) increased significantly after one hour of hypoxia without reoxygenation compared to normal levels (6.17±0.32 vs 5.48±0.16; $p<0.01$) and remained increased after reoxygenation compared to sham control (6.01±0.36 vs 5.60±0.17; $p<0.05$). ZO-1

protein expression in membrane fraction of CC decreased by 50% after one hour of hypoxia (P<0.01; Figure 1). Reoxygenation did not appear to change ZO-1 protein expression four hours after hypoxia.

Conclusion(s) We conclude that hypoxia resulted in acute reduction in ZO-1 protein expression in the piglet brain, corresponding to the observed changes of cerebral water content. Cerebral edema is mediated through different mechanisms including cytotoxic cellular swelling, vasogenic edema and osmotic build up. Our data suggest that vasogenic edema and BBB break down may have contributed to brain swelling shortly after hypoxia. Understanding the mechanism of hypoxia-induced cerebral edema may lead to novel strategies for neuroprotection aimed at stabilizing the neurovascular unit post hypoxia.

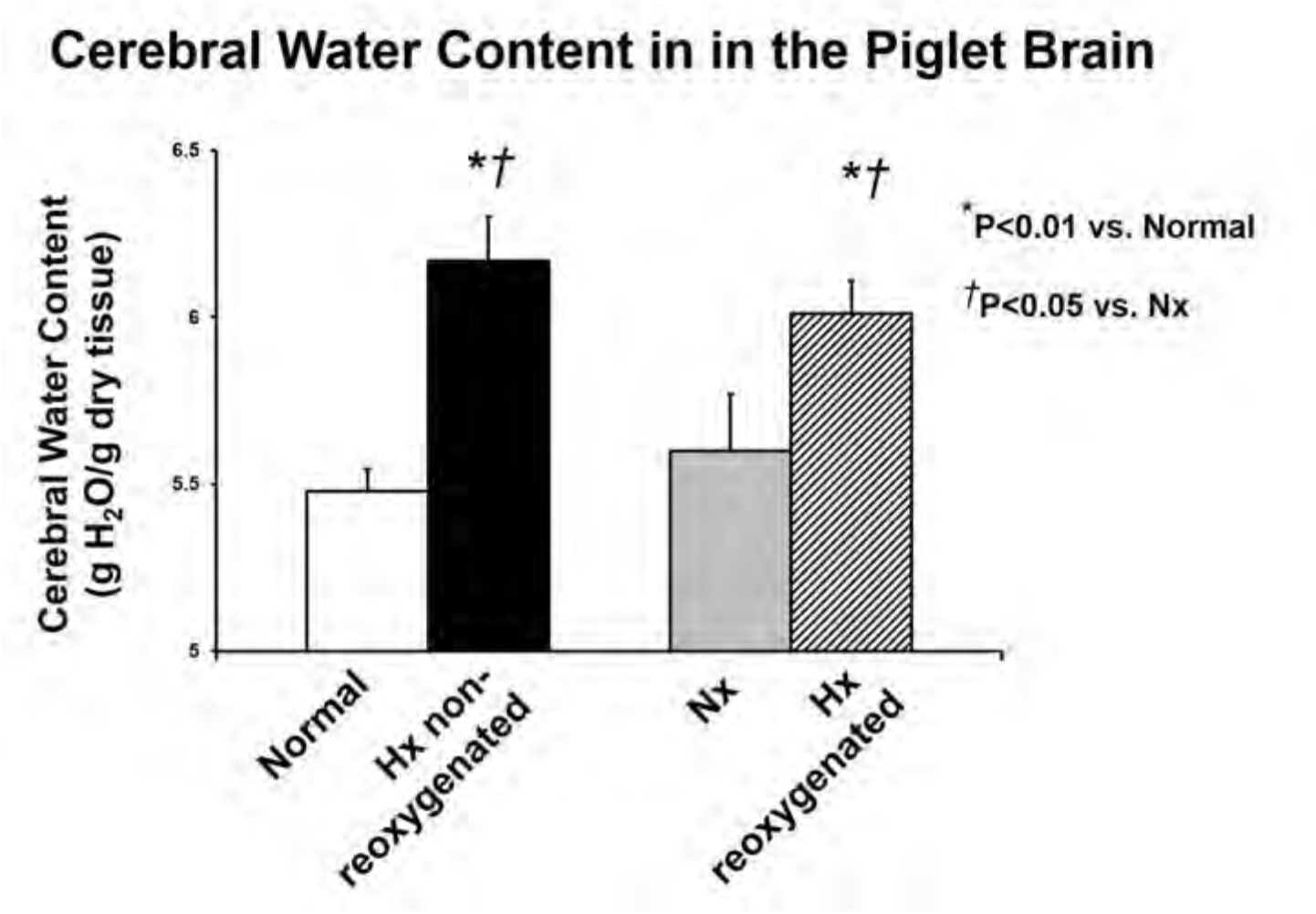

Figure 1. Cerebral water content in newborn piglets determined in fresh samples of frontal CC before and after incubation x72hs at 90°C, and expressed as g H2O/g dry tissue (M+SE). *p<0.01 versus normal non-instrumented piglets (open bars). †p<0.05 versus normoxic controls. Hx non-reoxygenated, animals made hypoxic x 1 hour then euthanized for brain harvest without reoxygenation (solid bars); Nx, anesthetized and ventilated piglets maintained with normoxic FiO_2 x 4 hours (grey bars); Hx reoxygenated, animals made hypoxic x 1 hour then reoxygenated x4 hours (hatched bars).

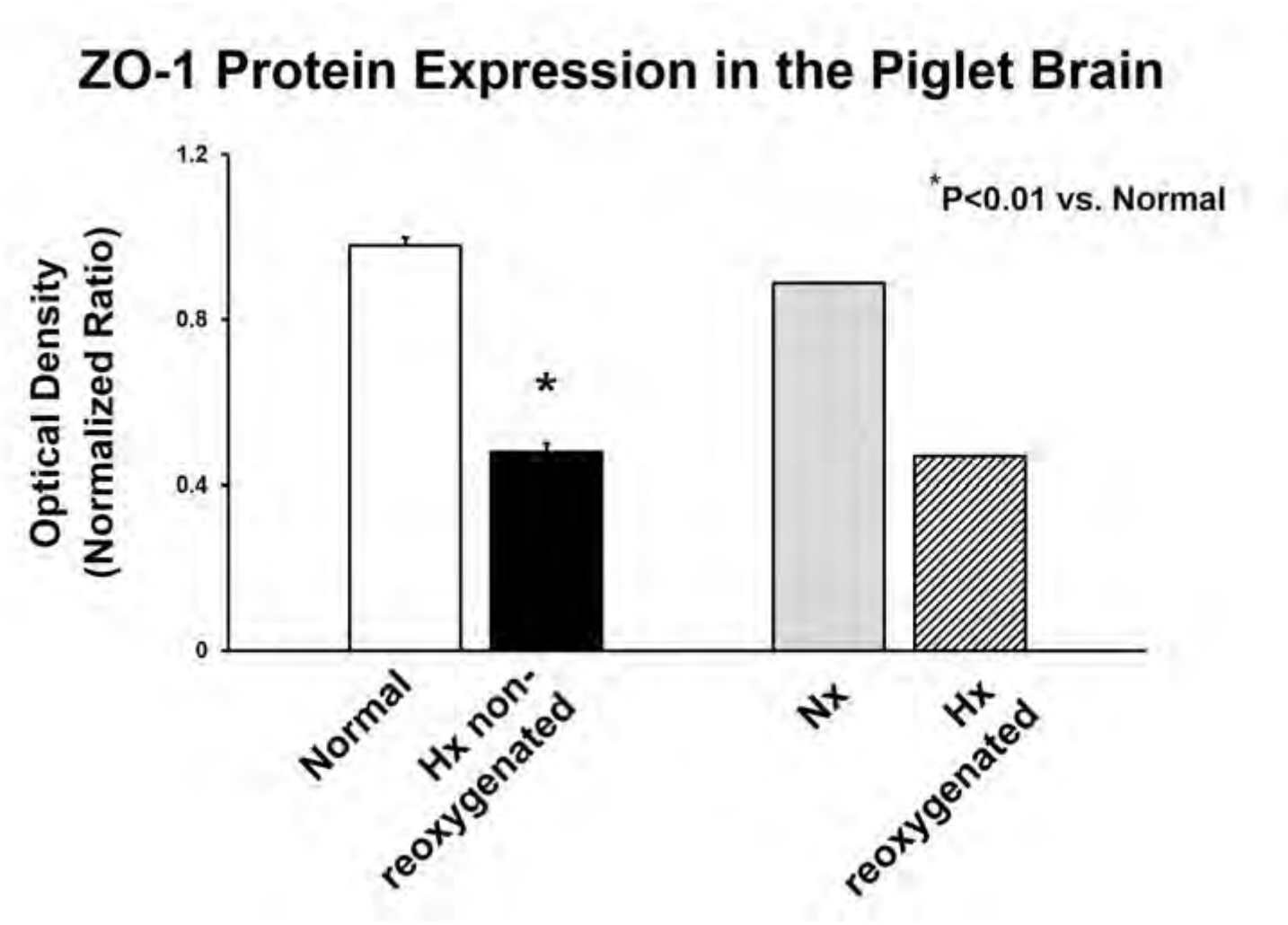

Figure 2. ZO-1 protein expression in the newborn piglet brain determined by Western blot. The cerebral cortex was flash frozen in liquid nitrogen and stored for biochemical analysis. Samples of the cerebral cortex were homogenized in RIPA buffer, and the membrane fraction was separated by ultracentrifugation and probed on Western blots using a specific mouse monoclonal antibody. The optical densities of the bands were normalized to that of a normal piglet used as internal control across the gels and expressed as normalized ratios to internal control (M+SE). *p<0.01 versus normal non-instrumented piglets (open bars; n=3). Hx non-reoxygenated, animals made hypoxic x 1 hour then euthanized for brain harvest without reoxygenation (solid bars; n=4); Nx, animals maintained with normoxic FiO_2 x 4 hours (grey bars; n=1); Hx reoxygenated, animals made hypoxic x 1 hour then reoxygenated x4 hours (hatched bars; n=2).

Physiological Data

Group	Lowest Systolic BP (mmHg)	Lowest PaO2 (mmHg)	Lowest pH	Maximum Base Deficit	Cerebral ATP (µMol/g tissue)	Cerebral Lactate (µMol/g tissue)
Normal (n = 9)	97 ±11	NA	NA	NA	1.30 ± 0.21	10.9 ± 2.5
Nx (n = 6)	76 ± 10†	79 ± 15	7.38 ± 0.10	-0.9 ± 4.8	0.71 ± 0.20†	13.5 ± 2.8

Hx non-reoxygenated (n = 9)	39 ± 19*†	16 ± 2*	6.92 ± 0.11*	-22.4 ± 3.5*	0.59 ± 0.09*†	44.7 ± 7.8*†
Hx reoxygenation (n = 9)	42 ± 10*†	21 ± 8*	6.99 ± 0.14*	-23.6 ± 4.9*	0.86 ± 0.29†	24.9 ± 10.9*†

*p<0.05 versus normoxic controls (Mean ± SD). †p<0.05 versus normal, non-instrumented piglets. Nx: Normoxia; Hx: Hypoxia.

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Relative Effect of Severe Hypoxia versus Severe Hypercapnia on Caspase 3 Activity in the Cerebral Cortex of Newborn Piglets.

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Background Caspase 3 activated by caspase 9 executes cell death via an intrinsic pathway cell by cleaving numerous intracellular proteins and enzymes. Previously we have shown that cerebral hypoxia as well as hypercapnia result in increased caspase activity in the cerebral cortex of newborn piglets.
Objective The present study aims to asses relative effect of severe hypoxia induced activation of caspase 3 as compared to severe hypercapnia induced activation in the cerebral cortex of newborn piglets.
Design/Methods Anesthetized ventilated Newborn piglets (3-5days old) were grouped in to Normoxia (Nx, n=12), Hypoxia (Hx, n=6) and Hypercapnia (n=6) and compared to their respective normal groups. Hypoxia was induced by decreasing FiO_2 from 0.21 to 0.07 for one hour. Hypercapnia was induced in piglets by inhaled CO_2 to achieve $PaCO_2$ of 80 mmHg for 6 hrs. ATP and PCr were determined biochemically. Following centrifugation, caspase 3 activity was measured in cytosol spectrofluorometrically at 37°C for 500 sec using a specific fluorogenic substrate.
Results PH, $PaCO_2$ & PaO_2 of Normoxic piglets were 7.41±0.07, 42 ± 3 mmHg & 107 ±14 mmHg. In Hypercapnic piglets 7.25 ± 0.01, 77 ±6 mmHg & 106 ±13 mmHg. ATP levels (µmol/g brain) in normoxia (Nx, n=12) were 4.3 ±0.23, in hypoxia (Hx, n=6) 1.43±0.28, decreased by 66% , and 4.0 ±1.4 in hypercapnia, decreased by 13% from Hx. Pcr levels (µmol/g brain) were 3.73 ±0.17 in Nx , 0.79 ±0.11 in Hx, decreased by 79% , and 3.18 ±0.17 in hypercapnia decreased by 17%. Caspase 3 activity (nmols/mg protein/hr) increased from 9.39 ±0.73 in Nx to 18.94 ±3.64 in Hx and from 15 ±2 in normocapnia to 17 ±2 in hypercapnia.
Conclusion(s) The data show that following hypercapnia the increased caspase 3 activity of 13%, is significantly lower than the increased activity of 101% following hypoxia. Following the severe depletion of the high energy phosphates after severe hypoxia, activation of caspase 3 follows an intrinsic pathway leading to cell death. Recent data suggest that there is additional extrinsic pathway mediated RIPK- 1 & RIPK-3 that lead to further activation of caspase 3, including caspase 8. During hypercapnia, activation of caspase 3 may be due to increased hydrogen ion concentration leading to cellular membrane lipid peroxidation and thus altering nuclear membrane and further molecular alteration. The indication that hypercapnic toxicity is significantly lower as compared to hypoxia may have clinical implications.

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Reducing Turnaround Times (TAT) of Newborn Screens (NBS) in a level IV NICU: A Quality Improvement Initiative

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Background Newborn screens are an effective tool for early recognition and management of genetic and metabolic disorders. Despite its established utility, achieving target TAT of 48 hours is a challenge for NICUs.
Objective To reduce the average monthly NBS TAT by 20% by May 2020. The balancing measures were unacceptable samples and samples missing information.
Design/Methods Observational time series conducted in a level IV referral NICU since May 2019 using Plan-Do-Study-Act (PDSA) model for improvement. Process mapping and baseline data analysis were performed to identify reasons for TAT delay. A series of interventions were implemented to reduce NBS TAT. Figure 1 highlights aims, key drivers and interventions. Statistical process control charts were used to display average monthly TAT, percent of unacceptable samples, samples missing information and TAT < 48hours. Established rules for detecting special cause were applied.
Results A total of 133 NBS were collected since May 2019. Special cause improvement was achieved in average TAT from 71.8 to 39.7 hours, a 45% reduction, with 8 consecutive points below the mean (Figure 2). Since interventions, the physician documentation

compliance of need and plan for NBS is 88.6%. The NBS collection window compliance is 78.4% and UPS pickup compliance is 86.4%. A consistent increase has been observed in the percent of samples with TAT < 48hrs with an average of 69.4% (Figure 3). These interventions have not increased the percent of unacceptable samples and/or missing information (Figure 4).
Conclusion(s) Implementation of process changes in NBS sample collection by streamlining specimen processing and shipping can improve TAT without adversely affecting the number of unacceptable samples or samples missing information. Key interventions for success included multidisciplinary collaboration, implementation of NBS collection time window and UPS placard scanning system to ensure timely sample pick-up. Continued surveillance and engagement from stakeholders are vital to ensure sustainability.

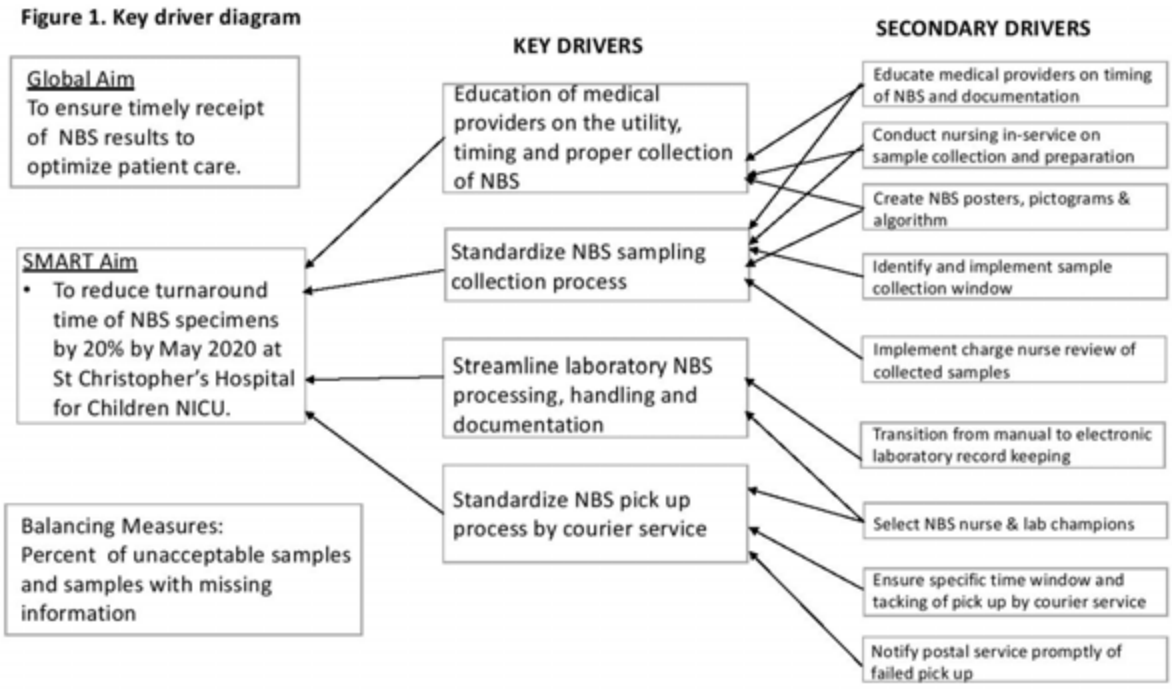

Figure 1.Key Driver Diagram

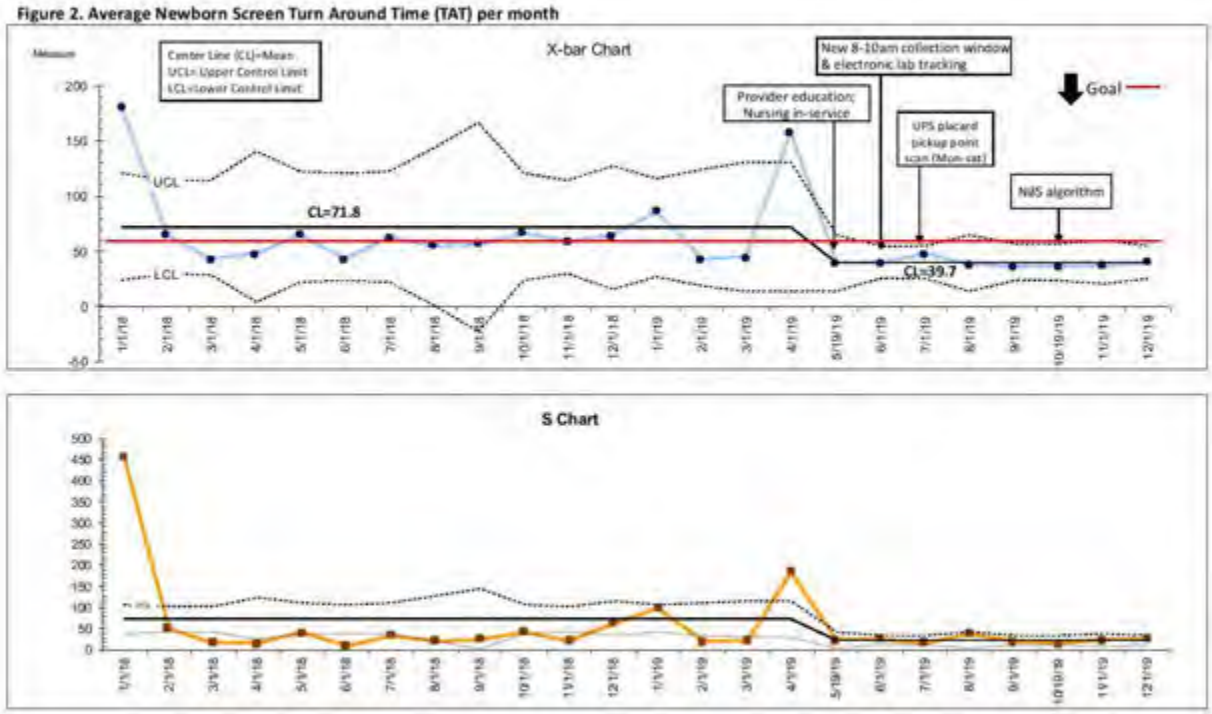

Figure 2. Average Newborn Screen Turn Around Time (TAT) per month

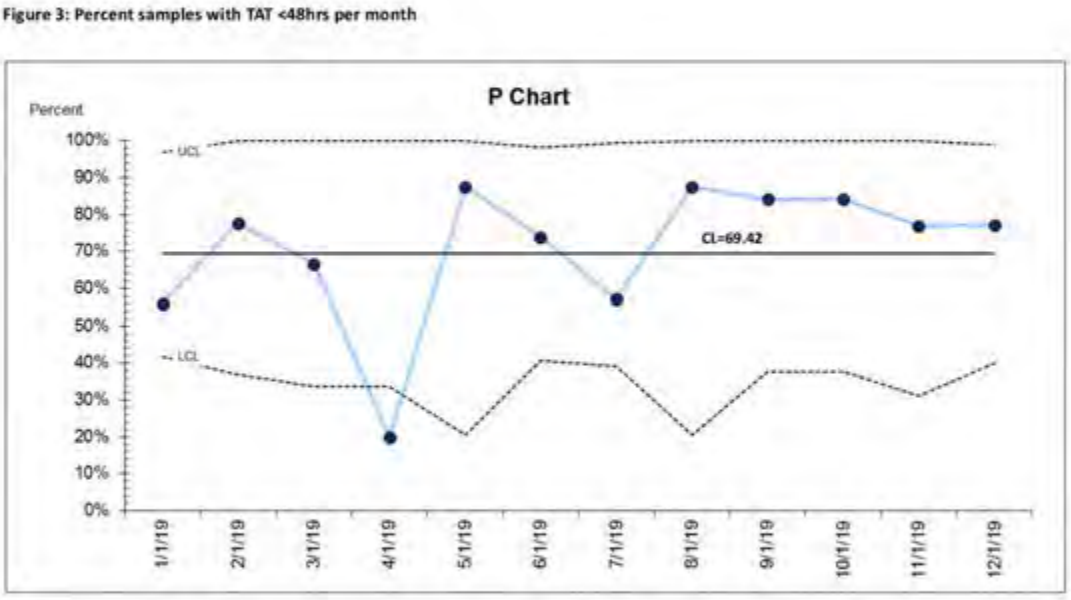

Figure 3.Percent samples with TAT<48hrs per month

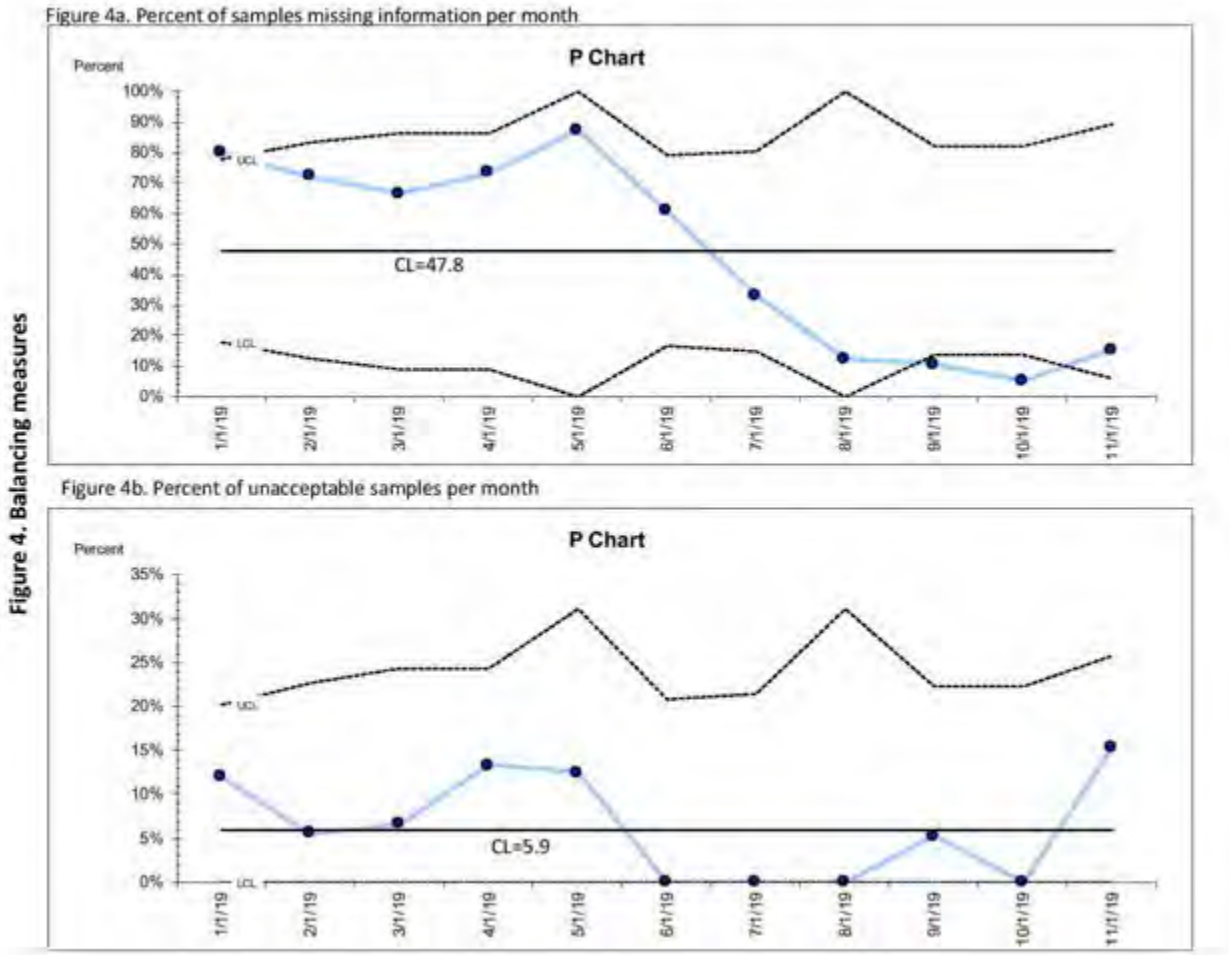

Figure 4.Balancing Measures

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Neonatal Pneumothorax: a Single-Center, Descriptive Study of Risk Factors and Outcomes

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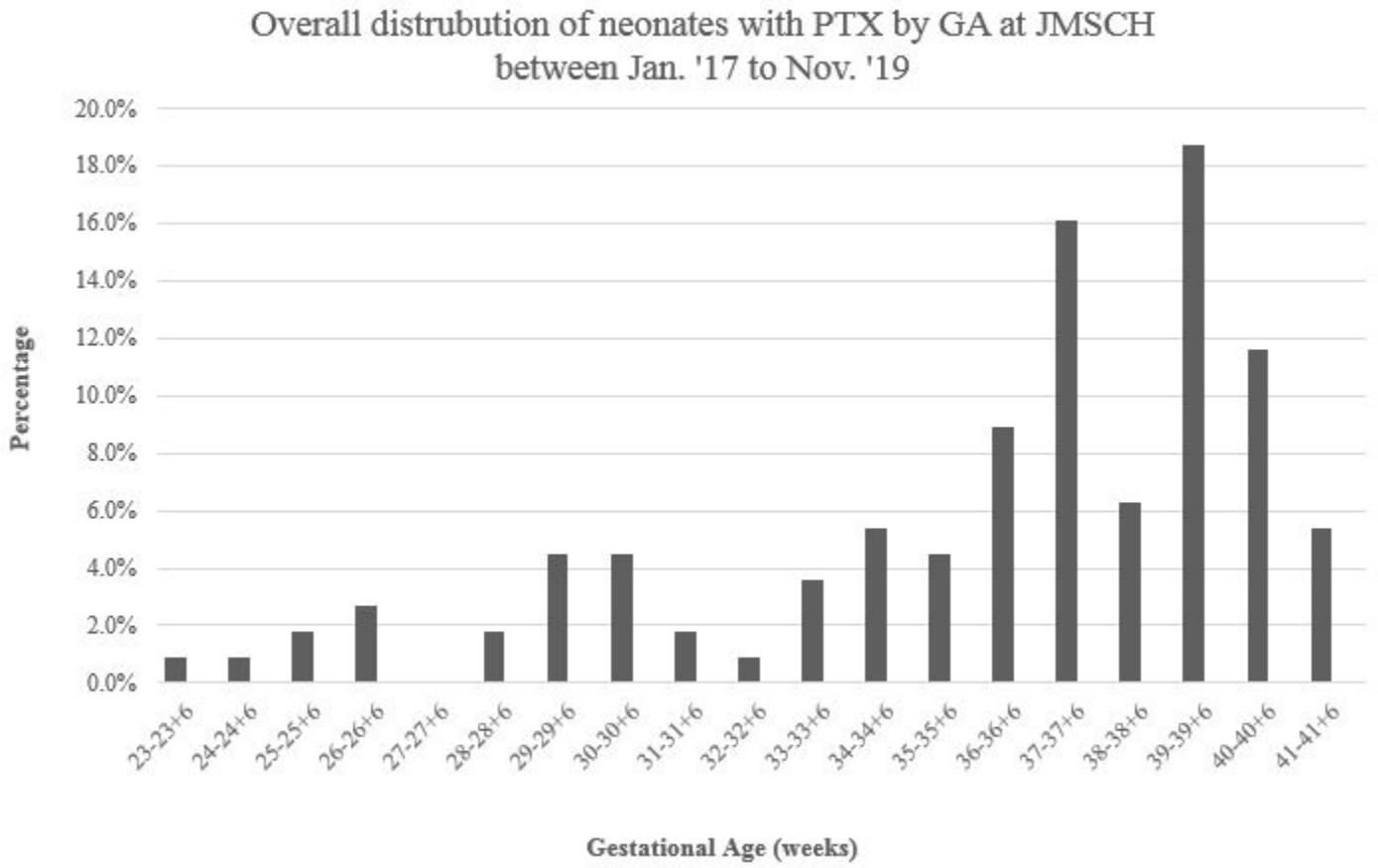
Background Pneumothorax (PTX) is a potentially deadly air leak syndrome that can occur in the neonatal period. Many risk factors for PTX have been described in literature. Rates of PTX reported in the Vermont Oxford Network (VON) range from 1-3% (interquartile range) for all gestational ages (GA). At our institution the incidence of PTX in neonates admitted to the Neonatal Intensive Care Unit (NICU) is higher than reported in the literature.
Objective We aim to identify risk factors, outcomes, and prognosis for neonatal PTX diagnosed at our institution's NICU by analyzing patient demographics, PTX characteristics, and interventions.
Design/Methods We performed a retrospective, descriptive study using medical chart review of neonates diagnosed with PTX in the NICU at Joseph M. Sanzari Children's Hospital (JMSCH), from January 2017 through November 2019. Data on GA, birth weight, pregnancy/delivery, days on ventilator/oxygen support, and treatment methods was collected. Statistical analysis was performed.
Results During the study period we had 112 cases of PTX that were diagnosed in the NICU and when compared to VON, our incidence of PTX in this population is higher, 4% vs. 3% (VON 75th %). For PTX sorted by GA: 58% were GA ≥37, 18% were GA 34-36^{+}6, 10% were GA 30-33^{+}6, and 12% in neonates of GA <30 weeks. Of the cases, 82% were unilateral and 19.6% tension PTX**.** There was underlying lung disease in 97%: 51% with respiratory distress and 41% transient tachypnea of the newborn. 48% had

early PTX (age≤4hr). 56% were diagnosed while on continuous positive airway pressure (CPAP). Mortality was 3.5% (all born GA ≤26). Half of PTX cases resolved with expectant management (EM). Chest tube (CT) placement was the primary intervention in 19% and needle drainage (ND) in 11%. Of those treated initially with ND, 17% required CT. Infants who required intervention weighed less, were less mature, and had tension PTX, than those who did not. Infants who underwent EM had shorter duration of support by non-invasive ventilation and supplemental oxygen, and had shorter length of stay.
Conclusion(s) Our data suggests that there is a correlation between use of CPAP and development of PTX. Other findings are similar to those in published literature of increased incidence: in males, of right-sided unilateral PTX, in patients with concomitant lung disease. We plan to review resuscitation practices at our institution to identify areas of improvement and decrease incidence of PTX.

Patient Characteristics Comparing Treated and Untreated PTX in the Neonate Diagnosed at JMSCH NICU

PATIENT/PTX CHARACTERISTICS	PTX UNTREATED (N=57)	PTX TREATED (N=55)	p-value
Median Gestational Age (weeks)	$39^{+}0$	$36^{+}3$	0.000000751
Birth Weight (grams)	3138.8 +/- 588	2275.9 +/- 987	0.000000251
Male	75% (43)	61.8% (34)	0.123
Vaginal Delivery	43.8% (25)	34.5% (19)	0.3169
1 min APGAR ≤ 8	71.9% (41)	63.6% (35)	0.408
5 min APGAR ≤8	36.8% (21)	34.5 (19)	0.743
Twin	1.75% (1)	10.9% (6)	0.049
Full Steroid Course	5.26% (3)	18.1% (10)	0.572
Oligohydramnios	12.28% (7)	9.09% (5)	0.588
Congenital Anomaly	10.53% (6)	14.5% (8)	0.525
Maternal Diabetes	7.02% (2)	9.09 (5)	0.710
Labor Present	66.67% (38)	54.5% (30)	0.192
Initial NICU Admission	77.19% (44)	74.5% (41)	0.775
Maternal Age (years)	30.7 +/- 5.3	31.9 +/- 5.5	0.276
Surfactant Use	8.77% (5)	45.4% (25)	0.00000893
Unilateral PTX	73.6% (42)	90.9% (50)	0.0166
Right PTX	75.4% (43)	63.6% (35)	0.448
Tension PTX	3.51% (2)	36.3% (20)	0.0000129
Pneumomediastinum	15.7% (9)	7.27% (4)	0.160
Size of PTX			
small	78.9% (45)	20% (11)	-
moderate	17.5% (10)	45.4% (25)	-
large	1.75% (1)	30.9% (17)	-
Early PTX (age≤4hr)	70.1% (40)	25.4% (14)	-
Age at Diagnosis (5-48hr)	26.3% (15)	63.6% (35)	-
Respiratory Support when PTX occurred			
room air	10.5% (6)	1.81% (1)	-
nasal cannula	3.50% (2)	0% (0)	-
high-flow nasal cannula	3.50% (2)	35.45% (3)	-
CPAP	66.67% (38)	45.4% (25)	-
NIMV	7.01% (4)	14.5% (8)	-
SIMV	5.36% (3)	27.2% (15)	-
HFOV/HFJV	3.50% (2)	3.63% (2)	-


Overall distrubution of neonates with PTX by GA at JMSCH between Jan. '17 to Nov. '19
Percentage
20.0%
18.0%
16.0%
14.0%
12.0%
10.0%
8.0%
6.0%
4.0%
2.0%
0.0%
23-23+6
24-24+6
25-25+6
26-26+6
27-27+6
28-28+6
29-29+6
30-30+6
31-31+6
32-32+6
33-33+6
34-34+6
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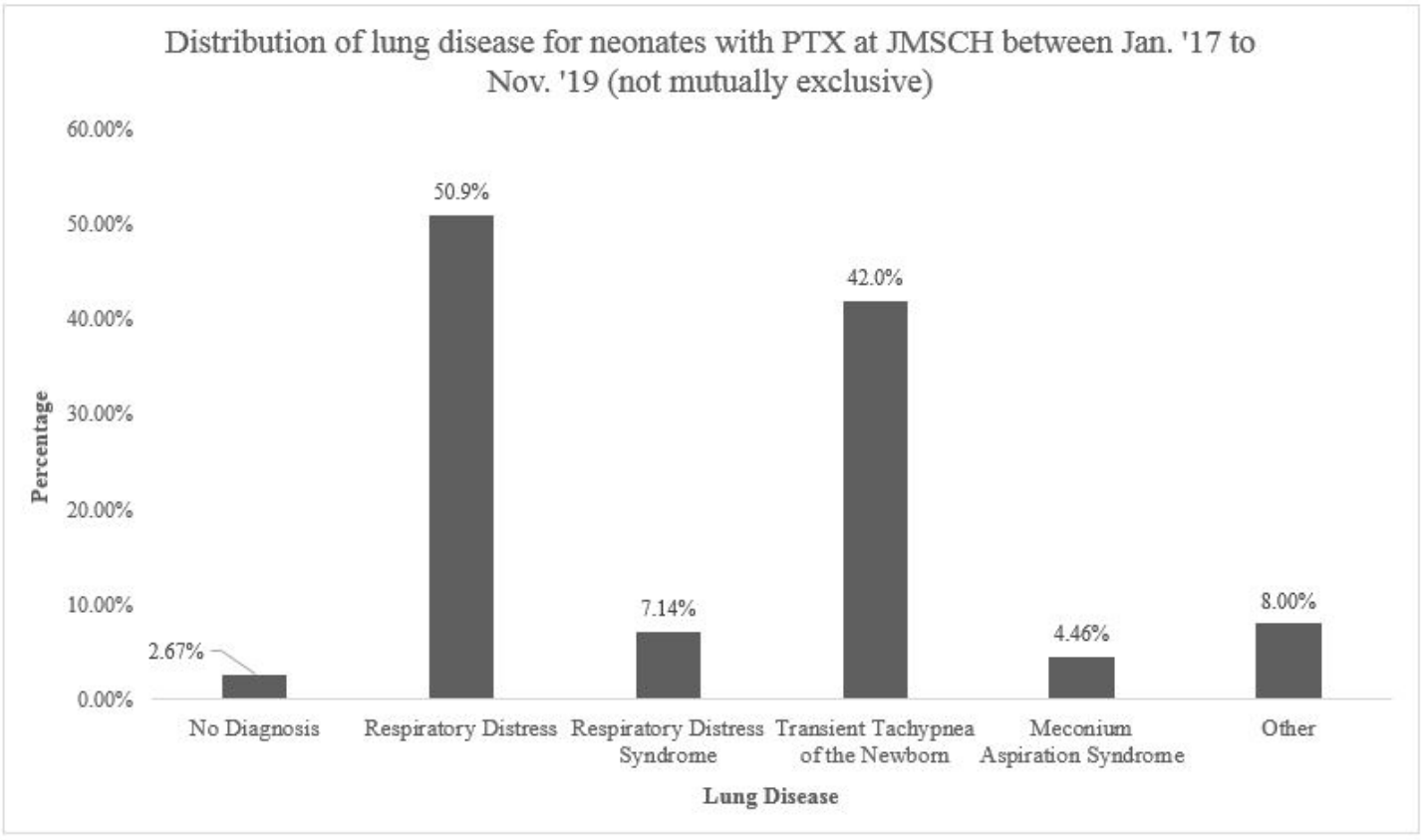
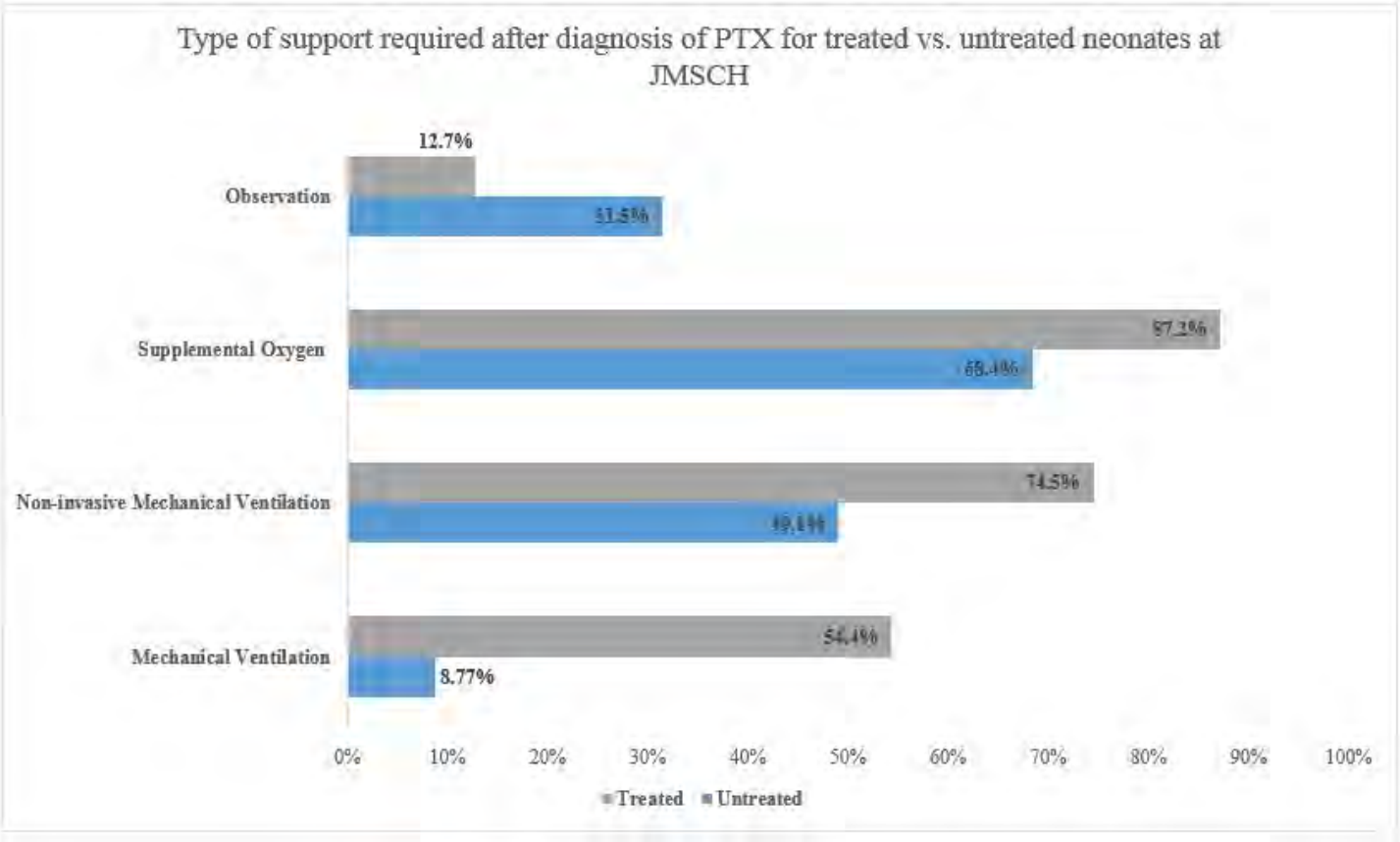
38-38+6
39-39+6
40-40+6
41-41+6
Gestational Age (weeks)


Distribution of lung disease for neonates with PTX at JMSCH between Jan. '17 to Nov. '19 (not mutually exclusive)
Percentage
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
2.67%
50.9%
7.14%
42.0%
4.46%
8.00%
No Diagnosis
Respiratory Distress
Respiratory Distress Syndrome
Transient Tachypnea of the Newborn
Meconium Aspiration Syndrome
Other
Lung Disease



Abstract: 234

Improving Delivery Room Preparedness by Implementing An Electronic Checklist

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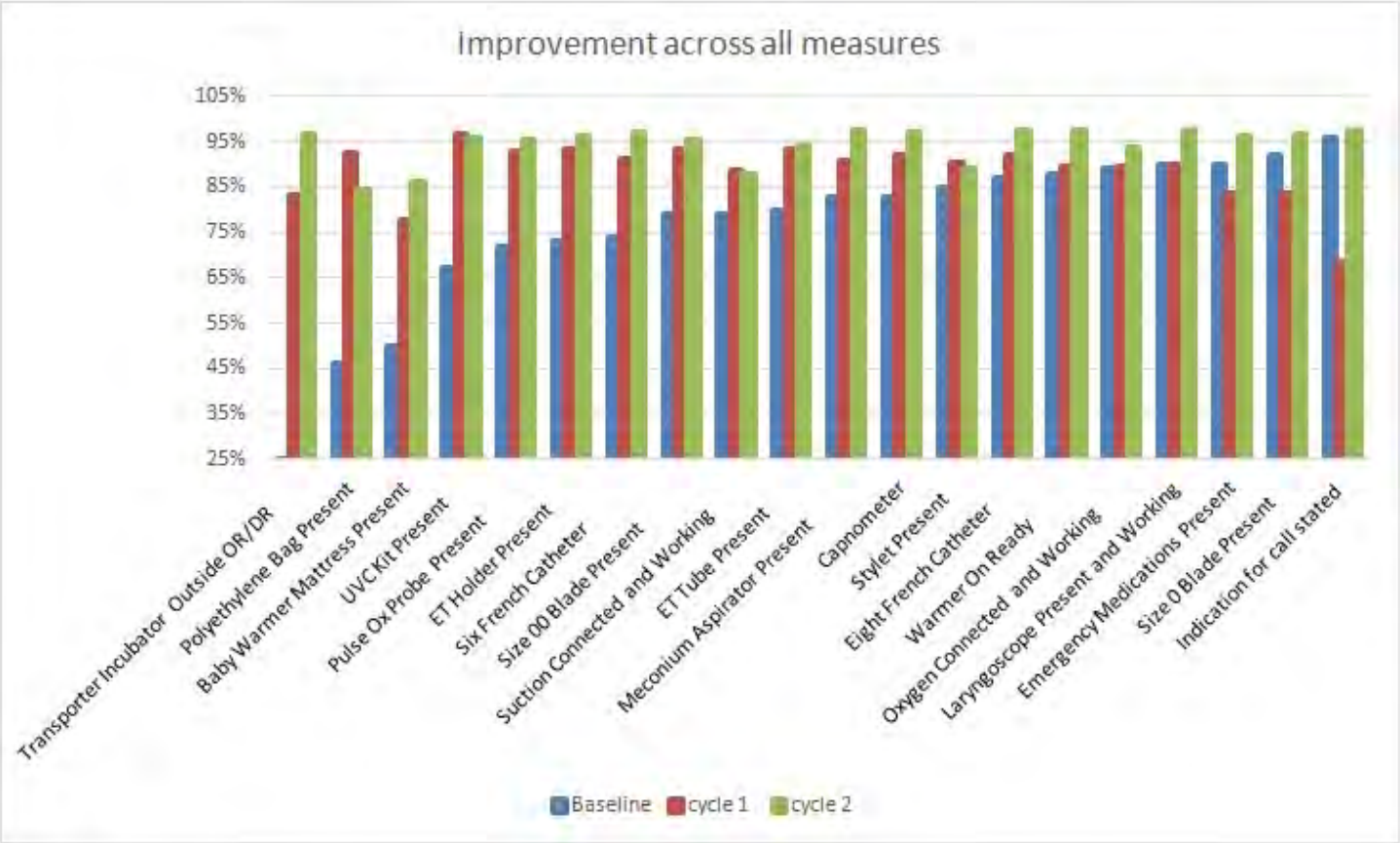
Background The National Resuscitation Program (NRP) has issued guidelines regarding delivery room tasks to be performed prior to newborn delivery. Successful resuscitation requires all necessary equipment and supplies in the delivery room, and inadequate preparedness has led to gaps in quality of care.

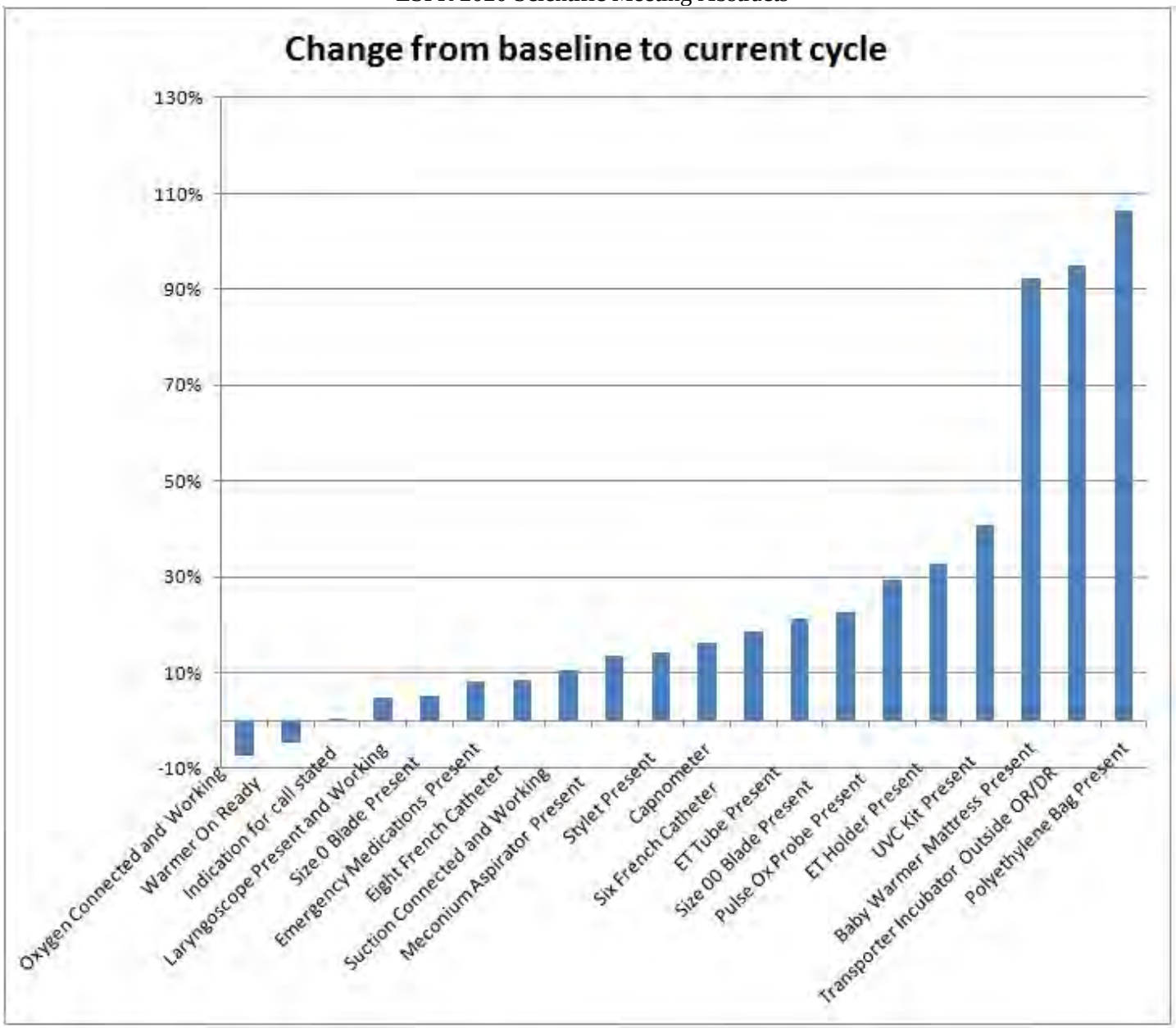
Objective To improve the preparedness of the labor and operating rooms for neonatal resuscitation prior to newborn deliveries as highlighted by the NRP in an urban community teaching hospital.

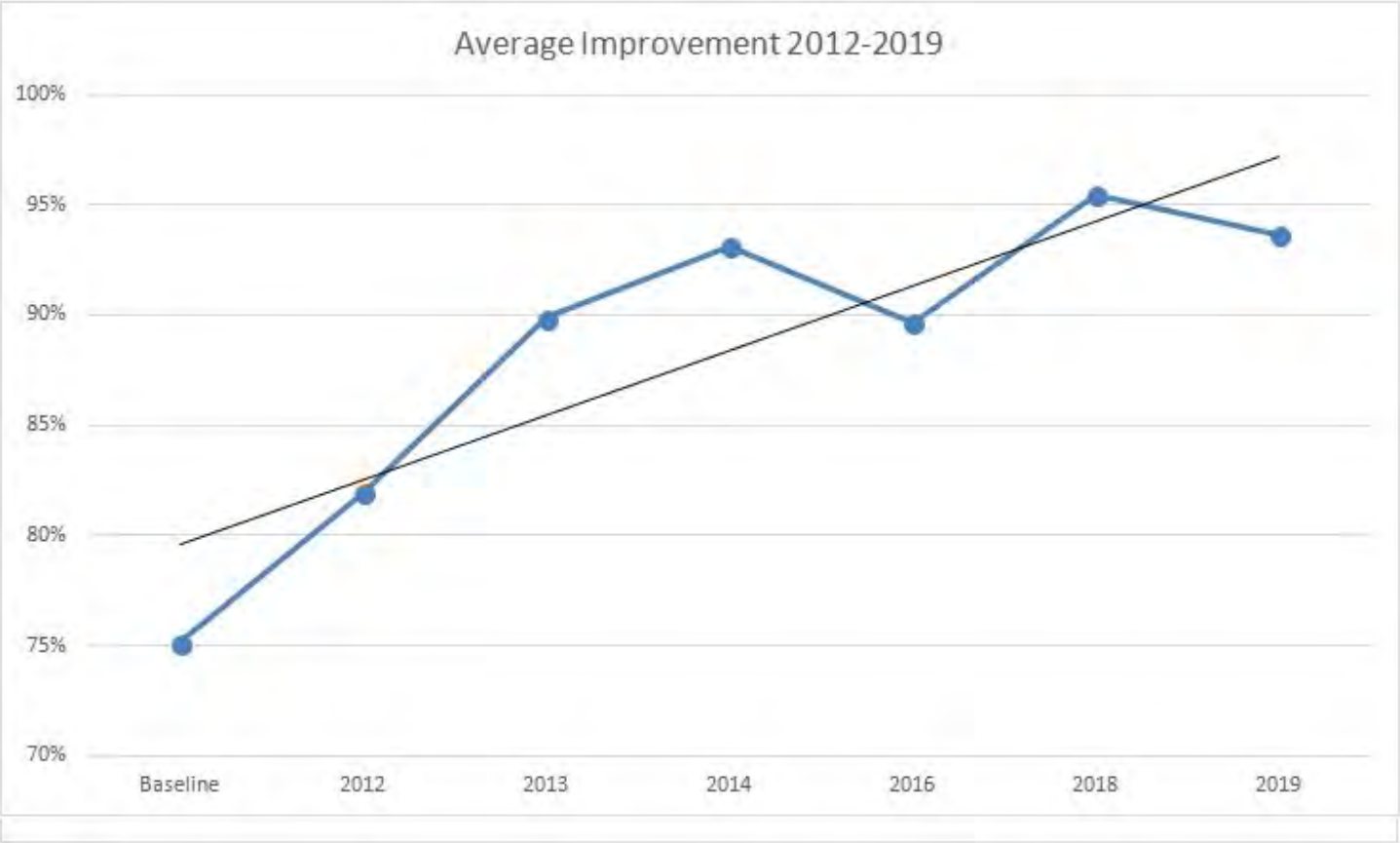
Design/Methods NRP certified pediatric residents (PGY1) and nurses were eligible to collect data. When called for a delivery, they surveyed the labor and operating rooms, assessing the availability of all necessary equipment using a binary checklist for availability and function. Also, Quality Improvement (QI) meetings were held between the OB GYN and Pediatrics departments regarding patient care. Microsoft Excel was used to collect and analyze the data transferred from paper forms during Plan/Do/Study/Act (PDSA) cycle 1, which ran from May 2012 through December 2016. An electronic checklist was implemented in PDSA cycle 2 which ran from December 2017 through December 2019. The electronic checklist was intended to streamline the process, alleviating the need to manually calculate results as form responses were automatically populated into a database, decreasing the number of errors and time needed for data entry and calculation.

Results Before introducing the checklist, no specific method of documenting equipment was required prior to newborn delivery. Pre-intervention data showed an average overall equipment preparedness rate of 80% for neonatal resuscitation, including 0% neonatal transport incubator present in cases of urgent transport to the Neonatal Intensive Care Unit (NICU). After cycle 2, incubator presence increased to 97%. Also, attendings can now access the data in real time for QI meetings to increase interdepartmental preparedness of labor and operating rooms. Checklist implementation and addressing issues at the QI meetings increased equipment preparedness rate to a mean of 93% in 30 months. Neonatal transport equipment has been present, warmed and ready with a compliance rate of 95%.

Conclusion(s) By implementing our checklist and addressing the issues regularly at hospital QI meetings, we were able to improve the quality of patient care by achieving and maintaining >90% preparedness of all necessary equipment and supplies per NRP regulation in our labor and operating rooms prior to newborn deliveries.


Improvement across all measures
105%
95%
85%
75%
65%
55%
45%
35%
25%
Transporter Incubator Outside OR/DR
Polyethylene Bag Present
Baby Warmer Mattress Present
UVC Kit Present
Pulse Ox Probe Present
ET Holder Present
Six French Catheter
Size 00 Blade Present
Suction Connected and Working
ET Tube Present
Meconium Aspirator Present
Capnometer
Stylet Present
Eight French Catheter
Warmer On Ready
Oxygen Connected and Working
Laryngoscope Present and Working
Emergency Medications Present
Size 0 Blade Present
Indication for call stated
Baseline
cycle 1
cycle 2


Change from baseline to current cycle
130%
110%
90%
70%
50%
30%
10%
-10%
Oxygen Connected and Working
Warmer On Ready
Indication for call stated
Laryngoscope Present and Working
Size 0 Blade Present
Emergency Medications Present
Eight French Catheter
Suction Connected and Working
Meconium Aspirator Present
Stylet Present
Capnometer
Six French Catheter
ET Tube Present
Size 00 Blade Present
Pulse Ox Probe Present
ET Holder Present
UVC Kit Present
Baby Warmer Mattress Present
Transporter Incubator Outside OR/DR
Polyethylene Bag Present



Abstract: 235

Antibiotic stewardship intervention in neonates with transient tachypnea of the newborn reduces antibiotic utilization in a neonatal intensive care unit

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Background Transient tachypnea of the newborn (TTN) is a self-limited cause of respiratory distress in newborns, attributed to a delay in the clearance of fetal alveolar fluid, and is the most common cause of respiratory distress in the early newborn period. Several risk factors are associated with this, including delivery by caesarean section (CS). Empiric antibiotics are often initiated even in late-preterm and term neonates, for the concern of respiratory distress presenting as early-onset sepsis (EOS), but growing evidence suggests that antibiotics are unnecessary in infants with TTN without risk factors for EOS.

Objective To reduce initiation of antibiotic use in infants with suspected TTN by implementing antibiotic stewardship guidelines.

Design/Methods Within a quality-improvement framework, an antibiotic stewardship intervention was implemented in August 2019 for a target population of: neonates ≥35 weeks, admitted to the neonatal intensive care unit of NewYork Presbyterian Komansky Children's Hospital, with respiratory distress within the first 6 hours of life, clinically consistent with TTN. These infants were born via CS without labor, and with no other known risk factors for early onset sepsis. Antibiotics were not initiated unless the attending physician deemed it necessary based on other clinical signs. Antibiotic use (including days of therapy, DOT), blood culture results, and clinical outcomes were collected.

Results In the preceding 6 months, 83% (19/23) of neonates in the target population received empiric antibiotics. This was reduced to 53% (10/19) of neonates in the 4 months following the intervention, representing a 30% reduction in antibiotic exposure for this population. No cases of culture-positive or culture-negative EOS occurred in neonates that did not receive antibiotic therapy.

Conclusion(s) An intervention to limit initiation of antibiotics in infants suspected to have TTN was successful in reducing antibiotic exposure in the target population and was not associated with any adverse outcomes.

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Acute Pediatric Sexual Assault Management: An iLearn Module

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Background Research and clinical practice have demonstrated that new trainees and physicians experience both discomfort and a perceived knowledge gap when caring for pediatric patients who present after acute sexual assault (ASA) due to a lack of exposure. Management of ASA is often not part of the curriculum in medical school or pediatric residency programs. In order to ameliorate this lack of exposure, our residency program implemented an educational activity consisting of different stations aimed to educate residents on managing ASA which was found to have been very time consuming. In order to improve learning, an iLearn module was created which was thought to benefit residents and faculty since the learning tasks could be done on their own time.
Objective This study aims to evaluate resident knowledge acquisition and feedback for this newly-created iLearn module focusing on ASA patients presenting to the emergency department with pre and post module surveys, and compare results to previous feedback from initial educational in-person training.
Design/Methods
The project was exempt from IRB approval. Residents in Pediatrics, Emergency Medicine, and Psychiatry were offered the opportunity to participate in an iLearn module designed to tackle how to approach a pediatric ASA case. Prior to beginning the module, participants were asked to complete a survey using Likert scales to assess the overall level of comfort and knowledge with each aspect of caring for a sexually assaulted pediatric patient. After completion of the survey, participants completed the iLearn activity. The online activity covers history taking, a comprehensive look at a forensic evidence kit (FEK) and how to use it, an overview of necessary written documentation to be completed during a case, and the laboratory studies and medical management that may be required during the initial evaluation. After completion of the activity, a post-module survey will be available with similar questions as the pre-survey to determine the efficacy of the intervention on knowledge acquisition, and how effective the residents found the activity. These results will be compared to the data obtained from the surveys before and after the educational in-person training on pediatric ASA.
Results Data collection ongoing.
Conclusion(s) We hypothesize this iLearn module will be more convenient and provide the knowledge and demonstrations to increase the exposure, level of comfort and level of knowledge in caring for a pediatric patient after ASA, which we hypothesize will be demonstrated in the post-survey.

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A Quality Improvement Initiative on Implementing Hospital-Based Safe Infant Sleep Practices for High Risk Population

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Background Sleep related infant deaths (SRID) are a leading cause of infant mortality in New York, causing 50 infant deaths in New York City annually. The Bronx ranks second highest among the boroughs at 0.5 SRID cases per 1000 deaths. Parents who observe safe sleep practices (SSP) in hospital are twice as likely to continue this practice at home.
Objective To prevent SRID in high risk population by increasing SSP in newborn nursery (NBN) and Neonatal Intensive Care Unit (NICU) by 40% by June 2020.
Design/Methods Pediatric physicians and staff completed IHI Risk Reduction for SIDS online modules. Nurse champions then led an initiative to improve SSP of infants in the NBN and NICU. Cribs were audited from 5-7/18 pre-intervention and 12/18-12/19 post-intervention. Parents were surveyed in postpartum unit and at the 2 week and 2 month clinic visits. Surveys were aimed at understanding cultural perspectives in a diverse patient population. Housestaff were surveyed to assess knowledge of SSP. PDSA cycles were conducted to adopt the use of sleep sacks.
Results 248 crib audits were performed over 19 months. In NICU, SSP education and huddles succeeded in increasing supine position, eliminating fluffy blankets & reducing use of excess blankets. In NBN, co-sleeping was down from 18% to 0%, however excess blanket use continued. Sleep sacks were given to families in NBN with subsequent decrease in swaddling following small tests of change. 55 parents were surveyed in clinic. 82% of parents reported receiving SSP education from a provider prior to discharge; 31% reported receiving it in clinic. 91% of residents completed an assessment survey; 98% of them believed in-hospital modeling of SSP was important in preventing SRID. Only 32% of residents recalled receiving formal training; 12% recalled completing online modules. Head nurses participated in a focus group to understand provider beliefs around SSP. The biggest improvement for babies during hospitalization was supine positioning. However, clinic survey data showed that unsafe sleep practices, especially co-sleeping, were still occurring in families with concerns about SSP.
Conclusion(s) Staff education and nursing involvement have led to improvement in SSP at our institution. However, online safe sleep

education for staff does not address cultural barriers nor prepare staff to tackle cultural beliefs around infant sleep in a diverse and immigrant patient population. A mixed methods approach to addressing families and cultural influences is in process.

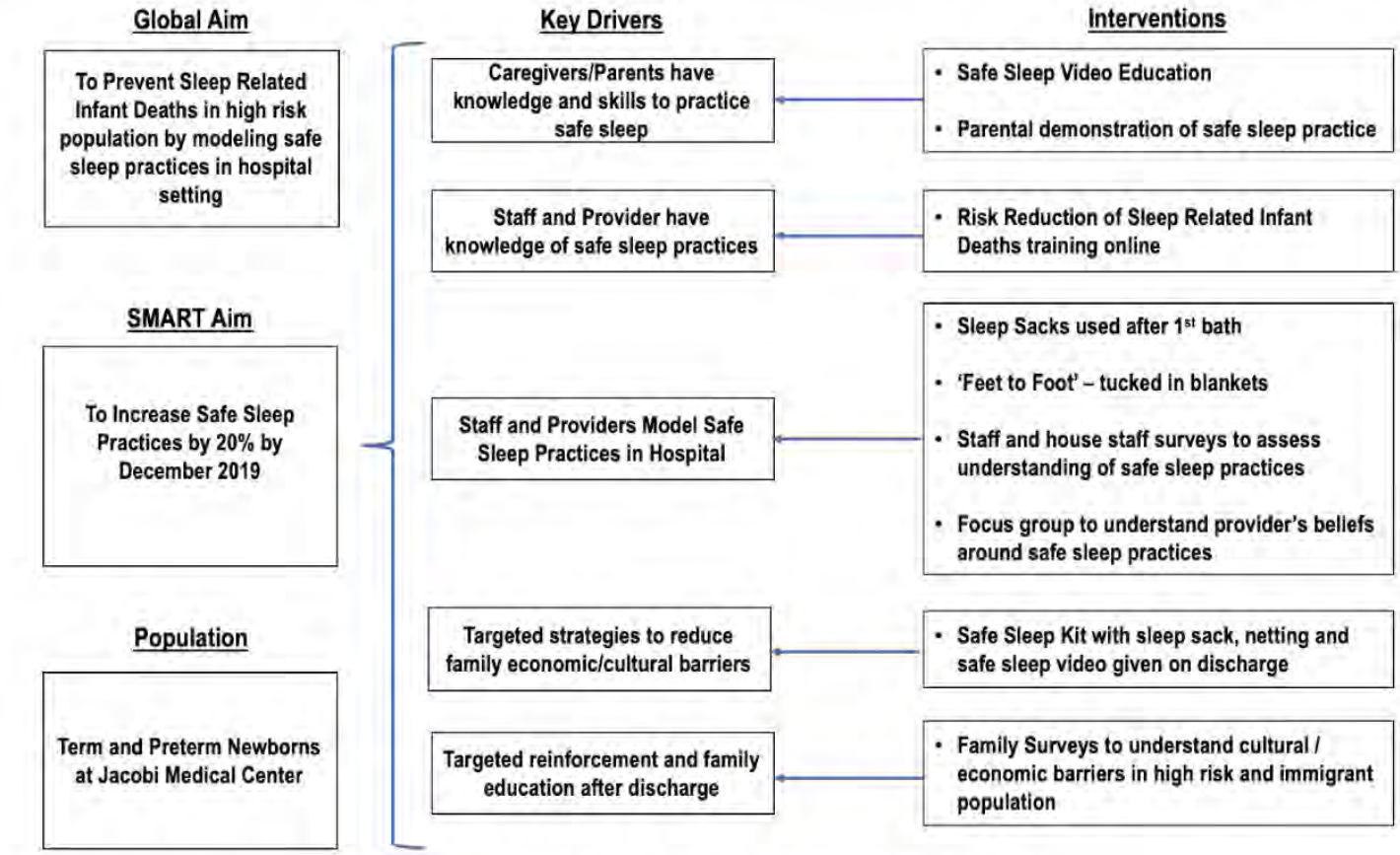

Figure 1. Key Driver Diagram to improve In-Hospital Safe Sleep Practices

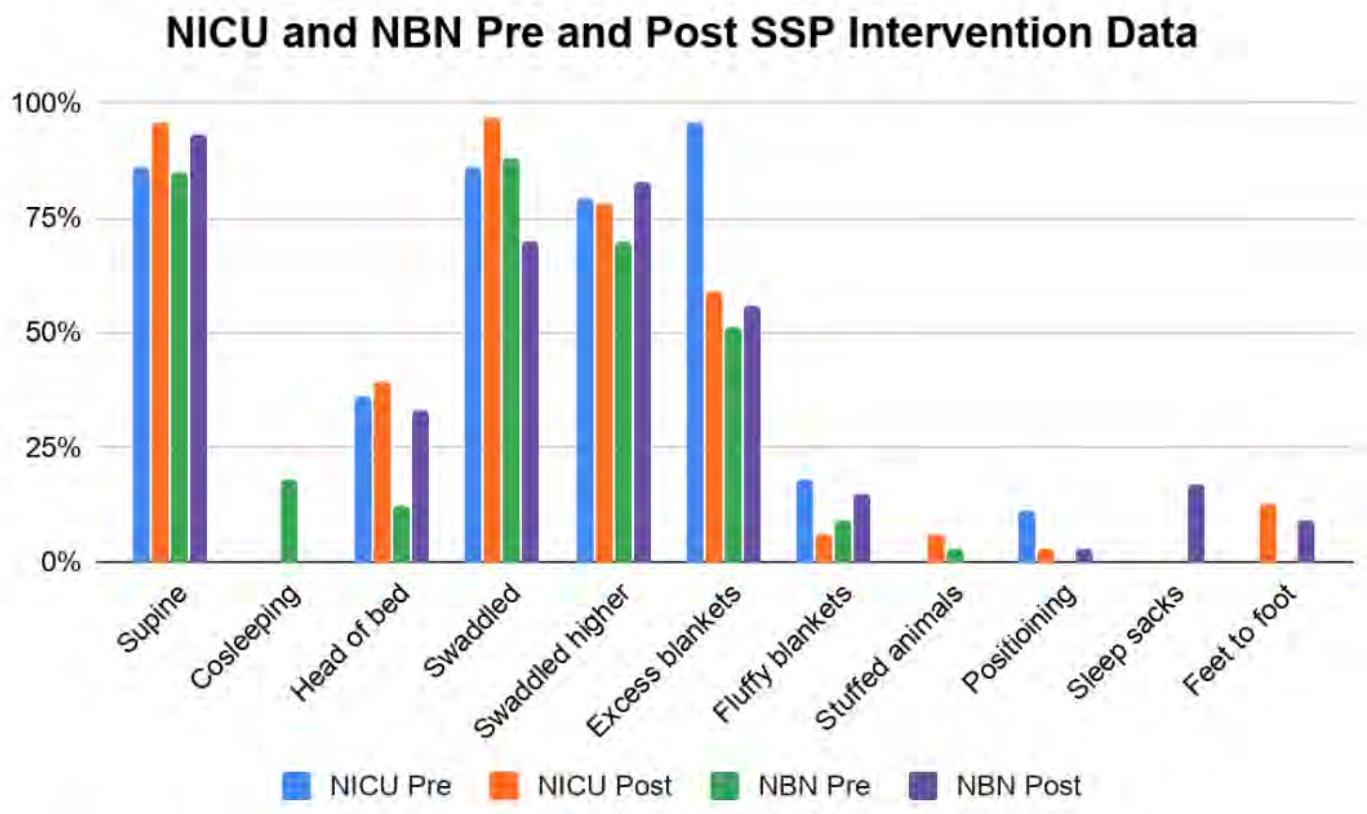

Figure 2. Pre and post-intervention comparison of various SSP audits

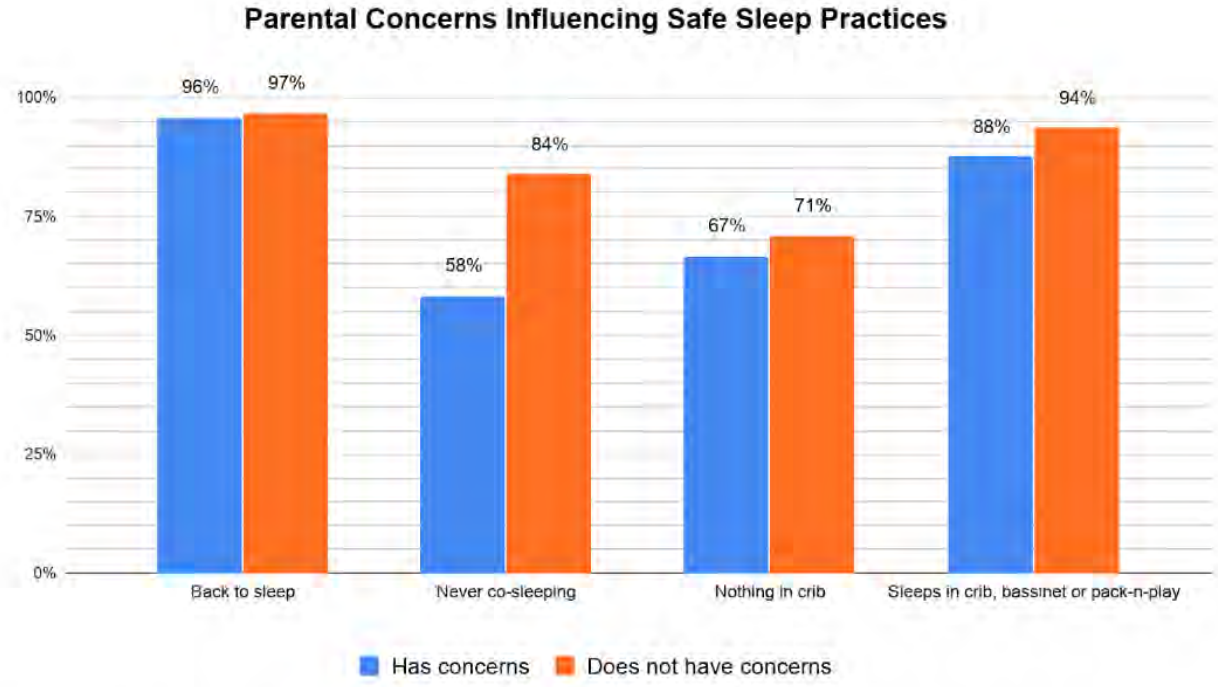

Figure 3. Safe sleep practices in parents with concerns and without concerns about the baby

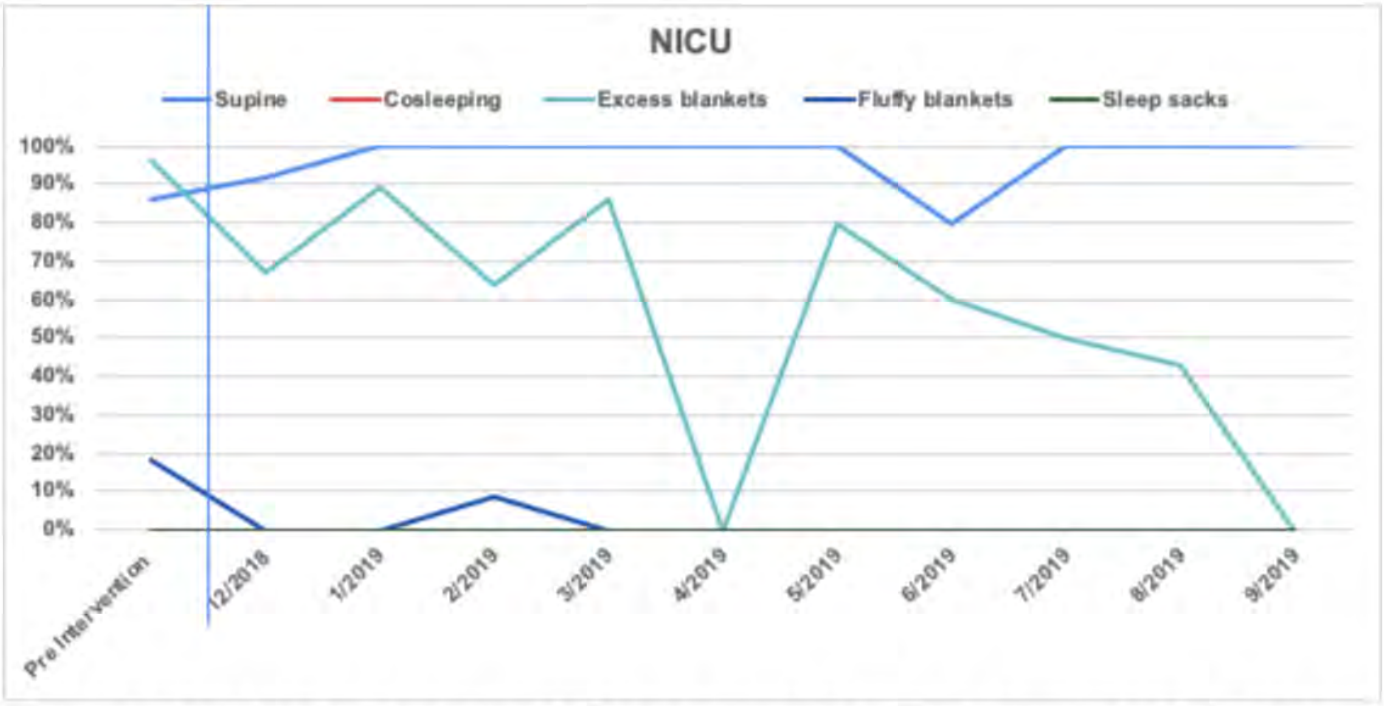

Figure 4. NICU: Run plot displaying observed trend in SSP over 9 months in the NICU

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Socioeconomic disadvantage is associated with worse infant sleep quality

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Background Socioeconomic disparities in sleep quality exist in school age children and partially mediate the relationship between socioeconomic status (SES) and school achievement. Whether or not socioeconomic disparities in sleep exist during infancy is unknown.

Objective To investigate the relationship between familial SES and infant sleep quality.

Design/Methods Mother-infant pairs from a broad range of SES were recruited from the New York metropolitan area when their children were 6-, 9- or 12-months of age. Mothers provided information about basic demographics, parental education, income and family size. Mothers also completed the Brief Infant Sleep Questionnaire (BISQ), a validated tool used to assess infant sleep quality and environment.

Factor analysis using the BISQ responses was used to create an Infant Sleep Quality Score (ISQS) (range -1 to 1). Multiple linear regressions were used to investigate the relationship between socioeconomic factors (parental education, income-to-needs [ITN] ratio) and the ISQS. Child age and sex were included in the models as covariates. Models also investigated the extent to which co-rooming (i.e., where the child sleeps at night) mediated links between socioeconomic factors and the ISQS.

Results 84 mother-infant pairs were included in this analysis, with equal representation of 6, 9, and 12-month-olds (Table 1). A majority of the infants were male (66.7%). 45% of mothers identified their children as Hispanic. The families had a wide range of ITN ratios and mean years of parental education.

Higher log transformed familial ITN ratios significantly predicted better infant sleep quality scores (β=0.25, p=0.006) (Table 2, Figure 1). In a separate model, increased mean years of parental education also significantly predicted better infant sleep quality scores (β=0.03, p=0.024) (Table 2, Figure 2). The association between these socioeconomic factors and ISQS was statistically mediated by co-rooming (Table 2).

Conclusion(s) In this population of infants living in NYC, we found that infants from homes with lower income and less parental education are at higher risk for poor sleep. The relationship between sleep quality and SES in this cohort appeared to be partially mediated by whether or not the child slept in a room alone.

Table 1. Demographic Characteristics

Variable	n=84
Age: N (%)	
6mo	28 (33.3)
9mo	28 (33.3)
12mo	28 (33.3)
Sex: N (%)	
Female	28 (33.3)
Male	56 (66.7)
Child Race: N (%)	
White	26 (31.0)
Black	21 (25.0)
Asian	1 (1.2)
Other	24 (28.6)
Missing	12 (14.3)
Child Ethnicity: N (%)	
Hispanic	38 (45.2)
Not Hispanic	39 (46.4)
Missing	7 (8.3)
Familial ITN Ratio: Median (IQR)	2.3 (0.7-5.6)
Log ITN* Ratio: Mean (SD)	0.3 (0.6)
Annual Income: Median (IQR)	$50,000 ($20,000-$125,000)
Adults Supported: Mean (SD)	2.2 (0.8)
Children Supported: Mean (SD)	1.8 (1.1)
Mean Parental Education (years): Mean (SD)	15.2 (3.7)
Gestational age (weeks): Mean (SD)	39.6 (1.3)
Infant Sleep Quality Score: Mean (SD)	0.04 (0.5)

*ITN= annual familial income divided by the family-size specific federal poverty level for the specific year

Table 2. Linear Regression Results Modeling Infant Sleep Quality Score (ISQS)

Model Variable	β	p-value	Full Model Statistics
Family Poverty Model			R^2=0.09, F=2.66, p=0.054
Log ITN Ratio	0.25	0.006**	
Age (months)	0.01	0.56	
Sex (1=Female)	-0.02	0.85	
Parental Education Model			R^2=0.06, F=1.81, p=0.151
Mean Parental Education (years)	0.03	0.024*	
Age (months)	0.01	0.74	
Sex (1=Female)	-0.02	0.88	
Family Poverty Model with Mediator			R^2=0.15, F=3.48, p=0.011*
Co-Sleeping (1=Infant Sleeps Alone)	0.36	0.022*	
Log ITN Ratio	0.11	0.31	
Age (months)	0.01	0.56	
Sex (1=Female)	-0.09	0.46	
Parental Education Model with Mediator			R^2=0.13, F=2.89, p=0.027*
Co-Sleeping (1=Infant Sleep Alone)	0.36	0.018*	
Mean Parental Education (years)	0.01	0.45	
Age (months)	0.01	0.65	
Sex (1=Female)	-0.06	0.58	

*p<0.05

**p<0.01

Figure 1. Log Transformed Familial Income-to-Needs Ratio vs. Unadjusted Infant Sleep Quality Scores

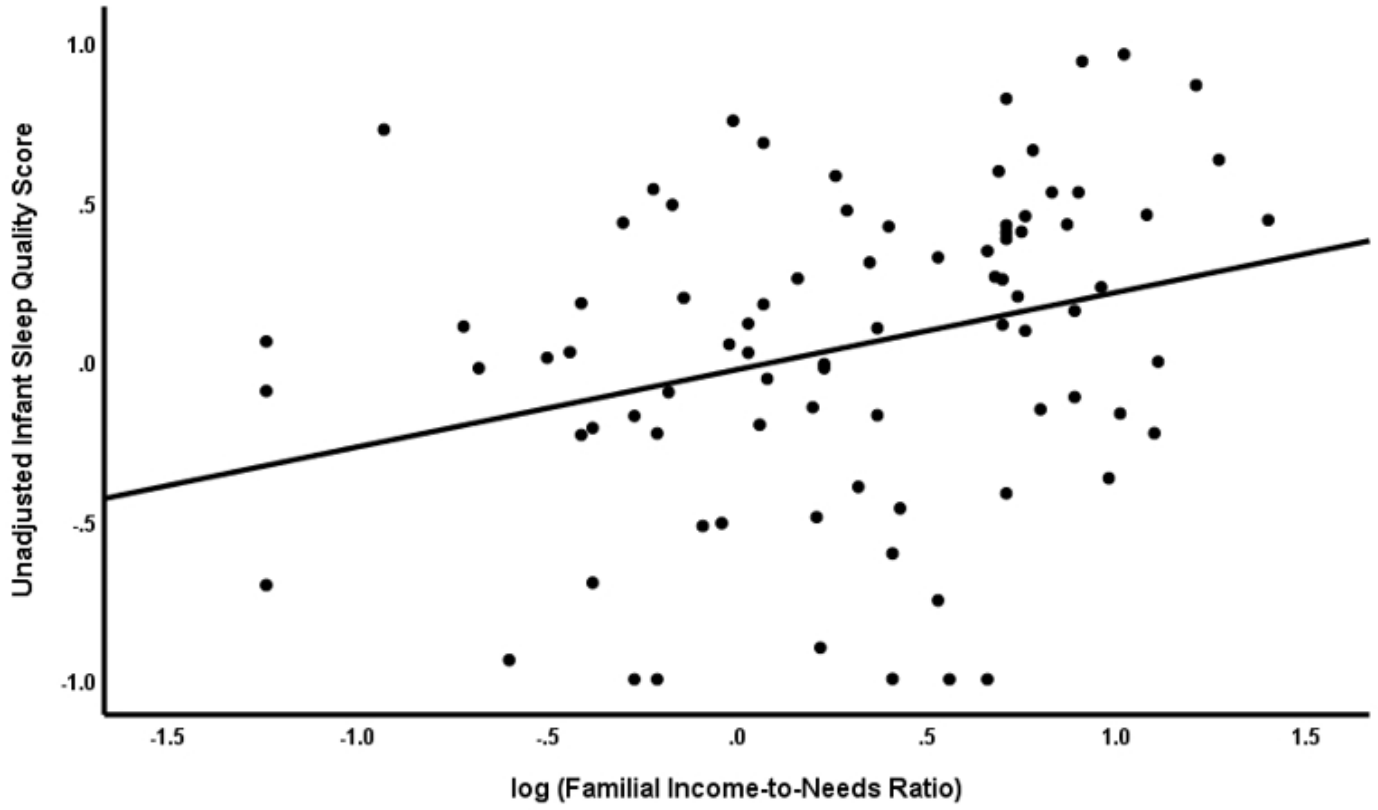
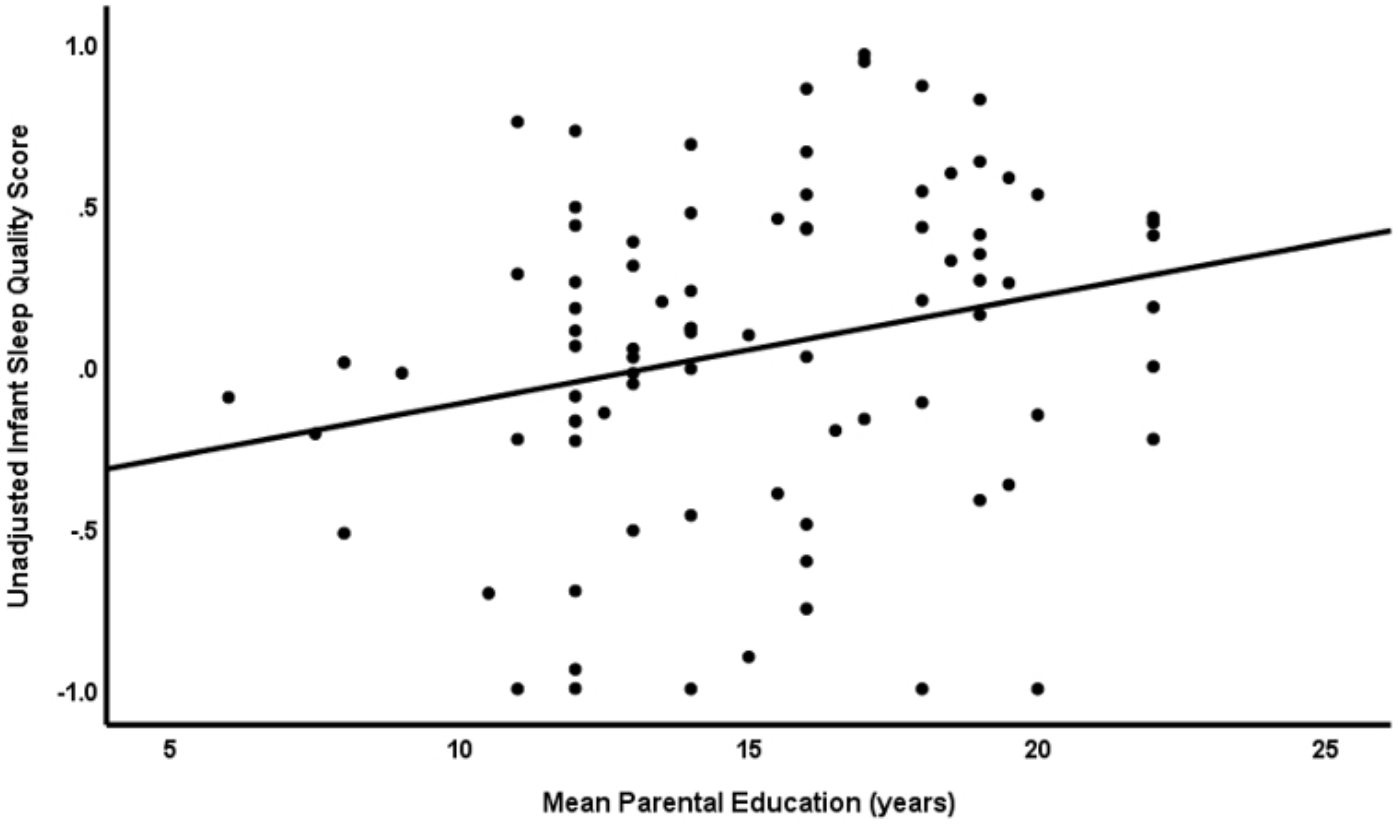


Figure 2. Mean Parental Education vs. Unadjusted Infant Sleep Quality Scores



Abstract: 239

Quality of Therapy Services for Children with Developmental Disabilities in a Suburban/Urban Under-served Population

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Background There is a longstanding history of minority mistrust in the United States health system due to past injustice and inequity of care. Developmental delays affect children from all socioeconomic backgrounds. Providing services for treatment is of the utmost importance; quality care should be provided for all children, including traditionally under-served populations.
Objective To examine the relationship between race (white vs. non-white minority (NWM)) and income regarding parental satisfaction with and perceived child improvement with therapy services.
Design/Methods Patients were recruited from the waiting room of a developmental pediatrics office. Parents were asked about their child's demographics and satisfaction with therapy services. For children receiving multiple therapy services, one was selected at random for analyses. Services examined included Physical Therapy(PT), Occupational Therapy(OT), Speech Therapy(ST), Special Instruction(SI), Feeding Therapy(FT), and Applied Behavioral Analysis(ABA). A Mann-Whitney U Test was used to evaluate the association between race and parental satisfaction. A Chi-square test was used to examine associations between race and parentally-perceived improvement of child’s skills. Pearson correlations were used to investigate relationships between income and parent satisfaction as well as income and child improvement.
Results 118 caregivers of patients aged 0-17 years old were recruited. Mean child age was 7.72 years, with 76.4% male, 51.7% white. After randomization to account for children receiving multiple therapy services, children receiving ABA (n=12), ST (n=38), OT (n=23), PT (n=17), FT (n=1), SI (n=16), and Other services (n=10) were included in data analyses. White populations were not found to be more satisfied with their therapy services than NWM populations (U=1334, p=0.334). No association between race (Fig. 1) and child improvement was identified (p=0.352). No associations between income (Fig. 2) and parent satisfaction (r=0.10, p=0.100) or child improvement (r=0.155, p=0.155) were identified.
Conclusion(s) Parents of children who receive developmental therapy services are seemingly equally satisfied and note equal improvements across socioeconomic groups. While our results are positive, it is essential to note our study excluded children who were unable to receive needed services. Future studies should include all children who would qualify for services on basis of developmental delays in order to evaluate for inequity.

Figure 1: Race Demographics of Children of Families Surveyed

Race (select all that apply)	n (%)
American Indian or Native American	4 (3.4%)
Asian American or Asian	11 (9.3%)
Black or African American	10 (8.5%)
Hispanic or Latino	30 (25.4%)
Native Hawaiian or Other Pacific Islander	1 (8.5%)
Other	1 (8.5%)
White	69 (58.5%)
Total	**118**

Figure 2: Annual Household Income of Families Surveyed

Annual Household Income	n (%)
Less than $20,000	3 (2.5%)
$20,000 - $34,999	3 (2.5%)
$35,000 - $49,000	10 (8.5%)
$50,000 - $74,999	8 (6.8%)
$75,000 - $99,999	17 (14.4%)
$100,000 - $249,999	50 (42.4%)
$250,000 - $499,999	13 (11.0%)
More than $500,000	2 (1.7%)
No Answer	12 (10.2%)
Total	**118**

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The effects of neighborhood and individual socioeconomic status on parental engagement and psychological distress in the Neonatal Intensive Care Unit

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Background Individual measures of socioeconomic status (SES, e.g education) are often used to study population health. In contrast, neighborhood-based SES measures provide a more sophisticated view of how community factors influence health outcomes. Prior studies suggest that higher individual SES is associated with increased resilience. However, no studies have ascertained the influence of neighborhood SES on parental engagement or psychological distress in the neonatal intensive care unit (NICU).

Objective a) To determine the effect of neighborhood SES on parental psychological distress and parental engagement, b) To compare the effect of individual versus neighborhood SES on these relationships.

Design/Methods Parents of neonates ≤34 weeks gestation in the NICU (n =45; response rate 83%) were surveyed 2 weeks after birth (Table 1). Neighborhood SES was determined by calculating the "Concentrated Disadvantage" z-score (CDZ) from census tract data using the Association of Maternal and Child Health Programs' methodology. Parental education level and engagement in NICU activities (e.g kangaroo care, pumping, calls/visits) were collected. Psychological distress was measured by validated scales (Parent Stress Scale-NICU, Connor-Davidson Resilience Scale, State-Trait Anxiety Inventory, Edinburgh Postnatal Depression Scale). Statistical analysis by Spearman correlation and regression was performed.

Results Higher parental CDZs (more disadvantaged) were associated with lower birthweights (ρ =-0.41), increased resilience (ρ = 0.32), decreased anxiety (ρ =-0.38), and decreased stress from the infant's appearance (ρ =-0.35). Parents with higher CDZ and lower education participated less in NICU activities but called more frequently (Figure 1). Parental education and psychological distress were not correlated. In regression analysis, those with higher CDZ had double the odds of high resilience scores (OR 2.43) (All $p < 0.05$).

Conclusion(s) Although parents with low SES by both measures engaged less frequently in NICU activities, only neighborhood SES was associated with parental psychological distress. Specifically, the inverse relationship between low neighborhood SES and high resilience differs from previous reports of a positive relationship between individual SES and resilience. Community factors build a parent's resilience and influence how they cope with hospitalization more than individual factors. CDZ may be a better measure of SES than individual, self-reported measures.

Table 1 - Demographic Information (n=45)[a]	
Parent age (years)	30.02 ± 6.07
Gestational age (weeks)	29.73 ± 3.25
Birthweight (grams)	1364 ± 522.89
Concentrated Disadvantage Z-score (CDZ)[b]	0.29 ± 0.85
Parent race/ethnicity	
White, non-Hispanic	16 (36%)
All other races/ethnicities	29 (64%)
Parent gender	
Female	39 (87%)
Male	6 (13%)
Parent education level	
High school education or less	16 (36%)
Some college education or more	29 (64%)
Parent marital status	
Single	14 (31%)
Married or partnered	31 (69%)
In our cross-sectional survey study, participants were mostly mothers from racial minorities. The average birthweight for infants in the study is in the very low birthweight range (< 1500g).	
[a] Values are mean ± SD for continuous variables and n (%) for categorical variables.	
[b] Even though CDZ is a z-score, the average CDZ is not 0. This is because z-scores were calculated for each participant's census tract by using the mean and standard deviation for all census tracts in counties where participants lived.	

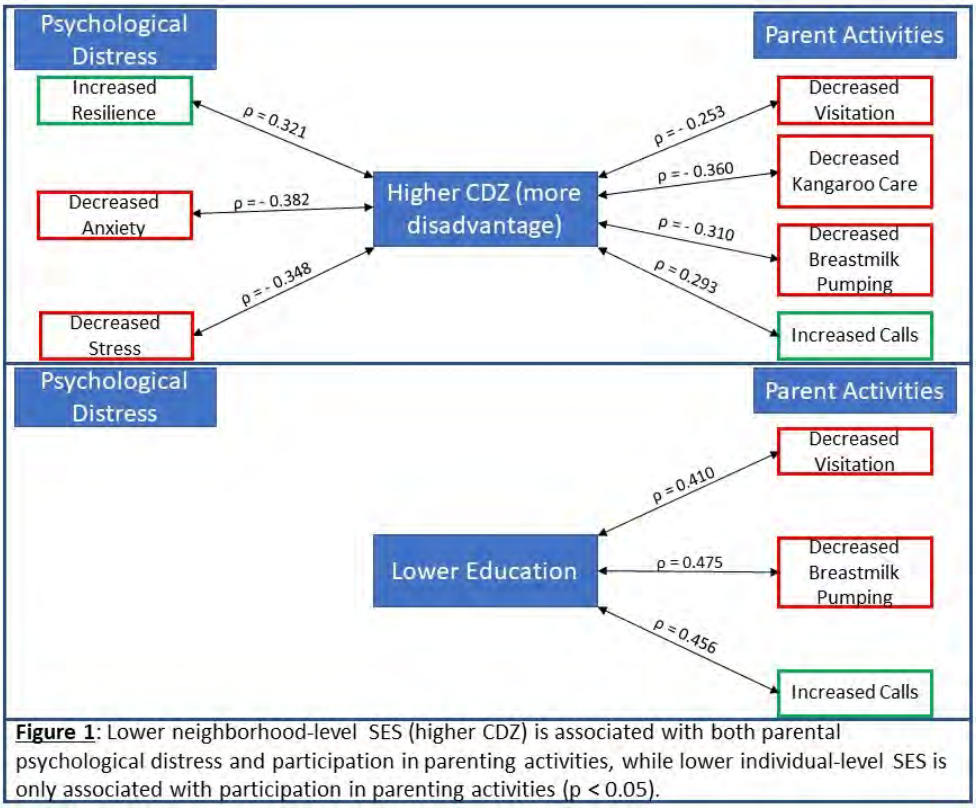

Figure 1: Lower neighborhood-level SES (higher CDZ) is associated with both parental psychological distress and participation in parenting activities, while lower individual-level SES is only associated with participation in parenting activities ($p < 0.05$).

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Severe Neonatal Hyperbilirubinemia: Identifying Risk Factors for Exchange Transfusion

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Background Hyperbilirubinemia is one of the most common diagnoses leading to hospital admission in the newborn population. Severe unconjugated hyperbilirubinemia often results in ICU-level admission due to kernicterus risk and need for possible exchange transfusion. Identifying newborns at risk for severe hyperbilirubinemia and who will ultimately require exchange transfusion and ICU admission has not been historically well described in the literature.
Objective Our goal was to identify trends in patient demographics and risk factors for exchange transfusion in newborns with severe unconjugated hyperbilirubinemia admitted to the NICU.
Design/Methods A retrospective chart review of all neonates admitted to the Children's National Health System NICU with a primary diagnosis of hyperbilirubinemia from January 1, 2014 to December 31, 2018 was performed. Patients with a diagnosis of direct hyperbilirubinemia were excluded. Patients were identified using data collected from the Children's Hospital Neonatal Database. Additionally, hospital electronic medical records were reviewed for patient demographics, lab results, record of exchange transfusion, and hyperbilirubinemia risk factors.
Results 251 charts of neonates admitted to the NICU for hyperbilirubinemia were reviewed. 221 patients met inclusion criteria. Of these 221 patients, only 9 patients received exchange transfusion (4%). Patients with a peak bilirubin over or equal to 25 were statistically more likely to receive exchange transfusion than patients with a peak bilirubin under 25 (78%, $p<0.001$). Patients who were exclusively breastfed were less likely to receive exchange transfusion (71%, $p=0.01$). Similarly, patients with a primary diagnosis of breastfeeding jaundice were less likely to receive exchange transfusion (69%, $p=0.0007$). Patients with G6PD deficiency were more likely to receive exchange transfusion (44%, $p=0.0004$). Patients requiring exchange transfusion had lower birth weights than patients who did not receive exchange transfusion (2800 ± 765g, $p=0.02$). Although not statistically significant, all patients who received exchange transfusions were non-white.
Conclusion(s) G6PD, while known to be a relatively benign condition, was associated with a risk of receiving exchange transfusion in jaundiced newborns. Newborns with severe jaundice who were exclusively breastfeed were less likely to receive exchange transfusion. We continue to evaluate additional risk factors for severe hyperbilirubinemia in this population.

Table 1. Patient Demographics for NICU Admissions with Unconjugated Hyperbilirubinemia

		n (%)	No Exchange Transfusion n (%)	Exchange Transfusion n (%)	p
Total patients with hyperbilirubinemia		221 (100)	212 (96)	9 (4)	
Male		123 (56)	117 (55)	6 (33)	0.73
Race/Ethnicity	Black	90 (41)	84 (40)	6 (67)	0.41*
	White	53 (24)	53 (25)	0 (0)	
	Asian	30 (14)	29 (14)	1 (11)	
	Latino	31 (14)	29 (14)	2 (22)	
	Other	10 (5)	10 (5)	0 (0)	
	Unknown	7 (3)	7 (3)	0 (0)	
Day of Life at Admission median ± SD			4±3	5±3	0.96~
GA weeks median ± SD			39±2	38±2	0.168^
	>36 weeks	204 (92)	197 (93)	7 (78)	0.15*
	≤36 weeks	17 (8)	15 (7)	2 (22)	
Birthweight (grams) median ± SD			3175±576	2880±765	0.02~

Table 2. Exchange Transfusion Risk Factors

		n (%)	No Exchange Transfusion n (%)	Exchange Transfusion n (%)	p
Peak Bilirubin	≥25	32 (14)	25 (12)	7 (78)	<.0001*
	<25	189 (86)	187 (88)	2 (22)	
Bilirubin ≥25 and DOL at Admission ≤3		5 (2)	2 (1)	3 (33)	0.0005*
Exclusively Breastfed		150 (69)	148 (71)	2 (25)	0.01*
Breastfeeding Jaundice		148 (67)	147 (69)	1 (11)	0.0007*
G6PD		11 (5)	7 (3)	4 (44)	0.0004*
ABO Incompatibility		54 (26)	51 (26)	3 (33)	0.70*

* Fisher's Exact, ~ANOVA; ^Kruskal-Walli

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A Genetic Variant of FAM13A is Associated with Bronchopulmonary Dysplasia (BPD) in Extremely Low Birth Weight Infants (ELBWs)

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Background Bronchopulmonary dysplasia is an extremely common lung disease whose prevalence continues to rise with the increasing survival of ELBWs. Pathogenesis is multifactorial, with a strong genetic foundation. Family with sequence similarity 13, member A (FAM13A) polymorphism is associated with multiple human lung pathological conditions, including COPD, asthma, silicosis, and pulmonary fibrosis. The FAM13A gene is located on 4q22 and is comprised of 25 exons. Function of FAM13A is still unknown, but three possible mechanisms have been proposed: (1) FAM13A may act as a signal transduction gene because its significant single nucleotide polymorphisms (SNPs) lie within an intronic region downstream of a Rho GTPase-activating protein domain, which is important for regulation of cell proliferation and survival, (2) FAM13A may activate Wnt signaling pathway, which has a role in both airway and alveolar epithelial development as well as repair after injury, and (3) FAM13A may regulate carnitine palmitoyl transferase-fatty acid oxidation, which plays a role in regulating reactive oxygen species production, contributing to lung epithelial cell death. In this pilot study, we seek to determine associations of FAM13A SNPs with BPD in ELBWs.

Objective We hypothesize that FAM13A gene variants rs2609264, rs2869967, rs2013701, rs7671167, rs2609261, rs6837671, rs6830970 and rs2609255 are associated with susceptibility to BPD in ELBWs.

Design/Methods DNA from buccal swabs of ELBWs were collected, isolated, and analyzed with RT-PCR using specific TaqMan probes for rs2609264, rs2869967, rs2013701, rs7671167, rs2609261, rs6837671, rs6830970 & rs2609255. BPD was defined as O_2 dependence at 36 weeks postmenstrual age. Parents gave informed consent. Statistical analysis using chi-square, t-test, and z-test were performed, with $p < 0.05$ denoting significance.

Results Patients with BPD were born earlier ($p<0.001$) and at lower birth weight ($p<0.001$). For rs2609255, there is a significant difference ($p=0.04$) in genotype distributions between BPD and No BPD. For rs2609264, rs2869967, rs2013701, rs7671167, rs2609261, rs6837671 and rs6830970, these differences were not statistically significant. The difference for rs2609255 was not independent from prematurity following multiple logistic regression analyses

Conclusion(s) In this pilot study, we found that FAM13A rs2609255 is associated with development of BPD in ELBWs. We speculate that this genetic variant may influence airway and alveolar development and remodeling

		No BPD (n = 68)	BPD (n = 102)	p value
Gestational age, wks, median (IQR)		26 (25, 27)	25 (24, 26)	<0.001*
Birth weight, g, median (IQR)		836 (717, 910)	670 (595, 820)	<0.001*
SGA, n (%)		9 (19)	18 (17)	0.44
Male Gender, n (%)		20 (39)	52 (52)	0.005*
Race, n (%)	Non Hispanic Black	21 (30)	36 (35)	0.59
	Caucasian	21 (30)	27 (26)	
	Hispanic	22 (32)	26 (25)	
	Other	14 (20)	13 (12)	
Antenatal steroids, n (%)		53 (77)	75 (73)	0.36
Chorioamnionitis, n (%)		10 (14)	20 (19)	0.34
Sepsis, n (%)		9 (13)	27 (26)	0.99
PDA, n (%)		36 (52)	37 (36)	0.40

* P value <0.05

Demographic Characteristics for Neonates with and without BPD for FAM13A SNP rs2609255

Genotype Distribution for FAM13A SNP rs2609255 for ELBW with and without BPD

rs2609255	NoBPD	BPD	P value
TT	36 (53%)	48 (47%)	0.04
Tg	16 (23.5%)	41 (40%)	
gg	16 (23.5%)	13 (13%)	
Any g	32 (47%)	54 (53%)	0.45
MAF (0.35)*	0.35	0.33	0.9

*1000 Genomes

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Tracheal aspirate transcriptomics and miRNA profile of an ELBW Bronchopulmonary Dysplasia (BPD) cohort

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Background Bronchopulmonary Dysplasia (BPD) is the most common and serious chronic lung disease of prematurity, affecting more than 10,000 infants in the US every year. Over the past few decades, the incidence of BPD has significantly increased as a result of the improved survival of extremely low birth weight (ELBW) infants. The diagnosis of BPD is determined by the need of mechanical ventilation at 36 weeks and a chest X-ray, since there are no biomarkers for BPD. Tracheal aspirates (TAs) represent a non-invasive sample easily obtained from infants undergoing mechanical ventilation that could provide a source of novel BPD biomarkers for diagnosis and information on molecular events in the developing lung.
Objective Our objective is to analyze the expression profile of miRNA and transcripts in a cohort of ELBW infants.
Design/Methods TAs were collected from ELBW (BW<1000g) infants receiving invasive mechanical ventilation at the Penn State Children's Hospital. Patients (n=54) had a confirmed clinical diagnosis of BPD (n=36), or no evidence or history of BPD (no-BPD, n=18). MiRNAs were purified with the serum and plasma miRNA Purification Kit (Norgen), and analyzed with the miScript miRNA PCR Array Human miRNome array (Qiagen). Transcriptomics were conducted by RNAseq in a sample subset (n=17; 12 BPD, 5 no-BPD). Data were analyzed with the limma package in R to identify significant differences between groups. Ingenuity Pathway Analysis (IPA) was used to identify canonical pathways.
Results We found 60 differentially expressed miRNAs (19 upregulated, 41 downregulated) in TAs from BPD vs. no-BPD. The top 5 upregulated miRNAs were miR-1304, miR-197, miR-106b*, miR-431, and miR-125b-1*, and the 5 downregulated miRNAs; miR-100, miR-125b, miR-23b, miR-7c, and miR-375. RNAseq detected 15 differentially expressed genes; 6 upregulated (CACNA2D1, DIS3L, ECT2, LINC00303, IGLV5-37, SPRR2E) and 9 downregulated (OR6B2, AP1S2, OR4A21P, USH1G, DCAF4L1, CLDN7, FAM89A, TRAPPC6B, C1S). Predicted interactions between differentially expressed miRNAs and genes were identified, as well as associations with networks of Organismal Injury, Inflammatory disease, Cell-To-Cell Signaling, and DNA replication, Recombination, and Repair.
Conclusion(s) Differentially expressed miRNA and transcripts in TAs from BPD newborns represent potential biomarker signatures for diagnosis and progression, and are associated with developmental and inflammatory mechanisms that occur during disease pathogenesis.

Abstract: 244

Proficiency Of Laryngeal Mask Airway Insertion Skill In NRP Certified Providers

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Background In 2015, NRP recommended laryngeal mask airway (LMA) as an alternative to the endotracheal tube (ETT) in situations where the provider is "unable to intubate and unable to ventilate." LMA insertion is being taught in the NRP routinely, although endotracheal intubation is the primary method considered as the standard of care in neonatal resuscitation. LMA insertion is a relatively simple procedure with an average insertion time of 9 seconds. (1)
Objective To study the proficiency of NRP providers in the LMA insertion technique. We hypothesized that NRP providers will have LMA insertion skills equivalent to the standard of care (ETT insertion).
Design/Methods We did a manikin-based study from July 2019 to December 2019. We enrolled 31 NRP providers (3 neonatologists, 5 neonatology fellows, 5 pediatric residents, 14 advanced practice providers, and 4 respiratory therapists (RRT)) with one or more

years since the first certification and with current valid NRP provider/instructor status. After informed consent, we instructed the participants to insert an ETT and LMA in the manikin. The procedures were video recorded. Time taken to insert and start effective ventilation with each device, including the number of attempts for successful insertion, was noted. A Likert scale questionnaire was filled by each participant indicating the level of confidence, perception of ease, and the ability to provide effective positive pressure ventilation (PPV) with each of the procedures. We used paired T-tests for the statistical analysis.

Results The participant characteristics of the study are summarized in table1. 8(25.8%) out of the 31 participants failed to insert any one of the devices. We found that the mean time taken to insert the ETT and LMA was not statistically different (32 seconds vs. 36 seconds). (table 2) The insertion time of LMA was strikingly longer than expected (36 sec vs 9 sec). LMA insertion had a higher failure rate compared to the standard of care. (figure 1) Providers had lesser confidence to insert LMA when compared to ETT. They did not perceive LMA insertion as a more effortless procedure relative to endotracheal intubation. The providers felt that their ability to provide adequate PPV using LMA was inferior to ETT. (figure 2)

Conclusion(s) The NRP certified providers in this study did not demonstrate proficiency in the insertion of LMA equivalent to the endotracheal intubation (standard of care).

Reference:

1. Paterson SJ, et al. Neonatal resuscitation using the laryngeal mask airway. Anesthesiology. 1994.

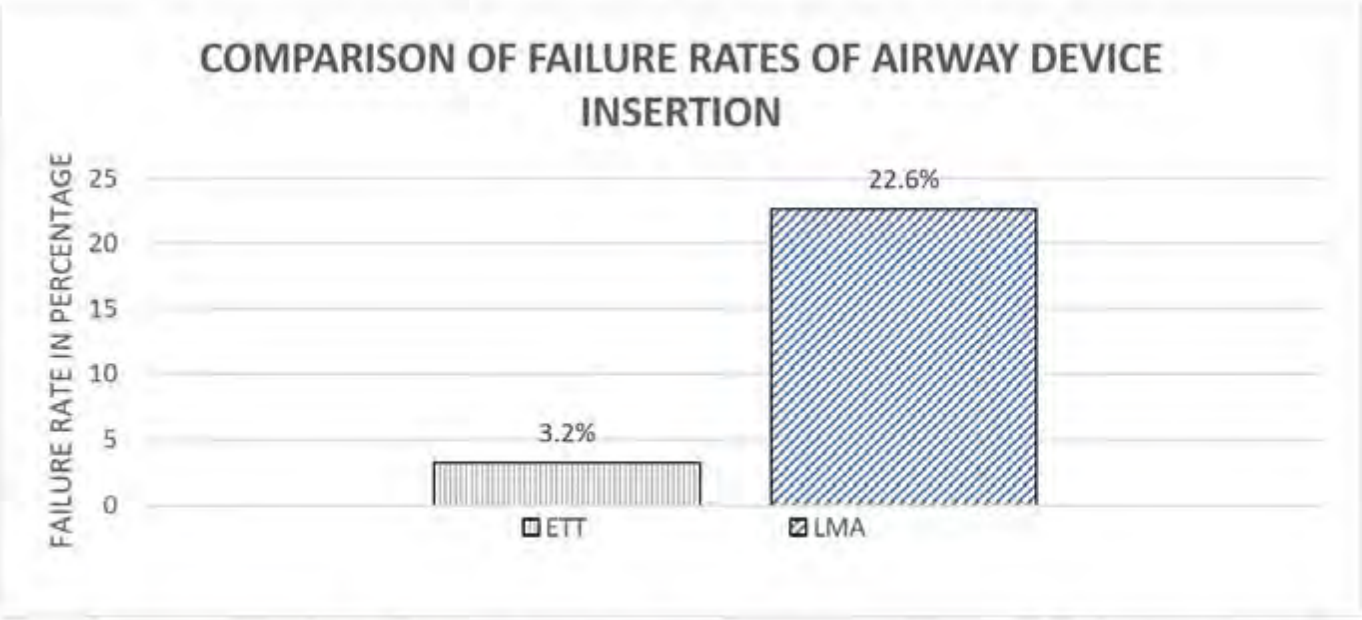

FIGURE 1: COMPARISON OF THE FAILURE RATES OF ETT AND LMA INSERTION AMONG 31 PARTICIPANTS (1 VS. 7)

COMPARISON OF FAILURE RATES OF AIRWAY DEVICE INSERTION

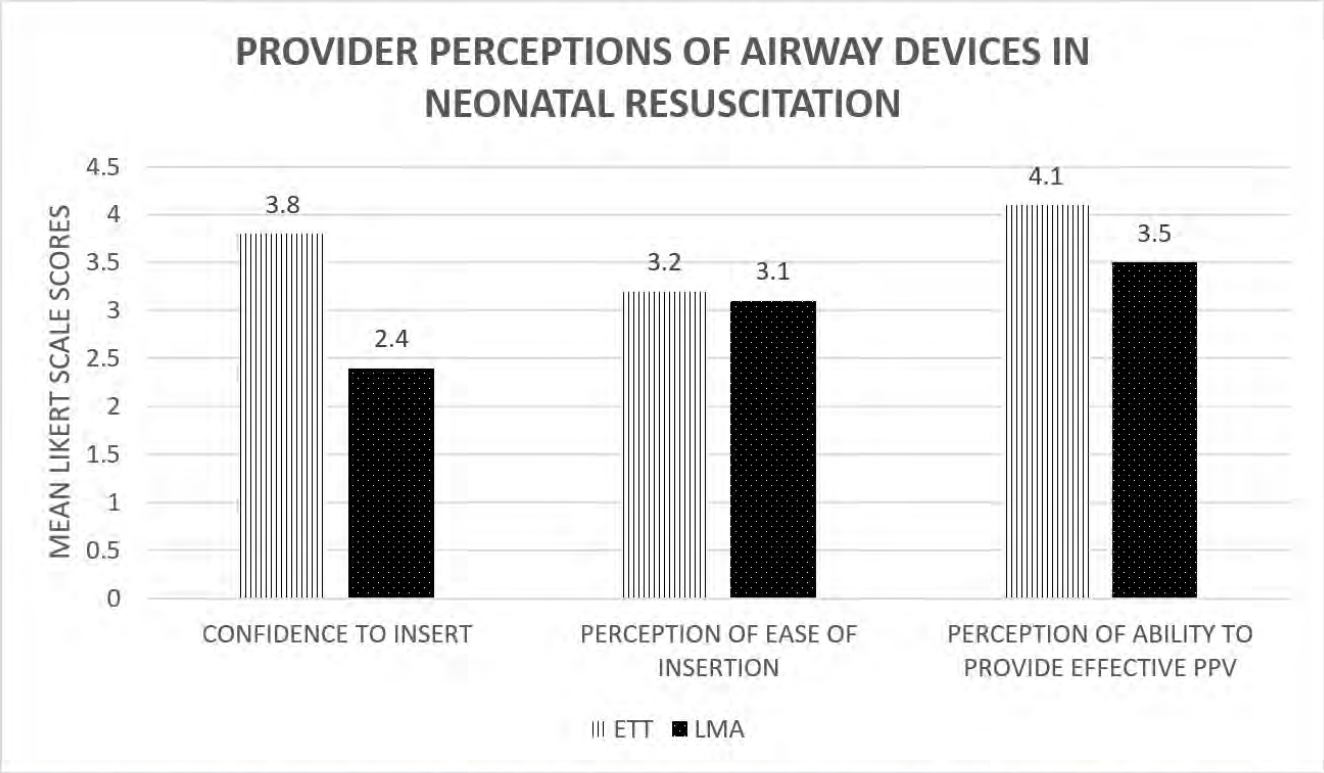

FIGURE 2: PROVIDER PERCEPTIONS COMPARING THE ETT AND LMA PROCEDURES BASED ON THEIR ANSWERS TO THE LIKERT SCALE QUESTIONNAIRE

PROVIDER PERCEPTIONS OF THE AIRWAY DEVICES IN NEONATAL RESUSCITATION

TABLE 1. PARTICIPANT CHARACTERISTICS OF THE STUDY

PATICIPANT CHARACTERISTICS	NUMBER (PERCENTAGE)
Total number of participants in the study	31
Mean duration of experience as NRP provider (years)	11± 10
Mean duration since the last NRP course (months)	10± 7
Number of providers who were also NRP instructors	11 (35.4)
Number of providers who had hands-on exposure to LMA insertion in NRP	18(58.0)
Number of providers who had at least one LMA insertion ever in a newborn infant	4 (12.9)
Number of providers who had atleast 45-60 ETT insertions in their clinical practice	15(48.4)

TABLE 2. COMPARISON OF INSERTION OF LMA AND ETT

VARIABLE	ENDOTRACHEAL TUBE (N=23)	LARYNGEAL MASK AIRWAY (N=23)
Mean time taken to insert in seconds (95% confidence interval)	32 (28-40)	36 (28-45)
Mean time taken to start ventilation in seconds (95% confidence interval)	39 (31-47)	44 (36-53)
Unsuccessful insertions (percent of total 31 participants)	1 (3.2)	4 (12.9)
Successful insertion requiring > 2 attempts (percent of total 31 participants)	0 (0)	3 (9.7)
Failure of insertion of airway device (percent of total 31 participants)	1 (3.2)	7 (22.6)*

* p-value < 0.05

Abstract: 245

Mitochondria-Targeted Antioxidant Therapy Accelerates Recovery of Bronchopulmonary Dysplasia (BPD) and Associated Mitochondrial DNA Damage

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Background Prior studies identified that mitochondrial oxidative stress contributes to a BPD phenotype with neonatal hyperoxia. Mitochondrial dysfunction is also known to persist beyond neonatal O_2 exposure. We have demonstrated that treatment with a mitochondria-targeted antioxidant *following* hyperoxia improved somatic growth and attenuated both RVH and pulmonary vascular remodeling. We hypothesize that treatment may also accelerate recovery of the BPD phenotype and associated mitochondrial DNA damage.
Objective To determine if mitochondria-targeted antioxidant therapy accelerates recovery of
1. compromised alveolarization with evidence of improved lung and pulmonary vascular growth
2. hyperoxia-induced mitochondrial DNA damage
Design/Methods Newborn C57/Bl6 mice were exposed to normoxia (21% O_2, control) or hyperoxia (75% O_2, BPD) from birth through postnatal day 14 (P14). Following exposures, mice were randomized to 7 days of treatment with a mitochondria-targeted antioxidant, mito-TEMPO (0.7 µg/g subcutaneous) or PBS vehicle with sacrifice at P21. Lungs were inflation-fixed and morphometric analysis of alveolarization (chord length, alveolar area and alveolar wall thickness) was performed by Scion Morphometry. Radial alveolar and vessel counts were determined as indicators of lung and pulmonary vascular growth. PBS perfused lung tissue was analyzed by rtPCR for impacts on expression of key regulators of lung development (HIF1α/2α/1β, VEGFα/R1/R2, TTF1, SOD2/3, FOXA2) and by a quantitative PCR assay for evaluation of mitochondrial DNA injury.
Results Mito-TEMPO following hyperoxia improved alveolarization with decreased chord length, alveolar area and alveolar wall thickness (Fig 1A-D). Mito-TEMPO further improved lung and pulmonary vascular growth by improved radial alveolar and vessel counts (Fig 2A-B). Mito-TEMPO failed to impact mRNA expression of key regulators by rtPCR. However, quantitative PCR identified accelerated repair of hyperoxia-induced mitochondrial DNA damage (Fig 3).
Conclusion(s) Improved treatment options and novel therapeutics to address the growing burden of BPD are greatly needed. Our data identifies that treatment with a mitochondria-targeted antioxidant *following* hyperoxia accelerated recovery of a BPD phenotype with improved alveolarization, decreased fibrosis and improved lung and pulmonary vascular growth. These findings may be in part due to improved mitochondrial function and further implicate mitochondrial oxidant stress in the development of BPD.

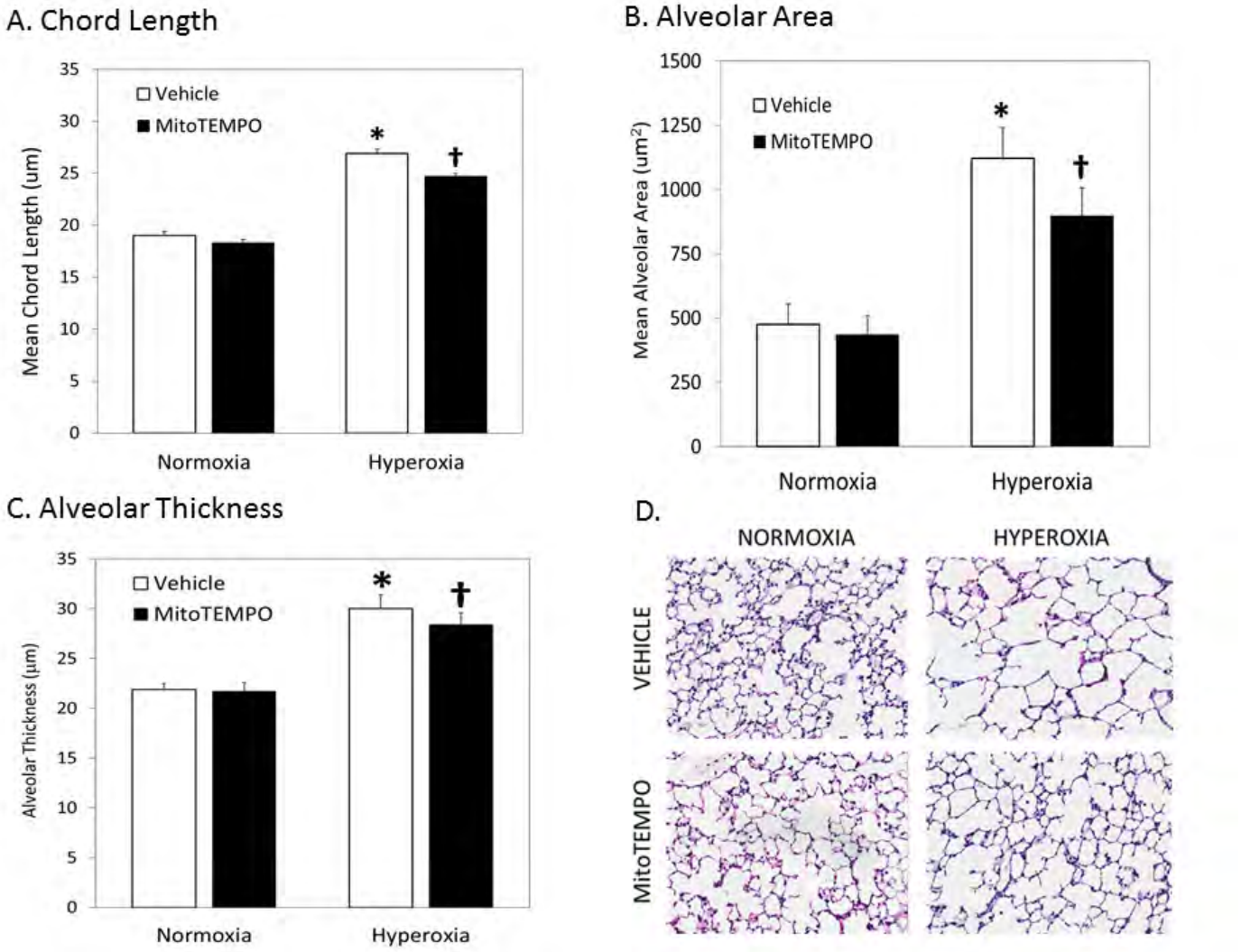

FIGURE 1A-D: MitoTEMPO improves alveolarization and decreases lung fibrosis. Increases in chord length (A), alveolar area (B) and alveolar wall thickness (C) observed with neonatal hyperoxia were attenuated by treatment with MitoTEMPO. (D) Representative lung images. *$\rho < 0.05$ compared with normoxia + vehicle and †$\rho < 0.05$ compared with hyperoxia + vehicle.

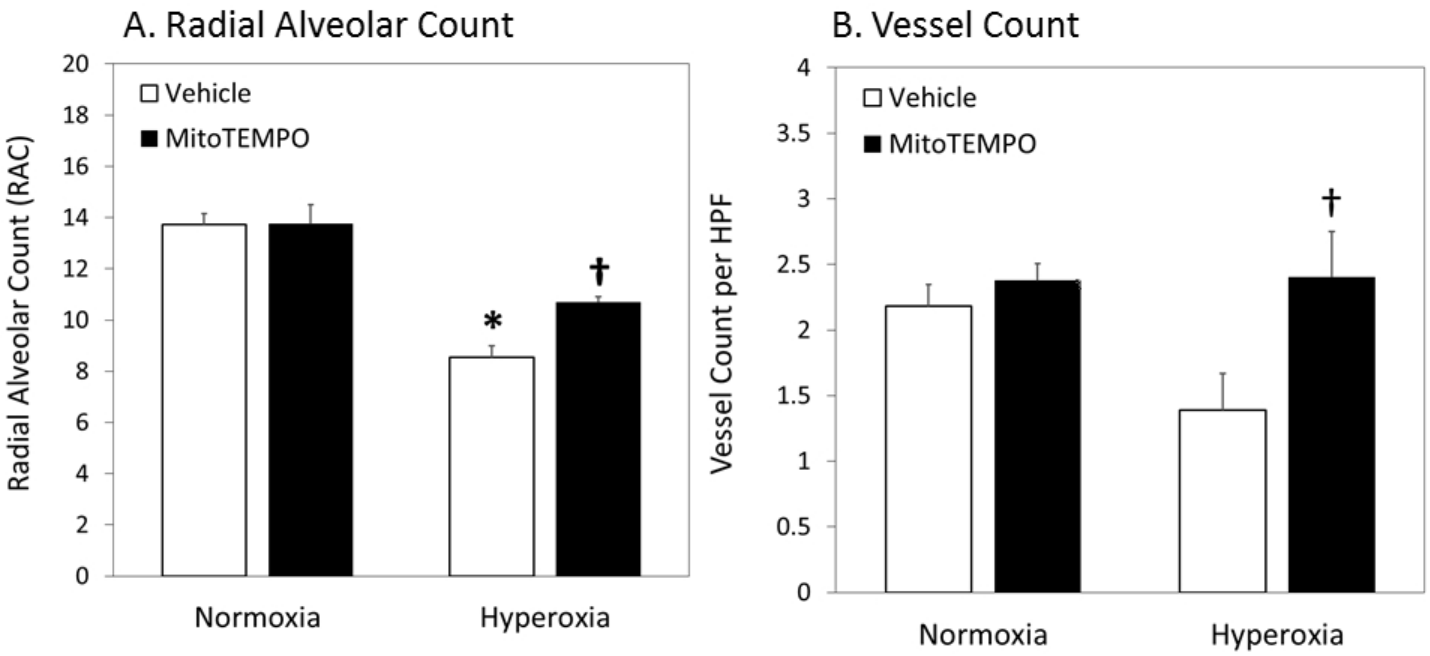

FIGURE 2A,B: MitoTEMPO improves lung and pulmonary vascular growth. (A) Decreased RAC observed with neonatal hyperoxia was attenuated by treatment with MitoTEMPO. (B) Improved vessel count was demonstrated in hyperoxia mice treated with MitoTEMPO. *$\rho < 0.05$ compared with normoxia + vehicle and †$\rho < 0.05$ compared with hyperoxia + vehicle.

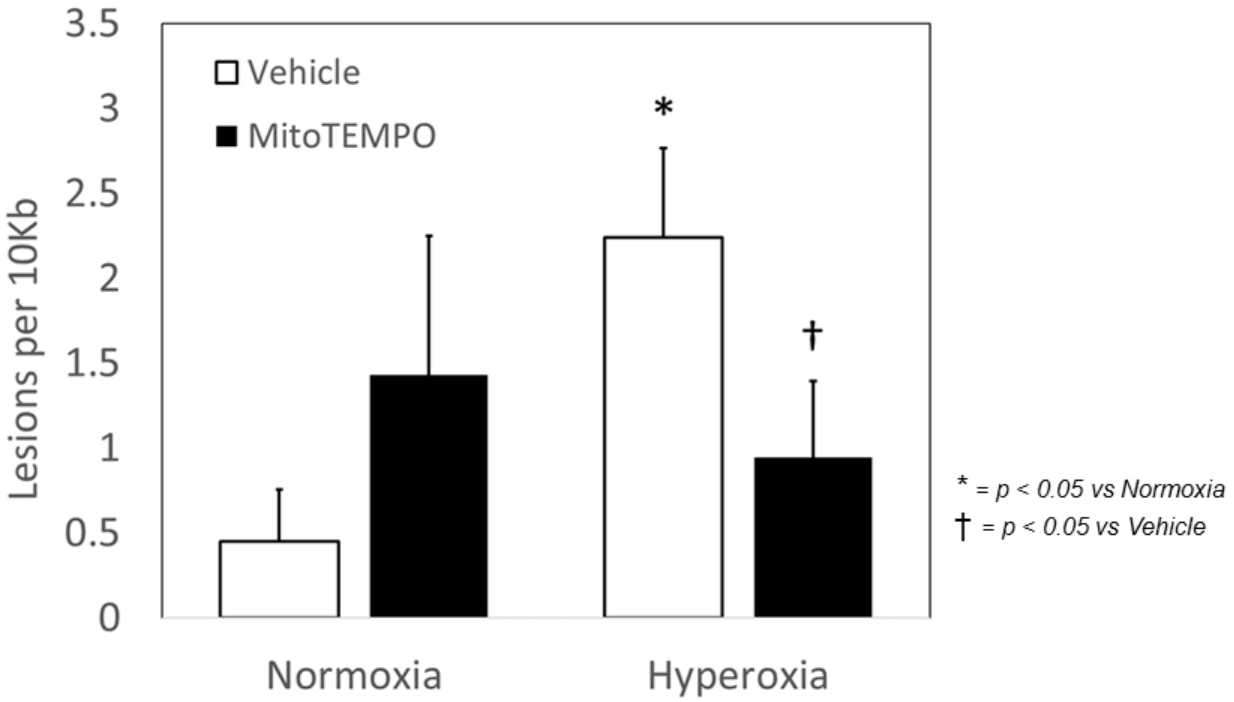

FIGURE 3: Mito-TEMPO accelerated repair of hyperoxia-induced mitochondrial DNA damage. *ρ < 0.05 compared with normoxia + vehicle and †ρ < 0.05 compared with hyperoxia + vehicle.

Abstract: 246

Association Between Parenteral Nutrition Osmolality and Morbidities in Preterm Neonates

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Background Parenteral nutrition (PN) is a lifesaving tool for premature and very low birth weight (VLBW) neonates by providing nutritional needs until enteral nutrition is sufficient to promote growth. It is initiated shortly after birth and is administered via peripheral or central catheter. PN osmolality (PN-O) is determined by amount of particles added to solution. Extreme PN-O is a risk factor for line events such as phlebitis, line occlusion and infiltration. Premature infants are at increased risk for hyperbilirubinemia, necrotizing enterocolitis (NEC) and intraventricular hemorrhage (IVH). There are no data associating extreme PN-O in premature neonates with line events, hyperbilirubinemia, NEC and IVH.
Objective To explore association between PN-O and line events, severity hyperbilirubinemia, NEC and IVH in neonates <32 weeks gestational age (GA) and VLBW.
Design/Methods Chart review was conducted of neonates born <32 weeks GA and BW <1500 grams born at Flushing Hospital Medical Center and admitted to neonatal intensive care unit (NICU) on PN between Oct 2012 and Oct 2019. Data extracted from EMR included GA, mode of delivery, BW, Apgar score, type of ventilatory support, PN-O, severity of hyperbilirubinemia (>4 days on phototherapy), occurrence of NEC, IVH grade at day seven of life (grade I-IV) and line events. PN-O was calculated for the first 7 days using formula (mOsm/L) = (amino acid in g/L x 10) + (glucose in g/L x 5) + (cations meq/L x 2). Data was analyzed using

Spearman rho correlations and Mann-Whitney U tests, $p<0.05$ was considered significant.
Results Of 113 charts reviewed, 69 charts met inclusion criteria with mean GA of 28±3 weeks and BW 1240±456 grams. Most were male (51%) born by caesarian section (68%) with Apgar score ≥7 at 5 minutes (93%). Majority (80%) were on invasive ventilatory support and had a central line placed (91%). Severity of hyperbilirubinemia 61%, NEC in 13%, IVH 39% (56% grade I and II, 44% grade III and IV) and line event in 9%. PN-O ranged from 70 to 2728 mOsm/L with median of 517 mOsm/L. There was no association between PN-O and severity of hyperbilirubinemia, IVH grade and line events, $p>0.05$. There was a positive association between NEC and high PN-O, $p< 0.05$.
Conclusion(s) In our small sample, there was no association between PN-O and severity of hyperbilirubinemia, IVH grade and line related events. There was association between high PN-O and NEC.

Abstract: 66
Acute Necrotizing Encephalopathy in child with influenza A
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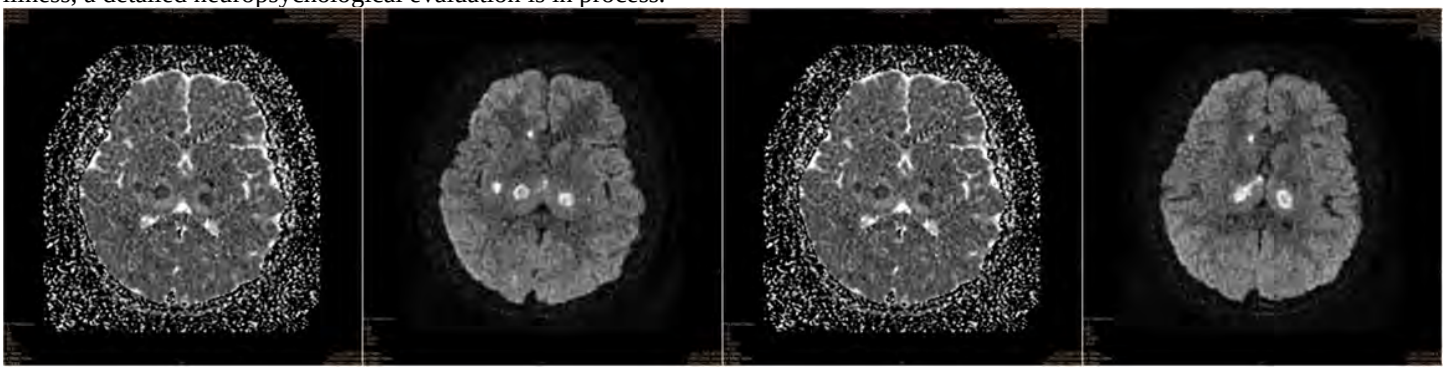
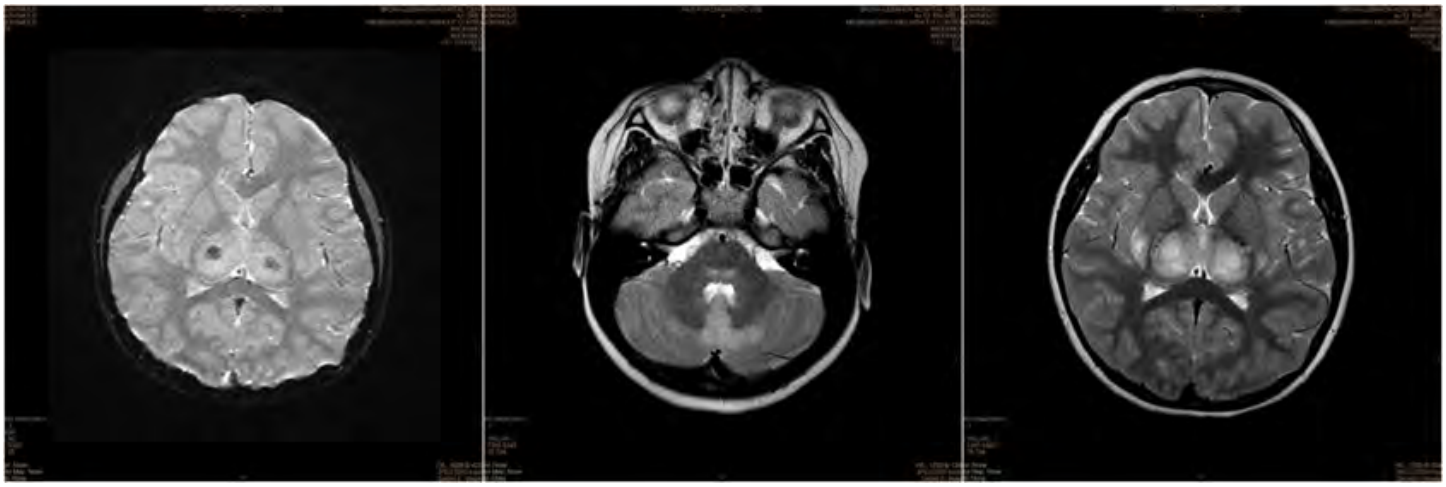
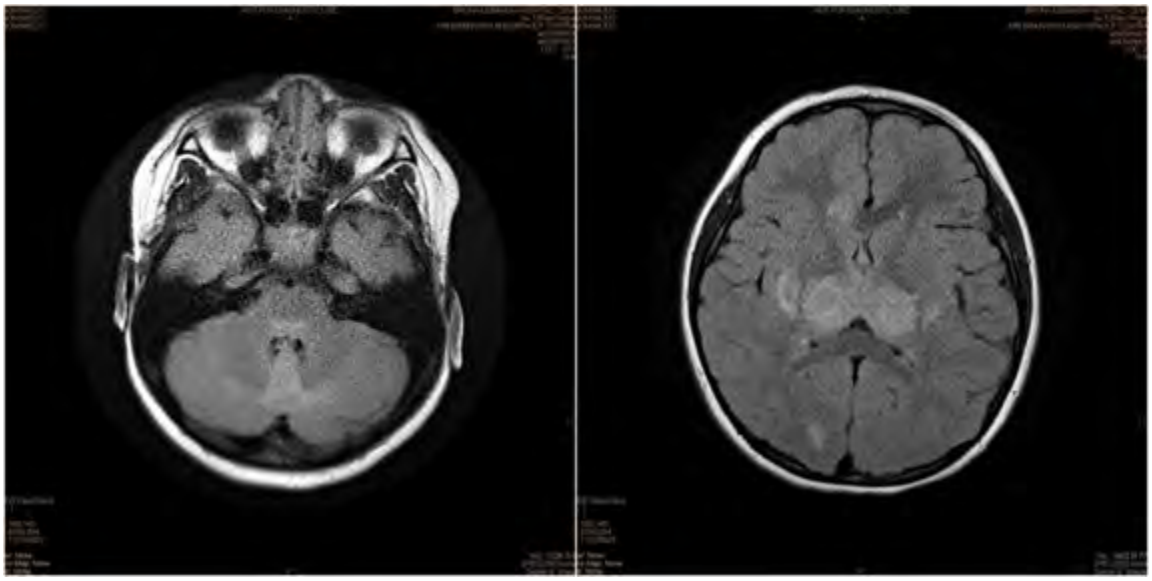
History (including chief complaint, history of present illness and relevant past and family medical history) A previously healthy 5 year old Hispanic girl presented with history of URI symptoms for 3 days and acute altered mental status. She was not immunized to influenza.
Physical examination findings (including vital signs) She was afebrile, obtunded, hyperkinetic, localized pain poorly, and had bilateral ankle clonus.
Laboratory or Diagnostic imaging or Procedures CBC, CMP and urine drug screen were normal. CSF showed 2 WBC, protein of 57mg/dl (normal range 15-45mg/dl) and normal glucose. Respiratory viral panel PCR showed Influenza A H1. EEG showed symmetrical slowing without epileptiform discharges. MRI brain was diagnostic (see images). MRA of the brain was normal. EEG at 2 months showed extreme sleep spindles (a marker of thalamic and cognitive dysfunction) that resolved by 4 months.
Final Diagnosis Our patient was diagnosed with acute necrotising encephalopathy (ANE) based on history, physical exam and an MRI of her brain. She received 2 doses of IVIG 1gm/kg/day and high dose methylprednisolone within 24 hours. HSV PCR, EBV and mycoplasma studies were negative. She followed commands, moved limbs against gravity by 48 hrs, named family members on day 4 and stood with support on day 10. On DOA 20, she was discharged with mild ataxia that resolved by 2 months.
She received monthly IVIG (1gram/kg) for 6 months. She developed dominant thalamic hand tremors that improved with therapy. She has no behavioral or cognitive deficits at 1 year. Influenza vaccination the next season was uneventful.
ANE is a rare para-respiratory infectious process associated with influenza A, mostly reported from Asia. Recurrences and severe neurological sequelae are common. The mortality rate is up to 30% with treatment. CSF studies show elevated protein and xanthochromia. The pathogenesis involves cytokine overproduction with systemic inflammatory response. There is an association with mutation of the RanBP-2 gene, with recurrences also in negative patients. Testing for RanBP-2 mutation was negative for this patient, and her HLA subtypes have not been reported to be associated with ANE.
MRI showed symmetrical thalamic edema and hemorrhagic necrosis.
ANE is treated with high dose steroids, IVIG, plasmapheresis and brain hypothermia. Outcomes are shown to improve with early treatment. In this case, prompt use of methylprednisolone and IVIG monthly for 6 months resulted in rapid, lasting recovery. Transient extreme sleep spindles have not been previously reported with ANE, and appears not to preclude excellent outcome. At 1 year, post-illness, a detailed neuropsychological evaluation is in process.


DWI and ADC images demonstrate restricted diffusion in the bilateral thalami, right putamen, and right genu of the corpus callosum.



Axial images of the basal ganglia and cerebellar vermis. Gradient Recall Echo images demonstrate blooming artifact within both thalami, compatible with petechial hemorrhage. T2 weighted images demonstrate central hyperintensity within the thalami and right putamen.



Axial FLAIR images demonstrate abnormal hyper intense signal within the posterior pons, cerebellar vermis, and both thalami, right putamen, and right genu of the corpus callosum.

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Assessment of Temporal Variations in Adherence to NRP Using Video Recording in the Delivery Room

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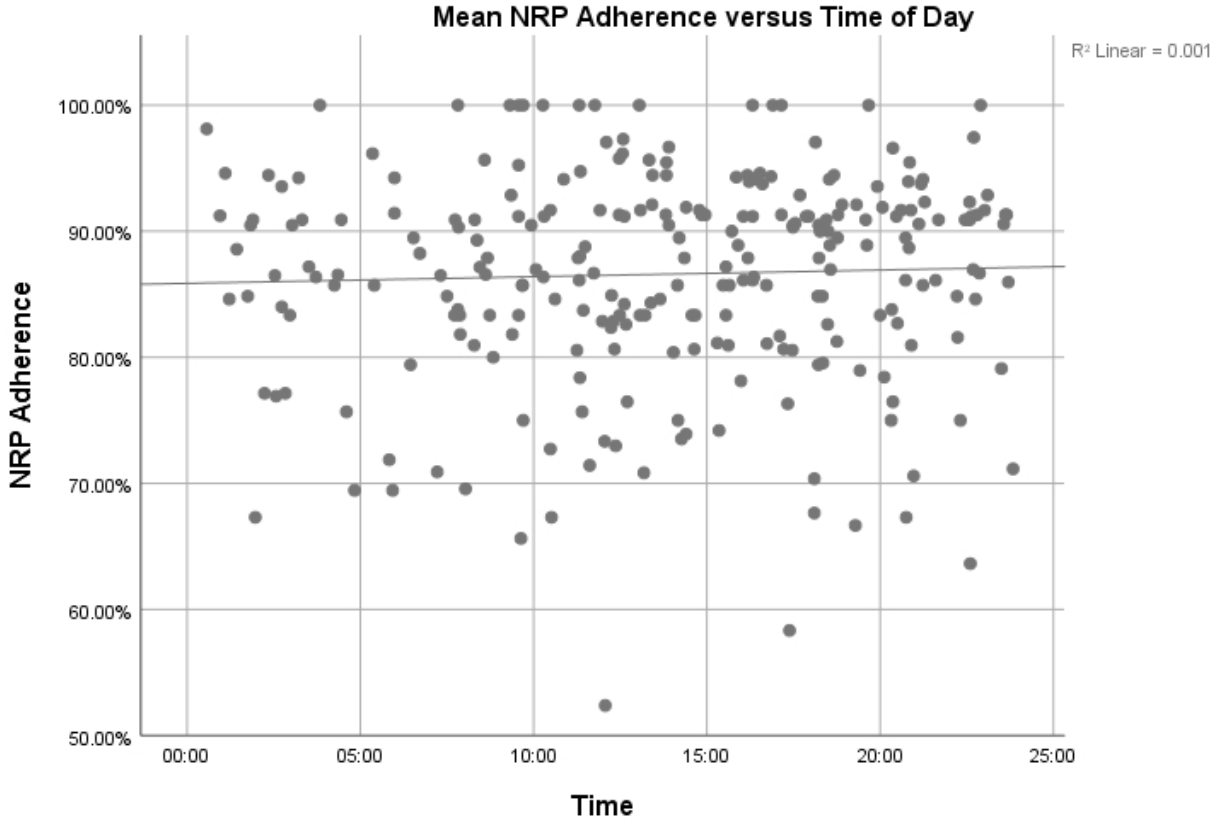
Background The Neonatal Resuscitation Protocol (NRP) guidelines are the standard of care for neonatal resuscitation. Adherence to NRP is challenging, and previous literature has shown conflicting evidence on outcomes of neonates born in the evening and overnight hours. Video recording and video evaluation tools have demonstrated efficacy in improving resuscitation outcomes.
Objective To evaluate differences in NRP adherence in delivery room (DR) resuscitations between daytime hours, evening, and nighttime hours using video recording as an objective measure.
Design/Methods This is a retrospective review of prospectively collected data from a level 3 perinatal center. DR resuscitations from 01/2017 to 06/2018 were recorded and scored. A version of the modified Neonatal Resuscitation Assessment (mNRA) was used to assess NRP compliance in the DR. Three daily resuscitative periods were assessed: daytime hours (0700 – 1459), evening (1500 - 2259), and nighttime hours (2300 - 0659). Only resuscitations that required the administration of continuous positive airway pressure

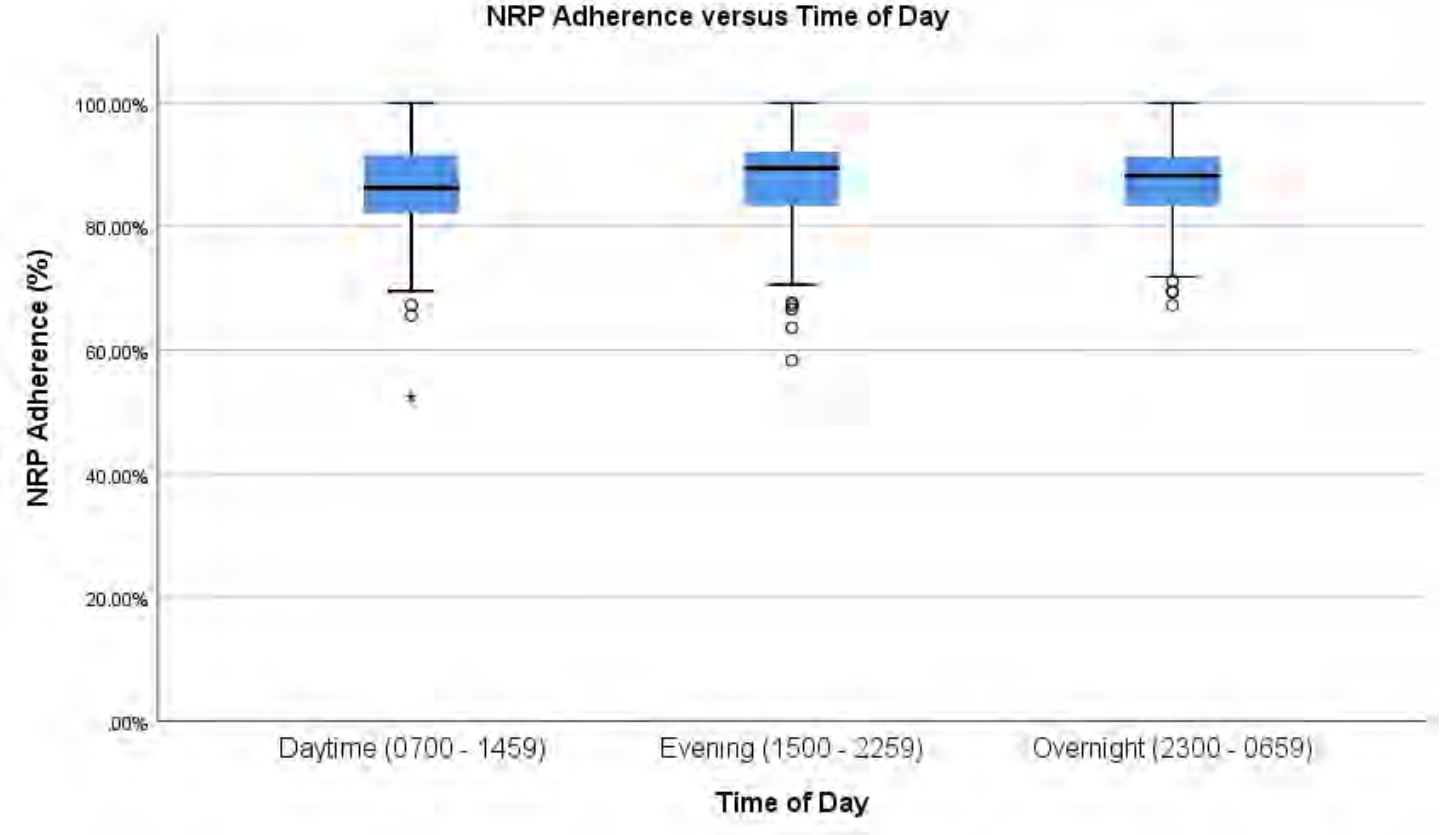
or higher were included in the analysis. After establishing interrater reliability, three independent research team members scored the resuscitations.
Results A total of 260 resuscitations were assessed. Mean rates of NRP adherence were 86.16% during daytime, 86.97% during evening, and 86.59% during nighttime hours. There were no significant differences in adherence to NRP during any of the three time points (daytime vs. evening p=0.48; daytime vs. night p=0.78; evening vs. night p=0.79); these differences remained statistically similar after controlling for deliveries that included positive pressure ventilation (PPV), intubation, or chest compressions. PPV was given more appropriately during evening compared to daytime hours (p = 0.042), which remained significant after controlling for deliveries that required PPV or greater (p = 0.019). A high degree of successful intubations was seen at all time points. There were no significant differences when the resuscitative periods were divided into daytime (0700-1859) vs. nighttime hours (1900-0659) only.
Conclusion(s) In this retrospective study, there were no significant differences in adherence to NRP between daytime, evening, and nighttime hour resuscitations. Overall, NRP adherence was high across all three time periods. Further research is needed to determine which factors contribute to sustained NRP adherence during evening and nighttime hours.

Table 1: NRP adherence across three study periods

	Day Shift (0700-1459)	Evening Shift (1500-2259)	Overnight Shift (2300-0659)	p-value
Number of Deliveries (%)	104 (40%)	112 (43%)	44 (17%)	
NRP Adherence				
Deliveries requiring CPAP or greater (n = 260)	86.16 ± 8.7	86.97 ± 8.1	86.59 ± 7.9	0.48*; 0.78°; 0.79^
Deliveries requiring PPV or greater (n = 196)	85.53 ± 8.6	87.21 ± 9	85.7 ± 8.6	0.22*; 0.92°; 0.41^
Deliveries with intubation attempts (n = 47)	85.43 ± 9.6	87.27 ± 8.5	84.53 ± 9.6	0.41*; 1.00°; 0.43^
Deliveries with chest compressions/medications (n = 9)	86.65 ± 7.5	85.56 ± 9.7	79 ± 0	0.86*

P is significant if <0.05.
* = comparison between day and evening
° = comparison between day and night
^ = comparison between evening and night.





Abstract: 249

Soy-based vs Soy-MCT-Olive-Fish Oil-Based Lipid Infusions: Effects on Unbound Bilirubin and Response to Phototherapy in Preterm Infants--A Pilot Study

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Background Bilirubin-induced neurotoxicity (BIND) is mediated by the fraction of total serum bilirubin (TSB) that is not bound to albumin ("free bilirubin", or Bf). Intravenous lipid emulsions increase unbound free fatty acids (FFAu) in the blood, which compete with bilirubin for albumin binding and increase Bf relative to TSB. Previous studies have confirmed that soy-based lipid (IL) increases Bf in preterm infants and that Bf levels are unresponsive to phototherapy at high IL doses. The effects of soy-MCT-olive-fish oil-based lipid (SMOF) on Bf and its responsiveness to phototherapy are not known.

