Abstract: 1

Early discontinuation of LARC in an urban minority adolescent population

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Background Teenage pregnancy rates are significantly higher in Black and Hispanic adolescents. Long acting reversible contraception (LARC: IUD and implant) is safe and effective. LARC has been proposed as a highly effective means of preventing pregnancy or delaying pregnancy until it is desired. Little is known about the experience of minority adolescents choosing LARC.
Objective To describe the rates of and factors affecting discontinuation of LARC methods among urban minority adolescents.
Design/Methods We conducted a prospective cohort study at an adolescent clinic in an academic medical center serving a low-income minority population. The study population included adolescents ages 13-21 who chose a LARC method from April 2017 through Jan 2019; adolescents were followed for a 12 month period. Outcome measures were rates of discontinuation of LARC, reasons for discontinuation, and pregnancy at 12 months post insertion. In a multivariate analysis, we examined predictors of discontinuation including age, race, ethnicity, gravity, parity, history of termination of pregnancy and history of STI.
Results Study population included 67 adolescents: mean age 17.2 years (SD 2.1), African American 82%, Hispanic 15%, 91% Medicaid, ever pregnant (24%), parity ≥1 18%, history of STI 33%. Of the 67 adolescents, 15 (22%) chose intrauterine devices, and 52 (78%) adolescents chose the implant. At 12 months, 15/67 (22%) adolescents discontinued LARC: 5/15 (33%) discontinued use of an IUD, and 10/52 (19%) discontinued the implant. Reasons for discontinuation of the IUD included cramping, irregular bleeding and desiring pregnancy, and reasons for discontinuation of the implant included irregular bleeding, weight gain, arm discomfort and desiring pregnancy. Of those who discontinued the LARC, 10/15 (67%) were not using any contraceptive method and 5/15 (33%) had switched to another method (pills, patch). By 12 months after insertion of the LARC, 3/67 (4%) were pregnant and all of these were after discontinuation of LARC. There were no pregnancies during LARC use. In the multivariate analysis, none of the demographics or personal historical factors predicted discontinuation of LARC.
Conclusion(s) Rates of discontinuation of LARC methods among adolescents were low overall, but higher for the IUD (33%) than for the implant (19%). Our study findings support the provision of LARC to adolescents.

Abstract: 2

Prevalence, Attitude and Knowledge of Electronic Nicotine Delivery Systems in Youth in an Urban Multiethnic Community

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Background Electronic nicotine delivery systems (ENDS) include electronic (e) cigarettes and vaping devices used to smoke or vape a nicotine flavored solution. US Surgeon General's report in 2016 concluded that e-cigarettes are unsafe for adolescents and young adults. There are no studies on prevalence, attitude and knowledge of ENDS use in youth in an urban multiethnic community.
Objective To determine prevalence, attitude and knowledge of ENDS use in youth in an urban multiethnic community.
Design/Methods A questionnaire in English or Spanish was offered to adolescents visiting Flushing Hospital Medical Center between July and October 2019. Questionnaire included demographic questions (age, gender, ethnicity), questions on knowledge, attitude and practices of ENDS use. Responses were analyzed using percentages
Results There were 69 participants and only 23 (32%) reported ENDS use. Respondents were male (52%) with mean age of 16.6±2.2 years. They were mostly Hispanic (74%) and Asian (17%), attending high school (74%) and having B average or better (83%). The most commonly used ENDS were e-cigarettes (91%) followed by vape pipes (87%) and atomizers (87%). First time use was between age 12 to 15 years in 61% and 91% started because of peer pressure. More than half (65%) believed ENDS were safe and 73% believed ENDS to be safer than conventional cigarettes. Most were not aware of side effects such as blood vessel disease (78%) and lung disease (43%).
Conclusion(s) In our small multiethnic sample, youth of high school age was using ENDS due to peer pressure. Most felt ENDS were safe and they were not aware of health consequences. Healthcare providers need to educate their youth starting at age 12 years of adverse health effects of ENDS.

Abstract: 3

Examining the Relationship between Healthcare Autonomy and Ability to Independently Utilize Insurance Benefits amongst US College Students

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Background Healthcare transition from a pediatrician to adult care provider is a crucial period in which young adults (YA) begin to gain healthcare autonomy. Lack of familiarity with the healthcare system may increase YAs' risk of underutilizing medical services which can result in poor health outcomes. There is little research on the association of YA ability to independently utilize health

insurance (IUHI) and their healthcare autonomy (HA).
Objective To evaluate the relationship between YA HA and their self-reported ability to IUHI.
Design/Methods An anonymous online survey was distributed nationwide to college students (ages 18-22) via emails disseminated by student organizations. The survey included 1) HA score items (e.g. do you independently: schedule appointments, go to appointments, fill out medical forms/prescriptions, adhere to medication regimens) and 2) IUHI (e.g. do you: have health insurance info on hand, know how copay works, know how to check provider coverage or procedure costs, know how to handle bills). The IUHI evaluation was limited to respondents with health insurance. A linear regression was used to analyze the relationship between self-reported ability to IUHI and HA. This model was adjusted for age, gender, and race to account for potential confounders.
Results The sample consisted of 311 respondents (80% female, 57.9% White). Further demographic information is provided in Table 1.There was a significant positive linear relationship between HA scores and HI independence scores ($\beta = 0.8204$, $p<.001$). In the adjusted model, this association was also significant ($\beta = 0.7055$, $p<.001$). See Table 2 for the individual HA and HI item responses.
Conclusion(s) For YA, the ability to navigate their own HI is associated with greater HA. Pediatricians should encourage parents to initiate conversations with their YA regarding navigating HI to facilitate the healthcare transition. Parents should guide teens through HI practices such as determining coverage and paying copays, as well as HA practices such as scheduling, filling prescriptions, and, adhering to medication schedules at earlier ages to promote familiarity and competence. These practices will set the foundation for a smooth transition from pediatric to adult care. Physicians should encourage this competence by engaging directly with teens and encouraging staff to have teens self-fill forms and pay copays with parental supervision.

Table 1: Demographics of college students who responded to the survey (n=311)

Demographics	n	Percent
Age		
18 years old	45	14.5%
19 years old	70	22.5%
20 years old	89	28.6%
21 years old	77	24.8%
22 years old	30	9.6%
Gender		
Female	227	80.8%
Male	50	17.8%
Other/Prefer not to say	4	1.4%
Race		
White	180	57.9%
Black	20	6.4%
Asian	77	24.8%
Other	34	10.9%

Table 2. Responses for HA and HI Independence Questions

Healthcare Autonomy (n=311)	Always	Most of the time	About half the time	Sometimes	Never
I schedule my doctor appointments by myself.	41.5%	25.4%	8.4%	15.7%	9.0%
I go to my medical appointments without my parent/guardian accompanying me.	46.9%	30.2%	7.4%	9.7%	5.8%
I fill out medical forms by myself.	59.2%	26.0%	6.4%	6.1%	2.3%
I fill my prescription by myself.	55.0%	19.9%	7.1%	7.7%	10.3%
I am responsible for adhering to my medication schedules.	78.8%	14.8%	2.6%	2.2%	1.6%

Health Insurance Independence (n=288)	Agree	Disagree
*I know how to check what my insurance covers by myself.**	38.0%	62.0%
I keep my insurance information on hand.	79.5%	20.5%
I know how a co-pay works.	71.2%	28.8%
I know how to check if a provider accepts my insurance by myself.	50.0%	50.0%
I have a general idea of how much different procedures cost under my insurance.	29.5%	70.5%
I can handle insurance bills on my own.	16.3%	83.7%

** n=287 due to 1 missing response.*

Abstract: 4

Menstrual Management for Adolescents with Special Health Care Needs: Relationship Between Level of Adaptive Functioning and Menstrual Concerns

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Background Menarche is a challenging time of transition, even more so for caregivers of adolescents with special health care needs (SHCN). Few research studies have sought to understand the specific menstruation-related concerns of this population.
Objective Understand caregiver concerns about the menstrual cycles of their adolescents with SHCN and their interests in potential options for medical management. Relate the adolescent's level of functional ability to the type and level of interest of the caregiver.
Design/Methods Caregivers of adolescent girls with SHCN ages 10-18 were recruited for the study during their routine visit to the Center for Children and Youth with SHCN, an urban, complex primary care practice. Caregivers completed: 1) a survey on menstrual history and areas of interest in menstrual management; 2) the Pediatric Evaluation of Disability Inventory – Computer Adaptive Test (PEDI-CAT), a questionnaire that measures children's functional ability. Fisher's exact test was used to relate the level of the adolescent's functional ability to caregiver concerns and interests in menstrual management.
Results 40 caregivers of adolescent girls with SHCN completed the study. Caregivers were predominantly non-White and Catholic or other Christian; demographics are detailed in Tables 1 and 2. Pain (57.5%) and behavior (42.5%) were the most frequently identified menstrual concerns. When related to the PEDI-CAT score, caregivers of girls with very low function were more likely to desire permanent elimination of menses compared to caregivers of girls with at least low-average function ($p = 0.08$). While most caregivers were interested in learning more about menstrual management, caregivers of girls with very low function tended to express higher levels of interest ($p = 0.09$). Most families were interested in learning more individually from their primary doctor, rather than in a group setting.
Conclusion(s) Caregivers of adolescent girls with SHCN show an interest in menstrual management options and in learning more about these options from their pediatrician in this family-centered approach. Pain and behavior are areas of concern, and caregivers of girls with very low function are more likely to be interested in permanent elimination of menses compared to girls of higher levels of function. These findings inform next steps, the implementation of an office-based intervention to provide menstrual education and management based on the adolescent's level of functional ability.

Table 1: Characteristics of Adolescents Enrolled in the Study

Adolescent age	Range: 10 to 18 years old Average: 14 years old
Age at menses	Range: 8 to 15 years old Average: 12.3 years old
Insurance status	93% with Medicaid
Menarche status	75% have reached menarche
Menstrual management status	12.5% already on some form of menstrual management

Table 2: Characteristics of Caregivers Enrolled in the Study

Caregiver Relationship to Child: n (%)		**Age of Caregiver (years)**		**Religion: n (%)**	
Biological mother	26 (65%)	Range	23 – 57	Catholic	13 (32.5%)
Biological father	3 (7.5%)	Mean	41.4	Protestant	3 (7.5%)
Grandmother	2 (5%)	Median	42.5	Baptist	1 (2.5%)
Adoptive mother	4 (10%)			Other Christian	12 (30%)
Sibling	1 (2.5%)			Muslim	2 (5%)
Skilled caregiver	2 (5%)			Other	4 (10%)
Self[1]	1 (2.5%)	**Highest level of education completed: n (%)**		None	5 (12.5%)
Other	1 (2.5%)			**Religiosity[2]: n (%)**	
Race: n (%)		Elementary	1 (2.5%)	Very	7 (17.5%)
Black	12 (30%)	Middle school	4 (10%)	Quite	12 (30%)
Hispanic	22 (55%)	High school	21 (52.5%)	Somewhat	11 (27.5%)
Caucasian	4 (10%)	College	8 (20%)	Not very	8 (20%)
Other	2 (5%)	Post-graduate	3 (7.5%)	Not at all	1 (2.5%)

[1] Age of respondent: 18 years old

[2] Respondents were asked: "How religious would you say you are?"

Abstract: 5

Correlation between Screen Time and Progression of Myopia in Adolescents

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Background Myopia is defined as a refractive error of the eye where light focuses in front of, instead of on, the retina. It is usually diagnosed and progresses from school-age through adolescence at an average rate of 0.5 diopters/year. It is associated with an increased risk of visual problems, such as retinal detachment, choroidal degeneration, cataracts, and glaucoma. The incidence of myopia has increased among adolescents in industrialized nations where children have more access to portable screen devices. Prior studies have established a significant relationship between indoor time and progression of myopia. However, there are still intervening variables that need to be considered, particularly screen time. A better understanding of the relationship between screen time and myopia is needed since interventions to decrease screen time in adolescents have been found to be effective

Objective To determine the relationship between screen time and progression of myopia in adolescents

Design/Methods We conducted a cross-sectional study to examine the relationship between progression of myopia and screen time using a convenience sample of patients aged 12-18 years who were seen for yearly follow up visits specifically related to myopia.

Patients with any other eye disorder were excluded from the study. Progression of myopia was measured using a refractor to compare the amount of correction needed during a prior and current clinic visit. Demographic data and screen time were obtained through a self-administered survey. Statistical analysis included univariate and bivariate analysis of the relationship between myopia and screen time and other demographic variables
Results 32% of respondents were male and 68% were female. 26% of respondents were African-American and 74% were Latino. Age (Mean ± SD) was 13.7 ± 0.5 years. Bivariate analysis, including Welch sample T test for mean differences, found no significant differences in screen time for age, sex and ethnicity. There was significant correlation between screen time and progression of myopia in the right eye ($r=0.67$, $p=0.02$), the left eye ($r=0.54$, $p=0.02$) and the combination of left and right eye measurements ($r=0.63$, $p=0.004$).
Conclusion(s) These data suggest that increased screen time in portable devices such as cellphones and tablets plays a significant role in accelerating the rate at which myopia progresses through adolescence. Future studies should be designed to determine the impact of decreased screen time in reducing the progression of myopia

Abstract: 6
Youth Perceptions of Transitioning from PediatricTo Adult Care
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Background Transitioning from pediatric to adult care continues to be an issue for patients reaching the age of majority. Available transition guidelines leave unmet gaps which is detrimental for patient health. Most studies seek parental or provider input but rarely the youth themselves.
Objective To understand physician, youth, and caregiver perceptions of the transition from pediatric into adult care.
Design/Methods A four-pronged approach was used for this study including a survey to elicit opinions of physicians caring for adolescents as well as 15 semi-structured interviews to further obtain qualitative details on provider perspectives from 8 cities in North America. Youth and caregiver perspectives were elicited via paired youth and parent surveys administered at the International Children's Advisory Network 2018 Summit in Edinburgh Scotland and in the Connecticut Children's emergency department. Youth and caregiver focus groups were held to further gather input on this issue. Results from the four phases were transcribed, coded and independently analyzed by three reviewers.
Results 100 provider, 53 caregiver, and 61 youth surveys were administered. 57% of providers reported a rating of 1 to 5 (on a 10 item liker scale) and 0% of participants rating current transition processes as a 9 or 10. The top barrier for transition for providers is a lack of communication between pediatric and adult doctors (68%), and the top ranked strategy for improved transitions include providing transition guidelines (68%). The vast majority of youth surveyed report that their doctor did not talk to them about transitioning. The majority of youth believe they should be involved in transition preparations between the ages of 16-18, and officially transition into adult care at 18 years. In contrast, the timeline provided by majority of caregivers indicate a shorter timeframe for preparing of transition. They agree that youth should start preparations at 18 years and transition fully into adult care that same year. Caregivers also reported higher satisfaction with the transition process experience, readiness and involvement, the latter with a mean satisfaction at 8.33 on a likert scale out of 10 for caregivers compared to youth at 5.77.
Conclusion(s) Discrepancies exist between youth and caregiver perspectives on timeline for preparations for transition which create difficulties for providers in preparing families for transition. Continued assessment and research is needed to establish and disseminate best practices on this issue.

Abstract: 7
Pediatrician-Initiated Sex Education of Adolescents with Mild Intellectual Disabilities
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Background Mild intellectual disability (mID) refers to individuals with an IQ of 50-70. They can learn 6th grade educational skills, and as adults are relatively independent and can work semiskilled jobs. Individuals with mID engage in sexual activity at similar rates to the non-disabled yet are more likely to have an STI or unwanted pregnancy. Thus, an effective introduction to sexual health from primary care pediatricians (PCPs) is critical.
Objective To evaluate the extent to which PCPs initiate discussions on sexual health subjects with adolescent patients with mID compared to non-disabled adolescents.
Design/Methods An anonymous survey was sent via email to pediatricians nationwide. Participation was limited to PCPs who had seen patients ages 12-18 in the past year. Using 5-point Likert scales (1=almost never, 5=almost always) PCPs reported how often they discuss sexuality topics, such as puberty, sexual activity, consent, and HPV vaccination, with adolescents without ID, and with those with mID. PCPs reported the patient age at which they begin discussions on sexual health (stratified by patient gender).

Wilcoxon signed-rank tests were used to assess differences in frequency and patient age for discussing sexuality topics, as well as likelihood to refer patients to support groups/sexual awareness classes, across mID status. All analyses were conducted in R, version 3.6.1.

Results 416 of the 655 respondents met inclusion criteria. PCPs initiated discussions on sexual health at a later age with patients with mID than with non-disabled patients. This disparity was noted for males (W=205.5, p<.001) and females (W=282, p<.001). For most sexual health subjects, PCPs were more likely to discuss topics with non-disabled patients (Table 1). However, the concept of appropriate touch was discussed more often with patients with mID (Table 1). Despite these disparities, as a whole, PCPs discuss many topics with patients with mID "very often" or "almost always," such as HPV vaccination and menstruation. No difference was found in likelihood to refer patients to support groups/sexual awareness classes (W=298, p=.78).

Conclusion(s) PCPs are generally discussing sexuality topics with patients with mID. It is notable that PCPs are emphasizing appropriate touch with patients with mID. In light of increased unwanted pregnancies and STI rates in the mID population there is room for improvement in discussing sexual health subjects. Further educational materials should be disseminated to ease these difficult conversations with mID patients.

Table 1: Mean Likert Scale Responses Regarding the Discussion of Sexual Health Subjects with Adolescent Patients

Question	Non-Disabled[a]	Mild ID[a]	p-value[b]
Body changes in puberty/adolescence	4.56	4.40	<.001
Menstruation and feminine hygiene	4.65	4.52	<.001
Sexual activity, including oral, vaginal, and anal sex	4.14	3.62	<.001
Romantic relationships, including the concepts of love and affection	3.58	3.38	<.001
The concept of giving and receiving consent to sexual encounters	3.63	3.56	.11
The concept of appropriate vs. inappropriate touch	3.76	3.90	<.001
Contraception, including condoms, oral contraceptives, IUD, intra-vaginal ring, patch, injection, etc.	4.29	3.86	<.001
Pregnancy	4.19	3.75	<.001
STIs	4.40	3.81	<.001
HPV vaccination	4.85	4.74	<.001

[a]Mean values obtained from 5-point Likert item response to the question "When discussing sexuality with [these patients], how often do you discuss the following topics?" (1=*almost never*, 2=*rarely*, 3=*sometimes*, 4=*very often*, 5=*almost always*)
[b]p-values obtained from Wilcoxon signed-rank tests

Abstract: 8

Let's Talk About Sex: Pediatrician Barriers to Discussing Sex with Intellectually Disabled Adolescents

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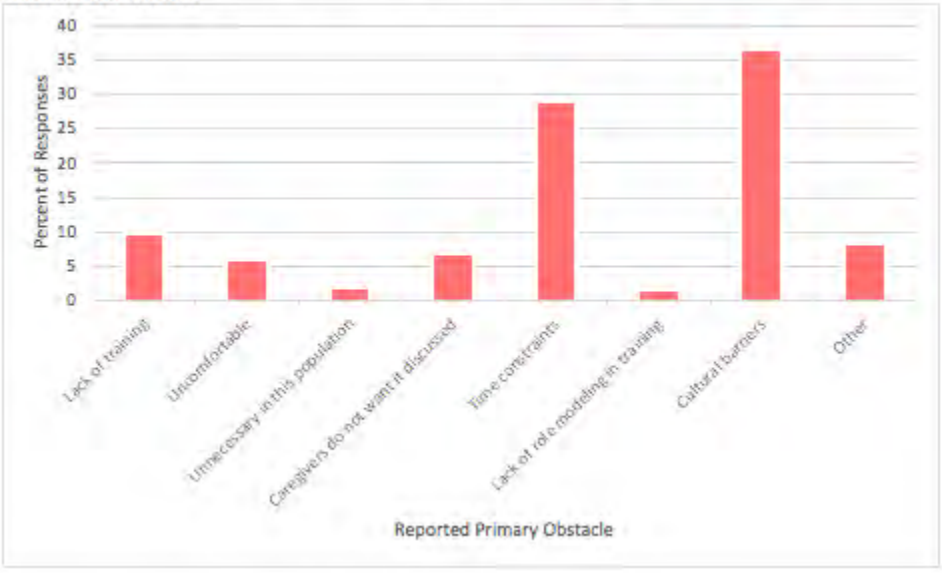
Background While the American Academy of Pediatrics has guidelines for promoting sexual development in adolescents, primary care pediatricians (PCPs) may not be aware of specific recommendations for those with intellectual disabilities (ID). Thus, PCP opinions and concerns regarding sexual health discussions with ID patients should be investigated.

Objective To assess PCP attitudes and barriers to initiating discussions on sexual health with adolescents with ID.

Design/Methods An anonymous survey was distributed to PCPs throughout the U.S. via email. Participation was limited to PCPs who had seen patients ages 12-18 in the past year. The survey asked PCPs about their opinions concerning discussions of sexual health

with patients. PCPs also identified barriers to these discussions and reported on any training they received. Using 5-point Likert scales (1=*not aware*, 5=*extremely aware*), PCPs reported their level of awareness of support groups/sexual health classes for adolescents in need. Wilcoxon signed-rank tests were used to compare PCP beliefs about discussion of sexual health with non-disabled patients and patients with mild ID. Data was analyzed using R, version 3.6.1.
Results In total, 655 responses were recorded and 416 met inclusion criteria of currently practicing primary care pediatrics. The primary obstacles identified to discussing sexual health with adolescents with ID were cultural barriers, limited appointment time, and lack of training (Figure 1). PCPs felt it was more important to discuss sexual health with non-disabled patients than with adolescents with mild ID (W=294, p=.001). When asked about awareness of support groups/sexual health classes, 70.3% of PCPs were not aware, 27.1% were slightly or moderately aware, and only 2.6% were very or extremely aware of these resources. Only 10.4% of physicians received formal education on discussing sexual health with individuals with ID and 81.4% thought it would be valuable to receive more education on this topic.
Conclusion(s) PCPs have identified unique challenges they face when discussing sexual health with adolescents with ID. Overcoming these obstacles including cultural barriers, time constraints and lack of training is essential in order to increase the frequency and quality of these conversations. PCPs have recognized that further education in initiating sexual health conversations with patients with ID in both medical school and beyond would be beneficial to improving their comfort levels with this important topic.

Figure 1: Pediatricians' Reported Primary Obstacle to Discussing Sexual Health with Adolescents with ID



Abstract: 9
Who Should Have the Talk? Physician and Caregiver Roles in the Sexual Health of Adolescents with Intellectual Disabilities
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Background Adolescents with intellectual disabilities (ID) are often provided with modified or simplified sex education. Therefore, it is essential for other adult figures to assist with this education to avoid unanswered questions and negative outcomes. Primary care pediatricians (PCPs) must navigate and respect caregivers' wishes while simultaneously looking out for their patients' confidentiality and best interests.
Objective To assess PCP perspectives of the role of the caregiver in promoting the sexual health and development of adolescents with ID, and to evaluate caregiver involvement in these discussions at office visits.
Design/Methods An anonymous survey was distributed to PCPs throughout the U.S. over email. Participation was limited to PCPs who had seen patients ages 12-18 in the past 12 months. PCPs reported, using 5-point Likert items, how often discussions of sexual health occur with the caregiver present, as well as how often caregivers have requested that this subject be discussed at appointments. PCPs also reported on who should primarily be responsible for discussing sexuality with adolescents in general. Data was analyzed using R, version 3.6.1.
Results Of the 655 recorded responses, 416 met inclusion criteria. Overall, pediatrician-initiated discussions on sexual health occurred with the caregiver in the room more often with adolescents with ID than with non-disabled adolescents (W=355, p<.001). However, caregivers asked the PCP to discuss the subject with their non-disabled adolescents at annual visits more often than with adolescents with ID (W=4016, p<.001). The majority of PCPs (76.6%) felt that the caregiver should be primarily responsible for leading

discussions on sexual health, while 19.2% felt the responsibility is in the hands of healthcare providers. Of note, PCPs reported that some caregivers asked them not to discuss sexuality with their adolescent with ID (6.1%), which created a barrier to having these discussions.
Conclusion(s) These findings imply the heightened importance of the caregiver in promoting the healthy sexual development of adolescents with ID. However, PCPs should not assume that the caregiver will initiate these conversations and should inquire into why some caregivers do not wish for these conversations to be held. Annual visits to the PCP may provide a useful venue for both physician and caregiver to initiate discussions on sexual health with ID adolescents.

Table 1: Mean Likert Item Responses Regarding Pediatrician Interactions with Caregiver When Discussing Their Adolescents' Sexual Health

Patient Group	Discussions Occur with Caregiver Present[a]	Caregiver Expresses Desire for PCP to Discuss Subject[b]
Non-disabled	2.27	2.92
Mild ID	2.91	2.66
Moderate ID	3.93	2.20
Severe/Profound ID	4.48	1.90

[a]Mean values obtained from 5-point Likert item response to the question "When you discuss sexual health with any of your adolescent patients, how often does the conversation occur with a caregiver present?" (1=*almost never*, 2=*rarely*, 3=*sometimes*, 4=*very often*, 5=*almost always*)
[b]Mean values obtained from 5-point Likert item response to the question "How often have caregivers expressed their desire for you to discuss sexual health with their adolescents during annual visits?" (1=*almost never*, 2=*rarely*, 3=*sometimes*, 4=*very often*, 5=*almost always*)

Abstract: 10
Quality Improvement: The Diagnosis and Management of Pelvic Inflammatory Disease in a Pediatric Emergency Department
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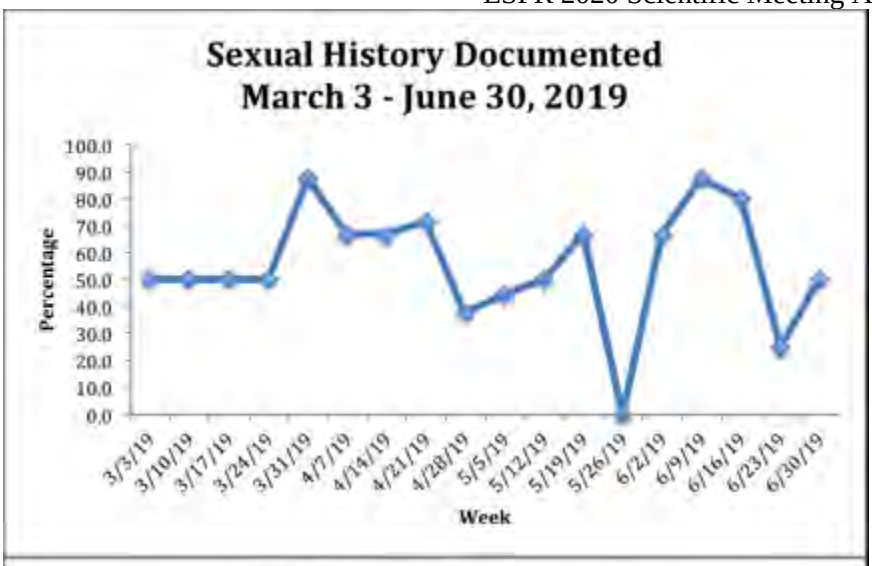
[1]Emergency Department, Connecticut Childrens Medical Center, Hartford, Connecticut, United States, [2]Adolescent Medicine, Pediatrics, University of Connecticut, Hartford, Connecticut, United States, [3]Residency Program, Pediatrics, University of Connecticut, Hartford, Connecticut, United States

Background Adolescent females are at highest risk for developing pelvic inflammatory disease (PID) which is known to cause long-term sequelae, including chronic pain, recurrent PID, recurrent lower genital tract infections, and infertility. Although reproductive health concerns are the most common reason for emergency department (ED) visits among adolescents, PID is often misdiagnosed or mistreated in this setting despite CDC guidelines.
Objective To identify gaps in the identification and treatment of PID in a pediatric emergency department and to implement interventions to improve care using QI methodology.
Design/Methods This is a QI project conducted in an urban pediatric ED. Inclusion criteria are adolescent females ages 14-20 who presented with chief complaints of abdominal pain, pelvic pain, or vaginal symptoms. Exclusion criteria are patients who denied sexual activity, had symptoms inconsistent with PID, or received another medical diagnosis accounting for their symptoms. Baseline data was collected from March 2019-June 2019. Charts were audited by trained pediatric residents and reviewed by an adolescent medicine physician with expertise in PID. Baseline data collection included participant age, type and gender of primary provider (resident, fellow, midlevel or attending), documentation of sexual history, gonorrhea/chlamydia testing, documentation of a bimanual exam, and antibiotic therapy. Initial educational interventions began in August 2019.
Results A total of 121 participants met study criteria with an average age of 16. Residents were the primary provider for 62.2% of patients followed by midlevels (26.0%), fellows (6.3%), and attendings (5.5%). Sexual history was documented for 57.0% of participants (median weekly percentage 53.5%). STI testing was obtained in 26.4% of participants (median weekly percentage 25.0%). A bimanual exam was performed or offered to 14.9% of participants (median weekly percentage 10.6%). Two patients were correctly identified and treated for PID. Only 7.4% of participants received all CDC recommended components of a PID evaluation which include a sexual history, STI testing, and a bimanual exam performed or offered.
Conclusion(s) Among adolescents presenting to a pediatric ED with symptoms concerning for possible PID, only 7.4% received all components of an appropriate evaluation. Additional provider education is needed to improve the identification and management of PID.


Sexual History Documented
March 3 - June 30, 2019
Percentage
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
3/3/19
3/10/19
3/17/19
3/24/19
3/31/19
4/7/19
4/14/19
4/21/19
4/28/19
5/5/19
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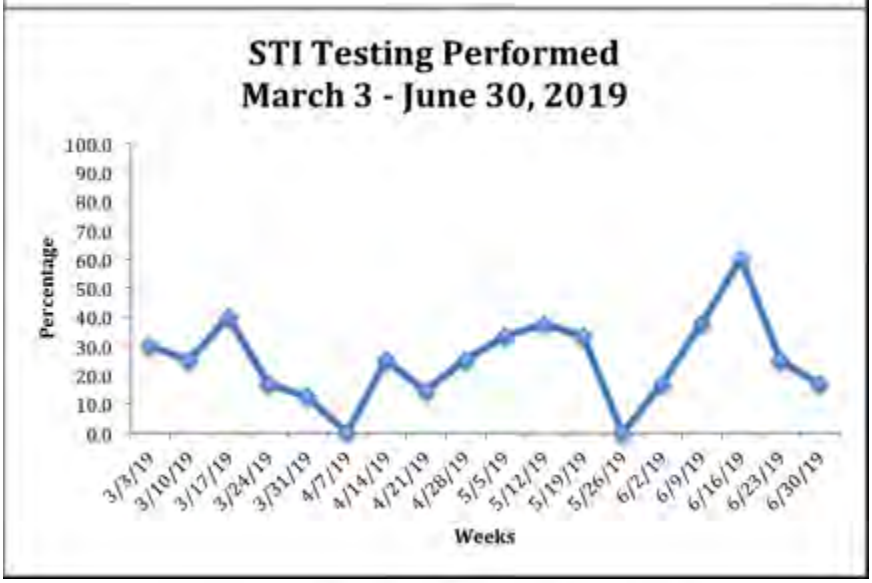
6/2/19
6/9/19
6/16/19
6/23/19
6/30/19
Week


STI Testing Performed
March 3 - June 30, 2019
Percentage
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
3/3/19
3/10/19
3/17/19
3/24/19
3/31/19
4/7/19
4/14/19
4/21/19
4/28/19
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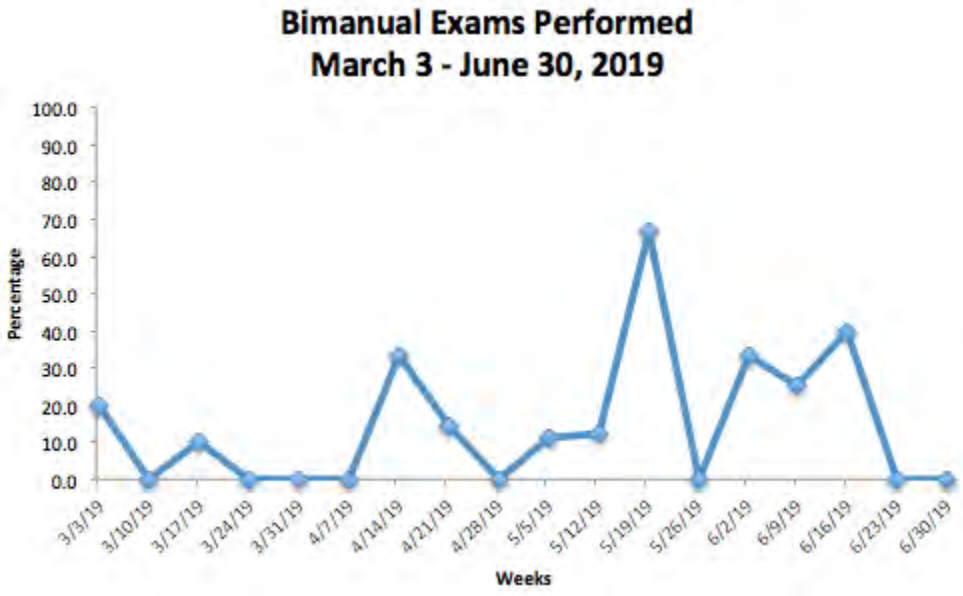
6/23/19
6/30/19
Weeks


Bimanual Exams Performed
March 3 - June 30, 2019
Percentage
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
3/3/19
3/10/19
3/17/19
3/24/19
3/31/19
4/7/19
4/14/19
4/21/19
4/28/19
5/5/19
5/12/19
5/19/19
5/26/19
6/2/19
6/9/19
6/16/19
6/23/19
6/30/19
Weeks

Abstract: 11

The Use of Zofran at Discharge from Pediatric Emergency Departments

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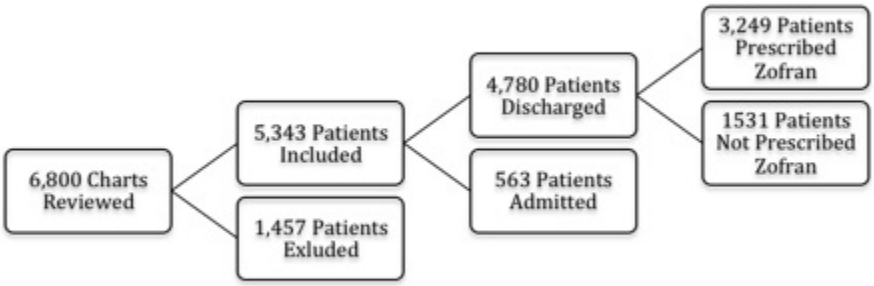
Background Nausea and vomiting are common presentations to pediatric emergency departments (PED). The use of ondansetron (Zofran) in PED has been steadily increasing to help promote oral rehydration and prevent the need for IV fluids and admission. The prescribing of Zofran at discharge varies greatly between hospitals and providers.

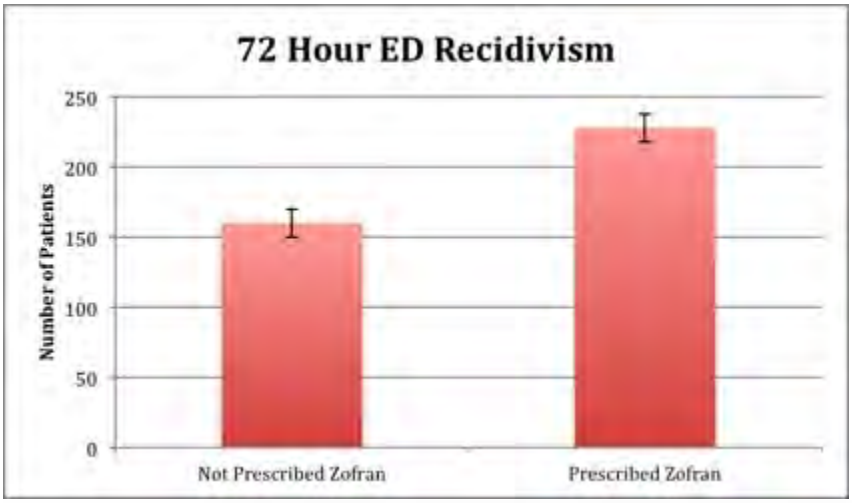
Objective The purpose of this study is to describe the prescription practices of Zofran at discharge for patients who received Zofran in the PED for acute gastroenteritis (AGE) and vomiting. Secondary outcomes include assessing the association between Zofran prescriptions, patient volumes in the PED and provider type.

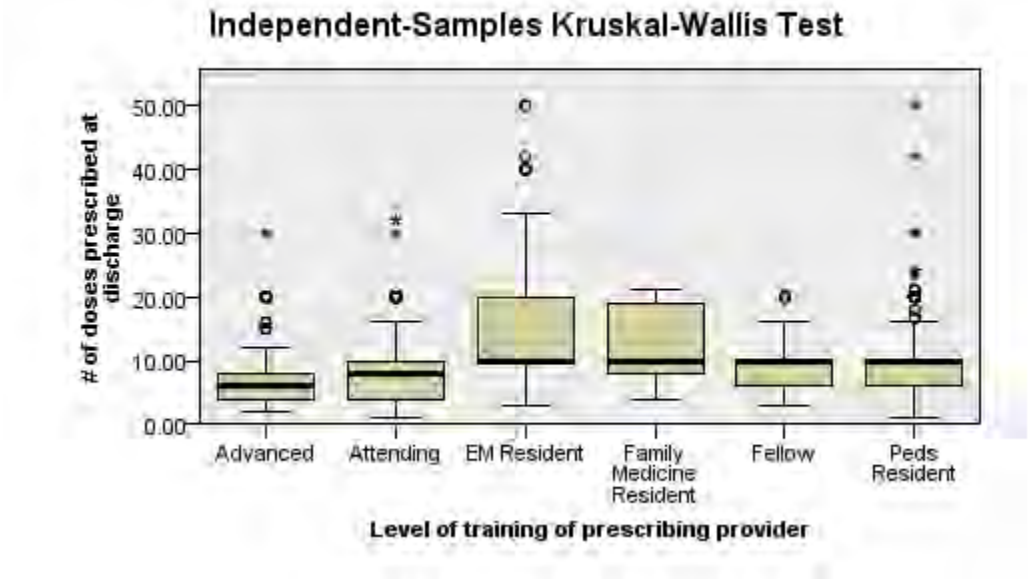
Design/Methods This is a single center retrospective cohort study. The inclusion criteria are all children between 6mo-18yo who presented to the PED between 1/1/2018- 12/31/2018 who received Zofran in the ED for gastroenteritis, vomiting, and/or nausea and were discharged home. All patients who received Zofran for other indications were excluded from the study. Data collected included: age, race, sex, triage level, ED business (number of patients who registered in the ED each hour), 72 hour recidivism, and provider type.

Results There were 4,870 subjects that met criteria. Of these patients 3,249 (66.7%) were prescribed Zofran at discharge. The 72 hour recidivism rate if prescribed Zofran at discharge was 7.0%, compared to 10.5% if not prescribed Zofran ($p<0.001$). The average number of doses of Zofran prescribed at discharge was 9.1, ranging from 1-50 doses. The distribution of the amount of Zofran prescribed was similar across those that returned to the ED and those who did not, when controlled for age, gender and triage level (p=NS). The amount of Zofran prescribed by advanced practitioners was less compared to pediatric residents ($p= 0.016$), EM residents ($p=0.00$), and family medicine residents ($p=0.001$). The amount of Zofran prescribed by advanced practitioners was similar to attendings and fellows (p=NS). The correlation between the amount of Zofran prescribed and ED business was R^2 of 0.003 (r -0.088, $p<.001$).

Conclusion(s) The majority of patients who received Zofran in the ED for AGE were also discharged with a prescription. Those prescribed Zofran at discharge were less likely to return to the ED within 72 hours and the amount of Zofran prescribed did not affect recidivism. Advanced practitioners prescribed less Zofran than other provider types. There was no correlation between ED business and the amount of Zofran prescribed.







Demographics

	Not Prescribed Zofran	Prescribed Zofran	Total
n	1,531 (32.0%)	3,249 (68.0%)	4,780 (100%)
Age in yrs (Median (IQR))	6 (2-12)	5 (2-9)	
Female	819 (53.5%)	1,698 (52.3%)	2,517 (52.7%)
Race			
- White/ Caucasian	451 (29.5%)	847 (26.1%)	1,298 (27.2%)
- Black/ African American	225 (14.7%)	545 (16.8%)	770 (16.1%)
- Hispanic	599 (39.1%)	1,317 (40.5%)	1,916 (40.1%)
- Asian	23 (1.5%)	74 (2.3%)	97 (2.0%)
- Other	233 (15.2%)	466 (14.3%)	699 (14.6%)
Triage Level			
- 2	53 (3.5%)	63 (1.9%)	116 (2.4%)
- 3	599 (39.1%)	981 (30.2%)	1,580 (33%)
- 4	634 (41.4%)	1,557 (47.9%)	2,191 (45.8%)
- 5	244 (15.9%)	648 (19.9%)	892 (18.7%)
- other	1 (0.1%)	0 (0.0%)	1 (0.02%)

Abstract: 12

Utilization of the pediatric emergency department amongst patients with delayed concussion presentation.

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Background There is an increasing number of emergency department (ED) evaluations and rates of head imaging for mild traumatic brain injuries including concussion. Head CT (HCT) is not recommended in the evaluation of concussions as findings will be normal.
Objective The aim of this study is to analyze the characteristics and management of pediatric patients with concussions who present to a pediatric emergency department greater than 3 days after injury ("delayed presentation.")
Design/Methods A retrospective, cohort study was conducted in a suburban pediatric ED at a Level 1 trauma center with approximately 45,000 visits annually during the 2018 calendar year. Data were retrieved from electronic medical records. Admitted patients and those with prior neurologic conditions were excluded. Wilcoxon rank sum test and Fishers exact test were used to compare patient characteristics; multivariable logistic regression was used to assess the correlation between patient characteristics and delayed presentation.
Results A total of 264 patients <18 years with a discharge diagnosis of concussion were identified. Of the 242 patients who met inclusion criteria, 27 (11%) patients had delayed presentation. The median age was 12.5 years, 61.6% were male, 36.7% were sports-related. Those with delayed compared to non-delayed presentation were older (median age 15 vs 12 years p=0.001). History of a prior visit and mental illness were more common in patients with delayed presentation (p<0.001 and 0.041 respectively). There was no significant difference in presenting symptoms based on timing of presentation. The overall HCT rate was 33.1%; there was no significant difference in percentage of HCT obtained between patients with or without delayed presentation. Children with abnormal physical findings were more likely to get neuroimaging (OR 1.95; 95% CI 1.12-3.38); HCT results were all normal when obtained.
Conclusion(s) Patients with concussions evaluated in a pediatric ED are more likely to present 3 or more days after the date of their injury if they are older, have had a prior visit, or have a mental health history. HCT rates are not dependent on the day of presentation. Delayed presentation could be expected among older pediatric patients or those with a mental health history and may not benefit from ED evaluation.