Objective The goals of the study were to compare Bf levels, the response of Bf to phototherapy, and FFAu profiles in very preterm infants receiving IL vs SMOF infusions. We hypothesized that Bf will 1) increase significantly in infants receiving increasing doses of IL, but not SMOF, and 2) decrease on phototherapy for those receiving > 2 g/kg/day of SMOF, but not IL.

Design/Methods Very preterm infants (< 1500 g, < 32 wks) were infused with IL (n=14) or SMOF (n=8) at clinician discretion, and phototherapy was prescribed using standard practice guidelines based on TSB levels. TSB, Bf, and FFAu profiles were measured while on 0, 1, 2, and 3 g/kg/day of lipid, and at the times of initiation and termination of phototherapy. TSB was analyzed in the clinical laboratory; Bf, FFAu, and FFAu profiles were measured using novel fluorescent probes.

Results The IL and SMOF groups were similar in gestational age and birth weight. Increasing doses of IL, but not SMOF, resulted in increased Bf levels (p=0.008) (Table 1). TSB was not affected by either lipid. Higher doses of IL infusion led to markedly increased FFAu levels (p<0.001), while SMOF resulted in less significant increases in FFAu (p=0.054). Phototherapy was not effective for lowering Bf for infants receiving IL, but may have been effective for those receiving SMOF (p=0.15) (Table 2). Serum unbound linoleic acid was significantly higher in IL- than SMOF-treated infants (p<0.05).

Conclusion(s) The results of this pilot study suggest that SMOF displaces less bilirubin than IL, leading to lower Bf levels and better response to phototherapy. We speculate that the mechanism for this finding may be related to differences in serum FFAu profiles and

albumin binding affinities. Consequently, infants receiving SMOF may be at lower risk of BIND than those receiving IL, even with similar TSB concentrations.

Dose g/kg/d	Unbound Bilirubin (Bf) nM/L, mean ± SD			Total Serum Bilirubin (TSB) mg/dl, mean ± SD			Unbound FFA (FFAu) nM/L, mean ± SD		
	IL	SMOF	p	IL	SMOF	p	IL	SMOF	p
0	4.5 ± 2.5	4.9 ± 1.9	0.80	3.9 ± 1.2	3.7 ± 2.1	0.87	2.1 ± 0.6	2.4 ± 0.7	0.61
1	6.9 ± 3.6	13.3 ± 10.0	0.12	4.8 ± 2.1	4.6 ± 1.4	0.71	5.1 ± 4.3	1.6 ± 0.3	0.20
2	7.2 ± 6.5	7.4 ± 4.1	0.41	4.0 ± 2.5	4.0 ± 1.9	0.84	9.2 ± 3.7	3.6 ± 3.7	0.23
3	10.2 ± 5.6	9.7 ± 4.1	0.82	4.7 ± 2.5	4.0 ± 1.4	0.43	29.1 ± 7.4	9.2 ± 6.5	0.19
r	0.38	0.05		0.07	-0.05		0.83	0.594	
p	0.008	0.82	--	0.64	0.82	--	0.001	0.054	--

Effects of escalating doses of IL vs SMOF on Bf, TSB, and FFAu in preterm infants

Parameter	IL			SMOF		
	Photo on (mean ± SD)	Photo off (mean ± SD)	*p*	Photo on (mean ± SD)	Photo off (mean ± SD)	*p*
TSB (mg/dl)	5.3 ± 2.6	3.3 ± 2.0	0.03	4.9 ± 1.4	3.0 ± 1.2	0.01
Bf (nM/L)	6.9 ± 7.1	5.0 ± 3.1	0.39	13.3 ± 10.0	7.2 ± 5.0	0.15

Effects of phototherapy on TSB and Bf in preterm infants receiving IL or SMOF

Abstract: 250

Implementation and Outcomes of a Dextrose Gel Protocol for Management of Neonatal Hypoglycemia

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Background Neonatal hypoglycemia (NH) is a common cause of adverse neurodevelopmental outcomes during the transition to extra-uterine life, and affects 5-15% of otherwise healthy babies. If present, it requires monitoring and management with early feeding or intravenous (IV) dextrose. The use of 40% oral dextrose gel (DG) as a non-invasive, inexpensive alternative, has been shown to reduce the need for IV dextrose therapy with reduced neonatal intensive care unit (NICU) admission rates and improved breastfeeding. Prior studies have used a weight-based dose (WD) of 200mg/kg (0.5ml/kg), but the ideal dose has not been established. WD requires an accurate weight, increases the risk of dosing errors and requires pharmacy verification possibly delaying intervention which can be mitigated by using a standardized dose (SD).

Objective The primary outcome is to assess the impact of a DG protocol in reducing IV dextrose therapy. Secondary outcomes include rates of NICU admission, breastfeeding, and adverse effects. We also evaluate the impact of a WD as compared to a SD of

800 mg (2ml) for all outcomes.
Design/Methods Single center, retrospective cohort study, of infants ≥ 35 weeks admitted to the newborn nursery between 7/1/15-6/30/18 who developed hypoglycemia. A WD-DG protocol was introduced on 12/1/16 and transitioned to a SD-DG protocol on 3/1/17. Neonates with blood glucose <40mg/dl received DG with feeds up to 2 attempts after which persistent hypoglycemia prompted transfer to the NICU for IV dextrose therapy. Data was collected via retrospective systematic chart review.
Results Of 16,490 neonates admitted to the nursery in our study period, 1600 (9.7%) became hypoglycemic with an incidence of 7.1% before DG protocol implementation, and 8.9% after. There was a significant reduction in IV dextrose use after introduction of a DG protocol 11.2% vs. 6.5% (p=0.003) with no difference between WD and SD eras. There was also a reduction in NICU admissions 28.0% vs. 16.1% (p<0.001) and an increase in the proportion of infants discharged home exclusively breastfeeding 33.8% vs. 43.5% (p=0.01). There was no difference in the incidence of adverse effects between the pre and post DG groups as well as between WD-DG and SD-DG.
Conclusion(s) Implementation of a DG protocol reduced IV dextrose administration, NICU admissions and improved exclusive breastfeeding rates with no change in adverse events. SD-DG seems to be a safe alternative to WD-DG for prompt protocolized use.

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Bedside assessment of work of breathing (WOB) indices in premature infants with respiratory insufficiency

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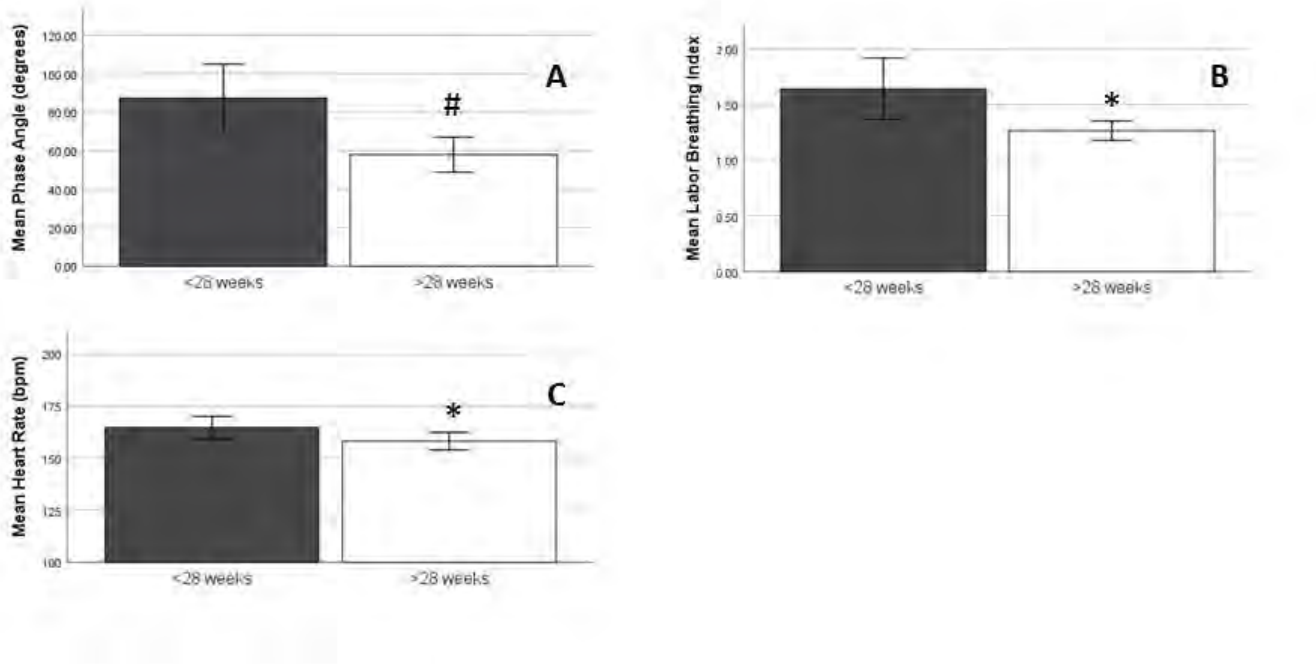
Background Thoracoabdominal asynchrony, a sign of increased work of breathing, is commonly seen in preterm infants secondary to highly compliant rib cage and poor compensation by inspiratory rib cage muscles. Respiratory inductive plethysmography (RIP) is non-invasive method that measures thoracoabdominal motion and provides an objective measurement of work of breathing. Studies suggest that premature infants breath differently than healthy full term infants but normative data for premature infants
Objective The objective of this study is to compare the WOB indices in preterm infants with respiratory insufficiency born at gestational age of <28 weeks to infants born at a gestational age of >28 weeks.
Design/Methods This was a subanalysis of a prospective, observational study of infants (27-37 weeks CGA and >4 days PNA) stable on HFNC. Phase angle, a WOB index representing relative asynchrony between thoracic (RC) and abdominal (ABD) excursions, and the Labored Breathing Index (LBI) were noninvasively measured by RIP. A phase angle of 40-80 represents increasing thoracoabdominal asynchrony and increased work of breathing. A LBI = 1 represents perfect synchrony and a LBI of >1 reflects increasing paradoxical motion between RC and ABD. A high-resolution pulse oximeter with a 2 second sample rate collected oxygen saturation and heart rate data throughout the study. Oxygen stability was assessed by standard deviation (SD) of oxygen saturation where an increased SD suggests increased variability.
Results This study included 32 preterm infants (Table 1). Premature infants demonstrate increased work of breathing compared to term infants. Infants born at a gestational age of <28 weeks demonstrated increased phase angle (p=.005), LBI (p=.011), and heart rate (1-sided test, p=.026) compared to infants born at >28 weeks (Figure 1). There was no significant difference in oxygen saturation, oxygen stability, respiratory support, or oxygen requirement. There was no significant difference in the corrected gestational age at the time of the study.
Conclusion(s) Premature infants demonstrate increased thoracoabdominal asynchrony compared to term infants. Infants born at a gestational age of <28 weeks demonstrated increased work of breathing indices and higher heart rates compared to infants born at >28 weeks despite similar CGA at the time of the study, suggesting that abnormal breathing patterns/ increased work of breathing persist longer in infants born extremely premature .

	GA <28 weeks (n=15)	GA >28 weeks (n=17)	P-value
Black, n(%)	7 (47%)	6 (35%)	.064
Birth Weight, grams, mean ± SD	**823.8 (156)**	**1280.0 (351)**	**.000***
Weight at study, grams, mean ± SD	1692.3 (543)	1546.47 (301)	.347
Corrected Gestational Age, weeks, mean ± SD	33.3 (2.5)	33.11 (2.1)	.810
Phase Angle, degrees, mean ± SD	**87.31 (34.2)**	**57.92 (18.8)**	**.005***
Labored Breathing Index	**1.64 (.54)**	**1.27 (.18)**	**.011***
Respiratory Rate, bpm, mean ± SD	27.1 (10.3)	25.58 (13.4)	.711
Saturation, %, mean ± SD	92.2 (4.3)	93.1 (4.0)	.541
Oxygen Stability, SD, mean ± SD	3.9 (1.8)	4.0 (4.8)	.995
Heart Rate, bpm, mean ± SD	**165 (10)**	**158 (9)**	**.029***
HFNC Support	3.2 (.98)	3.2 (.79)	.975
FIO2 requirement	26.2 (4.4)	23.7 (4.4)	.115

Demographic, Clinical, and Work of Breathing Indices for infants born at <28 weeks compared to infants born at >28 weeks.



Mean Phase Angle, Labor Breathing Index, and Heart Rate for infants born at <28 weeks compared to infants bonr at >28 weeks.

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Genetic Variants of HMGB1 and AGER are Associated with BPD and PDA in ELBW Infants

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Background BPD and PDA are significant causes of morbidity and mortality in ELBW infants, and both conditions have strong genetic foundations. The High Mobility Group Box 1 (HMGB1) protein and RAGE are associated with pulmonary conditions including asthma, COPD, pneumonia, and lung cancer. HMGB1 is expressed in lung endothelium, lung epithelium, and alveolar macrophages. Advanced glycation end product receptor (AGER) encoding RAGE, is a pro-inflammatory pattern recognition receptor that is an important mediator for COPD and BPD. HMGB1 binds to RAGE to induce cell migration. AGER is also responsible for HMGB1-induced autophagy, inflammation, and metabolism.

Objective We investigated the hypothesis that HMGB1 and AGER gene variants are associated with the susceptibility to BPD or PDA in ELBW infants.

Design/Methods DNA was collected from ELBW infants using buccal swabs in this ongoing IRB-approved study. The DNA was then isolated and analyzed with RT-PCR by allelic discrimination using specific TaqMan probes for rs1360485, rs1412125, and rs2070600. BPD was defined as the need for supplemental oxygen at 36 weeks PMA. PDA was present if either medical or surgical treatment was given. Statistical analyses included chi-square, t-test, z-test, Fischer exact, and Mann-Whitney U test with $p \leq 0.05$ significant.

Results ELBW infants with BPD were born earlier ($p<0.003$) and weighed less ($p<0.032$) compared to infants without BPD. The genotype distributions and any minor allele were significantly different for those with BPD for AGER SNP rs2070600 ($p=0.007$; 0.018, respectively); and, genotype distributions, any minor allele, and minor allele frequencies were significantly different in those with PDA for HMGB1 SNP rs1360485 ($p<0.001$; $p<0.001$; p 0.005, respectively). This HMGB1 variant was independent of prematurity for PDA.
Conclusion(s) In this pilot study, there were significantly different genotype distributions for one variant of AGER and BPD, and another variant of HMGB1 for PDA in ELBW infants. We speculate that this AGER variant abrogates the pro-inflammatory response in BPD (the minor allele was more common in the 'NoBPD' group, and this missense variant decreases inflammation). We speculate that the HMGB1 variant decreases the HMGB1 expression needed for ductal tissue remodeling, and hence leads to persistence of the DA (the minor allele is a 3'UTR variant known to interact with a miRNA, which destabilizes the HMGB1 transcript and decreases expression).

Table 1: Demographic Characteristics and Genotype Distributions for Neonates with and without BPD for rs2070600

		No BPD (n=48)	BPD (n=110)	p value
Gestational age, wks, median (IQR)		26 (25, 27)	25 (24, 26)	0.003*
Birth weight, g, median (IQR)		700 (700, 890)	740 (640, 840)	0.032*
SGA , n (%)		7 (15)	19 (18)	0.82
Male Gender, n (%)		17 (35)	57 (53)	0.067
Race, n (%)	Non-Hispanic White	13 (33)	34 (32)	0.624
	Non-Hispanic Black	10 (26)	29 (27)	
	Hispanic	12 (31)	37 (35)	
	Other	4 (10)	6 (6)	
Antenatal steroids, n (%)		43 (96)	90 (87)	0.222
Chorioamnionitis, n (%)		6 (12)	19 (18)	0.465
Sepsis, n (%)		6 (13)	11 (10)	0.847
BPD, n (%)		26 (54)	75 (70)	0.082

Genotype		No BPD, n (%)	BPD, n (%)	P value
AGER rs2070600 C/T n = 158	CC	33 (68.8)	95 (86.4)	0.007*
	Ct	15 (31.3)	13 (11.8)	
	tt	0 (0)	2 (1.8)	
	Any t	15 (31.3)	15 (13.6)	0.018*
	MAF	0.1563	0.0773	0.22

Table 2: Demographic Characteristics and Genotype Distributions for Neonates with and without PDA for rs1360485

		No PDA (n = 41)	PDA (n =93)	p value
Gestational age, wks, median (IQR)		25 (24, 27)	25 (24, 26)	0.199
Birth weight, g, median (IQR)		760 (655, 820)	760 (610, 850)	0.987
SGA , n (%)		8 (20)	12 (14)	0.529
Male Gender, n (%)		15 (44)	45 (50)	0.702
Race, n (%)	Non-Hispanic White	15 (41)	28 (33)	0.491
	Non-Hispanic Black	12 (32)	27 (31)	
	Hispanic	9 (24)	22 (26)	
	Other	1 (3)	9 (10)	
Antenatal steroids, n (%)		36 (95)	74 (88)	0.417
Chorioamnionitis, n (%)		6 (15)	14 (17)	0.935
Sepsis, n (%)		5 (13)	15 (17)	0.693
BPD, n (%)		23 (58)	66 (77)	0.046*

Genotype		No PDA, n (%)	PDA, n (%)	P value
HMGB1 rs1360485 T/C n = 134	TT	32 (54.2)	14 (18.7)	<0.001*
	Tc	16 (27.1)	35 (46.7)	
	cc	11 (18.6)	26 (34.7)	
	Any c	27 (45.8)	61 (81.3)	<0.001*
	MAF	0.322	0.580	0.005*

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Antibiotics-induced gut dysbiosis blunts sympathoadrenal responses to acute hypoglycemia in young mice: whole genome shotgun metagenomics analysis

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Background The microbiome co-evolved with their mammalian host and serves a pivotal role in various metabolic, nutritional, physiological, and immunological processes. Perturbations of the normal microbial balance (gut dysbiosis) early in life are linked to a wide range of adult diseases yet signaling mechanism(s) remain elusive. We discovered that in germ free mice, adrenal catecholamine responses to stress are impaired (Giri et al., Peds Res 85:574, 2019) suggesting developmental modification of the reflex arc or absence of an ongoing microbiome signal.
Objective To determine whether antibiotic-induced gut dysbiosis alters the peripheral stress responses to hypoglycemia in normally colonized adolescent mice.
Design/Methods C57Bl6 male mice were given regular water (control); cocktail of vancomycin, erythromycin, neomycin, gentamycin and ampicillin in drinking water for 2 weeks (Abx); or Abx followed by recolonization via co-housing with age matched controls (Abx +R). At 8 weeks postnatal age, mice were either exposed to insulin-induced hypoglycemia or injected with saline. Urine and blood were used for hormone analysis, cecum for SCFA analysis, and fecal samples for whole genome shotgun metagenomics. Protocol was approved by IACUC, NYMC.
Results Abx caused a profound decrease in microbial diversity & abundance of Bacterioidetes and Firmicutes; and increases in Proteobacteria & antibiotic resistance genes. Abx mice exhibited 4-fold enlargement of the ceca with no detectable SCFA. During hypoglycemia, normal responses in plasma corticosterone (intact HPA stress axis) & glucagon (intact parasympathetic signaling) were observed across all groups. However, Abx mice had 60 – 70% reduction in basal & stress-induced urinary epinephrine levels. Recolonization restored gut bacterial quantity and diversity, but sympathoadrenal stress system remained hyporesponsive along with reduced levels of cecal SCFA – a fermentation signal already known to affect catecholamine biosynthesis (Giri, 2019).
Conclusion(s) This is the first evidence that, even in a mature animal, gut dysbiosis results in prolonged sympathoadrenal hyporesponsiveness that persists after recolonization. Data suggests that mutable neurohumoral mechanism(s) exist throughout life. Unraveling these inter-species signaling pathways could lead to new therapeutic possibilities where manipulation of gut microbiota alters behavioral responses.

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A Pilot Nursing-Specific Neonatal Resuscitation Program (NRP) Simulation (SIM) Refresher Course Improves Performance of Initial Neonatal Resuscitation (NR)

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Background Nurses serve as frontline providers at low risk deliveries, are responsible for assessing the newborn, providing initial steps of resuscitation (IS) and if needed, starting bag mask ventilation (BMV) and calling for help. There are limited data on optimal methods of discipline specific training in these skills. We piloted a SIM refresher course focusing on the initial portion of NR prior to arrival of larger team.
Objective Evaluate the efficacy of an NRP refresher course on nursing performance of IS (warm, dry, stimulate, suction), calling for help, initiation of BMV and performance of ventilation corrective steps: adjust mask (M), reposition head (R), suction airway (S), open mouth (O) & increase pressure (P) (MRSOP).
Design/Methods A refresher course was piloted in Fall 2019 in a large delivery service among labor and delivery (L&D) and neonatal intensive care unit (NICU) nurses. The brief 15 min, one-on-one course was developed by a multidisciplinary team and is comprised of 3 parts. 1. Sim 1 (pre-teaching) to establish baseline skills. 2. Debrief to provide specific feedback, teaching and opportunity to practice. 3. Sim 2 (post-teaching) to solidify learning. Individual performance during each SIM was recorded by an instructor on a novel NeoNatalie Advanced manikin (Laerdal Medical) using a control iPad. A readout allows the instructor to provide real time feedback and to obtain quantitative data of performance (Fig 1). Data was scored to indicate completion of: IS, call for help, initiating BMV, performance of MRSOP, and consideration for alternative airway (Table 1). McNemar's & paired t-tests were utilized for analysis. This is an IRB approved study.
Results 68 L&D/NICU nurses were included in this study. Mean total performance scores were higher in Sim 2 versus Sim 1 (15.0 vs 7.2; $p < 0.001$) (Fig 2). In Sim 2 vs Sim 1 participants were more likely to call for help (94.1% vs 41.2%; $p <0.001$). Almost all participants initiated BMV in Sim 1 and Sim 2 (95.6% vs 100%, $p=0.25$ respectively). More participants performed at least one step of MRSOP (100% vs 88.2%; $p= 0.008$) and all of MRSOP (38.2% vs 1.5%; $p < 0.001$) in Sim 2 vs Sim 1 (Table 3).
Conclusion(s) Implementation of a brief nursing-specific NRP SIM refresher course significantly improves performance of initial resuscitation skills from baseline. The observation of low baseline scores suggests an urgent need for more frequent refresher courses to achieve and maintain mastery of NRP skills.

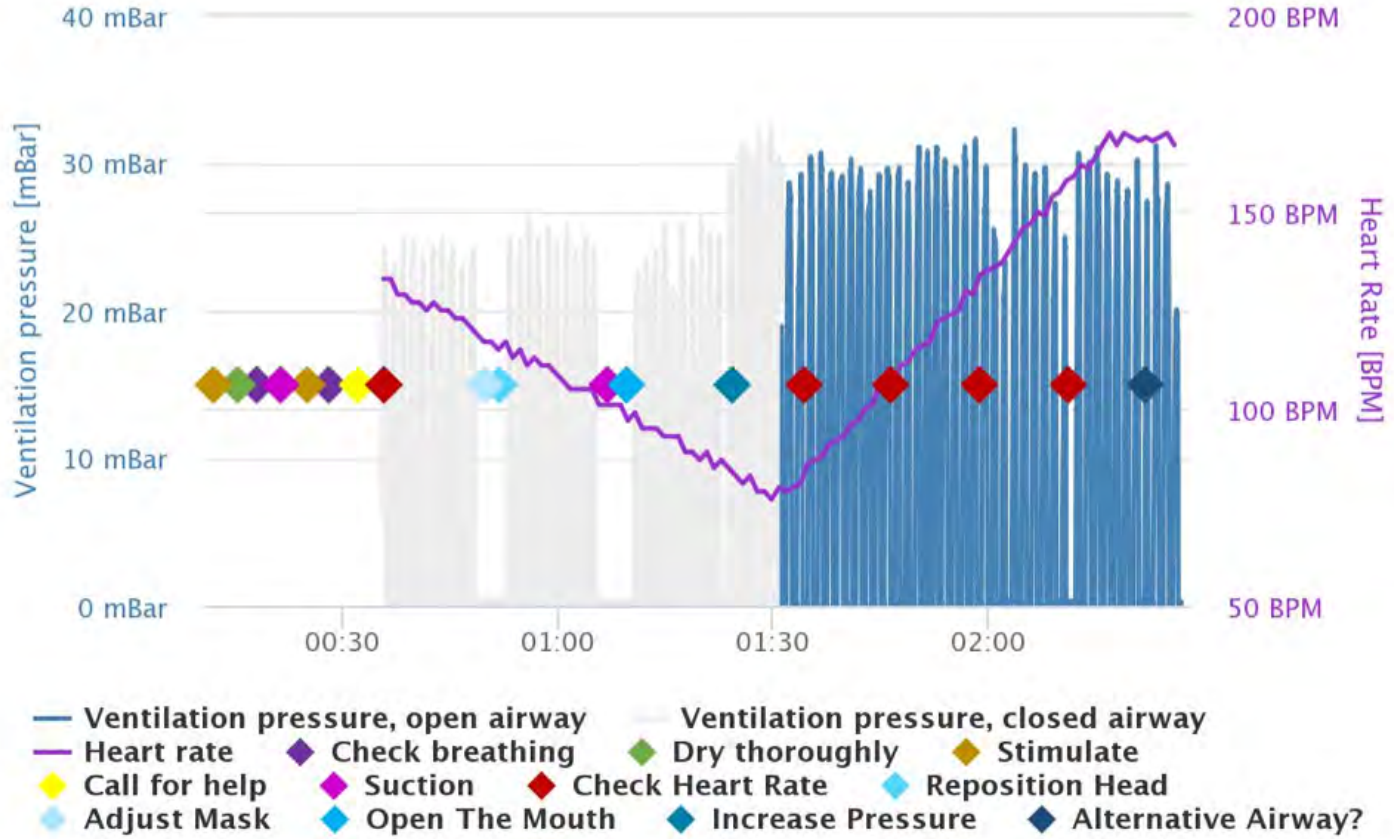

Figure 1: Subject Performance During SIM. *Note: Colored diamonds indicate instructor recording the performance of corresponding skill.*

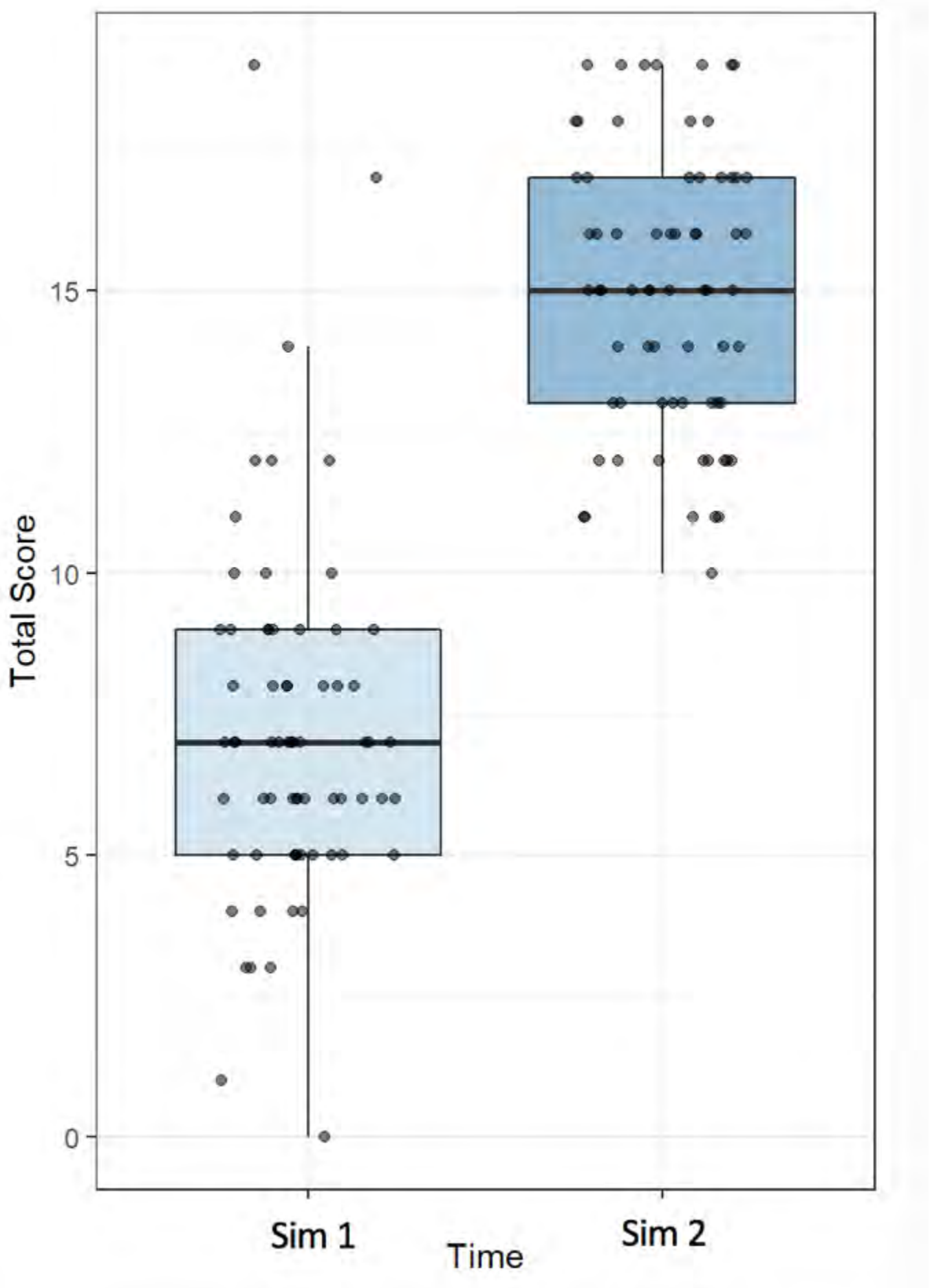
Total Score
15
10
5
0
Sim 1
Sim 2
Time

Figure 2. Distribution of Total Score Among Participants. p <0.001, mean of differences (95% CI): 7.81 (6.89, 8.73), α = 0.05

Table 1. Simulation Scoring

Skill	0 points	1 point	2 points
Stimulate	no attempt	N/A	stimulates with blanket or towel
Dry	no attempt	replaces wet towel OR places hat on manikin	removes wet towel AND places hat on manikin
Suction	no attempt	partially completed OR completed in wrong order	suctions mouth THEN nose
Call For Help	no attempt	verbalizes	N/A
Readjust Mask	no attempt	performs	performs AND verbalizes
Reposition Airway	no attempt	performs	performs AND verbalizes
Suction After PPV	no attempt	performs	performs AND verbalizes
Open Mouth	no attempt	performs	performs AND verbalizes
Increase Pressure	no attempt	N/A	verbalizes
Consider Alternate Airway	no attempt	N/A	verbalizes

Table 2. Performance Characteristics

Skill	Sim 1 (%)	Sim 2 (%)	p-value
Call For Help	41.2	94.1	<0.0001
Initiate PPV	95.6	100	0.25
Perform Any Step of MR SOP	88.2	100	0.008
Perform All Steps of MR SOP*	1.5	38.2	<0.0001

*The majority of participants did not perform O in Sim 2 (52.9%), while most performed M, R, S, and P (69.1%).

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Developing A Standardized Nasal Cannula Weaning Protocol in the NICU: A Performance Improvement Initiative

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Background National efforts to reduce the incidence of Chronic Lung Disease are ongoing. Compared to other VON participating units, our NICU is within the interquartile range for CLD; but is above the interquartile range on metrics of nasal cannula (NC) use. A

patient receiving prolonged and unnecessary application of NC is at risk for a slower advancement of per os, cue-based feeds, an increased risk of barotrauma at high cannula flow- rates, breakdown of their nasal septum, and possible prolongation of their hospitalization. There is minimal published data that provides guidance on effective NC weaning strategies in the NICU. To address this issue, we created a multidisciplinary team that developed a standardized NC weaning protocol for use in our NICU.
Objective We hypothesized that the creation of a standardized NC weaning protocol in our NICU would result in the significant reduction of NC days and length of hospitalization.
Design/Methods A retrospective chart review of patients ≤1500 grams born between Jan. '16 and Nov. '19 who received NC support in our NICU was performed. We standardized patient parameters that would prompt daily consideration by the NICU medical team to "opt-in" for a wean of flow by 0.5 LPM. This weaning protocol was implemented in Sep. '17. As part of the PDSA cycle, data was analyzed six months after our intervention started. Based on this interval data, in Apr. '18 we implemented a change to the protocol by making the wean an "opt-out of" daily automatic respiratory therapist (RT) driven practice. We compared outcomes between pre/post cohorts.
Results We identified 177 newborns pre and 193 newborns post-implementation. Descriptive characteristics are provided (Table1). In the first 6 months of the intervention, all primary outcomes increased in the "opt-in" intervention group (Table2). Following the change to the weaning protocol, the primary outcomes of NC duration and length of hospitalization were significantly reduced in the "opt-out" group (Table3). Table4 demonstrates a trend of reduction in all primary outcomes between the pre and "opt-out" groups.
Conclusion(s) We developed a novel weaning protocol for neonates receiving NC support. There were no adverse effects associated with this intervention. When medical providers are actively involved in the decision to wean NC flow on a daily basis, patients stayed on that support longer with a longer length of stay. An "opt-out" RT driven weaning strategy based on target patient parameters results in significantly less NC use.

Table 1- Descriptive Characteristics

Variable	Pre-Intervention (n=177)	Post-Intervention (n=193)	p-value
Birth Weight- grams (mean, ±SD)	1038, ±265	1052, ±272	0.619
Gestation Age- weeks (mean, ±SD)	28.2, ±2.5	28.6, ±2.4	0.108
Sex- male (n, %)	94, 53.1%	96, 49.7%	0.518
Intubated During 1st Week of Life- yes (n, %)	124, 70.1%	126, 65.3%	0.327
Intratracheal Surfactant Given- yes (n, %)	121, 68.4%	120, 62.2%	0.212
Mechanical Ventilation in NICU- yes (n, %)	119, 67.2%	127, 65.8%	0.771
Mechanical Ventilation Duration- days (mean, ±SD)	16.5, ±26	12.5, ±20.7	0.104
NIPPV Duration- days (mean, ±SD)	3.5, ±5.8	2.5, ±5.3	0.073
CPAP Duration- days (mean, ±SD)	7, ±6.9	10.5, ±10.6	*<0.001

Table 1- Descriptive Characteristics

Table 2- Pre-Intervention and 1st Intervention Group Comparative Outcomes

Variable	Pre-Intervention (n=177)	1st Intervention Group (n=55) "Opt-in to wean"	p-value
Length of Hospitalization- days (mean, ±SD)	74.2, ±39.8	78.5, ±38.4	0.483
Nasal Cannula Duration at any Fio2- days (mean, ±SD)	37.1, ±27.3	42.9, ±31.3	0.18
Nasal Cannula Duration with Fio2<26%- days (mean, ±SD)	24.7, ±17.5	24.3, ±15.5	0.881

Table 2- Pre-Intervention and 1st Intervention Group Comparative Outcomes

Table 3- Intervention Group Comparative Outcomes

Variable	1st Intervention Group (n=55) "Opt-in to wean"	2nd Intervention Group (n=138) "Opt-out of wean"	p-value
Length of Hospitalization- days (mean, ±SD)	78.5, ±38.4	67, ±31.2	*0.033
Nasal Cannula Duration at any Fio2- days (mean, ±SD)	42.9, ±31.3	31.5, ±24.8	*0.008
Nasal Cannula Duration with Fio2<26%- days (mean, ±SD)	24.3, ±15.5	22, ±16.4	0.391

Table 3- Intervention Group Comparative Outcomes

Table 4- Pre-Intervention and 2nd Intervention Group Comparative Outcomes

Variable	Pre-Intervention (n=177)	2nd Intervention Group (n=138) "Opt-out of wean"	p-value
Length of Hospitalization- days (mean, ±SD)	74.2, ±39.8	67, ±31.2	0.074
Nasal Cannula Duration at any Fio2- days (mean, ±SD)	37.1, ±27.3	31.5, ±24.8	0.064
Nasal Cannula Duration with Fio2<26%- days (mean, ±SD)	24.7, ±17.5	22, ±16.4	0.173

Table 4- Pre-Intervention and 2nd Intervention Group Comparative Outcomes

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Birth Weight Prediction During Delivery Room Resuscitation: Visual Estimate vs. Ultrasound Estimated Fetal Weight Percentile on the Modified Fenton Curve

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Background Accurate dosing of medications and fluids during neonatal resuscitations may be critical to prevent neonatal morbidity and mortality. Currently, in the absence of accurate measure of birth weight (Bwt) in the delivery room (DR), providers often estimate weight by visual inspection. These visual weight estimates (VWEs) may be imprecise and can lead to dosing errors. We have identified an objective method of estimating Bwt that involves extrapolating prenatal ultrasound estimated fetal weight (UEFW) percentiles onto the modified Fenton growth curve (MFGC).

Objective To evaluate the reliability of the VWEs in predicting Bwt, and to compare VWE accuracy to UEFW percentiles extrapolated onto the MFGC. We hypothesize that VWEs are unreliable for predicting Bwt and are less accurate than UEFW percentiles extrapolated on the MFGC.

Design/Methods This prospective study enrolled appropriate for gestational age (AGA) neonates ≤36 weeks without intrauterine growth restriction or congenital anomalies and whose UEFW percentiles were documented in the EMR. We compared VWEs by attending neonatologists, nurse practitioners (NP) and neonatology fellows in the DR and UEFW percentiles extrapolated on the MFGC curve to actual Bwt. To detect >10% difference between the estimated weights and actual weights with an estimated error of 5%, 65 subjects were needed.

Results Sixty-five neonates with gestational ages of 24-35 weeks and actual weights of 530-2920g were enrolled. No significant differences existed between the VWEs and the actual Bwt (p=0.72), although the largest percent difference was 27%. Also, the UEFW percentiles extrapolated on the MFGC did not differ significantly from the actual Bwt (p=0.78). Nevertheless, when compared to the actual Bwt, UEFW percentiles extrapolated on the MFGC were more accurate than the VWEs with a smaller absolute mean deviation (p=0.001). Neonatology fellows exhibited larger absolute deviations between VWEs and the actual Bwt when compared to the NP or the attending neonatologist estimates (p<0.03). Deviation of UEFW percentile on MFGC extrapolations did not correlate with gestational age (p=0.31), race (p=0.57), or sex (p=0.64).
Conclusion(s) Visual estimates of weight by experienced personnel in the DR can provide a reliable way of predicting Bwt of AGA infants ≤36 weeks. Additionally, UEFW percentile extrapolation onto the MFGC yields a more reliable estimate of Bwt in the DR.

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Monthly and Yearly Trends in Incidence of Stage II and III NEC - A 28-Year Study
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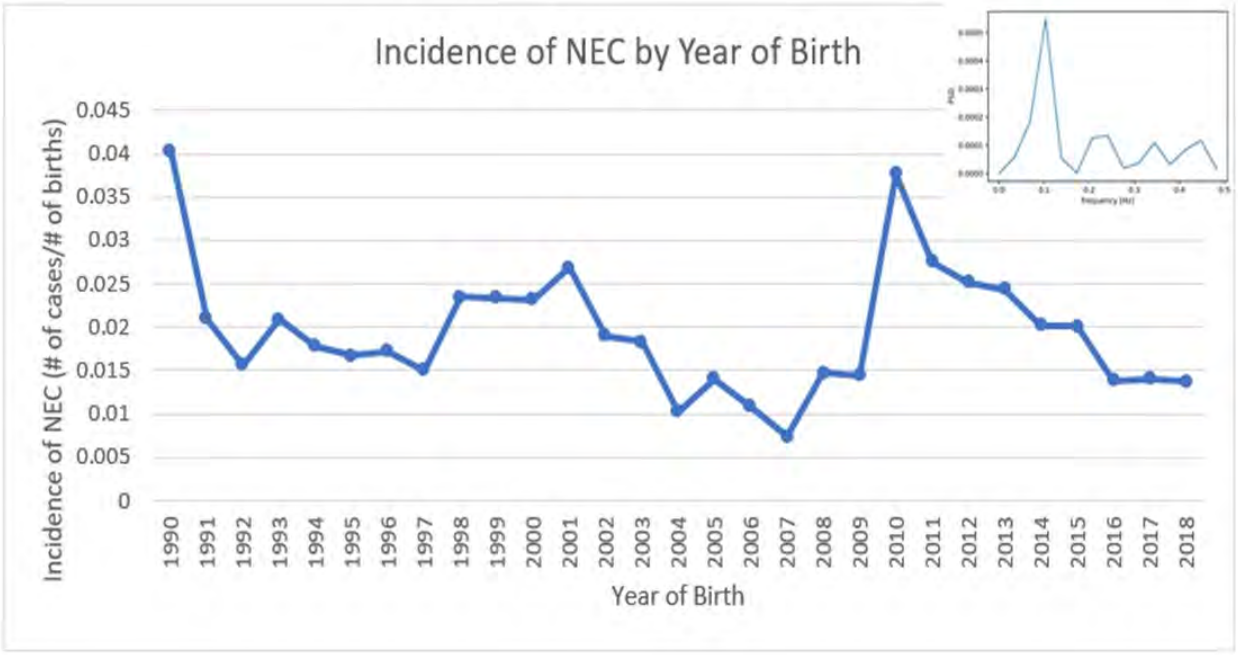
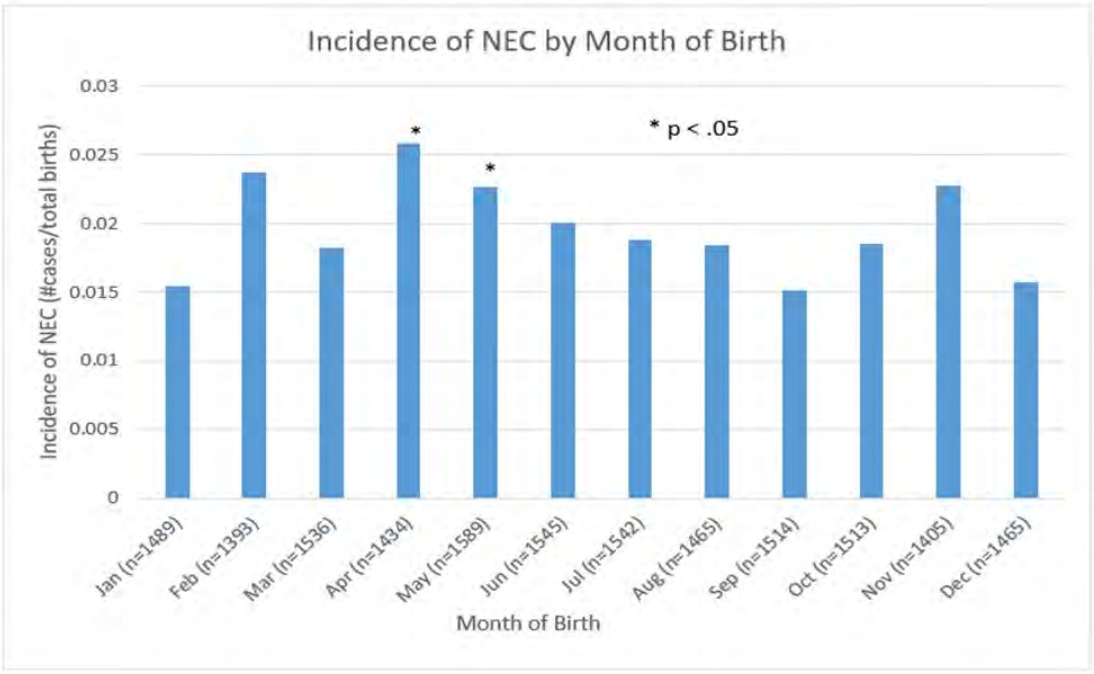
Background There are conflicting reports of temporality and seasonal variations in the incidence of necrotizing enterocolitis (NEC). A long-term sample from a defined geographical region may be useful in clarifying this issue and providing clues to risk factors for NEC.
Objective To investigate monthly and yearly temporal trends in NEC incidence over a period of 28 years from two tertiary care NICUs in Central CT, USA.
Design/Methods A retrospective cohort study was conducted at two tertiary NICUs of the Connecticut Children's Medical Center (CCMC). All infants admitted between Jan. 1990 and Apr. 2018 at the CCMC Farmington NICU and between Feb. 2007 and Oct. 2018 at the CCMC Hartford NICU, were studied. Infants with Stage II or III NEC were identified from prospectively collected databases. Infants with spontaneous intestinal perforations were excluded from the diagnosis of NEC. During the study period, these NICUs experienced changes in neonatal practice consistent with other centers in the US. Donor human milk with cow's milk-based fortifiers was introduced into the NICUs in 2003. NEC incidence was determined based on birth dates.
Results There were 17,890 infants admitted over the study period of 28 years. Yearly NEC incidence also showed a multi-modal distribution with spikes observed in certain years (Figure 1). In order to investigate the periodical pattern of the annual incidence of NEC, a spectrum analysis was performed (inset, Figure 1). The spectrum analysis revealed a strong 10-year periodic pattern in NEC incidence. There was a bimodal distribution of NEC incidence by both month of birth (Figure 2) and month of diagnosis. April/May birth along with BW, GA, RDS and IVH were significantly associated with NEC. Variables found to be significant in univariate analyses were analyzed for confounders using multiple logistic regression-MLR (Table 1). Birth in the month of April/May (p = .0388) and IVH (p = .0039) remained statistically significant correlates of NEC after controlling for other confounding variables in the MLR (Table 1).
Conclusion(s) Yearly variations were observed in the incidence of NEC. A bimodal distribution of NEC was observed during the calendar year, with a peak observed in the months of April/May and a second peak in November (Figure 2). These trends suggest possible environmental determinants of NEC. Similar seasonality has been observed in certain viruses associated with NEC (adenovirus and torovirus). Further investigation into such associations may be warranted.



Stage II and III NEC in Central Connecticut NICUs - 28-year trend and Spectral Analysis (inset)



Variations in Stage II and III NEC Incidence by the Month of Birth

Multivariate Logistic Regression Analysis of Risk Factors for NEC

Risk Factors for NEC	Exp (Coef)	Lower 95% CI	Higher 95% CI	P-Value
Birth-Weight (gm)	0.999	0.999	0.999	<0.001
Intraventricular Hemorrhage	1.583	1.159	2.161	0.039
Birth Months - April/May	1.270	1.016	1.458	0.0388
Retinopathy of prematurity	1.297	0.957	1.757	0.0938
Respiratory Distress Syndrome	1.261	0.915	1.737	0.1562
Patent Ductus Arteriosus	1.010	0.746	1.369	0.9470

Logistic Regression Model incorporating all risk factors that were significant on univariate analysis. Listed in order of significance of association with NEC.

Abstract: 258

Are Serine Protease Inhibitor Polymorphisms associated with BPD and PDA in ELBW Infants?

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Background Bronchopulmonary dyslasia (BPD) and patent ductus arteriosus (PDA) are serious conditions affecting extremely low birth weight (ELBW) infants. Twin studies suggest that heritability of BPD is about 79%, while heritability of PDA is about 93% for patients requiring medical treatment, and 48% for patients requiring surgical treatment. SERPINS (serine protease inhibitors) are critical in helping to oppose the proteolytic effects of neutrophil elastase in the lung. SERPINB1 has been shown to protect the airways by regulating the excess protease released during the inflammation following pulmonary infections. SERPINE2 gene is associated with chronic obstructive pulmonary disease in Korean, Finnish, Norwegian as well as an International COPD Genetic Networks population. In this study, we seek to determine the association of SERPIN B1 and E2 gene variants with BPD and PDA in ELBW infants.
Objective We investigated the hypothesis that single nucleotide polymorphisms of SERPINE2 and SERPINB1 are associated with susceptibility to BPD or PDA in ELBW infants.
Design/Methods DNA from buccal swabs of ELBW infants whose parents gave informed consents were collected, isolated and analyzed via RT-PCR using TaqMan probes for six SERPINE2 variants (rs975278, rs6734100, rs729631, rs7562213, rs759646 and rs840088) and three SERPINB1 variants (rs316339, rs316341, rs31337). BPD was defined as oxygen dependence at 36 weeks postmenstrual age. PDA was defined as ductus needing medical or surgical treatment. , Fisher's exact, Mann-Whitney U, t-test and z-test were performed; $P \leq 0.05$ was considered significant.
Results There were statistically significant differences in birth weight, gestational age, sepsis, and PDA between BPD and No BPD groups. There were also statistically significant differences in birth weight, gestational age, chorioamnionitis, and BPD between PDA and No PDA groups. No significant differences were found in genotype distributions of SERPIN E2 and B1 SNPs (comparisons with P>0.2 not shown).
Conclusion(s) In this pilot study, there were no significant associations between BPD or PDA and the investigated genetic variants in ELBW infants. We speculate that other functional genetic variants and a larger sample size (N=188 per group) may be needed to demonstrate such an association.

Table 1. Comparison of demographic characteristics in the study groups with and without BPD.

		No BPD (n = 70)	BPD (n = 119)	P value
Gestational age, wks, median (IQR)		**26 (25, 28)**	**25 (24, 26)**	**<0.001***
Birth weight, g, median (IQR)		**830 (750, 928)**	**695 (600, 840)**	**<0.001***
SGA, n (%)		**13 (19)**	**26 (23)**	**0.710**
Male Gender, n (%)		**26 (37)**	**60 (51)**	**0.083**
Race, n (%)	Non-Hispanic White	**20 (29)**	**35 (30)**	**0.927**
	Non-Hispanic Black	**22 (32)**	**33 (28)**	
	Hispanic	**22 (32)**	**39 (34)**	
	Other	**4 (7)**	**9 (8)**	
Antenatal steroids, n (%)		**61 (88)**	**100 (87)**	**0.962**
Chorioamnionitis, n (%)		**6 (14)**	**15 (18)**	**0.739**
Sepsis, n (%)		**7 (10)**	**38 (32)**	**<0.001***
PDA, n (%)		**36 (51)**	**91 (77)**	**<0.001***

Table 2. Comparison of demographic characteristics in the study groups with and without PDA.

		No PDA (n = 60)	PDA (n = 129)	P value
Gestational age, wks, median (IQR)		**26 (25, 28)**	**25 (24, 26)**	**0.001***
Birth weight, g, median (IQR)		**820 (680, 910)**	**740 (610, 840)**	**0.006***
SGA, n (%)		**10 (17)**	**30 (24)**	**0.399**
Male Gender, n (%)		**35 (59)**	**63 (49)**	**0.259**
Race, n (%)	Non-Hispanic White	**23 (40)**	**32 (25)**	**0.239**
	Non-Hispanic Black	**16 (28)**	**39 (31)**	
	Hispanic	**15 (26)**	**46 (37)**	
	Other	**4 (6)**	**9 (7)**	
Antenatal steroids, n (%)		**50 (85)**	**111 (89)**	**0.560**
Chorioamnionitis, n (%)		**7 (12)**	**72 (58)**	**<0.001***
Sepsis, n (%)		**7 (14)**	**28 (23)**	**0.129**
BPD, n (%)		**27 (45)**	**91 (71)**	**0.001***

Table 3. Comparison of SNP genotype distribution in the study groups with and without BPD.

Genotype		No BPD, n (%)	BPD, n (%)	P value
rs975278 C/T n = 188	CC	**43 (66)**	**82 (67)**	**0.156**
	Ct	**19 (29)**	**26 (21)**	
	tt	**3 (5)**	**15 (12)**	
	Any t	**22 (32)**	**41 (40)**	**0.927**
	MAF (t = 0.321[a])	**0.192**	**0.228**	**0.709**

[a]1000 Genomes Project

Table 4. Comparison of SNP genotype distribution in the study groups with and without PDA.

Genotype		No PDA, n (%)	PDA, n (%)	P value
rs975278 C/T n = 192	CC	**47 (68)**	**81 (72)**	**0.134**
	Ct	**12 (17)**	**22 (20)**	
	tt	**10 (15)**	**9 (8)**	
	Any t	**22 (32)**	**31 (30)**	**0.663**
	MAF (t = 0.321[a])	**0.2319**	**0.1786**	**0.496**
rs316339 A/G n = 119	GG	**18 (58)**	**49 (56)**	**0.160**
	Ga	**10 (32)**	**18 (20)**	
	aa	**3 (10)**	**21 (24)**	
	Any a	**13 (42)**	**39 (44)**	**0.984**
	MAF (a = 0.275[a])	**0.258**	**0.341**	**0.531**

[a]1000 Genomes Project

Abstract: 259

Predictors of PN Dependence and Intestinal Failure in Infants after Necrotizing Enterocolitis

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Background Necrotizing enterocolitis (NEC), a severe complication of prematurity, is associated with significant morbidity and mortality, including short bowel syndrome, long-term total parenteral nutrition (TPN) dependence and intestinal failure (IF). Few studies have looked at neonatal feeding practices as predictors of PN dependence (PND) or IF after NEC. This study seeks to identify clinical and nutritional predictive variables of PND and IF in infants after NEC.

Objective

Design/Methods A single-center, retrospective analysis of infants with NEC (2011-2019). Subjects who died before discharge or were transferred out were excluded. Demographic data, enteral feeding practices, total residual intestinal length (TRIL), duration of antibiotics, recurrence of NEC, and need for surgery were analyzed. Primary outcomes included PND, >30 days of TPN, and IF, >60 consecutive days of TPN after initial NEC diagnosis. Univariate analysis was performed and only independent variables with $p<0.1$ will be included in multivariate analysis. Logistical regression will be used to model both PND and IF.

Results A total of 177 infants diagnosed with NEC were enrolled, and after the above exclusion criteria, 162 were analyzed. Fifty-five (33.9%) infants had PND and 30 (18.5%) infants developed IF. Not surprisingly, infants with PND and IF were more likely to be treated surgically (73.7% and 83.3%, respectively) than medically. In univariate analysis, infants with PND and infants who developed IF had lower birth weights, lower gestational age (GA), longer time to first enteral feed after birth, longer time to full enteral feed after birth, longer time to restart enteral feeds after NEC, and longer antibiotic use. Type of first enteral nutrition differed significantly between groups. Infants with PND and IF had significantly decreased TRIL when normalized to expected length based on GA (Tables 1 & 2).

Conclusion(s) As expected, residual total intestinal length and need for surgical intervention are key clinical variables associated with PND and IF after NEC. However, nutritional variables such as time and type of enteral feeding are also associated with PND and IF, suggesting that early feeding practices may impact intestinal development and predict intestinal recovery in infants with NEC. Subsequent multivariate analysis will be performed to investigate the predictive value of these key variables independently.

Table 2. Univariate analysis for Intestinal Failure (IF)

	IF (n = 30)	no IF (n = 132)	p value
GA (wks)	26.6 (25.4-28.6)	31.5 (29.3-33.3)	1.29E-07
Female	10 (33.3%)	54 (40.9%)	0.5368
BW (gm)	814 (698.5-1142.3)	1539.5 (1072.8-1955)	9.29E-08
BW Groups			0.0001
BW >2500 g	0 (0%)	11 (8.3%)	
1500-2500 g	3 (10%)	58 (43.9%)	
1000-1500 g	9 (30%)	36 (27.3%)	
<1000 g	18 (60%)	27 (20.5%)	
Time to First Feed			
Days of life (DOL)	4 (3-5)	2 (2-3)	0.000006
Early (<3d)	13 (44.8%)	103 (80.5%)	0.000253
Late (>3d)	16 (55.2%)	25 (19.5%)	
First Feed Type			0.000881
BM only	16 (53.3%)	27 (20.5%)	
Formula only	5 (16.7%)	26 (19.7%)	
BM + Formula	3 (10.0%)	52 (39.4%)	
Not documented/NPO	6 (20.0%)	27 (20.5%)	
Time to Full Feed			
Days of life (DOL)	11 (9.5-18.75)	8 (6-10)	0.000881
Early (<7d)	3 (11.5%)	42 (35.6%)	0.044223
Late (<7d)	15 (57.7%)	50 (42.4%)	
Not reached before NEC	8 (30.8%)	26 (22.0%)	
Full Feed Type			0.930197
BM only	2 (6.7%)	12 (9.1%)	
Formula only	3 (10.0%)	14 (10.6%)	
BM + Formula	11 (36.7%)	56 (42.4%)	
Not reached/NPO	8 (26.7%)	28 (21.2%)	
Not documented	6 (20.0%)	22 (16.7%)	
Time to Restart Feeds (d)	18 (14-27.75)	11 (9-15)	0.000003
Restart Feed Type			0.647879
BM only	18 (60.0%)	71 (60.2%)	
Formula only	9 (30.0%)	28 (23.7%)	
BM + Formula	3 (10.0%)	19 (16.1%)	
Complications			
NEC Recurrence	7 (23.3%)	16 (12.1%)	0.144685
Surgical (vs Medical)	25 (83.3%)	22 (16.7%)	5.71E-12
Antibiotic Duration (d)	15 (13.75-17.25)	10 (9-14)	0.000002
Residual Intestinal Length			
SB length (cm)	65.99 (41.5-79.3)	126.8 (113.5-142.3)	2.82E-13
% Expected	0.802 (0.49-0.94)	1.0 (1.0-1.0)	2.90E-19
Colon length (cm)	25.7 (22.9-28.9)	33.8 (31.3-36.2)	3.56E-10
% Expected	1.0 (0.84-1.0)	1.0 (1.0-1.0)	1.47E-04
Total length (cm)	90 (73.7-107.9)	161.2 (142.8-178.6)	1.98E-13
% Expected	0.851 (0.61-0.92)	1.0 (1.0-1.0)	6.53E-17

Values are median (IQR) or n (%).

Table 1. Univariate analysis for PN dependence

	PN Dependence (n= 55)	No PN Dependence (n=107)	p value
GA (wks)	28 (26.1-30.2)	31.9 (29.9-33.7)	3.07E-08
Female	20 (35.1%)	44 (41.9%)	0.5011
BW (gm)	1005 (732-1325)	1640 (1253.5-2018.5)	6.26E-09
BW Groups			1.68E-07
BW >2500 g	1 (1.8%)	10 (9.5%)	
1500-2500 g	8 (14.0%)	53 (50.5%)	
1000-1500 g	20 (35.0%)	25 (23.8%)	
<1000 g	28 (49.1%)	17 (16.2%)	
Time to First Feed			
Days of life (DOL)	3 (2.5-5)	2 (2-3)	0.0001
Early (<3d)	32 (60.4%)	84 (80.8%)	0.0078
Late (>3d)	21 (39.8%)	20 (19.2%)	
First Feed Type			0.0332
BM only	23 (40.4%)	20 (19.0%)	
Formula only	8 (14.0%)	23 (21.9%)	
BM + Formula	15 (26.3%)	40 (38.1%)	
Not documented/NPO	11 (19.3%)	22 (21.0%)	
Time to Full Feed			
Days of life (DOL)	11 (8-13)	8 (6-10)	0.0031
Early (<7d)	8 (16.0%)	37 (39.4%)	0.0129
Late (<7d)	27 (54.0%)	38 (40.4%)	
Not reached before NEC	15 (30.0%)	19 (20.2%)	
Full Feed Type			0.4909
BM only	5 (8.8%)	9 (8.6%)	
Formula only	4 (7.0%)	13 (12.4%)	
BM + Formula	22 (38.6%)	45 (42.9%)	
Not reached/NPO	17 (29.8%)	19 (18.1%)	
Not documented	9 (15.8%)	19 (18.1%)	
Time to Restart Feeds (d)	17 (14-27.5)	10 (8-14)	2.82E-12
Restart Feed Type			0.8357
BM only	35 (61.4%)	54 (59.3%)	
Formula only	15 (26.3%)	22 (24.2%)	
BM + Formula	7 (12.3%)	15 (16.4%)	
Complications			
NEC Recurrence	16 (28.1%)	7 (6.7%)	0.0003
Surgical (vs Medical)	42 (73.7%)	5 (4.8%)	1.33E-20
Antibiotic Duration (d)	14 (14-16)	10 (7-13)	4.15E-12
Residual Intestinal Length			
SB length (cm)	84.4 (62.2-114.9)	134.2 (116.9-145.7)	6.49E-14
% Expected	0.919 (0.77-0.99)	1.0 (1.0-1.0)	5.44E-22
Colon length (cm)	26.3 (23.3-31.7)	34.9 (32.1-36.8)	1.17E-14
% Expected	1.0 (0.84-1.0)	1.0 (1.0-1.0)	2.31E-09
Total length (cm)	110.3 (86.2-143.6)	169.1 (148.4-182.5)	1.07E-14
% Expected	0.901 (0.81-0.98)	1.0 (1.0-1.0)	2.84E-21

Values are median (IQR) or n (%).

Abstract: 260

Incidence of neonatal hypoglycemia on the second day of life among healthy newborns after passing the American Academy of Pediatrics (AAP) Hypoglycemia Screening Guidelines.

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Background The AAP recommends screening for hypoglycemia on the first day of life among high-risk neonate; late preterm (LPT), large for gestational age (LGA), small for gestational age (SGA) and infant of diabetic mother (IDM) while the Pediatric Endocrine Society recommends maintaining serum glucose > 50 mg/dL on the second day of life. The incidence of hypoglycemia with point of care testing (POCT) beyond the first day of life using the PES criteria is poorly described.

Objective To determine the incidence of hypoglycemia in healthy, asymptomatic neonates with or without risk factors on the 2nd day of life. We hypothesized that a significant portion of neonates will demonstrate hypoglycemia on the 2nd day of life, despite fulfilling AAP screening criteria during the first 24 hours of life (HOL).

Design/Methods In this prospective study, n=151 (Control=51, LGA+IDM=50, SGA+LPT=50) healthy, asymptomatic neonates in the Baby Friendly newborn nursery, at > 24 hours and < 48 hours, without or without risk factors for hypoglycemia were enrolled. A preprandial POCT glucose was determined using bedside glucometer at least 2 hours after feeding. For neonates with POCT <50 mg/dL, serum glucose testing was done. Further management was done as per standard clinical protocol (Figure 1). Data regarding last feed, HOL, gestational age (GA), birth weight (BW), maternal body mass index (BMI), demographic data and resuscitation were recorded. We used Chi-Square to compare hypoglycemia rates. Regression models were fit to the data to identify independent clinical predictors of hypoglycemia and adjust for potential confounders.

Results Among 151 patients, the incidence of hypoglycemia was highest for SGA+LPT neonates (12%). In comparison, 6% of LGA+IDM neonates and 7.8% of control neonates had POCT glucose <50 mg/dL. Patients were similar in terms of gender, mode of delivery, resuscitation, Apgar scores and maternal BMI (Table 1). In regression models, maternal BMI, time from last feed and history of resuscitation did not affect the incidence of hypoglycemia on the second day of life. Being fed by breast milk correlated with lower POCT values (p=0.001) and a higher incidence of hypoglycemia on the second day of life (p=0.004) regardless of risk stratification (Table 2).

Conclusion(s) The incidence of hypoglycemia of 6-12% among asymptomatic neonates beyond 24 HOL suggests there may be a benefit to extending hypoglycemia screening beyond the first day of life.

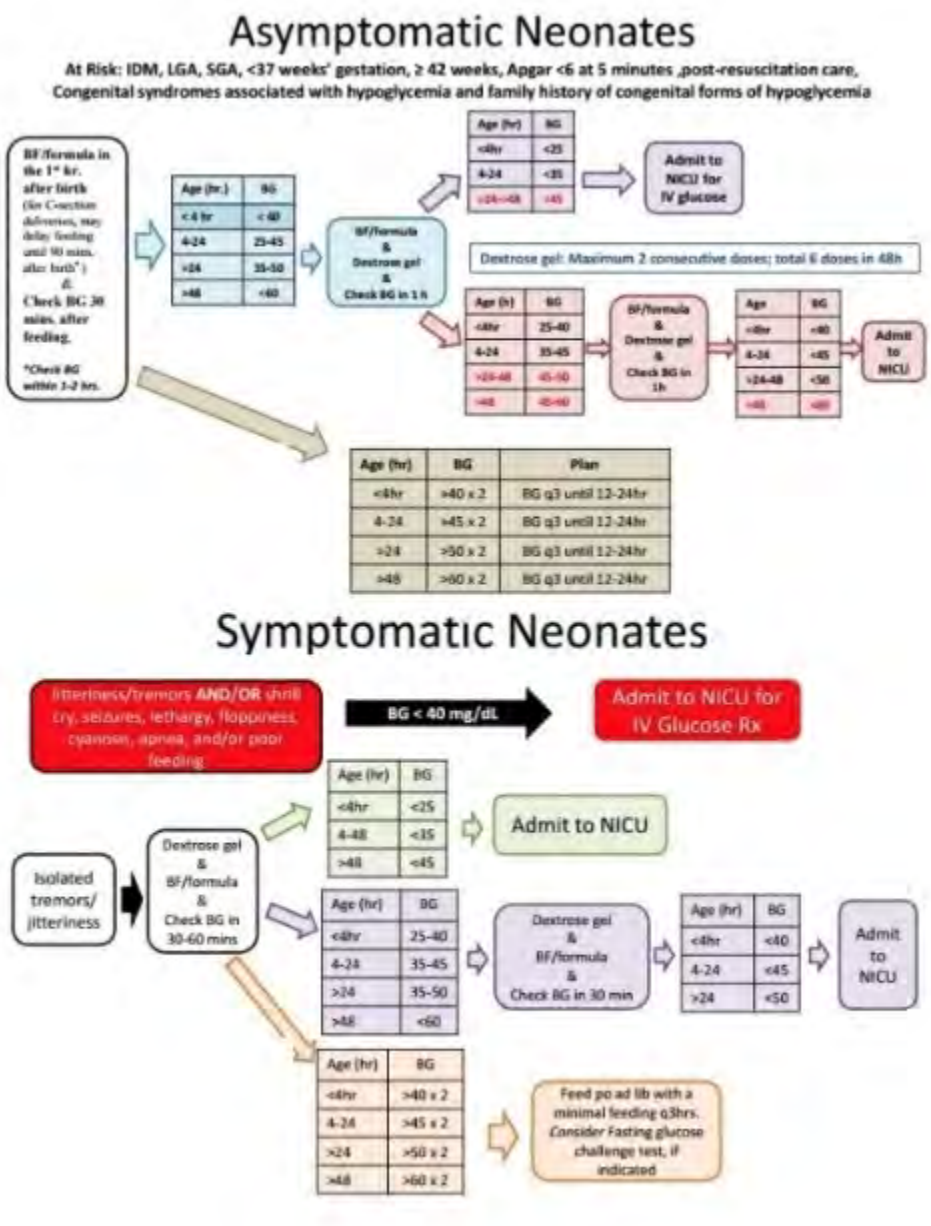

Figure 1: Weiler NICU Hypoglycemia Protocol

	Control N=51	SGA+LPT N=50	LGA+IDM N=50	P-Value
Female/Male	25/26	21/29	24/26	0.748
GA, mean (range)	39(37-41) w	38(35-41) w	39(37-41) w	0.000
BW, mean(SD)	3322(433)	2623(351)	3503(522)	0.000
Apgars, mean(SD) 1 min 5 min	 8.7(0.8) 9.0(0.2)	 8.7(0.8) 9.0(0.2)	 8.8(0.4) 8.9(0.3)	 0.751 0.391
Ethnicity, n (%): Asian-Indian Hispanic-Latino Asian Non Hispanic-Latino African American Caucasian	 2(3.9%) 25(49%) 0(0%) 7(13.7) 14(27.5%) 3(5.9%)	 8(16%) 26(52%) 1(2%) 0(0%) 12(24) 3(6%)	 11(22%) 20(40%) 0(0%) 2(4%) 11(22%) 6(12%)	
Maternal BMI, mean(SD)	32 (7)	30 (7)	34 (8)	0.405
Vaginal Delivery, n (%)	33 (64%)	26(52%)	32 (64%)	0.343
Singleton, n	49	43	49	0.035
HOL, mean(SD)	37(5)	34 (6)	34 (5)	0.011
Resuscitation (Cpap, PPV), n	4	11	7	0.162

Table 1: Patients Characteristics

	Hypoglycemia (POCT) >24h <48h: YES	Hypoglycemia (POCT) >24h <48h: NO	Hypoglycemia (Serum Glu) >24h <48h: YES	Hypoglycemia (Serum Glu) >24h <48h: NO	P-Value
Maternal BMI, mean(SD)	29(6)	32(7)	28(3)	32(7)	0.248, 0.470
Breast Milk only, n	9	36	3	42	0.004, 0.129
Time Elapsed from the Last Feed, mean(SD)	161(42)	147(39)	159(41)	166(70)	0.248, 0.764
Resuscitation	7%	15%	0%	14%	0.716,0.704
HOL, mean(SD)	37(5)	35(5)	39(2)	35(5)	0.231, 0.197
	POCT Measurements				
Maternal BMI	R: 0.980, P-Value: 0.236				
Feeding Type	R: 0.275, P-Value: 0.001				
HOL	R: 0.020, P-Value: 0.806				
Time Elapsed from the Last feed	R: 0.011, P-Value: 0.898				
Resuscitation	R: 0.200, P-Value: 0.809				
	Control	SGA+LPT	LGA+IDM	P-Value	
Mean POCT	65	61	65	0.087	
Hypoglycemia (POCT) >24h <48h	4(7.8%)	6(12%)	3(6%)	0.548	
Hypoglycemia (Serum Glu) >24h <48h	2(3.9%)	2(4%)	0(0%)	0.363	

Table 2: Results

Abstract: 261

Nasal continuous positive airway pressure levels for the prevention of morbidity and mortality in very low birth weight infants: a systematic review and meta-analysis

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Background The use of nasal continuous positive airway pressure (nCPAP) over mechanical ventilation in very preterm infants increases survival without bronchopulmonary dysplasia (BPD). However, the magnitude of benefit is modest and nCPAP failure remains common. The impact of pressure level selection on nCPAP efficacy is uncertain.

Objective To compare the impact of "Low" (≤ 5 cm H2O) vs "High" (> 5 cm H2O) initial nCPAP pressure level selection in very low birth weight (VLBW) or very preterm infants.

Design/Methods This is the first report of a published Cochrane Neonatal Review Group (CNRG) protocol for this review question; we used the standard methodology of the CNRG. We included controlled trials that randomized VLBW or very preterm (< 32 weeks gestational age) infants to High vs Low initial nCPAP levels within 28 days of age. We compared nCPAP levels for initial and post-extubation respiratory support separately. Studies were eligible if they included the primary outcome of death or BPD at 36 weeks postmenstrual age or 1 of 17 pre-specified secondary outcomes.

Results Of 1580 search result records screened, 6 studies contributed data from 367 subjects (Figure 1; Table 1). For the comparison of nCPAP levels for initial respiratory support, a single study reported on the primary outcome of death or BPD; Low: 19/118 (16%) vs High: 18/111 (16%); risk ratio (RR) 0.99, 95% confidence interval (CI) 0.55, 1.79; (Murki, 2016). In meta-analysis of secondary outcomes, there were no significant differences between groups for nCPAP failure requiring endotracheal intubation or air leak syndrome (Figure 2). For the comparison of nCPAP levels for post-extubation respiratory support, a single study reported on the primary outcome of death or BPD; Low: 7/34 (21%) vs High: 10/35 (29%); RR (95% CI) 0.72 (0.31, 1.67) (Buzzella, 2014). In meta-analysis of secondary outcomes, there were again no significant differences between groups for nCPAP failure requiring endotracheal intubation or air leak syndrome (Figure 3).

Conclusion(s) There continues to be insufficient evidence to guide nCPAP level selection in preterm infants, with few studies, an overall limited sample size, and inconsistent outcome measures and effect estimates. Additional well-designed clinical trials addressing this key aspect of neonatal respiratory support are needed.

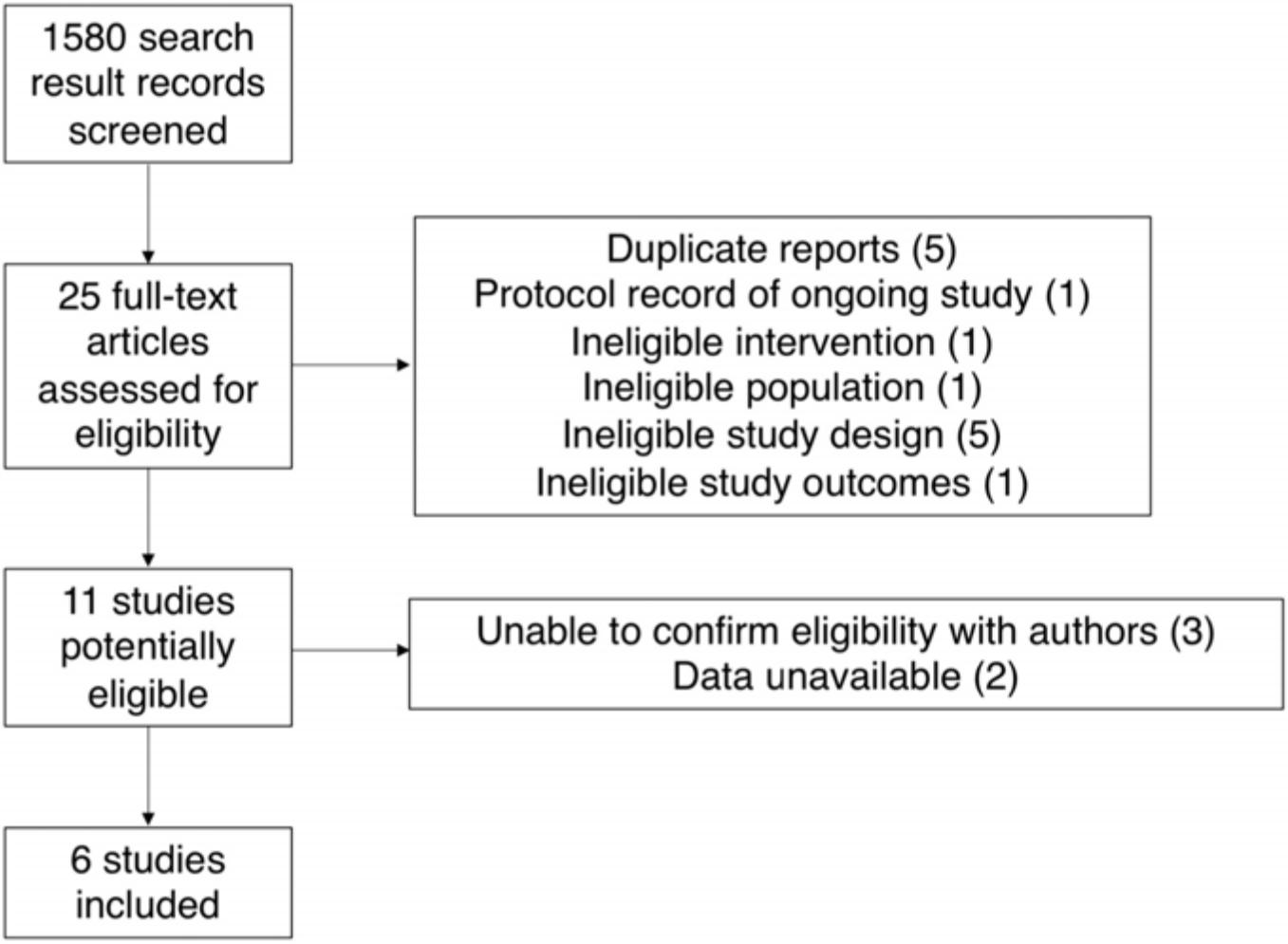

Figure 1. Systematic Review Flow Diagram. The standard search methodology of the Cochrane Neonatal Review Group was applied. The following search strategy was last applied on 10/9/2019: PubMed: ((infant, newborn[MeSH] OR newborn OR neonate OR neonatal OR premature OR low birth weight OR VLBW OR LBW or infan* or neonat*) AND (randomized controlled trial [pt] OR controlled clinical trial [pt] OR randomized [tiab] OR placebo [tiab] OR drug therapy [sh] OR randomly [tiab] OR trial [tiab] OR groups [tiab]) NOT (animals [mh] NOT humans [mh])); CINAHL: (infant, newborn OR newborn OR neonate OR neonatal OR premature OR low birth weight OR VLBW OR LBW or Newborn or infan* or neonat*) AND (randomized controlled trial OR controlled clinical trial OR randomized OR placebo OR clinical trials as topic OR randomly OR trial OR PT clinical trial); Cochrane Library: (infant or newborn or neonate or neonatal or premature or preterm or very low birth weight or low birth weight or VLBW or LBW).

Study	Timing of nCPAP	Eligible review outcomes	Eligible subjects (*N*)	
			Low nCPAP (≤ 5 cm H2O)	High nCPAP (> 5 cm H2O)
Dhir et al; Indian Journal of Pediatrics, 2016	Initial support	nCPAP failure requiring endotracheal intubation; air leak syndromes	7	9
Lavizzari et al; Archives of Disease in Childhood Fetal Neonatal Edition, 2014	Initial support	Measures of oxygenation (FiO2 to meet SpO2 targets), carbon dioxide values, heart rate, lung volume measurements	5	2
Murki et al; Acta Paediatrica, 2016	Initial support	Death or BPD; death prior to hospital discharge; nCPAP failure requiring endotracheal intubation; air leak syndromes; duration of supplemental oxygen; duration of continuous distending pressure; IVH; ROP, measures of oxygenation (maximal FiO2)	118	111
Miadema et al; Journal of Pediatrics, 2013	Initial support	Measures of oxygenation (transcutaneous), carbon dioxide values, lung volume measurements	10	10
	Post-extubation		1	1
Buzzella et al; Journal of Pediatrics, 2014	Post-extubation	Death or BPD; death prior to hospital discharge; nCPAP failure requiring endotracheal intubation; air leak syndromes; duration of supplemental oxygen; duration of endotracheal intubation; IVH; ROP	34	35
Kitsommart et al; e-Journal of Neonatology Research, 2013	Post-extubation	nCPAP failure requiring endotracheal intubation; air leak syndromes; duration of continuous distending pressure; IVH; measures of oxygenation (maximal FiO2 during nCPAP)	11	13

Table 1. Included studies. Abbreviations: NCPAP, nasal continuous positive airway pressure; N, sample size; cm H2O, centimeters of water; FiO2, fractions of inspired oxygen; SpO2, peripheral oxygen saturation; BPD, bronchopulmonary dysplasia; IVH, intraventricular hemorrhage; ROP, retinopathy of prematurity.

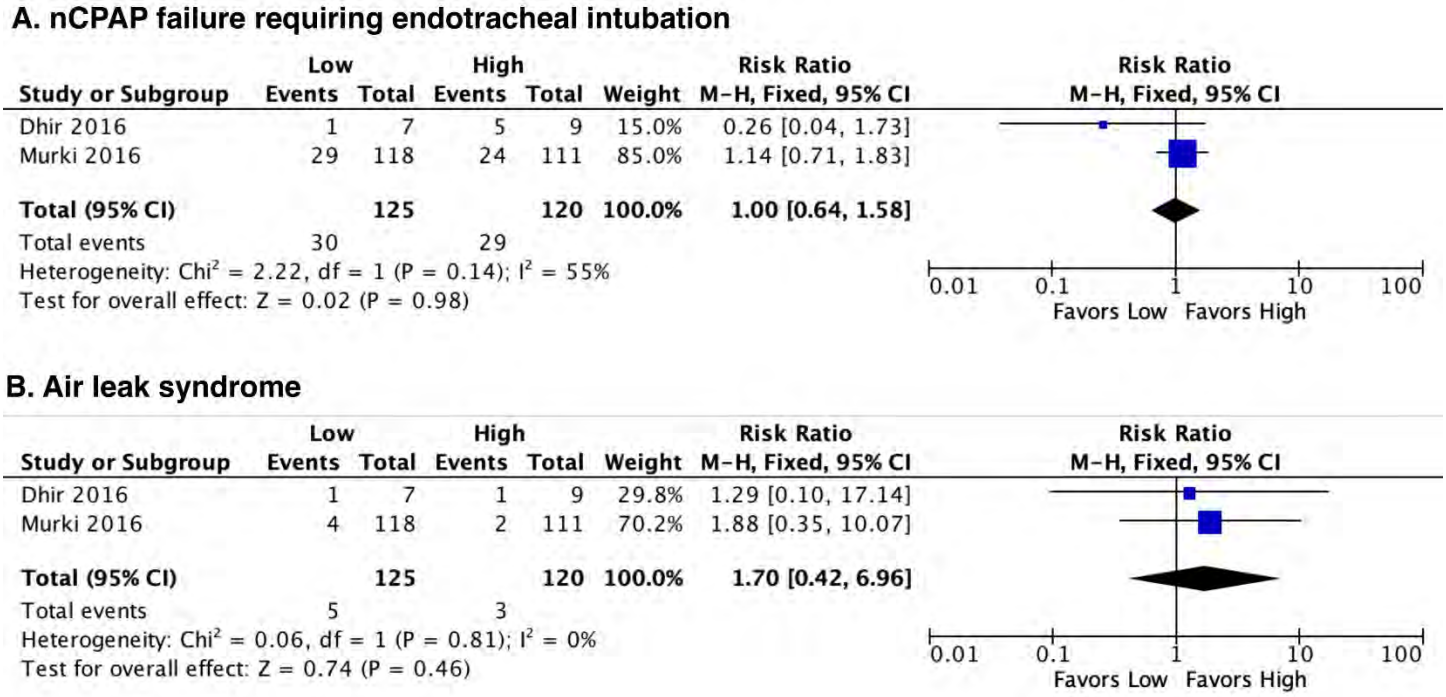

Figure 2. Impact of Low vs High nCPAP levels for initial respiratory support on nCPAP failure requiring endotracheal intubation and air leak syndromes. Forest plots depict impact of initial "Low" (≤ 5 cm H2O) vs "High" (> 5 cm H2O) nasal

continuous positive airway pressure (nCPAP) level selection for initial respiratory support in very low birth weight or very preterm infants within the first 28 days of life, for the outcomes of: (A) nCPAP failure requiring endotracheal intubation and (B) air leak syndromes. Meta-analysis performed through a Mantel-Haenszel fixed-effects approach for meta-analysis.

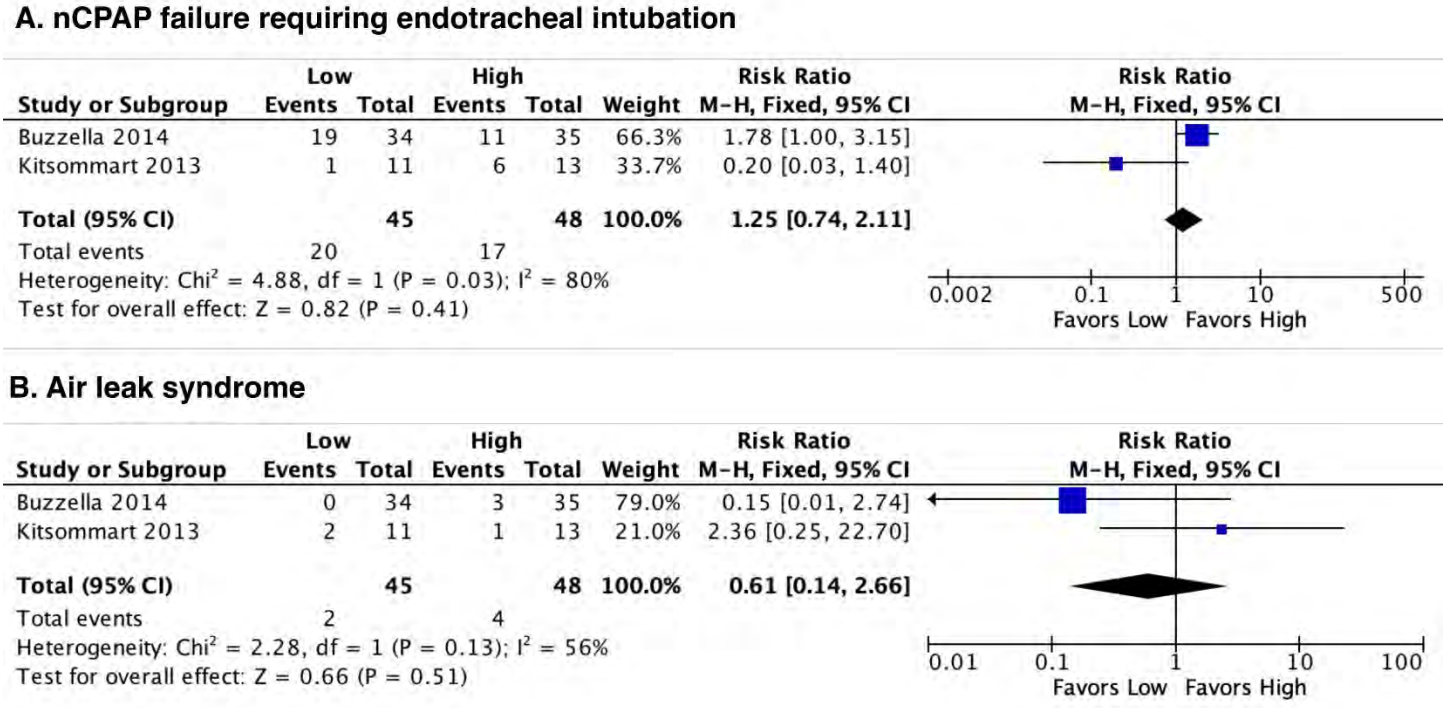

Figure 3. Impact of Low vs High nCPAP levels for post-extubation support on nCPAP failure requiring endotracheal intubation and air leak syndromes. Forest plots depict impact of initial "Low" (≤ 5 cm H2O) vs "High" (> 5 cm H2O) nasal continuous positive airway pressure (nCPAP) level selection for post-extubation respiratory support in very low birth weight or very preterm infants within the first 28 days of life, for the outcomes of: (A) nCPAP failure requiring endotracheal intubation and (B) air leak syndromes. Meta-analysis performed through a Mantel-Haenszel fixed-effects approach for meta-analysis.

Abstract: 262

Dry Electrode Electrocardiography (ECG), the NeoBeat, Decreases Time to Accurate Heart Rate (HR) Assessment in the Delivery Room (DR)

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Background Heart rate (HR) is used to guide interventions during DR resuscitation. Currently pulse oximetry (PO) and ECG are the preferred modes of HR assessment in the DR. However, each modality has limitations. PO is influenced by adequate perfusion and underestimates HR when compared to ECG. ECG electrodes are difficult to attach on wet skin and require appropriate skin preparation. Recently, dry electrode ECG technology (NeoBeat) has emerged as a potentially superior method of assessing HR and can be placed on wet skin.
Objective Compare time to accurate HR acquisition obtained via ECG, PO versus Neobeat during DR resuscitation.
Design/Methods Currently standard ECG and PO is utilized for HR assessment at deliveries. We previously established a practice plan to standardize ECG and PO placement and demonstrated that ECG was quicker at detecting HR. The availability of the NeoBeat (Laerdal Global Health) has afforded the opportunity for comparison with the other two methods for HR assessment. Upon delivery PO, ECG, and NeoBeat were placed in sequential order. Time of each device placement, time from placement to HR acquisition and total time to HR acquisition were observed and recorded independently. Data were analyzed using the Friedman test with post-hoc pairwise Wilcoxon signed-rank tests and Holm adjustment for multiple comparisons. The study was IRB approved.
Results 15 neonates with an average gestational age of 36wks and birthweight 2.62kg had all 3 devices placed and time to HR/device placement recorded. Ten (67%) were male. Four received PPV, 1 was intubated, and 6 received CPAP in the DR. No infant received chest compressions [Table 1]. The NeoBeat was placed faster (median 3s) than both PO (19s, p = 0.0002) and ECG (19s, p=0.0002) [Fig 1]. After placement the NeoBeat acquired HR faster (14s) than both PO (76s, p = 0.0002) and ECG (29s, p = 0.01) [Fig 2]. Total time from initiation of device placement to HR acquisition was fastest with the NeoBeat (17s) as compared to PO (100s, p= 0.0002)

and ECG (43s, p=0.0004)[Fig 3].(all duration values =median)
Conclusion(s) These preliminary observations in a small cohort of relatively well neonates demonstrate that the NeoBeat is significantly faster in time to device placement and time to HR acquisition than the other two modalities. Additional studies are ongoing to evaluate the role of NeoBeat in HR acquisition in newborns that need more advanced including intensive resuscitation.

Figure 1: Time for Device Placement

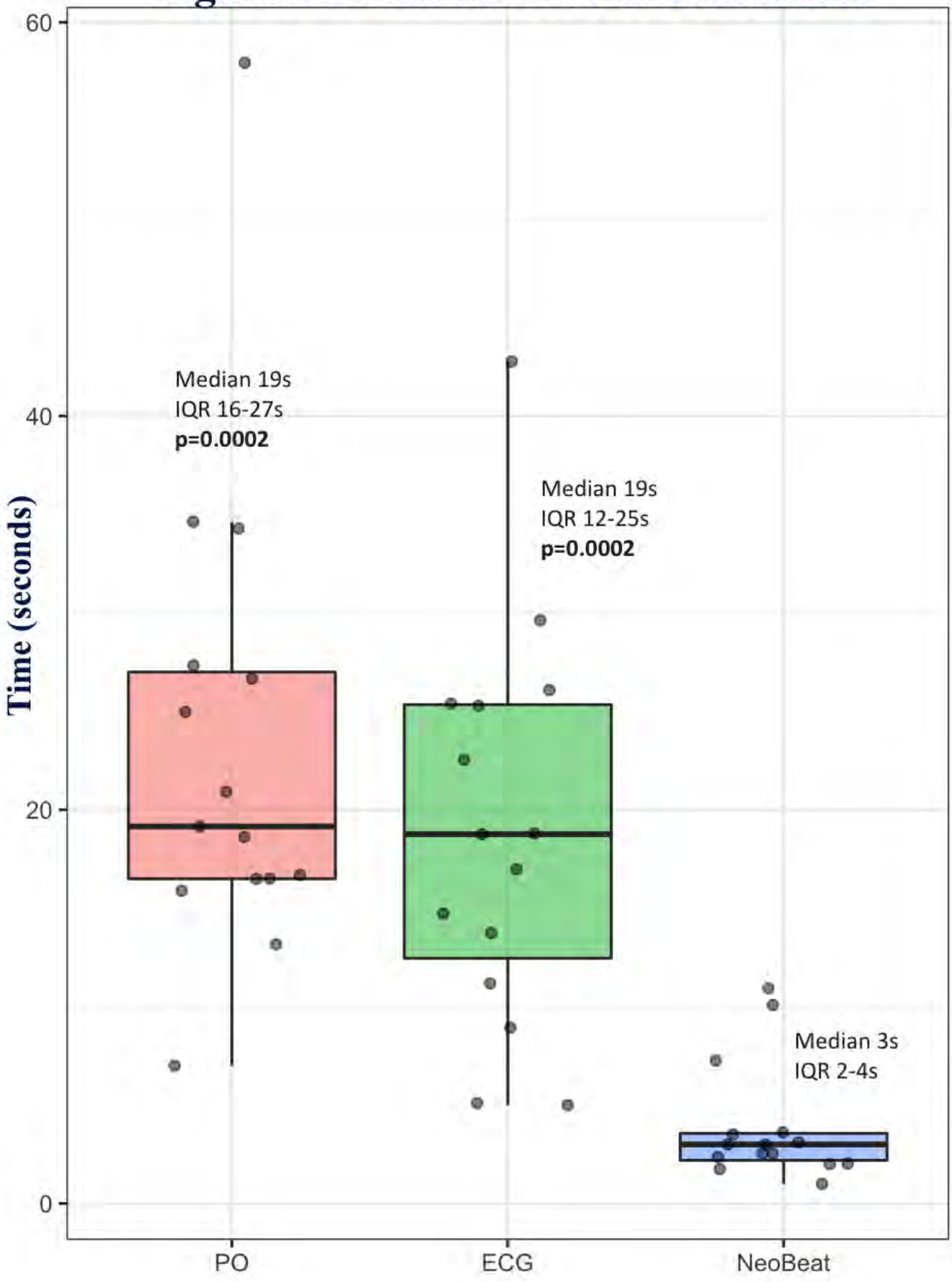


Figure 2: Time to HR Post Device Placement

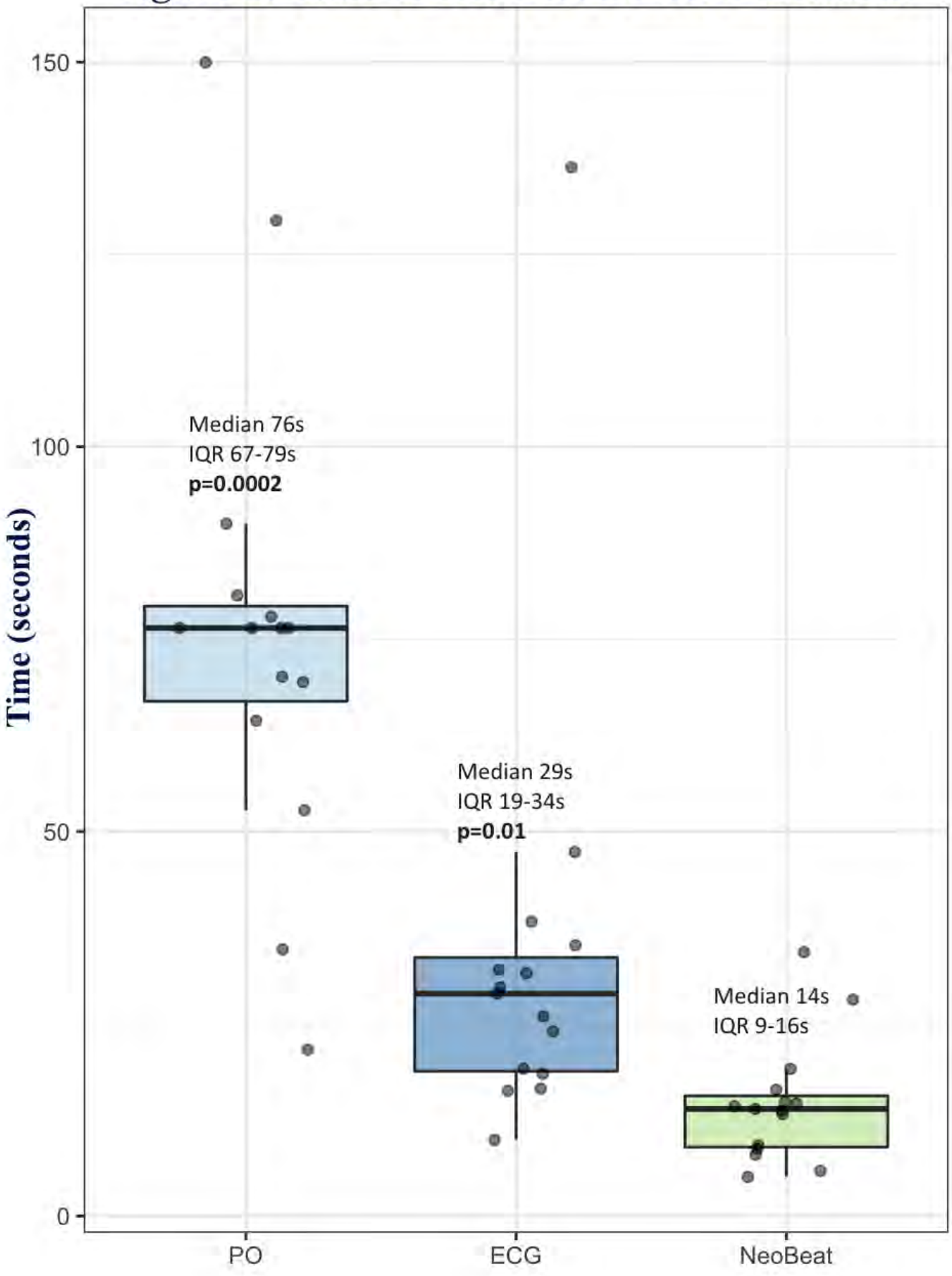


Figure 3: Total Time to HR Acquisition

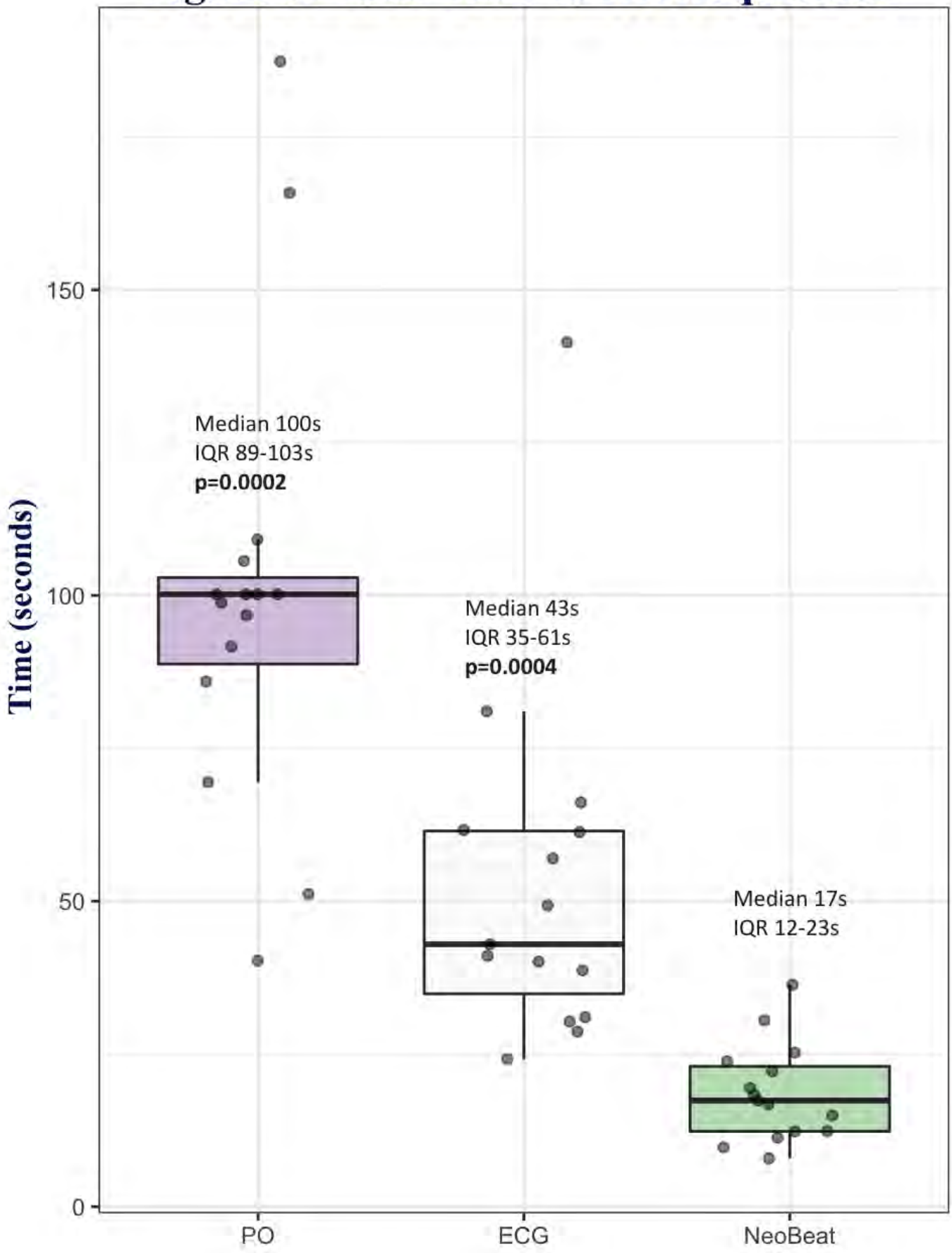


Table 1: Patient Demographics

	Total Patients (n=15)
Gestational Age (weeks) Mean (SD) Median [min, max] Preterm 34-36 6/7 wks Preterm <34 weeks	 36.0 (2.62) 34.6 [31.9, 40.9] 7/15 (46.7%) 2/15 (13.3%)
Birthweight (grams) Mean (SD) Median [min, max]	 2620 (736) 2450 [1590, 4010]
Mode of Delivery Cesarean Section Vaginal Delivery	 10/15 (66.7%) 5/1 (33.3%)
Gender Female Male	 5/15 (33.3%) 10/15 (66.7%)
Apgar (1 min) Median [min, max]	 8.00 [3.00, 9.00]
Apgar (5 min) Median [min, max]	9.00 [5.00, 9.00]
CPAP in the DR	6/15 (40%)
PPV in the DR	4/15 (26.7%)
Intubation in the DR	1/15 (6.7%)
Chest Compressions in the DR	0/15 (0%)

Abstract: 263

Respiratory Distress Severity Score (LPT-RDS severity score) to identify the Late Preterm Infants 34 - 36 6/7 weeks (LPT) with suspected Respiratory Distress Syndrome (RDS) that might benefit from Surfactant (surf) Administration

Adriana Restrepo-ormsby, Gita Jani, Lisa Drinker, Amy Zucker, Goel Rajiv, Sandeep Sadashiv, Purvi Kapadia-jethva, Matthew Devine, John Chuo
Pediatric/Neonatology, CHOP, Hatfield, Pennsylvania, United States

Background Although RDS in late preterm infants is relatively low (9%, 4% and 3% at 34, 35 and 36 weeks respectively), this group makes up the fastest growing subset of preterm infants with significant morbidity. Currently available assessment tools such as Silverman score (1956) and Downes' score (1970) to identify respiratory failure were established years ago prior to routine use of CPAP, pulse oximetry and surf administration. These methods are currently rarely used.

Objective Develop a scoring system (LPT-RDS severity score) to help identify LPT with suspected RDS that might benefit from surf administration.

Design/Methods We prospectively collected data on 116 eligible infants (LPT) with respiratory support ≧4hrs or surf anytime) from January 2018 until present in 7 units for: respiratory rate, grunting, retractions, respiratory support and FiO2 requirement **at 4hrs of age or at the time of surf if given < 4hours of age.** Additionally, we collected data on Chest x-ray, PCO2 and pH if available. Each characteristic was assigned a value from 0-2. LPT-RDS severity scores I, included sum of clinical characteristics while score II, included sum of clinical + labs/ x-ray characteristics.

Data were collected and sorted into three groups, No surf (n=72), early surf (n=34) and late surf (n=10)

Results Mean LPT-RDS severity score I were 3.5, 6.9 and 6.6 for the no, early, and late surf groups respectively with p value of <.001

for none vs early or late surf. There was no statistical difference between early v/s late surf with *p* value of 0.943. Mean LPT-RDS severity score II were 4.5, 8.9 and 8.2 for the no, early, and late surf group respectively with p value of <.001. Again, there was no statistical difference between early vs late surf with *p* value of 0.312.

Conclusion(s) LPT-RDS severity scores I and II at 4hrs of age were significantly lower in no surf group compared to early or late surf groups.

The LPT-RDS scores appear to correlate with clinical judgment in decision

Evaluation of Respiratory Distress Using Down's Score

	0	1	2
Respiratory Rate	< 60/min	60 – 80/min	> 80/min
Retractions	No retraction	Mild retractions	Severe retractions
Cyanosis	No cyanosis	Cyanosis relieved by O_2	Cyanosis on O_2
Air Entry	Good bilateral air entry	Mild decrease in air entry	No air entry
Grunting	No grunting	Audible by stethoscope	Audible with ear

Currently Available Respiratory Severity Scores

Clinical Assessment at the time of surfactant administration or at 4hrs of life (whichever comes first)

Assessment	at surf if <4hrs or 4hrs of life
Date	
time	
Respiratory Rate (0 =< 60 1=60-80 2=>80)	
Grunting (0=none 1= with stethoscope 2= without steth)	
Retractions (0=none 1=just visible 2=marked)	
Respiratory support (0=NC/HFNC 1=CPAP 2=Vent)	
FiO2 (0=21% 1=22-30% 2=>30%)	
Blood Gas (0=none 1= ABG 2=CBG)	
ABG/CBG pH (0=>7.25 1=7.15-7.25 2=<7.15)	
ABG/CBG Pco2 (0=<55 1=55-65 2=>65)	
Chest X ray (0=clear 1=hazy/>8ribs 2=ground glass/<8ribs)	

LPT-RDS Severity Score Values

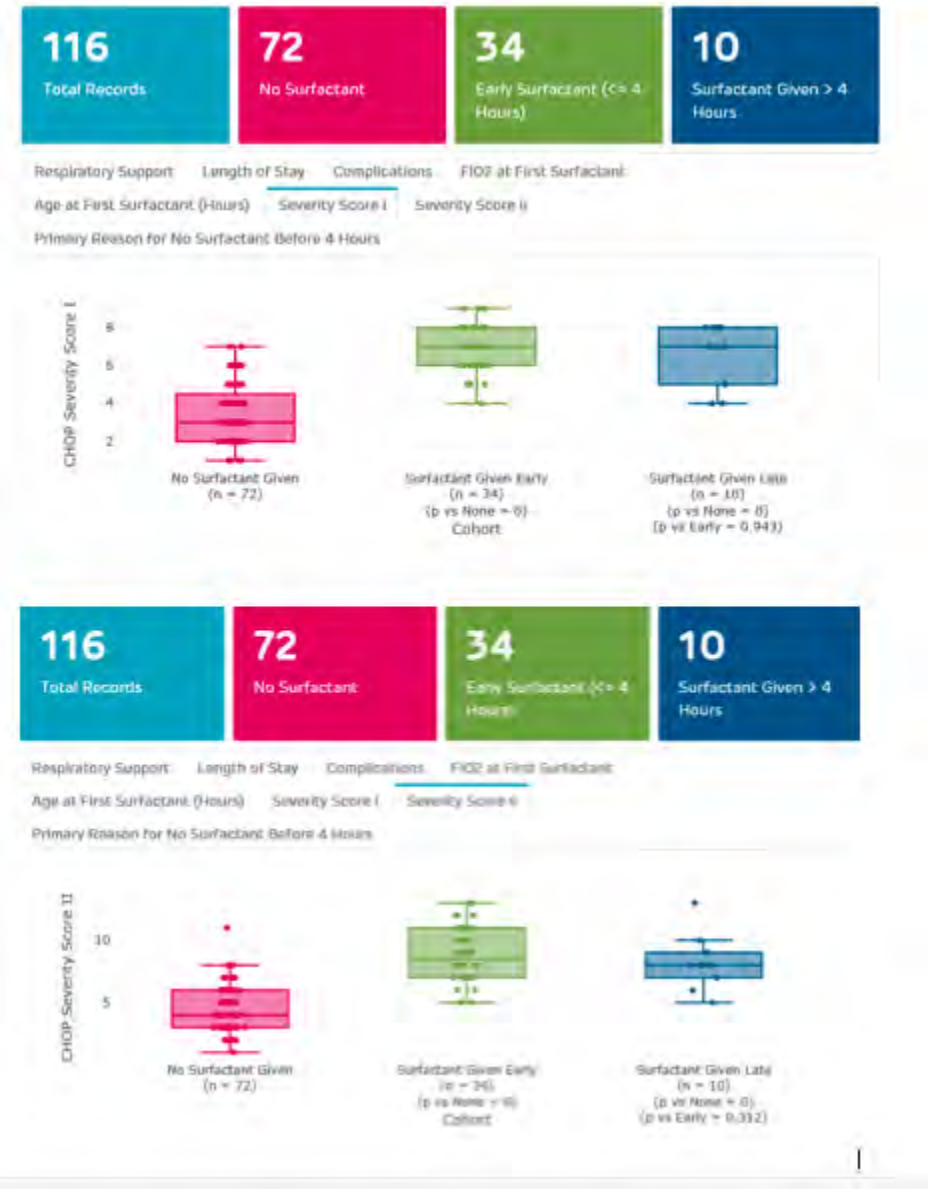
LPT- RDS Severity Score I

Cohort	Number	Mean Score	p-value vs No Surf	p-value vs Early Surf
No Surfactant Given	72	3.5	-	<.001
Early Surf (≤ 4 Hours)	34	6.9	<.001	-
Late Surf(> 4 Hours)	10	6.6	<.001	.943

LPT- RDS Severity Score II

Cohort	Number	Mean Score	p-value vs No Surf	p-value vs Early Surf
No Surfactant Given	72	4.5	-	<.001
Early Surf (≤ 4 Hours)	34	8.9	<.001	-
Late Surf(> 4 Hours)	10	8.2	<.001	.312

LPT-RDS Severity Score Data



LPT-RDS Severity Scores Graph

Abstract: 264

Impact of Nitric Oxide with Vitamin A on Vascular Proteins in Fetal Lung Endothelial Cells

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Background Interrupted lung vessel formation underlies preterm infant bronchopulmonary dysplasia (BPD). BPD rates remain unaltered despite respiratory care advancements. Therapy with Vitamin A (retinoic acid, RetA) alone or Nitric Oxide (NO) alone have some potential lung benefits, but not to a sufficient degree to warrant routine clinical use. Recent work by us and others suggest Vitamin A and NO act synergistically to promote angiogenic development in immature lungs exposed to O_2, leading to potential reduction in BPD. The molecular pathways involved in the positive vascular effects are not understood.

Objective O_2 exposure disrupts angiogenic and angiostatic protein levels in immature lungs, altering lung microvascular development. Combined RetA and NO treatment during O_2 may ameliorate this disruption.

Design/Methods Gestational day 19 fetal mouse lung endothelial cells (ATCC) were cultured (48 hours) in Room Air (RA), O_2 (0.4 FiO_2), or O_2 ± NO (10ppm) and ± RetA (10^{-8}). At 48 hours, cell lysates were analyzed with a targeted mouse angiogenic antibody microarray (R&D Systems). Protein levels were quantified by densitometry. Significant differences in protein expression between RA, O_2 and O_2 + NO + RetA conditions were identified by multivariate analysis with FDR rate cutoff of 0.01 ($q<0.0001$).

Results The microarray consisted of 53 proteins, 32 angiogenic and 11 angiostatic. Compared to RA, 30 proteins were significantly altered by 0.4 FiO_2 exposure; 19 angiogenic proteins were increased and 6 decreased; 2 angiostatic proteins were increased and 3 decreased. Compared to O_2 alone, 8 proteins (Table) were altered by exposure to combined therapy (O_2+NO+RetA); 5 of these 8 were also impacted by O_2 alone. All had a reversal of the O_2 effect by combined therapy except IP10, that was further decreased by combined therapy. Three proteins (all angiogenic) modified by combined therapy were not impacted by O2 alone (----).
Conclusion(s) O_2 profoundly impacts many proteins that regulate lung angiogenesis. NO + RetA combined therapy during O_2 exposure partially reverses only a small number of these proteins, and also impacts proteins not impacted by O_2 alone. Our prior studies show that NO + RetA combined therapy improved in vitro endothelial cell tube formation. That work, together with this study, suggests that NO + Ret A therapy during O_2 use may attenuate abnormal vascular development in developing lungs exposed to O_2 by modifying a small set of angiogenic proteins.

	RA vs O_2	O_2 vs Combined Therapy
Angiogenic		
Pentraxin 3	↓	↑
Serpin E1	↓	↑
Cyr61	↑	↓
Coagulation Factor3	------	↑
CXCL16	------	↓
MCP-1	------	↓
Angiostatic		
IGFBP3	↓	↑
IP10	↓	↓↓

Abstract: 265
Early Surfactant Administration Might be Beneficial in Late Preterm Infants with Suspected RDS by Reducing Respiratory Morbidity
Adriana Restrepo-ormsby, Gita Jani, Lisa Drinker, Amy Zucker, Goel Rajiv, Sandeep Sadashiv, Purvi Kapadia-jethva, Matthew Devine, John Chuo
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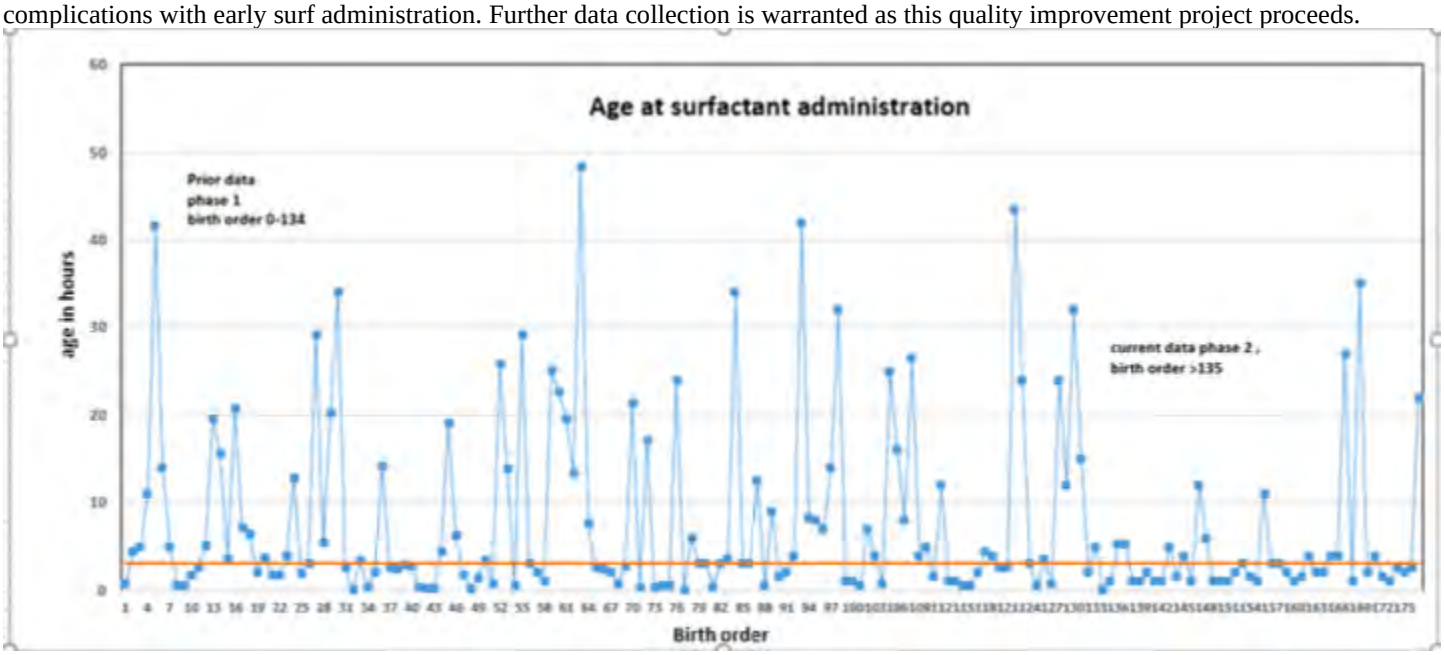
Background Prior studies concluded insufficient data exists for timing and benefits of early surfactant (surf) in Late Preterm Infants (LPT) with Respiratory Distress Syndrome (RDS) while clear guidelines exist in infants < 32 weeks.
Prior prospective observational study of (78 infants from 7/15 to 7/16) in our network (phase 2) comparing no surf, early (≤ 4 hours) and late (> 4 hours) surf administration in LPT with RDS demonstrated that duration of respiratory(resp) support was higher in the late surf vs early surf group (p 0.014). The incidence of pneumothorax was significantly higher in the late surf (12.8%) compared to early surf group (2.3%). Early surf administration rate was 59%
Objective Implement an Early Surf Recommendation for (LPT) with suspected RDS to reduce incidence of resp morbidity.
Design/Methods We prospectively collected data (phase 3) on 111 eligible infants (LPT with respiratory support ≧4hrs or surfactant anytime) over 24 months in 7 units with the goal to increase early surf administration from 59% to >75%.

Guidelines were established for close observation and early surf administration in these LPT. The ultimate decision to administer surf was at the discretion of the physician. Implementation across 7 units was done using improvement methodology.
Data were collected and sorted into three groups,

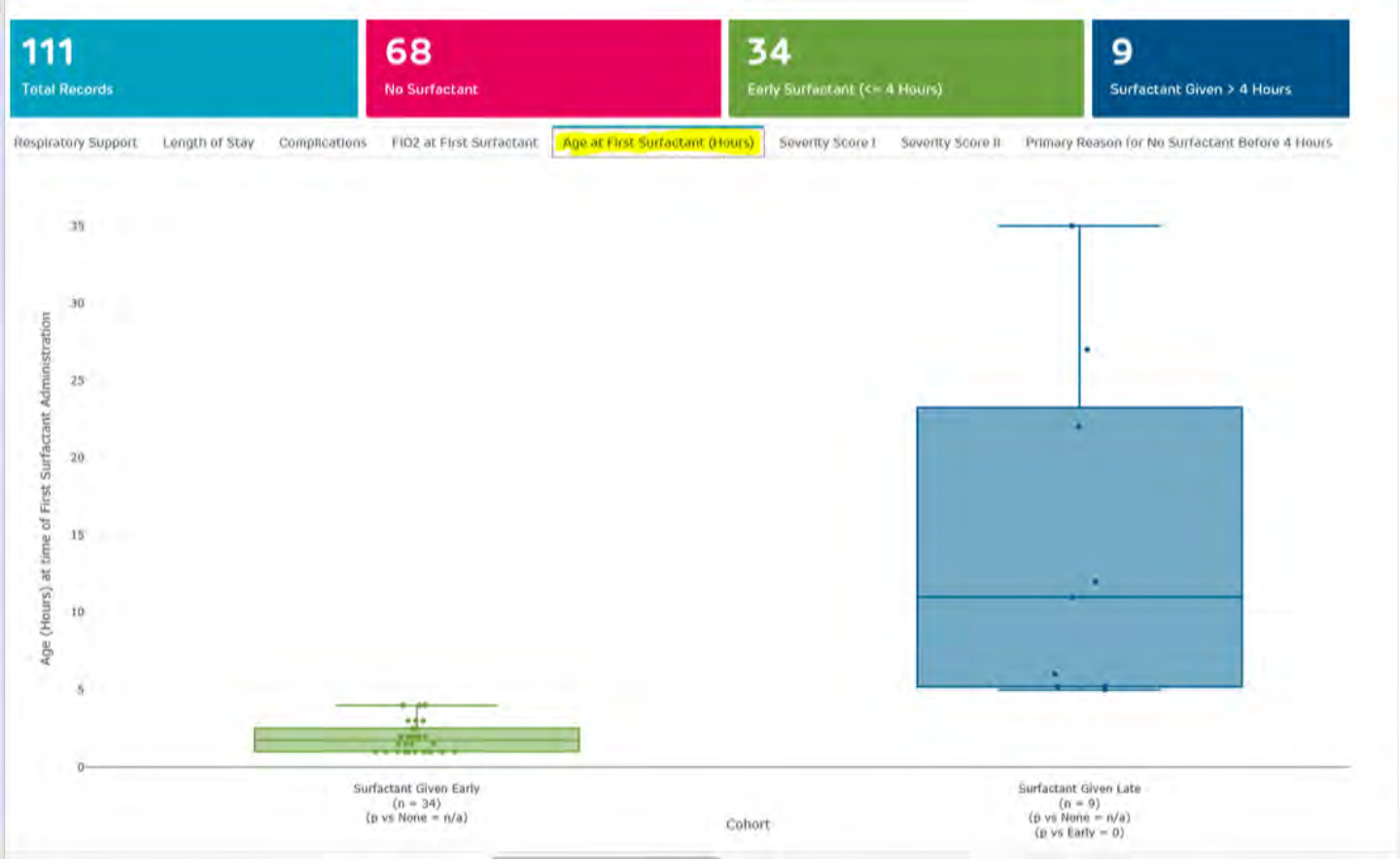
No surf (n=68), early surf (n=34) and late surf (n=9) for the duration of resp support, primary indicators for early surf, age at surfactant and complications.

Results Primary reasons for early surf were FiO2 >30% and work of breathing. Median age at surf was 1.8 hours and 11 hours for early and late surf respectively, (p value=0). We increased the early surf administration from 59 to 79%, this correlates with special cause signal in the run chart starting Feb 2019. Total median resp support hours were 20, 59.5 and 45 for no surf, early surf and late surf group respectively, p value not significant for early v/s late surf. The incidence of pneumothorax was 1.4%, 2.9% and 11% in no surf, early surf and late surf respectively p value (no surf vs early: 0.3, no surf vs late: 0.007 and early vs late 0.03).

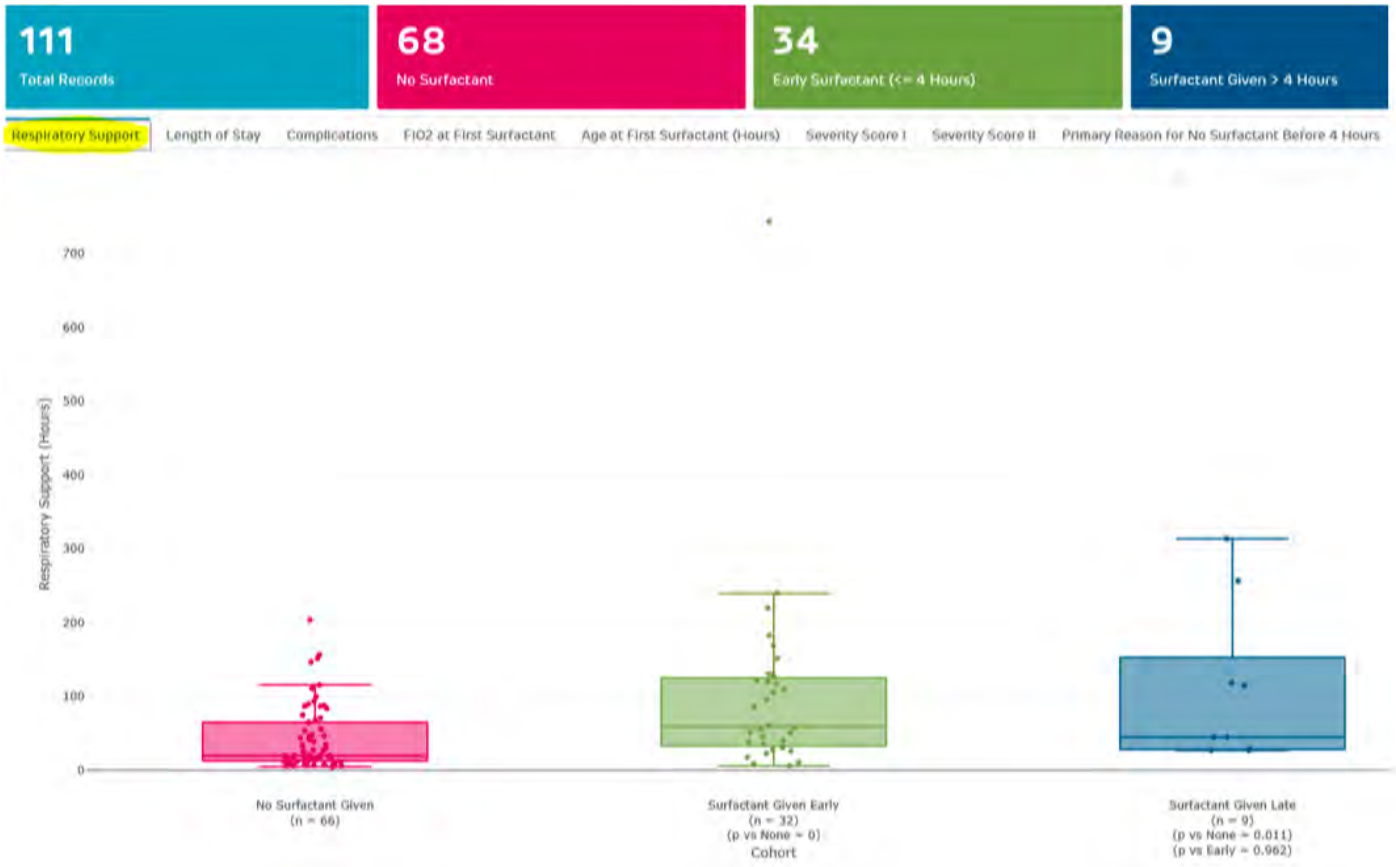
Conclusion(s) Conclusions: We were able to exceed our goal to increase early surf administration from 59% to 79% without complications related to early surf administration. We continue to show significant lower incidence of pneumothorax and other complications with early surf administration. Further data collection is warranted as this quality improvement project proceeds.



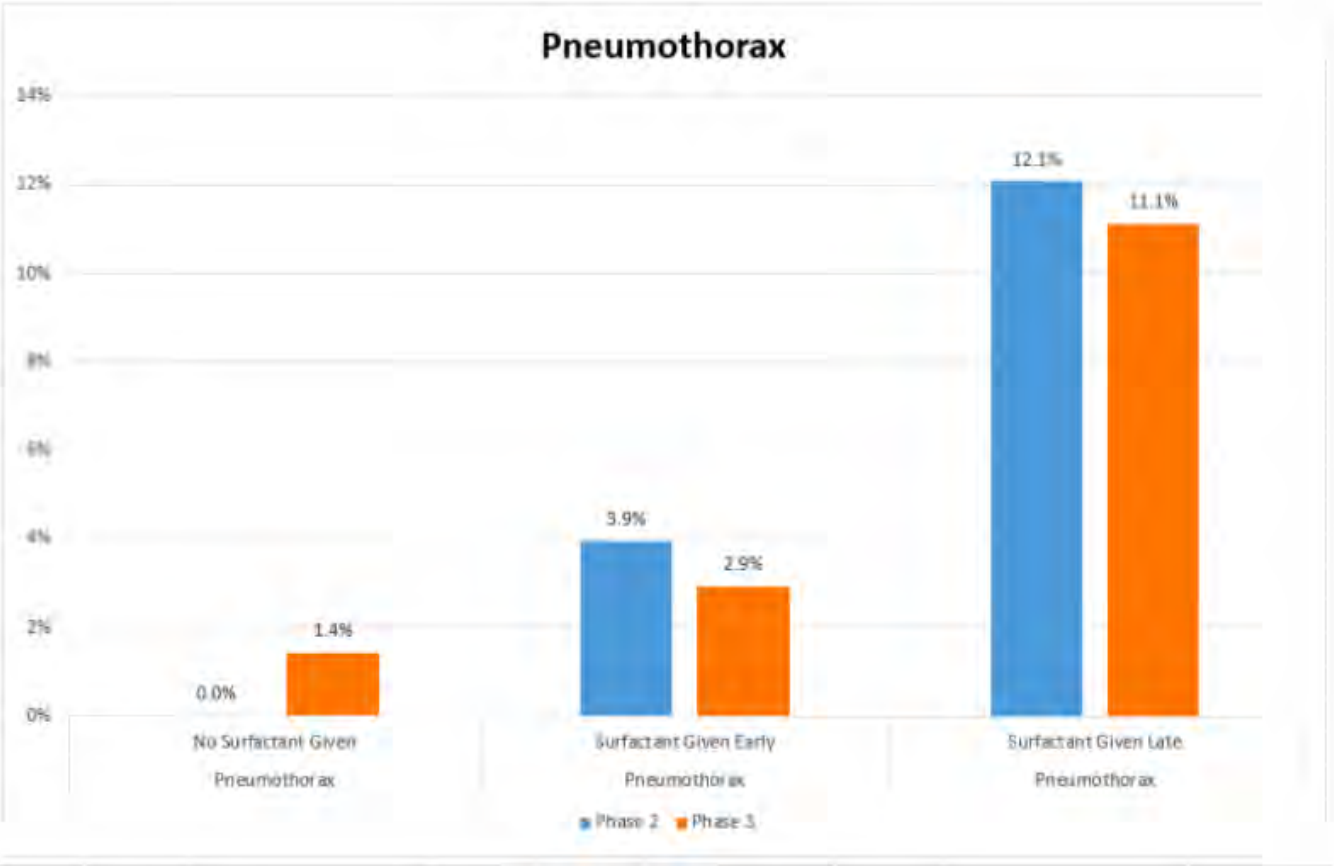
Age at Surfactant administration Run Chart



Age at Surfactant administration



Total Respiratory Support Hours



Pneumothorax Incidence

Abstract: 266

Efficiency, efficacy and confidence with drill-assisted as compared to manual intraosseous needle placement in a newborn model

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Background The Neonatal Resuscitation Program recommends intraosseous (IO) access as an alternative route for medications during resuscitation when vascular access cannot be obtained. However, most trained providers have limited or no experience with the use of an IO device and data regarding provider's experience with this skill in a newborn are scarce. Furthermore, there are currently no studies which have compared provider efficiency, efficacy and confidence with drill-assisted as compared to manual IO needle placement in a size-appropriate simulated newborn model.
Objective To determine whether there is a difference in efficiency, success rates and confidence in neonatal IO placement with drill-assisted as compared to manual insertion.
Design/Methods This IO placement study was embedded in a prospective, randomized trial to evaluate pharmacokinetics and efficacy of IO epinephrine. The newborn ovine asphyxia model affords optimal procedural simulation as term lambs are comparable in size to a newborn. IO access was placed in asphyxiated study animals prior to resuscitation. The method of IO access placement was designated by a randomly selected treatment card. IO needles were inserted on the flat surface of the tibia, medial to the tibial tuberosity. Time to placement and success rates (defined as presence of blood aspirate) was recorded. A post intervention survey was completed by providers. The survey assessed confidence with insertion and placement as well as ease of aspiration and securement using a 5-point Likert scale. Outcomes and responses were compared by Student's t-test with significance defined as $p < 0.05$.
Results A total of 23 procedures were performed by 8 providers during the study period. The average time to obtain IO access was 8.7 seconds faster with a drill (Figure 1). Success rates were 100% with drill-assistance as compared to 90% with manual IO. Drill-assisted placement also resulted in higher scores for confidence with insertion and placement as well as ease of aspiration and securement (Figure 2).
Conclusion(s) IO needle placement was found to be faster with the drill-assisted device, however this difference may be of limited

clinical relevance. Importantly, there were significant differences in the perceived confidence and procedural ease with drill-assistance. As healthcare professionals commonly lack experience with this procedure, access to appropriate simulation models, education and equipment for clinical use with newborn care is warranted

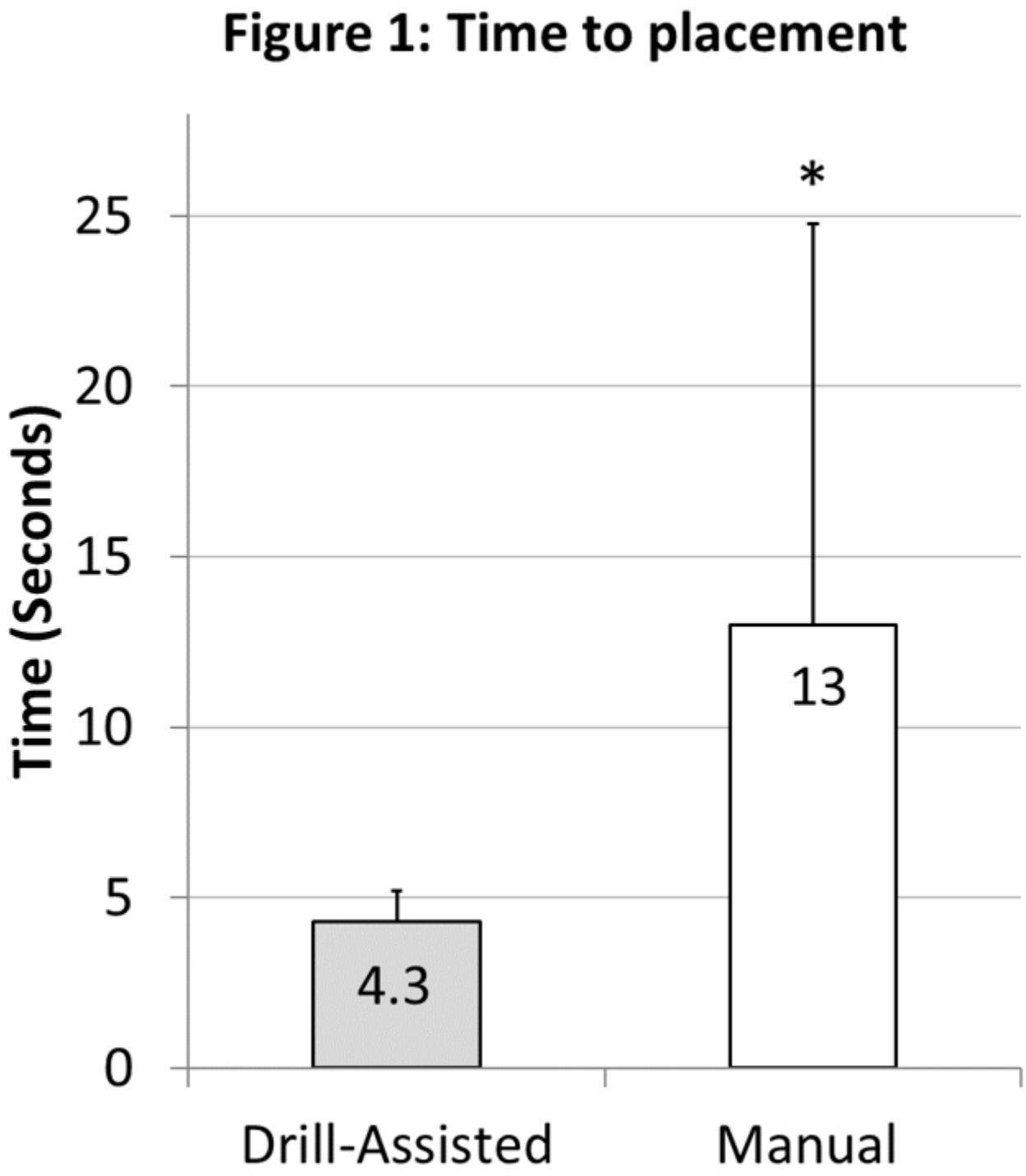

Figure 1: Time to placement with drill-assisted and manual IO. * $p < 0.05$ as compared to drill-assisted.

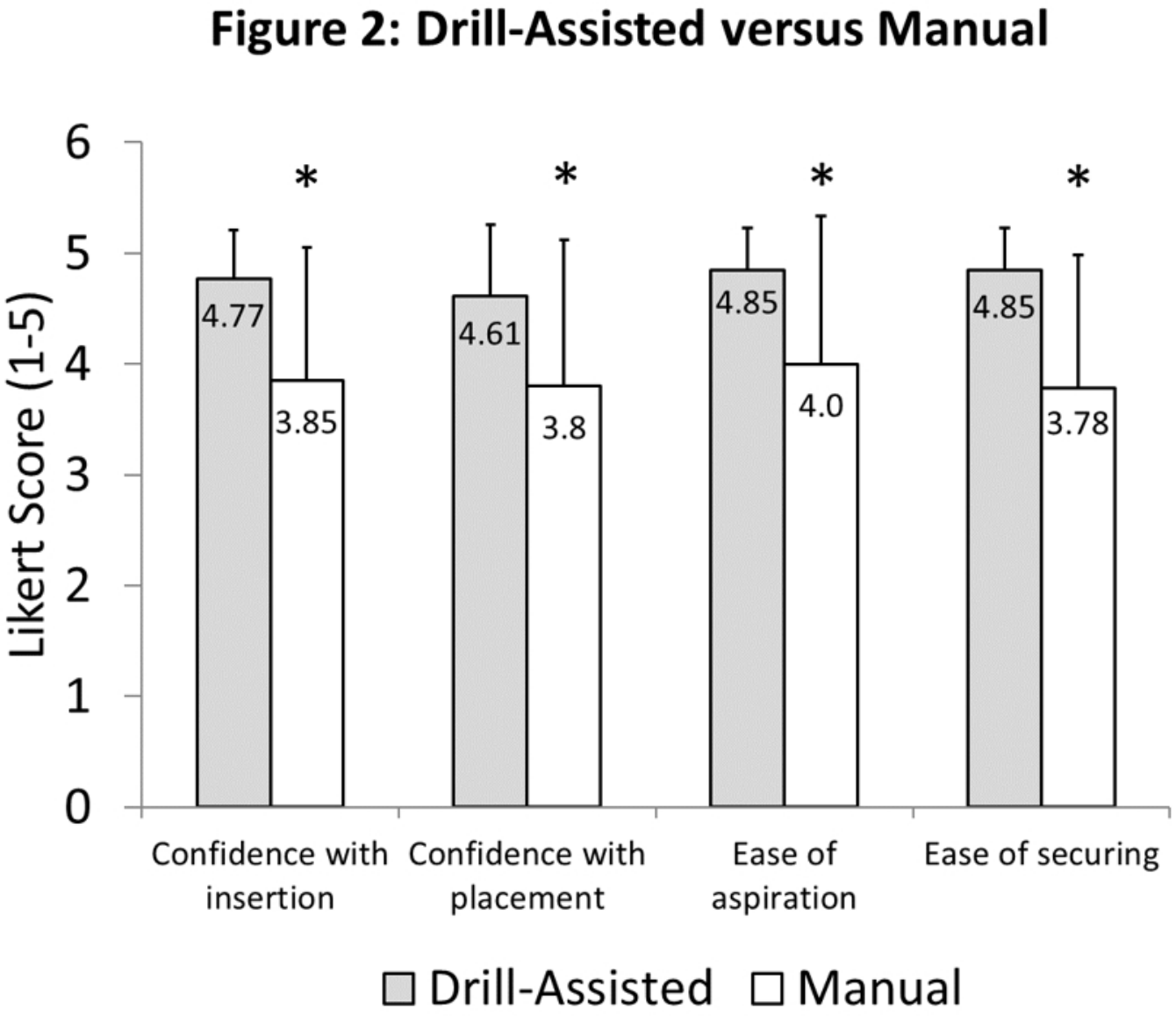

**Figure 2: Survey results for confidence and ease of use with drill-assisted as compared to manual IO. *** $p < 0.05$ as compared to drill-assisted.

Abstract: 267

iNO Prevents Apparent PRBC Transfusion (Tx)-Induced Reduction of Gut Microcirculatory Flow in Preterm Neonates

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Background The most common indication for packed red blood cell (PRBC) transfusion (Tx) is extreme anemia ± clinical signs yet, no universally agreed upon safe Hct has been identified. Extreme anemia is an independent risk factor for NEC and combined exposure to PRBC Tx increases that risk – a phenomenon known as Transfusion Related Acute Gut Injury. Sood et al showed that a subset of anemic VLBW neonates Tx'ed had a fall in NIRS splanchnic oxygenation before the onset of NEC despite a rise in their CNS NIRS. Since Hgb must rise with Tx, falling NIRS suggested a PRBC-induced reduction in flow to a single microvascular bed. During extreme anemia, NO is released from S-nitrosyl-Hgb as a local vasodilator. PRBCs are devoid of NO & have significant quantities of free Hgb that scavenge available endogenous NO in humans at 100-1,000 fold higher affinity leading to vasoconstriction and resultant injury. We hypothesized that iNO could prevent the putative NO-scavenging vasoconstrictor effect.

Objective To evaluate the effect of iNO on NIRS before, during, and after PRBC transfusion for extreme anemia.
Design/Methods 5 neonates (Hct: 23 ± 1; 23%; Retic: 5.6 ± 0.9; 5%, *mean ± sem; median*) at 6 wks postnatal age who were Tx'ed with PRBC 15 ml/kg over 3h for a progressively falling Hct were evaluated. Cerebral, splanchnic, and flank NIRS probes were placed. We administered iNO 20 ppm 1h before, during & 1h after the Tx to mitigate the presumed microvascular risk.
Results BW and GA ages were 1012 ± 326; 685g, 29 ± 2; 27wks & patients were studied on postnatal day 42 ± 6; 43d. 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. After Tx, CNS & flank NIRS increased 50-100% over low baseline values & fractional extraction improved by 50% in all patients. However, in only 3 infants the splanchnic NIRS signal fell by 40% within 2-3h of discontinuing iNO accompanied by worsening of FTOE by 50%. There were no differences in in antecedent risks, vital signs, or other co-morbid factors between the two groups.
Conclusion(s) These data suggest that only high FTOE/low gut NIRS identified those mucosal barrier systems likely to have hypoxia-induced inflammation and enhanced microvascular sensitivity showing a paradoxical effect of PRBC on tissue oxygenation. We initiated a FDA #1571 approved, 3 site, blinded RCT (ClinicalTrials.gov) to confirm the association with iNO during PRBC Tx.

Abstract: 268
Use of High Frequency Percussive Ventilation as an Alternative Ventilation Strategy in ELGANs
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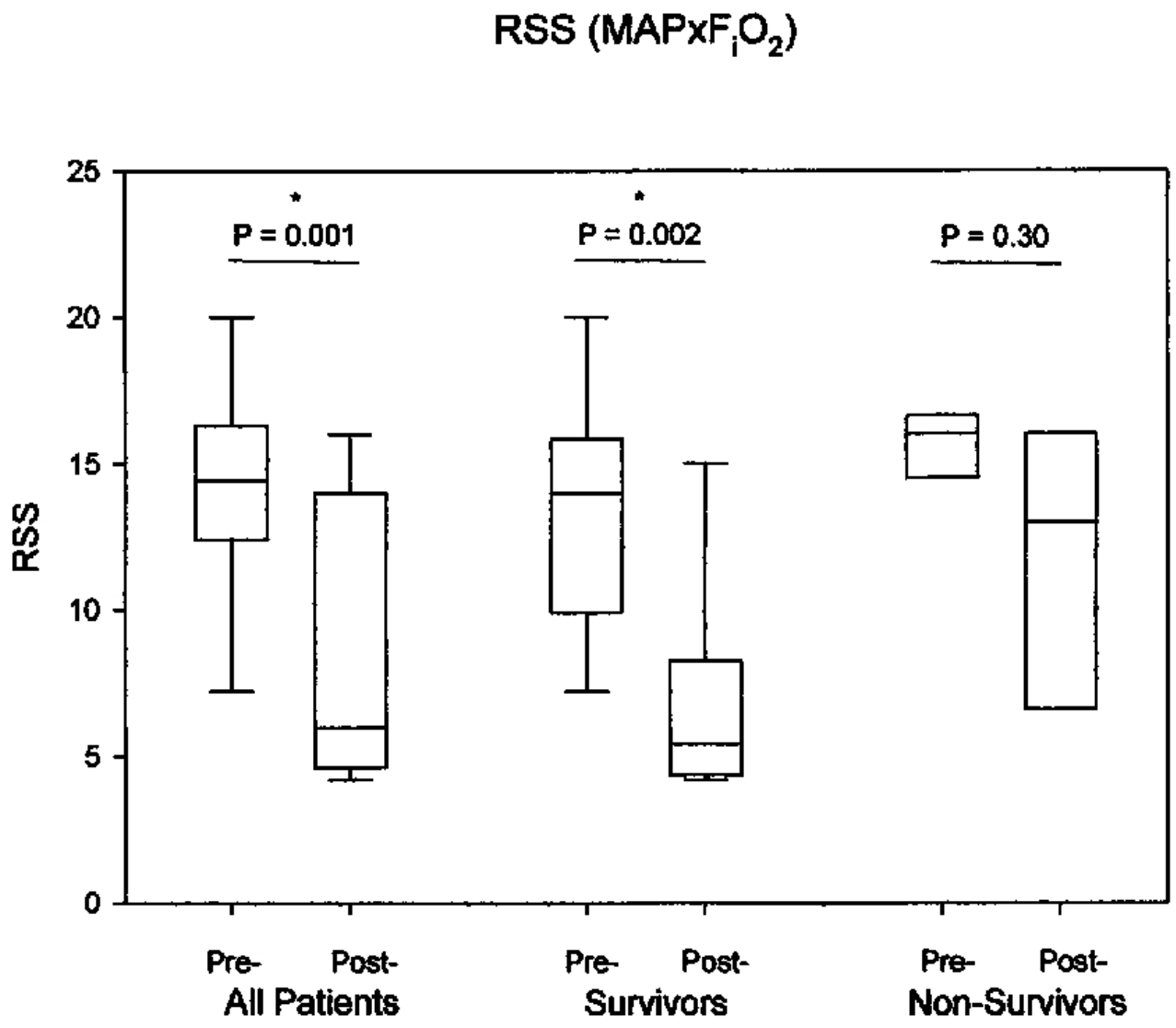
Background High frequency percussive ventilation (HFPV) is a more versatile form of high frequency ventilation that allows high-frequency breaths to be superimposed upon conventional ventilation. It is often used as a rescue strategy in severe lung disease unresponsive to maximal conventional support with repeated areas of alveolar collapse secondary to increased airway secretions in an effort to combine the benefits of both conventional and high frequency ventilation while reducing any associated damage. We retrospectively reviewed ELGAN neonates who failed multiple ventilator strategies for improvement upon trial of HFPV.
Objective To evaluate the use of HFPV as an alternate ventilation strategy in the ELGAN population
Design/Methods Retrospective review of ELGAN infants which required HFPV due to severe lung disease. Alternative ventilator strategies, settings, and demographics were recorded. Respiratory severity scores (RSS) were also calculated for each infant
Results 9 infants with an average gestational age of 25.4±1.4 (average±SD) weeks and birth weight of 667±172 grams were evaluated. All infants were trialed on multiple ventilator methods with no improvement in their severe lung disease prior to being transitioned to HFPV. Of the 9 infants, 6 survived and 3 did not. Of the infants that survived, the RSS prior to being placed on the HFPV was 14 (11.6, 14.3) (median, interquartile range) with a decreased to 5.4 (4.5, 6.0) after the change. For the three infants that died there was an RSS of 16 (15.3, 16.3) with a smaller decrease to 13 (9.8, 14.5) following the switch to HFPV.
Conclusion(s) For the infants that survived there was a dramatic improvement in RSS due to an improvement in oxygenation following placement on HFPV. This indicates an improved functional residual capacity from the effectiveness of HFPV in alveolar recruitment. The infants that died did not show as dramatic a reduction in RSS as those that survived therefore they may be a more specific population that can benefit from HFPV. For several of the infants, mucus plugging was believed to be a major component of their respiratory complications. HFPV has been previously shown to be very effective in aiding mucociliary clearance of secretions. While the full breadth of uses for the HFPV in the neonatal population may not be fully understood, we propose that it can be beneficially in neonates with shifting atelectasis believed to be due to extensive mucus plugging. We also propose using HFPV earlier in management instead of only as a rescue maneuver.

Demographics	Survived	Non-Survived	Total
GA (mean)	25 (±0.9)	27.1 (±1.4)	25.5 (±1.5)
BW (gm)	685 (±131)	631 (±268)	667 (±172)
APGAR (1MOL)	3 (±2)	3 (±1)	3 (±2)
APGAR (5MOL)	5 (±2)	6 (±1)	5 (±2)
PDA	5/6	3/3	10/11
Prenatal Steroids	6/6	2/3	10/11
DOL VDR started	55 (47,71)	60 (51,123)	60 (46, 74)
DOL VDR stopped	105(68,110)	157(120,205)	105(82,140)
MAP Pre	14 (13.3,16.3)	16 (15.3,16.3)	14.5 (14,16.6)
MAP Post	13 (11.3,14.8)	13 (12,14.5)	13 (11, 15)
FiO2 Pre	0.98 (0.9, 1.0)	1.0 (1.0,1.0)	1.0 (0.95,1.0)
FiO2 Post	0.45 (0.4,0.6)	1.0 (0.8,1.0)	0.6 (0.4,1.0)
RSS Pre	14 (11.6,14.3)	16 (15.3,16.3)	14.5 (14,16)
RSS Post	5.4(4.5,6.0)	13 (9.8,14.5)	6 (4.8,13)

Demographics



RSS before and after HFPV initiation

Abstract: 269

Noninvasive Ventilation after Extubation in Infants Admitted to the Neonatal Intensive Care Unit: An Institutional Experience

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Background Noninvasive ventilation as compared to mechanical ventilation is an important strategy in improving outcomes in preterm neonates. Studies have shown that noninvasive ventilation of continuous positive airway pressure (CPAP), bi-level PEEP(SIPAP), or HFNC is as effective as invasive ventilation with no increased difference in mortality or rates of bronchopulmonary dysplasia. Studies have shown reduced incidence of nasal trauma with HFNC compared to CPAP and survey studies show preference by nurses and parents due to improved perception of comfort.

Objective The purpose of this study is to evaluate the effectiveness of HFNC as compared to SIPAP and CPAP in preventing reintubation within the first 72 hours of extubation. Recently HFNC has become part of the standard of care for respiratory support for infants at NYU. Secondary objectives included evaluating the characteristics associated with extubation failure in neonates.

Design/Methods This was a retrospective observational study. All intubated infants born at NYU Langone Health from January 1, 2016-December 30, 2018 who were admitted to the NICU were included. Infants were divided into three cohorts based on mode of non-invasive ventilation after extubation, CPAP, SIPAP, HFNC. Exclusion criteria included extubation to room air or nasal cannula, transfer out prior to discharge, death, discharge on a ventilator, or significant congenital anomalies. Data analysis was done utilizing SPSS 25.
Results 180 infants were included in the study. 19 infants were reintubated within the first 72 hours. Of these 90% were on Sipap ventilation mode and 10.5% were on CPAP, no patients on HFNC were reintubated. The infants who were reintubated were younger with a mean adjusted gestational age (GA) of 28.0 days as compared to 33.3 days of life. They were smaller infants and on the ventilator for longer. Infants requiring reintubation had higher FIO2 requirements after extubation, with blood gases notable for lower pH and higher pCO2s as well as higher respiratory rates.
Conclusion(s) Infants with smaller birth weight and younger GA were more likely to be extubated to SIPAP and have higher rates of extubation failure. We found no difference in extubation failure in near-term and term neonates who were extubated to either CPAP or HFNC. Therefore we conclude that HFNC is as effective as CPAP for near-term and term neonates. More studies need to be done in preterm infants to evaluate the effectiveness of HFNC and CPAP.

Table 1. Demographics							
	CPAP		SIPAP		HFNC		p-Value
N, %	59	32.8	104	57.8	17	9.4	
Gestational Age days (Mean, SD)	37.1	3.65	29.4	4.37	38.2	3.53	<0.01
Preterm (n, %)	17	28.8	95	91.3	3	17.6	<0.01
Birthweight, grams (Mean, SD)	2913.3	839.7	1394	798.8	3135.6	864.8	<0.01
Gender							NS
Male (n, %)	31	52.5	57	54.8	10	58.8	
Female (n, %)	27	45.8	47	45.2	7	41.2	
Size							NS
AGA (n, %)	53	89.8	92	88.5	14	82.4	
SGA (n, %)	3	5.1	8	7.7	1	5.9	
LGA (n, %)	3	5.1	4	3.8	2	11.8	
IUGR	1	1.7	8	7.7	1	5.9	NS
Gestation							NS
Singleton (n, %)	52	88.1	82	78.8	16	94.1	
Twins (n, %)	7	11.9	21	20.2	1	5.9	
Triplet (n, %)	0	0	1	1	0	0	
Delivery Mode							NS
NSVD (n, %)	29	49.2	34	32.7	7	41.2	
C-section (n, %)	30	50.8	70	67.3	10	58.8	
LOS days (Mean, SD)	30	29.6	78.6	47.8	40.8	40.4	<0.01
Weight at discharge, grams (Mean, SD)	3397.4	753.7	3058.4	753.7	3803.2	909.9	<0.01
Days To Full feeds (Mean, SD)	19.1	49.2	24.8	20	22.1	32.3	NS
Corrected Age at Discharge days, (Mean, SD)	41.3	3.4	40.6	4.9	44.1	3.9	<0.05

Table 1: Demographics

Table 2. Maternal Demographics							
	CPAP		SIPAP		HFNC		p-Value
N, %	59	32.8	104	57.8	17	9.4	
AMA (n, %)	27	45.8	46	44.2	3	1.8	NS
PROM (n, %)	8	13.6	20	19.2	0	0	NS
Antenatal steroids (n, %)	16	27.1	82	78.8	2	11.8	<0.01
Antenatal antibiotics (n, %)	20	33.9	44	42.3	3	17.6	NS
Chorioamnionitis (n, %)	15	25.4	18	17.3	2	11.8	NS
Preeclampsia (n, %)	5	8.5	20	19.2	1	5.9	NS

Table 2: Maternal Demographics

Table 3. Outcomes							
	CPAP		SIPAP		HFNC		p-Value
N, %	59	32.8	104	57.8	17	9.4	
Extubation Failure (n, %)	2	10.5	17	89.5	0	0	<0.05
Age at extubation, Days (Mean, SD)	11.4	25.7	11.5	20.6	19.4	31.7	NS
Adjusted GA Extubation (Mean, SD)	38.5	3.6	31.2	4.4	41.0	3	<0.01
Weight grams at extubation (Mean, SD)	3198.3	909.7	1535	894	3517	841.5	<0.01
Days on ventilator (Mean, SD)	6.22	7.6	8.55	14.2	6.71	6.2	NS
Total Intubations (Mean, SD)	1.12	0.77	1.58	0.99	1.12	0.3	<0.01

Table 3: Outcomes

Table 4. Extubation Failure					
	Failure		None		p-Value
Extubation Failure n:	19		16		
Age Extubation Days (Mean, SD)	17.2	36.2	11.6	21.7	NS
Gestational Age (Mean, SD)	28.0	3.7	33.3	5.5	NS
Corrected GA Extubation (Mean, SD)	30.3	5.8	35.1	5.5	<0.01
Weight grams (Mean, SD)	1357.6	1000	2374.8	1223.5	<0.05
Days on vent (Mean, SD)	8.2	9.9	7.5	12.1	NS
72 hours prior to extubation					
MAP Prior to extubation (Mean, SD)	7.5	1.2	7.8	1.5	NS
FIO2 Prior to Extubation (Mean, SD)	32.3	9.7	32.1	8.3	NS
pH avg Pre (Mean, SD)	7.40	0.06	7.38	0.08	NS
pCO2 avg Pre (Mean, SD)	42.11	6.7	41.8	7.8	NS
Base Deficit avg Pre (Mean, SD)	5.25	3.1	5.26	3.22	NS
ABDs Pre (Mean, SD)	0.74	1.1	0.91	3.2	NS
PIP Pre (Mean, SD)	15.35	1.05	15.9	1.8	NS
PEEP Pre (Mean, SD)	5.1	0.2	5.2	0.5	<0.05
Heart Rate (Mean, SD)	157.5	12	144.4	15	NS
Respiratory Rate (Mean, SD)	54.8	11.9	51.1	10.7	NS
72 hours after extubation					
FIO2 After Extubation (Mean, SD)	42.8	14.7	27	5.8	<0.01
pH avg post (Mean, SD)	7.3	0.12	7.42	0.1	<0.01
pCO2 avg Post (Mean, SD)	52.96	17.2	39.4	7.5	<0.01
Base Deficit avg Post (Mean, SD)	5	2.6	4.95	3.36	NS
ABDs Post (Mean, SD)	0.74	1.1	0.91	3.2	NS
Heart Rate (Mean, SD)	155.95	26.2	149.7	3.5	NS
Respiratory Rate (Mean, SD)	51.4	11.3	47.11	7.8	<0.01

Table 4: Extubation Failure

Abstract: 318

Short-Term Cardiac Effects of Perinatal Exposure to Cannabis in Newborns

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Background Cannabis (THC) intake acutely increases sympathetic activity and decreases parasympathetic activity, resulting in tachycardia, vasodilation, and an increase in cardiac output with little or no increase in blood pressure. The consequential neonatal cardiac outcomes with perinatal exposure to THC have not been previously addressed.

Objective To assess the effects of perinatal THC exposure on neonatal cardiac outcomes [newborn's heart rate (HR) in the first 48 hours, neonatal arrhythmias, need for cardiac consultations, and need for cardiac procedures (electrocardiography (EKG), echocardiography, Holter monitoring)]. Secondarily, to assess these effects on other neonatal outcomes [birth weight (BW), hospital length of stay (LOS), need for NICU admission].

Design/Methods Retrospective cohort study of all neonates ≥37 week-gestation born at Brookdale Hospital to mothers with documented Drugs of Abuse Urine (DAU) testing from Nov 2013 to Oct 2019 to compare HR (min, max, and average), neonatal arrhythmias, the need for cardiac consultations, and the need for cardiac procedures in the first 48 hours between newborns with and without perinatal THC exposure. Study population was stratified into 3 groups: A) both mothers and newborns tested negative for THC; B) mothers were THC+ while newborns were THC-; C) both mothers and newborns were THC+. Exclusion criteria include maternal use of substances other than THC, and maternal and neonatal medical conditions that may affect neonatal cardiac outcomes. Comparison was performed using Chi–squared or Fisher's Exact Test for categorical variables, and Student's T-test for numerical variables.

Results Total of 1742 neonates were included in the study; group A 1534 (88%), group B 104 (6%), group C 104 (6%) (Figure 1). Demographic characteristics are shown in Table 1. Smoker mothers were found more likely to test THC+. Table 2 compares characteristics of the groups. There was no significant difference in HR, incidence of arrhythmias, the need for cardiac consultations, the need for cardiac procedures, or NICU admission rate among the three groups. BW was significantly lower in neonates of mothers with DAU+; this finding was independent from mother's smoking status. Compared to group A, neonate's LOS in group C was significantly longer (Figure 2).

Conclusion(s) In the study population, perinatal exposure to THC did not seem to be related to negative short-term neonatal cardiac effects, nor did it increase NICU admissions. However, it was linked to smaller BW, and longer LOS.

Figure 1. Flowchart.

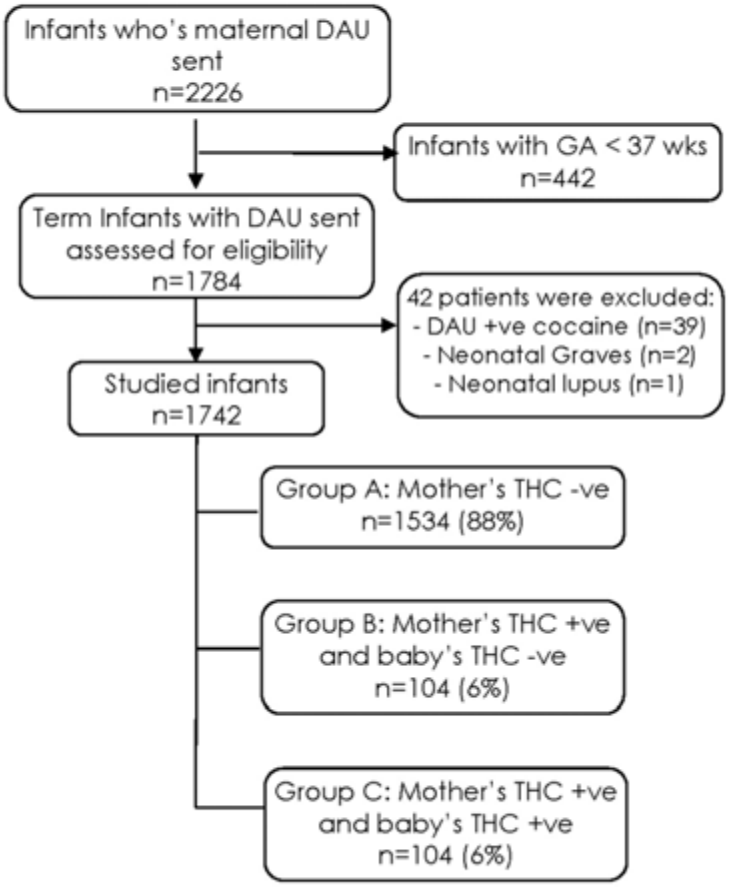

Figure 1

Table 1. Demographic and other baseline characteristics of studied patients*

Variable	Mother's THC -ve (Group A) N=1534 (88%)	Mother's THC +ve, Baby's THC -ve (Group B) N=104 (6%)	Mother's THC +ve, Baby's THC +ve (Group C) N=104 (6%)	p-value
Male Sex (newborns), n (%)	762 (50%)	58 (56%)	51 (49%)	0.474[1]
Race: -Black, n (%) -Hispanic, n (%) -Other, n (%) -White, n (%)	 1167 (76%) 149 (10%) 203 (13%) 15 (1%)	 88 (85%) 5 (5%) 10 (9%) 1 (1%)	 85 (82%) 6 (6%) 12 (11%) 1 (1%)	 0.384[1]
Maternal Age, Mean (±SD)	27.2 (± 6.3)	27.1 (± 6.2)	26.7 (±5.1)	0.928[2] 0.324[3]
Marital status: -Married, n (%) -Single, n (%) -Other, n (%)	 202 (13%) 1298 (85%) 34 (2%)	 9 (9%) 93 (89%) 2 (2%)	 11 (11%) 92 (88%) 1 (1%)	 0.538[1]
Mother is working, n (%)	355 (23%)	15 (14%)	21 (20%)	0.101[1]
Maternal smoking, n (%)	396 (26%)	59 (57%)	52 (50%)	<0.001[2] <0.001[3]

1=comparing the 3 groups (A, B, C), 2=comparing A and B, 3=comparing A and C

* Comparison was done using Chi–squared ($\chi 2$) test or Fisher's Exact Test for categorical variables, and Student's t-test for numerical variables.

Table 1

Table 2. Comparison in newborns' outcomes*

Variable	Mother's THC -ve (Group A) N=1534 (88%)	Mother's THC +ve, Baby's THC -ve (Group B) N=104 (6%)	Mother's THC +ve, Baby's THC +ve (Group C) N=104 (6%)	p-value
Admitted to NICU, n (%)	280 (18%)	20 (19%)	19 (18%)	0.969[1]
EKG performed, n (%)	49 (3%)	3 (3%)	1 (1%)	0.417[1]
Echo performed, n (%)	84 (5%)	3 (3%)	1 (1%)	0.065[1]
Cardiac consultation performed, n (%)	72 (6%)	5 (5%)	0 (0%)	0.072[1]
Holter done, n (%)	2 (0.1%)	0 (0%)	0 (0%)	0.870[1]
Episodes of Tachycardia, n (%)	11 (0.7%)	1 (1%)	1 (1%)	0.929[1]
Episodes of Bradycardia, n (%)	34 (2%)	0 (0%)	2 (2%)	0.305[1]
Average HR at 0-24 hrs, Mean (±SD)	136 ±9	137 ±8	136 ±9	0.075[2] 0.666[3]
Average HR at 24-48 hrs, Mean (±SD)	136 ±10	137 ±11	135 ±10	0.685[2] 0.302[3]
Maximum HR at 0-24 hrs, Mean (±SD)	153 ±12	156 ±13	154 ±14	0.037[2] 0.547[3]
Maximum HR at 24-48 hrs, Mean (±SD)	146 ±16	148 ±14	146 ±13	0.418[2] 0.723[3]
Minimum HR at 0-24 hrs, Mean (±SD)	122 ±11	123 ±10	121 ±9	0.409[2] 0.242[3]
Minimum HR at 24-48 hrs, Mean (±SD)	128 ±13	128 ±11	125 ±14	0.646[2] 0.069[3]
LOS, Median (IQR)	3 (2-4)	3 (2-5)	3 (2-5)	0.055[2] <0.001[3]
Birth weight (BW) in grams, Mean (±SD)	3171 (±450)	2986 (±449)	2912 (±391)	<0.001[2] <0.001[3]
‡ Smokers: n=507 Birth weight (BW) in grams, Mean (±SD)	**n=394 3133 (±447)**	**n=59 3014 (±464)**	**N=52 2880 (±431)**	0.058[2] <0.001[3]
‡ Non-Smokers: n=1742 Birth weight (BW) in grams, Mean (±SD)	**n=1134 3184 (±450)**	**n=45 2950 (±432)**	**n=51 2945 (±347)**	0.001[2] <0.001[3]

1=comparing the 3 groups (A, B, C), 2=comparing A and B, 3=comparing A and C

‡ Comparison in BW among different groups, stratified by mother's smoking

* Comparison was done using Chi–squared ($\chi 2$) test or Fisher's Exact Test for categorical variables, and Student's t-test for numerical variables.

Table 2

Figure 2. Comparison in length of stay between different groups, expressed as boxplots

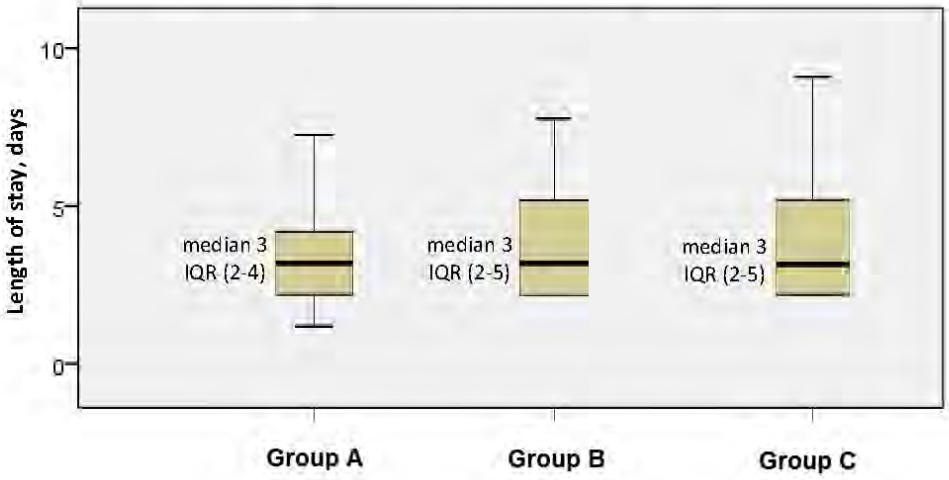

Figure 2

Abstract: 271

NEWBORN WITH PROGRESSIVE LETHARGY AND RESPIRATORY DISTRESS

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History (including chief complaint, history of present illness and relevant past and family medical history) HPI: Male infant delivered vaginally at 38+5 weeks to a 35 year old G4P2102 female from Guatemala who received adequate prenatal care. Her GBS status was negative and other prenatal laboratories were unremarkable. APGAR scores were 8 and 9 at 1 and 5 minutes respectively. Infant was initially feeding well, taking both breast and formula, until 6 hours of life when he was noted to have respiratory distress with worsening lethargy. No fever, vomiting, jerking movements or diarrhea was noted at the time.
History of early neonatal death in male sibling 7 years prior, but no known family history of consanguinity.
Physical examination findings (including vital signs) Significant Physical Examination Findings:
Vital signs: RR: 80 HR:150 T:98.3F 0_2 sat- 80-90%
RUL-81/48 RLL- 72/41 LUL – 89/55 LLL-79/41
Birth weight:2800g (26^{th} %) Length:47.5cm (25^{th} %) Head circumference:32cm (10^{th} %)
Lethargic, hypotonic infant in respiratory distress with intermittent grunting, subcostal and intercostal retractions. Equal breath sounds bilaterally. Normal heart sounds with no murmurs.
Laboratory or Diagnostic imaging or Procedures Labs:
CBC:
WBC-23.4 x $10^{3/}$L N- 44% L- 27% bands-7%
Hb-13.5mg/dl
Hct-41.1%
Platelets-162 x 10^3/mL
BMP:
Na-144mmol/L
K-3.7mmol/L
Cl-104 mmol/L
HCO3-5mmol/L
BUN- 10mg/dl
Creatinine-0.69mg/dl
Ca-9.2mg/dl
Blood glucose-79mg/dl
ABG: pH: 6.96 $pC0_2$-23 $p0_2$-91 Bicarb-8 Base deficit-27 (initial)
pH: 7.06 $pC0_2$-22 $p0_2$-65 Bicarb-6 Base deficit-22 ical-1.28 (following bicarb bolus)
pH: 7.01 $pC0_2$-21 $p0_2$-70 Bicarb-5 Base deficit-25 ical-0.97 (following initiation of Intravenous fluids and bicarb infusion)
Blood Culture: negative
HSV PCR: negative
Urinalysis: 1+ ketones
Radiologic Investigations:
Chest x-ray: no infiltrates
Echo: Elevated right ventricular systolic pressure . Flattened septum. Normal biventricular systolic function.
Tests leading to the diagnosis:
Metabolic:
Serum Lactate: 22.6mmol/l (0.5-2.2)
Serum Pyruvic Acid: 0.1mg/dl (0.3-0.7)
Lactate/Pyruvic Ratio: 228
Serum Ammonia: 82umol/l (54-90)
Serum Acylcarnitine profile
Elevations including C4-OH suggesting ketosis
Amino Acid Profile:
Elevated B-aminoisobutyricacid and Alanine consistent with lactic acidosis.
Urine Organic Acids:
Lactic acid 1500mmol/L (0-60)
Pyruvic acid 2251mmol/L (0-50)
Acetoacetic acid 3229mmol/L (0-4)

Whole Exome Sequence:
Homozygous for variant in COX5B gene (inherited from both parents)
Heterozygous for variant in FARS2 gene (maternally inherited)
Variants in Mitochondrial gene MT-ND1 (maternally inherited)
Final Diagnosis Final Diagnosis:
Electron Transport Chain Defect (mitochondrial)
Persistent Pulmonary Hypertension of the Newborn

Abstract: 272

Prolonged Direct Hyperbilirubinemia in an Adolescent Boy with Sickle Cell Disease

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History (including chief complaint, history of present illness and relevant past and family medical history) A 12-year-old African American boy with sickle cell disease (HbSS) presented with worsening pain of all extremities over three days. Other symptoms included anorexia, worsening jaundice and tea-colored urine.
Physical examination findings (including vital signs) His temperature was 98.5F, heart rate 85 beats/min, blood pressure 117/70 mmHg, respiratory rate 17/min, and oxygen saturation 97% (room air). Physical examination revealed scleral icterus, non-tender hepatomegaly, and right-sided upper extremity weakness.
Laboratory or Diagnostic imaging or Procedures Significant laboratory findings included normocytic anemia(hemoglobin 8g/dl,MCV 83fl), reticulocytosis(22%), direct hyperbilirubinemia(32 mg/dl), transaminitis(AST 682,ALT 599), elevated INR(1.5), and 92%hemoglobin S. Viral and autoimmune serologies were negative. Head magnetic resonance (MR) imaging did not reveal any intracerebral hemorrhage. MR cholangiopancreatography revealed biliary sludge and cholelithiasis, with no evidence of obstruction within the biliary system (Figure 1). Liver biopsy demonstrated sinusoidal obstructive hepatopathy, secondary iron overload and fibrosis, consistent with sickle cell intrahepatic cholestatis.
Final Diagnosis Acute sickle cell intrahepatic cholestasis, an extreme variant of sickle cell hepatopathy, is a rare but potentially fatal complication of sickle cell disease. Treatment is supportive, along with exchange transfusion and target Hemoglobin S < 30%. Biochemical improvement typically occurs within days to weeks. In this case report, we describe a more prolonged course for improvement (over 8 weeks) despite early exchange transfusion and target Hemoglobin S%, suggesting the need for long term outpatient therapy.
The patient received intravenous hydration, analgesics and simple packed red cell transfusion(10ml/kg), which resulted in acute resolution of pain and weakness; however, direct hyperbilirubinemia persisted. Partial exchange transfusion, followed by weekly transfusions (Figure 2), was associated with a gradual decrease in bilirubin and Hemoglobin S levels (91% to 16% over 24 days). Other treatments provided were plasmapheresis, phenobarbital and ursodeoxycholic acid. The patient was discharged on the fourth week (direct bilirubin 38.6mg/dL) and remained on a transfusion protocol. Eight weeks after admission, he remained asymptomatic, and with an improved direct bilirubin level of 9.0 mg/dL.

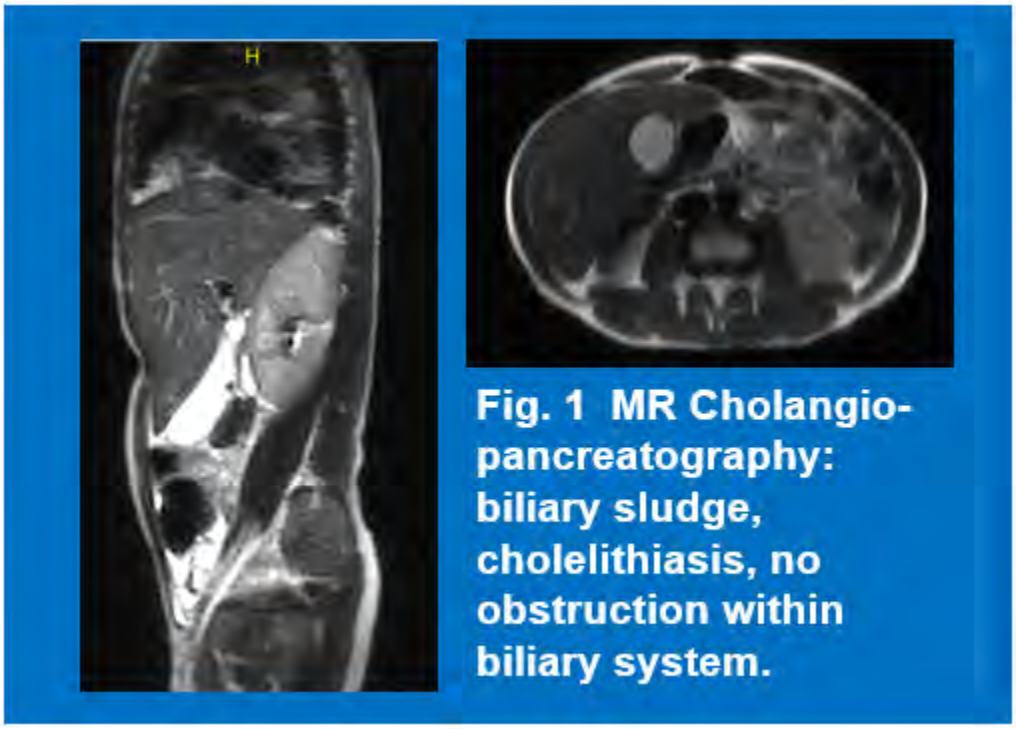
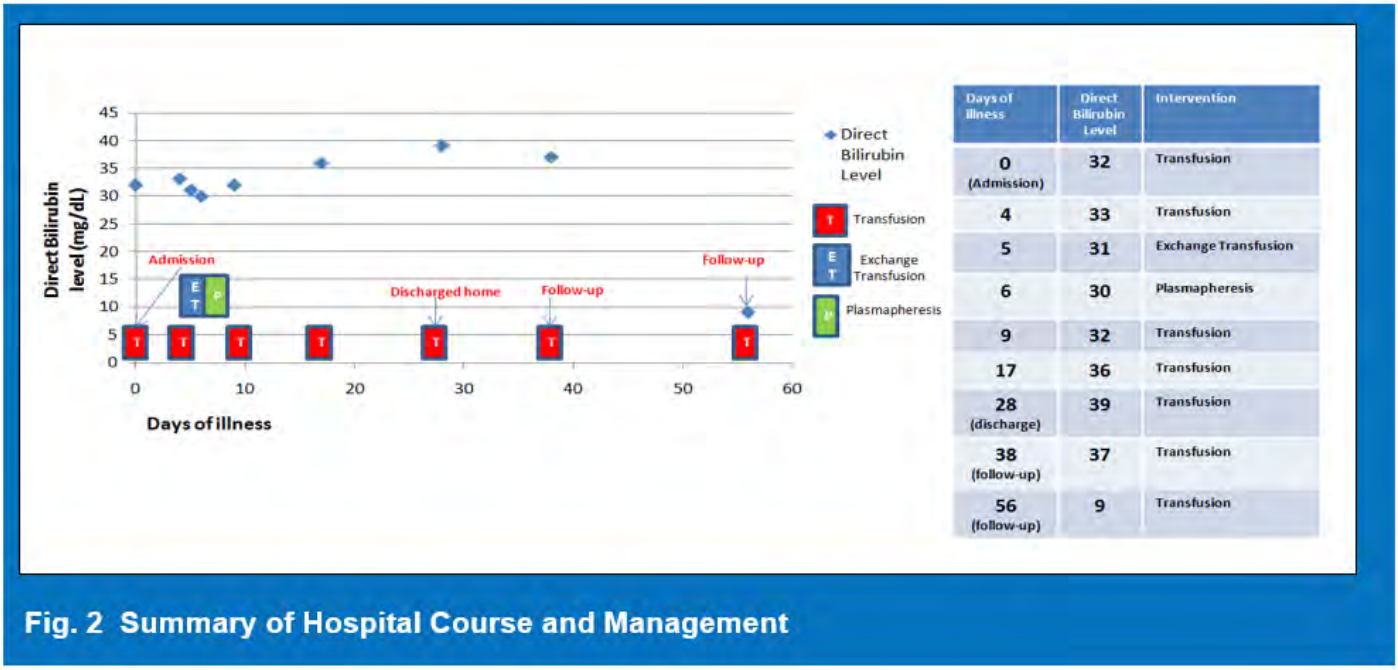


Fig. 1. MR Cholangiopancreatography



Days of Illness	Direct Bilirubin Level	Intervention
0 (Admission)	32	Transfusion
4	33	Transfusion
5	31	Exchange Transfusion
6	30	Plasmapheresis
9	32	Transfusion
17	36	Transfusion
28 (discharge)	39	Transfusion
38 (follow-up)	37	Transfusion
56 (follow-up)	9	Transfusion

Fig. 2 Summary of Hospital Course and Management

Abstract: 273
Near Hanging by Mosquito Net: Abuse or Accident?
Zara N. Ilahi, Dana Kaplan
Pediatrics, Staten Island University Hospital, Riverside, Connecticut, United States

History (including chief complaint, history of present illness and relevant past and family medical history) A 7-year-old male with no past medical history presented to the Emergency Department (ED) via EMS after a reported strangulation by a mosquito net while sleeping. The patient was sleeping on the top bunk of his bunk bed, which had a mosquito net attached to it. The father heard a noise from the bedroom and found the patient hanging from the top of the bunk bed with the mosquito net around his neck and initiated CPR.
Physical examination findings (including vital signs) ED Vitals/Exam:
Temperature- 98.4 F, BP: 82/55, HR: 102, O2 Saturation: 98%
General: Unresponsive, agonal breathing
HEENT: Normocephalic/atraumatic. Pupils equal and reactive. Airway intact, uvula midline. Superficial abrasions on anterior neck
Cardiac: Regular rhythm
Lungs: Accessory muscle use, rhonchi
GI: Sof, non-distended
MSK: No lower extremity edema, radial/pedial pulses 2+ bilaterally
Neuro: Unresponsive to painful stimuli, GCS 6
Laboratory or Diagnostic imaging or Procedures In the ED CT head, neck, abdomen and CT angiograph of the neck were all within normal limits. CT chest showed bilateral upper lobe consolidations concerning for aspiration pneumonia. Patient required intubation with mechanical ventilation for 4 days. MRI of the brain was normal. Arterial Blood Gas (ED) pH- 7.38, pCO2- 36, pO2- 103, HCO3- 21, Oxygen Saturation- 96, Lactate 0.5
Final Diagnosis After a six-day hospital stay, the patient was discharged home with full neurological functions intact.
Strangulation results from external compression of the neck vasculature that can lead to asphyxiation. Hanging is a specific type of strangulation where death occurs due to external pressure applied to the neck from suspension by a ligature, resulting in asphyxia and therefore death. A near hanging occurs from the same mechanism as hanging, however in this instance the patient survives. Hanging injuries are distinguished from other types of strangulation, such as manual and ligature strangulation, by the element of suspension. Clinical features of any hanging insult can vary and therefore injuries may or may not be present, as with other types of strangulation. Given the severity of the injury and increased morbidity and mortality, child abuse should be considered as part of the differential diagnosis.
Accidental vs non-accidental strangulation relies mostly on clinical history and scene reenactment and therefore a multidisciplinary approach to the patient is required. In this situation, corroborative information provided by family members in addition to collaboration with the child abuse pediatrician and child protective services was necessary to conclude that this case was likely accidental.

Abstract: 274
An unusual case of hemolytic disease of the newborn infant due to Anti-Jkb antibodies
Zara N. Ilahi, Eleny Romanos-Sirakis
Pediatrics, Staten Island University Hospital, Riverside, Connecticut, United States

History (including chief complaint, history of present illness and relevant past and family medical history) 37 week GA male born by NSVD to a G6P4 mother. Maternal history was significant for two intrauterine fetal demises at term and positive titers for anti-C, anti-e, and anti-Jkb antibodies. Other maternal prenatal labs were negative. Maternal blood type was O+; newborn was blood type O+, coombs positive and anti-Jkb positive.
Physical examination findings (including vital signs) Weight:4415g, Temperature: 97.7F, HR: 153, RR: 60
General: Active, alert, pink, no jaundice
HEENT: NCAT, PERRLA
Cardiac: RRR, no murmurs
Lungs: CTABL
Abd: Soft NT/ND
Neuro: Appropriate tone
Laboratory or Diagnostic imaging or Procedures Newborn was admitted to regular nursery where he was monitored for signs of acute hemolytic anemia/jaundice. At 2.5 hours of life (HOL) bilirubin (total/direct) was 3/0.2 mg/dl, hematocrit was 39.5% with 6.3% reticulocytes. At 13 HOL, bilirubin was 5.6/0.2 mg/dl, phototherapy was initiated; phototherapy was discontinued at 35 HOL and rebound bilirubin was stable.
Hematocrit dropped from 39.5% at birth to 29.4 % at 41 HOL with 8.4% reticulocytes. Newborn was transferred to NICU and received intravenous immunoglobulin (IVIG) and a packed red blood cell (pRBC) transfusion. Phototherapy was reinitiated at 81 HOL due to rising bilirubin and was discontinued after less than 24 hours of treatment.
Final Diagnosis The patient was discharged home and monitored closely as an outpatient to assess for potential delayed hemolytic anemia.
Alloimmune hemolysis is most commonly due to RhD incompatibility or ABO maternal/fetal incompatibility. A rare presentation of hemolytic disease of the newborn occurs due to Kidd antigens. We are aware of 13 documented cases of anti-Jkb related hemolysis in

the newborn, with 4 requiring phototherapy and 1 requiring pRBC transfusion.
Kidd antibodies cross the placenta, bind to complement, and produce hemolysis. Kidd antibodies are not always detected by routine screening as they have the tendency to disappear after the first few months of exposure. Kidd antibodies can cause both immediate and delayed hemolytic transfusion reactions secondary to a strong response in a later re-exposure to antigen positive RBC.
Of the limited reported cases in the literature, only a minority of newborns were treated with phototherapy/pRBC transfusion. Our case is unique as our patient received phototherapy, a pRBC transfusion, and IVIG. The role of IVIG in these cases is not well-described, but was utilized to supplement the treatment of this neonate. With this case report, we aim to illustrate the variable degree of hemolysis that can be associated with anti-Jkb antibody in a newborn.

Abstract: 275

An unusual case of neonatal G6PD deficiency presenting with hyperbilirubinemia and thrombocytopenia

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History (including chief complaint, history of present illness and relevant past and family medical history) 40 week GA male was born by NSVD to a G2P1 mother, history significant for hypothyroidism, treated with synthroid during pregnancy. Maternal prenatal labs were negative. Newborn was large for gestational age with Apgars 9, 9, blood type O+/coombs negative.
Physical examination findings (including vital signs) Weight-2875g, Temperature- 98.6F, HR- 150, RR- 52
General: Well appearing, active, pink, no jaundice
HEENT: NCAT, PERRLA, RR present bilaterally
Cardiac: RRR
Lungs: CTABL
Abdomen: Soft, NT, ND
Neuro: Appropriate tone
Laboratory or Diagnostic imaging or Procedures Transcutaneous bilirubin (TcB) at 24 hours of life (HOL) was 5.5 mg/dL, low intermediate risk, but increased to high risk bilirubin,16.1 mg/dL at 41 HOL. Serum indirect bilirubin at 42 HOL was 19.4 mg/dL; phototherapy was initiated. Hematocrit (HCT) was 44.9%. Bilirubin trended up and platelets were 175,000/uL. Intravenous hydration was added and bilirubin improved. At 57 HOL indirect bilirubin increased to 22.5 mg/dL. Newborn underwent double exchange transfusion. Prior to exchange transfusion, platelet count was 73,000/uL, with HCT of 40.2%, and decreased to 42,000/uL post-exchange transfusion with HCT drop to 25.2%. Due to unclear etiology of the worsening thrombocytopenia in the context of hemolysis, IVIG was administered.
Indirect bilirubin improved after double exchange transfusion to 13.3 mg/dL. Platelets trended to normal without further intervention. No infection was found with negative blood and urine cultures, and infant was treated with 48 hours of empiric antibiotics that were started after noting thrombocytopenia. Glucose-6-phosphate dehydrogenase test came back low at 1.2 units/g Hgb confirming the diagnosis of G6PD deficiency.
Final Diagnosis We present a rare case of a newborn with hemolytic anemia and thrombocytopenia who was found to have G6PD deficiency. While G6PD is a cause of hyperbilirubinemia in the newborn, it is not typically associated with thrombocytopenia. We are aware of a case report of a 4 year old who presented with hemolysis, thrombocytopenia, and acute kidney injury, treated for atypical HUS, but was found to have G6PD deficiency after he returned twice more with hemolysis and thrombocytopenia without renal involvement. We are not aware of any reported cases of newborns with G6PD deficiency presenting with hemolytic anemia and thrombocytopenia. While newborns may present with thrombocytopenia, no causes for the thrombocytopenia were found in this case. G6PD deficiency should remain on the differential diagnosis when evaluating patients with hemolysis and thrombocytopenia.

Abstract: 276

Respiratory Failure in a Term Neonate

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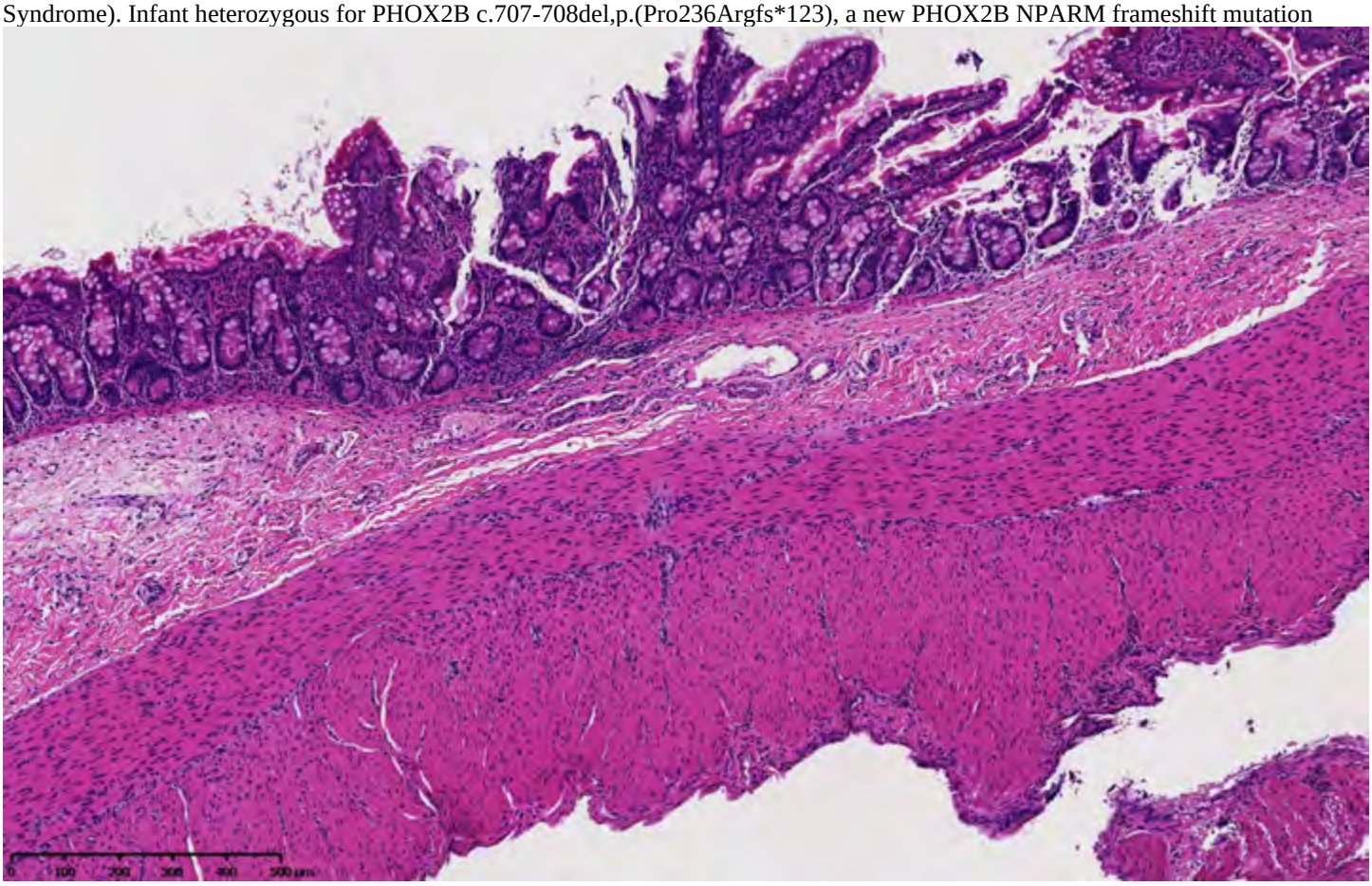
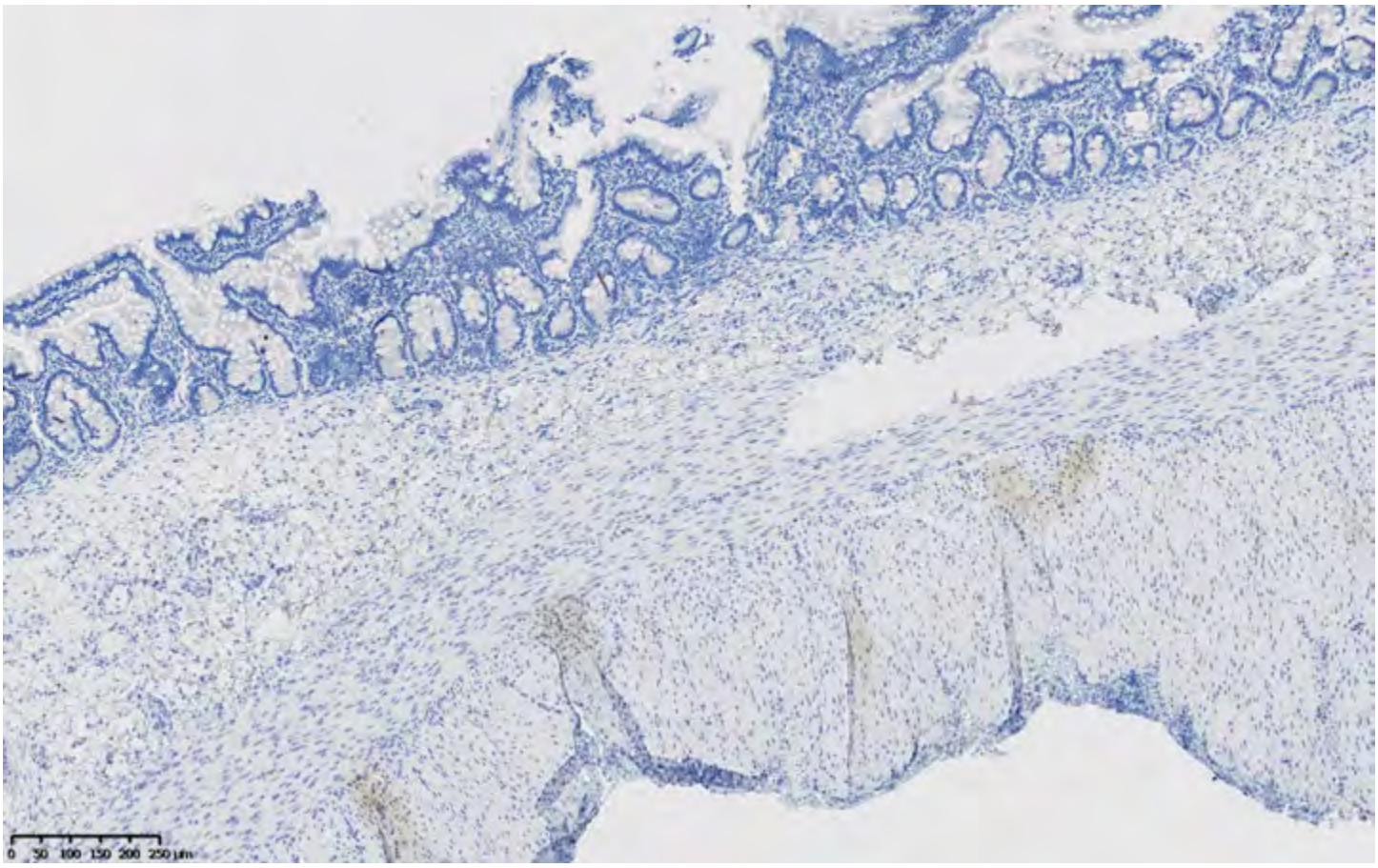
History (including chief complaint, history of present illness and relevant past and family medical history) A term female was delivered to a G4P3 surrogate (IVF with donor egg, father's sperm) via Cesarean due to a non-reassuring tracing during elective induction. There was extensive prenatal testing of both biologic parents; no significant family histories. Prenatal labs were normal. Polyhydramnios was detected at 31 weeks and thick meconium was noted at delivery. Infant required PPV at birth with Apgars 6, 7, and 7. She was placed on CPAP, then intubated due to apnea, cyanosis, and CO2 retention. She was on low ventilatory support with low FiO2; however, extubation attempts failed quickly due to hypoventilation and apneas. Her course was also complicated by systemic hypertension as well as recurrent emesis and abdominal distension despite small-volume transpyloric feedings. She passed

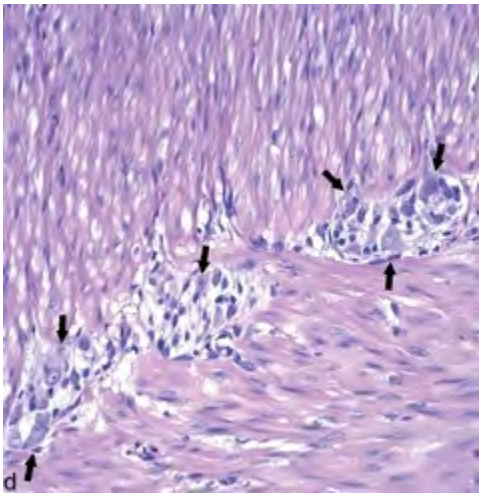
meconium twice in her first 24 hours.
Physical examination findings (including vital signs) T: 36.9 C, HR: 177, BP: 60/33, RR: 28, SpO2: 100% on 21% FiO2
Wt: 3.56 kg, L: 51 cm; HC: 34.5 cm
HEENT: small anterior fontanelle; pupils dilatated, OD minimally reactive, OS non-reactive, red reflexes present; widened intercanthal space, downward slanting palpebral fissures; broad-based nasal root; patent nares; slightly low set ears; smooth philtrum. Lungs clear with no increased work of breathing. Normal cardiac exam. Abdomen slightly full but otherwise normal exam. Neuro: Responsive to interventions, alert, focuses gaze and attends to voice, symmetric movements, low-normal central tone, good strength, brisk DTRs, gag present, no suck
Laboratory or Diagnostic imaging or Procedures Venous Cord Gas pH 7.39, pCO2 40 mmHg
Baby's pCO2 on CPAP at 1 hour was 90 mmHg; pCO2 was 20-41 mmHg following intubation
Normal pyruvate, lactate, thyroid function, VLCFA, creatinine kinase, and DC newborn screen
Cytogenomic SNP Microarray: Normal
Chest X-Ray: lungs clear, well-expanded
Abdominal Xray: Slight gaseous distention of bowel loops
Head ultrasound, Brain MRI/MR spectroscopy, EEG, EMG, dilated eye exam, echocardiogram, and renal ultrasound all normal for age.
Contrast Enema: Normal
Upper GI: Normal rotation, no obstruction, mildly distended jejunal loops.
Direct Laryngoscopy: No abnormalities
Sleep Study (on mechanical ventilation): Nondiagnostic
Rectal Biopsy: Negative for ganglion cells
Laparoscopy with serial intestinal biopsies: Negative for ganglion cells to level of the ligament of Treitz
Additional targeted genetic testing sent on day 9 based on clinical suspicion
Final Diagnosis Congenital Central Hypoventilation Syndrome (CCHS) with Total Intestinal Aganglionosis (Haddad Syndrome). Infant heterozygous for PHOX2B c.707-708del,p.(Pro236Argfs*123), a new PHOX2B NPARM frameshift mutation



Hematoxylin and eosin stain of jejunum showing no evidence of ganglion cells or nerves.



Immunohistochemical analysis with calretinin and S100 demonstrates lack of ganglion cells and paucity of Schwann cells within myoenteric plexuses of jejunum.



Reference hematoxylin and eosin stain showing presence of ganglion cells.
Gulwani H. Hirschsprung disease. PathologyOutlines.com website. http://www.pathologyoutlines.com/topic/colonhirschsprung.html. Accessed January 7th, 2020.

Abstract: 277

Massive hemorrhagic gastritis in 11-year-old with influenza B and NSAID use

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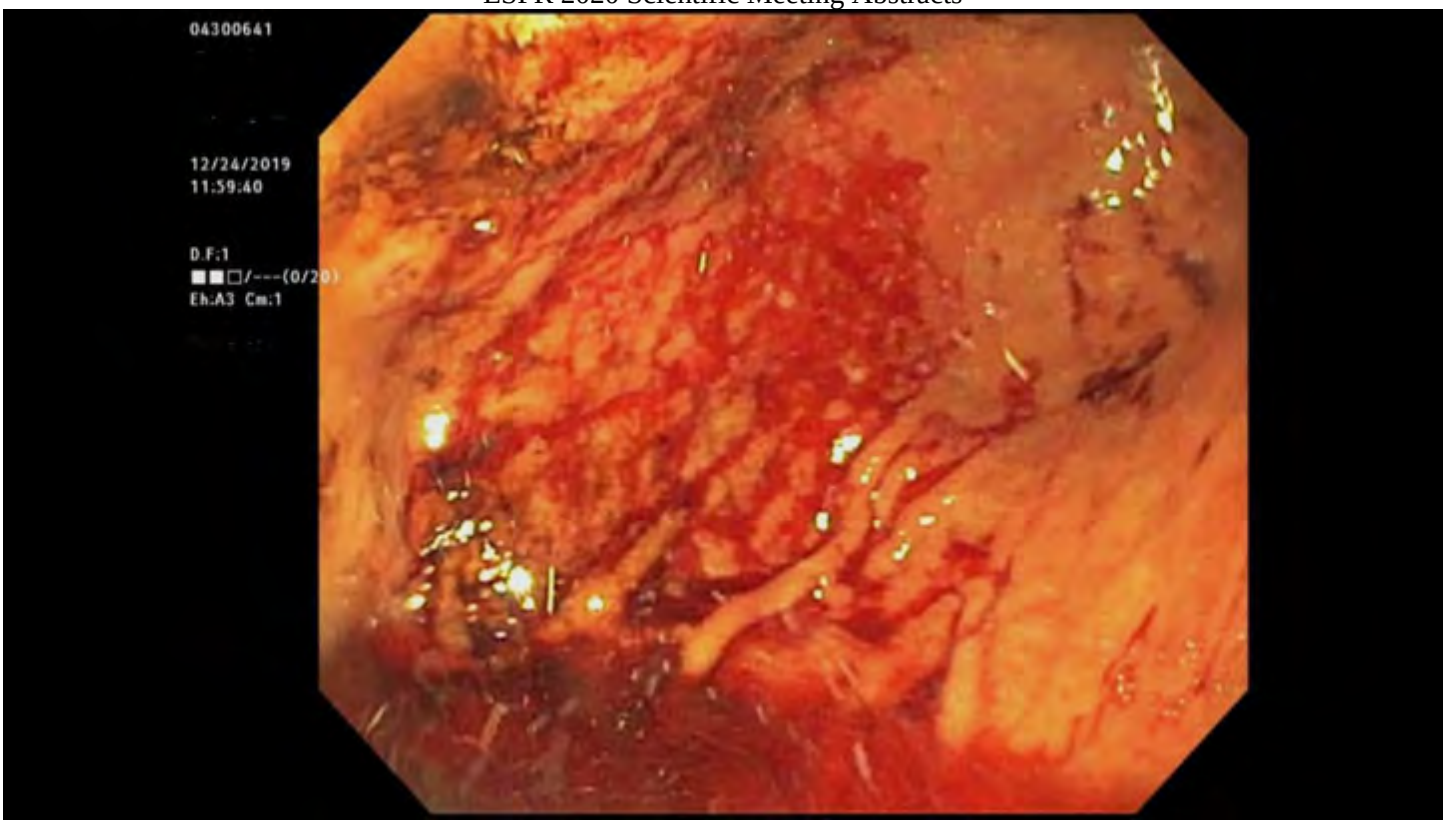
History (including chief complaint, history of present illness and relevant past and family medical history) An 11-year-old healthy male presents to the emergency department with hematemesis and syncope
Had 4-day history of fever up to 103.6 F, with cough and sore throat. He received acetaminophen and ibuprofen for the fever. At presentation he had 2 episodes of vomiting with bright red blood and clots, followed by fainting. Also had dark stool
Family History Mother treated for H.Pylori
Physical examination findings (including vital signs) Pulse **151** BP **86/56** RR 22 Sat 98% Temp 98.9
General: lethargic, pale, diaphoretic
HEENT: dried blood on lips
Lungs: Clear to auscultation
Heart: Sinus tachycardia no murmur
Abdomen: soft non tender no organomegaly
Neuro: Normal
Laboratory or Diagnostic imaging or Procedures CBC WBC 8.57 **HB 7.7** HCT 22.9 PLT 153
CMP Na 137 K 4.4 Cl 106 CO2 21 **Urea 26** creatinine 0.7 ALT 13 AST 28 Bili 0.1
PT 18.6 PTT 41 INR 1.6
Influenza rapid antigen **positive for influenza B**
Replogle under low intermittent suction with no return of blood
Normal saline boluses, packed RBCs and fresh frozen plasma adminestered for persistent hypotension
Urgent upper endoscopy image 1
Multiple clots and large volume blood in the stomach. Epinephrine injections were attempted. Due to ongoing bleeding, the clot was removed. After improved visualization, diffuse active bleeding throughout the stomach was seen, more so in the lesser curvature. Hemospray ® was applied liberally with limited response
CT angiogram to localize the source of the bleeding was limited due to hemospray within the stomach
Aorto- mesenteric angiogram showed no active bleeding but prophylactic embolization of the left gastric artery was performed due to location of gastric hemorrhage
Repeat endoscopy 3 days later showed active bleeding in cardia/fundus markedly less than previously which was controlled by hemospray®
The patient tolerated regular diet without evidence of further bleeding and was discharged on a high dose proton pump inhibitor.
Final Diagnosis 11-year-old male presenting with hemorrhagic gastritis in the setting of influenza B infection and recent NSAID use requiring multiple blood transfusions, endoscopic treatment (limited response) and left gastric artery embolization.
Although rare, hemorrhagic gastritis in the setting of influenza infection, is a serious complication that is important to recognize. On literature review we found reports of 7 children who presented with hematemesis during the influenza H1N1 pandemic in 1988 with hemorrhagic gastritis on endoscopy and confirmed influenza A H1N1 infection. Two children died as a result of their illness. There is no mention of hemorrhagic gastritis with influenza B infection in the literature.



Abstract: 278

Chicken bone- A rare cause of pneumomediastinum?

Dhwani Sahjwani, Suchitra Hourigan, Stefany Honigbaum-Garrity
Pediatrics, Inova Childrens Hospital, Fairfax, Virginia, United States

History (including chief complaint, history of present illness and relevant past and family medical history) 16 year old male presented to the emergency department with difficulty breathing, midline chest pain and blood tinged emesis. He also reported a cough associated with a feeling of something stuck in his throat. He was at a restaurant eating chicken wings a few hours prior to presentation when he suddenly started to choke on a chicken bone he swallowed.
Past medical history significant for Asthma and Gastroesophageal reflux disease.
No significant family history.
Physical examination findings (including vital signs) Temp: 99.5 °F
Heart Rate: 77
Respiratory Rate:16
BP:131/58
General: Sleepy but arousable, no acute distress
HEENT: Atraumatic, moist mucous membranes, no lymphadenopathy noted
Lungs: No increase in work of breathing, **diminished breath sounds at the bases Left > Right**, no palpable subcutaneous crepitus
Heart: Regular rate and rhythm, no murmurs/gallops/rubs
Abdomen: Soft, non-tender, non-distended, Bowel sounds diminished
Neuro: Cognitively intact
Extremities: Bilaterally equal pulses, no edema or cyanosis
Skin: No abnormal skin findings
Laboratory or Diagnostic imaging or Procedures CBC, CMP on admission were within normal limits
Initial Chest Xray showed pneumomediastinum
In addition to pneumomediatinum**, Chest CT** findings suggested at least a mucosal injury allowing gas to dissect into the wall of the esophagus. However no contrast extravasation was identified on the study for the source of the air leak.
First **Esophagram** demonstrated extravasation along the right side of the esophagus at the T4 level.
EGD + Stent placement was performed on day 2 after admission. **His EGD showed mucosal changes including ringed esophagus, mucosal friability and stenosis indicative of underlying eosinophilic esophagitis which further increase risk for perforation.**

There was presence of a linear tear at the mid-esophagus.

Second **Esophagram** performed 4 days later demonstrated no esophageal leak, presence of esophageal stent and 3 clips which were scheduled to be removed in 2-3 weeks.

Final Diagnosis Esophageal perforation following ingestion of a sharp foreign body is a rare cause of **pneumomediastinum** in the late adolescent age group. The factors affecting mortality following esophageal perforation is the time interval between injury and treatment as well as the treatment choice.

Stent placement is an unusual non-surgical management option in the pediatric population. Even though historically operative repair has been the standard of care, stents demonstrate rapid leak occlusion, provide the opportunity for early oral nutrition, significantly reduce hospital length of stay, are removable, and avoid the potential morbidity of operative repair.

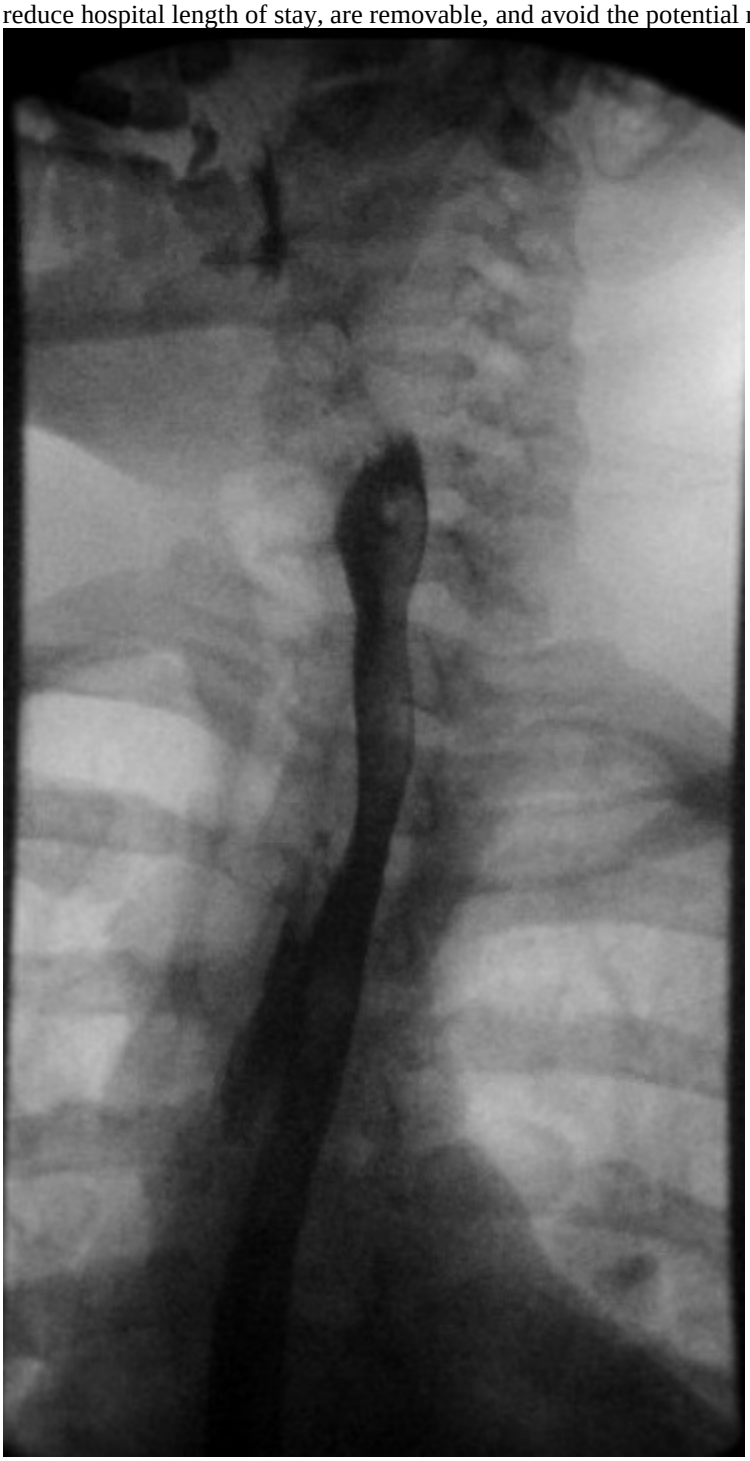
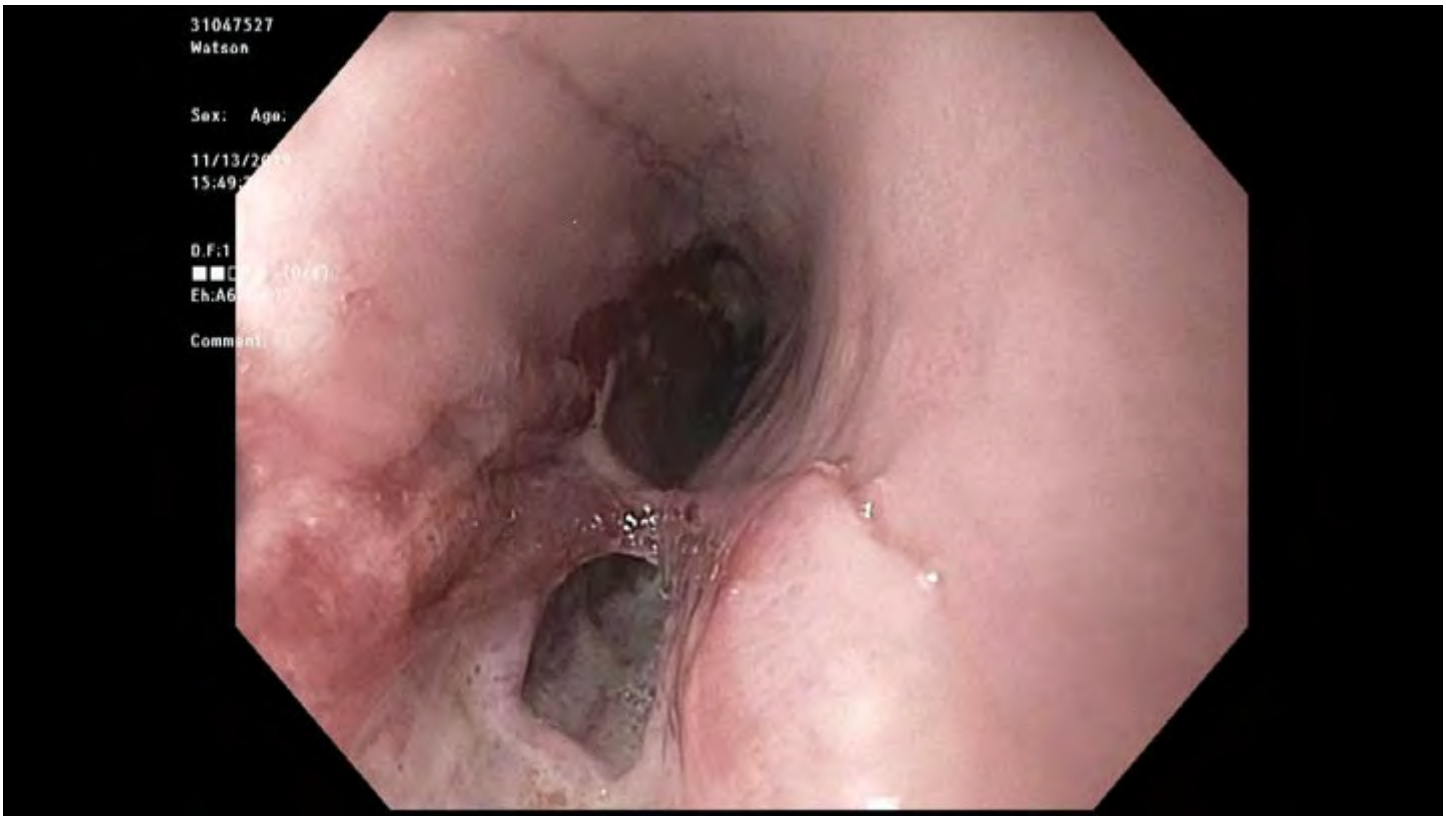
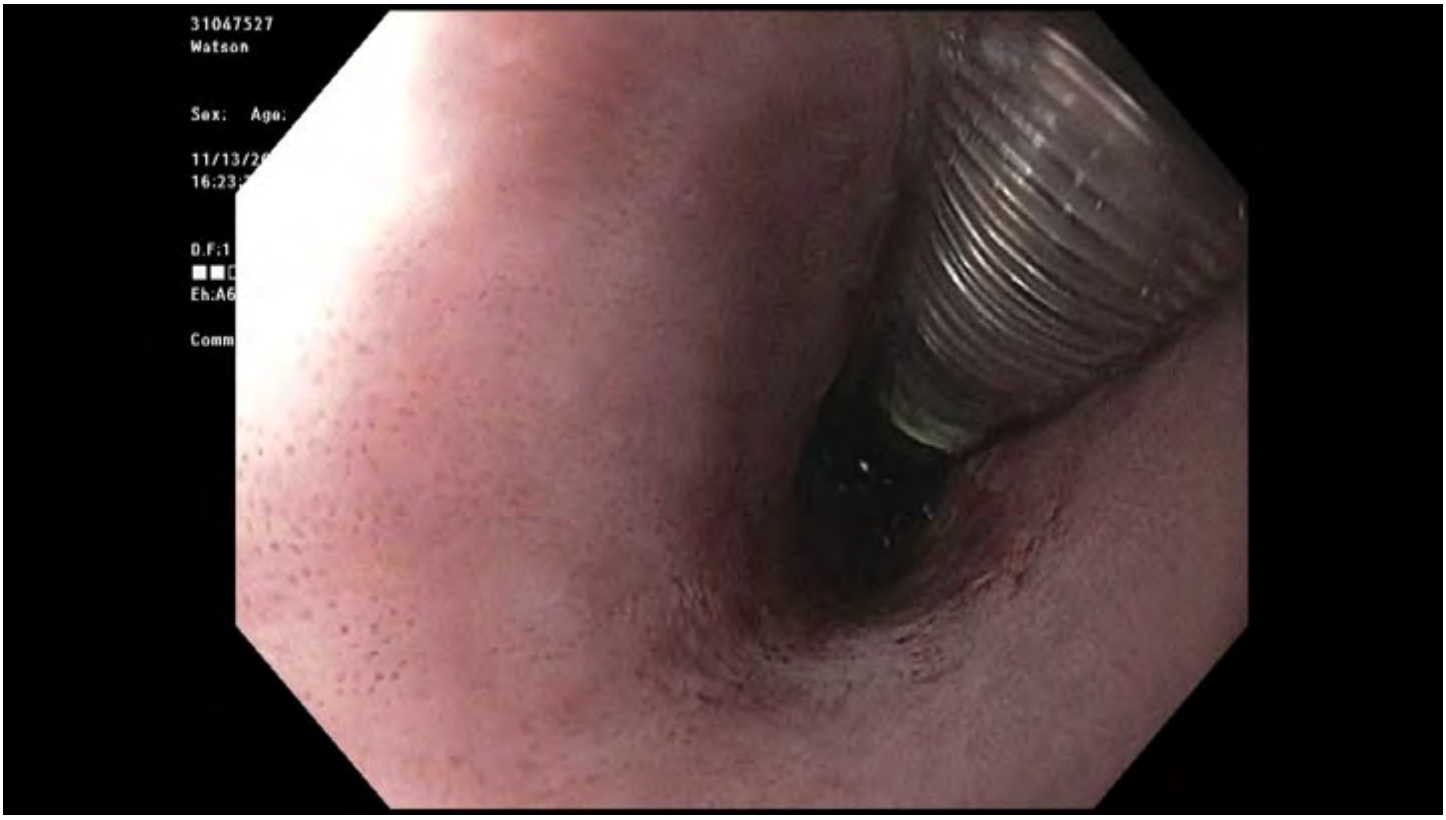


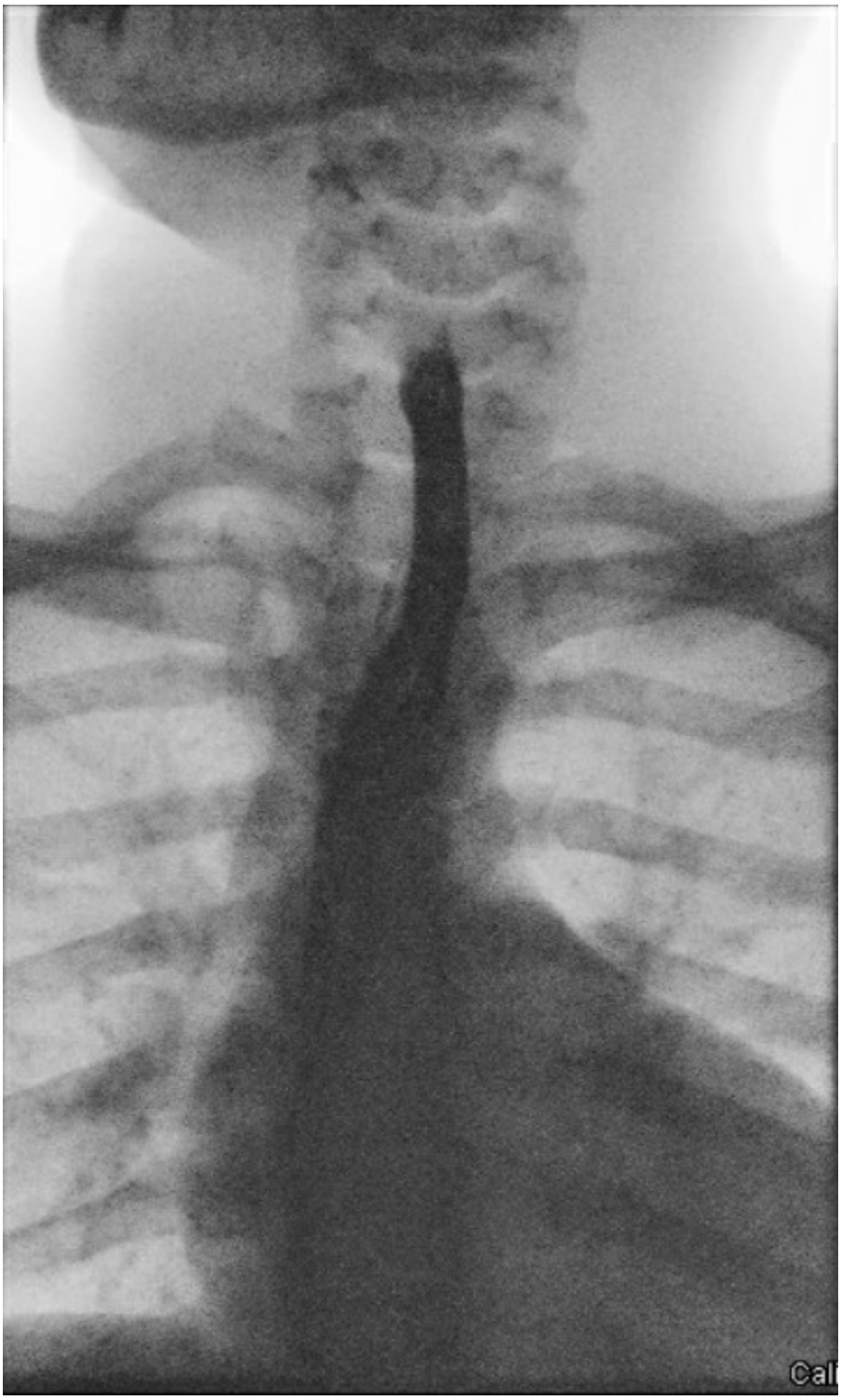
Image of first Esophagram which was noted to have a right sided leak.



Endoscopy image displaying perforation



Esophageal stent placed under fluoscopic and endoscopic control.



Esophagram demonstrating resolution of leak.

Abstract: 279

Diagnostic Dilemma in a Neonate with Pulmonary Hypertension

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History (including chief complaint, history of present illness and relevant past and family medical history) A male infant was born at 39 2/7 wks to a 40 y/o mother via repeat C-section. Rupture of membranes at the time of delivery with clear fluid, infant born vigorous with spontaneous cry, routine resuscitation provided, APGAR 9/9. Prenatal history significant for polyhydramnios and concern for omphalocele on initial ultrasounds which resolved. He was admitted to nursery. At 12 hours of life was noted to have tachypnea and cyanosis, saturation on room air 50% pre-ductal. Transferred to NICU, intubated, with persistently low sats despite FIO2 100%. Started on iNO with improvement in clinical status. Failed trial of extubation, was maximized on iloprost and iNO and had echo which showed severe PPHN. Also found to be rhino-enterovirus positive. Was transferred to ECMO center on day 7 and placed on VV ECMO with initial response. ECMO course complicated by extensive clot formation requiring circuit changes despite therapeutic heparin levels. Anticoagulant changed to bivalirudin. Thrombophilia work up negative. ECMO course also notable for clot burden and hemodynamic instability requiring conversion to VA ECMO, bronchoscopy with multiple clots found in R mainstem bronchus, large pneumothorax requiring chest tube placement. He required ECMO for 10 days and had a brief period of hemodynamic stability post decannulation. Continued to have severe worsening PPHN despite maximal therapy and subsequently succumbed to unremitting PPHN.

Physical examination findings (including vital signs) RR51, Sats50% on 100%Fio2, HR154
Initial exam at ECMO center-sedated, intubated, no dysmorphic features, minimal retractions, B/L equal breath sounds, normal genitals, patent anus

Laboratory or Diagnostic imaging or Procedures Blood gas at 12 hours of life: pH 6.89/pCo2 59/pO2<22/BD-18/lactate 13
CXR (Figure1)

Final Diagnosis On genetic testing, was found to have heterozygous point mutation of FOXF1 consistent with alveolar capillary dysplasia (ACD). ACD is a rare lung development disorder. Infants typically have initial period of stability and develop severe hypoxemia in first few hrs-days of life which is refractory to general supportive care. They often require extensive period of ECMO support with symptoms recurring after successful weaning from ECMO. We conclude that ACD should be considered as a cause of severe unremitting PPHN even in the presence of other potential etiologies. Hypercoagulability complicating ECMO, although not described thus far, could be associated with ACD. This case is intended to enhance awareness and clinical suspicion for this rare lethal disease, so appropriate testing (lung biopsy/genetic test) can be initiated early.

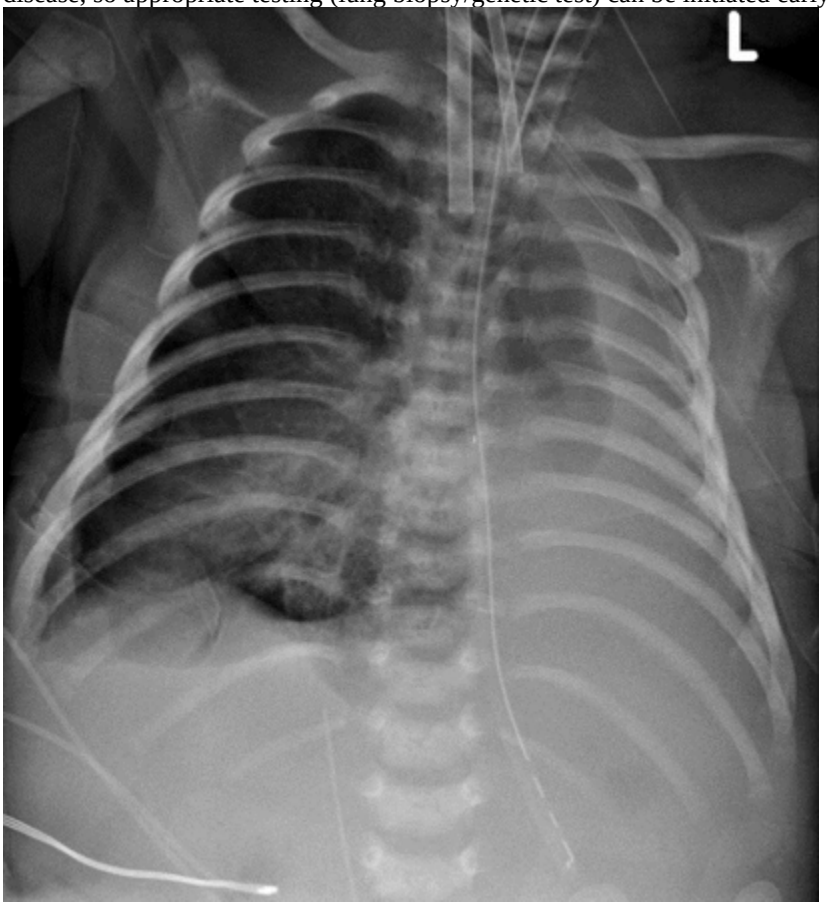


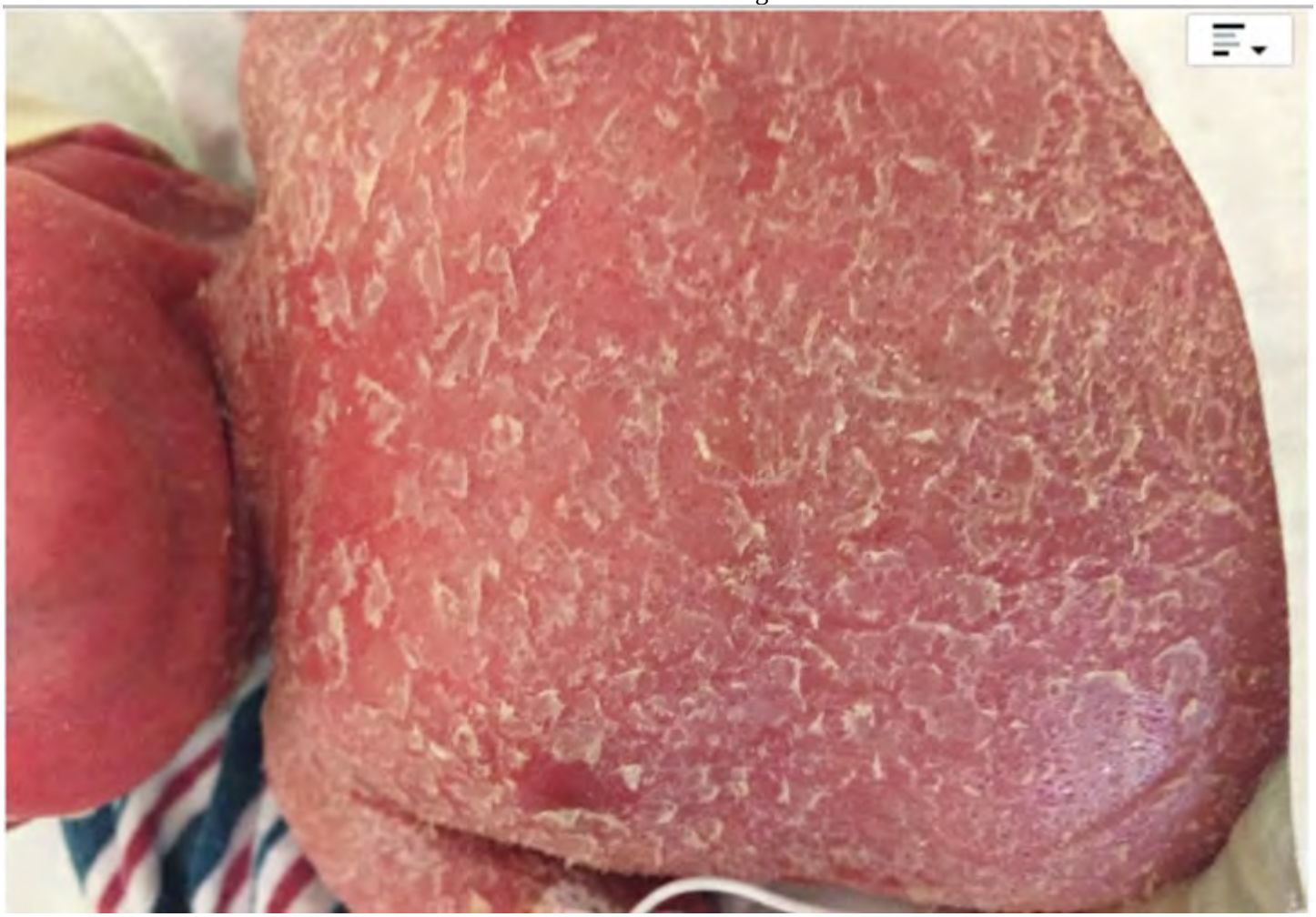
Figure1

Abstract: 280

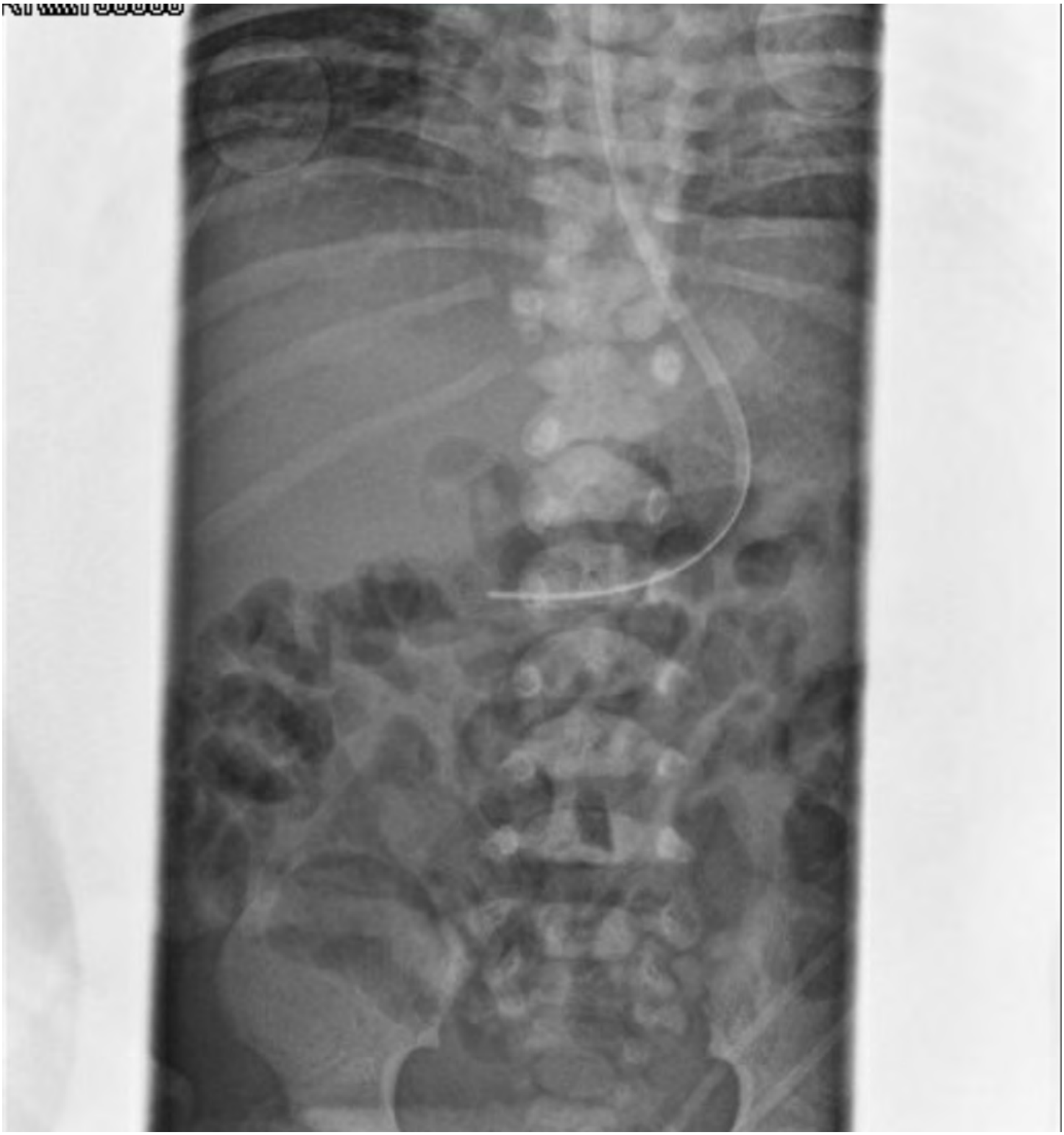
A Case Report of Icthyosis Follicularis, Alopecia and Photophobia Syndrome with Atypical Features

Peter C. Janzen[1], Beenish Rubbab[1], Carolina Saldarriaga[1], Natalie Hauser[2], Sonia Thomas[2]
[1]Pediatrics GME, INOVA Children's Hospital , Falls Church, Virginia, United States, [2]Genetics, Pediatric Specialists of Virginia, Falls Church, Virginia, United States

History (including chief complaint, history of present illness and relevant past and family medical history) A 38 weeks of gestation male presenting at birth SGA to a healthy 28-year-old G2P2 mother. Pregnancy was complicated with IUGR and oligohydramnios first noted at 37 weeks gestation. Previous perinatal ultrasounds were without abnormal findings. Family history was insignificant for IFAP syndrome or other similar defects.
Physical examination findings (including vital signs) Vitals were unremarkable other than tachypnea that improved with nasal CPAP which he required for 24 hours. He remained afebrile with hemodynamic stability during remainder of his hospitalization. At delivery, he was noted to have dry, scaly, and peeling skin in addition to alopecia and absent eyebrows. Other physical exam findings included short palpebral fissures, malformed and posteriorly rotated ears, short nose with anteverted nares, systolic murmur, mild hypospadias, thoracic kyphosis, and height, weight, and head circumference in the <1st percentile.
Laboratory or Diagnostic imaging or Procedures Echocardiogram showed a large perimembranous VSD, small ASD, and bicuspid pulmonary valve. Renal ultrasound revealed Grade 2 hydronephrosis and radiographs of the spine showed diffuse vertebral dysmorphism resulting in kyphosis and gibbus deformity. Brain MRI was normal. Full exome sequencing showed a previously described pathogenic hemizygous mutation in MBTPS2 (membrane-bound transcription factor protease site 2) gene, p.Arg429His c.1286 G>A in chromosome Xp22.12. The mother was found to be the carrier.
Final Diagnosis Ichthyosis follicularis, alopecia, and photophobia (IFAP) syndrome is a rare genetic disorder with less than 50 reported cases in the literature. IFAP syndrome results from mutations to MBTPS2 gene located in chromosome Xp22.12 which codes for a zinc metalloprotease involved in the regulation of cholesterol homeostasis. This enzyme allows cells to cope with stress to the endoplasmic reticulum. The oculocutaneous findings are present at birth with other features such as short stature, intellectual disability, and seizures developing within the first years of life.
In addition to the expected triad, our patient demonstrated several multisystem abnormalities not previously documented such as large cardiac septal defects, hypospadias, and hydronephrosis. The patient’s genotypic variant has been previously reported to result in very low residual enzyme activity and a more severe phenotype. However, this is the first reported case of a patient with IFAP syndrome with additional significant cardiac and genitourinary abnormalities.



Icthyosis of skin



Dysmorphism of lower thoracic vertebrae

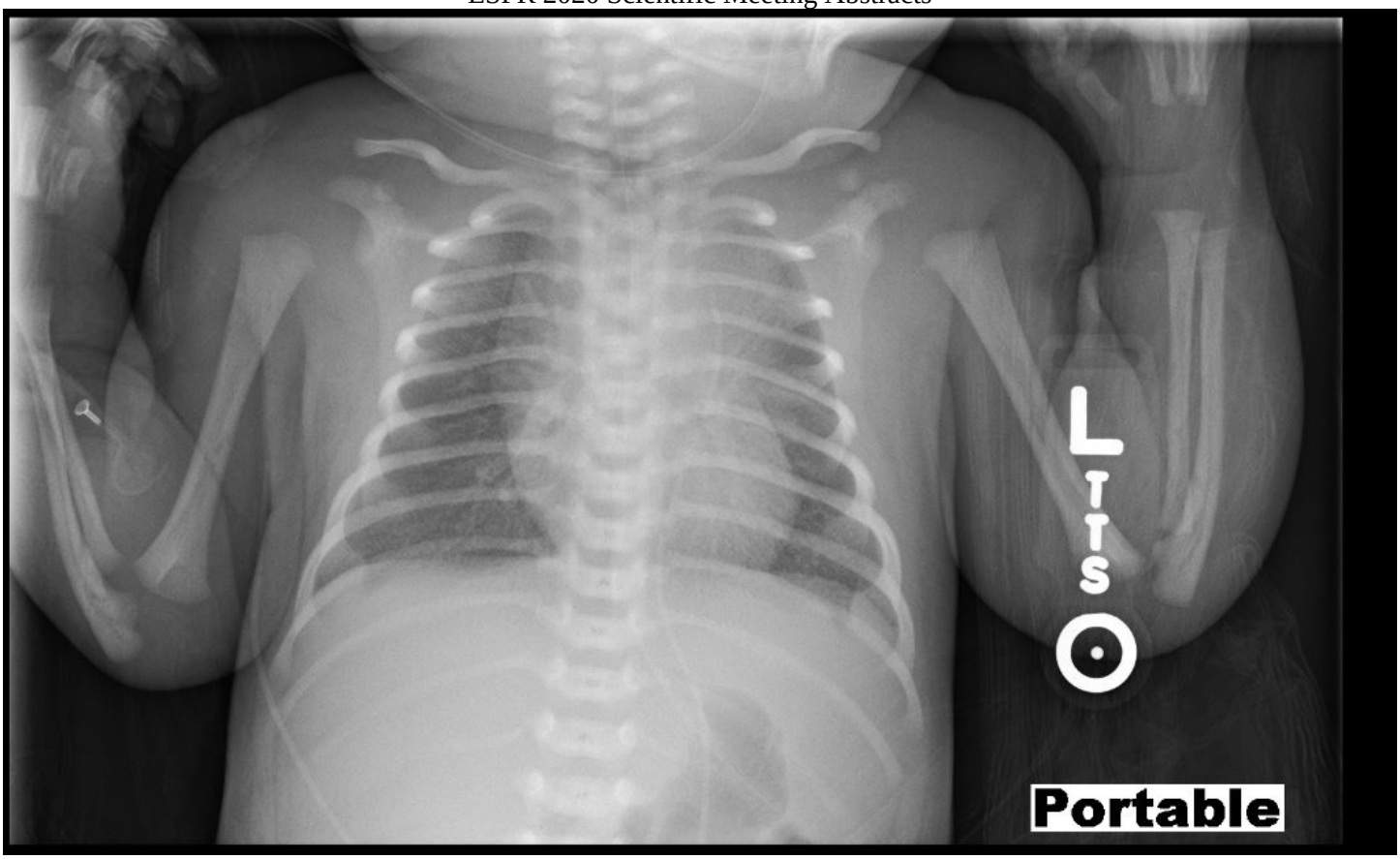
Abstract: 281

Severe Respiratory Failure in Full Term Newborn

Sumaiya Ullah[2], Marwa Khalil[1]

[1]Neonatology, Hackensack University Medical Center, Hackensack, New Jersey, United States, [2]Pediatrics, Hackensack University Medical Center, Hackensack, New Jersey, United States

History (including chief complaint, history of present illness and relevant past and family medical history) A 5 hour old male transferred from Nursery to NICU for respiratory distress
He was born via spontaneous vaginal delivery at 37 weeks gestation to 28-year-old gravida 4,para 3 woman,with induced labor due to cholestasis.She was Group B Strep negative with unremarkable prenatal course
Infant delivered 5 hours after rupture of membranes with clear fluid in vertex position.He had Apgars 8 & 9 during 1 & 5 minute respectively, birthweight of 3810g (81st percentile) & length of 52cm (86th percentile). At 5 hours of life, patient desaturated on simple nasal cannula.He was subsequently transferred to the NICU with grunting & tachypnea, requiring nasal CPAP
In NICU,he had worsening respiratory distress, was intubated & placed on high frequency oscillatory ventilation.He received 3 doses of surfactant,however had poor ventilation,worsening hypercapnia,moderate pulmonary hypertension,& required high frequency jet oscillation with nitric oxide
On Hospital Day(HD) 7,infant was started on steroids due to progressively increasing oxygen requirements with no improvement.Immediately following 3-day course of steroids,he showed significant improvement.He was extubated on HD11,& successfully transitioned to room air by HD15.Throughout this course, he was afebrile,with relatively stable vital signs,making appropriate urinary output & discharged home on oral feeds.
Physical examination findings (including vital signs) Vital Signs: Temp:98.5F, BP:71/37, Resp:23, SpO2:92%
General:Pink,Active,& Responsive
Chest:Tachypneic with moderate retractions,Good air entry,Breath sounds equal bilaterally
Cardiovascular: Regular rate & rhythm,No murmur,Pulses normal
Abdominal:Soft,Non-tender,No masses
Genitourinary:Normal male
Skin:no rash or bruising
Neurological:Alert,active with normal tone,Moves all extremities
Laboratory or Diagnostic imaging or Procedures Arterial Blood Gas: 7.289/57.2/22.0/-4.8
Blood Culture: negative
Chest X-Ray: Increased interstitial markings bilaterally
Final Diagnosis Due to birth history with no risk factors, in addition to negative workup for structural heart disease & diffuse lung injury without focality, this is most consistent with Childhood Interstitial Lung Disease Syndrome. Based on infant's drastic improvement with steroid therapy, diffuse lung injury was most likely inflammatory in nature.
Most chILD in neonates include lung developmental disorders (i.e acinar dysplasia), surfactant deficiency, or genetic disorders associated with abnormal/dysfunctional pulmonary tissue. Definitive diagnosis requires High-resolution CT Scan, genetic tests, and/or lung biopsy. Morbidity & mortality vary widely based on etiology of the diffuse lung injury.



Chest XRay during admission

Abstract: 282

Atrioventricular block in Dengue Virus Infection

Shahwar Yousuf, Saul Antonio Diaz Martinez, Ashutosh Das
Pediatrics, Bronxcare Health System, Bronx, New York, United States

History (including chief complaint, history of present illness and relevant past and family medical history) A previously healthy 13-year-old male recently returned from vacation in Dominican Republic, presented to our Emergency department with five-day history of high-grade fever and generalized abdominal pain. Fever was associated with headache, dizziness, nausea, vomiting, non-bloody diarrhea and reduced appetite. Rest of the review of systems were negative

Physical examination findings (including vital signs) Physical examination was with in normal limits

Viital Signs:
Temperature (degrees F) 98.6 degrees F
Pulse (bpm) 86 bpm
Rate (breaths/min) 16
BP Systolic (mm Hg) 127
BP Diastolic (mm Hg) 64
SpO2 (%) 99 %
SaO2 Method room air

Laboratory or Diagnostic imaging or Procedures His initial CBC showed leukopenia and thrombocytopenia (Table 1). Testing was sent for Zika, Dengue, Chikungunya, and Malaria.

On 4th day of admission, patient developed asymptomatic bradycardia ranging between 41-58 bpm. A 12-lead ECG revealed type I AV block (Figure 1). Repeat CBC showed thrombocytopenia as noted at the time of admission (Table 1). Lyme titers and thyroid function tests were ordered to evaluate the cause of the heart block. The patient remained clinically stable and thrombocytopenia improved by day 5 of admission. After discharge, his dengue serology was reported as positive (Table 1). The patient followed up with cardiology after discharge and his PR interval was less than 180ms which was normal and he did not need any further evaluation

Final Diagnosis Atrioventricular Block in Dengue Virus Infection

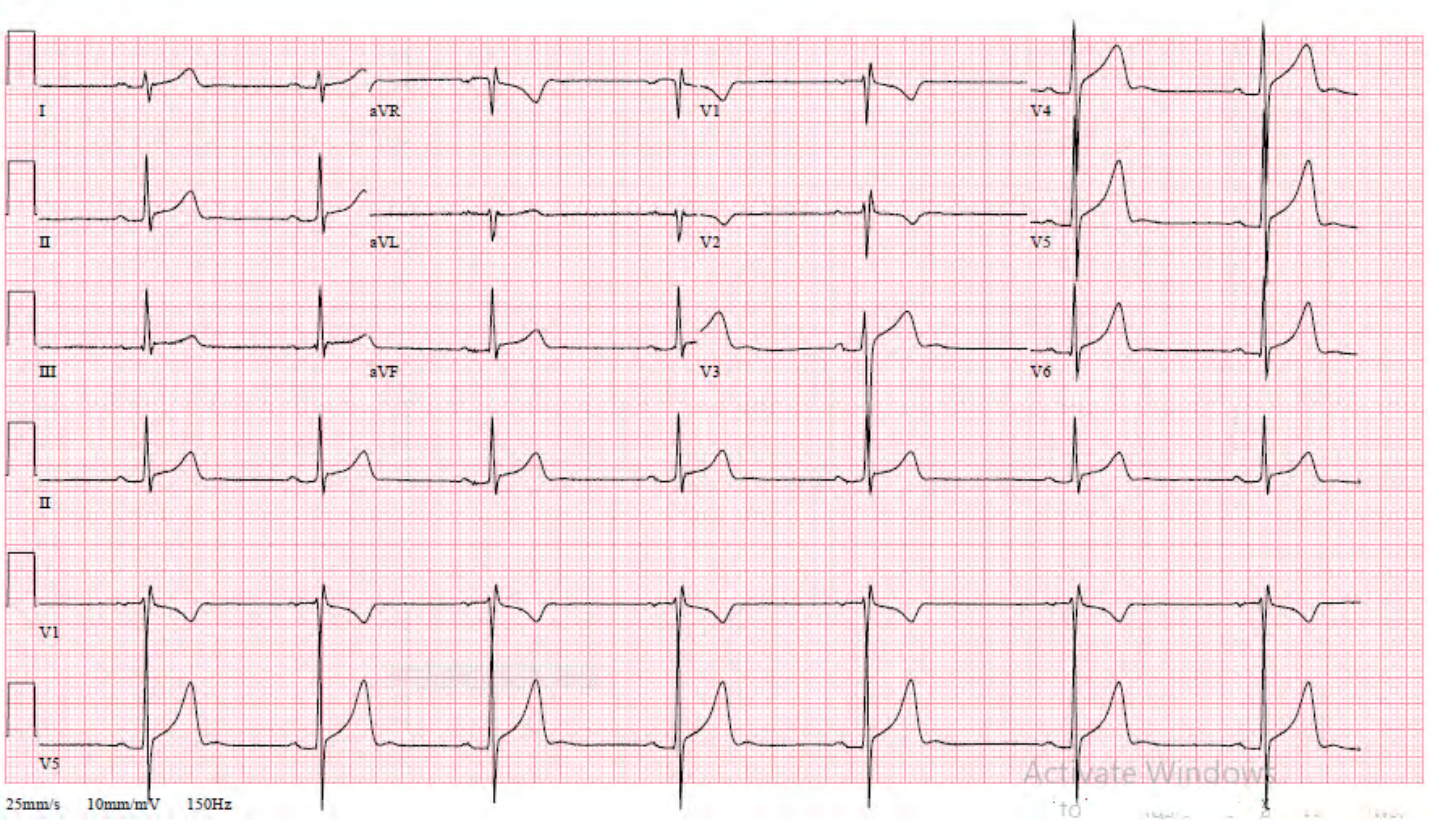


Figure 1

CBC on day 1	WBC: 2000/uL, Hct:47.3%, Hb: 15.3g/dL, Plt:94000/uL
CBC on day 4	WBC: 4300/uL, Hct:41.3%, Hb: 13.6g/dL, Plt:54000/uL
CBC on day 5	WBC: 5000/uL, Hct:41.3%, Hb: 13.6g/dL, Plt:79000/uL
Malaria Smear x 3	Negative
Dengue fever IgM Antibodies	Negative on Day 1 of admission
Dengue Virus NS1 on day 1	**24.05** (Normal range <1)
Dengue Virus NS1 on day 2	**22.28** (Normal range <1)
Chinkungunya IgG	Negative
Chinkungunya IgM	Negative
Urine Culture	Negative
RSV/Influenza	Negative
Zika RNA serum, Zika RNA urine, Zika IgM	Not detected, Negative
PT/PPT/ INR on Day 2	PT: 14.9(10.7-12.9 sec) PTT: 37.6(25.1-36.5 sec) INR:1.26 (0.9-1.09) 12.8/36.9/1.08
PT/PPT/ INR on Day 3	PT: 12.8 (10.7-12.9 sec) PTT: 36.9 (25.1-36.5 sec) INR:1.08 (0.9-1.09)
D-Dimers	710 (0-230 ng/ml)
Fibrinogen Assay	182 (185-450 mg/dl)
Stool culture	Negative
Stool Ova and parasite	Negative
Stool Occult Blood	Negative
Factor VII assay	76 (60-150)
Lyme antibody by Western Blot	Negative <0.90
TFT panel	Free thyroxine: 1.62(0.8-2.0 ng/dl), T3: 132 (123-221 ng/dl), TSH: 2.43 (0.5-4.30 mIU/L)

Table 1

Abstract: 283

Recurrent Episodes of Hemoptysis in the Setting of Pulmonary Capillaritis

Donika Hasanaj, Taylor Duffin, Jeffrey Loeb, Shannon Vitone, Nathan Roberts
Wake Forest School of Medicine, Summerfield, North Carolina, United States

History (including chief complaint, history of present illness and relevant past and family medical history) A ten-year-old Caucasian female, with a past medical history notable for chronic iron deficiency anemia and poor weight gain in childhood, presented with frank, large-volume hemoptysis. The patient has a family history significant for psoriasis in her mother and rheumatoid arthritis in her paternal grandfather. Prior to presentation, the patient developed shortness of breath as well as a productive cough with yellow sputum of two weeks duration. She presented to medical attention due a low grade fever and frank hemoptysis. Upon presentation, the patient was noted to be hypoxic, tachycardic, and ultimately she developed respiratory failure requiring intubation and mechanical ventilation.

Physical examination findings (including vital signs) Initial vital signs showed T 98.3 F, BP 146/80, HR 157, RR 31, and SpO2 85% on room air with rapidly worsening hypoxia. On physical exam, the patient appeared sickly with pallor. Head and neck examination was non-contributory. Cardiac exam revealed a regular rhythm with tachycardia, but otherwise no murmurs, rubs, or gallops. She demonstrated signs of respiratory distress with tachypnea and accessory muscle usage, and upon auscultation she was noted to have diffuse coarse rales in all lung fields with no rhonchi. The remainder of the physical exam was otherwise unremarkable.

Laboratory or Diagnostic imaging or Procedures Initial serum hemoglobin level was 3.8 g/dL and white blood cell count was 25,800 cells/mL. Chest radiography followed by CT imaging of the chest demonstrated bilateral confluent lung opacifications. A respiratory virus panel resulted positive for both adenovirus and metapneumovirus. Other infectious studies were negative.

Inflammatory markers revealed a normal ESR with a CRP of 8.9mg/L. Antibodies for ANA, dsDNA, Proteinase 3, Myeloperoxidase, Smith, anti-Ribonucleoprotein, anti-glomerular basement membrane, SSA, SSB, Beta 2 Glycoprotein, C-ANCA and P-ANCA were checked and all were found to be unrevealing. Lung biopsy revealed diffuse alveolar hemorrage with hemosiderosis and foci of capillaritis.
Final Diagnosis This case presents a ten-year-old child with severe anemia and respiratory failure due to diffuse alveolar hemorrhage resulting from isolated pauci immune pulmonary capillaritis as confirmed by a lung biopsy. PC is a rare immune-mediated vasculitis of the pulmonary vasculature that can manifest with diffuse alveolar hemorrhage (DAH).

Abstract: 284
Cerebral Calcifications in a de novo SCN2A variant mutation
Rachel Chidester, Natalie Hauser
Pediatrics, Inova Children's Hospital, Alexandria, Virginia, United States

History (including chief complaint, history of present illness and relevant past and family medical history) 37w5d female born to an HSV+ G3P2 29 year old mother presenting with mild dysmorphic features, and seizures. Dysmorphic features included deep-set eyes and cupped ears. The baby had multiple seizures after birth, presenting as bicycling of the upper and lower extremities.
Physical examination findings (including vital signs)
Laboratory or Diagnostic imaging or Procedures A video EEG confirmed seizure activity and encephalopathy. Brain CT and MRI imaging showed several areas of multiple bilateral punctate foci in the basal ganglia representing abnormal calcifications. Infectious disease workup was negative for TORCH infection in blood or CSF. Genetic testing with whole exome confirmed a de novo SCN2A likely pathogenic variant associated with Early Infantile Epileptic Encephalopathy type 11.
Final Diagnosis SCN2A mutations affect sodium channels in the nervous system, and present with epilepsy and autism spectrum disorder. A review of the literature for typical features associated with SCN2A variants does not describe brain calcifications as a typical or even a rare feature. This is a new physical finding that we will describe and discuss.

Abstract: 285
Unusual Cause of Weight Loss and Fever
Sarah Schaffer, Abigail Strang, Aaron Chidekel
Pediatric Pulmonology, AI duPont Hospital for Children, Philadelphia, Pennsylvania, United States

History (including chief complaint, history of present illness and relevant past and family medical history) CC: Weight loss, fever
HPI: GM is a 16 year old male with no significant PMH who presented with weight loss of 25lbs associated with nausea and vomiting over the past three months and new-onset fever for 4 days. In addition to systemic symptoms, GM reported chest tightness and productive cough and disclosed that he used marijuana and nicotine through vaping device on a daily basis for the past few months. Infectious and malignancy work up were nonrevealing. Abdominal CT showed abnormalities in the lung bases. Pulmonology was consulted, and dedicated CT chest showed ground glass opacities bilaterally. Spirometry revealed significantly reduced flows and volumes, and he was noted to have mild desaturations on 6 minute walk test. He was started on high-dose steroids with taper and remained abstinent from vaping with resolution of symptoms and weight gain. CT and inflammatory markers showed interval improvement, and spirometry revealed normal and much improved airway function at 3-week follow up.
Physical examination findings (including vital signs) BP 102/55, Pulse 108, Temp 39.2 °C, RR 20, Sp02 96%, BMI 20.97 kg/m2
GENERAL APPEARANCE: alert and not in distress, gaunt appearing
LUNGS: unlabored respirations, no intercostal retractions or accessory muscle use, clear to auscultation without rales or wheezes
HEART: regular rate, regular rhythm and no murmurs detected
VASCULAR: well perfused with normal pulses in the distal extremities
ABDOMEN: soft, nontender, no masses palpated
NEURO: no focal deficits noted, intact gait, intact strength and sensation
Laboratory or Diagnostic imaging or Procedures CBC within normal limits
CMP with mild hyponatremia
Respiratory viral panel negative
Sputum culture: normal respiratory flora
CRP 22, ESR 46
LDH: 1028, Uric Acid 3, CK 41
UDS: + THC
Lipase and Amylase WNL
Celiac panel negative
Chlamydia, Neissieria and HIV negative

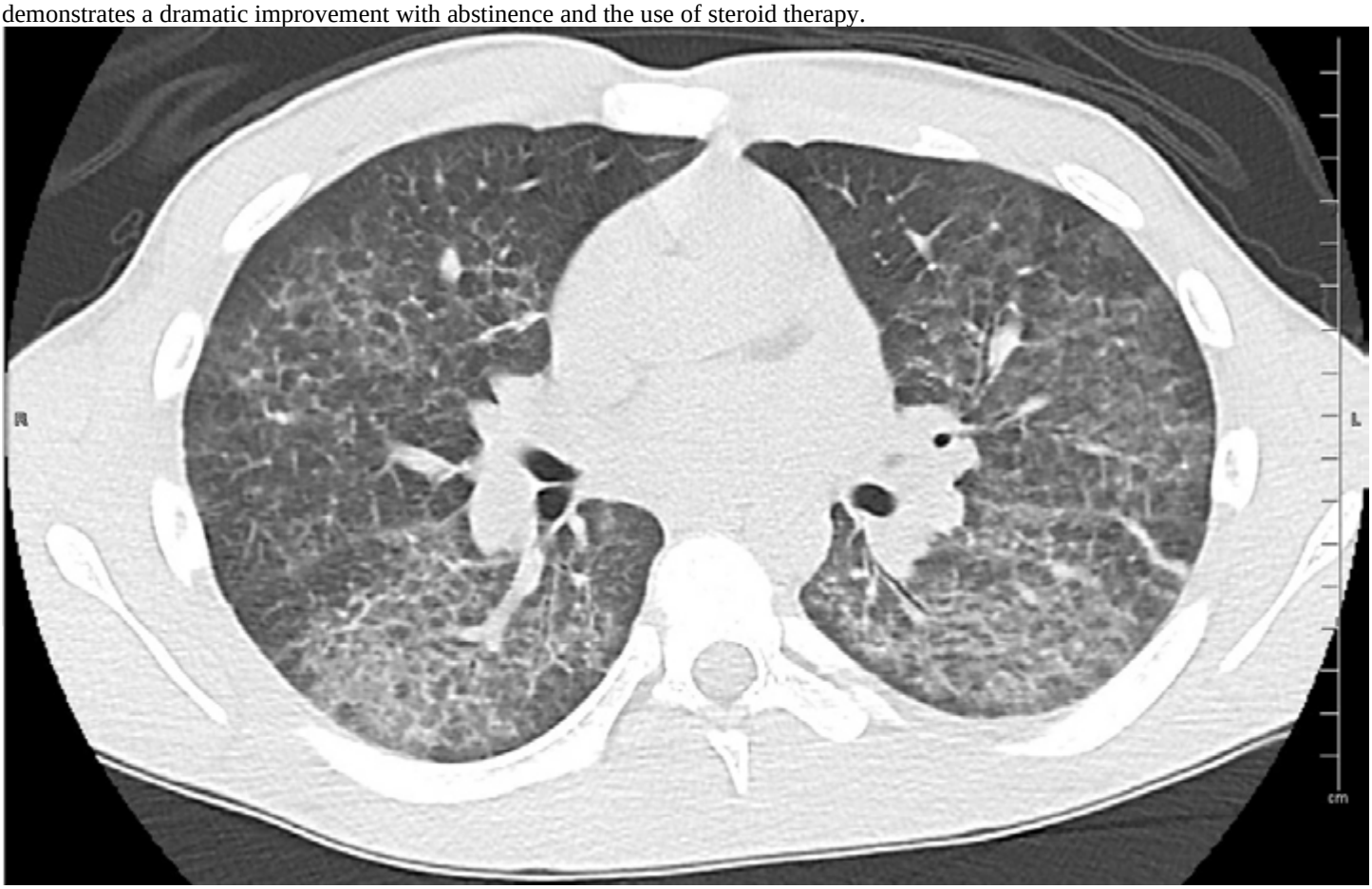
Imaging:

Chest Xray: Coarsened pulmonary markings. No consolidation.

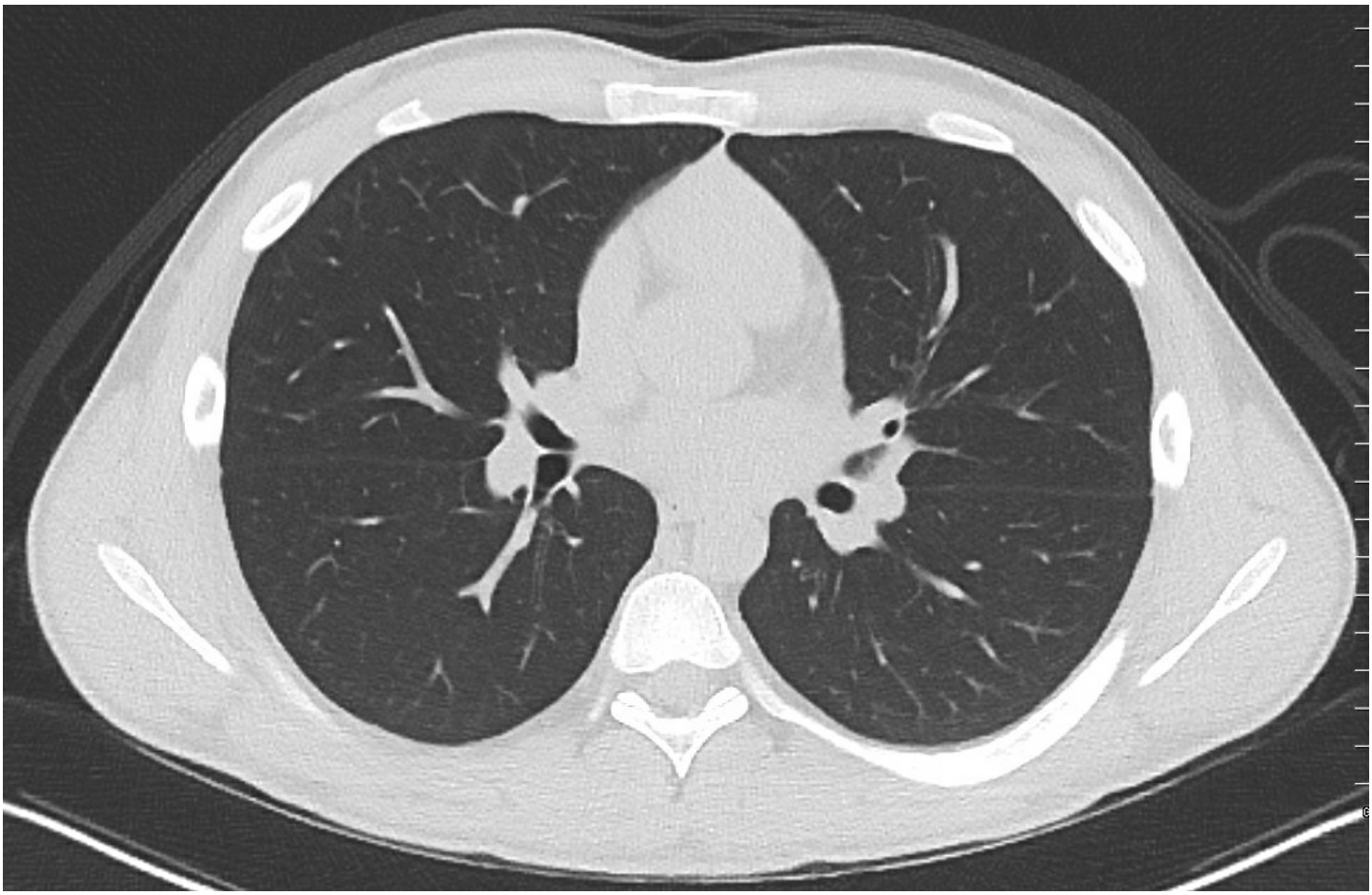
CT Chest w/o contrast: Diffuse, patchy areas of groundglass opacification and interlobular septal thickening throughout both lungs with a lower lobe predominance and relative sparing of the periphery. Findings are suggestive of an inflammatory/hypersensitivity process.

Follow up CT 3 weeks after discharge: Near complete resolution of the diffuse groundglass opacification and interlobular septal thickening

Final Diagnosis Although the patient had significant lung injury secondary to vaping as demonstrated on CT and spirometry findings, this case highlights how EVALI may present with primarily systemic and gastrointestinal symptoms. Additionally, this case demonstrates a dramatic improvement with abstinence and the use of steroid therapy.



CT Chest on admission


CT Chest: 3 week follow up

Abstract: 286

Sex Trafficking in a 16-year-old Female: Psychological Control used by traffickers

Natasha Jouk, Liliana C. Buitrago, Roy Vega
Pediatrics , Bronxcare Heath System , Bronx, New York, United States

History (including chief complaint, history of present illness and relevant past and family medical history) A 16-year-old female presented to the ED for medical evaluation after being rescued by the authorities from a human trafficking gang. The patient reported that she endured one month of captivity during which she was repeatedly raped, physically assaulted and threatened with weapons. She reported tenderness in various parts of her body. Pictures of the patient were posted on a mobile application to solicit “clients”. The patient refused a rape kit stating that she was not raped, instead "she was working for the money and the clients always wore condoms". She disclosed that her traffickers had inserted a chip in the right ear to monitor and track her. She had a past medical history of developmental delay, depression, and anxiety for which she was on sertraline. She had received weekly therapy at home and was in special education. She had previously been admitted to the hospital for depression and anxiety treatment. There was no family history.

Physical examination findings (including vital signs) There were mild swelling and tenderness to palpation of the right mastoid area without erythema. The patient reported a beeping noise during the right ear examination. Multiple bruises and soft tissue hematomas, in various stages of healing, were noted throughout her body.

Laboratory or Diagnostic imaging or Procedures X-Ray of the skull showed a radiopaque foreign body, confused by hair. CT scan of the head was normal and showed no foreign body.

Final Diagnosis On admission, she did not want to speak to medical staff insisting that the “chip” be removed from behind her right ear first. HIV post-exposure prophylaxis was refused. The patient was evaluated by the surgical team due to complaints of “beeping in the right ear”. The management of the case was challenging due to her belief that she was being monitored.

The final diagnosis was Post-traumatic stress disorder in a victim of human trafficking. Psychological tactics and manipulation are used by traffickers to keep victims fearful and under their control. Human trafficking victims live in a constant state of fear and

anxiety destroys their self-esteem and hinders their ability to attempt to escape. There are few published studies documenting the mental healthcare needs of trafficked children. The high rates of PTSD in trafficked children have been reported. It is well known that traffickers use psychological manipulation and coercion. The goal of this case report is to document the extent to which traffickers will go to keep victims under their control and the need for further studies of mental health care.

Abstract: 287

Severe lung injury associated with electronic cigarette use in an adolescent patient with history of mannose-binding lectin deficiency

Rachel M. Cinlemis[1], Mollie Walton[1], Amit Vohra[2]
[1]Medical Education, Dayton Children's Hospital , Dayton, Ohio, United States, [2]Pediatric Intensive Care Unit, Dayton Children's Hospital, Dayton, Ohio, United States

History (including chief complaint, history of present illness and relevant past and family medical history) This is the case of a 17-year-old female who presented with a two-day history of shortness of breath and non-productive cough. These symptoms developed during oral cefdinir treatment for a right sided pneumonia. The patient admitted using nicotine-containing vaping devices for three years and THC-delivering devices for three months prior to presentation. Parents reported a medical history significant for frequent ear infections during childhood, which lead to the diagnosis of MBL deficiency at 8 years of age. In 2010, her MBL protein test resulted <50 and MBL pathway function test or marker for C4b protein was <120 ng/mL.
Physical examination findings (including vital signs) Vital signs: HR 120 bpm, tachypnea 42/min, saturations 83%. Physical exam was significant for mild digital clubbing. Lungs were clear with diminished aeration. There were no rhinorrhea, congestion, or sneezing.
Laboratory or Diagnostic imaging or Procedures Initial work-up included chest radiographs, which suggested bilateral diffuse alveolar disease and a chest CT angiogram with ground glass opacities sparing the peripheral lung fields (figure 1). Infectious work-up was extensive (table 1). Her viral panel was positive for Rhinovirus/Enterovirus, with all other infectious testing negative. Immunoglobulin levels were normal. Rheumatologic work-up was normal (table 2). She was admitted to the PICU for acute hypoxemic respiratory failure. Initial treatment consisted of three days of noninvasive ventilation, including BiPAP and high flow nasal cannula, and a five-day course of antibiotics. On day two of admission, her respiratory status remained unchanged. Empiric intravenous steroids were initiated. The patient had a good clinical response to steroids and was able to wean off of BiPAP. She transitioned to oral steroids to complete a two-week course with steroid taper. Respiratory status gradually improved, and she was eventually weaned to room air by day six. Spirometry was performed when clinical status stabilized. FEV1 was 61% of predicted with FEV1/FVC ratio of 100%, indicative of moderate impairment of lung function unresponsive to bronchodilators (table 3). On outpatient Pulmonology follow-up, she was started on a thrice-weekly regimen of azithromycin for its anti-inflammatory properties. Serum propyl glycol levels were negative, it is the active ingredient in the used e-cigarette solution.
Final Diagnosis Electronic-vaping associated lung injury and a novel association with MBL deficiency affecting the innate host defense system.

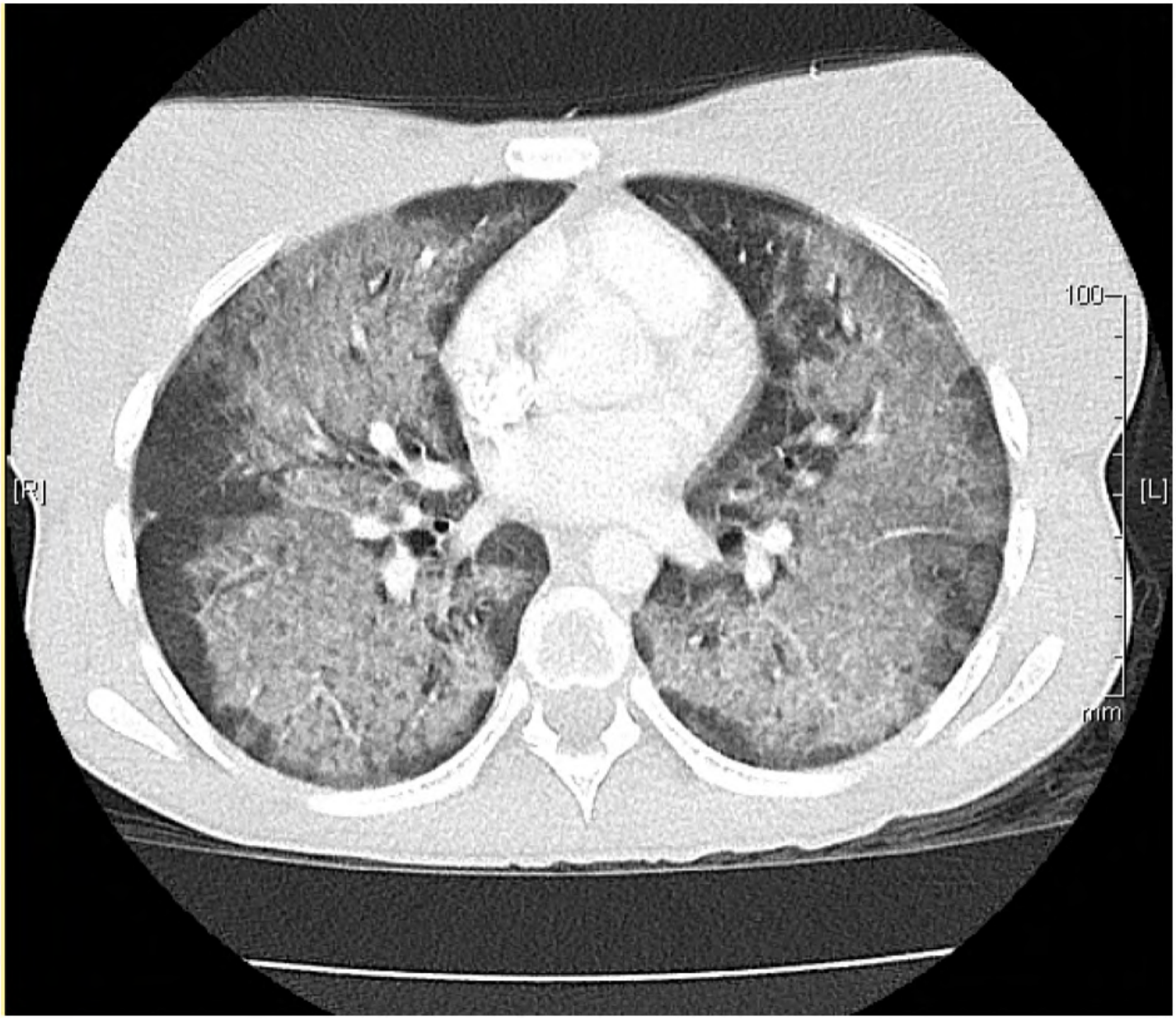


Figure 1. Slice of chest CT angiography obtained during admission.

Lab	Result
HIV 1,2 Ab and Ag	Negative
Histoplasma (urine Ag)	Negative
Histoplasma (serum Ab)	Negative
RIDP	Rhino/Enterovirus positive
Legionella urine Ag	Negative
Mycoplasma titers	Negative
Hypersensitivity pneumonitis panel	Negative
Sputum culture	Moderate growth of normal flora
Blood culture	Negative
AFB culture	Not performed
WBC	15,7000
Immunoglobulins	IgG 768 mg/dL, IgA 171 mg/dL, IgM 84 mg/dL, IgE 53.8 mg/dL

Table 1. Patient's infectious and immunologic work up admission.

Lab	Result
ANA	<1:20
C3	138 mg/dL
C4	24.8 mg/dL
p-ANCA	0
Anti-Smith Ab	0
dsDNA Ab	<1:10 IU/mL

Table 2. Rheumatologic work up following acute illness. Work-up was unremarkable.

	Pre-bronchodilator	Post-bronchodilator
FVC	54	+8
FEV1	61	+7
FEV1/FVC	112	+0
FEF 25-75%	100	-11

Table 3. Pulmonary function testing following acute illness - showing moderate impairment of lung function without any significant response with bronchodilation.

Abstract: 288

Case of Adolescent with Hyperhidrosis in Context of Vaping Synthetic Cannabinoid Oil

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[1]Pediatrics , Staten Island University Hospital, Staten Island , New York, United States, [2]Pediatric Endocrinology, Staten Island University Hospital, Staten Island, New York, United States, [3]Pediatric Hematology/Oncology, Staten Island University Hospital, Staten Island, New York, United States, [4]Kansas City University of Medicine, Kansas City, Missouri, United States

History (including chief complaint, history of present illness and relevant past and family medical history) A 17-year-old male with a past medical history of Eosinophilic Esophagitis and Osgood-Schlatter disease was referred for oncology evaluation due to 2 weeks of diaphoresis. He developed drenching sweats mainly involving his upper body, which occurred throughout the day. His sweating was significant enough that he quit school to live at home, where he isolated himself with limited activities. He denied fever, weight loss, recent travel history, or use of new medications. He had a history of smoking with e-cigarettes with synthetic cannabinoid oil daily, with increased use over the past 2 months, believing that vaping would reduce severity of symptoms. Review of systems was also significant for abdominal pain, 2 episodes of non-bloody diarrhea per day, and decreased appetite. He also endorsed new blisters on both fingers, with an erythematous rash on his left palm.
Physical examination findings (including vital signs) Vital signs significant for elevated blood pressure of 141/88. On physical exam, pertinent findings included diaphoresis of the upper body and blisters of the distal fingers bilaterally.
Laboratory or Diagnostic imaging or Procedures Infectious disease evaluation was negative for Rickettsia, Babesia, Ehrlichia, and Lyme, TB, and chlamydia. Endocrine evaluation revealed normal thyroid function. Further work up was performed to rule out neuroendocrine tumors. An MRI abdomen was negative for any abnormal adrenal findings; lab work including CBC, LDH, uric acid, ESR, serotonin, and a 24 hour cortisol, metanephrine, and catecholamine urine collection was all within normal limits. 5hiaa urine test resulted as elevated (11.6) and then normal on repeat sent after cessation of vaping. Urine toxicology was positive for tetrahydrocannabinol.
Final Diagnosis At follow up, he reported discontinuation of vaping for one week. He endorsed that episodes of sweating were less intense and also no longer occurring on a daily basis. The rash present on his hand had also resolved. He was further referred to rheumatology and psychiatry for further evaluation, and diagnosed with general anxiety disorder. Cessation of vaping reduced the frequency and intensity of his sweating; suggesting the possibility that vaping the synthetic THC oil may have contributed to or exacerbated his symptoms. Further research is required to determine whether there is a causative relationship between e-cigarette use and the hyperhidrosis this 17-year old patient experienced. Nonetheless, this case study helps to expand the literature on potential e-cigarette side effects.

Abstract: 289

Complete renal recovery in patient with anuria AKI of 72 hours with Hypertensive Encephalopathy: A case report of APSGN

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History (including chief complaint, history of present illness and relevant past and family medical history) Anuria alone is not an indication for acute dialysis. Furthermore, randomized controlled trials that have addressed time of initiation of renal replacement therapy (RRT) in critically ill patients are inconclusive. In the absence of emergent indications of renal replacement therapy, in a patient who is hemodynamically stable, delayed RRT initiation is not unreasonable. The question is how long can we wait for? Here we described a 9-year-old male without past medical history who presented with fever, vomiting, and decreased urine output for 5-6 days prior to admission. No significal family history, sick contact or recent travel.
Physical examination findings (including vital signs) On admission, patient was afebrile with normal vital signs. Physical examination was notable for generalized abdominal tenderness otherwise unremarkable.
Laboratory or Diagnostic imaging or Procedures Laboratory results were significant for anemia (Hgb 10.7 g/dL), elevated BUN (123 mg/dL), and serum creatinine (12.9 mg/dL), metabolic acidosis (TCO2 17 mmol/L), hyponatremia (132 mmol/L), hypocalcemia (7.8 mg/dL), hyperphosphatemia (5.9 mg/dL), and hypoalbuminemia (2.8 g/dL). Additional work up showed high ESR (33 mm/hr), CRP (24.37 mg/L), and ASO titer 715 units/ml (nl 0-199 units/mL); low C3 37 mg/dL (nl 80-175 mg/dl) and normal C4. ANA, anti-DS DNA, and viral panel (HIV, hepatitis) were normal. Renal ultrasound demonstrated mildly enlarged and bilaterally hyperechoic kidneys without evidence of hydronephrosis. Kidney biopsy was consistent with crescentic acute post streptococcal glomerulonephritis (APSGN) (**Fig.** 1). Dialysis was not initated. Patient remained on supportive therapy. After anuria of 72 hours, renal function started improving (**Fig. 2)**. Interestingly, hypertensive encephalopathy, which often occurs at uremia phase, was delayed. Patient developed hypertension, altered mental status and visual hallucination at recovery phase of AKI. He was transferred to PICU. Blood pressure was controlled with amlodipine and Lasix. Anticonvulsant was not initiated at the time. Steroid pulse was delayed. Patient was discharged home after 9 day hospitalization and he was readmitted for seizure episode and hypertension, anticonvulsant was then initiated.
Final Diagnosis The case is anuric AKI secondary to APSGN with late onset of hypertensive encephalopathy. It provides evidence of proper medical management for anuric AKI of 72 hours with complete renal recovery. It highlights the importance of blood pressure monitoring during renal recovery to prevent neurological damage.

Figure 1: Kidney biopsy from the patient. (A) H&E staining shows crescent pattern. (B) PAS staining shows the crescent pattern. (C) H&E staining shows prominent neutrophil infiltrate. (D) Immunofluorescence findings are positive for C3. (E) And (F) Electron microscopy shows numerous subepithelial "hump" like deposits indicated as red arrows.

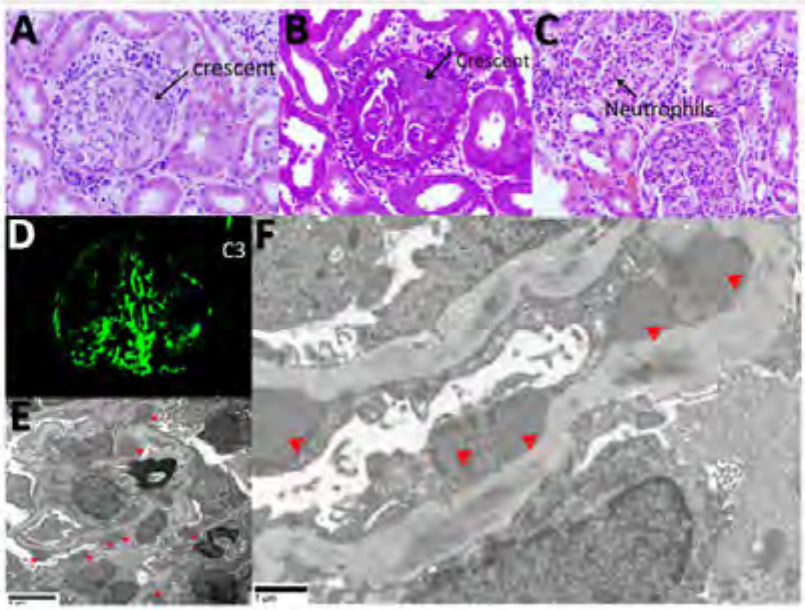
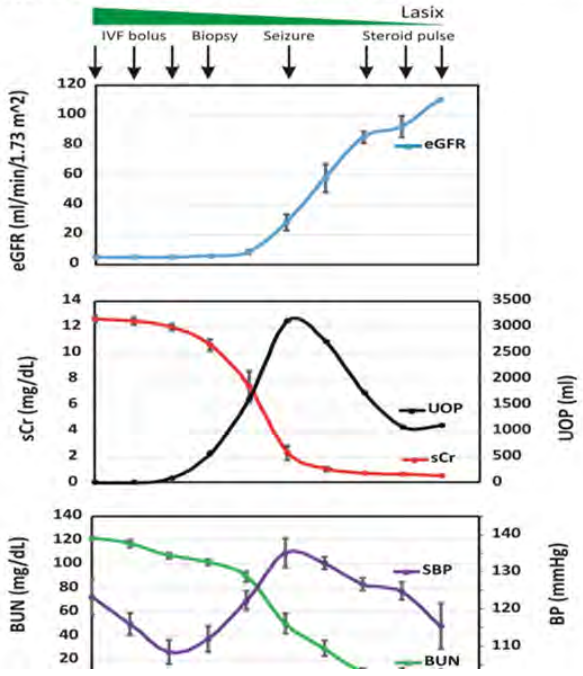


Figure 2. Clinical course of patient starting from the admission to discharge. Medical treatment is documented in the upper panel of the figure with IV Normal Saline bolus 1.5-2 liters per day, IV Lasix 40 mg q12h followed by oral Lasix after 5 days of treatment, IV SoluMetrol 1 g daily for total 3 days once seizure was controlled and BP improved. Kidney biopsy s performed on HD#3 and seizure occurred on HD#5 after uremia was resolved.



Abstract: 290

Risk of Late-Onset Autoimmune Complete Heart Block: Analysis of Published Data

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[1]Pediatrics, New York University Langone Health, New York, New York, United States, [2]Rheumatology, NYU Langone Health, New York, New York, United States

Background The presence of maternal anti-Ro (SSA) and/or anti-La (SSB) antibodies is a known risk factor for the development of congenital complete heart block (CHB). Most clinicians begin fetal echocardiography (echo) surveillance at 16-18 weeks gestational age (GA) but because the incidence of CHB > 24 weeks GA is unclear, there is uncertainty as to when it may be safe to stop surveillance. A detailed analysis of published data is lacking.
Objective We aimed to ascertain the risk of late-onset CHB among offspring of SSA/SSB-positive mothers in the published literature.
Design/Methods Using the search term “autoimmune congenital heart block” on PubMed and Ovid, we gathered prospective studies of SSA/SSB-positive mothers with regular fetal echo surveillance starting from before CHB diagnosis. We also used the same search term to gather retrospective studies with CHB diagnosis in fetal life (if there was prior normal heart rate) or after birth in offspring of SSA/SSB-positive mothers. Then using references of each study, we gathered additional studies that met the above criteria, and this was continued until no new study was found. We ensured that the same patients potentially reported in different studies were accounted for only once by considering the time period and site(s) of each study.
Results Nine prospective studies included 1,178 SSA/SSB-positive pregnancies, from which 24 cases of CHB were diagnosed during the pregnancy (2.0%). Among these 24 cases, three (12.5%) were diagnosed at > 24 weeks but only one case was diagnosed after 26 weeks GA, and there had been a lag period between diagnosis and the most recent previous fetal echo (Table 1). From the retrospective studies, 50 patients were diagnosed with CHB in the fetal or neonatal period (Table 2) and 25 in the non-neonatal childhood period, > 1 month of age (Table 3). An additional Swedish study found 13 cases diagnosed after birth, 12 with prior documentation or report of normal heart rate and rhythm. Because this study appeared to be an outlier, the data are presented separately in Table 4. Our analysis of both the prospectively- and retrospectively-diagnosed CHB cases revealed that the timing of the screening, including the most recent screening, of fetal cardiac rhythm and rate was not always clear.
Conclusion(s) Late-onset autoimmune CHB in offspring of SSA/SSB-positive mothers occurs in a very low proportion of cases. Our analysis suggests that prenatal surveillance should continue beyond 24 weeks GA but is limited by inconsistent published surveillance data.

Table 1: Prospective Studies of Antibody-Positive Pregnant Mothers with Regular Prenatal Screening

Study (years of enrollment)	Number of Pregnancies Studied	Prenatal Monitoring	Number of Complete Heart Block	Number of Late-Onset Complete Heart Block (GA at detection)
PITCH study: US-based multicenter study (2007 – 2009)	20	Echo weekly from 16 – 26 weeks and biweekly until 34 weeks	1	1 (25)
Multicenter study across eight European centers (2004 – 2008)	24	Echo every two to three weeks from 15 to 30 weeks	1	1 (26)
Single center study at Hospital for Sick Children, Toronto (1988 – 1997)	118	Echo at weeks 18-20, 24-26, and 32-34	1	0
Single center study at Pitie-Salpetriere Hospital, Paris (1991 – 2002)	165	Repeated echo until 32 weeks	1	0
Study across four referral hospitals in Italy (1985 – 2001)	118	Monthly echo until 18 weeks, then every 2-4 weeks	2	0
Single center study at Hospital for Sick Children, Toronto (2000 – 2008)	150	Echo weekly from 19-24 weeks and until 32 weeks if previous child with CHB	3	1 (28)
PRIDE Study: US-based multicenter study (2000 – 2006)	98	Echo weekly from 16 to 26 weeks and then biweekly until 34 weeks	3	0
Home monitoring study: multicenter study across 16 centers (Not reported)	273	Weekly or bi-weekly surveillance echo, home Doppler device twice daily, diagnostic echo if home Doppler device abnormal. Continued until 26 weeks	2	0
Single center study in Stockholm, Sweden (2000 – 2015)	212	Weekly echo from 18-24 weeks and postnatal ECG	5	0
	Total: 1,178		Total: 24	Total: 3

Table 2: Retrospective Studies with Fetal (*Study 1) and Neonatal Diagnoses of Complete Heart Block in Offspring of Antibody-Positive Mothers

Study Description (years of enrollment)	Number with Fetal (*Study 1) or Neonatal Diagnosis of Complete Heart Block	Previous Screening?
*Case report from Osaka, Japan (2013)	1	Maternal heart rate at 12 weeks GA
Neonatal lupus French registry (1976 – 2014)	7	**Three patients seemed to have routine sonograms performed after 15 weeks GA
Glasgow, Scotland – 10 individuals with Complete Congenital Heart Block (Not reported)	4	None reported
Diagnostic database of the Department of Pediatric Cardiology at Necker Enfants-Malades in Paris (1980 – 2004)	4	None reported
Data gathered through the Swedish National Patient Register, Swedish Pacemaker and Implantable Cardiac Device, and through local clinical registers and a network of cardiologists and rheumatologists at the six university hospitals in Sweden (1949 – 2009)	29	None reported
Italian Registry of Neonatal Lupus (1969 – 2017)	5	None reported
	Total: 50	

*Diagnosed at 14 weeks GA

**Twelve patients diagnosed with heart block. Seven had complete heart block and five had incomplete heart block (one had 1st degree that progressed to 2nd degree, two had 2nd degree, and two had variable).

Table 3: Retrospective Studies with Non-neonatal Childhood Diagnoses (> age 1 month) of Complete Heart Block in Offspring of Antibody-Positive Mothers

Study Description (years of enrollment)	Number of Diagnosis of Complete Heart Block in Childhood Period	Age at Diagnosis	Previous Screening?
Research Registry for Neonatal Lupus (RRNL) (1970 – 2007)	2	1) 18 months 2) 2 years and 7 months	**The patient diagnosed at 18 months had sonogram in 2nd trimester that showed transient bradycardia but subsequent prenatal echo was unable to confirm it as AV block. At birth, EKG showed borderline 1st degree AV block.
Glasgow, Scotland - 10 individuals with Complete Congenital Heart Block (Not reported)	1	18 months	None reported
Pacemaker Clinical Center of the Heart Institute of the University of Sao Paulo (1974 – 2007)	17	*Nine patients diagnosed between birth and 1 year *Eight patients diagnosed after 1 year	None reported
Five tertiary referral centers in Finland (1950 – 2000)	3	One patient diagnosed at 2 years *Two patients diagnosed between 2 and 16 years	None reported
Diagnostic database of the Department of Pediatric Cardiology at Necker Enfants-Malades in Paris. (1980 – 2004)	2	*One patient diagnosed between 1 month and 1 year *One patient diagnosed between 1 and 5 years	None reported
	Total: 25		

*Specific ages not reported

**The patient diagnosed at 18 months required a pacemaker

Table 4: A Single Retrospective Study: Patients with complete heart block were identified through the Swedish National Patient Register, Swedish Pacemaker and Implantable Cardiac Device, and through local clinical registers and a network of cardiologists and rheumatologists at the six university hospitals in Sweden. All patients born between 1949 and 2009. All mothers of patients included in this chart were anti-Ro and/or anti-La antibody positive

Age at Diagnosis	Previous Screening
4 months	Normal prenatal heart rate with transient abnormal fetal heart rhythm during labor
10 months	Documented normal pre and perinatal heart rate
14 months	Documented normal pre and perinatal heart rate
16 months	None reported
2 years	Documented normal pre and perinatal heart rate
4 years	Documented normal pre and perinatal heart rate
9 years	Documented normal pre and perinatal heart rate. Also with normal EKGs and echocardiographs throughout infancy
12 years	Documented normal pre and perinatal heart rate
18 years	Documented normal pre and perinatal heart rate
19 years	Documented normal pre and perinatal heart rate
30 years	Documented normal pre and perinatal heart rate
36 years	Documented normal pre and perinatal heart rate
43 years	Reported normal heart rhythm at birth

Abstract: 290

Usefulness of the Asthma Control Test in a Continuity Clinic

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Background Asthma is the most prevalent chronic disease of childhood and disproportionately affects African-American and Hispanic populations. Current guidelines recommend assessing asthma control at every primary care visit. The Asthma Control Test is a validated tool to assess asthma control and potentially guide provider management.
Objective To assess the impact of the Asthma Control Test (ACT) on provider practice in a continuity clinic.
Design/Methods We conducted a cross-sectional study of asthma encounters in a continuity clinic that serves an urban low-income, minority population. The study population included a convenience sample of encounters of English speaking patients aged 4+ years with a diagnosis of asthma who presented to the clinic between 01/01/2018 and 02/28/2019. We excluded children with a history of prematurity (<35 weeks gestation) and those recently placed in foster care. Outcome measures were documentation of asthma severity and control, medication management (refill or change in controller medication) and referral to subspecialist (Pulmonology or Allergy).
Results The study population included 127 encounters of children with asthma: mean age 8 years, 75% African American, 43% female, 85% Medicaid. In 30% of the encounters providers used an ACT. Providers that used an ACT were more likely to document asthma severity (92% ACT used vs. 84% ACT not used) and were also more likely to document asthma control (47% ACT used vs 31% ACT not used), but these differences were not statistically significant. The rates of medication refill and changes in medication and subspecialist referral were comparable among between encounters with and without ACT.
Conclusion(s) The use of ACT was not associated with significant changes in provider documentation or management of asthma in a continuity clinic. Additional research is needed to evaluate the feasibility and usefulness of adopting the ACT in continuity clinics.

Abstract: 292

Trends in maternal illicit drug use and its impact on neonatal discharge in an inner-city hospital, 2007-2018

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Background Maternal illicit drug use during pregnancy is a major health and social issue to the mother-neonatal dyad. In the US, 5-6% of mothers used illegal drugs during pregnancy. 13-30% of illicit drug exposed newborns are removed from their families by Child protective services (CPS) and are placed in foster care.

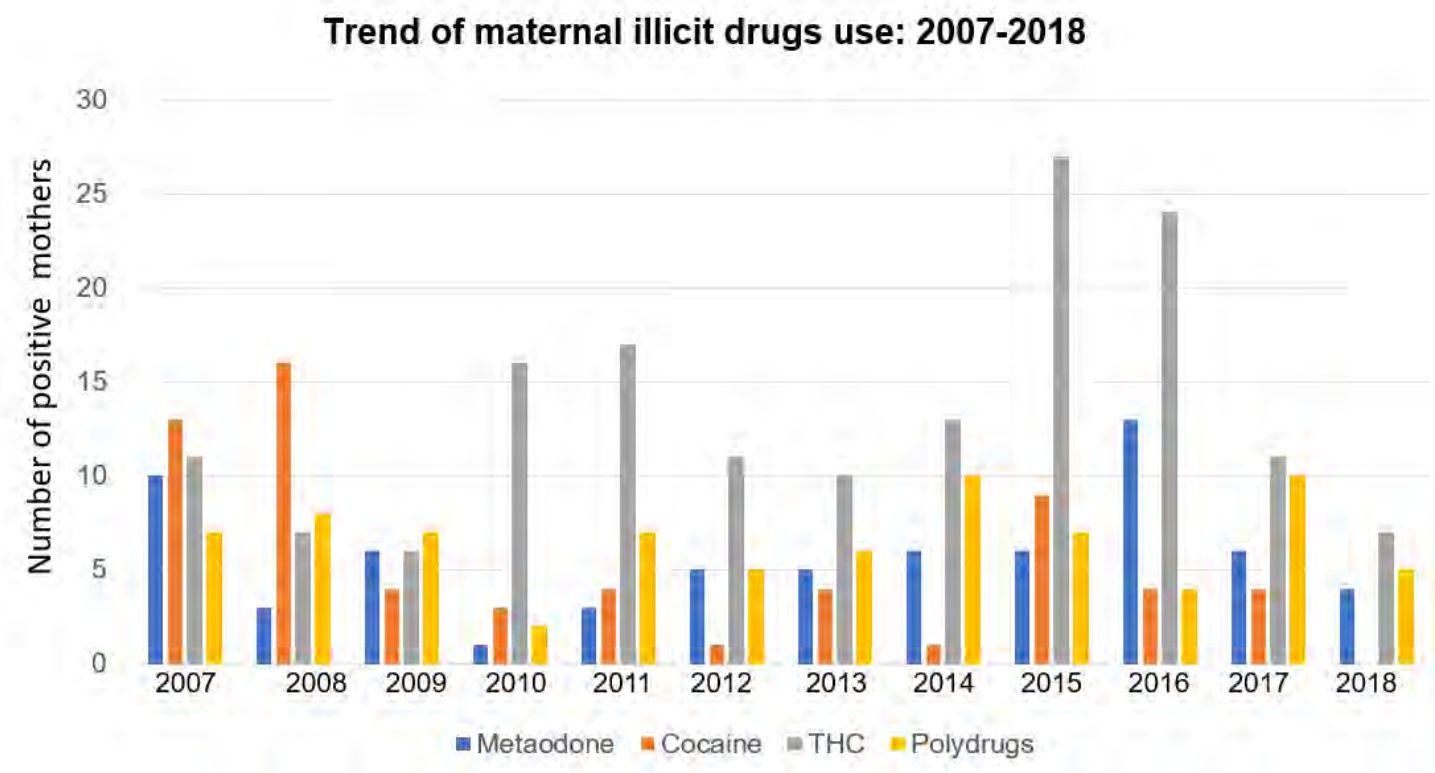
Objective To examine the trend of illicit drug use in pregnant mothers and its effect on neonatal discharge in a large metropolitan, baby friendly hospital.

Design/Methods This was a retrospective study, conducted between 2007-2018 in a level 3, inner city, baby friendly hospital. This study enrolled all mothers who were tested for drugs during pregnancy including mothers with- a history of drug use, poor prenatal care, placental abruption and abnormal behavior. Maternal urine was tested during pregnancy and newborn urine was tested within two days of birth. We tested urine for opiates, methadone, phencyclidine (PCP), marijuana (THC), cocaine, benzodiazepine, and barbiturates.

Maternal and neonatal variables including age, ethnicity, gestational age, birth weight, gender, smoking, and alcohol were extracted from medical records. Neonatal treatment for neonatal abstinence syndrome (NAS) and newborn discharge to CPS was also extracted. Mothers who received drugs due to medical reasons were excluded from the study.

Results A total of 414 mothers were tested. 90% were positive for illicit drugs. However, a smaller number of neonates were positive for drugs as compared to mothers ($p<0.001$). Trend of drug use was semi-sigmoidal in pattern. THC was the commonest drug detected in the urine of mothers and neonates. Its use was on rise over the years, especially among African American mothers. The rate of cocaine and methadone used was similar and remined steady. 38% of mothers also smoke cigarettes. About one third of newborns required medications for NAS. The majority (64%) of these neonates were treated with morphine. 34% of drug positive neonates were discharged to CPS. Maternal use of cocaine (62%) was a leading factor in neonatal discharge to CPS.

Conclusion(s) Maternal use of illicit drugs had a semi-sigmoidal curve; cocaine use was the major contributor in neonatal discharge to social services.



Trend of maternal illicit drug use

Maternal & Neonatal Variables

Maternal Age (range) Years	16-49
Mothers <20 yrs	21 (5%)
Mothers >40 yrs	23 (5.5%)
Birth weight <2.5 Kg	119 (28.7%)
Birth weight > 4 kg	23 (5.5%)
African American	164 (39.6%)
Hispanic	134 (32.3%)
White	26 (6.2%)

Percentage of types of drugs

Mother tested for drugs n-414	Mothers +ve for drugs n=375	Neonates +ve for drugs n=248
THC	160 (42.6%)	65 (26.2%)*
Polydrugs	78 (20.8%)	48 (19.3%)
Cocaine	63 (16.8%)	64 (24.5%)
Methadone	68 (18.1%)	64 (25.8%)
Other drugs	10 (2.6%)	10 (4%)
Cigarette smoking	158 (38.1%)	

* $p<0.0001$

NAS & Neonatal discharge

Neonates +ve for drugs n=248	Neonates required Rx for NAS n=82 (33%)
NAS-Rx by Morphine	53 (64.6%)
NAS Rx by Phenobarbital	20 (24.3%)
NAS Rx by combinations of morphine and Pheno	9 (11%)
Neonates discharge to CPS	85 (34.2%)
Maternal cocaine use and discharge to CPS	53 (62.3%)

Abstract: 293

Pathway for Management of Infants with Beckwith-Wiedemann Syndrome

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Background Beckwith-Wiedemann Syndrome (BWS) is a complex multiorgan genetic imprinting disorder with much phenotypic variability, often resulting in early airway obstruction, abdominal wall defects, hyperinsulinism, and cancer predisposition. BWS can present in the neonatal period or in the general pediatric office. At our high-volume referral center, mean number of BWS patients admitted per year increased from 23 in 2007-2012 to 54 in 2013-2018. Precise diagnosis of BWS can be accomplished with specific subspecialty and lab evaluation, including genetic testing from tissue. Specific genetic causes are associated with unique phenotypes and prognosis. Without experience and education in the significant variability in presentation of BWS, critical evaluation steps can be overlooked and diagnosis can be delayed or missed. Therefore, it is necessary to gain early expert consultation.
Objective Develop a standardized evaluation protocol to improve early diagnosis and management of Beckwith-Wiedemann Syndrome.
Design/Methods A multi-disciplinary team across pediatric subspecialties met from October 2018 through June 2019 to develop a cohesive diagnosis and management pathway for infants with suspected BWS. Literature review was performed. Expert clinical opinion was obtained from health care providers in departments including Genetics, Pulmonology, Plastic Surgery, and Endocrinology. A Neonatology clinical consensus conference was held in April 2019. All participating health care providers agreed upon the pathway.
Results A pathway for management of infants with BWS was developed. The pathway highlights clinical features (Table 1) and guides subspecialty evaluation (Table 2) and genetic testing for infants at risk of BWS. The pathway provides links to provider and family resources.
Conclusion(s) The development of the BWS Pathway will aid in recognition of potential BWS patients and ensure necessary subspecialty evaluation and comprehensive testing. The global availability of the pathway will reduce delayed or missed diagnosis and standardize management of these complex infants.

Table 1: Beckwith-Wiedemann Syndrome Clinical Features	
Call Genetics for ANY Cardinal Feature or Multiple Suggestive Features	
Cardinal Features	**Suggestive Features**
Omphalocele	Umbilical hernia and/or diastasis recti
Macroglossia	Birthweight >2 SDS above the mean
Lateralized overgrowth	Polyhydramnios and/or placentomegaly
Hyperinsulinism (>1 week, requiring escalated treatment)	Transient hypoglycemia (<1 week)
Multifocal and/or bilateral Wilms tumor or nephroblastomatosis	Typical BWS tumors (neuroblastoma, rhabdomyosarcoma, unilateral Wilms tumor, hepatoblastoma, adrenocortical carcinoma, pheochromocytoma)
	Facial nevus simplex
	Ear creases and/or pits
	Nephromegaly and/or hepatomegaly

Table 1. Beckwith-Wiedemann Syndrome Clinical Features

Table 2: Subspecialty Evaluation		
Indication	**Consult**	**Testing, Procedures**
All Patients	Genetics	Methylation testing, CDKN1C mutation analysis, high density array/copy number analysis
Macroglossia	Plastic Surgery	Consideration of tongue reduction surgery
	Pulmonology	Sleep study to evaluate for OSA
	ENT	Airway evaluation
Hypoglycemia	Endocrinology	Diagnostic fast
Omphalocele	Surgery	Multiple tissue collection at time of surgery (for genetic testing) Call Genetics for tissue sample during any surgical procedure (i.e. circumcision)
Lateralized Overgrowth	Orthopedic Surgery	Follow-up for leg length discrepancy
Embryonal Tumors	Oncology	Abdominal ultrasound every 3 months x7 years, AFP every 3 months x4 years
Consider in All Patients	Cardiology	Echocardiogram
	Pathology	Placenta evaluation
	Feeding Team	Swallow study

Table 2. Beckwith-Wiedemann Syndrome Subspeciality Evaluation

Abstract: 294

Care Coordination in Primary Care after NICU Discharge

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Background Children with medical complexity (CMC) are defined as those with multiple complex chronic conditions or technology dependence. Care coordination (CC) is a team-based, family-centered intervention utilized in many settings to address the needs of CMC. Many CMC require NICU care, yet there is limited information on the use of CC for CMC during NICU discharge and transition to primary care.
Objective To evaluate the transition from NICU to primary-care based CC for CMC and to assess differences in transition from a NICU in the same health system as the primary care site (in-network) versus other NICUs (outside).
Design/Methods This cohort study focuses on children discharged from NICUs and receiving CC management at a single primary care medical home. This site expanded CC services for CMC in 4/2017 through a value-based contract with a single Medicaid payer. To date, this program has provided services to 623 CMC. Manual chart review was used to abstract data. We assessed child characteristics (birth weight, gestational age, sex, race, and number of follow-up appointments at discharge). The primary CC outcome assessed was time to CC involvement. Other CC outcomes included time to first primary care visit, availability of NICU records, and presence of CC nurse at first visit. We also assessed ED visits in first year of life.
Results From 4/2017-12/2019, 54 CMC were discharged after NICU stay and enrolled in CC at our site. 40 children were discharged from an in-network hospital and 14 were discharged from outside hospitals (Table 1). Characteristics of children were similar between groups, except children discharged in-network had longer initial hospital stays (114.1 days vs 64.9 days) and more follow-up visits recommended (5.0 vs 3.1). Time to CC involvement was 10.7 days after discharge from in-network hospital compared to 19.3 days from outside hospitals. In addition, discharge paperwork was more likely to be available (100% in-network; 64% outside, $p<0.001$) and a CC nurse was more likely to be present at the first visit (in-network 77%; outside 31%, $p=0.001$) for in-network children. There was no difference in other CC transition measures or in ED.
Conclusion(s) At one site with robust CC, most CMC received CC within three weeks of NICU discharge. Some CC transition

measures were better for children from in-network NICUs versus outside. Early communication between all NICUs and CC services may improve the transition experience for children, families, and providers.

Table 1. Child characteristics and CC transition measures

	In-network discharges (n = 40)	Outside discharges (n = 14)	P-value
Child characteristics			
Birth weight, grams	2025 +/- 1248	1878 +/- 1223	0.7
Gestational age, weeks	32.1 +/- 6.1	31.4 +/- 6.2	0.7
Male, n	29 (73%)	8 (57%)	0.3
Black race, n	34 (85%)	13 (93%)	0.5
Length of initial hospital stay, days	114.2 +/- 83.9	64.9 +/- 52.9	0.02*
# Follow-ups at discharge	5 +/- 2	3 +/- 1	0.001*
CC transition measures			
Time to CC involvement (from discharge), days	10.7 +/- 59.6	19.3 +/- 33.7	0.5
Time to first clinic visit (from discharge), days	2.4 +/- 1.4	2.6 +/- 2.6	0.7
Discharge records available, n	40 (100%)	9 (64%)	<0.001*
CC nurse present at first clinic visit, n	30 (75%)	4 (31%)	0.001*
# ED visits in first year of life	2 +/- 2	4 +/- 4	0.1

Data expressed as mean +/- SD for continuous parameters; number of cases (%) for dichotomous parameters. P-values reflect t-test for continuous variables and chi-squared test for categorical variables. *$p < 0.05$.

Abstract: 295

Professional Guidelines for the Care of Extremely Premature Neonates: Clinical Reasoning vs. Ethical Theory.