Abstract: 13

Adverse Effects associated with the use of Electronic Vaping Products on Adolescents and Young Adults

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Background The use of electronic vaping products (vapes) has increased dramatically. Despite the increasing prevalence among adolescents and young adults, few studies have examined the clinical symptoms associated with vaping.
Objective To determine the prevalence of vaping among adolescents and young adults, to identify clinical symptoms that may be associated with vaping, and to understand beliefs about vaping that may contribute to its growing prevalence.
Design/Methods A questionnaire was administered to a convenience sample of subjects aged 12-23 years presenting for medical care to the Penn State Hershey Medical Center in central Pennsylvania. The questionnaire focused on use of vapes, presence of clinical symptoms during the previous six months, and perceived beliefs associated with vaping. Stratification was performed to compare subjects who used vapes frequently (at least once a month) and those who were infrequent/non-users (never tried or tried one time).
Results Data analysis was performed on 418 completed questionnaires. The mean age of subjects was 17 years old and 55% were female. 80% (n=333) of subjects were considered infrequent/non-users and 20% (n=85) were considered frequent users. When stratified by frequency of use, frequent users were more likely to report the following symptoms in the last six months compared to infrequent/non-users: nausea [65% (95% CI: 53-75) vs. 44% (95% CI: 39-50), *P*=.0008], cough [58% (95% CI: 46-68) vs. 39% (95% CI: 34-44), *P*=.002], sleep disturbances [52% (95% CI: 41-63) vs. 30% (95% CI: 25-35), *P*=.0001], dehydration [47% (95% CI: 36-58) vs. 27% (95% CI: 22-32),*P*=.0004], weakness [46% (95% CI: 35-57) vs. 27% (95% CI: 22-32), *P*=.0007], racing heart [41% (95% CI: 30-52) vs. 22% (95% CI: 18-27), *P*=.04]. There were no significant differences in reported headaches, chest pain, dizziness, and abdominal pain between the two groups. In respect to perceived beliefs about electronic vaping products, 56% of respondents believed that they "can help someone quit smoking," 38% believed that they "are safer than cigarettes," 31% believed that they "are less addictive than cigarettes," and 19% believed that they "allow me to be social with my friends."
Conclusion(s) Based on our preliminary data, 20% of respondents use electronic vaping products at least once a month. Frequent users were more likely to report nausea, cough, sleep disturbances, dehydration, weakness, and racing heart. The perceived beliefs about vapes could be related to their growing use among a younger population.

Abstract: 14

Enhanced Care Coordination for Patients with Behavioral Health Needs in a Pediatric Emergency Department

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Background The rate of children presenting to pediatric emergency departments (PEDs) for mental healthcare has been rising for several years. Care of these children is complex and utilizes limited PED resources. Literature has shown Care Coordination (CC) improves outcomes for medically complex children and may improve the care of children with MH concerns.
Objective The goal of this pilot project is to demonstrate success of a novel CC project by determining the number of connections from CC for PEDs mental health (MH) patients has made since the start in 2015.
Design/Methods Children visiting the PED with a MH chief complaint were recruited for enrollment into CC. Inclusion criteria included up to 18 years of age and living in the geographic area serviced by CC. Children with established CC and those requiring psychiatric admission were excluded. CC staff contacted patient families by phone and assessed needs for CC within 48 hours of discharge. To communicate the care plan, CC staff connected with community providers by phone calls, emails, faxes. CC staff tracked all services provided.
Outcome measures included PED efficiency, defined as total number of children cared for by PED social work (PED-SW) and connectivity. Connectivity was defined as number of children engaged in CC and communication of the discharge plan to community providers categorized as primary care providers (PCP), school and MH service providers. These measures from the most recent data in 2018 were compared to the same time period of September-November in 2015, the first year post-CC.
Results PED-SW cared for 367 more MH patients in 2018 (531) vs. 2015 (218). In 2018, PED-SW identified that 74% of their MH patients met criteria and those were referred to CC vs. 32% in 2015. 170 families were either lost to follow-up or declined services. Out of 2710 CC encounters, 1545 (57%) were focused on behavioral health connections; 542 (20%) were focused on school connections. See tables 1 and 2.
Conclusion(s) There has been a significant increase in the families that CC has been able to assist with connectivity. PED-SW efficiency has improved based on the improved availability of CC and other CC/ED quality improvements focusing on patient connections.

Table 1. Emergency Department Volume

	2015	2018
Total PED volume	57611	60653
MH pts	3290	3643
PED-SW involved	218	531

Table 2. ECC Patient Demographics

	ECC PT 2015 (n=69)	ECC PT 2018 (n=585)
Male (%)	70%	57%
Female	30%	43%
Mean Age	11	15
White (%)	31%	42%
African American (%)	19%	19%
Other/Unknown (%)	50%	39%

Abstract: 15

Trends in Emergency Department Use in the First Year of Life

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Background Emergency department visits by young children have increased in the last decade.
Objective To examine trends and factors associated with Emergency Department (ED) use in the first year of life.
Design/Methods We conducted a retrospective cohort study of infants born 10/1/2014-2/18/2019 receiving care at an urban academic pediatric practice and enrolled in a Medicaid Managed Care Organization (MCO). The MCO covers 40% of the patients in the practice. In addition to well child care, the practice offers same day acute care visits on weekdays. The data source was the MCO claims database. The primary outcome was ED use by 12 months of age; measures included number of ED visits, age at first ED visit, ED frequency of visits by infant age (in months), day of week and month of year, and correlation of number well visits with number of ED visits. Frequent ED use was defined as the 90th percentile for ED visits/child. In a multivariate regression, we controlled for sex, ethnicity, and well visits.
Results The study population included 1,472 infants: 69% were African American, 24% Hispanic, 7% other; 50% were females. By 12 months of age, infants made a median of zero ED visits, a mean of 0.48 (SD 0.99) and an interquartile mean of 0.5 ED visits. More than a third of the infants (n=580, 39.4%) made one or more ED visits: 14.5% made 1 visit, 10.6% made 2, 5.6% made 3 visits, 8.7% made 4 or more). The 90th percentile was at 3 ED visits. Most infants (54%) made their first ED visit by 4 months of age (Figure1). However, the frequency of visits slightly increased throughout the first year of life. (Figure 2) ED visits were comparable across weekdays and weekend days. ED visits showed a seasonality effect, with higher number of visits in the winter months. We found a low but significant positive correlation between the number of well visits and the number of ED visits (Pearson R 0.27, CI 0.22 to 0.75, $p<0.001$). This significant association held in the multivariate regression, controlling for sex and ethnicity.
Conclusion(s) Among infants receiving care in an academic pediatric practice and enrolled in a Medicaid Managed care plan, more than a third made an ED visit in their first year of life. ED use started very early in life, continued steadily through the first year of life, and showed a seasonality effect. The finding that infants with greater continuity of care were also more likely to make more ED visits merits further exploration.

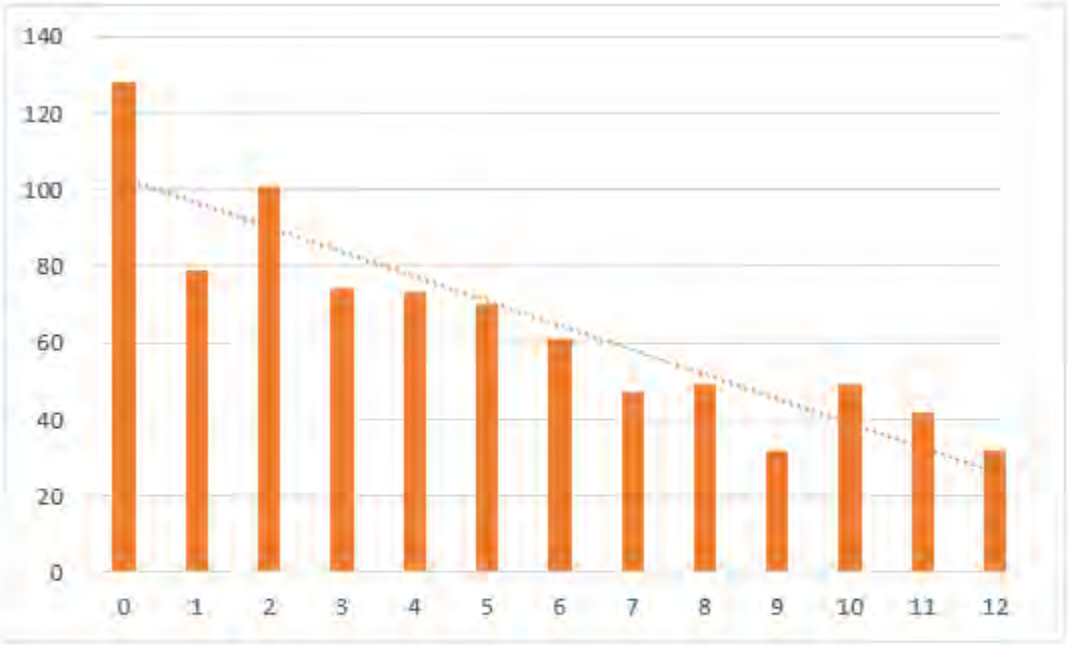

Figure 1. First ED Visit by Infant Age in months (N=580 infants)

Pearson R -0.9, CI -.97 to -0.7, p <0.001

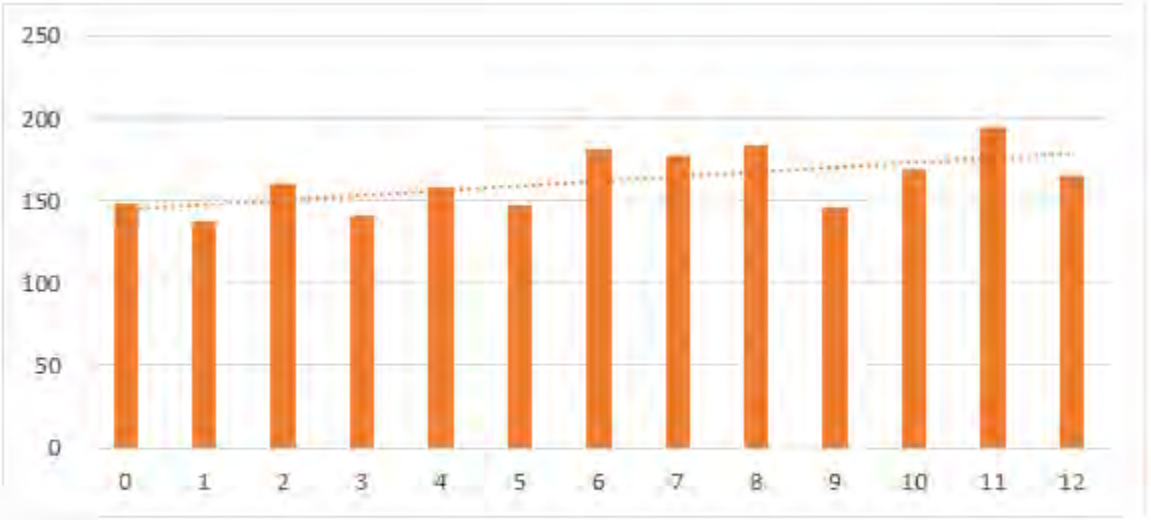

Figure 2. Number of ED Visits by Infant Age at Visit in months (N=1461 ED visits)

Abstract: 16

Improving Readiness for Emergency Pediatric Intubations with a Wall-Hanging Broselow System

Evan M. Fox, Kathryn E. Kasmire
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Background Pediatric readiness, including access to pediatric resuscitation equipment, is essential for emergency departments (EDs). Poor readiness has been shown to correlate with higher mortality (Ames et al., *Pediatrics*, 2019). Organization of pediatric resuscitation equipment by patient size, such as in Broselow carts, has been shown to improve time and accuracy in accessing resuscitation equipment (Agarwal et al., *Pediatrics*, 2005).

Objective Improve readiness for pediatric airway management in our ED by implementing a Broselow color coded system for airway supplies, and assess the effectiveness of the new system.

Design/Methods A commercially available "Broselow Flying Carpet" wall-hanging system (Armstrong Medical) was purchased and stocked with airway equipment used in our ED (Figure 1). The wall-hanging system was chosen due to barriers to using carts in multiple locations in our ED. The system was used for a trial period, during which feedback from staff was sought to improve the system. The Broselow system was assessed compared to the current system in which pediatric and adult airway equipment is stored in an "airway box" within the code cart with equipment grouped by type. ED staff including patient care assistants, nurses, physician assistants, residents, and physicians were given a mock scenario and assessed for accuracy and time to gather supplies needed for intubation. Times were compared with t-tests.

Results During the trial period, staff identified the need to have several items added to the Broselow bags, including nasopharyngeal airways and endotracheal tube tape. Supply lists were created and attached to the bags to allow for easy restocking after use (Figure 2). After updating the system, 24 staff completed a mock scenario using the Broselow system and 20 using the airway box. The median time for selection of intubation supplies was significantly shorter for the Broselow system at 49 seconds (interquartile range 32-66 seconds) compared to 226 seconds (interquartile range 178 to 273 seconds) for the airway box, $p<0.001$. Accuracy was also recorded; incorrect sized supplies were selected 0 times with the Broselow system versus 13 times (mean of 0.65 errors per scenario) with the airway box.

Conclusion(s) A wall-hanging Broselow color coded system with supplies organized by patient size decreases the time to selection of pediatric intubation supplies providing excellent accuracy. The wall-hanging system requires minimal space and was placed with code carts in multiple locations in our ED.


≤ 9kg
0-11 months old
10-11kg
1 year old
12-14kg
2 years old
15-18kg
3-4 years old
19-22kg
5-6 years old
24-30kg
7-9 years old
≥ 32kg
≥ 10 years old
CODE
CART
UNLOCK
LOCK
PRAXAIR

Figure 1: Broselow system hanging near a code cart

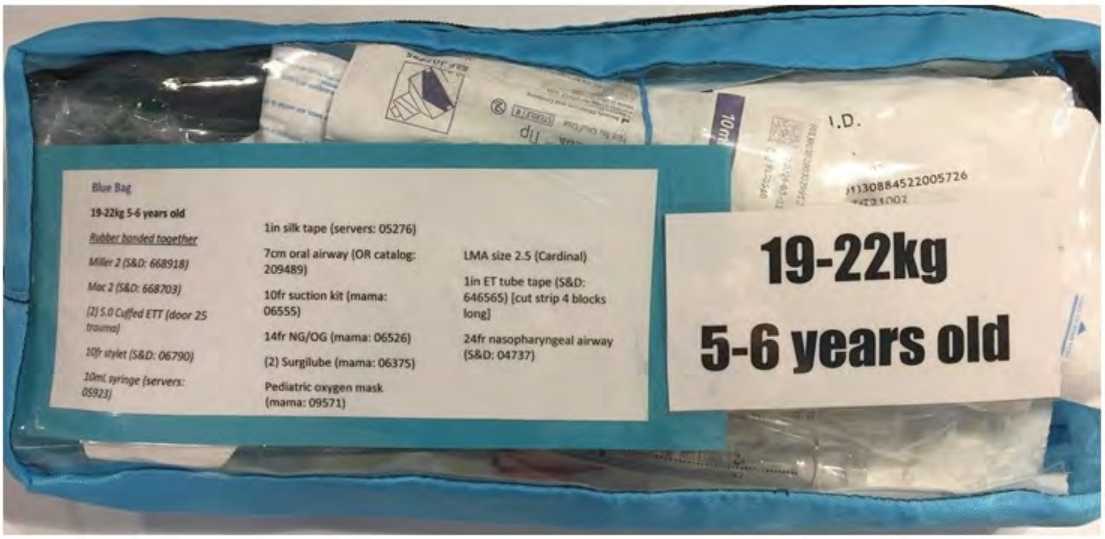


Figure 2: Broselow bag labeling and contents

Abstract: 17

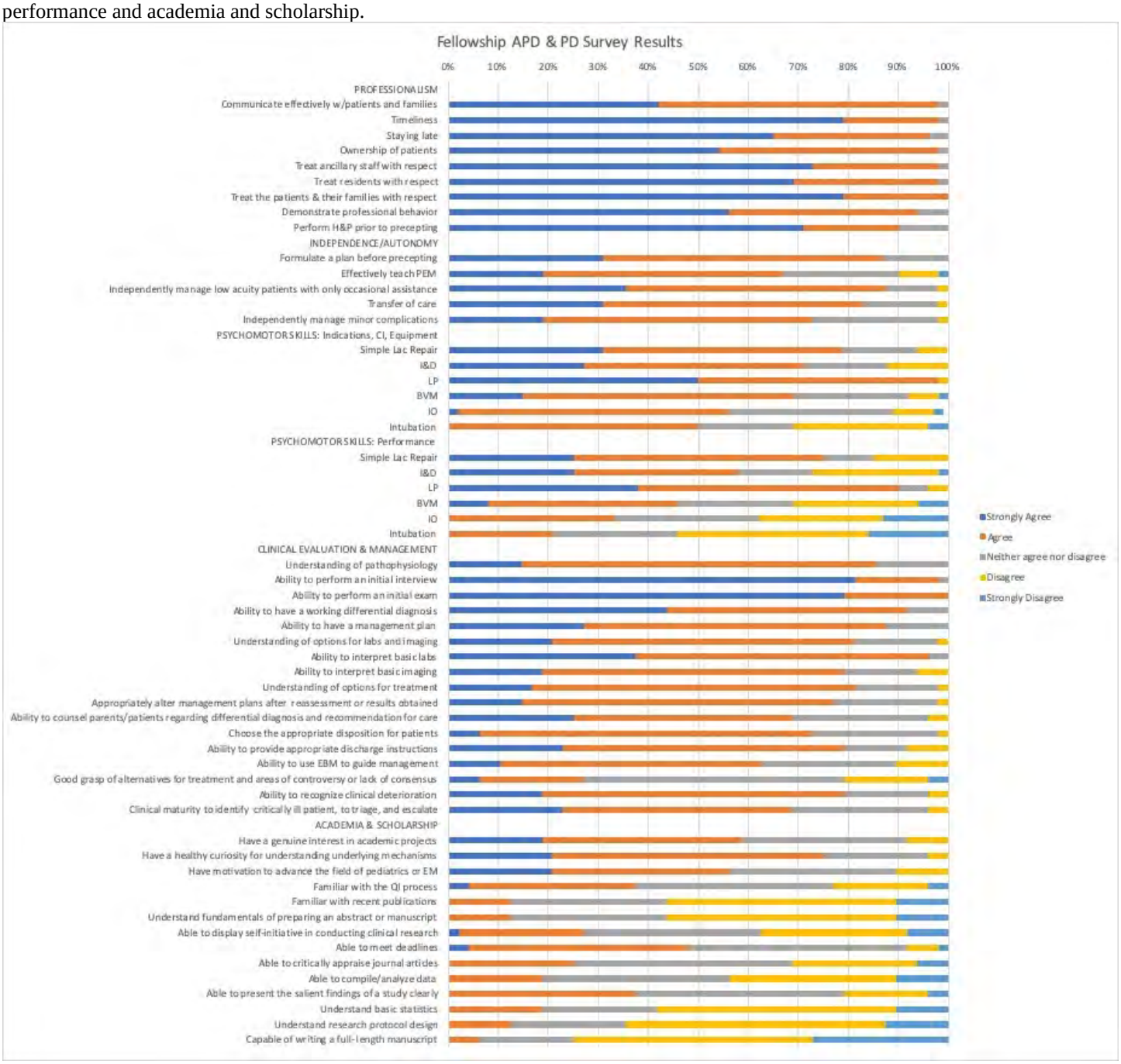
Pediatric Residency Preparedness for Pediatric Emergency Medicine Fellowship: A Survey of Fellowship Program and Associate Program Directors

Rabia N. Malik, Melissa L. Langhan
Pediatric Emergency Medicine, Yale University School of Medicine, New Haven, Connecticut, United States

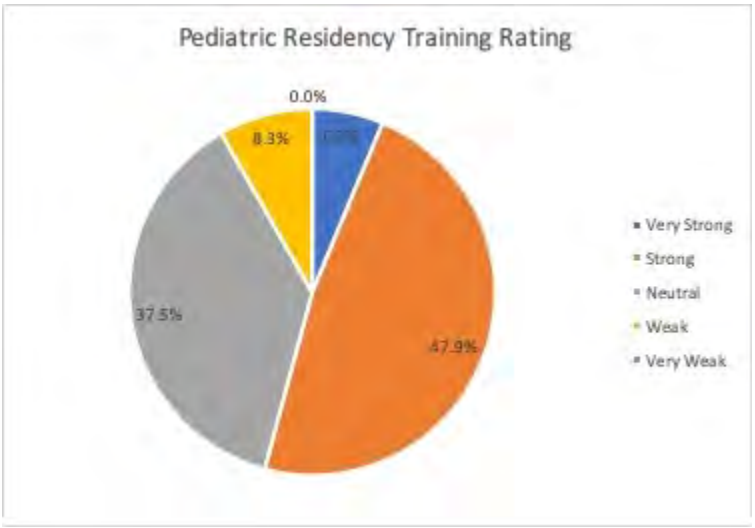
Background Over the past decade, there has been a steadily increasing interest in the field of pediatric emergency medicine (PEM) among pediatric residents. While some residency programs provide curriculum tracks that offer training opportunities in a specific subspecialty, there are requirements pediatric residents must complete prior to graduation that may or may not pertain to their ultimate subspecialty of choice. The current Accreditation Council for Graduate Medical Education (ACGME) requirements are for a minimum of 3 months of PEM rotations.
Objective To examine the perception of PEM program directors (PDs) and associate PDs (APDs) regarding the preparedness of new PEM fellows who have graduated from pediatric residency programs.
Design/Methods This was a cross-sectional study of PEM fellowship PDs and APDs. A 26-item validated survey was electronically distributed from November to December 2019 and consisted of five domains: professionalism, autonomy, psychomotor skills, clinical evaluation and management, and academia/scholarship. A 5-point Likert scale rated PD/APD agreement regarding an incoming fellows' ability to perform each task.
Results 48/119 (40%) eligible PDs & APDs responded. Most respondents were from programs with 6-10 total fellows (60%) and

from urban areas (94%). Most programs (56%) have a clinical competency committee of <5 faculty members. The majority of respondents strongly agreed or agreed that fellows perform adequately in areas of professionalism, independence, and clinical evaluation and management; the only exception was intraosseous (IO) and intubation performance (Fig 1). There were similar results in the psychomotor domain regarding indications, contraindications and equipment knowledge. However, in psychomotor skill performance, there was a shift to neutral to disagree for certain skills (IO placement and intubation). There were also more neutral to disagree responses in the academia/scholarship domain. The majority of PDs (54%) feel that current pediatric residency training is strong to very strong (Fig 2).

Conclusion(s) Overall, PEM fellowship PDs & APDs feel that incoming PEM fellows are adequately trained in the areas of professionalism, independence, and clinical evaluation and management. There are areas of improvement within psychomotor skill performance and academia and scholarship.



PD & APD survey with results



PD & APD rating of pediatric residency program training for PEM fellowship

Abstract: 18

Feasibility of Universal Suicide Screening in a Pediatric Emergency Department

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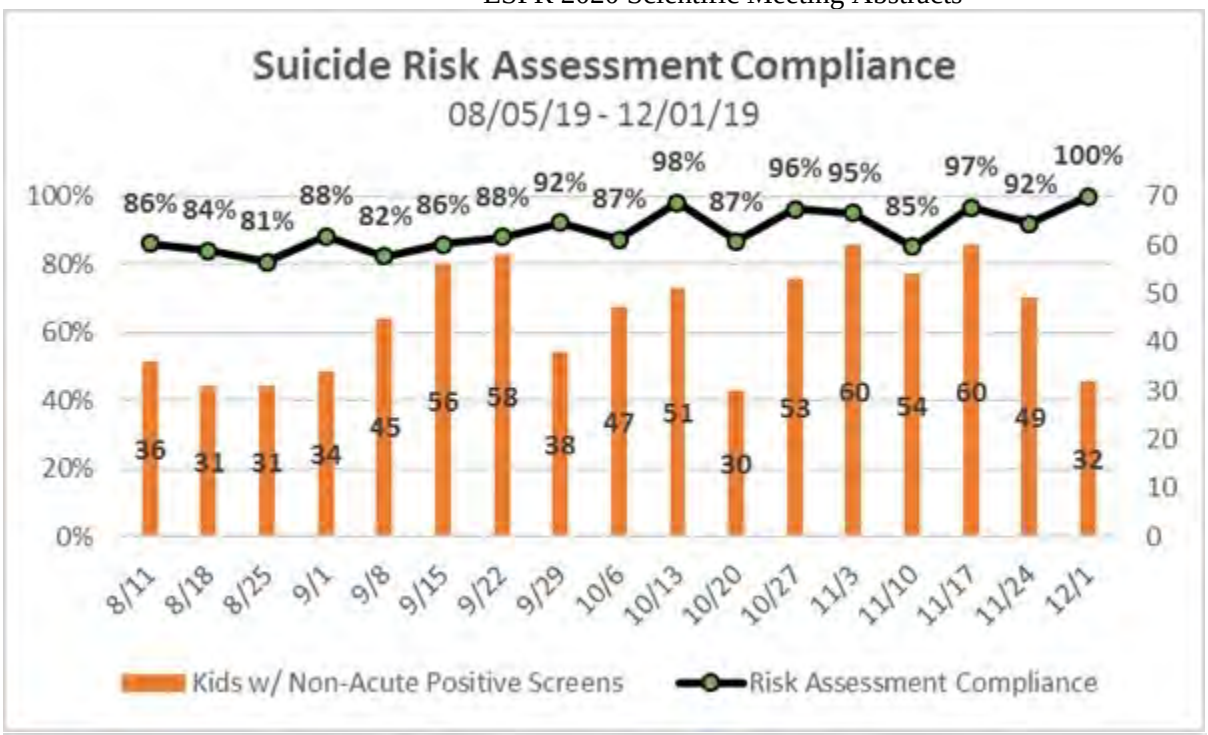
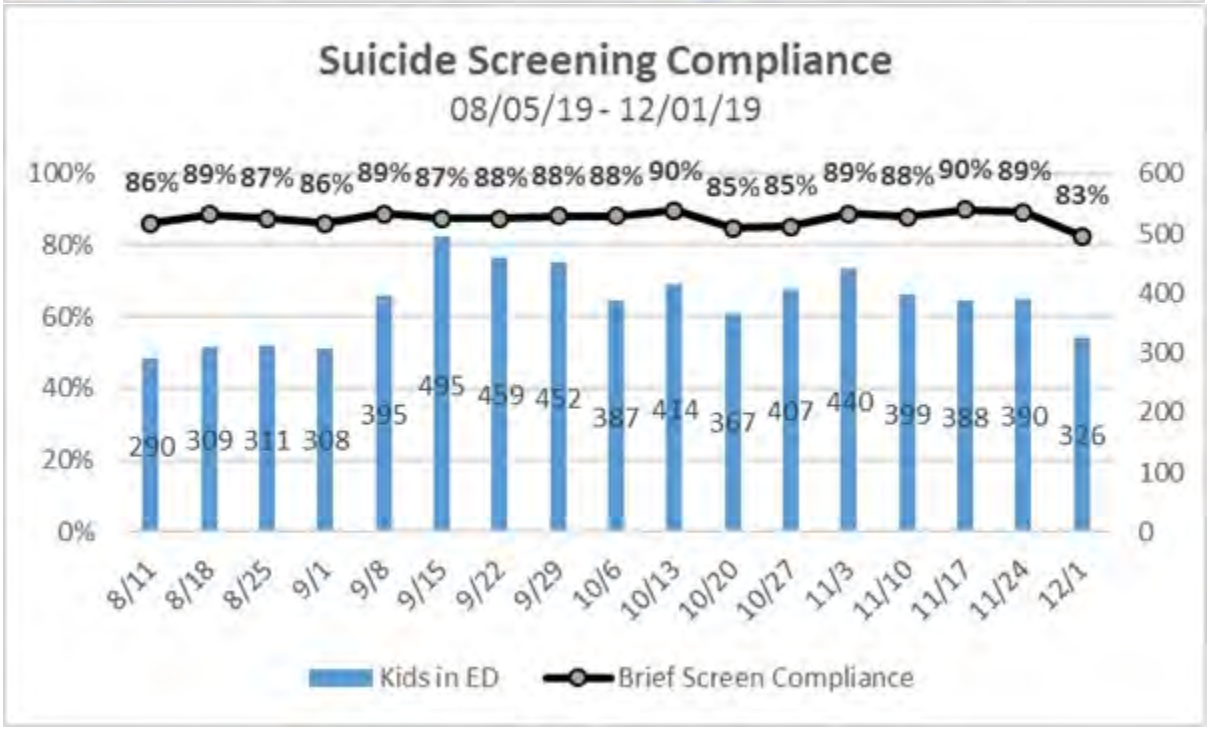
Background Suicide is the second leading cause of death for ages 10 – 34 years in the United States. Rates in adolescents have been climbing over the last decade and focus on prevention should be a priority. Implementation of universal suicide risk screening in pediatric emergency departments (PED) may provide early detection and intervention for at risk youth.
Objective Demonstrate the feasibility of implementing universal suicide risk screening and risk assessment in a PED.
Design/Methods Monthly quality improvement data monitoring was implemented with the adoption of a universal suicide screening and risk assessment process in the PED. Children were asked a validated brief suicide screening by nursing staff and if positive had a risk assessment performed by providers and/or social work. Responses were determined to be acute positive, non-acute positive, negative, not developmentally appropriate, incomplete, or not asked.
All children 10 and older presenting to the PED were tracked. Demographics were analyzed to determine any associations. Feasibility was determined by measuring screening/risk assessment compliance, declined screenings, and high/low risk positive screens.
Results 6,537 children 10 and older presented to the PED from August to December 2019. See table 1 for demographics. 5723 (87%) received a brief screen with 906 (17%) positive screens; 609 (11%) had behavioral chief complaints; 297 (6%) had non-behavioral (medical) chief complaints. 52 (5%) children who screened positive were only 10 years old. Nine (<0.1%) parents declined screening. Providers completed 689 (90%) risk assessments. About a third of the positive screens were assessed as high risk. Females ($p<0.05$) and "non-Hispanic or Latino" ($p<0.05$) children had a significant association with positive brief screens. There were no significant differences among other demographic response groups.
Conclusion(s) Universal suicide risk screening for adolescents is feasible in a PED. Screening and risk assessment compliance rates were high (>85%). Suicidal thoughts and/or behaviors were prevalent in children presenting to the PED with non-behavioral chief complaints and even more prevalent amongst those presenting with behavioral health concerns. Identifying all at risk youth and providing them resources early may improve patient safety. PEDs with limited resources may consider focused screening for females and non-Hispanic or Latino patients.

Table 1. Demographics

Gender	
Male	3176 (49%)
Female	3361 (51%)
Age	
10-13	2811 (43%)
14-17	3072 (47%)
18+	654 (10%)
Race	
Asian	79 (1%)
White or Caucasian	2464 (38%)
Black or African American	1307 (20%)
Other	2687 (41%)
Ethnicity	
Hispanic or Latino	2381 (36%)
Not Hispanic or Latino	4052 (62%)
Other	104 (2%)
Insurance	
Commercial	2468 (38%)
Medicaid	3838 (59%)
Self-pay/Other	231 (3%)





Abstract: 19

Timely Transfer of Pediatric patients from Pediatric Emergency Department (ED) to the Pediatric Inpatient Unit

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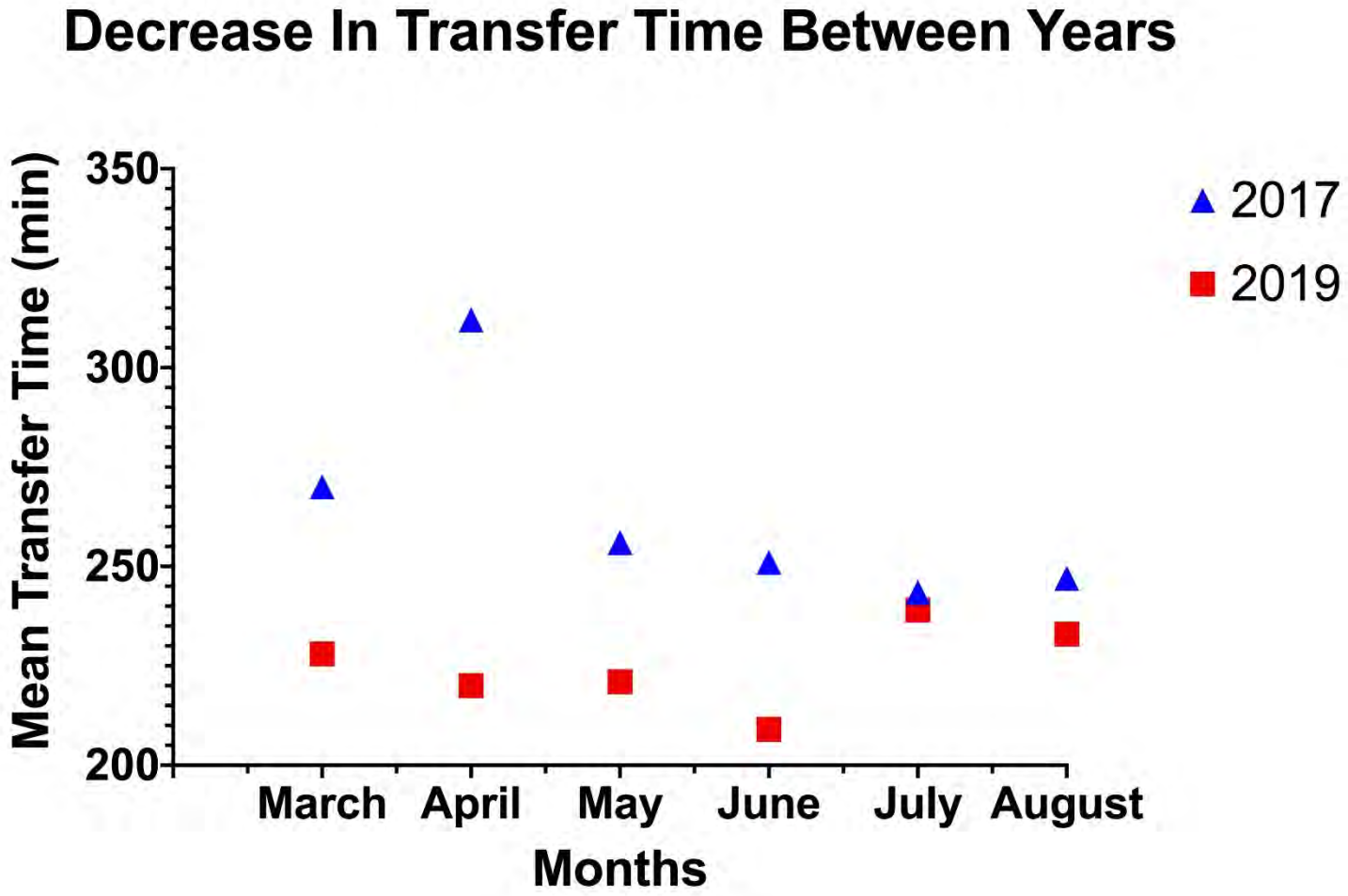
Background The lengthy waiting times of patients who will be admitted from the emergency department (ED) to the inpatient unit cause significant disruptions in the workflow and have been shown to increase hospital length of stay, in-hospital mortality and overall costs.

Objective The aim of this study is to develop a patient flow model and implement interventions that can minimize the ED-to-inpatient unit transfer time.

Design/Methods To identify rate-limiting steps and implement focused interventions to decrease transfer time, a multidisciplinary oversight committee was formed. The committee consisted of representatives from ED, nursing department, respiratory therapists, transport team, house cleaning staff, admitting, pharmacy, laboratory, and residents. After the committee established causes of delay, in-service programs were completed where team members were educated on a transfer model. Time for the patients to be transferred to the inpatient unit from the time they arrive in ED was compared using plan-do-study-act (PDSA) cycles before and after the interventions. T-test was used to compare the transfer time in two different years.

Results The committee identified the main rate-limiting steps to be: lab or radiology results that impact isolation needs, availability of an empty and clean bed, waiting for transport staff or respiratory therapist that will accompany the transport, and change of shifts that delay taking sign-out reports to accept the admission. Annual PDSA cycles were performed between 2017 and 2019 for months March to August. In 2017, before the intervention, the mean transfer time of pediatric patients from the ED to the inpatient unit was 263 minutes (n=989, median=254 minutes). In 2019, the PDSA cycle showed, the mean transfer time of pediatric patients from ED to inpatient unit was decreased to 225 minutes (n=820, median=225 minutes, p = 0.014)

Conclusion(s) This QI shows that implementing interventions to improve efficiency in steps for transfer can decrease the ED to inpatient unit transfer time significantly. We hope to create a new plan and move forward with an early prediction model which will permit early and accurate prediction of potential hospitalizations to enable earlier start on the rate-limiting steps identified by the committee.



Abstract: 20

Informing Action Toward Integrated Mental Health Practice in the Pediatric Primary Care Setting

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Connecticut Childrens, Hartford, Connecticut, United States

Background Primary care pediatricians recognize the prevalence of mental health needs in their patient populations. Unfortunately, pediatricians have not yet fully incorporated the available tools and supports that would enable regular and consistent screening, diagnosis, treatment, counseling, and referral of children with mental health conditions.

Objective To better understand the pediatric primary care role and to determine action steps toward better integration of children's

mental health care.
Design/Methods A mixed methods concurrent exploratory strategy including a survey of primary care pediatricians and focus groups of pediatric primary care staff and community mental healthcare providers. The survey elicited feedback on confidence, training, and other practice behaviors. The focus groups engaged in system support mapping and priority setting to better define systems level roles, responsibilities, and action steps toward integrated mental health care.
Results Eighty-four pediatricians completed the 47-item survey (64% response rate) providing information on their experience and beliefs, comfort in managing specific concerns, level of integration/collaboration within the larger system, and practice readiness. Six focus group system support mapping sessions were held with 33 participants from primary care practices and 15 participants from mental health agencies in which they explored their roles within the larger system and identified needs and resources to strengthen their joint work.
Conclusion(s) Pediatricians who report feeling trained, and confident in their ability to diagnose mental health conditions, are more comfortable in treating and managing these issues. Pediatricians and mental health providers recognize their roles relative to one another, but gaps remain with persistent representations of cross-sectoral communication and information sharing being prioritized. The study identifies several opportunities to promote better care for children with mental health concerns within the pediatric primary care setting, including enhancing communications with mental health providers and the better promotion of existing supports and services available to pediatric primary care.

Figure 1. Level of contact/collaboration

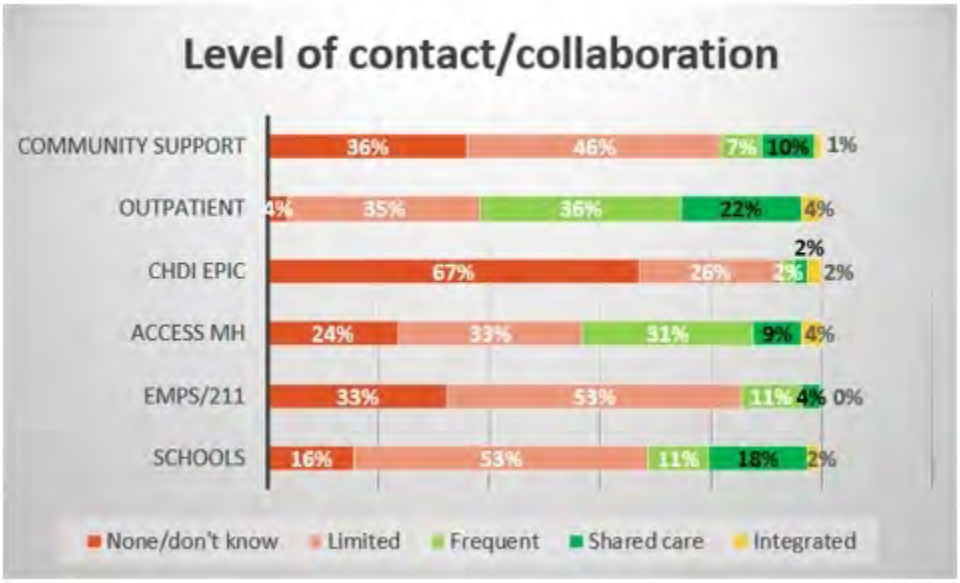
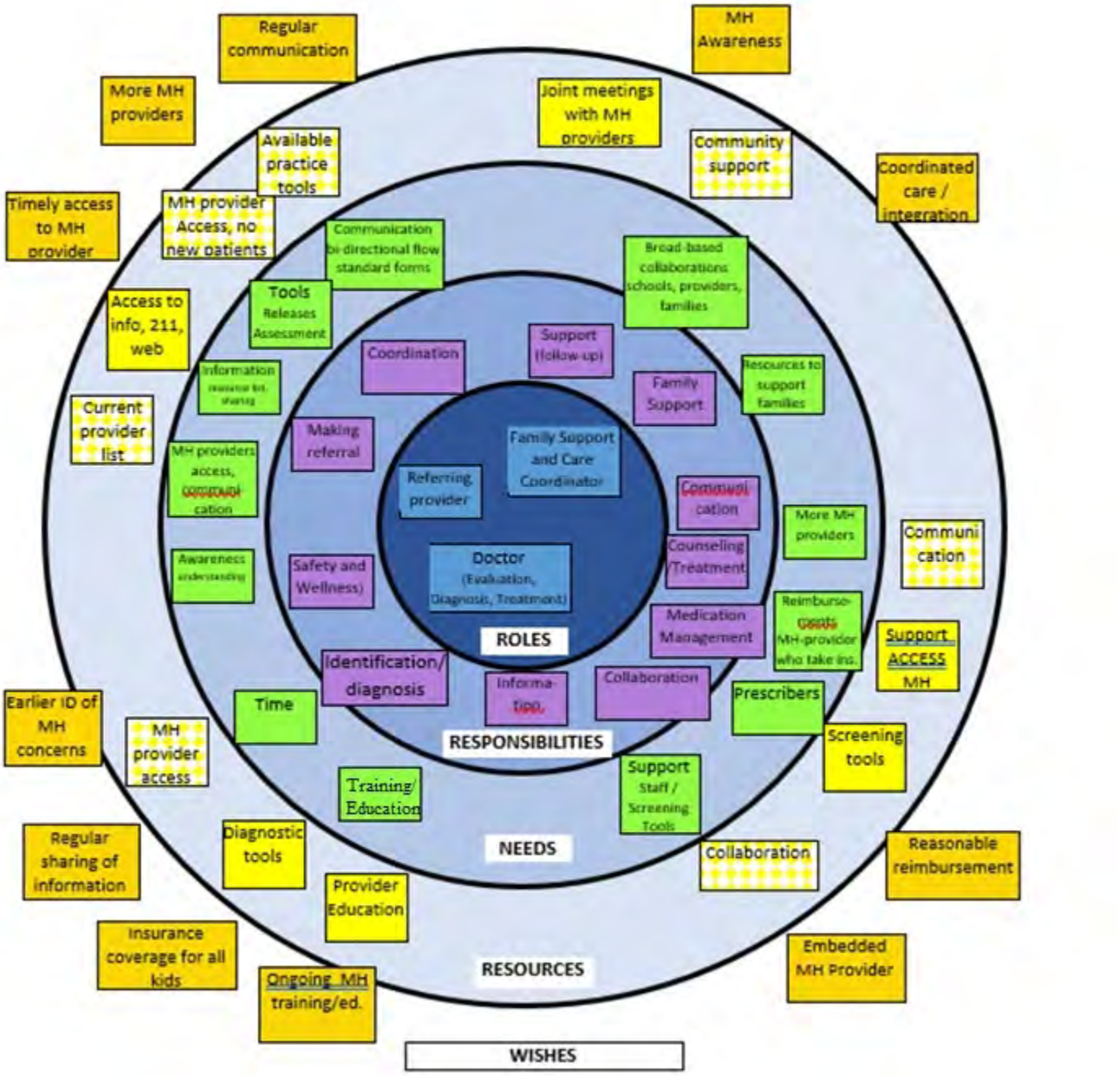


TABLE 1. Pediatrician confidence by comfort in treating/managing conditions chi-squares

Comfort in Treating…	X^2	n	df	p=	Cramer's V
ADHD	9.031	83	6	0.172	NA
Anxiety	51.570	83	6	0.000	0.557
Depression	45.935	83	6	0.000	0.526
Non-specific disorder	13.881	82	6	0.031	0.291
PTSD	25.763	83	6	0.000	0.394
Eating disorder	22.361	83	6	0.001	0.367
Anger	26.377	81	6	0.000	0.404
School problems	15.782	83	6	0.015	0.308
Bipolar	24.780	82	6	0.000	0.389
Drug problems	23.391	83	6	0.001	0.375
Family problems	23.189	83	6	0.001	0.374
Domestic violence	18.167	83	6	0.006	0.331

Figure 2. Pediatric Primary Care System Support Map



Abstract: 21

Clinical Profile of children with new-onset seizure, and factors contributing to their adherence to follow up visits.