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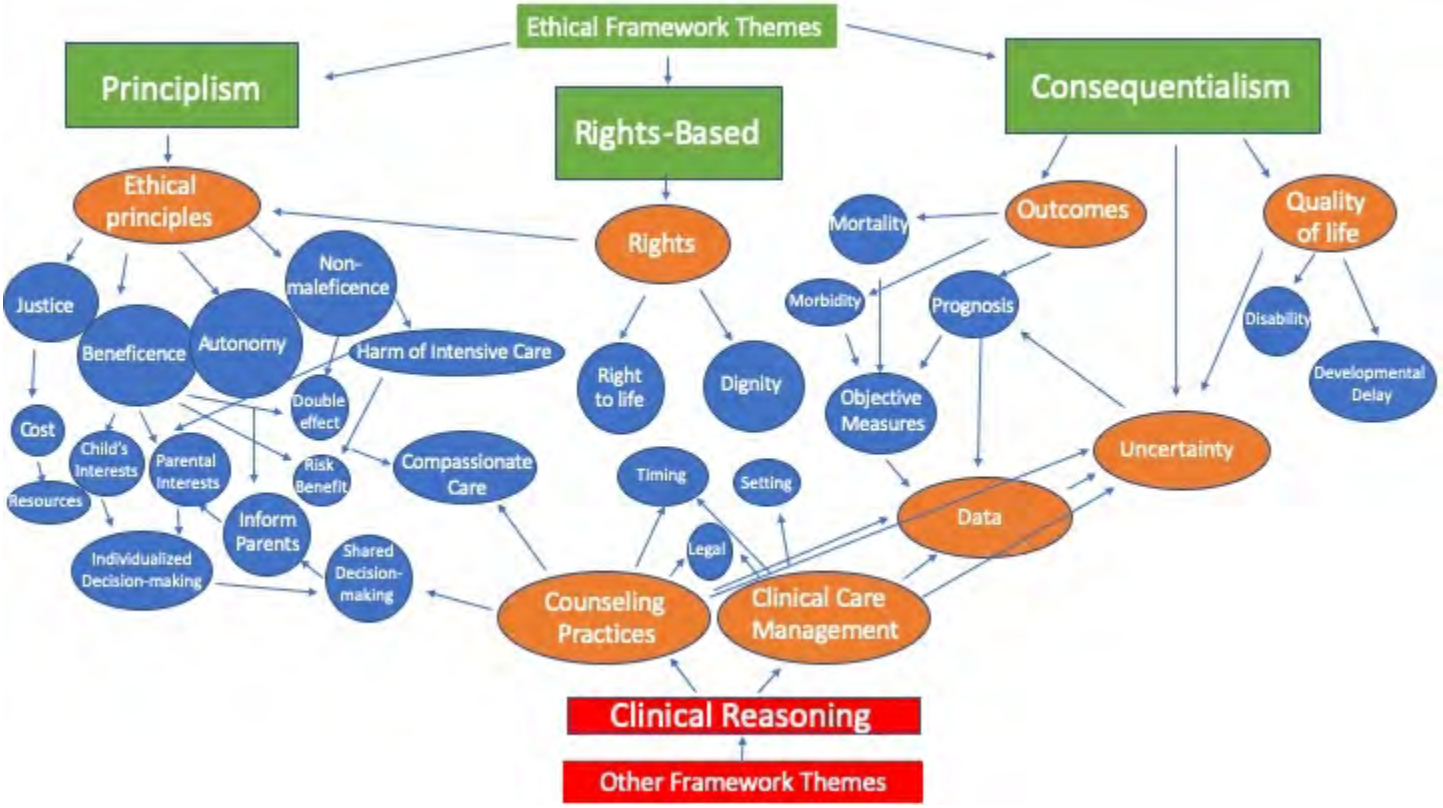
Background Professional statements guide decision-making around neonatal resuscitation at the border of viability. A systematic review of international guidelines by Guillen et al in 2015 found considerable variability between statements in both the type of data they included, and their clinical recommendations for infants at 23-24 weeks of gestation age (GA). Thus, this GA range marks an ethical gray zone. A systematic analysis of how professional statements utilize ethical frameworks within their recommendations is lacking.
Objective To identify ethical frameworks used within neonatal professional statements on decision-making for resuscitation of extremely premature infants.
Design/Methods We reviewed published management guidelines for neonatal resuscitation at 22+0-25+0 weeks GA as previously identified by Guillen et al in 2015. PubMed and Google scholar were searched for updates to selected guidelines. A modified ground theory was used for analysis. Open coding was done by each author to identify items that were used to direct ethical decision-making. Items were reviewed using an iterative process to group them under exclusive categories. Categories were grouped under overarching themes or frameworks. These frameworks were then compared to ethical frameworks previously defined by the Neufield Council on Bioethics.
Results Of 31 previously selected guidelines, 24 were accessible and available in English for review. These yielded 100 items grouped into 8 categories: counseling practices, clinical care management, data, uncertainty, outcomes, quality of life, ethical principles, and rights. From these categories, four ethical themes emerged, fitting the defined ethical frameworks of consequentialism, principlism, and rights-based ethics. A fourth theme, clinical reasoning, was identified as another framework for guiding decision-making that did not fit a defined ethical framework. While all guidelines organized ethical considerations within a clinical reasoning

framework, few explicitly defined how an ethical framework could be applied in clinical decision-making.
Conclusion(s) Professional statements on neonatal resuscitation at the border of viability use a clinical reasoning framework to present data and ethical considerations that guide decision-making in this ethical gray zone. Little content is dedicated to how ethical frameworks may be applied to this decision-making. Elaborating on the ethical frameworks from which these practical recommendations are based would enhance these guidelines.



Coding diagram of analyzed professional statements depicting identified subcategories (blue), categories (orange), and overarching themes of ethical frameworks (green) or other frameworks (red).

Abstract: 296
Relative Effect of Hypoxia versus Hypercapnia on Cyclic-AMP Response Element Binding Protein (CREB) Phosphorylation in the Cerebral Cortex of Newborn Piglets
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Background In hypoxia, altered nuclear mechanisms followed by calcium influx resulting in CaM Kinase IV activation leads to increased phosphorylation of CREB protein at Ser^{133} in the newborn piglet brain. CREB, a nuclear transcription factor, regulates apoptotic genes that are regulators of programmed cell death. Previously we showed that following hypoxia and hypercapnia there is significant increased expression of CREB phosphorylation.
Objective The present study aims to assess the relative effect of severe hypoxia induced expression of CREB phosphorylation compared to prolonged hypercapnia induced expression.
Design/Methods Anesthetized ventilated newborn piglets (3-5days old) were grouped to hypoxia (Hx, n=6) and hypercapnia (n=6) and compared to their respective normoxic groups (Nx, n=6). Hypoxia was induced by decreasing FiO_2 from 0.21 to 0.07 for one hour. Hypercapnia was induced in piglets by inhaled CO_2 to achieve a $PaCO_2$ of 80 mmHg for 6 hours while FiO_2 was maintained at 0.21. Energy metabolism was documented by ATP and PCr levels. Cerebral cortical fractions were isolated and the expression of nuclear CREB protein phosphorylation at $Serine^{133}$ was measured by immunoprecipitation and western blot analysis.
Results ATP levels (mmol/g brain) in Nx were 4.3 ±0.23, in Hx were 1.43± 0.28 decreased by 66%, and 4.0 ±1.4 in hypercapnia which is decreased by 13% from Hx. PCr levels (mmol/g brain) were 3.73 ±0.27 in Nx, 0.79 ±0.11 in Hx decreased by 79%, and 3.18 ±0.17 in hypercapnia decreased by 17%. CREB phosphorylation (ODxmm2) increased from 51 ±8 in Nx to 114 ±38 (ODxmm2) in Hx, increased by 101%, and from 103 ±14 to 150 ±15, an increase of 50% in hypercapnia.
Conclusion(s) The data show that increased expression of CREB phosphorylation during hypercapnia is significantly lower than the increased expression of CREB phosphorylation during hypoxia. Since we have shown previously increased CaM kinase activity in

hypoxia, it appears that CREB phosphorylation increased expression derives from CaM kinase stimulation in hypoxia. Increased hydrogen ion concentration during hypercapnia results in cell membrane lipid peroxidation leading to calcium influx in the cytosol and subsequently in the neuronal nucleus. The effect of severe hypercapnia on CREB phosphorylation is significantly decreased compared to that of severe hypoxia possibly due to the preservation of the high energy phosphates.

Abstract: 297

Cerebral Taurine and Brain Edema in the Hypoxic Piglet

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Background Taurine is an inhibitory amino acid in the brain that induces hyperpolarization and exhibits osmoregulatory and neuromodulatory properties that may protect against cerebral injury. Taurine accumulates in the brain after hypoxia and is thought to counteract neuronal depolarization, cellular dysfunction, and cellular swelling secondary to energy failure. Previously, we have shown significant cerebral edema after hypoxia and reoxygenation in piglets.
Objective To test the hypothesis that taurine levels are increased in the cerebral cortex (CC) in the hypoxic piglet brain, and to investigate the relation between cerebral edema and taurine levels after hypoxia.
Design/Methods Anesthetized ventilated male newborn piglets (3-5 days old) were maintained with normoxic FiO_2 0.21 x4hrs (Nx, n=6) or subjected to Hx [FiO_2 0.07 x1hr; Hx, n=6] then euthanized, or reoxygenated with FiO_2 0.21 x4hrs at normal body temperatures (HxNT, n=6) then the brain was harvested. Five piglets were cooled to 33°C x4hrs after Hx (HxHT). Cerebral water content was determined in fresh samples of CC before and after incubation x72hrs at 90°C and compared to normal controls (n=6). ATP and lactate levels were measured biochemically in CC to determine cerebral energy status. Taurine levels (µMol/g tissue) in whole tissue extracts of CC were determined using high performance liquid chromatography.
Results Hypoxia resulted in significant hypoxemia, hypotension, acidosis and cerebral energy failure (Table 1). Cerebral water content increased by 8.1% from normal levels after 1 hour of Hx and remained increased by 9.1% after reoxygenation ($p<0.01$; Figure 1). Cerebral taurine levels were increased by 49% after Hx and reoxygenation for 4 hours from normal and sham controls ($p<0.05$), but not after 1 hour of hypoxia alone (Figure 2). Hypothermia x4hrs did not result in significant changes in cerebral water or taurine.
Conclusion(s) We conclude that cerebral taurine increases after hypoxia and reoxygenation, but not after hypoxia alone. In contrast, cerebral edema occurs shortly after hypoxia, without reoxygenation. Studies have shown that taurine accumulation is induced by cellular swelling due to intracellular osmosensitive properties of its transporter mechanism. The observed lag between taurine accumulation and cerebral edema suggests a more significant role for vasogenic than cytotoxic edema in the early stages of hypoxia-induced cerebral edema. Taurine may attenuate swelling and rupture of the cell, and taurine supplementation shortly after Hx may provide a novel strategy for neuroprotection.

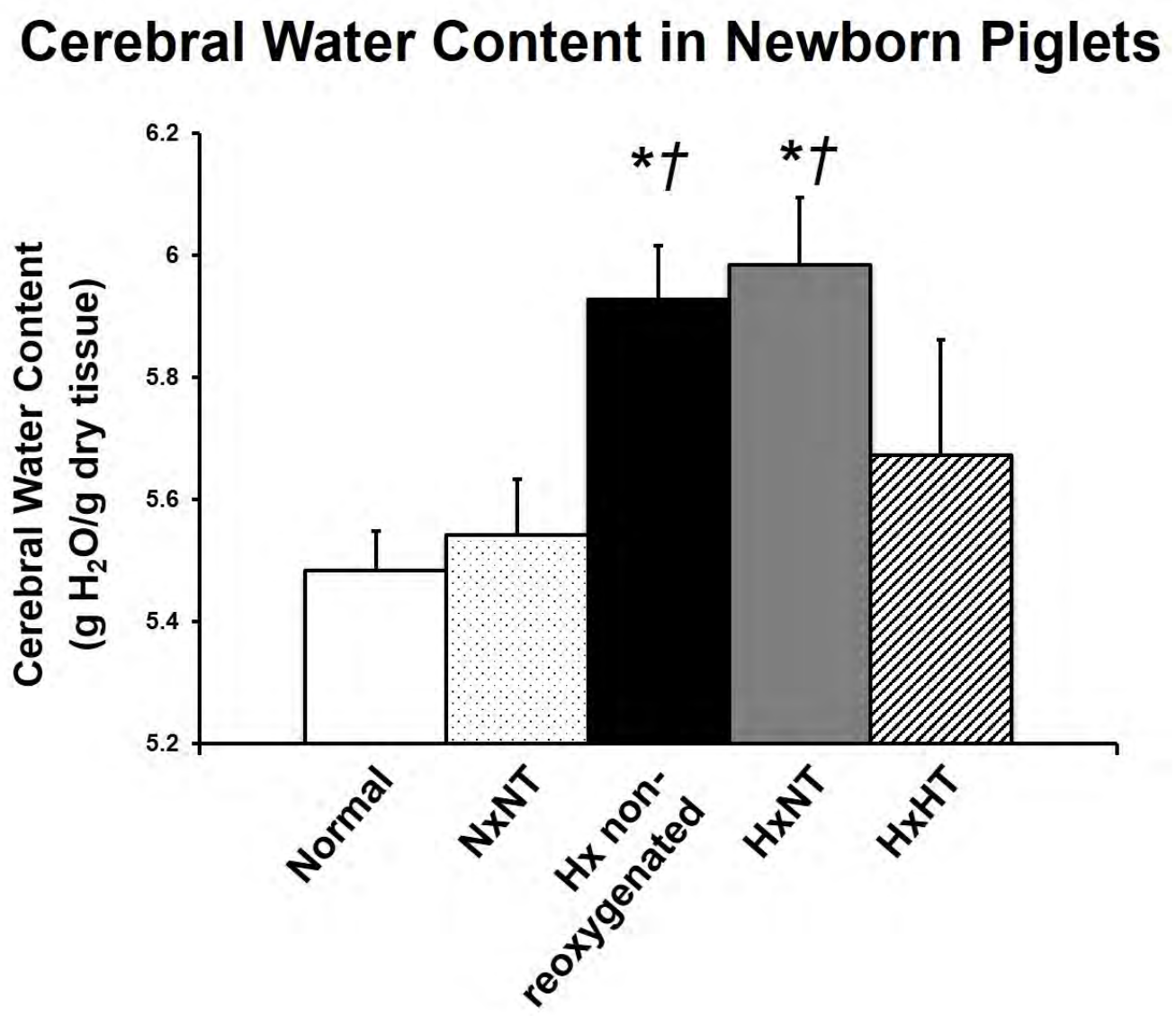

Figure 1. Cerebral water content in newborn piglets determined in fresh samples of frontal CC before and after incubation x72hs at 90°C, and expressed as g H_2O/g dry tissue (M+SE). *$p<0.05$ versus normoxic controls. $^{\dagger}p<0.01$ versus normal non-instrumented piglets (open bars; n=4); NxNT, normoxia normothermia (dotted bars; n=4); Hx, hypoxia non-reoxygenated (solid bars; n=3); HxNT, animals made hypoxic then reoxygenated x4 hours under normothermic conditions (grey bars; n=4); HxHT, animals made hypoxic then reoxygenated x4 hours under hypothermia (hatched bars; n=4).

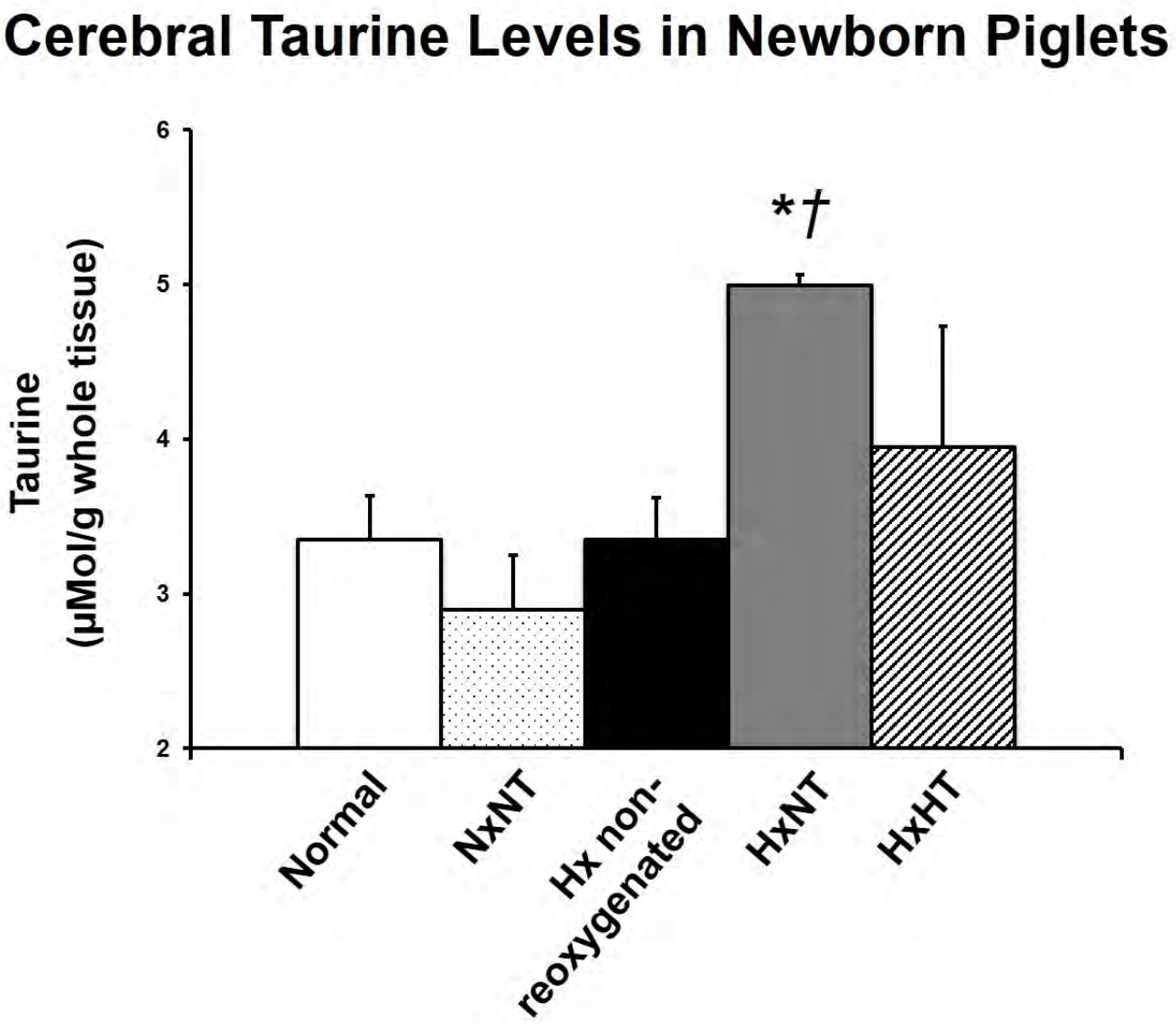

Figure 2. Taurine levels in whole tissue extracts of samples of cerebral cortex harvested from newborn piglets and flash frozen in liquid nitrogen for further biochemical analysis. Amino acids in aliquots of whole tissue homogenates were derivatized with o-phthaldialdehyde to fluorescent compounds and were determined isocratically by high performance liquid chromatography (HPLC) relative to known standards, expressed as µMol/g whole tissue (M+SE). *$p<0.05$ versus normoxic controls. †$p<0.05$ versus normal non-instrumented piglets (open bars; n=6); NxNT, normoxia normothermia (dotted bars; n=6); Hx, hypoxia non-reoxygenated (solid bars; n=6); HxNT, animals made hypoxic then reoxygenated x4 hours under normothermic conditions (grey bars; n=6); HxHT, animals made hypoxic then reoxygenated x4 hours under hypothermia (hatched bars; n=5).

Physiologic Data

Group	Lowest Systolic BP (mmHg)	Lowest PaO2 (mmHg)	Lowest pH	Maximum Base Deficit	Cerebral ATP (µMol/g tissue)	Cerebral Lactate (µMol/g tissue)
Normal (N=6)	99±14	NA	NA	NA	1.24±0.27	9.6±2.5

NxNT (N=6)	75±10†	75±14	7.41±0.08	-0.7±5.3	0.79±0.38	13.0±2.8
Hx non-reoxygenated (N=6)	47±24*†	17±2*	6.86±0.10*	-27.7±3.3*	0.60±0.11†	43.8±9.6*†
HxNT (N=6)	46±8*†	20±13*	6.99±0.11*	-23.0±3.1*	0.89±0.36	16.1±4.2†
HxHT (N=5)	49±6*†	18±1*	7.00±0.05*	-22.4±3.8*	1.71±0.27*†	16.1±4.2†

*p<0.05 versus normoxic controls (Mean±SD). †p<0.05 versus normal non-instrumented piglets (Mean±SD). Nx, normoxia normothermia; Hx, hypoxia non-reoxygenated; HxNT, animals made hypoxic then reoxygenated x4 hours under normothermic conditions; HxHT, animals made hypoxic then reoxygenated x4 hours under hypothermia.

Abstract: 298

Relative Effect of Hypoxia versus Hypercapnia on Caspase 9 Activity in the Cerebral Cortex of Newborn Piglets

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Background Caspase 9 activation is achieved in the neuronal cytosol by the concentration of ATP, cytochrome C and apoptosome formation. We have shown that following hypoxia there is significant increase in caspase 9 activity in newborn piglet brain.
Objective The present study aims to assess relative effect of severe hypoxia induced activity of caspase 9 compared to severe hypercapnia in the cerebral cortex of newborn piglets
Design/Methods Anesthetized ventilated newborn piglets (3-5days old) were grouped into hypoxia, (Hx, n=6) and hypercapnia(n=6) and compared to their respective normal groups. Hypoxia was induced by decreasing FiO_2 from 0.21 to 0.07 for one hour. Hypercapnia was induced in piglets by inhaled CO2 to achieve $PaCO_2$ of 80 mmHg for 6 hrs. Cerebral energy metabolism was documented by ATP and PCr levels. Cytosol fraction of the cerebral cortex was isolated following centrifugation and caspase 9 activity was measured spectrophotometrically at 37°C for 500 sec using a specific flurogenic substrate
Results PH, $PaCO_2$ & PaO_2 of normoxic piglets were 7.41±0.07, 42 ± 3 mmHg & 107 ±14 mmHg and in hypercapnic piglets were 7.25 ± 0.01, 77 ±6 mmHg & 106 ±13 mmHg. ATP levels (µmol/g wet brain) in normoxia (Nx, n=12) were 4.3 ±0.23, in hypoxia (Hx, n=6) 1.43±0.28, decreased by 66% and 4 ±1.4 in hypercapnia which is decreased by 13% from Hx. Pcr levels (µmol/g brain) were 3.73 ±0.17 in Nx, 0.79 ±0.11 in Hx decreased by 79%, and 3.18 ±0.17 in hypercapnia, decreased by 17%. Caspase 9 activity (nmols/mg protein/hr) increased from 1.27 ±0.15 Nx to 2.15 ±0.13 (nmols/mg protein/hr) in Hx, increased by 69%, and from 3.6 ±0.4 in Normocapnia to 4.3 ±0.3 in Hypercapnia, an increase of 19%.
Conclusion(s) The data show the toxicity in the piglet brain after hypercapnia is significantly lower compared to being exposed to hypoxia. During hypoxia, the interaction between procaspase-9 and Apaf-1 molecules result in increased activation of caspase-9, a driving force in the activation of caspase 3 via intrinsic pathway leading to cellular death. During hypercapnia the nuclear membrane lipid peroxidation induced by respiratory acidosis alters nuclear membrane enzyme activities in the presence of relative normal high energy phosphates Indicating the reduced toxicity induced by hypercapnia in the activation of caspase 9. The difference in toxicity generated by hypercapnia as compared to hypoxia may have significant implications in the clinical settings.

Abstract: 299

Among term pregnancies, does mode of delivery differ by use of substances such as marijuana or electronic cigarettes?

Nilima V. Jawale[1], Shetal Shah[1], Dilani Wanasinghe[1], Allison Pool[1], Amruta Bamanikar[2], Olivia Shyong[3], Gurpinder Kaur[4], Clare Giblin[1], Tessa Lavan[5], Heather Brumberg[1]
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Background Cesarean deliveries (CD) are rising & associated with social determinants of health as well as maternal conditions. However, little is known regarding the impact on delivery mode, of exposures such as marijuana (MJ), or electronic cigarettes (ECig), alone or in combination.
Objective To determine the association of delivery mode among term (≥37 weeks) mothers without prior CD who used MJ, ECig, or tobacco products (TP), individually or in combination, during pregnancy.
Design/Methods This is an interim analysis of maternal survey data merged with birth certificates of singleton infants. Exposure

groups included self-reported use during pregnancy: 'Single' (exclusive MJ, ECig, or TP use), 'Multiple' (≥2 of MJ, ECig, or TP use), or 'Non-Users' (NU). Covariates included: maternal race, high-risk pregnancy conditions (i.e. advanced maternal age, chronic diseases, gestational diabetes/hypertension), Medicaid status, alcohol or illicit substance use, marital status, foreign-born status, & adverse life events (i.e. partner incarceration, joblessness, homelessness). Logistic regression was used to assess the association of delivery mode with exposures (Single, Multiple, & NU) adjusted for covariates. Subgroup logistic regression analysis of CD & each race/ethnicity separately using the same factors was also performed.
Results There were a total of 687 mothers: Single (n=53, 8%), Multiple (n=20, 3%), & NU (n=614, 89%). In bivariate analysis, the rate of CD trended toward significance between Single (23%) & Multiple users (45%, p=0.05). CD rates among Single users did not differ by each of the specific exposures. Medicaid enrollment & adverse life events were more common in Multiple compared to Single or NU (p's<0.01). As expected, CD rates were higher in high-risk pregnancy conditions & lower in married mothers (p's<0.05). Hispanic mothers had significantly more Medicaid enrollees & foreign-born, while 'Other Race' & Whites had higher rates of marriage. In adjusted models, no association between mode of delivery & exposure groups was detected. However, Whites had 5 times higher odds of CD in Multiple compared to Single users (Odds Ratio 5.1, 95% CI 1.1-24.4). Black & Hispanic subgroup models did not differ by exposure & delivery.
Conclusion(s) Among White mothers, use of more than one substance during pregnancy (MJ, ECig, or TP) increases odds of CD at term. Clinicians may need to not only assess individual exposures, but also understand the potential impact of multiple substance use on risk of CD.

Abstract: 300
DOES INTENTION TO BREASTFEED AMONG EXCLUSIVE MARIJUANA USING MOTHERS DIFFER COMPARED WITH OTHER SUBSTANCE USERS?
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Background Coincident with increased legalization, marijuana (MJ) use is increasing among pregnant women and women of reproductive age. However, mothers' intention to breastfeed (BF) when using MJ around the time of pregnancy is unclear.
Objective We sought to compare intention to BF among mothers exclusively using MJ with those using electronic cigarettes (ecig), tobacco products, multi-substances, and non-users.
Design/Methods This is an interim analysis of surveys from parents of live singletons merged with birth certificate data. Subjects were categorized into 5 groups: ecig use only (ECO), marijuana use only (MJO), tobacco products only (TPO), multi-substance users (MSU; ≥ 2 of , marijuana, illicit drugs, ecig & tobacco), & non-users (NU; neither ecig, tobacco, marijuana). Due to small numbers exclusive illicit drug users were not able to be analyzed separately. Intention to BF was compared across groups. Also assessed were adverse life events in the peri-conceptional period such as partner incarceration, job loss, & homelessness. Logistic regression controlled for race/ethnicity, age, education, & adverse life events.
Results Of 935 mothers: 1% were ECO, 3% were MJO, 9% were TPO, 9% were MSU, 78% were NU. In bivariate analysis, NU were older & ECO & MJO were younger. NU were more likely to be educated, married & along with ECO-employed. MSU had the highest rates of adverse life events. NU had the highest rates of intention to BF (78%) & were significantly higher than TPO and MSU (p's<0.001). MJO were just as resolved to BF as NU. In adjusted models, there was no difference in intention to BF between MJO and NU.
Conclusion(s) Mothers using exclusive MJ are similarly committed to BF as non-users. As studies suggest providers focus on legal issues when counseling MJO mothers, our findings highlight the need for clinicians to discuss potential newborn exposure via BF in discussions with MJO women- both pre and postnatally.

Abstract: 301
Improving Non-Alcoholic Fatty Liver Disease (NAFLD) screening in Pediatrics.
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Background The North American Society for Pediatric Gastroenterology, Hepatology and Nutrition (NASPGAN) released a 2017 guideline to screen for NAFLD in children aged 9 and 11 years in all obese children (BMI ≥95th percentile) and in overweight children (BMI ≥85th to <94th percentile) with additional risk factors (central adiposity, insulin resistance, prediabetes/diabetes, dyslipidemia, sleep apnea, family history of NAFLD/NASH)using serum alanine aminotransferase (ALT). A previous retrospective study at this institution demonstrated that only 23.3% of pediatric patients who qualified for NAFLD screening due to obesity were

screened. Among pediatric patients who were overweight with no documented risk factors, only 4.6% were screened. A quality improvement (QI) initiative was created to improve screening rates.
Objective Improve compliance of pediatric NAFLD screening in obese children to 50% by the end of 2019.
Design/Methods A QI project utilizing PDSA cycles was carried out to measure the percentage of patients meeting criteria for whom ALT was ordered and done. ALT was deemed elevated when higher than 26 mg/dL for males and 22 mg/dL for females as recommended. Secondary factors followed were discussion of lifestyle modifications and referral to GI specialists as indicated and provider knowledge about the guidelines.
Interventions were then carried out according to PDSA methodology: pre-training assessment and initial education of providers about the guidelines (10/01 to 12/31/2018); screening algorithm posted in all the outpatient clinics along with pre-/post-education surveys (1/1 to 3/31/19); follow-up educational sessions carried out (7/1 to 10/1/19).
Results Through the 5 surveys done over 3 cycles, there was improvement knowledge about use of ALT for screening of NAFLD to 100% of responders after educational sessions. The rate of ALT appropriately ordered improved to 59% for the obese patient. One hundred percent of patients with ALT > 80 were referred to GI.
Conclusion(s) We successfully implemented the new NASPGHAN recommendations for pediatric NAFLD screening through QI efforts which have not been reported before. Challenges in the implementation of screening include poor compliance of the patients in having the testing actually done and the necessity of providing frequent reminders to providers to adhere to the guidelines. More sustained efforts need to be continued to further improve compliance.

Abstract: 302
Myoepithelial Carcinoma of the Stomach in a Pediatric Patient
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Background Myoepithelial carcinomas are rare tumors in both adults and children. They represent < 1% of cancers in the pediatric population. Twenty percent of all soft tissue myoepithelial tumors occur in children. They most often present in the soft tissues and often have mixed pathologies. While there are several small studies, there remains a paucity of literature on myoepithelial tumors especially in children. As such, there is no clear standard of care for visceral myoepithelial carcinomas.
Objective We present an atypical presentation of myoepithelial carcinoma of the stomach in a 10 yo female who was initially admitted to the Pediatric intensive care unit with a syncopal episode after sudden onset hematemesis and dark red stool.
Design/Methods A previously healthy 10 yo female with a 1-2 day history of dark red stool presented with a syncopal event after an episode of hematemesis. She presented in hypovolemic shock, noted to have a hemoglobin of 4.7. After stabilization, an endoscopy revealed an ulcerated mass in the pylorus of the stomach (Figure 1). There was initial concern for a possible hemangioma. A CT (computed tomography) abdomen showed a gastric antral mass measuring 3x3.4 x2.6cm, no adjacent adenopathy, regional or metastatic spread (Figure 2). She underwent a resection and reconstruction distal gastrectomy w/ distal gastroduodenostomy with negative margins.
Results The resected specimen showed a 3 cm submucosal based cellular epithelioid and spindle cell neoplasm with infiltrative growth, necrosis, increased mitoses and vascular invasion (Figure 1). The tumor expressed keratin, CD56 and GFAP (Glial fibrillary acidic protein) consistent with myoepithelial differentiation. Staging included a positron emission tomography scan which showed an active right submandibular node with associated abnormal lymph nodes. A neck dissection showed lymph node hyperplasia but no involvement of disease. The decision was made to treat for visceral myoepithelial carcinoma with ifosfamide based chemotherapy and radiation. Repeat CT scans of the abdomen have shown no recurrence of the disease.
Conclusion(s) Myoepithelial Carcinoma of the viscera is rare and a standard treatment approach has not yet been developed. Full surgical resection is ideal, and ifosfamide based chemotherapy may be warranted due to the aggressive nature of the disease and high rate of local and metastatic failure. Radiation likely plays a role, based on head and neck data. Targeted therapy may play a role. More data needs to be collected on this rare disease.

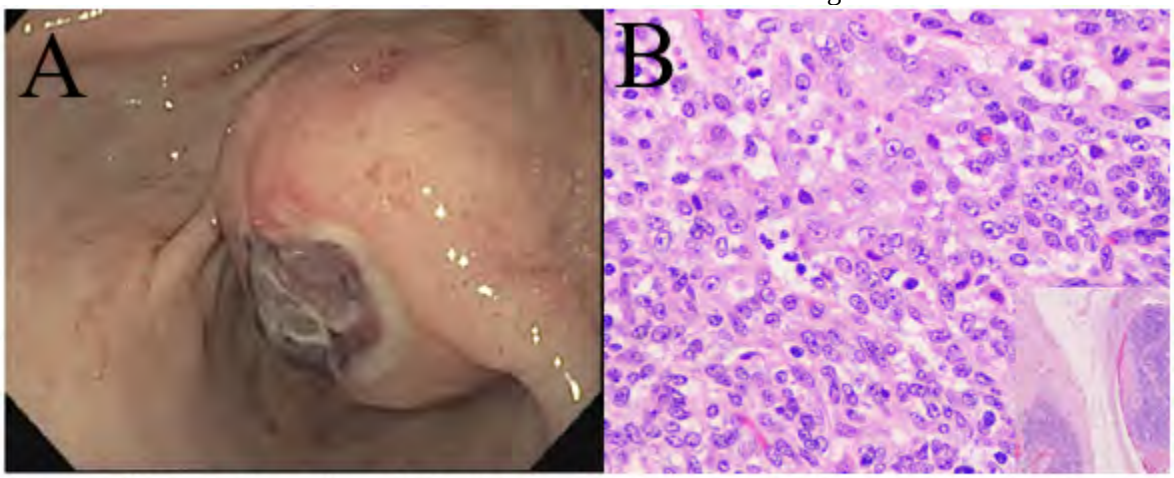

Figure 1: (A) Endoscopic view of the mass at the pylorus of the stomach. Note the ulcerated appearance as well as the vascular nature of the mass. (B) On histopathology, the mass showed epithelioid and spindle cell morphology with vascular invasion (inset) (H&E, 400x).

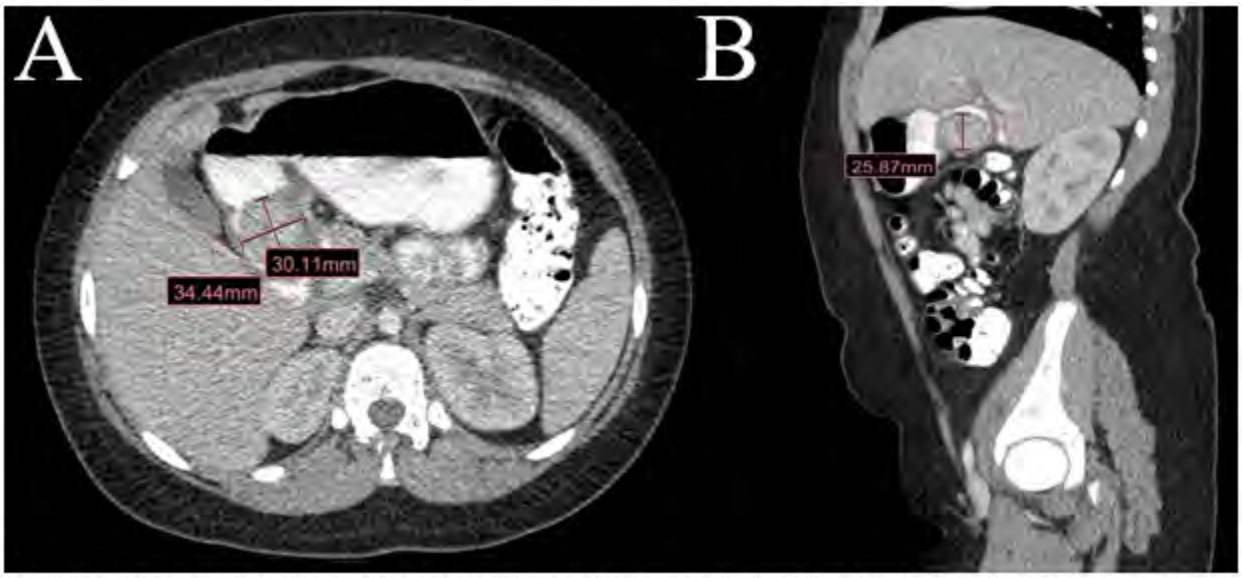

Figure 2: CT scan w/ contrast of the abdomen transverse (A) and sagittal (B) views displaying mass in the stomach measuring 34.44mm x 30.11mm x 25.87mm

Abstract: 303

Historical Perspectives from Philadelphia: Fifty years after the discovery of the Hepatitis B vaccine

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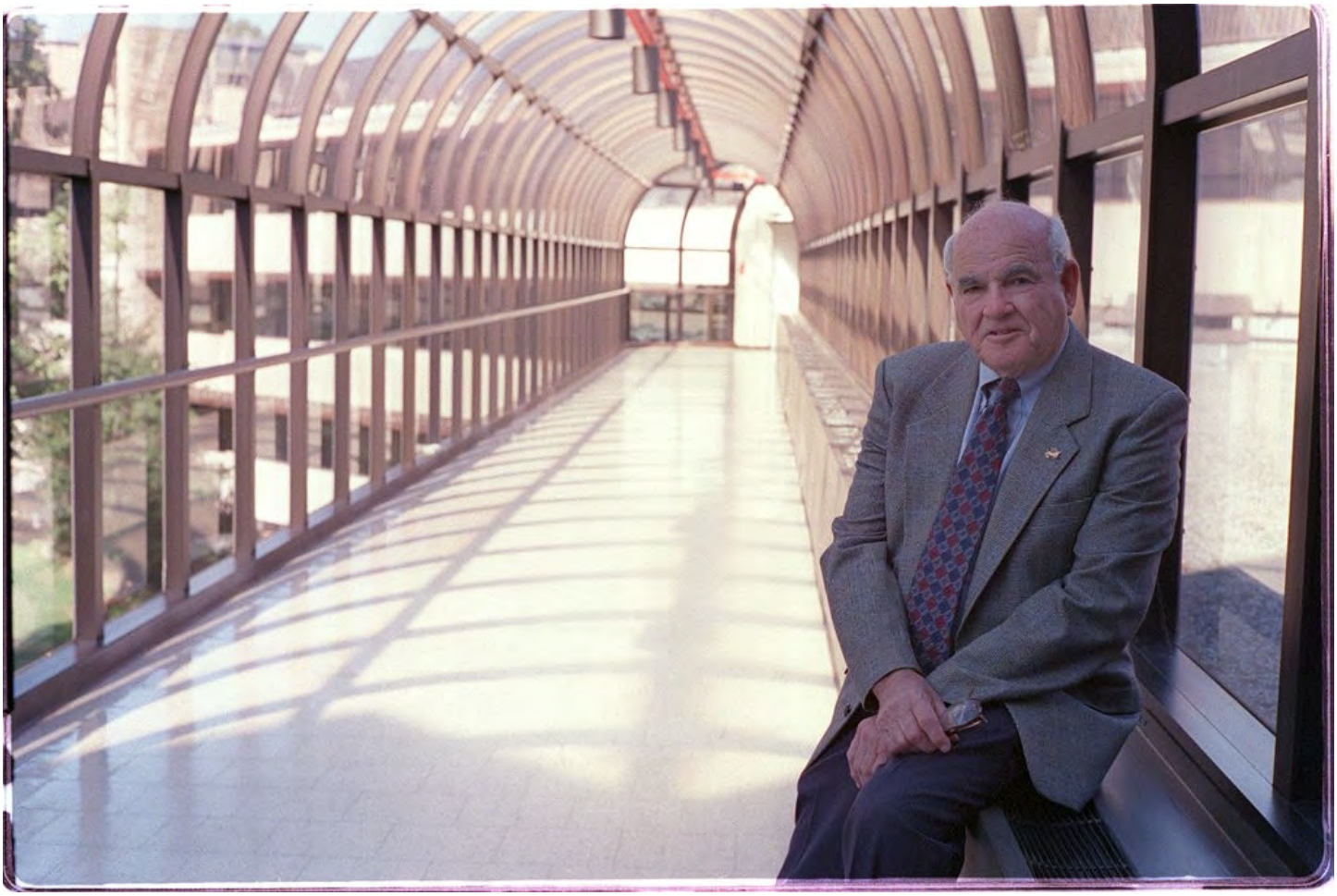
Background Over the past five decades, Hepatitis B viral infection has remained a global health problem with Hepatitis B virus related liver disease killing about 600,000 people annually. Interestingly, Dr Baruch S Blumberg ,a medical anthropologist and virologist, who lived and worked in Philadelphia from the 1960's, discovered the causative agent of "the yellow jaundice", a disease of global importance in the 1960's. This agent originally known as the Australian antigen came to be known as the Hepatitis B virus. He linked the chronic infection with this virus to liver disease and in conjuction with Dr Irving Millman, a microbiologist, developed the first blood test to detect the virus and developed the first potent vaccine against Hepatitis B, while working at the Fox Chase Cancer Center in Philadelphia in1969. His research took place in many countries including the Phillipines, India, Japan, Canada, Scandinavia, Australia and Africa. The discovery of this potent vaccine against Hepatitis B virus brought hope to millions of people by preventing hepatitis B associated liver disease.

Objective To chronicle the evolution of the Hepatitis B vaccine from the first heat treated virus to the present recombinant vaccine that is highly effective today.

Design/Methods Retrospective study of archives of the Hepatis B Foundation, Mutter Museum of the College of Physicians of

Philadelphia,newpaper articles and scientific abstracts/articles including the scientific autobiography of Dr Blumberg " Hepatitis B : The Hunt for a killer Virus" (Princeton University Press, 2002)
Results Hepatitis B vaccine has evolved over the last fifty years from the initial heat treated viral component developed by Drs Blumberg and Millman to the widely commercially available recombinant vaccine today. It remains highly effective in preventing Hepatitis B infection and its complications. Despite this,certain population groups at risk of Hepatitis B remain resistant to immunization today
Conclusion(s) The provision of a safe and effective vaccine against Hepatitis B infection is credited to Dr Baruch Bloomberg who lived in Philadelphia and won a Nobel prize for his discovery. Fifty years later, great strides have been made in the prevention of chronic liver disease but sadly a great proportion of vulnerable people remain unimmunized despite a safe and effective vaccine being available



Baruch S. Blumberg at the Fox Chase Cancer Center in 2001.
Sal DiMarco Jr. for The New York Times©

Abstract: 304
Factors Associated with Receipt of Meningococcal B Vaccine among US Adolescents
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Background Invasive meningococcal serogroup B (MenB) disease is a rare but potentially life-threatening public health problem. The greatest burden of disease is in adolescents and young adults, with recent outbreaks on college campuses. In 2015, a national recommendation that adolescents may be vaccinated against MenB was introduced, with 16-18 years the preferred ages for vaccine administration. To date, uptake of MenB vaccine has been low, with only 14.5% of 17-year-olds vaccinated by 2017. Little is known about patterns of uptake following implementation of the MenB vaccine recommendation.
Objective To determine factors associated with MenB vaccine receipt among US adolescents.
Design/Methods This analysis used the 2017 National Immunization Survey-Teen (NIS-Teen) Public Use Dataset. NIS-Teen is a cross-sectional, nationally representative survey conducted annually by CDC in two phases: a telephone survey of parents followed by

healthcare provider-verified immunization records. The present analysis was limited to adolescents 17 years of age with adequate provider data (n=3807). Multivariable logistic regression was used to evaluate associations between MenB vaccine receipt and sociodemographic and healthcare utilization factors, including receipt of prior vaccinations.
Results The sample was 50.8% male, 53.2% non-Hispanic white, and 85.1% reported at least one healthcare visit in the past year. MenB receipt was found to be significantly associated with up-to-date human papillomavirus (HPV) vaccination status (aOR 2.18, 95% CI: 1.34-3.52), receipt of seasonal influenza vaccine in the past 3 years (aOR 1.60, 95% CI: 1.07-2.42), and Hispanic and non-Hispanic Black race/ethnicity (aORs: 1.69, 95% CI: 1.04-2.76; 1.71, 95% CI: 1.07-2.76). Factors that were not significantly associated with MenB receipt included sex, whether the adolescent had a health care visit in the past year, and receipt of meningococcal conjugate (MenACWY) vaccine by age 13. Adolescents residing in the South were less likely to be vaccinated against MenB (aOR: 0.58; 95% CI: 0.39-0.88).
Conclusion(s) Among US adolescents in 2017, uptake of MenB vaccine was significantly associated with prior receipt of HPV and influenza vaccines, but not MenACWY vaccine. Of note, MenB, HPV and influenza vaccines are generally not required for school entry, whereas requirements for MenACWY existed in 24 states for the 2016-17 school year. These findings highlight factors associated with early adoption of MenB vaccine, which can help to inform future work to increase coverage.

Abstract: 305
Assessing the Temporality of Adverse Effects of Vaccines in the NICU
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Background Premature infants are at an increased risk of contracting vaccine-preventable diseases and experience worse morbidity and mortality outcomes. Evidence supports keeping premature infants on a regular vaccination schedule regardless of gestational age or birth weight, but the schedule is often delayed, in part because preterm infants experience an increased incidence of adverse events compared to term infants.The most recent literature points to a mix of findings regarding an increase in cardiorespiratory events after immunization with little data evaluating newer combination vaccines.
Objective The aim of our study was to determine if the most recent version of the two-month immunization in the NICU contributes to an increased number of adverse events.
Design/Methods This was a retrospective, single-center, observational study with a target population of infants born at less than 32 weeks gestation at Thomas Jefferson University Hospital who received the two-month vaccination series in the NICU between 2017-2019. The primary outcome was the number of cardiorespiratory events (apnea, bradycardia, and desaturations), which was measured in the 72 hours before and after immunization. Our data collection source was EPIC medical records. We analyzed our data using the Generalized Estimating Equation (GEE) with Poisson link to compare the incidence between pre- and post-immunization events.
Results Thirty-seven neonates met the inclusion criteria. The mean (SD) gestational age was 27.3±2.56 weeks and the mean birth weight was 989±313 grams (Table 1). The incidence rate ratio (IRR) between pre-and post-immunization was 2.1 for desaturation (95% CI: 1.21-3.63; $p = 0.008$), 3.5 for bradycardia (95% CI: 0.97-12.58; $p = 0.05$), and 1.33 for apnea (95% CI: 0.26-6.94; $p = 0.732$) (Table 2).
Conclusion(s) The results support links between immunization and increased risk of desaturation and bradycardia with the most recent formulations of the two-month immunization. This indicates that neonates should be closely monitored after receiving two-month immunizations.

Table 1

Sex	Male = 18 (48.7%) Female = 19 (52.3)
Birth weight (grams) (med, IQR)	890 SD = 313 IQR = 770 – 1200
Gestational Age (weeks) (med, IQR)	27 (25-29)
Prenatal Steroids (%)	31 (83.8)
APGAR Score (med, IQR)	8 (6-8)
Length of Stay (days) (med, IQR)	88 (75-121)

Table 2

Outcome Variable	Pre		Post		Rate Ratio (Post vs Pre)	
	IR	SE	IR	SE	IRR (95% CI)	p-value
Desaturation	1.38	0.41	2.89	0.78	2.1 (1.21 ,3.63)	0.008
Brady	0.11	0.06	0.38	0.19	3.5 (0.97 ,12.58)	0.05
Apnea	0.08	0.05	0.11	0.06	1.33 (0.26 ,6.94)	0.732

Abstract: 306

Optimal Dwell Time and Risk of Central Line-Associated Bloodstream Infections (CLABSIs) in Neonates: Does Catheter Type Matter?

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Background Despite quality improvement initiatives to eliminate CLABSIs nationwide, patients in the neonatal intensive care unit (NICU) continue to be the most vulnerable population. Identifying modifiable risk factors such as optimal dwell time has reduced CLABSI risks. Peripherally placed central catheters (PICC) and surgically placed tunneled catheters (TC) are the most common types of catheter in NICU patients. The association between catheter type and CLABSI risk remains to be determined.

Objective To evaluate the impact of PICC vs. TC on (1) CLABSI incidence and (2) the optimal maximum catheter dwell time in a cohort of preterm and term infants treated in a Level IV NICU.

Design/Methods This single-center retrospective cohort study included NICU patients at Children's National Hospital that had a PICC or TC between 1/2011 through 10/2019. Along with central line type and its associated dates of placement and removal, birthweight (BW), diagnosis of bronchopulmonary dysplasia (BPD) and necrotizing enterocolitis (NEC) were extracted from the Children's Hospitals Neonatal Database (CHND). CLABSIs were identified by Infection Preventionist using CDC National Healthcare Safety Network definition. CLABSI rate per 1000 central line days including overall and stratified by catheter type, BW, BPD, and NEC were calculated. Poisson regression was performed to determine association between dwell time stratified by catheter type and CLABSI risk.

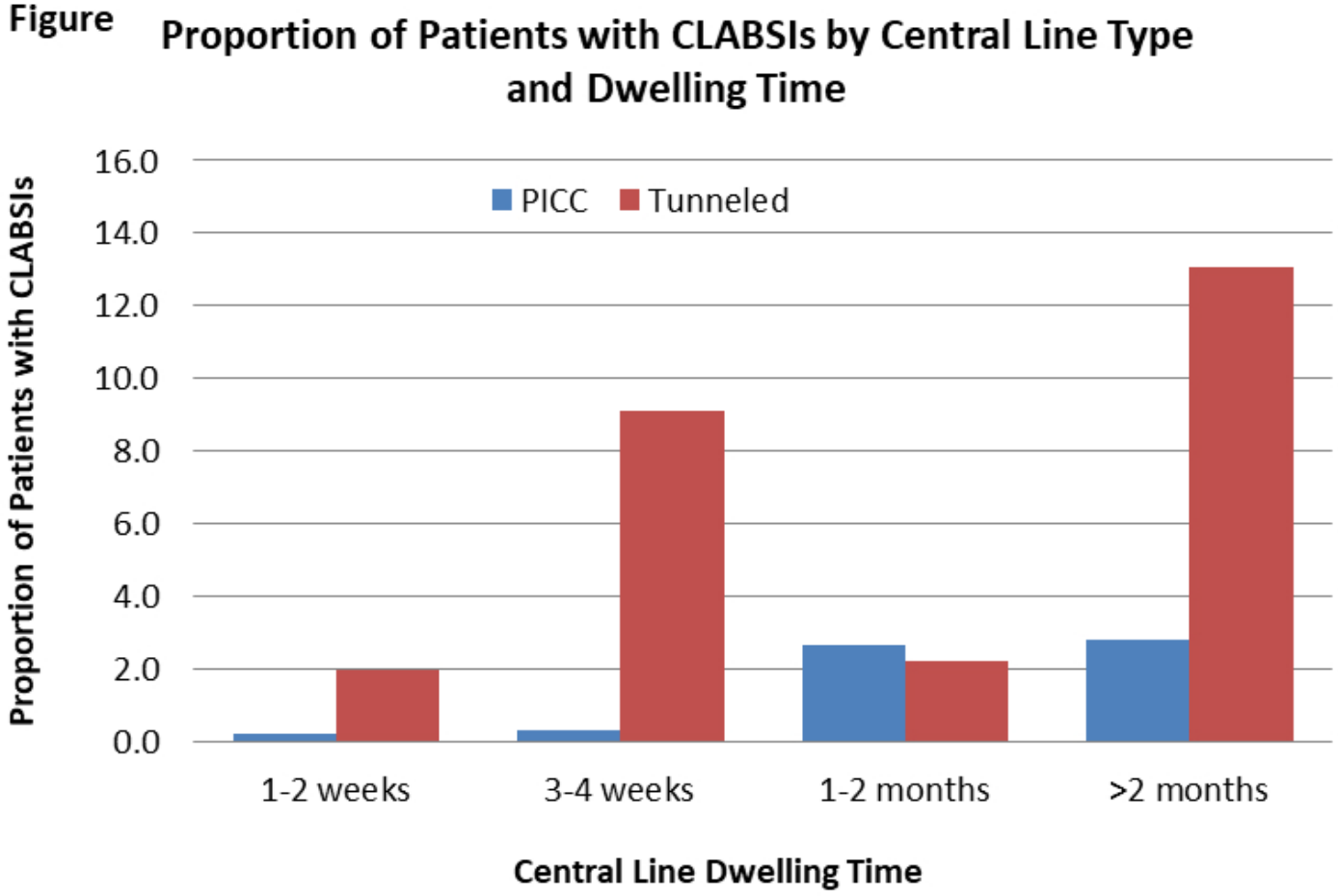
Results Twenty-eight patients developed 30 episodes of CLABSI in 62284 line-days, resulting in overall CLABSI rate of 0.48 per 1000 central line days. CLABSI rate in patients with TC was significantly higher than those with PICC in overall, patients with BPD, and patients without NEC (Table). Comparing to patients with PICC, a greater proportion of CLABSI patients with TC had prolonged dwelling time for greater than 2 months (Figure).

Conclusion(s) This study illustrates TC is associated with increased CLABSI risk. However, this increased CLABSI risk may be attributed to the more prolonged TC dwell time of greater than 2 months compared to the shorter PICC dwell time. A multicenter study is urgently needed to determine optimal dwelling time to prevent CLABSIs, especially in patients with TC.

Table. Comparison of CLABSI Rates by Central Line Type

		PICC			Tunneled		
		CLABSI	Line days	CLABSI Rate	CLABSI	Line days	CLABSI Rate
Total		19	53671	0.35	11	8613	1.28
Birthweight (g)	<750	3	15038	0.20	6	3219	1.86
	751-1000	4	8549	0.47	4	1974	2.03
	1001-1500	1	7116	0.14	0	767	0.00
	1501-2500	3	9277	0.32	0	954	0.00
	2501-	8	13691	0.58	1	1699	0.59
	Unknown	0	2465	0.00	0	149	0.00
NEC diagnosis	Yes	8	16631	0.48	1	2328	0.43
	No	11	39505	0.28	10	6434	1.55
BPD diagnosis	Yes	6	20665	0.29	6	3794	1.58
	No	13	35471	0.37	5	4968	1.01

Figure



Abstract: 307

Hoarseness as a Presentation of Pulmonary Tuberculosis in a Pediatric Patient

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Background To our knowledge there are fewer than 10 documented cases of pulmonary tuberculosis (TB) in the literature which have described hoarseness as a primary complaint. None of these cases have been identified in the pediatric population. Our case highlights hoarseness as a rare presentation of pulmonary TB.
Objective To describe an atypical presentation of pulmonary tuberculosis in a pediatric patient.
Design/Methods Case report

Results A seventeen year old female presented to the emergency room with severe hoarseness and sore throat on a background of four months of productive cough with green sputum and an unintentional 16 pound weight loss. She denied fever, night sweats, or hemoptysis. She is a New York resident but had lived in Pakistan for six years and returned to the United States eighteen months prior to presentation. On physical exam, the patient's oropharynx was non-erythematous without exudates or tonsillar hypertrophy, and her voice was hoarse. On auscultation, an expiratory wheeze was noted bilaterally but more prominent on the right. No lymphadenopathy was appreciated. Preliminary laboratory evaluation revealed leukocytosis with a neutrophilic predominance. A chest x-ray demonstrated large cavitary lesions in the right upper lobe and right hilar adenopathy. A chest CT revealed scattered solid nodules in all lobes. A CT scan of the neck showed an enlarged left palatine tonsil. Flexible laryngoscopy was within normal limits. Her quantiferon test was indeterminate and a PPD was positive at 22mm. Acid-fast bacilli stains revealed numerous acid-fast bacilli. Mycobacterium tuberculosis complex PCR of the sputum was positive, and a sputum culture grew Mycobacterium tuberculosis sensitive to rifampin, isoniazid, pyrazinamide, and ethambutol (RIPE) therapy. The patient was diagnosed with active pulmonary TB and was treated with RIPE therapy.
Conclusion(s) Hoarseness has previously been described in the setting of primary laryngeal TB or in association with concomitant laryngeal and pulmonary TB infections. This case is unique in that the patient's hoarseness most likely occurred without laryngeal involvement. Recent literature suggests that hoarseness in association with pulmonary TB may be attributed to entrapment of the recurrent laryngeal nerve by mediastinal lymphadenopathy, or by direct invasion of the nerve resulting in vocal cord paralysis. Although a rare presentation, pulmonary TB should be considered in the differential diagnosis of hoarseness in children with a significant history of travel to a TB endemic country.

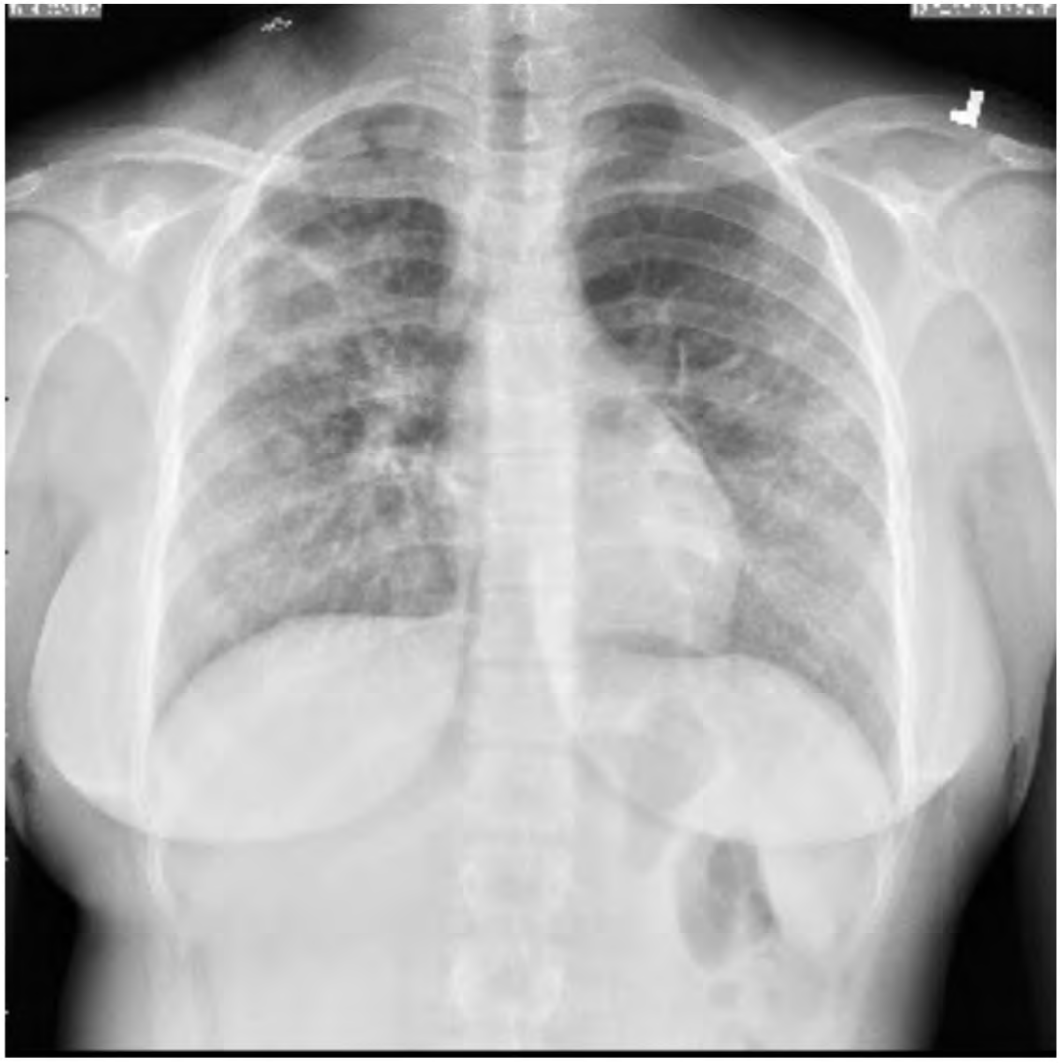

Figure 1. Initial chest X-ray showing 4.2 cm cavitary lesion in the right upper lung. 1cm solid nodule in the right mid lung. Ill defined left mid lung consolidation

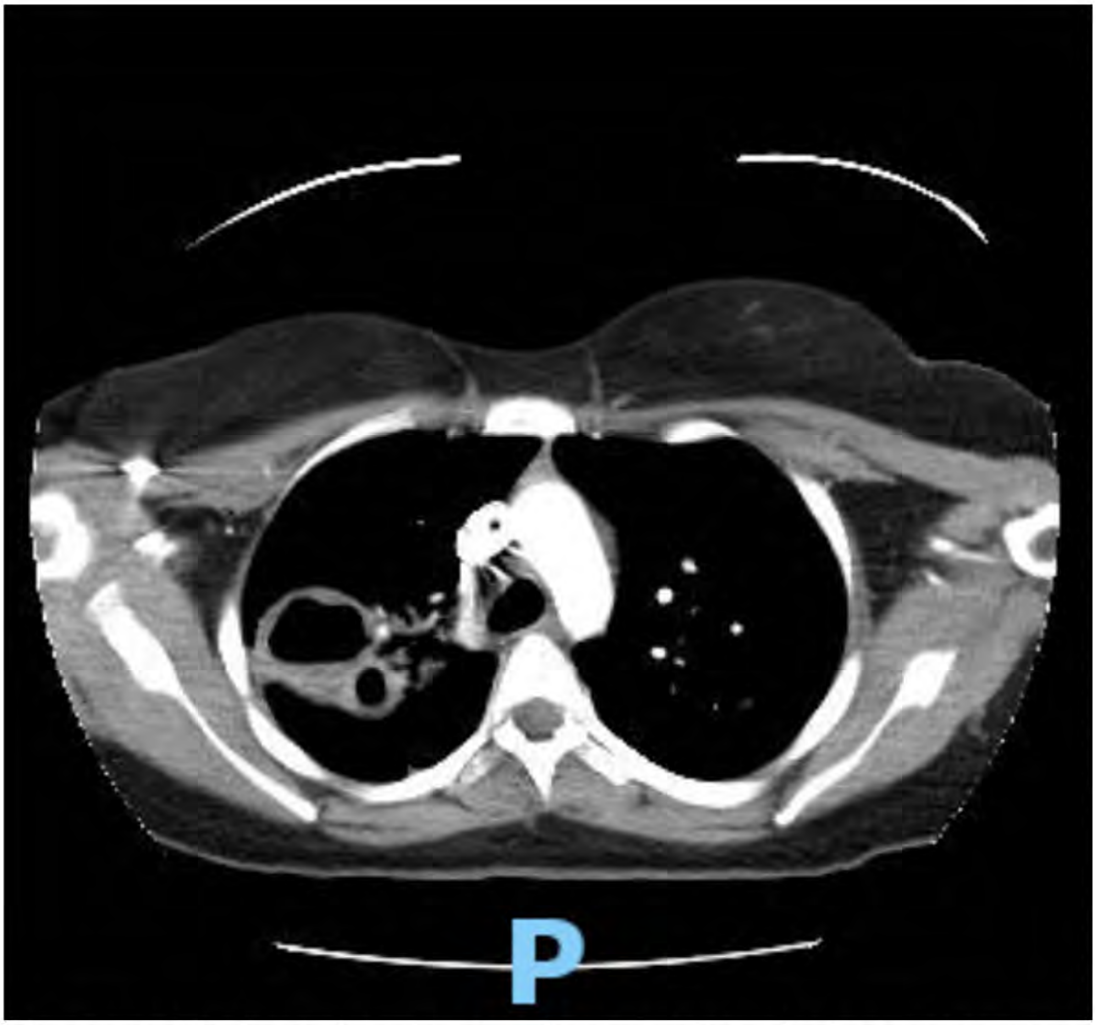

Figure 2. CT chest showing two large cavitary lesions measuring 3.8 and 3.9cm in the posterior right upper lobe as well as numerous other scattered solid nodules in all lobes and measuring up to 1.8cm

Abstract: 308

Prevalence of Congenital Anomalies of the Kidney and Urinary Tract (CAKUT) in the greater Buffalo region: A retrospective study

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Background Congenital Anomalies of the Kidneys and Urinary Tract (CAKUT) are implicated in 30-60% of childhood chronic kidney diseases (CKD), and it is the leading cause of End Stage of Renal Disease (ESRD) in pediatrics. CAKUT also constitutes 20-30% of all congenital malformations and the prevalence is about 4.2 per 10,000 births. Etiology remains unclear, however, previous gene panel studies showed monogenic causation is up to 12% of patients with CAKUT.

CAKUT represents a spectrum of conditions from complete bilateral renal aplasia (i.e. agenesis), to unilateral aplasia, hypoplasia (defined as small kidneys < 2SD below the expected mean), and dysplasia where the kidneys fail to differentiate normally. Since patients may be asymptomatic, early detection, close follow up and proper treatment are paramount.

Objective We sought to perform a retrospective study of CAKUT populations and in comparison to general pediatric patients with renal diseases in the greater Buffalo region.

Design/Methods Our first step was to establish a database for CAKUT patients using electronic medical record (EMR) according to the following criteria:

- Age less than 21 years old

- Has arrived at a clinic appointment ≤ 260 weeks ago
- Not deceased
- Not marked as inactive in Allscripts
- One of the following ICD10 codes for CAKUT

We then divided the CAKUT patients into 9 groups: 1) renal agenesis/hypoplasia/dysplasia; 2) ureteral pelvic junction obstruction (UPJ); 3) vesicoureteral reflux (VUR); 4) congenital posterior ureteral valve (CPUV); 5) multicystic dysplastic kidney (MCDK); 6) duplicated collecting system; 7) megaureter; 8) ectopic kidney; 9) horse-shoe kidney. Gender and CKD distribution of CAKUT patients were calculated.

In parallel, we established a database for pediatric renal patients in greater Buffalo region using clinic register book.

Results In total 732 patients (**Table 1**), urologic diseases (54%) were most common, followed by primary glomerular disease (30%), secondary glomerular disease (14%). The most prevalent of the CAKUT categories was renal agenesis/dysplasia/hypoplasia (37%). The second most common was MCDK, accounting for 23% of the patients. The least common category is megaureter (<1%) (**Figure 1)**. Gender (**Figure 2)** and CKD staging **(Figure 3)** among CAKUT were summarized.

Conclusion(s) In the greater buffalo region, CAKUT represents 35% of children who have renal diseases. Moreover, renal agenesis/dysplasia/hypoplasia is the most common CAKUT.

Table 1. The most frequently identified renal diseases in pediatric patients in the greater buffalo region.

Urologic diseases • CAKUT **35%** • Nephrolithiasis **11%** • UTI/pyelonephritis **4%** • Enuresis **3%** • Renal tumor **1%**	**54%**
Primary glomerular disease • Nephrotic syndrome **9%** • FSGS **3%** • IgA, HSP, PSGN, MPGN, RPGN • ANCA vasculitis, C3GN, HUS	**30%**
Secondary glomerular disease • Diabetes **5%** • Hypertension **4%** • SLE **2%** • Crohn **1.5%** • Sickle cell disease **< 1%**	**14%**
Tubular disease • Renal tubular acidosis **1.5%** • Bartter syndrome **< 1%** •	**2%**
Total patients: 732	**100%**

Figure 1. Percentage of 257 CAKUT patients in greater Buffalo region.

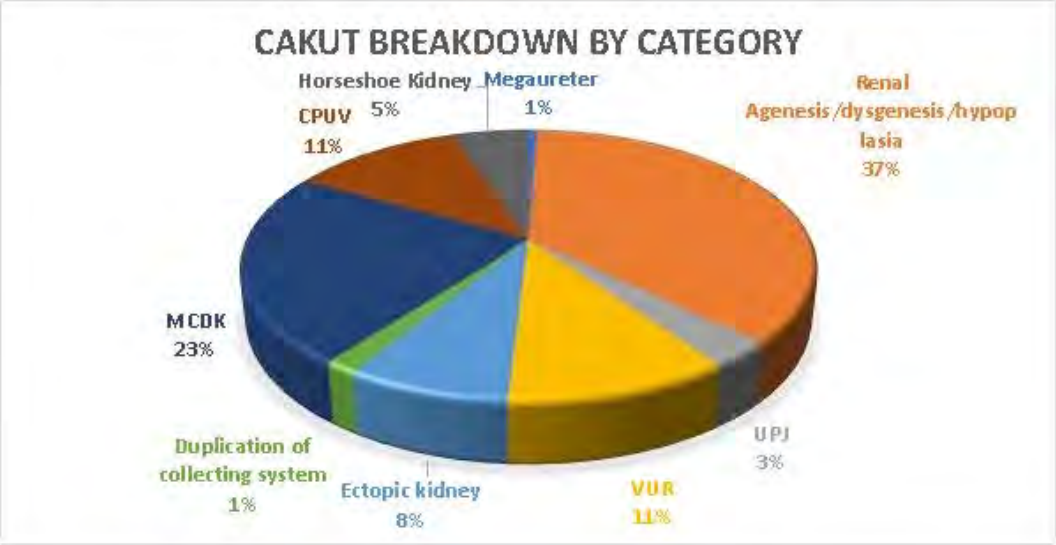


Figure 2. Gender distribution in CAKUT at greater Buffalo region.

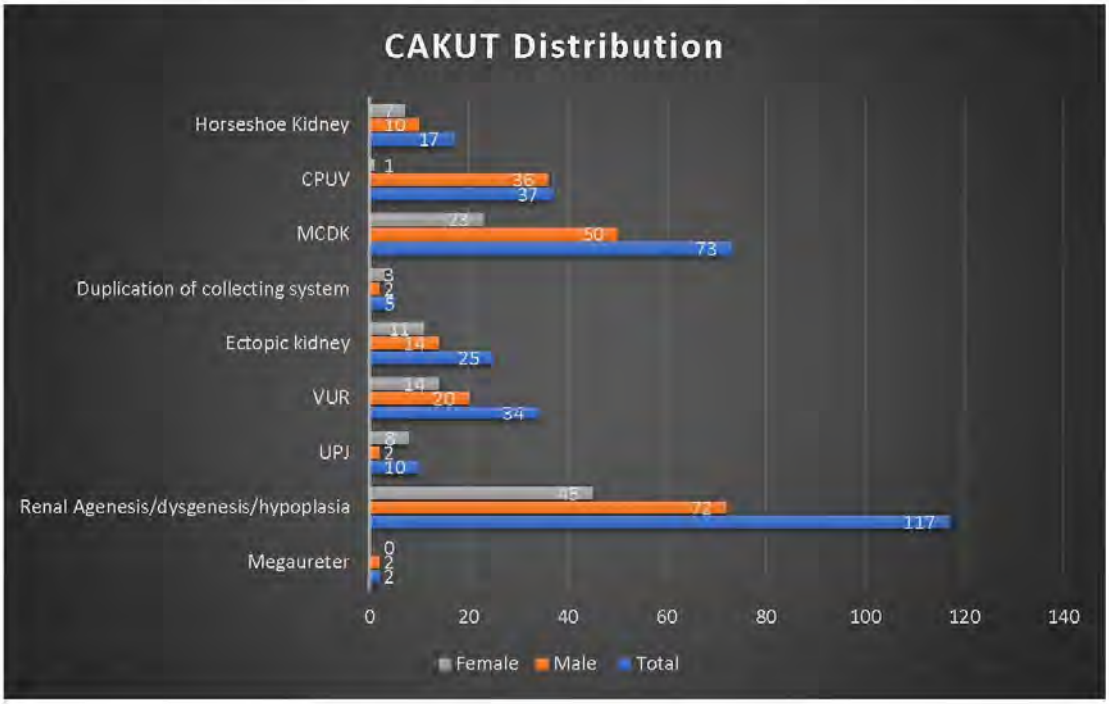
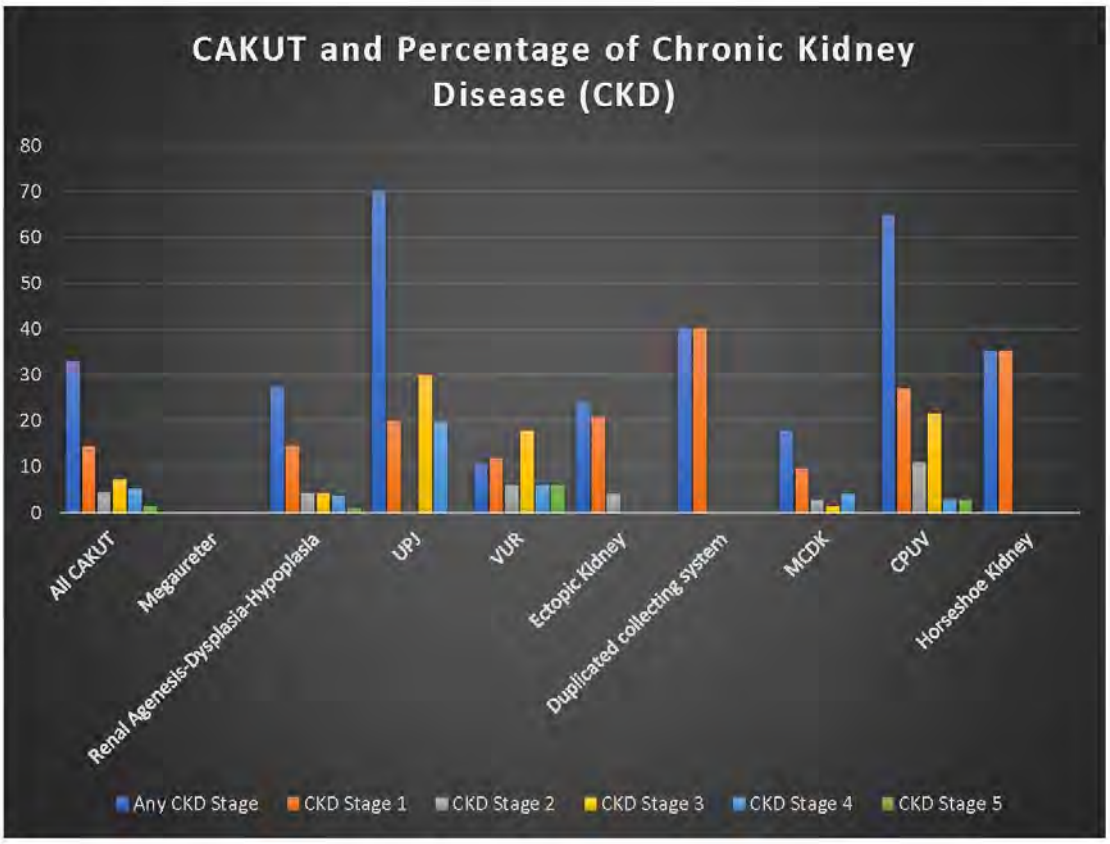


Figure 3. CKD staging in CAKUT at greater Buffalo region.



Abstract: 309

Tailored mHealth messages for obesity prevention: application to a Pediatric Emergency Department (PED)

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Background PEDs reach high-risk children as part of obesity prevention efforts. PED clinicians need feasible tools to screen children's behaviors for brief interventions. We have developed obesity prevention messages tailored to responses to the Pediatric-Adapted Liking Survey (PALS), a feasible and valid screener of diet and physical activity behaviors.
Objective To evaluate child and parent responses to PALS, the tailored messages, and message type by the child's weight.
Design/Methods Child-parent dyads admitted to an urban PED were approached to complete a tablet-based PALS (children reported for themselves, parents reported their child's likes/dislikes), demographic and food security questions. BMI percentile was determined from measured weight/height for underweight, normal, overweight and obese according to the CDC. Based on responses of liking/disliking PALS foods and activities, children and parents received tailored messages that encouraged or reinforced healthy behaviors. They indicated liking/disliking of changing the target behavior as well as rated the usability of the PALS and messages.
Results 186 children participated (average age 10±4 y, 59% public insurance, 46% male, 32% Hispanic, 19% Black) with 4% underweight, 61% normal, 16% overweight, and 19% obese by BMI percentile and 17% overweight/obesity by waist circumference. Food insecurity was reported by 26% of families. ≥90% of children and parents rated they could complete PALS without help, easily fix their mistakes, and doing PALS made them think about their behaviors. Children and parents each received 2-3 messages. Most (≥80%) reported the messages provided new information and were helpful. Although message usefulness did not vary by child BMI percentile group, the most frequent message varied in normal (decreasing sweets) versus overweight (encouraging milk consumption) versus obese (decreasing sedentary behavior) groups. Most children (80%) across all BMI groups indicated they would love/really like/like to change the target behavior of the encouraging messages.
Conclusion(s) PALS encouraged child/parent dyads to reflect on their diet and physical activity behaviors. The type of message varied by the child's weight, yet ratings of message usefulness did not. Responses to the tailored messages indicated target behaviors the children and parents were willing to address for reinforcement by PED clinicians.

Abstract: 310

Buzzwords and Bologna: Formula Marketing Influences on Parental Infant Formula Purchasing Behavior

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Background The production of baby formula continues to go unregulated by the Food & Drug Administration. Healthy sounding buzzwords such as "probiotics" and "prebiotics" are substances added to infant formulas and advertised by formula companies as promoting optimal gut health, despite the American Academy of Pediatrics stating that more research is needed to confirm these claims. It is essential to understand the power of formula marketing and "health buzzwords" on parental formula choice.
Objective To examine parental infant formula choices and to assess the role of formula "buzzword" additives on choice likelihood.
Design/Methods Parents (n=102) in a pediatric waiting room were shown five similar images of baby formula differing only with respect to the two formula additives featured on the front of each jar (Figure 1). They were asked to rank the formulas in order of preference and to indicate how likely they were to purchase each formula on a 5 point Likert scale. Formula choices included: nutrients and compounds (N&C), nutrients and probiotics (N&Pro), nutrients and prebiotics (N&Pre), probiotics and prebiotics (Pro&Pre), and nutrients and vitatropin (N&V). N&C served as a control while vitatropin was a fictitious ingredient meant to test how parents respond to fabricated additives. Wilcoxon signed-rank tests with a Bonferroni corrected alpha of .005 were used to test for significant differences in purchasing likelihood.
Results The majority of respondents (53.2%) selected probiotics as their first-choice formula additive (Table 1). Only 17.7% of respondents selected N&V, a fictitious additive, as their last-choice, while 45.6% selected N&C as their last-choice preference. On a scale of 1 (*extremely unlikely*) to 5 (*extremely likely*), N&C had a mean purchasing likelihood of 2.85, N&Pro of 3.97, N&Pre of 3.63, Pro&Pre of 3.32 and N&V of 3.10. Parents were significantly more likely to buy N&Pro and N&Pre over N&C (Figure 2). Parents were also more likely to purchase N&Pro over N&Pre and Pro&Pre (Figure 2).
Conclusion(s) Despite limited evidence supporting the benefits of non-researched formula ingredients, respondents significantly favored purchasing formulas with positive-sounding "buzzword" additives. Some parents even ranked "vitatropin", a completely fabricated additive, over other more neutral-sounding ingredients. Physicians must be aware of the factors affecting parental purchasing behavior and counsel parents accordingly.

Figure 1: Images of five baby formulas presented to respondents

Figure 2: Differences in Parental Purchasing Behaviors of Infant Formula

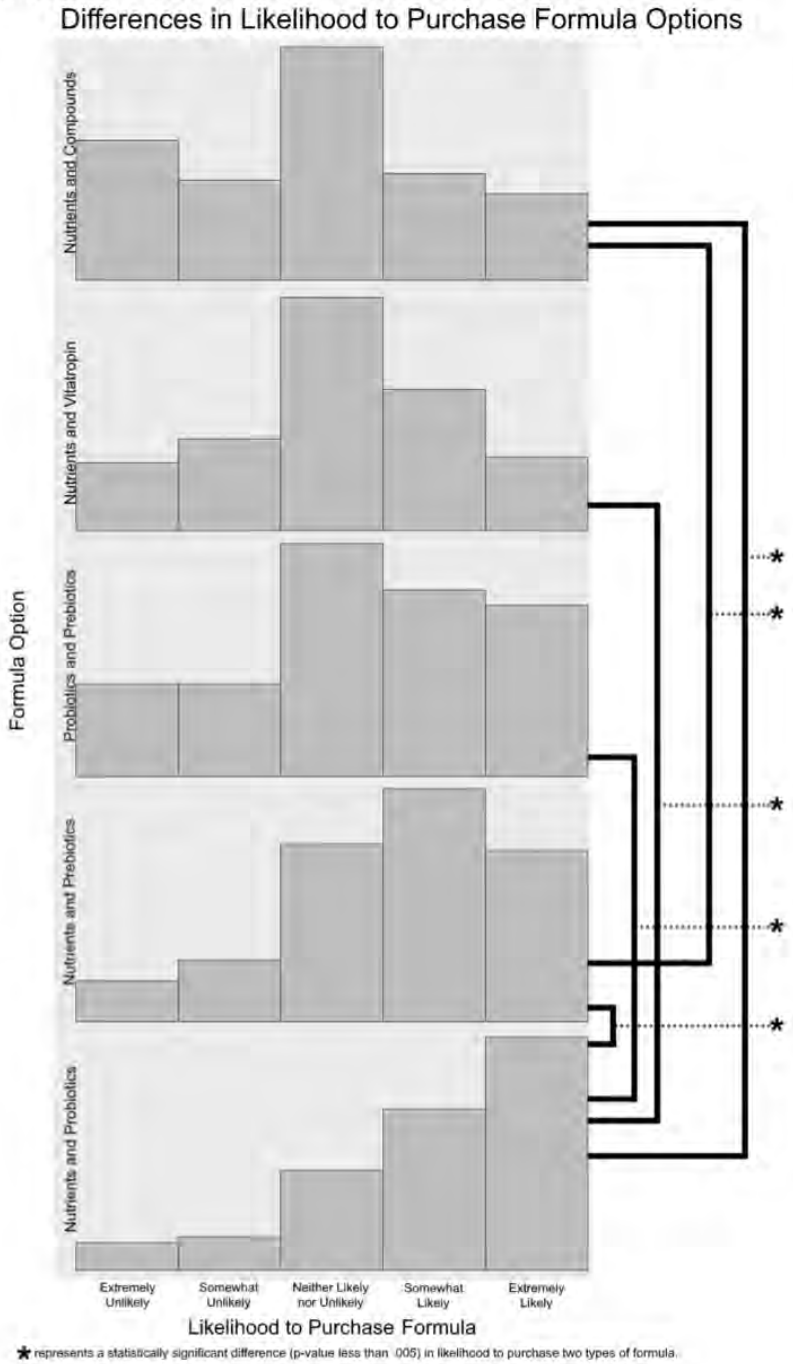

Table 1: Parental Purchasing Preferences of Five Infant Formula Options

	Infant Formula Option				
	Nutrients & Compounds	**Nutrients & Probiotics**	**Nutrients & Prebiotics**	**Probiotics & Prebiotics**	**Nutrients & Vitatropin**
First choice	6 (7.6%)	42 (53.2%)	9 (11.4%)	14 (17.7%)	8 (10.1%)
Last choice	36 (45.6%)	4 (5.1%)	5 (6.3%)	20 (25.3%)	14 (17.7%)

Table 2: Demographic characteristics of respondents (n = 102).

Characteristic	n (%)
Parent's Gender	
Male	6 (5.9%)
Female	88 (86.3%)
Prefer Not to Answer	8 (7.8%)
Parent's Race	
Asian American or Asian	9 (8.8%)
Black or African American	6 (5.9%)
Hispanic or Latino	13 (12.7%)
White or Caucasian	51 (50.0%)
Multi-racial, Other	5 (4.9%)
Prefer Not to Answer	18 (17.6%)
Parent's Age	
18-19	6 (5.9%)
20-29	11 (10.8%)
30-39	30 (29.4%)
40-49	35 (34.3%)
50-59	7 (6.9%)
60+	2 (2.0%)
Prefer Not to Answer	11 (10.8%)
Parent's Highest Level of Education	
High School Graduate or Less	11 (10.8%)
Vocational or Trade Program	2 (2.0%)
Some College	13 (12.7%)
Associate Degree	4 (3.9%)
Bachelor's Degree	26 (25.5%)
Master's Degree	29 (28.4%)
Doctorate or Professional Degree	7 (6.9%)
Prefer Not to Answer	10 (9.8%)
Family's Annual Household Income	
Less than $35,000	7 (6.9%)
$35,000 - $49,999	6 (5.9%)
$50,000 - $74,999	12 (11.8%)
$75,000 - $99,999	14 (13.7%)
$100,000 - $249,999	34 (33.3%)
$250,000+	7 (6.9%)
Prefer Not to Answer	22 (21.6%)

Abstract: 311

Exploring Healthcare Employee's Perceptions about Sugar-Sweetened Beverages: A Qualitative Study

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Background Childhood obesity has increased to epidemic proportions placing children at increased risk of diabetes, hypertension and other related co-morbid conditions. Although many factors influence obesity, research indicates that sugar-sweetened beverage (SSB) consumption plays a significant role in driving obesity trends. Developing a comprehensive intervention focused on SSB consumption is therefore critical. Furthermore, community health centers and employees and health providers could play a key role in promoting healthy lifestyles. A recent study found that providers who practice healthy habits themselves are more likely to counsel their patients about behavior changes focused on health. Promoting health-related behaviors for community health centers is a fundamental first step in combating childhood obesity and related chronic diseases.
Objective To explore the attitudes, barriers, and facilitators of SSB consumption among employees to assist in developing a more targeted effective intervention for community health centers.
Design/Methods Qualitative research was conducted with multiple focus groups guided based on Bandura's Social Cognitive Theory at an urban Federally Health Qualified Center. 40 participants were assigned to 4 different focus groups. Participants included English and non-English speaking employees between 18-65 years of age; 85% were women. All responses were recorded and analyzed using grounded theory methodology.
Results During interviews, employees expressed their experience and perceptions of SSB consumption and challenges in practicing and promoting sugar-free beverages. Employees were also asked about recommendations to facilitate the consumption of sugar-free beverages. Health care themes consisted of two categories of importance, three categories of barriers and four categories of recommendations. The importance category included serving as a role model and increasing the capacity to educate others. Barriers included financial issues, accessibility to sugar-free beverages, and lack of education. Recommendations included the development of educational campaigns for patients and employees, incorporating educational activities in the community and increasing accessibility to healthy beverages
Conclusion(s) This study provided a framework for investigating issues related to decreasing SSB consumption by describing barriers and recommendations identified by health care employees.

Abstract: 312

Food insecurity screening in FQHC

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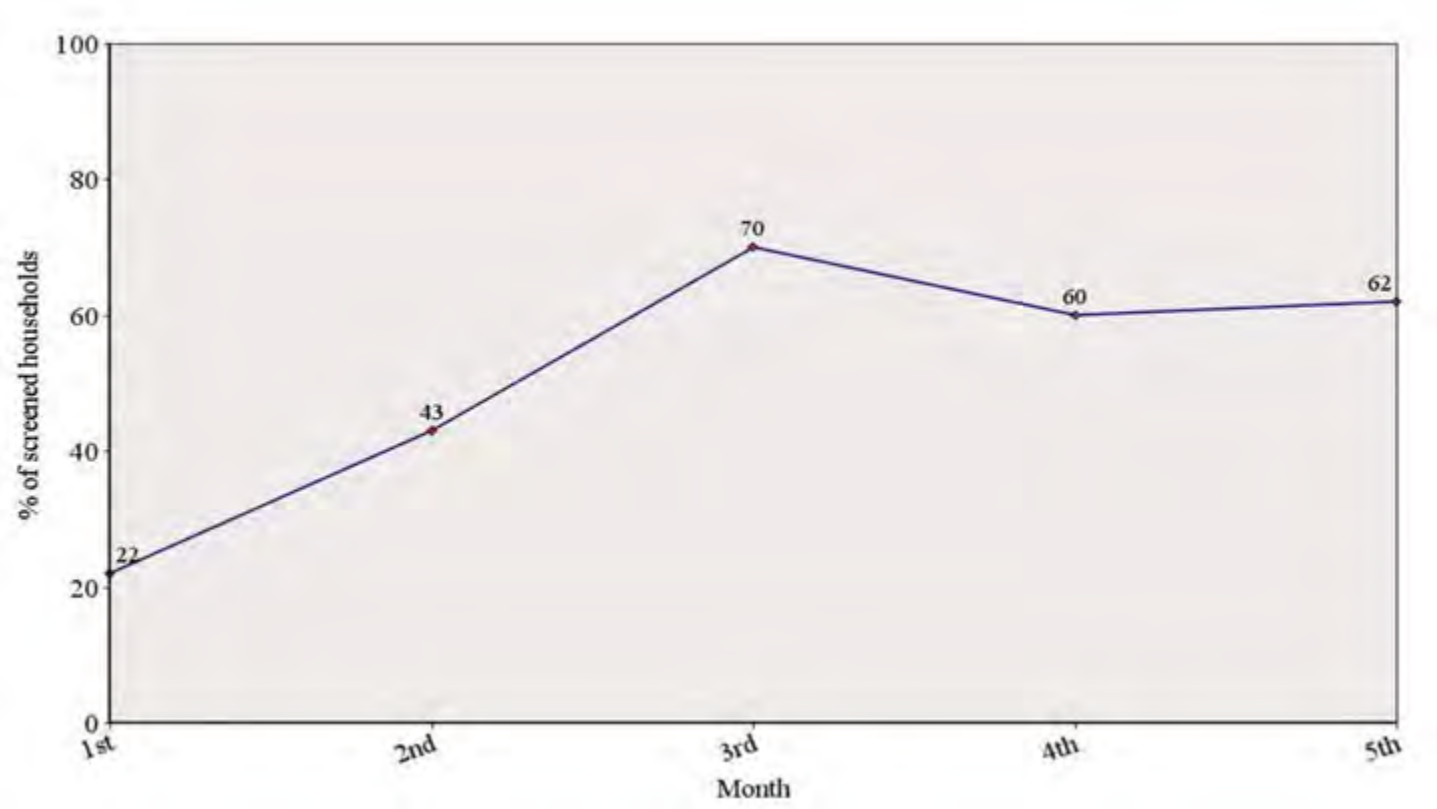
Background In 2018, 7 percent of children under age 18 (more than 6 million) lived in food-insecure households, and 1 percent lived in households with very low food security among children. Food insecurity can lead to poor growth, obesity, mental health problems, and poor educational and developmental outcomes. In our residents-run FQHC that serves children from underserved population, we implemented an evidence based screening tool for food insecurity during well-child care visits. For patients whose households were found to be food insecure, their caregivers were provided with written information in (English or Spanish or Portuguese) about available resources including federal programs, school meals programs, summer meals programs, pantries and Emergency food resources.
Objective The goal was to improve resources utilization, achieve at least 60% screening rate and evaluate the presence of relationship between food insecurity and unhealthy weight.
Design/Methods We used the Hunger Vital Sign during routine well child care visits, consisting of 2 questions with answers (often true, sometimes true or never true).
1- Within the past 12 months, we worried whether our food would run out before we got money to buy more.
2- Within the past 12 months, the food we bought just did not last, and we did not have money to get more.
It's an evidence based screening tool developed by Children's HealthWatch which showed that a positive response to either question had a sensitivity of 97% and specificity of 83%. The project data collection spanned 5 months. We used a plan-do-study-act quality improvement model. The average cycle duration was 6 weeks and it was a planned sequence of activities aiming at improving the screening process and resources utilization.
Results Pre-project 5 month baseline data, found 2 (0.6%) patients only identified as food insecure. After implementing the project, out of 239 screened patients, 7 were excluded and 101 (43%) were screened positive. 78% were Hispanic. BMI for those screened positive > 2 years of age; >95%(27%) 85-95% (31%), <5%(4%). By the 3rd month of project, screening rate was >60%. 41% of food insecure households were able to utilize one or more of the resources.
Conclusion(s) Food insecurity is a major missed problem for those who depend on FQHCs for their healthcare. Food insecurity leads

to dependence on low quality high carb food leading to obesity and other health consequences. Application of hunger vital sign screening tool in a FQHC increased ability to effectively screen, identify and help households with food insecurity.



Abstract: 313

Crack Cocaine Epidemic (E-1) vs Opioid Epidemic (E-2): Viewed through the Lens of Investigators and Attorneys

Laine Garber[2], Hallam Hurt[1]

[1]neonatology, Children's Hospital of Philadelphia, Philadelphia, Pennsylvania, United States, [2]undergraduate, Yale University, New Haven, Connecticut, United States

Background In the 1980s-90s E-1 swept through America, primarily portrayed as occurring in urban African Americans of low SES . Although cocaine use has not disappeared, the nation now is focused on the E-2, and attendant reports of overdosing, high death rate, and entanglement with Big Pharma.

Objective To investigate similarities and differences between E-1 and E-2 as perceived by investigators (INV) and attorneys (ATT) involved in either or both E-1 and E-2.

Design/Methods Phone interviews with 8 INV with all with a minimum of 3 articles in peer reviewed journals, and 2 ATT with extensive work in women's rights. Conversations were open ended with prompts regarding government and social responses. A hypothetical question (HYPO) was posed to all : "If another E-1 were to occur now, in the same original demographic, do you think the government/social response would be the same?" Conversations were recorded; responses were tabulated on an excel spread sheet.

Results Investigators: 3 PhDs, 5 MDs, and 2 JDs. Selected responses:10/10 felt race differed, with E-1 primarily African Americans and E-2 more heterogeneous; 9/10 described E-1 as primarily low SES with E-2 more heterogeneous;10/10 described E-1 as an urban issue with E-2 comprised of urban, suburban and rural populations; 6/10 felt incarceration was higher in E-1 vs E-2; 6/10 described Big Pharma as implicated for E-2. 10/10 noted greater sympathy for E-2 vs E-1; 10/10 found media coverage more negative and without scientific basis for E-1 than for E-2. Answers regarding government response varied, with 6 feeling it was more punitive in E-1 vs E-2, consistent with a majority feeling government now has a better understanding of addiction E-2. Responses to the HYPO : 4/10 felt the response of government would not differ today if a crack epidemic were to occur in same demographic as in E-1, 4 were uncertain, and 2 felt the response would be more positive given recent emphasis on addiction as a disease.

Conclusion(s) There was unity of responses for differences in E-1 vs E-2 in regard to race, SES, locale, media coverage and sympathy for E-2 vs E-1, with less unity regarding other issues. Responses to the hypothetical question were concerning, with 4 respondents feeling there would be no difference in government response now, and 4 additional respondents being uncertain. COMMENT: Marked differences exist between E-1 and E-2. The current more informed attitude toward addiction is welcome, however, concern remains regarding support for specific demographics.

Abstract: 314

Efficacy of a Pulmonology Referral in Reducing Emergency Room Visits and Hospitalizations for Pediatric Asthma Exacerbations

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[1]Pediatrics, Staten Island University Hospital, Brooklyn, New York, United States, [2]Winthrop Hospital, Mineola, New York, United States, [3]Northwell Health, Staten Island, New York, United States

Background Asthma is the most common chronic disease of childhood. Poorly controlled asthma could lead to deterioration of lung function over time, with development of irreversible airway obstruction. Frequent ER visits or hospitalizations due to asthma exacerbations can significantly reduce the quality of life for the child and his or her family. The asthma coalition of Staten Island proposed an initiative to refer children to a pulmonologist when the child had poorly controlled asthma, resulting in ER visits or hospitalizations.
Objective The goal of this study was to determine the efficacy of a pulmonology referral in decreasing asthma related emergency room(ER) visits and hospitalizations for pediatric asthma exacerbations.
Design/Methods A retrospective chart review was performed by the first author on asthmatics seen by the principle investigator, one of the pediatric pulmonologists at the Cohen Children's Northwell Health Physician Partners Pediatric Specialists at Hylan Boulevard on Staten Island. The number of ER visits and hospitalizations 1 year pre and post pulmonologist evaluation, was determined to ascertain the efficacy of the pulmonology referral in decreasing ED visits and hospitalizations for asthma exacerbations.
Results A total of 150 patients were included in this study, with the majority being classified as either. mild persistent or moderate persistent asthmatics. Mean ER visits pre pulmonology visit was 2.31, and mean ER visits post pulmonology visit was 0.22, difference (pre – post) =2.35, p-value < 0.001. Analysis of hospitalizations showed similar results. Mean number of hospitalizations pre pulmonology evaluation was 0.49, and post pulmonology visit was 0.05, difference=0.44, p-value <0.001.
Conclusion(s) Providing a pulmonology referral for children hospitalized or seen in the ER with an asthma exacerbation, was effective in significantly reducing ER visits and hospitalizations for asthma exacerbations.

Abstract: 315

Digital Media Use and Cyber Safety in Children and Adolescents: Providing Knowledge and Tools to Pediatric Residents for Screening and Education.

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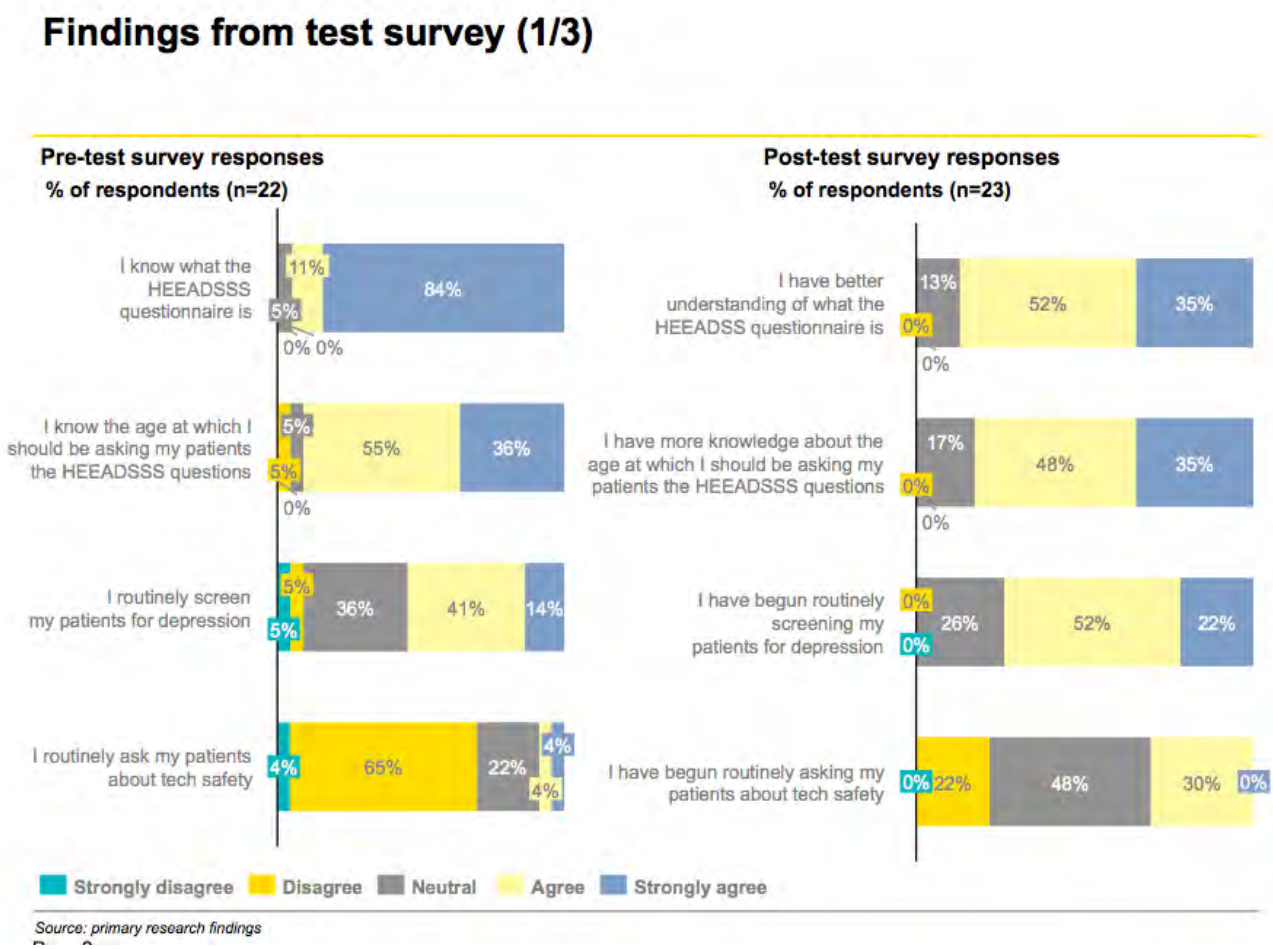
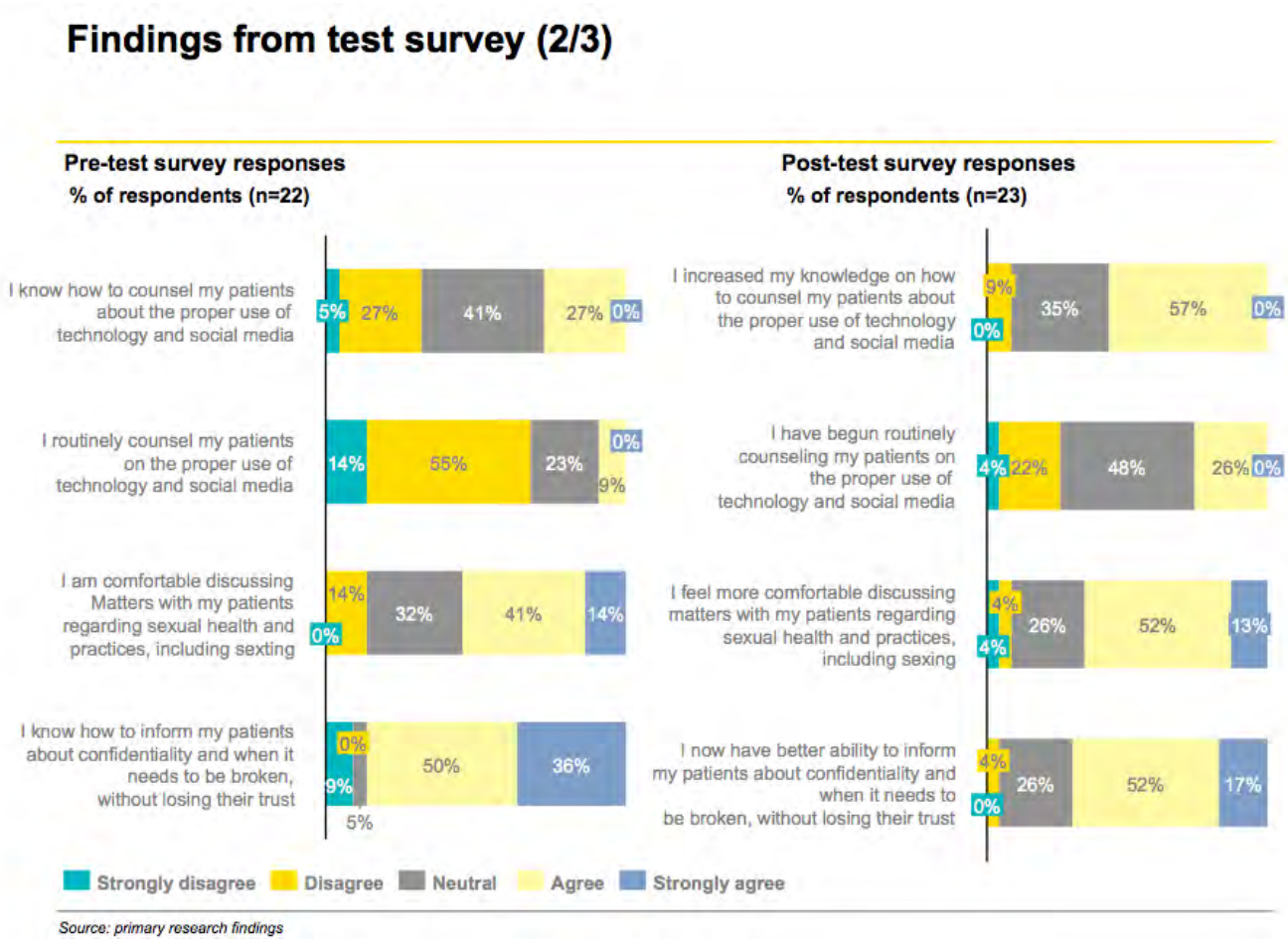
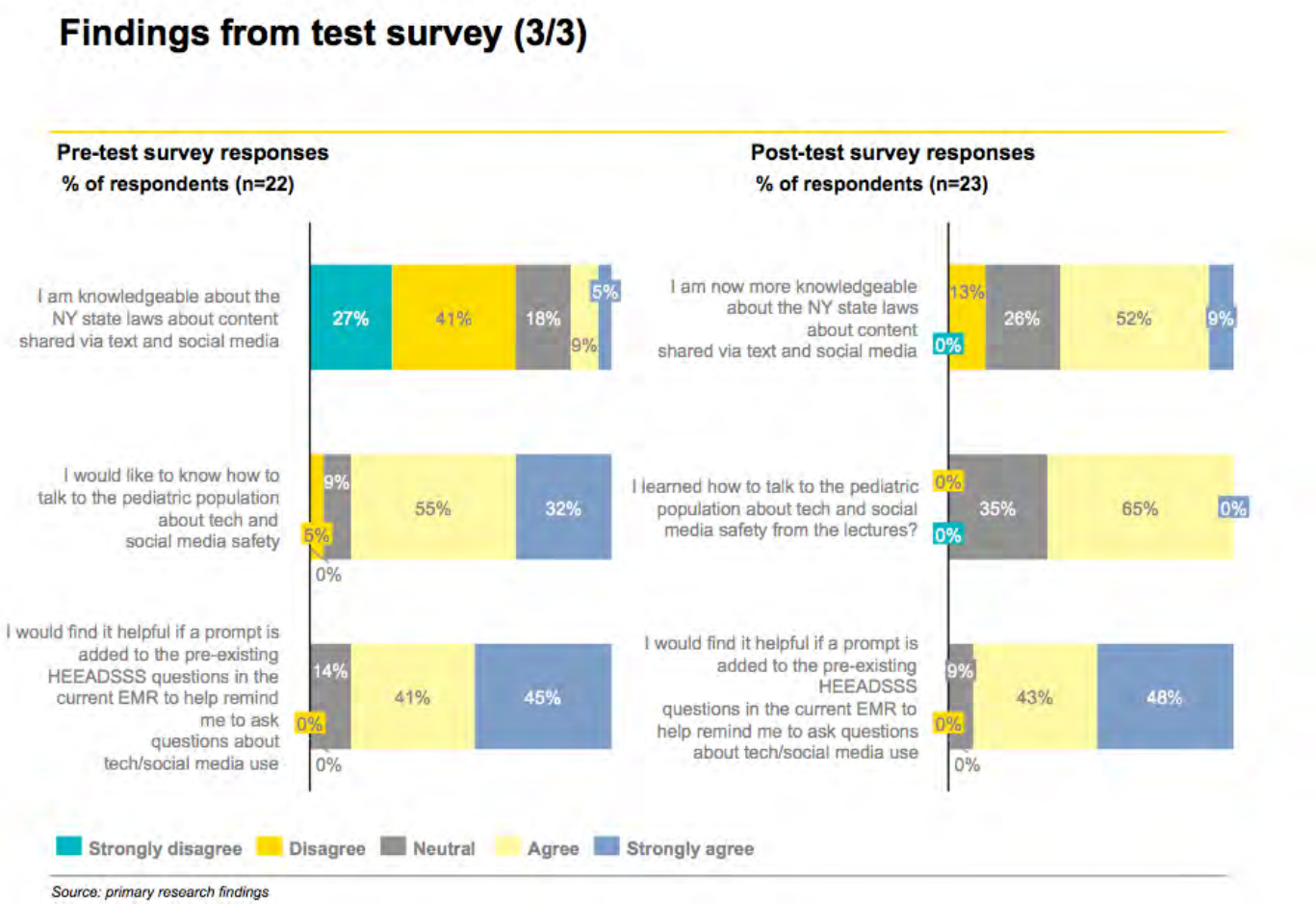
Background Digital technology and social media use is a major part of an adolescent's life. Cyberbullying and cyber sexual bullying is a growing problem, and is an area of focus for research. Adolescents who experience cyber bullying are at an increased risk of developing various mental and physical health problems.
Currently, the HEEADSSS assessment, which is a standardized tool, is what pediatricians use to screen for eating disorders, drug and alcohol abuse, sexual practices, depression, and suicide in adolescents. However, the current screening tool does not specifically address tech/social media use and cyber safety issues.
Objective Identify the current knowledge of pediatric residents, at Staten Island University Hospital, about tech safety, cyberbullying and screening in their patients and provide pediatric residents with the tools and knowledge to screen patients and educate families on cyberbullying and the proper use of social media.
Design/Methods Population: Pediatric residents at Staten Island University Hospital.
Survey: pre-test to determine current practices and level of comfort.
Intervention: Present three lectures on topics related to social media/cyberbullying.
Re-survey: post-test to determine if intervention was successful and identify any potential weak areas.
Results The results showed that 4% of the residents said they agree when it came to routinely asking their patients about tech safety. After the intervention, this increased to 30% agreeing.
Twenty-seven percent of residents agreed that they know how to counsel their patients about the proper use of technology and social media. After the intervention, this increased to 57 percent.
Nine percent of residents agreed to having knowledge about the New York State laws about content shared via text and social media, this increased to 52% agreeing, post intervention.
Sixty-five percent of residents agreed that they learned how to talk to the pediatric population about tech and social media safety from the lectures.
Conclusion(s) In comparing the pretest and post-test results, we found that the intervention increased the number of residents that started counseling their patients about social media safety and screening for cyberbullying. The results also showed that the intervention increased the residents' knowledge about these topics and made it so they felt more equipped to counsel routinely. Many also felt they had a better understanding about the New York State laws when it pertains to minors and sexting.


Findings from test survey (1/3)
Pre-test survey responses
% of respondents (n=22)
I know what the HEEADSSS questionnaire is
11%
84%
5%
0% 0%
I know the age at which I should be asking my patients the HEEADSSS questions
5%
55%
36%
5%
0%
I routinely screen my patients for depression
5%
36%
41%
14%
5%
I routinely ask my patients about tech safety
4%
65%
22%
4%
4%
Post-test survey responses
% of respondents (n=23)
I have better understanding of what the HEEADSS questionnaire is
13%
52%
35%
0%
0%
I have more knowledge about the age at which I should be asking my patients the HEEADSSS questions
17%
48%
35%
0%
0%
I have begun routinely screening my patients for depression
0%
26%
52%
22%
0%
I have begun routinely asking my patients about tech safety
0%
22%
48%
30%
0%
Strongly disagree
Disagree
Neutral
Agree
Strongly agree
Source: primary research findings

Results (1/3)


Findings from test survey (2/3)
Pre-test survey responses
% of respondents (n=22)
Post-test survey responses
% of respondents (n=23)
I know how to counsel my patients about the proper use of technology and social media
5%
27%
41%
27%
0%
I routinely counsel my patients on the proper use of technology and social media
14%
55%
23%
0%
9%
I am comfortable discussing Matters with my patients regarding sexual health and practices, including sexting
14%
0%
32%
41%
14%
I know how to inform my patients about confidentiality and when it needs to be broken, without losing their trust
0%
9%
5%
50%
36%
I increased my knowledge on how to counsel my patients about the proper use of technology and social media
9%
0%
35%
57%
0%
I have begun routinely counseling my patients on the proper use of technology and social media
4%
22%
48%
26%
0%
I feel more comfortable discussing matters with my patients regarding sexual health and practices, including sexing
4%
4%
26%
52%
13%
I now have better ability to inform my patients about confidentiality and when it needs to be broken, without losing their trust
4%
0%
26%
52%
17%
Strongly disagree
Disagree
Neutral
Agree
Strongly agree
Source: primary research findings

Results (2/3)



Results (3/3)

Abstract: 316

Low Reported Cyberbullying in Patients due to Varying Perceptions of the Definition of Cyberbullying

Monitha Patel[2], Jimmy Terray[2], Danielle J. Chenard[1], Steven Rogers[1], Sharon Smith[1]
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Background Reported rates of cyberbullying victimization of adolescents vary from 2% to 72%. Low rates may reflect unwillingness to report cyberbullying or how teens perceive cyberbullying.
Objective Determine the prevalence of cyberbullying and change in reported rate of cyberbullying over a 4-year period among a group of adolescents. Secondary outcomes include the level of parental involvement on the internet and types/frequency of technology use.
Design/Methods This was a prospective cohort study of teens who presented to pediatric emergency department during 2016 (9/28/2015-10/11/16, period 1) and 2019 (2/16/19-11/26/19, period 2). Inclusion criteria were 11-17 years old (until 18th birthday) and English speaking; and exclusion criteria were in police, foster, or DCF custody, previous participation, critical illness, injured history or chief complaint of significant behavioral health issue (suicidal).The 34-item survey was administered by research assistants using Qualtrics program on a tablet, and parents left the treatment room while completed.
Results 89 patients were enrolled in 2016 and 107 patients were enrolled in 2019, see Table 1 for demographics. The frequency of reported cyberbullying was low at 3.37% and 2.11% for period 1 and period 2, respectively (p=NS). In-person bullying slightly increased from 5.6% to 9.5% from 2016 to 2019 (p=NS). The level of reported parental involvement on the internet decreased significantly from 72% to 52.3% between the study periods (p<0.01). Parental involvement decreased with increasing teen age; 74.4% of adolescents from ages 11-13 years reported parental involvement on the internet versus 25.6% of adolescents from ages 14-17 years (p<0.01).
Conclusion(s) The rate of reported cyberbullying did not significantly change over four years. Both online and in person bullying rates were very low in both periods suggesting that teens may not perceive some behaviors as bullying, have a higher tolerance for

online bullying, or feel less comfortable reporting in these exposures. The significant decrease in parental monitoring on the internet over the four-year period suggests that adolescents have more freedom on the internet, and this increases the risk of being cyberbullied. Parental involvement on the internet is higher among younger adolescents compared to older adolescents. These findings suggest that older adolescents also have more freedom on the internet and are at risk of being cyberbullied.

Table 1. Patient Demographics

	2016 Patients (n=89)	2019 Patients (n=107)
Male	43%	41%
Female	57%	59%
Mean Age	14.2	13.8
African American	15%	18%
Caucasian	34%	31%
Hispanic	34%	36%

Table 2. Reported Rates of Cyberbullying, In-Person Bullying, and Parent Involvement

	2016 Patients (n=89)	2019 Patients (n=107)
Cyberbullying (P=NS)	3.37%	2.11%
In-Person Bullying (P=NS)	5.60%	9.50%
Parental Involvement (P<0.01)	72%	52.3%

Figure 1. Number of adolescents that reported parental involvement with internet usage for each age group (n=47).

Abstract: 317

While We Sleep: Do Parenting blogs Promote American Academy of Pediatrics (AAP) Safe Sleep Recommendations

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Background In 2016, the AAP updated its guidelines (AG) regarding safe infant sleeping practices to mitigate the risk of all sleep-related infant deaths. It is uncertain to what extent parents follow these AG, but research suggests that new parents primarily seek information from the Internet. Online parenting blogs, where caregivers seek advice from other parents, provide valuable insight into parents' practices and rationale.

Objective To examine parental discussions regarding their infants' sleeping practices on publicly accessible online parenting forums/ blogs.

Design/Methods Discussions concerning infant sleeping practices were identified on popular parenting blogs with the key terms: "sleep", "SIDS", "newborn sleep", and "infant sleep." The discussions were analyzed and descriptive statistics and odds adjusted ratios were performed. Thematic analysis of the original post (OP) determined the topic of the discussion (sleep position, co-sleeping, room-sharing, etc.). Each OP or comment was assessed as to whether or not it aligned with AG and was examined for the type of evidence (TOE) cited.

Results A total of 920 blog posts were analyzed. Overall, OP topics include: co-sleeping (41%) sleep position (17%), sleeping tips (13%) and other (29%) Of the 920 posts, 23.7% aligned with AG, 34.7% did not align with AG, and 52.5% only asked for advice. 69.7% of OPs that allowed comments had a majority of non-AG adhering comments and only 30.3% of OPs contained a majority of adhering comments. With regard to TOE cited by OPs (n=93), 63% cited medical TOE, 11% anecdotal, and 22% none. 60.3% posts that cited medical TOE mentioned the AAP. The OP was more likely to align with AG when it cited medical TOE or mentioned the AAP. Odds of a post aligning with AG was 15.05 times higher when the post cited TOE from health professionals/ medical literature (Table 1). In total, 69.8% of posts that cited TOE from health professionals/ medical literature aligned with AG and 86.7% of posts that did not cite medical TOE did not align.

Conclusion(s) The majority of OPs and comments did not adhere to AG. Regardless of whether or not the OP aligned with AG, the majority of comments (>50%) did not align with AG. However, when the AG or medical literature or health professionals was cited,

the post was considerably more likely to reinforce evidence-based practices. Therefore, it is vital that physicians inform parents of the AG and parents should be warned about the misinformation available online.

Table 1: Odds Ratio of a Post Adhering to AAP Guidelines in Relation to Citing Evidence from Medical Literature or a Health Professional

	Adhered to AAP Guidelines	Did not Adhere to AAP Guidelines	Total
Cited evidence from medical literature or health professional	44	19	63
Did not cite evidence from medical literature or health professional	4	26	30
Total	48	45	93

**Excluded ones that had no response for evidence cited (2) and excluded ones that were just asking for advice (5)*

OR = 15.05

Abstract: 319

Burden on Children with Hypoplastic Left Heart Syndrome Who Have Undergone Single Ventricle Surgical Palliation and on their Families

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Background There is much literature on the clinical outcomes of children with Hypoplastic Left Heart Syndrome (HLHS) who undergo Single Ventricle Surgical Palliation (SVSP), yet little is described on how these outcomes affect and burden the children and their families.

Objective The purpose of this study is to describe the short and long-term burden on daily life of families with children who have undergone SVSP at our institution.

Design/Methods We conducted semi-structured interviews of parents of children with HLHS who underwent SVSP at our institution from 2008-2017. The interview included a questionnaire with eight Likert scale questions, three yes or no questions and an open-ended question regarding prenatal counseling, hospitalization, discharge instructions and home routine.

Results Preliminary data of 7 patients born in 2008-2012 have been analyzed. About half of parents were surprised and most reported distress with the amount of lab tests during hospitalization, the number of follow-up appointments, and the feeding regimen at home (Table 1). All parents reported disruption of the daily routine and having to cut back work hours in order to take care of their child. Parents' narrative (Table 2) emphasized the quantitative results and included concerns that the prenatal consult was either "too negative" or "painted too rosy of a picture."

Conclusion(s) Preliminary results showed that parents of children who have undergone SVSP experienced significant burden for their children and their family either during hospitalization or after discharge. Moreover, most parents found prenatal counseling to be contradictory to their baby's clinical course. It is important to describe long-term burdens of children undergoing single ventricle palliation and distress of their families in order to provide realistic information and facilitate informed consent during prenatal counseling.

	Were you surprised by:	Were you distressed by:
Hospitalization:		
X-rays	33%	50%
Echocardiograms	50%	20%
Blood draws	50%	80%
Discharge:		
Discharge medications	17%	40%
Follow up appointments	40%	75%
Feeding regimen	60%	75%

Table 1. Parents' interviews regarding hospitalization and discharge

Time period	Response
Prenatal consult	"They were much more negative than what actually happened. I did not like the doctor we saw prenatally. She was very, very negative." "They gave me a worse scenario than what actually played out" "They may have brought up palliative care but I shut it down right away. It was never an option for me to have my baby and then watch him die." "Given 3 options: termination, 'give birth and let him pass,' or 3 open heart surgeries. Everyone pushed for termination." "Prenatally just told that he would have Norwood/Glenn/Fontan. Made it seem like it was just 'boom, boom, boom.' False sense of security based on statistics. Not counseled about possibility of neurological problems at all."
The hospitalization	"I knew x-rays had impacts. Not distressed by echocardiograms, but always by blood draws." "During her hospitalization I was very disturbed by the amount of blood."
Discharge	"Nasogastric tube wasn't expected. Diuretics were anticipated, but the doses and changes that had to be made were not anticipated." "Upon first discharge, nobody told me how difficult it would for my daughter to gain weight...She came home on a feeding tube; it really bothered me to see her like that." "Amount of appointments and appointments not being on the same day often created a burden. I didn't foresee readmissions."
Home Routine Financial/Professional	"My husband shortened his work hours" "Both parents had to quit jobs."
Support/Direct Care	"I have support, but people are not always qualified to give it. After the Glenn [surgery] I got a nurse for her. I need help, not the baby." "Family members and baby sitters are afraid to take care of the child."
Siblings	"Did the other children show worsening in their school performance? We are too busy to check." "Other children also want to be able to sleep in mom's bed"

Table 2. Parents' Narrative

Abstract: 320

Anatomically Large vs Functional PDA Management Strategy in Extremely Low Birth Weight Infants (ELBWs): Indomethacin, Ibuprofen or ligation?

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Background Significant PDA is associated with increased risk for BPD, NEC, IVH, PVL, ROP & death. For > 35 yrs, timing & optimal intervention remain controversial. Large PDAs are less likely to spontaneously close after 1wk postnatal age (PNA). Since 1999 our protocol for PDA evaluation was consistent, we thus sought to determine whether other major changes in overall management affected outcomes arising from *anatomical* strategy (size only) rather than defining *functional* departures occurring later in hospital course

Objective Determine impact of introducing exclusive breast milk, indomethacin/ibuprofen & RAM cannula use (NIV-non-invasive ventilation) on our standard approach to PDAs

Design/Methods Retrospective review of a 13-yr epoch (Jan '06 - Dec '18) of medical records of all ELBWs treated in our Level IV NICU. Our *anatomical* approach to PDAs involved obtaining echo on day 3-5 PNA for all ELBWs regardless of clinical signs. If PDA was moderate or large (equal to aortic diameter), ibuprofen 10-5-5 mg/kg/d or indomethacin at 0.2 mg/kg/d x 3 was administered. Echo was repeated, if still persistent, a 2nd or 3rd course of drug was given. After day 7 PNA ibuprofen dosing was incremented to 18-

9-9mg/kg/day to accommodate improved GFR. Contraindication or persistence following medical management was managed by ligation

Results We reviewed 837 neonates, 493 (59%) had an *anatomically* large PDA. Among those with a large PDA, 119 (24%) didn't receive any treatment indicating that overall, 463 (55%) never had a functionally significant PDA (Figure 1). 354 of 493(72%) received pharmacological treatment and 108(22%) had surgical ligation (alone or after drug). Rate of surgical ligation decreased over 13 yrs from 23% to <13%; NEC fell (12 to 8% after breast milk); severe ROP (≥ stage 3) decreased from 6 to 2%; while incidence of BPD(O_2 @ 36 wks) increased (from 35 to 44% after NIV). Both grade III/IV IVH and PVL remained static (11%, 5% respectively). Each outcome is equal to or lower than average co-morbidities for ELBWs as reported by NICHD.

Conclusion(s) Universal screening for *anatomically* large PDAs at 3-5d PNA enabled spontaneous closure in 55% of ELBWs without increasing comorbidities even with different styles of other management. Of all ELBWs, 31% received pharmacological treatment and 12% required ligation. We conclude that screening for PDAs at 3-5d & treating only anatomically large PDAs is an appropriate approach that minimizes pharmacologic and surgical risks

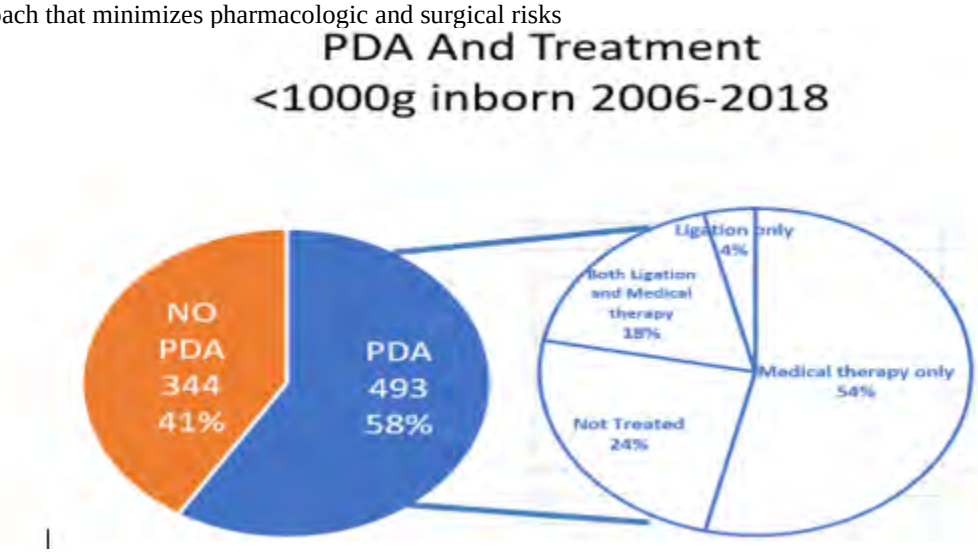
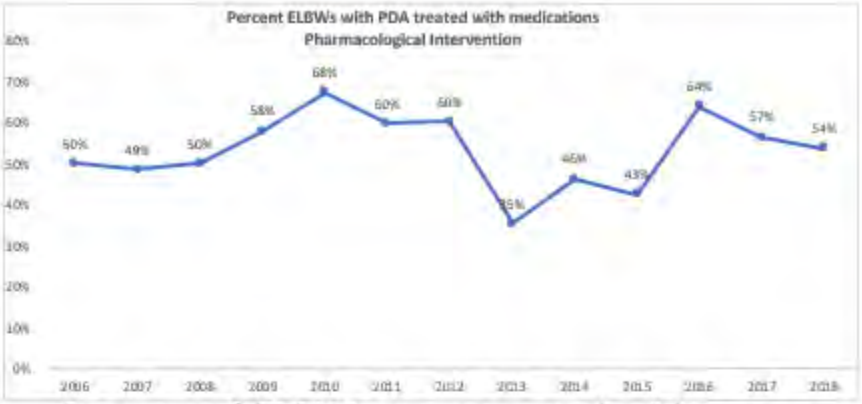
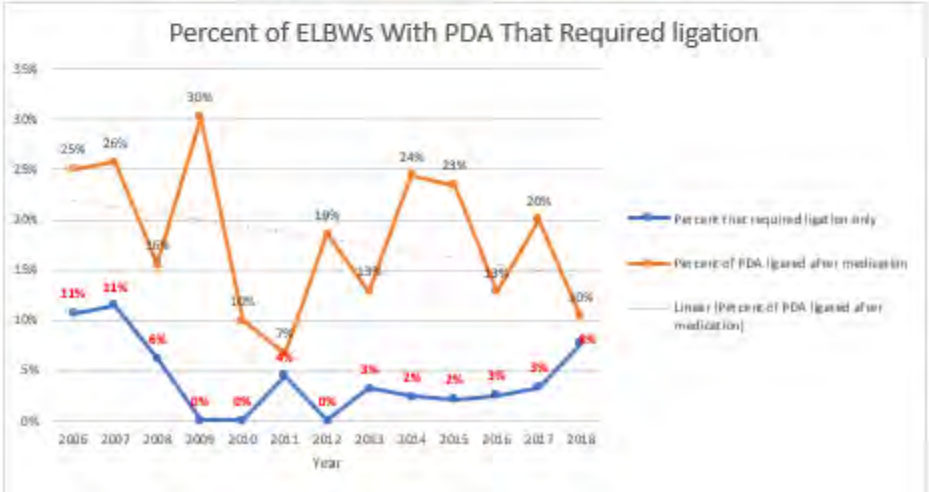
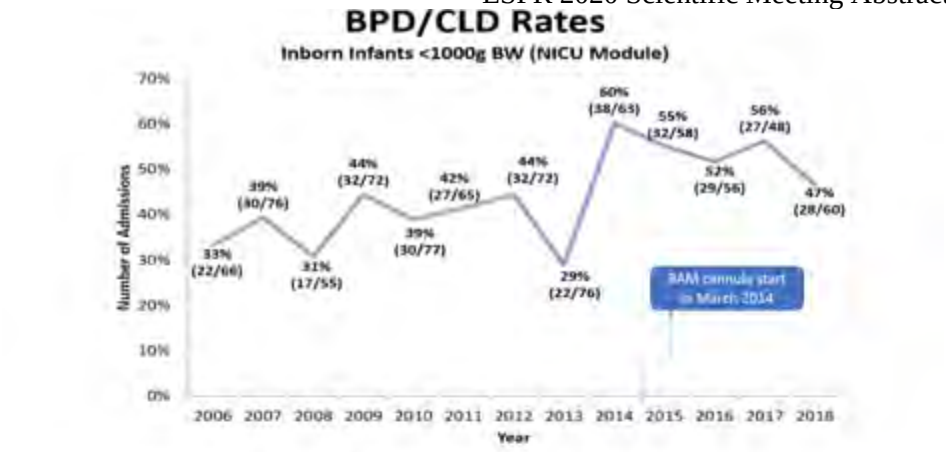


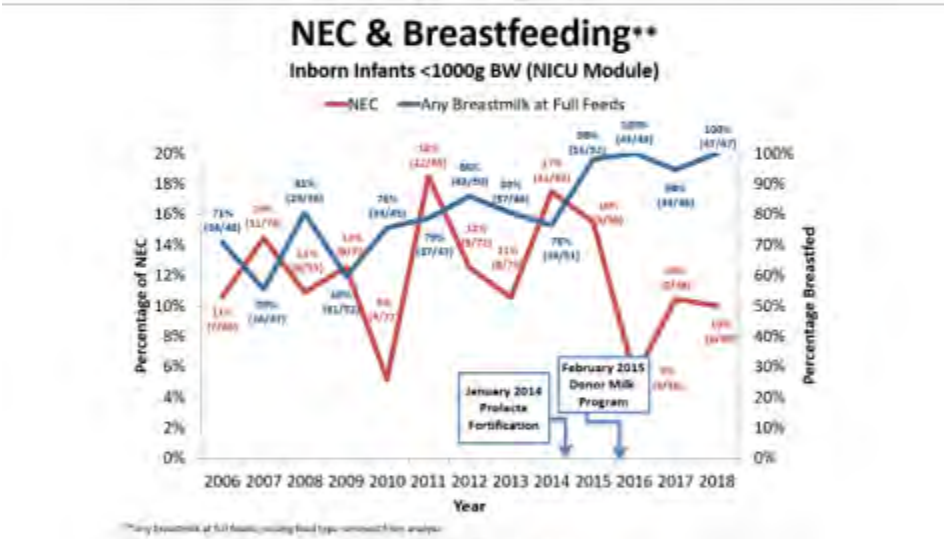
Figure 1

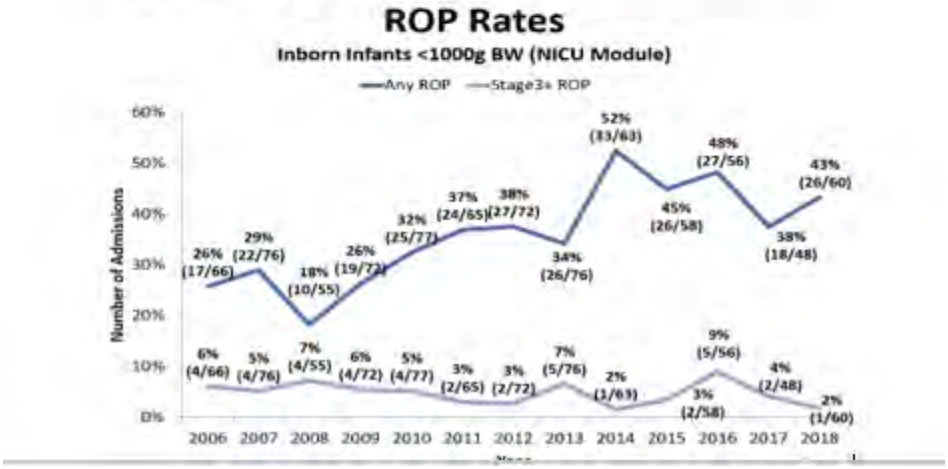


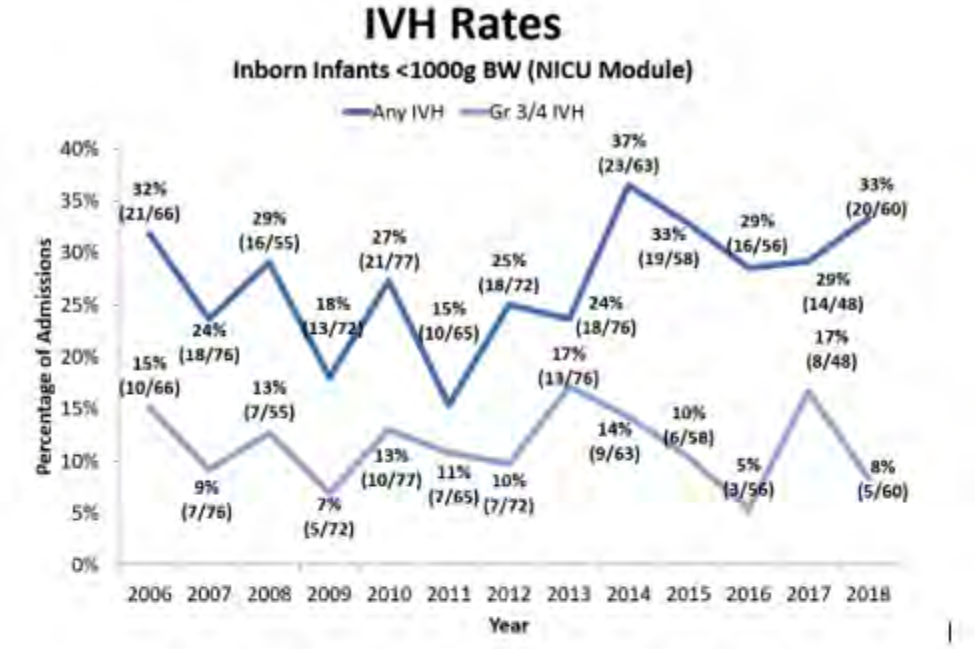
Percent of ELBWs were treated with Indomethacin /Ibuprofen/ or both

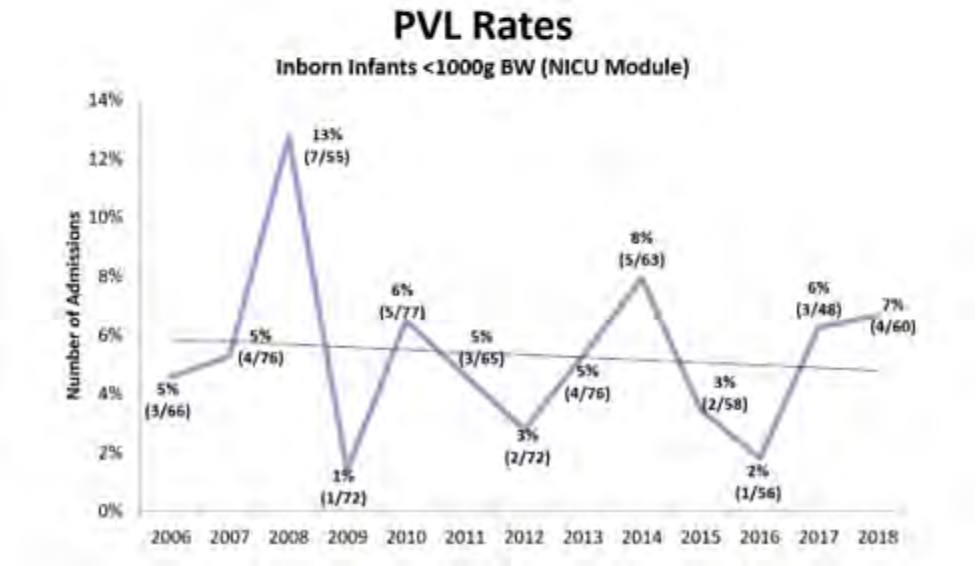



BPD/CLD Rates
Inborn Infants <1000g BW (NICU Module)
Number of Admissions
Year
33% (22/66)
39% (30/76)
31% (17/55)
44% (32/72)
39% (30/77)
42% (27/65)
44% (32/72)
29% (22/76)
60% (38/63)
55% (32/58)
52% (29/56)
56% (27/48)
47% (28/60)
BAM cannula start in March 2014


NEC & Breastfeeding**
Inborn Infants <1000g BW (NICU Module)
NEC
Any Breastmilk at Full Feeds
Percentage of NEC
Percentage Breastfed
Year
January 2014 Prolacta Fortification
February 2015 Donor Milk Program


ROP Rates
Inborn Infants <1000g BW (NICU Module)
Any ROP
Stage3+ ROP
Number of Admissions
26% (17/66)
29% (22/76)
18% (10/55)
26% (19/72)
32% (25/77)
37% (24/65)
38% (27/72)
34% (26/76)
52% (33/63)
45% (26/58)
48% (27/56)
38% (18/48)
43% (26/60)
6% (4/66)
5% (4/76)
7% (4/55)
6% (4/72)
5% (4/77)
3% (2/65)
3% (2/72)
7% (5/76)
2% (1/63)
3% (2/58)
9% (5/56)
4% (2/48)
2% (1/60)





Abstract: 321

Non-Invasive Carbon Dioxide Monitoring Following Cardiac Surgery in Infants with Congenital Cardiac Disease

Brett T. LaBrecque, Nim Goldshtrom, Diana Vargas, Caitlin Ehret, Rakesh Sahni
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Background Timely and accurate evaluation of a patient's ventilatory status is key in the post-operative care of infants undergoing congenital cardiac repair or palliation surgery. Continuous end-tidal carbon dioxide ($EtCO_2$) monitoring is often utilized to approximate the patient's arterial partial pressure of carbon dioxide ($PaCO_2$). Due to the altered hemodynamics and physiology of these patients, the accuracy of $EtCO_2$ is sub-optimal. Continuous non-invasive transcutaneous monitoring of carbon dioxide ($TcCO_2$) may be able to evaluate ventilation more accurately in these infants.

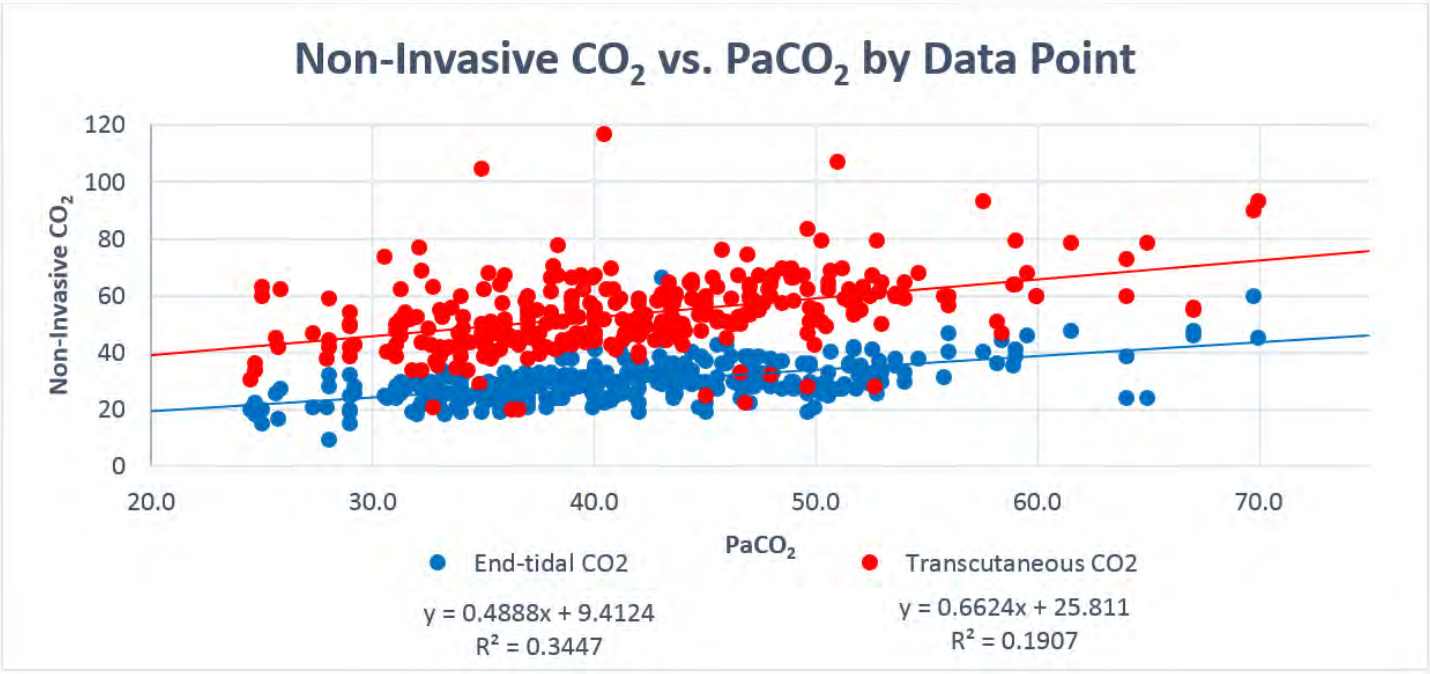
Objective The purpose of this study is to evaluate $EtCO_2$ and $TcCO_2$ as they compare to $PaCO_2$ in infants undergoing cardiac surgery in the post-operative period. We tested the hypothesis that $TcCO_2$ will more closely represent the $PaCO_2$ than $EtCO_2$ during the postoperative period.

Design/Methods This is a prospective, self-controlled, observational cohort study evaluating $EtCO_2$ and $TcCO_2$ as they relate to $PaCO_2$. Continuous physiologic monitoring was performed on 35 infants (BW = 3000 ± 832 g; GA = 37.8 ± 3.5 wk.) who underwent

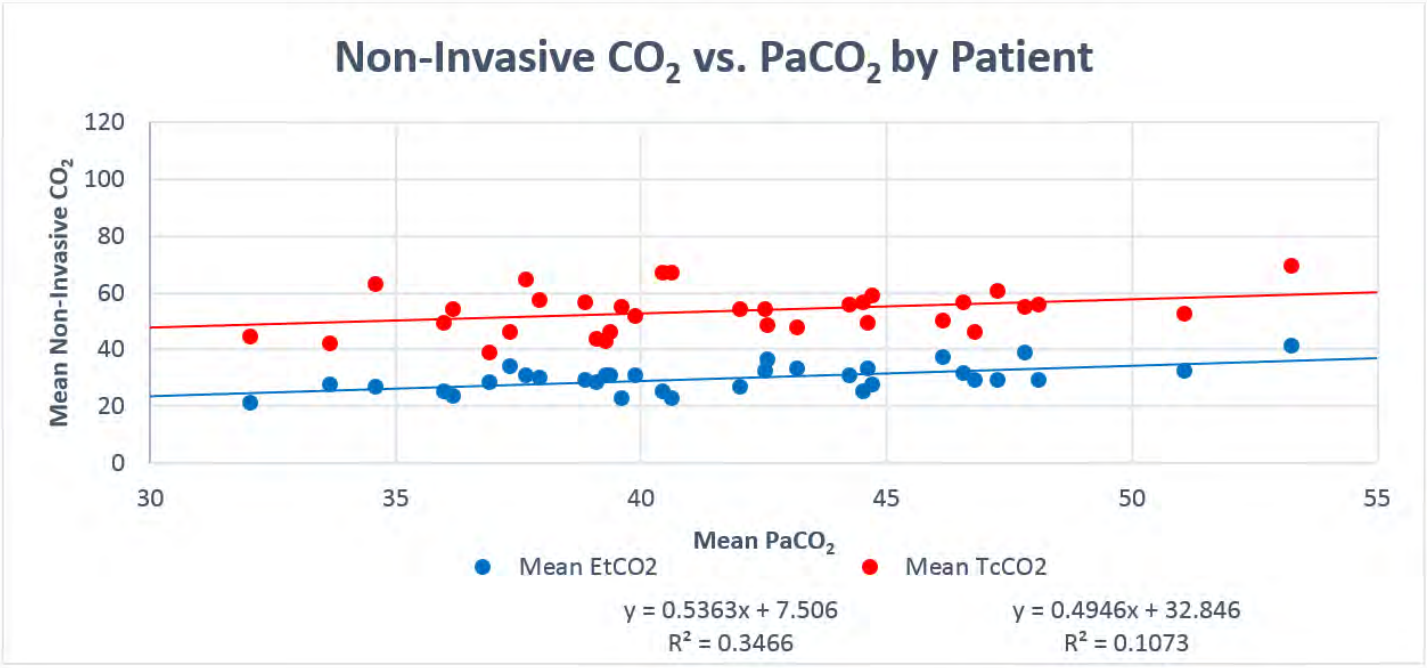
open repair or palliation of congenital cardiac disease in the Infant Cardiac Unit at Columbia University. Upon returning from the operating room, the infants were placed on continuous $EtCO_2$ and $TcCO_2$ monitoring. Frequent intermittent $PaCO_2$ values were obtained from arterial blood gas analysis as part of standard routine care. Simultaneous $EtCO_2$ and $TcCO_2$ values were recorded at the time of every $PaCO_2$ measurement for the first 24 hours post-operatively. Differences between $EtCO_2$ and $PaCO_2$ ($\Delta EtCO_2$) and $TcCO_2$ and $PaCO_2$ ($\Delta TcCO_2$) were computed and data were analyzed on both a per-point and per-patient basis.

Results 313 individual simultaneous observations were obtained from 35 patients. On a per-point basis, $\Delta EtCO_2$ was 12.2mmHg ± 6.7 and $\Delta TcCO_2$ was 13.3mmHg ± 10.2 ($p=0.10$). On a per-patient basis, $\Delta EtCO_2$ was 12.2mmHg ± 4.2 and $\Delta TcCO_2$ was 13.2mmHg ± 7.1 ($p=0.42$). Secondary analysis showed a significant difference between $\Delta EtCO_2$ in patients with and without mixing physiology (15.2mmHg ± 7.1 and 10.4mmHg ± 5.9 respectively, $p<0.0001$).

Conclusion(s) Our study suggests that there is no significant difference in accuracy between $TcCO_2$ and $EtCO_2$ in post-operative congenital cardiac infants. The presence of mixing physiology does appear to significantly increase the $\Delta EtCO_2$ in this cohort of patients.



Scatterplot with regression line depicting the per-point analysis. Transcutaneous values are indicated by a red dot. End-tidal values are indicated by a blue dot.



Scatterplot with regression line depicting the per-patient analysis. Transcutaneous values are indicated by a red dot. End-tidal values are indicated by a blue dot.

Abstract: 322

Cardiac Output Measurements During Neonatal/Pediatric Veno-Arterial (VA) ECMO Support; An Animal Model

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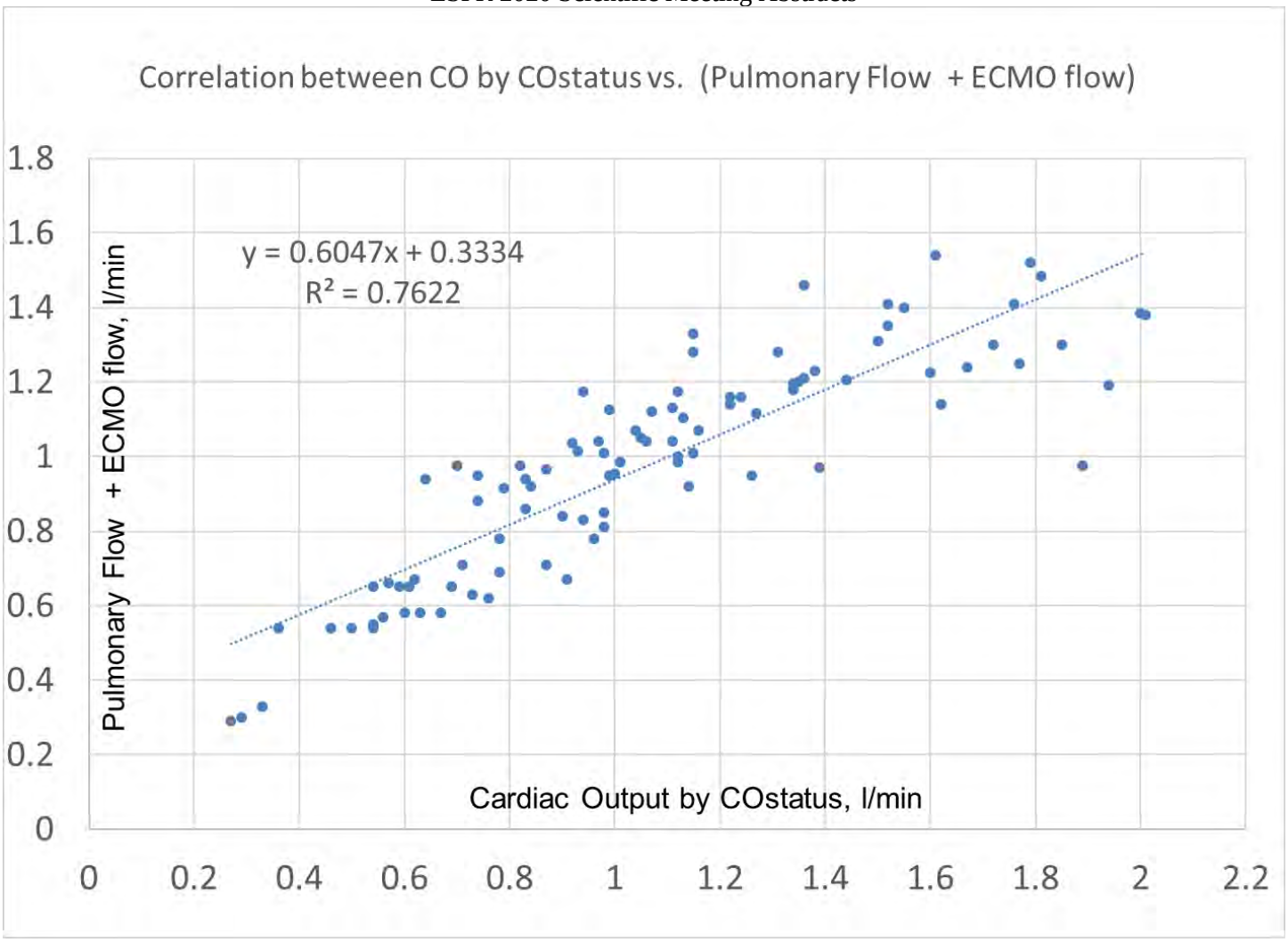
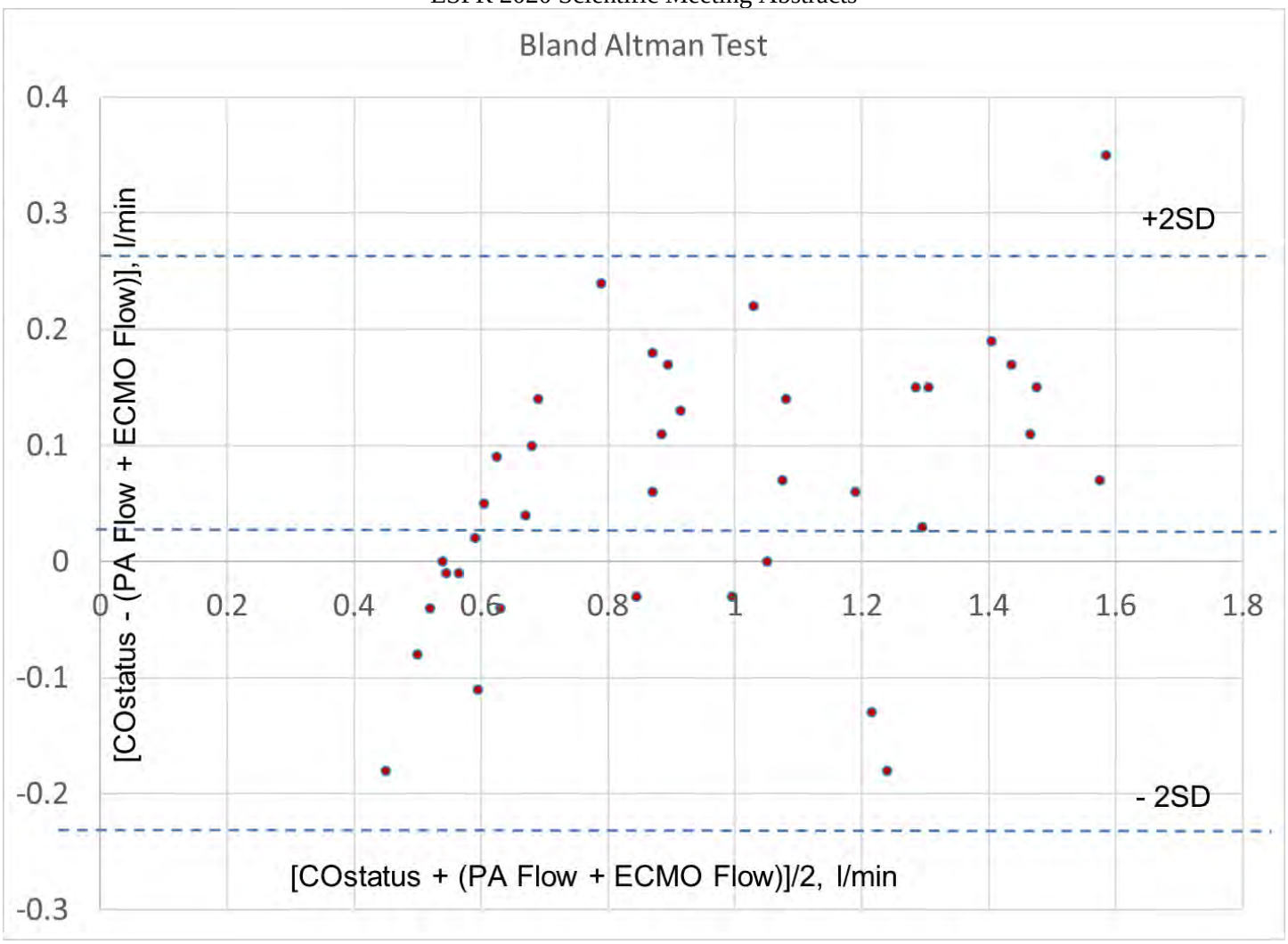
Background The *gold standard* for ECMO therapy has been veno-arterial (VA) ECMO. Patients on VA ECMO, awaiting cardiac recovery, have increasing risk of complications with increasing duration of ECMO support. In order to reduce the complications, physicians need to be able to identify and quantify cardiac recovery by Cardiac output (CO) measurements. Currently there is no simple noninvasive technology to measure CO in neonatal and pediatric patients.
Objective The aim of the study was to validated ability of COstatus technology to measure CO in VA ECMO setting in animal model that could be later used in human patients.
Design/Methods After approval by IACUC, six animals, 3 lambs1 to 5 days old and weighing 3.7-4.4 and 3 piglets weighing 10.3-11.6 Kg were placed on VA ECMO. The ECMO circuit included a Jostra rotoflow centrifugal pump and pediatric oxygenator with the circuits primed with heparinized animal blood. Perivascular Flow probe 8PAU or 10PAU or 12PAU depends on animal size was located on PA and connected TS420 Meter measure CO_{PA} COstatus monitor, was used to measured total flow CO_{COstat} in ascending aorta the mixture of PA flow and ECMO flow. ECMO flow (Q_{ECMO}) was measured by ELSA monitor. All Equipment was manufactured by Transonic Systems Inc. Ithaca, NY.
After completion of the animal experiments for each ECMO run, the subjects were euthanized per IACUC protocol.
Results Total 74 comparisons were made between CO_{COstat} and (CO_{PA}+ Q_{ECMO}). CO_{COstat} varied 0.27 -2.01 l/min; CO_{PA} varied 0-0.98 l/min ; Q_{ECMO} varied (0.21- 0.84) l/min. Correlation coefficient $R^2 = 0.77$. Bland Altman mean error 2SD/mean*100 was 26%. That is less than 30% that meats Critchley -Critchley criteria for two CO methods that are interchangeable.
Conclusion(s) Animal comparison data suggest that cardiac output by COstatus monitor accurately measures the sum of native cardiac output and ECMO flow, thus can be used to measure the progress of CO recovery in VA ECMO patients.
Supported by NIH Grant 4 R44 HL136008-01


Correlation between CO by COstatus vs. (Pulmonary Flow + ECMO flow)
y = 0.6047x + 0.3334
R² = 0.7622
Pulmonary Flow + ECMO flow, l/min
Cardiac Output by COstatus, l/min
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
2.2



Abstract: 323

Effect of Maternal Obesity on Neonatal Hypoxic-Ischemic Encephalopathy

Sharmeen Azher, Upender Munshi, Meredith Monaco-Brown, Rubia Khalak
Pediatrics, Albany Medical Center, Albany, New York, United States

Background The effect of maternal obesity on hypoxic ischemic encephalopathy (HIE) has not been extensively studied. Previous research has shown that infants born to obese mothers are more likely to receive the diagnosis of HIE but it is not known whether maternal obesity further impacts the need for resuscitation or development of seizures.