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Background Four to ten percent of children experience at least one episode of seizure during the first 16 years of life. The commonest type is simple febrile seizures occurring typically before 5 years of age. Simple febrile seizures (SS) are benign in nature with no adverse outcomes. New onset non-simple febrile seizures (OS) may be a symptom of some underlying neurological or other system disorder. There is insufficient information on OS in children

Objective To investigate the clinical profile of new onset seizure in children and factors associated with their attendance to subsequent follow- up visits

Design/Methods Design: Retrospective. Population: children of age 1 month to 21 years of age presenting with new-onset seizures. Variables: demographics, family & developmental history, pertinent laboratory tests, neuroimaging (NI), EEG (electroencephalogram), type of seizure, anti-seizure medications, follow-up visits (FUV). Statistics: Patients with SS were compared with OS via standard methods including univariate logistic and multivariate logistic regression analyses.

Results [n=155] SS vs OS: OS was different from SS in terms of higher age (table 2): ($p<0.001$); absence of fever & normal WBC count (p 0 .001); abnormal EEG & NI (p 0.001), medicinal treatment (p0.01) and attendance to FUVs (p 0.03). The EEG anomalies in OS were as follows: 67% had generalized spike and sharp wave, high voltage burst, slowing and 3 hertz spike and wave. 32% had localized spike and wave, slowing, and delta waves. Abnormalities in NI were as follows: intracranial cysts, extra axial fluid collection and mesial temporal sclerosis. Overall commmonest types of seizure was generalized tonic clonic (52.3%, Table 1). In the univariate analysis, fever was associated with decreased (OR:0.25, 95% CI:0.08, 0.78, $p<0.05$) and abnormal EEG with increased odds for attendance to first FUV (OR:3.39, 95% CI:1.30, 8.82, $p<0.05$) while in the multivariate analysis, only abnormal EEG remained significant (OR:2.89, 95% CI: 1.09, 7.69, $p<0.05$). Abnormal EEG was associated with increased odds for attendance for second FUV (OR: 8.07, 95% CI: 1.94, 33.61, $p<0.01$).

Conclusion(s) The first onset, non-simple febrile seizures occur in a higher age group and are associated with abnormal EEG and neuro-imaging. Intracranial cysts, abnormal extra-axial fluid collection, and mesial sclerosis are the commonest brain pathologies. Children with abnormal EEG are more compliant with subsequent follow up visits.

Table 1.Clinical Characteristics of 155 children with New Onset Seizure

Variable	Mean (SD) or n (%)
Age (years) [Mean]	8.2 (6.67)
Sex (boy)	86 (55.5)
Race/ethnicity (non-white)	66 (42.6)
Developmental/behavioral issues (yes)	35 (22.6)
Fever (yes)	62 (40%)
Seizure family history	
Yes	10 (6.5)
Missing	3 (1.9)
Drug abuse history (yes)	13 (8.4)
Alcohol abuse history (yes)	8 (5.2)
Abnormal neurological exam (yes)	70 (45.2)
White blood cells (abnormal)	32 (20.6)
Abnormal electrolytes (yes)	22 (14.2)
EEG	
Normal	86 (55.5)
Abnormal	31 (20.0)
Not done	38 (24.5)
Imaging	
Normal	100 (64.5)
Abnormal	9 (5.8)
Not done	46 (29.7)
Antiepileptic medications (yes)	33 (21.3)
Trauma history (yes)	13 (8.4)
Seizure type	
Simple febrile	24 (15.5)
Simple/complex partial	20 (12.9)
Complex febrile	30 (19.4)
Generalized tonic-clonic and others	81 (52.3)

Table 1.

Table 2. Comparison of clinical characteristics of children with SFS and ONOS

Variable	Simple Febrile Mean (SD) or n (%) (n=24)	All Other Seizures Mean (SD) or n (%) (n=131)	p-value
Age (years) [Mean]	2.1 (1.35)	9.4 (6.65)	<0.001
Sex (boy)	14 (58.3)	72 (55.0)	0.76
Race/ethnicity (non-white)	10 (41.7)	56 (42.7)	0.92
Development/ Behavioral issues (yes)	2(8.3)	33(25.2)	0.1
Fever (yes)	23 (95.8)	39 (29.8)	<0.001
Family history of seizure (yes)	2 (8.3)	8 (6.3)	0.66
Drug abuse history (yes)	0 (0.0)	13 (9.9)	0.22
Alcohol abuse history (yes)	0 (0.0)	8 (6.1)	0.61
Neurological exam (yes)	9 (37.5)	61 (46.6)	0.41
White blood cells (abnormal)	12 (50.0)	20 (15.3)	<0.001
Electrolytes (abnormal)	5 (20.8)	17 (13.0)	0.34
EEG			<0.001
Normal	7 (29.2)	79 (60.3)	
Abnormal	0 (0.0)	31 (23.7)	
Not done	17 (70.8)	21 (16.0)	
Imaging			<0.001
Normal	6 (25.0)	94 (71.8)	
Abnormal	0 (0.0)	9 (6.9)	
Not done	18 (75.0)	28 (21.4)	
Antiepileptic medications (yes)	0 (0.0)	33 (25.2)	0.01
Trauma history (yes)	0 (0.0)	13 (9.9)	0.22
Follow-up visit 1	0 (0.0)	24 (18.3)	0.03
Follow-up visit 2	0 (0.0)	10 (7.6)	0.36

Table2.

Abstract: 22

Thyroid Function Tests in Term Newborns with Maternal Dysfunction in a Multiethnic Community

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Background Thyroid dysfunction in pregnancy is common and increasing in prevalence. Autoimmune thyroid disease (AITD) is the most common cause of thyroid dysfunction and rates of AITD as determined by presence of thyroid antibodies vary with ethnicity, highest in Whites. Thyroid antibodies can cross the placenta and are associated with fetal and neonatal hypothyroidism. Since neonates with congenital hypothyroidism (CH) do not have physical signs at birth, diagnosis is often made by newborn screen on filter paper obtained between 24-48 hours of life. Untreated CH can cause profound cognitive deficits and poor growth. There are no guidelines regarding testing for CH after newborn screening in term newborns with maternal dysfunction.
Objective To determine TFT's in term newborns with maternal thyroid dysfunction
Design/Methods A retrospective chart review of all neonates with gestational age (GA) $\geq$37 weeks born at Flushing Hospital Medical Center between Jan 2013 and Sept 2019 with known maternal thyroid dysfunction. Data extracted from EMR included maternal age, maternal diagnosis and treatment, ethnicity, GA, birth weight (BW), gender, Apgar score, TFTs of newborn, day of life tested and newborn screen result. Data were analyzed using percentages.
Results Thirty-six of 101 newborns born to mothers with thyroid dysfunction were reviewed for their TFTs. Majority (92%) of the mothers were on levothyroxine. Mean age of the mothers was 31$\pm$6.3 years and most were Asian Indian (36%), Hispanic (28%) and Asian (22%). More than half of the newborns (61%) were male. Mean GA was 39 weeks, mean BW 3196.5$\pm$554.7 grams and Apgar score $\geq$8 at 1 minute in all. First TFTs obtained within first 36-48 hours of life included total thyroxine 17.7$\pm$6.4 ug/dl, total T3 97$\pm$88 ng/dl, T3RU 38.4$\pm$6.6% and TSH 8.76$\pm$5.61 uU/ml. Three quarters (75%) were not in euthyroid reference range for age. Repeat TFTs obtained in 41% before two months of age included total thyroxine 11.3$\pm$3.4 ug/dl, total T3 80$\pm$87 ng/dl, T3RU 48.4$\pm$7.0% and TSH 5.25$\pm$3.15 uU/ml. Four continued to have abnormal TFTs (36%), two were treated for CH and two were lost to follow up. All newborn screens were screen negative.
Conclusion(s) Thyroid function tests obtained in immediate newborn period were most often falsely elevated and transient. Term infants with maternal dysfunction require thyroid function testing beyond immediate newborn period if CH is suspected despite normal newborn screen.

Abstract: 23
Characteristics of Children with Elevated Blood Lead Level (BLL) in a Diverse Urban Population
Jisha R. Jacob, carly barron, mollie lobl, sonia aviles, shelley rodriguez, Robert M. Moore, Marguerite Tirelli, jeffrey gershel, Kerry Godfrey, Kathleen Porder, Yogangi Malhotra
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Background Lead toxicity continues to be a preventable health problem in urban populations. NYC DOH data in 2017 showed 17.6% of children <6yo with a BLL >5µg/d were from the Bronx.
Objective To identify characteristics and risk factors of children <18 years with blood lead level (BLL) >5 µg/dL.
Design/Methods We performed a six-year retrospective chart review of all patients <18 yo with BLL of >5 µg/dL attending a diverse urban primary care clinic in the Bronx. BLLs were obtained via routine screening or when the patient was deemed to be at high risk. The patients were recalled to Lead Clinic where teaching was provided and a survey was completed screening for risk factors and/or sources of lead exposure, including: recent immigration, international travel in the past year, peeling paint at home, nearby construction, parents' occupations, smokers in the home, and autism/learning problems.These patients were then followed for repeat BLL until there were three successive levels <5 µg/dL with length to follow up levels documented. DOH home inspection reports of index cases were followed up to link environmental exposures and interventions.
Results A total of 113 patients (54.8% male), with an average age of 3.8 years, met inclusion criteria. 85% had an elevated BLL between 5-10µg /dL, 15% had BLL 10-20µg /dL. One patient was found to initially have a BLL >20µg /dL (immigrant from Europe) and two others later developed BLL >20µg /dL (peeling paint exposure). Lead Clinic was attended promptly by 90% of pts but only 32% of the pts with BLL between 5-10µg had a repeat BLL within 3 months. The most common sources of lead toxicity were recent international travel or immigration (45.1%), peeling paint (17.7%), and combination of peeling paint and travel (8.8%). The top three countries of recent immigration/travel were Gambia (21%), Pakistan (18%) and Bangladesh (18%). Of the total patients followed to date, 36% have been followed until they had three BLLs <5 µg /dL. Developmental delays were noted in 17.7% of the patients.
Conclusion(s) The top risk factors for elevated BLL in our population are recent immigration/international travel, followed by peeling paint in the home. Despite lead clinic attendance, a significant number of pts did not have repeat BLL testing in the recommended interval. Future interventions to improve lead screening and follow up include EMR optimization, provider education and developing culturally specific education material.

Risk Factors for Elevated BLL

Risk Factor	Number of pts	Percentage
Intl Travel/Immigration	51	45.1%
Peeling Paint	20	17.7%
Intl Travel + Peeling Paint	10	8.8%
Intl Travel + other factors	4	3.5%
Construction	5	4.4%
Peeling Paint + Construction	2	1.8%
Cosmetics	2	1.8%
Unknown	19	16.8%

Abstract: 24

Improving Newborn Screen Documentation in Outpatient Clinics

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Background The American Academy of Pediatrics (AAP) recommends that all pediatricians develop office policies and procedures to ensure that newborn screening (NBS) is conducted and that results are transmitted to them in a timely fashion.
Objective Baseline data at Bronxcare Health System from 2015 showed that the rate of NBS documentation at 1 month of age was 83.6%, and overall rate of documentation was 91.8%, with 8.1% remaining undocumented. Our aim is to improve NBS documentation to 100%, as recommended by AAP.
Design/Methods This quality improvement project follows the Model for Improvement, using PDSA cycles to bring about change. A retrospective review of charts to assess providers' compliance with documentation of NBS result is done twice a year, starting from 2015. We assess compliance with documentation of NBS results by 1 month of age, and overall documentation rates of NBS results.
Results From 2015-2019, 4 PDSA cycles were completed. Interventions included: ensuring online access for residents to the New York state online reporting system for NBS test results; providing online instructions on how to access results; and recommending providers to input the ICD10 codes of NBS results into the electronic medical record for easier reference. The rates of documentation at 1 month have increased from 30% in 2015 to 92.4% in 2019, and overall documentation rates from 91.8% to 97.3% (Figure 1).
Conclusion(s) A consistent improvement in documentation at 1 month was noted in our fourth PDSA cycle, after the start of periodic email reminders. Improving documentation rates at certain satellite clinics have been a challenge, likely due to provider unawareness of the quality improvement project. To address this, the next steps are to provide individual feedback to providers with lower than average rates of documentation, and to continue provider education and e-mail reminders to providers/residents.

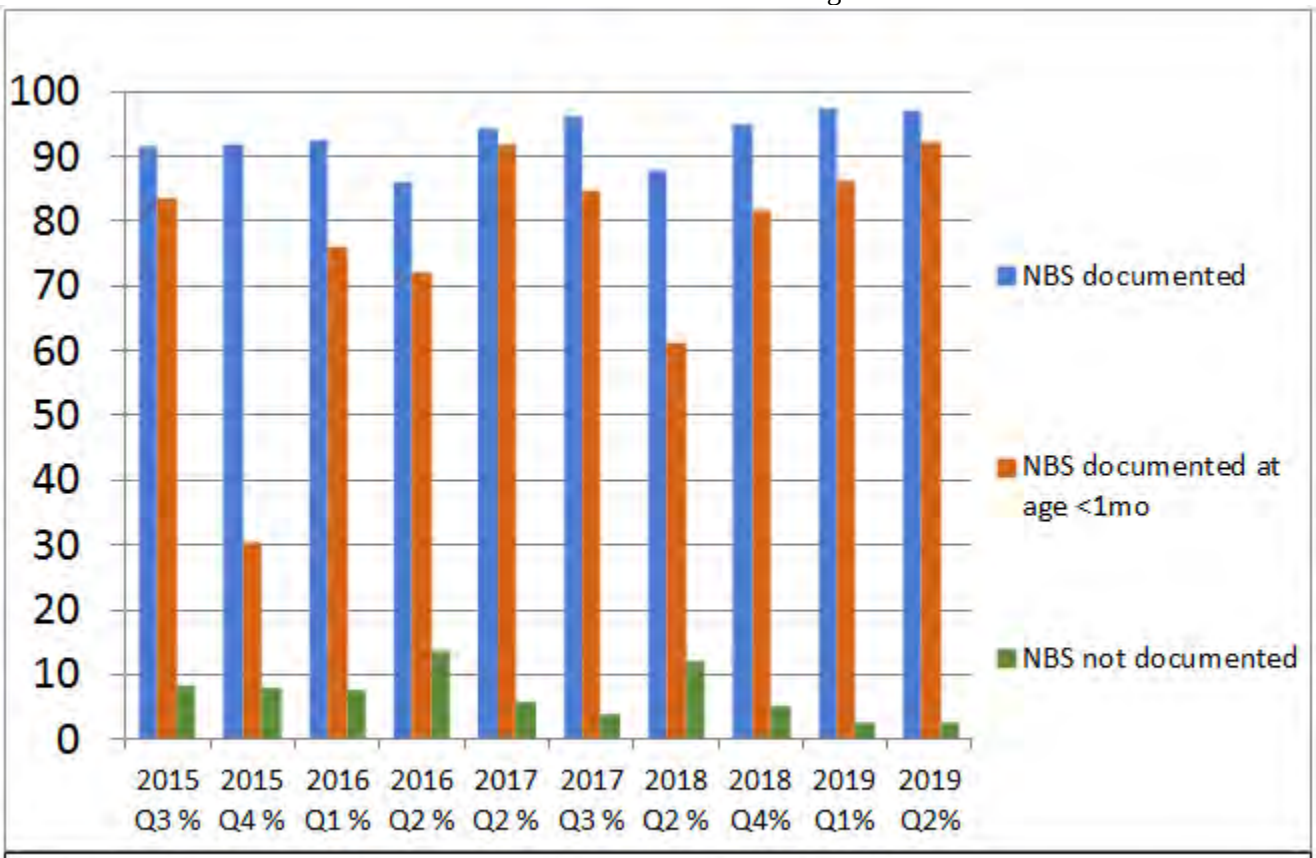

Figure 1. Newborn screening documentation rates from 2015 to 2019

Abstract: 25

Missed Opportunities for Depicting and Promoting the Use of Professional Emotional Support in Children's Television Programs

Faith Park, Christine Campisi, Ruth Milanaik
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Background Past research has shown that American media often perpetuates the stigma of receiving professional emotional support by presenting people dealing with emotional issues as “different” or “weak.” Although many children's shows include emotional challenges that must be overcome, it is unknown to what extent children’s television series emphasize the value of seeking professional help in situations when a character is dealing with these issues.
Objective To assess the presence and characteristics of emotional challenges depicted on popular children’s television shows and the use of professional emotional support.
Design/Methods Television shows were identified as eligible if they were popular with grade school children, showed live action characters and had more than one episode. The first episode from each season was watched; other episodes from the season were chosen randomly. Instances of emotional issues that arose and whether or not professional help was sought were noted. Additionally, series names, episode names, character names, and synopsis points were recorded. Pearson’s correlations were used to evaluate associations between the year of an episode’s airing and portrayals of mental health issues.
Results The majority of episodes analyzed (45/82, 54.9%) included an emotional issue that would have benefitted from professional emotional health support (Table 1). While a variety of emotional issues, some intense in nature, were presented, the character was only supported by a professional 6.7% of the time (Table 2). It was found that the earlier the year in which the episode was aired, the more frequently emotional issues were depicted (r=.295, p=.007). Females were depicted more frequently as having emotional issues (77.8%) when compared to males (22.2%).
Conclusion(s) Only a very small percentage (6.7%) of episodes depicted characters receiving help from an emotional support professional. The overwhelming majority of instances depicted females as having emotional issues. These findings highlight the need to normalize professional help-seeking and decrease stigma surrounding this topic. Additionally, gender stereotypes may serve to further isolate males as they are depicted as dealing with emotional issues substantially less than their female counterparts. Children’s

television writers could help to decrease negative associations with receiving professional help by depicting popular characters seeking, receiving and benefiting from professional emotional support.

Table 1: Show name, year aired, and number of episodes in which mental health issue was depicted

Characteristic	n (%)
Show	
Andi Mack	15/82 (18.3%)
Bunk'd	17/82 (20.7%)
Coop and Cami Ask the World	5/82 (6.1%)
Fast Layne	5/82 (6.1%)
Girl Meets World	15/82 (18.3%)
Liv and Maddie	20/82 (24.4%)
Sydney to the Max	5/82 (6.1%)
Mental Health Issue Depicted?	
Yes	45/82 (54.9%)
No	37/82 (45.1%)
Total Episodes	**82**

Table 2: Categories of mental health issues depicted and number of males versus females dealing with mental health issues

Characteristic	n (%)
Emotional Challenge Depicted	
Addiction/Attachment	2/45 (4.4%)
Anger	4/45 (8.9%)
Anxiety	1/45 (2.2%)
Bullying/Harassment	6/45 (13.3%)
Coping with Trauma	3/45 (6.7%)
Death of a Loved One	2/45 (4.4%)
Depression	3/45 (6.7%)
Strained relationships with family and loved ones	24/45 (53.3%)
Emotional Support Provided?	
Yes	3/45 (6.7%)
No	42/45 (93.3%)
Gender of Person Dealing with Emotional Challenge	
Male	10/45 (22.2%)
Female	35/45 (77.8%)
Total	**45**

Abstract: 26

Caregivers' Compliance with the American Academy of Pediatrics (AAP)'s Sudden infant death syndrome (SIDS) Risk Reduction Guidelines is Deficient in Specific Protective Components: Report from a Safety Net Hospital

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Background SIDS is a clinical entity in which the cause of death is undetermined despite a thorough investigation. The rate of SIDS declined from 130.3 deaths /100,000 live births in 1990 to 35.4 deaths/100,000 live births in 2017 following a "Safe to Sleep" campaign initiative by AAP. 1,400 cases of SIDS were reported in the year 2019 by CDC. The incidence of SIDS is highest in the 1st 6 months of life.

Objective 1) To assess the caregivers' (Ca) knowledge, awareness & practice of safe sleep recommendations in a predominantly Hispanic population 2) To assess improvement in these variables after continued education during the 1st 4 months of life 3) To detect the significant critical deficiencies in caregivers' practice despite education.

Design/Methods Retrospective study conducted at the pediatrics outpatient clinic of a suburban teaching safety net hospital. During

the infants' routine visits at 2-4 weeks, 2 months and 4 months of age, the caregivers answered a questionnaire, comprised of the AAP specified risk and protective factors for SIDS and Safe Sleep guidelines (table1). The caregivers' age, gender, race/ethnicity and relation to infant, as well as numbers of children < 18 yrs of age and total persons living in the household were noted. Standard statistical methods were applied to analyze data.

Results Total visits=506 (table 2). 64-73 % of caregivers were Hispanic. Mother was the primary caregiver in 84-87% of cases with mean age of 28.7-29.1 yrs during the 3 visits . On average 2.2 children and 4.7 persons lived in the household. 88.1 to 98.5% of caregivers answered yes tor baby sleeping on back; in a crib; not sharing a crib or bed; and having no pillows or toys while sleeping during the 3 visits. Not falling asleep with baby ranged from 77.8 to 85.1%. Use of blanket in crib while sleeping increased from 54.9% at 2-4 weeks, to 61.2% at 2, and 73.0% at 4 months despite counselling. The use of pacifier decreased from 23.9%, to 25.2%, and 19.3% over the 3 visits. Breast feeding decreased consistently from 70.5%, to 55.3%, and 43.1% at 2-3 weeks,2 months and 4 months visits (figure 1).

Conclusion(s) Breast feeding, use of pacifier and no use of blankets while sleeping, the 3 protective components of the Guidelines for Sleep Safety and SIDS Risk Reduction are poorly followed by caregivers and need effective reinforcement measures.

Clinical characteristics of the caregivers

Variable	Visit 1 M (SD) or n (%)	Visit 2 M (SD) or n (%)	Visit 4 M (SD) or n (%)
Caregiver age (years) [mean]	28.7 (6.50) (n=255)	28.9 (6.70) (n=123)	29.1 (6.66) (n=54)
Race/ethnicity			
White	14/280 (5.0)	2/147 (1.4)	2/63 (3.2)
Black	56/280 (20.0)	34/147 (23.1)	7/63 (11.1)
Hispanic	188/280 (67.1)	95/147 (64.6)	46/63 (73.0)
Pacific Islander	3/280 (1.1)	1/147 (0.7)	1/63 (1.6)
South Asian	15/280 (5.4)	7/147 (4.8)	5/63 (7.9)
Other	4/280 (1.4)	8/147 (5.4)	2/63 (3.2)
Relationship			
Mother	249/281 (88.6)	125/148 (84.5)	54/62 (87.1)
Father	22/281 (7.8)	12/148 (8.1)	5/62 (8.1)
Both Parents	9/281 (3.2)	10/148 (6.8)	3/62 (4.8)
Grandparent	1/281 (0.4)	0/148 (0.0)	0/62 (0.0)
Other	0/281 (0.0)	1/148 (0.7)	0/62 (0.0)
Children (number) [mean]	2.1 (1.34) (n=281)	2.2 (1.14) (n=148)	2.3 (1.56) (n=61)
People living in house (number) [mean]	4.7 (1.82)	4.7 (1.63)	4.6 (1.75)

Table 2.

Caregivers response to questionnaire			
Variable	2-4 weeks	2 months	4 months
Baby sleep on his/her back every day (yes)	258/287 (89.9)	133/151 (88.1)	61/65 (93.8)
Baby sleep in a crib, bassinet or baby box (yes)	279/285 (97.9)	146/152 (96.1)	63/64 (98.4)
Baby share a bed or crib with anyone else (no)	278/287 (96.9)	142/151 (94.0)	64/65 (98.5)
Any pillows where your baby sleeps (no)	276/282 (97.9)	146/151 (96.7)	61/65 (93.8)
Baby sleep with a blanket (no)	158/288 (54.9)	93/152 (61.2)	46/63 (73.0)
Toys where your baby sleeps (no)	275/284 (96.8)	146/152 (96.1)	59/64 (92.2)
Ever fall asleep with your child (no)	223/262 (85.1)	105/135 (77.8)	45/54 (83.3)
Child sleep with a pacifier (yes)	63/264 (23.9)	35/139 (25.2)	11/57 (19.3)
Been advised about sleep safety (yes)	198/274 (72.3)	111/138 (80.4)	45/56 (80.4)
Breast feed your child (yes)	196/278 (70.5)	78/141 (55.3)	25/58 (43.1)
Child drink formula (yes)	197/216 (42.5)	93/101 (92.1)	27/30 (90.0)

Table 3.

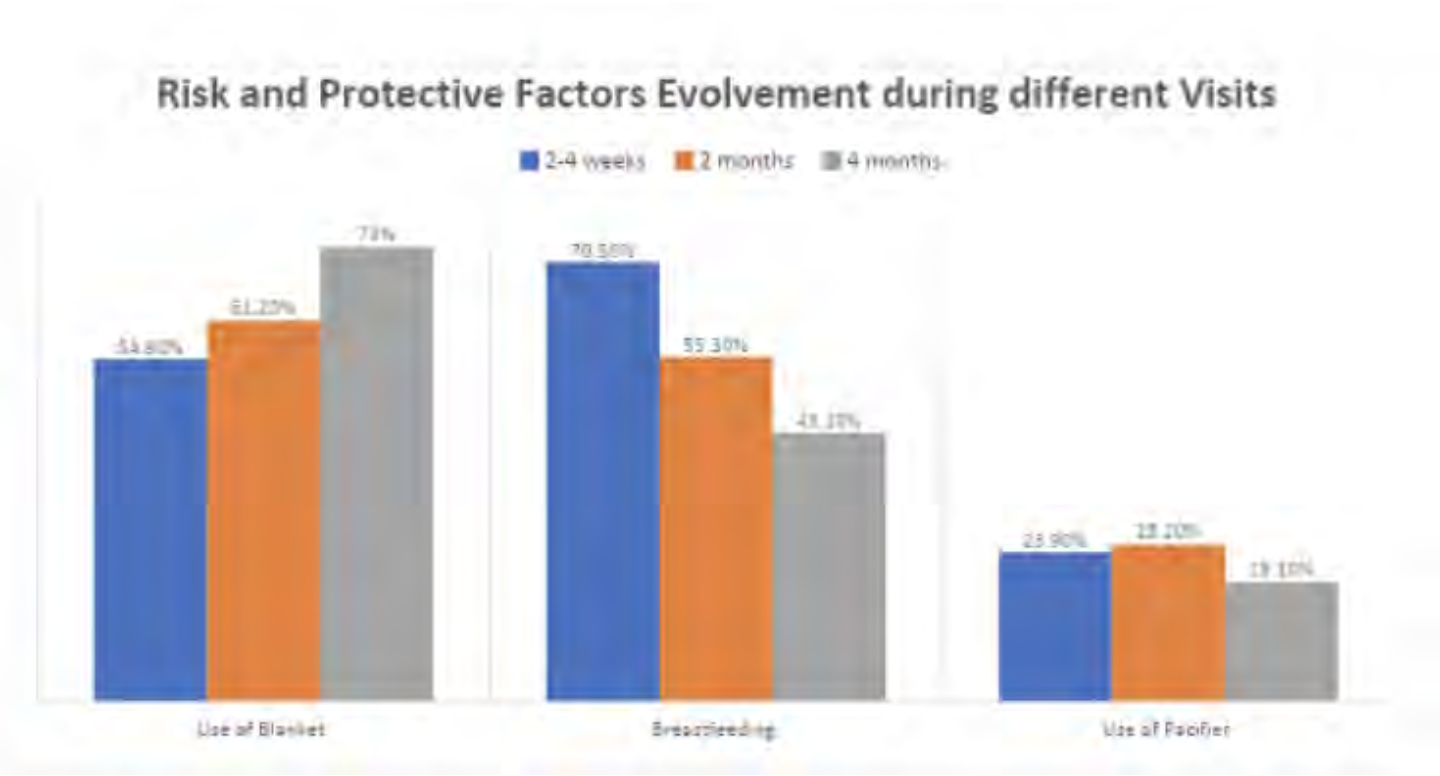

Figure 1.

Risk and protective factors associated to SIDS

Risk Factors	Protective Factors
Sharing a crib or bed (co-sleeping)	Breastfeeding
Use of pillows	Sleeping on their backs
Use of blankets	Sleeping in a crib
Presence of toys in the crib	Using a pacifier
Falling asleep while holding the baby	

Abstract: 27

Awareness and Early Screening of Postpartum Depression in Multiethnic Parents in an Urban Community Hospital

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Background Prevalence of postpartum depression (PPD) is reportedly more common in mothers than in fathers (2:1). Maternal depression is a risk factor for failure to thrive, poor socioemotional development and lower cognitive performance. The American Academy of Pediatrics recommends early screening throughout prenatal care and during well-child care (WCC) visits for entire postpartum year. Patient Health Questionnaire-9 (PHQ-9) is most often used screening tool for PPD. There are no recommendations as to timing, frequency and use of PHQ-9 in postpartum period for mothers and fathers.
Objective To determine effectiveness of PHQ-9 for screening PPD and to identify risk factors or positive screening in new parents at infant's first WCC visit in a multiethnic community hospital.
Design/Methods Surveys were offered in English or Spanish to new parents (mothers and fathers) of term newborns delivered at Flushing Hospital Medical Center visiting our Pediatric Ambulatory Care Center for their first WCC visit between July 1, 2019 and Oct 31, 2019. Survey included demographic questions (age, mother or father, gravida, level of education) followed by PHQ-9.

Responses to PHQ-9 were scored 0-3 with maximum score of 27. A PHQ-9 score between 5-9 was mild depression and 10-14 moderate depression. Data were analyzed using student t-test and chi square, $p < 0.05$ was considered significant.
Results Of 144 parents surveyed, 77% were mothers and 22% fathers. The mean age of the parents was 31±2 years. Participants were Hispanic (56%) and Asian (35%). Majority of the mothers (80%) and fathers (65%) had high school education or less. Most (66%) were married, planned their pregnancy (72%) and were multigravida (59%). Ten mothers (9%) and five fathers (16%) had mild depression and two mothers (2%) had moderate depression, making overall rates of depression similar for mothers (11%) and fathers (16%). Of mothers who screened positive, their pregnancies were often unplanned (67% vs 31%, $x^2=6.17$, $p=0.01$). They also had higher rates of gestational diabetes mellitus (GDM) (42% vs 14%, $x^2=5.40$, $p=0.02$). More than half of the mothers' (51%) decisions were made with family members ($x^2=4.65$, $p=0.03$) and friends ($x^2=3.75$, $p=0.05$).
Conclusion(s) PHQ-9 was a useful screening tool for PPD in both mothers and fathers at infant's first WCC visit, where rates were similar for both in our multiethnic community. Unplanned pregnancy and GDM may be risk factors for PPD in mothers.

Abstract: 28

An Analysis of Parental Practices, Concerns, and Opinions on Caffeine Consumption in Children

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Background Caffeine is a stimulant that can lead to detrimental health consequences such as anxiety and elevated heart rate in children. The American Academy of Pediatrics (AAP) advises against caffeine consumption (CC) in children under age 12 due to risks of behavioral and academic problems. Given that parents influence their child's diet, investigation into parental opinions of CC in children is crucial.
Objective To study parental practices and concerns of CC in children under the AAP-recommended age of 12.
Design/Methods Publically available parenting forums were reviewed for keywords "caffeine AND children" and "coffee AND children." Posts were included if the author was a parent and mentioned CC in children. Posts were assessed for a child's age and gender. Parental practices analyzed included amount of coffee given, concerns about coffee, and reasons for giving it.
Results Overall, 122 parenting forum threads were analyzed for CC in children ages 1 to 12. Of posts analyzed, 58.3% of parents allowed regular CC; 41.7% did not. No significant difference was found between genders allowed CC (males: $n=24$, females: $n=34$, $p = 0.086$). 48.1% of 1-2 year olds, 60.5% of 3-5 year olds, and 95.2% of elementary and middle school-aged children were allowed coffee each day. Reasons cited by parents who allowed regular CC included a lack of concern about CC as long as they controlled the amount of coffee (20.5%) and treatment of medical conditions (6.6%) (Figure 2). A significant difference was found between the average age of children allowed and not allowed coffee (allowed: 5.09 years, not allowed: 2.70 years, $p < 0.001$). A weak positive, but statistically significant, correlation was found between a child's age and the amount of CC allowed ($r = 0.295$, $p = 0.038$). The most common concern about coffee was high caffeine content (29.6%) (Fig. 2), though concerns had no effect on a parent's decision to allow CC (allowed: 30, not allowed: 25, $p = 0.525$).
Conclusion(s) The majority of children in this study regularly consume caffeine despite parental concerns. Physicians must continue to warn and advise parents against CC in young children. No forum thread mentioned consulting physicians or AAP guidelines, which indicates a need for clinicians to reinforce the AAP recommendation of no caffeine under age 12. To aid clinicians in the dissemination of this information, the AAP must make it readily available online for parents through resources such as the Bright Futures Parent Handouts.

Figure 1. Demographic characteristics of children in the parenting forum threads.

Characteristic	n (%)
Age (years)	
1-2	28 (20.8%)
3-5	37 (27.4%)
6-10	13 (9.6%)
11-14	7 (5.2%)
Unspecified	50 (37.0%)
Sex	
Female	57 (42.2%)
Male	41 (30.4%)
Unspecified	37 (27.4%)
Total	**135**

Figure 2. Reasons cited by parents for giving children coffee and parental concerns about coffee.

Characteristic	n (%)
Reason cited (select one)	
Parent controls amount of caffeine/sugar in coffee and feels it is a safe amount	25 (20.5%)
Coffee was given at the child's request (taste preference, prevent tantrum)	23 (18.9%)
Medical condition (ADHD, migraines)	8 (6.6%)
Parental influence (cultural practice, frequent parental consumption)	12 (9.8%)
Parent did not allow child to have coffee	52 (42.6%)
Unspecified	2 (1.6%)
Total	**122**
Concern mentioned (select all that apply)	
High caffeine content	43 (29.6%)
Added sugar	14 (9.7%)
Addictive effects	12 (8.3%)
Other health concerns (calories, additives, acidity)	5 (3.4%)
Unspecified	71 (49.0%)
Total	**145**

Abstract: 29

Decreasing Inappropriate Use of Continuous Pulse Oximetry Monitoring in Patients with Bronchiolitis

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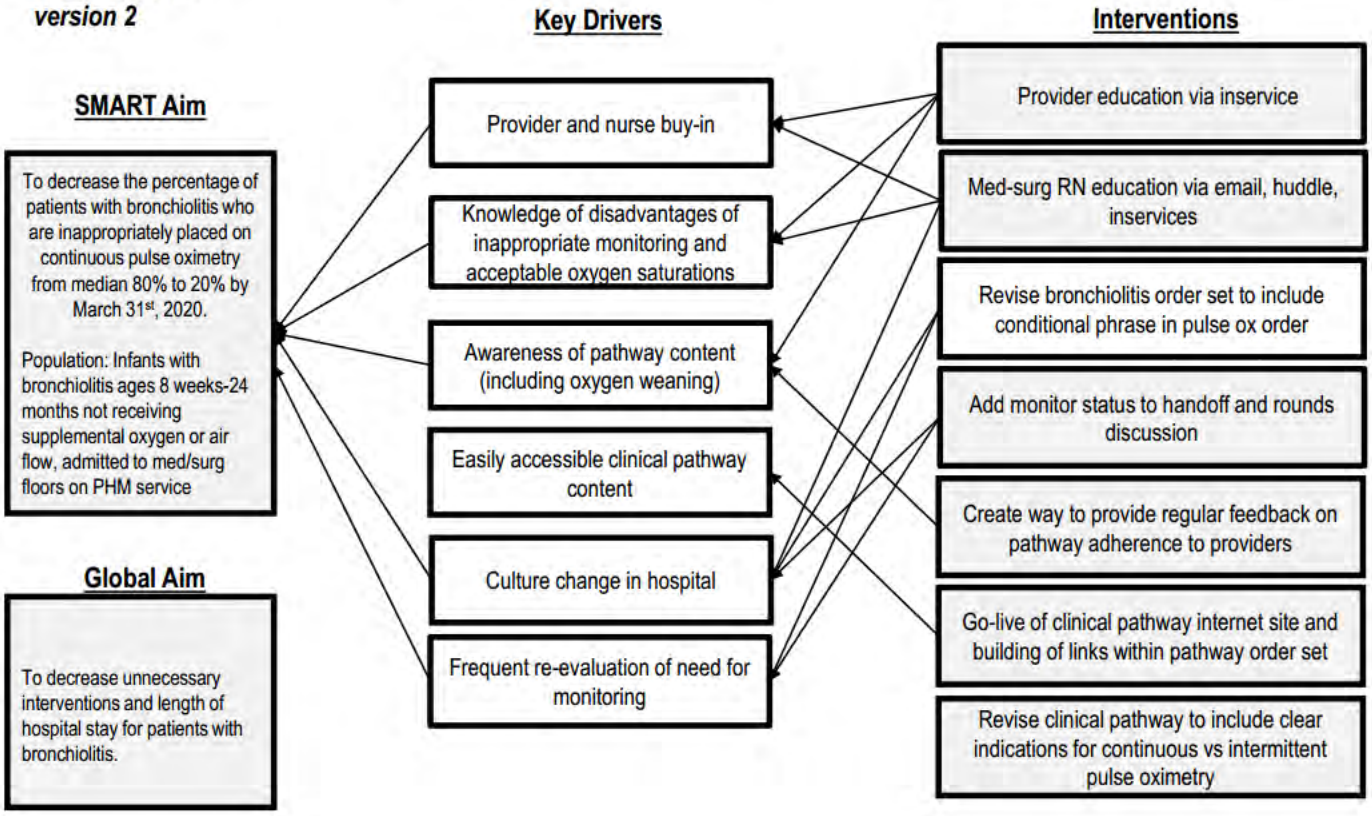
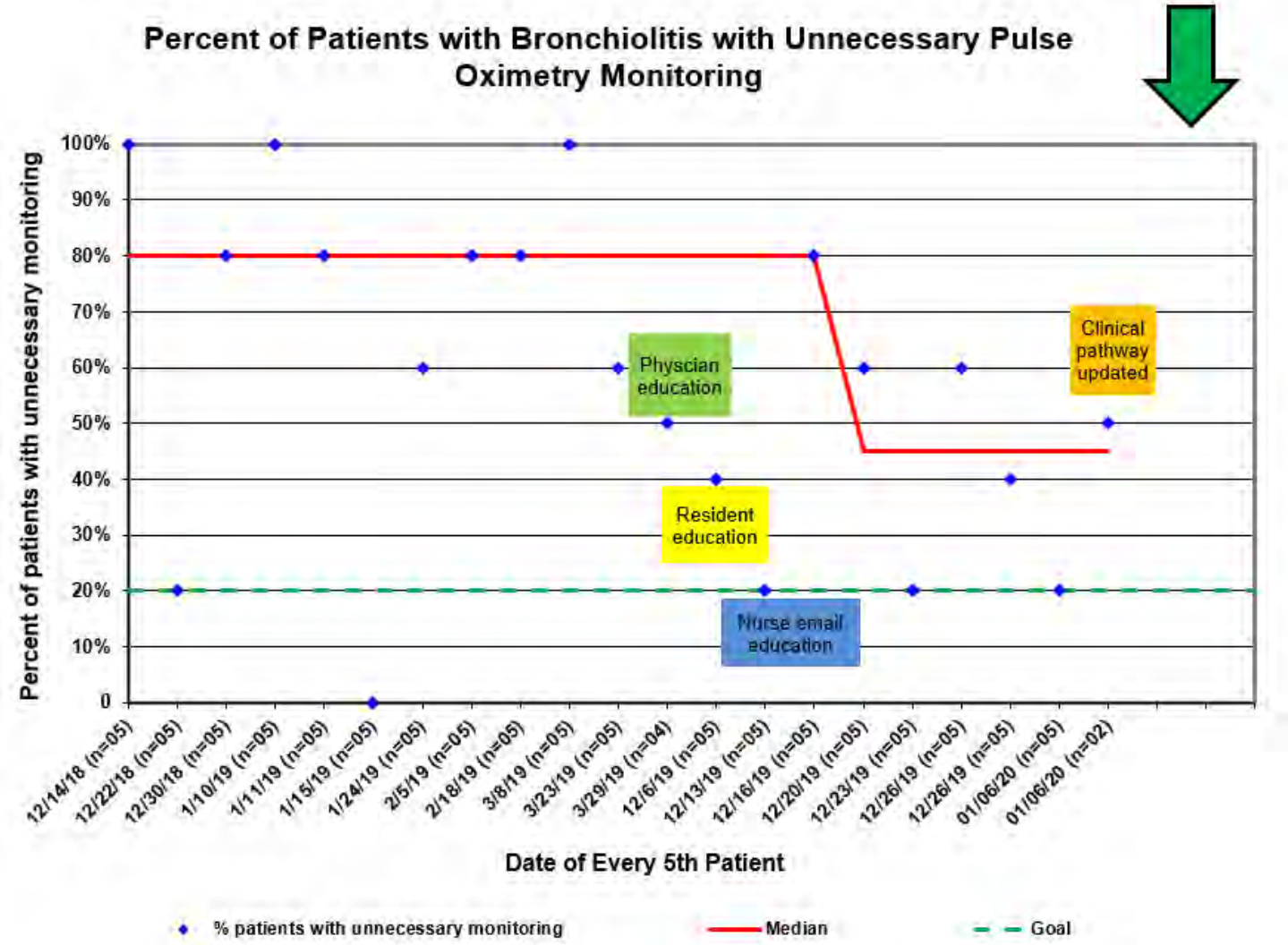
Background Bronchiolitis is the leading cause of infant hospitalization in the United States, costing $1.7 billion annually. Overuse of continuous pulse oximetry in these patients has been shown to increase length of stay, implementation of unnecessary interventions and overall cost. Nationally, continuous pulse oximetry is overused 46% of the time.
Objective The global aim of this initiative was to decrease unnecessary interventions and length of hospital stay for patients with bronchiolitis. The SMART aim was to decrease the percentage of patients with bronchiolitis with unnecessary continuous pulse oximetry monitoring from a median of 80% to 20% by March 31st, 2020.
Design/Methods Utilizing the Model for Improvement, multiple PDSA cycles described in the key driver diagram were completed to decrease unnecessary pulse oximetry monitoring for patients with bronchiolitis (Figure 1). Education was provided to physicians, advanced practitioners, residents, and nurses. Visual reminders were placed in nursing lounges. The existing bronchiolitis clinical pathway was updated to include clear expectations for pulse oximetry monitoring. The existing order set will be changed to include pulse oximetry order with conditions for continuous monitoring. Additionally, run charts will be posted weekly on daily management system boards on each medical-surgical floor and shared at daily nursing huddles to increase awareness of performance. The primary process measure is percentage of patients on medical-surgical floors with unnecessary continuous pulse oximetry monitoring. Secondary process measures include average length of stay.
Results After implementation of the interventions described, there was a downward shift in the median of inappropriate pulse oximetry monitoring from 80% to 50%.
Conclusion(s) Quality improvement methods can be successfully used to decrease inappropriate monitoring in bronchiolitis. Future planned PDSA cycles will aim to decrease this median further toward the goal of 20%. We will also hope to see decrease in length of stay at the end of data collection. If successful, this model could be spread to other units in the hospital to decrease unnecessary monitoring.

Decreasing Inappropriate Use of Continuous Pulse Oximetry Monitoring in Patients with Bronchiolitis

Key Driver Diagram (KDD)

Project Leader(s): Amy Blodgett, Ilana Waynik
Date: 1/6/2019
version 2





Abstract: 30

Urinary Tract Infections Caused by Extended-Spectrum β-Lactamase Producing Organisms in Two Urban Multiethnic Community Hospitals

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Background Urinary tract infections (UTI) in children, either community acquired (CA) or nosocomial, are most frequently caused by gram negative bacilli. Multidrug-resistant strains of Enterobacteriaceae (E) which include Escherichia coli and Klebsiella are caused by enzymes known as extended-spectrum β-lactamases (ESBL). Children with ESBL-E CA-UTI are more difficult to treat due to limited availability of broad-spectrum antibiotics approved for their use.
Objective To describe epidemiology, clinical spectrum, antibiotic choices and outcomes of CA-UTI due to ESBL-E in past 5 yrs in 2 urban multiethnic community hospitals.
Design/Methods Retrospective chart review of CA-UTI in two urban teaching community hospitals of children aged 2 mos to 10 yrs between Jan 2014 and Dec 2018. Age, gender, ethnicity, clinical presentation, urinalysis, culture results with antimicrobial susceptibility testing (AST), antibiotic used and length of stay (LOS) were extracted from EMR. CA-UTI is colony count $>10^5$ CFU/ml of midstream urine or $>10^4$ CFU/ml of catheter sample within 48 hrs of collection. G1 included CA-UTI due to ESBL-E and G2 non ESBL-E CA-UTI. Data were analyzed using chi-square test, $p<0.05$ was considered significant.
Results There were 81 patients identified in G1 and another 81 age matched patient in G2. Number of ESBL-E CA-UTI/yr ranged from 12-20 without any trends. No statistical significance was detected between G1 and G2 for gender (p=0.86), median age (p=0.91) and ethnicity (p=0.24). Fever was statistically significant in G1 65% vs G2 33% ($x^2=16.69$, $p<0.001$) and for abdominal pain in G2 45% vs G1 16% ($x^2=6.98$, p=0.008). Higher rate of urine nitrates in G2 40% vs G1 28% ($x^2=2.58$, p=0.11) was not statistically

significant. Urine leukocyte esterase in G1 67% vs G2 40% was significant (x^2==14.00, p=0.01). AST in G1, 30% required intravenous carbapenems, 30% nitrofurantoin and 24% TMP/SMX. In G2, 75% were susceptible to cephalosporins. For admitted patients, the median LOS of 5 days in G1 was significantly longer than median LOS of 3 days in G2, p<0.01.
Conclusion(s) In our small sample, there was no increase in number of ESBL-E CA-UTI/ yr in last 5 years. Children with fever, positive leukocyte esterase without abdominal pain were more likely to have ESBL-E CA-UTI. LOS was significantly greater in group with ESBL-E CA-UTI. Nitrofurantoin and TMP/SMX provided better coverage for CA-UTI in our multiethnic community hospitals.

Abstract: 31
Teaching Ultrasound-Guided Peripheral Intravenous Catheter Placement to Pediatric Residents
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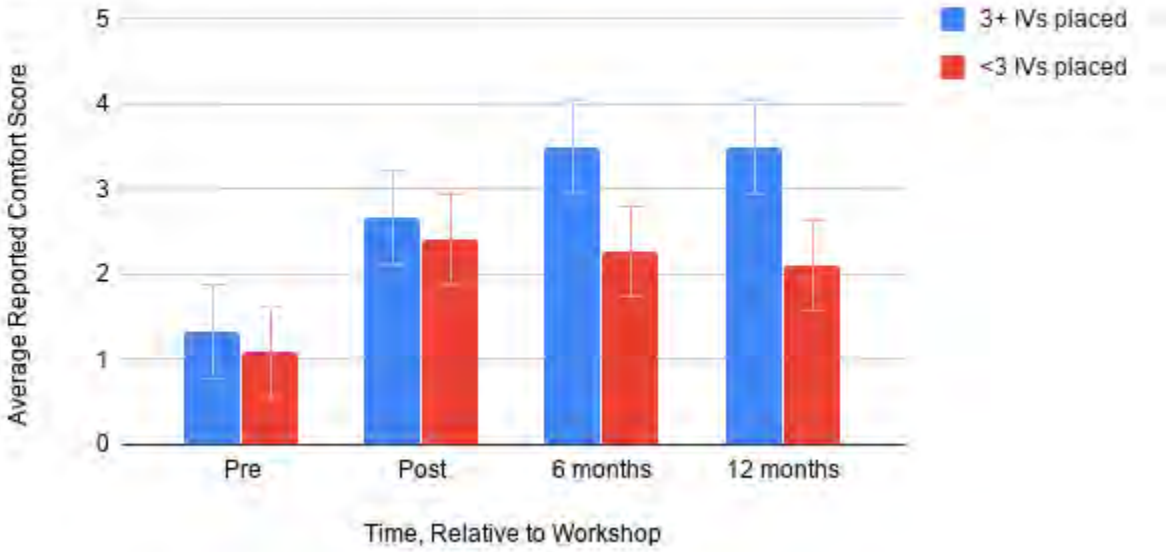
Background Ultrasound-guided peripheral intravenous catheter (USGPIV) placement has been found to be superior to traditional methods of catheterization for pediatric patients with difficult access, yet pediatric residents are not routinely taught this skill. The purpose of this study was to evaluate the success of teaching USGPIV placement to pediatric residents.
Objective
Design/Methods We conducted a prospective cohort study of interested pediatric residents without prior USGPIV experience over a 1 year period. Each resident participated in a 1-hour didactic workshop led by an experienced sonographer, followed by supervised attempted cannulation of each other. Success rates were studied at the time of the workshop. Surveys assessing comfort with cannulation on a 1-5 Likert scale were administered before, then immediately, 6 months and 12 months after the workshop. Residents had to perform 3 successful cannulations on non-patients in order to be credentialed in our institution. Attempts on pediatric patients were then monitored via metadata in a novel procedure note in the electronic medical record.
Results 18 residents were included in the study. Following the workshop, there were 8 (44.4%) successful cannulations. 6 of the participants completed the 3 non-patient cannulations for credentialing. There were 7 attempted cannulations of pediatric patients, of which 2 (28.6%) were successful. There was an increase in comfort with cannulation following the workshop from 1.2 to 2.5, or 214% (95% CI, 151-313%). Comfort was maintained at 6 and 12 months post-workshop, 2.7 (P<0.00001) and 2.7 (P<0.0001), respectively. Residents who placed 3 or more catheters were more comfortable than those were placed less than 3 at 6 and 12 months post-workshop, 3.5 vs 2.3 (P<0.002) and 3.5 vs 2.1 (P<0.002), respectively.
Conclusion(s) The workshop increased and maintained resident comfort with performing USGPIV cannulation in all participants. However, residents who successfully placed more than three USGPIV catheters were more comfortable than those who placed less. Additionally, successful cannulation of healthy adults did not implicate future success on admitted pediatric patients.

Figure 1. Average reported comfort with performing USGPIV catheterization relative to educational workshop

Figure 2. Comparing reported comfort with performing USGPIV catheterization between residents who placed three or more IVs to less than three, relative to educational workshop



Abstract: 32

Intravenous Fluid Management in Children with Bronchiolitis on High Flow Nasal Cannula

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Background Bronchiolitis is a lower respiratory infection affecting children <2 years of age. Respiratory syncytial virus (RSV) is the causative agent in >50% of the cases. High flow nasal cannula (HFNC) is a non-invasive respiratory support shown to reduce the need

for invasive respiratory support and the need for pediatric intensive care unit (PICU) admission. Infants and children with bronchiolitis are at risk of fluid retention due to increased antidiuretic hormone and when on humidified air therapy due to decreased insensible losses. Fluid management in children with bronchiolitis on HFNC has not been studied.
Objective To explore the association between different intravenous (IV) fluid management strategies and length of HFNC therapy in children with bronchiolitis.
Design/Methods Retrospective chart review of children aged 2 months to 2 years admitted to two urban teaching hospitals between October 2013 and October 2019 with diagnosis of bronchiolitis managed with HFNC. Age, gender, weight, birth history, past medical history, RSV and influenza rapid antigen detection, length of respiratory support (in 12 hour increments), IV fluid management and biochemical studies were extracted from EMR. Data were analyzed using chi square and Kruskul-Wallis, $p<0.05$ was considered significant.
Results Of 350 charts reviewed, 132 met inclusion criteria with median age of 5 months. More than half were male (61%) and approximately half (49%) were RSV rapid antigen positive. All patients had normal electrolytes, BUN and creatinine. Patients received IV bolus at presentation in ED in 51%, and in hospital day one IV fluid administration was >101 ml/kg in 54%, ≤100 ml/kg in 29% and 17% received no IV fluids. Almost two thirds (62%) stayed on HFNC >24 hours, less than a fifth (18%) on HFNC <24 hours and another fifth (21%) needed advanced treatment or transferred to PICU. There was no significant difference when comparing fluid groups (0, <100, >101 ml/kg) and HFNC per 12 hour intervals, $x^2=27.9$, $p=0.26$. There was no significant association between amount of IV fluids given and time on HFNC, $x^2=13.2$, $p=0.10$. There was also no significant difference between IV bolus groups with median time on HFNC (median time 37-48 hours), $U=1831.5$, $p=0.37$ and RSV positive on HFNC, $U=1629.0$, $p=0.37$.
Conclusion(s) In our small sample, amount of IV fluid was not associated with hours on HFNC. Both IV bolus and positive RSV were not related to number of hours on HFNC.

Abstract: 33
Feasibility of Early Detection of Trisomy 21 in Neonates Using Facial Analysis Software
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Background Trisomy 21 is the most common chromosomal disorder, affecting 1 out of every 700 births in the United States. Infants with Trisomy 21 are at increased risk for a myriad of comorbidities, including heart defects, developmental disabilities, endocrine disorders and hematological disorders. Early diagnosis is vital in order to provide appropriate and timely medical care to patients with Trisomy 21. This study aims to demonstrate the feasibility of computer aided diagnosis that uses facial analysis of photographs for the detection of Trisomy 21. Previous studies using this facial analysis software in older children with Trisomy 21 achieved accuracy between 0.943 and 0.967 using automated facial features and machine learning classifier.
Objective
Design/Methods We are enrolling healthy controls and patients with Trisomy 21 in the NICU. Inclusion criteria include age less than 12 months and face absent of artificial objects such as nasogastric tubes or endotracheal tubes at the time of photography. Facial photographs are taken with the proprietary app developed at Children's National Hospital on a smartphone and stored in a secure and HIPAA compliant hospital database. The computer software uses facial patterns to identify dysmorphic features commonly associated with Trisomy 21. Image-based face recognition and analysis will identify the relationship between specific facial characteristics and Down syndrome. Accuracy, precision, recall and other measurements will be utilized to evaluate the method.
Results The study is currently in the enrollment phase. At this time, 44 infants have been enrolled in the study, which includes 38 healthy controls and 6 infants with confirmed diagnosis of trisomy 21 by genetic testing. The study demonstrated the feasibility of using mobile technology to capture data for early detection of trisomy 21 in NICU.
Conclusion(s) We aim to validate computer-aided detection as a new and effective modality in the diagnosis of Trisomy 21. By validating a low cost and easy to use diagnostic tool, we hope to improve the rate of early diagnosis in newborns with Trisomy 21.

Abstract: 34
Factors beyond Eat, Sleep and Console (ESC) that predict early discharge home in Infants with Neonatal Opioid Withdrawal Syndrome (NOWS)
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Background Due to the rise in opioid abuse in the U.S., there has been a rise in NOWS. At CHoR, 10% of infants born during 2018 were diagnosed with NOWS. NOWS occurs when neonates are exposed to opioids in utero and results in a myriad of withdrawal symptoms. The average hospital cost for a NOWS infant is $66,700, which is higher than that of an infant without NOWS, $3,500

(Patrick, *et al.* 2015). Treatment for NOWS is highly variable, with some patients requiring pharmacotherapy. A simplified ESC tool has been associated with reductions in length of stay (LOS), pharmacological intervention, and hospital costs (Grossman, *et al.* 2017).
Objective We aimed to assess ESC and Finnegan score tools as well as other factors that could be influencing LOS in the NOWS.
Design/Methods We performed a retrospective chart review on opiate-exposed infants >34 weeks gestation who were born at the CHoR 2017-2019 and identified Finnegan scores and assigned ESC scores based on clinical data. We collected medical history, demographics, parental visitation and treatment.
Results Of the 194 infants included in our study, 59 (30%) required postnatal pharmacotherapy with an average LOS of 25 ± 10 days, compared to the average LOS of 6 ± 4 days for infants who did not receive pharmacotherapy. Using ESC 107 infants (55%) reached ESC threshold for assessment of postnatal pharmacotherapy. Infant antenatal exposure to methadone and heroin predicted later pharmacotherapy use, $p<0.05$ with 26% of infant whose mothers were treated with Subutex (N=92) requiring pharmacotherapy compared to 52% of infants whose mothers were treated with Methadone (N=42). Additionally, parental presence during infant's hospitalization was associated with decreased pharmacotherapy and LOS, $p<0.05$.
Conclusion(s) In this cohort, use of ESC identified greater numbers of infants who were at risk for pharmacotherapy intervention compared to the modified Finnegan scoring system. Furthermore, antenatal exposure to methadone, heroin and subutex was independently associated with varying risks for later pharmacotherapy and associated LOS. Studies evaluating diagnostic tools may need to address the changing antenatal treatment exposure as a potential confounder in determining success of ESC and Finnegan scoring system. Finally, given that greater parental presence during an infant's hospital stay was associated with reduced pharmacotherapy and reduced LOS, opportunities to identify methods to increase or mimic parental presence should be explored.

Abstract: 35

Mode of ventilation and medical therapies applied on extracorporeal membrane oxygenation in infants with congenital diaphragmatic hernia

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Background Extracorporeal membrane oxygenation (ECMO) is often employed in infants with congenital diaphragmatic hernia (CDH). Successful ECMO decannulation requires adequate aeration of the lung fields and resolution of pulmonary hypertension.
Objective The goal of our study was to describe the association between pulmonary hypertension therapy (PHT), modes of mechanical ventilation, diuresis and ECMO decannulation.
Design/Methods We performed a single-institution chart review of children with CDH who were cannulated for ECMO between January 1, 2014 and October 31, 2019. Exposures included PHT, mode of ventilation and diuresis. PHT included inhaled nitric oxide (iNO) and treprostinil. Mode of ventilation was dichotomized into conventional (synchronized intermittent mechanical ventilation) versus lung opening (airway pressure release ventilation, high-frequency percussive ventilation, high-frequency oscillatory ventilation). Diuresis included loop diuretic and slow continuous ultrafiltration (SCUF). The association between each exposure, ECMO duration, CDH repair time and mortality were calculated. Descriptive and statistical analyses were performed.
Results A total of 56 infants diagnosed with CDH had at least one ECMO run. The average ECMO duration was 19.2 d ± 9.6 d. All infants were initially ventilated on ECMO with conventional ventilation (16.4 d ± 8.2 d); 28 (50%) required at least one lung opening ventilation mode. Nearly all infants 53 (94.6%) were treated for PHT on ECMO; all received iNO and 17 (30.4%) also received treprostinil therapy. Active fluid management in 50 (89.3%) infants included 47 (84%) treated with diuretic medication and 32 (57%) SCUF. PHT was not associated with longer ECMO run time. Use of lung opening ventilation mode ($p=0.04$), diuretic ($p=0.01$) and SCUF ($p=0.0001$) were associated with longer ECMO run time.
Conclusion(s) Among the infants studied the majority received PHT and diuretic therapy while 50% required a lung opening ventilation mode to facilitate ECMO decannulation.

Table 1. Demographic Data

Sex	
Male	*34 (60.7 %)*
Female	*22 (39.3 %)*
Gestational age (weeks)	*38.1 (37.6-38.8)*
Hernia side	
Left	*44 (78.6 %)*
Right	*12 (21.4 %)*
Liver position	
Intra-abdominal (down)	*6 (10.7 %)*
Intra-thoracic (up)	*50 (89.3 %)*
ECMO Duration (days) [a]	*19.2 ± 9.6*
Lung opening ventilation strategy (n=28, 50%)	
APRV [b]	*14 (50 %)*
HFOV [c]	*4 (14.3 %)*
APRV and HFOV	*9 (32.1 %)*
APRV, HFOV and HFPV [d]	*1 (3.6 %)*
Therapies required on ECMO	
Inhaled Nitric Oxide	*53 (94.6 %)*
Treprostinil	*17 (30.4 %)*
Loop-diuretic	*47 (83.9 %)*
SCUF [e]	*32 (57.1 %)*
CDH repair time (days)	
On ECMO (n=18, 32.1%)	*20 (10-23)*
Off ECMO (n=29, 51.8%)	*26 (22-30)*
Death	*17 (30.4 %)*
Age at Death (days) [a]	*48 ± 39.8*

Categorical variables are represented as a percent, and numerical variables are represented as median (IQR= 25th - 75th percentile). [a] *Values are represented as mean ± standard deviation.* [b] *Airway pressure release ventilation (APRV).* [c] *High-frequency oscillatory ventilation (HFOV).* [d] *High-frequency percussive ventilation (HFPV).* [e] *Slow continuous ultrafiltration (SCUF).*

Table 2.
Relationship Between Decannulation Therapies and Outcomes

	ECMO duration (days) [a]	Mortality	CDH repair time (days)
Pulmonary Hypertension Therapy			
Nitric Oxide (+) (n=53, 94.6%)	*19.7 ± 9.7*	*15 (28.3%)*	*23 (20-27)*
Nitric Oxide (-) (n=3, 5.4%)	*10.3 ± 3*	*2 (66.7%)*	*22*
Treprostinil (+) (n=17, 30.4 %)	*22.6 ± 9.9*	*6 (35.3%)*	*22 (11-29)*
Treprostinil (-) (n=39, 69.6%)	*17.8 ± 9.3*	*11 (28.2%)*	*24 (21-27)*
Ventilation Mode			
Conventional (n= 28, 50%)	*16.6 ± 9*	*8 (28.6%)*	*23 (16-26.5)*
Lung opening ventilation mode [b] (n=28, 50%)	*21.9 ± 9.7*	*9 (32.1%)*	*23 (21-31)*
Diuresis Therapy			
Loop-diuretic (+) (n=47, 83.9%)	*20.6 ± 8.6*	*12 (25.5%)*	*23 (19-27)*
Loop-diuretic (-) (n=9, 16.1%)	*11.8 ± 11.6*	*5 (55.6%)*	*23.5 (21-26)*
SCUF [c] (+) (n=32, 57.1%)	*23.3 ± 9.6*	*7 (21.9%)*	*23 (19-27)*
SCUF [c] (-) (n=24, 42.9%)	*13.8 ± 6.8*	*10 (41.7%)*	*24 (21-27)*

Categorical variables are represented as a percent, and numerical variables are represented as median (IQR= 25th - 75th percentile). [a] Values are represented as mean ± standard deviation. [b] Lung openning ventilation mode is defined as any requirement for airway pressure release ventilation, high-frequency percussive ventilation or high-frequency oscillatory ventilation. [c] Slow continuous ultrafiltration (SCUF).

Abstract: 36

Glucocorticoid Receptor Binding Affinity in Full Term Neonates Delivered to Laboring versus Nonlaboring Mothers.

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Background Glucocorticoids (GCs) play an essential role in the development and maturation of fetal organs prior to birth. GCs also serve an important role during late gestation as the stimulus for lung maturation via surfactant production and release. As gestational age increases, the adrenal axis matures and GC concentrations increase in the fetal circulation, especially during the transition to extrauterine life. Neonatal GC levels have been demonstrated to be increased in neonates delivered vaginally compared to cesarean delivery. This surge is due to positive feedback between placental CRH and fetal cortisol. Given that varying levels of GCs are expressed throughout fetal development and extrauterine life, it is important to identify what factors can affect GC receptor binding and function.
Objective To compare glucocorticoid receptor binding in full-term neonates born to mothers who went into labor versus mothers who delivered via C-Section without going into labor using fluorescein-labeled dexamethasone (F-Dex) monocyte binding assay.
Design/Methods This is an IRB approved, single-center study. Cord blood samples were collected immediately after delivery from full-term (37-40 weeks gestational age) neonates delivered to mothers without pregnancy complications including gestational diabetes, chronic diabetes, hypo/hyperthyroidism, infection, smoking history, and fever. Samples were divided into two groups neonates of laboring mothers versus neonates of nonlaboring mothers who underwent scheduled cesarean section (control). Monocytes were isolated from the cord blood samples and glucocorticoid receptor binding affinity of each sample was analyzed using an F-Dex binding assay which has been previously validated in our lab.
Results Preliminary results so far show that there was no significant difference in F-Dex binding between the neonates born to mothers who went into labor versus mothers who delivered via C-Section without going into labor.
Conclusion(s) Given the important role that GC plays in the development of the fetus, especially in lung maturation, we examined whether labor plays a role in affecting GC binding to the GC receptor. Our preliminary data show that labor did not affect F-Dex binding to the GC receptor. However, more data needs to be acquired in order to support our findings.

Abstract: 37

TTN: An Act of Disappearance?

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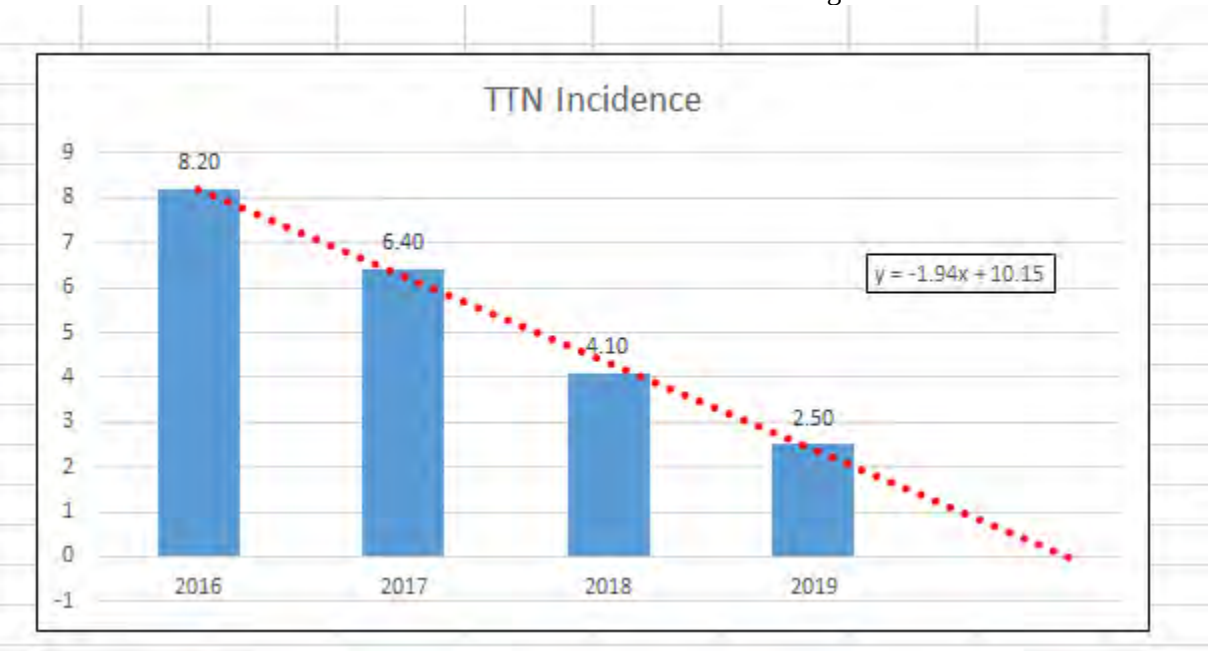
Background Transient tachypnea of the newborn (TTN), is benign and self-limited, however, is a major cause of NICU admissions. Risk factors of TTN include cesarean delivery without labor, precipitous birth and preterm delivery.
Objective Multiple obstetric and neonatal interventions introduced in neonatal resuscitation and in the care of the newborn immediately after birth in the last decade include elective cesarean section after 39 weeks of gestation, use of Room Air, T-piece, and pulse oximetry, and cardiopulmonary monitors in neonatal resuscitation, delayed cord clamping, and use of antenatal steroids for late preterm deliveries. Whether combined use of these measures decreased the incidence of TTN is the aim of the study.
Design/Methods This retrospective analysis included neonates admitted in NICU at Montefiore St. Luke's Cornwall Hospital, Newburgh with a diagnosis of TTN from 2016 to 2019. Neonates were symptomatic within 6 h of life, had radiological confirmation and required respiratory support for the management. Neonates born <36 weeks, born by emergency cesarean section, multiple gestations, and those required PPV at birth were excluded.
Results The incidence of TTN was 8.2 per 100 NICU admissions in 2016, and decreased to 6.4 in 2017, 4.1 in 2018, and 2.5 in 2019.
Conclusion(s) There is a gradual decrease in the incidence of TTN following the introduction of multiple obstetrical and neonatal interventions. If the current trend persist, TTN disappears in a couple of years.



Timeline and Obstetrical and Neonatal interventions

Interventions	Year of Initiation
Elective cesarean after 39 weeks	2012
Room air resuscitation	2013
Use of pulse oximetry	2014
Use of T piece	2104
Delayed cord clamping	2017
Cardiopulmonary monitoring	2017
Use of early CPAP at birth	2017
Antenatal steroids for 34-36 weeks of gestation	2018

Abstract: 38

Pattern of Inflammatory Markers in Meconium Aspiration Syndrome

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Background Aspiration of meconium can cause chemical inflammation, resulting in significant neonatal morbidity and mortality. Meconium aspiration syndrome (MAS) has been associated with elevated inflammatory markers. Antibiotics are widely used in meconium aspiration syndrome (MAS) because the differentiation between MAS and pneumonia can be difficult, and MAS can also be complicated by secondary infection. Patterns of inflammatory marker response to MAS have not been well differentiated from response to infection, making antibiotic management difficult.
Objective To examine the pattern of inflammatory indices in MAS during the first week of life and correlates with blood culture results.
Design/Methods As part of a larger antibiotic stewardship initiative, we did a retrospective cohort study of inborn neonates in an academic medical center with level III NICU diagnosed with MAS between 1/1/2015 and 12/31/2018. We included babies who had determinations of C-reactive protein (CRP), white blood cell count (WBC), immature to total neutrophil count (IT ratio) and absolute neutrophil count (ANC) during the 1st week of life. We excluded babies who were transferred or expired within 24 hours without a CRP value. We also collected data on the degree of illness and need for respiratory support.
Results 84 infants were diagnosed with MAS during the study period, 8 were excluded, for a total study population of 76. Mean gestational age was 40 weeks and birth weight 3.4 kg. The pattern of CRP rise over time showed a peak at 48 hrs. with an average

value of 44.0 mg/L (Figure 1). Infants needing respiratory support had higher CRP at 12 hours of life (HOL) (p 0.035) and 24 HOL (p 0.046) compared to infants with normal CRP. High CRP at 48 HOL (p 0.000) was associated with longer duration of antibiotic treatment. IT ratio, WBC and ANC showed similar pattern with peak at 12 HOL, but the values are not significant to be concerned for infection (Figures 2,3,4). SNAPPE II (Score for Neonatal Acute Physiology with Perinatal Extension) did not correlate with CRP. Two infants had positive blood culture for E. coli and one for Strep. Viridians. Blood culture results showed no significant correlation with the CRPs.

Conclusion(s) Meconium aspiration syndrome leads to a pattern of rise in CRP with a peak at 48 HOL and decline thereafter. Elevated inflammatory markers correlate poorly with blood culture results and should not be used to justify use of prolonged antibiotics in infants with MAS.

Figure1. Average CRP in infants with MAS in the first 96 hours of life (N=76)

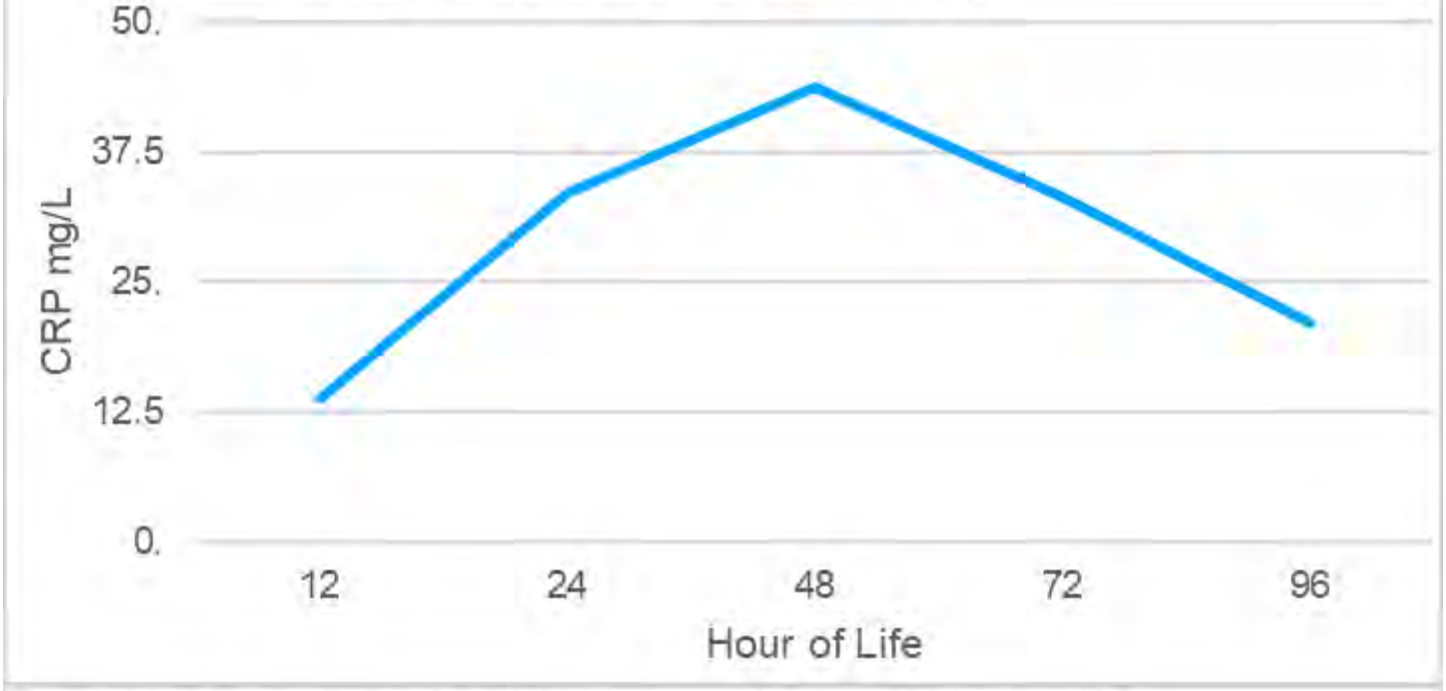
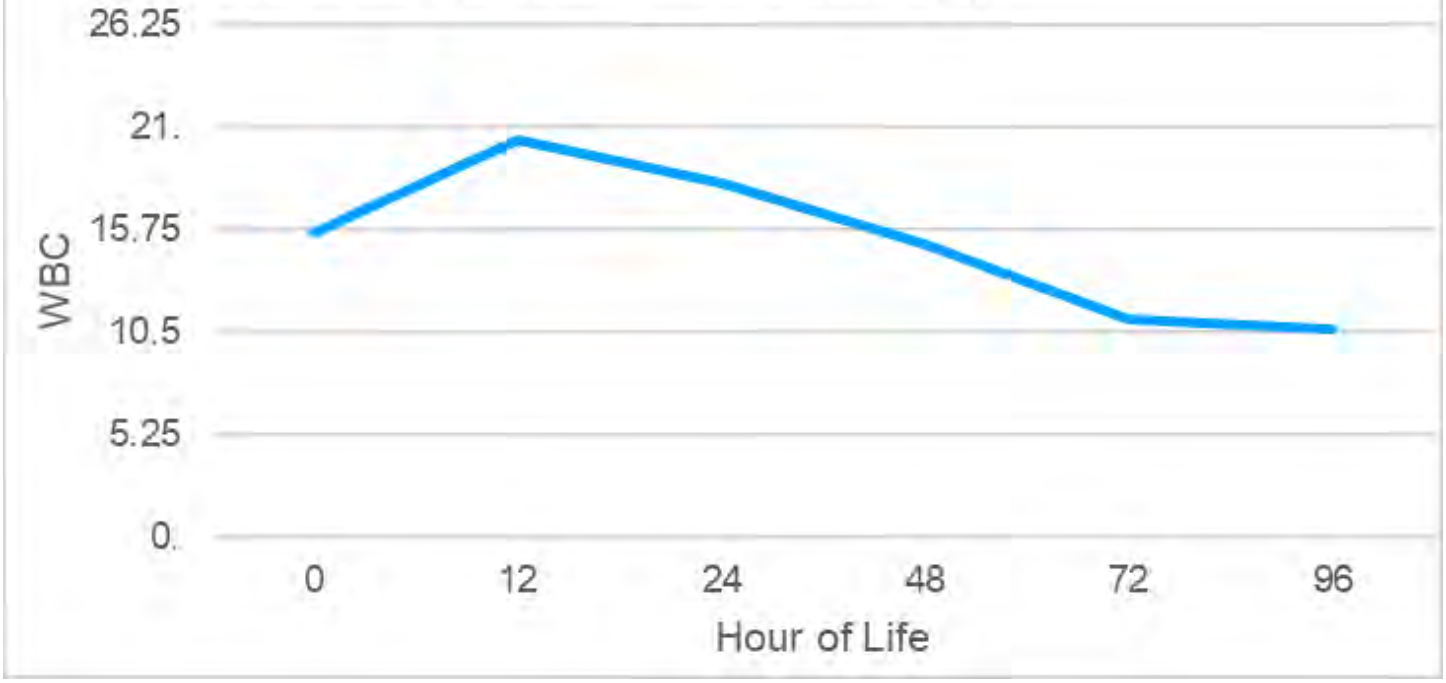
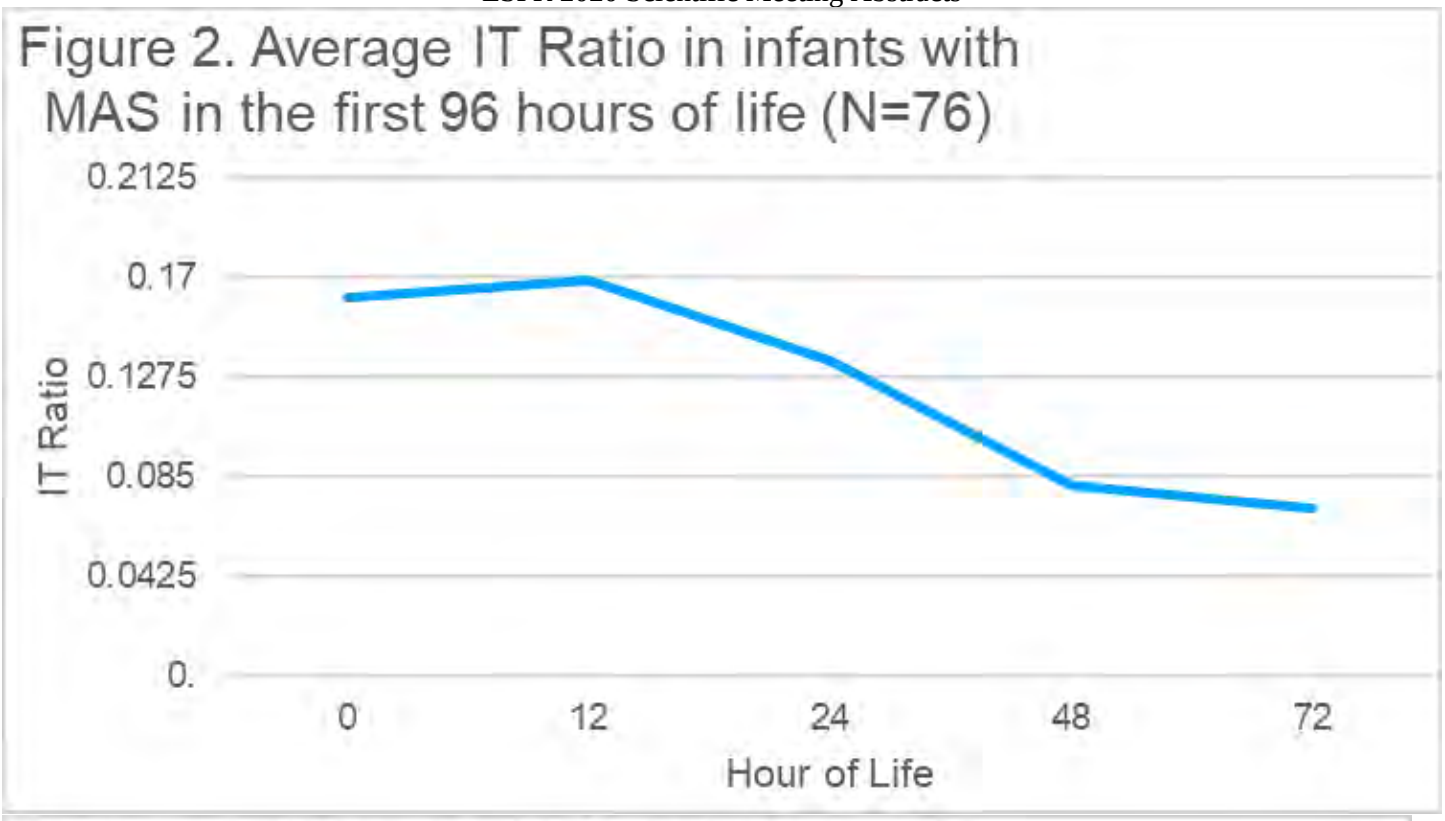
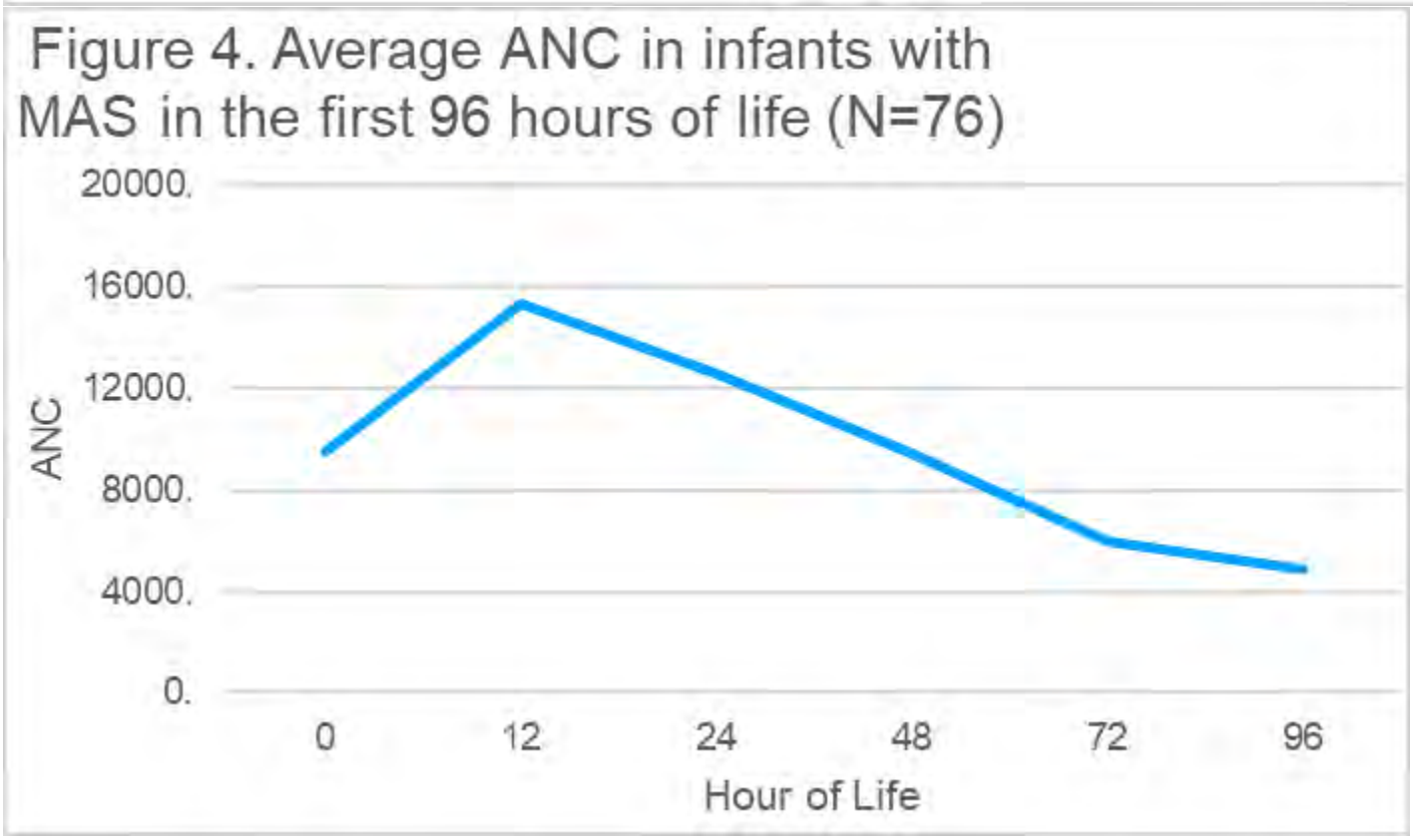