Objective To determine if maternal obesity confers an additional risk of delivery room (DR) resuscitation or seizures in infants with HIE.

Design/Methods Data for all live-born singleton births of 36 0/7-42 0/7 weeks gestation was obtained from the New York State Perinatal Data System. Data analyses included maternal co-morbidities, delivery and infant characteristics. The NIH definition of obesity was used (BMI ≥ 30 kg/m2). Chi square tests were used for a baseline comparison of categorical data for HIE infants born to normal (BMI < 30) and obese mothers (BMI ≥ 30). Infants received HIE diagnosis based upon physiologic and neurologic criteria. Logistic regression was used to control for potential confounders (pre-existing and gestational hypertension and diabetes) to assess the impact of maternal BMI on need for DR resuscitation and seizures.

Results Of the 99,952 mother-infant dyads reviewed, we found that infants born to obese mothers were more likely to receive the diagnosis of HIE than infants born to normal BMI mothers (0.16% vs 0.08%, p=0.001). When the infants with HIE were compared, the infants born to obese mothers were more likely to have acidosis at birth with a cord pH of 6.93 (SD 0.20) p=0.015, Table 1. There was no difference in birth weight, cesarean delivery, 5-minute Apgar score or the need for delivery room resuscitation when comparing the infants in both groups. When maternal obesity levels were stratified by NIH classification (level I=BMI 30-34.9, level II=BMI 35-39.9 or level 3= BMI>40), we found that there was no additional risk conferred with increasing levels of obesity (p=0.645). Table 2 shows that infants born to obese mothers were not more likely to have neonatal seizures or to receive the diagnosis

of moderate or severe HIE as determined by a modified Sarnat staging assessment tool.
Conclusion(s) Maternal obesity predisposes HIE infants to greater acidosis at birth, however, it is not associated with an increase in the severity of HIE or seizure occurrence. Further studies are needed to determine if there are other subtle physiologic changes in an infant born to an obese mother that may help to explain why the profound acidosis does not result in increased short-term sequelae.

Table 1. Delivery Outcomes in HIE Infants Born to Normal BMI and Obese Mothers

	BMI < 30 N = 66 Count	BMI ≥ 30 N = 52 Count	P value, Chi²test
Mean Birth Weight (g)	3316.82, SD ±579.77	3315.06, SD± 716.00	0.988
Gender			
Female	28	22	0.989
Male	38	30	
Delivery			
Cord pH	7.04, SD ±0.17	6.93, SD ±0.20	0.015*
Assisted vaginal delivery	2 (3.03%)	3 (5.77%)	0.325
Cesarean birth	32 (48.48%)	29 (55.77%)	0.756
Apgar at 5 minutes (median):			T value
0-3			0.555
4-6	27 (43.55%)	16 (33.33%)	
7-10	29 (46.77%)	23 (47.92%)	
	6 (9.68%)	9 (18.75%)	
Resuscitation			
Endotracheal tube insertion	38 (57.58%)	24 (46.15%)	0.257
Chest compressions	18 (27.27%)	14 (26.92%)	0.519

Table 2. Comparison of HIE infants born to normal BMI and obese mothers

	BMI < 30 N = 66	BMI ≥ 30 N = 52	P value, Chi^{2}test
Diagnosis of HIE			T value
Mild	16 (24.24%)	15 (29.41%)	0.623
Moderate	41 (62.12%)	28 (54.90%)	
Severe	9 (13.64%)	8 (15.69%)	
Seizures (clinical/EEG)	25 (37.88%)	19 (36.54%)	0.928

Abstract: 324

Assessing the Adherence to the American Academy of Pediatrics (AAP) Guidelines for Discharge Documentation of the High-Risk Infant in an Urban Level IV Neonatal Intensive Care Unit (NICU)

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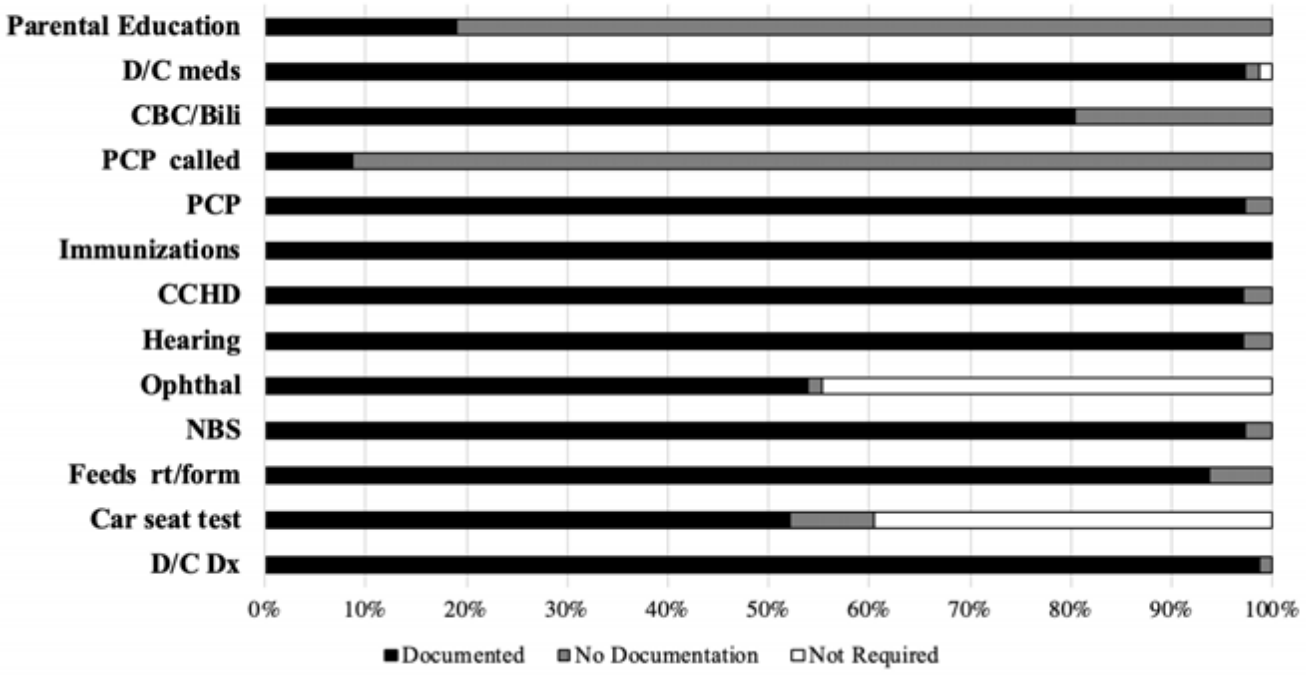
Background Over the past three decades, the likelihood of neonates who are born preterm or ill, and survive, has dramatically increased due to technological advances. When discharged, these infants are at higher risk for chronic medical conditions and disabilities. Studies have shown that effective discharge planning is a key factor related to the quality of inpatient care and avoidance of hospital readmission. The AAP has developed 6 guidelines for documentation at discharge, described as 13 elements, for the transition of care to their primary care provider (PCP).
Objective To assess documentation adherence to the AAP discharge guidelines for high-risk infants in an urban level IV referral-based NICU over a one-year period
Design/Methods After institutional review board approval, a retrospective review of the electronic health record (EHR) was performed to assess the discharge summaries of all infants discharged home from 7/1/17-6/30/2018. Summaries were assessed for inclusion of the 13 recommended discharge elements as put forth by the AAP. Exclusion criteria included: having previously been home, having an interim care provider, transfer to another care facility or death prior to discharge. Data was analyzed using Statistical Package for Social Sciences (SPSS) software version 25.
Results A total of 201 charts were reviewed. Of those, 51 were excluded and 150 charts were analyzed. The study population (Table 1) included 66 full term infants and 84 preterm infants; <28 weeks gestation (n=25), 28-32 weeks (n=27) and 32-37 weeks (n=32). The assessment of inclusion of discharge elements (Figure 1) demonstrated that 10 of the 13 elements were present 93.22% of the time. The 3 remaining elements had lower documentation compliance with parental education at 18.7%, PCP communication at 8.7%, and the last complete blood count at 78%.
Conclusion(s) In this study population, there was >90% documentation compliance in 10 out of 13 discharge elements as put forth by the AAP. However, there is room for improvement as even a small frequency of omitted discharge information can affect patient safety in the transition of care from the high-risk NICU environment to the outpatient medical home. Optimizing this documentation, perhaps through enhanced triggers in the EHR, may help improve transition to home and/or potentially decrease hospital readmissions, parental stress, and unnecessary burden on the healthcare system.

Figure 1. Discharge Documentation Compliance



Patient Demographics

Gestational Age (weeks)	34 1/7 (mean)	5 3/7 (SD)
Birth Weight (grams)	2239.4	1090.9
Admission Weight (grams)	2442.5	946.6
Discharge Weight (grams)	3489.3	1067.2
Age at Admission (days)	10.2	20.0
Age at Discharge (days)	61.6	54.7

All values are expressed as mean and standard deviation (SD).

Abstract: 325

Resuscitation Outcomes At 22 weeks Gestational Age: A Single Center's Experience

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Background The edge of viability for premature infants is being pushed lower in part due to recent NRP recommendations stating that resuscitation should be considered at 22 weeks gestational age (WGA) after discussion with family. Based upon evidence that intact survival is possible for infants born at 22 WGA, Baystate Children's Hospital changed its policy in 2016 to consider resuscitation of infants in the 22nd WGA after NICU consultation with family regarding risks and outcomes.
Objective Describe a single center's experience and outcomes after changing the limit of viability and thus attempts at resuscitation from 23 to 22 WGA.
Design/Methods We retrospectively compared rates of outcomes pre-policy change (birth years 2012-15) to post policy change (birth years 2016-19) of infants born at 22 WGA, and compared variables that may factor into survival. Additionally, we compared outcomes of those infants born at 22 vs 23 WGA at our institution, as well as to the Vermont Oxford Network (VON) as a whole.

Statistical analysis was performed using chi-squared analysis for categorical variables and fisher's exact test for continuous variables.
Results 0% (n= 11) of 22 WGA infants were resuscitated pre-policy and 60% (n= 15) were resuscitated post-policy (p=0.002). Of those resuscitated (n=9), 33.3% survived until ultimate discharge with an overall survival of 20% (n= 15). Comparing those that survived vs died after resuscitation, there were no differences in GA, birthweight, sex, multiples status, race/ethnicity, prenatal factors or Apgars. Of those that survived until discharge, all had BPD and late onset infections, none had NEC/bowel surgery, and 2 had evidence of brain injury. Comparing infants at 22 vs 23 WGA over the same time period, there were no difference in survival rates (33.3% vs 50%; p= 0.45) or length of stay of survivors (153 ± 38 vs 185 ±98 days; p=0.65). More opted for resuscitation in the 23 week group (100% vs 60%; p=0.003), and of those that survived initial resuscitation but later died, the average length of stay was higher in 23 WGA infants (23.7 ± 23.9 vs 1.83 ± 0.98 days; p=0.044). In comparing to VON (birth year 2018), there were 1,170 infants born at 22 WGA with median survival of 0 days (interquartile range 0-15.5).
Conclusion(s) After implementing a new policy to consider resuscitation at 22 WGA at our institution, there has been an increase in resuscitation efforts and in survival to ultimate discharge of 22 WGA infants. Survival rates are better than those seen nationally and are similar to those born at 23 WGA.

Abstract: 326
Higher caloric intake is associated with reduced risk of developing severe bronchopulmonary dysplasia in extremely low birth weight infants
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Background Bronchopulmonary dysplasia (BPD) is an important morbidity of prematurity, especially in extremely low birth weight (ELBW) infants. The pathogenesis of BPD is multifactorial with multiple risk factors including postnatal growth failure. However, there is a paucity of information regarding profiles of nutritional intake and their impact on growth in ELBW infants with severe BPD.
Objective To examine nutritional intake profiles and growth trajectories of ELBW infants with severe BPD.
Design/Methods Case-control study of ELBW infants admitted to Women & Infants Hospital of RI from Aug-2011 to Dec-2017 with and without severe BPD. Severe BPD was defined as infants who required positive pressure ventilation, nasal intermittent positive pressure ventilation, continuous positive airway pressure, high flow nasal cannula >2 L/min and/or FiO_2 >30% at 36 wks PMA (120 cases). The control cohort included infants matched by age, birth weight, sex, and gestational age (104 controls). Bivariate comparisons were made between groups using t-test or Wilcoxon test for continuous variables or Chi-squared for categorical variables. Predictors of BPD were identified using multiple logistic regression with robust standard errors to adjust for matching.
Results Infants with severe BPD were born at lower gestational ages and weights, had an increased number of ventilator and total oxygen days, and were more likely to receive treatment with surfactant, postnatal steroids, and chronic diuretic therapy (all p<0.0001). Mean total caloric intake (kcal/kg/day) through wk 12 was lower in infants with severe BPD compared to controls (Figure 1A, p<0.0001). There was no difference in fluid or protein intake through wk 12. Weight gain velocity was lower in severe BPD than control cases (13.3±1.64 vs. 14.6±1.63 g/kg/day, p<0.0001). Weight and length Z-score changes between birth and PMA 36 wks (or discharge if sooner) were lower in severe BPD infants (p<0.001, Fig. 1B). In a logistic regression model, caloric intake through wk 12 was significantly lower with the effect size consistent across models, reducing the odds of severe BPD by ~ 4% for each 1 kcal/kg (p<0.001, Table 1). Growth, measured by Z-score change, was significant for length, reducing the odds of BPD by ~35% for each Z-score point.
Conclusion(s) Higher total caloric intake and greater linear growth in ELBW infants was associated with reduced odds of developing severe BPD.

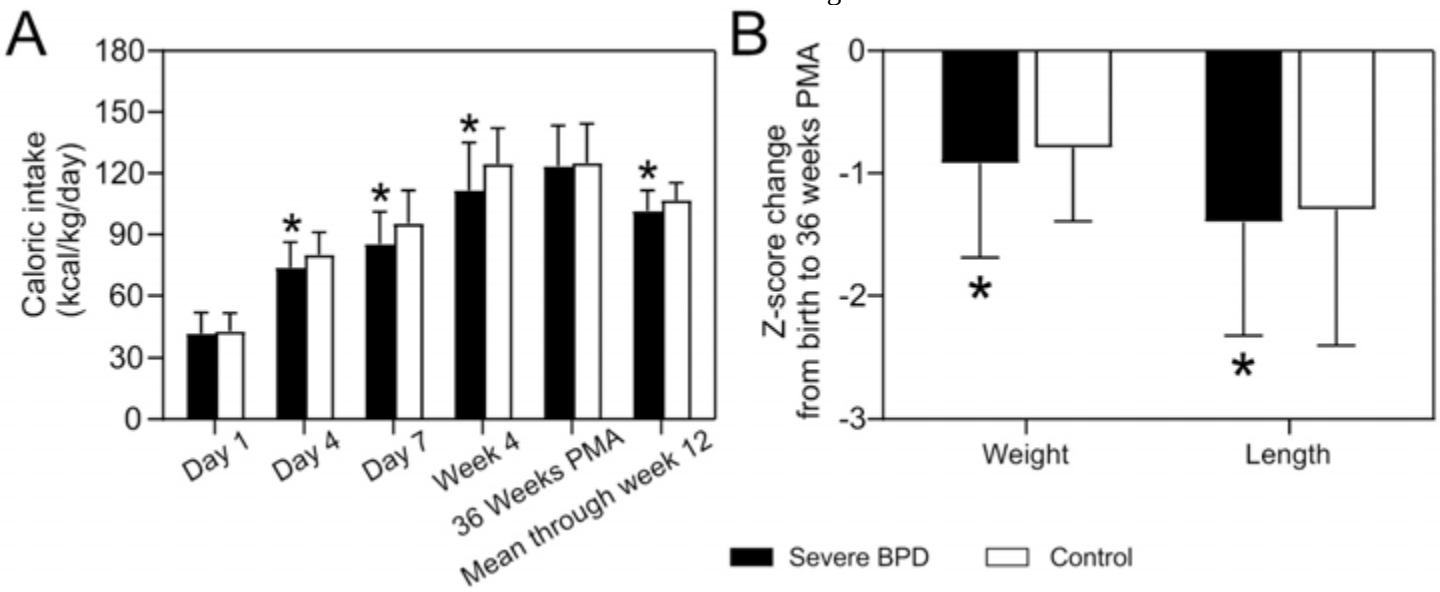

Figure 1. Closed bars represent severe BPD cases and open bars represent control cases. (A) Caloric intake plotted for days 1, 2, and 7, week 4, 36 weeks PMA and mean total caloric intake from birth to week 12. (B) Change in Z-score from birth to 36 weeks PMA (or discharge, if sooner) for weight and length. *p<0.05

Logistic Regression Models for Predictors of Severe BPD

Variable	Weight model OR, 95% CI, p	Length model OR, 95% CI, p	Head circumference model OR, 95% CI, p
Birth Z-score	1.08, 0.88-1.33, 0.4388	0.79, 0.63-1.0, 0.0495	0.91,0.75-1.11, 0.3552
Surfactant	3.34, 1.87-5.98, 0.0001	3.26, 1.72-6.16, 0.0004	3.48,1.88-6.45, 0.0001
Caloric intake to 12 weeks (per kcal/kg)	0.96,0.95-0.98, 0.0001	0.96,0.95-0.99, 0.0009	0.96,0.94-0.98, 0.0001
Z-score change, birth to 36 weeks	0.78,0.57-1.0, 0.0525	0.65,0.48-0.89, 0.0075	0.85,0.68-1.07, 0.1643

Subjects were matched by age, birth weight, gestation, sex. Matching was adjusted for by robust standard errors.

Abstract: 327

Predictive Value of the BSID-II and the Bayley-III for Early School Age Cognitive Function in Very Preterm Infants

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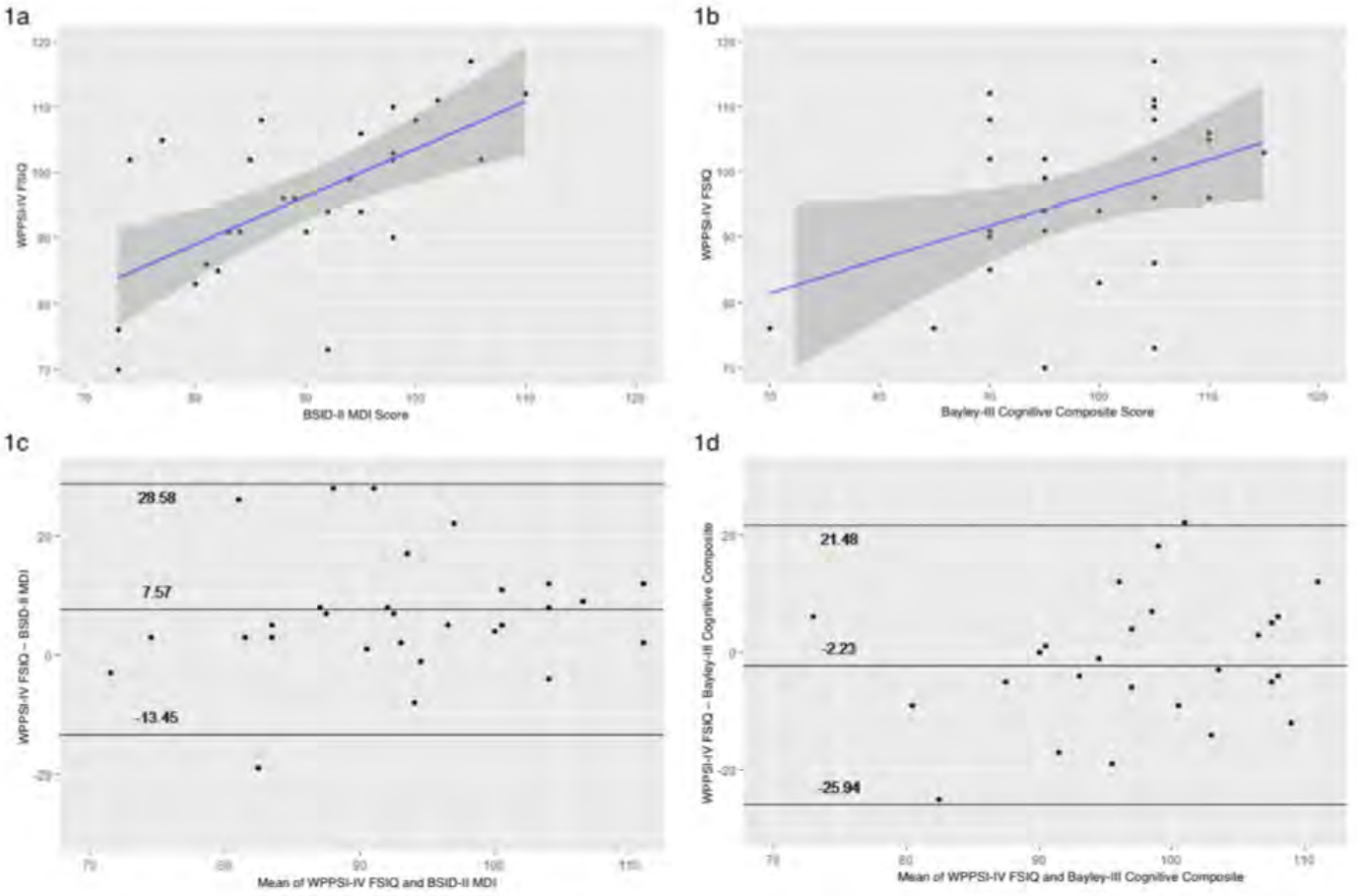
Background Neurodevelopmental follow up during the first few years of life serves to identify children with developmental delay who may benefit from specialized interventions. The Bayley Scales of Infant Development (BSID) is the most widely reported tool for developmental assessment in the first two years of life. Ideally, early developmental assessments such as the Bayley would be helpful for predicting later cognitive outcomes, however studies about the prognostic value of the Bayley are conflicting.
Objective To compare the predictive validity of the Bayley Scales of Infant Development, Second Edition (BSID-II) and the later Bayley-III for cognitive function at early school age in very preterm infants.
Design/Methods Seventy-seven former preterm infants (born <32 weeks gestation and ≦2000g) completed both the BSID-II and the Bayley-III at 2 years corrected age. Children enrolled at hospitals that perform follow-up beyond 2 years had cognitive assessments with the Wechsler Preschool and Primary Scale of Intelligence Fourth Edition (WPPSI-IV) at early school age. Associations between

Bayley and WPPSI full scale IQ (FSIQ) scores were assessed using correlation coefficients, linear regression, and Bland-Altman plots.
Results Thirty-one of 44 eligible children (70%) were tested with the WPPSI-IV at 47+/-11 months (Table 1). The children tested with the WPPSI-IV were not significantly different from those not tested. Average BSID-II Mental Development Index (MDI) was 86+/-19, Bayley-III Cognitive composite score was 101+/-12 and WPPSI FSIQ was 96+/-12. Correlation between the BSID-II Mental Development Index (MDI) and WPPSI FSIQ was 0.54 ($p<0.001$); correlation between Bayley-III cognitive composite score and WPPSI FSIQ was 0.31 ($p=0.03$) (Table 2). Linear regression models also demonstrated that BSID-II was more closely correlated with FSIQ than Bayley-III. Bland-Altman plots demonstrated that this bias was consistent across the full range of scores (Figure 1).
Conclusion(s) The BSID-II underestimated FSIQ and the Bayley-III overestimated FSIQ. Children at risk for impairment might be missed with the Bayley-III. As the Bayley-4 is introduced, clinicians and researchers should be cautious about interpretation of scores until performance of this new measure is fully understood.

Figure 1. Scatterplots and Bland-Altman plots comparing the BSID-II MDI and Bayley-III cognitive composite with WPPSI-IV FSIQ



1a. Scatterplot of the BSID-II MDI against the WPPSI-IV FSIQ. Regression coefficient is 0.6008 (95% CI 0.31-0.88, p=0.0002).
1b. Scatterplot of the Bayley-III cognitive composite score against the WPPSI-IV FSIQ. Regression coefficient is 0.5120 (95% CI 0.05-0.97, p=0.03).
1c. Bland-Altman plot of BSID-II MDI score and WPPSI-IV FSIQ.
1d. Bland-Altman plot of Bayley-III cognitive composite score and WPPSI-IV FSIQ.

Figure 1

Table 1. Characteristics of Participants

		All Participants (n=77)	Participants WPPSI Performed (n=31)	Participants WPPSI Not Performed (n=46)	p value
Maternal Demographic Data					
Age, y, mean		29.2 ± 6.4	26.5 ± 6.1	31.0 ± 5.9	0.0031
Married status, %					0.25
	Single	42	55	33	
	Married	46	39	50	
	Divorced	0	0	0	
	Unknown	13	7	17	
Maternal race or ethnicity, %					0.19
	Black	53	58	50	
	White	39	36	41	
	Asian	1	0	2	
	Hispanic	3	7	0	
	Unknown	4	0	7	
Maternal education, %					0.19
	< High School	25	36	17	
	2 years college	12	7	15	
	4 years college	23	26	22	
	Graduate level	13	7	17	
	Unknown	27	26	28	
Infant Birth Data					
Gender, %					0.30
	Male	49	42	54	
	Female	49	58	44	
	Unknown	1	0	2	
Gestational age, wk		28.1 ± 2.4	28.0 ± 2.3	28.4 ± 2.5	0.48
Birthweight, g		1155 ± 378	1132 ± 357	1170 ± 395	0.58
Multiple gestation, %		38	45	33	0.47
Small for gestational age, %		3	3	2	1
Infant race or ethnicity, %					0.59
	Black	53	58	50	
	White	44	42	46	
	Hispanic	0	0	0	
	Asian	1	0	2	
	Other	0	0	0	
	Unknown	1	0	2	
Neonatal Risk Factors					
Bronchopulmonary dysplasia, %		10	19	4	0.059
Intraventricular hemorrhage grade 3 or 4, %		4	3	4	0.029
Necrotizing enterocolitis, %		7	7	7	1
Patent ductus arteriosus ligation, %		13	13	13	1
Retinopathy of prematurity requiring laser treatment, %		4	7	2	0.55
Sepsis, %		17	19	15	0.76
Length of stay, d		72.1 ± 68.9	65.1 ± 87.0	77.1 ± 53.2	0.47
Postnatal steroids, %		12	13	11	0.038
Mechanical ventilation, %		64	71	59	0.21
Later Risk Factors					
Hearing loss, %		8	7	9	0.023
Blindness, %		0	0	0	1
Major neurologic abnormality, %		9	3	13	0.14
Autism, %		4	7	2	0.0016
Study Characteristics					
Corrected age in months at BSID-II		19.2 ± 2.9	19.6 ± 1.8	18.9 ± 3.5	0.52
Corrected age in months at Bayley-III		18.7 ± 2.4	19.4 ± 1.7	18.3 ± 2.7	0.077
Age in months at WPPSI		47.4 ± 11.4	47.4 ± 11.4	N/A	N/A

Data are presented as mean ± SD or No. of %

Table 1

Table 2. Summary Statistics and Correlations Between BSID-II and Bayley-III Scores and WPPSI-IV FSIQ

		Mean	Standard Deviation	Median (Interquartile Range)	Correlation with WPPSI FSIQ	P-value for correlation
BSID-II						
	MDI	85.7	19.3	88 (17)	0.54	<0.001
Bayley-III						
	Cognitive composite	101.2	11.8	100 (15)	0.31	0.030
	Language composite	94.3	22.2	94 (20)	0.39	0.005
WPPSI-IV						
	Full scale IQ (FSIQ)	95.8	12.2	96 (14)	-	-

Table 2

Abstract: 328

6 year neurodevelopmental (ND) follow up of survivors with Apgar Score (AS) of 0 at 10 minutes of life, following Selective Head Cooling (SHC) at a single center NICU

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Background An AS of 0 at 10 minutes has been recognized as a strong predictor of mortality and neurologic morbidity in term infants. Most outcome studies in the therapeutic hypothermia era have reported normal development and mild ND delay ranging from 0-56% in survivors at 18 - 24 months of age among infants with AS of 0 at 10 minutes. One multicenter study of outcomes at 6 years reported 21% of children without moderate or severe disability.
Objective To report ND outcomes at 6 years of age in a cohort of term babies with AS of 0 at 10 minutes of life who received intensive resuscitation (CPR/epinephrine) and underwent SHC at a single center NICU
Design/Methods Retrospective chart review of peripartum & perinatal variables in infants born between 2007-2012. Infants underwent standardized IQ testing by a psychologist (GR) using the Wechsler Preschool and Primary Scale-4; Normal IQ defined as a score of ≥ 85. ND assessments were performed by a neonatologist at 3 and 6 years (1 child seen only up to 3 years). All MRIs were reviewed by a neuroradiologist. The examiners were blinded to the infant's initial NICU clinical status.
Results 10 infants presented with AS of 0 at 10 mins; 9 of 10 infants were outborn. Two died and 2 were lost to follow up. By pediatrician report, one of the latter was developing normally at 18 months. All 6 survivors were severely encephalopathic prior to SHC. Initial postnatal pH < 7.00 in 5 of 6 cases. The MRI was normal (n=2) and no infant had basal ganglia injury (BGI). Table 1 outlines the less severe MRI changes in the 4 remaining infants. None of the survivors had cerebral palsy (CP) (GMFCS classification), gross motor delay or hearing and visual deficits. Three children had normal IQ scores (107, 98, 86) and normal development or mild ND deficits; 2 had moderately low IQs (79, 73) and ND deficits, including ADHD, language delay, working memory deficits, sensory integration problems, and anxiety. One child was intellectually deficient with severe ND deficits.
Conclusion(s) All surviving children had evidence of severe cardio-respiratory compromise at birth, suggestive of cerebral hypoperfusion, but none had evidence of BGI or CP at follow-up. This suggests a neuroprotective effect of SHC. However, subtle ND deficits, including ADHD, language delay, memory deficits, sensory integration problems, and anxiety, were evident in most survivors. This may reflect the less severe and more cortically located lesions noted on MRI.

Table 1. Peripartum, Perinatal, and Outcome Variables for Surviving Children with Apgars of 0 at 10 Minutes

Child	Peripartum Events	Initial Postnatal pH	MRI at 5-7 days	FSIQ at 6 years	Other deficits	Special services
1 *	Bradycardia, Vasa previa	7.09	Normal	107	None	None
2	Delivery in ambulance	6.96	Restricted Diffusion in hippocampus, mammillary body, Corpus callosum	98	None	None
3	Failed VBAC #	6.99	Restricted Diffusion in Left parieto-occipital region. Small SDH	86	Working memory deficit	OT ST
4	Fetal bradycardia	6.69	Normal	79	ADHD, language delay	OT ST
5	Abruption ##	6.64	Multiple Punctuate lesions	73	ADHD Severe expressive language delay Sensory integration difficulty	OT ST
6	Deceleration + Fetal bradycardia	6.90	Occipital lesions	66	ADHD, Anxiety Working memory deficit	OT ST

No detectable HR at 25 minutes; ##No detectable HR at 20 minutes,

MRI=Magnetic Resonance Imaging, FSIQ= Full Scale Intelligent Quotient; VBAC = Vaginal Birth after Cesarean Section, SDH = Subdural Hemorrhage, ADHD= Attention Deficit Hyperactivity Disorder, OT: Occupational therapy, ST: Speech therapy
*Seen for follow-up at 3 years only

Table 1. Peripartum, Perinatal, and Outcome Variables for Surviving Children with Apgars of 0 at 10 Minutes

Abstract: 329

The Impact of Developmental Family Meetings on Neonatal Follow-up Program First Appointment Show Rate

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Background Neonatal Follow-up Program (NFP) provides comprehensive medical and developmental care for former preterm and medically complex infants. NFP screens former preterm infants for developmental delay and refers to Early Intervention when indicated. However, NFP first appointment show rate is only 67% for high risk preterm infants born at our level III Intensive Care Nursery.

Objective This quality improvement initiative aims to improve NFP first appointment show rate from 67% to 80% in 12 months. The process measure is implementation of standarized 34-week corrected age developmental family meetings in the Intensive Care Nursery (PDSA Ramp 1).

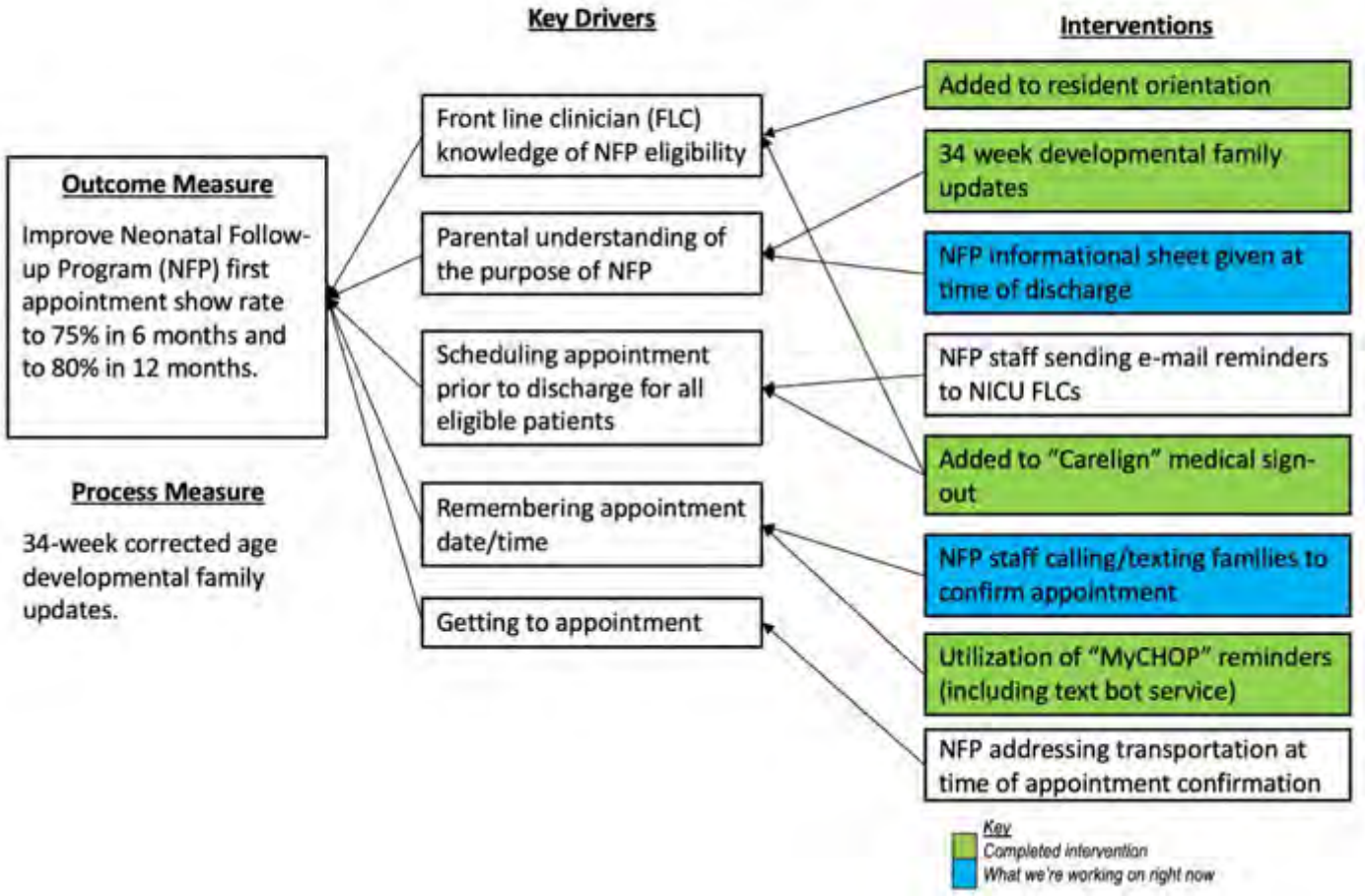
Design/Methods A key driver diagram was developed to explore contributors to NFP show rate (Figure 1). The intervention was chosen as a process measure to address parental understanding of the purpose of NFP. All preterm infants born at less than 33 weeks gestation and/or less than or equal to 1500 grams were selected for this initiative. Meetings were listed on the attending physicians' weekly family contact sheets (PDSA Cycle 1). Weekly reminders were sent to social workers as well as attending and fellow physicians listing qualifying patients (PDSA Cycle 2). At patient 34-week corrected age, a neonatal attending/fellow physician led a family meeting that introduced NFP, concept of corrected age, and purpose of developmental follow-up. PDSA cycles were used to refine a family information packet developed for this family meeting based on continuous patient feedback. Meetings were documented (PDSA Cycle 3) and tracked. Show/no-show status was documented at the patients' first NFP appointment.

Results 130 patients were eligible for 34-week corrected age developmental family meetings from October 2018 to October 2019. Rate of meetings for all eligible patients increased from 75% to 100% (Figure 2). To date, NFP first appointment show rate has not been impacted by this process measure (Figure 3).

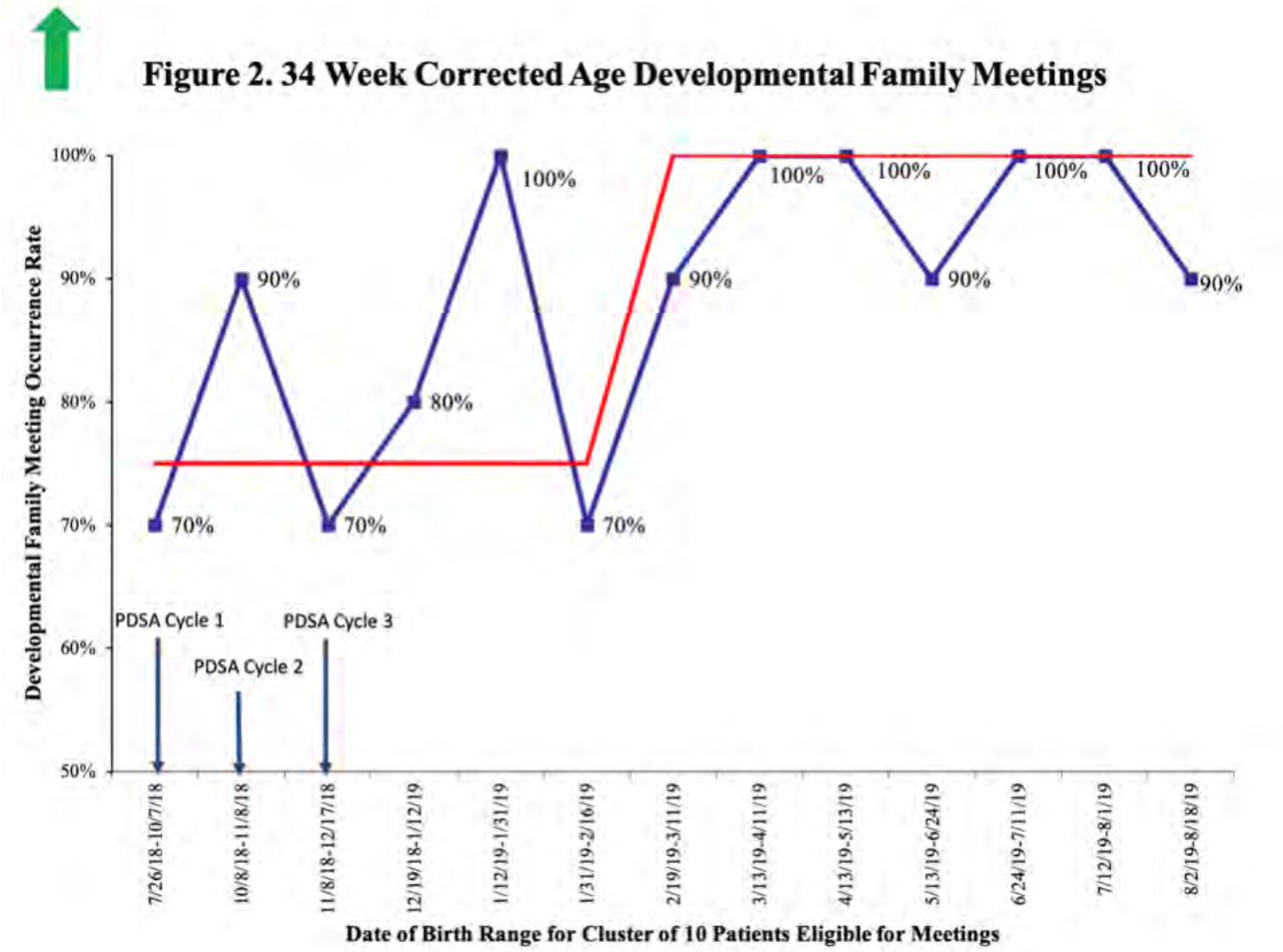
Conclusion(s) 34-week corrected age developmental family meetings targeting parental understanding of the purpose of NFP have had no measurable impact on NFP first appointment show rate. Other interventions currently being addressed to improve NFP first

appointment show rate include institution of text reminders by NFP staff and provision of a handout at discharge with NFP site photograph, directions, and appointment date and time (PDSA Ramp 2).

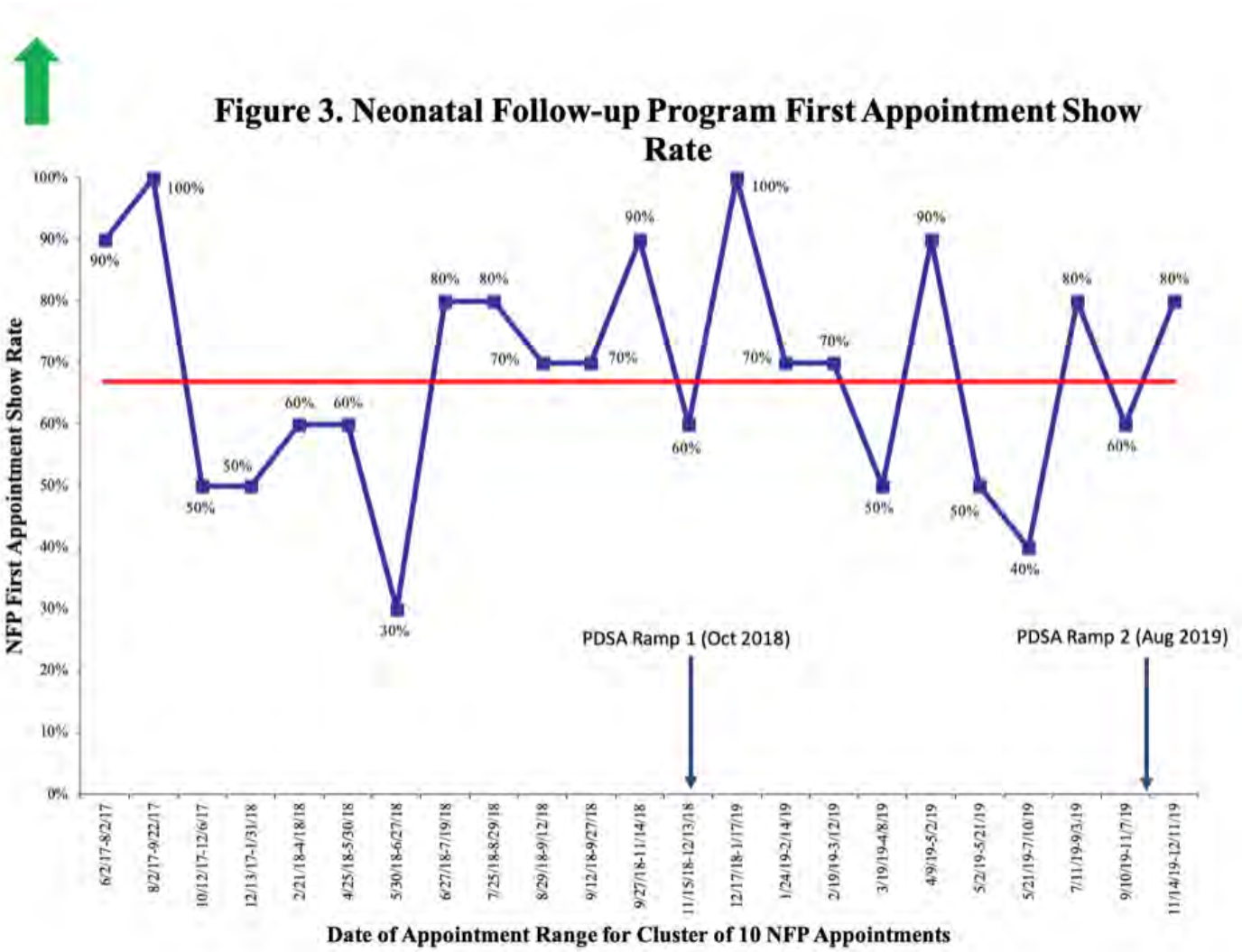
Figure 1. Neonatal Follow-up Program First Appointment Show Rate Key Driver Diagram



Driver diagram of contributors to Neonatal Follow-up Program show rate.



Run chart demonstrating median developmental family meeting occurrence rate clustered by groups of 10 eligible patients.



Run chart demonstrating median Neonatal Follow-up Program first appointment show rate clustered by groups of 10 patient appointments.

Abstract: 330

Postnatal head growth and neurodevelopmental outcomes in preterm neonates

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Background Despite many improvements in perinatal care, preterm infants continue to be at risk for neurodevelopmental (ND) delays. Nutrition and growth play a key role in ND outcomes. Current studies show a variable association between head growth (HG) and ND outcomes and uncertainty regarding risk factors for poor HG. Thus, identifying modifiable risk factors associated with poor postnatal HG in neonates could be a promising way to improve ND outcomes.

Objective To look for an association between postnatal HG and ND outcomes at 18-24 months corrected gestational age (GA) in preterm infants born at < 32 weeks and identify risk factors associated with poor HG.

Design/Methods We performed a retrospective chart review of preterm infants ≤ 32 weeks admitted to NYU Langone Health or Bellevue Hospital NICU from November 2013 to June 2017. After discharge, infants were followed in the NYU ND follow up clinic at 18-24 months corrected age. Data collected included maternal demographics, infant hospital course and growth parameters, and developmental assessments performed using Bayley Scales of Infant and Toddler Development III. Differences in head circumference (ΔHC) z-scores were calculated from birth to follow-up based on CDC data. Subjects were categorized into three groups: reference (-1 ≤ ΔHC z-score ≤ 1), poor HG (ΔHC z-score < -1), and accelerated HG (ΔHC z-score > 1). Multinomial regression analysis was used to compare the groups, SPSS 25.

Results 126 infants were included in the study, poor HG (n= 14) occurred in 11% of subjects and accelerated HG (n= 60) occurred in 48% of subjects. When comparing the groups, the reference group received less antenatal steroids (p = <0.01), while the poor HG subjects had lower birth weight (p =0.04) and GA (p =0.03) but higher rates of BPD (p =0.01). No other differences were noted between the groups (Table 1).

The poor HG group had statistically significant lower language scores (OR 0.92, 95% CI 0.85-0.99). When adjusted for differences between the groups, this relationship did not remain (OR 0.98, 95% CI 0.94-1.04), but BPD was found to be significantly associated with poor HG (p<0.017). No other significant associations were noted (Table 2).

Conclusion(s) Although this study found no association between postnatal HG and ND outcomes after adjusting for group differences, BPD was identified as a significant risk factor for poor HG. Larger studies are needed to further explore the relationship of BPD and poor HG on ND delays in premature infants.

Table 1: Maternal and Neonatal Characteristics

	Reference (n=52)	Poor HG (n=14)	Accelerated HG (n=60)	P-value
Maternal characteristics				
Age, mean (SD)	34.3 (5.6)	32.2 (4.6)	34.4 (4.5)	NS
Preeclampsia, n (%)	10 (19.2)	2 (14.3)	13 (21.6)	NS
Antenatal steroid, n (%)	42 (80.8)	14 (100)	58 (96.7)	<0.01
Cesarean delivery, n (%)	33 (63.5)	11 (78.6)	45 (75.0)	NS
Neonatal characteristics				
BW (g), mean (SD)	1375 (439)	1107 (431)	1205 (391)	0.04
GA (wk), mean (SD)	29.4 (2.4)	27.7 (2.3)	28.5 (2.6)	0.03
Sex (male), n (%)	34 (65.4)	7 (50)	26 (43.3)	NS
IUGR, n (%)	11 (21.1)	5 (35.7)	10 (16.7)	NS
Full feeds (days), mean (SD)	19.3 (14.7)	33.3 (20.9)	24.7 (23.5)	NS
Postnatal steroid, n (%)	6 (11.5)	2 (14.3)	7 (11.7)	NS
NEC, n (%)	1 (1.9)	0 (0)	4 (6.7)	NS
BPD, n (%)	16 (30.8)	10 (71.4)	28 (51.9)	0.01
IVH Grade 3-4, n (%)	1 (1.9)	0 (0)	1 (1.7)	NS
PVL, n (%)	3 (5.8)	0 (0)	3 (5.0)	NS
ROP, n (%)	4 (7.7)	2 (14.3)	5 (8.3)	NS
ΔHC z-score, mean (SD)	0.2 (0.6)	-2.8 (1.5)	1.9 (0.7)	<0.01

BW=birth weight, GA=gestational age, IUGR=intrauterine growth restriction, NEC=necrotizing enterocolitis, BPD=bronchopulmonary dysplasia, IVH=intraventricular hemorrhage, PVL=periventricular leukomalacia, ROP=retinopathy of prematurity

Table 2: Multinominal Regression Comparing Neurodevelopmental Outcomes

Bayley Domain, Composite	Reference, mean (SD)	Poor HG, mean (SD)	OR (95% CI)	p-value	Accelerated HG, mean (SD)	OR (95% CI)	p-value
Cognitive	99.1 (14.3)	98.6 (12.5)	1.02 (0.94-1.11)	NS	94.6 (12.2)	0.97 (0.91-1.02)	NS

Motor	94.4 (11.3)	94.9 (14.6)	1.06 (0.96-1.17)	NS	93.1 (11.2)	1.06 (1.00-1.13)	0.06
Language	95.0 (13.2)	90.1 (16.7)	0.92 (0.85-0.99) *0.98 (0.94-1.04)	0.03 *0.54	90.1 (11.8)	0.96 (0.91-1.01)	NS

All results are in relation to the reference group. *Adjusted for BPD, GA, BW, and antenatal steroid use.

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A Quality Improvement Initiative to Reduce Vancomycin Utilization in a Level IV NICU with low MRSA Prevalence

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Background Late onset sepsis (LOS) can lead to significant morbidity and mortality in neonates. Gram positive infections, predominantly caused by staphylococcal species are empirically treated with Vancomycin as a broad spectrum antibiotic in most NICUs. Empiric use of vancomycin has resulted in increased resistance in gram positive organisms, leading to significant morbidity and public health concern in neonates. Efforts to prevent and control this growing problem are ongoing.

Objective To critically review MRSA screening practices and decrease vancomycin utilization by 50% in a level IV NICU by September 2019.

Design/Methods A quality improvement initiative was performed from January 2016 to September 2019 at a level IV NICU. MRSA screening practices, colonization and infection rates, as well as vancomycin utilization rates (VUR) were analyzed from January 2015 to September 2019. VUR was defined as days of therapy per 1000 patient days. A multidisciplinary neonatal antibiotic stewardship team was convened and multiple periodic interventions were implemented. As a balancing measure, the rates of coagulase negative staphylococcal (CONS) infection were analyzed and the morbidity was reviewed. Statistical analysis included chi-square tests as well as student's t-test.

Results A historic review of data analyzing approximately 700 patients (2015-2016) revealed low MRSA colonization prevalence (3.7%) and high VUR (37.7/1000 patient days). There were no statistically significant differences in MRSA colonization or colonization acquisition after screening practices changed from weekly to screening at admission and discharge only (Table 1). Less than 2% of patients acquired MRSA colonization during hospitalization and none of these patients developed a blood-stream MRSA infection. After implementation of Antibiotic Stewardship, the VUR gradually decreased from 44.0/1000 patient days in 2016 to 22.7 in 2019 (Figure 1) with no significant increase in MRSA colonization, acquisition or blood-stream infection (Table 2). In addition, there were no statistically significant differences in CONS infection rates and no mortality related to this pathogen.

Conclusion(s) Antibiotic stewardship and a multidisciplinary approach significantly reduced vancomycin utilization with no significant increase in MRSA colonization, MRSA infection or CONS infection rates. Further studies are required to evaluate the long-term effects of vancomycin restriction in the NICU.

Table 1: MRSA Screening

	1/2015 – 6/2017 (Weekly Screening) N = 860	7/2017 – 9/2019 (Screening at admission and discharge) N = 774	P value (95% CI)
Total MRSA PCR Tests	2219	1307	
Positive PCR	49 (2.2)	28 (2.1)	0.8 (-0.85 – 1.18)
Negative PCR	2170 (97.8)	1279 (97.8)	1.0 (-1.1 – 0.96)
Patients with positive PCR	31 (3.6)	24 (3.1)	0.6 (-1.3 – 2.3)
Positive at admission	20 (64.5)	11 (45.8)	0.2 (-7.2 – 41.6)
Acquired during hospitalization	11 (35)	13 (54.2)	0.2 (-6.7 – 42.1)

Table 1: MRSA Screening

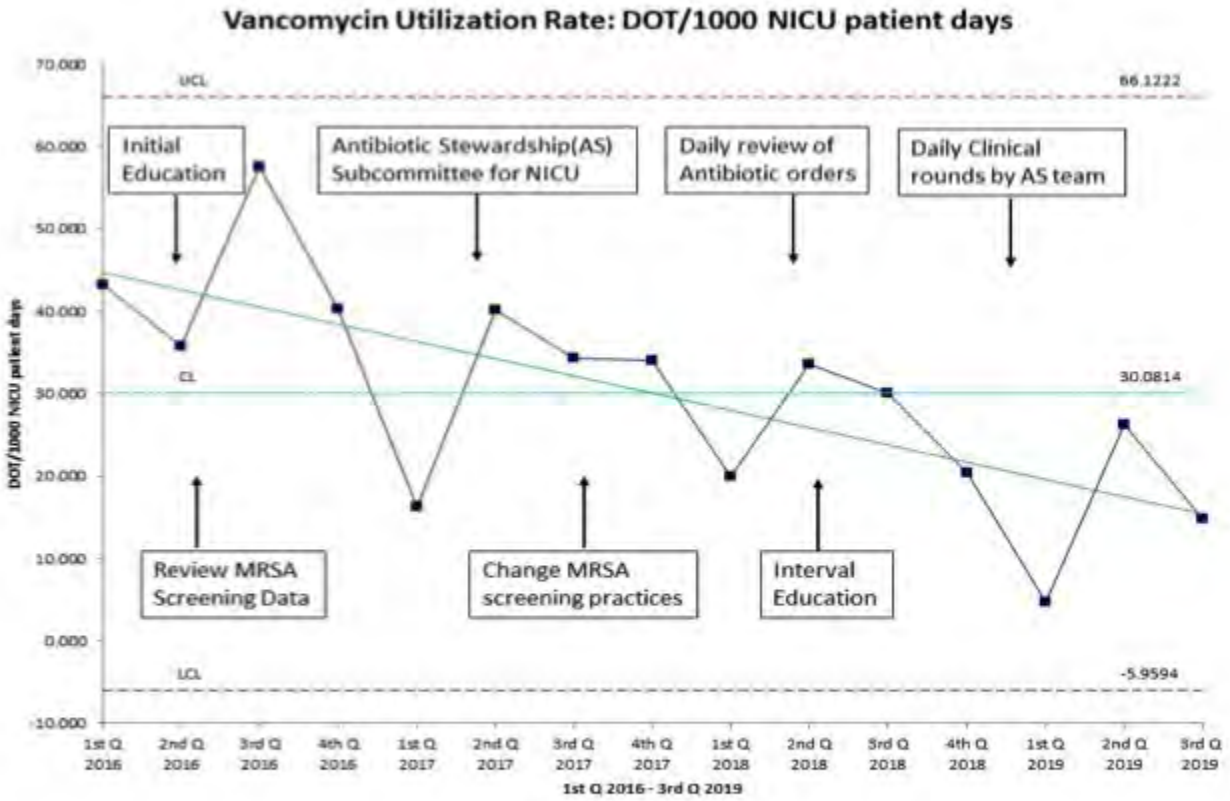

Figure 1: Vancomycin Utilization Rate

Table 2: MRSA Colonization and Vancomycin Utilization

	2015	2016	2017	2018	2019
Total number of patients (n)	364	333	353	350	236
MRSA negative patients (%)	352 (96.7)	319 (95.8)	345 (97.7)	339 (96.9)	226 (95.8)
MRSA positive patients (%)	12 (3.3)	14 (4.2)	8 (2.3)	11 (3.1)	10 (4.2)
MRSA colonization acquisition rate	1.1%	0.9%	1.2%	2.4%	2.2%
Vancomycin Utilization Rate (DOT/1000 patient days)	31.0	44.1	30.9	25.8	22.7

Table 2: MRSA Colonization and Vancomycin Utilization

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Antiviral signaling at the maternal fetal interface

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Background Differences in the antiviral interferon (IFN) response of various cell types within the maternal fetal interface at the placental level are poorly understood. Research has shown that the chorionic villi at the maternal-fetal interface are not very susceptible to viral infection due to constitutive type III IFN expression, while the fetal membrane is highly susceptible to infection. However, whether this permissiveness is due to lack of IFN signaling capacity in the fetal membrane is unknown, as the fetal membrane's antiviral IFN pathways are not well studied.

Objective This study sought to identify the role of different pattern recognition receptors (PRRs) in placental cells derived from the chorionic villi and trophoblast layers, hypothesizing that antiviral IFN signals differ and are reduced in cells derived from the fetal membrane.

Design/Methods Immortalized trophoblast-derived choriocarcinoma cells (JEG3s and BeWos) and primary amniotic epithelial cells (PAECs) were stimulated with synthetic ligands: poly(I:C), 2'3'cGAMP, 3p-hpRNA, and R848 (TLR3, STING, RIG-I, and TLR7/8 agonists, respectively). RT-qPCR was used to analyze gene expression for a panel of representative interferon stimulated genes and type I/type III IFNs, and quanti-blue assay was used to measure secreted embryonic alkaline phosphatase activity in cell culture supernatant to indicate protein level response.

Results Type III interferon response in JEG3s and BeWos were present, along with evidence of TLR3 signaling which indicates placental cells capability to respond to RNA viruses. Preliminary data shows PAEC showed negligible changes in IFN gene expression.

Conclusion(s) These data suggest that, with regard to type of stimulation, the IFN response may be skewed to type I or type III depending on the placental cell. Further research investigating the role of the IFN response in fetal membrane susceptibility to viral infection should analyze whether specific IFNs confer protective immunity, which could inform potential antiviral treatments to prevent maternal and fetal infection by teratogenic viruses.

Abstract: 333

Newborn Hepatitis B Vaccination: Impact of 24-hour administration policy and determinants of refusal

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Background The American Academy of Pediatrics recommends hepatitis B vaccination within 24 hours of birth for medically-stable newborns with birth weight ≥2000 grams. Our maternity center adopted this recommendation in January 2018, changing the existing policy that recommended hepatitis B vaccination at any time prior to hospital discharge. Concern was raised that the proximity of vaccine administration to delivery could have the unintended effect of increasing vaccine refusal.

Objective To determine change in proportion of newborns receiving hepatitis B vaccine within 24 hours of birth and prior to hospital discharge; describe demographic characteristics associated with in-hospital vaccine refusal after implementation of the 24-hour administration policy.

Design/Methods A retrospective cohort study of mothers and infants born in a single center at gestational age ≥36 0/7 weeks with birth weight ≥2,000 grams and cared for in postpartum floors. Pre-intervention study period: 07/01/2017-01/06/2018; post-intervention study period: 01/07/2018-06/30/2019. Changes in proportion receiving hepatitis B vaccine before and after policy change was assessed using a statistical process control methods. Comparisons between groups were made using chi-square and Student's T test as appropriate.

Results Of 8,203 eligible infants, 1895/2211 (85.8%) infants born in the pre-intervention period received hepatitis B vaccine prior to hospital discharge compared to 5537/5992 (92.4%) during the post-intervention period ($p<0.001$). A significantly greater proportion received vaccine <24 hours after birth, 41.7% vs. 81.2% ($p<0.01$) (Figure 1 & Table 1). On univariate analysis, vaccine refusal was significantly associated with race, infant sex, insurance, marital status, parity, delivery method, breastfeeding, gestational age, and vitamin K refusal (Table 2) and not associated with
maternal age, infant low birth weight, religion, early discharge and need for resuscitation at birth.

Conclusion(s) Rates of hepatitis B vaccination significantly increased at our hospital after instituting a policy of administration <24 hours after birth. Understanding characteristics of families that refuse in-hospital hepatitis B vaccine may inform future strategies to decrease the rate of pediatric
vaccine refusal.

Fig. 1: Change in Hepatitis B vaccination rates before and after 24-hour administration policy

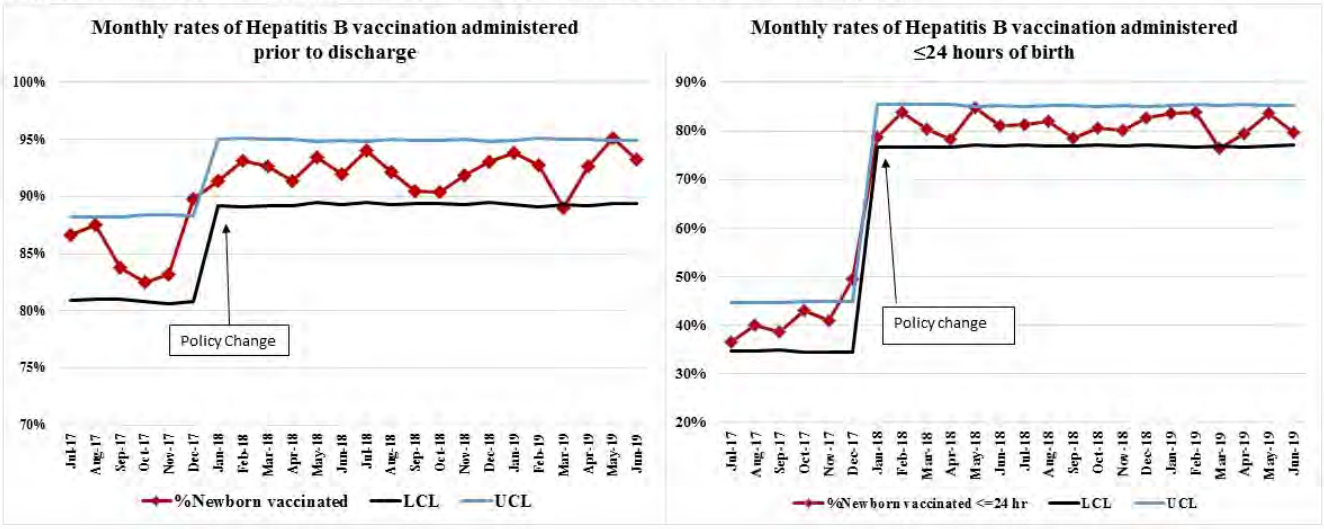

Figure 1: Change in Hepatitis B vaccination rates before and after 24-hour administration policy

Table 1. Rates of hepatitis B vaccination before and after 24 hour policy

Metric	Pre-intervention n=2211	Post-intervention n=5992	p-value
Hepatitis B vaccine given ≤24 hours after birth, n (%)	923 (41.7)	4865 (81.2)	<0.01
Hepatitis B vaccine given before discharge, n (%)	1895 (85.8)	5537 (92.4)	<0.01

Table 1: Rates of hepatitis B vaccination before and after 24 hour administration policy

Characteristics, n	Refused HepB vaccine		Given HepB vaccine		p-value
	n=457	%	n=5535	%	
Male sex	201	44.0%	2691	48.6%	<0.01
Race					<0.01
White	243	53.2%	3372	60.9%	
African American	181	39.6%	1555	28.1%	
Asian	12	2.6%	400	7.2%	
Other	21	4.6%	208	3.8%	
Insurance					0.02
Private	286	62.6%	3755	67.8%	
Medicaid/not insured	171	37.4%	1780	32.2%	
Religion					0.06
Christian	166	36.3%	2260	40.8%	
Jewish	19	4.2%	228	4.1%	
Islamic	42	9.2%	340	6.1%	
Other	10	2.2%	221	4.0%	
No affiliation given	220	48.1%	2486	44.9%	
Marital status					0.02
Single	185	40.5%	1953	35.3%	
Married	262	57.3%	3509	63.4%	
Other	10	2.2%	73	1.3%	
Maternal Age					0.74
<20	11	2.4%	134	2.4%	
20-34	324	70.9%	3948	71.3%	
35-39	93	20.4%	1203	21.7%	
40+	29	6.3%	250	4.5%	
Parity prior to delivery					<0.01
P0	186	40.7%	2567	46.4%	
P1	153	33.5%	1845	33.3%	
P2	75	16.4%	714	12.9%	
P3	22	4.8%	263	4.8%	
P4+	21	4.6%	146	2.6%	
Vaginal delivery	353	77.2%	3941	71.2%	<0.01
Gestational Age					0.01
<37 weeks	9	2.0%	168	3.0%	
37-38 6/7 weeks	103	22.5%	1457	26.3%	
39-40 6/7 weeks	296	64.8%	3508	63.4%	
41-41 6/7 weeks	47	10.3%	386	7.0%	
>42 weeks	2	0.4%	16	0.3%	
Birth weight <2500 grams	17	3.7%	168	3.0%	0.37
5 minute Apgar < 7	0	0.0%	7	0.1%	0.74
Breastfeeding	424	92.8%	4649	84.0%	<0.01
Early discharge (≤ 1 day)	19	4.2%	153	2.8%	0.12
Refused Vitamin K	21	4.6%	22	0.4%	<0.01

Table 2: Demographic characteristics of families refusing in-hospital Hepatitis B vaccination compared to those administered the vaccine.

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Hypoxemia burden in term and preterm infants with proven and ruled out early onset sepsis: Opportunities for antibiotic stewardship

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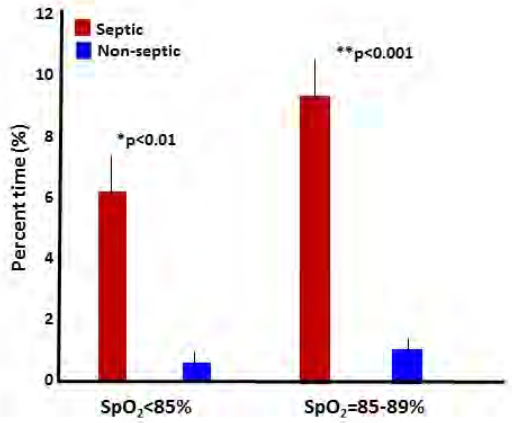
Background Nonspecific clinical signs and suboptimal diagnostic tests limit accurate identification of term and preterm infants with early onset sepsis (0-72h age), resulting in significant antibiotic overuse. Unnecessary and excess exposure to empiric broad-spectrum antibiotics is associated with significant morbidity in the neonatal population. Hypoxemia burden during the first two days of life may help in discriminating true sepsis from a negative sepsis evaluation and aid in a more targeted approach to antibiotic treatment decisions.
Objective To compare the hypoxemia burden (SpO_2<85% and SpO_2=85-89%) in term and preterm infants with true early onset sepsis and negative sepsis evaluation during the first two days of life.
Design/Methods Infants admitted to the neonatal intensive care unit from 2014-2018 that underwent prospective continuous oxygen saturation of hemoglobin with pulse oximetry (SpO_2) recording from birth through first two days of life were included. Respiratory support was targeted to maintain SpO_2 between 90-95% with supplemental oxygen and ≥90% without supplemental oxygen. Hypoxemia burden was calculated as the percentage of the error-corrected recording where SpO_2<85% and SpO_2=85-89%. Data from infants with proven (positive blood culture) early onset sepsis were compared to data from twice the number of gestational age and birth weight matched controls suspected of having sepsis but with negative sepsis evaluation.
Results 237,000 valid SpO_2 data points were collected from 28 infants with proven early onset sepsis (gestational age=31.6±5.5 weeks, birth weight=1871±1105 g) and 56 infants (gestational age=31.9±5.4 weeks, birth weight=1897±1076 g) with negative sepsis evaluation. Mean hypoxemia burden was greater in infants with proven early onset sepsis on day of life 1 (SpO_2<85%: 6.2±10.2 vs. 0.6±1.3%, p<0.01; SpO_2=85-89%: 9.3±9.1 vs. 1.1±1.9%, p<0.001) (figure1) and day of life 2 (SpO_2<85%: 2.6±4.3 vs. 0.8±1.2%, p<0.05; SpO_2=85-89%: 5.2±6.5 vs. 0.6±1.4%, p<0.01) compared to infants with negative sepsis evaluation.
Conclusion(s) Knowledge of hypoxemia burden during the first two days of life may assist decisions for continuation or earlier discontinuation of empiric antibiotics among term and preterm infants with suspected early onset sepsis.



Difference in hypoxemia burden in infants with proven and ruled out early onset sepsis on day 1

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Magnesium Sulfate and perinatal depression among preterm infants

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Background Magnesium sulfate (MgSO4) is commonly used for severe hypertension in pregnant women with preeclampsia and to improve neurodevelopmental outcomes in preterm deliveries.
Objective To examine the association of the cumulative dose of MgSO4 given to pregnant women prior to delivery and perinatal depression among preterm infants including poor Apgar scores, need for positive pressure ventilation (PPV) after birth, intubation or need for respiratory support (RS) in DR and during the first 3 days of life.
Design/Methods We reviewed the charts of pregnant women presented with preterm delivery (<34wk) who received MgSO4 between 2008-2015. We collected data of maternal age, BMI, type of hypertension, total cumulative dose of MgSO4 given and duration from first dose to delivery. we collected infants gestational age (GA), birth weight (BW), Apgar scores, SGA/LGA and singleton status, serum Mg levels, resuscitation in DR and need for RS within first 3 days of life. We examined the association of MgSO4 with outcomes using correlation coefficient (cc) and multilinear regression analysis.
Results We identified 218 infants whom mothers presented in preterm delivery and received MgSO4 for at least 1 hour within 3 days prior to delivery. Mean GA was 28 (+3), BW was 1009g (+343), maternal BMI was 31.8 (+7.5). Mean cumulative dose of MgSO4 was 28.1 grams (+25.9) and duration from first infusion to birth was 16.7 hours (+19.4). Mean infants' Mg level was 2.74 (+0.77) and age when first Mg level was obtained was 13.2 hours (+3.6). There was positive correlation between MgSO4 dose or duration of infusion with infants Mg level (cc: +0.52, p<0.001 and +0.24, p<0.001), respectively. There was no significant correlation between MgSO4 dose and Apgar scores at 1 or 5 min, need for PPV or Intubation in DR (cc: +0.09, p=0.21, +0.13, p=0.057, -0.03, p=0.68, and -0.04, p=0.59), respectively. Mean cumulative Mg dose was 26.4 (+25.8) in infants intubated in DR vs. 28.6 (+25.9) among non-intubated infants (p=0.58) while controlling for GA, BW, SGA/LGA or singleton status and maternal BMI. There was no correlation between MgSO4 dose and intubation or escalation of RS in days of life 0,1 and 3. There was no correlation between MgSO4 dose and occurrence or severity of IVH.
Conclusion(s) High dose and prolonged infusion time of MgSO4 in preterm delivery correlated with high Mg level in preterm infants within first 24 hours of life. However, it was not associated with respiratory depression in DR or increased need for RS during first three days of life.

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Effects of Antenatal Corticosteroids on Late Preterm Neonates

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Background Antenatal corticosteroids (AC) improve survival and respiratory outcomes in preterm neonates (24 0/7-33 6/7 wks gestation). In order to decrease respiratory morbidity, the American College of Obstetricians and Gynecologists (ACOG) extended their recommendation to use AC in late preterm (LP) pregnancies (34 0/7-36 6/7 wks) in October 2016. Since then, a few studies have demonstrated higher rates of hypoglycemia in LP infants exposed to AC.
Objective To determine whether exposure to antenatal AC indeed decreases respiratory morbidities and can be viewed as a new risk factor for neonatal hypoglycemia in LP infants.
Design/Methods This single center retrospective study includes inborn infants who delivered at 34 0/7-36 6/7 wks gestation between January and October 2016. Effect of AC on respiratory morbidity was assessed by presence of respiratory distress (RD) in the first 24hrs of life and total days on respiratory support (RS). Glycemic control was assessed by lowest blood glucose (LG) level in the first 24hrs of life. Effects of AC on outcomes were evaluated using t-tests, chi-squares, and generalized estimating equations.
Results 344 mothers and 404 neonates met inclusion criteria. 57.7% of neonates were exposed to AC. AC treatment resulted in almost significant reduction of RD rate (p=0.05) among all LP neonates. Gestational age (GA) had a significant effect on both rate of RD (p=0.00) and LG (p=0.00). Thus for further analysis, all neonates were divided into groups according to their GA: 34, 35, or 36 wks. AC exposure for infants born before 35 wks did not change rate of RD, but significantly shortened duration of RS among neonates with RD (p=0.04) compared to neonates with RD and no AC exposure. LG levels were similar between AC-exposed and non-exposed infants in this group. AC exposure for infants born after 35 wks had no difference in rate of RD or duration of RS compared to infants with no AC exposure. However, AC exposure for infants born after 36 weeks resulted in signifciantly lower LG levels (p=0.07) compared to neonates with no AC exposure.
Conclusion(s) Findings suggest that current ACOG recommendations to use AC for LP pregnancies may decrease respiratory morbidity only in infants born before 35 weeks gestation, but significantly increase risk for development of hypoglycemia in infants born after 36 weeks. Exposure to AC should be viewed as additional risk factor for the development of neonatal hypoglycemia.

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Impact of Non-Pharmacologic Interventions on Fractional Tissue Oxygen Extraction (FTOE) in Full-Term Neonates at Risk for Neonatal Abstinence Syndrome (NAS)

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Background The incidence of NAS has worsened in recent years. Newborns exposed to opioids in utero benefit from non-pharmacologic interventions like swaddling and breastfeeding. Near-infrared spectroscopy (NIRS) noninvasively estimates tissue oxygenation, potentially providing information on bedside intervention effectiveness. We hypothesized that swaddling/holding infants at risk for NAS would be associated with decreased cerebral and peripheral muscle oxygen extraction from baseline.
Objective
Design/Methods This prospective cohort study was funded by an AAP Resident Research Grant and IRB approved at Stony Brook Children's. Well-baby nursery infants at risk for NAS with positive toxicology for opioids were included. Subjects underwent cerebral and peripheral muscle (thigh) NIRS monitoring prior to feeds on days of life (DOL) 3, 5, and 7. Each session included 20 minutes in the crib followed by 10 minutes swaddled/held. Aggregate pre-swaddling and swaddling data were compared and stratified by monitoring site and postnatal day.
Results Twenty-eight neonates with mean (± SD) GA 39 ± 1.3 wk and BW 3126 ± 457 g were enrolled. Ten (36%) were exposed to one opiate while 18 (64%) had multi-drug exposures. Sixteen neonates (57%) were exposed to buprenorphine, and 6 (21%) received morphine for NAS treatment. Across all subjects' measurements, cerebral and peripheral muscle FTOE were not significantly affected by swaddling/holding. Increased muscle FTOE was observed in response to swaddling/holding on DOL3. Comparing single- and multi-drug exposure, no differences in cerebral FTOE were observed in response to swaddling. However, in multi-drug exposed subjects, increased peripheral FTOE was observed in response to swaddling. Individual data for each site and DOL are displayed in Table 1. Infants exposed to buprenorphine demonstrated lower cerebral FTOE while swaddled on DOL7 (0.20 ± 0.04 vs 0.17 ± 0.04, p = 0.03) and demonstrated higher peripheral FTOE from baseline while swaddled on DOL3 and 5 (DOL3 0.25 ± 0.07 vs 0.29 ± 0.10, p = 0.03; DOL5 0.27 ± 0.14 vs 0.32 ± 0.18, p = 0.02). In morphine-treated neonates, no differences in cerebral or peripheral FTOE were observed in response to swaddling (Table 2).
Conclusion(s) Tissue oxygenation monitoring demonstrates potential to provide clinically useful information among infants at high risk for NAS. Further research is required to best determine which subjects would benefit most from NIRS monitoring.

Table 1. Cerebral and Peripheral Fractional Tissue Oxygen Extraction (FTOE) Responses to Swaddling among Infants at Risk for Neonatal Abstinence Syndrome (NAS) by DOL and Number of Exposures

	Cerebral FTOE Pre-Swaddling	Cerebral FTOE Swaddled	p-value	Muscle FTOE Pre-Swaddling	Muscle FTOE Swaddled	p-value
All Infants DOL3	0.19 ± 0.06	0.19 ± 0.05	0.88	0.23 ± 0.07	0.27 ± 0.11	0.03*
All Infants DOL5	0.20 ± 0.06	0.19 ± 0.06	0.61	0.25 ± 0.12	0.28 ± 0.15	0.08
All Infants DOL7	0.20 ± 0.05	0.18 ± 0.05	0.59	0.23 ± 0.11	0.23 ± 0.11	0.79
Single-Drug Exposure DOL3	0.19 ± 0.06	0.18 ± 0.05	0.63	0.22 ± 0.07	0.25 ± 0.11	0.18
Single-Drug Exposure DOL5	0.19 ± 0.05	0.19 ± 0.06	0.99	0.23 ± 0.09	0.24 ± 0.11	0.55
Single-Drug Exposure DOL7	0.20 ± 0.04	0.19 ± 0.05	0.15	0.25 ± 0.12	0.24 ± 0.11	0.66
Multi-Drug Exposure DOL3	0.19 ± 0.07	0.20 ± 0.06	0.62	0.25 ± 0.08	0.30 ± 0.11	0.05*
Multi-Drug Exposure DOL5	0.21 ± 0.07	0.20 ± 0.06	0.41	0.29 ± 0.15	0.35 ± 0.20	0.06
Multi-Drug Exposure DOL7	0.19 ± 0.07	0.16 ± 0.06	0.25	0.19 ± 0.08	0.22 ± 0.12	0.17

FTOE expressed as mean $\pm$ SD

*p-value ≤ 0.05 indicates statistical significance

Table 2. Cerebral and Peripheral Fractional Tissue Oxygen Extraction (FTOE) Responses to Swaddling among Infants at Risk for Neonatal Abstinence Syndrome (NAS) by DOL and Exposure Type

	Cerebral FTOE Pre-Swaddling	Cerebral FTOE Swaddled	p-value	Muscle FTOE Pre-Swaddling	Muscle FTOE Swaddled	p-value
Exposed to Buprenorphine DOL3	0.20 ± 0.07	0.20 ± 0.05	0.89	0.25 ± 0.07	0.29 ± 0.10	0.03*
Exposed to Buprenorphine DOL5	0.19 ± 0.05	0.19 ± 0.05	0.84	0.27 ± .14	0.32 ± .18	0.02*
Exposed to Buprenorphine DOL7	0.20 ± .04	0.17 ± .04	0.03*	0.26 ± .14	0.25 ± .13	0.67
Not Exposed to Buprenorphine DOL3	0.17 ± .05	0.17 ± .05	0.95	0.20 ± .07	0.23 ± .11	0.34
Not Exposed to Buprenorphine DOL5	0.21 ± .07	0.20 ± .07	0.45	0.23 ± .07	0.22 ± .08	0.87
Not Exposed to Buprenorphine DOL7	0.19 ± .07	0.19 ± .07	0.75	0.20 ± .07	0.22 ± .09	0.21
Exposed to Morphine DOL3	0.17 ± .05	0.18 ± .06	0.46	0.18 ± .08	0.25 ± 0.13	0.21
Exposed to Morphine DOL5	0.23 ± .07	0.21 ± .07	0.36	0.21 ± .07	0.23 ± 0.11	0.61
Exposed to Morphine DOL7	0.21 ± 0.05	0.18 ± 0.06	0.15	0.21 ± .08	0.23 ± .11	0.49
Not Exposed to Morphine DOL3	0.19 ± .06	0.19 ± .05	0.53	0.24 ± 0.07	0.27 ± 0.11	0.09
Not Exposed to Morphine DOL5	0.19 ± 0.05	0.19 ± .06	0.84	0.26 ± 0.13	0.30 ± .16	0.10
Not Exposed to Morphine DOL7	0.19 ± .06	0.18 ± .05	0.21	0.24 ± .13	0.24 ± .12	0.94

FTOE expressed as mean ± SD

*p-value ≤ 0.05 indicates statistical significance

Abstract: 338

Diagnosis of obstructive sleep apnea in a patient with congenital methemoglobinemia using polysomnography.

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History (including chief complaint, history of present illness and relevant past and family medical history) We present a case of a teenager with past medical history significant for congenital methemoglobinemia who presented to our sleep center for symptoms concerning for obstructive sleep apnea. These symptoms included excessive daytime sleepiness, snoring, mouth breathing, and restless sleep.

Physical examination findings (including vital signs)

Laboratory or Diagnostic imaging or Procedures Using standard equipment, our patient's polysomnogram showed an AHI of 5.5/hour, SpO_2 levels ranging from 41-57% (mean 50%), and desaturations with an average 4% decrease. The SpO_2 data showed good signal intensity throughout the study without any artifact.

Final Diagnosis The patient was diagnosed with obstructive sleep apnea as per scoring criteria established by the American Academy of Sleep Medicine. These results show that the standard pulse oximeter used during PSG can accurately detect alterations in oxygen saturations; therefore, standard alternate scoring criteria do not need to be developed to diagnose obstructive sleep apnea in patients with congenital methemoglobinemia.

The SpO_2 data showed good signal intensity throughout the study without any artifact

Abstract: 339

Complete renal recovery in patient with a rare kidney disease: A case report of C3GN

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History (including chief complaint, history of present illness and relevant past and family medical history) The C3 Glomerulopathy (C3GN) is a rare kidney disease due to dysregulation of the complement cascades. Incidence is 1/1,000,000 in the United States. Without treatment, approximately 70% of affected children and 30-50% of affected adults will develop worsening of proteinuria and progress to end-stage renal disease (ESRD) within 10 year of diagnosis. Here we described a 9 year old African American girl who was originally from Sudan with 2-month history of fatigue and decreased appetite. She presented with abdominal pain, facial and joint swelling 1 week and fever 3 days prior to admission. Family history was not contributory. There was no sick

contact or recent travel.
Physical examination findings (including vital signs) Vital signs: Tmax 38.1oC, HR 112 bpm, RR 22 bpm, BP 116/67 mmHg, SpO2 100%, wt 51 kg (98%), ht 156 cm (99%). Physical examination revealed periorbital edema and swelling of hands and ankles.
Laboratory or Diagnostic imaging or Procedures Laboratory tests showed anemia (Hgb 7.4 g/dL), hypoalbuminemia (serum albumin 2.5), hematuria, and proteinuria (urine protein 1120 mg/24 hr, urine protein/creatinine ratio =1). Additional laboratory testing revealed low C3 37 mg/dL (nl 88-220 mg/dL), high C3 nephritic factor 131.3 unit/mL (nl < = 0) and high anti-factor H antibodies 83.4 mg/dL (nl 37-68 mg/dL), high ESR (122 mm/hr) and CRP (30 mg/L). Peripheral and cytoplasmic antineutrophil cytoplasmic antibodies (ANCAs), and antibodies to glomerular basement membrane (GBM) as well as antinuclear antibody (ANA) were negative. Normal serum creatinine and normal renal ultrasound. Renal biopsy showed mesangial and endocapillary proliferation. Immunofluorescence revealed isolated strong granular C3 staining in the mesangium and along the glomerular basement membrane (**Fig. 1**).
Final Diagnosis The diagnosis of C3GN was confirmed. The patient was treated with ACEi, mycophenolate, and combination of "pulse" methylprednisolone at 30 mg/kg/day IV bolus (maximum 1 g) for three consecutive days, followed by 2 months of daily oral prednisolone (2 mg/kg/day) and alternate-day prednisolone weaning from 1 mg/kg to 0.1 mg/kg for additional 12 months. In response to treatment, proteinuria has resolved (**Fig. 2**). C3 nephritic factor decreased (73.5 unit/mL, 44% reduction). Both complement regulatory factor H and C3 returned to normal (**Fig. 3**). This case provides evidence of fully responsiveness of rare form of complement dysregulation C3GN to the therapy. The disease has NOT recurred in more than one year after initial presentation.

Figure 1. Renal biopsy. A) There is Membranoproliferative appearance as shown with endocapillary proliferation and occasional double contours of glomerular basement membranes. There is also proportional interstitial fibrosis and tubular atrophy (Jones silver stain). B) Mesangial proliferation and variable endocapillary proliferation with double contours demonstrated on Jones silver stain. C) There is by definition intense C3 by immunofluorescence, in a mesangial and chunky, irregular capillary loop pattern, with no immunoglobulin staining (anti-C3 immunofluorescence). D) In C3GN, mesangial and subendothelial deposits are apprarent by electron microscopy. These differ from dense deposit disease (DDD) in that they are NOT replacing the lamina densa or do NOT have the unusual dense appearance of DDD (electron micscopy).

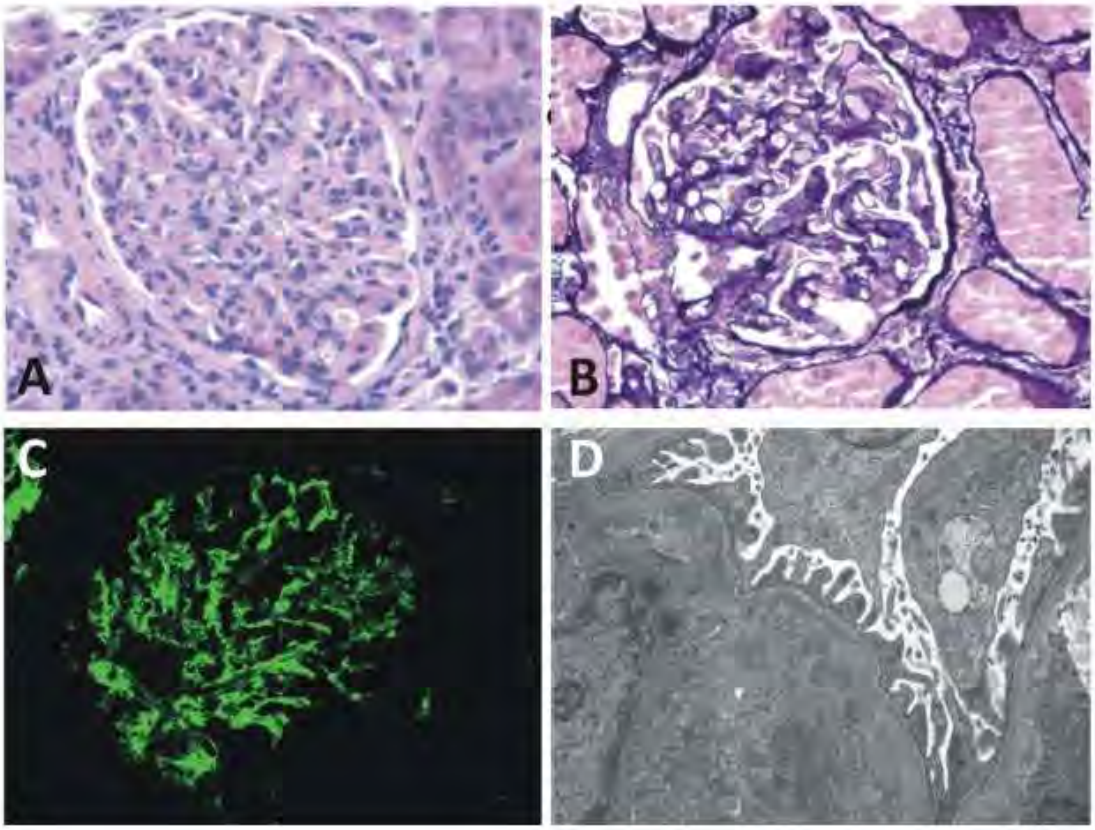


Figure 2. Responses of proteinuria (A), hypoalbuminemia (B), low hemoglobin (C) and hypo-complement 3 (D) to the treatment. Of note, proteinuria has resolved. Moreover, the disease has NOT recurred in more than one year after initial presentation.

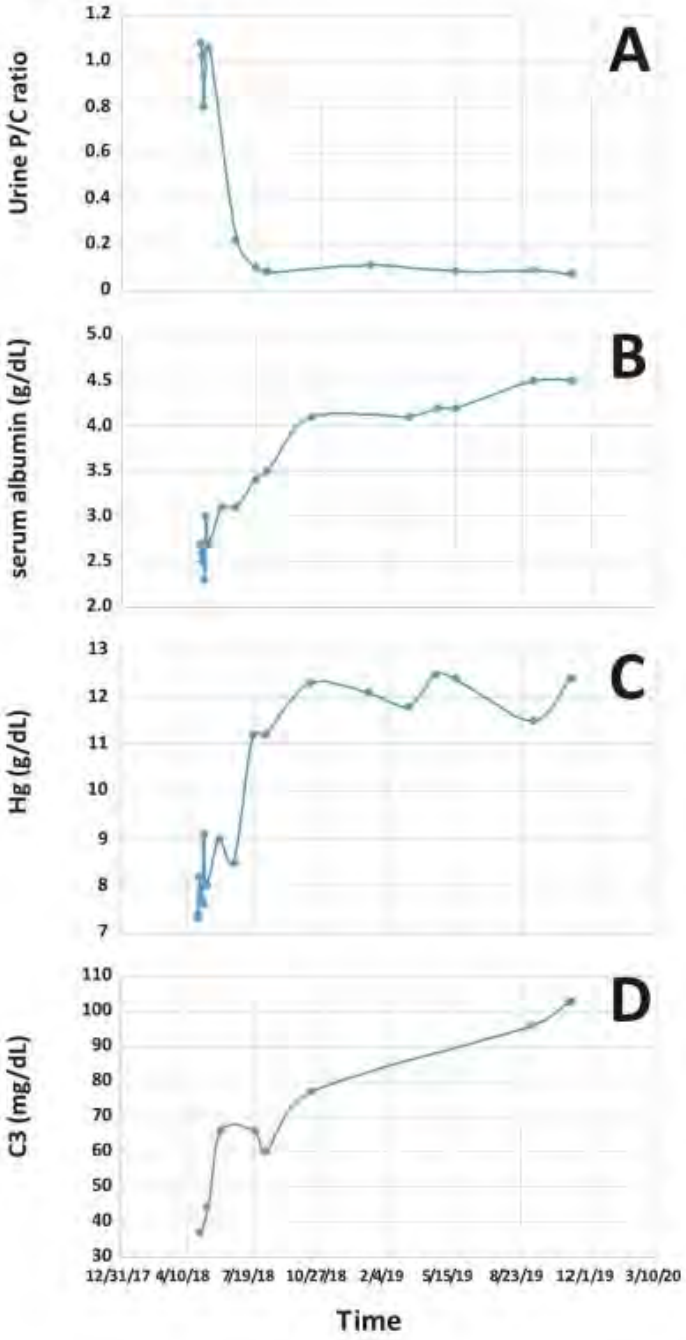
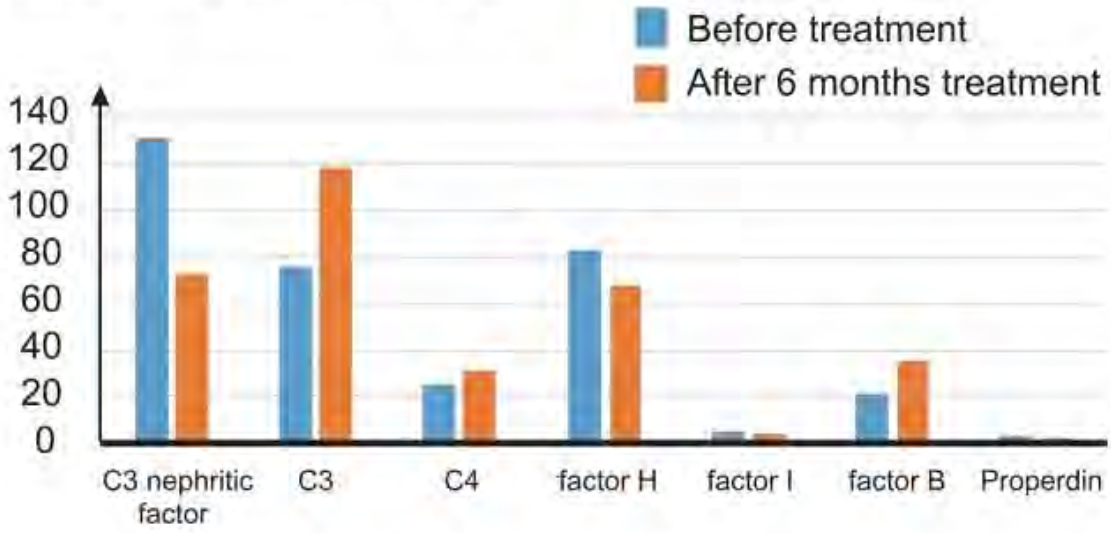


Figure 3. Complete complement profile before and after 6 month therapy. Of note, C3 nephritic factor was significantly reduced. Both C3 and complement regulatory factor H returned to normal.



Abstract: 340

Renal involvement and its treatment in pediatric patients with PR3 ANCA positive granulomatosis with polyangiitis (GPA)

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History (including chief complaint, history of present illness and relevant past and family medical history) Granulomatosis with polyangiitis (GPA), previously known as Wegner's granulomatosis, is a necrotizing granulomatous vasculitis which predominantly affects small to medium-sized arteries, resulting in multisystem diseases. It is characterized by pauci-immune crescentic glomerulonephritis and granulomatous inflammation of the lungs. Since early presentation can be nonspecific, a high index of suspicion is required for making a diagnosis. Furthermore, childhood GPA is rare, but the incidence is rising. Recurrence is often seen (up to 50% of cases), and the disease can be fatal without proper treatment (34% of patients develop ESRD). Here we describe three pediatric patients, ages between 10 and 14 years old, who were diagnosed with GPA in 2014 – 2019 **(Table 1)**. Patients were previously healthy, and developed nonspecfic constitutional signs and symptoms of fever, weakness, joint pain and swelling, epistaxis and purpura 2 months prior to admission. No sick contact or recent travel. Family histories were non-contributory.
Physical examination findings (including vital signs) Physical examination revealed epistaxis and purpura. Gingival hyperplasia and bleeding/friability (Patient A). Saddle nose deformity (Patient C) (**Figure 1**).
Laboratory or Diagnostic imaging or Procedures Laboratory tests showed proteinuria, hematuria, positive C-ANCA and PR3 (**Table 1**). Renal biopsy revealed pauci-immune crescentic glomerulonephritis (**Figure 2**). They met the European League Against Rheumatism, Pediatric Rheumatology International Trials Organization, and Pediatric Rheumatology European Society (EULAR/PreS) criteria for GPA. Patient A developed pulmonary hemorrhage and was admitted to PICU. Patient C had worsening of serum creatinine (3.26 mg/dL). All patients were treated with induction therapy for six months followed by maintenance therapy. Induction therapy consisted of high dose glucocorticoids, cyclophosphamide, and rituximab for all three patients, as the first line therapy. Plasmapheresis was added to the therapeutic regimens for two patients, whereas IVIG was for one patient. The maintenance therapy consisted of azathioprine in combination with low-dose glucocorticoids (**Table 2**).
Final Diagnosis Three patients were diagnosed as granulomatosis with polyangiitis (GPA). Two patients who were diagnosed in 2014-2015 have had no relapse since initial presentation. One patient who was diagnosed 6 months ago just completed induction therapy with partial renal recovery.

Table 1. Admission data of three patients

	Patient A	Patient B	Patient C
Age	14 yr	13 yr	10 yr
Gender	Male	Male	Female
Birth Place	Lake Charles (Louisiana)	Lake Charles (Louisiana)	Iraq (immigrant to US at age 5 yr)
PMH	Previously healthy	Previously healthy	Previously healthy
6 weeks prior to admission	• Epistaxis • Purpura	• Epistaxis • Purpura	• Epistaxis • Purpura
On admission – Chemistry	• Hypertension (178/109 mmHg)	• Normal BP	• Normal BP
	• sCr 1.02-1.25	• sCr 0.6	• sCr 3.26
	• proteinuria (Urine p/c = 2) • hematuria	• proteinuria (Urine p/c = 0.79) • hematuria	• proteinuria (Urine p/c = 2.8) • hematuria
	• ESR 90 • CRP 15.8	• ESR 20 • CRP 0.28	• ESR 127 • CRP 103
On admission - serology	• C-ANCA 1 :640 • Serine Protease (PR3) 1501 • P-ANCA neg • Myeloperox 0	• C-ANCA 1 :80 • Serine protease (PR3) 841 • P-ANCA neg • Myeloperox 0	• C-ANCA 1 :640 • Serine Protease (PR3) 188.7 • P-ANCA neg • Myeloperox 0
	• C3 182 and C4 21	• C3 166 and C4 32	• C3 136 and C4 53.4
	• ASO 200	• ASO < 100	• ASO
	• GBM 0	• GBM 0	• GBM 0
	• Antiphospholipid neg • Anticardiolpn neg	• Antiphospholipid neg • Anticardiolpn neg	• Antiphospholipid neg • Anticardiolpn neg

Figure 1. Physical examination: **Upper**: patient A had Gingival hyperplasia, bleeding/friability. Purpura scattered on bilateral upper and lower extremities. **Middle:** Patient B had diffuse erythematous papular rash over arms, legs, and anterior trunk. Scattered flesh colored papules on the lower abdomen. **Lower:** Patient C had scattered purpura on the upper extremities (R>L) and saddle nose deformity.

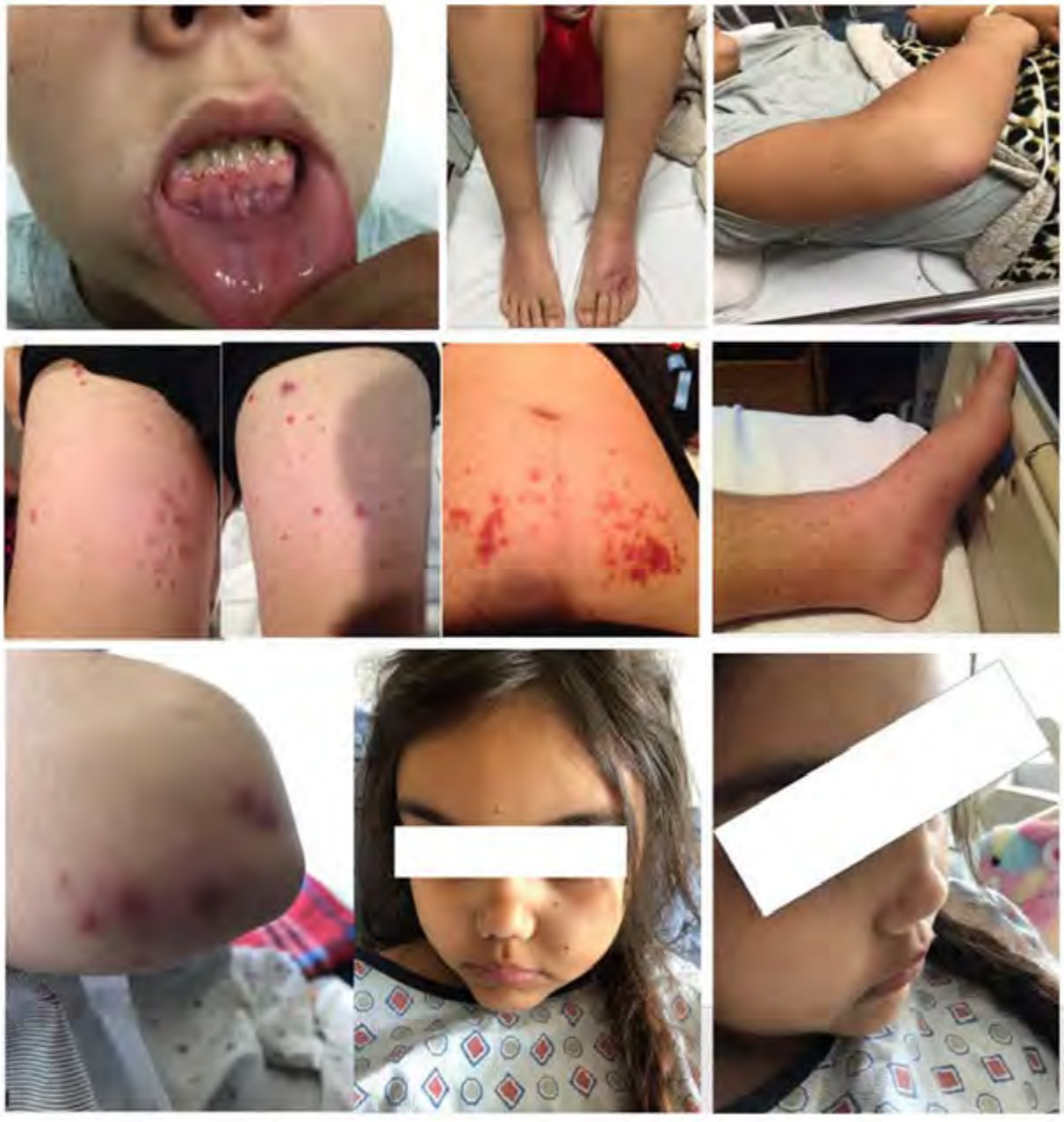
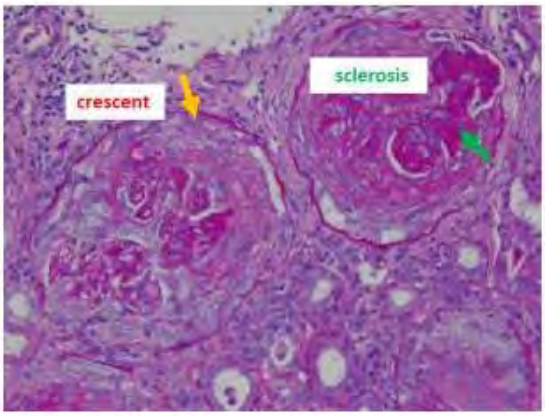
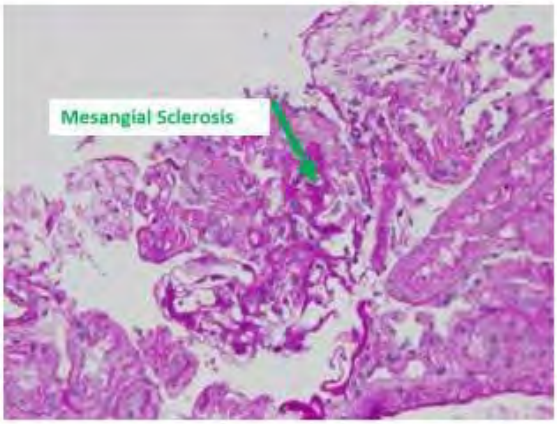


Figure 2. Kidney biopsy of pauci-immune glomerulonephritis from three patients. Upper : Patient A had 42% of Crescent and sclerosis. Middle : Patient B had 1/13 sclerotic lesion and no Crescent seen. Lower: Patient C had 100% of Crescent and sclerosis.





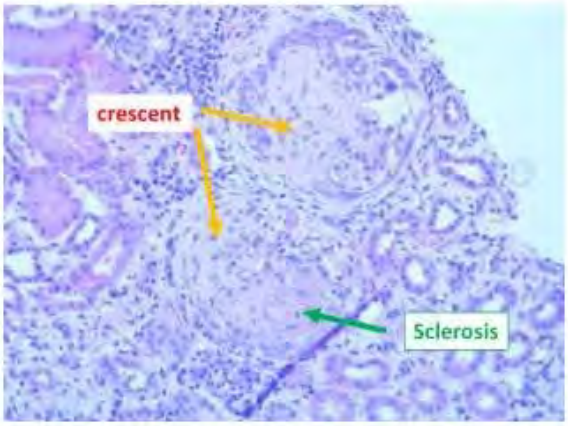


Table 2. Treatments that were used for the patients

	Patient A	Patient B	Patient C
Induction therapy	• IV SoluMedrol 1g x3 • Oral prednisolone 60 mg daily	• IV SoluMedrol 1g x3 • Oral prednison 60 mg daily	• IV SoluMedrol 1g x3 then weekly x8 (1g x6 + 500 mg x2) • Oral prednison 50 mg daily
	• IV Cytoxan 1000 mg x4 (750 mg/m^2 monthly)	• IV Cytoxan 1000 mg x 6 (750 mg /m^2 monthly)	• IV Cytoxan 500 - 700 mg/m^2 x 6 1st 500 mg/m^2 2nd 550 mg/m^2 3rd 600 mg/m^2 4th 650 mg/m^2 5th 700 mg/m^2 6th 750 mg/m^2
	• IV Rituximab 375 mg/m^2 x2	• IV Rituximab 375 mg/m^2 x 4	• IV Rituximab 375 mg/m^2 x 4
	• TPE x 5	• TPE x 6	• none
	• IVIG x1	• none	• none
Maintenance	• Off prednisone • Off Cytoxan • Off Azathioprine	• Off prednisone • Off Cytoxan • Off Azathioprine	Not initiated

Abstract: 341

Congenital Absence of Right Lateral Abdominal Wall Musculature

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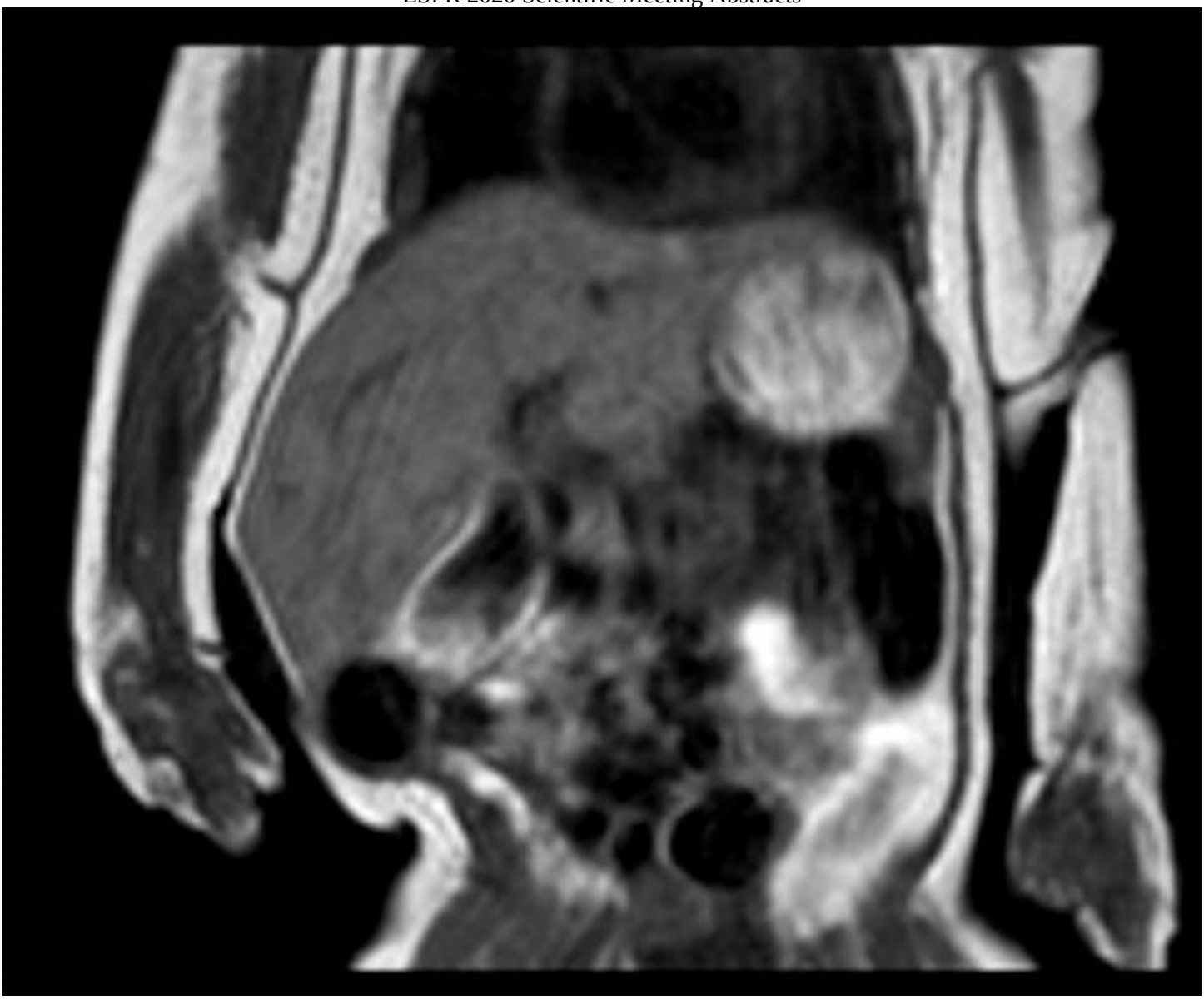
History (including chief complaint, history of present illness and relevant past and family medical history) A 34 6/7 week female born to a 36 year old G8P5 now 6 mother with pregnancy complicated by maternal obesity, BMI of 41, and poorly controlled diabetes mellitus; HbgA1C 10.6. Prenatal ultrasound showed polyhydramnios and fetal hepatomegaly. APGARS were 4,6,8, requiring brief PPV and CPAP for apnea and respiratory distress.

Physical examination findings (including vital signs) Infant had multiple preauricular skin tags, and one skin tag on her left upper eyelid. She had a II/VI non-radiating systolic murmur. There was a large, non-fluctuant, abdominal mass extending laterally from the right upper quadrant, with a consistent solid texture on palpation. Generalized poor tone noted. Bruising present on posterior left arm and petechiae present on forehead.

Laboratory or Diagnostic imaging or Procedures Abdominal imaging showed a defect in the right lateral abdominal wall musculature and lateral liver and bowel herniation as well as multiple right lower rib anomalies. LFTs, coagulations studies, and urinalysis were within normal limits, as well as kidney structure and function. FISH for 22q11 duplication or deletion was negative with normal karyotype and microarray. Other work up revealed 2 VSDs and a ASD on echo, aspiration on modified barium swallow requiring G-tube placement, transient hypoparathyroidism, mild right optic nerve hypoplasia, and a low lying conus without tethered cord.

Final Diagnosis This case illustrates a unilateral absence of lateral abdominal wall musculature without associated genitourinary tract abnormalities, which was likely the result of diabetic embryopathy. Congenital absence of abdominal wall musculature is often seen in males in the setting of prune belly syndrome. This syndrome includes anterior abdominal wall laxity, undescended testicles, and genitourinary tract abnormalities. There are case reports, however, describing a prune belly-like syndrome in females. Our case is unique in that our infant had no associated genitourinary tract abnormalities and had unilateral absence of lateral abdominal wall musculature. The genetic work up was negative and given maternal history of poorly controlled diabetes mellitus during pregnancy, all of her congenital anomalies were thought to be secondary to diabetic embryopathy. Birth defects are seen in about 10% of diabetic pregnancies and are the result of hyperglycemia, which disrupts normal cellular metabolism and signaling. Anomalies may be seen in any organ system, but CNS, craniofacial, cardiovascular, and skeletal systems are among those commonly involved.



Absence of the abdominal wall musculature at the right lateral aspect of the abdomen resulting in lateral herniation of the right lobe of the liver.

Abstract: 342

Disseminated Zoster causing Acute Cerebellar Ataxia in an Immunocompetent Infant

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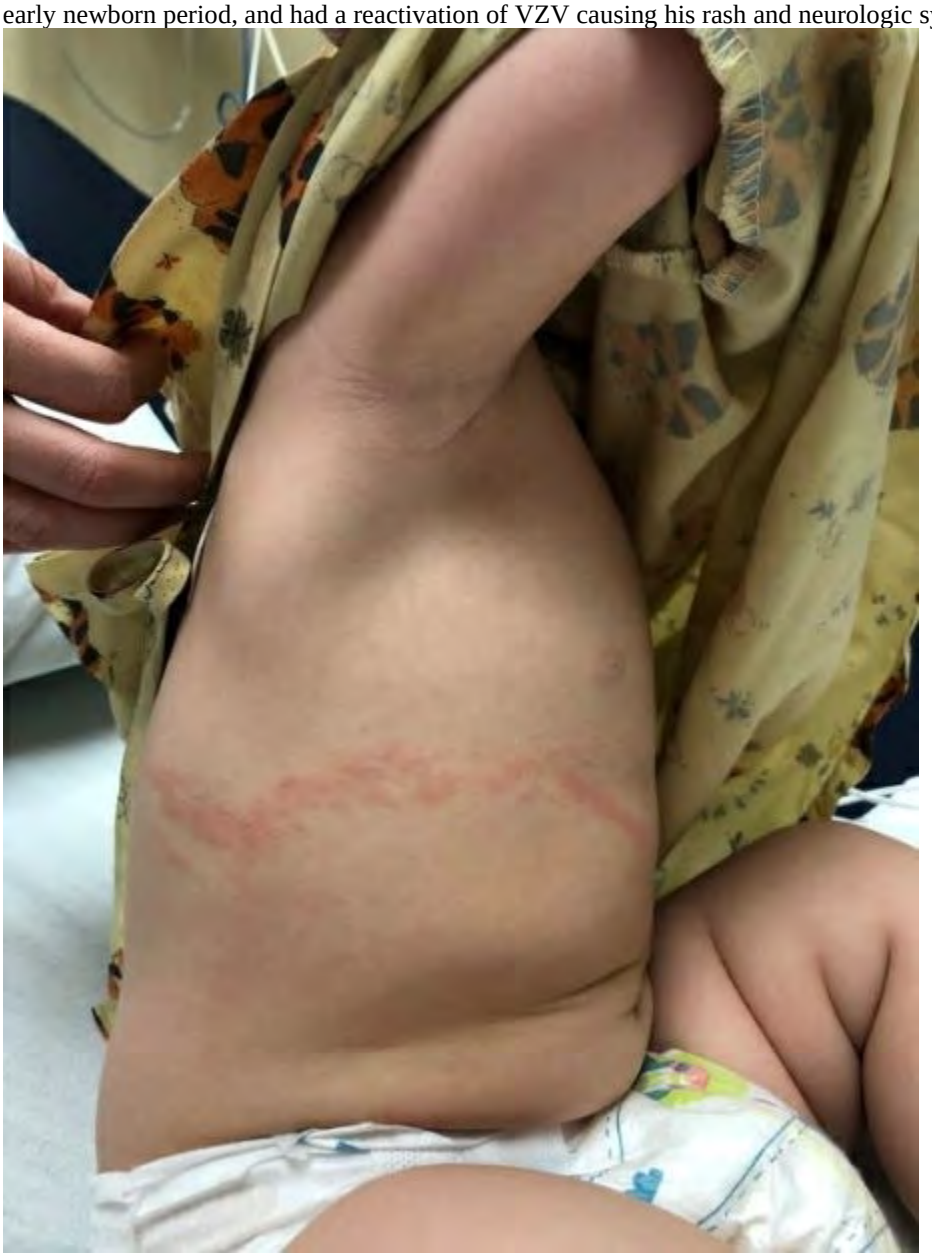
History (including chief complaint, history of present illness and relevant past and family medical history) A previously healthy 13-month-old boy presented to the ED with a 2-day history of ataxia and an amorphous micropapular exanthem presenting circumferentially over the right T10 and right L5 dermatomes. The patient received his 12-month vaccines 6 weeks prior to presenting to the hospital. During his 7-day admission, his ataxia resolved while on IV Acyclovir and he was followed outpatient for further workup. Of note, the patient's mother was HIV negative and received her VZV immunization series. The father's VZV exposure and immunization history were unknown.

Physical examination findings (including vital signs) T 97.1, HR 120, RR 34, BP 119/96, SpO2 97%
Constitutional: well appearing, alert, and interactive
Eye: EOMI, no nystagmus
Neck: supple, no meningismus
Gastrointestinal: soft, nontender, no masses

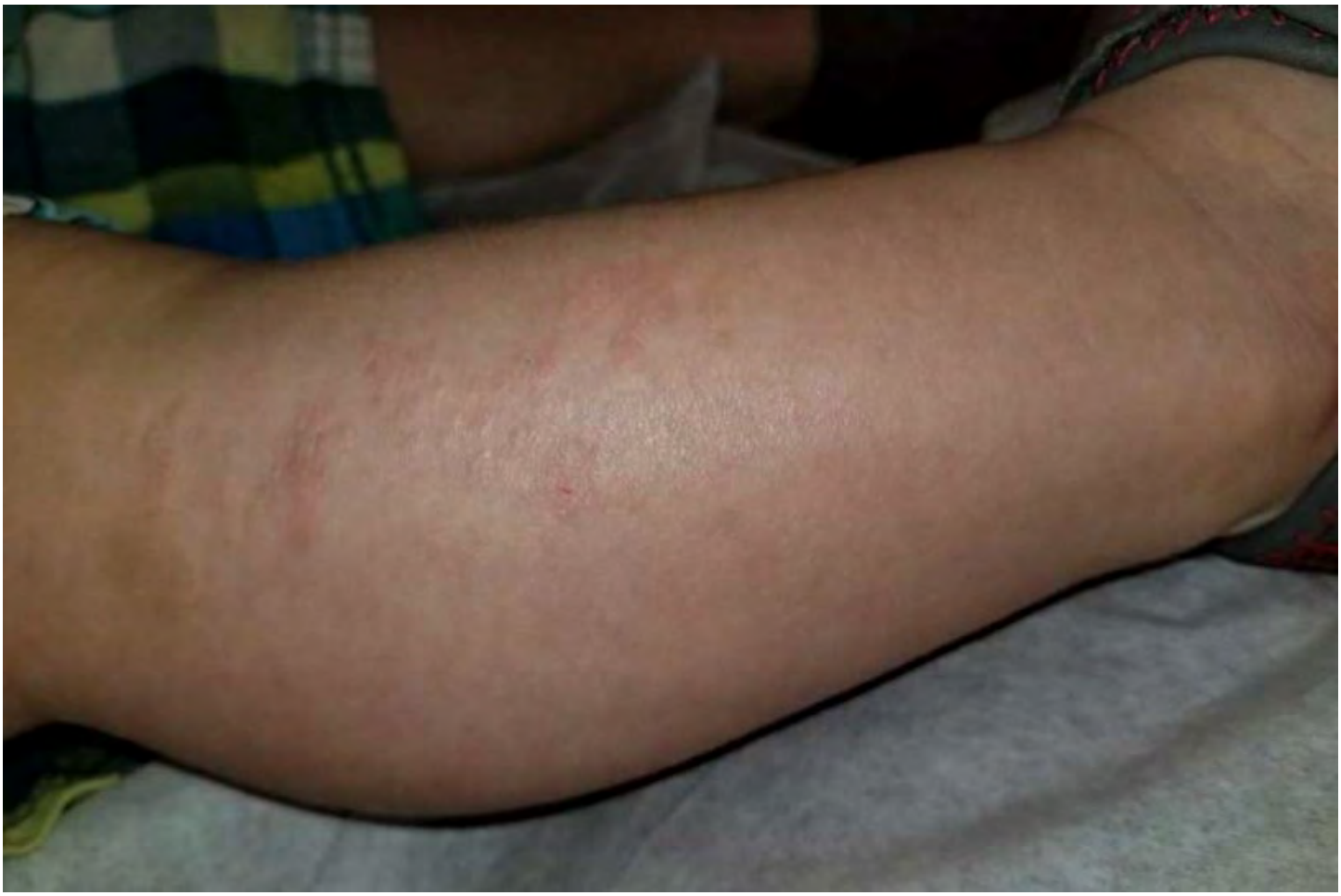
Skin: right girdle (T10) distribution of slightly raised amorphous micropapular exanthem, circumferential to mid-torso. Second area on pretibial right shin and a patch on dorsum of right foot (L5) with dry micropapular areas on light pink surrounding plaque. No areas have active vesicles with fluid or or crusting. No excoriations or boils.
Neurologic: normal tone, 2+ DTR, CN II-XII intact, normal tone, able to sit alone, gait is wide-based and mildly unsteady, normal light touch, Babinski absent, no clonus

Laboratory or Diagnostic imaging or Procedures Upon arrival to the ED, the patient had a normal laboratory workup which included CBC, Electrolytes, BUN, Creatinine, LFTs, and urine toxicology. Lumbar Puncture was performed and had normal cell counts and negative CSF cultures. A multiplex PCR containing varicella-zoster detection and all pathogen targets tested were negative. During his hospital admission he had an MRI Brain with and without contrast which showed no evidence of acute cerebellitis or intracranial mass. Given the concern for neuroblastoma, urine organic acids, urine HMA, and urine VMA were obtained and all normal. After hospital discharge, total immunoglobulin levels were within normal limits for age. His Varicella IgG Antibody was equivocal on multiple assessments, but he showed appropriate immune response to Diphtheria and Tetanus. There were never any active vesicles to be swabbed for PCR testing.

Final Diagnosis The patient was diagnosed with Acute Cerebellar Ataxia. He likely had a subclinical primary varicella infection in his early newborn period, and had a reactivation of VZV causing his rash and neurologic symptoms.



Rash, Right Trunk (T10)


Rash, Right Leg (L5)

Abstract: 343

Euglycemic DKA related to SGLT2 inhibitor use in a patient with cobalamin C deficiency and diabetes

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[1]Endocrinology and Diabetes, Children's Hospital of Philadelphia, Philadelphia, Pennsylvania, United States, [2]Human Genetics, Children's Hospital of Philadelphia, Philadelphia, Pennsylvania, United States

Background Individuals with inherited metabolic disorders (IMD) and diabetes mellitus (DM) pose management challenges.
Objective This case illustrates unique considerations for DM management in patients with IMD.
Design/Methods Data were gathered from the EMR, patient, family, and clinical team.
Results A 24yo female with cobalamin C deficiency (CblC), autoimmune thyroiditis, and DM presented with 3wks of emesis and abdominal pain, acutely worse 1d before presentation. CblC deficiency, the most common inherited disorder of cobalamin metabolism, has multi-systemic effects. Acute metabolic decompensation with acidosis occurs rarely. Treatment includes high dose hydoxycobalamin, methionine, and betaine, a methyl donor. Our patient had CbIC related pigmentary retinopathy, intellectual impairment, and seizures. DM was diagnosed 5mos prior based on random hyperglycemia (256 mg/dL) and HbA1c 6.5%. After Metformin initiation with poor tolerance, she was switched to ertugliflozin, a sodium-glucose co-transporter (SGLT2) inhibitor 4mos prior; alogliptin was added for persistent hyperglycemia 1mo later. Review of systems was notable for anorexia, fatigue, and a 37lb weight loss over 5mos. Laboratory studies demonstrated venous blood gas pH 7.19, CO2 16.0mmol/L, HCO3 6.1mmol/L, base excess -20mmol/L, glucose 138mg/dL, unremarkable WBC count, lipase, and lactate. Initially acidosis was attributed to CblC associated metabolic decompensation. Additional studies included beta-hydroxybutyrate (β-OHB) 11.0mmol/L (ref 0.1-0.3mmol/L), HbA1c 8.2%, homocysteine 125.4umol/L (ref 10.5-16.7umol/L), methylmalonic acid (MMA) 4500nmol/L (ref 0-370nmol/L). Marked ketonemia with ertugliflozin use led to a diagnosis of SGLT2 inhibitor induced euglycemic diabetic ketoacidosis (DKA). She responded well to insulin infusion and transitioned to basal-bolus insulin. Subsequent testing demonstrated elevated insulin, GAD65, ISA512, and ZnT8 antibodies consistent with autoimmune DM. Multi-disciplinary review identified the following DKA risk factors:

SGLT2 inhibitor use (previously reported), CblC (competition for MMA and β-OHB excretion, obligate high carbohydrate diet, intellectual disability impairing symptom communication), insulin deficiency (unrecognized autoimmune DM), and dehydration.
Conclusion(s) In individuals with IMD associated with acidosis who develop DM it is important to assess for insulin deficiency and consider risk/benefit balance of glucose-lowering therapies that may also predispose to acidosis.

Abstract: 345
Acute, Bilateral Blindness in a 10-Year-Old Female with AQP4-IgG Negative, MOG-IgG Positive Neuromyelitis Optica
Britton Preroff, Ryan Breuer
Pediatrics, University of Buffalo, Buffalo, New York, United States

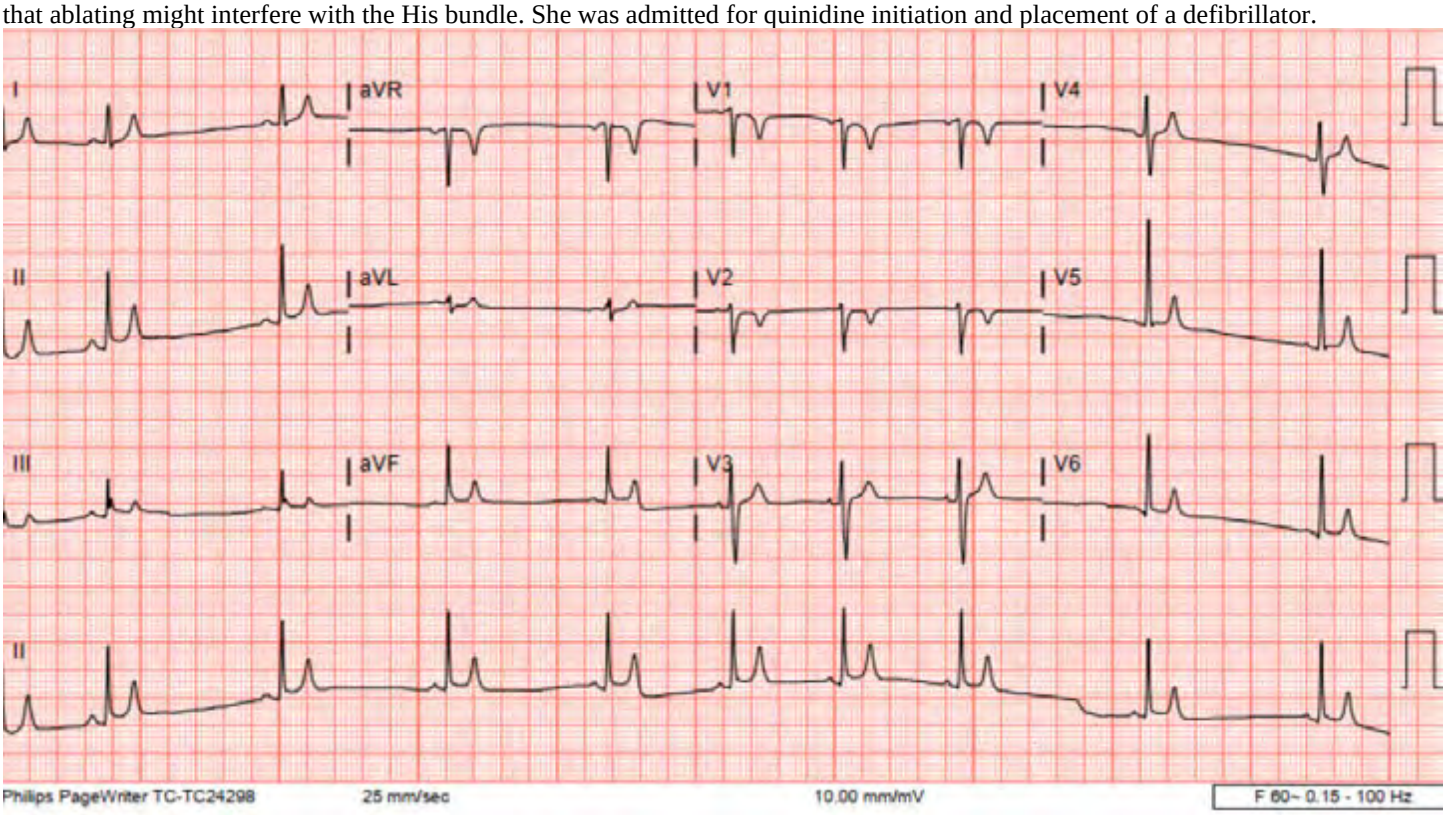
History (including chief complaint, history of present illness and relevant past and family medical history) The patient is a previously healthy 10-year-old female who presented to an outlying hospital with four days of a scaly, diffuse erythematous rash and one day of vision loss in both eyes.
Physical examination findings (including vital signs) T- 37.2, HR- 84, BP- 98/56, RR- 18. Upon transfer to our institution, she was found to have complete vision loss (including light imperception), mild ophthalmoplegia, and bilateral papilledema. Strength and sensation were intact throughout. Skin was notable for dry, non-blanching, crusted excoriated lesions on right and left forearms.
Laboratory or Diagnostic imaging or Procedures Head CT was unremarkable. MRI brain showed bilateral optic neuritis. She was immediately started on IV methylprednisolone (1g daily for five days) and started on plasmapheresis, where she received a total of six treatments (one every other day). The patient was also started on eculizumab, dosed after each apheresis treatment.
Serology was negative for serum aquaporin-4 IgG and NMO antibodies, positive for MOG IgG. Infectious studies from serum and cerebrospinal fluid were all negative, with the exception of Coxsackie B virus.

Final Diagnosis The patient was diagnosed with AQP4-IgG Negative, MOG-IgG Positive Neuromyelitis Optica. Neuromyelitis optica is an autoimmune disease of the central nervous system impacting the optic nerves, spinal cord and brain. Untreated it can lead to blindness, weakness or paralysis of the extremities, muscle spasm, paresthesias, encephalitis and even death. Antibodies to Aquaporin-4 have been associated with approximately 80% of cases. Recent studies have identified antibodies to myelin oligodendrocyte glycoprotein (MOG) as a sensitive and specific biomarker of NMO, with levels potentially guiding therapy. At the conclusion of her plasmapheresis course, patient's right eye visual acuity had improved to 20/20. Due to the serious morbidity and potential for mortality in NMO, early diagnosis and treatment are key to optimizing outcomes. Recent description of an AQP4 negative, MOG-positive phenotype highlights the importance of a high index of suspicion, as well as the need for further study on the use of plasma exchange and eculizumab in this population.

Abstract: 347
A Case of Frequent Pre-Syncopal Events
Divya Harpalani[2], Harris Leopold[1]
[1]Pediatric Cardiology, Connecticut Children's Medical Center, Hartford, Connecticut, United States, [2]Pediatrics, Connecticut Children's Medical Center, Hartford, Connecticut, United States

History (including chief complaint, history of present illness and relevant past and family medical history) A 16 year old female presented to the Emergency Department with an episode of heart racing and palpitations. On the day of presentation, she experienced heart racing, as well as darkening of her vision for a few seconds. She went to the school nurse where her heart rate was 95 bpm while sitting and 160 bpm while standing. She was then sent to the ED for evaluation.
In the ED, she admitted to having prior episodes of her vision darkening, lightheadedness, and fast heart rate over the past year. Also feeling more fatigued and tired with these episodes. Symptoms were alleviated if she laid down and rested. She denied having syncope, chest pain, shortness of breath, abdominal pain, cold/heat intolerance, color change. An EKG was obtained showing premature atrial contractions and sinus tachycardia. IV fluids were given with improvement in symptoms and patient was discharged. She continued to have episodes of pre-syncope and was referred to cardiology where she continued to have several follow up visits. Holter monitoring and EKGs were done throughout this time.
Family medical history: Diabetes, HTN in maternal grandmother, HTN in maternal grandfather. No family history of congenital deafness, MI/stroke or cardiomyopathy. Two month old in family with death attributed to SIDS . Two 1st degree relatives (father and brother) with same diagnosis.
Physical examination findings (including vital signs) VS: HR: 65 | RR: 18 | BP: 103/64 mmHg | SpO2: 99 %
Constitutional: Well-developed and well-nourished. No distress
HENT: Normocephalic and atraumatic. No JVD present
CV: S1 normal. S2 normal. Occasional extra beats heard. no clicks. no murmurs. The pulses were equal in the upper and lower extremities
Pulmonary/Chest: Effort and breath sounds normal. No respiratory distress

Abdominal: Soft. Bowel sounds are normal. She exhibits no mass
Neurological: alert and oriented x3
Skin: warm, no pallor
Laboratory or Diagnostic imaging or Procedures EKG as shown
Holter monitor: sinus arrhythmia, atrial bigeminy, no premature ventricular beats
Final Diagnosis The patient was found to have a QTc interval varying between 290 and 320. Genetic testing revealed a mutation in the KCNH2 gene associated with short QT syndrome. Her father and brother were found to have the same diagnosis and the same gene mutation, though both have remained asymptomatic. She started consistently revealing junctional bigeminy with episodes of pre-syncope. She was evaluated in an EP lab where it was revealed that the rhythm was emerging from the fasciculoventricular fiber and that ablating might interfere with the His bundle. She was admitted for quinidine initiation and placement of a defibrillator.



Abstract: 348
An unusual case of Lyme Disease presenting as Myositis
Sonja Salandy, Raqibat Akiyode
Pediatrics , BronxCare Health System, Bronx, New York, United States

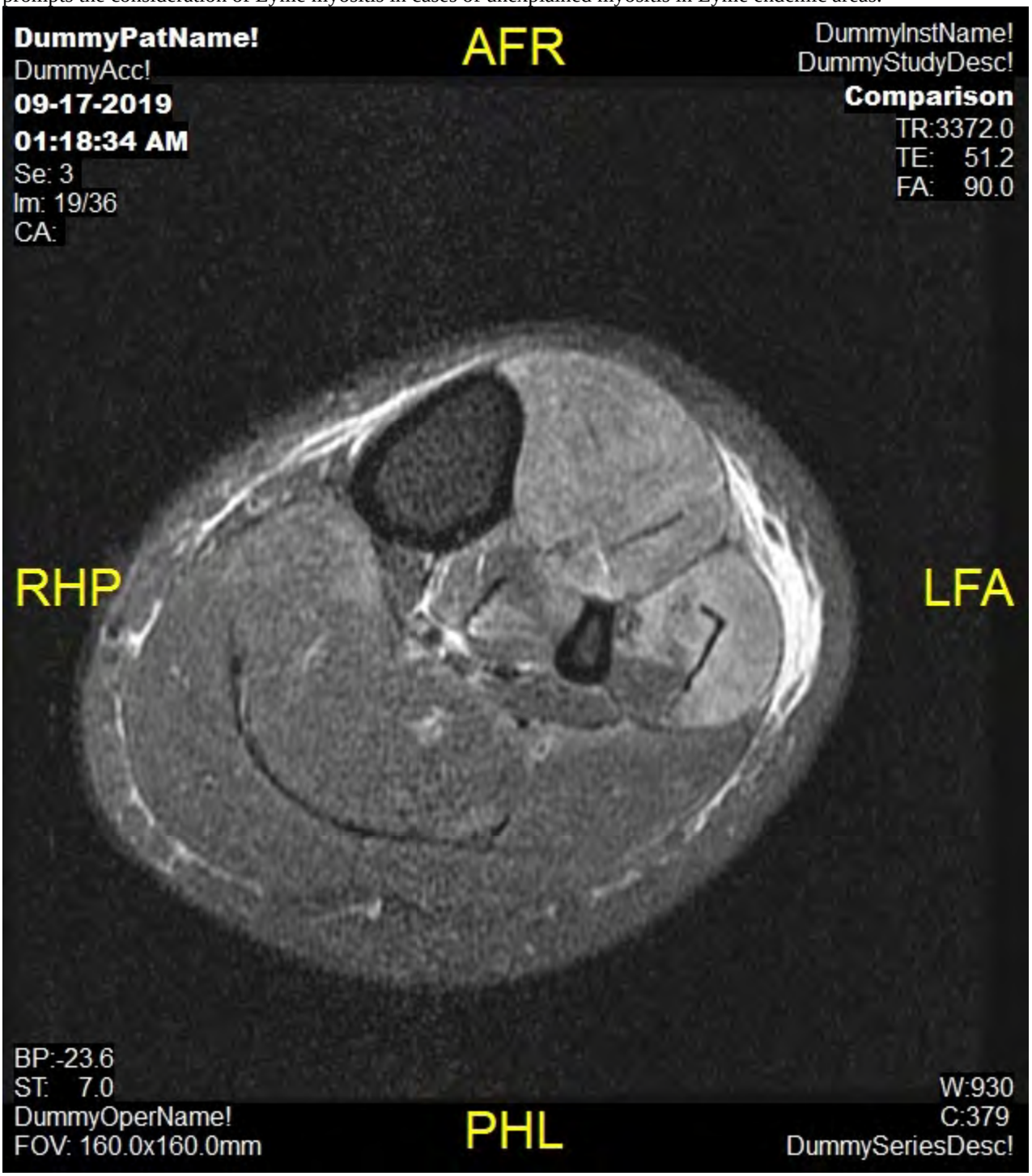
History (including chief complaint, history of present illness and relevant past and family medical history) Lyme disease, caused by the spirochete Borrelia burgdorferi, can affect multiple systems leading to varied clinical manifestations. We report a case of an 18-year-old female who presented with myositis.
An 18-year-old female from Jamaica, with a past medical history of cerebellar ataxia, presented with the sudden onset of bilateral leg weakness, pain, and swelling for one day. Her symptoms were preceded by a mechanical fall with trauma to the knee. While visiting the U.S. she resided in Baychester for 4 months with no history of tick bites.
Physical examination findings (including vital signs) At presentation, the patient was afebrile. Physical examination was significant for new onset bilateral lower limb edema, calf tenderness, reduced power and reflexes. She uses a walker at baseline, but was further restricted in her gait. No rash was noted.
Laboratory or Diagnostic imaging or Procedures Initial lab studies showed CPK levels of 18710unit/L, which rose and peaked at 23,028 unit/L on day 3 of admission. IV methylprednisolone was administered for 48 hours and then tapered on prednisone. Renal function was stable, venous ultrasound of the lower extremities showed no deep vein thrombosis. ANA, aldolase and thyroid function tests were all normal. T2 MRI fat saturated axial images of the lower limbs showed muscular edema, consistent with myositis (Fig. 1). Additional investigations showed: elevated transaminases (AST 292 unit/L, ALT 71 unit/L); urinalysis positive for large blood and elevated Myoglobin (1370 mcg/L). Lyme antibody with reflex to Western Blot was positive for 2 IgM bands. CPK trended down to 1,444 unit/L. The patient was subsequently discharged on Doxycycline for 14 days.

Final Diagnosis A rare manifestation of Lyme disease is myositis and Lyme disease should be considered in unusual cases of myositis. Majority of the patients with Lyme myositis have localized muscle involvement and symptoms include pain, swelling, tenderness and weakness of the affected limb(s). Creatine Kinase level have been reported to be normal or elevated.

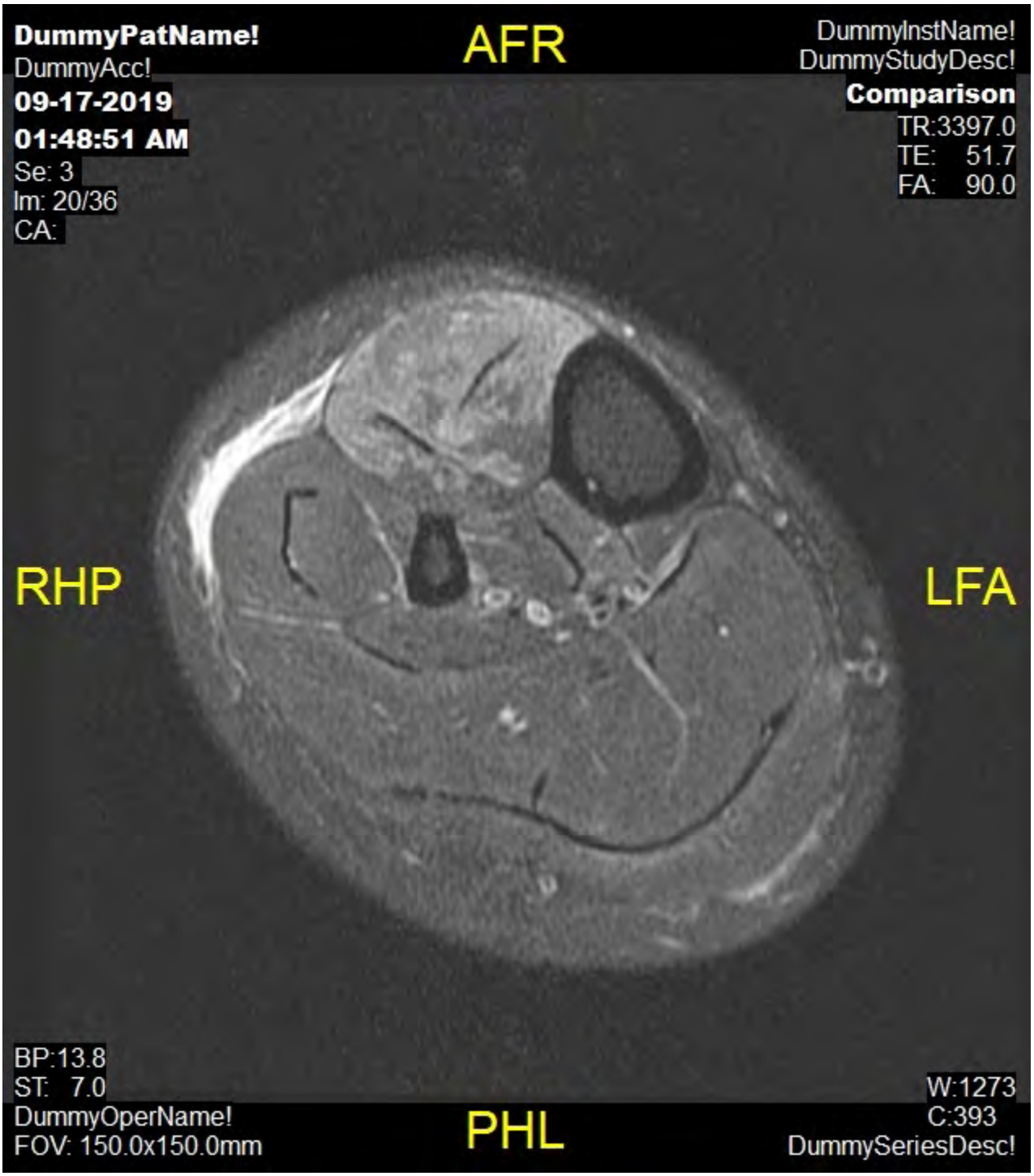
Early recognition and treatment of Lyme myositis is critical in the management, even when the history is devoid of a tick bite. [TR1]

The diagnosis is based on the clinical features, serologic studies, and MRI findings. Rare manifestations like myositis can be diagnosed by muscle biopsy. PCR of musculature and synovial fluids may also serve as diagnostic adjuncts.

The diagnosis of Lyme disease remains a challenge to clinicians. This case illustrates a rare manifestation of Lyme disease and prompts the consideration of Lyme myositis in cases of unexplained myositis in Lyme endemic areas.



T2 MRI fat saturated axial images showing muscular edema, consistent with myositis.



T2 MRI fat saturated axial images showing muscular edema, consistent with myositis

Abstract: 349

Case of an unreported genetic variant of salt losing 3-β-hydroxysteroid dehydrogenase deficiency

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History (including chief complaint, history of present illness and relevant past and family medical history) A 7-year-old male presents to the Pediatric Endocrinology clinic for initial consultation, following a fourth hospitalization for correction of electrolyte

derangements and dehydration.
Birth history was significant for penoscrotal hypospadias and chordee. State newborn screen was reported to be normal, and a karyotype was 46 XY. US reported absent Mullerian structures. He was treated with hypospadias repair; however, further evaluation for cause of ambiguous genitalia was not performed. Past medical, surgical, and family histories were otherwise unremarkable.
He had presented inpatient in the past for four episodes of emesis and fever, with associated electrolyte abnormalities. Previous evaluation completed on the patient included a normal upper gastrointestinal study, normal lactic acid, acylcarnitine profile, ammonia, and random cortisol of 20mcg/dL during illness. The most recent admission was to the ICU with hyponatremia, hyperkalemia, metabolic acidosis, ketonuria, and hypoglycemia. Given his recurrent electrolyte derangements, referral to metabolic genetics, pediatric nephrology, and pediatric endocrinology was initiated during this ICU admission. Pediatric nephrology workup was unremarkable. Metabolic genetics workup was negative for metabolic syndrome.
Physical examination findings (including vital signs) Vitals were notable for tachycardia to 152 BPM and temperature of 38.2 degrees Celsius during his most recent admission.
Pertinent physical exam (otherwise unremarkable): No thyromegaly. Testes descended bilaterally, with well formed scrotum. Normal penile length, though presence of reduntant tissue. No skin hyperpigmentation.
Laboratory or Diagnostic imaging or Procedures Endocrinology evaluation yielded the following labs: 17OH progesterone 366 ng/dL [<110], 17OH pregnenolone >5000 [<188], and DHEA 1170 [<3.4]. ACTH stimulation revealed baseline cortisol 13 ng/dL and peak 14 [3-21 $x10^3$], indicating flat response. ACTH was 76 pg/mL [10-60].
Genetic testing was sent to Invitae and showed a HSD3B2 c.518T>G p.Leu173Arg, heterozygous, variant of unknown significance (maternal), and HSD3B2 c.694C>G p.His232Asp, heterozygous, VUS (paternal).
Final Diagnosis Diagnosis confirmed HSD3B2 deficiency, not identified by state newborn screen, with two distinct genetic mutations, one of them previously unreported. The identified maternal gene has a population frequency of only 0.003%, and the paternal gene has not previously been observed.
The patient was started on daily glucocorticoid and mineralocorticoid replacement and has had no further adrenal crises.

Abstract: 350
Case of a Drooling Neonate
Jillian Taylor[2], kelechi ikeri[1], Vilmaris Quinones Cardona[1]
[1]Neonatology, St Christopher's Hospital for Children, Philadelphia, Pennsylvania, United States, [2]Pediatrics, 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) A 935g female with intrauterine growth restriction born at 29 weeks and 5 days gestation to a 26 year old G6P2032 female with chronic hypertension on hydralazine. Mother was induced for preeclampsia, received magnesium sulfate and two doses of betamethasone. Cesarean section was performed due to non-reassuring fetal heart tones. The infant required resuscitation with CPAP for tachypnea and desaturations. APGARS were 5 and 8, at 1 and 5 minutes respectively.
The infant was weaned to room air by day of life (DOL) 8 and had a fairly stable clinical course in the referring NICU. Fortified nasogastric feeds were tolerated until 6 weeks of life when she was noted to have copious oral and nasal secretions resulting in gagging and choking episodes. Prior head ultrasounds were normal. Brain MRI obtained on DOL43 showed an asymmetric right maxilla and normal brain structure. Omeprazole and glycopyrrolate were started at 8 weeks of life without improvement. Due to persistent symptoms and poor weight gain despite multiple formula changes, fortifications and thickening of feeds, she was transferred to our institution for further evaluation and management.
Physical examination findings (including vital signs) Vital signs: T 37C HR 160bpm RR 60bpm BP 84/54 mmHg SpO2 99% in room air
Weight: 1900g (<3%ile) Length: 41cm (<3%ile) Head circumference: 32cm (3%)
Non-dysmorphic drooling infant with a nasogastric tube in place in no distress. Breath sounds were clear and equal bilaterally. Heart sounds were normal without murmurs. A small reducible umbilical hernia was noted and bowel sounds were normoactive. She had an appropriate tone for gestation with normal reflexes.
Laboratory or Diagnostic imaging or Procedures CBC
WBC 19.8$x10^{-3}$ cells/mcL (6-18)
Hb 7.2 g/dL (10.6-16.4)
Hct 22.6% (32-50)
Platelets 504 10^{-3} cells/mcL (150-450)
Retic 3.7% (0.8-2.8)
BMP
Na 136 mmol/L (134-142)
K 5.7 mmol/L (3.5-5.6)
Cl 105 mmol/L (96-110)
CO2 24 mmol/L (20-28)

BUN 10 mg/dL (4-14)
Creatinine 0.23 mg/dL (0.2-0.4)
Glucose 85 mg/dL (70-105)
Calcium 10.5 mg/dL (8.9-10.5)
Tests leading to the diagnosis:
Upper GI: segmental abrupt irregular luminal narrowing within the mid to distal esophagus, concerning for stricture, patulous esophagus proximal to this narrowing, with delayed passage of contrast, and rounded filling defects along the greater curvature of the distal gastric body (Figure 1).
Upper endoscopy: stricture at 10 cm with abnormal esophageal mucosa consisting of white excess tissue without bleeding or fistula, which would not allow the infant scope of 5.6mm diameter to pass (Figure 2).
Final Diagnosis Isolated Congenital Esophageal Stenosis

Figure 1. Upper Gastrointestinal Series

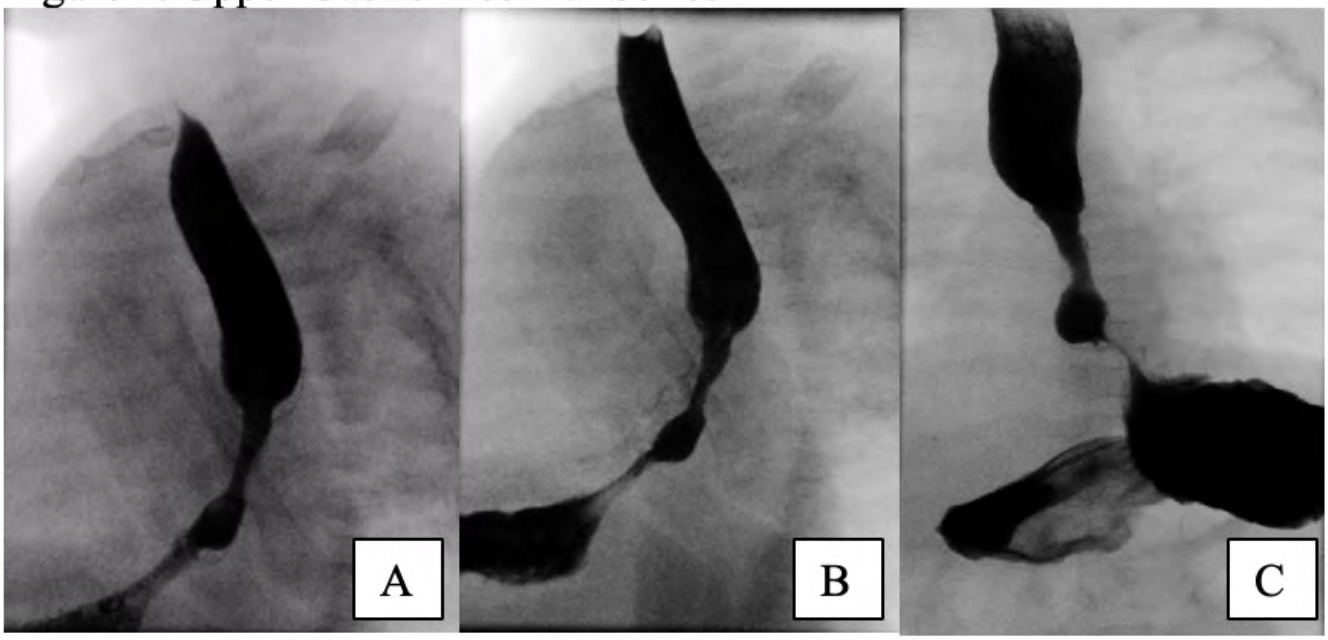
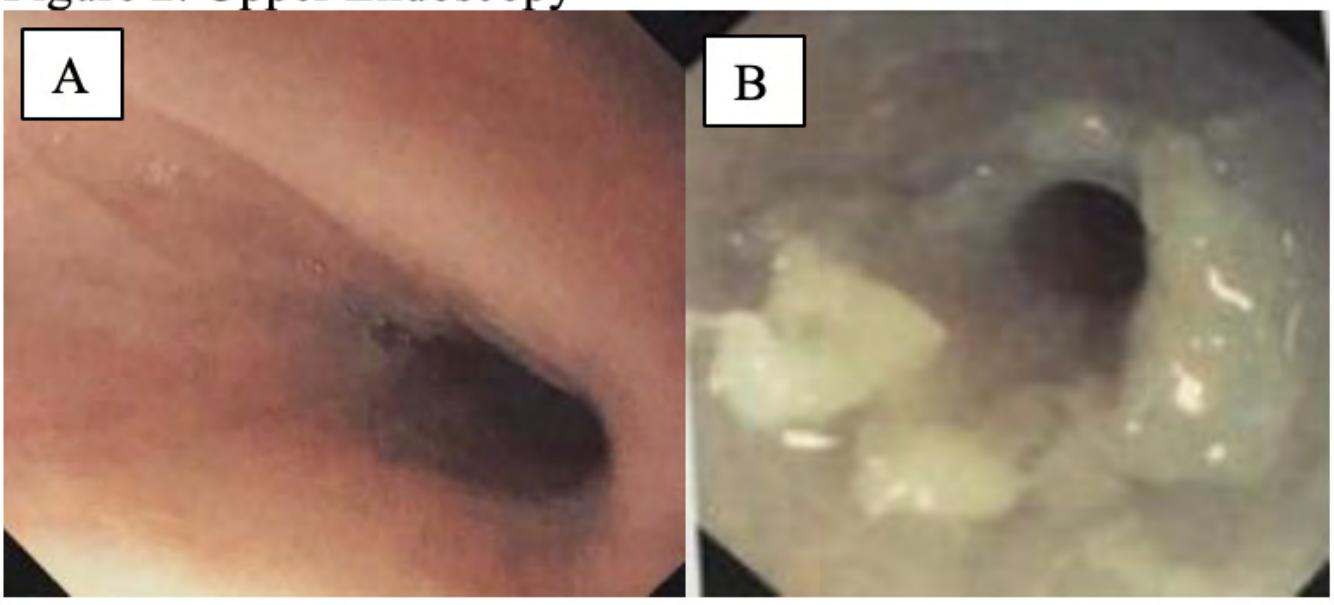


Figure 2. Upper Endoscopy



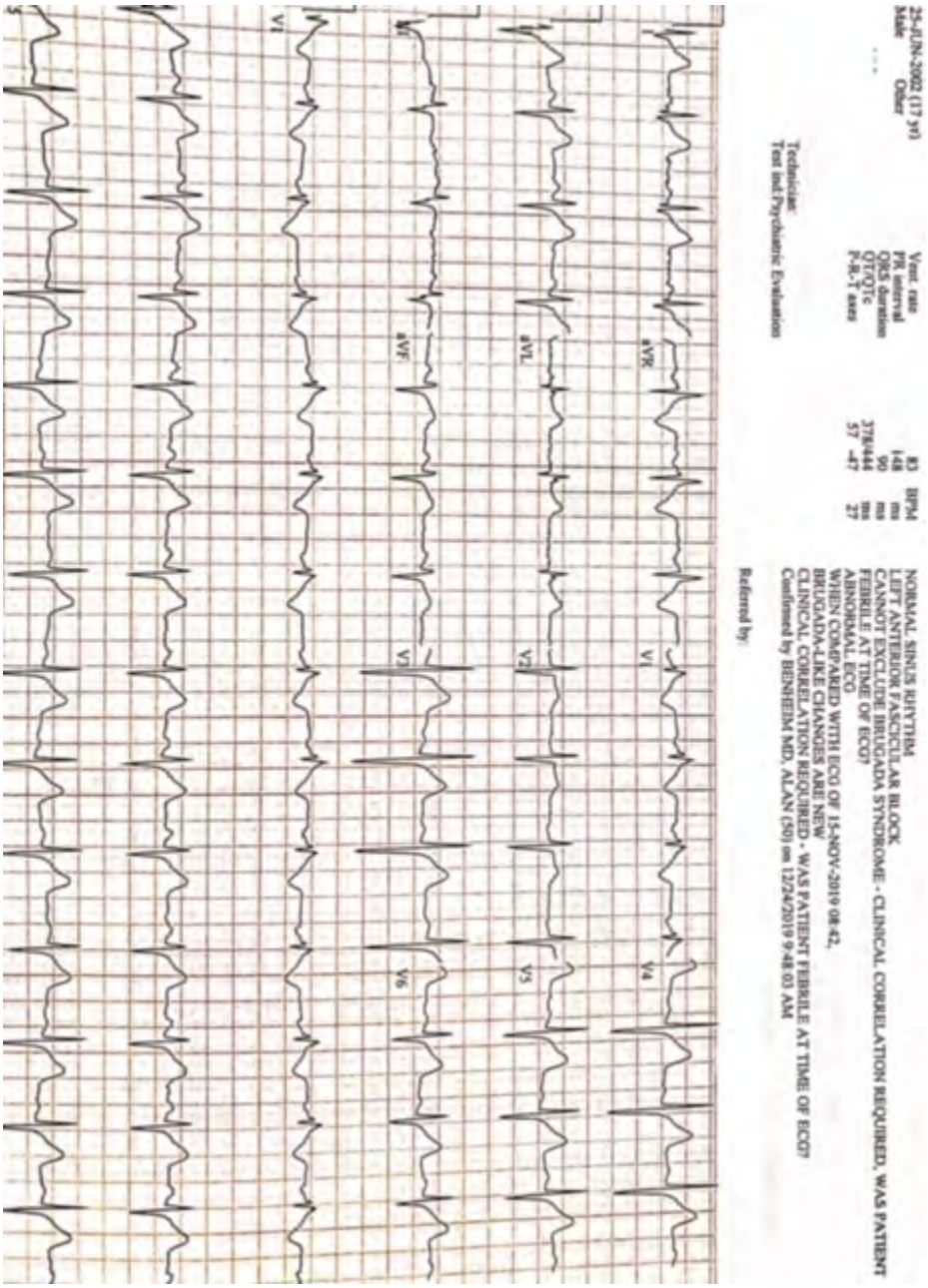
Abstract: 351

Drug Induced Brugada Syndrome in a Bipolar Teen Patient presenting with Marijuana Altered Mental Status.

David Kling
Pediatrics, Inova Children's Hospital, Washington, District of Columbia, United States

History (including chief complaint, history of present illness and relevant past and family medical history) 17 y/o M with a history of Bipolar disorder presents to the emergency room (ER) for altered mental status and hallucinations and full medical clearance before admitted to a psychiatric facility. His home medications are Lithium daily and Sustenna injection monthly. He

admitted to smoking marijuana 5 hours prior to arrival to the ER and LSD the day prior. He complains of visual hallucinations and has disorganized thoughts. Due to his AMS it was difficult to obtain a complete and reliable review of systems.
Physical examination findings (including vital signs) Pulse 98, BP 137/70, Resp 26, SpO2 98%, Temp 99.1F. Agitated male but direcatable. Pupils reactive. RRR, normal S1 and S2, no murmurs. Lungs CTAB. Abdomen soft and nontender. Disorganized thinking.
Laboratory or Diagnostic imaging or Procedures Labs were drawn including: complete blood count, complete metabolic panel, thyroid stimulating hormone, alcohol, aspirin, and acetaminophen levels which were all normal. A urine drug screen was positive for cannabis. A screening electrocardiogram which was read a normal sinus rhythm with left anterior fascicular block.
Final Diagnosis The same ECG was read by the cardiologist who noted brugada-like changes. Comparing it to an ECG that was done a month prior, these changes were not present. Therefore the patient had a brugada phonocopy, presumably induced by lithium or cannabis.



Abstract: 352
A 35-week Preterm infant with polyhydramnios and decreased fetal movement, status post therapeutic hypothermia for severe hypoxic-ischemic encephalopathy
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Neonatology, University at Buffalo, Buffalo, New York, United States

History (including chief complaint, history of present illness and relevant past and family medical history) Chief complaint: A 35-week preterm infant with status post extensive neonatal resuscitation

History of present illness: Infant born by cesarean section for non-reassuring fetal heart tracing at 35-wk gestation. Baby girl was floppy, cyanotic, and bradycardic at birth with heart rate <60/min and no respiratory effort. The infant received extensive neonatal resuscitation with endotracheal intubation, chest compression, epinephrine and volume resuscitation. APGARs were 1, 1, 1 and 4 at 1, 5, 10 and 15 minutes respectively. Bloody amniotic fluid raised concern for abruption or umbilical cord tear during the birth process. Venous cord gas was a pH of 7.24 and a base deficit of -3.6. However, initial arterial blood gas was a pH of 7.05 and a base deficit of -13 with an abnormal neurological exam. The infant was admitted to the neonatal intensive care unit and placed on the mechanical ventilator. Based on the perinatal event, abnormal neurological exam and blood gas, the infant received whole-body cooling treatment for severe hypoxic-ischemic encephalopathy.

Prenatal History: Pregnancy was complicated with polyhydramnios, intrauterine growth restriction (<1st %) and decreased fetal movement. The maternal screening results were unremarkable except for GBS culture not done.

Family History: Negative for inherited disorders but significant for parental consanguinity (first cousin).

Physical examination findings (including vital signs) Birth weight is 1820 grams (9th percentile). Vital signs were temperature of 36.3°C, heart rate of 126 per min, respiratory rate of 45 per min, blood pressure of 73/36 mmHg and oxygen saturation of 80-85% on 100% O_2. Physical exam showed an atraumatic normocephalic head. No spontaneous eye movement, pupil fixed and dilated. Equal breath sounds with diffuse crackles bilaterally. The cardiovascular exam was unremarkable. The extremities exam noted for joint contractures. Neurological exam was notable for a limp, unresponsive infant with no spontaneous activity, no suck reflex, no gag reflex, and no Moro reflex.

Laboratory or Diagnostic imaging or Procedures Laboratory tests performed on admission (Table 1) and diagnostic imaging and other studies (Table 2) are shown. Brain MRI performed after cooling therapy reports **no evidence of hypoxic-ischemic injury**. Given the significant unexplained neurological exam, extensive metabolic and genetic workup was done including whole-exome sequencing which confirmed the diagnosis.

Final Diagnosis Glycogen storage disease type IV, fatal perinatal neuromuscular subtype

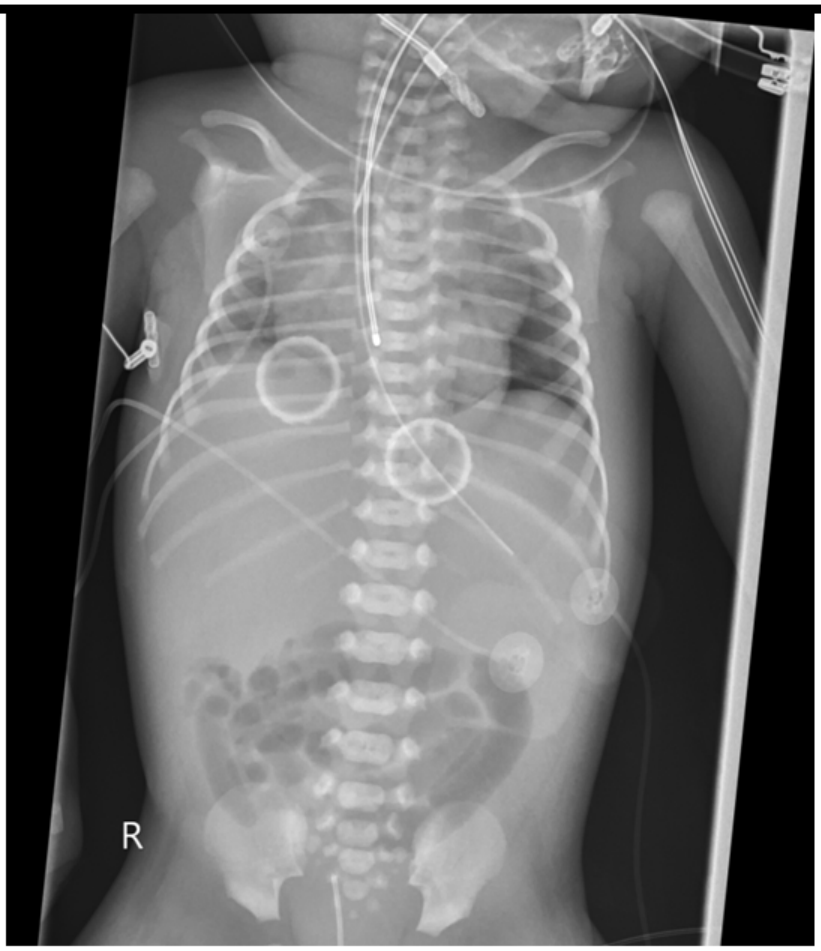
Complete blood count	Blood chemistry	Arterial blood gas
White blood cell count 23.8X10^3/mcL	Sodium 136 mEq/L	pH = 7.049
Hemoglobin 17.8 g/dL	Potassium 4.3 mEq/L	pCO2 = 66 mmHg
Hematocrit 53.7%,	Chloride 104 mEq/L	pO2= 55 mmHg
Platelets 164X10^3	Bicarbonate 15 mEq/L	Base deficit= 13
Neutrophil 58%	Blood urea nitrogen 12 mg/dL	
Lymphocytes 58%	Creatinine 0.63 mg/dL	
Monocyte 8%	Calcium 8.2 mg/dL	
Band 0%	Glucose 159 mg/dL	
	Alkaline phosphatase 195 U/L	
	Aspartate aminotransferase 613 U/L	
	Alanine Aminotransferase 191 U/L	
	Total Protein 4 g/dL	
	Albumin 2.7 g/dL	
	Total Bilirubin 2.2 mg/dL	

Table 1: Laboratory Tests on Admission

Study	Result
EEG	Abnormal due to excessively discontinuous background. In addition isolated sharp waves are seen in a multiregional distribution without a pattern of evolution to suggest active seizures.
Head ultrasound on admission	Midline structures appear grossly normally formed. Right greater than left increased echogenicity of the periventricular white matter likely indicating white matter injury. No definite intraventricular hemorrhage or ventriculomegaly.
MRI Brain after cooling therapy	Parenchymal signal is age-appropriate. There is no restricted diffusion. There is no focal signal abnormality. There is no parenchymal or intraventricular susceptibility to suggest hemorrhage. The ventricles are at the upper limits of normal in size. Extra-axial fluid spaces are also upper limit of normal. Corpus callosum is present and complete. Tectum is unremarkable. Pituitary gland has normal neonatal appearance. There is no Chiari malformation.
MRI Brain on day of life 35	Unremarkable MRI examination of the brain. No evidence to suggest sequela of previous ischemic insult.
Whole Exome Sequencing	Pathogenic variant in the GBE 1 gene was detected. Both parents were heterozygous. Defects in GBE 1 may cause glycogen storage disease type IV.

Table 2 - Diagnostic imaging and other studies

Chest X-Ray on Admission



Endotracheal tube is in the thoracic trachea, enteric tube is in the stomach, temperature probe is behind the left atrium, urinary catheter projects over the bladder. Cardiothymic silhouette is unremarkable. Lungs are hypoinflated with hazy opacity. No focal opacity, pleural effusion or pneumothorax. Gas is present in bowel in the abdomen. No gas present in the rectum. No pneumatosis, portal venous or free gas. No abnormal calcification. Liver and spleen are potentially enlarged.

Abstract: 353

Don't Be Irrational: a difficult case of rash

Katherine Callaghan, Stephen Gan
Pediatrics, AI DuPont Hospital for Children, Wilmington, Delaware, United States

History (including chief complaint, history of present illness and relevant past and family medical history) J.S. is a 13 year old girl with depression, PTSD, psychogenic nonepileptic seizures, and self inflicted injury, presenting in October with a suspected wound infection. 4 days prior, patient developed a painful blister around her central right thigh attributed to a "mosquito bite." She was first taken to an outside hospital where her wound was cultured, she was given prednisone and discharged on mupirocin. She presented to our hospital after worsening pain the following day.

In ED, history revealed no new medications; she was on Prozac without recent dosage adjustment. There was no family history of immunodeficiency or skin abnormalities. Social history revealed patient was homeschooled, lived with mom and sibling, and had several pets including dogs, cats, and rabbits. She did not endorse current stressors, depressed mood, substance abuse, or current self injury. She did not travel or play outside. She denied trauma or new exposures.

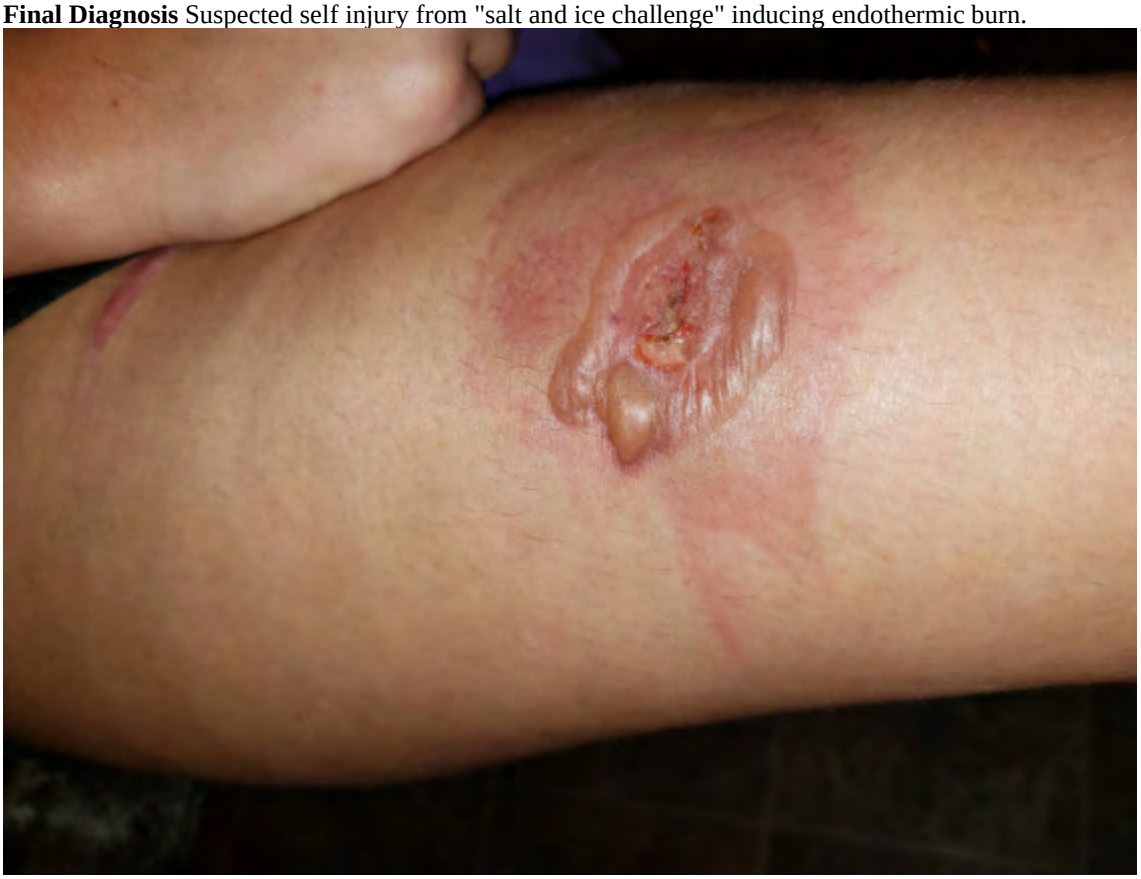
On second presentation to the ED a month later, a similar history was obtained in regards to a new "mosquito bite" which blistered and developed into rash. The same past medical, allergy, medication, social history was obtained.

Physical examination findings (including vital signs) On initial physical exam, the patient was afebrile, normotensive and without tachycardia. The patient was well appearing and smiling. The right anterior thigh wound was exquisitely tender to touch, blistered, with mild streaking [image 1]. She was neurovascularly intact. No rash was visualized on flexor surfaces, upper extremities, face, back or distal lower extremities. There were no other pertinent positives on exam.

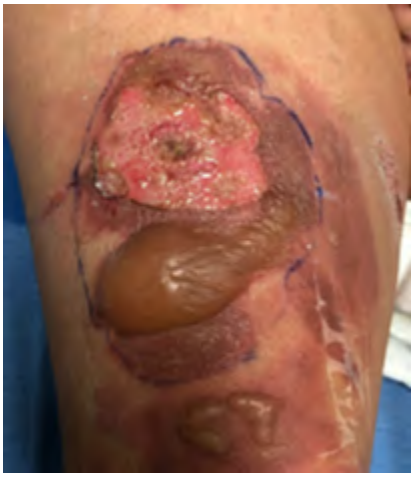
On second presentation, the patient was again afebrile with age appropriate vitals. Right anterior thigh wound was healed. LLE revealed a serpiginous, nonblanching, erythematous rash on her left anterior and medial thigh with extension to medial shin beyond borders the patient's mother had drawn with marker 2 days prior [image 3]. Tender while awake, pain was nonreproducible while asleep. No other rash was visualized.

Laboratory or Diagnostic imaging or Procedures Laboratory work showed unremarkable CBC, BMP, ESR/ CRP, negative blood and wound culture. MRI of right thigh showed no abscesses, but mild inflammation of subcutaneous tissue without involvement of deep fascial compartments, consistent with cellulitis. Dermatology and plastic surgery felt the wound was related to severe contact dermatitis or burn. The wound did not improve on antibiotics. On second presentation, similar lab work was negative.

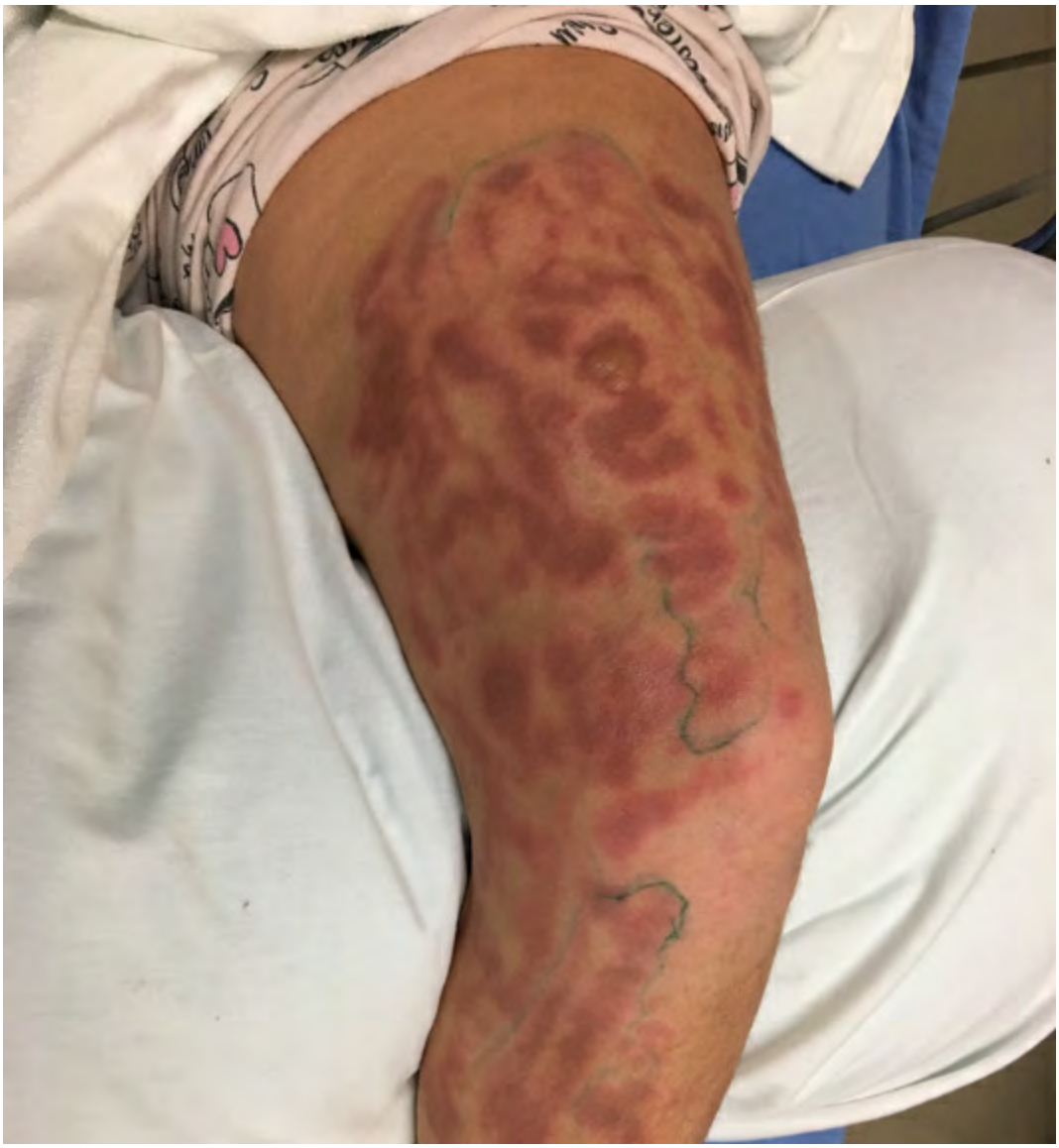
Final Diagnosis Suspected self injury from "salt and ice challenge" inducing endothermic burn.



Initial right thigh wound



Progression RLE wound



Second presentation LLE

Abstract: 354

Unilateral Parotitis in a child with Parainfluenza virus 3 infection

Sharon Karunakaran, Lekhana Rajan, David Hunte, Sree Chirumamilla
Pediatrics, BronxCare Hospital System, New York, New York, United States

History (including chief complaint, history of present illness and relevant past and family medical history) A previously healthy 3 year old female presented to the ED with 1 day history of cough, fever and respiratory distress. She had visited the Dominican Republic 1 week prior. Immunizations were up to date. Patient was born in the U.S.

Physical examination findings (including vital signs) She was alert, afebrile, O_2 saturation 95% on RA, RR 60/min with decreased breath sounds bilaterally and accessory muscle use on admission. On day of admission (DOA) 2, respiratory distress improved but acute onset of left parotid gland swelling with tenderness and erythema of overlying skin was noted.

Laboratory or Diagnostic imaging or Procedures Influenza and RSV rapid tests were negative. CXR revealed right lung infiltrates. Respiratory viral panel detected Parainfluenza virus 3. CT soft tissue neck showed diffuse superficial fat stranding involving the left buccal, pre-and posterior articular, and left posterior cervical soft tissues, compatible with cellulitis (Image 1). There were no associated drainable abscess formations.

Final Diagnosis The patient was admitted, administered IV Ceftriaxone and placed on high flow nasal cannula and FiO2 30% in the

PICU. On DOA 2, due to rapid increase in size of parotid swelling and concern for potential airway compromise, dexamethasone was administered. Antibiotics were changed to ampicillin-sulbactam and vancomycin pending blood culture. The patient was diagnosed with unilateral parotitis due to Parainfluenza virus 3. By DOA 3, the swelling had significantly improved.
Parotitis in children can be due to infectious and non-infectious causes. Non- mumps parotitis (NMP) has been associated with Epstein-Barr virus (most common), Influenza A, Human herpes virus 6, Para influenza virus 2 &3 and Herpes simplex virus 1 & 2. Most patients present with fever and cough preceding onset of parotitis. Involvement of other salivary glands is uncommon. In determining the etiologic agents among cases of NMP, obtaining PCR testing for respiratory viruses should be considered. Testing for illnesses that mimic mumps might result in more timely and appropriate treatment, including antibiotic cessation.

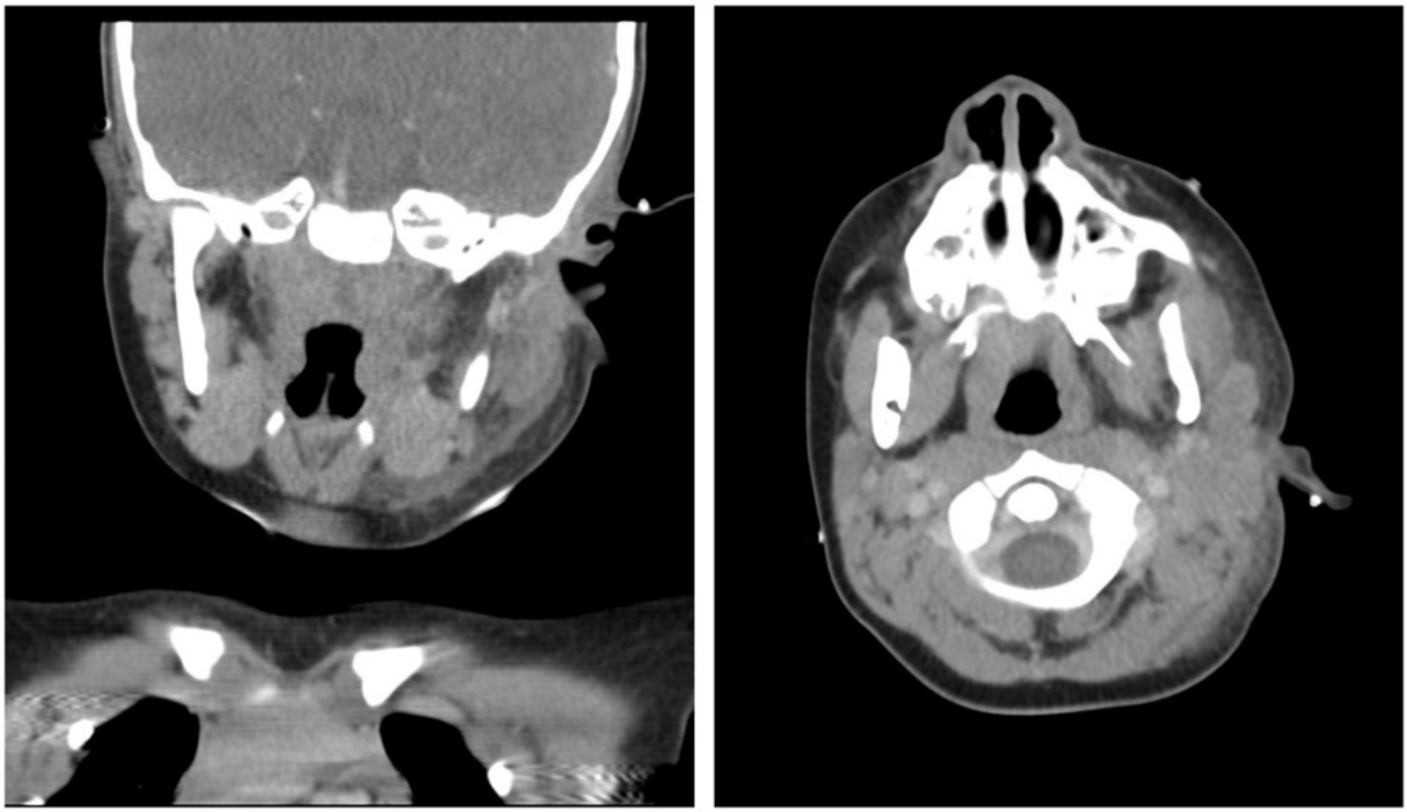


Image 1. Axial and coronal CT images of the face with contrast, which demonstrate swelling of the left parotid and left sub mandibular gland. There is prominent stranding of the left buccal soft tissues. There is no evidence of rim enhancing fluid collection within the glandular tissues or subcutaneous fat.

Abstract: 355
Scarlet fever associated with Rhabdomyolysis in a 2-year-old female.
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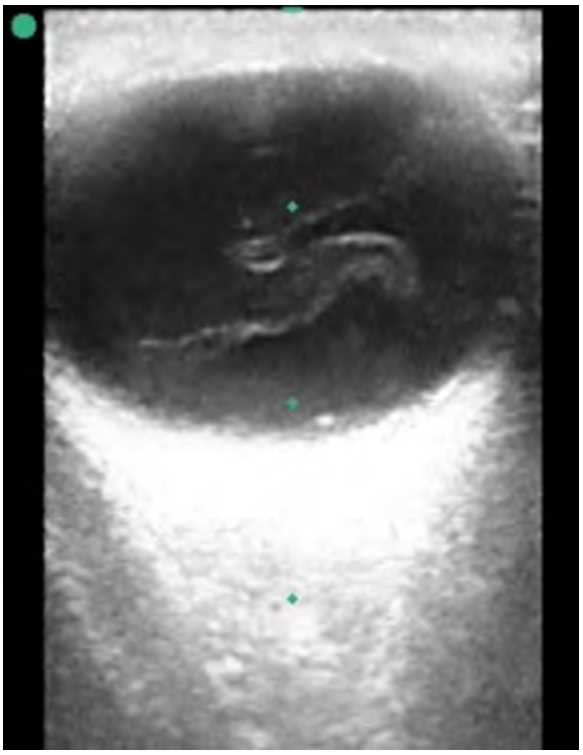
History (including chief complaint, history of present illness and relevant past and family medical history) 2 year old female child brought by the mother with a c/o of refusal to walk and bear weight for 1 day. She had fever T-max of 103 F and URI symptoms for 3 days, associated with decrease oral intake and 2 episodes of non-bloody, non-bilious vomiting. One week prior admission, there is history of fall while paying with no subsequent join swelling or pain. No dark color of the urine, diarrhea, skin rash, lethargy, sick contacts, recent travel, pets or exposure to cats reported.
No history of ingestion of chronic medication use, except for ibuprofen and Tylenol for the fever.
No significant past medical history. Family history noncontributory.
Physical examination findings (including vital signs) Initial vitals no fever or tachycardia. She appeared to be in pain and was non-ambulatory. On physical examination normal HEENT; no evidence of otitis media or pharyngitis. Extremities showed limitation of range of motion in lower limbs due to pain, more pronounced on dorsiflexion of both feet. Her preferred position was extension of legs with plantarflexed feet. Reflexes and sensations were within normal limits, with no vascular compromise noted. Dorsalis pedis pulses (+2) were palpated bilaterally. There was no skin rash noted on admission.
Laboratory or Diagnostic imaging or Procedures On admission Normal CBC, BMP, CRP.

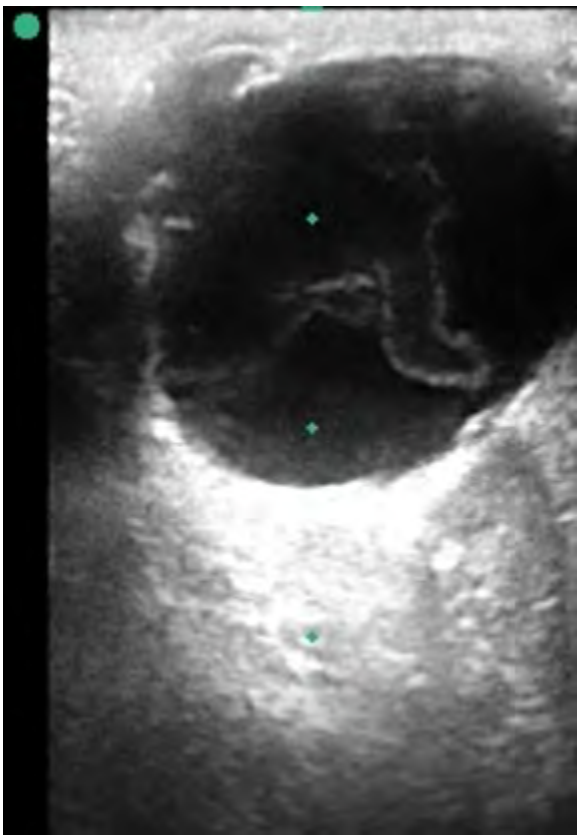
EKG showed normal sinus rhythm.
Blood culture and urine culture were negative.
Because of the history of fever, rash and refusal to ambulate, CPK was elevated 7036U/L (Normal value 20 to 200U/L)
Initial LFTs with elevated Aspartate Transaminase of 369U/L (Normal: 13-35U/L and Alanine Transaminase of 135 U/L (Normal: 5-45U/L)
Urinalysis negative for microscopy RBCs, WBCs or myoglobin.
Heterophile antibodies and EBV serology were negative.
ASLO titers were <50 on admission (Normal range <100 Todd U/ml in <5 years).
RVP was negative.
Final Diagnosis On day 2 of admission, she continued spiking fevers and developed a diffuse sandpaper-like rash covering the trunk and extremities, prompting testing for GAS. Scarlet fever was diagnosed, and she was started on IV Ceftriaxone. Her symptoms gradually improved, she was eventually able to dorsiflex her feet without pain, with a trend down of CPK and LFTs. Repeated ASO titers 1 month after trend up confirm the diagnosis. We present a rare case of Scarlet fever associated with Rhabdomyolysis. There are reports of rhabdomyolysis associated with GAS infection in adults, but it is rarely reported in children. The clinical symptoms of extremity weakness with fever should prompt clinicians to evaluate for rhabdomyolysis.

Abstract: 356
Ocular Point of Care Ultrasound: Description of Intermediate Vitritis in an Adolescent Female
Rahul Shah[1], Paul Rychwalski[1], Ami Kurzweil[2], Heather Tory[2], Henry Chicaiza[1]
[1]Connecticut Children's/University of Connecticut, New Haven, Connecticut, United States, [2]University of Connecticut, Hartford, Connecticut, United States

History (including chief complaint, history of present illness and relevant past and family medical history) An adolescent female with no PMHx presented to the pediatric ED with 1 month of blurry vision. She was seen by an optometrist earlier in the day and a dilated eye exam revealed b/l papilledema. She was directed to the ED for further evaluation and consideration of neuroimaging.
ROS: Notable for change in vision and intermittent HA that did not cause emesis or night awakenings. Denied eye pain, photophobia, changes in her activity level or appetite, fever, cough and dizziness. She had not been ill immediately prior to the onset of her change in vision. No change in speech or gait. No sick contacts.
Family Hx: Uncle with MS
Physical examination findings (including vital signs) VS:
Temp: 36.9 °C
BP: 117/69
HR: 76
RR: 20
O2 Sat: 100% (RA)
Wt: 38 kg
BMI: 15 kg/m^2
Well-appearing and non-toxic. A comprehensive neuro exam was unremarkable. CN II-XII intact. Normal strength, coordination and gait. Rapid alternating movements were intact. No dysmetria. Pupils were 6 mm b/l (previously dilated). Fundoscopic exam was suggestive of papilledema. Visual acuity was 20/25 (R) and 20/40 (L).
Laboratory or Diagnostic imaging or Procedures Head CT: Unremarkable. Ocular POCUS applied to further assess papilledema. On POCUS, patient's optic nerve sheath diameters were under 6 mm in diameter b/l and there did not appear to be any optic disc elevation. However, hyperechoic debris could be seen swirling in b/l posterior chambers with a lacy-like appearance, crossing the midline, not tethered to the optic nerve. This appeared consistent with vitreous hemorrhage and/or detachment. Such a preliminary diagnosis was made and discussed with ophthalmology.
Additional labs were ordered after the patient was evaluated by ophthalmology. This is further discussed in the following section.
Final Diagnosis Bilateral intermediate uveitis, likely due to pars planitis, with active vitritis.
Patient was evaluated by ophthalmology and was found to have panuveitis and macular edema. Outpatient labs were ordered in consideration for underlying infectious or rheumatologic diagnosis. CBC showed a WBC of 4.9, Hgb of 13.0 and platelets of 322. HLA-B27 was negative, ESR was 2 and CRP was 0.5. RF, Lyme Disease antibody, and Toxoplasma gondii antibody were negative. The patient was started on systemic steroids. Upon reevaluation, the patient was diagnosed with b/l intermediate uveitis w/active vitritis. Lysozyme, angiotensin converting enzyme levels as well as Treponema pallidum antibody and QuantiFERON testing were unremarkable. Urine beta-two microglobulin was normal. Patient was started on methotrexate and tapered off steroids.



Swirling, lacy hyperechoic debris crossing midline and not tethered to the optic nerve. (Image 1 of 2)



Swirling, lacy hyperechoic debris crossing midline and not tethered to the optic nerve. (Image 2 of 2)

Abstract: 357

Neonate with Abdominal Distension

Laura Belden

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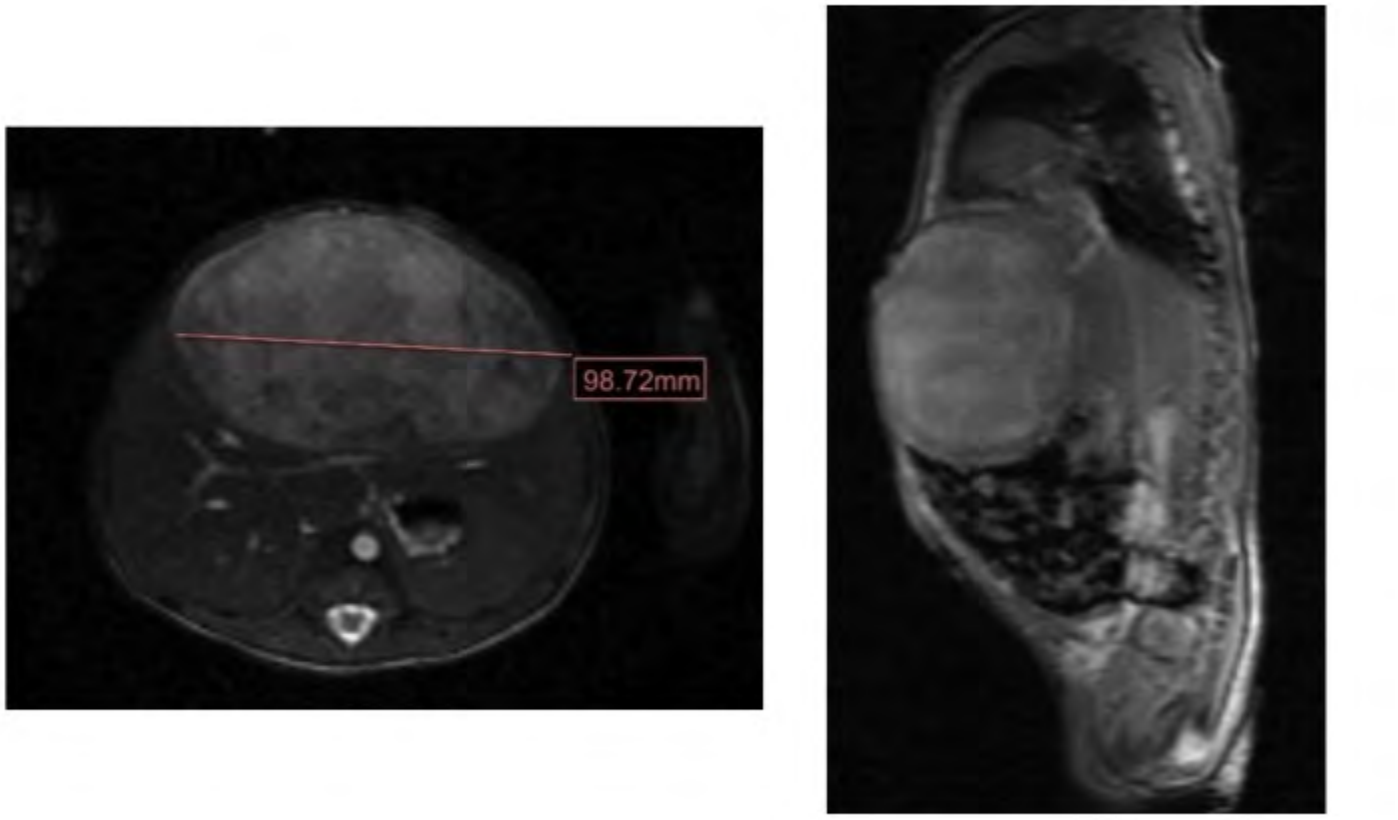
History (including chief complaint, history of present illness and relevant past and family medical history) HPI: RH is a male infant delivered at 39 weeks who was transferred at 1 hour of life for evaluation of abdominal distension and suspected hepatomegaly. Maternal and Delivery History: Mother is a 37yo G4P1021 with unremarkable prenatal labs. She had good prenatal care, normal mid-second trimester fetal Ultrasound, normal NIPT and MSAFP. Her pregnancy was complicated by AMA, anxiety/depression and palpitations. Her only medications include PNV, Prozac, Reglan and progesterone. No substance use. Mother presented in labor and infant was delivered via SVD without any complications. APGARs 9, 9. However, the infant's birth exam was signfiicant for a grossly hard & distended abdomen and he subsequently developed respiratory distress so was emergently transferred to AIDHC.
Physical examination findings (including vital signs) Weight: 3800g (81%ile); Length: 51cm (72%ile); Head Circumference 36.5cm (95%ile)
Vital Signs: Temp 37.3C, Pulse 152, Resp58, SpO2 100%, BP 64/33
Pertinent Physical Exam Findings:
–RESP: mild respiratory distress on HFNC 4L 21% with intermittent grunting and subcostal retractions
–CV: Grade II/IV systolic murmur at LSB, strong femoral pulses
–ABD: grossly distended and firm-epigastric/LUQ/RUQ, hepatosplenomegaly?, no bruit, no ascites, + bowel sounds, umbilical cord clamped- c/d/I
–SKIN: no rashes, no lesions
Laboratory or Diagnostic imaging or Procedures Admission Laboratory studies:
–ABG: pH 7.29, pCO2 48, pO2 69, BE -3.6
–CBC: WBC 26.6 (N47, B9, L24, M15) Hgb10, Hct34.8, Plts273, Retic13.99
–CMP: Na 135, K 4.7, Cl104, TCO2 22, BUN 12, Cr 0.7, Alb2.9,Tprot5.4,Tbili1.9,Dbili0, AST 158, ALT 33, AlkPhos57
–Infant Blood type: A neg, Coombs pos
Babygram on DOL0 revealed prominent soft tissue opacity across the upper abdomen with displacement of bowel loops concerning for organomegaly or less likely a space-occupying lesion
Abdominal US on DOL0 revealed a large, well-defined heterogeneous lesion approximately 7.6 x 10.0 x 5.6 cm, with heterogeneous echotexture, small hypoechoiccystic spaces within and questionable internal vascularity.
Abdominal MRI completed on DOL1 (see images below)
Additional laboratory studies:
- DOL 1 - HCG assay: 15 IU/L (ref range <50)
- DOL 2 - Alpha-1-fetoprotein: 7810 ng/ml --> DOL 7: 3440 ng/ml (ref range 50-100,000)
IR Liver Mass Biopsy on DOL3
- pre-procedure imaging revealed minimal internal blood flow but marked hypervascularity along the lesion periphery
- Exensive necrosis in vast majority of samples (1 viable piece suggests a vascular lesion)
- Immunohistochemistry showd negative Glut1
Abdominal US on DOL25 revealed interval decrease in size of mass
Final Diagnosis Rapidly Involuting Congenital Hemangioma (RICH)



Abdominal MRI completed on DOL 1

Abstract: 73

Prenatal Diagnosis of Costello Syndrome Using Non-invasive Prenatal Single Gene Testing

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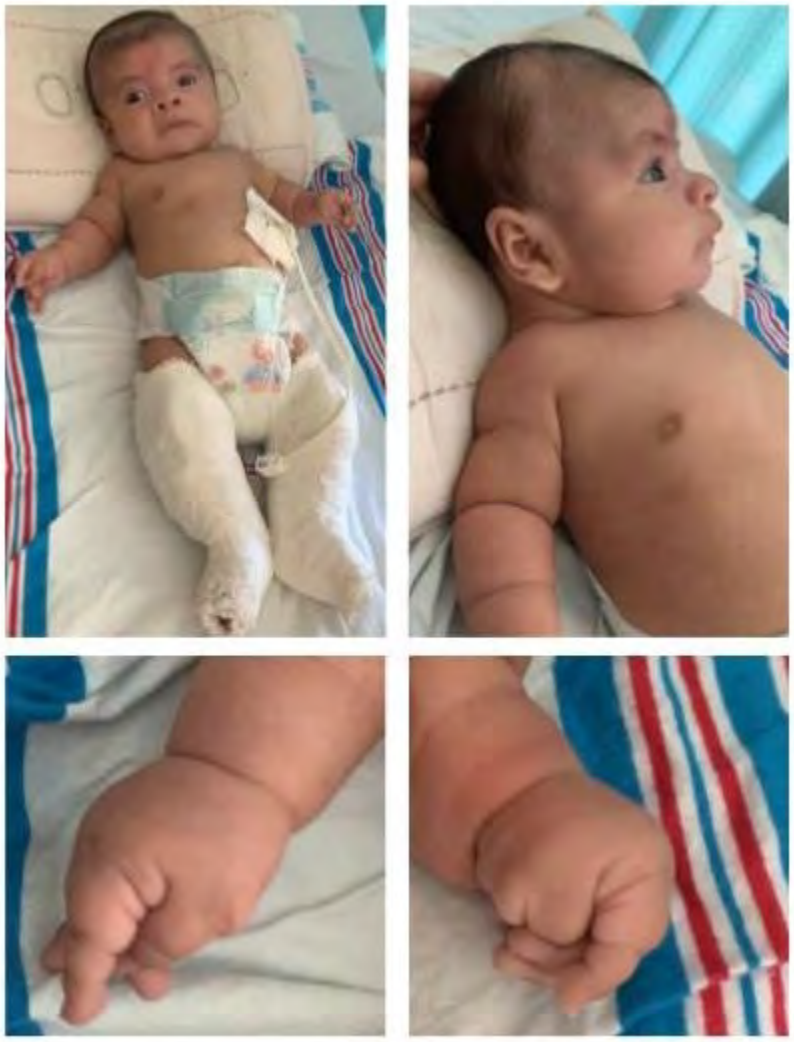
History (including chief complaint, history of present illness and relevant past and family medical history) A 38-year-old woman was referred for genetic screening at 28 weeks of gestational age (GA) due to polyhydramnios, shortened limbs seen on prenatal ultrasound, and advanced maternal age. A cell-free DNA, non-invasive prenatal single gene screening was positive for G12S HRAS mutation.

Physical examination findings (including vital signs) The infant was delivered via elective cesarean section at 36 weeks and 6 days GA. He was managed in the neonatal intensive care unit for respiratory distress and hypoglycemia. Physical examination was significant for macrocephaly, wide depressed nasal bridge, short neck, rhizomelic limb shortening, micropenis, and bilateral equinovarus deformity of the feet(Figure1).

Laboratory or Diagnostic imaging or Procedures Due to the association with hypertrophic cardiomyopathy (HCM), echocardiography was performed within 1 hour of life and showed pulmonary hypertension. Brain MRI showed a possible cavernous mass lesion and small arachnoid cyst over the left cerebellar hemisphere. Postnatal gene-targeted testing confirmed CS diagnosis with p.G12S pathogenic variant. After the management of respiratory distress, hypoglycemia, jaundice, and orthopedic casting, he was transferred to another hospital at 45 weeks of age for gastrostomy tube placement due to persistent oral feeding difficulty.

Final Diagnosis Costello syndrome (CS) is a rare disorder that affects multiple organ systems. Almost all cases have been diagnosed postnatally, except for two cases diagnosed prenatally from chromosome analysis by amniocentesis. Costello syndrome affects

multiple organ systems including feeding difficulties; short stature; macrocephaly; developmental delay; coarse facial features; loose, soft skin; diffuse hypotonia and joint laxity; and cardiac involvement with a congenital heart defect. The phenotypic spectrum is wide and can range from mild features to early lethal complications mostly as a result of severe progressive HCM and respiratory compromise. CS is an autosomal dominant genetic condition caused by mutations in the HRAS gene, but almost all cases have been new mutations with no family history. Disease course depends on cardiac and tumor complications. Treatment requires a multidisciplinary team directed toward the specific clinical findings. To our knowledge, this is the first reported case of prenatally diagnosed CS via maternal blood testing. Molecular diagnosis in the prenatal period allows neonatal providers to prepare for potential complications in the postnatal period.



Abstract: 45

Days on Antibiotics and Delay in Achieving Full Nipple feeding Adversely Impact the Duration of Hospitalization in Moderately Preterm Neonates

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Background Decreasing limit of viability has resulted in the resuscitation of extremely premature infants with longer duration of NICU hospitalization. The stress of separation from a child significantly impacts the child-parent relationship. Prolonged NICU stay is associated with deficient mother-child bonding, the heavy financial burden on parents and post-discharge child abuse. Maternal separation, painful procedures, isolation, bright lights and loud sounds (Coughlin, 2013) result in continuous activation of stress response system which induces alterations in the neurobiology of child, leading to impairments in learning, memory, and the ability to regulate emotions. Dysregulation of the stress response system eventually results in behavioral and coping mechanism deficits in later life. Measures taken in neonatal care of preterm infants may decrease their length of stay (LOS)
Objective To investigate the clinical factors implicating the length of stay (LOS) of moderately premature neonates in NICU

Design/Methods Retrospective study Subjects: Preterm infants of gestational age (GA) of 23.0/7 to 33,0/7 weeks Variables: maternal complications; Infants' GA; Birth weight (BW); sex; race; Apgar scores at 1 & 5 minutes of life; receipt of oxygen therapy (O2); intracranial bleed; ROP; NEC; PDA; number of days on antibiotics (DABX); feeding intolerance; surgery; DOL feeds started (DFS); number of days on IV fluid (DIVF); DOL nipple feed started (DNIP); number of days on tube+ nipple feeding (DNIPG); DOL of achieving full nipple feeds (DFF); number of nil per oral (NPO) days; DOL achieving 2200 g of body weight (D22) and LOS. Statistics: Data as mean (SD) and number (%).Univariate linear regression, multiple logistic regression and correlation co-efficient tests done.

Results [n= 119, Tables 1-3.] In univariate analysis, LOS was inversely associated with GA, BW, Apgar 1 & 5; and directly with O2 therapy, PDA, DABX, DFS; DFF, DIVF, NPO days, and absence of maternal diabetes mellitus (table 2). In multivariate analysis, LOS was associated with lower GA and BW, increased DBX, & with higher DFF. LOS correlated significantly with DFF (r=.8, p =0.000); DFS (r =0.5, p =0.000); DNIPG (r= 0.8, p =0.000) and D22 (r =0.9 ,p= 0.000, table 3)

Conclusion(s) LOS is independently associated with the days on antibiotics and the delay in achieving full nipple feeding. Judicious use of antibiotics and improving feeding strategies may shorten LOS in moderately preterm neonates.

Sample Characteristics of 119 Neonates

Variable	M (SD)	n (%)
Neonate		
Gestational age (weeks)	30.4 (2.17)	
Birthweight (grams)	1,473.0 (427.50)	
Sex (male)		61 (51.3)
Race/ethnicity (non-white)		76 (63.9)
Apgar 1	6.5 (2.28)	
Apgar 5	7.7 (1.29)	
Any oxygen treatment (yes)		102 (85.7)
Patent ductus arteriosus (yes)		17 (14.3)
Bronchopulmonary dysplasia (yes)		31 (26.1)
Days on antibiotics (number)	5.9 (5.96)	
Day of life feeding started	3.6 (1.98)	
Milk (any breastmilk)		87 (73.1)
Colostrum given (yes)		75 (63.0)
Total days on intravenous fluid (number)	18.6 (13.54)	
Day of life full nipple feeding	25.5 (19.15)	
Days no oral feed (number)	4.8 (4.25)	
Daily weight gain (grams)	22.2 (7.50)	
Maternal		
Gestational hypertension (yes)		41 (34.5)
Gestational diabetes (yes)		13 (10.9)
Antenatal steroids (yes)		110 (92.4)
Antenatal magnesium (yes)		102 (85.7)
Antenatal antibiotics (yes)		74 (62.2)
Outcome		
Length of stay (days)	46.1 (22.0)	
Days to reach 2,200 grams (number)	37.2 (19.85)	
Day of life full feeding achieved	20.4 (14.17)	

Note: M=mean, SD=standard deviation

Table 1.

Linear Regression Analyses for Length of Stay

Variable	Univariate B (SE)	Multivariate B (SE)
Neonate		
Gestational age (weeks)	-8.64 (0.49)***	-1.89 (0.76)*
Birthweight (grams)	-0.04 (0.003)***	-0.01 (0.003)***
Sex (male)	2.35 (4.05)	---
Race/ethnicity (non-white)	0.72 (4.22)	---
Apgar 1	-3.64 (0.83)***	-0.42 (0.57)
Apgar 5	-6.76 (1.44)***	0.73 (1.02)
Any oxygen treatment (yes)	24.99 (5.31)***	-0.36 (2.65)
Patent ductus arteriosus (yes)	23.87 (5.36)***	-0.68 (2.51)
Bronchopulmonary dysplasia (yes)	35.03 (3.29)***	0.80 (2.69)
Days on antibiotics (number)	40.28 (4.78)***	11.63 (2.93)***
Day of life feeding started	48.04 (7.65)***	5.29 (4.62)
Milk (any breastmilk)	8.90 (4.50)*	-0.87 (2.04)
Colostrum given (yes)	12.26 (4.04)***	1.29 (1.90)
Total days on intravenous fluid (number)	54.02 (3.54)***	8.01 (5.01)
Day of life full nipple feeding	1.02 (0.05)***	0.35 (0.09)***
Days no oral feed (number)	38.67 (5.17)***	-2.44 (3.81)
Daily weight gain (grams)	-0.10 (0.27)	---
Maternal		
Gestational hypertension (yes)	-6.39 (4.22)	---
Gestational diabetes (yes)	-15.71 (6.33)*	-2.51 (2.57)
Antenatal steroids (yes)	1.88 (7.66)	---
Antenatal magnesium (yes)	6.46 (5.76)	---
Antenatal antibiotics (yes)	2.32 (4.17)	---
Intercept	---	93.93 (25.57)***

Note: B=unstandardized beta, SE=standard error, Milk p=0.05, Adjusted R square=0.87

*p<0.05, ***p<0.001

Table 2.

Correlations of Length of stay(days) with feeding variables

Day of life achieving full nipple feeding	Pearson Correlation	.884**
	Sig. (2-tailed)	.000
	N	119
Day of life feeding started	Pearson Correlation	.502**
	Sig. (2-tailed)	.000
	N	119
Day of life achieving full feeds(OG+Nipple)	Pearson Correlation	.866**
	Sig. (2-tailed)	.000
	N	119
Day of life achieving body weight of 2200g	Pearson Correlation	.922**
	Sig. (2-tailed)	.000
	N	119

**. Correlation is significant at the 0.01 level (2-tailed).

Table 3.

Presentation of the Young Investigator and Clinical Case Competition Awards
Lori Billinghurst
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The Role of Pediatric Practitioners in Addressing the National Opioid Overdose Crisis
Scott E. Hadland
Pediatrics, Boston Medical Center, Boston University School of Medicine, Boston, Massachusetts, United States

The dyad affected by Neonatal Abstinence Syndrome: A comprehensive, developmental approach
Lauren M. Jansson
Pediatrics, Johns Hopkins University School of Medicine, Baltimore, Maryland, United States

Abstract: 358
Adolescent pregnancy intentions, social support and choice of contraception
Joy Friedman, Veronica Flake, Matilde M. Irigoyen
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Background Choosing highly effective contraception in adolescents is influenced by attitudes towards pregnancy, social influences and external support regarding contraception.
Objective To determine the association between adolescent pregnancy intention, social support and choice of contraception.
Design/Methods We conducted a prospective cohort study from Feb 2018-Jan 2019 at an adolescent clinic in an academic medical center serving a low-income minority population. Adolescents ages 14-21 who initiated a new contraceptive were surveyed regarding level of social support surrounding contraceptive use, desired pregnancy timing ("within 1 year, 1-2 years, >2 years, never") and contraception plans ("how sure you will continue this same method for one year?"). Outcome measures were choice of contraception (short acting (pill, patch, ring), intermediate (DMPA) and long acting reversible contraceptives (LARC) (IUD, implant)).
Results 107 adolescents participated: mean age 17.5 (SD 1.9), African American 87%, Hispanic 14%, 84% Medicaid, ever pregnant (24%), parity ≥1 3%, naïve to contraception 58%.
Most (82%) wished to defer pregnancy for ≥2 years and 11% reported "never" wanting to become pregnant; 80% were "sure" they

would continue their chosen contraceptive for at least one year. Only half (54%) would be “very upset” if they became pregnant in the next 3 months. Most (84%) would tell a parent they were using contraception, only half (52%) would tell their partners and 43% would tell friends about their chosen contraceptive method. All adolescents (100%) who were willing to tell a support person expected this person would be “very supportive” of their choice to use contraception.
A third (38%) of participants selected LARC methods (9% chose IUD, 29% chose implant), 19% chose DMPA and 43% selected short acting methods (pill, patch).
Adolescents who would feel “very upset” if pregnant, those who were “very sure” they would continue their contraceptives for 1 year, and those who would tell friends about their contraceptives were significantly more likely to select LARC ($p<0.05$, all).
Conclusion(s) Strength of intention to avoid pregnancy and perceived peer social support predicted choice of LARC among adolescents at high risk for pregnancy.

Abstract: 359

The Impact of Learning Methods on Sexually Transmitted Disease Knowledge in Adolescents

Jennifer Hale[1], Jacob Greenberg[2], Maua H. Mosha[3], Adrienne Nguyen[4], Alyssa S. Bennett[5]
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Background Adolescents and young adults account for approximately 50% of newly diagnosed STDs each year. School-based sex education has been shown to increase safer sex practices in teenagers. The literature advocates for incorporating elements of active learning in favor of passive forms of learning to promote intellectual engagement in adolescents.
Objective This study aims to identify the types of learning methods used within school-based sex education that are associated with improved STD knowledge.
Design/Methods We conducted a cross-sectional study of 162 full-time students ages 13 to 17 presenting to an urban pediatric ED. Those who were non-English speaking, deaf, or medically/emotionally unstable were excluded. During a single study visit, participants completed a 17-item semi-structured interview and a 29-question self-administered electronic survey. An STD knowledge score (SKS) was calculated by awarding one point for each correct response during the semi-structured interview. Participants were asked how they learned about STDs in school; their reported learning activities were categorized as active learning (A), passive learning (P), or mixed learning (A and P). Partial correlations, ANCOVA, and multivariable linear regression were used in the data analysis while controlling for age.
Results Adolescents reported participating in 0 to 5 STD-related learning activities, including lectures, projects, skill-based lessons, peer-led education, videos, readings, discussions, role playing, and games. After controlling for age, there was a positive correlation between SKS and number of learning activities utilized (Figure 1, $p < 0.001$). Median SKS of participants who reported engaging in mixed learning styles were higher than those who learned actively ($p=0.044$), passively ($p=0.011$), or had never learned about STDs ($p<0.001$) (Figure 2). Additionally, those who learned passively were more knowledgeable about STDs than those who reported never learning about STDs (Figure 2, $p=0.005$). Most participants thought that the amount of time learning about STDs in school should increase (58%) or stay the same (39%) as opposed to decrease.
Conclusion(s) Adolescents whose school-based sex education incorporated more learning activities and a combination of active and passive learning styles had higher STD knowledge scores. Health educators should apply a variety of techniques when educating adolescents, especially given that adolescents are interested in spending more time learning about STDs as part of their sex education.

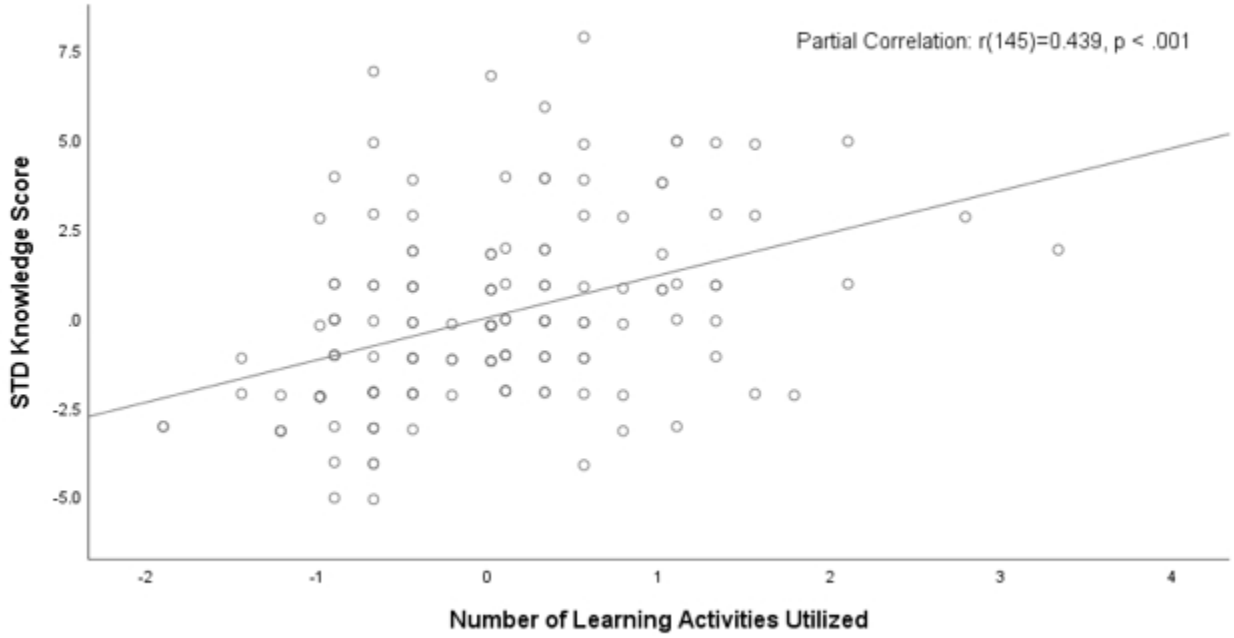

Figure 1. Partial Regression Plot of STD knowledge scores (SKS) vs. number of STD learning activities controlling for age ($F(2,145)=38.3$, $N=148$, $p<0.001$, $R^2=0.35$). Both number of STD learning activities and age are significant predictors of SKS.

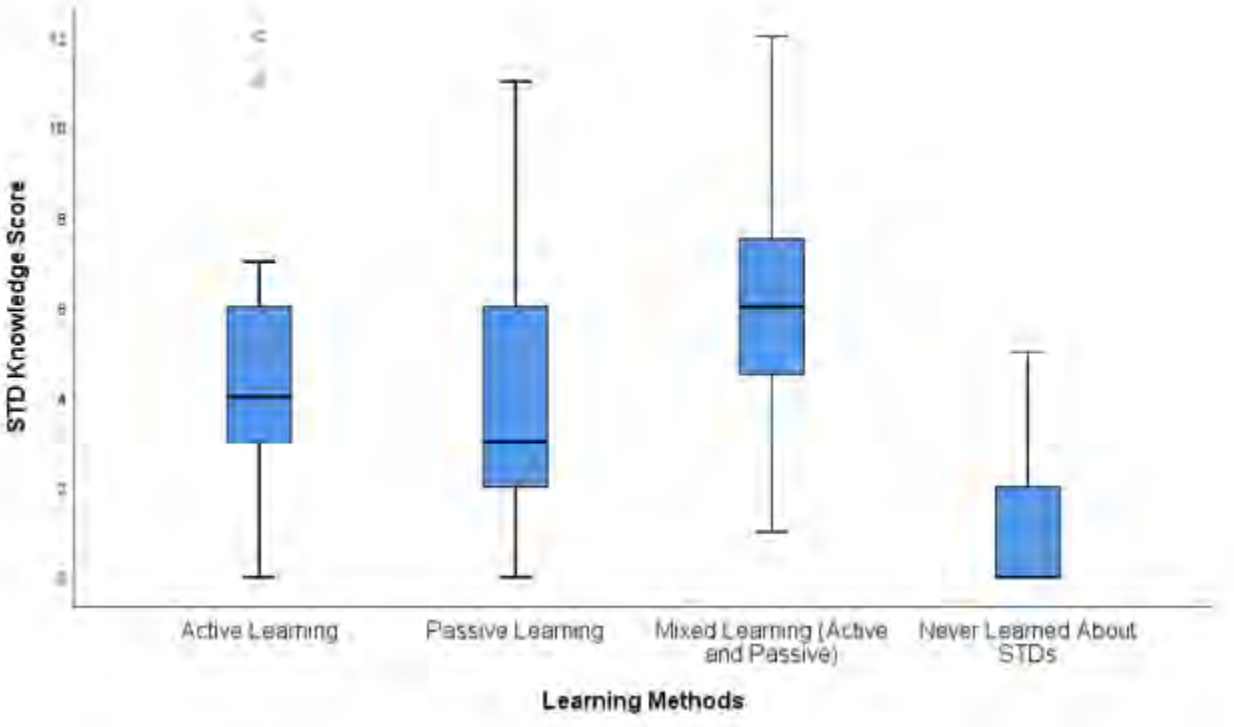

Figure 2. STD knowledge score (SKS) vs. learning methods (N= 150).

Abstract: 360

Differences in STD Knowledge, Sexual Risk-Taking Behaviors, and Sexual Health Education Among Heterosexual and Sexual Minority Adolescents

Jennifer Hale[1], Jacob Greenberg[2], Maua H. Mosha[3], Adrienne Nguyen[4], Alyssa S. Bennett[5]
[1]University of Connecticut School of Medicine, Farmington, Connecticut, United States, [2]Pediatric Emergency Medicine, Connecticut Children's Medical Center, Hartford, Connecticut, United States, [3]Research, Connecticut Children's Medical Center, Hartford, Connecticut, United States, [4]University of Connecticut, Storrs, Connecticut, United States, [5]Adolescent Medicine, Connecticut Children's Medical Center, Hartford, Connecticut, United States

Background In the US, sexual minorities (SM) experience higher rates of STDs and are more likely to partake in sexual risk-taking behaviors than their heterosexual (H) peers. Formal sex education has been shown to increase safer sex practices but most interventions are focused on heterosexual behaviors.
Objective This study aims to investigate differences in STD knowledge, sexual risk-taking behavior, and sources of sexual health information between heterosexual and sexual minority adolescents.
Design/Methods We conducted a cross-sectional study of 162 full-time students ages 13 to 17 presenting to an urban pediatric ED. Those who were non-English speaking, deaf, or medically or emotionally unstable were excluded. Subjects completed a 17-item semi-structured interview and a 29-question self-administered survey. Adolescents who identified as asexual (A), pansexual, bisexual, gay, lesbian, unsure (U), or other were categorized as SMs. STD knowledge scores (SKS) were calculated by awarding one point for each correct response during the semi-structured interview. Mann Whitney U test and Chi-square test were used to compare SKS across sexual orientation groups and test associations between risk-taking and sexual orientation.
Results SM adolescents had higher median SKS (6) than H adolescents (4) (p=0.091). Bisexual adolescents were significantly more knowledgeable about STDs (SKS=7) than H adolescents (SKS=4, p=0.011), A adolescents (SKS=0.5, p=0.044), and U adolescents (SKS=0.5, p=0.001) (Figure 1). SM adolescents reported higher sexual risk-taking behaviors than H adolescents (Figure 2). In both groups, school was the most common source to learn about sex (Figure 3). SM were less likely than H to learn about sex from their parents (H=52%, SM=28%, $\chi^2(1)=5.46$, p=0.019) but reported learning more from their friends (H=56%, SM=59%, $\chi^2(1)=0.06$, p=0.801), the internet (H=30%, SM=38%, $\chi^2(1)=0.64$, p=0.424), and social media (H=21%, SM=31%, $\chi^2(1)=1.53$, p=0.216) (Figure 3). Most participants learned about heterosexual and vaginal sex only (Figure 4).
Conclusion(s) Although SM adolescents exhibited greater STD knowledge, they reported higher sexual risk-taking behaviors than their heterosexual peers. This discrepancy may be associated with predominantly heterosexual sexual behaviors discussed during school-based sex education. Additionally, heterosexual-focused sex education may lead adolescents to seek additional sources of information such as the internet and social media.

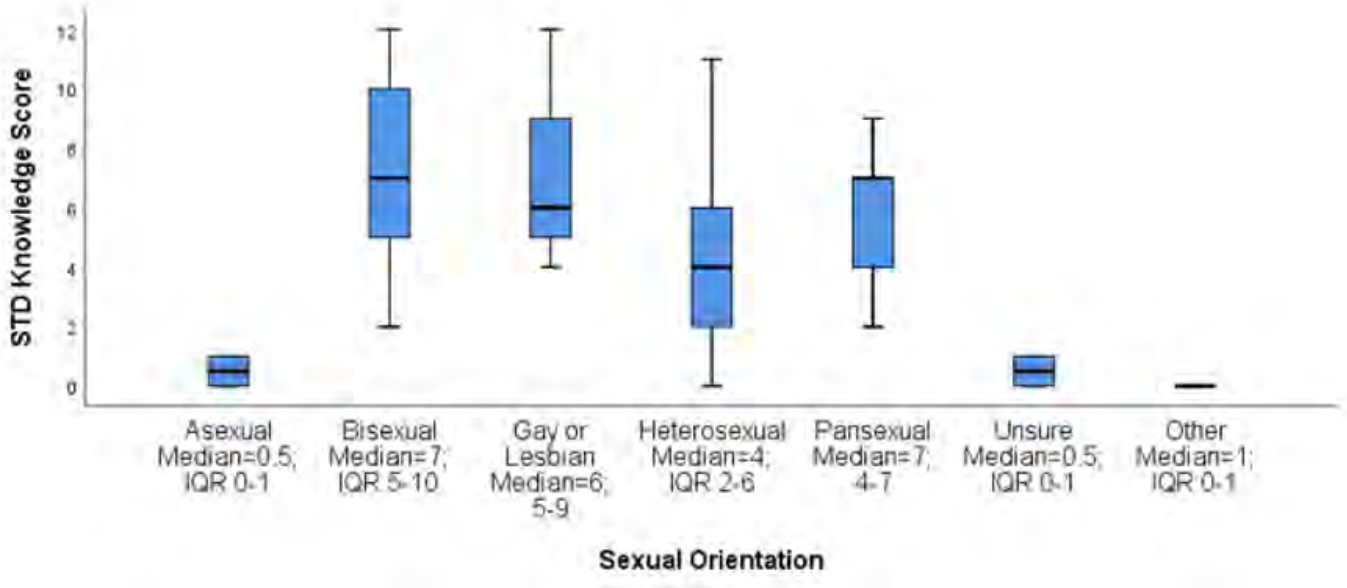

Figure 1. STD knowledge scores and sexual orientation (N=161).

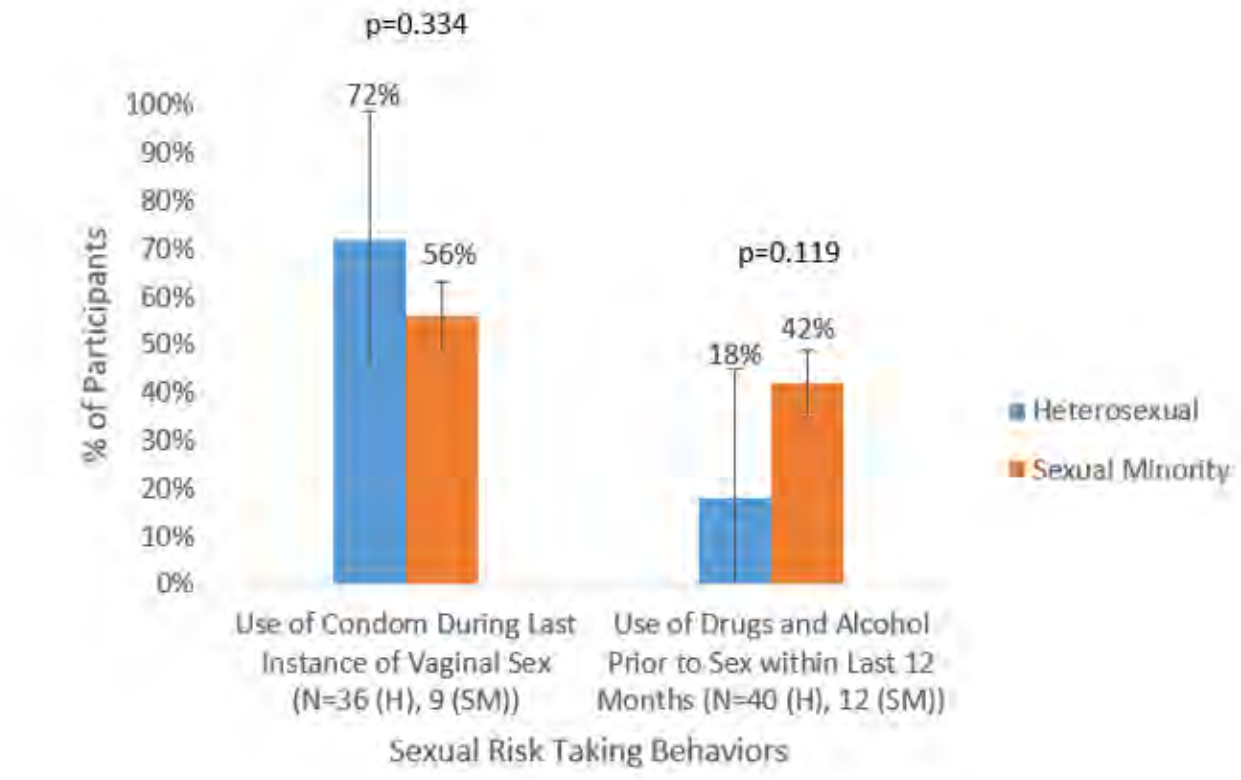

Figure 2. Percentage of participants who reported engaging in sexual risk-taking behaviors.

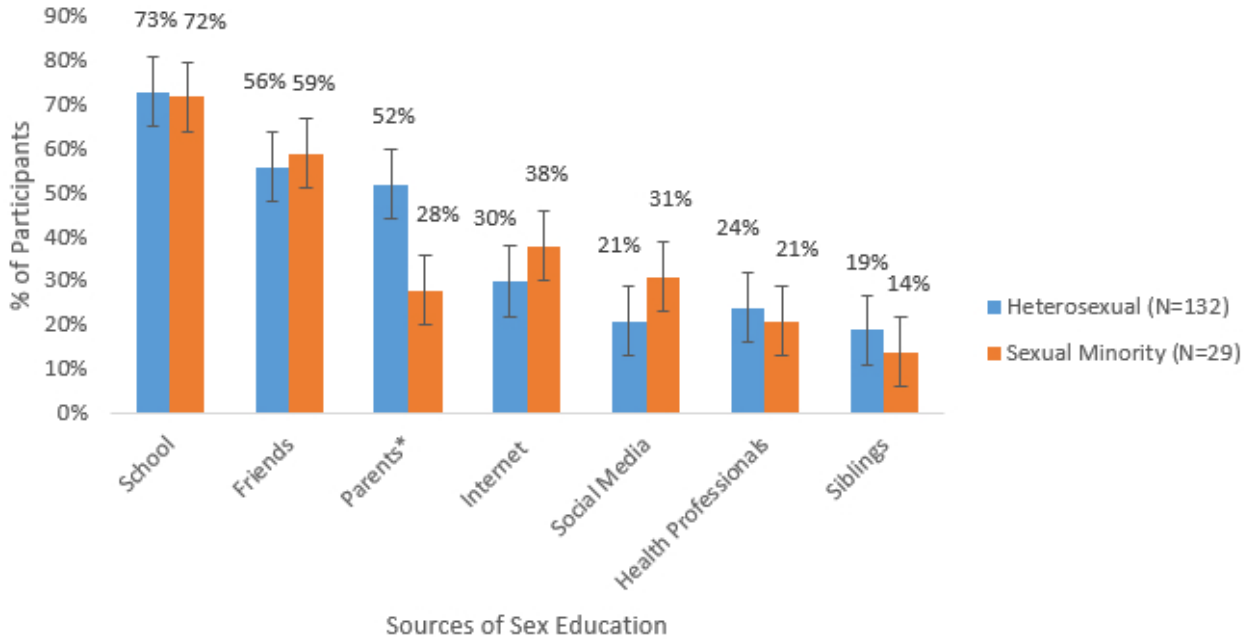

Figure 3: Percentage of participants who report learning about sex from each source.
* indicates statistically significant difference

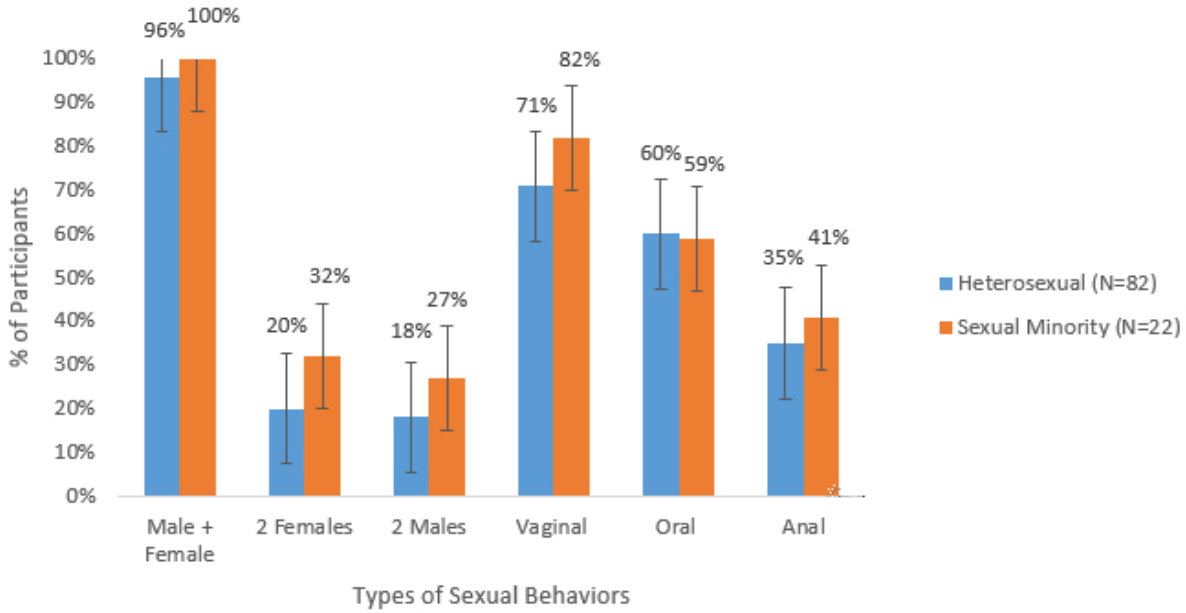

Figure 4: Percentage of participants who reported learning about specific types of sexual behavior.

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Young Adults' Perceptions on Ideal Age for Healthcare Transition and Comfort Levels with Pediatricians vs. Adult Care Providers

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Background Pediatricians (CP) often struggle with identifying the ideal transition age (ITA) to encourage their teen patients to transfer to adult healthcare providers (AP). As teens become young adults (YA), the variety of topics that must be discussed at health care visits expands substantially, yet patients may feel more comfortable discussing adult topics (AT), such as sexuality and illicit substances, with AP. Comfort levels on these topics may influence YA opinions on the ITA, while other YA may seek the familiarity of their CP.
Objective To examine YA ITA and the relationship between their ITA and their provider preferences for discussing AT.
Design/Methods An anonymous online survey created in Redcap was distributed nationwide to college students through email. Respondents were asked demographics, their ITA (options ranged from <13 to >25), and were asked if they feel more comfortable speaking with their CP or a new AP on the following topics: flu, broken bone, sexuality, safe sex, STI testing, birth control, anxiety/depression, weight, and substance abuse. Based on these 9 prompts, a composite provider preference was defined, ranging from 0 (maximally comfortable with childhood provider) to 9 (maximally comfortable with new adult provider). Linear regressions were used to model ITA as a function of this composite measure, controlling for age, gender, and race.
Results Overall, 311 respondents (83.6% female, 57.9% White) met inclusion criteria (ages 18-22 and currently attending college). Mean ITA was 18.7 years. The mean ITA for males and females were 18.89 and 18.45 years, respectively. For those who identified as "gender nonconforming", "other", or chose not to specify their gender, the mean ITA was 17.7 years. The majority of participants stated they felt more comfortable speaking with an AP about all topics indicated (Table 1). Higher scores on the provider preference composite measure were associated with preferring a younger ITA ($\beta = -0.29$, $p<.001$).
Conclusion(s) College students ages 18-22 felt more comfortable discussing all medical and adult social topics with an AP. Pediatricians must recognize that YA may be reluctant to discuss important healthcare topics and should provide guidance on healthcare transition to teens to facilitate the transition process.

Table 1: Responses for CP vs AP Preference for Various Health Topics

Topic	Childhood Care Provider	New Adult Care Provider
Sick with a flu	47%	53%
Broke a bone	35%	65%
Had sexuality questions	19.5%	80.5%
Had sex safety questions (contraceptives, condoms, concerns)	17.8%	82.2%
Wanted to get tested for a sexually transmitted infection	11.8%	88.2%
Had birth control questions	17.8%	82.2%
Had questions about anxiety and depression	27.3%	72.7%
Had weight concerns	31.6%	68.4%
Had substance abuse concerns	18.5%	81.5%

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Teenage Sexual Risk Behaviors and Prescription Pain Medication Misuse: Analysis of the 2017 National Youth Risk Behavior Survey

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Background Previous studies have identified associations between adolescent substance use and risky sexual behaviors. However, few studies to date have examined the association between prescription pain medication (PPM) misuse and sexual risk behaviors (SRBs) in adolescents, and each relied on small, local samples. In 2017, the CDC introduced a new question to the Youth Risk Behavior Survey (YRBS) asking US high school students specifically about lifetime PPM misuse.
Objective To assess the relationship between PPM misuse and SRBs in a sample of US high school students.
Design/Methods A secondary analysis was performed on responses to the 2017 YRBS, a nationally representative survey of US high school students (n=14,765). PPM misuse was defined as the use of PPM without a prescription or differently than how a doctor told to use it. 5 SRBs were identified: 1) ever had sexual intercourse; 2) currently sexually active; 3) had ≥4 lifetime sexual partners; 4) drank alcohol or used drugs before last intercourse; and 5) failure to use contraceptives at last intercourse. Logistic regressions were used to test for associations between lifetime PPM misuse and SRBs. Models were adjusted for grade, sex, race/ethnicity and lifetime substance use. R, version 3.6.1, was used for all analyses, which accounted for the complex survey design of the YRBS using package *survey*.
Results 14% of high school students used PPM without a prescription, or differently than instructed by a doctor, during their lifetime (Table 1). Adolescents who had ever misused PPM during their lifetime had significantly higher odds of having had sexual intercourse (aOR=1.39, 95%CI: [1.15, 1.68]), being currently sexually active (aOR=1.47, 95%CI: [1.24, 1.73]), having had ≥4 lifetime sexual partners (aOR=1.61, 95%CI: [1.19, 2.17]), and drinking alcohol/using drugs before last intercourse (aOR=1.81, 95%CI: [1.33, 2.45]) (Table 2). Some of these associations were identified for students who had misused PPM only 1-2 times in their lifetimes (Table 2). For sexually active students, PPM misuse was also associated with higher odds of not using a condom at last intercourse, but not with the use of contraceptives as a whole.
Conclusion(s) Students who misuse PPM are significantly more likely to also engage in several SRBs. Pediatricians and caregivers should be mindful of the elevated prevalence of SRBs in students who misuse PPM, allowing them to more effectively target safe sex education resources to students who may need them most.

Table 1. Prevalence of Prescription Pain Medication Misuse Among US High School Students Across Several Demographics, 2017 YRBS (n=14765)

	Overall		Prescription Pain Medication Misuse		
	n	%[a]	n	%[a]	OR (95% CI)
Grade					
9	3921	27.3	421	10.9	[Ref]
10	3715	25.7	479	12.8	1.20 (0.91, 1.58)
11	3602	23.9	523	15.4	**1.22** (1.12, 1.33)
12	3383	23.1	588	17.0	**1.19** (1.12, 1.25)
Sex					
Female	7526	50.7	1094	14.4	[Ref]
Male	7112	49.3	920	13.4	0.91 (0.80, 1.04)
Race/Ethnicity					
White (Non-Hispanic)	6568	54.6	930	13.6	[Ref]
Black (Non-Hispanic)	3278	16.1	425	13.9	1.02 (0.78, 1.33)
Hispanic	3653	22.4	533	15.0	1.06 (0.94, 1.19)
Ever drank alcohol					
No	5528	39.6	156	2.9	[Ref]
Yes	8251	60.4	1747	21.3	**9.07** (7.70, 10.68)
Ever used marijuana					
No	9160	64.4	527	5.5	[Ref]
Yes	5122	35.6	1410	28.6	**6.91** (6.09, 7.85)
Ever used cocaine					
No	13789	95.2	1559	11.3	[Ref]
Yes	719	4.8	476	67.6	**16.42** (11.65, 23.14)
Ever used heroin					
No	14087	98.3	1819	13.2	[Ref]
Yes	293	1.7	212	77.8	**23.10** (17.08, 31.24)
Ever used methamphetamines					
No	13994	97.5	1751	12.8	[Ref]
Yes	384	2.5	277	73.2	**18.68** (13.43, 25.98)
Ever used inhalants					
No	11197	93.8	1310	11.9	[Ref]
Yes	750	6.2	352	48.1	**6.89** (5.71, 8.30)
Ever used ecstasy					
No	13761	96.0	1616	11.9	[Ref]
Yes	590	4.0	412	71.1	**18.27** (14.70, 22.71)
Ever injected any illegal drug					
No	14065	98.5	1820	13.2	[Ref]
Yes	258	1.5	185	75.8	**20.57** (14.45, 29.27)

[a] Percentage is weighted.

Table 2: Adjusted Logistic Regression Analyses Assessing Associations Between Prescription Pain Medication (PPM) Misuse and Sexual Risk Behaviors in US High School Students, 2017 YRBS (n=14765)

PPM Misuse Frequency[a]	Ever had sexual intercourse aOR (95% CI)[c]	Currently sexually active[b] aOR (95% CI)[c]	Had ≥4 lifetime sexual partners aOR (95% CI)[c]	Used alcohol/drugs before sexual intercourse aOR (95% CI)[c]	Use of Contraceptives[c]	
					No contraceptives used[d] aOR (95% CI)[c]	No condom used[d] aOR (95% CI)[c]
Never	[Ref]	[Ref]	[Ref]	[Ref]	[Ref]	[Ref]
Ever used	**1.39** (1.15, 1.68)	**1.47** (1.24, 1.73)	**1.61** (1.19, 2.17)	**1.81** (1.33, 2.45)	1.26 (0.90, 1.76)	**1.57** (1.24, 1.98)
1-2 times	1.25 (0.98, 1.61)	**1.51** (1.15, 1.99)	1.01 (0.71, 1.45)	**1.73** (1.07, 2.79)	0.91 (0.57, 1.43)	1.27 (0.90, 1.81)
3-19 times	**1.46** (1.11, 1.92)	**1.34** (1.09, 1.64)	**2.11** (1.47, 3.03)	**1.66** (1.21, 2.28)	**1.89** (1.25, 2.87)	**1.78** (1.35, 2.35)
≥20 times	**1.66** (1.09, 2.53)	1.62 (0.95, 2.74)	1.72 (0.98, 3.02)	**2.15** (1.31, 3.53)	1.15 (0.68, 1.96)	**1.83** (1.08, 3.12)

[a] Lifetime prescription pain medication misuse.

[b] Had sexual intercourse with ≥1 person 3 months prior to the survey.

[c] Among students who were currently sexually active.

[d] At last intercourse.

[e] Adjusted for grade level, sex, race/ethnicity, and lifetime alcohol, marijuana, cocaine, heroin, methamphetamine, inhalants, ecstasy, and/or injection drugs use

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Exploring the Cannabidiol (CBD) Craze: Understanding Older Adolescents' Experiences with CBD

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Background After the 2018 Farm Bill, which lifted the federal ban on hemp products, CBD use has grown tremendously. The US CBD market is expected to reach $24 billion by 2023. Recent social media reports cite 18-21 year olds as the fast growing group of CBD users. To date, there is minimal research on this population's experience with and rationale for using CBD.
Objective To examine young adults' experience with CBD.
Design/Methods Respondents were 18-21 years olds, English speakers in the US, that had heard of CBD. An anonymous survey was distributed via an online crowdsourcing platform. An algorithm using measures, such as unique identifiers, validation questions at the beginning/end of the survey, and a short-answer question, was used to screen responses. Participants currently using CBD (e.g. within the past 30 days) reported their primary reason for using CBD, its efficacy, duration of use, and if it had taken the place of any medications. Non-users shared any past experiences with CBD.
Results Of the 145 respondents, 59.3% were female (n=86). The mean age was 20, and participants were located in 41 states. Approximately 43% (n=62) were current users, and over two-thirds (68.3%, n=99) reported using CBD at least once. Anxiety was the most frequent reason why participants began using CBD (32.3%, n=32), followed by insomnia/sleep issues and stress, at 14.1% (n=14) and 13% (n=13) respectively. Just over a quarter of current users (25.8%, n=15) have been using CBD for at least 1 year while 42% (n=26) started using CBD within the last 3 months. Over half (61.3%, n=38) use vaping products, 37.1% (n=23) ingest oil, and over one third (35.5%, n=22) use more than one type of CBD product. All current users felt CBD was at least "slightly effective" in addressing their primary compliant. Almost a third (32.3%, n=20) reported using CBD as a substitute for a medication they were previously taking. However, over half (56.7%, n=32) of current users had informed their doctors they were using CBD. Those that stopped using CBD most commonly cited high pricing (56.8% , n=21) when asked why they stopped.
Conclusion(s) Despite a lack of medical evidence, two-thirds reported using CBD at least once, and many in lieu of some medication. While all the current CBD users found it to be effective, the majority are using vaping products which is alarming given the recent reports on the dangers of vaping. It is critical that physicians discuss CBD's uses and emphasize the risks of certain CBD products with their patients.

Abstract: 364

Are Young Adults Well-Informed? Assessing Older Teens' and Young Adults' Medical Resources on and Knowledge of Cannabidiol (CBD)

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Background The public's interest in CBD has risen with the rapid growth of the CBD market. There is minimal research on CBD's applications and side-effects, but its popularity has led to countless articles/blog posts about CBD which, at best, cite anecdotal evidence. Older teens and young adults (TYA) undergo a transition where they gain autonomy; as such, they begin to make independent health decisions, such as supplemental usage, but may lack important medical research skills to make informed decisions.
Objective To investigate what sources TYA consult regarding CBD use and assess their CBD knowledge.
Design/Methods An anonymous survey was distributed via an online crowdsourcing platform. An algorithm utilizing measures such as unique identifiers, validation questions, and short-answer questions, was used to screen responses. Eligible participants were 18-21 year old English speakers in the US, and had heard of CBD. Respondents shared their introductory and primary medical resource (PMR) used for CBD information. They then completed a 10-question quiz based on the FDA's frequently asked CBD questions.
Results 145 responses met the inclusion criteria. Participants were 59.3%, female (n=86), mean age 20, and respondents were from 41 states. Approximately half (49.6%, n=72) were introduced to CBD by "family/friends" or "coworkers" while 41.4% (n=60) discovered CBD through "news outlets" or "social media." Roughly half (49.0%, n=71) used non-scientific literature, such as social media or the news, while 37.2% (n=54) used their "friends/ family" or "coworkers" as their PMR. Only 14% (n=20) reported "scientific literature" or a "physician" as their PMR. When analyzed by introductory resource, PMR, and age, no significant differences were identified with how well participants performed on the quiz. Less than half (48.3%, n=70) knew that CBD has not "been proven to cure certain types of cancers." Only 40.6% (n=59) knew CBD could "have potential negative effects," and 44.1% (n=64) did not know that CBD may "interfere with the effectiveness of certain drugs or medications" (Table 1).
Conclusion(s) Due to prevalence, physicians should discuss CBD use and potential side-effects. Additionally, pediatricians must reinforce in their TYA patients responsible medical research practices, such as using credible sources and fact-checking claims prior to medical decision making. This small investment of a pediatrician's time can have a lasting impact on how their TYA patients make future medical decisions.

Table 1. CBD Knowledge Quiz Results (N=145)

Question or Statement	Correct Answer	Correct Responses (n)
Drug tests that test for marijuana only screen for THC and not for CBD.	True	59.3% (86)
Is CBD an ingredient in any prescription medications?	Yes	40.0% (58)
Can CBD get you high?	No	80.0% (116)
Are over-the-counter CBD products regulated by the U.S. Food and Drug Administration (FDA)?	Yes	40.7% (59)
Does CBD have potential negative effects?	Yes	40.7% (59)
Marijuana and hemp are the same thing.	False	75.2% (109)
CBD products may also contain THC.	True	57.2% (83)
CBD can interfere with the effectiveness of certain drugs and medications when taken together.	True	55.6% (81)
CBD has been proven to cure certain types of cancers.	False	48.3% (70)
Marijuana contains CBD.	True	77.2% (112)
	Mean Score:	~6/10

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The Role of Gender in Adolescent Perceptions of Sexual Health Education

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Background Formal sexual health education programs have been shown to increase safe sex practices in adolescents. However, there is a steady decline in the number of teenagers who report receiving this formal education in the US. Specifically, female adolescents have experienced a more significant decrease in access to sexually-transmitted disease (STD) education than their male counterparts.
Objective To evaluate whether gender affects adolescents' preference for more or less time dedicated to STD-related education and their reported primary source of sexual health information.
Design/Methods This is a cross-sectional study of 161 full-time students, ages 13-17 years old, presenting to an urban, pediatric emergency department. Patients who were non-English speaking, deaf, or medically/emotionally unstable were excluded. During a single study visit, adolescents completed a confidential, semi-structured interview and a self-administered, electronic survey. Data collected included: primary source of sexual health information and whether or not adolescents felt that the amount of time spent learning about STDs in schools should change.
Results 413 participants were approached and 161 enrolled in the study. Of the participants enrolled, 62% were female and 38% were male. When asked about primary source used to learn about sexual health, both male and female adolescents reported most commonly utilizing school (Figure 1, 38% F, 33% M). A greater percentage of males reported using their friends/peers (20% F, 24% M), the internet (6% F, 11% M) and siblings (1% F, 8% M). A greater percentage of females reported learning from their parents (28% F, 18% M). When asked about the amount of time spent learning about STDs in school, the majority of both male and female adolescents felt that the time should either increase (61% F, 53% M) or stay the same (35% F, 45% M) as opposed to decrease (4% F, 3% M).
Conclusion(s) Adolescents most commonly report school as their primary source to learn about sexual health. Teenagers are interested in learning more about STDs in school. Gender does not appear to have a role in sources adolescents use for sexual health education or their perception regarding STD learning.

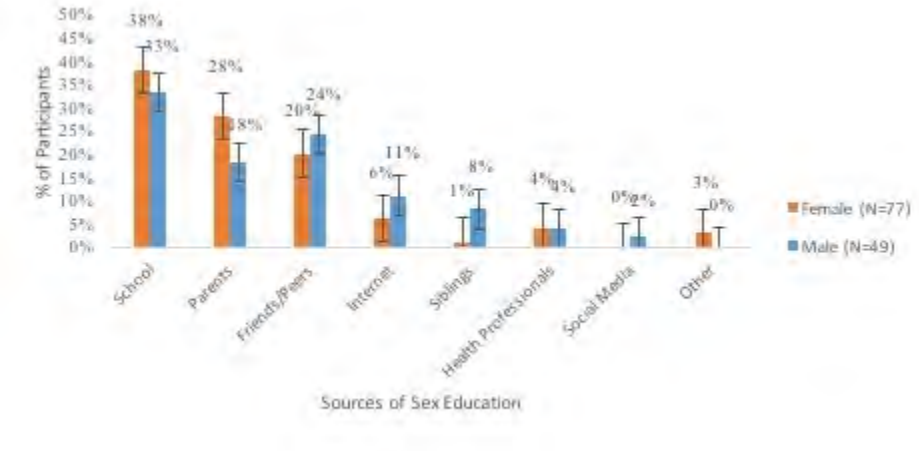

Figure 1. Percentage of participants who reported using each source as their primary resource to learn about sex.

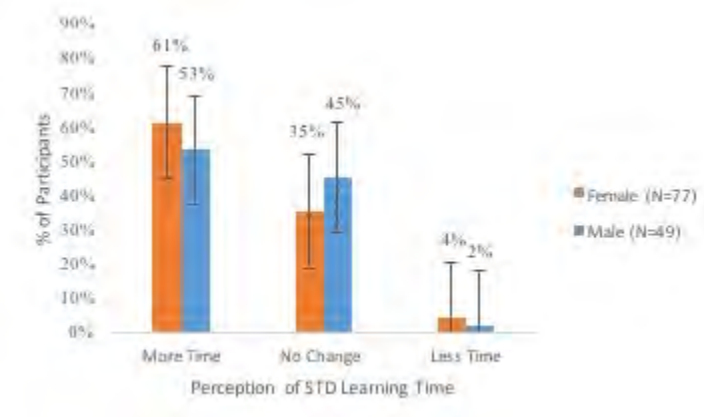

Figure 2. Adolescent perceptions regarding time spent learning about STDs in school.

Table 2

	Female (n=77)	Male (n=49)
More Time	61%	53%
No Change	35%	45%
Less Time	4%	2%

Adolescent perceptions regarding time spent learning about STD's in school

Table 1

	Female (n=77)	Male (n=49)
School	38%	33%
Parents	28%	18%
Friends/Peers	20%	24%
Internet	6%	11%
Siblings	1%	8%
Health Professionals	4%	4%
Social Media	0%	2%
Other	3%	0%

Percentage of participants who reported using each source as their primary resource to learn about sexual health

Abstract: 366
Fetal physiologic response and transplacental exposure with maternal E-cigarette aerosol inhalation
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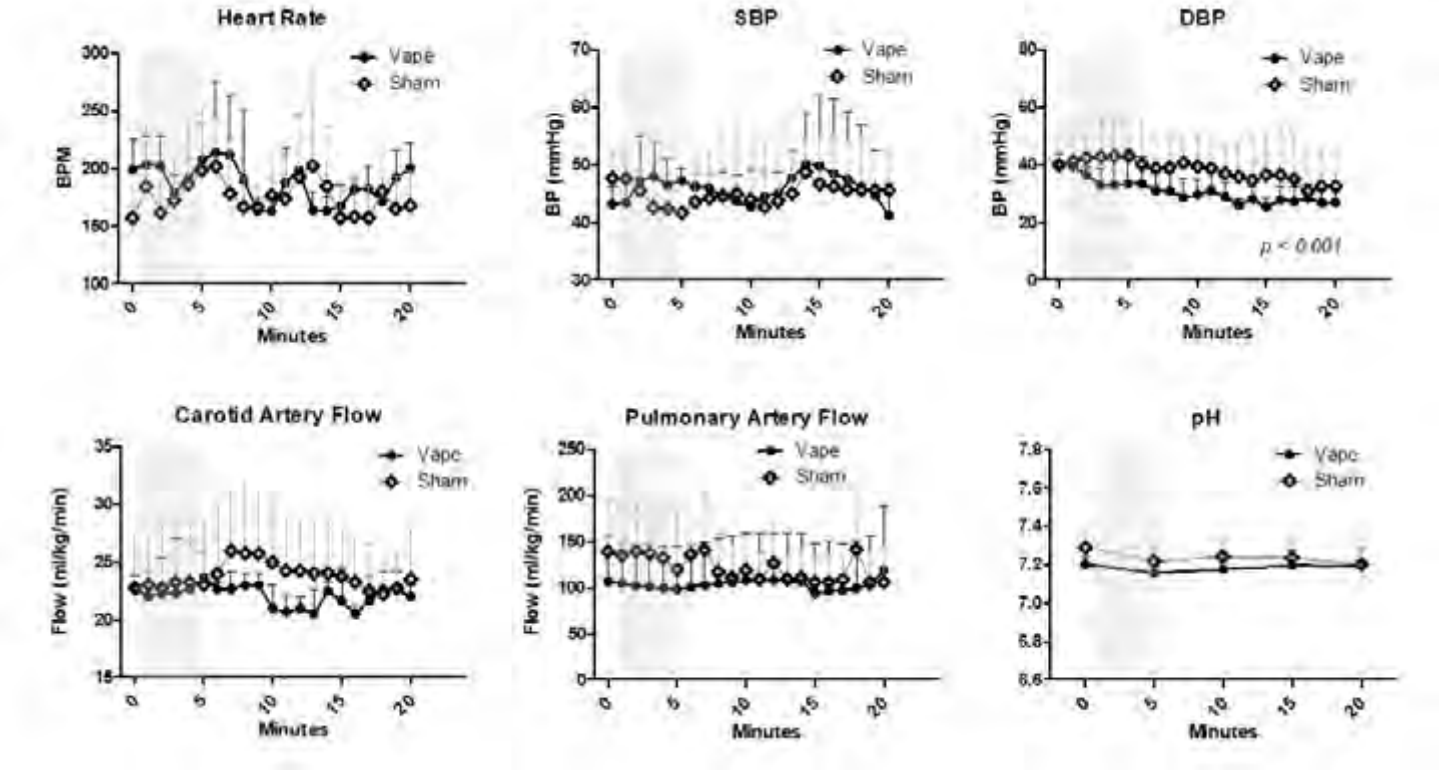
Background E-cigarette (EC) use is growing among pregnant woman and women of child bearing age. This trend may attributed to misconceptions that ECs are a safer alternative to tobacco. Prevalence studies suggest that 5-15% of women report EC use during pregnancy with as high as 39% of tobacco users reporting dual use. However, limited is known regarding transplacental exposures with EC or the physiologic effects on an exposed fetus.
Objective To determine acute physiologic response and transplacental chemical exposures in a fetus following maternal E-Cigarette aerosol inhalation.
Design/Methods 8 term pregnant sheep were anesthetized and ventilated for fetal delivery by cesarean. Fetal lambs were partially exteriorized and intrumentation for blood sampling and invasive monitoring was performed on placenta prior to maternal aerosol exposure. E-cigarette aerosol was generated from menthol-flavored JUUL E-cigarette and delivered into the maternal ventilatory circuit by positive pressure ventilation (PPV). Exposure included 10 x 70 mL puffs of aerosol (Vape, n = 4) or PPV alone (Sham, n = 4). Paired blood samples were collected every 5 min from ewe and fetus for blood gas and chemical analysis by UPLC or GCMS. Data from continuous hemodynamic monitoring of the fetus was collected.
Results Vape and Sham exposed fetuses demonstrated comparable hemodynamics with no clear impact of EC exposure on sinusoidal heart rate pattern, systolic blood pressure, carotid and pulmonary blood flow or acidosis. However, vape exposure resulted in acute decrease in diastolic blood pressures (Figure 1). There was no significant change in maternal heart rate, blood pressures or blood gases during this time (Figure 2). Paired analysis by GCMS identified numerous flavoring chemicals present in both maternal and fetal blood. However, some flavoring chemicals were noted only in maternal or fetal samples. UPLC for paired nicotine/cotinine levels remains pending.

Conclusion(s) Continuous fetal monitoring suggests minimal change in hemodynamics with maternal aerosol exposure. However, efficient transfer of flavoring chemicals to the fetus occurs. Despite limitations of this animal model, our data suggests that select flavoring chemicals which fail to cross the placenta may be safer options.



Fetal hemodynamic responses following maternal EC aerosol exposure. Grey bars indicate period of EC exposure.

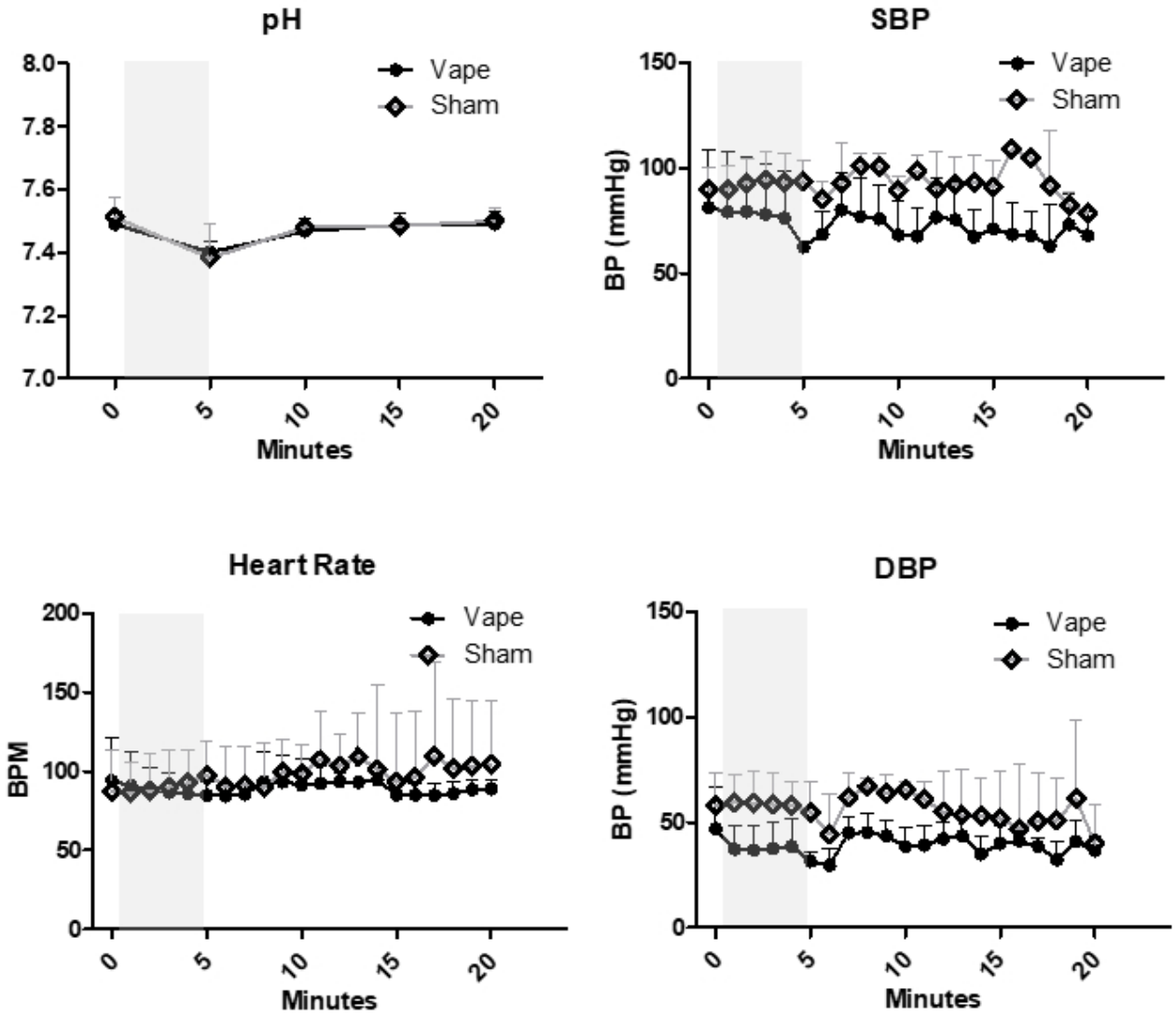


Figure 2: Maternal hemodynamic responses following EC aerosol exposure. Grey bars indicate period of EC exposure.

Abstract: 367

Gestational Exposure to Menthol Aerosol Impacts Pregnancy Success Rates but does not Compromise Fetal Growth

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Background Approximately 7% of women in the United States smoke during pregnancy with rates up to 15% in underserved populations. Surveys suggest that over 85% of pregnant women report use of menthol cigarettes. In addition, menthol is being considered for exemption from E-cigarette flavoring bans with growing use of these products in women of child-rearing age. However, the impact of gestational menthol aerosol exposure remains unknown.

Objective To determine the impact of gestational exposure to aerosolized menthol on pregnancy success rates, fetal and postnatal growth, and cardiopulmonary development

Design/Methods Wild type C57Bl/6 mice were bred with daily surveillance of females for a copulation plug. Females were exposed to aerosolized menthol (15 mg/mL ±menthol in nicotine-free 50%/50% propylene glycol/vegetable glycerin [PG/VG]) or control (50%/50% PG/VG alone) from embryonic day 0 (E0 or day of plug) through delivery (E19) in a CH Technologies programmable exposure system. To mimic published clinical exposures, 16 cycles of 10 x 70 mL puffs of menthol or PG/VG aerosol was delivered

every 30 minutes over an 8 hour period daily. Pregnancy rates, litter size, birthweight and postnatal growth were compared in menthol and PG/VG exposed. Heart and lung tissue of offspring were harvested at postnatal day 14 (P14) with micro-dissection of hearts for assessment of right ventricular hypertrophy (RVH = weight RV/LV+S) as well as inflation fixation of lungs for morphometric analysis. Serum samples for analysis of menthol levels were obtained from exposed females and representative P0 offspring.
Results Presence of a copulation plug correlated with successful pregnancy in only 33% of menthol exposed females while 80% of PG/VG and 86% of unexposed females demonstrated successful pregnancy (**Figure 1**). Menthol exposure did not compromise litter size (8 ± 1 for both menthol and PG/VG), fetal birthweight (1.33g ± 0.16 (menthol) versus 1.22g ± 0.07 [PG/VG]) or postnatal growth (**Figure 2**). In addition, RVH was comparable at P14 (0.38 ± 0.05 (menthol) versus 0.37 ± 0.09 [PG/VG]). Morphometric analysis of lung tissue for impacts on cardiopulmonary development and analysis of menthol levels remains pending.
Conclusion(s) Compared to control litters exposed to PG/VG alone, exposure to aerosolized menthol in a model paralleling clinical use resulted in compromised pregnancy rates but did not impact fetal well-being as evidenced by comparable litter size, birthweight, postnatal growth and RVH.

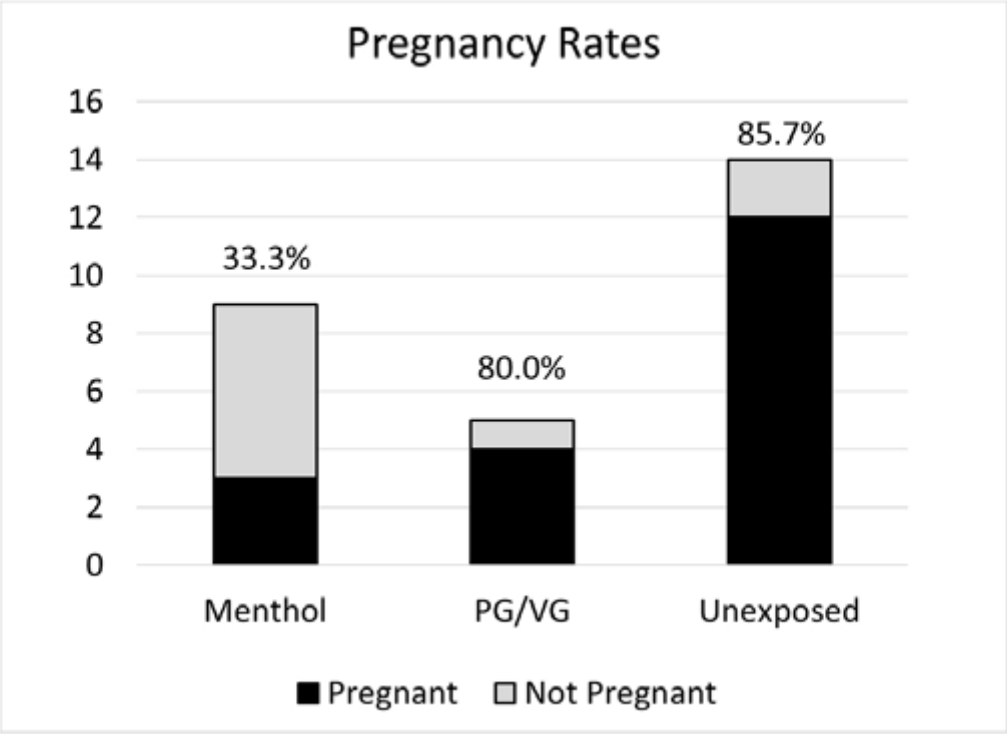

Figure 1: Compromised rates of successful pregnancy with daily exposure to aerosolized menthol.

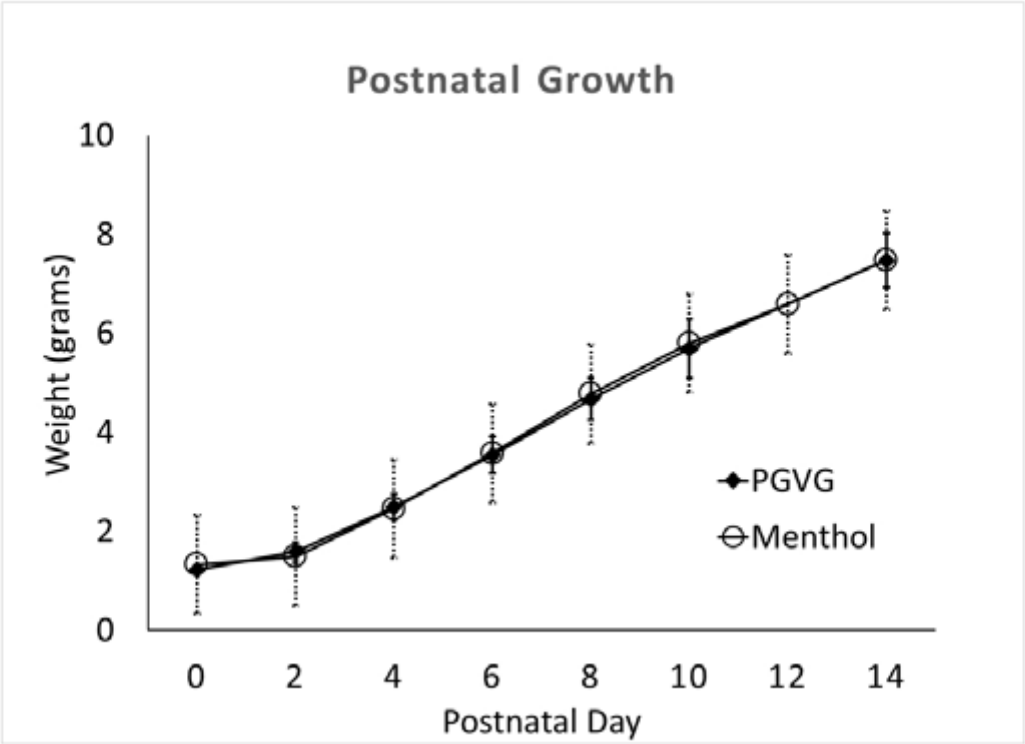

Figure 2: Comparable postnatal growth in offspring after gestational exposure to menthol and PG/VG.

Abstract: 368

Gestational Exposure to E-Cigarette Carriers Alone Results in Compromised Postnatal Growth with Right Ventricular Hypertrophy

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Background E-cigarette (EC) use is growing among pregnant woman and women of child bearing age. This trend may attributed to misconceptions that ECs are a safer alternative to tobacco. Prevalence studies suggest that 5-15% of women report EC use during pregnancy. However, the impact of gestational exposures remains poorly characterized, including the impact of exposure to the carriers propylene glycol/vegetable glycerin (PGVG) alone.
Objective To determine the impact of gestational exposure to aerosolized PGVG on pregnancy success rates, fetal and postnatal growth as well as brain and cardiopulmonary development.
Design/Methods C57Bl/6 mice were bred with daily surveillance for copulation plugs. Females were exposed to aerosolized nicotine and flavoring-free 50%/50% PGVG from embryonic day 0 (E0 or day of plug) through delivery (E19) in a CH Technologies programmable exposure system. Treatment included 10 x 70 ml puffs of PGVG aerosol delivered every 30 min x 16 cycles to parallel published clinical use. Outcomes were compared with sham-handled controls. Rates of pregnancy, litter size, offspring birthweight (BW), and head weight (HW) at birth as well as postnatal growth were evaluated. All litters were culled to comparable size with collection of brain from select offspring at postnatal day 0 (P0) . Heart and lung tissue were harvested at P14 with micro-dissection of hearts for assessment of right ventricular hypertrophy (RVH = weight RV/LV+S) as well as inflation fixation of lungs for morphometric analysis.
Results Comparable pregnancy rates (80% [PGVG] versus 85% [control]) and litter size (8 ± 1 [PGVG] and 8 ± 0.8 [control]) were observed with exposure. While a trend towards lower BW was noted with PG/VG, this difference was not significant (1.22g ± 0.07 [PGVG] versus 1.29g ± 0.13 [control]). PGVG offspring had lower HW (0.300g ± 0.005 [PGVG] versus 0.342g ± 0.008 [control]), suggestive of compromised brain growth (Fig 1). Gestational exposure to PGVG also resulted in compromised postnatal growth with 8.2% growth failure by P14 (Fig 2). RVH was also present at P14 in PGVG offspring (0.37 ± 0.09 [PGVG] versus 0. 29 ± 0.05 [control]). Morphometric analysis of brain and lung tissue remains pending.
Conclusion(s) In a model paralleling clinical use of ECs, gestational exposure to PGVG alone resulted in postnatal growth failure,

RVH, and possible compromised brain growth. These data advocate for further evaluation of the safety of gestational exposure to common constituents present in ECs.

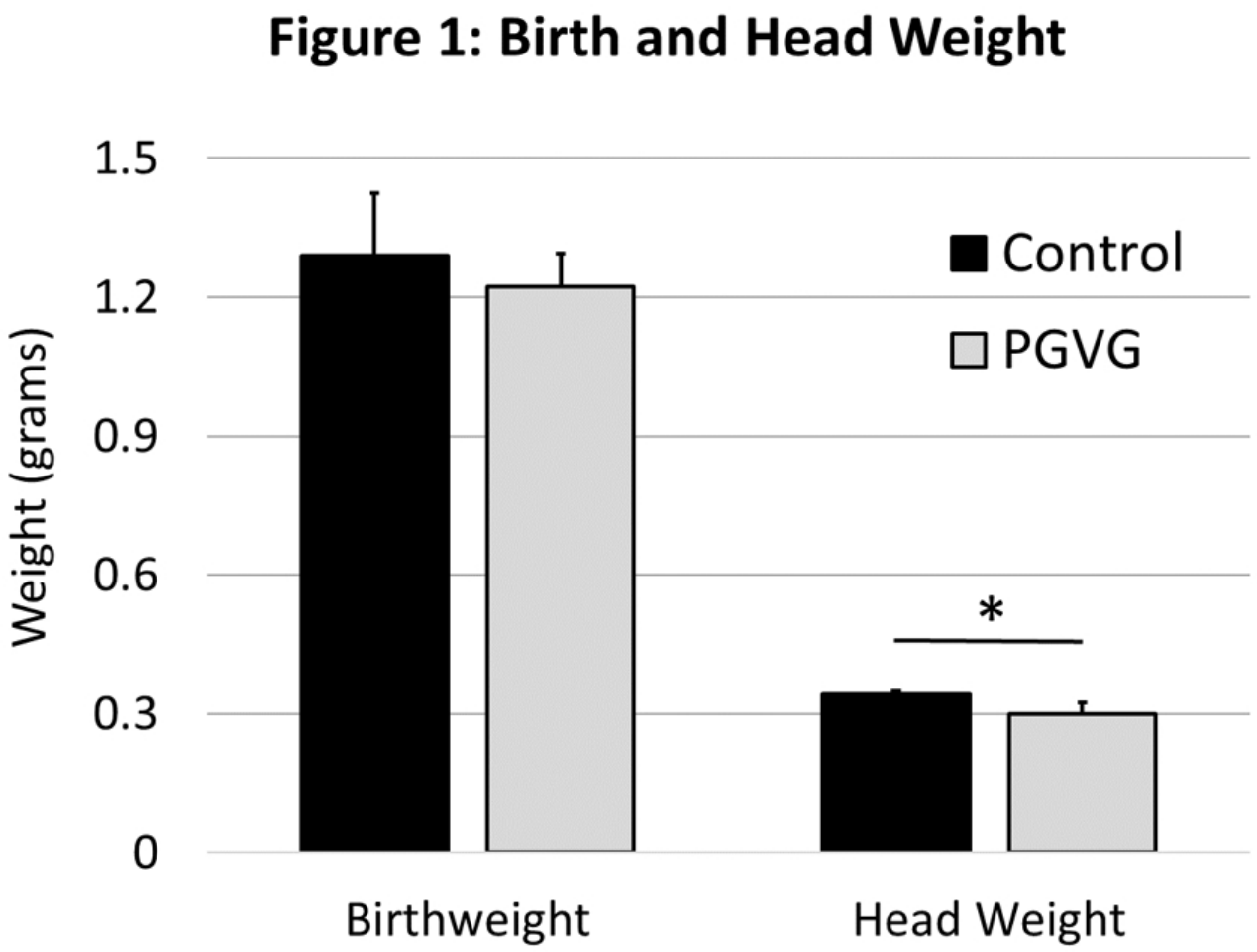

Figure 1: Birth and head weight following gestational exposure to PGVG. * $p < 0.05$.

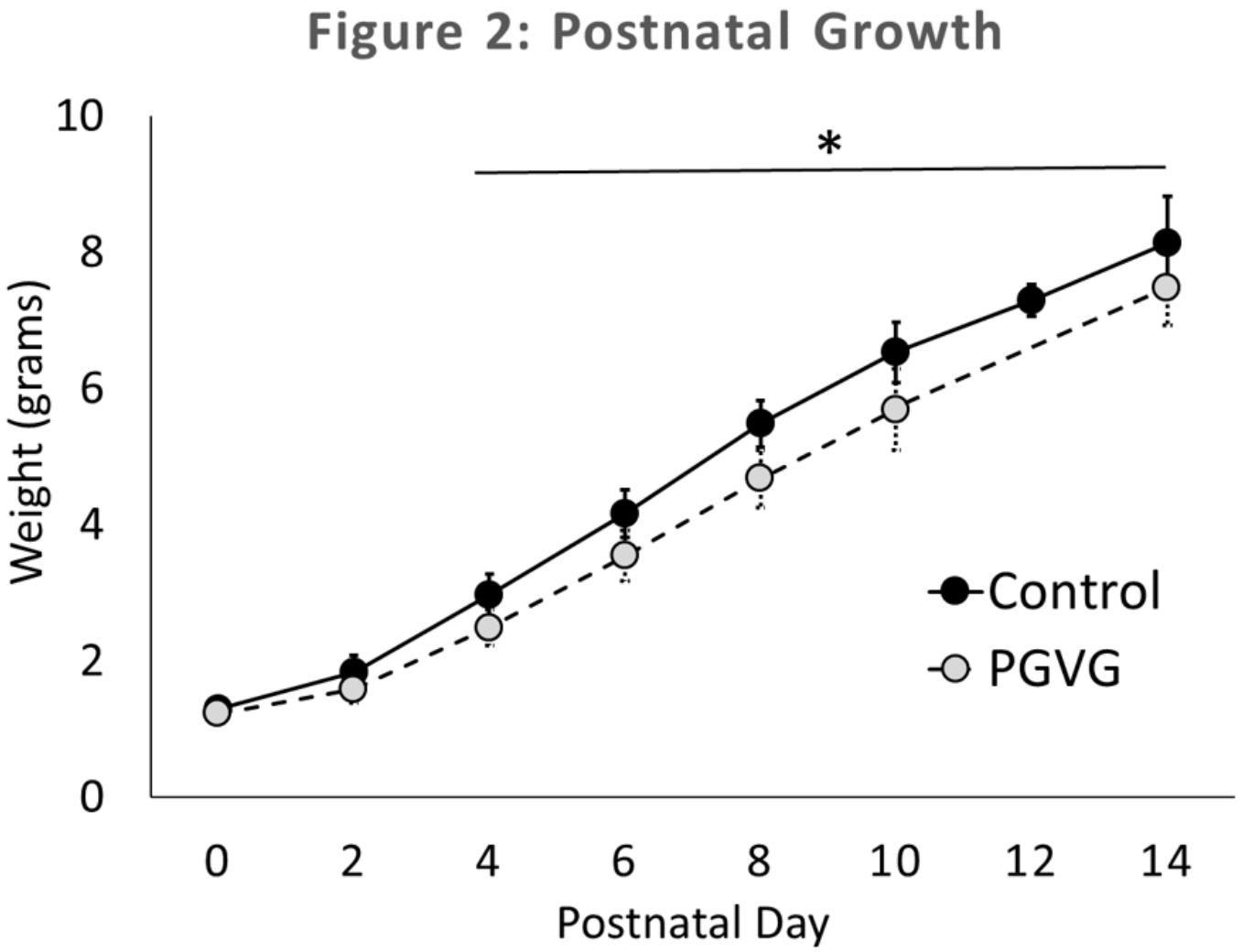

Figure 2: Postnatal growth following gestational exposure to PGVG as compared to sham-handled controls. * $p < 0.05$ by 2-way ANOVA with Bonferroni post-hoc analysis.

Abstract: 369

Urine Collection for Environmental Chemical Exposure Assessment in the NICU

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Background Early exposure to environmental chemicals has been linked to adverse neurodevelopment. In the NICU, plasticizers leach from medical equipment into preterm infants. Although numerous studies of NICU-based exposure to plasticizers rely on urinary biomarkers, there is currently no standard method of collection for environmental analysis. Prior studies collected urine via disposable diapers, cotton balls, and other absorbent materials. It is known from other populations that collection method may significantly impact the yield and reproducibility of specific organic biomarkers. The "best" method of infant urine collection for biomarker yield and accuracy has not been established.
Objective To quantify the yield and accuracy of multiple methods for preterm infant urine specimen collection for phthalate biomarkers.
Design/Methods We evaluated 5 collection materials: cotton balls, woven and non-woven gauze, disposable diapers, and ostomy bags (repurposed to collect urine). Cotton balls were evaluated by two methods: squeezing and aspirating.
First, in a laboratory setting aliquots of standard reference material were dropped on each material in duplicate, allowed to absorb, and extracted to simulate clinical collection. Second, ten collection trials for each method were attempted with preterm infants to

determine feasibility in the clinical setting.
All samples were analyzed in one batch for a panel of nine phthalate metabolites by enzymatic deconjugation, solid phase extraction, and coupled reversed-phase high performance liquid chromatography – triple quadrupole mass spectrometry. Mean, standard deviation, coefficient of variance, and percent recovery were calculated per metabolite for each collection method.
Results Lab trials: Accuracy of biomarker levels against standard reference values and the coefficient of variance within method are depicted in Table 1. Percent recovery was in the accepted range for aspirated and squeezed cotton balls and ostomy bags, but not acceptable for the woven and non-woven gauze. Diaper specimens were not analyzable as the diaper absorbent crystallized the specimens.
Clinical trials: Only 3 trials of ostomy bags were completed due to the technical difficulties presented. Trial success is depicted in Table 2. Volume collected per method is depicted in Table 3.
Conclusion(s) The "aspirated cotton ball" method performed best by all metrics. These results inform interpretation of existing NICU-based environmental health research and provide guidance towards standardizing urine collection from infants.

Table 1

Collection Method	Descriptive Statistic	MCPP	MEP	MiBP	MBP	MBZP	MEHP	MECPP	MEHHP	MEOHP
Lab Analyzed Reference Material	coefficient of variance (%)	4.27	1.84	3.19	7.61	3.97	2.22	1.01	1.57	2.43
	percent difference	14.6	0.66	7.54	11.81	8.85	10.67	0.83	6.52	14.62
Cotton balls, squeezed	coefficient of variance (%)	32.87	32.88	35.58	33.35	35.76	34.96	35.85	33.23	34.02
	percent difference	28.59	24.75	28.52	27.49	30.33	26.21	26.32	25.37	29.60
Cotton balls, aspirated	coefficient of variance (%)	2.01	1.12	3.96	0.35	3.75	6.21	1.85	3.73	6.77
	percent difference	6.40	13.36	7.19	7.66	12.28	21.21	18.91	16.02	5.85
Gauze, woven	coefficient of variance (%)	40.77	45.81	48.50	45.41	46.07	31.78	49.16	42.70	42.86
	percent difference	49.84	54.27	51.31	48.59	52.82	54.56	56.31	55.45	47.65
Gauze, non-woven	coefficient of variance (%)	58.96	62.71	62.95	68.60	58.26	67.18	60.69	61.89	56.60
	percent difference	41.10	47.23	38.75	42.19	45.18	43.34	49.69	47.75	41.25
Ostomy bag	coefficient of variance (%)	32.87	32.88	35.58	33.35	35.76	34.96	35.85	33.23	34.02
	percent difference	10.10	12.75	6.72	8.20	5.94	15.77	12.91	9.77	6.08

MCPP = mono-(3-carboypropyl) phthalate, MEP= mono-ethyl phthalate, MiBP = monoisobutyl phthalate, MBP = monobultyl phthalate, MBZP = monobenzyl phthalate, MEHP = mono-(2-ethylhexyl) phthalate, MECPP = (2-ethyl-5-carboxypentyl) phthalate, MEHHP = mono(2-ethyl-5-hydroxyhexyl) phthalate, MEOHP = mono(2-ethyl-5-oxohexyl) phthalate

Table 2: Collection Success in Clinical Setting

Collection Method	Successful trials* (%)
Cotton ball, squeezed	60.0
Cotton ball, aspirated	60.0
Gauze, woven	10.0
Gauze, non-woven	40.0
Ostomy bag	66.7
Diaper	30.0

*Trials were considered successful if a minimum of 0.5mL of urine was collected without contamination by stool

Table 3: Volume collected

Collection Method	Mean ± sd (mLs)
Cotton ball, squeezed	1.75 ± 0.76
Cotton ball, aspirated	1.61 ± 1.24
Gauze, woven	0.2 ± 0.21
Gauze, non-woven	1.35 ± 1.44
Ostomy Bag	10.9 ± 1.98
Diaper	1.18 ± 0.49

Volume collected was considered only if the trial was successful

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Identification of retinal hemorrhage on magnetic resonance imaging compared to dilated fundoscopic examination among suspected child abuse victims

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Background Evaluation for retinal hemorrhage (RH) is a critical component of the workup for young victims of suspected abusive head trauma (AHT). Dilated fundoscopic examination (DFE) is considered the gold standard assessment for RH, but can be difficult to perform given patient age, clinical status and the need for ophthalmological expertise. Prior studies have demonstrated that magnetic resonance imaging (MRI) can detect RH but few have compared it to DFE.
Objective To demonstrate the sensitivity and specificity of MRI for RH compared to DFE among suspected child abuse victims.
Design/Methods A secondary analysis of a retrospective cohort study was performed of children ≤ 2 years of age who were admitted for evaluation by our institution's multidisciplinary child protection team for either clinical concerns of AHT or as an occult injury screen for suspicion of general physical abuse with neuroimaging performed. ICD codes were used to identify patients admitted with concerns for physical abuse between January 2010-January 2019 across 2 hospital sites. The electronic health record (EHR) was then queried to determine if patients met study inclusion criteria: evaluation by the child protection team, brain MRI, and completion of DFE. Patients with incomplete or inaccessible MRI or DFE results were excluded. All DFE were performed by pediatric ophthalmologists and consultation notes were extracted from the EHR by one reviewer. All MRIs were reviewed for the presence of RH by one of two pediatric neuroradiologists who were blinded to the results of the DFE. Abuse classification (suspicious for abuse, plausibly accidental, undetermined) was determined based upon the outcome of the child protection team consultation and also extracted from the EHR by one reviewer.

Results Of the 88 patients who met study criteria, 41 (46%) were found to have RH on DFE. Compared to DFE in all patients, MRI evaluation for RH has a sensitivity of 48.8% (95% CI 32.9-64.9), specificity of 97.9% (95% CI 88.7-99.6), PPV of 95.2% (95% CI 76.2-99.9) and NPV of 68.7% (95% CI 56.2-79.4). 59 of the 88 patients who had both MRI and DFE performed were classified as suspected abuse. Compared to DFE in this subset, MRI has a sensitivity of 55.6% (95% CI 38.1-72.1), specificity of 100% (95% CI 85.2-100), PPV 100% and NPV 58.9% (95% CI 49.9-67.4).
Conclusion(s) Findings of RH on MRI are highly specific with a high positive predictive value and could be considered as an alternative when DFE is unavailable.

Abstract: 371

Validating the use of a Transcutaneous Bilirubinometer (TcB) to Non-Invasively Assess Total Bilirubin Levels in Tanzania, a Low Resource Country

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Background Hyperbilirubinemia (HYPERB) progressing to bilirubin encephalopathy/kernicterus has a disproportionate burden in low resource settings. The incidence of HYPERB in Tanzania is unknown since the diagnosis is invariably clinical without a total serum bilirubin (TSB). TcB is used to screen newborns in the USA; obtained values are plotted on an age-related nomogram to guide therapy. We hypothesized that the TcB will correlate with a TSB to facilitate management of HYPERB.
Objective To determine whether: 1. TcB levels correlate with a TSB. 2. TcB can be used as a screening tool to manage HYPERB in Tanzania.
Design/Methods Prospective observational study of neonates ≥35 weeks admitted to the neonatal unit at Muhimbili National Hospital from Nov 2018-Oct 2019. A TcB measurement (TcB, Draeger JM-105) was determined concurrently with a lab TSB obtained for clinical jaundice. Blood typing (ABO) was recorded and Rh status is rarely available. HYPERB is treated with phototherapy.
Results 182 newborns of gestational age 38.4 ±1.8 wks, birthweight 3000g ±580g were enrolled. Pertinent findings were male (60%), exclusive breast feeding (83%) and ABO incompatibility (36%). The mean TcB was 10.1 ±5.8 mg/dL and TSB 10.4 ±6.1 mg/dL; the latter obtained at a postnatal age of 74.0 ±44.0 hrs. One infant was encephalopathic. The mean difference of TcB - TSB was -0.4 ±2.3 mg/dL. TcB underestimated TSB in 71% of neonates (mean difference -1.4 ±1.4) and overestimated TSB in 29% (mean difference 2.1 ±2.0) (Fig 1). TcB correlated with TSB (r^2 0.85) (Fig 2). Using a Bland-Altman plot, the mean difference and imprecision for TcB vs TSB for TcB values <10 mg/dL was -0.6 ±1.6 mg/dL and for TcB ≥10 mg/dL, -0.2 ±2.8 mg/dL. TcB values ≥10 mg/dL had greater imprecision (±2.8 mg/dL) (Fig 3,4). When plotting TcB values on a risk stratified nomogram (BiliTool™) by postnatal age (24, 48, 72, 96 and 120 hrs of life) the TcB was able to detect infants in the high-risk category (>95th percentile) with a sensitivity ranging from 75 to 100%, specificity 92 to 100% and a positive predictive value of 67 to 100%. Comparable results were obtained for ABO incompatibility.
Conclusion(s) These findings suggest that TcB is a reliable method of estimating TSB and can be used as a screening tool to guide diagnosis and treatment of hyperbilirubinemia in Tanzania. These observations can be extended to the well newborn population (~7000 deliveries) who are typically discharged by 24 hours without a bilirubin assessment.

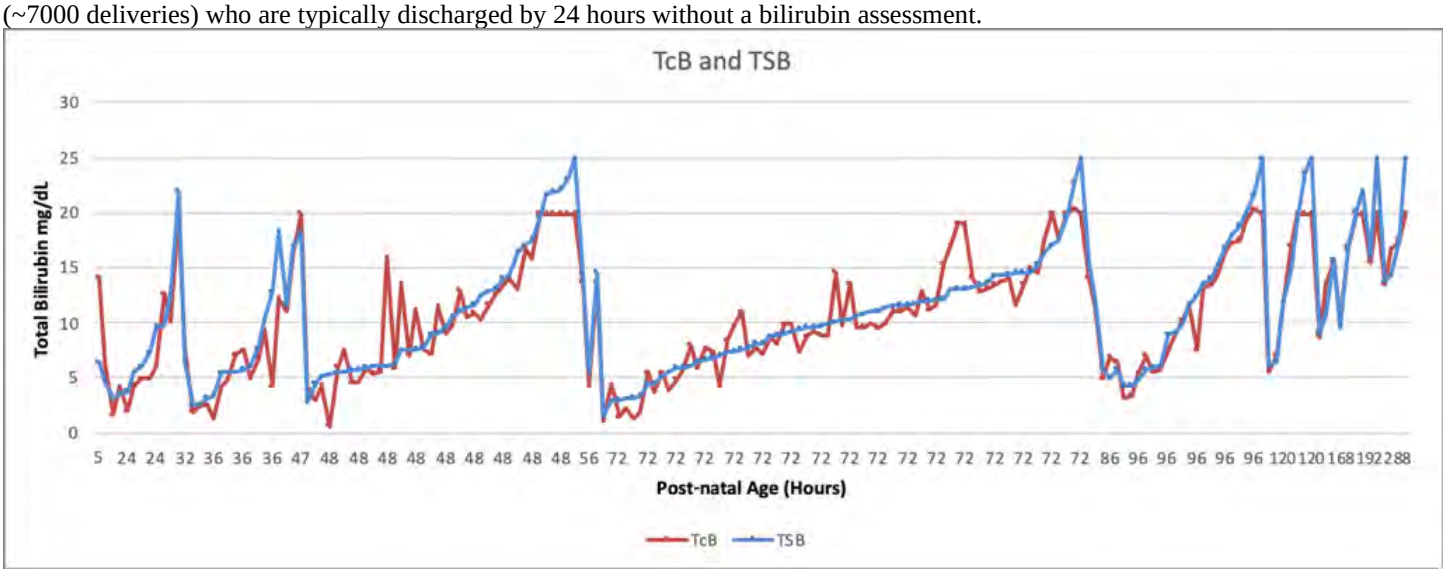

Figure 1: Relationship of TcB (Draeger JM-105) and TSB

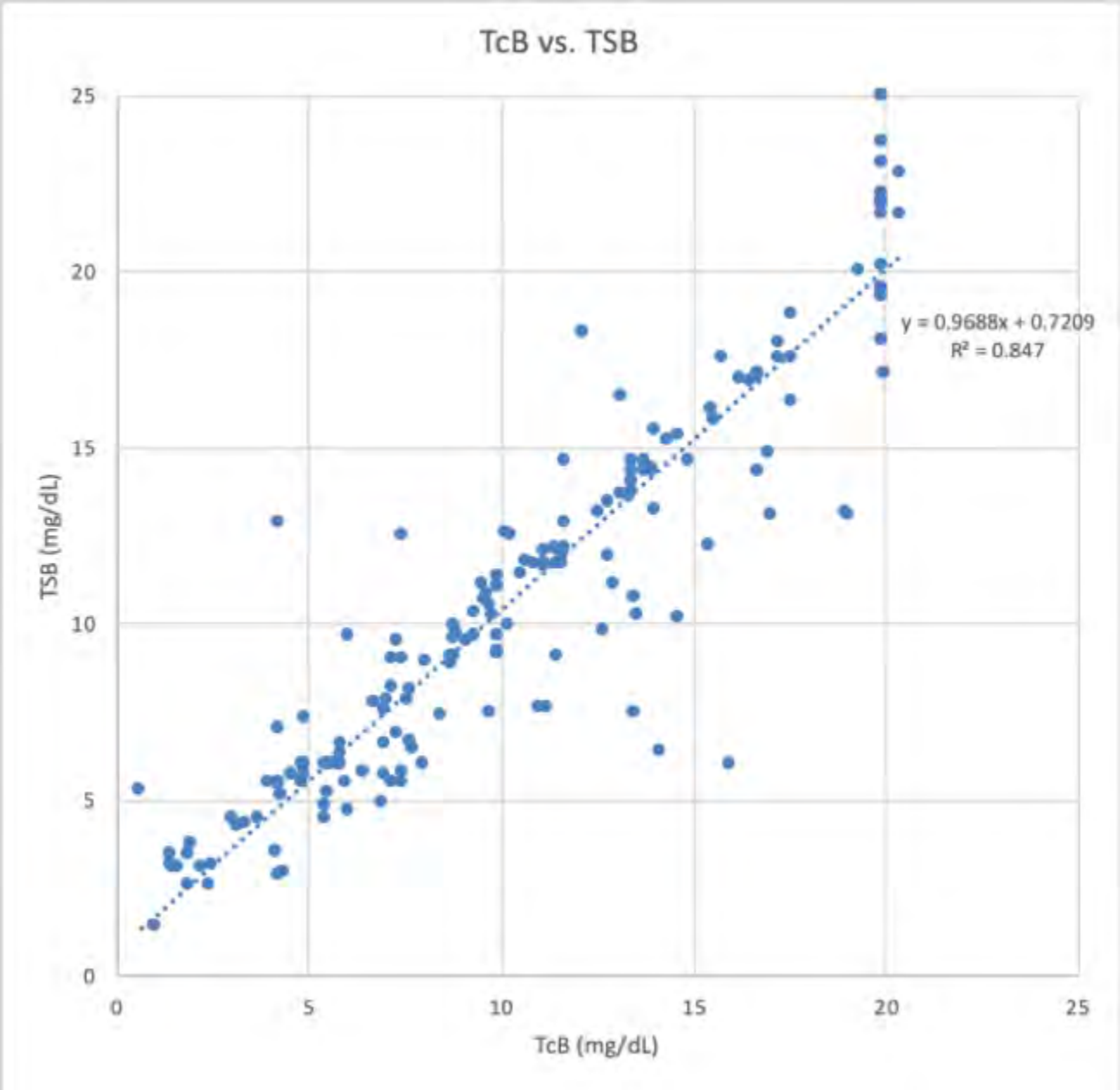

Figure 2: Correlation of TcB compared to TSB

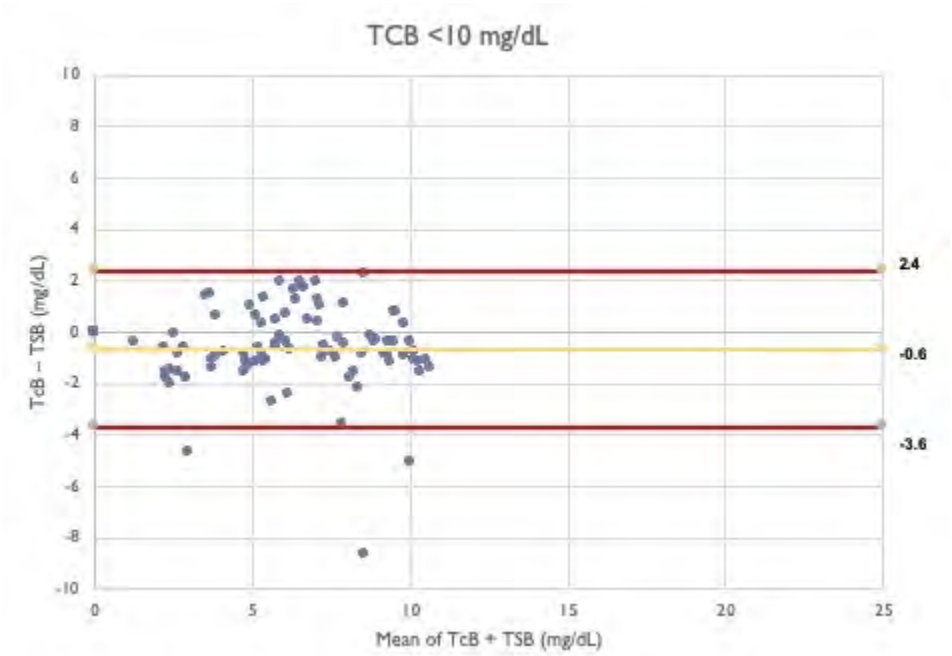

Figure 3: Mean bias (yellow line) ± Imprecision (red lines) of TcB (<10 mg/dL) and TSB

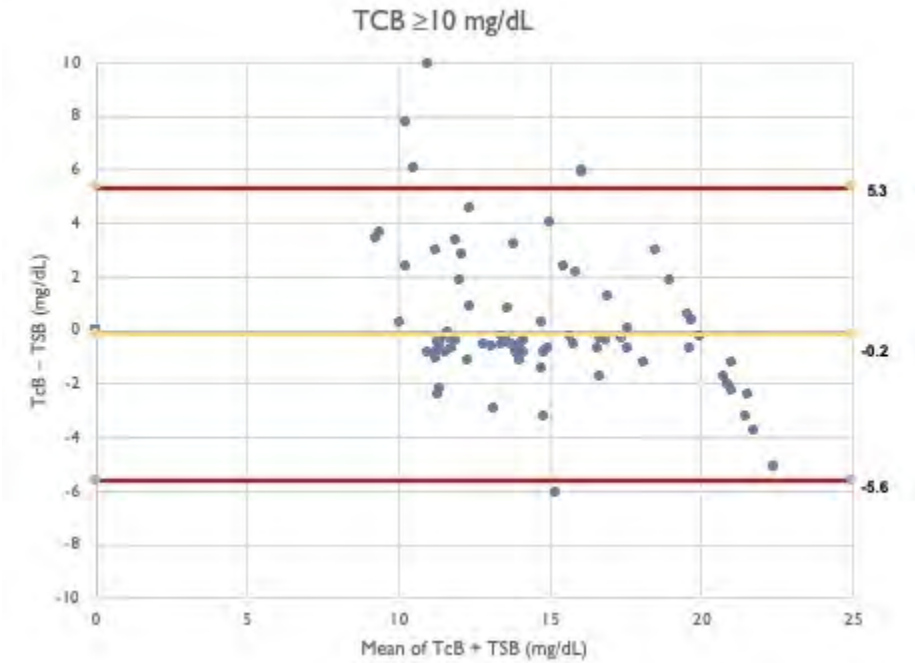

Figure 4: Mean bias (yellow line) ± Imprecision (red lines) of TcB (≥10mg/dL) and TSB

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Health Care Costs of Major Morbidities associated with Prematurity in United States Children's Hospitals

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Background Bronchopulmonary dysplasia (BPD), intraventricular hemorrhage (IVH), and retinopathy of prematurity (ROP) are major morbidities in preterm infants, and previous studies have found BPD to be the most significant cost burden compared to other complications associated with prematurity. However, these studies were single-center cohorts and/or from more than a decade ago.

Costs in the setting of contemporary management changes are unknown.
Objective To analyze costs of severe BPD (sBPD), severe IVH (sIVH), and severe ROP (sROP) from a contemporary cohort of large children's hospitals in the US.
Design/Methods A retrospective cohort of preterm infants [gestational age (GA) 24-32 weeks with birth weight 500-2500g] admitted in the first 3 days of life in 2007-2018 who survived to 36 weeks postmenstrual age (PMA) or discharged home after 34 weeks PMA from hospitals participating in the Pediatric Health Information System was identified. Additional eligibility criteria are described in Table 1. Daily charges were adjusted by hospital geographical price/wage index, converted to costs using service-specific ratios of costs to charges for each hospital and year, then inflated to 2018 US$ using consumer price index, and accumulated for the initial hospitalization. Quantile regression was employed to examine morbidities costs across different total costs quantiles.
Results 33,244 infants from 13 hospitals were eligible for analysis. Table 1 describes the cohort characteristics. Costs were higher in lower GA, and the costs associated with having each morbidity were higher ($p<0.001$) within each GA category (Figure 1A-1C). For example, in GA 25-26 weeks, median costs of sBPD were $478,390 vs. $287,710 in those without sBPD. Costs were also higher ($p<0.001$) with each additional morbidity (Figure 1D). In the fully adjusted median regression model (Table 2), sBPD had incremental costs of $33,354, sIVH $11,186, and sROP $11,760. Quantile process plots (Figure 2A-2C) show that sBPD had similar incremental costs from 40^{th}-60^{th} %tile, but started to have rising incremental costs after 60^{th} %tile of the total costs. sIVH and sROP had relatively stable incremental costs across wider ranges of total costs.
Conclusion(s) sBPD remains the most costly morbidity in preterm infants and likely the contributing morbidity for increased costs, whereas sIVH and sROP do not contribute a greater effect as the total costs increase. Additional studies in characterizing resources used in sBPD may help to identify a cost saving strategy.

PATIENTS[a]		HOSPITALS[a]	
TOTAL	33244 (100.0%)	TOTAL	13 (100%)
sBPD[b]	3316 (10.0%)	Region	
sIVH[c]	1347 (4.1%)	Northeast	2 (15.4%)
sROP[d]	878 (2.6%)	Midwest	6 (46.2%)
Gestational age		South	3 (23.1%)
24 weeks	1449 (4.4%)	West	2 (15.4%)
25-26 weeks	4342 (13.1%)	Number of NICU Beds	
27-28 weeks	6096 (18.3%)	< 60	3 (23.1%)
29-30 weeks	8037 (24.2%)	60-79	4 (30.8%)
31-32 weeks	13320 (40.1%)	>= 80	6 (46.2%)
Birth weight		Associated with a NRN Center	
500-749g	3123 (9.4%)	Yes	3 (23.1%)
750-999g	5630 (16.9%)	No	10 (76.9%)
1000-1499g	12294 (37.0%)	Has NPM Fellowship	
1500-1999g	9772 (29.4%)	Yes	11 (84.6%)
2000-2499g	2425 (7.3%)	No	2 (15.4%)
Gender		MSA population	
Male	17697 (53.2%)	< 1 million	2 (15.4%)
Female	15547 (46.8%)	1-3 milllion	8 (61.5%)
Race/Ethnicity		> 3 million	3 (23.1%)
Non-Hispanic White	12750 (38.4%)		
Non-Hispanic Black	5123 (15.4%)		
Hispanic	3548 (10.7%)		
Other/Unknown	11823 (35.6%)		
Multiple gestation	7224 (21.7%)		
Major congenital anomaly	6459 (19.4%)		
Age at first admission			
0 DOL	31571 (95.0%)		
1 DOL	1321 (4.0%)		
2 DOL	205 (0.6%)		
3 DOL	147 (0.4%)		
Length of Stay, days (IQR)	52 (33-82)		
Mechanical ventilation, days (IQR)	1 (0-7)		

[a] Hospitals that admitted fewer than 5 infants without major congenital anomalies in each GA category (24-26, 27-28, 29-30, 31-32) per year were excluded. Hospitals and patients without billing records were also excluded.