Figure 3. Average WBC in infants with MAS in the first 96 hours of life (N=76)







Abstract: 39

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

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Background As neonates transition from a relatively hypoxic environment to extra-uterine life, arterial oxygen saturation dramatically increases. The ability for immature tissue to adequately extract and utilize the oxygen for aerobic metabolism remains unknown. The development of near-infrared spectroscopy (NIRS), which measures specific tissue oxygen saturation (StO2) noninvasively, allows us to calculate the organs' autoregulation function to determine if adequate tissue oxygenation is maintained.
Objective Determine the relationships of NIRS brain and somatic autoregulation function to patients' clinical parameters related to their severity of illness.
Design/Methods In this prospective cohort pilot study, after parental consent, neonates less than 34 weeks with arterial access, were enrolled. Neonates with comorbidities such as perinatal asphyxia, congenital anomalies or NEC were excluded. We collected data including gestational age, birthweight, medication and nutrition. The FORE-SIGHT Elite (CASMED Inc., CT, USA) NIRS probe was placed on forehead and to the right anterior abdominal wall for 24 hours. Neonates were monitored with peripheral pulse oximetry, heart and respiratory rate and continuous arterial blood pressure. Arterial blood pressure, arterial SpO2 and cerebral and somatic NIRS were used to derive autoregulation function by calculating a pressure passive index (PPI) from StO2 and mean arterial pressure (MBP).
Results Preliminary data was obtained from 17 neonates (BW 540 to 2370g, GA 23.0 to 33.2 weeks). Three neonates did not have blood pressure recordings and were excluded. Table 1 provides data on autoregulation function for MBP by categorizing PPI values as 1=good, 2=borderline and 3=poor autoregulation function. The PPI borderline zone is a hypothetical range of values where autoregulation function is transitioning from good to poor. For normal autoregulation function, PPI values tend to be low and constant for a range of MBP, and increase at certain lower and higher MBP values at the MBP autoregulation thresholds.
Conclusion(s) Our results show that even the most premature neonates, as long as they maintain normal BP and systemic circulation, can autoregulate cerebral perfusion. When BP are above or below the normal MBP for age, the neonate is at risk for losing autoregulation. The PPI can potentially serve as a useful marker for autoregulation. This project is ongoing with more patients being enrolled for more detailed analysis.

subject	body location, MBP>>>	0-20	20-25	25-30	30-35	35-40	40-45	45-50	50-55	55-60	60-65	65-70
1	Brain	3	3	3	3	3	3	3	3	3	3	3
1	Abdomen	3	1	2	1	1	1	1	2	2	2	3
2	Brain	2	1	1	1	1	1	3	3			
2	Abdomen			3	1	1	2	3				
3	Brain			1	1	1	1	1	3			
3	Abdomen			1	1	1	2	3	3			
4	Brain			1	1	1	1	1	1			
4	Abdomen			1	1	1	1	1	2			
6	Brain				1	1	1	2	2			
6	Abdomen				1	1	1	1	1	1		
7	Brain					2	1	1	1	1	2	
7	Abdomen					3	2	1	1	1	1	1
8	Brain		2	1	1	2	1		2		2	3
8	Abdomen	1	1	1	2	3	2		1		2	3
10	Brain	2		1	1	1	1	1	1	1	1	3
10	Abdomen			3	2	2	1	1	1	1	1	3
11	Brain			1	2	1	1	1	3	2	3	
11	Abdomen			2	2	2	1	1	3	1	1	
12	Brain		1	1	1	1	1	1				1
12	Abdomen		3	2	1	1	2					2
13	Brain	2	1	1	2	2	2	3	3	3	3	
13	Abdomen		3	3	2	2	1	3	1	1	1	1
14	Brain				3	1	1	1	1	1	2	
14	Abdomen				3	1	2	2	2	2	3	
15	Brain	3	3	3	2	2	2	1			3	3
15	Abdomen	3	1	1	1	1	1					
16	Brain			2	1	1	2	2		3	3	3
16	Abdomen		1	1	1	1	2	3				
18	Brain		1	1	1	2	2	1	3			3
18	Abdomen		1	1	1	1	2	3	2	3		
19	Brain				1	1	1	2	3	3	3	3
19	Abdomen				1	1	1	1	3			
20	Brain		3	2	3	3	3	1	1	3		
20	Abdomen	2	1	1	1	1	1				3	

Key: 1= good autoregulation (PPI <0.33), 2= borderline autoregulation (PPI = 0.33 to 0.399), 3= poor autoregulation (PPI>/= 0.40)

Abstract: 40

The Spectrum of Neonatal Abstinence Syndrome in the Last Decade

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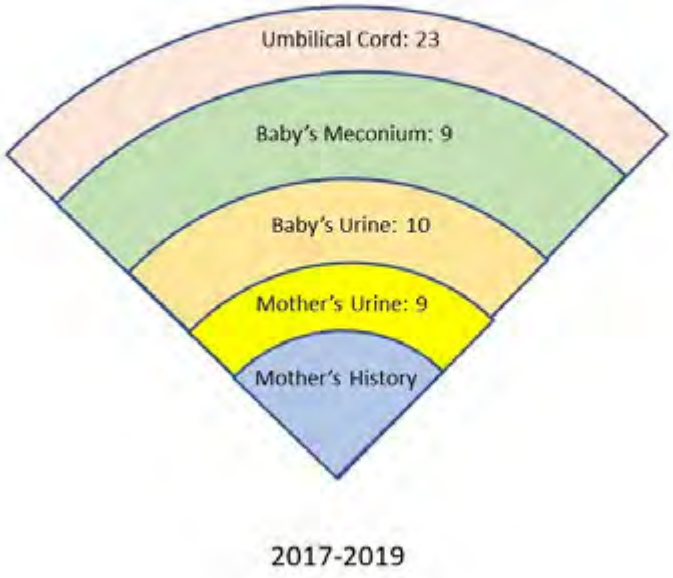
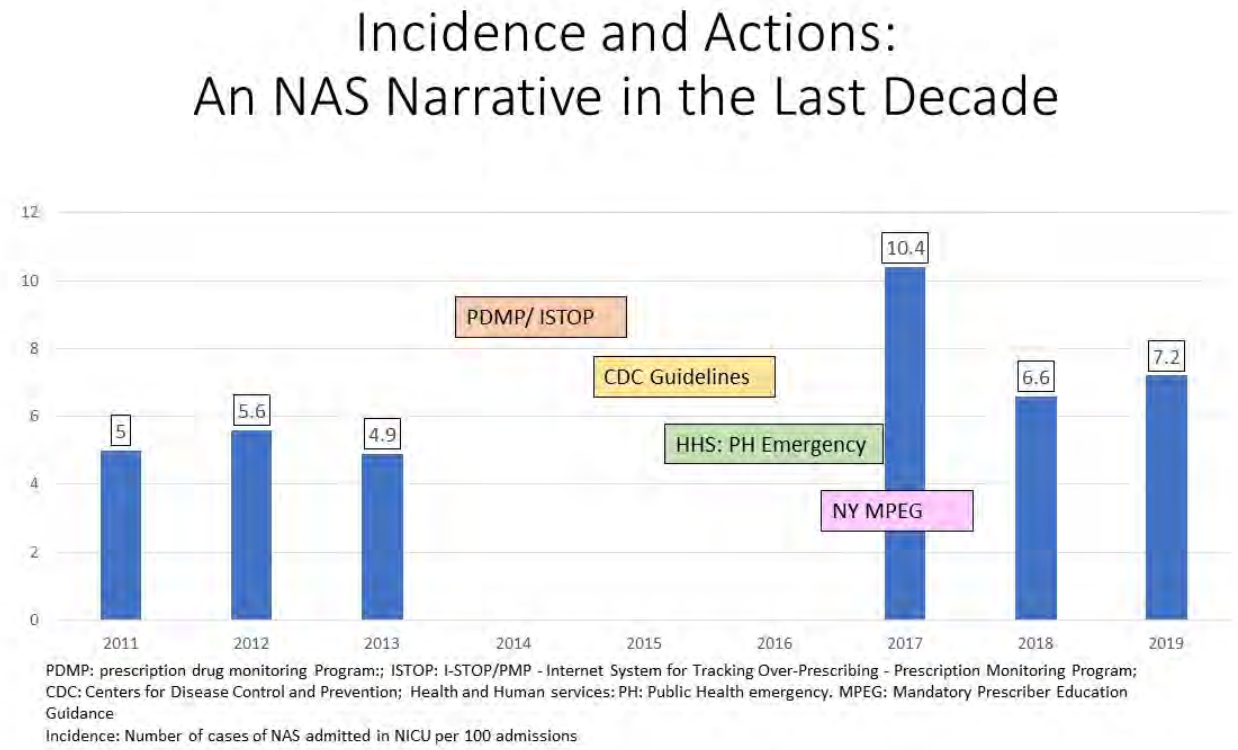
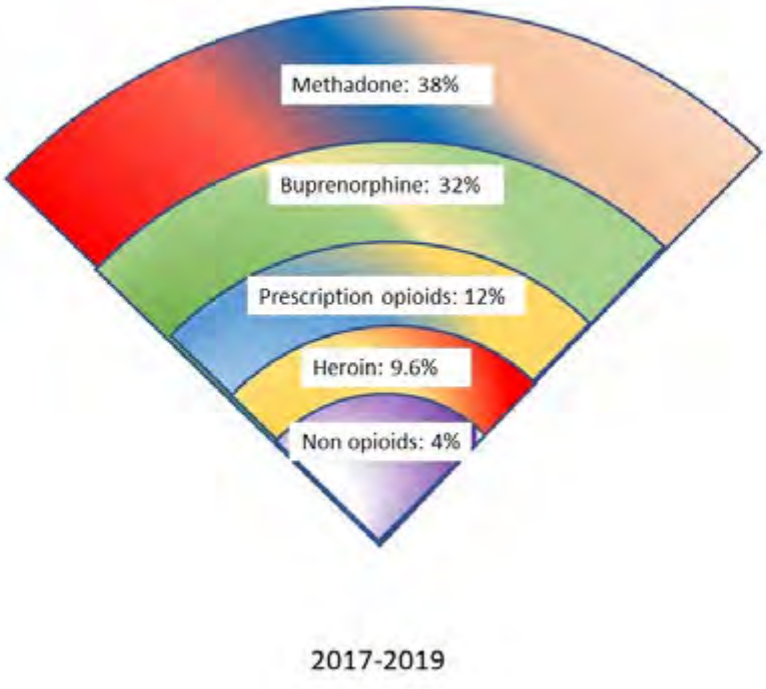
Background Neonatal abstinence syndrome (NAS) reached epidemic proportions in the last decade. Multiple interventions introduced at the federal and state levels to fight opioid crisis in the last decade include prescription drug monitoring programs, health initiatives to control opioid epidemic, guideline for prescribing opioids, and mandatory prescriber education guidance and other measures to fight opioid crisis across the country.
Objective Whether there is any change in the incidence or pattern of NAS in the last decade is the aim of the study
Design/Methods This retrospective analysis included neonates admitted in NICU at Montefiore St. Luke's Cornwall Hospital, Newburgh NY with a diagnosis of NAS. The diagnosis of NAS was suspected in a symptomatic neonate exposed to the substances in-utero. Confirmation of drug abuse increased from 3 sources to 4/5 sources during the last decade. (Figure 1). Infants were subjected to the treatment, when finnegan scores were ≥ 8 X 3, or ≥ 12 x 2, despite nonpharmacological interventions. The incidence and pattern of NAS neonates admitted from 2011 to 2013 were compared with neonates from 2017 to 2019. Neonates born < 36 weeks or birth weight < 2000 g were excluded from the study.
Results TThere were 31 neonates with NAS in the earlier years and 54 neonates in the later years. (Table 1) The incidence of NICU admissions with NAS varied from 4.9 in 2013 to 10.4 in 2017; however, there is no change in the incidence between the two groups or undividual years. (Figure 2) There is no difference in the spectrum of drugs used by the mothers during pregnancy. (Figure 3) There is also no difference with regards to the incidence of polysubstance abuse, higher methadone dose (> 200 mg), or the use of neuro-psychiatric medications bewteen the two groups. (Table 1)
Conclusion(s) There is a no change in the incidence or the pattern of NAS between the initial years and later years of the last decade, and longer time may be needed to see the response to the interventions introduced in the last decade.



The matrices for confirmation of drug abuse increased in later part of last decade



The incidence of NAS and various interventions introduced to in the last decade.



The spectrum of NAS in the later part of the last deacde

Characteristics		Early (2011-2013) group infants with NAS (32)	Late (2017-2019) group infants with NAS (54)
Birth weight (grams) Mean ± SD (range)		3080 ± 502 (2100-4450)	3014 ± 462 (2025-4215)
Sex	Boys	19 (59.3%)	33 (61.1%)
Gestation (weeks) Mean ± SD (range)		38.2 ± 1.6 (36 41)	38.1 ± 1.5 (35 41)
Race:	White	30 (93.7%)	50 (92.5%)
	African American	1 (3.1%)	1 (1.8%)
	Hispanic	1 (3.1%)	3 (5.5%)
Maternal age (years) Mean ± SD (range)		29.7 ± 4.4 (21 38)	29.1 ± 3.6 (23 38)
Pregnancy	Gravida: 1	7 (21.8%)	12 (22.2%)
	Gravida: 1-4	14 (43.7%)	25 (46.2%)
	Gravida: >4	11 (34.3%)	17 (31.4%)
Parity	Para 0	12 (37.5%)	17 (31.4%)
	Para 1-4	17 (53.1%)	36 (66.6%)
	Para >4	3 (9.3%)	1 (1.8%)
Insurance	Medicaid	29 (90.6%)	52 (96.2%)
Delivery	Vaginal delivery	23 (71.8%)	26 (48.1%)
	Cesarean section	8 (25%)	27 (50.0%)*
	Vacuum extraction	1(3.1%)	1 (1.8%)
Exposure	Methadone	5 (15.6%)	12 (22.2%)
	Methadone +	5 (15.6%)	8 (14.8%)
	Buprenorphine	7 (21.8%)	9 (16.6%)
	Buprenorphine+	2 (6.2%)	8 (14.8%)
	Prescription opioids	3 (9.3%)	1 (1.8%)
	Prescription opioids+	3 (9.3%)	7 (12.9%)
	Heroin	3 (9.3%)	1 (1.8%)
	Heroin +	3 (9.3%)	7 (12.9%)
	Other (non-opioid drugs)	1 (3.1%)	2 (3.7%)
Exposure	More than one drug abuse	16 (50%)	28 (51.8%)
	Methadone > 200 mg	0 (0.0%0	6 (11.1%)

Table: Characteristics of neonates and results of exposure to the substances *in-utero*

Abstract: 41

Peri-procedural Events in Neonates with Retinopathy of Prematurity Requiring Laser Photocoagulation in a Level IV NICU

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Background Laser photocoagulation is standard of care for treatment of threshold retinopathy of prematurity (ROP), and respiratory support is commonly achieved using endotracheal intubation and mechanical ventilation. There is no consensus on pain and airway management during laser treatment for ROP. Neonates are especially sensitive to many drugs including anesthetic agents, placing them at risk of life-threatening systemic complications and lingering respiratory depression.
Objective To describe the peri-procedural events of infants requiring laser photocoagulation for ROP.
Design/Methods Retrospective chart review of neonates requiring ROP exam between 1/2017 and 3/2019 at an academic level IV referral NICU. Baseline maternal and neonatal characteristics, ROP exam findings and ophthalmologic interventions were collected. Among those requiring laser treatment, cardiorespiratory index (CRI) scores, pain scores, need for intubation, and duration of respiratory support were obtained. Descriptive analysis and group comparisons were performed using Statistical Package for Social Sciences (SPSS) software version 24.
Results A total of 140 patients were included (Figure 1). Neonatal and maternal characteristics comparing laser and non-laser groups are depicted in Table 1. Twenty-seven patients (19.2%) received laser treatment; one was performed at an outside hospital. Eighty-five percent (22/26) required re-intubation with atropine, fentanyl and vecuronium, 3 were already intubated, and 1 had non-invasive ventilation with sedation. The mean NPASS pain scores after laser were 0.038 on Day 0, 0.096 on Day 1 and 0.12 on Day 2. The mean CRI scores on Day 0-2 were all 1 (no change from baseline).
Of the infants that required intubation, 36% had >1 intubation attempt and 16% had >1 extubation attempt (Table 2). The average duration of intubation following laser was 2.48 days, with 40% needing steroids and 16% racemic epinephrine to facilitate extubation. The mean total respiratory support time was 9 days post-laser photocoagulation.
Conclusion(s) Nearly all infants undergoing laser photocoagulation for ROP required rapid sequence intubation and continued respiratory support. All had minimal peri-procedural pain and stable cardiorespiratory index scores. Next steps include a quality

initiative to implement a moderate sedation protocol during laser treatment in an effort to reduce the need for intubation and associated complications.

Figure 1. Study Population

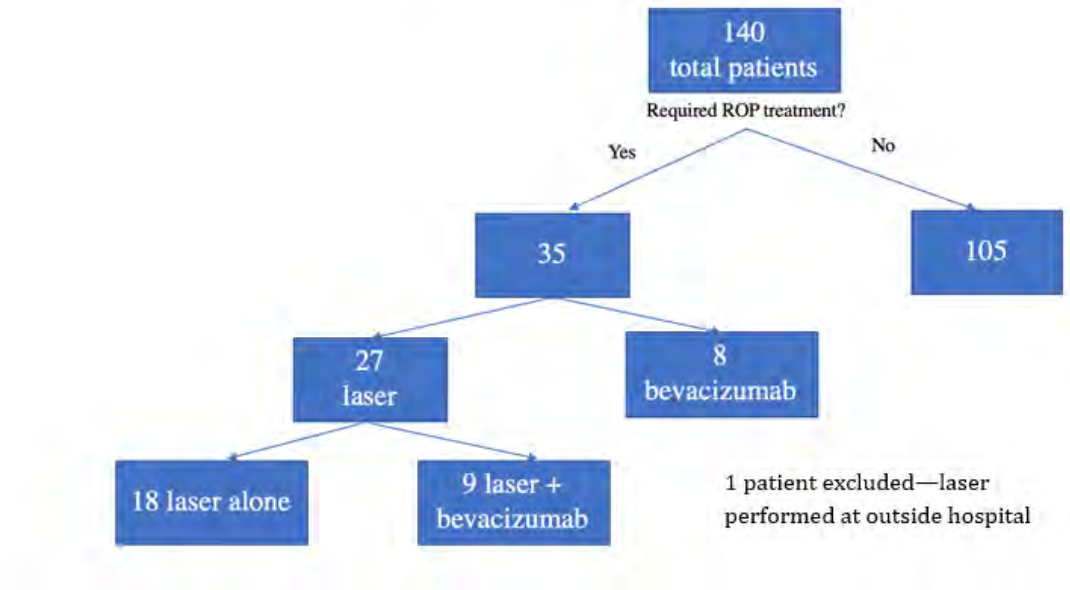

Figure 1. Study Population

Table 1. Neonatal and maternal characteristics

	Laser (n=27)	No laser (n=113)	p-value
Gestational age (mean, weeks)	25.1 ±1.4	27.5 ±4.4	0.004
Birthweight (mean, grams)	750 ±225	1083 ±447	<0.001
Gender (female, %)	59.3	52.5	0.529
Hispanic (%)	28.6	22.1	1
Small for gestational age (%)	14.8	16.8	1
Required delivery room resuscitation (%)	100	89.4	0.087
Pregnancy induced hypertension (%)	14.8	18.6	0.784
Placental chorioamnionitis (%)	18.5	8.8	0.167
Maternal antibiotics (%)	66.7	41.6	0.03
Antenatal steroids (%)	88.9	58.4	0.013
Surfactant (%)	85.2	59.3	0.024
Respiratory distress syndrome (%)	96.3	75.2	0.016
Late-onset sepsis (%)	18.5	11.5	0.343
Pneumothorax (%)	3.7	1.8	0.477
Seizures (%)	0	3.5	1
Bronchopulmonary dysplasia (%)	92.6	57.5	0.002
Intraventricular hemorrhage (%)	40.7	36.3	0.760
Patent ductus arteriosus (%)	77.8	38.1	<0.001
Necrotizing enterocolitis (%)	25.9	22.1	0.799
Intestinal perforation (%)	29.6	4.4	<0.001
Periventricular leukomalacia (%)	0	2.7	1
Most severe ROP exam			<0.001
Stage 0	3.7	53.9	
Stage 1	3.7	30.9	
Stage 2	59.3	8.9	
Stage 3	33.3	6.3	
Bevacizumab (%)	33.3	7.1	0.001
Death (%)	0	0.9	1

Table 1. Neonatal and Maternal Characteristics

Table 2. Laser group respiratory characteristics

Respiratory characteristics	Frequency
Pre-laser respiratory status (N=26)	
Room air	11 (42.3)
Nasal cannula	7 (26.9)
CPAP/NIPPV	5 (19.2)
Intubated	3 (11.1)
Pre-laser intubation attempts	
1	14 (63)
2	1 (4.5)
3	5 (22.7)
4	1 (4.5)
5	1 (4.5)
Extubation attempts	
0	3 (12)
1	18 (72)
2	4 (16)
Peri-extubation steroids	10 (40)
Racemic epinephrine	4 (16)
Total duration of intubation (mean, days)	2.48
Total duration of non-invasive respiratory support (mean, days)	8.99

Laser Group Respiratory Characteristics

Abstract: 42

Vibrotactile stimulation promotes physiologic stability but does not increase inter-feed sleep duration in opioid-exposed newborns

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Background Infants withdrawing from opioids at birth experience a range of symptoms, including altered sleep and pathophysiologic instability. Non-pharmacologic interventions remain the first-line treatment for infants experiencing withdrawal. Stochastic vibrotactile stimulation (SVS) used with standard supportive measures including pharmacotherapy has shown promise in helping opioid-exposed infants with Neonatal Abstinence Syndrome (NAS) attain physiologic stability, with decreased tachypnea, tachycardia and movement activity during periods of stimulation. Effects of SVS on sleep in opioid-exposed newborns are largely unexplored.
Objective This study investigated the efficacy of SVS stimulation for increasing inter-feed sleep duration and promoting physiologic stability among newborns being treated for opioid withdrawal.
Design/Methods Fourteen opioid-exposed newborns on ad-libitum feeds receiving pharmacologic treatment for NAS were studied at the UMass Memorial NICU. All infants received SVS through a vibrating crib mattress while supine over three consecutive inter-feed intervals. Seven infants (mean PMA 40.3 wks, 1.7 SD; 4 male) received stimulation in the second interval only (SVS OFF-ON-OFF; FNF); seven infants (39.9 wks PMA, SD 1.4; 3 male) received stimulation in the first and third intervals (SVS ON-OFF-ON; NFN).

Surface sensors were used to record cardiac, respiratory and movement activity. Quality of pulse-oximetry plethysmography signals and video also identified movement and wake periods.
Results There was no effect of stimulation on inter-feed interval duration regardless of order of stimulation. Mean respiratory and heart rate were each significantly reduced for SVS ON in the FNF protocol ($P<0.05$), but not in NFN protocol. There was significantly more movement activity during SVS OFF for FNF ($P<0.05$), but not for the NFN protocol.
Conclusion(s) In this small cohort, SVS did not increase sleep duration of inter-feed intervals, but did promote greater physiologic stability during the ON period in the FNF protocol. Lack of significant physiologic changes in the NFN protocol may be due to carry-over effects of SVS ON into the OFF period. Additional studies with larger sample sizes are needed to discern whether physiologic changes from SVS extend beyond the intervention.
Support: NIDA R21DA035355; Wyss Foundation, Harvard University

Abstract: 43
Communicating Neurologic Information to Shocked Parents in the Neonatal Intensive Care Unit
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Background Parents of infants with neurologic conditions are asked to understand unexpected, complex information with long-lasting implications.
Objective Our goal was to identify informational needs of mothers of infants with neurologic conditions.
Design/Methods We contacted parents by mail who had infants with neurologic diagnoses (post-hemorrhagic hydrocephalus, stroke, or hypoxic ischemic encephalopathy) and had expressed interest in improving NICU communication. We conducted semi-structured interviews with respondents and analyzed the interview transcripts using editing analysis to reveal major themes.
Results Thematic saturation was achieved after 10 interviews. Demographics of participants are summarized in Table 1; education and income were above population means. Two domains emerged: mothers' mindset (Table 2) and preferences for information delivery (Table 3). Mothers describe a state of shock with a focus on immediate needs and maintaining comfort and control during acute trauma. Tracking the details of their infant's care provides a sense of stability and hypervigilance became a form of parental advocacy. Parents prefer simple information delivery about immediate next steps and find it difficult to process data on long-term outcomes. Most do search for medical background on the internet, but they prefer personalized information from providers they know or other parents. They do not want to be told how to feel. Many negatively recall care providers pushing them to be pessimistic about the future or pressuring them to redirect care.
Conclusion(s) NICU providers must optimize mothers' comfort and sense of control to facilitate their processing complex neurologic information. Parents' aversion to complicated or distressing information, especially about long-term outcomes, must be balanced with a need for informed decision making. Future work will focus on finding ways to incorporate the perspectives of a wider range of parents, including fathers.

Table 1.) Demographics of Participants	
Maternal Characteristics	
Age at birth	31 (22 – 38)
Highest degree achieved	College (high school – graduate school)
Married	7 (70%)
First child	9 (90%)
Race	
White	8 (80%)
Black or African American	2 (20%)
Household Income	$100,000-150,000 (<$25,000 – >$150,000)
Infant Characteristics	
Diagnosis	
Post-hemorrhagic hydrocephalus	5
Hypoxic ischemic encephalopathy	3
Stroke	2
Length of stay	37.5 (6-311)
Female	5 (50%)
Singleton	10 (100%)

Table 2.) Parents Mindset	
State of shock	"Every single thing that happened to her in the NICU was brand new information to me, [something] that I didn't even know could happen to people."
Seeking comfort	"You don't want to leave your pod. I feel like it becomes your house…That was like my tiny little home. That's where everything was for me."
Seeking control	"That's my job to look at his nose and know that yesterday that tiny little [mark] wasn't there. I think that's why it turned into such a hypervigilant job for me."

Table 3.) Preferences for Information Delivery	
Prefer simple information	"All you need is very simple when you're looking at your [baby] lying there not doing well… the medical jargon becomes noise."
Human connection	"Anything having to do with infant neurology, everything is up in the air…If you want to share that information it has to be done with a liaison for someone to help explain. Because if someone is just staring at a screen and even if she gets the most effective vignette or story, or visual, it's really not going to make a difference if people can't internalize it and interpret it."
Avoid prescribing emotion	"The one thing I will never forget, and it wasn't the neurologist—it was the doctor on call—he looked at us and he goes, well it's not the best but it could've been worse. And I'll never forget that because here I am thinking of myself, I'm like, this is the best. Our son is alive."

Abstract: 44

An Innovative, Objective Tool for Assessing and Managing Narcotic Withdrawal in Newborn Infants

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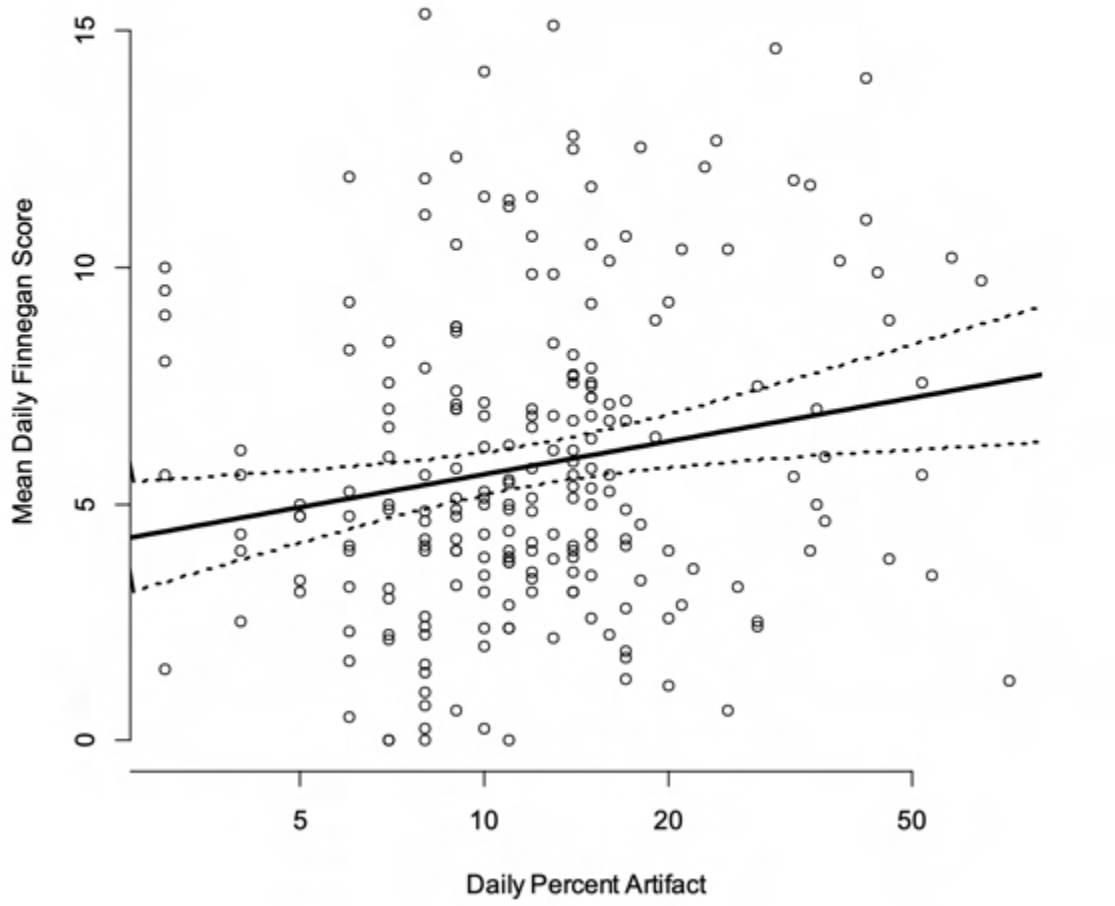
Background Neonatal abstinence syndrome (NAS) continues to be a major medical problem in newborn infants. Assessments of symptoms of NAS using scoring systems such as Finnegan scores (FS) are characteristically subjective, biased, and time consuming. In infants with NAS, the most reliable signs of withdrawal are likely to be movement related. Therefore, movement-related pulse oximetry artifact (MPOA) can potentially be used as an objective, reliable and efficient tool to assess and manage NAS.
Objective To evaluate quantitative estimates of MPOA and compare them with FS in the assessment and management of NAS.
Design/Methods We performed a retrospective, observational study in 14 infants admitted to the Neonatal Intensive Care Unit (NICU) with NAS between June 2016 and December 2018. Cardiorespiratory data including pulse oximetry were continuously recorded during the hospitalization in all infants. Demographic data and daily FS were obtained from the electronic medical record. Percentage of daily MPOA was estimated using an automated algorithm that compared heart rate (HR) from the cardiac monitor with the pulse oximeter-derived pulse rate (PR). If the difference between the HR and the 1-second lagged PR was greater than 1 standard deviation from the 1-hour smoothed HR, data were considered to be movement artifact. This methodology has previously been described in the literature.
Results Demographic characteristics of the study population are included in Table 1. MPOA data was non-normally distributed; therefore, analyses were performed using the log-transformed data. Repeated measures analyses demonstrated a significant positive correlation between the percentage of daily artifact and the daily FS when the day of life was controlled for in the model ($p = 0.007$) (Figure 1). For each percent change in artifact, FS increased by 0.08, CI [0.079, 0.081]. Gestational age, the use of pharmacotherapy, the infant's urine toxicology at birth, and the maternal urine toxicology at delivery were not associated with FS.
Conclusion(s) MPOA obtained from distorted heart rate waveforms may be a more objective and reliable measure for assessing and managing narcotic withdrawal in newborn infants.

Figure 1: Correlation Between Mean Daily FS and Log-Transformed Percent Daily Artifact



Demographic Characteristics of the Study Population

Sex	Male: 50% (7/14) Female: 50% (7/14)
Mean Gestational Age, Weeks (SD)	37.3 (2.0)
Infant Urine Toxicology at Birth	*Positive: 71.4% (10/14)* Cocaine: 20% Opiates: 10% Methadone: 20% Polysubstance: 50%
Maternal Urine Toxicology at Delivery	*Positive: 92.8% (13/14)* Cocaine: 7.7% Opiates: 15.4% Methadone: 23.1%

	Polysubstance: 46.2% Marijuana: 7.7%
Pharmacotherapy	*Treatment: 64.3% (9/14)* Morphine: 77.8% Morphine, Clonidine: 11.1% Morphine, Methadone: 11.1%
Mean Length of Stay, Days (SD)	32.0 (21.0)

Abstract: 46

Salivary Cortisol Correlates with Electrocorticol Power on High Density EEG of Hospitalized Preterm Infants

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Background The hypothalamic-pituitary-adrenal (HPA) axis mediates hormone production in response to stress beginning in the second trimester of gestation. Salivary cortisol levels reflect HPA activity and is a commonly used biomarker of stress response. Both prenatal and early childhood stress exposure are associated with altered neurodevelopment. Preterm infants spend a critical period of development, equivalent to the fetal third trimester, in the neonatal intensive care unit (NICU), a potentially stressful environment. High density electroencphalography (HD EEG) can serve as an early marker of neurodevelopment in preterm infants.

Objective To quantify the relationship between salivary cortisol and HD EEG in hospitalized preterm infants participating in the NICU-HEALTH cohort study.

Design/Methods NICU-HEALTH enrolls infants born between 28 and 33 weeks gestation at birth. Among the study procedures, paired saliva specimens are collected weekly for cortisol analysis and a 30 minute sleep-coded 32-lead HD EEG is done in the week prior to discharge. Of the enrolled participants, 63 had at least one analyzable saliva sample collected in the week prior to acceptable EEG. EEG is screened for artefact and EEG power was computed per minute and averaged over sleep states. Simple linear regression was used to investigate the relationship between the log power of individual EEG frequencies and the log of the minimum cortisol in the week prior to EEG. Multivariate models accounting for sex, gestational age, race (white/non-white), multiple gestation and chronological age at time of EEG were subsequently carried out.

Results In this preliminary analysis of 63 participants, univariate analysis was significant ($P < 0.05$) spanning all frequencies from 2 – 21 Hz with effect size ranging from 0.31 to 0.46. Multivariate analysis was significant in 10 frequencies falling into the theta, alpha and beta bands with effect size ranging from 0.34 to 0.37.

Conclusion(s) Salivary cortisol was associated with HD EEG electrocortical power, particularly at alpha and theta frequencies, in this small population of preterm infants. This implies that NICU-based stress may impact preterm infant neurodevelopment.

Association of salivary cortisol and HD EGG electrocortical power by frequency

Neural Oscillation	Frequency (Hz)	Bivariate β (std. error)	Bivariable p vaule	Multivariable β (std. error)	Multivariable p value
Delta	1	0.25 (0.13)	0.05	0.20 (0.14)	0.14
Delta	2	0.31 (0.14)	0.03	0.27 (0.15)	0.07
Delta	3	0.33 (0.15)	0.03	0.30 (0.15)	0.06
Theta*	4*	0.37 (0.15)*	0.02*	0.35 (0.16)*	0.03*
Theta*	5*	0.35 (0.15)*	0.02*	0.34 (0.15)*	0.03*
Theta*	6*	0.36 (0.15)*	0.02*	0.34 (0.15)*	0.03*
Theta*	7*	0.36 (0.15)*	0.02*	0.33 (0.16)*	0.04*
Alpha	8	0.35 (0.15)	0.02	0.31 (0.16)	0.06
Alpha*	9*	0.38 (0.15)*	0.01*	0.33 (0.16)*	0.04*

Alpha*	10*	0.41 (0.15)*	0.01*	0.35 (0.17)*	0.04*
Alpha*	11*	0.44 (0.15)*	<0.001*	0.37 (0.17)*	0.03*
Alpha*	12*	0.44 (0.15)*	<0.001*	0.37 (0.16)*	0.03*
Alpha*	13*	0.46 (0.15)*	<0.001*	0.37 (0.17)*	0.03*
Beta	14	0.39 (0.15)*	0.01	0.32 (0.16)	0.05
Beta	15	0.37 (0.14)	0.01	0.31 (0.16)	0.06
Beta	16	0.38 (0.14)	0.01	0.31 (0.17)	0.06
Beta*	17*	0.40 (0.14)*	0.01*	0.34 (0.17)*	0.04*
Beta	18	0.36 (0.15)	0.02	0.31 (0.16)	0.07
Beta	19	0.36 (0.15)	0.02	0.31 (0.17)	0.08
Beta	20	0.36 (0.15)	0.02	0.32 (0.17)	0.06
Beta	21	0.35 (0.15)	0.02	0.30 (0.17)	0.08
Beta	22	0.28 (0.16)	0.08	0.24 (0.17)	0.18
Beta	23	0.23 (0.16)	0.15	0.19 (0.17)	0.28
Beta	24	0.22 (0.16)	0.18	0.15 (0.18)	0.39
Beta	25	0.20 (0.16)	0.23	0.14 (0.18)	0.43
Beta	26	0.16 (0.17)	0.32	0.11 (0.18)	0.52
Beta	27	0.13 (0.17)	0.44	0.06 (0.18)	0.73
Beta	28	0.15 (0.17)	0.39	0.08 (0.18)	0.65
Beta	29	0.11 (0.17)	0.52	0.04 (0.18)	0.81

* Significant at $p < 0.05$; Note: 0-1 Hz and 30 Hz not shown due to lack of space; salivary cortisol levels and HD EEG power are not significantly associated at these frequencies.

Abstract: 47

Heart Rate Variability: A Physiological Biomarker of Neonatal Stress Resilience?

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Background The neonatal intensive care unit is a stressful environment. We know that preterm infants experience stress, but it is not clear to what degree early-life stress impacts long-term outcomes in this population. An established biomarker of stress response in preterm infants is salivary cortisol, which reflects hypothalamic-pituitary-adrenal (HPA) axis activity. A speculated physiological biomarker of resilience to stress is heart rate variability (HRV), which reflects sympathetic nervous system activity. These two systems modulate stress response.

Heart-rate variability is the time fluctuation between consecutive heart beats. In adults, high HRV has been linked to cognitive resilience and low HRV has been linked to difficulty coping with stress. We hypothesize that higher HRV is associated with lower cortisol levels in preterm infants.

Objective To quantify the relationship between HRV and salivary cortisol in hospitalized preterm infants.

Design/Methods This pilot cohort includes 30 moderately preterm infants enrolled in the parent NICU-HEALTH study, a prospective preterm environmental health birth cohort. For each infant, we calculated the standard deviation of the normal (10th to 90th percentile) RR interval (SDNN index) from a minimal artifact 5-minute electrocardiogram recording and measured time-matched salivary cortisol levels. Geometric means of the log values of salivary cortisol and SDNN were included in a mixed linear effects model adjusted for gestational age and sex. Mixed effects accounted for repeat measures per participant and per family as some participants are twins.

Results Preliminary analysis of 82 paired salivary cortisol and SDNN measurements from the first 12 participants have been completed. In this small preliminary analysis, cortisol did not significantly correlate with HRV (β -0.62, P 0.16).

Conclusion(s) Heart rate variability may be a valid physiological biomarker of preterm infant resilience to stressors in the NICU.

Preliminary analysis limited by small sample size shows that further investigation is required to determine the relationship between cortisol and HRV in preterm infants. Data from the full pilot cohort including 30 participants and more than 350 paired HRV and salivary cortisol measurements will be presented at PAS 2020.

Abstract: 48

Maternal obesity is a Risk Factor For Increased Body Mass Index (BMI) and Increased Body Fat Deposition in Male Neonates.

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Background Maternal obesity (MO) impacts fetal/neonatal health by offering an altered genetic biochemical and hormonal intrauterine milieu. The adverse effects extend beyond intrauterine and neonatal life into adulthood & include obesity, hypertension dyslipidemia, & cardiovascular disorders.
Fetal growth anomalies are a known complication of MO. 18% of infants born to obese mothers are large for gestational age (LGA). A 2.5 times higher risk of the delivery of LGA neonates in obese gravidas is independent of gestation associated diabetes mellitus (GDM). Abnormalities in fetal-neonatal growth & anthropometric parameters that might contribute to anomalous growth patterns in LGA offsprings of obese mothers are not specifically investigated. Such information might help in understanding the pathogenesis of their long term complications.
Objective To investigate the effects of maternal body mass index (BMI) on neonatal BMI, arm fat area (AFA), & relevant clinical variables.
Design/Methods Retrospective study. Variables: Newborn- gestational age (GA), race, sex, birth weight (BW), crown-heel length, BMI (kg/m^2), AFA (AFA=6.4883+0.059 X weight, mm^2; (Verma, 2015) Maternal- standard data, BMI, GDM, hypertension, substance abuse, chronic illness, medications. Statistics: Multivariate linear regression analyses. Maternal BMI analyzed as a continuous & categorical predictor using 2 analytical models & 2-tailed p values.
Results (Tables 1-3, n=396). Increasing maternal BMI was significantly & directly associated with neonatal AFA (B = 1.11, SE = 0.20, $p < 0.001$, Table – 3) & BMI (B = 0.05, SE = 0.01, $p<0.001$, Table -2). Male gender was independently & directly associated with AFA (B 6.5, SE 2.4, $p < 0.01$, Table -3). Increasing GA was associated with both increasing neonatal BMI (B = 0.22, SE = 0.06, $p < 0.001$, tables 2 &3) & AFA (B8.3 SE 1 , $p<0.001$). Moderate (BMI 35-39.99 kg/m^2) & severe obesity (BMI >39.99 kg/m^2) were each significantly associated with increasing AFA (B=11.70, SE=5.52, $p<0.05$; B=24.82, SE=5.79, $p<0.001$) and increasing neonatal BMI (B=0.62, SE=0.29, $p<0.05$; B=0.97, SE=0.30, $p<0.01$).
Conclusion(s) Moderate and severe maternal obesity leads to the delivery of neonates with increased body fat deposition and BMI. Male infants born to obese mothers are independently at risk for increased adiposity. Such a neonatal sex dichotomy may be a precursor of gender-specific diseases of adulthood. Maternal obesity should be managed more vigorously in the male fetus.

Table 1

Clinical Characteristics of the mothers and infants

Variable	M (SD)	n (%)
Neonate		
Gestational age (weeks)	38.8 (1.20)	
Sex (male)		188 (47.5)
Race/ethnicity		
White		43 (10.9)
Black		65 (16.4)
Hispanic		235 (59.3)
Other		53 (13.4)
Mode of birth (Cesarean)		110 (27.8)
Maternal		
Age (years)	29.5 (6.54)	
Body mass index [kg/m^2, mean]	32.1 (5.83)	
18.30-24.99		28 (7.1)
25.00-29.99		129 (32.6)
30.00-34.99		137 (34.6)
35.00-39.99		60 (15.2)
>39.99		42 (10.6)
Chronic disease (yes)		25 (6.3)
Hypertension (yes)		22 (5.6)
Gestational diabetes (yes)		29 (7.3)
Outcome		
Neonate body mass index	12.6 (1.26)	
Neonate arm fat area	201.3 (25.74)	

Note: M=mean, SD=standard deviation;

Clinical Characteristics of the mothers and infants

Table 2

Linear Regression Analysis Neonatal BMI (kg/m^2)

Variable	Model 1 B (SE)	Model 2 B (SE)
Neonate		
Gestational age (weeks)	0.22 (0.06)***	0.22 (0.06)***
Sex (male)	0.07 (0.13)	0.07 (0.13)
Maternal BMI (kg/m^2) (continuous)	0.05 (0.01)***	
18.30-24.99		Reference
25.00-29.99		0.11 (0.26)
30.00-34.99		0.12 (0.26)
35.00-39.99		0.62 (0.29)*
>39.99		0.97 (0.30)**
Chronic disease (yes)	-0.15 (0.26)	-0.19 (0.27)
Hypertension (yes)	-0.10 (0.28)	-0.09 (0.28)
Gestational diabetes (yes)	0.19 (0.25)	0.24 (0.25)
Intercept	2.93 (2.24)	4.31 (2.25)

Note: B=unstandardized beta, SE=standard error, *p<0.05, **p<0.01, ***p<0.001

Linear Regression Analysis Neonatal BMI (kg/m^2)

Table 3

Linear Regression Analysis for Neonatal Arm Fat Area (mm^2)

Variable	Model 1 B (SE)	Model 2 B (SE)
Neonate		
Gestational age (weeks)	8.52 (1.05)***	8.38 (1.07)***
Sex (male)	6.42 (2.39)**	6.57 (2.41)**
Maternal BMI (kg/m^2) (continuous) 18.30-24.99 25.00-29.99 30.00-34.99 35.00-39.99 >39.99	1.11 (0.20)***	 Reference 5.24 (4.98) 7.48 (4.99) 11.70 (5.52)* 24.82 (5.79)***
Chronic disease (yes)	-0.87 (5.00)	-0.18 (5.12)
Hypertension (yes)	-6.15 (5.26)	-5.99 (5.30)
Gestational diabetes (yes)	4.54 (4.69)	5.09 (4.74)
Intercept	-175.0 (42.84)***	-143.50 (43.03)**

Note: B=unstandardized beta, SE=standard error, *p<0.05, **p<0.01, ***p<0.001

Linear Regression Analysis for Neonatal Arm Fat Area (mm^2)

Abstract: 49

Is there a national consensus on MRSA surveillance and decolonization strategies in Neonatal Intensive Care Units?

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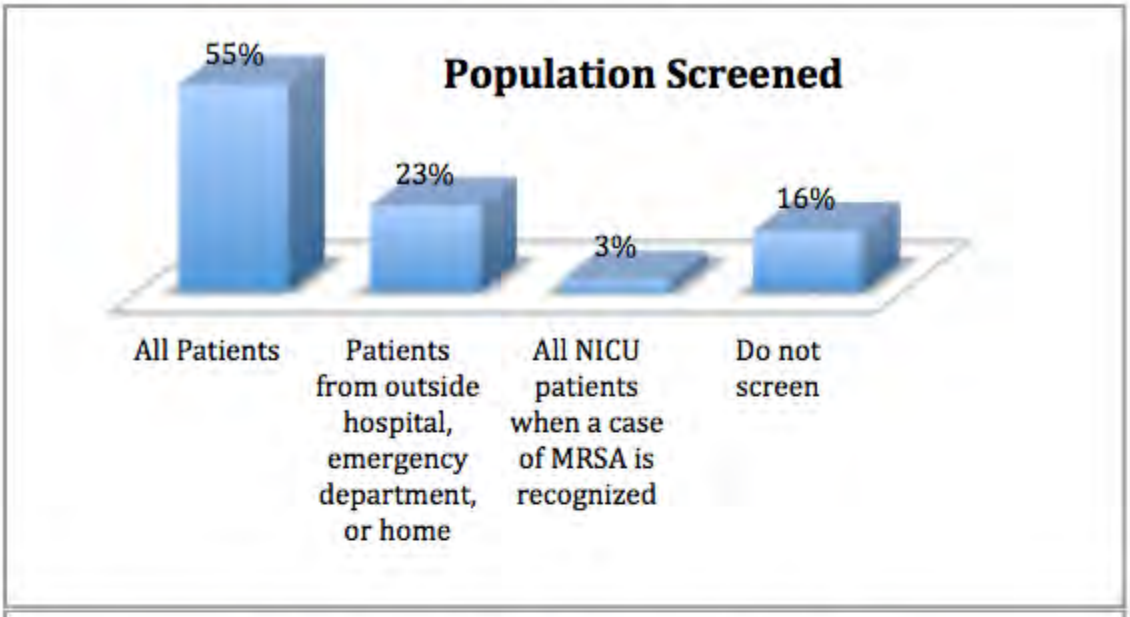
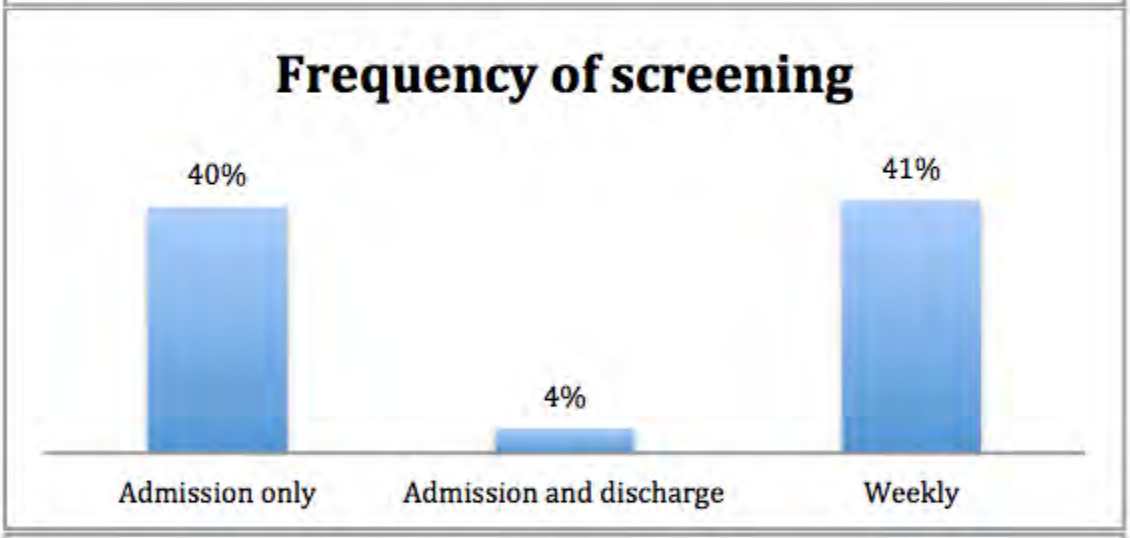
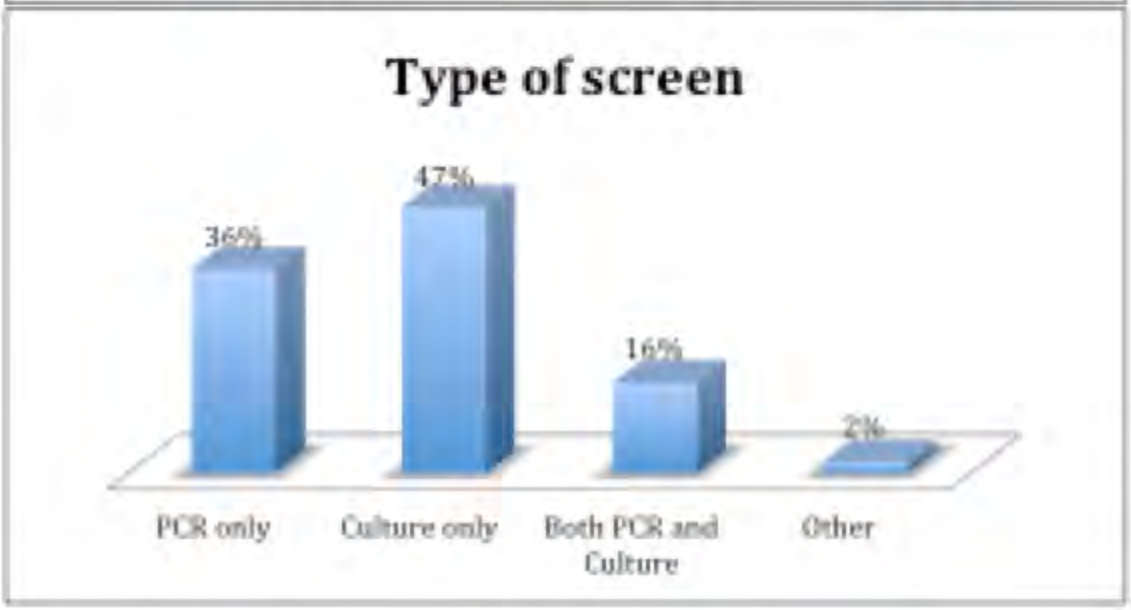
Background Methicillin resistant staphylococcus aureus (MRSA) infection in neonates is associated with significant morbidity, mortality and increased hospital cost. Multiple studies have shown that these infections are often preceded by colonization. No consensus has been established for MRSA surveillance and decolonization strategies. Published comparisons of the accuracy and value of different surveillance protocols are lacking.
Objective To evaluate the neonatal MRSA screening methods and decolonization practices across multiple different NICUs nationally.
Design/Methods An anonymous survey was distributed electronically to members of the AAP section of Neonatal-Perinatal Medicine (SoNPM) in May 2019. The data was collected and summarized in REDCap. IRB approval obtained prior to the data collection.
Results There were a total of 279 respondents in our national survey. A 96% of the respondents were from Level III or Level IV NICUs, of which, 63% work in training institutions. In regards to screening for MRSA, 55% of NICUs screen all patients, 23% perform selected screenings of patients admitted from an outside hospital, emergency department or home, and 16% do not perform

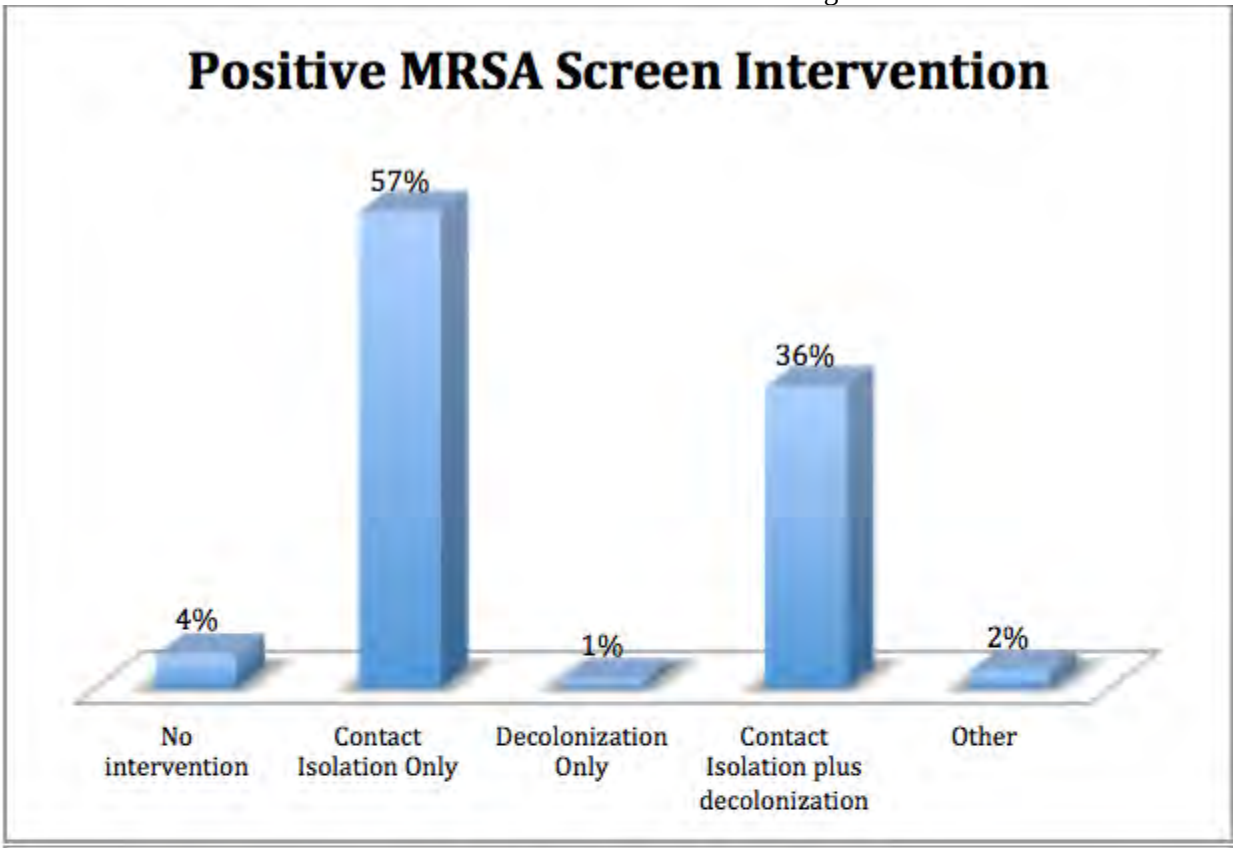
routine screening. Screenings are performed by various modalities including 36% units screen by MRSA PCR only, 49% screen by culture only and 15% screen using both PCR and culture. The most common site for screening is the nares (65%). The frequency of screening is about the same for screening at admission only or weekly (40 and 41% respectively). For those infants that screen positive, 36% of respondents intervene by placing infant on contact isolation and perform decolonization with most respondents using Mupirocin (57%) or Mupirocin plus Chlohexidine (25%) as a treatment strategy. More than 99% of the units surveyed, do not screen healthcare providers. However, only 33% of respondents felt that MRSA screening is necessary or helpful and 20% felt that decolonization is helpful.

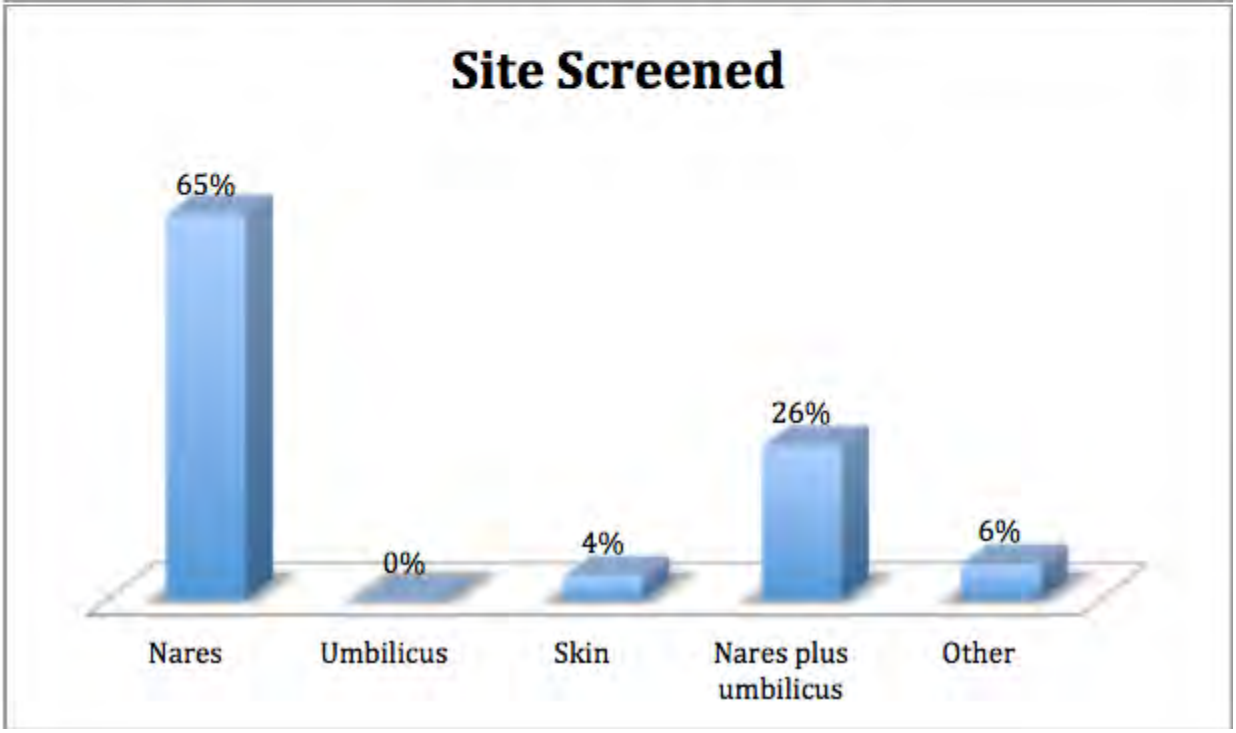
Conclusion(s) There is a wide variability on neonatal MRSA surveillance practices and decolonization strategies. Future studies are needed to determine an effective, common strategy.

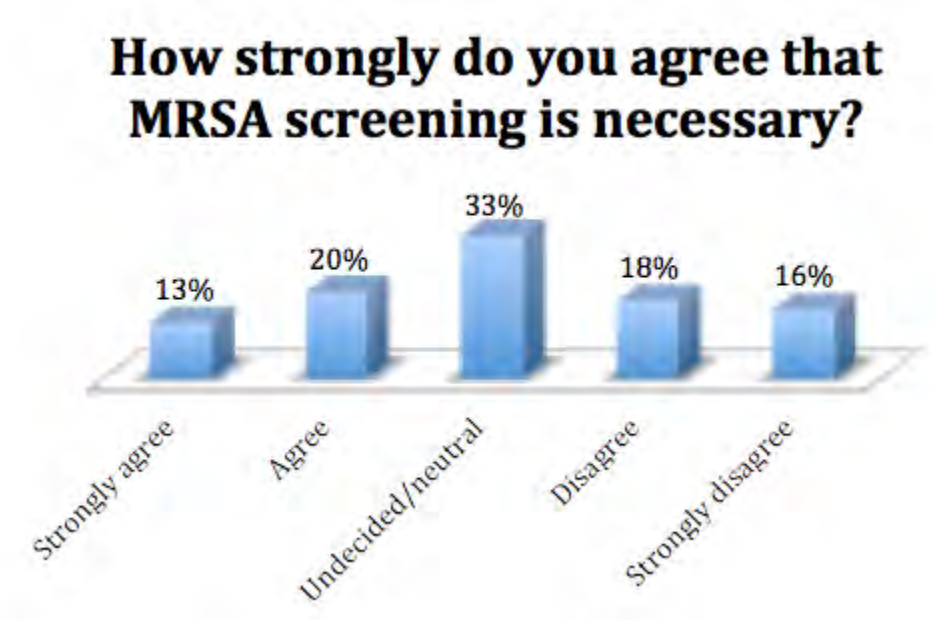

Population Screened
55%
23%
3%
16%
All Patients
Patients from outside hospital, emergency department, or home
All NICU patients when a case of MRSA is recognized
Do not screen


Frequency of screening
40%
4%
41%
Admission only
Admission and discharge
Weekly


Type of screen
36%
47%
16%
2%
PCR only
Culture only
Both PCR and Culture
Other


Positive MRSA Screen Intervention
57%
36%
4%
1%
2%
No intervention
Contact Isolation Only
Decolonization Only
Contact Isolation plus decolonization
Other


Site Screened
65%
26%
0%
4%
6%
Nares
Umbilicus
Skin
Nares plus umbilicus
Other



Abstract: 50

Leukocytosis in Newborns with Isoimmunization

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Background Maternal-fetal blood group incompatibility is a common hemolytic disease of the fetus and newborn. Obtaining serum bilirubin and complete blood count (CBC) to detect early jaundice and anemia in newborns (NB) with blood group incompatibility is a common practice. Although leukocytosis in absence of clinical signs is a poor predictor of sepsis, NB with white blood cell (WBC) count >30,000/uL are suspected to have neonatal sepsis. Broad-spectrum and prolonged antibiotic use are associated with increase antimicrobial resistance rates and altered microbiome affecting immune system, growth and development.
Objective To explore risk factors of leukocytosis in NB with ABO/Rh incompatibility and positive Coomb's test.
Design/Methods This retrospective case control study was performed at Flushing Hospital Medical Center analyzing NB born between January 2013 to January 2019 with ABO/Rh incompatibility and positive Coomb's test. NB ≤ 36 weeks gestation age (GA), prolonged rupture of membranes, chorioamnionitis and Group B streptococcus positive mother were excluded from the study. Data extracted from EMR included gender, ethnicity, GA, mode of delivery, gravida, birth weight (BW), NB hemoglobin, platelet count, reticulocyte count, total bilirubin, maternal comorbidities and medications. Cases (WBC ≥30,000/uL) and controls (WBC <30,000/uL) were compared using chi-square, $p<0.05$ was considered significant.
Results Of the 604 NB charts reviewed with ABO/Rh incompatibility and positive Coombs test, 334 met inclusion criteria. A total of 86 (26%) cases and 248 (74%) controls were compared (1:3 ratio). Female gender ($p= 0.003$), GA > 40 weeks ($p= 0.002$) and NB with bilirubin level > 9 mg/dl ($p = 0.007$) were independently more common among cases compared to controls (Table). Antenatal maternal anemia was more common among controls, $p=0.03$. BW, mode of delivery, NB hemoglobin, platelet and reticulocyte counts, maternal comorbidities and medications were not statistically different for cases and controls.
Conclusion(s) In our small sample, a NB with isoimmunization and leukocytosis is more likely to be female, of higher GA and higher total bilirubin level at six hours of life. Knowledge of these risk factors can help clinicians manage leukocytosis and influence antibiotic stewardship.

Table: Leukocytosis in Newborns with Isoimmunization

Variables	Cases (86) n (%)	Control (248) n (%)	χ^2	p value *
Gender (female)	56 (65)	121 (49)	6.83	0.003
GA >40 weeks	31 (36)	50 (20)	12.44	0.002
Maternal anemia	4 (5)	32 (13)	4.52	0.03

Total bilirubin (> 9 mg/dl)	5 (6)	5 (2)	12.19	0.007

*p <0.05 was significant

Abstract: 51

A QI Project to Prevent Intraventricular Hemorrhage by Minimizing Invasive Procedures

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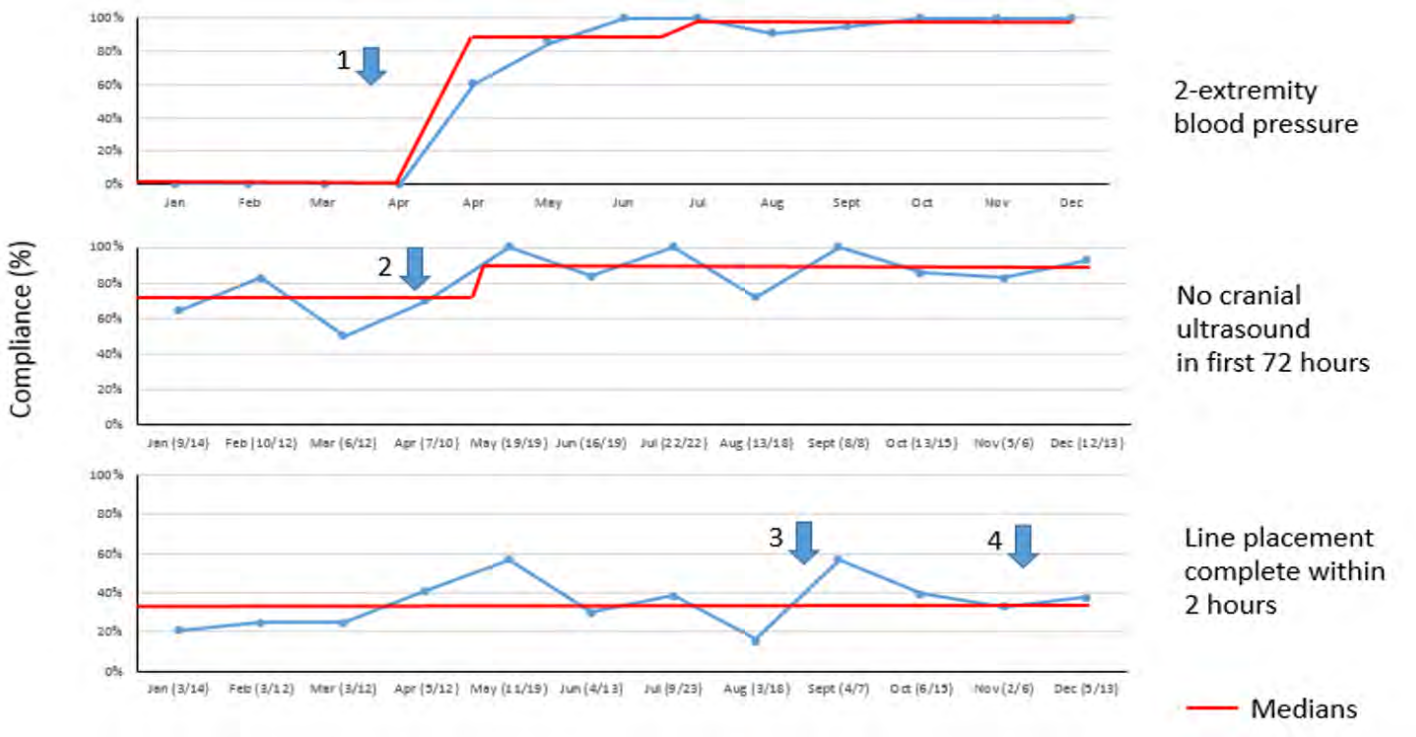
Background Minimal stimulation during the first 3 days reduces the incidence of intraventricular hemorrhage (IVH), a major cause of morbidity in preterm infants. Review of practices in our NICUs identified medical procedures (routine performance of 4-extremity blood pressure on admission and cranial ultrasonography in the first 3 days) that caused significant agitation but rarely yielded actionable data in the absence of a specific indication. In addition, umbilical lines are often essential for preterm infants admitted to NICU, but their placement is potentially associated with agitation, blood pressure fluctuation, and hypothermia. Baseline data revealed that median time to completion of umbilical line placement in our NICUs was > 2 hrs.
Objective For preterm infants (< 32 weeks): 1) replace the existing practice of 4-extremity blood pressures with 2-extremity blood pressures on admission; 2) eliminate routine performance of cranial ultrasonography in the first 3 days of life; and 3) reduce time to umbilical line placement to < 2 hrs.
Design/Methods A multidisciplinary IVH Prevention Team was created at our Level III and IV academic NICUs. During the 1st intervention, staff were instructed on the low utility of 4-extremity blood pressures and early cranial sonography during daily briefs for each shift and by e-mail. For the 2nd intervention, evidence-based presentations on the limited utility of head ultrasounds in the first days were disseminated to the medical faculty. For the 3rd intervention, the target of < 2 hrs for umbilical line placement was publicized on rounds, at briefs, and by e-mail, as well as real-time coaching. For the 4th period, champions at each unit were designated to reinforce the targets with individuals and small groups.
Results Performance of 2-extremity blood pressures on admission and avoidance of cranial ultrasonography in the first 3 days increased rapidly after interventions 1 and 2. However, the median of 34% of lines placed within 2 hrs has not improved.
Conclusion(s) Practice change (2-extremity blood pressure, fewer sonograms) can be accomplished rapidly by education alone when it is associated with improved workflow and clear demonstration of a consensus motive (IVH prevention). Introduction of an IVH prevention minimal stimulation program using these high-yield targets has improved the visibility of the initiative and morale. We speculate that this will contribute to the acceptability and success of process changes to address additional goals, including timely and efficient line placement.



Abstract: 52

A NICU quality improvement project to assess compliance to neonatal red blood cell transfusion guidelines

Cara Lee[2], Alexandre Medina[1], Sripriya Sundararajan[1]

[1]Pediatrics/Division of Neonatology, University of Maryland School of Medicine, Baltimore, Maryland, United States, [2]University of Maryland School of Medicine, Baltimore, Maryland, United States

Background There is wide variation in RBC transfusion practice among the newborn intensive care unit (NICU) providers. There was a critical knowledge gap to determine the compliance to RBC transfusion guidelines following its implementation based on hematocrit, respiratory support and fractional inspired oxygen, at University of Maryland NICU. Our hypotheses was that compliance to the newly established guidelines will reduce both the transfusion rate and transfusion associated morbidities, necrotizing enterocolitis (NEC) and retinopathy of prematurity (ROP) in the very low birth weight (VLBW) preterm population.

Objective Measure compliance to RBC transfusion guidelines among the multiple NICU provider teams (resident vs. neonatal nurse practitioners (NNP) and determine transfusion associated morbidities including NEC, ROP, and patent ductus arteriosus (PDA) during the pre- (2016) and post- (2017) implementation periods of RBC transfusion guidelines in VLBW infants.

Design/Methods Following IRB approval, retrospective medical record review on 318 VLBW infants from Jan 1 2016 thru Dec 31, 2017 was performed. Provider teams received monthly education on neonatal RBC transfusion guidelines and dissemination of evidence based blood transfusion practices in the NICU. Birth weight, gestational age, number and volume of RBC transfusion, and outcomes including ROP, NEC, sepsis and PDA were determined. Differences in proportion were analyzed by Chi-square and t-tests.

Results Of the 158 transfused cohort, preterm infants <28 weeks and <1000g received the most the largest number of transfusions in the first 2 weeks of life (mean 10.8 vs.2.8 and mean 9.1 vs. 2.3) compared to infants >28 wks and >1000g (Table 1). The mean compliance to RBC transfusion guidelines for VLBW infants improved from 2016 to 2017 by 17.89% (Fig 1and was greater in the resident compared to the NNP team (86% vs. 75%, $p<0.05$, Table 2). Despite minimal change in rate of development of NEC, sepsis, and PDA, both type 1 and type 2 ROP and ROP treated by laser showed a decrease between 2016 and 2017 (Fig 2).

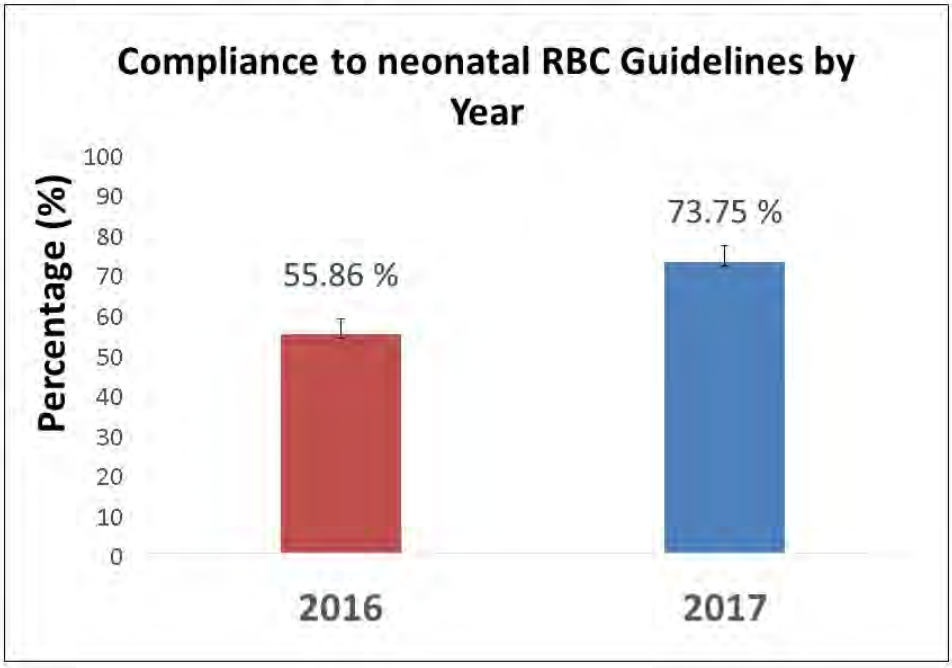
Conclusion(s) Improved compliance rates between the two study periods demonstrate that education and utilization of neonatal RBC transfusion guidelines was effective. Decreasing trends in the development of ROP may be associated with reduced use from improved compliance to RBC transfusion guidelines. Disparity in compliance rates among NICU providers indicate a need for continued education.

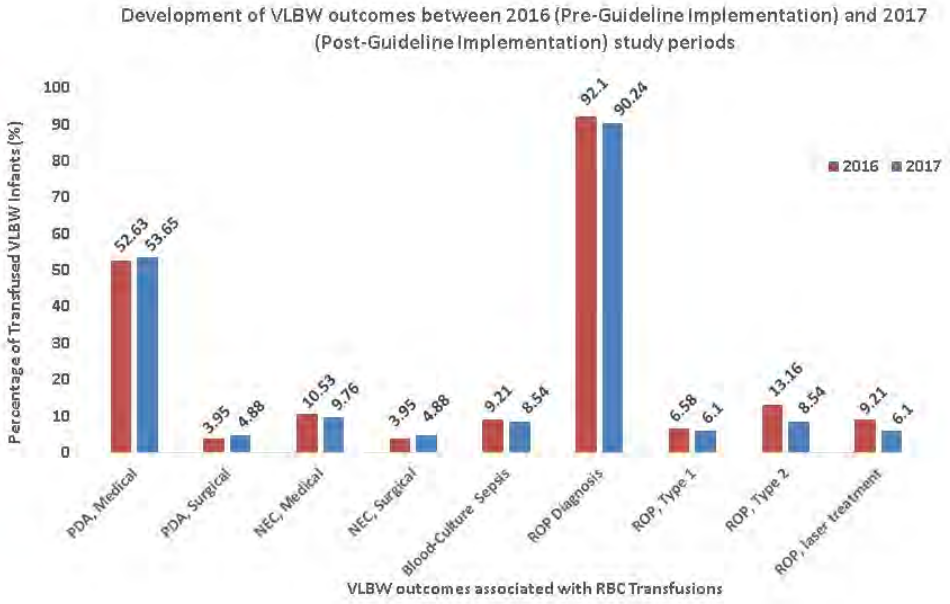
Table 1: Demographics of the preterm infant study cohort

		2016 (*n=76*)		2017 (*n=82*)		
		# Infants	Mean # transfusions	# Infants	Mean # transfusions	p-value
Total # Infants Tx		76	6.6	82	6.3	0.75
GA	< 28 wks	37	10.8	52	8.0	0.11
	28-32 wks	32	2.8	27	3.5	0.44
	32-36 wks	6	2.3	3	1.7	0.53
	36+ wks	1	2	0	0	N/A
Birth Weight	<500g	0	0	2	7.5	N/A
	501-1000g	48	9.1	50	8.8	0.83
	1001-1500g	28	2.3	30	2	0.40
	>1500g	0	0	0	0	N/A
DOL of Tx	< 7 days	38	10.6	45	8.9	0.30
	7-14 days	13	2.7	13	5.1	0.27
	15-21 days	12	3.4	8	2	0.17
	22-28 days	4	1.5	3	1	0.20
	>28 days	9	4.7	13	2.4	0.81

Table 2: Transfusion compliance characteristics in study cohort based on provider teams
The data are presented as N (%)

	2016 (*n=76*)			2017 (*n=82*)				
	# Tx events	# compliant events	% compliant	# Tx events	# compliant events	% compliant	% change compliance	p-value
Total	505	292	57.8	516	408	79.07	21.25	<0.05*
PURPLE Team	272	157	57.7	267	225	84.3	26.5	<0.05*
ORANGE Team	233	135	57.9	249	183	73.5	15.5	<0.05*
Residents (purple)	196	118	60.2	187	161	86.1	25.9	<0.05*
NNPs (orange & purple)	309	174	56.3	329	247	75.1	18.8	<0.05*





Abstract: 53

Evaluating the Effectiveness of a Formal Care Path for Discharge of Infants with Bronchopulmonary Dysplasia (BPD) from the NICU: A Pilot Study

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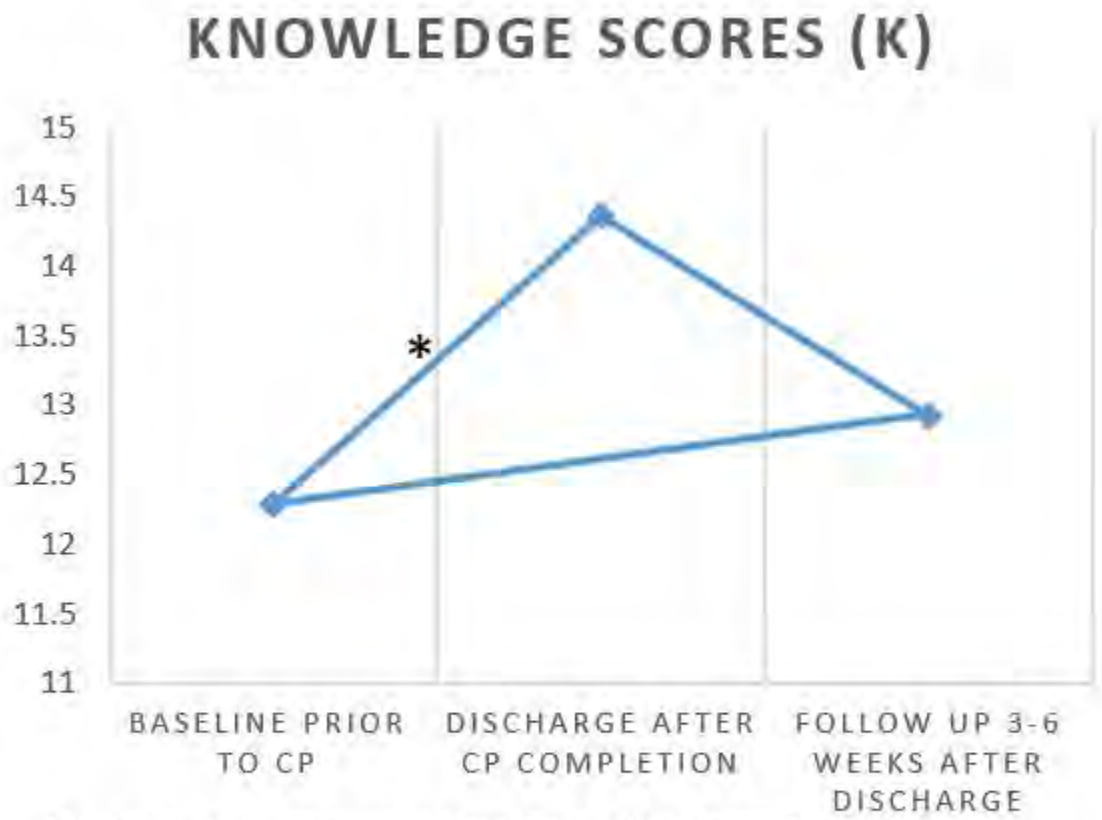
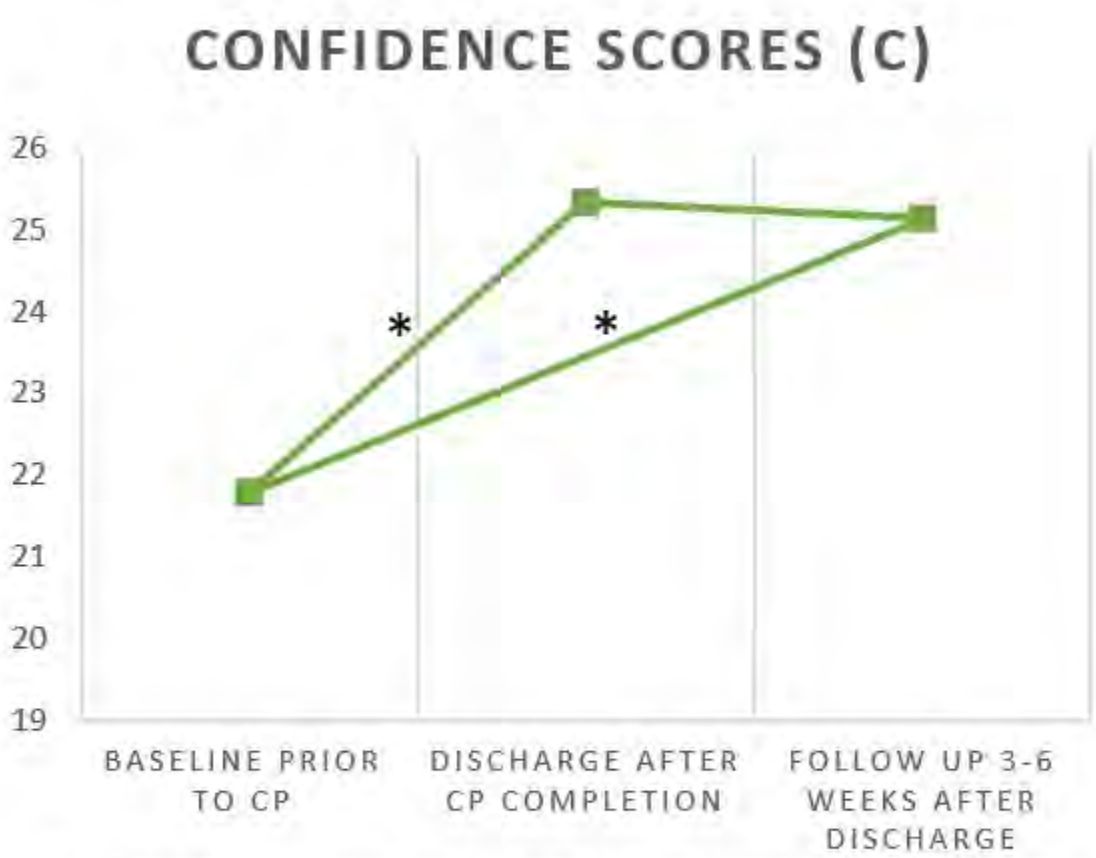
Background Infants with BPD pose a challenge to caregivers even after hospital discharge because of their complex needs. There are no formal plans of care shown to improve parent's knowledge and confidence in care of their infant with BPD.
Objective This pilot study aims to assess the effectiveness of a BPD Care Path (CP) in improving parents' knowledge and confidence to care for their infants with BPD after discharge.
Design/Methods A prospective pre-post educational intervention observational study was conducted at the Connecticut Children's NICU in Farmington, CT. Parents were surveyed using a convenience sampling approach before and after participating in a formal BPD CP which included:
a) an initial multidisciplinary BPD CP meeting with a written care-plan and a checklist of tasks was provided to the parents;
b) gradual introduction of knowledge material by caregivers, specifically nursing, and
c) documenting of parents' competencies by providers for all checklist items prior to infant's discharge.
The baseline questionnaire survey of knowledge (K) and confidence (C) was done with consenting parents when their infant with BPD was deemed likely to be discharged home on medication. The formal BPD CP was started 2-4 weeks before anticipated discharge. Post BPD CP surveys were administered at discharge and again at clinic follow-up in 3-6 weeks. Surveys were scored with points for correct and negative points for incorrect answers to multiple choice questions. Graded points were given for degrees of confidence expressed using Likert scales. Using non-parametric Friedman's Q and Wilcoxon Signed-Ranks tests, knowledge (K), confidence (C), and total composite (T) scores of responses were compared at baseline, discharge and follow up.
Results Of 19 infants with BPD whose parents qualified, 17 were enrolled and surveyed. Three participants did not complete the discharge survey and two were lost prior to follow up. There was a significant difference between K, C and T across the three periods of response. (*Table*) K, C and T at discharge were significantly higher than the K, C and T scores at baseline prior to BPD CP. C and T at follow up 3-6 weeks after discharge were not significantly different than at discharge, but remained significantly higher than baseline pre-BPD CP scores. (*Figures*)
Conclusion(s) A formal CP for parents of infants with BPD can increase knowledge and confidence prior to discharge without a significant drop in knowledge retention at follow up.