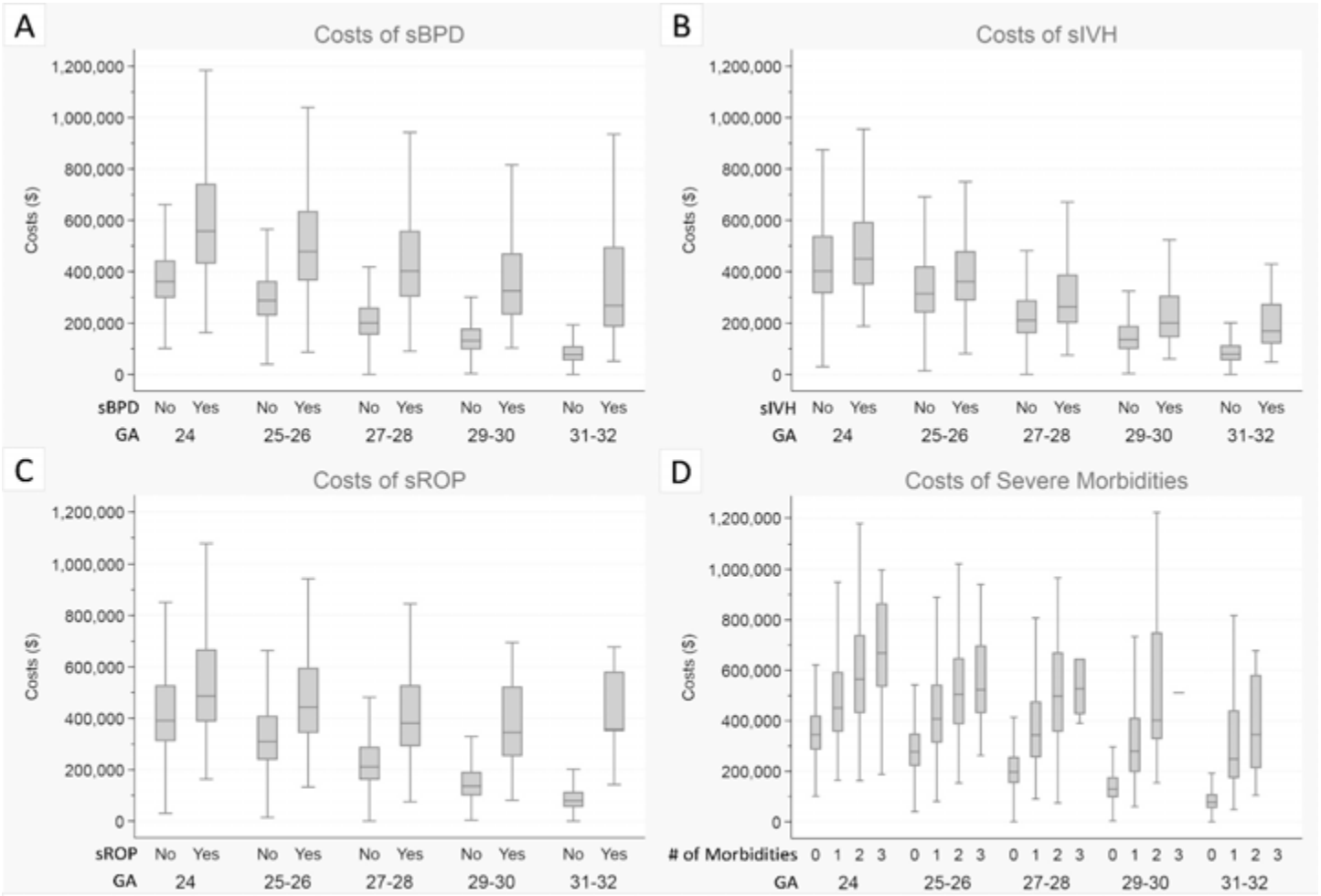
[b] sBPD was defined as need for at least 4 days of positive pressure ventilation and/or mechanical ventilation during the 35th week PMA, using daily respiratory services charges.

[c] sIVH was defined as grade III/IV from the International Classification of Diseases, Ninth Revision and Tenth Revision, Clinical Modification (ICD-9-CM and ICD-10-CM) codes.

[d] sROP was defined as ROP needing surgery (identified from ICD-9 and ICD-10 Procedure Codes) or anti-VEGF therapy (identified from daily pharmacy charges).

Note: IQR = interquartile range, NRN = Neonatal Research Network, NPM = neonatal-perinatal medicine, MSA = metropolitan statistical area.

Table 1: Patient and Hospital Characteristics



Box-and-whisker plots with whiskers at 1.5*IQR above Q3 and 1.5*IQR below Q1. Extreme outliers beyond the whiskers are not shown.
A) Costs of sBPD by GA, statistically significant ($p<0.001$) in each GA category.
B) Costs of sIVH by GA, statistically significant ($p<0.001$) in each GA category.
C) Costs of sROP by GA, statistically significant ($p<0.001$) in each GA category.
D) Costs of total number of severe morbidities (sBPD, sIVH, sROP) by GA, statistically significant ($p<0.001$) in each GA category.

Figure 1: Distribution of Costs by Gestational Age

	Adjusted by Hospital		Adjusted by Hospital and All Covariates	
Covariates	Coefficient (95% CI)	p-value	Coefficient (95% CI)	p-value
sBPD (ref: no)	295417 (287899, 302935)	<0.001	33354 (30556, 36152)	<0.001
sIVH (ref: no)	193353 (183184, 203522)	<0.001	11186 (8159, 14213)	<0.001
sROP (ref: no)	303479 (288800, 318158)	<0.001	11760 (5807, 17713)	<0.001
Gestational age (ref: 31-32 weeks)		<0.001		<0.001
24 weeks	329165 (319748, 338582)		5912 (1700, 10124)	
25-26 weeks	235117 (231113, 239120)		1228 (-1303, 3758)	
27-28 weeks	129986 (127613, 132359)		-1963 (-3485, -440)	
29-30 weeks	54612 (52798, 56426)		-2959 (-3933, -1984)	
Birth weight (ref: 2000-2499g)		<0.001		<0.001
500-749g	298795 (292574, 305015)		1181 (-1508, 3870)	
750-999g	191368 (187759, 194976)		-1177 (-3193, 840)	
1000-1499g	74979 (72367, 77591)		-2318 (-3639, -996)	
1500-1999g	14977 (12856, 17098)		-1905 (-3007, -803)	
Male Gender (ref: Female)	4561 (1582, 7541)	0.003	-13 (-615, 589)	0.965
Race/Ethnicity (ref: non-Hispanic White)		<0.001		<0.001
Non-Hispanic Black	9908 (5085, 14731)		1941 (1025, 2857)	
Hispanic	3330 (-2527, 9187)		497 (-619, 1613)	
Other/Unknown	-9635 (-12803, -6466)		1691 (884, 2497)	
Multiple gestation (ref: singleton)	-14026 (-17587, -10464)	<0.001	211 (-581, 1004)	0.601
Major congenital anomaly (ref: not present)	108434 (103094, 113774)	<0.001	6813 (5750, 7876)	<0.001
Age at first admission (ref: 0 DOL)		<0.001		0.013
1 DOL	34229 (23821, 44637)		1485 (-401, 3372)	
2-3 DOL	35423 (15861, 54985)		4836 (910, 8762)	
Length of Stay (days)	3447 (3427, 3467)	<0.001	2925 (2893, 2957)	<0.001
Mechanical ventilation (days)	5163 (5074, 5253)	<0.001	1035 (980, 1091)	<0.001

Table 2: Median Regression of Costs

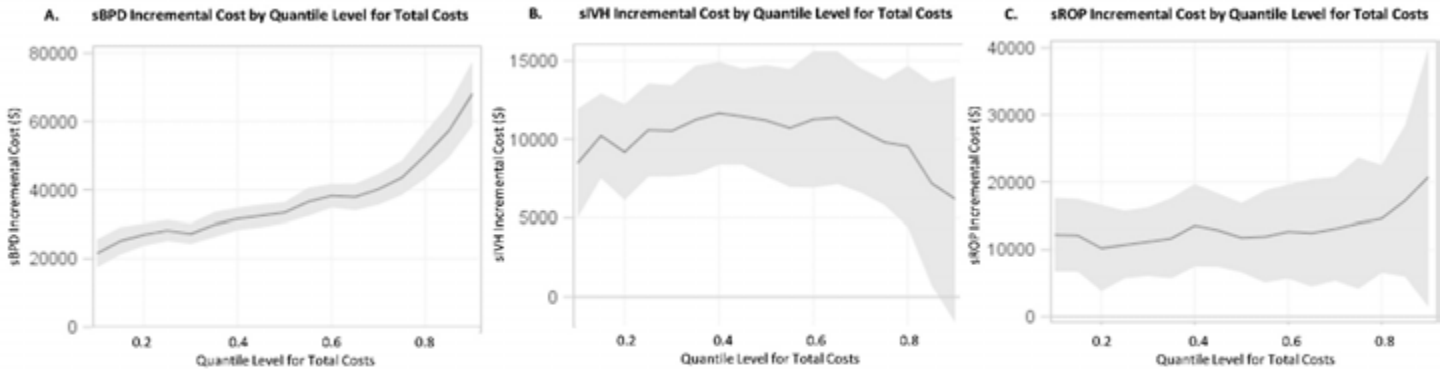


Figure 2: Quantile Process Plots for sBPD, sIVH, sROP

Abstract: 373

Challenges of Appropriate Vancomycin Dosing in Children

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Background Vancomycin is a glycopeptide antibiotic that is widely used to treat suspected or confirmed infections caused by methicillin-resistant *Staphylococcus aureus* and coagulase-negative staphylococcus. Adequate drug levels are needed for efficient bacterial killing with higher serum trough concentrations of 15-20 ug/ml than are recommended for complicated infections. There are no current recommendations for higher dosing in children, and data on the effect of various vancomycin regimens on renal function are limited.
Objective To compare recommended and required daily dosing of vancomycin to achieve therapeutic trough levels in children without renal dysfunction and to assess the impact of dosing on renal function.
Design/Methods A retrospective chart review was conducted in patients aged 0 to 18 yrs who received intravenous vancomycin between Jan 2013 to Jan 2019 in two urban community hospitals. Inclusion criteria were 1st trough level drawn at steady state within 30 minutes before the 4th or subsequent dose. Exclusion criteria were renal dysfunction or those with inadequate collected samples. Trough level between 10-20 ug/ml was considered optimal. Estimated glomerular filtration rate (eGFR) was calculated using Schwartz equation. Vancomycin dosing was obtained from Neofax® for neonates and from Lexicomp® for children. Data were analyzed using paired and independent sample student t-test, one way ANOVA and chi-square, $p<0.05$ was considered significant.
Results Of 484 charts reviewed, 329 met inclusion criteria. Of 126 neonates, 23% achieved therapeutic trough levels at the initial recommended dosing. Neonates <28 wks gestation age (GA) had significantly lower trough level (6.5 ug/ml, p=0.008) and least likely to achieve normal trough levels when compared to other neonates (7%, p=0.005), table 1. Of 183 children, optimal trough levels were achieved in only 33%, table 2. Higher vancomycin dosing did not affect eGFR among neonates and children 4-18 yrs. Although higher dosing significantly decreased eGFR in children aged 1 mos to 4 yrs, the difference was not clinically significant. Across all age groups, additional 13.8 to 18.2 mg/day was needed to achieve therapeutic levels, table 3.
Conclusion(s) At currently recommended dosing of vancomycin, majority of neonates and children achieved suboptimal vancomycin trough level, in particular neonates <28 wks GA. Higher doses are needed to achieve therapeutic trough levels. Higher adjusted dosing did not meaningfully alter eGFR in neonates and children with no preexisting renal condition.

Table 1: Neonates (n=126), vancomycin trough, dose change and eGFR

GA	<28 wks (n=41)	28-<34 wks (n=50)	34-37 wks (n=14)	≥37 wks (n=21)	p value
1st trough mean (SD)*	6.5 (2.6)	8.6 (4.4)	10.1(4.3)	7.7 (3.4)	0.008
optimal level n (%)**	3 (7)	12 (24)	7 (50)	7 (33)	0.005
dose change mean (SD)*	+16.7 (7.3)	+15.3 (6.8)	+13.8 (11.9)	+15.5 (7.1)	0.71
change in eGFR mean (SD)**	+2.8 (6.7)	+4.4 (8.5)	-0.1 (17.8)	-3.8 (13.8)	0.04

* Analyzed using one-way ANOVA to determine differences between groups. ** Analyzed using chi-square test to determine differences between groups.

Table 2: Children (n=183), vancomycin trough, dose change and eGFR

age	1 mos-<1 yr (n=55)	1-<4 yrs (n=47)	4-<12 yrs (n=62)	12-18 yrs (n=19)	p value
1st trough mean (SD)*	9.8 (5.2)	8.3 (3.8)	8.3 (3.5)	10.7 (3.2)	0.04
optimal level n (%)**	20 (36)	14 (30)	18 (29)	9 (47)	0.44

dose change mean (SD)*	+14.8 (12.3)	+18.2 (7.6)	+16.2 (7.5)	+17.3 (7.9)	0.52
change in eGFR mean (SD)**	-17.8 (28.9)	-30.7 (49.3)	-17.1 (35.4)	-4.0 (40.6)	0.16

* Analyzed using one-way ANOVA to determine differences between groups. **Analyzed using chi-square test to determine differences between groups

Table 3: Vancomycin dosing and eGFR characteristics*

Variables		initial dose	final dose**	eGFR initial	eGFR final***
neonates	<28 wks	21.0 (8.2)	36.2 (8.3)	26.1 (10.0)	28.0 (8.0)
	28- <34 wks	27.6 (7.6)	41.0 (9.0)	28.0 (8.5)	32.7 (8.2)
	34- <37 wks	32.1 (9.3)	40.0 (12.5)	41.0 (33.4)	38.9 (23.4)
	≥37 wks	33.7 (13.6)	48.6 (16.2)	61.1 (21.7)	57.5 (19.9)
children	1 mos- <1 yr	56.5 (10.0)	69.1 (13.0)	104.7 (34.0)	87.3 (28.5)
	1- <4 yrs	52.3 (12.1)	66.0 (12.5)	160.2 (40.9)	134.4 (25.7)
	4- <12 yrs	54.3 (9.7)	67.4 (10.4)	173.4 (40.3)	163.1 (31.0)
	12-18 yrs	57.7 (13.7)	73.7 (23.5)	161.6 (33.6)	165.7 (32.9)

*All information presented as mean (SD). **Using paired sample t-tests, there is a statistically significant increase in vancomycin dose within each age group, ($p<0.01$). ***Using paired sample t-test, there is a statistically significant decrease in eGFR over time in infants and in children aged 1 to 4 yrs, ($p<0.05$) but no clinically significant decreases across any groups

Abstract: 374

The Association Between Early Newborn Well Visits and Emergency Department Non-Urgent Visits During the Neonatal Period in an Urban Community-Based Hospital

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Background National data has documented that neonatal emergency department visits (NEDV) are common and occur in approximately 8% of live births. Many of these visits are non-urgent and contribute toward the inefficient use of healthcare resources. Multiple studies have attempted to determine the reasons for these high visit rates. The American Academy of Pediatrics recommends that newborns have a scheduled well-child visit (WCV) within 3 to 5 days of discharge from the hospital. Some studies have investigated the timing of the first WCV in relation to NEDV. However, previous research has revealed that many newborns are not being seen by a primary caregiver within the recommended time period. It has not been determined whether early outpatient visits prevent non-urgent NEDV.

Objective To determine whether early newborn WCV prevent non-urgent ED visits during the neonatal period in an urban community-based hospital system

Design/Methods Retrospective chart review of newborns discharged from a community-based hospital system between January 1, 2011 to January 1, 2019 who had a documented non-urgent ED visit during the neonatal period (28 days old or less). Non-urgent ED visits were defined as no ordered diagnostic tests, no pharmacological/medical intervention, no succeeding admission/transfer to the inpatient unit, and vital signs within normal range. The outcome was newborns who did or did not have a WCV within 5 days of discharge.

Results 273 subjects were seen in the ED who fulfilled the inclusion study criteria. 63% were Hispanic and 37% were black. 53% were male. 70.6% of subjects had a WCV and 29% of subjects did not. Univariate and bivariate modalities using chi square and *t*-tests were utilized. There was no significant relationship between non-urgent NEDV and neonates who did or did not have the recommended WCV with regard to sex, race, gestational age between 37 0/7 to 41 6/7 weeks, birth order, and mode of delivery.

Conclusion(s) A WCV within 3-5 days per AAP recommendations does not prevent non-urgent NEDV in an urban community.

Additional research is needed to determine effective interventions in decreasing these visits. Future studies should consider determining the most common non-urgent chief complaints in order to further guide a standardized focus on anticipatory guidance and education prior to discharge from the well-baby unit and during the first well-child visit.

Abstract: 375

Bronchiolitis: Investigating guidelines efficacy in preventing ICU transfers.

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Background Since introduction of the clinical guidelines in 2006 followed by the 2014 guidelines, bronchiolitis management has changed dramatically. However, it has been observed recently that more patients in our departement with bronchiolitis got transferred to the PICU. It raised a concern about whether the guidelines should be applied to every patient.
Objective To assess the rate of pediatric intensive care unit transfers in patients 1-23 months old admitted with bronchiolitis who were managed in inpatient settings after fully implementing the 2014 AAP clinical practice guidelines.
Design/Methods A retrospective charting of children admitted to inpatient with bronchiolitis over a 1 season (10/2015–03/2016) during the time of a QI project that fully implemented the guidelines to achieve cost savings and compared it with data of children admitted during the season prior to the 2014 guidelines (10/2013-03/2014).
Patients 1-23 months old with primary diagnosis of bronchiolitis were included. Exclusion criteria included patients with direct admission to PICU, concomitant asthma or pneumonia, chronic lung disease, cystic fibrosis, congenital or acquired heart disease, airway issues (eg., vocal cord paralysis, tracheomalacia, tracheostomy), immune disorder, sickle cell anemia. Also excluded in the post-guidelines charting, any patient treated with antibiotics, bronchodilators or steroids.
Data collected particularly noted risk factors of hypoxemia on admission, previous history of bronchiolitis, bronchodilator use and causative viruses.
Results Prior to the guidelines, Eighty-two patients were identified after exclusions. Median age was 3 months, 56% were females, 15% had previous bronchiolitis, 18% had previous bronchodilator use, 35% had O2 saturation on admission (<90%), RSV alone was the identified virus in 59% and 41% had unidentified organism. 4 patients were transferred to PICU.
After implementing the guidelines, Seventy-four patients were identified after exclusions. Median age was 3 months, 52% were females, 14% had previous bronchiolitis, 14% had previous bronchodilator use, 33% had O2 saturation on admission (<90%), RSV alone was the identified virus in 56%, compared to 21% rhino/enterovirus only, 5% both viruses, 3% coronavirus and 15% unidentified organism. 5 patients were transferred to PICU (p=0.9).
Conclusion(s) Adherence to the guidelines showed no significant increase in the rate of ICU transfers regardless of the causative organism, degree of hypoxemia, previous bronchiolitis or previous bronchodilators use

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The Effects of Meditation Practice on Burnout Levels in Pediatric Residents

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Background Physician burnout has become a significant concern at both the resident and attending level. According to the 2019 Medscape National Physician Burnout, Depression & Suicide Report, 44% of physicians have reported career burnout. Recent studies have even reported burnout in medical students, with increased risk upon further training. One proposed solution to this problem is incorporating mindfulness and meditation into residency wellness curriculum.
Objective The goal of this study was to measure burnout in pediatric residents before and after the implementation of a 3 month mindfulness and meditation curriculum.
Design/Methods This study took place in an urban based pediatric residency program (N=23). A 3-month long meditation study was adapted from a mindfulness and meditation curriculum (Chung et al., 2018). Standardized surveys (The Oldenburg Burnout Inventory & Five-Facet Mindfulness Scale) were administered at baseline and final sessions. Previous studies demonstrated that placing residents in leadership roles increases participation through investment. Five residents were chosen as meditation ambassadors to lead voluntary 10-minute bi-weekly meditation sessions. Dr. Nitin Ron, an experienced meditation and mindfulness expert, led 3 monthly didactic style 45-minute sessions, each including a guided meditation. Session 1 was an introduction to mindfulness and meditation, session 2 included resident feedback, and session 3 concluded with a debriefing of the strengths and weaknesses of curriculum specific to our program. The Toronto Mindfulness Scale (TMS) was administered to assess the resident's meditation experience awareness after each 10 minute meditation session. Data was collected and analyzed using SPSS version 25.
Results Retaining participants longitudinally was a challenge, leading to insufficient data for comparison between baseline and final sessions. We were able to analyze the repetitive measures from weekly session TMS data, with P-value 0.03 noted between curiosity sub-scores of the first and fourth resident guided meditations. Despite small cohort size, data shows increased awareness in the residents after meditation, suggesting decreased burnout through meditation.

Conclusion(s) The meditation sessions were effective in decreasing the risk of burnout. This study also highlighted some of the limitations when instituting wellness curriculum, including participant retention and small cohort size. In phase 2 of the study, we aim to expand the cohort to include interdepartmental residents and attending staff.

Table 1

Questionnaire	Subscales	Focus	Format
Oldenburg Burnout Inventory (OLBI)	*Disengagement*	assesses employee feelings toward work; higher score in this subscale indicates participant's negative attitudes toward work	Four positively worded and four negatively worded questions scored on a 1-4 scale.1=strongly agree; 4= strongly disagree. negatively worded questions are reverse scored (Ex: answer of 1 would be scored as 4)
Five-Faceted Mindfulness Scale (FFMQ)	*Acting with Awareness*	assesses if participant is able to stay present and aware while ignoring potential distractions	These are negatively worded questions scored on a 1-5 scale. 1=very often; 5=not at all. Answers are reverse scored (Ex: answer of 1 will be scored as 5; answer of 3 will remain 3 as it is a neutral score)
	Nonreactivity to inner experiences	assesses participant's ability to stay calm and objective in stressful situations	The questions are positively worded. All answers are directly scored on a 1-5 scale, 1 = very often; 5 = not at all
Toronto Mindfulness Scale (TMS)	*Curiosity*	measures individual's internal awareness and self-consciousness	Statements are scored on a scale from 0 to 4. 0=not at all; 4=very much
	Decentering	measures self-awareness and openness to experience	

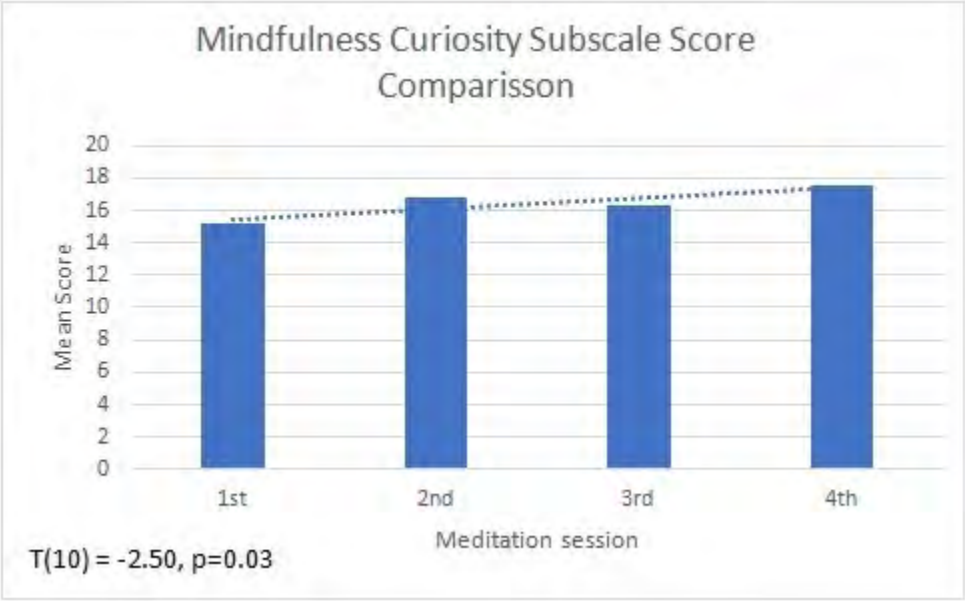
Synopsis of the Inventories used.

Table 2

Descriptive statistics of the cohort *% (n)

		All subjects	Repetitive measures subgroup
Age	20-30	46% (11)	45% (5)
	31-40	50% (12)	55% (6)
	Unknown	4% (1)	
	Total	24	11
Marital Status	Single	29% (7)	27% (3)
	Married	46% (11)	55% (6)
	In Relationship	17% (4)	18% (2)
	Unknown/other	8% (2)	
	Total	24	11
Gender	Male	17% (4)	27% (3)
	Female	79% (19)	73% (8)
	Unknown/other	4% (1)	
	Total	24	11
Ethnicity	Caucasian	38% (9)	55% (6)
	Hispanic	21% (5)	27% (3)
	Asian	29% (7)	18% (2)
	Unknown/other	12% (3)	
	Total	24	11
Training	PGY-1	25% (6)	27% (3)
	PGY-2	38% (9)	45% (5)
	PGY-3	33% (8)	27% (3)
	Unknown	4% (1)	
	Total	24	11
Mindfulness ambassador	Yes	21% (5)	45% (5)
	No	75% (18)	55% (6)
	Unknown	4% (1)	
	Total	24	11

Demographics



Curiosity Subscale graph showing upward trend from meditations 1 to 4 of each participant. Due to a high attrition rate of residents, meditations 1-4 are relative to each participant's sessions attended.

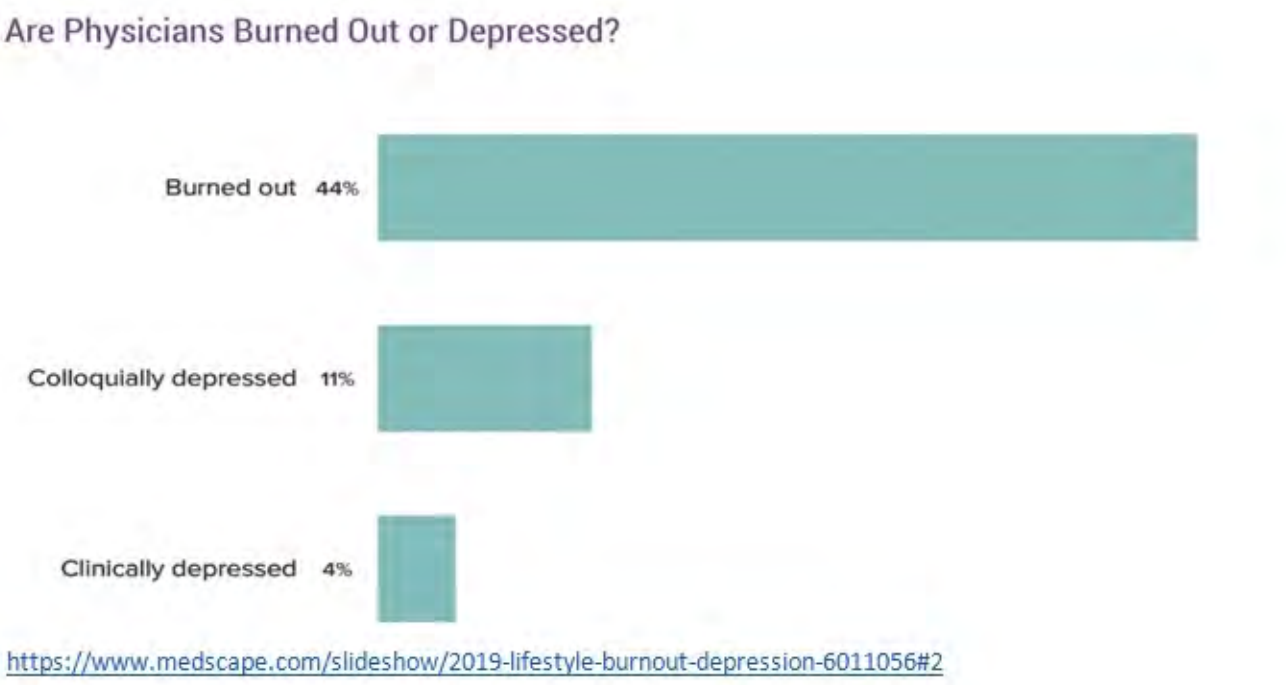


Figure from Medscape's 2019 study for Background information reference. Not original work from the study.

Abstract: 377

Chaperones for Medical Exams of Older Children and Adolescents: Who, when and for what?

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Background A medical chaperone is a person who serves as a witness for a patient and healthcare practitioner during a medical examination. The presence of a chaperone may help to emphasize the professional nature of the interaction, the content of the examination, and to have a witness of the interaction in case there is misunderstanding. Pediatric literature regarding medical chaperone use and preference is extremely limited.
Objective The purpose of our investigation is to better understand attitudes and beliefs of parents and children towards the use of chaperones during physical exams of pediatric patients.
Design/Methods This is a cross-sectional study of children aged 8-18 years and their parents, who presented a children's hospital to receive care. Eligible patients and their parents were approached in the emergency department, ambulatory clinic and inpatient unit. Those who consented to participate received separate, anonymous, surveys. The survey collected demographic data and asked which individuals should be present in the room for different aspects of the child's physical examination. Data were collected with electronic tablets (iPads) using Qualtrics XM online survey platform.
Results The survey was completed by 79 patients and 61 parents. Mean age for patients was 14 years and 56% were female. Mean age for parents was 41 years old and 85% were female. Of patients, 81% responded that they were heterosexual. Patient preference for examination presence is shown in Table 1. When being examined by a provider of the opposite sex as compared to a same sex

provider, there were significant differences in preferences among female patients for exam of the breasts, genitalia, and rectum, but not the throat, heart/lungs, or abdomen. Male patients did not have any significant preference for any aspects of the exam by provider type. Parents preferences are shown in Table 2. There was no difference in parent preferences when their child was being examined by a provider of the same vs. opposite sex as their child.

Conclusion(s) This study indicates that adolescent females, but not males, have significant differences for who they prefer to be in the room for certain aspects of the physical exam. A minority of patients and parents preferred a chaperone to be present, whereas the majority preferred a parent to be in the room. Patient and parent considerations should be taken into account when creating policies for the use of medical chaperones.

Figure 1: Patient preference regarding persons present in exam room when being examined by a physician

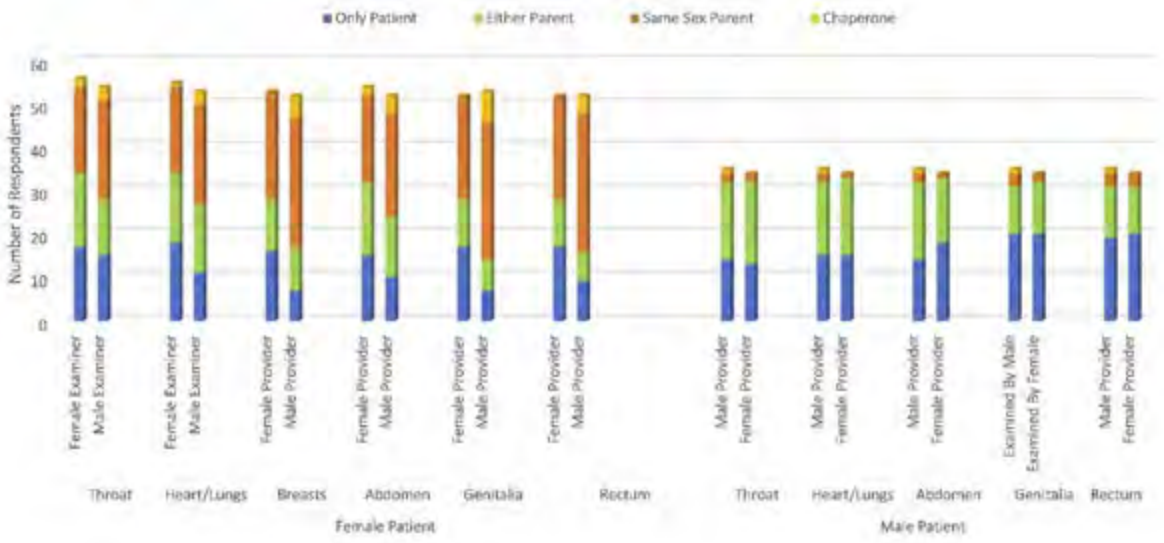

Table 1. Parent preference for presence during examination of their child (N= 61)

Body Part Being Examined	**Same Sex Provider (N)**	**Opposite Sex Provider (N)**
THROAT		
Patient only	18	18
Either parent	40	40
Same sex parent	6	8
Chaperone	2	2
HEART LUNGS		
Patient only	13	13
Either parent	43	43
Same sex parent	6	8
Chaperone	4	3
BREASTS (Females only)		
Patient only	6	7
Either parent	18	17
Same sex parent	12	11
Chaperone	2	3
ABDOMEN		
Patient only	11	11
Either parent	41	38
Same sex parent	9	12
Chaperone	5	7
GENITALIA		
Patient only	11	10
Either parent	32	33
Same sex parent	17	17
Chaperone	8	6
RECTUM		
Patient only	11	10
Either parent	33	34
Same sex parent	17	17
Chaperone	10	9

Abstract: 378

An Analysis of Parental Knowledge and Beliefs of Probiotics and Prebiotics in Infant Formula

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Background Many infant formula manufacturers have released formulas containing strains of probiotics and prebiotics (P&P) touting them as similar to breast milk despite the American Academy of Pediatrics (AAP) citing conflicting scientific evidence regarding their safety and efficacy. Given the growing selection of commercially available (P&P)-fortified formulas, it is critical to assess parental knowledge and attitudes of these unregulated compounds.
Objective To evaluate parental knowledge and beliefs of P&P and its effects on parents' infant formula choices.
Design/Methods Caregivers in a pediatric waiting room completed an anonymous paper survey. The survey asked about demographics and parental knowledge/opinions on P&P benefits, safety, composition, and regulation. Differences in parental likelihood to purchase specific formulas were assessed using Wilcoxon signed-rank tests with a Bonferroni corrected alpha of .005. Kendall's rank correlations were used to analyze associations between parental knowledge and beliefs and likelihood of purchasing specific formulas.
Results Overall, 102 caregivers responded. While 89.9% of parents responded they knew what probiotics are, only 64.6% defined it correctly (Table 2). For prebiotics, 36.1% of parents claimed to know what they are, but only 7.6% identified the correct definition (Table 2). Formula containing probiotics was chosen as first choice 53.2% of the time, prebiotics was chosen 11.45%. No associations were identified between parental correctness of the definition and the likelihood to purchase formulas (probiotics: $\tau = .026$, $p = 0.78$; prebiotics: $\tau = -.030$, $p = 0.77$) (Table 3). Parents were significantly more likely to purchase infant formula with probiotics if they believed that probiotics are "safe for infant use" ($\tau = .347$, $p < .001$) or "supported by scientific research" ($\tau = .347$, $p < .001$). Parents were also significantly more likely to purchase prebiotic-fortified formula if they believed that prebiotics are "safe for infant use" ($\tau = .270$, $p = 0.05$) and "contain live bacteria" ($\tau = .346$, $p = 0.01$).
Conclusion(s) Despite a lack of knowledge of P&P, parents favored purchasing P&P formulas for their children. Physicians must inform parents of the limited scientific evidence confirming their health benefits and the need for more research regarding their safety. The AAP must update its guidelines on the routine use of P&P in young children to reflect the current body of literature and should make this information readily available online to both clinicians and parents.

Table 1. Parent/child/household demographic characteristics of the sample (n = 102).

Characteristic	n (%)
Parent's Gender	
Male	6 (5.9%)
Female	88 (86.3%)
Prefer Not to Answer	8 (7.8%)
Parent's Race	
Asian American or Asian	9 (8.8%)
Black or African American	6 (5.9%)
Hispanic or Latino	13 (12.7%)
White or Caucasian	51 (50.0%)
Multi-racial, Other	5 (4.9%)
Prefer Not to Answer	18 (17.6%)
Parent's Age	
18-19	6 (5.9%)
20-29	11 (10.8%)
30-39	30 (29.4%)
40-49	35 (34.3%)
50-59	7 (6.9%)
60+	2 (2.0%)
Prefer Not to Answer	11 (10.8%)
Parent's Highest Level of Education	
High School Graduate or Less	11 (10.8%)
Vocational or Trade Program	2 (2.0%)
Some College	13 (12.7%)
Associate Degree	4 (3.9%)
Bachelor's Degree	26 (25.5%)
Master's Degree	29 (28.4%)
Doctorate or Professional Degree	7 (6.9%)
Prefer Not to Answer	10 (9.8%)
Family's Annual Household Income	
Less than $35,000	7 (6.9%)
$35,000 - $49,999	6 (5.9%)
$50,000 - $74,999	12 (11.8%)
$75,000 - $99,999	14 (13.7%)
$100,000 - $249,999	34 (33.3%)
$250,000+	7 (6.9%)
Prefer Not to Answer	22 (21.6%)
Total	**102**

Table 2. Parental knowledge of probiotics and prebiotics.

	n (%)
Do you know what probiotics are?	
Yes, I know	89 (89.9%)
No, I do not know	10 (10.1%)
Please select the statement that best describes probiotics.	
Live microorganisms that maintain or improve gut bacteria[a]	62 (64.6%)
Enzymes and proteins that maintain or improve gut bacteria	17 (17.7%)
Nondigestible fibers that help the growth of healthy gut bacteria	0 (0.0%)
Vitamins and minerals that help the growth of healthy gut bacteria	9 (9.4%)
I don't know	8 (8.3%)
Do you know what prebiotics are?	
Yes, I know	35 (36.1%)
No, I do not know	62 (63.9%)
Please select the statement that best describes prebiotics.	
Live microorganisms that maintain or improve gut bacteria	9 (11.4%)
Enzymes and proteins that maintain or improve gut bacteria	14 (17.7%)
Nondigestible fibers that help the growth of healthy gut bacteria[b]	6 (7.6%)
Vitamins and minerals that help the growth of healthy gut bacteria	8 (10.1%)
I don't know	42 (53.2%)

[a] Correct definition of probiotics

[b] Correct definition of prebiotics

Table 3. Correlations between parental knowledge and beliefs and purchase likelihood (n = 102).

	Kendall Rank Correlation Coefficient (τ)	p-value
Likelihood to purchase probiotic-fortified formula		
Parent correctly identified definition of probiotics	0.026	0.782
Parental agreement with "Probiotics are safe for infant use"[a]	0.347	**<0.001**
Parental agreement with "Probiotics contain live bacteria"[a]	0.188	0.056
Parental agreement with "Probiotics are supported by scientific research"[a]	0.347	**<0.001**
Likelihood to purchase prebiotic-fortified formula		
Parent correctly identified definition of prebiotics	-0.030	0.770
Parental agreement with "Prebiotics are safe for infant use"[a]	0.270	**0.05**
Parental agreement with "Prebiotics contain live bacteria"[a]	0.346	**0.01**
Parental agreement with "Prebiotics are supported by scientific research"[a]	0.173	0.207

[a] Scored using Likert item: (1) Strongly disagree, (2) Disagree, (3) Neutral, (4) Agree, (5) Strongly agree

Abstract: 379

Rate of hospitalization and resource utilization in children hospitalized with skin and soft tissue infections

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Background Skin and soft tissue infections (SSTI) are the fourth most common diagnosis for hospitalized children nationwide accounting for more than $172 million in hospitalization costs per year in 2012. Previous literature describing prevalence using ICD-9 diagnosis codes were unable to differentiate between cellulitis and abscess diagnoses, a limitation no longer present in hospitalizations billed with ICD-10 codes after 2015.

Objective To determine the rate of hospitalizations for SSTI in children in 2016 and examine resource utilization and hospital costs.

Design/Methods This is a retrospective cross-sectional study using the 2016 HCUP KID database for children under 21 years of age. Inclusion into the cohort was based on ICD-10 diagnosis codes for abscess and cellulitis. In-hospital births and patients with complex chronic conditions were excluded. ICD-10 Procedure Coding System (PCS) were used to characterize whether these patients had an incision and drainage (I&D) or ultrasound was performed. Differences between the SSTI groups were assessed using Rao-Scott chi-square test for categorical variables. The primary outcome measure in a logistic regression model was use of I&D. Predictor variables included patient level demographics, hospital characteristics, type of SSTI (abscess, cellulitis or abscess/cellulitis) and presence of MRSA.

Results The number of hospitalizations nationally for SSTI in 2016 was 60,611 corresponding to a rate of 73.5 per 100,000 children. The total national bill for hospitalizations for SSTI in 2016 was $1,608,410,159. Median cost for a hospitalization with abscess was $5074, cellulitis was $3557 and an admission for both cellulitis and abscess was $ 4381. ($p < 0.001$). Characteristics of the hospitalization at the patient and hospital level differed by SSTI type (Table 1 and 2). In hospitalizations for abscess, factors independently associated with increased odds of I&D were African American race, Medicaid and uninsured status, and ultrasound performed (Table 3).

Conclusion(s) SSTI remains a leading reason for pediatric hospital admission. There has been a significant increase the rate and cost of pediatric SSTI hospitalizations in 2016 compared to the 2012 data. I&D is associated with ultrasound use and contributes to cost. Future studies should focus on the use of ultrasound and I&D in children hospitalized with SSTI.

Table 1: Patient characteristic for all SSTI sdmissions, compared among SSTI type

	All Subjects		Abscess		Cellulitis		Both Abscess & Cellulitis		
	Frequency	Weighted Frequency (%)	Frequency	Weighted Frequency (%)	Frequency	Weighted Frequency (%)	Frequency	Weighted Frequency (%)	P-Value
Total	43763	60611 (100)	12544	17393 (29)	22498	31121 (51)	8721	12097 (20)	
Age Group									<.001
0-3 years	17268	23981 (39.6)	5854	8138 (46.8)	7522	10432 (33.5)	3892	5411 (44.7)	
4 - 7 years	6093	8462 (14)	1115	1550 (8.9)	4104	5693 (18.3)	874	1218 (10.1)	
8 - 12 years	5908	8208 (13.5)	1175	1636 (9.4)	3751	5203 (16.7)	982	1369 (11.3)	
13 - 17 years	7435	10281 (17)	2209	3060 (17.6)	3744	5169 (16.6)	1482	2052 (17)	
18-21 years	7059	9679 (16)	2191	3010 (17.3)	3377	4623 (14.9)	1491	2046 (16.9)	
Gender									<.001
Female	20524	28430 (46.9)	6770	9386 (54)	9676	13384 (43)	4078	5659 (46.8)	
Race									<.001
White	20558	28433 (50.2)	5380	7451 (45.7)	10750	14847 (51.2)	4428	6135 (53.8)	
Black	7036	9771 (17.2)	2621	3644 (22.4)	3132	4338 (15)	1283	1789 (15.7)	
Hispanic	9379	12989 (22.9)	2606	3612 (22.2)	4953	6855 (23.6)	1820	2523 (22.1)	
Asian or Pacific Islander	1307	1791 (3.2)	362	496 (1.5)	752	1030 (3.6)	193	265 (2.3)	
Native American	559	782.5 (1.4)	175	249 (1.5)	265	368 (1.3)	119	165 (1.4)	
Other	2118	2917 (5.1)	614	844 (5.2)	1122	1547 (5.3)	382	526 (4.6)	
Missing	2606	(10.0)							
Payor									<.001
Medicare	133	183.8 (0.3)	30	41 (0.2)	79	110 (0.4)	24	32 (0.3)	
Medicaid	24832	34429 (56.9)	7422	10303 (59.3)	12322	17061 (54.9)	5088	7065 (58.5)	
Private insurance	15442	21319 (35.2)	4151	5736 (33)	8387	11568 (37.2)	2904	4015 (33.3)	
Uninsured	1860	2595 (4.3)	556	778 (4.5)	869	1210 (3.9)	435	608 (5)	
Other	1426	1979 (3.3)	369	513 (3)	803	1114 (3.6)	254	352 (2.9)	
Income by Zipcode, dollars									<.001
1 - 42,999	15887	22118 (37)	5014	6986 (40.7)	7535	10477 (34)	3338	4655 (39.1)	
43,000 - 53,999	10501	14584 (24.4)	2952	4099 (23.9)	5361	7439 (24.2)	2188	3046 (25.6)	
54,000 - 70,999	9313	12830 (21.4)	2560	3533 (20.6)	4991	6868 (22.3)	1762	2430 (20.4)	
More than 71,000	7516	10316 (17.2)	1853	2545 (14.8)	4359	5986 (19.5)	1304	1785 (15)	
MRSA									<.001
MRSA (B95. 62)	5543	7683 (12.7)	1932	2682 (15.4)	1391	1921 (6.2)	2220	3080 (25.5)	
I&D									<.001
Underwent I&D	13413	18596 (30.7)	6801	9445 (54.3)	1791	2468 (0.5)	4821	6682 (55.2)	
Ultrasound									<.001
Skin/Soft Tissue Ultrasound	214	305 (0.5)	108	154 (0.9)	68	96 (0.3)	38	54 (0.4)	

Table 1:Patient characterstics for all SSTI admissions, compared among SSTI type

Table 2: Hospital characteristic for all SSTI sdmissions, compared among SSTI type

	All Subjects		Abscess		Cellulitis		Both Abscess & Cellulitis		
	Frequency	Weighted Frequency (%)	Frequency	Weighted Frequency (%)	Frequency	Weighted Frequency (%)	Frequency	Weighted Frequency (%)	P-Value
Hospital Region									<.001
Northeast	8022	10891 (18)	2115	2870 (16.5)	4548	6168 (19.8)	1359	1852 (15.3)	
Midwest	8858	11992 (19.8)	2449	3313 (19)	4662	6318 (20.3)	1747	2360 (19.5)	
South	18257	25905 (42.7)	5611	7962 (45.8)	8563	12153 (39.1)	4083	5790 (47.9)	
West	8626	11823 (19.5)	2369	3248 (18.7)	4725	6481 (20.8)	1532	2094 (17.3)	
Hospital BedSize									0.11
Small	5786	8332 (13.7)	1521	2199 (12.6)	3093	4434 (14.2)	1172	1699 (14)	
Medium	10229	14160 (23.4)	2860	3960 (22.8)	5332	7383 (23.7)	2037	2818 (23.3)	
Large	27748	38118 (62.9)	8163	11235 (64.6)	14073	19304 (62)	5512	7580 (62.7)	
Teaching Hospital									<.001
Rural	2943	4288 (7.1)	802	1162 (6.7)	1400	2049 (6.6)	741	1077 (8.9)	
Urban nonteaching	6766	9318 (15.4)	1686	2321 (13.3)	3552	4886 (15.7)	1528	2111 (17.5)	
Urban teaching	34054	47004 (77.6)	10056	13910 (80)	17546	24186 (77.7)	6452	8909 (73.6)	
Children's Hospital									0.02
Children's Hospital	10193	14716 (24.3)	2964	4279 (24.6)	5441	7855 (25.2)	1788	2581 (21.3)	

Table 2: Hospital characterstics for all SSTI admissions, compared among SSTI type

Table 3: Factors Associated with I&D of Hospitalizations for Abscess

Predictor	Adjusted Odds Ratio	95% CI	P-Value
Age Group			
0-3 years	1.0 (referent)		
4 - 7 years	0.76	0.66 - 0.86	<0.001
8 - 12 years	0.58	0.51 - 0.67	<0.001
13 - 17 years	0.61	0.54 - 0.69	<0.001
18-21 years	0.55	0.48 - 0.62	<0.001
Gender			
Female	1.0 (referent)		
Male	0.93	0.48 - 0.62	0.06
Race			
White	1.0 (referent)		
Black	1.16	1.05 - 1.29	0.00
Hispanic	0.87	0.78 - 0.98	0.02
Asian or Pacific Islander	0.88	0.71 - 1.09	0.26
Native American	0.74	0.49 - 1.11	0.15
Other	0.98	0.82 - 1.17	0.82
Payor			
Medicare	1.12	0.55 - 2.29	0.75
Medicaid	1.11	1.10 - 1.21	0.02
Private insurance	1.0 (referent)		
Uninsured	1.42	1.17 - 1.72	<0.001
Other	0.95	0.74 - 1.21	0.67
Income by Zipcode, dollars			
1 - 42,999	1.09	0.96 - 1.23	0.17
43,000 - 53,999	0.96	0.85 - 1.1	0.57
54,000 - 70,999	1.04	0.92 - 1.17	0.56
More than 71,000	1.0 (referent)		
Children's Hospital Status			
Chilldren's Hospital	1.0 (referent)		
General Hospital	0.94	0.82 - 1.09	0.43
Teaching Hospital			
Rural	1.02	0.84 - 1.23	0.86
Urban nonteaching	0.99	0.88 - 1.14	0.98
Urban teaching	1.0 (referent)		
Hospital Bedsize			
Small	1.12	0.96 - 1.27	0.16
Medium	0.91	0.81 - 1.02	0.12
Large	1.0 (referent)		
Hospital Region			
Northeast	1.05	0.92 - 1.21	0.43
Midwest	0.99	0.87 - 1.13	0.89
South	1.0 (referent)		
West	1.01	0.87 - 1.16	0.93
Ultrasound			
No	1.0 (referent)		
Yes	2.32	1.7 - 3.19	<.001

Table 3: Factors associated with I&D of hospitalizations for abscess

Abstract: 380

High Flow Nasal Cannula Oxygen (HFNC) Use in Children with Bronchiolitis admitted to the Inpatient Wards and its Impact on Intensive Care Unit (ICU) Utilization

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Background Bronchiolitis is the most common cause of hospitalization among infants. HFNC is noninvasive respiratory support with heated and humidified air-oxygen mixtures via a nasal cannula interface, increasingly used for patients with bronchiolitis. Initial use was primarily in critical care settings; early studies of HFNC on pediatric wards showed no benefits in ICU or hospital LOS. Subsequent studies suggest higher flow rates of 1.5-2 L/kg/min are efficacious and safe. Our institution implemented an “enhanced” HFNC protocol with flow rates of 1.5-2 mL/kg/min on the wards in 2019.
Objective Evaluate impact on critical care resource utilization of an “enhanced” flow rate HFNC protocol for management of previously healthy infants with bronchiolitis on the general pediatric wards compared to a pre-protocol period.
Design/Methods A quasi-experimental retrospective study in an urban pediatric hospital of children ages 0-24 months with a diagnosis of acute bronchiolitis managed with HFNC. Patients admitted between January 12 - April 30, 2017 (pre-protocol) and January 12 - April 30, 2019 (protocol) were included. The primary outcome was ICU LOS; secondary outcomes included ICU transfers, number of rapid responses and codes, and emergency department (ED), ward, and hospital LOS.
Results 703 electronic medical records of children from 0-24 months diagnosed with bronchiolitis within the two timeframes were reviewed for eligibility. There was no difference in percentage of patients initiated on HFNC between the two groups (13.4% v. 15.5%, p=0.48). 24 patients from the pre-protocol period and 40 patients from the protocol period met inclusion criteria (Fig. 1). There were no significant demographic differences between the two populations (Table 1). When compared to the pre-protocol group, the protocol group demonstrated shorter ICU LOS (28.7 h v 78.8 h, $p<0.001$) and hospital LOS (74.2 h v 98.6 h, p=0.009). The protocol group had fewer patients managed in the ICU (60% v 100%, $p<0.001$) and patients requiring transfer to the ICU from the wards (23.8% v 100%, $p<0.004$). There was no significant difference between the protocol and pre-protocol groups in the percentage of children who needed escalation in care beyond HFNC (12.5% v 25.0%, p=0.199).
Conclusion(s) Implementation of an enhanced HFNC protocol on the inpatient wards is safe and reduces ICU LOS and overall hospital LOS in children 0-24 months with bronchiolitis.

Figure 1: Inclusion and Exclusion of Patients with Bronchiolitis

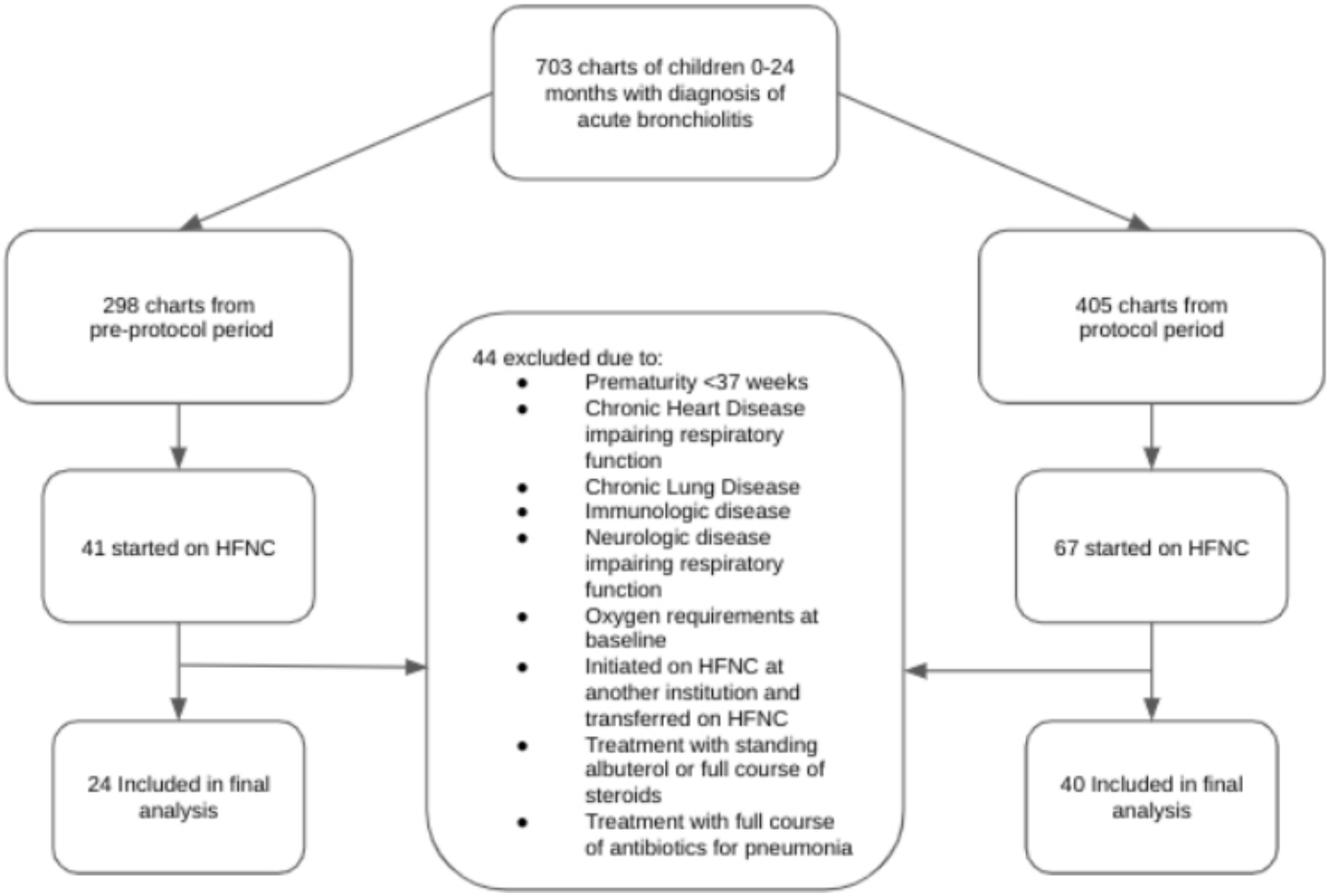

Figure 1: Inclusion and Exclusion of Patients with Bronchiolitis

Characteristic	Pre-protocol (n=24)	Protocol (n=40)	P Value
Patients <2 yo with Bronchiolitis	305	432	
% Patients with Bronchiolitis on HFNC	13.4	15.5	0.48
% Patients Included in Final Analysis	7.9	9.3	0.51
% Females	45.8	30.0	0.20
Mean Age (mo)	8.0	9.7	0.26
Mean Weight (kg)	8.5	8.9	0.56
Medications Received in ED (N(%))			
None	15 (62.5%)	21 (52.5%)	0.44
Albuterol Nebulizer	7 (29.0%)	18 (5.0%)	0.21
Racemic Epineprine Neb	1 (4.2%)	2 (5.0%)	0.88
3% Saline Neb	0	0	NA
Steroids	3 (12.5%)	10 (25.0%)	0.29
Antibiotics	2 (8.3%)	1 (2.5%)	0.29

Table 1: Baseline Characteristics of Patients in the Pre-Protocol and Protocol Seasons

	Pre-protocol (n=24)	Protocol (n=40)	P-Value
Admits to Pediatric Wards (N(%))	4 (16.7%)	21 (52.5%)	0.004
HFNC Initiation Location (N(%))			0.003
ED	17 (70.8%)	34 (85.0%)	
Wards	0 (0%)	5 (12.5%)	
ICU	7 (29.2%)	1 (2.5%)	
Mean HFNC Initiation Rate (L/kg)	0.94	1.23	0.018
Mean HFNC Peak Rate (L/kg)	1.13	1.55	0.005
Mean HF Duration (hr)	40.4	34.3	0.325
Patients Requiring ICU Stay (N(%))	24 (100%)	24 (60%)	<0.001
Mean ED LOS (hr)	4.7	5.8	0.042
Mean Hospital LOS (hr)	98.6	74.2	0.009
Mean ICU LOS (hr)	78.8	28.7	<0.001
Escalation of Care in ICU (N(%))	6 (25.0%)	5 (12.5%)	0.199
CPAP	4	3	0.255
BIPAP	3	1	0.110
Mechanical Ventilation	0	0	NA
ECMO	0	0	NA
Heliox	0	1	0.435

Table 2: Pre-Protocol and Protocol HFNC Flow Rates, Length of Stay, and Escalation of Care

	Pre-protocol Ward Admits (n=4)	Protocol Ward Admits (n=21)	Chi Square
Patients with Rapid Responses (N(%))	4 (100%)	7 (33%)	0.014
Number of Codes	0 (0%)	0 (0%)	NA
Transfers to the ICU	4 (100%)	5 (24%)	0.004

Table 3: Adverse Events in Patients Admitted to Wards

Abstract: 381

Enhancing patient experience around a timely, patient-centered discharge at a Mother-Baby unit with diverse urban population

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Background The discharge process on a postpartum unit can have many barriers, especially in a diverse urban setting with high immigrant population. Each discharge consists of two disciplines preparing the couplet for a safe discharge. Only 30% of our couplets were exiting the unit by noon after discharge

Objective The objective of the study was to determine if enhanced communication about the discharge process led to a timely, patient-centered discharge

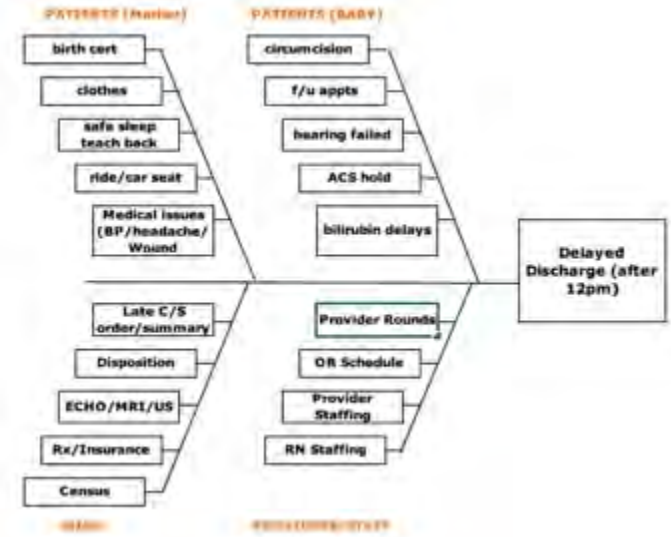
Design/Methods An interdisciplinary team was formed. The most common reasons for delayed exit from the unit after discharge were the maternal causes as listed in the fishbone diagram – the ride being the primary reason for delays. The main test of change was a communication tool (Fig 2) placed at the foot of each bed alongside the patient's whiteboard. A PDSA ramp involved several iterations of the communication tool being tested with the evolution of a more-patient centered communication (PCC) tool (Fig 3). The initial aim to prepare the mother and the baby for an 11am discharge evolved into preparing for a discharge time as requested by the family, thereby meeting their discharge expectations.

Staff began the discharge discussion upon admission to the postpartum unit. As the discharge topics are discussed, staff will leave a check mark on the appropriate patient day thereby alerting subsequent staff caring for the mother, as to which discharge topics need an initial discussion or have been completed, such as the birth certificate.

Three questions of the discharge domain of the Consumer Assessment of Healthcare Providers and Systems survey were monitored to measure success of communication around discharge

Results The communication tool was used for approximately 1200 patients between April and December 2019. The variation of time to discharge decreased tremendously and was close to noon. All three questions in the CAHPS discharge domain showed marked improvement from 63% to 100%.

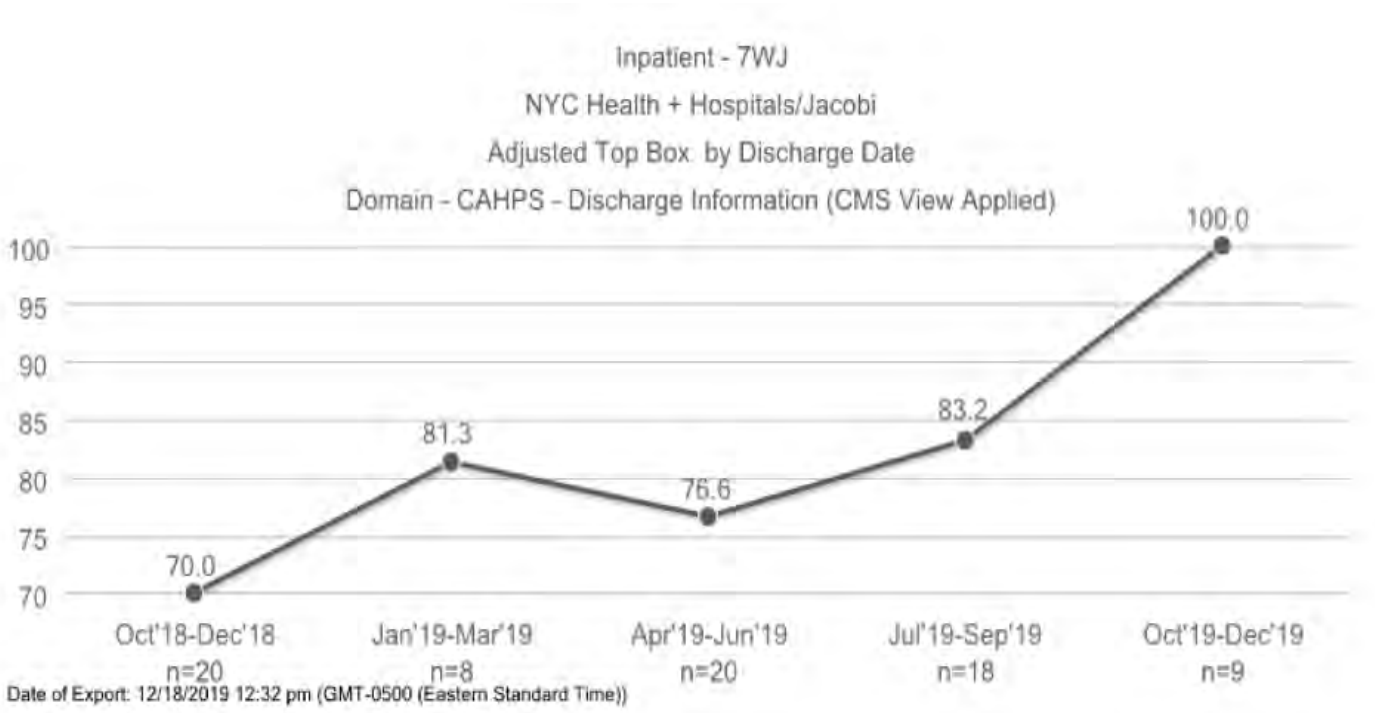
Conclusion(s) A clear, easy to understand and implement communication tool to begin conversations around readiness for discharge can significantly improve the patient experience while facilitating timely discharge from mother-baby unit



Causes of Delayed Discharge after 12pm

Discharge Communication Tool Version 1

Discharge Communication Tool Final Version



Discharge Communication CAHPS Score

Abstract: 382

Reducing Antibiotic Use and Laboratory Testing in Asymptomatic Term and Late Pre-Term Neonates at Risk for Early Onset Sepsis

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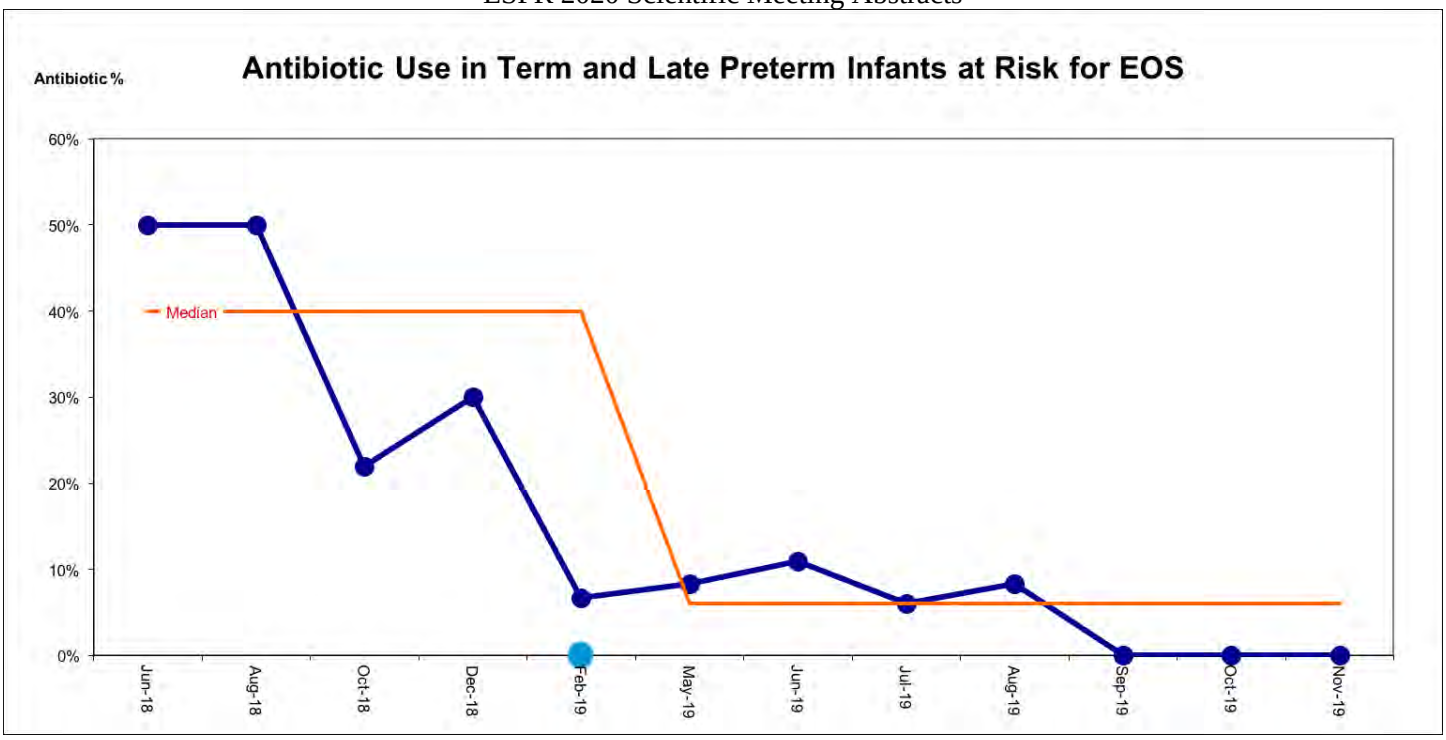
Background Neonatal exposure to antibiotics is linked to disrupted gut microbiome. We revised our nursery sepsis risk protocol to align with the American Academy of Pediatrics 2018 guidelines in order to further improve antibiotic stewardship in neonates at risk for early onset sepsis (EOS).

Objective We aimed to reduce antibiotic administration by 25% in asymptomatic neonates at risk for EOS, including those with abnormal laboratory findings, within 6 months of new protocol administration. Secondary aims included reducing antibiotic duration and decreasing laboratory testing and lumbar punctures (LP).

Design/Methods We conducted a retrospective cohort study of neonates ≥35 weeks gestation at risk for EOS in an urban academic medical center nursery. Pre-protocol period was 04/01/2018-04/30/2019 (cohort 1) and post-protocol was 05/01/2019-11/27/2019 (cohort 2). Inclusion criteria: neonates with maternal ICD 10 diagnosis of chorioamnionitis, prolonged rupture of membranes, and late preterm neonates exposed to group B streptococcus (GBS) with inadequate prophylaxis. Exclusion criteria: clinical illness at birth. Our revised sepsis risk protocol relied on clinical assessment and called for 1) holding off antibiotics in asymptomatic neonates with abnormal labs (complete blood count, C-reactive protein) 2) avoiding repeat labs if initial tests normal and 3) limiting LP to ill appearing neonates or those with bacteremia. Serial vitals and physical exams were performed. We discontinued antibiotics at 36-48 hours of negative cultures.

Results We evaluated 188 neonates. Antibiotic use decreased by 69% (P 0.023). Number of blood tests and LP rates decreased by 25 % and 75% respectively (Table). Five infants received antibiotics; 3 neonates for clinical illness at 8-10 hours of life, while 2 were given antibiotics off protocol. Of the 29% with abnormal labs, only 1 became symptomatic and received antibiotics for > 48 hours. No positive blood or CSF cultures were identified. No re-admissions seen for sepsis within three days of hospital discharge.

Conclusion(s) Using our revised EOS protocol that relied on clinical assessment, we were able to effectively reduce antibiotic usage, LP rates, and number of lab tests in both term and late pre-term neonates. We conclude that abnormal labs do not reliably predict neonatal EOS and were not associated with blood culture positivity. Asymptomatic neonates with abnormal labs may be safely monitored off antibiotics.



Pre and Post Protocol Management of Asymptomatic Neonates at Risk for EOS

	Cohort 1(pre)	Cohort 2(post)	P-value
Number of Neonates ≥35 weeks	93	95	
Antibiotic rate	16%	5%	0.023
Average # Blood Tests	4	3	<0.001
Lumbar Puncture	4%	2%	0.352
Abnormal Labs	28%	29%	1
Positive Blood culture	0	0	

Abstract: 383

Near Infrared Spectroscopy Measurements During Hypothermia Treatment for Hypoxic Ischemic Encephalopathy

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Background Neonates with hypoxic ischemic encephalopathy (HIE) are at risk for motor and neurodevelopmental impairment as well as organ dysfunction that can lead to kidney and liver injury. This can be due to initial injury as well as due to being kept hypothermic and fluid-restricted during treatment. Near- infrared spectroscopy (NIRS) measurements offers the ability of measuring cerebral, renal and splanchnic oxygenation. NIRS can help provide an estimate of blood and oxygen delivery, as well as target organ oxygen consumption.

Objective 1. To assess the value of using cerebral NIRS (CrSO2) to assess for hypoxic ischemic encephalopathy as part of a standardized cooling protocol.

2. To evaluate somatic NIRS (RrSO2 and SrSO2) monitoring as to its ability to predict end organ injury, and its use to monitor patient status during the cooling process.

Design/Methods This was a retrospective cohort study of all infants admitted to the NYU Langone Health Neonatal Intensive Care Unit from 1/1/2018-10/1/2019 who underwent total body cooling for HIE. As per protocol, NIRS were applied to forehead, and flank/abdomen when possible, for the duration of cooling process and rewarming. HIE was defined based on MRI findings of

ischemic injury, renal injury based on the KDIGO classification system and splanchnic injury on elevated liver function values above normal range for age. Data analysis was done utilizing SPSS 25.

Results 13 subjects underwent therapeutic hypothermia of which 10 survived to discharge, 2 died prior to MRI. 3 had HIE on MRI, of which their mean CrSO2 value was 91.3 + 1.4 compared to 8 without HIE on MRI with mean of 83.5 + 5.3 (p 0.04). Additionally, the cerebral fractional tissue oxygen extraction (CFTOE), was significantly lower for the infants with injury 0.07 + 0.02 compared to 0.15 + 0.05 (p 0.03). There was no significant difference in mean RrSO2 values or SrSO2 values in infants with renal or liver injury respectfuly.

Conclusion(s) In our practice, cerebral tissue oxygenation was significantly higher in patients with HIE as seen based on MRI changes. This demonstrates NIRS potential ability as a helpful adjunctive tool in making clinical decisions for patients not yet stable for an MRI assessment. While renal and splanchnic NIRS monitoring may not be predictive of organ injury, this may be because of the more transient state of somatic organ injury compared to the brain, and may still provide a useful and non-invasive method to ensure proper perfusion and oxygenation during the cooling process.

Table 1. Demographics

	Cohort n = 13	MRI confirmed HIE N = 3	Normal MRI n= 8	p-value
Gestational Age(Mean ± SD)	38.6 ± 1.6	39 ± 2	39.6 ± .9	0.54
Birth weight grams (Mean ± SD)	3517.4 ± 631.1	3629.7 ± 248.7	3242.5 ± 382.9	0.14
Sex, n (%)				0.39
Female	7 (53.8)	1 (33.3)	5 (62.5)	
Male	6 (46.20	2 (66.7)	3 (37.5)	
Delivery Mode, n (%)				0.63
NSVD	3 (23)	1 (33.3)	2 (25)	
Operative VD	2 (15.4)	0	2 (25)	
C-section	8 (61.5)	2 (66.7)	4 (50)	
Apgar Score (Median ± SD)				
1 minute	2 ± 1.3	1 ± 0.5	2 ± 1.3	0.24
5 minute	4 ± 1.4	4 ± 0.8	5 ± 1.4	0.37
10 minute	6 ± 1.8	4 ± 1.4	7 ± 1.7	0.39
Sarnat Stage (Median ± SD)	2 ± .5	2 ± 0	2 ± .5	0.17
Chorioamnionitis, n (%)	3 (23.1)	0	3 (37.5)	0.21
Cord prolapse (n, %)	1 (7.7)	0	1 (12.5)	0.52
NRFHT (n, %)	7 (53.8)	2 (66.7)	3 (37.5)	0.39
Cord pH (Mean ± SD)	6.97 ± .2	6.71 ± 0.1	7.04 ± 0.2	0.10
Cord Base Deficit (Mean ± SD)	12.9 ± 8.2	18	11.2 ± 7.4	0.45
Blood gas pH first hour (Mean ± SD)	7.15 ± .1	7.10 ± 0.1	7.19 ± 0.1	0.33
Blood gas BD first hour (Mean ± SD)	13.2 ± 8.2	18.3 ± 8.0	11.3 ± 8.6	0.25
Time to cool (hours) (Mean ± SD)	3.5 ± 1.0	3.4 ± .8	3.6 ± 1.0	0.71
Seizures, n (%)	5 (38.5)	3 (100)	2 (25)	.026
Pressor support n (%)	7 (53.8)	1 (33.3)	4 (50)	0.62
MRI DOL (Mean ± SD)	5.2 ± 1.7	5 ± 2.6	5.3 ± 1.4	0.82
Time to full feeds(Mean ± SD)	7.3 ± 2.6	6.5 ± 2.1	7.5 ± 2.8	0.65
Length of stay (Mean ± SD)	10.7 ± 6.2	11 ± 7.8	12.6 ± 5	0.69

Table 1: Demographics

Table 2. HIE					
	HIE	n	Mean	Std. Deviation	p-value
CFTOE	Yes	3	0.07	0.02	0.03
	No	8	0.15	0.05	
CrSO2 Mean	Yes	3	91.3	1.4	0.04
	No	8	83.4	5.3	

Table 2: HIE

Table 3. Acute Kidney Injury					
	AKI	n	Mean	Std. Deviation	p-value
RFTOE	Yes	1	0.25		0.85
	No	9	0.22	0.12	
RrSO2 Mean	Yes	1	74.2		0.88
	No	9	76.3	12.4	

Table 2: Acute Kidney Injury

Table 4. Liver Injury					
	Liver Injury	n	Mean	Std. Deviation	p-value
SFTOE	Yes	4	0.24	0.09	0.53
	No	7	0.28	0.08	
SrSO2 mean	Yes	4	72.1	6.1	0.83
	No	7	71.0	8.9	

Table 2: Liver Injury

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Late Caffeine Administration May Also Offer Renal Protection in Preterm Neonates

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Background Caffeine is well known to decrease the incidence of apnea of prematurity. Caffeine in addition to its diuretic properties, acts as an antagonist at the renal adenosine receptors, increasing the renal blood flow by changing the efferent and afferent arteriolar tone and thereby glomerular filtration rate (GFR). A recent multi-center study showed early use of caffeine in preterm neonates < 33 weeks gestational age (GA) to be associated with reduced risk of acute kidney injury. However, more research is needed to establish similar effects if started later and to determine the long term protective effects.

Objective Our study aims to assess the association of caffeine in improving the estimated GFR (eGFR) when initiated ≥ 5 days of life

in preterm neonates of GA <33 weeks.

Design/Methods This is a retrospective cohort study, which includes preterm neonates of GA < 33 weeks born at our center between January 2014 and June 2018. Three groups were identified - early caffeine group defined as neonates who received caffeine before 5 days of life, late caffeine group defined as neonates who received caffeine ≥ 5 days of life, and no caffeine group defined as neonates who never received caffeine. eGFR was calculated using modified Schwartz equation [eGFR, ml/min/1.73 m2 = k x length, cm/ S.Cr, mg/dL (k= 0.33 for preterm neonates)]. Data was analyzed using SPSS software. Mean (±SD) or number (%) was used for descriptive statistics. Comparison in baseline characteristics was done using $\chi 2$ or Fisher's Exact Tests for categorical variables, one-way ANOVA or Kruskal Wallis tests for numerical variables and student's t-test for renal parameters.

Results Among 134 preterm neonates assessed for eligibility, after exclusion criteria 121 were included for analysis: 22 (18%) in the late caffeine group, 75 (62%) in the early caffeine group and 24 (20%) in the no caffeine group (Fig. 1). Table 1 shows the baseline characteristics. No statistically significant difference was found between eGFR values for late vs early caffeine groups until 39 weeks postmenstrual age (PMA) (Fig. 2). Analysis between late vs. no caffeine groups showed late caffeine group had better mean eGFR compared to the no caffeine group despite better GA and birth weight in the later (P<0.05) (Fig. 3).

Conclusion(s) Our study indicates that caffeine may offer nephroprotection in all preterm neonates, even when started after day 5 of life. Further studies are needed to determine the long term renal effects and to optimize the dose of caffeine.

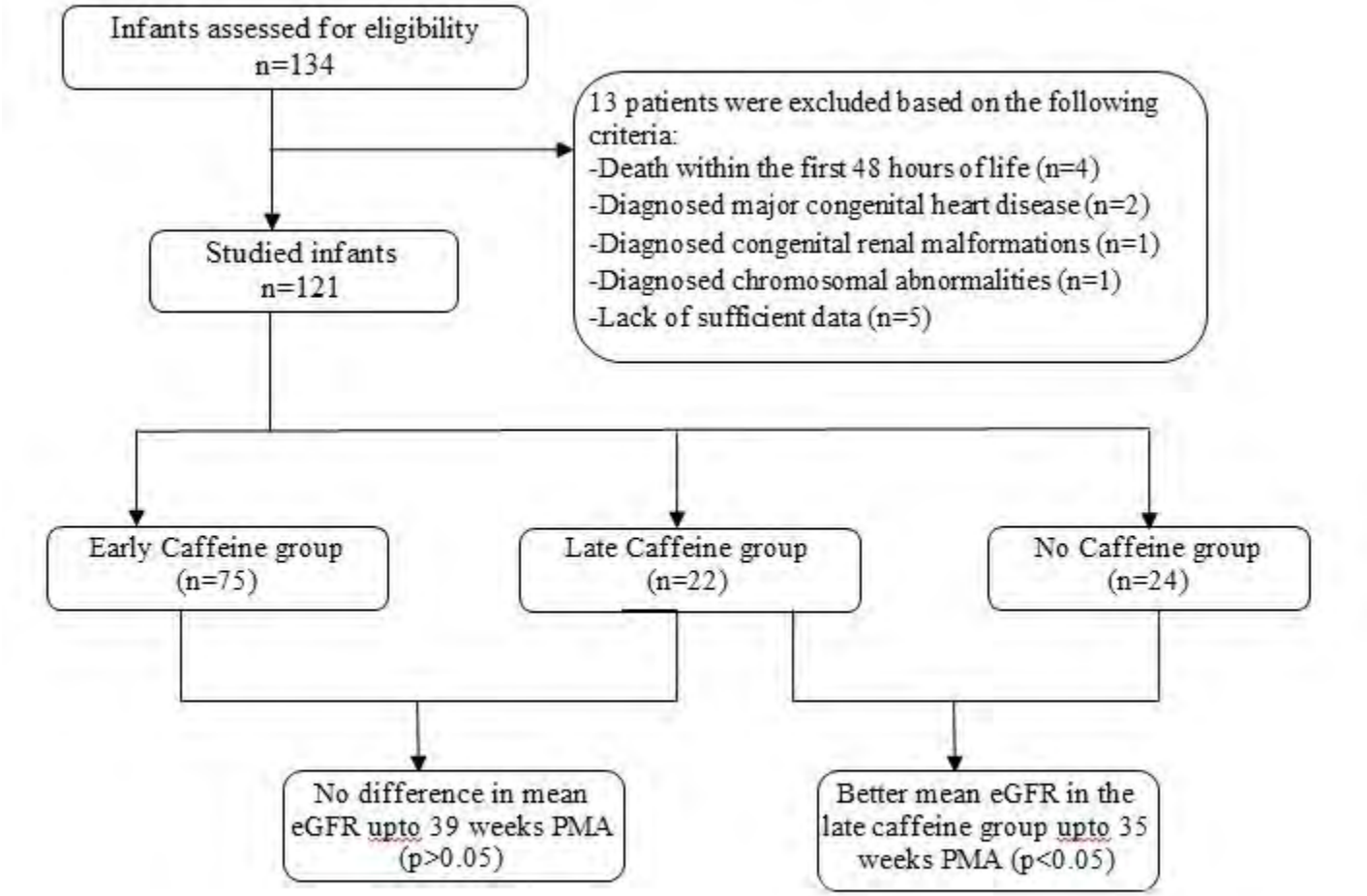

Figure 1: Flowchart for Late Caffeine Administration May Also Offer Renal Protection in Preterm Neonates

Figure 2: Comparison of eGFR between Late vs Early Caffeine Groups

Parameter	Late caffeine	Early caffeine	p-value
eGFR at PMA 24-25 (n=3 / N=9)	12.4 ± 1.6	12.7 ± 2.4	0.832
eGFR at PMA 26-27 (n=8 / N=32)	15.0 ± 3.2	17.6 ± 5.4	0.101
eGFR at PMA 28-29 (n=13/ N=45)	19.2 ± 6.2	21.4 ± 7.1	0.329
eGFR at PMA 30-31 (n=20/ N=70)	25.3 ± 9.3	25.2 ± 8.0	0.972
eGFR at PMA 32-33 (n=18 / N=68)	31.7 ± 10.6	33.8 ± 10.7	0.459
eGFR at PMA 34-35 (n=14 / N=49)	39.2 ± 12.3	43.2 ± 13.1	0.312
eGFR at PMA 36-37 (n=8 / N=29)	48.1 ± 6.4	48.6 ± 11.5	0.902
eGFR at PMA 38-39 (n=5 / N=15)	54.6 ± 11.2	56.2 ± 8.3	0.731

eGFR- modified Schwartz equation [eGFR, ml/min/1.73 m2 = k x length, cm/ serum Cr, mg/dL (k= 0.33 for preterm infants)].
Data is expressed as mean ± standard deviation
PMA: postmenstrual age
n= number of cases in Late caffeine group at that PMA
N = number of cases in Early caffeine group at that PMA

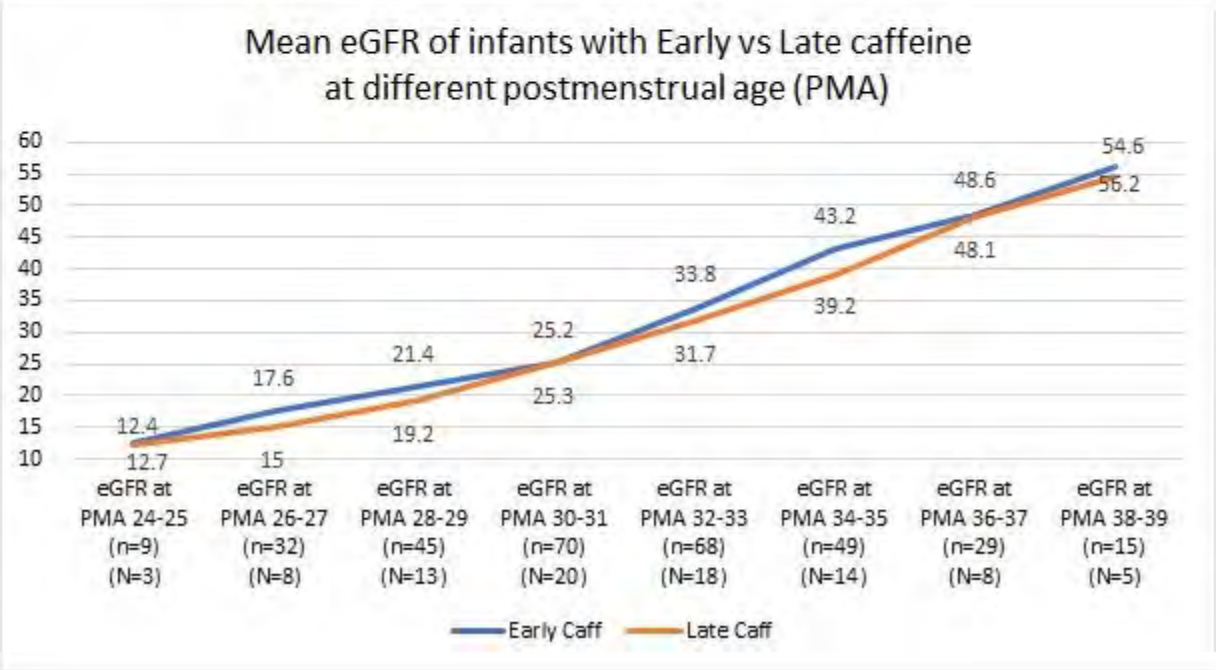

Figure 2: Comparison of eGFR between Late vs Early Caffeine Groups

Figure 3: Comparison in eGFR between LATE caffeine vs NO caffeine groups

Parameter	NO caffeine	LATE caffeine	*p*-value
eGFR at PMA 30-31 (n=9 / N=20)	17.1 ± 4.5	25.3 ± 9.3	0.003
eGFR at PMA 32-33 (n=19 / N=18)	19.9 ± 8.0	31.7 ± 10.6	0.001
eGFR at PMA 34-35 (n=12 / N=14)	25.3 ± 6.3	39.2 ± 12.3	0.001
eGFR at PMA 36-37 (n=5 / N=8)	39.5 ± 10.5	48.1 ± 6.4	0.089

eGFR: modified Schwartz equation [eGFR, ml/min/1.73 m2 = k x length, cm/ serum Cr, mg/dL (k= 0.33 for preterm infants)].
All data is expressed as mean ± standard deviation
PMA: postmenstrual age
n = number of cases in NO caffeine group at that PMA
N = number of cases in LATE caffeine group at that PMA

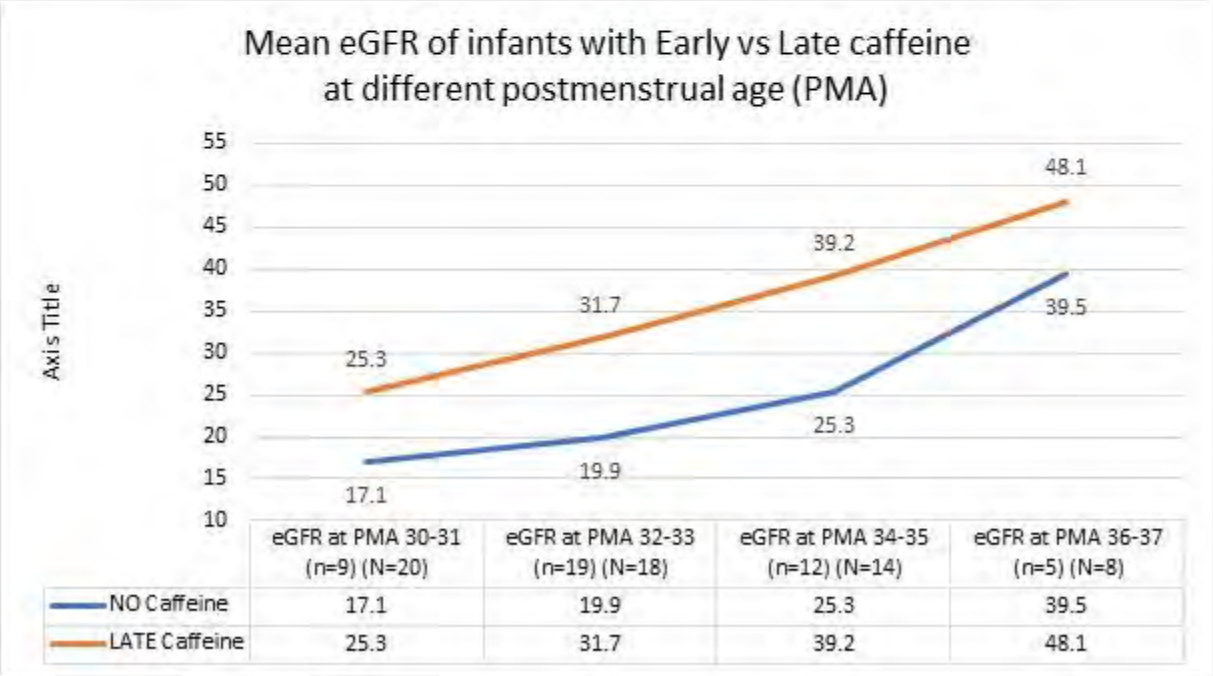

Figure 3: Comparison in eGFR between Late caffeine vs No caffeine groups

Demographic and clinical characteristics between early caffeine and late caffeine groups (n=121)

Characteristic	Early caffeine (n=75)	Late caffeine (n=22)	No caffeine (n=24)	p-value

GA, mean±SD	28.4 ± 2.3	28.6 ± 2.5	31.9 ± 1.1	<0.001
Maternal age, mean±SD	28.3 ± 6.3	27.5 ± 5.8	27.6 ± 5.6	0.812
Maternal intrapartum serum creatinine, mean ±SD	0.57 (±0.13)	0.55 (±0.14)	0.72 (±0.29)	0.017
Black Race, n (%)	67 (89%)	18 (82%)	22 (92%)	0.590
Birth weight (g), mean±SD	1065 ±331	1104 ±323	1743 ±503	<0.001
Cord Arterial pH, mean±SD	7.27 ±0.12	7.31 ±0.09	7.26 ±0.11	0.308
APGAR at 1 min, median (IQR)	6 (4-8)	6 (5-7)	8 (7-9)	0.006
APGAR at 5 min, median (IQR)	8 (7-9)	8 (6-9)	8 (8-9)	0.001
Day of life started caffeine, median (IQR)	2 (1-2)	7 (5-8)	NA	<0.001
Caffeine dose, median (IQR)	5 (5-6)	5 (5-6)	NA	0.674
Sepsis, n (%)	56 (75%)	15 (68%)	8 (33%)	0.001
Deceased, n (%)	4 (5%)	0 (0%)	0 (0%)	0.281
Use of inotropes, n (%)	11 (15%)	1 (5%)	0 (0%)	0.201
Use of gentamicin, n (%)	71 (95%)	22 (100%)	23 (96%)	0.817
Use of ibuprofen, n (%)	17 (23%)	3 (14%)	0 (0%)	0.103

Early caffeine: < 5 days of age, Late caffeine: >= 5 days, no caffeine: never received caffeine, SD: standard deviation, IQR: interquartile ratio, GA: gestational age

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Assessment of a Perinatal / Neonatal Palliative Care Training Course

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Background Perinatal / neonatal palliative care (PNPC) offers a plan of care for improving quality of life when the prolongation of life is no longer the goal of care or the complexity of the medical condition is associated with an uncertain prognosis. There is a gap in knowledge and competency regarding the management of infants with life-limiting conditions. To address this educational need, an interdisciplinary team developed a 3-day intensive training course. The course faculty presented evidence-based rationale and strategies for providing support for families and for achieving a state of comfort for newborns with life-limiting conditions.
Objective The aim of the present study was to assess the efficacy of the PNPC training course in improving the self-reported competence of participants.
Design/Methods A cross-sectional survey design was used to obtain data from nurses, physicians, and other health care professionals who attended the training course. A validated questionnaire was modified with permission to collect data. The modified questionnaire included 10 demographic items, 5 items related to participants' previous palliative care education, and 32 items that queried participants about their self-assessed competence using a forced 1 to 4 Likert scale. The survey was administered to participants using the web-based tool Qualtrics at two time points, at the beginning of the course and one week after the completion of the course.
Results The pre-course survey response rate was 100% while the post-course survey response rate was 67%. Physicians and nurses represented 88% of the participants, of which 60% were from neonatology, 14% were from obstetrics, 7% were from palliative care, 4% were from pediatrics and 12% were from other subspecialties. 47% of all participants reported having previous palliative care training. The 32 items addressing competency were clustered into the eight domains of quality palliative care. The responses to the questions in each domain for each participant were summed for the pre-course survey and the post-course survey. Results from paired sample t-tests were statistically significant in each domain. (Table 1)
Conclusion(s) The development and presentation of an evidence-based curriculum enables participants to reflect on their organizational practices and consider implementation opportunities. Formal palliative care education shows promise in increasing the self-reported competence of participants.

Table 1: Comparison of Pre-Test and Post-Test Results within Each Domain

Domain Name *(Number of items within domain)*	***n****	**Pre-Test** **M (sd)**	**Post-Test** **M (sd)**	**t-test (df); *sig.***
Structure and Process *(10)*	18	24.3 (10.1)	31.9 (9.6)	-3.5 (17); $p = .002$
Physical *(10)*	19	27.0 (6.7)	33.9 (7.0)	-5.1 (18); $p < .001$
Psychological and Psychiatric *(4)*	24	9.8 (3.2)	13.9 (2.4)	-6.0 (23); $p < .001$
Social *(3)*	38	7.9 (2.2)	10.2 (1.6)	-6.4 (37); $p < .001$
Spiritual, Religious, and Existential *(1)*	41	2.9 (0.88)	3.6 (0.5)	-5.1 (40); $p < .001$
Cultural *(1)*	42	2.9 (0.96)	3.7 (0.6)	-5.2 (41); $p < .001$
Care of Patient Nearing the End of Life *(2)*	38	5.7 (2.3)	7.1 (1.8)	-4.3 (37); $p < .001$
Ethical and Legal *(1)*	49	2.9 (1.1)	3.7 (0.8)	-5.1 (48); $p < .001$

* The sample size is based on the total number of participants completing each item in each domain in pre-test and post-test surveys.

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High Rates of Withdrawal of Life Sustaining Therapy(WLST) in Early Death (<12 hours) after Transfer to Level IV NICUs

Devika Locke[1], Jason Niehaus[2], Krishna Acharya[3], Anita Shah[4], Ankur Datta[5], Catherine Wraight[6], Erica Wymore[7], Julie Weiner[8], Nana Matoba[9], Brighid O'Donnell[22], Rebecca Rose[10], Amy Schlegel[11], Carl Coghill[12], Monica Wojcik[13], Pritha Nayak[14], Robert DiGeronimo[15], Girija Nataranjan[16], Steven Leuthner[17], Con Yee Ling[18], Narendra Dereddy[19], Jamie Seale[20], Helen Williams[21], Laura Jackson[22], Jessica Fry[2], Kevin M. Sullivan[1]

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Background The decision to transport a critically ill infant to a higher level NICU is designed to provide therapies to improve survival. Unfortunately, some infants die quickly following transport and little is known about the contributing factors or manner of their death.

Objective To compare characteristics and end-of-life events of infants who died less than 12 hours after transfer to level IV NICUs with other infants that die later following transfer.

Design/Methods Children's Hospitals Neonatal Consortium (CHNC) is a group of 34 level IV NICUs across the US that prospectively collect data on all admitted neonates. This was a retrospective cohort analysis using data collected between 2010-2016. Infants who were inborn were excluded. Demographic factors including race, gestational age, medical diagnoses and interventions were compared for infants who died less than 12 hours after transfer and infants who died greater than 12 hours after transfer. These categories were analyzed using parametric and non-parametric testing as appropriate.

Results A total of 6035 infant deaths were reviewed with 356 (5.9%) dying at less than 12 hours. Infants dying early were of younger

gestational age, lower birth weight, had increased comorbidities,and were more likely to be intubated and paralyzed at admission. Infants who died early more commonly had as their primary cause of death intra-abdominal catastrophes (35.4% vs. 10.8%), including GI perforation (7% vs. 4%) (Table 1). Additionally, a higher percentage of infants with early death had do-not-resuscitate (DNR) orders in place (51.7% vs. 19.8%), and they were less likely to have withdrawal of life-sustaining therapies (WILST) (55.6% vs. 72.9%), or receive cardiopulmonary resuscitation (CPR) around death (38% vs. 55.6%) (Table 2).

Conclusion(s) Infants in this cohort with early mortality after transfer have predictably higher acuity at admission. Surprisingly, the majority of early deaths appear to be anticipated with preceding DNR and WLST along with lower rates of CPR. This study highlights the importance of interdisciplinary decision making to ensure that patient transfers to higher levels of care continue to align with overall family goals of care.

Variable	Sub-Category	All	Died > 12 Hrs	Died < 12 Hrs	P value
N(%)		6035	5679	356	
Gestational Age (Wks)		33 (26,37)	33 (26,37)	29 (25, 36)	<0.001
Admission PMA (Wks)		34 (28,38)	35 (28,38)	31 (28,36)	<0.001
Birth Weight (g)		1760 (760, 2815)	1815 (766, 2830)	1085 (706.5, 2490)	<0.001
Treatment during transport or First Hour	Intubated and Ventilated	4927 (81.64)	4599 (80.98)	328 (92.13)	<0.001
	Inhaled Nitric Oxide (iNO)	729 (12.08)	680 (11.97)	49 (13.76)	0.315
	Continuous Vasoactive Agents	1521 (25.2)	1345 (23.68)	176 (49.44)	<0.001
	Paralysis by neuromuscular blockade	380 (6.3)	331 (5.83)	49 (13.76)	<0.001
Co-Morbidities Present on Admission	BPD	263 (4.36)	261 (4.6)	2 (0.56)	<0.001
	GI Perforation	253 (4.19)	228 (4.01)	25 (7.02)	0.006
	NEC	638 (10.57)	519 (9.14)	119 (33.43)	<0.001
	Pneumothorax	239 (3.96)	215 (3.79)	24 (6.74)	0.006
	Sepsis	312 (5.17)	285 (5.02)	27 (7.58)	0.034
	No Morbidities	3441 (57.02)	3291 (57.95)	150 (42.13)	<0.001
Primary Cause of Death	Unexplained	20 (0.33)	16 (0.28)	4 (1.12)	<0.001
	Respiratory Failure	1563 (25.9)	1476 (25.99)	87 (24.44)	.
	Infection	279 (4.62)	264 (4.65)	15 (4.21)	.
	GI/Intra-abdominal Catastrophe	738 (12.23)	612 (10.78)	126 (35.39)	.
	CNS Injury	869 (14.4)	844 (14.86)	25.7 (7.02)	.
Referred from Other Hospital	Other Level NICU	463 (7.67)	447 (7.87)	16 (4.49)	0.062
	Missing	403 (6.68)	374 (5.9)	29 (8.15)	.
	AAP Level 1 NICU	3679 (60.96)	3468 (61.07)	211 (59.27)	.
	AAP Level 2 NICU	1040 (17.23)	974 (17.15)	66 (18.54)	.
	AAP Level 3 NICU	450 (7.46)	416 (7.33)	34 (9.55)	.

Table 1

Table 2:

Variable	All	Died > 12 Hrs	Died < 12 Hrs	P Value
N (%)	6035	5679	356	
DNR	1309 (21.69)	1125 (19.81)	184 (51.69)	<0.001
WILST	4339 (72.89)	4201 (73.97)	198 (55.62)	<0.001
CPR Within 6 hours	3295 (54.6)	3160 (55.64)	135 (37.92)	<0.001

Table 2

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Actigraphy as an objective measure of irritability in Neonatal Abstinence Syndrome

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Background Opioid withdrawal among neonates with Neonatal Abstinence Syndrome (NAS) includes hyperirritability, defined by increased movement (e.g., jitteriness, exaggerated Moro reflex), incessant crying and prolonged wakefulness, disrupting the quantity and quality of sleep. Sleep disturbances in newborns impacts healthy neonatal growth and brain development and may contribute to poor neurodevelopmental outcomes. Current scoring tools for defining irritability in NAS rely on subjective assessments. Actigraphy, a non-invasive measure of movement activity, may serve as an objective marker to evaluate irritability in NAS.
Objective This preliminary study investigated whether wake and sleep states, indexed by high and low movement activity via actigraphy, were affected by low-level, stochastic (random) vibrotactile stimulation (SVS; 30-60Hz, 10-12µm RMS) using a specially constructed crib mattress previously shown to improve autonomic function.
Design/Methods Seven opioid-exposed neonates (mean PMA 40.3 wks, 1.7 SD; 4 male) hospitalized since birth and requiring pharmacological treatment for NAS were studied at UMass Memorial NICU. Infants on ad-libitum feeds were studied supine in their crib during a single session for three consecutive inter-feed periods: 1) OFF1=no SVS stimulation; 2) ON1=continuous SVS; 3) OFF2=no SVS stimulation. Movement activity was measured using an actigraph (accelerometer averaging movement frequency over continuous 1 min intervals) worn around the infant's ankle throughout the study session. Low activity=0-5 movements/min defined Quiet Sleep; Moderate activity=6-100 movements/min defined Active Sleep; and High activity=101-400 movements/min defined Wake.
Results There was a main effect of SVS on overall actigraph activity ($F(2,18)=8.33$; $P=0.003$) with significantly fewer movements/min during ON1 (mean 12.4, SD 7.3) than either OFF1 (mean 51.3, SD 26.7; $P=0.002$) or OFF2 (mean 37.9, SD 14.9; $P=0.050$). As illustrated in Figure 1, infants had more Quiet Sleep (low movement activity) and less Wake (high movement activity) during SVS ON than OFF. Active Sleep was not affected by SVS.
Conclusion(s) These preliminary findings showed an apparent decrease in movement activity with SVS, with actograms indicative of more Quiet Sleep and less Wake during SVS. Actigraphy may serve as an objective measure of irritability and help identify sleep quality in NAS.
Support: NIDA R21DA035355; NIDA R01DA042074; Wyss Foundation, Harvard University

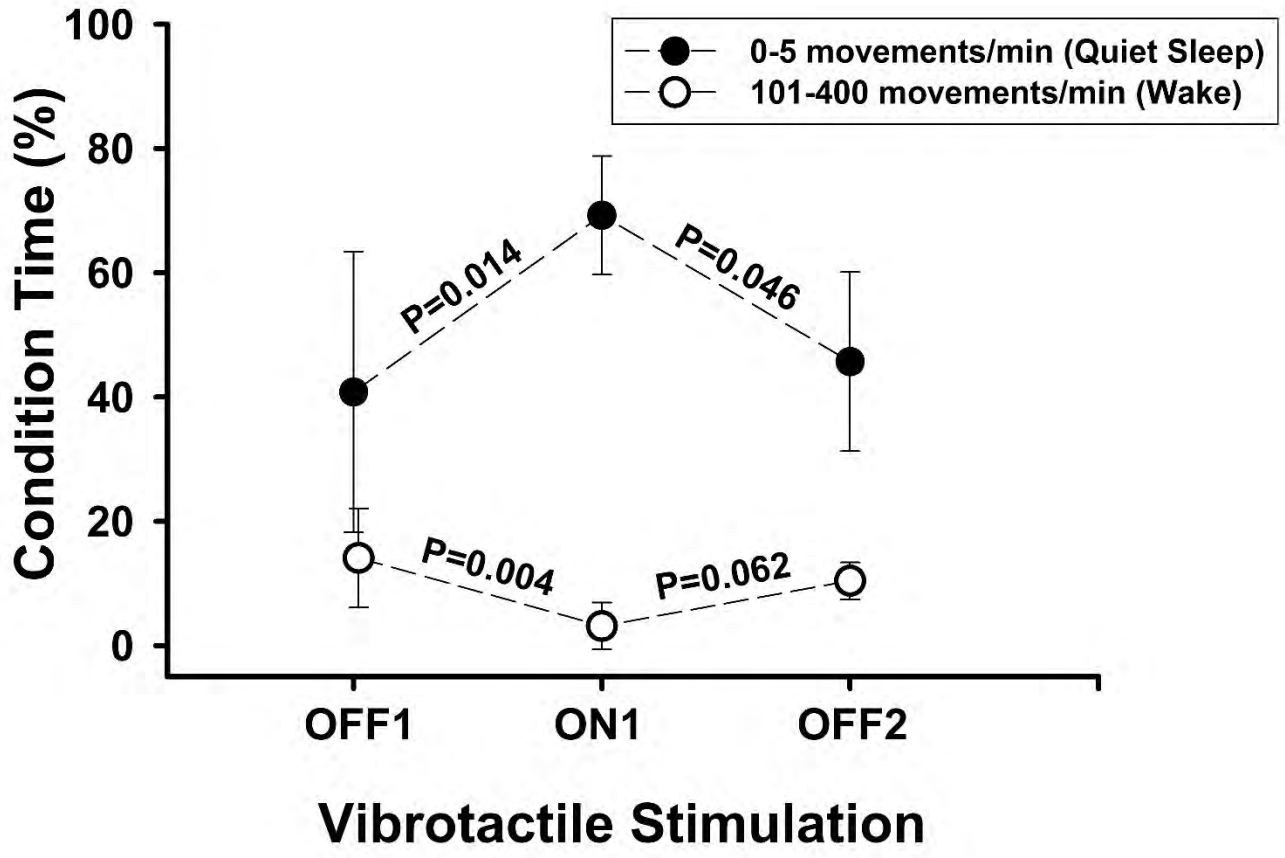

Figure 1. Reduced actigraph activity with vibrotactile stimulation in opioid-exposed newborns

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The 10-year experience of a referral Newborn/Infant Chronic Lung Disease Program

Kathleen Gibbs, Erik Jensen, Kevin Dysart, Nicolas A. Bamat, Kathleen Nilan, Sara B. DeMauro, Jason Z. Stoller, Huayan Zhang
Neonatology, Children's Hospital of Philadelphia, Philadelphia , Pennsylvania, United States

Background Bronchopulmonary dysplasia (BPD) is the most common and consequential chronic complication of preterm birth. BPD occurs along a wide-spectrum of severity and the management of the most severe forms presents a unique challenge that may be best suited for a multi-disciplinary team-based approach. The Newborn/Infant Chronic Lung Disease Program (neoCLD) at the Children's Hospital of Philadelphia (CHOP) was established in 2010 and has cared for over 500 infants with severe BPD.
Objective To describe the evolution of our multi-disciplinary care model, patient characteristics, and common therapeutic interventions for infants in our program over 10 years.
Design/Methods Case series of infants cared for by the neoCLD program at CHOP from 4/2010 to 11/2019.
Results 508 infants have been admitted to our program since 2010. Yearly admission numbers and key program milestones are shown in Figure 1. Current program composition and workflow are shown in Figure 2. Consensus care decisions, consistent communication with families, and inter-disciplinary research are program strengths. Patient characteristics are in Table 1. Most patients (65%) were admitted at >36 weeks postmenstrual age (PMA) for CLD care. Those admitted earlier often required care for additional complications of prematurity. In total, 88% of infants survived to hospital discharge and 64% were discharged directly home. Most were treated with systemic corticosteroids, diuretics, and post pyloric feedings. Nearly half were treated for pulmonary hypertension; 33% received sildenafil. Tracheostomy, gastrostomy tube +/- fundoplication were performed in nearly 40%. Markers of illness severity such as admission respiratory severity score and rates of tracheostomy did not change over time. Regional referral patterns are

shown in Figure 3.

Conclusion(s) Over a 10-year period, our NeoCLD program grew from a small consult team to a multi-disciplinary, inpatient medical service caring for >50 infants with severe CLD per year. Our program model promotes coordinated care and research performed by a diverse group of physicians and surgeons, family psychologists, nurses, therapists, social workers, case managers, and child-life specialists. Mortality rates among infants in the program were low. However, many infants underwent invasive diagnostics tests and surgical interventions during their hospital stay and were dependent on medical technologies beyond the time of discharge. Large scale studies are needed to optimize care for this vulnerable cohort of patients.

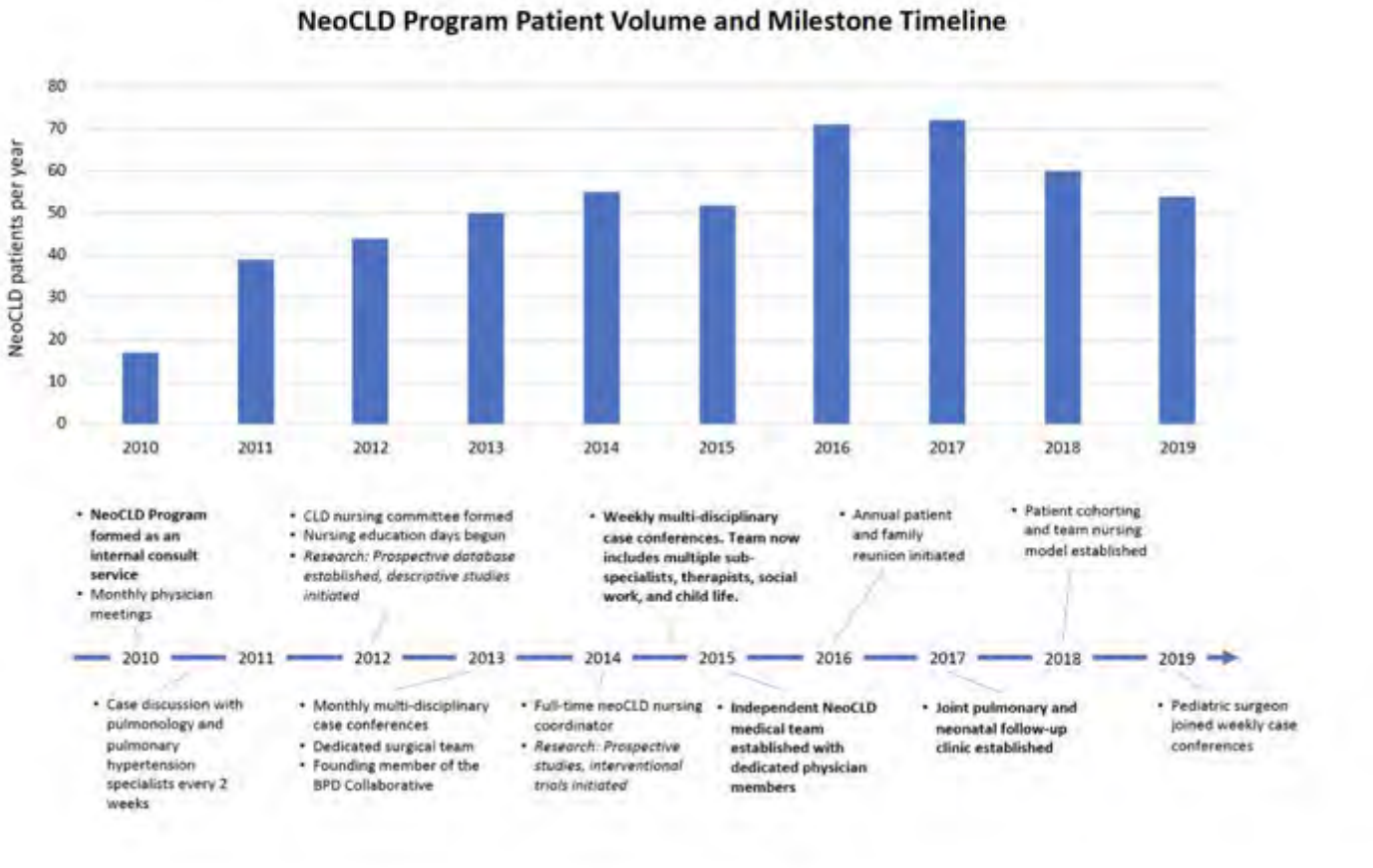

Figure 1: Evolution of NeoCLD Program

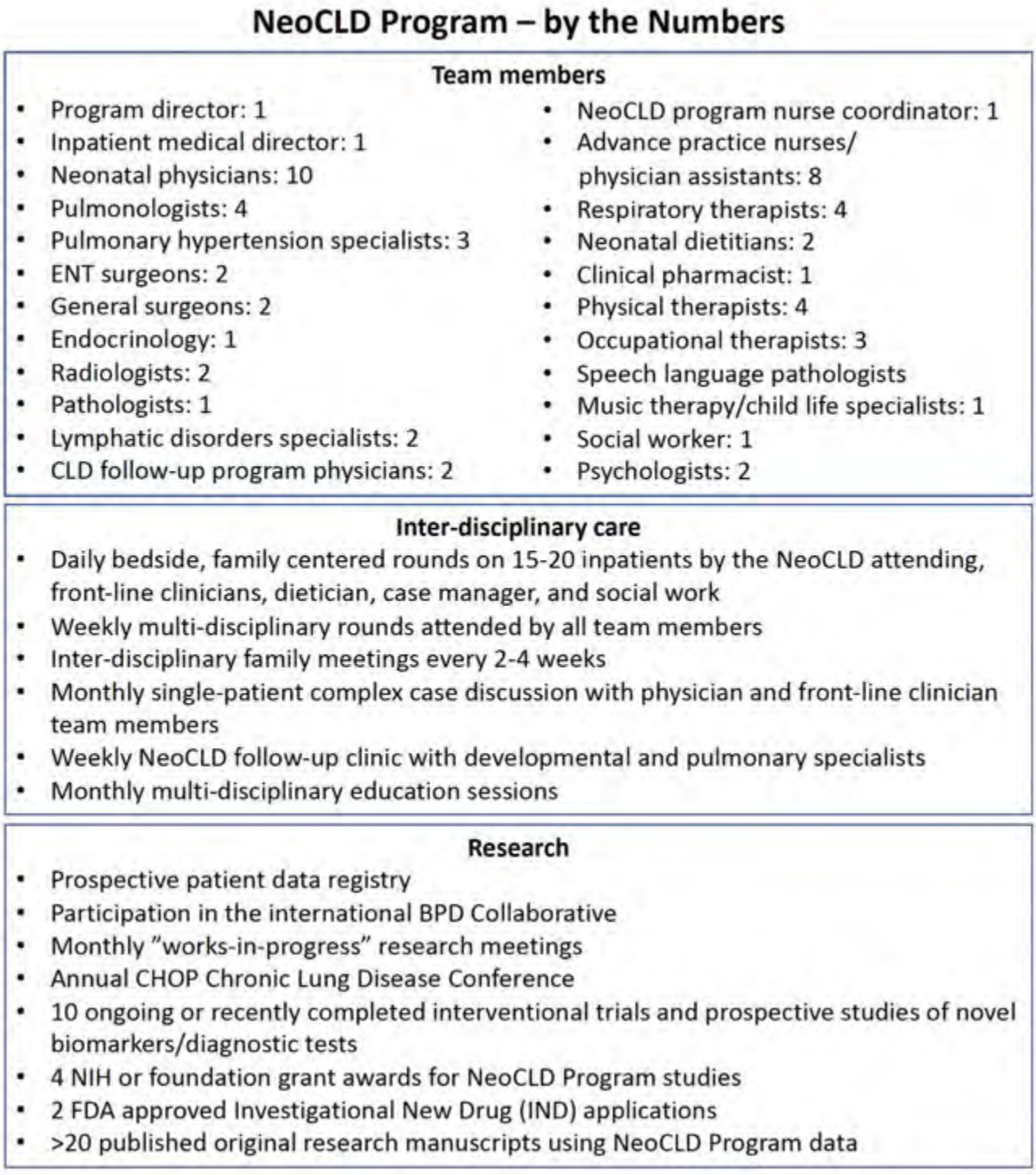

Figure 2: NeoCLD Program Composition and Characteristics

Patient Characteristics and NeoCLD Program Management	
Gestational age, weeks – mean (range)	25 (22-32)
Birthweight, grams – median (range)	690 (360-2940)
Male	60%
PMA at N/IICU admission, weeks – mean (range)	38 weeks (23-68)
Admitted after 36 weeks PMA	65%
Respiratory severity score on admission, median (range)	4.4 (1.1-28)
Mechanical ventilation at admission	66%
Discharge Demographics	
N/IICU length of stay, weeks – median (range)	15 (2-52)
Discharged alive	88%
Discharge directly to home	64%
Discharged to long term care/rehab facility	15%
Discharged to referring/outside hospital	6%
Tracheostomy	38%
Pulmonary Hypertension Management	
Treated with iNO during admission	46%
Treated with sildenafil	33%
Cardiac catheterization during admission	17%
Administered Respiratory Medications	
Dexamethasone during N/IICU admission	67%
Hydrocortisone during N/IICU admission	49%
Any systemic corticosteroid therapy	81%
Albuterol	75%
Ipratropium	27%
Administered Diuretic Therapies	
Furosemide	83%
Thiazide	77%
Spironolactone	10%
Received more than one diuretic class	71%
Feeding and Reflux Therapies	
Post pyloric feeding at any time	81%
Treated with an anti-reflux medication	58%
Gastrostomy tube	49%
Gastric fundoplication	41%
Select Diagnostic Testing	
Bronchoscopy	40%
Chest CT with/without angiography	63%

Table 1: Patient Characteristics

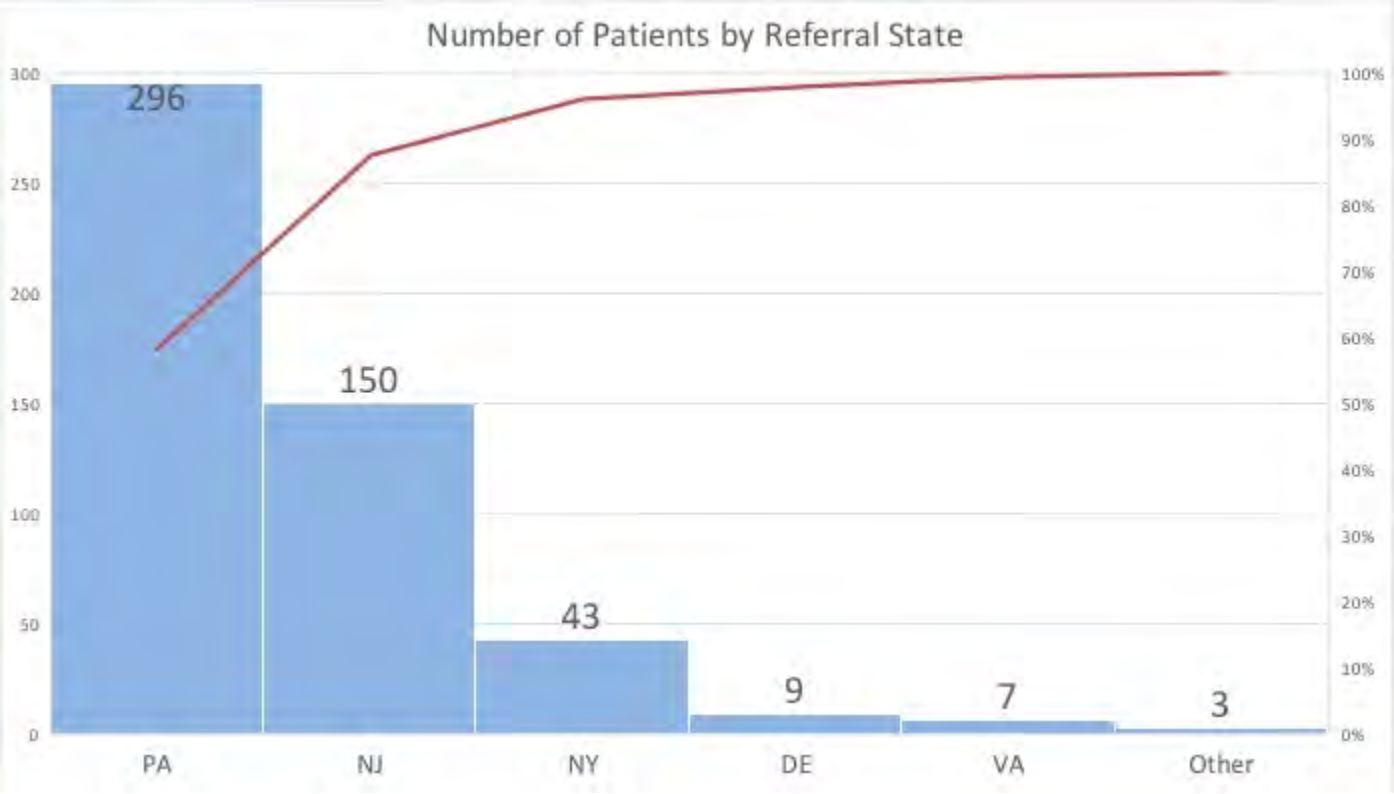

Figure 3: Patient Referral Patterns

Abstract: 389

Neonatal Provider Opinions Regarding the Use of Telemedicine During Simulated Neonatal Transport Resuscitations

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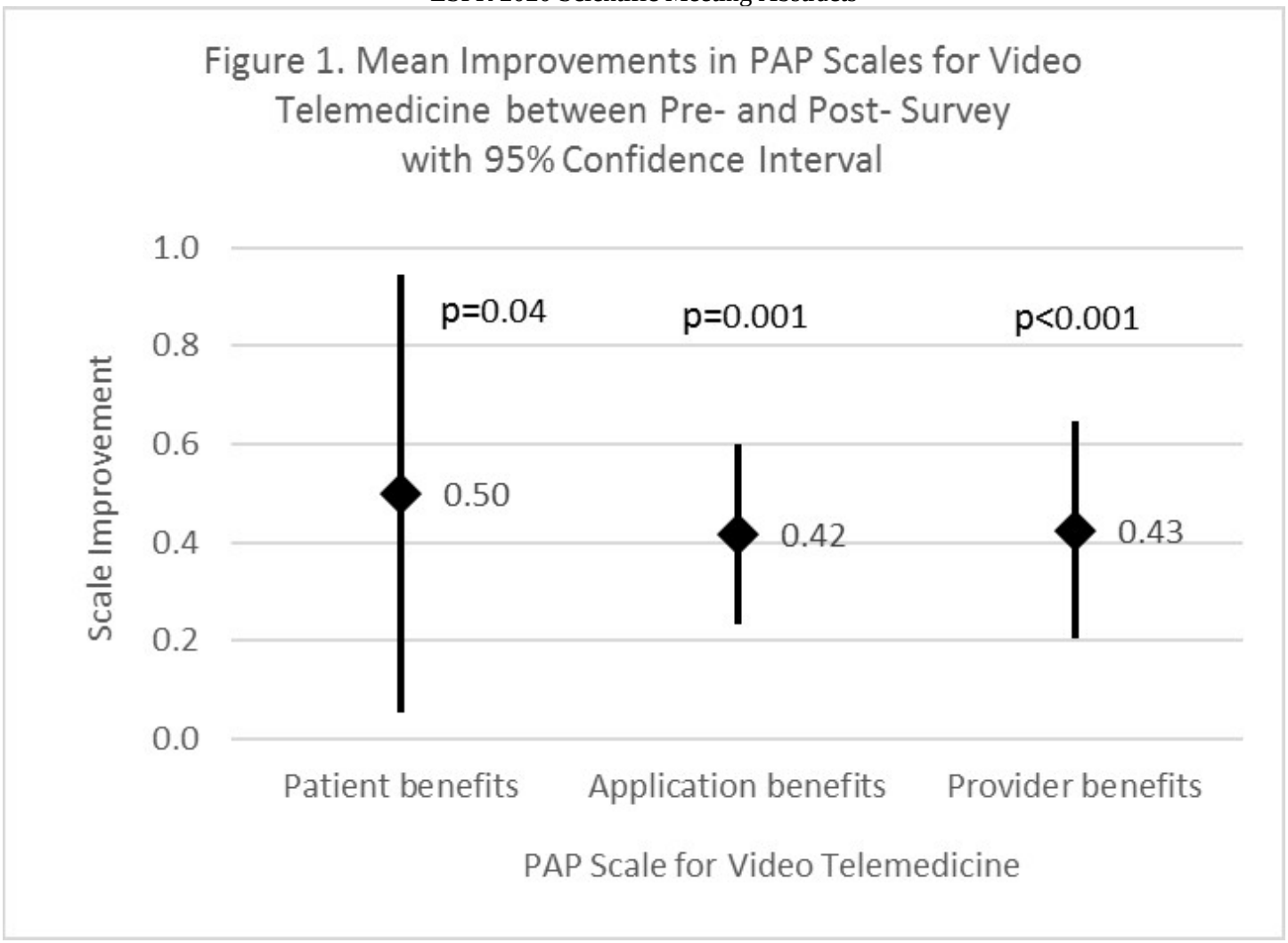
Background Telemedicine, specifically videoconferencing, has been used in neonatology to bridge disparities of experience between institutions but it has not yet been established to replace telephone guidance for infant resuscitations between neonatal intensive care units (NICUs).

Objective To assess opinions of NICU providers regarding use of telemedicine to guide neonatal transport resuscitations in comparison to current standard practice without telemedicine in addition to assessing the accuracy of obtaining clinical and radiological data via the telemedicine platform.

Design/Methods We conducted a pre- and post-survey of twenty NICU providers at the University of Massachusetts Memorial Medical Center (UMMMC) after obtaining a new telemedicine system that allows videoconferencing between UMMMC and affiliate community newborn nurseries. The pre-survey included 21 questions regarding comfort with telemedicine. Each provider then completed an identical simulation scenario using the new system. The provider utilized Neonatal Resuscitation Program algorithms to help guide a bedside provider through the simulated resuscitation. During each simulation, a bedside provider perfomed scripted errors and a consistent abnormal x-ray finding was displayed to assess whether providers were able to accurately identify the abnormalties via video. After the simulation, a second survey that contained 15 common items from the pre-survey was conducted to reflect the experience of using the video telemedicine platform. Factor analysis was used to develop the composite scales. The two surveys were then compared using the pre-post t-test at item and scale levels.

Results The use of telemedicine during simulated transport resuscitations led to significant improvement in providers' opinions regarding the use and accuracy of the telemedicine platform. At item-level, 8 out of 15 items showed statistically significant improvement ($p<0.05$). Three composite scales, representing patient, application and provider (PAP) benefits of using video telemedicine, were identified from factor analysis and validated psychometrically. They explained 76% of the total variance, with Cronbach alpha ranging from 0.70 to 0.94. All three scales showed significant improvements in using the system ($p<0.05$, Figure 1).

Conclusion(s) The use of telemedicine as compared to the current standard of care was perceived by NICU providers as a safe and accurate way of obtaining as well as managing clinical data for simulated neonatal transport resuscitations.



Abstract: 390

Airway Pressure and End Expiratory Lung Volumes (EELV) Delivered by Non-Invasive High Frequency Oscillatory Ventilation Compared to a Prototype High Frequency Nasal Cannula Device in Neonates

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Background Non-invasive ventilation (NIV) is now the preferred mode of respiratory support for many neonates. Non-invasive high frequency oscillatory ventilation (nHFOV) has been used when CPAP or conventional NIV failed. nHFOV combines advantages of HFV and CPAP, it is thought to be better at removing carbon dioxide (CO_2) and maintain functional residual capacity. We previously showed that a prototype High Frequency Nasal Cannula device (HIFI-NC) removes CO_2 more efficiently and delivers a higher tracheal pressure (TP) compared to regular HFNC or bubble CPAP. To date there are no data regarding TP and VT delivered via nHFOV in neonates

Objective To compare TP and EELV delivered by nHFOV compared to HIFI-NC via a 3-D prototype neonatal nasal airway using a lung simulator

Design/Methods A neonatal lung model 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,150 cm H_2O/L/s; simulated muscle pressure minus 5cm H_2O (active model). A nose fixture created using a 3-D printer attached to a standard 22-15-mm adapter and connected to ASL 5000 to simulate a neonatal nasal passage. The model was subjected to nHFOV via a size 3.0 nasal cannula using frequency of 8 Hz, inspiratory time 33%, amplitude 10cm and varying mean airway pressure of 5,6,7,8,9 and 10cmH_20. The model was then subjected to HIFI-NC at flows of 5, 6,7,8,9 and 10L/min. TP and EELV 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 and EELV increased with increasing MAP and flow but was significantly lower with nHFOV compared to HIFI-NC at every measurement setting.
Conclusion(s) In this simulated lung model, a measurable TP and EELV was delivered by nHFOV although it is much lower than HIFI-NC. Both TP and EELV were higher with increasing MAP and flow. The measured TP were significantly lower than the set ventilator pressures because of the leak via the nasal interface. Because HIFI-NC can deliver higher TP and EELV, this simpler device has the potential to provide better non-invasive support compared to nHFOV and may translate into clinical benefits

Tracheal Pressure and Tidal Volume

	nHFOV	HIFI-NC
Mean Tracheal Pressure (cmH2O) at MAP 5cm Vs Flow 5L/min	0.7± 0.1	2.2 ± 0.1
Mean Tracheal Pressure (cmH2O) at MAP 6cm Vs Flow 6L/min	0.9 ± 0.2	3.1 ± 0.1
Mean Tracheal Pressure (cmH2O) at MAP 7cm Vs Flow 7L/min	1.1 ± 0.2	4.5 ± 0.2
Mean Tracheal Pressure (cmH2O) at MAP 8cm Vs Flow 8L/min	1.3 ± 0.2	5.8 ± 0.2
Mean Tracheal Pressure (cmH2O) at MAP 9cm Vs Flow 9L/min	1.6 ± 0.2	7.6 ±0.2
Mean Tracheal Pressure (cmH2O) at MAP 10cm Vs Flow 10L/min	1.9 ± 0.2	9.3 ± 0.3
EEVL (mL) at MAP 5cm Vs Flow 5L/min	1.1 ± 0.2	2.4 ± 0.7
EEVL (mL) at MAP 6cm Vs Flow 6L/min	1.3 ± 0.7	3.2 ± 0.7
EEVL (mL) at MAP 7cm Vs Flow 7L/min	1.5 ± 0.7	4.5 ± 0.7
EEVL (mL) at MAP 8cm Vs Flow 8L/min	1.7 ± 0.7	5.6 ± 0.7
EEVL (mL) at MAP 9cm Vs Flow 9L/min	1.9 ± 0.7	7.2 ± 0.7
EEVL (mL) at MAP 10cm Vs Flow 10L/min	2.2 ± 0.7	8.8 ± 0.7

$p < 0.05$ for all measurements nHFOV vs HIFI-NC

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Can non-invasive measures of V/Q mismatch guide individualized CPAP level selection in preterm infants?
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Background The use of nasal continuous positive airway pressure (CPAP) over mechanical ventilation (MV) increases survival without bronchopulmonary dysplasia (BPD) in very preterm infants. Strategies to identify individualized, best CPAP levels that minimize ventilation/perfusion (V/Q) mismatch could help reduce CPAP failure.
Objective To measure within-subject changes in V/Q mismatch in response to an individualized CPAP level selection strategy.
Design/Methods We performed a single-arm trial (NCT02983825) in infants >24h of age, 27-35 weeks postmenstrual age, and requiring a fraction of inspired oxygen ($FiO2 \geq 25\%$ while on a CPAP level of 4-7 cm H2O. The study intervention was a protocol of stepwise CPAP level changes, with the direction and magnitude guided by the V/Q mismatch response at each step. V/Q mismatch was measured by the degree of right-shift (RS) in a curvilinear best-fit of multiple FiO2/SpO2 pairs, relative to the oxyhemoglobin dissociation curve (Fig 1). In each subject, RS was measured at 2 baseline periods 30 minutes apart, and then following each CPAP level change (Fig 2). “Best CPAP” was defined as the lowest CPAP level where a response (> 5% improvement in RS) was observed, and assigned as baseline when not observed. Our primary outcome was the within-subject change in RS between baseline and best CPAP, using a Wilcoxon signed-rank test for nonparametric matched-pairs.
Results Of 21 enrolled subjects, 12 were evaluable; the remainder were intubated for MV or fell outside of the eligible FiO2 and/or CPAP range during or after informed consent. Table 1 details cohort characteristics. 9/12 subjects completed the study protocol without meeting pre-specified stopping criteria. RS for each baseline and CPAP level change is depicted in Fig. 2. 6/9 subjects had a

response. The median [IQR] within-subject change in RS between baseline 2 and "best CPAP" was 1.2 [0-3.2] kPa; $p = 0.02$. A similar magnitude change in RS was observed between baseline periods at the same CPAP level 30 minutes apart; 1.3 [-1.3 - 3.5] kPa (Fig. 2, Table 2).

Conclusion(s) Non-invasive measures of V/Q mismatch are feasible, but challenged by the dynamically changing respiratory status of preterm infants requiring supplemental oxygen. It is unclear if the improved RS observed in response to an individualized CPAP level selection strategy reflects improvements in pulmonary gas exchange or random variation over time. The utility of this strategy for reducing CPAP failure requires further research.

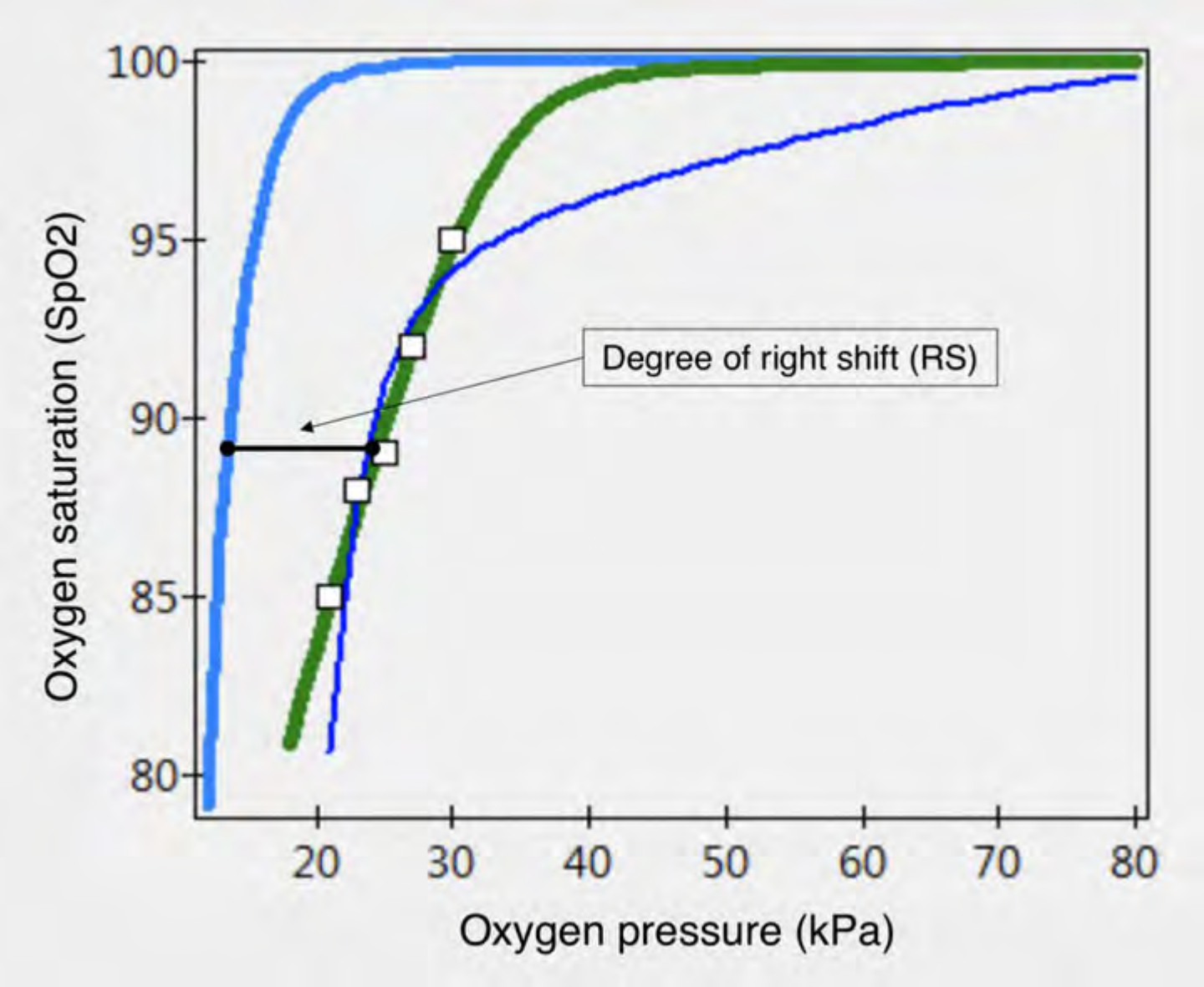

Figure 1. Right-shift: a non-invasive measure of V/Q mismatch. In preterm infants, small changes in delivered FiO2 cause changes in SpO2 measured by pulse-oximetry, generating FiO2/SpO2 pairs. A portable, computerized non-invasive gas exchange model generates a curvilinear best-fit overlying multiple FiO2/SpO2 pairs. The degree of right-shift in this curve relative to an oxyhemoglobin dissociation curve reference estimates the degree of V/Q mismatch. At sea level, FiO2 approximates the partial pressure of inspired oxygen (PiO2) in kilopascals (kPa). Abbreviations: SpO2, oxygen saturation; kPa, kilopascals; FiO2, fraction of inspired oxygen; V/Q, ventilation/perfusion.

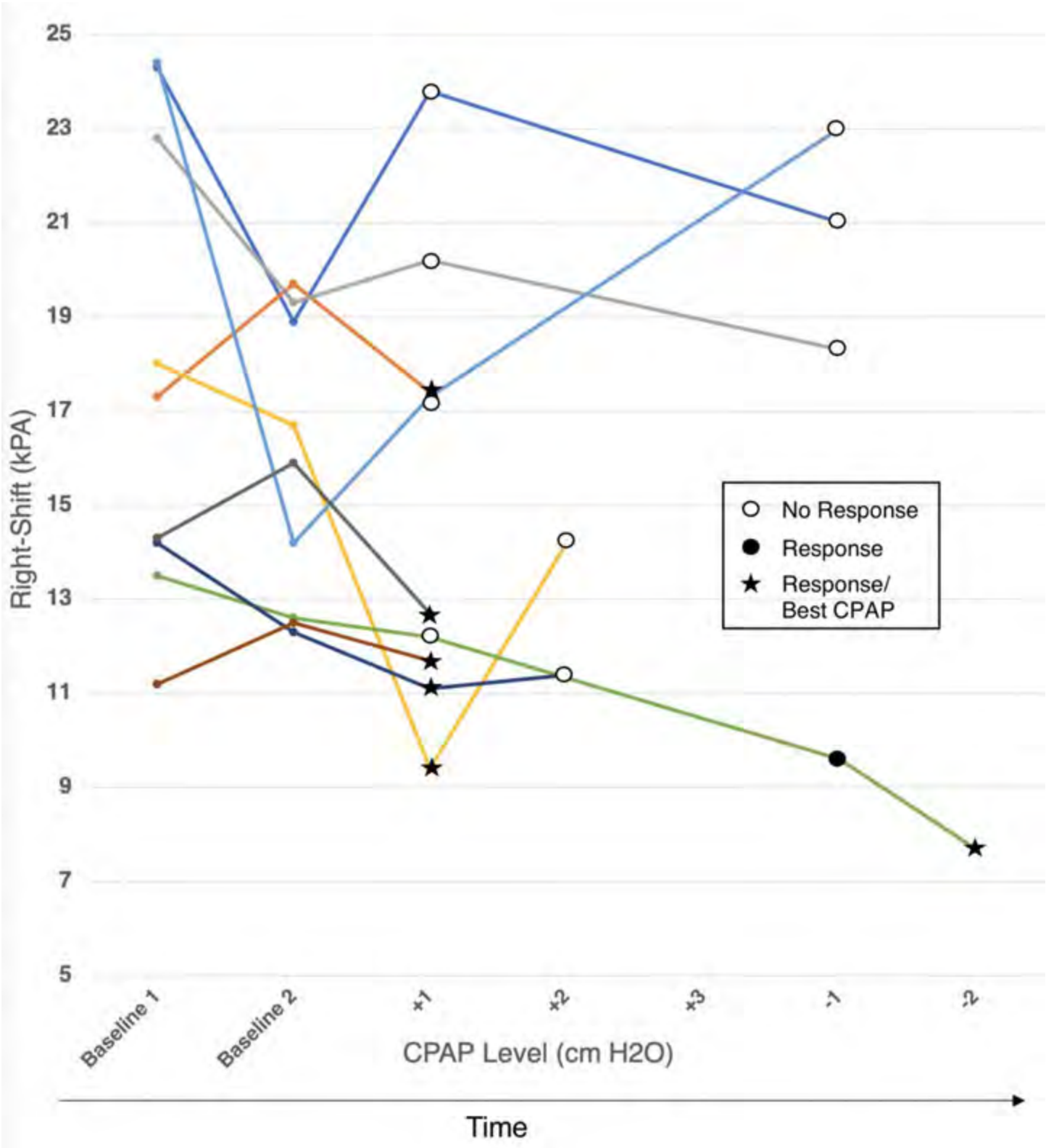

Figure 2. Within-subject change in V/Q mismatch in response to an individualized CPAP level selection strategy. Each line represents a subject completing the study. Right-shift (RS) was measured at 2 baseline periods 30 minutes apart, and then following an increase in CPAP by +1 cm H2O. Subsequent increases to a maximal level of +3 cm H2O from baseline (up to 8 cm H2O), were only applied following a "response" to the preceding increase, defined as a > 5% drop (improvement) in RS. If a response to +1 cm H2O was absent, stepwise decrements to a minimal level of -2 cm H2Ofrom baseline (down to 3 cm H2O) were tested. "Best CPAP" was

defined as the lowest CPAP level at which a response was observed. Baseline was assigned as “best CPAP” when no response was observed, with an associated change in RS of zero.

	Enrolled	Evaluated
Variable	**(n = 21)**	**(n = 12)**
Baseline characteristics		
Gestational age, median [IQR], weeks	26.1 [25.3-26.9]	26.9 [25.9 – 28.6]
Birth weight, median [IQR], g	796 [660-880]	850 [670-904]
Maternal ethnicity, No. (%)		
Not Hispanic or Latina	20 (95)	12 (100)
Hispanic or Latina	1 (5)	0 (0)
Maternal race, No. (%)		
White	5 (24)	2 (17)
Black	15 (71)	10 (83)
Asian	1 (5)	0 (0)
Sex, No. (%)		
Female	10 (48)	4 (33)
Male	11 (52)	8 (67)
Intrauterine growth restriction, No. (%)		
Yes	3 (14)	2 (17)
No	18 (86)	10 (83)
Received antenatal corticosteroids, No. (%)		
Yes	14 (67)	6 (50)
No or unknown	7 (33)	6 (50)
Multiple birth, No. (%)		
Yes	10 (48)	7 (58)
No	11 (52)	5 (42)
Clinical characteristics at evaluation		
Postnatal age at study, median [IQR], days	-	18.9 [16.4 - 39.0]
Baseline nasal CPAP level, median [IQR], cm H_2O	-	7 [6-7]
Baseline FiO_2, median [IQR], %	-	28 [27-29]
Prior surfactant use, No. (%)[a]		
Yes	-	9 (82)
No	-	2 (18)
Prior mechanical ventilation use, No. (%)		
Yes	-	10 (83)
No	-	2 (17)
Duration of mechanical ventilation, median [IQR], d	-	8 [0.6 – 17.8]

Abbreviations: IQR, interquartile range; CPAP, continuous positive airway pressure; FiO_2, fraction of inspired oxygen

Table 1. Cohort Characteristics

Comparison	*Effect Estimate N = 9*	*P-value*
Difference in right-shift of the oxygen hemoglobin dissociation curve, kPa		
Between baseline 2 and "best" CPAP, median [IQR] [a]	1.2 [0-3.2]	0.02
Between baseline 2 and CPAP +1 cm H_2O, median [IQR]	0.8 [-0.9-2.3]	0.52
Between baseline 1 and baseline 2 CPAP, in absence of CPAP level change, median [IQR]	1.3 [-1.3-3.5]	0.26
Difference in magnitude change from baseline 2 to best CPAP vs baseline 1 to baseline 2 CPAP, among responders [b]	0.8 [-0.5-4.0]	0.34

Abbreviations: V/Q. ventilation/perfusion; CPAP, continuous positive airway pressure; N, sample size; kPa, kilopascal; IQR, interquartile range

[a] As specified *a priori*, "best CPAP" defined as the lowest CPAP level at which a drop (improvement) in right-shift of > 5% from baseline 2 was observed. When no >5% improvement was observed at either +1 cm H_2O or - 1 cm H_2O, no "response" noted and "best" right-shift equivalent to baseline 2 right-shift, therefore difference always zero or positive.

[b] $N = 6$.

Table 2. Change in V/Q mismatch between baseline periods and "best CPAP".

Abstract: 392

Relative Effect of CaM Kinase IV Activity following Hypoxia versus Hypercapnia in the Cerebral Cortex of Newborn Piglets

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Background It is known that calcium/calmodulin activated enzymes, including CaM kinase IV, alters the activation of a number of intracellular and intranuclear signaling pathways that contribute to cell proliferation and cell death. Previous studies have shown that hypoxia as well as severe hypercapnia result in increased activity of CaM kinase IV in the cerebral cortex of newborn piglets.
Objective The present study aims to assess the relative toxicity of the hypoxia induced activation of CaM kinase IV as compared to hypercapnia induced activation of CaM kinase IV in the cerebral cortex of newborn piglets.
Design/Methods Anesthetized ventilated newborn piglets were grouped into hypoxia (Hx , n=6), hypercapnia (n=6) and matching normal controls (Nx n=6). Hypoxia was induced by decreasing FiO_2 from 0.21 to 0.07 for one hour. Hypercapnia was induced in piglets by inhaled CO2 to achieve a $PaCO_2$ of 80 mmHg for 6 hours while FiO_2 was maintained at 0.21. ATP and phosphocreatine levels were determined biochemically to document cerebral energy. Cerebral cortical fractions were isolated, and the activity of CaM kinase IV in the nuclear fraction was determined. CaM kinase IV activity was determined by ^{33}P incorporation into a specific substrate in a medium 50mM HEPES ph 7.5, 2 mM DTT, 40 µM syntide2, 0.2 mM ^{33}P-ATP, 10 mMMG acetate, 5 µ PKI 5-24, 2µM PKC, 19-36 inhibitor peptides.
Results ATP (µmol/g brain) was 4.3±0.23 in Nx and 1.43 ±0.28 in Hx and 4.0 ±1.4 in hypercapnia, decreased by 66% and 13% respectively. PCr (µmol/g brain) was 3.73 ±0.27 in Nx and 0.79 ±0.11 in Hx and 3.18 ±0.17 in hypercapnia, decreased by 79% and 17% respectively. CaM kinase IV activity increased from 1270.8 ±126.1 in Nx to 2680.8 ±136.0 (pmol/mg protein/min), 110% increase in hypoxia, and to 1529 ±98, 22% increase in hypercapnia.
Conclusion(s) The data show that upregulation of CaM kinase IV during 6 hours of hypercapnia is significantly lower than the increased CaM kinase activity during hypoxia. While the mechanism following hypoxia is due to severe depletion of cerebral energy, ATP and Phosphocreatine, the mechanism of upregulation following hypercapnia may be due to increase in hydrogen ion and lipid peroxidation despite of almost unchanged energy levels. The decreased toxicity generated by hypercapnia as compared to hypoxia may be due to the relative preservation of the high energy phosphates and may have significant implications in the clinical setting.

Abstract: 393

Revisiting the Definition of Bronchopulmonary Dysplasia in Premature Infants Undergoing a Gentle Respiratory Support Strategy

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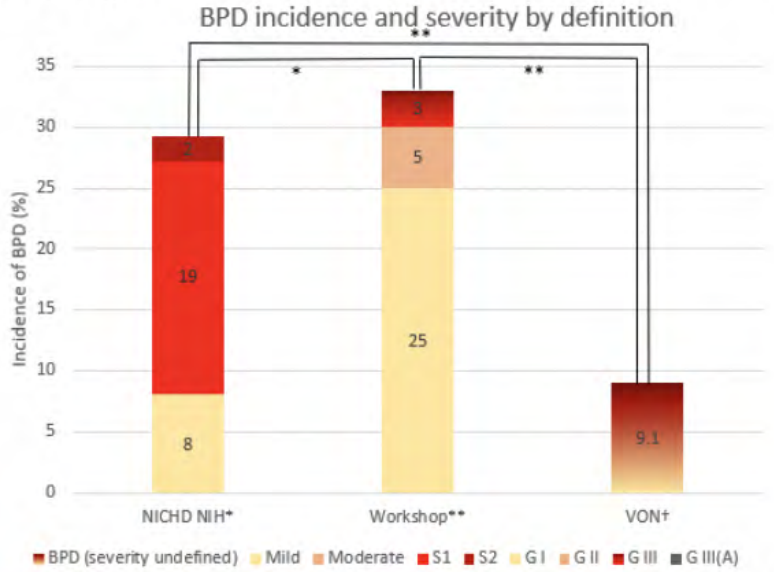
Background Definitions of bronchopulmonary dysplasia (BPD) lack uniformity and validity. A 2018 NIH BPD workshop proposed a new definition incorporating contemporary respiratory support practices, degree of O_2 supplementation at 36 weeks' postmenstrual age (PMA), and radiographic confirmation of lung disease. To date no published reports have compared BPD incidence using this new

definition to incidence using prior definitions.
Objective To compare the incidence of BPD in preterm infants using three different diagnostic criteria: 1) O_2 at 36 weeks' PMA (VON), 2) NICHD NIH severity-based definition (NIH), and 3) newest grading criteria (Workshop).
Design/Methods This is a retrospective cohort study of VLBW inborn infants ≤ 32 weeks' gestation born between January 2016 and December 2018 in a level IV NICU that practices "gentle respiratory support strategy" with use of nasal CPAP immediately after birth with selective ventilation and surfactant administration. Infants who died in the delivery room were excluded. Incidences of BPD based on three definitions were compared pairwise using McNemar's test.
Results Out of 372 infants (BW=978±285 g, GA=28±2 weeks) who met inclusion criteria, mortality rate was 6%. 97% of infants were exposed to antenatal steroids, and 77% were born via Cesarean section (Table 1). BPD incidence was 9%, 28% and 34% according to the VON, NIH and workshop definitions, respectively (Figure 1). McNemar's test showed significant discordance when comparing definitions (VON vs NIH, P< 0.001; VON vs workshop, P<0.001; NIH vs workshop P<0.05) (Figure 2). Predominant discordance occurred between both NIH and workshop definitions reclassifying VON-negative subjects into a BPD group. There was a significant association between multiple co-morbidities in any grade BPD group compared to those without BPD (Table 3). More infants had a significantly longer hospital stay after controlling for gestational age, gender, history of necrotizing enterocolitis and sepsis (P<0.001). A limitation of the workshop definition includes unclear criteria for radiologic findings of BPD.
Conclusion(s) The incidence of BPD varied widely depending on the definition used. The newest definition incorporates radiologic findings and considers use of CPAP without O_2 as mild (Grade 1) BPD; higher, more severe grades (II-III) are associated with multiple morbidities. Whether this definition will have a role in predicting long-term respiratory morbidities and neurodevelopment outcome remains to be determined.

Figure 1: Comparison of the incidence of BPD subgroup severity between the NICHD NIH, workshop and VON definitions.



*NICHD NIH definition: Oxygen treatment for at least 28 days and then degree of respiratory support and/or supplemental oxygen at 36 weeks' PMA used to distinguish between severities.
**BPD executive workshop definition: In infants <32 weeks' GA evidence of persistent parenchymal lung disease, radiographic confirmation of parenchymal lung disease, and at 36 weeks' PMA requires FiO_2 ranges/oxygen levels/O2 concentrations for ≥3 consecutive days to maintain arterial oxygen saturation in the 90%-95% range.
†VON definition: Need for supplemental oxygen at 36 weeks' PMA
**P<0.05* using McNemar's test
***P<0.01* using McNemar's test

Figure 1: Comparison of the incidence of BPD subgroup severity between the NICHD NIH, workshop and VON definitions.