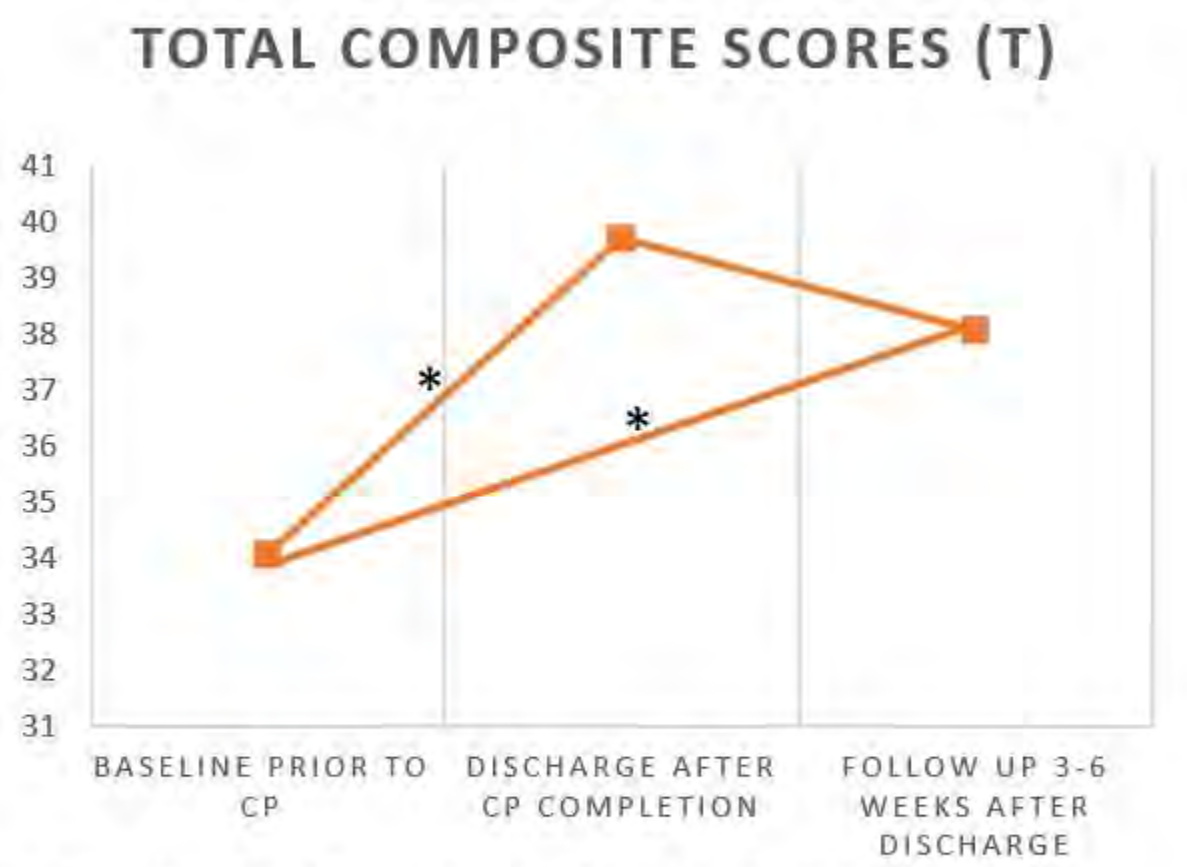
	Baseline prior to CP			Discharge after CP completion			Follow up 3-6 weeks after discharge			Friedman Test Analysis	
	N	Mean	Range of Scores	N	Mean	Range of Scores	N	Mean	Range of Scores	Q Value	P Value
Knowledge Score (K)	17	12.29	9-16	14	14.36	12-16	12	12.92	4-16	12.465	0.001
Confidence Score (C)	17	21.79	17.6-26.6	14	25.36	22.2-27	12	25.15	22.4-26.6	15.500	<0.0001
Total Composite Score (T)	17	34.08	29-40	14	39.71	35.2-42.8	12	38.06	28-42.2	13.167	0.001



*A Wilcoxon Signed-Ranks test indicated that knowledge scores at discharge were significantly higher than at baseline (Z=-3.088,p=0.002). Knowledge scores at follow up were not significantly different than at baseline (Z=-1.787,p=0.074) or discharge (Z=-1.140, p=0.254).



* A Wilcoxon Signed-Ranks test indicated that confidence scores at discharge were significantly higher than at baseline (Z=-3.297,p=0.001). Confidence scores at follow up were not significantly different from discharge (Z=-0.197, p=0.844), but remained significantly higher than baseline (Z=-2.550, p=0.011).



*A Wilcoxon Signed-Ranks test indicated that the total composite score (T) at discharge was significantly more than at baseline (Z=-3.297, p=0.001) as was the follow up T score compared to baseline (Z=-2.276,p=0.023). The follow up T score was not significantly different than the discharge T score (Z=-0.903, p=0.367).

Abstract: 54

NICU Antibiotic Stewardship

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Background There is a worldwide concern of the overuse of antibiotics in the Neonatal ICU (NICU) impacting antibiotic resistance. Increase antibiotic exposure changes the neonatal microbiome resulting in increased rates of confirmed infections, mortality, necrotizing enterocolitis (NEC) and prolonging the average length of stay. The NICU needs to establish proper antibiotic usage ranges and clarify elements and factors for antibiotic use. By adopting an Antibiotic Stewardship Protocol/Guideline (antibiotic time-out, early onset sepsis (EOS) calculator and enhance observations algorithm), the NICU will be able to decrease the Antibiotic Usage Rate (AUR) in ≥34-week infant admissions.

Objective To decrease AUR in infants ≥34-weeks admitted to the NICU by using antibiotic time-out, early onset sepsis calculator and enhance observations algorithm.

Design/Methods A Quality Improvement (QI) initiative to develop an Antibiotic Stewardship Protocol/Guideline containing an evaluation of pre-AUR from April 2019-October 2019 through chart audits by the number of patient days with exposure to antibiotics per 100 days. Following the chart audits, an education to implement an antibiotic time-out, to utilize the EOS calculator and to use the enhance observation algorithm will be utilized for infants of mothers with chorioamnionitis, prolong rupture of membranes (>18 hours) regardless of Group B Streptococcus (GBS) status, GBS and mother with inadequate prophylaxis and late preterm infants whose mothers had inadequate prophylaxis. Once the education is completed, the post education AUR will be followed for 3 months and then 6 months. A comparison of the pre-AUR and the post-AUR will be determined to observe the change in AUR percentage.

Results A decrease of 15% in AUR in infants ≥34-weeks admitted to the NICU by using antibiotic time-out, early onset sepsis

calculator and enhance observations algorithm.
Conclusion(s) Decrease AUR by 15% in infants ≥34-weeks during their NICU stay.

Abstract: 55
Diagnosis and Treatment of Osteopenia of Prematurity: Perspectives from Neonatologists
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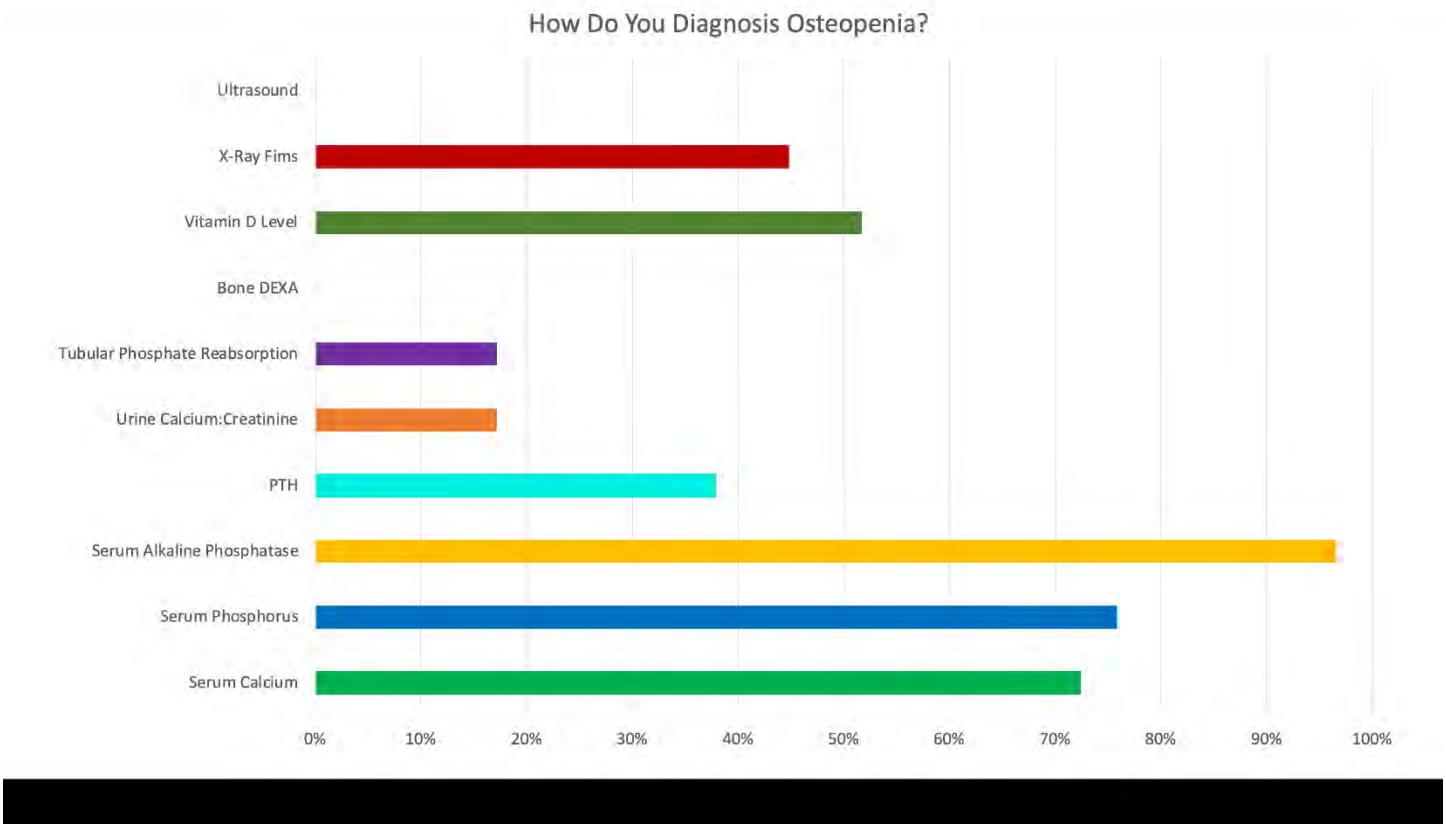
Background In the Neonatal Intensive Care Unit (NICU), premature infants are at risk for numerous complications of prematurity including but not limited to osteopenia. The incidence of osteopenia is estimated to be as high as 40% in some studies. In April 2013, the American Academy of Pediatrics Committee on Nutrition released a statement reinforcing the significance of optimizing nutrition in preterm neonates to improve bone health. However, there is a paucity of literature on the consensus of screening, diagnosis and management of osteopenia leading to a wide variety in practices among physicians and continued high morbidity among this fragile patient population.
Objective To understand osteopenia evaluation and treatment practices, analyze various correlations between osteopenia and other diagnoses and ultimately propose a protocol for best practice.
Design/Methods This pilot study consists of a cross sectional survey of neonatologists (n=29) from five core NICUs in our health system via an electronic email survey and a retrospective chart review through electronic records of patients admitted to our level IV NICU from 1/1/2015 to 12/15/2018 with a diagnosis of osteopenia, metabolic bone disease or rickets.
Results 88.66% (26/29) respondents from 4 level III and 1 level IV NICU screen infants born at <32 weeks GA and birth weight of ≤ 2000 grams. 51.72% (15/29) of respondents do not have a standardized protocol for screening premature infants for osteopenia in their unit. 75% of respondents do not have a standard management approach to this prevalent disease. 98% of respondents use serum calcium, phosphorous and alkaline phosphatase and 40% use vitamin D levels to screen and manage this population. Other lab values are used sparingly. 65% test lab values bimonthly after 1 month of life. All use Vitamin D to treat but vary in dosing from 200-1000 IU daily. 65.52% (19/29) respondents consult endocrine services with abnormal lab values to aid in management.
Conclusion(s) Osteopenia is prevalent in NICUs and screening methods vary widely among institutions and even within the same institution as most do not have a standardized approach for screening or management. Specialists are frequently consulted to aid in management with abnormal labs as clinicians are not comfortable managing on their own. Just as feeding protocols have proven to decrease the incidence of Necrotizing Enterocolitis (NEC), we propose a protocol for early screening, diagnosis and treatment to reduce morbidity related to this pervasive disease.



Abstract: 56

Sibling neonatal deaths due to X-linked myotubular myopathy

Jane Chung, Romal K. Jassar
Newborn Medicine, Tufts Medical Center, Boston, Massachusetts, United States

History (including chief complaint, history of present illness and relevant past and family medical history) A male infant was born at 37 4/7 weeks to a 22 year old mom with no significant past medical history. There was polyhydramnios noted one week prior to delivery but pregnancy otherwise was unremarkable. He was born via repeat C-section, and he emerged limp with no respiratory effort or movement. He was brought immediately to the warmer and heart rate was noted to be around 100 but apneic. PPV was given with no chest rise and endotracheal intubation also did not result in any lung air movement. Heart rate quickly dropped to less than 60 and a full neonatal code was initiated with increasing PPV pressures, chest compressions, epinephrine and saline resuscitation. Duration of code was 20 minutes. Notably, this mom had a previous birth one year ago at 36 2/7 weeks gestation that presented the same way as his brother, requiring a full code in the delivery room without any response.

Physical examination findings (including vital signs) Autopsy report showed a small for gestational age baby at the 7th percentile with no dysmorphic features or brain abnormalities. The significant findings were pulmonary hypoplasia (23g; expected for 38 weeks: 34.4-62.4g) and disorganized airways. Autopsy of the brother who died also showed a SGA infant at the 6th percentile with significant pulmonary hypoplasia (24g, expected for 36 weeks EGA: 32.9-57.3g).

Laboratory or Diagnostic imaging or Procedures Microarray was sent which was normal but the whole exome genome sequencing showed an X-linked mutation in the MTM1 gene which causes myotubular myopathy.

Final Diagnosis The brothers had X-linked myotubular myopathy which is a rare congenital disorder that can be classified as mild to severe based on ventilator support with the most severe being caused by mutations in the MTM1 gene, located on Xq28. The usual presentation is the severe form and they present with the inability to have any spontaneous respirations in the neonatal period along with profound hypotonia. Most infants with this condition die within the first year of life due to respiratory failure and there is currently no known treatment for this disease.

Abstract: 57

It's Not in My Head: Fever of Unknown Origin, Progressive Back Pain, and an Ataxic Gait in an Immunocompetent Boy

Rebecca Miller[1], Sinduja Lakkunarajah[2]
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History (including chief complaint, history of present illness and relevant past and family medical history) A healthy 5-year-old male with no past medical history, presented with 3 weeks of worsening back pain and intermittent tactile fevers, along with 1 week of acute onset ataxia and left head tilt. His back pain worsened over time and he started to develop difficulty walking. Several days prior to the initial ER visit, there was a painful lump in the left groin, that was tender to touch, without erythema, fluctuance or drainage.
In the ER, his vitals were stable and his exam was notable for generalized tenderness to palpation along the entire back, shotty inguinal lymphadenopathy, a 2cmx3cm tender lump to the left inguinal region, and a 3mm pustule to the left heel with some purulent drainage. Ultrasound obtained of the left inguinal lump showed an enlarged lymph node without a fluid collection. Basic labs and spinal x-rays were obtained and found to be within normal limits. The family was given the initial diagnosis of lymphadenitis and discharged to home.
He continued to have back pain not relieved by Ibuprofen. Over the course of two weeks, his back pain worsened, he was unable to walk, and required scheduled analgesia. He developed a head tilt and antalgic gait, and was referred to the ER by his PMD. The family denied travel history, trauma to the back or legs, extremity weakness, paresthesias, B symptoms, headaches, abnormal eye movements, abdominal pain, vomiting, diarrhea, urinary or bowel incontinence, changes in appetite, or sick contacts. Of note, there is a one-year-old cat in the home, but denied scratches or bites.
Pertinent PMhx and FHx: Negative
Physical examination findings (including vital signs) T 99.2F, HR 124, RR 20, BP 92/58, 98% RA
-Full range of motion of all extremities, no tenderness to palpation along back
-Ataxic gait and left-sided head tilt with ambulation, bilateral foot clonus
-2cmx2cm mass to left upper thigh, mobile, non-tender, without erythema, edema, warmth, or discoloration
Laboratory or Diagnostic imaging or Procedures -Platelets of 535
-CRP of 8.3 mg/L
-ESR of 58 mm/hr
-UA WNL
-LDH 359, normal uric acid
-CXR WNL
-KUB showed calcifications in the LUQ
-Abdominal U/S showed multiple small hypoechoic lesions within the spleen
-Non-contrast head CT showed no evidence of midline shift or hydrocephalus
-EBV, CMV, B. henselae antibodies and QuantiFERON-Gold pending
-CT spine showed minor soft tissue changes around T2 vertebra, and MRI spine showed hyper-intensity of the T2 vertebral body
Final Diagnosis Final Diagnosis: Bartonella Osteomyelitis and Hepatosplenic Disease
Bartonella henselae titres: IgG > 1:1024, IgM > 1:20

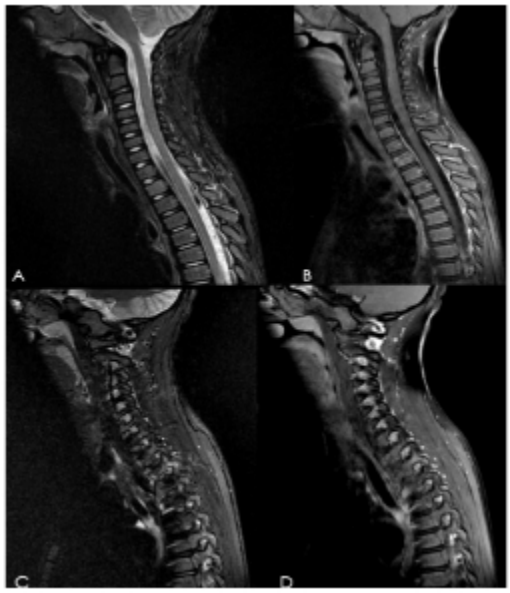


Figure 1.

Abstract: 58

A Case of Incidentally Discovered Heterotaxy Syndrome in the Setting of Heteroresistant E. coli Pyelonephritis

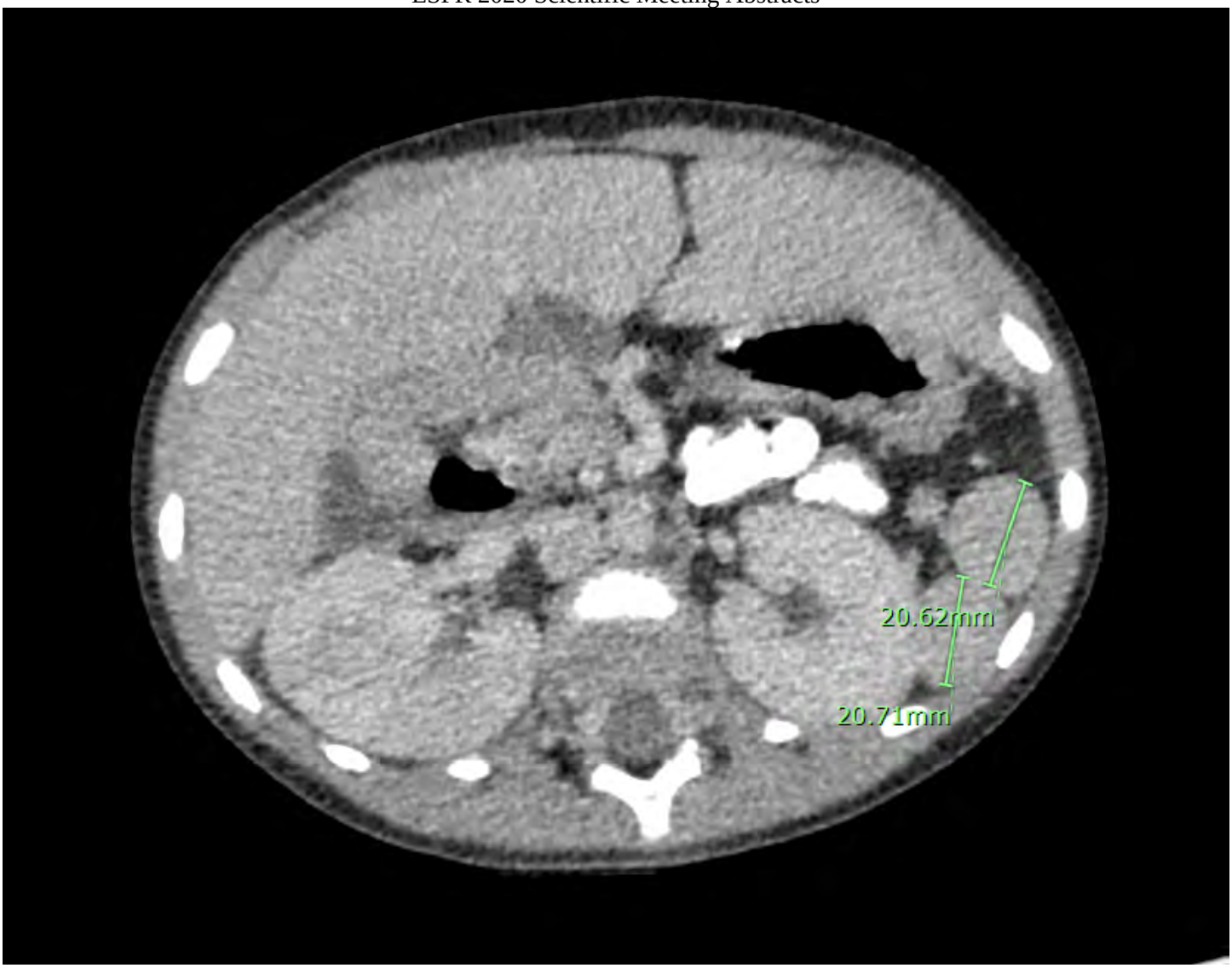
Filza Kaukab, Timothy Kita, James M. Klatte
baystate medical center, Chicopee, Massachusetts, United States

History (including chief complaint, history of present illness and relevant past and family medical history) XX is a 5 y/o F with ASD s/p patch repair in infancy, congenital left-sided hydronephrosis at birth (since resolved) and recent 1st UTI with ESBL *E.coli*, with persistent abdominal pain and fevers despite 10 days of treatment with TMP-SMX, and diagnosed with pyelonephritis based on CT imaging, UA and repeat urine culture.

Physical examination findings (including vital signs) Temp: 103.5°F
HR: 103
General: well-appearing
Back/abdomen: suprapubic and RLQ tenderness, right-sided abdominal guarding, no CVAT
Cardiac: systolic ejection murmur, loudest over the LUSB

Laboratory or Diagnostic imaging or Procedures LABS
UA: + nitrites, 1+ leukocytes, 31 WBCs/hpf, hyaline casts
Electrolytes, LFTs, BUN, creatinine: normal
IMAGING
Retroperitoneal ultrasound: bladder debris, no hydronephrosis
CT abdomen: polysplenia with ~7 splenules, enlarged right kidney with perinephric fat stranding and multiple abnormal hypodensities, azygous continuation of the IVC

Final Diagnosis XX was diagnosed with heterotaxy syndrome given her ASD, polysplenia, azygous continuation of her IVC and heteroresistant *E. coli* pyelonephritis. She received meropenem, with transition to amoxicillin/clavulanate at hospital discharge. Other lab testing included: HIV 4th generation Ab-Ag: negative, FISH for 22q11.2: negative; IgM, IgA, IgG and IgG subclasses: normal for age, Ab responses to diphtheria, tetanus, and *H. influenzae* vaccines: normal, Ab response to PCV13 vaccine: poor (appropriate responses to only 2/12 measured PCV13 serotypes); expanded T cell subsets/phenotyping: mild T cell lymphopenia for age (absolute CD4+ T cells = 370/μL, CD8+ T cells = 221/μL), quantitative T cell subset phenotyping: normal absolute counts and relative frequencies for naïve and activated CD4+ and CD8+ T cell subsets - though expansion of CD4+ and CD8+ memory T cells noted; lymphocyte proliferation to PHA and PWM mitogens, *Candida* and tetanus toxoid antigens: normal. PPSV23 vaccine was given prior to discharge. Tc-labelled, heat-altered, autologous erythrocyte scintigraphy with SPECT-CT imaging showed increased metabolic activity in the left upper quadrant at 1 hour of testing (consistent with normal splenic function). XX was seen as an outpatient by Nephrology, who advised obtaining a VCUG in the near future.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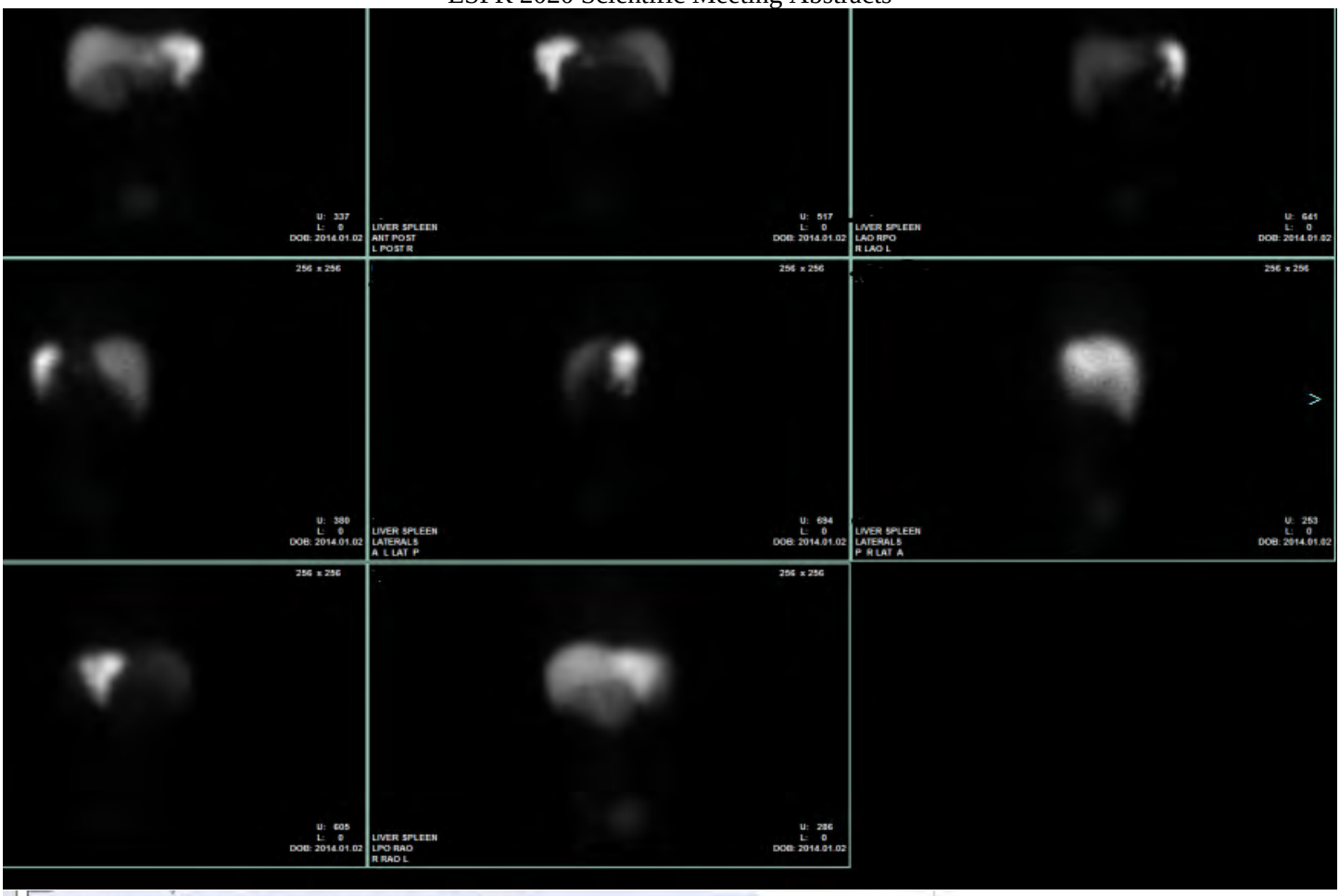

FLOW CYTOMETRY/IMMUNOPHENOTYPING	
Cd4/Cd8 Ratio	2.490 H
CD45 Lymph Abs Count, Flow	1,705
% CD4 (Helper T Cells)	32 *
Abs CD4 (Helper T Cells)	553 * L
% CD8 (Suppressor T Cells)	13 L
Abs CD8 (Suppressor T Cells)	222 L
% CD3 (T Cells)	52 L
Abs CD3 (T Cells)	881 L
% CD19 (B Cells)	32 H
Abs CD19 (B Cells)	549 L
% CD16+CD56 (NK Cells)	15
Abs CD16+CD56 (NK Cells)	257 *

	Initial *E. coli* urine culture	Repeat *E. coli* urine culture
	Interpretation	
ampicillin	R	R
ampicillin/sulbactam	S	I
amoxicillin/clavulanate	S	S
cefazolin	R	S
cefepime	R	S
ceftriaxone	R	S
ciprofloxacin	R	S
gentamicin	S	R
levofloxacin	R	S
meropenem	S	S
nitrofurantoin	S	S
piperacillin/tazobactam	S	S
TMP-SMX	S	R
tetracycline	S	R

Abstract: 59

Testicular tumor in a newborn.

Barbara Baglietto, Zonia G. Barbosa, Martha Perez
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 newborn was evaluated in the newborn nursery after an uneventful vaginal delivery born to a 28-year old multipara with an uncomplicated pregnancy and normal prenatal sonograms. Family history was negative for urogenital malformations or malignancies.

Physical examination findings (including vital signs) On physical exam at birth, patient was found to have left testicular enlargement. A round 2 x 2cm non-tender solid mass was palpated at the site of the left testicle. The right testicle was palpated within the inguinal canal.

Laboratory or Diagnostic imaging or Procedures A color doppler ultrasound revealed a 2.1x2.4x1.7 cm mixed cystic and solid lesion, no normal left testicular parenchyma was identified (Image 1). There was internal vascularity (Image 2), with no calcifications and small lymph nodes were noted in the left groin measuring up to 0.3 cm. This mixed solid and cystic mass was highly concerning for a testicular neoplasm. The right testicle was visualized in the right inguinal canal, with normal morphology (Image 3).

Final Diagnosis The patient was transferred to a center with pediatric urology, where a left radical orchiectomy was performed. Histopathology was consistent with a yolk sac tumor. No metastases were identified. Alpha fetoprotein measurements decreased from 117.7ng/ml post-operatively to 32.2ng/ml at four months of life. After one year, patient remains well without evidence of metastases on imaging.

Differential diagnosis of testicular masses in newborns are varied and include hydrocele, solid tumors, testicular torsion and torsion of the testis appendix, inguinal hernia, hematocele, orchitis, meconium periorchitis, supernumerary testis, and adrenal/splenic ectopic rests. Early identification and prompt diagnosis are essential in order to avoid complications. Ultrasound can identify lesions that are potentially malignant, such as in this case.

Given the rarity of yolk sac tumors, there are no universal treatment guidelines. The trend in current literature supports deferring chemotherapy for patients diagnosed at an early stage and treated with radical orchiectomy. A close follow-up and serial measurement of alpha fetoprotein is crucial.

Yolk sac tumors usually present in children between one and two years of age. Few cases of neonatal presentation have been reported in the literature. This is an unusual case of a testicular yolk sac tumor presenting at birth.

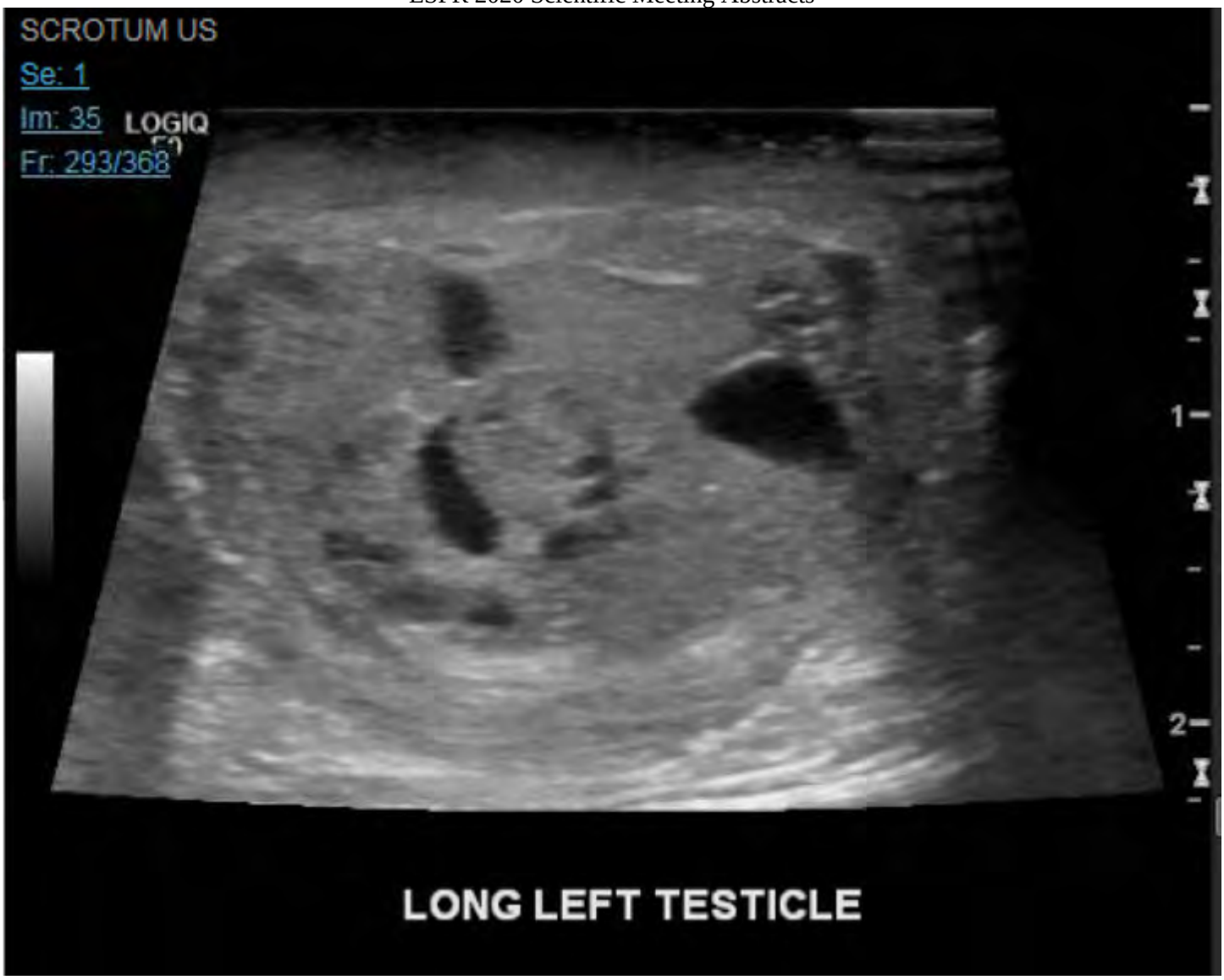

Image 1. *Ultrasound of left scrotum shows a 2.1 x 2.4 x 1.7 cm mixed cystic and solid lesion, no normal left testicular parenchyma observed.*

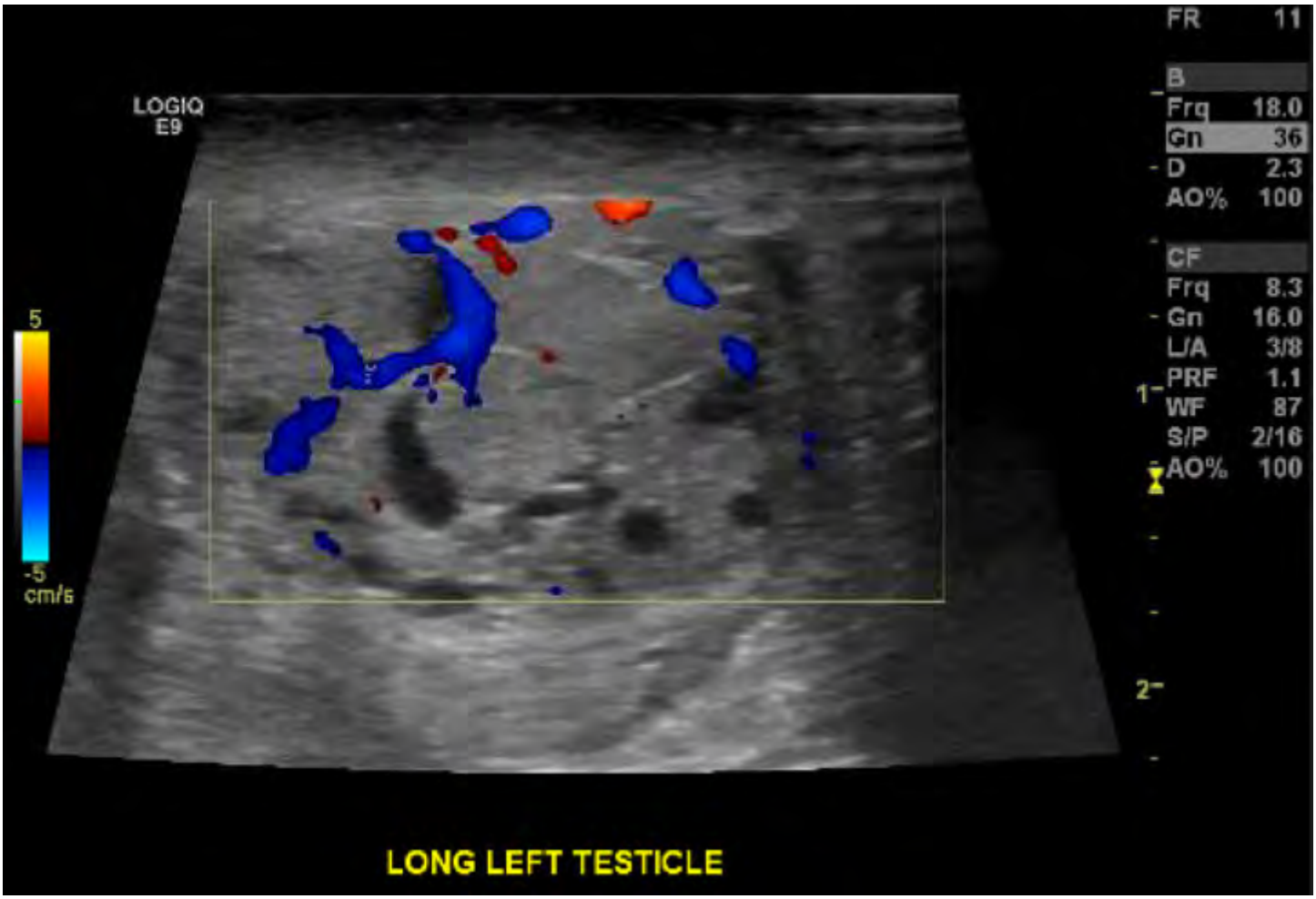

Image 2. *Doppler ultrasound of the left testicle showing internal vascularity.*

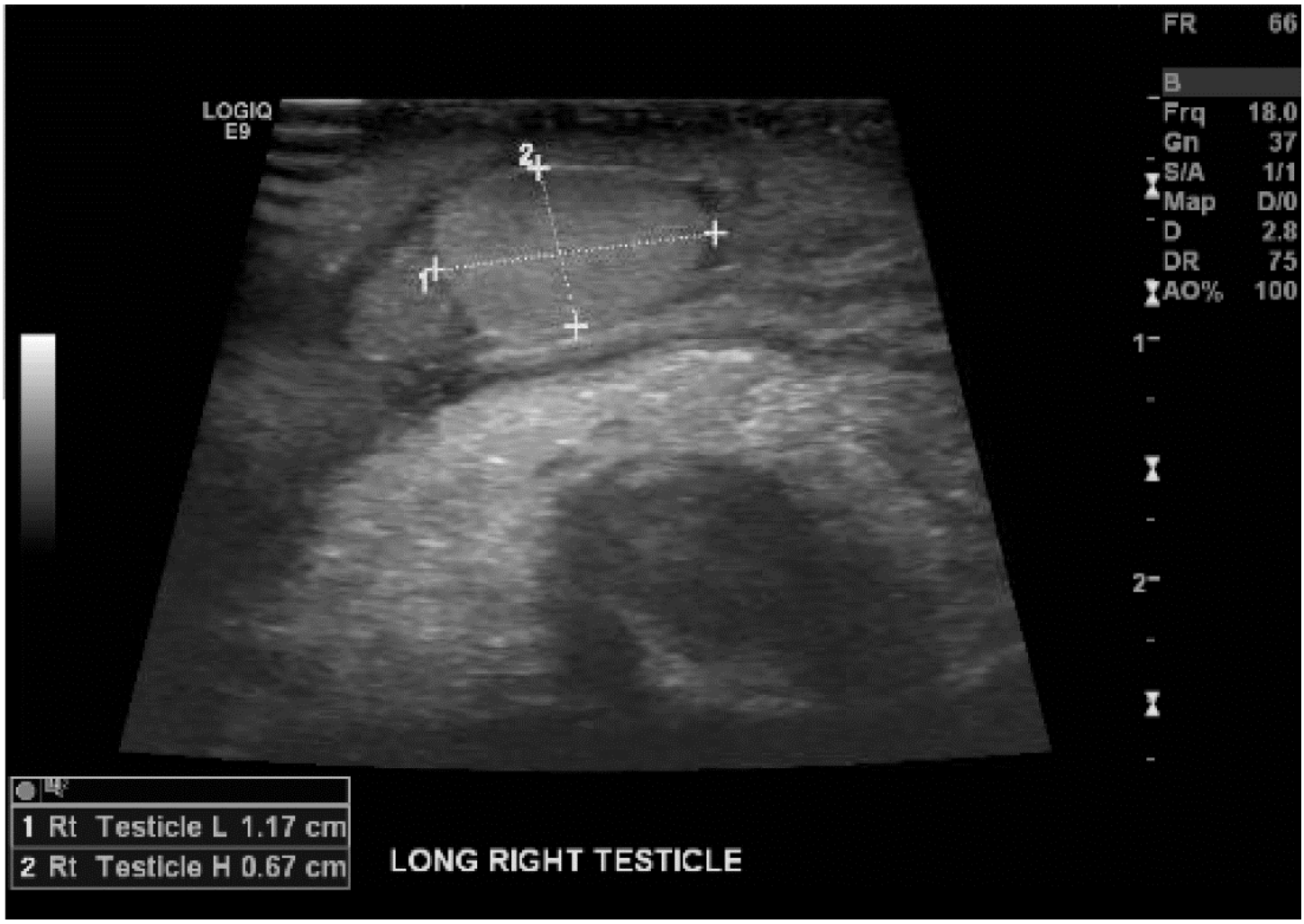

Image 3. *Ultrasound of right testicle 1.17 x 0.67 cm observed in right inguinal canal with normal morphology.*

Abstract: 60

Facial Swelling in a 1 month old – Abuse or Mimicker?