Table 1: Demographics and clinical baseline characteristics of all premature infants in this cohort

Characteristic	Total N=372 (%)
Birthweight (g)*	978 ± 285
Gestational age (weeks)*	28 ± 2
Number of male infants	199 (54)
Any antenatal steroids**	360 (97)
Gestational hypertension**	106 (28)
Maternal intra-amniotic infection**	27 (7)
Delivery mode, Cesarean section	287 (77)
Multiple gestation	151 (40)
Apgar score, median (IQR)	
1 minute	6 (4,9)
5 minutes	9 (8,9)
Resuscitation in the delivery room	
Requiring nasal prong CPAP	89 (24)
Intubation	54 (14)

*Mean ± SD **Unknown in two patients

Table 2: Incidence of BPD based on the VON, NIH and workshop definitions in survivors assessed at 36 weeks' PMA or discharged home, whichever came first stratified by birthweight.

Birth Weight Cohort (g)	Total: 352 N (%)	Birth Weight (g)*	Gestational age (weeks)*	VON N (%)	NIH N (%)	Workshop N (%)
≤750	91 (26)	618 ± 97	26 ± 2	20 (6)	57 (16)	57 (16)
751-1000	85 (24)	883 ± 79	27 ± 2	7 (2)	32 (9)	36 (10)
1001-1250	99 (28)	1134 ± 64	29 ± 2	4 (1)	11 (3)	21 (6)
1251-1500	77 (22)	1368 ± 74	30 ± 1	1 (0.2)	1 (0.2)	5 (1)
All ≤ 1500	352	993 ± 285	28 ± 2	32 (9)	101 (29)	119 (34)

*Mean ± SD

Table 3: Major neonatal morbidities in survivors associated with the proposed 2018 workshop definition of BPD compared to those without BPD§

Outcomes	No BPD N=233 n (%)	Grade I N=90 n (%) †	Grade II-III N=29 n (%) ††
Surfactant for RDS	45 (19)	34 (38)**	19 (69)**
Pneumothorax	7 (3)	6 (7)	2 (7)
Culture positive sepsis	4 (2)	9 (10)**	6 (21)**

PDA requiring pharmacologic closure	27 (12)	31 (34)**	17 (59)**
PDA requiring ligation	15 (6)	8 (9)	2 (7)
Surgical NEC	2 (1)	3 (3)	3 (10)*
Severe IVH (Grade III-IV)	4 (2)	5 (6)	1 (3)
ROP requiring surgery or Anti-VEGF	6 (3)	11 (12)**	3 (10)**
Oxygen at discharge	13 (6)	2 (2)	8 (28)**

§ Comparison by Chi-square or Fisher exact test as appropriate † Comparison between Grade I BPD cohort and No BPD cohort † † Comparison between Grade II-III BPD cohort and No BPD cohort *P value <0.05 **P value <0.01

Abstract: 394

A novel conformable facemask interface reduces mask leak during positive pressure ventilation: A randomized simulation trial

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Background Mask leak is a common and important impediment to effective facemask ventilation during neonatal resuscitation. To date, no single facemask has been shown to consistently prevent mask leak during positive pressure ventilation (PPV). We engineered a novel flexible and conformable mask interface ("mask cushion") to improve the facemask seal and prevent mask leak during PPV.
Objective To compare mask leak and other key ventilation parameters during PPV performed on a mannikin with a standard round mask versus the novel mask cushion.
Design/Methods Randomized cross-over simulation trial of neonatal fellows performing facemask ventilation on a manikin (Premature Anne, Laerdal) with standard round preterm mask (Fisher & Paykel) versus mask cushion. Each participant received standardized and scripted instructions and used the same manikin and T-piece resuscitator for both arms of the trial. Participants were randomly allocated to start with either standard mask or mask cushion and performed PPV for 90 seconds with the first assigned interface. Following a 90-second washout period, each participant performed PPV for 90 seconds with the second interface. Respiratory measurements of all PPV inflations were recorded with a respiratory function monitor (New Life Box, Advanced Life Diagnostics) that was not visible to participants. Inflations were analyzed using breath-by-breath analysis. The primary outcome was mask leak, calculated using the inhaled (Vti) and exhaled tidal volumes (Vte), (Vti-Vte)/Vti x 100. Secondary outcomes were Vte and proportion of inflations with significant mask leak (defined as mask leak > 30%). Outcomes were compared between interfaces using a Wilcoxon signed rank test.
Results There were 33 enrolled participants (Table 1). The mean number of PPV inflations delivered during each simulation was 69 (mask cushion) and 70 (standard mask). The mask cushion resulted in >50% reduction in the degree of mask leak, from a median 44% in the standard group (interquartile range [IQR] 33- 80%) to 15% (IQR 1-46%) with the mask cushion (Figure 1). In addition, PPV inflations performed with the mask cushion had significantly lower proportion of breaths with significant leak, and higher median exhaled Vte (Table 2).
Conclusion(s) A novel conformable mask cushion resulted in significantly less mask leak during simulated facemask ventilation. The impact of the mask cushion on PPV performance should be evaluated in the clinical setting.

Variable	All participants (N=33)	
Age (years), mean (SD)	32.1 (2.5)	
Sex, n (%)	Female	27 (79)
	Male	6 (18)
Post-residency years of experience, n (%)	0	19 (57)
	1	6 (18)
	2	5 (15)
	> 3	3 (9)
Previous equipment and practice used during delivery room PPV		
Typically used masks*, n (%)	Anatomic	11 (33)
	Round, Laerdal	5 (15)
	Round, Fischer & Paykel	14 (42)
	Unsure	8 (24)
Typically used ventilation equipment*, n (%)	T-piece resuscitator	31 (94)
	Self-inflating bag	2 (6)
	Flow-inflating bag	7 (21)
Typically used mask hold, n (%)	One hand hold	17 (51)
	Two hand hold	16 (48)

*Participants could choose all options that applied.

Table 1 – Participant demographics and previous equipment and practice for PPV
*Participants could choose all options that applied.

Variable	Cushion	Standard	p-value
Mask leak (%), median (IQR)	15 (1-46)	44 (13-80)	0.007
Proportion of inflations with >30% leak (%), median (SD)	3 (0-66)	78 (9-100)	0.001
Inhaled tidal volume (mL/kg*), median (IQR)	13 (8-16)	15 (10-23)	0.055
Exhaled tidal volume (mL/kg*), median (IQR)	9 (6-9)	7 (4-9)	0.008

Table 2- Characteristics of PPV Inflations
IQR, interquartile range; SD, standard deviation
*Using estimated weight for manikin

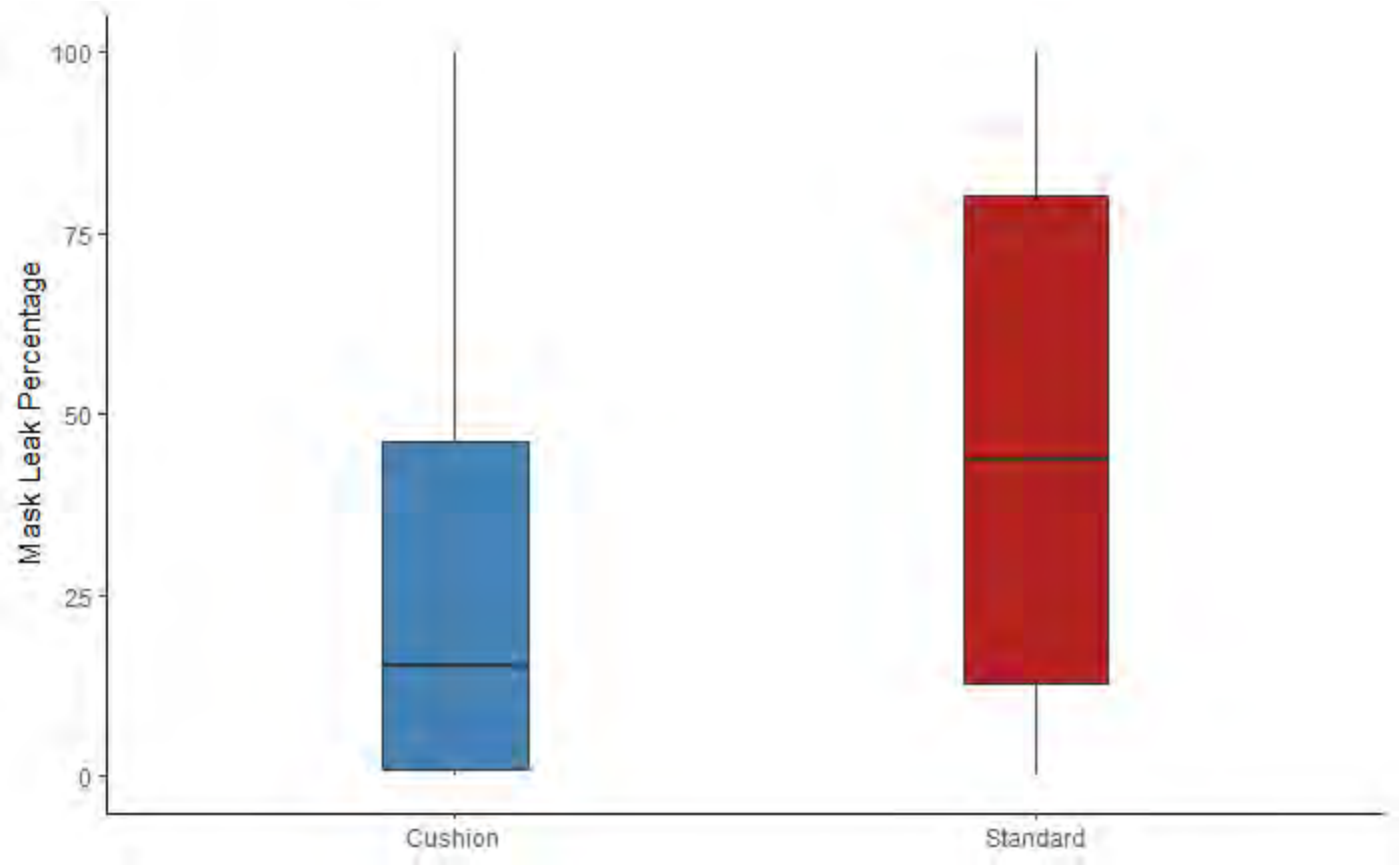

Figure 1. Comparison of leak between mask cushion and standard round mask
Legend: Median, interquartile range and absolute range of mask leak percentage

Abstract: 395

Carbon dioxide clearance using bubble CPAP with superimposed high frequency oscillations in a premature infant lung model: normal vs. abnormal lung mechanics

Emidio M. Sivieri, Eric Eichenwald, David M. Rub, Soraya Abbasi
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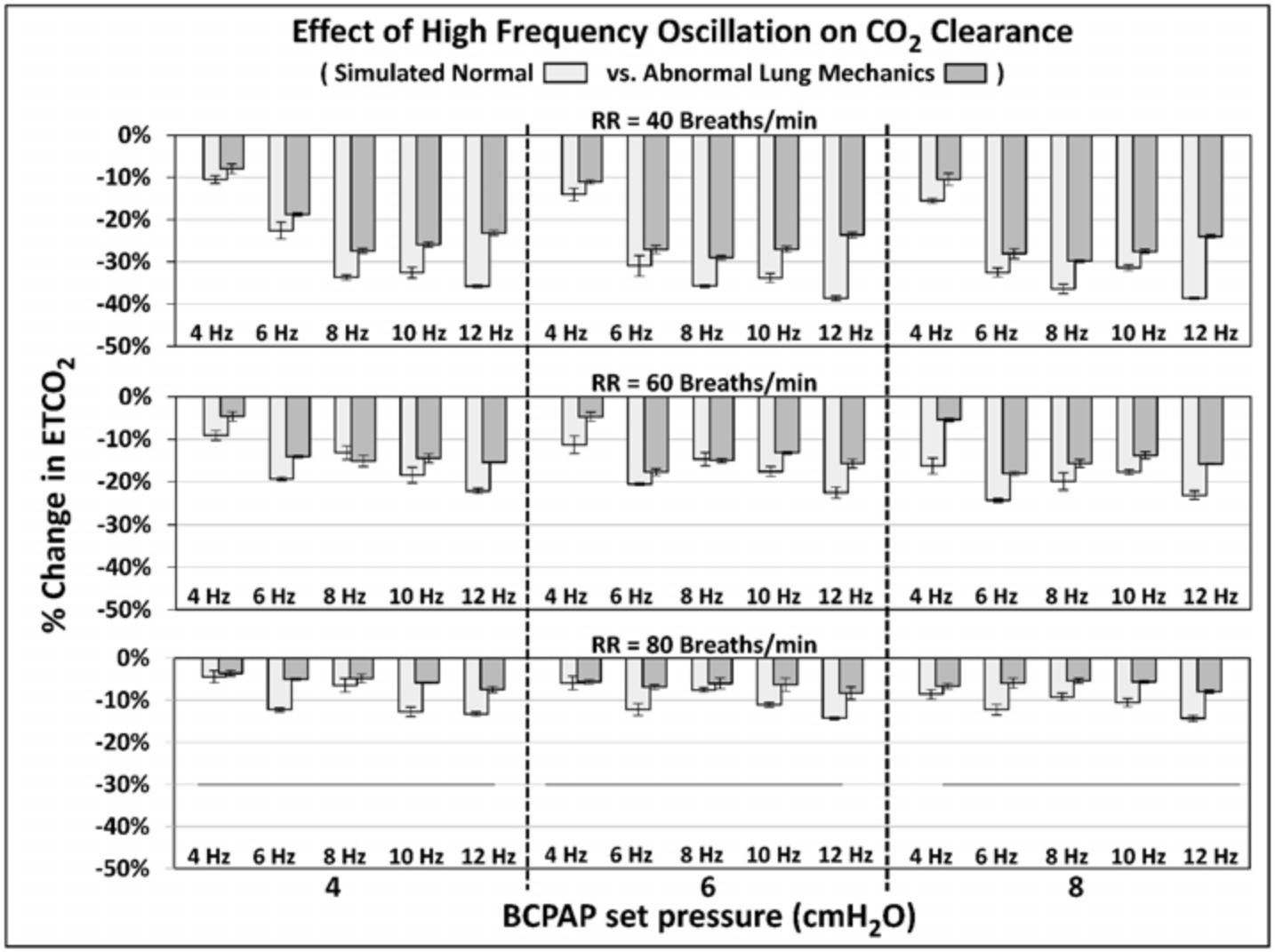
Background High frequency (HF) oscillatory ventilation has been shown to improve CO_2 clearance in premature infants. In a previous in-vitro lung model with normal lung mechanics we demonstrated significantly improved CO_2 washout by placing a HF oscillator in-line with the supply gas flow of both a bubble CPAP (BCPAP) and a high flow nasal cannula system
Objective To measure end-tidal carbon dioxide ($ETCO_2$) levels in an infant lung model simulating normal vs. abnormal lung

mechanics while connected to a BCPAP system with superimposed in-line HF oscillations
Design/Methods A premature infant lung simulator consisting of a 40mL silicone bellows with either: normal lung mechanics with compliance of 1.0mL/cmH_2O and airway resistance of 56 cmH_2O/(L/s); or abnormal lung mechanics with compliance of 0.5mL/cmH_2O and airway resistance of 136 cmH_2O/(L/s), was connected to a simulated upper airway (3.5mm nares diameter). 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 fixed tidal volume of 6.0 mL. 100% CO_2 was continuously injected at a fixed rate of 12 mL/min. Leak-free BCPAP was applied using Fisher&Paykel BCPAP (BC163 interface with BC3520 nasal prongs, supply flow 7 L/min). Oscillation was achieved by interrupting the supply gas by a 3-way solenoid valve at either 4,6,8,10 or 12 Hz with a 40% on-off duty cycle. Equilibrated $ETCO_2$ was measured at BCPAP set pressures of 4,6 & 8 cmH_2O and respiratory rates (RR) of 40,60 & 80 breaths/min
Results HF oscillation resulted in decreased $ETCO_2$ levels at all CPAP settings, RRs, and applied frequencies for both lung models. The overall mean±SD $ETCO_2$ decreased from non-oscillated baseline by 19.7±9.8% for the normal lung mechanics model vs. a lesser change of 14.0±8.4% for the abnormal model. Individual percent changes in $ETCO_2$ for all combinations of oscillation frequencies, RRs and BCPAP levels are shown in the Figure. Oscillation at 4 Hz was least effective for CO_2 removal compared to the higher frequencies
Conclusion(s) In this in-vitro premature infant lung model, HF oscillation of the BCPAP supply gas using an in-line flow interrupter was associated with improved CO_2 clearance as compared to non-oscillated BCPAP for both normal and abnormal lung mechanics models. This simple modification to BCPAP delivery devices may prove to be a useful enhancement to this mode of non-invasive respiratory support



Abstract: 396
Preserved pressure delivery during high frequency oscillation of bubble CPAP in a premature infant lung model with both normal and abnormal lung mechanics

Emidio M. Sivieri, Eric Eichenwald, David M. Rub, Soraya Abbasi
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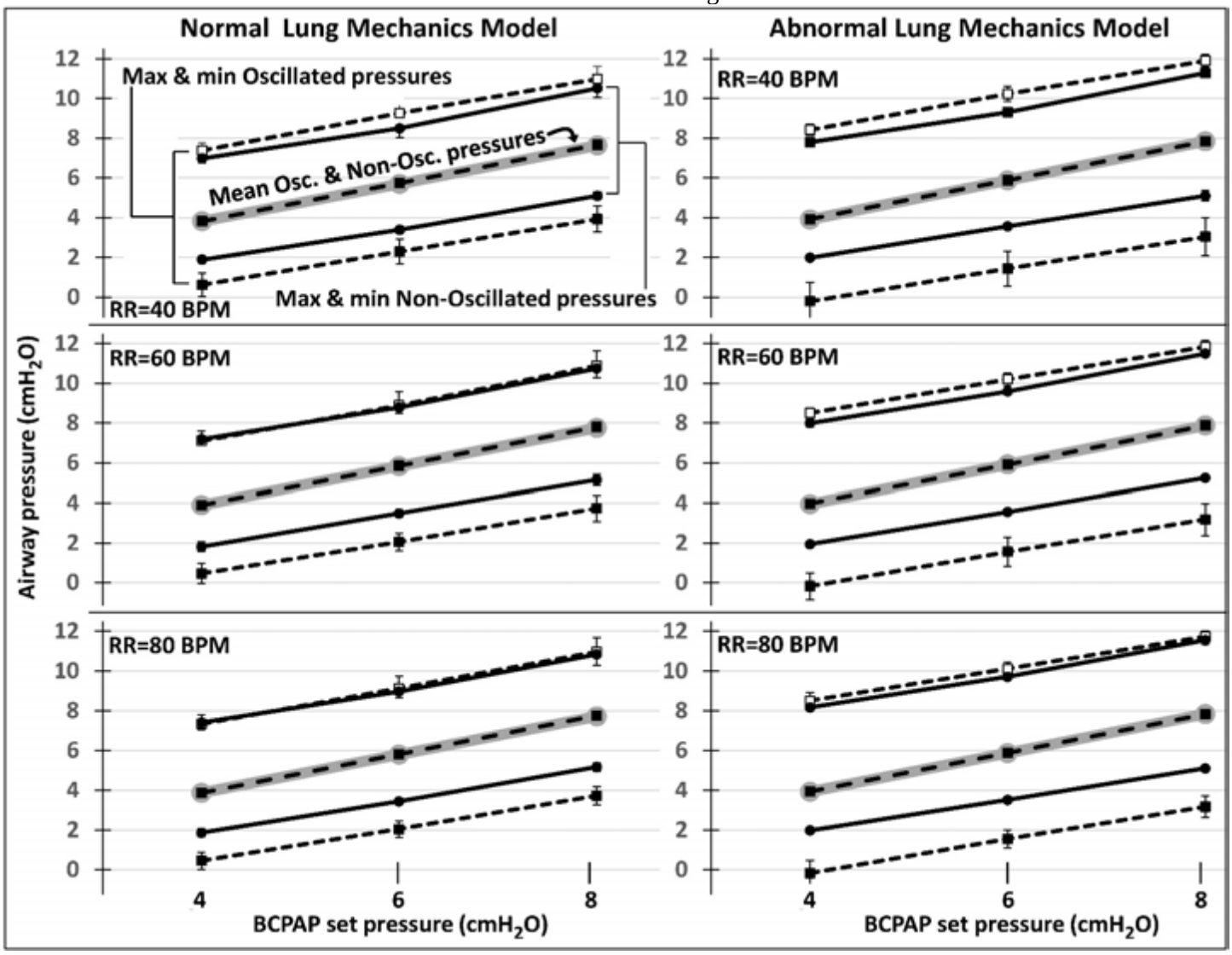
Background High frequency (HF) oscillatory ventilation has been shown to improve CO_2 clearance in premature infants. In a previous in-vitro lung model with normal lung mechanics we demonstrated significantly improved CO_2 washout by placing a HF oscillator in-line with the supply gas flow of a bubble CPAP (BCPAP) system. The effect of oscillation on delivered airway pressure (Paw) using this system has not been previously reported
Objective To measure Paw in an infant lung model simulating normal vs. abnormal pulmonary compliance and resistance while connected to a BCPAP system with superimposed in-line HF oscillations
Design/Methods A premature infant lung simulator consisting of a 40mL silicone bellows with either normal lung mechanics (compliance of 1.0mL/cmH_2O, airway resistance of 56 cmH_2O/[L/s]) or abnormal lung mechanics (compliance of 0.5mL/cmH_2O and airway resistance of 136 cmH_2O/[L/s]) was connected to a simulated upper airway (3.5mm nares diameter). Total instrumented dead space was 4mL. The model lung was placed in a rigid chamber connected to a computer controlled piston to simulate spontaneous breathing at a fixed tidal volume of 6.0 mL. 100% CO_2 was continuously injected at a fixed rate of 12mL/min. Leak-free BCPAP was applied using Fisher&Paykel BCPAP (BC163 interface with BC3520 nasal prongs, supply flow 7L/min). Oscillation was achieved by interrupting the supply gas by a solenoid valve at either 4,6,8,10 or 12Hz (40% duty cycle). End-tidal CO_2 and Paw in the simulated pharynx was measured at BCPAP set pressures of 4,6 & 8cmH_2O and respiratory rates (RR) of 40,60 & 80 breaths/min
Results Mean, max, and min Paw measurements (waveform means, peaks and troughs) averaged over all 5 frequencies are shown in the Figure. Oscillation resulted in no significant change in mean or max Paw from non-oscillated levels at all CPAP settings and RRs for both lung models. Paw oscillated minimums were significantly lower than non-oscillated values and by 1.4±0.42 ($p<0.03$) and 2.1±0.65 ($p<0.002$) cmH_2O in the normal and abnormal models respectively
Conclusion(s) In this in-vitro premature infant lung model, HF oscillation of the BCPAP supply gas using an in-line flow interrupter did not alter the mean or max delivered airway pressures while improving CO_2 clearance as compared to non-oscillated BCPAP for both normal and abnormal lung mechanics models. This simple modification to BCPAP may prove to be a useful enhancement to this mode of non-invasive respiratory support



Abstract: 397

Effects of inhaled iloprost for the management of persistent pulmonary hypertension of the newborn.

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Background Persistent pulmonary hypertension of the newborn (PPHN) is a disease with significant morbidity and mortality. Currently, the only FDA approved pulmonary vasodilator for the treatment of PPHN is inhaled nitric oxide (iNO). Despite being an effective treatment modality, it is estimated that about a third of the infants with PPHN will not respond to iNO treatment (iNO non-responders). Therefore, alternative therapeutic interventions for reducing pulmonary vascular resistance in neonates with PPHN have been explored in animal and human studies, with inhaled iloprost as one option that acts via prostacyclin pathway.

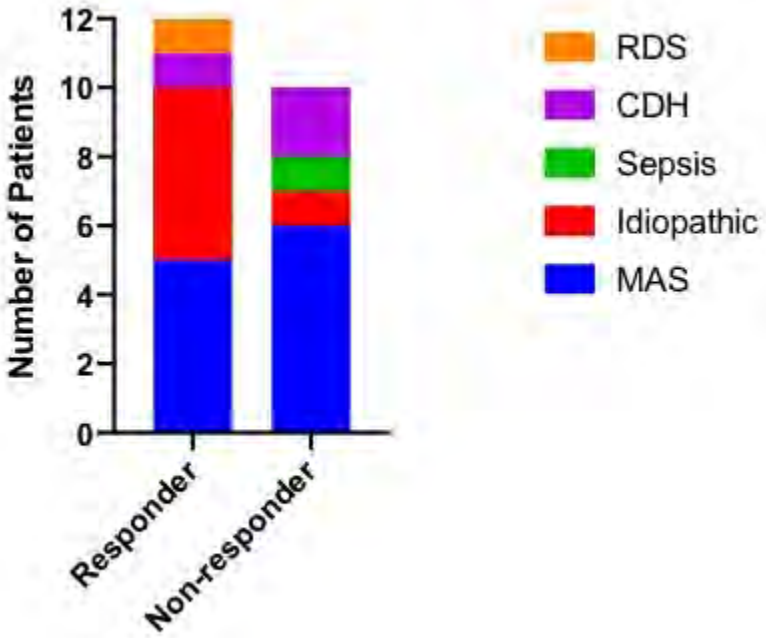
Objective To evaluate the effects of inhaled iloprost on oxygenation indices in neonates with PPHN.

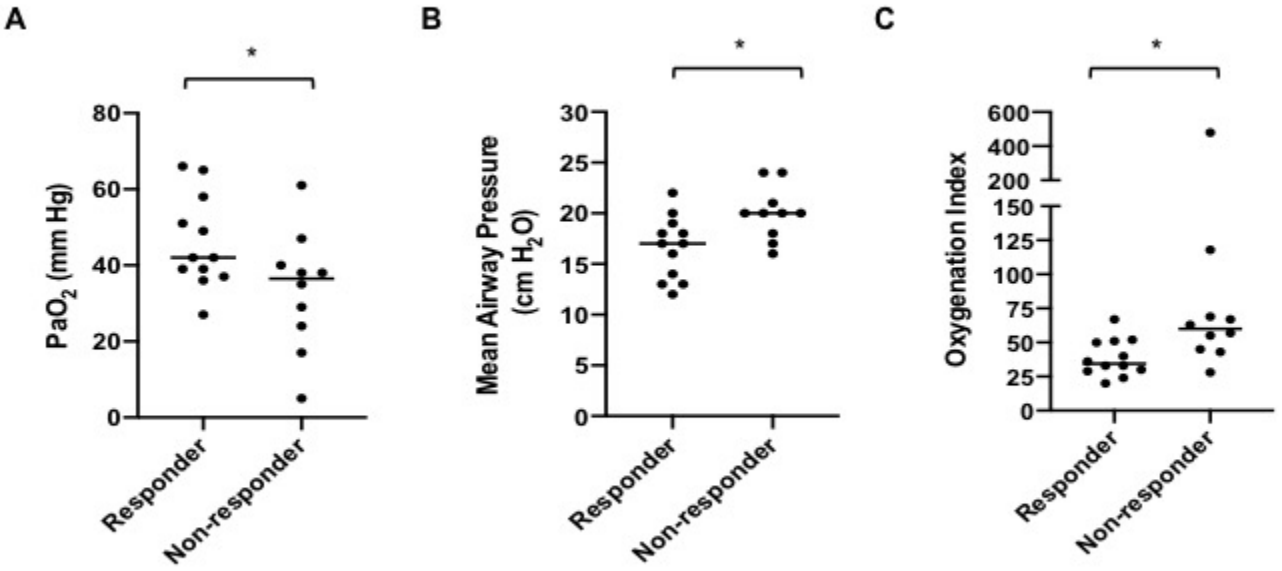
Design/Methods We conducted a retrospective chart review of thirty patients with iNO-refractory PPHN from January 2014 to November 2018, who received inhaled iloprost (dose range: 0.5-2.5µg/Kg every 1-4 hours). Twenty-two patients met the inclusion criteria; eight patients were excluded from the study (complex cardiac disease and extreme prematurity). Patients were categorized as responders or non-responders (patients who required extracorporeal membrane oxygenation or died) (Figure 1). Demographic characteristics were collected. Oxygenation index, mean airway pressure and arterial partial pressure of oxygen (PaO_2) were recorded.

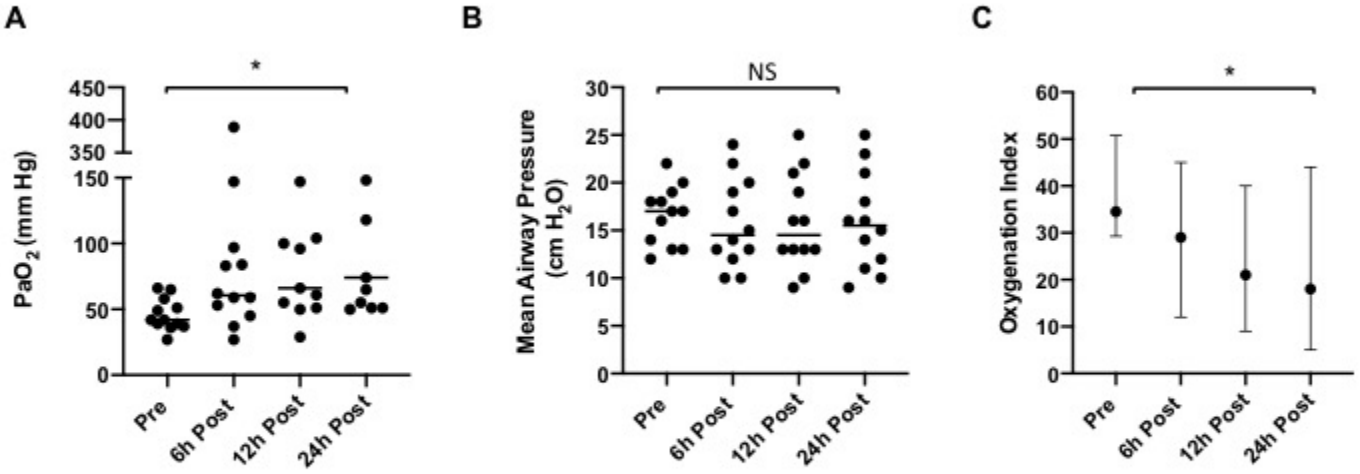
Results Among a total of twenty-two patients who were included in the study, ten were classified as non-responders as they required either ECMO or died. Gestational age and gender did not differ between responders and non-responders. The median PaO_2 was lower (36.5 vs 42; $P<0.05$, Mann-Whitney test) and median MAP was higher (20 vs 17; $P <0.02$, Mann-Whitney test) in non-responders

compared to responders just prior to initiating iloprost (Figure 2). Iloprost responders had a significant increase in median PaO_2 and decrease in median oxygenation index in the 24 hours after initiating treatment (Figure 3, $P < 0.05$, Kruskal-Wallis test), with no significant change in required mean airway pressure over that same period. There were no major changes in liver and kidney functions after starting iloprost.

Conclusion(s) Inhaled iloprost is well tolerated and seems to have beneficial effects in improving oxygenation indices in neonates with PPHN, who do not respond to iNO. There is a need of well-designed prospective trials to further ascertain the benefits of using inhaled iloprost as an adjunct treatment in neonates with iNO-refractory PPHN.


Number of Patients
12
10
8
6
4
2
0
Responder
Non-responder
RDS
CDH
Sepsis
Idiopathic
MAS


A
B
C
*
PaO2 (mm Hg)
80
60
40
20
0
Responder
Non-responder
Mean Airway Pressure (cm H2O)
30
25
20
15
10
5
0
Oxygenation Index
600
400
200
150
125
100
75
50
25
0



Abstract: 398

Clinical exam vs point-of-care ultrasound (POC-US) exam in the evaluation of the peripheral IV site in neonates

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Background Peripheral intravenous cannulas (PIV) are used in neonates for IV fluid and medication administration. Early and frequent visual inspections and physical exams (VI/PE) of the PIV sites performed by registered nurses (RN) are essential to prevent or limit tissue damage caused by PIV extravasation. Skin ultrasound (US) of the PIV catheter site provides rapid, real-time, high-resolution images of the anatomic structures at the point-of-care (POC).
Objective To compare POC-US exam with clinical VI/PE in the determination of malfunctioning and/or suspicious PIV sites
Design/Methods PIV sites suspicious and/or malfunctioning were assessed (VI/PE) by RN and findings, including decision whether or not to remove, were recorded before immediate POC-US exam of the site was performed. Sonographic exam included assessment of the skin for edema, PIVE fluid pockets, and PIV catheter location assessed by Doppler flow during normal saline flush.
Results Eighteen infants were studied (Table 1). Clinical VI/PE recommended removing 12 PIVs (67%) and POC-US exam recommended removal of 7 (39%) PIVs (Table 2). In 11 cases there was concordance between clinical and POC-US, 6 to remove and 5 not to remove the PIV. There was no agreement in 7 cases, clinical exam determined to remove PIV (n=6) but POC-US only recommended removal in 1 case.
Conclusion(s) We found no correlation between PIV removal based on clinical exam or POC-US exam. However, in this pilot study we observed that POC-US exam results would have saved 5 PIVs that were removed. We suggest the use of POC-US in addition to VI/PE in evaluation of questionable PIVs to improve the rate of unnecessary catheter removal. Eventually, this should result in decreased number of PIV catheter placement attempts and complications.

Table 1

Infant characteristics (N=18)	Mean ± SD (range)
Gestational age (weeks)	36.0 ± 3.8 (27 - 40)
Postconceptional age (weeks)	38.5 ± 6.5 (31 – 54)

Birth weight (g)	2520 ± 998 (710 – 4250)
Study weight (g)	2775 ± 971 (1033 – 4250)
PIV duration (hours)	28.7 ± 24.0 (7 – 96)

Table 2

		Clinical VI/PE	
		Do not remove PIV	Remove PIV
POC-US exam	Do not remove PIV	5 (83%)	6 (50%)
	Remove PIV	1 (17%)	6 (50%)

Abstract: 399

Utility of Vasopressin Rescue Therapy in Neonates with Persistent Pulmonary Hypertension of the Newborn

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Background Persistent pulmonary hypertension of newborn (PPHN) affects 1.9 per 1000 live births and has a varied mortality ranging between 4-33%. Although inhaled nitric oxide (iNO) has reduced the need for extracorporeal membrane oxygenation (ECMO) in this population, refractory cases persist. Vasopressin is gaining favor as treatment modality in neonates despite limited data and concerns for hyponatremia and decreased intestinal perfusion.
Objective To describe the effect of vasopressin on oxygenation and systemic blood pressure in neonates with PPHN compared to matched controls.
Design/Methods Retrospective chart review of neonates admitted with PPHN at a single tertiary NICU between 01/01/2017 and 12/31/2019. Neonates receiving vasopressin were matched to controls by birth weight, gestational age, sex and initial oxygenation index (OI).
Results A total of 14 neonates with PPHN were identified, 7 who received vasopressin and 7 corresponding controls. There was no difference in neonatal characteristics between groups (Table 1). In the vasopressin group, mean initial vasopressin dose was 40 mU/kg/hr, mean initiation time 30 hours of life, and mean duration 70 hours. Significant OI reduction was seen at 12 hours (p=0.003) and 24 hours (p=0.001) after initiation of vasopressin (Table 2). There was significant improvement in mean arterial pressure (MAP) within 1 hour (p=0.004) along with decrease in inotropic score by 6 hours (p= 0.0012) and vasoactive-inotropic score by 24 hours (p=0.019). There was no significant change in serum lactate or urine output, however, a decrease in serum sodium was noted by 12 hours (p=0.019).
Compared to the control group, the vasopressin group showed a trend towards improved OI within 12 hours (p=0.07, Fig 1) and statistically significant improvement in MAP within 1 hour of starting vasopressin (p= 0.044, Fig 2). Double the patients in the control group required ECMO for the management of refractory PPHN though not statistically significant. There was no difference in survival and no cases of necrotizing enterocolitis in either group.
Conclusion(s) This study suggests that vasopressin can be safely used as an adjunct therapy to improve oxygenation and augment blood pressure in cases with refractory PPHN. Close monitoring and management of hyponatremia is warranted. Next steps include a prospective cohort study to assess if vasopressin rescue therapy reduces the need for ECMO in this population.

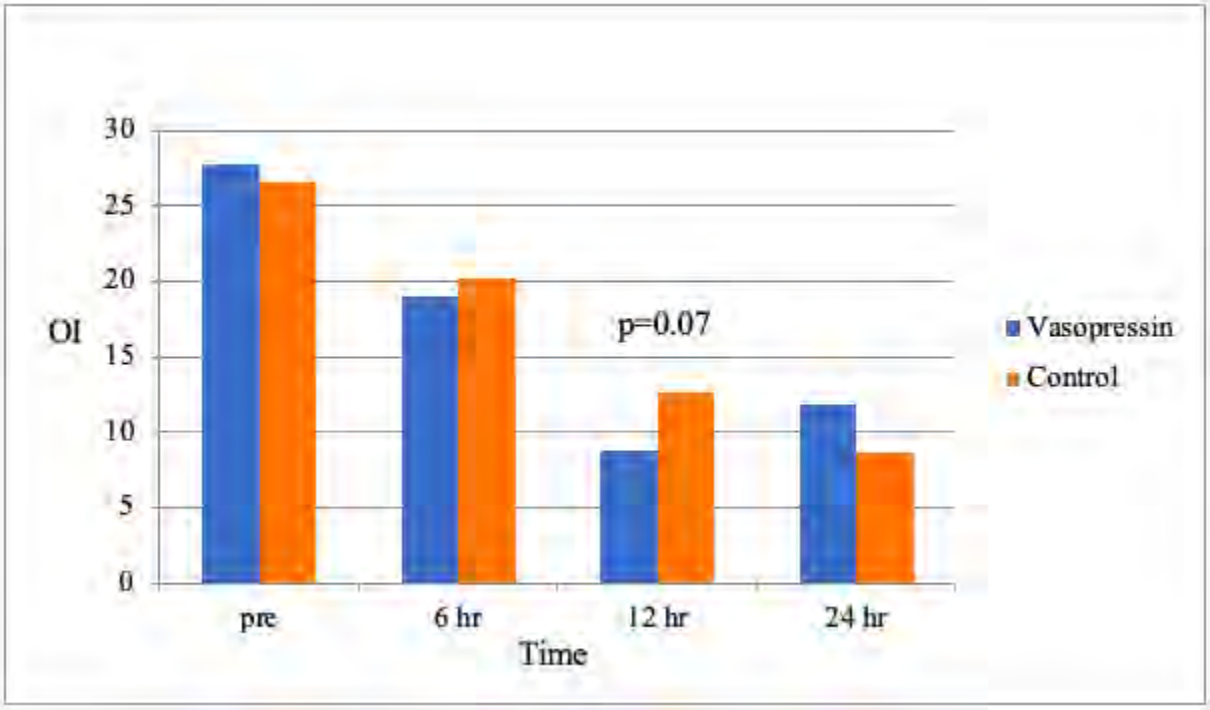

Figure 1 Trend in Mean Oxygenation Indices (OI)

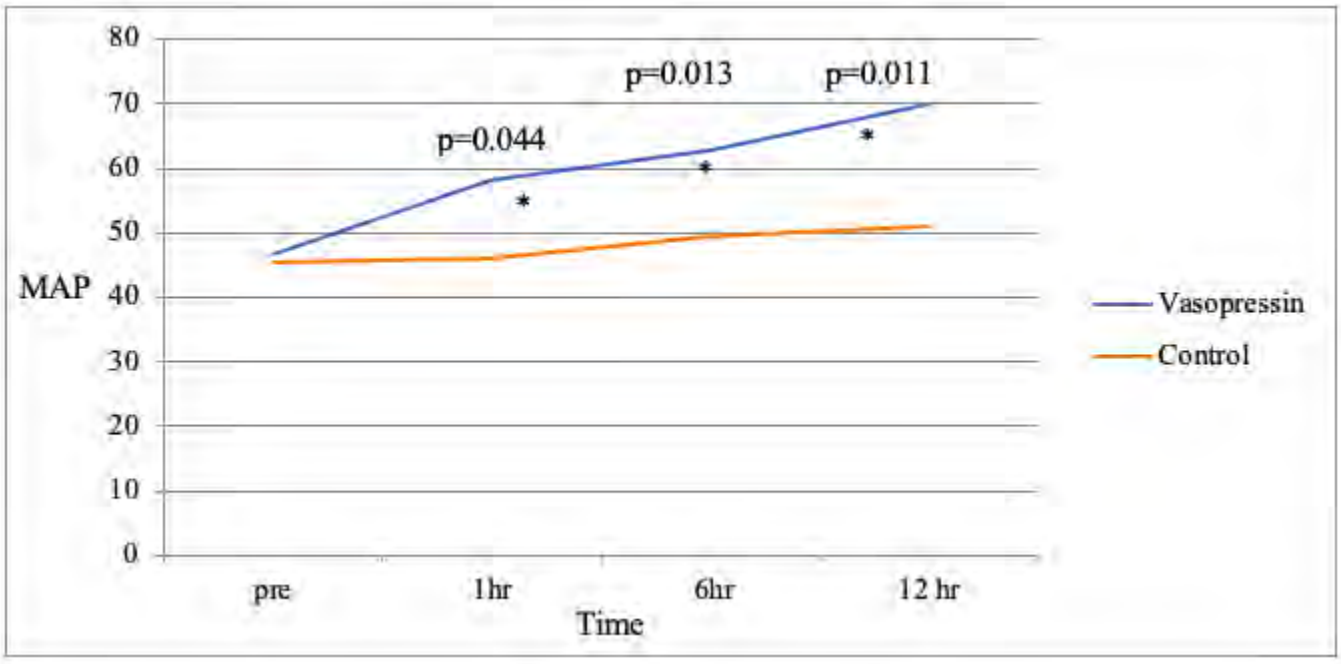

Figure 2 Trend in Mean Arterial Blood Pressure (MAP)

Table 1. Neonatal characteristics

Variable	Group1(Vasopressin) N=7	Group 2 (Non-Vasopressin) N=7	p- value
Birth weight (grams)	3051 ± 536.70	2930.43 ± 321	0.62

Gestational age (weeks)	38.9 ± 2.22	37.92 ± 1.89	0.37
Gender (male)	5 (71%)	5 (71%)	1.0
Initial oxygenation index	27.75 ± 25.19	26.52 ± 15.42	0.91
Use of inhaled nitric oxide	7 (100%)	7 (100%)	1.0
Need for ECMO	2 (28 %)	4 (57 %)	0.28
Necrotizing enterocolitis	0 (0%)	0 (0%)	
Survival to discharge	7 (100%)	6 (85%)	0.29

Table 2 Effects of Vasopressin on clinical and hemodynamic variable

Variable	Pre-vasopressin	1 Hour	6 hours	12 hours	24 hours	48 hours	72 hours
Oxygenation index	27.75 ± 25.19	24.94 ± 21.7	19.05 ± 21.47	8.78* ± 5.19	9.52* ± 5.37	19.40 ± 23.76	14 ± 12.12
Mean arterial BP (mm Hg)	46.71 ± 8.34	58.29* ± 12.32	62.86 ± 5.49	69.83 ± 13.31	63.80 ± 14.49	63.25± 10.21	71.33 ± 24.11
Inotropic score	30.72 ± 8.37	25.87 ± 5.81	11.29* ± 8.96	10.50* ± 10.24	10.60* ± 6.30	13.75* ± 5.31	20.33 ± 17.89
Vasoactive-inotropic score	31.07 ± 8.87	36.51 ± 6.16	20.44 ± 11.61	17.35 ± 13.27	16.67* ± 8.45	19.62 ± 11.55	26.16 ± 23.00
Heart rate (per minute)	154.29 ± 31.19	150.14 ± 23.87	128.86 ± 12.96	127 ± 17.50	130.8 ± 13.95	132.25 ± 11.29	141.67 ± 13.79
Urine output (ml/kg/hr)	3.19 ± 1.87	5.46 ± 6.5	5.02 ± 5.4	3.42 ± 1.83	2.65 ± 1.58	3.03 ± 0.75	4.65 ± 1.62
Serum Sodium (mEq/l)	136.29 ± 4.27	133 ± 2.16	133.57 ± 5.94	131* ± 3.79	126.20* ± 4.49	129 ± 5.22	134.33 ± 9.71
Serum lactate (mMol/L)	3.14 ± 2.12	3.65 ± 1.36	4.74 ± 2.80	4.43 ± 2.955	2.72 ± 1.97	2.10 ± 0.56	2.43 ± 0.49

* P value <0.05

Abstract: 400

Early Initiation of Enteral Feeding is Associated with Improved Weight Gain and Early Discharge in Moderately Preterm Neonates

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Background Feeding in preterm neonates is driven by “contingent caregiving”, guided via cues of readiness. This vital developmental function, based on the pre-feeding autonomic, motor, and behavioral state organization, is governed by neurologic maturation. The severity of co-morbidities plays a significant role. The sucking swallowing coordination in preterm neonates is established by 32-34

weeks of postmenstrual age. Little information is available on the effects of feeding methods on clinical course and outcomes in preterm neonates.
Objective To investigate the impact of different aspects of enteral feeding on the clinical course, complications &outcomes in moderately premature neonates.
Design/Methods Design: retrospective study Subjects: Preterm infants born at 28,0/7 to 33,0/7 weeks of gestational age (GA) Variables: GA; Birth weight (BW); sex; race; Apgar scores at 1 and 5 minutes of life; receipt of oxygen therapy; Intra-periventricular bleed; ROP; NEC; PDA; days on antibiotics; feeding intolerance (residuals leading to stopping/ decreasing volume by >35%); Day of life (DOL) feeds started (FS); DOL full feed achieved (FF); total number of days on IVF (DIVF); days to reach full feeds -including orogastric & nippling (DNIPOG); DOL of achieving full nipple feeds (DFNIP); days of nil by mouth (NPO); daily weight gain; length of stay (LOS), and days to achieve weight of 2200g (D22). Statistics: Data presented as mean (SD) and number (%). Univariate linear regression, multiple logistic regression and Pearson's Correlation Coefficient tests were performed.
Results (Tables 1-3, n=119). GA & BW were 30.4(2.1) weeks & 1473 (427.5) g (table1). FS was 3.6 (1.9) days. FS correlated with DNIPOG (r= 0.48, p=0.000; DFNIP (r=0.49, p=0.000); D22 (r=0.48, p=0.000) and LOS (r=0.5 p=0.000) . DFNIP had strong positive correlation with DNIPOG (r=0.86), LOS (r=0.88), and D22 (r=0.86). (table2)The significant relationships of DNIPOG with multiple neonatal clinical variables in univariate regression analysis (table 3) were lost in multivariate regression, suggesting that the relationships were interdependent.
Conclusion(s) Early initiation of enteral nutrition may result in the faster achievement of full feedings and earlier discharge in moderately preterm infants, as suggested by the direct relationship of the chronological age of starting enteral nutrition with early achievements of full enteral/nipple feedings, designated discharge weight and the length of NICU stay.

Sample Characteristics of 119 Neonates

Variable	M (SD)	n (%)
Neonate		
Gestational age (weeks)	30.4 (2.17)	
Birthweight (grams)	1,473.0 (427.50)	
Sex (male)		61 (51.3)
Race/ethnicity (non-white)		76 (63.9)
Apgar 1	6.5 (2.28)	
Apgar 5	7.7 (1.29)	
Any oxygen treatment (yes)		102 (85.7)
Patent ductus arteriosus (yes)		17 (14.3)
Bronchopulmonary dysplasia (yes)		31 (26.1)
Days on antibiotics (number)	5.9 (5.96)	
Day of life feeding started	3.6 (1.98)	
Milk (any breastmilk)		87 (73.1)
Colostrum given (yes)		75 (63.0)
Total days on intravenous fluid (number)	18.6 (13.54)	
Day of life full nipple feeding	25.5 (19.15)	
Days no oral feed (number)	4.8 (4.25)	
Daily weight gain (grams)	22.2 (7.50)	
Maternal		
Gestational hypertension (yes)		41 (34.5)
Gestational diabetes (yes)		13 (10.9)
Antenatal steroids (yes)		110 (92.4)
Antenatal magnesium (yes)		102 (85.7)
Antenatal antibiotics (yes)		74 (62.2)
Outcome		
Length of stay (days)	46.1 (22.0)	
Days to reach 2,200 grams (number)	37.2 (19.85)	
Day of life full feeding achieved	20.4 (14.17)	

Note: M=mean, SD=standard deviation

Table 1.

		Day of life feeding started
Day of life full nipple feeds achieved	Pearson Correlation	.496**
	Sig. (2-tailed)	.000
	N	119
Day of life full feeds achieved	Pearson Correlation	.478**
	Sig. (2-tailed)	.000
	N	119
Days to reach 2200g	Pearson Correlation	.477**
	Sig. (2-tailed)	.000
	N	119
Length of stay	Pearson Correlation	.502**
	Sig. (2-tailed)	.000
	N	119

**. Correlation is significant at the 0.01 level (2-tailed).

Table 2. Correlations between the day of life enteral feeding were started and other variables

Linear Regression Analyses for Day of Life Full Feeding Achieved

Variable	Univariate B (SE)	Multivariate B (SE)
Neonate		
Gestational age (weeks)	-5.42 (0.34)***	-0.94 (0.54)
Birthweight (grams)	-0.03 (0.002)***	<0.001 (0.002)
Sex (male)	0.55 (2.61)	---
Race/ethnicity (non-white)	-1.02 (2.71)	---
Apgar 1	-2.14 (0.54)***	0.88 (0.41)*
Apgar 5	-4.60 (0.92)***	-0.53 (0.74)
Any oxygen treatment (yes)	15.52 (3.44)***	-3.45 (1.89)
Patent ductus arteriosus (yes)	14.81 (3.47)***	1.44 (1.78)
Bronchopulmonary dysplasia (yes)	22.51 (2.12)***	3.66 (1.92)
Days on antibiotics (number)	23.57 (3.23)***	0.98 (2.09)
Day of life feeding started	29.43 (5.00)***	-0.32 (3.28)
Milk (any breastmilk)	4.98 (2.91)	---
Colostrum given (yes)	6.65 (2.63)***	-1.63 (1.17)
Total days on intravenous fluid (number)	36.48 (2.03)***	19.15 (3.56)
Day of life full nipple feeding	0.64 (0.04)***	0.23 (0.06)***
Days no oral feed (number)	26.31 (3.23)***	1.23 (2.72)
Daily weight gain (grams)	-0.14 (0.17)	---
Maternal		
Gestational hypertension (yes)	-5.03 (2.71)	---
Gestational diabetes (yes)	-8.59 (4.11)*	0.26 (1.84)
Antenatal steroids (yes)	-0.27 (4.93)	---
Antenatal magnesium (yes)	5.84 (3.69)	---
Antenatal antibiotics (yes)	0.75 (2.69)	---
Intercept	---	28.22 (18.30)

Note: B=unstandardized beta, SE=standard error, Adjusted R square=0.84

*p<0.05, ***p<0.001

Table 3.

Abstract: 401

Emotional Distress is Higher in Parents of Premature Neonates Compared to Parents of Neonates with Congenital Heart Disease

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Background Parents of infants admitted to neonatal intensive care units (NICUs) have higher levels of emotional distress (evidenced by higher depressive, stress, and anxiety symptoms) compared to parents of healthy term infants. NICUs routinely treat infants with many different diagnoses, including infants both born prematurely and infants born with congenital heart disease. We hypothesized that there are differences in the levels of distress in the parents of premature infants and parents of infants with congenital heart disease.

Objective To compare levels of depression, stress, and anxiety in parents of premature infants to parents of infants with congenital heart disease during the first two weeks of a baby's life.

Design/Methods This is a prospective cohort study following parents of premature infants and parents of infants with congenital heart disease in a 75 bed urban children's hospital with approximately 1000 admissions per year. Parents completed the validated Neonatal Unit Parental Stressor Scale (NUPS) and the Depression Anxiety Stress Index-21 (DASS-21) during the first two weeks of their infant's hospitalization. Given that neither group of parents had normally distributed NUPS or DASS-21 scores, statistical analysis was performed with Wilcoxon rank-sum testing.

Results 23 parents of premature infants and 81 parents of infants with congenital heart disease were enrolled. Stress and anxiety scores (DASS-21) were significantly higher in parents of premature infants as compared to parents of infants with congenital heart disease (stress score 10.09 vs 4.58, p=0.001; anxiety score 4.26 vs 2.01, p=0.05). Depression scores (DASS-21) trended towards significance with higher depression scores in parents of premature infants as compared to parents of infants with congenital heart disease (2.95 vs 1.89, p=0.25). There was no statistical difference in NUPS scores.

Conclusion(s) Consistent with prior literature, both groups of NICU parents in our study reported elevated levels of depression, stress, and anxiety symptoms. Parents of premature infants report higher levels of stress and anxiety than parents of infants with congenital heart disease. Further studies are necessary to examine what factors contribute to these higher levels of stress and anxiety in order to better address the emotional distress of parents of premature infants.

Parent Demographics		Parents of Premature Infants *N (%)* N=23	Parents of Infants with CHD *N (%)* N=81	p value
Gender	Mother	18 (78%)	48 (59%)	0.14
	Father	5 (22%)	29 (35%)	
Age (years)	<20	0 (0%)	1 (1%)	0.07
	20-29	5 (22%)	23 (29%)	
	30-39	10 (43%)	47 (59%)	
	>=40	8 (35%)	9 (11%)	
Education	Less than high school	2 (9%)	4 (5%)	0.58
	High School/GED	2 (9%)	13 (16%)	
	College	8 (35%)	34 (43%)	
	Professional/Graduate school	11 (48%)	29 (36%)	
Race	White/Caucasian (Non-Hispanic)	8 (35%)	44 (56%)	0.11
	Black/African American (Non-Hispanic)	5 (22%)	10 (13%)	
	Hispanic or Latino	7 (30%)	13 (17%)	
	Multiracial	2 (9%)	2 (3%)	
	Other	1 (4%)	9 (12%)	
Spirituality	Yes	17 (74%)	58 (75%)	0.89
	No	6 (26%)	19 (25%)	
Infant Demographics		**Premature Infants N (%) N=24**	**Infants with CHD N (%) N=53**	
Gestational Age (weeks)	<25	3 (12%)	0 (0%)	<0.0005
	25-28	4 (17%)	0 (0%)	
	29-32	17 (71%)	0 (0%)	
	33-37	0 (0%)	5 (9%)	
	>37	0 (0%)	48 (91%)	
Prenatal Knowledge of Diagnosis/Illness	Yes	21 (87%)	52 (98%)	0.09
	No	3 (13%)	1 (2%)	

Table 1. Parent and Infant Demographics.

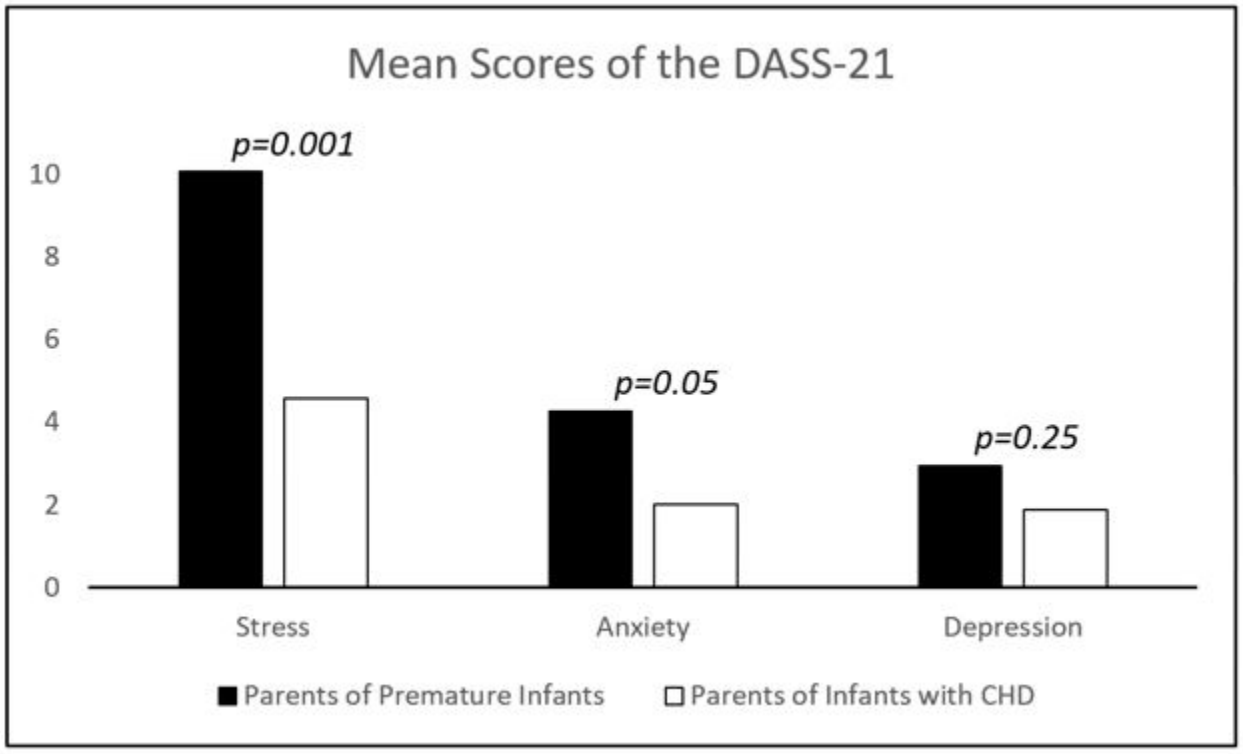

Figure 1. Results of the mean scores of the DASS-21 for the parents of the premature infants compared with the parents of the infants with congenital heart disease (CHD).

Abstract: 402

Impact of apnea countdown on premature infants' length of stay

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Background By 2019, per AAP recommendations, most neonatal intensive care units had adopted a practice of observing a variable number of apnea free days (apnea countdowns) prior to discharge without a home monitor. We continued performing pneumocardiograms (PCGs) due to the presumption that our length of stay, which was much shorter than the Vermont-Oxford average for very low birthweight infants, was favorably impacted by this practice.
Objective To compare length of stay prior to and after adopting a new apnea countdown protocol.
Design/Methods This study was done at a level III NICU at an academic medical center in an urban low-income minority community. Infants pre-apnea countdown were discharged 1/1/18 to 9/30/19, and post-apnea countdown babies were discharged between 10/1 to 12/31/19. We excluded preterm infants with neonatal abstinence syndrome. On 10/01/2019 we adopted an apnea countdown protocol that included discontinuation of routine PCGs, uniform guidelines for use of caffeine, and discharge readiness criteria for infants < 36 weeks gestational age (GA). Infant demographics and clinical course were abstracted from the electronic medical record. Outcome measures included length of stay (LOS), and discharge prescription of caffeine and home monitors.
Results A total number of 189 infants were included. Tables 1 and 2 show the infants' characteristics and outcome measures respectively. Caffeine was discontinued at a significantly lower post menstrual age (PMA) in the post countdown group. Significantly fewer infants were discharged home without a monitor or caffeine. LOS was not significantly different in both groups.
Conclusion(s) Replacing routine pneumocardiograms with an apnea countdown approach in premature infants < 36 weeks gestational age, does not increase length of stay. In addition, the post menstrual age for achieving pre-discharge readiness criteria was determined to be similar in both cohorts. The use of home monitors and caffeine at discharge was decreased with elimination of routine pneumocardiograms.

Table 1: Infant Characteristics

Variables	Pre-apnea countdown (n =153) (%)	Post-apnea countdown (n=36) (%)	P Value
GA (mean for entire group) (weeks)	32.21 ± 2.45	32.9 ± 2.28	0.11
GA subgroups:			
≤ 29 weeks	25 (16.3)	5 (13.9)	0.91
30-31 weeks	20 (13.1)	2 (5.5)	0.33
32-33 weeks	64 (41.8)	11 (30.5)	0.29
34-35 weeks	44 (28.8)	18 (50)	0.03
Birthweight (kg)	1.73 ± 0.51	1.78 ± 0.49	0.58
IVH (≥ grade 2)	3 (2.0)	0 (0)	0.92
NEC (≥ stage II)	0 (0)	0 (0)	N/A
Sepsis	9 (5.9)	4 (11.1)	0.06
BPD	4(2.6)	1 (2.8)	1.0
Received caffeine	62 (40.5)	8 (22.2)	0.06

Table 2: Outcomes

Variables	Pre-apnea countdown (n =153)	Post-apnea countdown (n=36)	P value
PMA reached room air (weeks)	33.41 ± 0.66	33.67 ± 1.56	0.37
PMA off respiratory support (weeks)	33.23 ± 4.62	32.96 ± 1.87	0.63
PMA off gavage feeds (weeks)	34.73 ± 1.88	34.74 ± 0.98	0.97
PMA in open crib (weeks)	34.62 ± 1.17	34.87 ± 0.96	0.19
Weight at time of PCG or start of apnea countdown (kg)	2.00 ± 0.28	1.96 ± 0.32	0.53
PMA at last apnea/event (weeks)	34.72 ± 1.73	34.75 ± 1.27	0.93
PMA when caffeine discontinued (weeks)	34.06 ± 1.61	32.63 ± 1.02	0.005
Discharge with home monitor (%)	74 (48.3)	1 (2.8)	<0.001
Discharge with caffeine (%)	30 (19.6)	0 (0)	0.027
PMA at discharge (weeks)	36.31 ± 4.62	35.78 ± 1.11	0.21
Length of stay (days)	25.70 ± 21.91	26.41 ± 19.23	0.85

Abstract: 403

Lipid Peroxidation Products as Predictors of Oxidant-Mediated Disease in Preterm Infants

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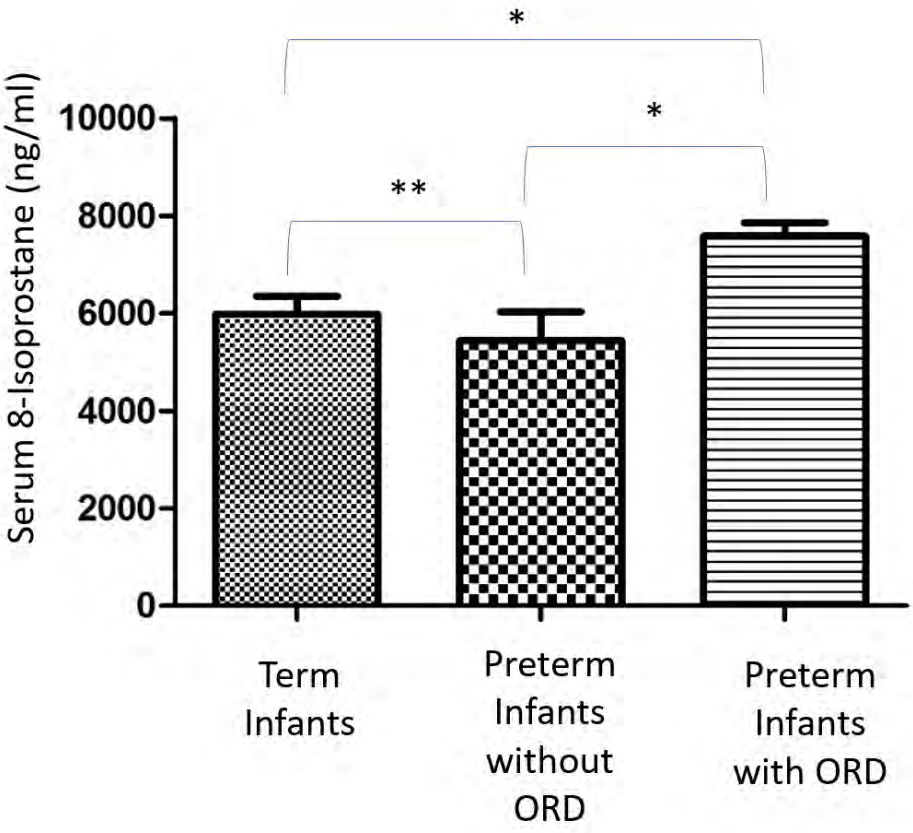
Background Preterm infants are highly susceptible to “oxygen radical diseases” (ORD) [e.g. bronchopulmonary dysplasia, retinopathy of prematurity (ROP) and necrotizing enterocolitis], but trials of antioxidant therapies for prevention have been disappointing. 8-iso-PGF2α (8-isoprostane) is a stable bioactive eicosanoid generated by free radical-catalyzed peroxidation of arachidonic acid. Oxidative stress also results in the formation of highly reactive lipid hydroperoxides from polyunsaturated fatty acids, which decompose to generate malondialdehyde (MDA).

Objective We hypothesize that elevated serum 8-isoprostane levels on day 0-1 and serially increasing urine levels of MDA are associated with the development of ORD.

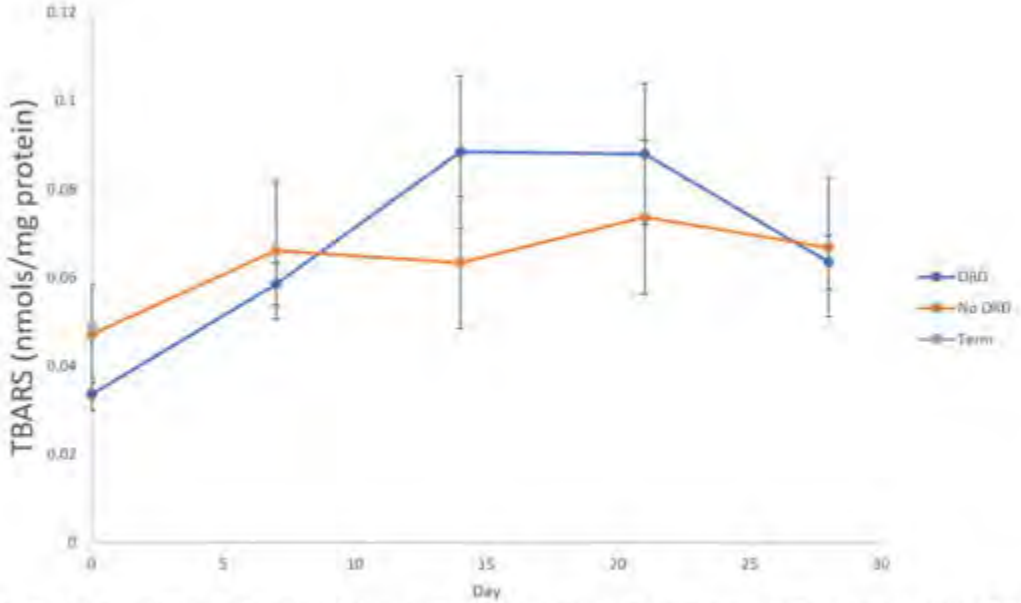
Design/Methods Preterm infants (<32 weeks gestation, <1500 g birth weight) were recruited at birth (n=40). Serum 8-isoprostane was quantified by ELISA on day 0-1, and urine MDA by colorimetric assay of thiobarbituric acid reactive substances (TBARS) on days 0, 7, 14, 21, and 28. ORD was defined as ROP > stage 1, pneumatosis, or oxygen requirement at 36 weeks corrected gestational age. For comparison, urine and serum from healthy term infants (n=39) were also analyzed.

Results Serum 8-isoprostane was significantly higher on day 0-1 in preterm infants who later developed ORD, compared to “no ORD” and term infants ($p<0.002$, Fig. 1). Urine TBARS levels increased from day 0 to day 14 only in the ORD group ($p<0.01$) but increased from day 0 to day 28 similarly in all preterm infants ($p<0.01$). TBARS levels were not significantly different between the groups (Fig. 2).

Conclusion(s) Elevated serum 8-isoprostane on the first day of life is associated with ORD in preterm infants. Similarly, urine MDA (TBARS) increases significantly in the first 2 weeks only for infants who later develop ORD. However, TBARS levels do not distinguish between infants with and without ORD at any specific time point, likely because the levels are affected by variations in hydroperoxide stability and renal function. If validated as biomarkers for ORD, early 8-isoprostane or initial rate of rise in TBARS may be useful for directing antioxidant therapies to the infants at highest risk.



* $p < 0.05$
** $p > 0.05$



Of note, p >0.05 for preterm infants without ORD on day 0 vs preterm infants without ORD on day 14, and p <0.05 for preterm infants with ORD on day 0 vs preterm infants with ORD on day 14.

	Term (n=39)	Preterm w/out ORD* (n=20)	Preterm w/ ORD* (n=20)
Male Gender, n (%)	22 (56%)	12 (60%)	12 (60%)
C-section, n (%)	20 (51%)	15 (75%)	12 (60%)
Maternal age ≥35, n (%)	8 (20%)	3 (15%)	5 (25%)
Preterm labor, n (%)	n/a	10 (50%)	14 (70%)
Chorioamnionitis, n (%)	14 (36%)	**2 (10%)***	**8 (40%)***
SGA, n (%)	9 (23%)	3 (15%)	2 (10%)
Multiples, n (%)	4 (10%)	5 (25%)	5 (25%)

*p = 0.028

Abstract: 404

Point-of-care ultrasound for evaluation of ECMO cannula position in neonates

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Background Extracorporeal membrane oxygenation (ECMO) provides cardiopulmonary support in patients who have failed maximal medical management. Correct venous cannula position is essential for optimal drainage and function, but difficult in neonates given the small cardiac dimensions. Dynamic real-time imaging is beneficial to ensure optimal cannula positioning and therefore, safe placement. Although chest x-ray (CXR) is universal for evaluation of cannula position, its predictive value for cannula position is limited. Echocardiography (echo) is more accurate, but limited by cost and availability. Point-of-care ultrasound (POCUS) is an emerging tool in neonatology and may offer a solution.
Objective To describe our experience using POCUS to evaluate ECMO venous cannula position and compare to conventional imaging.
Design/Methods Single center retrospective review of all infants on ECMO support between 01/2017 and 04/2019. Venous cannula position was evaluated using a combination of CXR, echo and POCUS according to the attending physician. POCUS and echo were performed by the neonatology and cardiology teams, respectively. POCUS studies were acquired using phased array and linear ultrasound probes. Patients with multiple POCUS studies had each study analyzed independently. If available within 24 hours of POCUS, CXR and echo were reviewed and compared with POCUS for agreement.
Results Twenty-three patients with 31 POCUS studies were reviewed. Six patients had multiple studies. Most were on veno-arterial ECMO with the common indications being congenital diaphragmatic hernia and pulmonary hypertension. Venous cannula tip location was identified in 28/31 (90%) of POCUS studies with 14 studies identifying malpositioned cannula: 12 deep (in the inferior vena cava, hepatic vein or too deep in the RA), 1 high (superior vena cava), 1 in right ventricle. Thirteen patients had an echo within 24 hours of POCUS with 85% agreement. Two patients had discrepancy between studies regarding the cannula tip location. All patients had a CXR within 24 hours of POCUS with 61% agreement. Venous cannula was repositioned in 7 patients after POCUS was obtained. Three patients utilized POCUS guidance during cannula repositioning with confirmation of final location.
Conclusion(s) There is a high discordance between CXR and ultrasound-based measures of venous cannula position. POCUS provides accurate real-time assessment of ECMO venous cannula position for experienced providers and may be a useful adjunctive imaging modality.

Table 1. Patient Demographics

# of Patients	23
Sex:	
Male	13
Female	10
Age at ECMO Cannulation[1] (days)	1 [0-178]
Mode of ECMO Support	
VA	13
VA+V	3
VVDL	6
VVDL+V	1
Length of ECMO Cannulation[2] (days)	10 ± 8
Weight[2] (kg)	3.41 ± 0.8
Diagnosis:	
Left CDH	5
Right CDH	1
PPHN (MAS)	15 (8)
Cardiac Arrest	2

[1]Median [Range]
[2]Mean ± Std Dev
ECMO, Extracorporeal membrane oxygenation; VA, Veno-arterial; VA+V, Veno-arterial with additional venous catheter; VVDL, Veno-venous double lumen; VVDL+V, Veno-venous double lumen with additional venous catheter; CDH, Congenital diaphragmatic hernia; PPHN, Persistent pulmonary hypertension of the newborn; MAS, Meconium aspiration syndrome.

Table 2. Summary of POCUS Studies

# of Studies	31
Patients with 1 Study	17
Patients with 2 Studies	4
Patients with 3 Studies	2
Indication	
Venous Cannula Location Confirmation	26
Assessment for Pericardial Effusion	2
Troubleshoot ECMO Complications	3
ECMO Day of Study[1]	1 [0-7]
Successful Identification of Venous Cannula Tip (%)	28/31 (90%)
Abnormal Cannula Position (%)	14/28 (50%)
Deep[2]	12
High[3]	1
In RV	1
Surgical Intervention after POCUS[4]	9/28 (32%)
Cannula retracted under POCUS guidance	3
Cannula retracted under Echo guidance	1
Cannula retracted	3
2nd Drainage Cannula Placed	2

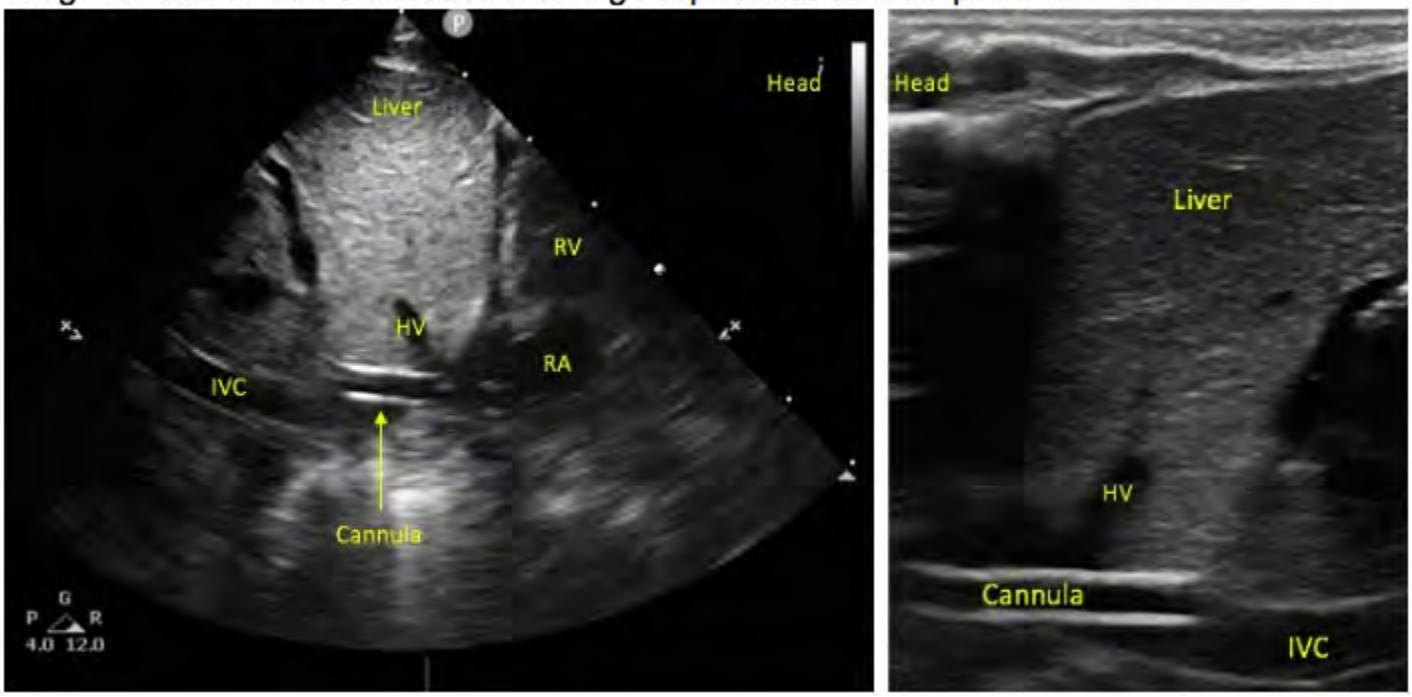
[1]Median [Range]
[2]Deep cannula position defined as located in inferior vena cava, hepatic vein or too deep in right atrium.
[3]High cannula position defined as located in the superior vena cava.
[4]Surgical intervention defined as adjustment of venous cannula or placement of 2nd drainage cannula.
POCUS, Point-of-care ultrasound; ECMO, Extracorporeal membrane oxygenation; RV, Right ventricle; Echo, Echocardiography.

Table 3. Comparison of POCUS with Echo and CXR

Echo	
# studies	13
Time between POCUS and Echo (hours:minutes)[1]	16:46 ± 11:10
Agreement between POCUS and Echo (%)[2]	11/13 (85%)
CXR	
# studies	31
Time between POCUS and CXR (hours:minutes)[1]	3:41 ± 1:42
Agreement between POCUS and CXR (%)	19/31 (61%)

[1]Mean ± Std Dev
[2]One patient with echo visualizing cannula in right atrium and POCUS visualizing cannula deep in inferior vena cava. Another patient with echo visualizing cannula in superior vena cava and POCUS visualizing cannula in junction of inferior vena cava and right atrium.
Echo, Echocardiography; POCUS, Point-of-care Ultrasound; CXR, Chest x-ray.

Image 1. Point-of-care ultrasound showing deep venous cannula position



POCUS images of a venous cannula in a patient on VA-ECMO for MAS and PPHN. The left image is using a phased array ultrasound probe. The right image is using a linear probe. The venous cannula extends below the level of the diaphragm into the IVC.
IVC, Inferior vena cava; HV, Hepatic vein; RA, Right atrium; RV, Right ventricle; POCUS, Point-of-care ultrasound; VA-ECMO, Veno-arterial extracorporeal membrane oxygenation; MAS, Meconium aspiration syndrome; PPHN, Persistent pulmonary hypertension of the newborn.

Abstract: 405

REDUCING EXTUBATION DELAYS IN THE NICU

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Background Prolonged invasive mechanical ventilation in preterm infants is associated with the development of bronchopulmonary dysplasia (BPD). Barotrauma, volutrauma, and free radical injury disrupt alveolar integrity, leading to fibrosis and simplification of lung architecture. Avoidance of prolonged intubation and increased use of less invasive ventilatory strategies decreases the risk of BPD. Barriers to timely extubation were identified: lack of uniform criteria, risk aversion (especially on night shift), and delays in notification about blood gas results not considered to be critical.
Objective Our SMART aim was to achieve an extubation rate of > 80% within 60 minutes of obtaining an "acceptable" blood gas while on "extubatable settings", by April 2019
Design/Methods "Extubatable" ventilator settings were defined for conventional and high frequency ventilation (Figure 1). "Acceptable" blood gases were defined as pH >7.20 and pCO_2 45-50 mmHg. PDSA cycles 1 and 2 were distribution of flyers and in-services for attendings, fellows, neonatal nurse practitioners and respiratory therapists about the extubation criteria, and implementation of a system for notification of clinicians of all blood gases, not only critical results. PDSA cycle 3 was emails to on-service teams at the beginning of each service block. Subsequently, active surveillance was initiated.
Results Baseline data indicated that only 28% of extubations that met criteria occurred within 60 minutes. This improved to 67% after cycle 2, and 86% after cycle 3. The median time from meeting criteria to extubation decreased from 325 minutes to approximately 30 minutes after PDSA cycle 2. A 6 month surveillance period after completion of the projects demonstrated that the improvement was sustained. Of note, the incidence of extubations prior to meeting criteria also increased, from 54% at baseline to 71%. The incidence of reintubation did not change.
Conclusion(s) Education interventions (level 1 reliability) are effective in decreasing time to extubation. Ongoing surveillance so far has shown that improvement is sustained. Broad acceptance of the rationale for non-invasive ventilation facilitated a significant change in practice. If necessary, further interventions will be instituted periodically.

HFJV

	All infants
PIP	16-20
PEEP	8
Jet rate	420
FiO2	<35%

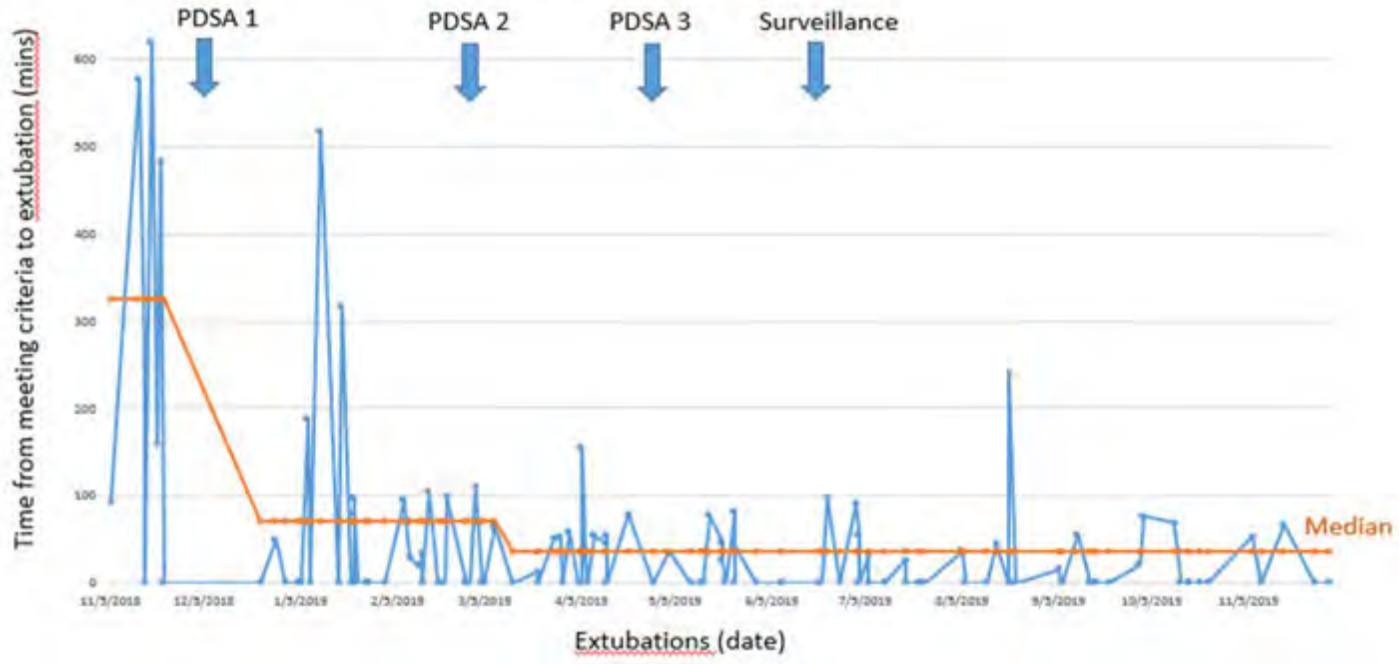
HFOV

	<1000g	1000-2000g	2000-3000g
MAP	8	9-10	10-12
Amp	16	18	20
FiO2	<0.40		

PC-SIMV

	<1000g	1000-2000g	2000-3000g
PIP	<16	16-20	20
PEEP	<6	<7	<8
PS	6-8		
FiO2	<0.40		
Rate	16-20		

Extubatable ventilator settings



Run Chart

Abstract: 406

The Roadmap to Success: Creating Unit-Based Teams to Increase Family Centered Rounding and Improve Care Team Communication

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Background Family Centered Rounding (FCR) allows the medical team to partner with patients and families in medical decisions, improving patient satisfaction, advocacy, communication, and safety. However, daily implementation is uncommon due to lack of time, lack of training, and lack of standardization.
Objective This project's aim was to increase the percentage of patients receiving FCR from 59% to 90% in 6 months.
Design/Methods The Model for Improvement and sequential PDSA cycles were utilized. The process of assigning patients to physician teams was delineated, teams were restructured, and FCR was standardized. The percentage of patients on their geographic team-based unit (process measure) was collected daily. Convenience sampling was used to obtain the frequency of FCR, care team

communication measured via “trio rounding” between physician, nurse, and caregiver (outcome measures), and duration of rounds (balancing measure).

Results The percentage of patients geographically assigned improved from a median of 40% (25th, 75th percentiles 38, 41) to 96% after PDSA Cycle 4 (25th, 75th percentiles 95, 100). However, with frequent admitting resident turnover, rising patient census, and competing priorities, this percentage dropped to below 90% in later months. To combat these barriers to geographic-based placement, changes were made via PDSA cycles and geographically assigned patient placement improved to 87% (25th, 75th percentiles 82, 89) (figure 1). Patients receiving FCR increased from 93 (59%) to 136 (93.6%), achieving the project’s aim by PDSA Cycle 4. However, this measure also experienced a small decline that later stabilized at 189 (87%) after PDSA Cycle 6 (figure 2). Trio rounding frequency significantly improved with an increase from 35% (n=33) to 81% (n=93) (figure 3). Implementation of unit-based teams and FCR, rounds exceeding the allotted time decreased from 36% (n=5) to 21% (n=5), by PDSA Cycle 6 (figure 4).

Conclusion(s) By increasing the percentage of patients on unit-based teams, 30% more patients received FCR (95% CI 19, 40) without prolonging rounding time. Results may be generalizable to similarly sized hospitals and residency programs. Future interventions will focus on improving FCR effectiveness and maintaining change implemented.

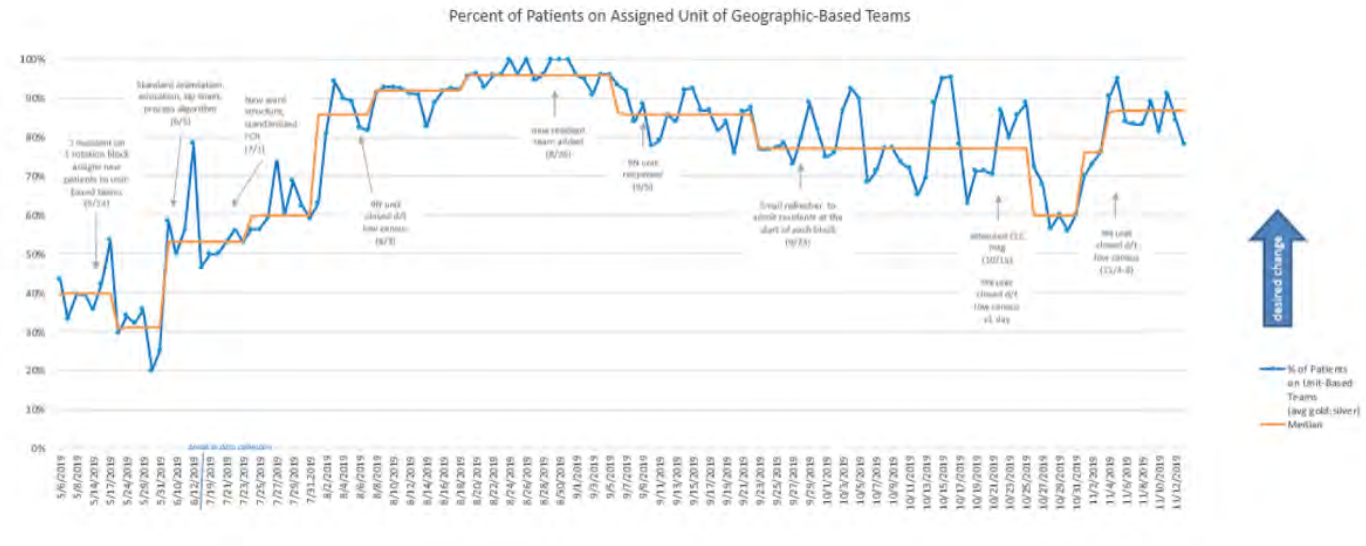

Figure 1: Percent of Patients on Assigned Unit of Geographic-Based Teams. The percentage of patients on assigned unit of geographic-based teams increased from a baseline median of 40% (25th, 75th percentiles 38, 41) to 96% (25th, 75th percentiles 95, 100) by PDSA Cycle 4. However, with frequent admitting resident turnover every 4 weeks, rising patient census, and competing priorities, this percentage dropped several times. New changes were implemented utilizing PDSA cycles, allowing the most recent percentage of geographically assigned patients to improve back to 87% (25th, 75th percentiles 82, 89). The median line was adjusted when trends and shifts were met according to run chart rules.

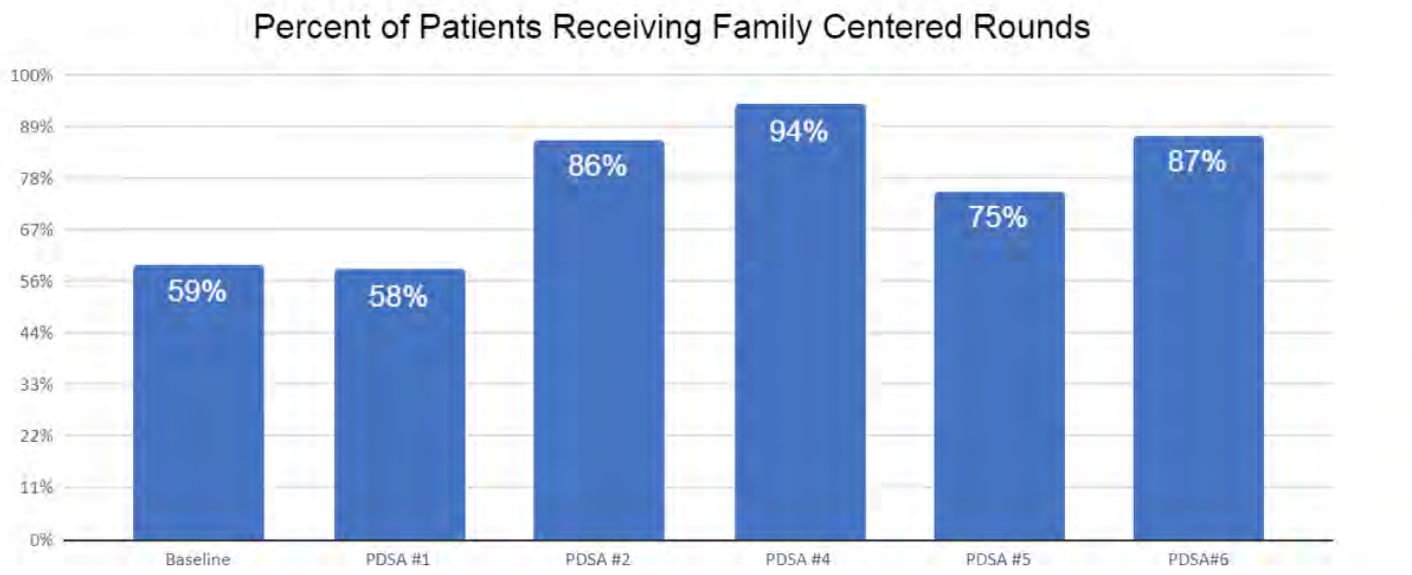

Figure 2: Percent of Patients Receiving Family Centered Rounds (FCR). Patients receiving FCR increased from 93 (59%) to 136 (93.6%), achieving the project's aim by PDSA Cycle 4. PDSA Cycle 5 reflected the similar decrease in geographically based teams, but PDSA Cycle 6 showed improved FCR frequency, with 87% (n=189) of patients receiving FCR. *Data was not collected for PDSA Cycle 3.

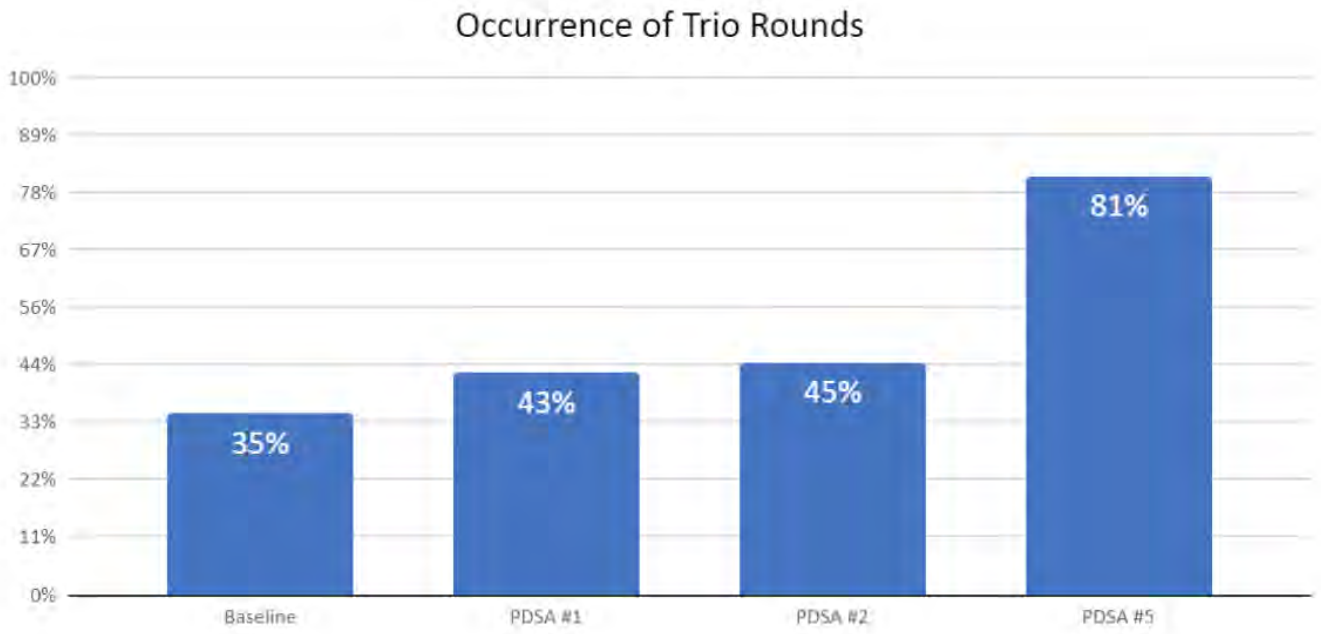

Figure 3: Percent of Patients Receiving Trio Rounds. The second outcome measure involved improving physician-nursing communication utilizing trio (physician, nurse, caregiver) rounds. There was a 48% increase in trio rounds since implementing geographic-based teams and increasing daily FCR. *Data was not collected for PDSA Cycle 3 and 4, but we continue to collect data for our current PDSA cycles.

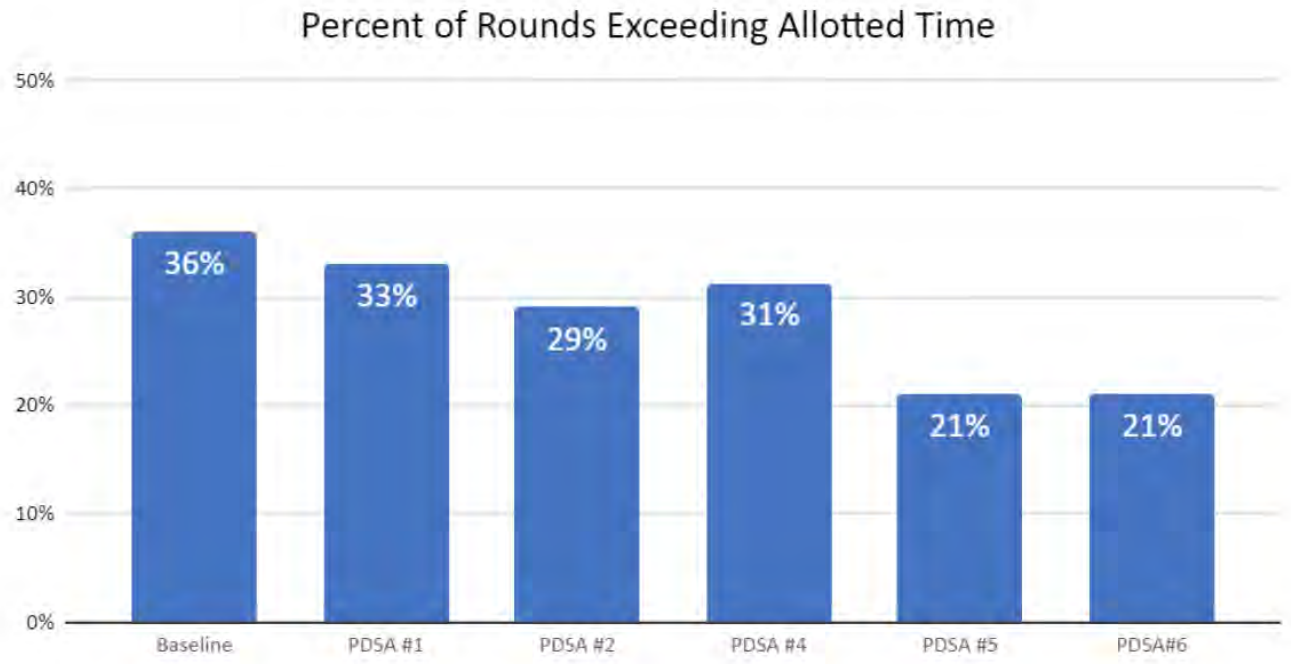

Figure 4: Percent of Rounds Exceeding Allotted Time. This balancing measure looked at the time it took to conduct rounds. The percentage of rounds exceeding the allotted time decreased from a baseline of 36% (N=5) to 21% (N=5) as of PDSA Cycle 6. *Data was not collected for PDSA Cycle 3. Unit-based teams potentially allowed for more efficient rounding as more patients received FCR without increasing the duration of rounds.

Abstract: 407

Effect of Increased Bundle Compliance of I-PASS Handoff Tool on Reported Errors on General Pediatric Unit

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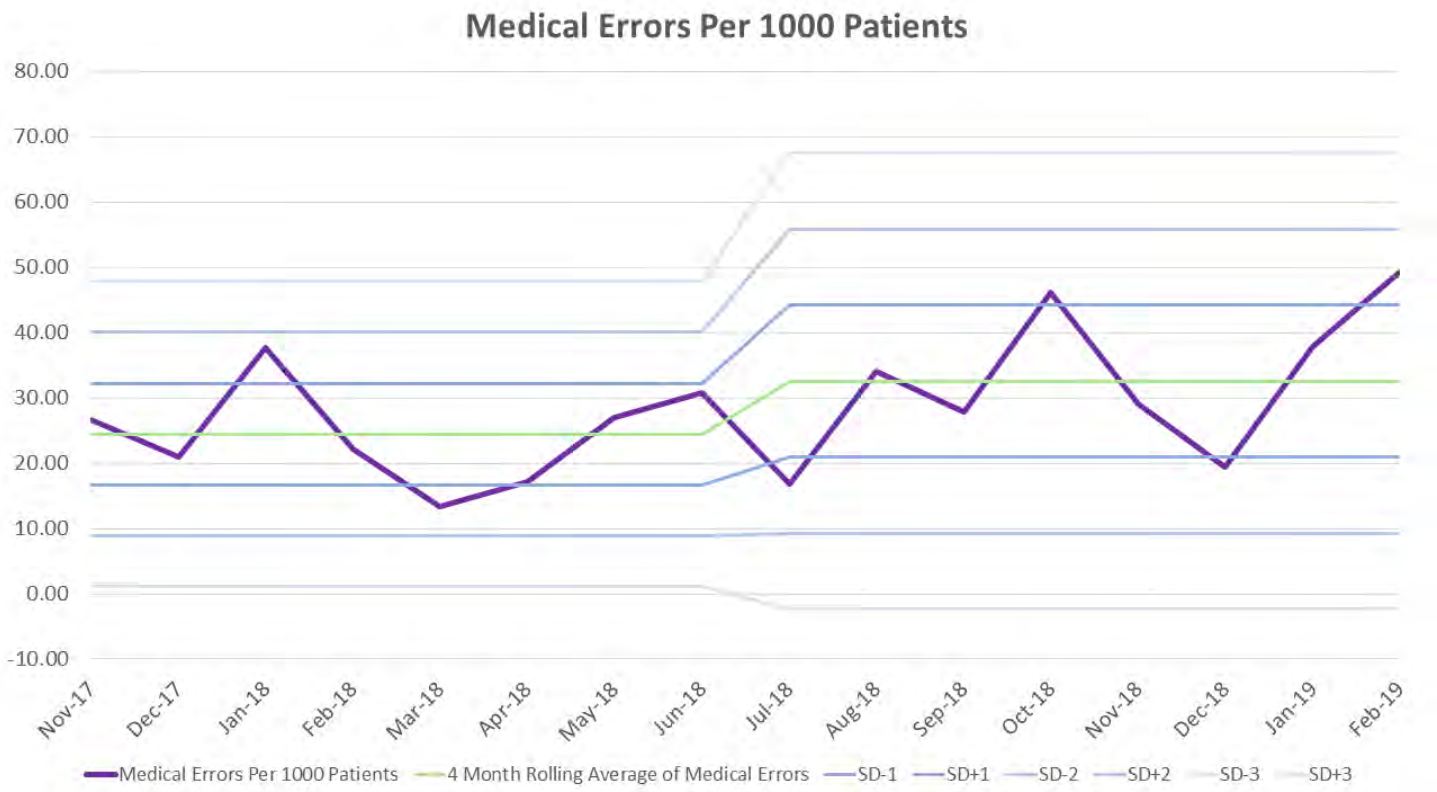
Background Miscommunication during transition of care is a cause of serious medical errors. The I-PASS handoff mnemonic has been shown to reduce medical errors in other institutions. In 2018, a rate of 90% I-PASS bundle compliance was reached in Stony Brook Children's Hospital, but the effects on the medical error rate were unknown.
Objective Based on data from other institutions, we aimed to measure the effect that I-PASS bundle compliance had on reported medical errors in an 8-month period prior to and after obtaining bundle compliance.
Design/Methods We used a local Safety Reporting System used at Stony Brook Children's Hospital (SB SAFE) to compare the medical error rate per 1000 patients in the 8 months prior to achieving I-PASS bundle compliance with the 8 months after achieving I-PASS bundle compliance. We achieved bundle compliance in July 2018 as measured by a data collection tool which included all five I-PASS components. Data was analyzed using a simple linear regression. A p-value of 0.05 was considered statistically significant. Data by month is shown in **Figure 1** and **Table 1. Table 2** shows the comparison of medical errors and the 4 month rolling average of bundle compliance achieved by month.
Results Pre-I-PASS bundle compliance data showed an average error rate of 24.49 per 1000 patients. In the 8 months following achievement of >90% bundle compliance, the average error rate increased to 32.55 per 1000 patients. A linear regression analysis showed an insignificant difference (p=0.126).
Conclusion(s) There was an insignificant increase, but potential upward trend in medical error reporting after I-PASS bundle compliance was reached. Although the self-reported nature may bias results, this is expected to be consistent across groups. This trend may be the result of increased awareness of communication as a contributing factor for errors. Future directions may be targeted to measure sustained improvement in IPASS bundle compliance, and potentially including error reporting within the local IPASS handoff bundle.



Medical errors per 1000 patients per month as well as 4 month rolling average of errors and standard deviation.

Month	Medical Error Rate (Per 1000 Patients)
Before Bundle Compliance Achieved	
Nov 2017	26.61
Dec 2017	21.04
Jan 2018	37.73
Feb2018	22.16
Mar 2018	13.30
Apr 2018	17.16
May 2018	27.03
Jun 2018	30.86
After Bundle Compliance Achieved	
Jul 2018	16.82
Aug 2018	34.01
Sep 2018	27.83
Oct 2018	46.14
Nov 2018	29.02
Dec 2018	19.41
Jan 2019	37.87
Feb 2019	49.31

Medical errors per 1000 patients per month, divided by before and after the achievement of I-PASS bundle compliance.

Month	Bundle Compliance (4 month rolling average)	Medical Error Rate (Per 1000 Patients)
Nov 2017	13.8%	26.61
Dec 2017	12.9%	21.04
Jan 2018	12.9%	37.73
Feb2018	12.9%	22.16
Mar 2018	42.9%	13.30
Apr 2018	42.9%	17.16
May 2018	42.9%	27.03
Jun 2018	42.9%	30.86
Jul 2018	93.0%	16.82
Aug 2018	93.0%	34.01
Sep 2018	93.0%	27.83
Oct 2018	93.0%	46.14
Nov 2018	91.0%	29.02
Dec 2018	91.0%	19.41
Jan 2019	91.0%	37.87
Feb 2019	91.0%	49.31

Medical error rate per 1000 and 4 month average of I-PASS bundle compliance.

Abstract: 408

Project SMILE: A quality improvement initiative to increase pediatric residents' use of tools to minimize pain during hospital procedures.

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Background In medical settings, children are subject to many painful procedures. Pain management during procedures is not only beneficial during the procedure by reducing psychological and physical trauma, but has been shown to impact a child's future response to pain and procedures.
Objective To measure the effectiveness of a new educational curriculum in encouraging the use of pain-minimizing techniques during procedures by pediatric residents.
Design/Methods A baseline evaluation of 20 procedures on the pediatric floor was obtained. Lectures on procedural pain and pain-minimizing techniques were provided, posters showing different techniques were displayed, pins were created and worn by the residents to raise awareness, reminder group texts were sent, the nursing and phlebotomy staff were involved, and a box with distraction tools was provided.
The acronym "Project SMILE" was created as a reminder of the available procedural pain reduction methods: S= Sucrose drops/breastfeeding for infants; M= maximize distractions; I= Incorporate comfort positioning; L= lidocaine numbing cream; E= Encourage patient/family participation.
Results At baseline, distraction was used in 61% of encounters and was seen as successful 64% of the time. Numbing cream was not used. Distress was perceived as mild in 90% of the patients and moderate in 30% by resident observation.
3 months after Project SMILE was initiated, an increased use of comfort positioning was reported by 73% of pediatric residents, 93% increased distraction, 81% increased numbing cream, 53% increased sucrose drops, and 27% reported increased use of breastfeeding

during procedures.
19 months after initiation, 67% residents reported sometimes/always using numbing cream for venipuncture, 92% reported using distraction, 50% using sucrose drops, 82% using comfort positioning, and 42% reported always/sometimes using breastfeeding during procedures. 6 months later, the reported usage of these techniques were 81%, 100%, 88%, 94%, and 38%, respectively.
Conclusion(s) The various measures to minimize procedural pain are well-documented, as are their benefits. However, use of these measures is not always optimized. Our initiative utilized a curriculum with a novel acronym and provided necessary tools for pediatric residents, leading to an increase in the use of methods to decrease procedural pain, which was sustained over time. This initiative can be modified for use in other programs to enhance the use of techniques to reduce procedural pain.

Abstract: 409

Sepsis Huddle Implementation in the Neonatal Intensive Care Unit (NICU)

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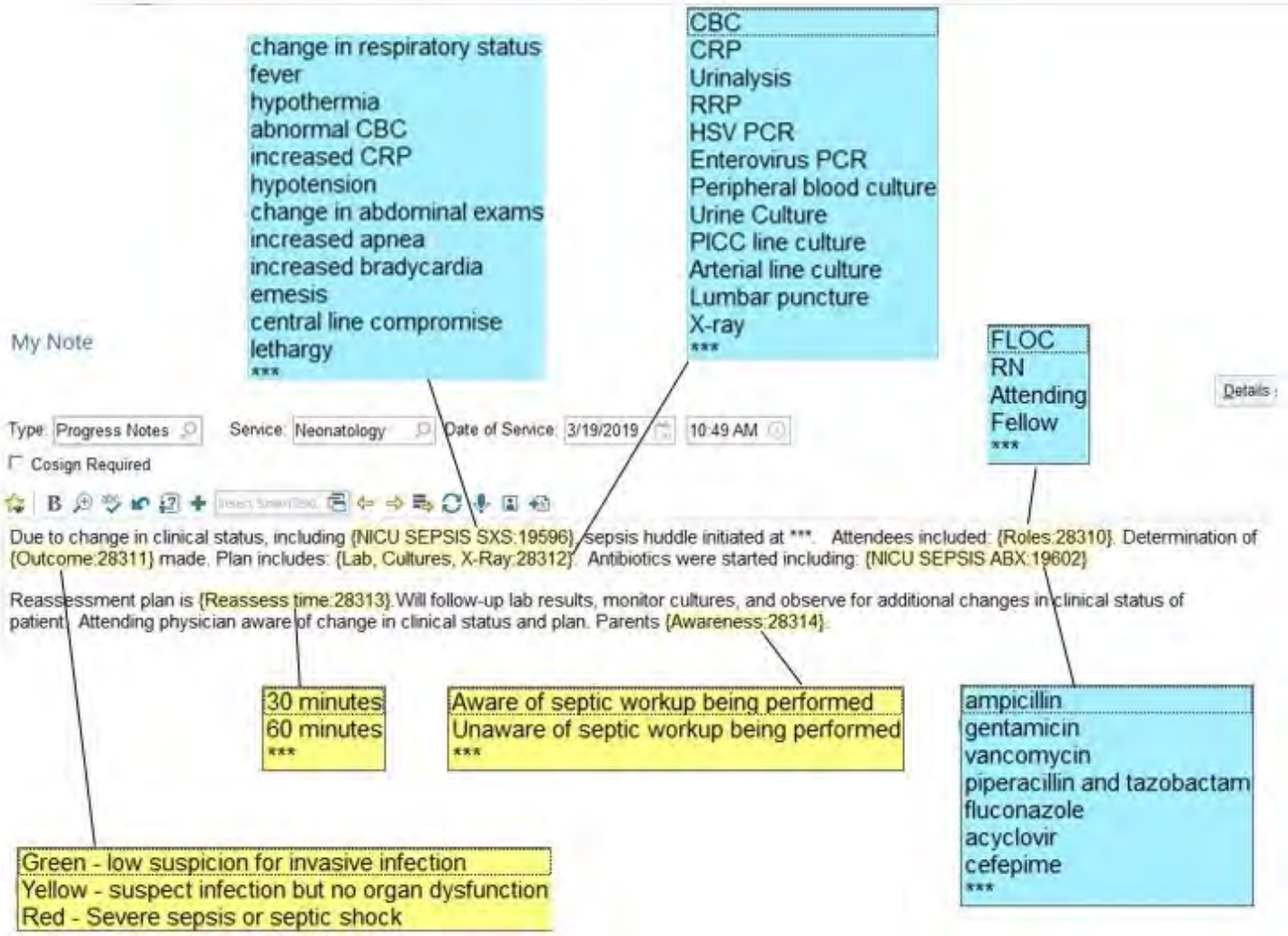
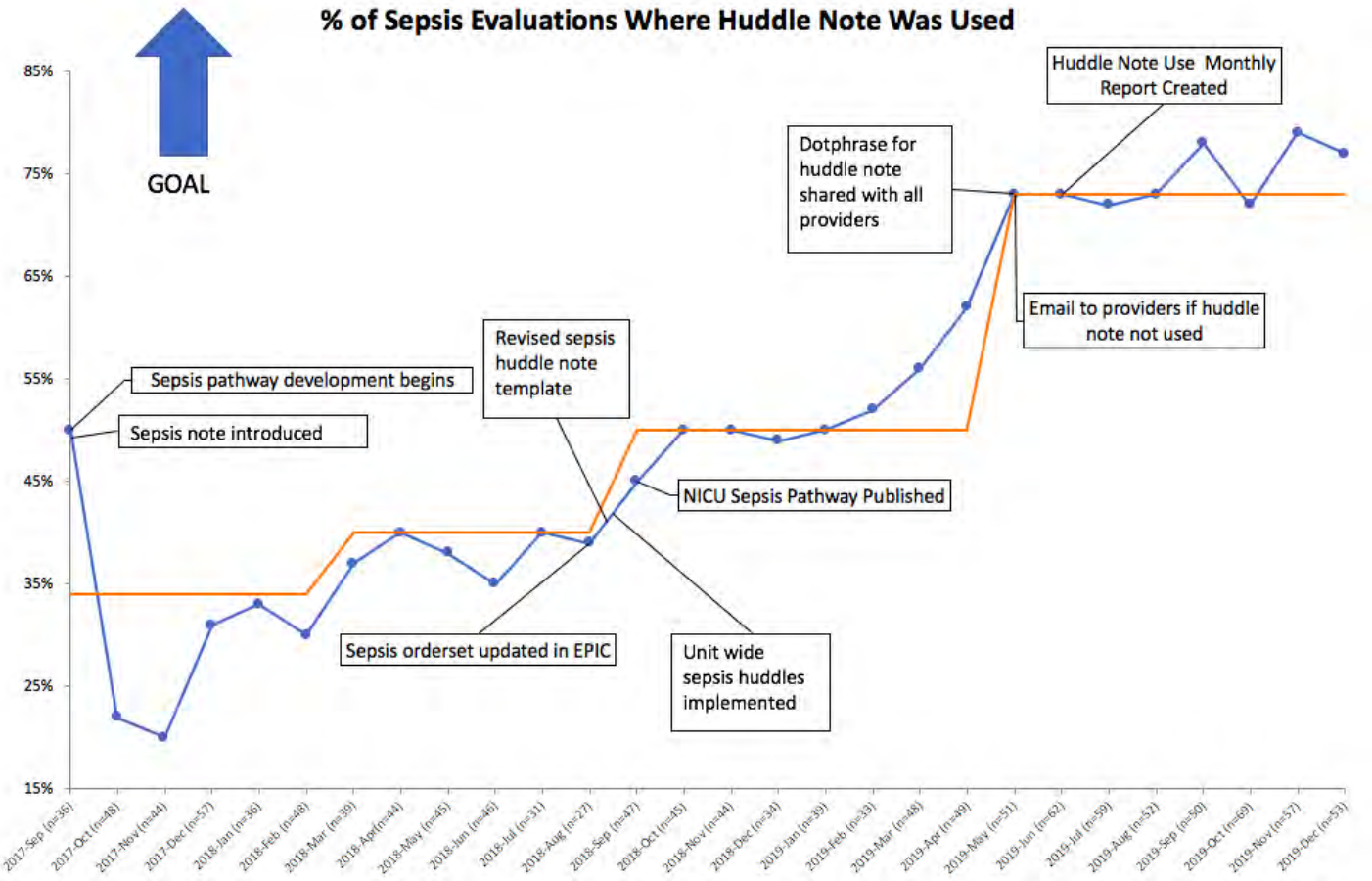
Background Prolonged time to initial antibiotic administration is associated with worse outcomes in infants with sepsis. Sepsis huddles promote bedside evaluation for suspected sepsis, and may improve sepsis identification, illness severity classification, and timeliness of therapy, but have not yet been adopted in NICUs. We implemented sepsis huddles in our 100-bed level IV NICU as one process to improve antibiotic timeliness.
Objective To increase huddle compliance (measured by frequency of huddle note documentation in sepsis evaluations (SEs)) from 34% to 60% by July 2019.
Design/Methods We previously had no process for real-time bedside discussions of decision-making surrounding SEs, and event notes were not routinely written. To improve communication at the time of SE, we implemented bedside sepsis huddles in September 2018 (fig 1). Huddles include at minimum a front-line clinician (FLC) and bedside nurse; huddle discussions are documented in a standardized note. We updated a sepsis event note template in our EHR to detail clinical signs prompting huddle, classify illness severity, and develop a management plan (fig 2). Huddle occurrence was identified by use of this note, and was tracked via embedded smart data elements. The process measure was proportion of SEs with huddle notes written. The outcome measure was proportion of SEs with timely antibiotic administration (defined as administration of the 1st of 2 broad spectrum antibiotics within 60 minutes of order entry).
Results There were 870 SEs among 432 infants between 9/1/18 and 11/30/19. Baseline sepsis event note use was 34%. With multiple PDSA cycles, huddle compliance improved to 74% in May 2019 (fig 3). Illness severity at the time of huddle was assessed as “green” (low suspicion for infection) in 21%, “yellow” (suspected infection without organ dysfunction) in 68%, and “red” (severe sepsis) in 3% of SEs. PDSA cycles included staff education, dissemination of the huddle note template to FLCs for easy access, and surveys sent to teams involved in SEs with delayed antibiotics in an effort to identify barriers. Overall antibiotic timeliness remains at 41%.
Conclusion(s) We successfully implemented sepsis huddles formally assessing illness severity, with improvement in compliance over one year. While antibiotic timeliness remains unchanged, huddles offer opportunities to enhance communication and identify barriers to timely antibiotic delivery. Future improvement work using insights gained from sepsis huddles will inform further PDSA cycles targeting improved antibiotic timeliness.

Sepsis Huddle Process Map
Abbreviations:
FLC: Front line clinician, RN: Registered Nurse, Pharm: Pharmacy
ABX: antibiotics (we generally start a combination of 2 antibiotics, vancomycin and cefepime)



Sepsis Huddle Note Template



Sepsis Huddle Run Chart

Abstract: 410

Decreasing pain experienced by patients 0-6 months of age during minor procedures in the YNHCH Pediatric Emergency Department by increasing the use of oral sucrose

Angelica M. Garcia[1], Chelsea Alvarez[2], Shannon Hurley[3], Jennifer Douglas[2], Beth L. Emerson[1]

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Background Pain is the most common adverse event during minor procedures performed in the pediatric Emergency Department. Inappropriate procedural pain management in young infants can lead to unsuccessful procedures, patient discomfort, and parental dissatisfaction. Many studies have shown that oral sucrose is associated with an overall decrease in pain responses in young infants. Oral sucrose is inexpensive, non-invasive, and easily administered.

Objective

To increase oral sucrose use for pain management for common invasive procedures (PIV, lumbar punctures, urine catheterization, venipuncture) in patients 0-6 months of age from 50% to 80% in the YNHH Pediatric Emergency Department within 12 months.

Design/Methods We initiated this project in June 2018 at an urban tertiary pediatric ED. We used the Model for Improvement (Plan-Do-Study-Act (PDSA)) methodology for this QI project. Baseline data was obtained prior to initiation of QI project, which consisted of percentage of oral sucrose use for common invasive procedures in the PED. We observed the process of ordering oral sucrose for common minor procedures, from triage to the time of the procedure. Furthermore, we identified key drivers that would lead to appropriate use of oral sucrose for this population: identification of patient needing procedure, family expectations, PED staff education, and order ease of use. (Figure 1) We conducted multiple interventions: (1) provider (attendings, fellows and nurse practitioners) education; (2) nurse education; (3) reporting at weekly management meetings; (4) resident education (5) technician education; (6) ordering process modification; (7) visual aids; and (8) EMR order set. We collected weekly data to inform PDSA cycles. (Figure 2) We utilized statistical process control for analysis.

Results Our study demonstrated improvement in oral sucrose use for pain management for common invasive procedures in patients 0-6 months of age from 50% to 90% over the course of 12 months. (Figure 3).

Conclusion(s) We use QI methodology to identify barriers and study interventions to increase oral sucrose use in patients 0-6 months old. Our intervention led to a 40% increase in oral sucrose use in this age group. Specifically, we found a significant improvement in oral sucrose use for patients ages 4-6 months (21% to 64%).

Figure 1. Key Driver Diagram

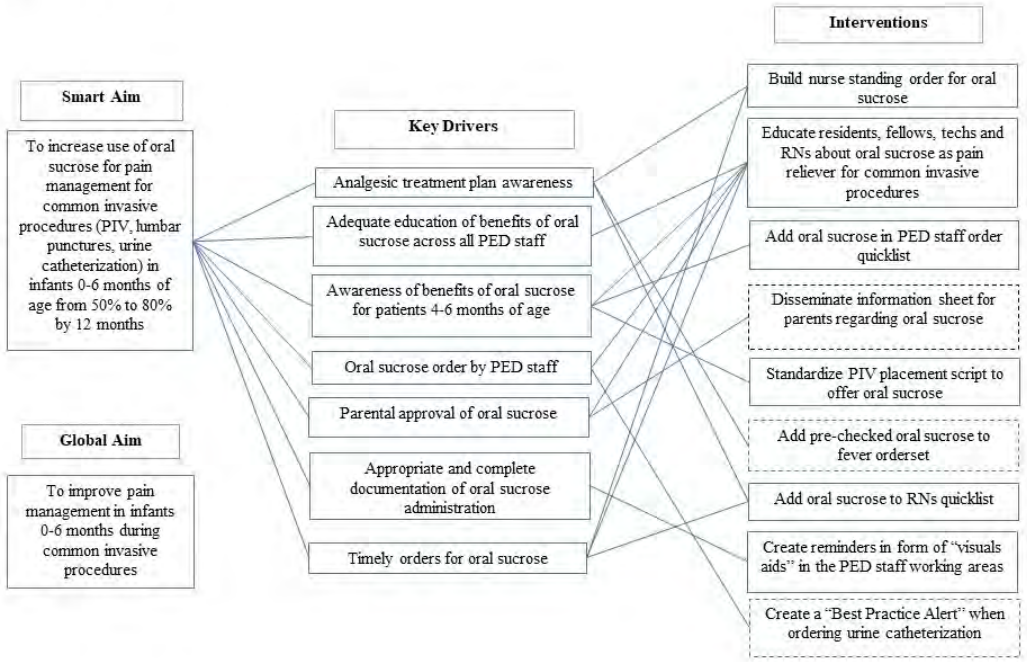


Figure 2. PDSA cycles

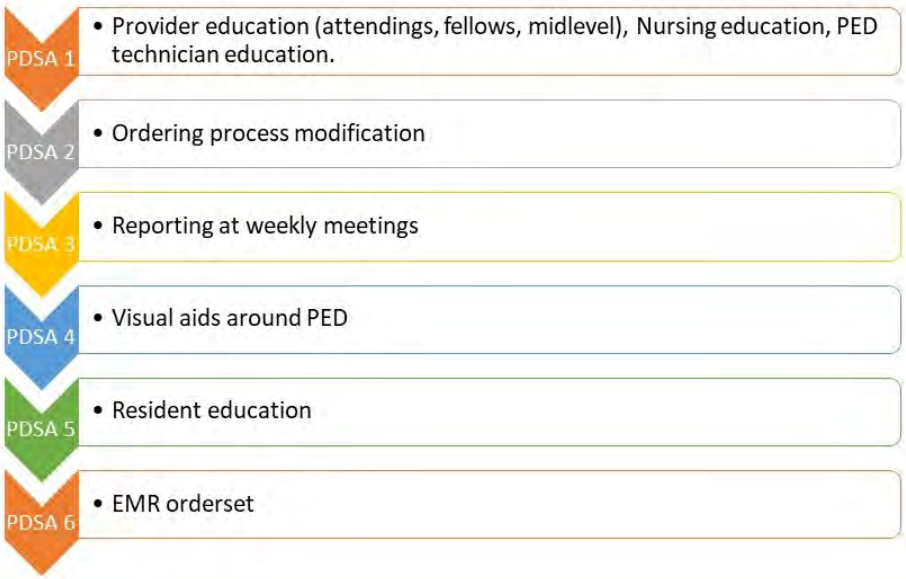
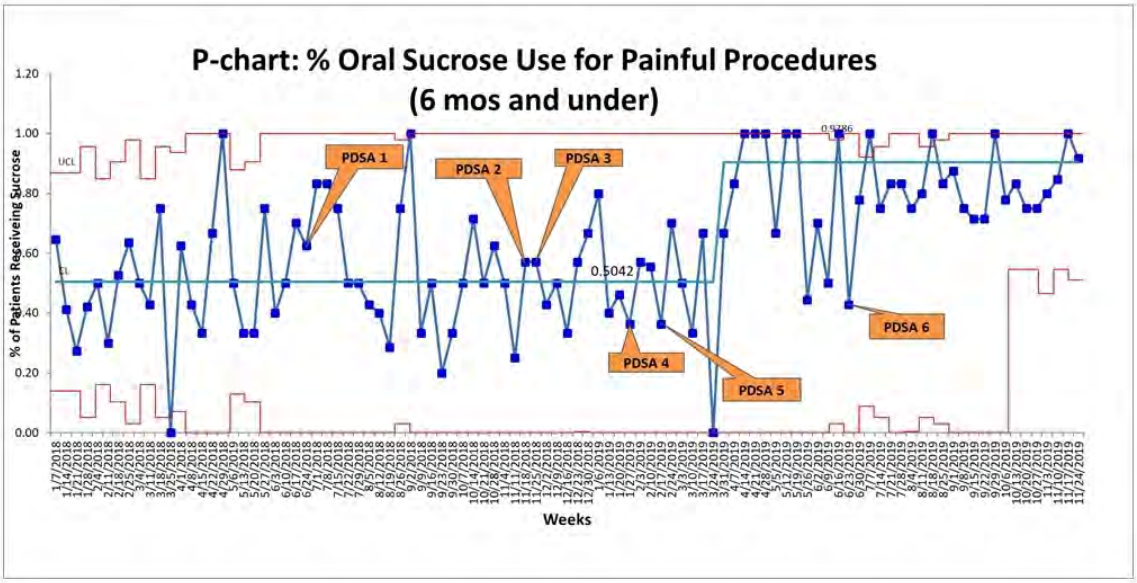


Figure 3. Statistical Process Control Chart. P-chart. The percent of oral sucrose utilized from July 2018 to July 2019 increased from 50%% to 90%. A run of eight in a row on the same side of the centerline was used to determine 'out of control signals' to shift mean.



Abstract: 411

Following your ABCs Decreases Severe Tracheal Intubation Associated Events

Heidi M. Herrick[1], Jacqueline Zedalis[4], Bridget Cei[4], Stephanie Murphy[4], Natalie Napalitano[4], Leane Soorikian[4], Kelle Matthews[4], Nicole Pouppirt[2], Rula Nassar[3], Tami Stuart[1], Akira Nishisaki[4], Elizabeth Foglia[1], Anne Ades[1], Ursula Nawab[1]
[1]Neonatology, Children's Hospital of Philadelphia, Philadelphia, Pennsylvania, United States, [2]Anne & Robert H. Lurie Children's Hospital of Chicago, Chicago, Illinois, United States, [3]Christiana Care Health System, Newark, Delaware, United States, [4]Children's Hospital of Philadelphia, Philadelphia, Pennsylvania, United States

Background Neonatal tracheal intubation (TI) is a high risk procedure, with up to 20% of TIs complicated by TI Associated Events (TIAEs). Our unit, a 100 bed level IV NICU with 25 TIs/month, measures TIAEs as part of participation in NEAR4NEOS, an international multicenter airway safety registry. TIAEs are classified as severe and non-severe.
Objective We aimed to reduce all TIAEs in the NICU by 10% in one year.
Design/Methods Our interprofessional TIAE working group performed process mapping and fishbone diagramming to identify primary drivers of TIAEs. We developed, implemented, and refined an Airway Bundle Checklist (ABC) to address the identified primary drivers of TIAEs: risk assessment, team preparation (use of video laryngoscopy), team communication (huddle and time out), and pre-medication administration (Figure 1).
Implementation occurred step-wise from 11/2017-4/2018. The outcome metric was rate of TIAES per 10 TIs. Process metrics were completion of the ABC, use of paralytic, use of video laryngoscopy, and use of the ABC specific time out prior to TI. Plan-Do-Study-Act cycles included ABC development, ABC refinement, interdisciplinary education, altering location of the ABC and time out cards, and monthly team and nursing competitions throughout the unit.
Results Baseline rate of TIAEs from 1/2017 to 10/2017 was 1 per 10 TIs demonstrating uncontrolled variation. We have not yet achieved a center-line shift in the rate of all TIAEs (Figure 2). However, we did achieve a center-line shift in the rate of severe TIAEs from 0.36 per 10 TIs to 0.20 per 10 TIs in 4/2018 (Figure 3). For our process metrics, ABC compliance (ABC initiation for patients at risk of TI) rates have been consistently >90% since 12/2018 (Figure 4) and use of paralytic and video laryngoscope remain high. Medications for intubation are currently pre-ordered for 93% of patients identified as at-risk.
Conclusion(s) The ABC decreased the rate of severe TIAEs in our unit. It has created important practice changes including identification of at-risk patients to improve situational awareness, pre-ordering medications for intubation, and standardization of procedural time out. It has reinforced utilization of paralytic pre-medication and video laryngoscope for TI. Future interventions include improving use of the standardized time out, monthly review of TIAE cases, introducing a unit wide TIAE conference to promote ongoing education, and attempting to eliminate severe TIAEs.

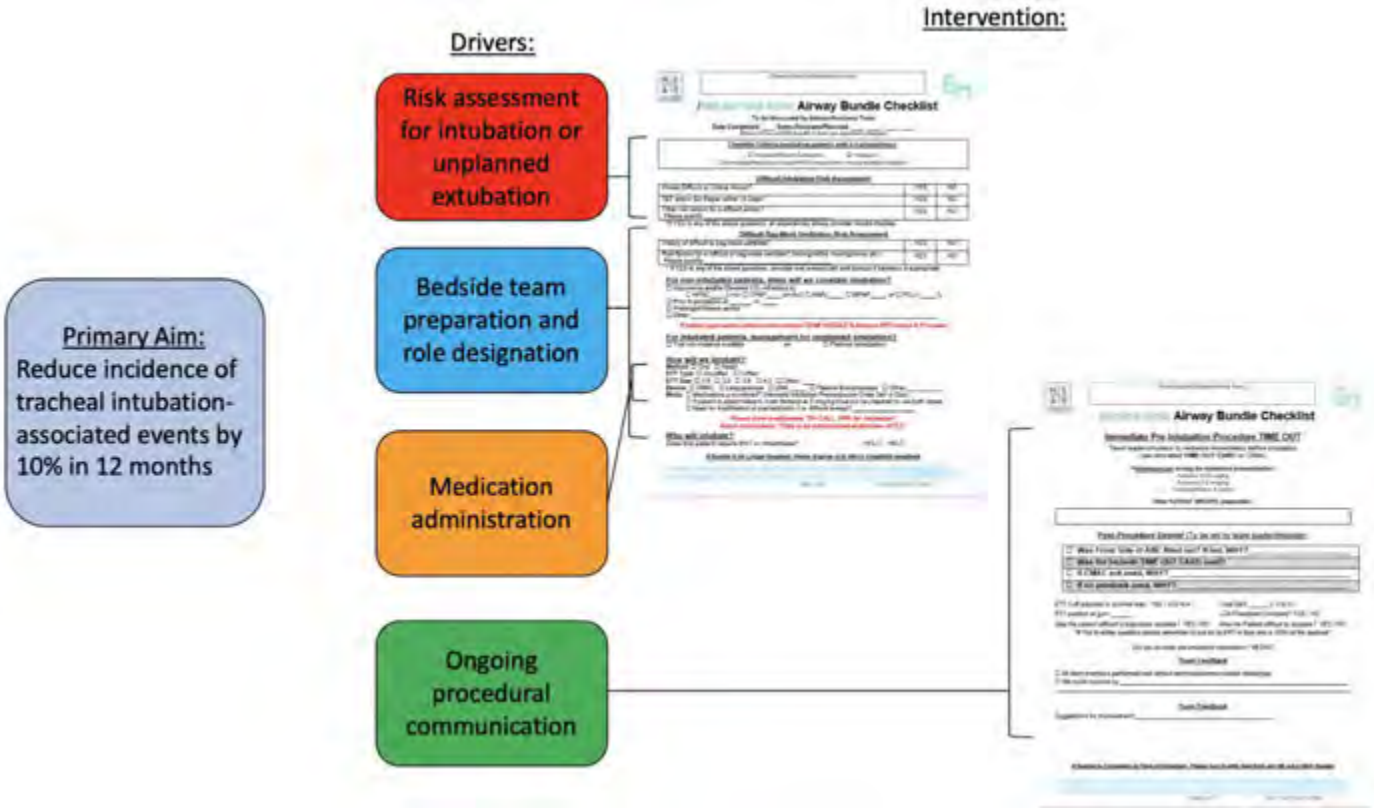


Figure 1. Driver Diagram

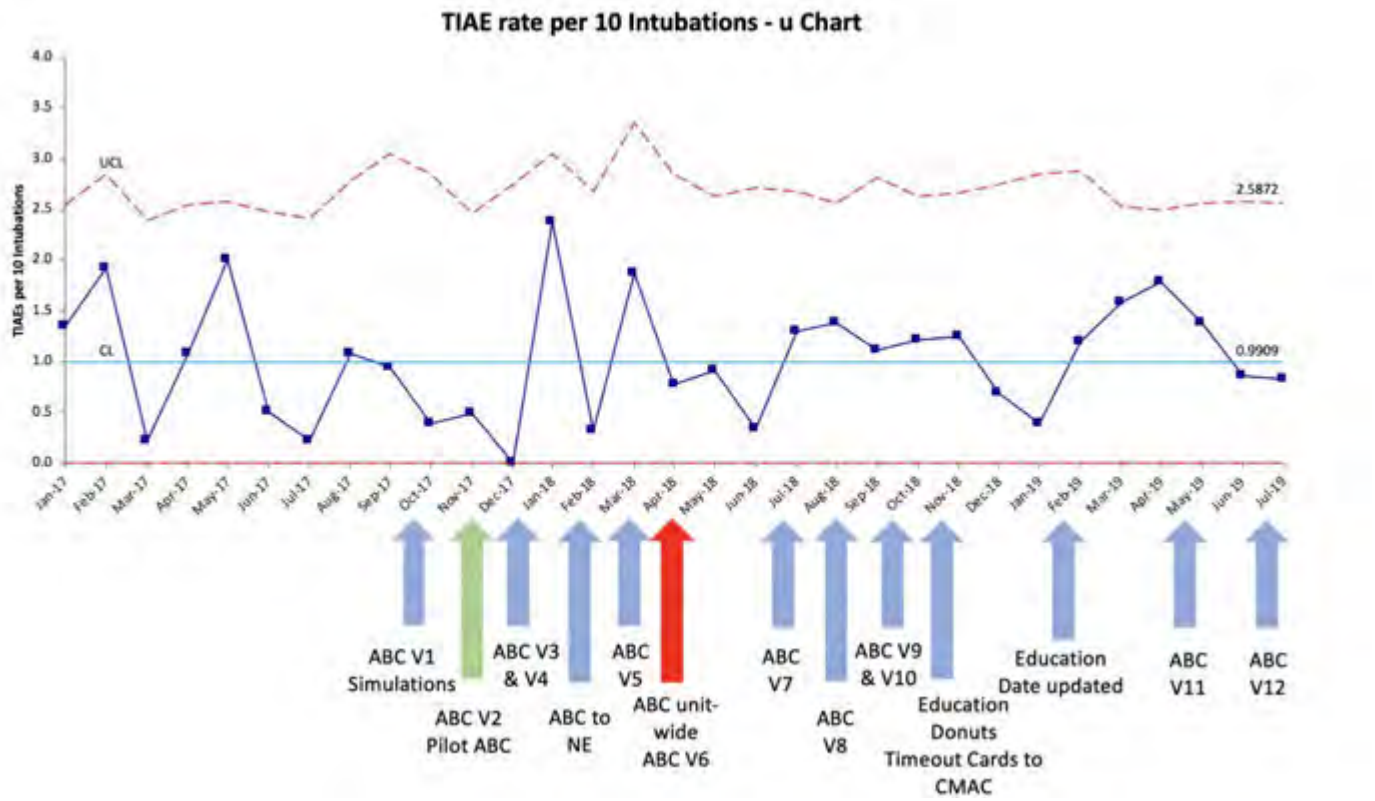


Figure 2. Overall TIAE Control Chart

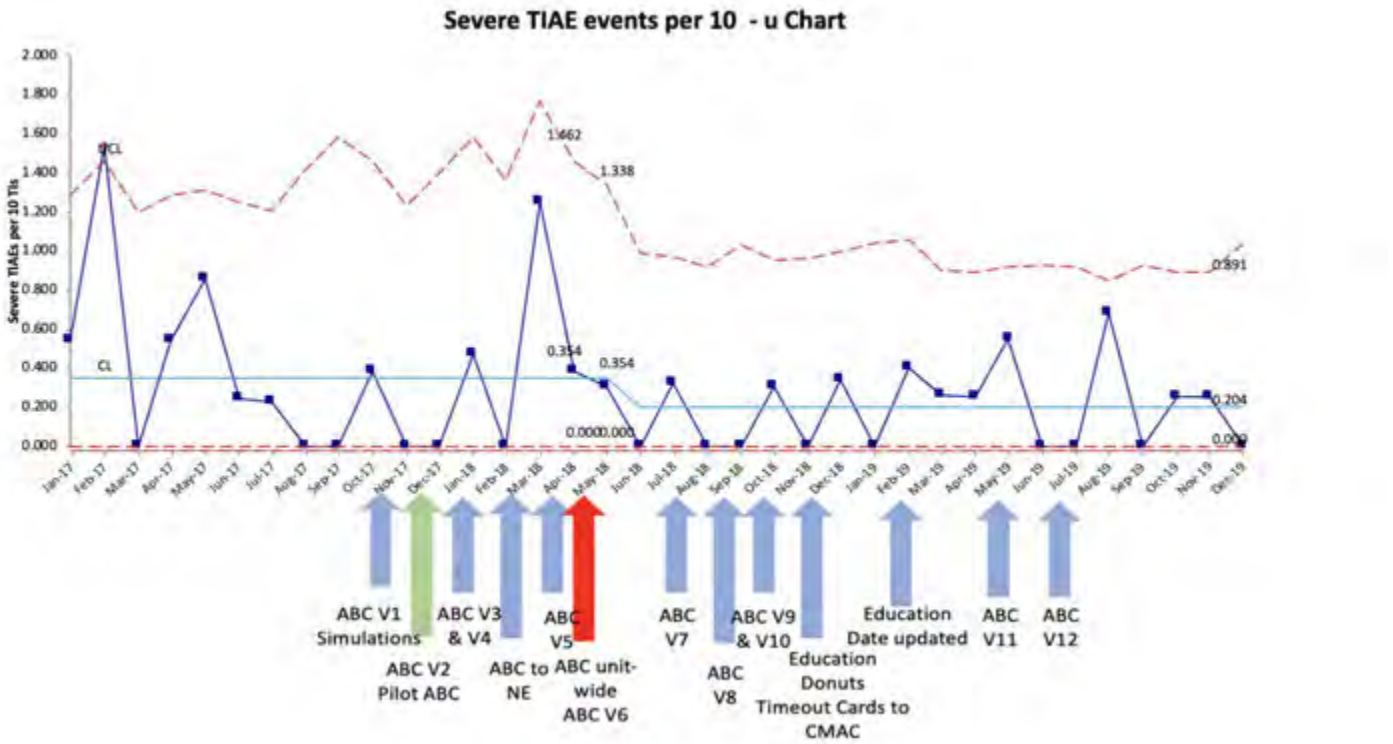


Figure 3. Severe TIAE Control Chart

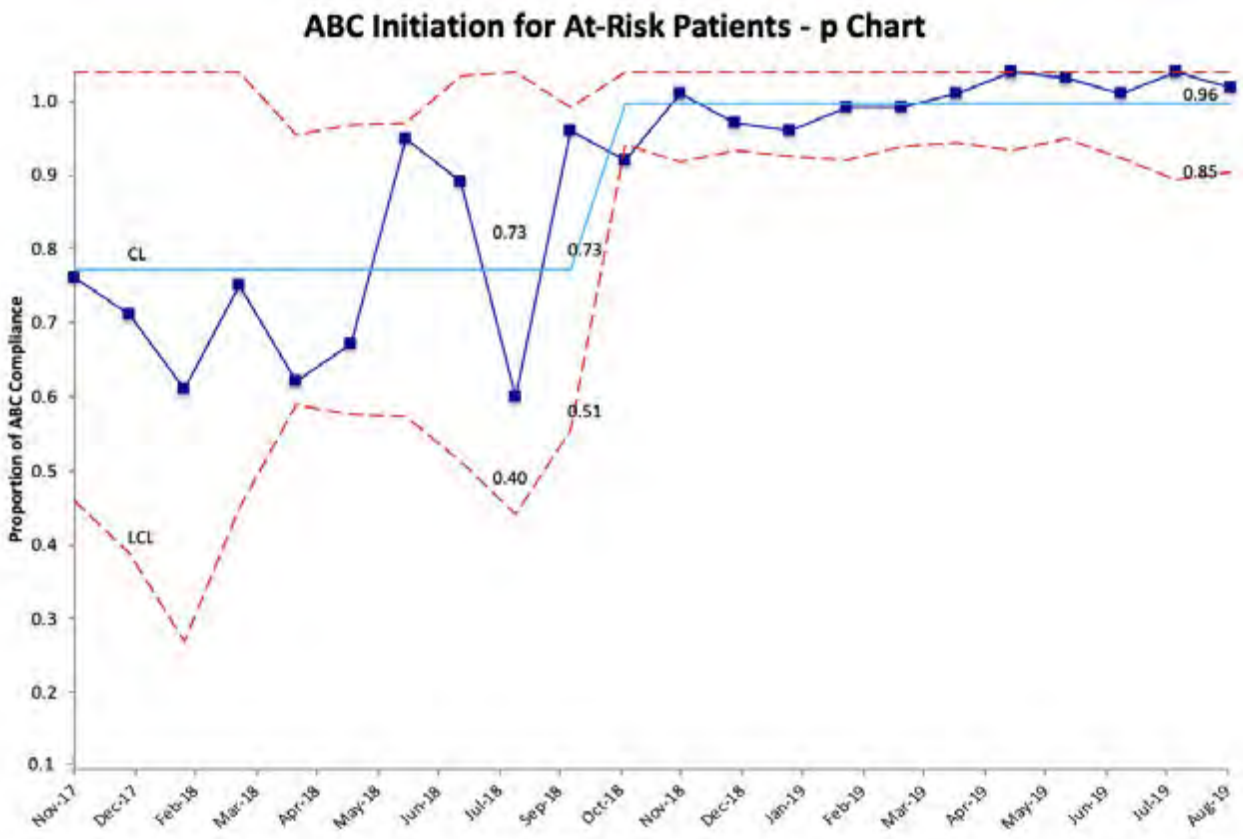


Figure 4. ABC Compliance Control Chart

Abstract: 412

A quality improvement Initiative to improve human milk feeding at hospital discharge among VLBW infants after implementation of a donor milk program

Shoshana Newman-Lindsay[2], Nayef Chahin[1], Karen D. Hendricks-Muñoz[1]

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Background Maternal milk consumption is the nutritional goal for premature infants in the NICU. Pasteurized donor human milk (PHDM) is preferred to assist as a bridge to mothers' milk or when mother's own milk (MOM) is not available. Although PDHM does not retain all of the bioactive and nutritional components of MOM, PDHM is associated with greater feeding tolerance, decreased necrotizing enterocolitis, decreased antibiotic use and shorter hospitalizations compared to formula. In efforts to improve discharge home on MOM our center instituted a PDHM program in 2015. We unexpectedly, saw a decline in the rate of MOM at hospital discharge among VLBW infants in the three years following implementation of a PDHM protocol, decreasing from 58% in 2015 to,42.9 % in 2016, 36% in 2017 to 19.7% in 2018 where we initiated a quality improvement effort to reverse this decline
Objective To Increase MOM feeding at hospital discharge among VLBW infants after implementation of a donor milk program
Design/Methods We used quality improvement methodology to address the decline by first conducting a provider (NBN and NICU) attitude toward donor milk survey (6/2018) to develop targeted intervention to educate staff on benefits of PDHM and MOM (11/2018). Targeted education consisted on ways to promote maternal breastfeeding, changed nurse staffing to facilitate NICU nurses providing education and start lactation within 2 and 6 hours of the baby's birth (2/2019) and early NICU admission breast pump access (2/2019)
Results Initial survey of all NICU and NBN nurses, residents and physicians indicated that 49% believed that "PDHM hinders maternal breastfeeding success". Education and targeted intervention lead to improvement in MOM at hospital discharge from 20% in

2018 to 42% in 2019 with no racial disparities identified
Conclusion(s) Our center saw a decline in human milk at discharge for VLBW infants after implementation of a donor milk program, due to less focus on MOM, a trend opposite what has been reported in multiple recent studies. Though 100% of VLBW infants receive MOM or donor milk during hospitalization, through a targeted on-going MOM QI intervention our center reversed the decline in MOM at discharge for the VLBW infant

Abstract: 413
Hypothermia Prevention in Preterm Neonates: A Success Story from a Rural Community NICU
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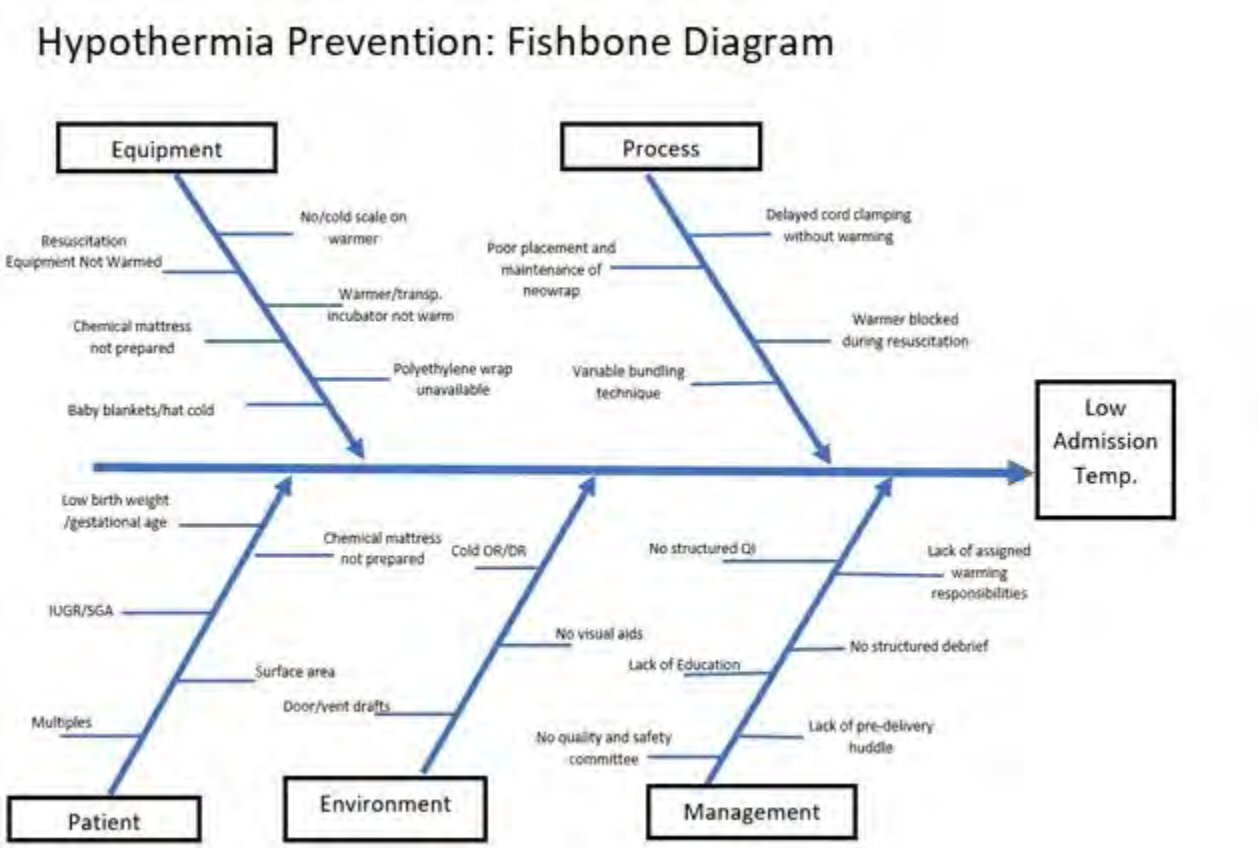
Background Hypothermia at birth can lead to significant morbidity and mortality in neonates. Due to greater evaporative, convective, conductive and radiation heat losses, and diminished physiologic response to cold stress, preterm infants are at higher risk for hypothermia. NRP added an increased focus on “warm and maintain normal body temperature” in latest revision to address hypothermia in neonates.
Objective To decrease the incidence of admission hypothermia (AH) in preterm neonates born at ≤ 36 weeks of gestation to less than 10% of total preterm births within one year.
Design/Methods A quality improvement project was performed at Level III NICU located in a rural community hospital from April to December 2019. Preterm infants born at ≤36 weeks of gestational age (GA) were included. AH was defined as temp <97.7^{0}F at the time of NICU admission. A Fishbone diagram (Fig 1) was developed using the baseline data and ongoing NICU practices. A comprehensive checklist (Fig 2) was created using a standardized bundled approach for data collection and to address the contributing factors leading to AH. A multidisciplinary QI team was convened, the team provided education to their respective groups. Infants were categorized based on the mode of delivery (C-section, Vaginal delivery) and GA at birth (≤32 and >32 weeks). A run chart (Fig 3) was created to monitor the progress, and evidence-based measures were periodically enacted.
Results Total of 91 infant born at ≤36 weeks of GA and admitted to NICU from April to Dec 2019. Baseline data revealed >50% AH in preterm neonates. Incidence of AH reduced from 50% in all (N=91) preterm infants in April to 0% in Nov-Dec 2019. AH reduced from 57% and 33% to none (0%) in infants born by C-section (n=57) and vaginal deliveries (n=34) respectively. No significant hypothermia was noted in infants born at ≤32 weeks of GA (2/20,10%). Among infants born at >32 weeks of GA (n=71), AH reduced from 56% in April to none (0%) in Nov-Dec 2019. A direct correlation was noted with low ambient temperature (<72^{0}F) and AH with 60% of infants developed hypothermia when the ambient temperature was <72^0 F (n=29). Incidence of low ambient temperature reduced from 60% in April to 0% in Dec 2019. A total of 7.3% infants had borderline hyperthermia (> 99.5^{0}F) with no clinical significance.
Conclusion(s) A multidisciplinary approach and implementation of a standardized evidence-based best practices resulted in significant reduction in the incidence of admission hypothermia in preterm infants born at ≤ 36 weeks gestation.



Fishbone diagram showing factors leading to neonatal hypothermia

Hypothermia Prevention in Preterm Neonates: Checklist

Patient Sticker

Date of Birth: _____

Gestational Age:_____weeks

Birth Weight: _____grams

Mode of Delivery: ☐ Vaginal ☐ C-section

PREPARATION

A. Delivery Room Preparation:

a.	Delivery Room or OR temp. 74-77°F (23°C -25°C)	☐ Yes	☐ No
b.	Radiant Warmer set at 100% heat output	☐ Yes	☐ No
c.	Non-sterile blankets under the warmer	☐ Yes	☐ No
d.	Hat (appropriate size) under the warmer	☐ Yes	☐ No
e.	Warm Sterile blankets for Delayed cord clamping	☐ Yes	☐ No
f.	Polyethylene sterile wrap for <32 weeks GA	☐ Yes	☐ No
g.	Thermal/Chemical Mattress available and activated	☐ Yes	☐ No

B. Transporter plugged in and pre-warmed to 37°C (98.6°F) ☐ Yes ☐ No

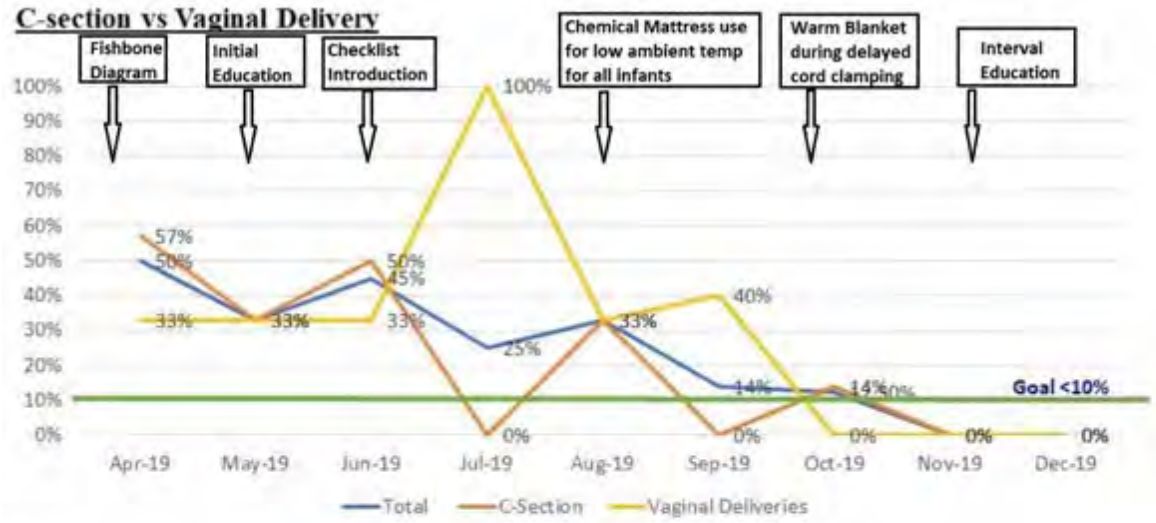
DATA COLLECTION TOOL

1. Team Huddle prior to delivery	☐ Yes	☐ No	
2. DR/OR Temperature at the time of delivery	_____° C (°F)		
3. If OR/DR temp. <72°F(22.2°C), was thermal mattress activated	☐ Yes	☐ No	
4. Delayed cord clamping performed	☐ Yes	☐ No	
5. Sterile blanket and/or polyethylene wrap used during DCC	☐ Yes	☐ No	
6. Polyethylene wrap used (N/A if not indicated)	☐ Yes	☐ No	☐ N/A
7. Thermal mattress activated and used (N/A if not indicated)	☐ Yes	☐ No	☐ N/A
8. Skin to skin performed	☐ Yes	☐ No	☐ N/A
9. Hat placed	☐ Yes	☐ No	
10. Transporter pre-warmed to 37°C(98.6°F)	☐ Yes	☐ No	
11. Infant temperature prior to transport to NICU	_____° C(°F)		
12. Thermal mattress continued for transport to NICU	☐ Yes	☐ No	☐ N/A
13. Infant's first temperature in NICU (time)	_____° C(°F)		

14. Additional Comments: _____

15. Team Members: _____

Checklist: Hypothermia prevention in preterm neonates



Monthly Run Charts with Periodic Interventions