Aviva Dworkin, Eleny Romanos-Sirakis, Dana Kaplan
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History (including chief complaint, history of present illness and relevant past and family medical history) 28 day old female with uncomplicated birth history presented to the Emergency Department (ED)with facial marks and associated swelling. On the day of admission, mother fed the infant after which she had a large spit up, prompting the mother to clean the infant's face with a baby wipe based with a citrus additive, never used before. Immediately after cleaning the infant's face, mother applied a Ketoconazole cream which had been prescribed by PMD for reported cradle cap. The mother then left the home and while in the car noticed in the rear view mirror that the infant had started to develop redness around her eyes and was crying. Upon completion of the short drive, the mother noted that the infant's nose and lips began to swell. The mother denied any history of trauma, prior injuries or bleeding episodes, fever or interval illness. No relevant past or family medical history.

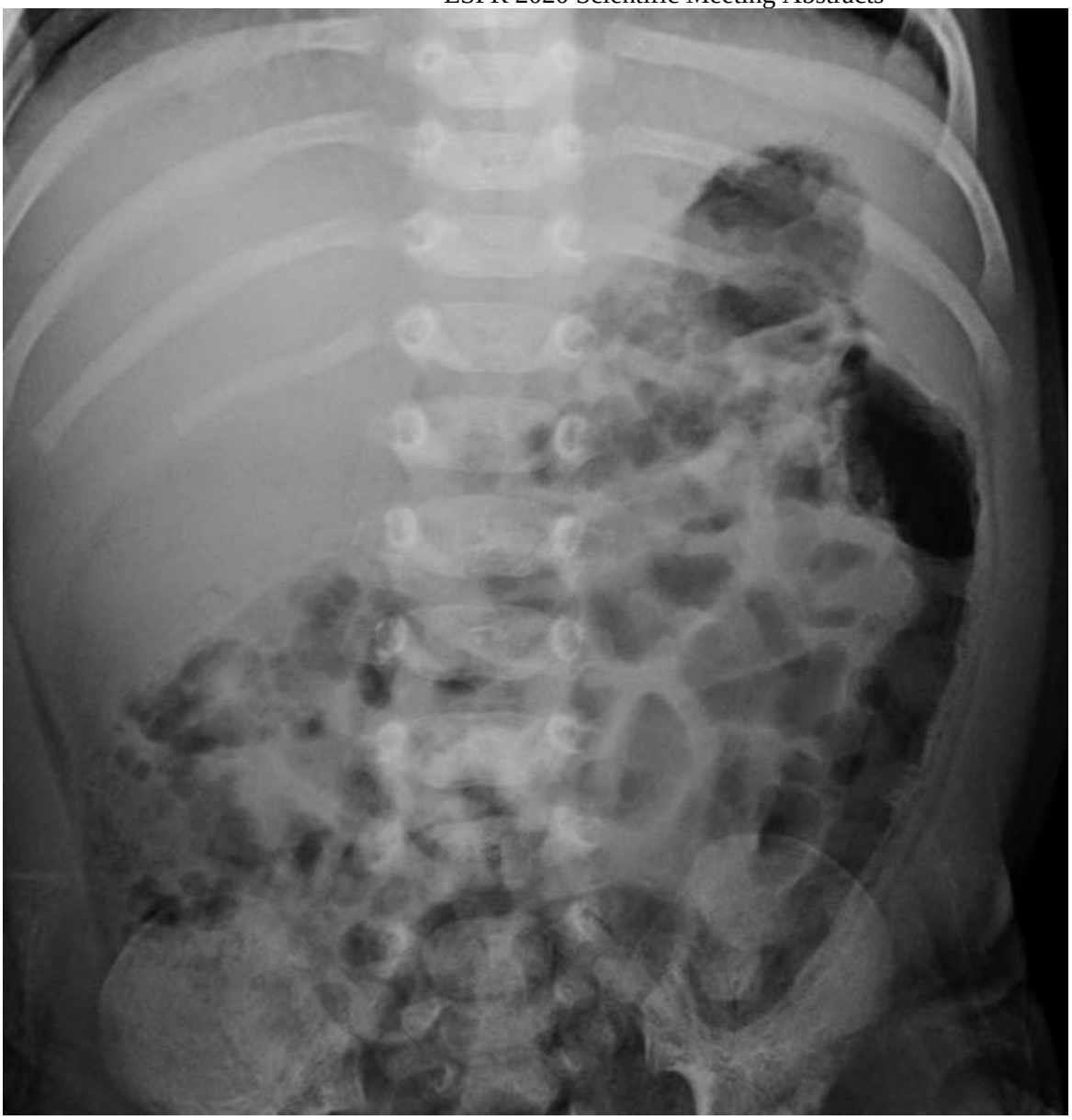
Physical examination findings (including vital signs) VITALS: T(C) Max: 37.2, HR: (144 - 166), BP: (59/42 - 75/36), RR: (42 - 52), SpO2: 100% , Height (cm): 55, Weight (kg): 3.845, BMI (kg/m2): 12.7

HOD1 Physical Exam: Alert, well developed, nourished, in no distress. Well groomed. Head was normocephalic and atraumatic. Anterior fontanel open, soft, and flat. Small subconjunctical hemorrhage of the lateral canthus of left eye. Pupils were equally round and reactive to light, extra-ocular movements normal. Full range of motion in extremities, no edema,. Diffuse macular lesions overlying the periorbital and frontal area which were erythematous/purple in color, non-palpable and non-blanching, with no associated edema or abrasions. Scattered lesions of the periorbital area were petechial in appearance. Blue patches on the left cheek. No other notable dermatologic findings. Neurologically appropriate for age with palmar, plantar reflex present. Developmentally

appropriate for a 28 day old.
HOD2 Physical Exam: Physical Exam unchanged except for notable improvement of dermatologic findings of face. No yellow discoloration of area suggesting healing bruise. Blue patches of the left cheek had disappeared.
Laboratory or Diagnostic imaging or Procedures 9.81) --11.0/32.3--(243
142 | 103 | 7
----------< 94
5.9| 22 | <0.5
Ca 10.6
TPro 5.7 / Alb 4.1 / TBili 1.7 / DBili 0.4/ AST 42 / ALT 31 / AlkPhos 279
CT Head Without Contrast: No acute or chronic findings.
Skeletal Survey and repeat Skeletal Survey 2 weeks later: No acute or healing injuries, normal bone mineralization.
Final Diagnosis: Contact drug irritation.
Final Diagnosis Contact drug irritation.

Abstract: 61
A Rare Case of Pneumatosis in an Infant
Jonathan Lee[1], Suchitra Hourigan[2], Catherine Chao[2], Sharon Day[1]
[1]Pediatric Emergency Medicine , INOVA, Fairfax, Virginia, United States, [2]Pediatric Gastroenterology, Pediatric Specialist of Virginia, Fairfax, Virginia, United States

History (including chief complaint, history of present illness and relevant past and family medical history) 13 day old male presenting for bloody stools. Patient was seen at day 5 of life for bloody stools and diagnosed with rectal fissures. Blood was initially minimal, however, has increased and is mucousy. Patient is feeding well with breast milk and cow's milk based infant formula. He has not had fevers or vomiting. He is gaining weight. He was referred to the ED by his PCP due to a significant amount of blood in stools. Infant was born full term without complications. He received Vitamin K. He was circumcised without excessive bleeding.
Physical examination findings (including vital signs) HR 160 **BP** 95/52 **RR** 32 **SpO2** 100% RA **T** 97.9 F **Wt** 3.45 kg
GEN: Alert, No distress
HEENT: AFSF, MMM
LUNG: CTAB. No WOB.
CV: RRR, no murmurs, 2+ pulses
ABD/GU: Soft, NT/ND, No rectal fissures.
NEURO: Good suck and tone, strong cry.
Laboratory or Diagnostic imaging or Procedures Stool Hemoccult: Positive
CBC: Unremarkable
CMP: Unremarkable
Final Diagnosis Cows Milk (CM) Protein Induced Allergic Proctocolitis of Infancy with Pneumatosis
Patient was admitted to the NICU, made NPO, started on IV fluids, vancomycin, gentamycin, and piperacillin-tazobactam due to concerns for necrotizing enterocolitis (NEC). Serial abdominal xrays were obtained and patient monitored for progression. After 3 days, with resolution of pneumatosis and stable exam, patient was started on amino acid based formula as the etiology of pneumatosis was thought to be CM protein allergy resulting in food protein induced allergic proctocolitis (FPIAP). Patient was discharged on hospital day 8.
Pneumatosis in newborns is concerning for NEC, a disease primarily affecting premature and low birth weight infants, with a mortality as high as 15-30%. Pneumatosis due to food protein allergy is an uncommon finding with few reported cases.
CM proteins are one of the most common allergens in children, affecting 2-7.5% of children under one year. Reactions can be IgE or non-IgE mediated and mixed. IgE mediated reactions result in anaphylaxis, while non IgE mediated reactions can present as food protein induced enterocolitis syndrome (FPIES), enteropathy (FPE), or proctocolitis, presenting with varying degrees of vomiting, diarrhea, bloody stools, and failure to thrive. The typical age of presentation of FPIAP is 2 to 8 weeks. Diagnosis is made primarily on history and food elimination. For IgE mediated reactions, testing is available, however, for non-IgE mediated reactions, there are no gold standards. The mainstay of treatment includes removal of the offending allergen, with most children outgrowing their allergic predisposition. We present a case of FPIAP starting at 5 days of life with pneumatosis.



Impression: Positive for pneumatosis in the left abdomen

Abstract: 62

Jewel of De-Nial

Mary C. Zabinski, Timothy kita, Ilyssa Greenberg
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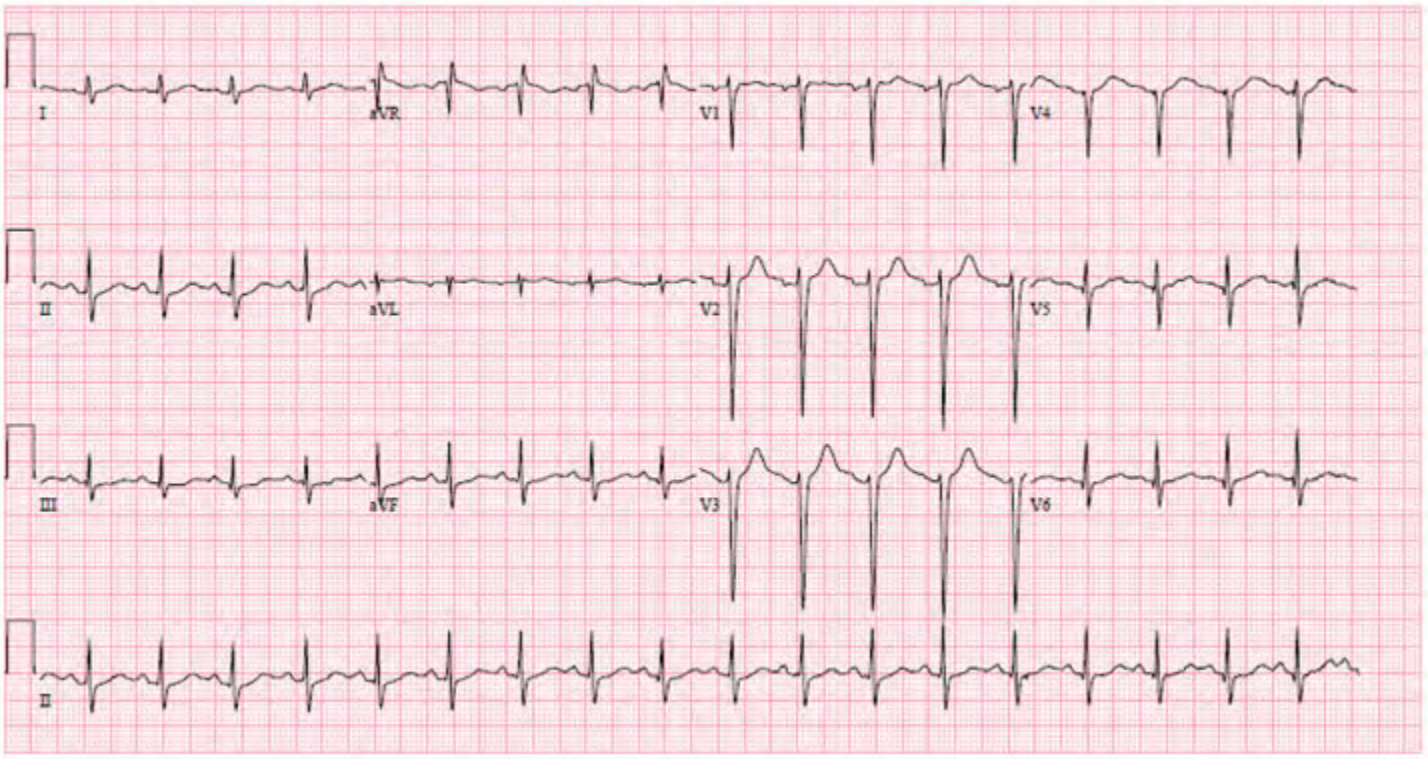
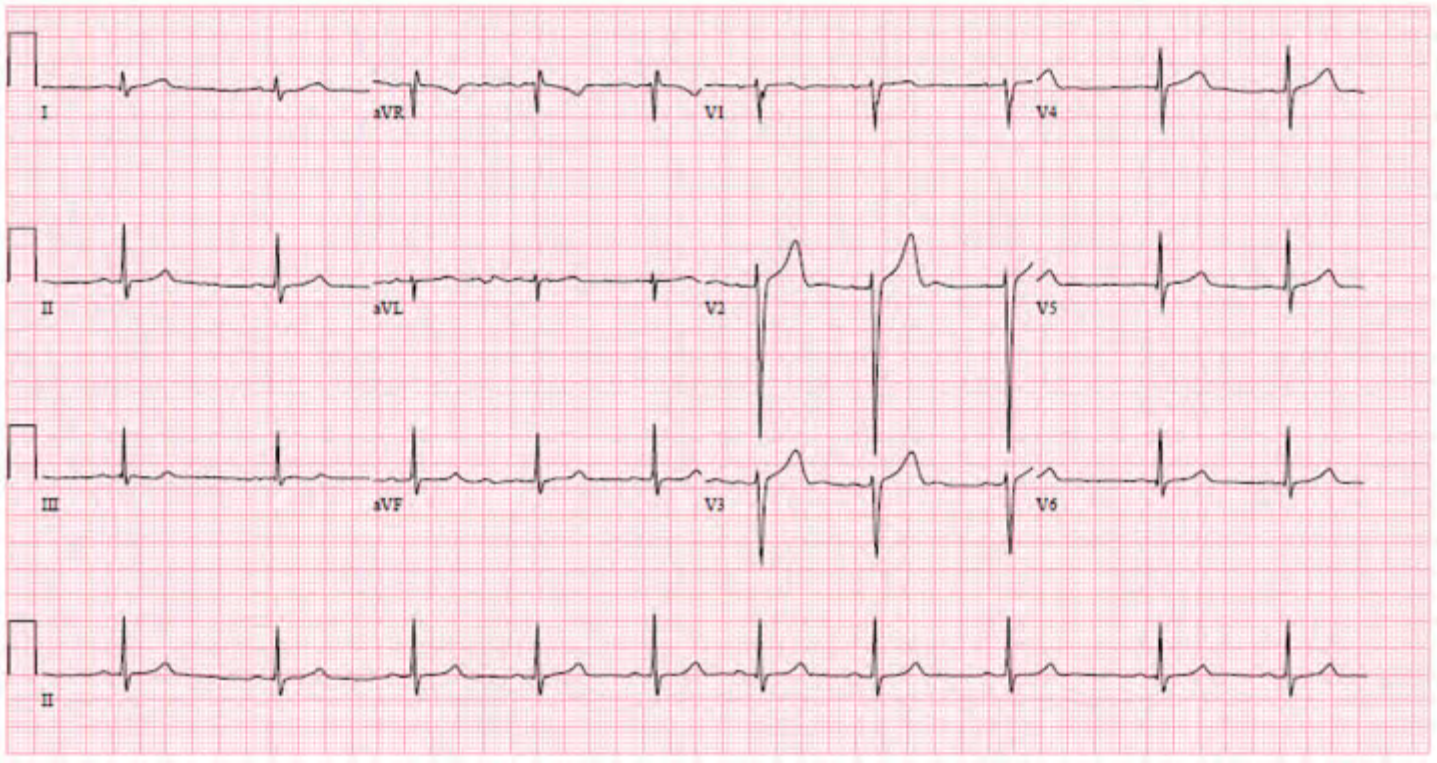
History (including chief complaint, history of present illness and relevant past and family medical history) JL was a 19 year old healthy male who presented with paresthesias and tachycardia following an episode of intensive vaping. Symptoms began with a tingling sensation across his face and progressed to include tingling in his bilateral upper extremities, lightheadedness, abdominal "tightness", and the sensation that his heart was racing. There was no personal or family history of heart disease. He was not taking any medications. He denied alcohol and other drug use.

Physical examination findings (including vital signs) Temperature: 98.2F
Pulse: 170 bpm
Respirations: 20 breaths/minute
Blood Pressure: 139/89
Oxygen Saturation: 100%
General: Alert, no acute distress
Mental Status: Normal affect. Oriented x3

Cardiovascular: Tachycardic, regular rhythm, no murmur appreciated
Neurologic: Cranial nerves II-XII grossly intact. No focal deficits. Normal sensation, strength, reflexes, range of motion, and gait
Laboratory or Diagnostic imaging or Procedures Initial labs revealed normal CBC, potassium of 3.0, creatinine of 1.2, anion gap of 19, bicarbonate of 19. EKG normal rhythm with QTc of 533ms.
Final Diagnosis Patient received magnesium for cardiac stabilization, potassium repletion, IV fluids, and serial EKGs. Labs normalized, and QTc prolongation improved and eventually resolved. During his brief one day hospitalization, JL's paresthesias and lightheadedness resolved completely.
Upon further history, patient endorsed vaping for the past three months. He reported doing so three times per day, three pulls per use, and one pod per week. Just prior to the onset of symptoms, JL had smoked approximately half a pod in one sitting.
The components of e-cigarettes include nicotine, benzoic acid, glycerol, propylene glycol, and "natural oils, extracts, and flavor" that are not specified by the manufacturer. Toluene, which is closely related to benzoic acid, has been linked to metabolic acidosis and hypokalemia in solvent inhalation. This organic acid is likely responsible for the elevated anion gap. Since cytochrome P-450 is inducible, JL's sharp increase in e-cigarette use may have overwhelmed this metabolic system resulting in high concentrations of benzoic acid in the blood. This was exacerbated by decreased ability of the kidney to excrete it in the setting of mild prerenal failure.
The exact cause of hydrocarbon-induced hypokalemia is unknown. Possible explanations include excess mineralocorticoid secondary to volume contraction and high urine flow rate secondary to the osmotic effect of organic acids. The patient's paresthesias and QTc prolongation were likely due to the hypokalemia from excessive vaping.
Final Diagnosis: Hypokalemia and QTc prolongation secondary to vaping



Initial EKG demonstrating prolonged QTc



Repeat EKG demonstrating resolved QTc

Abstract: 63

An 8-hour-old Term Newborn with Tachypnea

Elisabeth Anson
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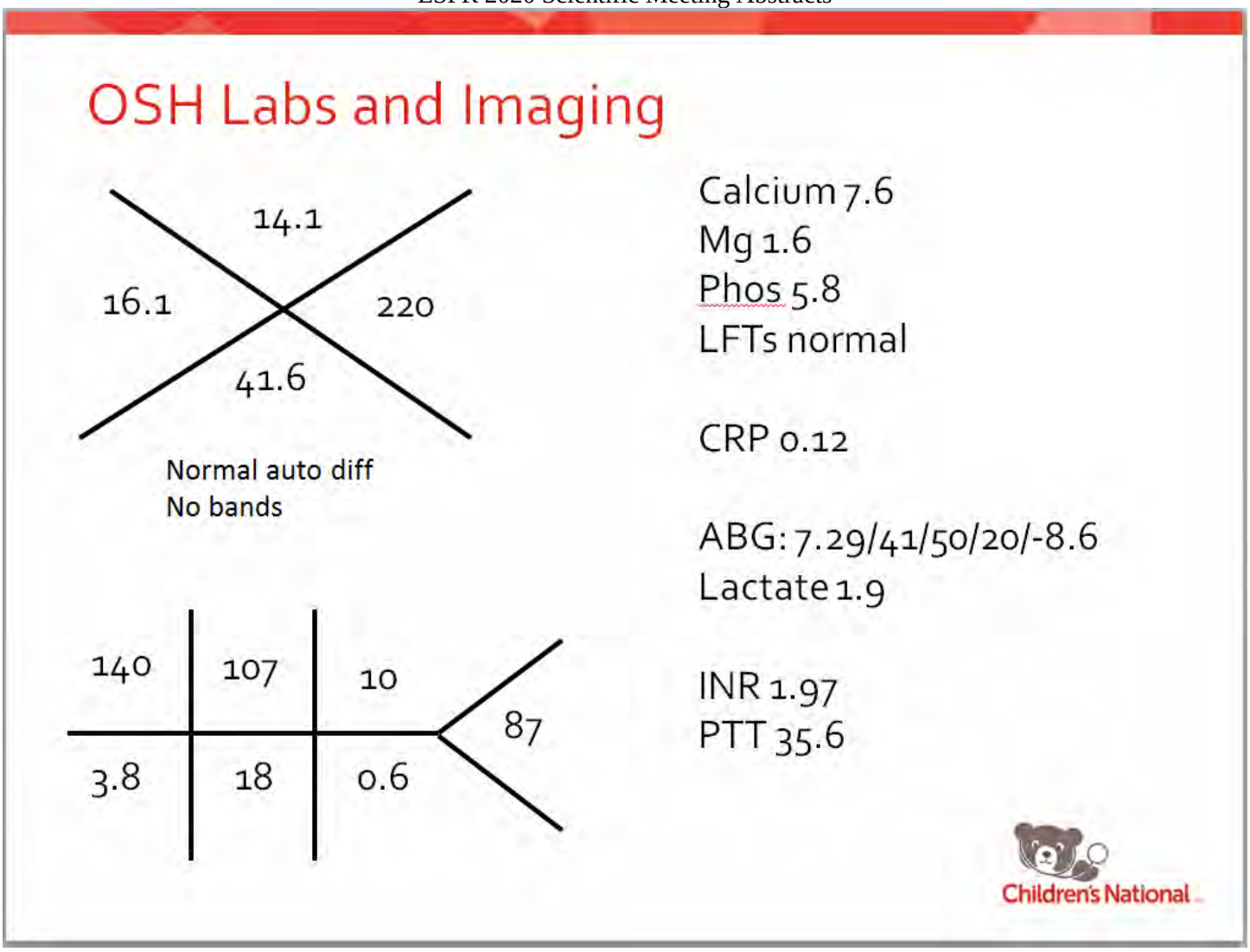
History (including chief complaint, history of present illness and relevant past and family medical history) Full term LGA infant born by uncomplicated repeat c-section to a 28yo G3P3 mother with a healthy pregnancy and good prenatal care. All maternal prenatal labs were negative including GBS, and rupture of membranes occured at time of delivery. Mother with two previously healthy children. Infant had a loose nuchal cord easily reduced and clear fluid. APGARs 9/9. Infant latched to breast well following delivery. At 8 hours of life, infant with tachypnea to 80s, mild retractions, and desaturations to 85-90% in room air. Infant also noted to be hypothermic with rectal temperature 36.3 celcius.

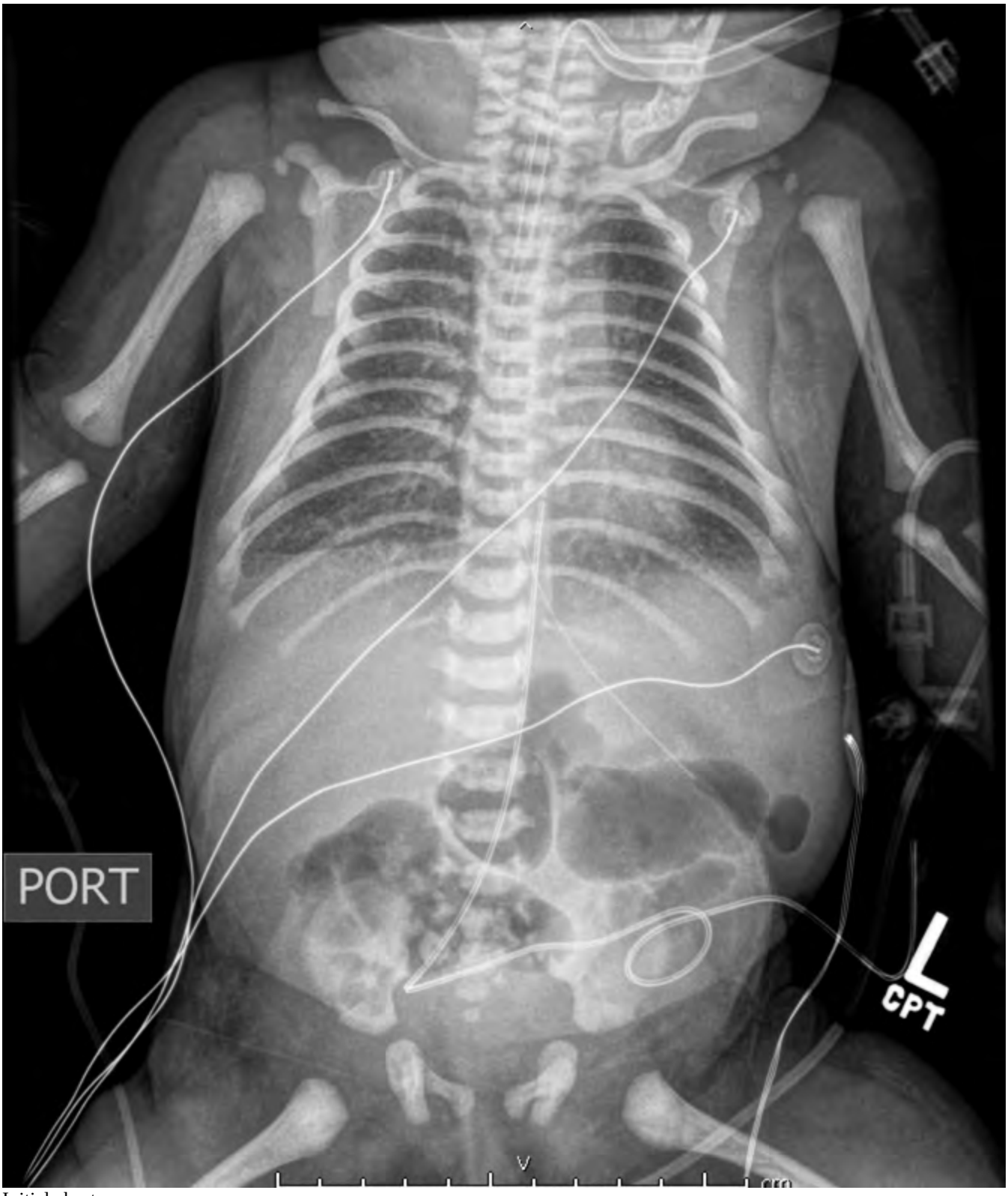
Physical examination findings (including vital signs) VS: T 36.3 rectal, HR 170, RR 86, 88% in RA (preductal), BP 76/49, MAP 50
Gen: Resting comfortably in mom's arms, no acute distress
HEENT: Normocephalic, normal conjuctiva, PERRLA, MMM
Resp: Tachypneic, moderate subcostal retractions & nasal flaring, mildly coarse breath sounds bilaterally, equal aeration bilaterally
CV: Tachycardic, regular rhythm, normal S1/S2, no murmur, cap refill 2 sec, 2+ brachial & femoral pulses
GI: Soft, NT, ND, no HSM or masses, +BS
Skin: Warm, no erythema, no rashes or lesions
Neuro: Normal tone throughout, Moro present & equal bilaterally, +planter & palmar grasp, strong suck

Laboratory or Diagnostic imaging or Procedures Please see attached image with laboratory values. Post-ductal saturation was 80% raising concern for PPHN. Infant was placed onto CPAP wih continued desaturations, quickly requiring 100% oxygen. He was intubated in the setting of hypoxemia and received surfactant. He continued to decompensate with preductal saturation 70% on high ventilatory settings. Inhaled nitric oxide was initiated for PPHN, and infant required dopamine to maintain blood pressures. PGE was initiated during transport to a tertiary care center for possible congenital heart disease. ECHO was normal and infant was cannulated onto ECMO for cardiorespiratory failure. His ECMO course was smooth and he came off ECMO on DOL 7. Within hours of decannulation off ECMO, he had profound cardiorespiratory collapse and was emergently re-cannulated.

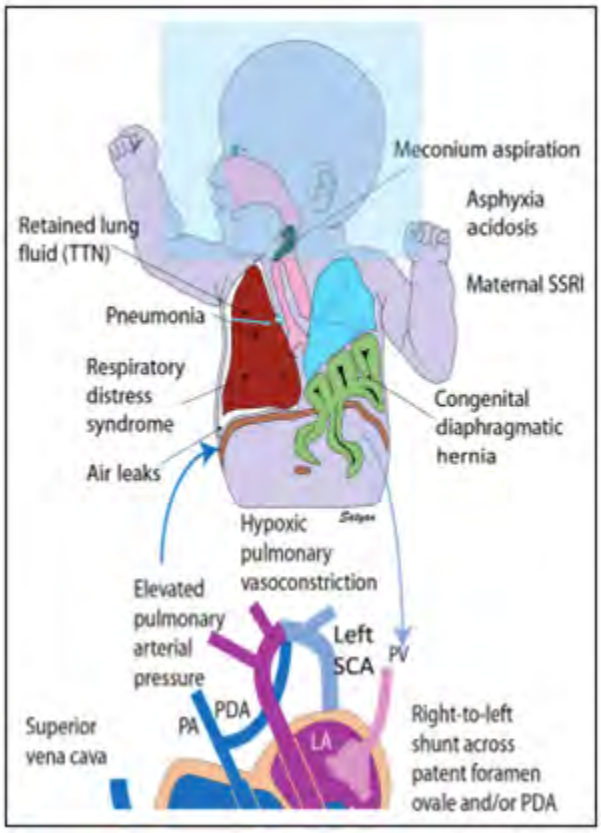
Final Diagnosis Alveolar capillary dysplasia with misalignment of pulmonary veins (ACD/MPV): A rare, congenital lung disease characterized by abnormal vasculature with thickened alveolar interstitum, misplacement of pulmonary capillaries away from alveolar surface, and fever capillaries overall. This diagnosis is nearly always lethal with a few milder cases identified.



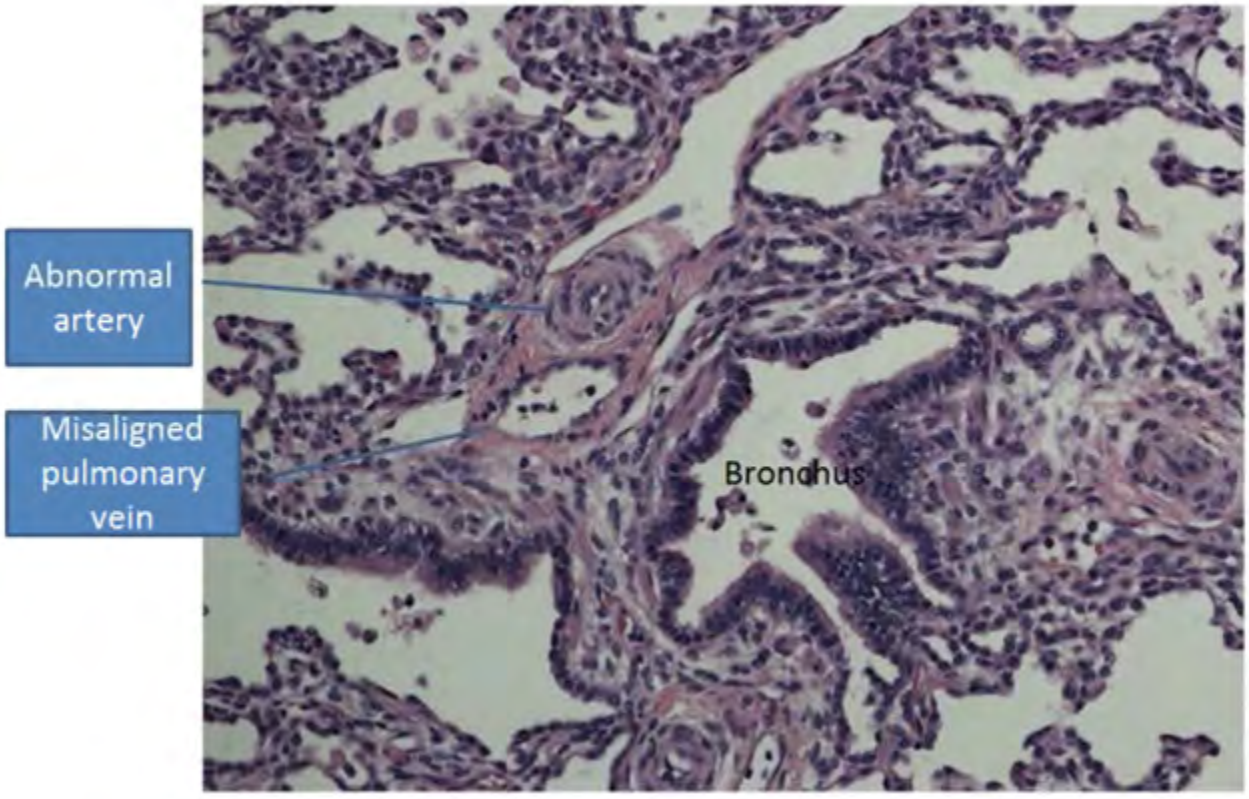
Initial laboratory values



Initial chest x-ray



Educational picture on different etiologies of PPHN. Neoreviews, Dec 2015.



Pathology slide from patient's lung, confirming underlying diagnosis.

Abstract: 64

An Infant with Hyperinsulinism Has Multiorgan Failure

Katharine P. Callahan, Andrea Duncan
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History (including chief complaint, history of present illness and relevant past and family medical history) A 20-day-old late preterm female with a history of perinatal hypoglycemia was transferred to a referral hospital for ongoing management of hyperinsulinism. Her mother failed an oral glucose tolerance test but was not on treatment for gestational diabetes mellitus. The patient's glucose at birth was 12 and her hypoglycemia was initially managed with D10. She was able to wean off IV fluid only once on 27 kcal formula. Critical labs on day of life nine were consistent with hyperinsulinism, so she was started on Diazoxide and transferred to a tertiary center.

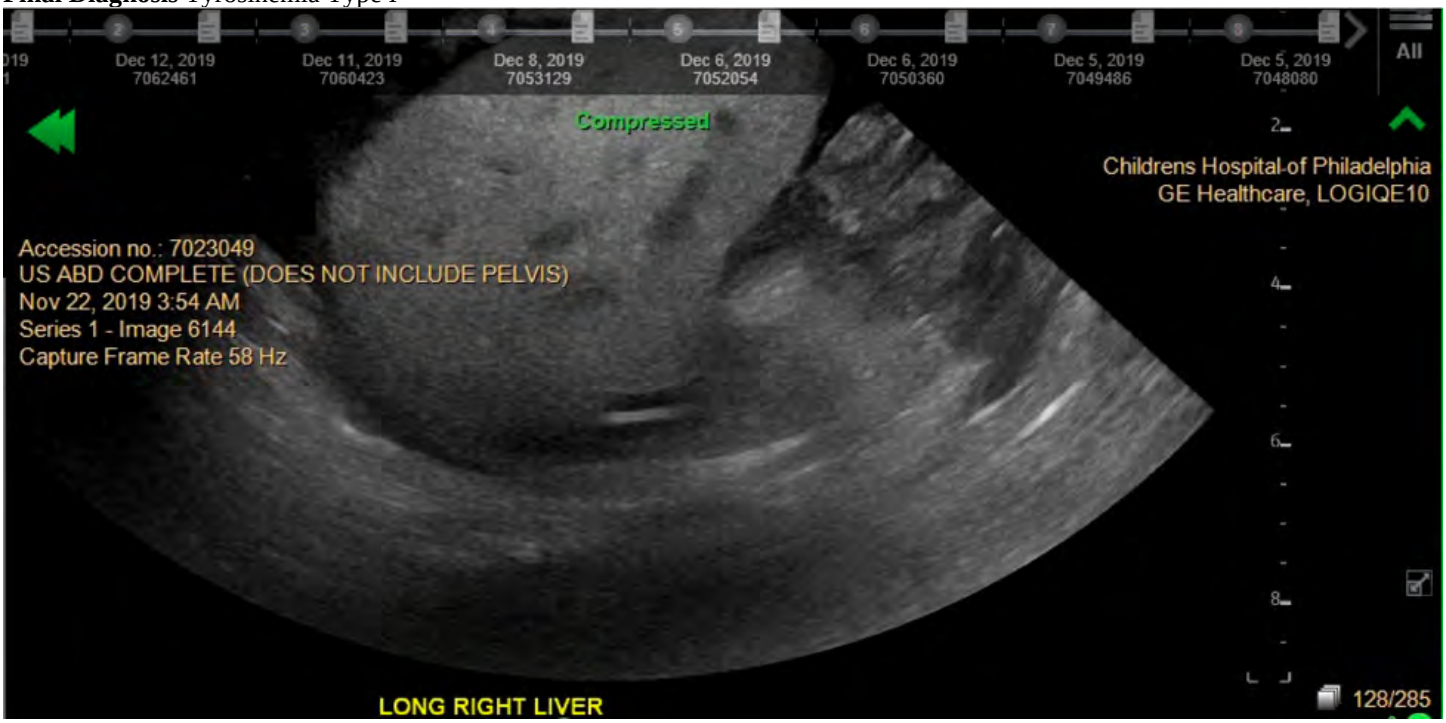
On the endocrinology floor, she continued on Diazoxide and was started on Chlorothiazde. She was initially on D12.5 and weaned off by day of life 22. Around that time, she was noted to be more edematous with worsening abdominal distension and respiratory distress. Labs revealed hyponatremia. Her blood pressures downtrended to 40s/10s, so medications were discontinued, and she was transferred to the NICU for further care.

Over the next three days she rapidly decompensated. Her respiratory distress increased, necessitating intubation, and an echo revealed pulmonary hypertension. She required dopamine, epinephrine, vasopressin, and hydrocortisone to support her blood pressure. She became febrile and was started on cefepime and acyclovir, but fevers continued. She had acute kidney injury with a quadrupling of creatinine. Her abdominal girth rapidly increased. Ultrasound revealed numerous hyperechoic liver lesions and complex ascites, so a peritoneal drain was placed. Labs revealed severe coagulopathy necessitating frequent repletion of blood products including cryoprecipitate and ultimately continuous FFP infusion; she hemorrhaged from an arterial line. Endocrinology, nephrology, cardiology, metabolism, and hepatology were consulted.

Physical examination findings (including vital signs) T:36.9 P:154 RR:56 BP:34/14 SpO2:100%
General: diffusely edematous
Pulmonary: increased work of breathing, tachypnea, subcostal retractions
Abdominal: distended, hepatomegaly
MSK: brisk capillary refill
Neurologic: normal Moro, suck, grasp; decreased tone and decreased responsivity for age

Laboratory or Diagnostic imaging or Procedures Lab values:
Day of NICU transfer and three days later if significantly changed
Hgb: 7
Hct 18
WBC: 7
Plt: 86
Na: 112
K: 4.1
Cl: 73
Bicarb: 28
BUN: 8
Cr: 0.5->2.0
Glu: 127
Albumin: 2.4
AST: 23->118
ALT: 811
GGT: 129
Alk Phos: 129
PT: 81
PTT: 100
INR: 6.6
Fib: 85
D-dimer: 4.7
Ammonia: 110
AFP: 164->616
Ferritin: 504
pH: 7.40->7.10
Imaging

Abdominal US: see image
CXR, HUS normal
Echo: Right sided pressures approximately equal to systemic pressure
Final Diagnosis Tyrosinemia Type I



Abdominal US:
Liver: The liver measures 5.8 cm. The liver appears diffusely echogenic and there are multiple rounded and ovoid hypoechoic lesions within the liver, too numerous to count, with largest seen in right lobe measuring 1.1 cm in greatest length.

Abstract: 65
Asymptomatic Infant, Unconcerned Mother, Shocked Residents: An ER/PICU Story
Manoj Nair, David Jimenez, Ruth Milanaik
Developmental and Behavioral Pediatrics, Cohen Children's Medical Center, Lake Success, New York, United States

History (including chief complaint, history of present illness and relevant past and family medical history) A 10-day old female patient (FP) was brought to the ER secondary to mother stating her OB/GYN urged her to go because “there was something wrong with her blood work.” Mother was unconcerned with child’s condition, but followed up at the behest of her doctor. Medical history was obtained via a Spanish interpreter. FP was born at 38 weeks gestation weighing 2722 grams via an uncomplicated vaginal delivery to a 35 year old G3 P2002 Hispanic mother with a pregnancy complicated by mild anemia and an elevated lead level of 7 µg/dl obtained on routine lab testing at the end of the 1st trimester. The DOH’s investigation of elevated lead levels concluded the mother’s exposure was due to washing her husband’s contaminated construction work clothing. No other potential sources were identified. After remediation, mother’s blood lead level was 2 µg/dl.
Physical examination findings (including vital signs) FP presented as asymptomatic and alert, displaying appropriate hunger cues with coordinated suck and swallow. She was easily soothed and her primitive/neonatal reflexes were normal. The mother stated that FP had not experienced vomiting, constipation, anorexia, colic, irritability, or lethargy.
Laboratory or Diagnostic imaging or Procedures Follow up maternal labs drawn four days post-partum revealed a lead level that was 47 µg/dl. Subsequent lab testing was performed at 10 days post-partum which revealed maternal and FP lead levels of 51 µg/dl and 65 µg/dl respectively, prompting the referral to the ER.
Final Diagnosis Upon presentation to the ER, FP was admitted to the PICU for chelation therapy. She was treated with succimer 70 mg (350 mg/m2/dose) PO every 8 hours for a 5 day course. Testing two days after the completion of treatment showed that FP's lead level had decreased to 33 µg/dl. On review of events leading up to the day of admission, the mother had disclosed participation in geophagia as part of a pregnancy ritual common in her hometown in Mexico in which clay soil is consumed. For this pregnancy, she had ingested soil from an urban neighborhood in NY. Although she initially shared this information, she strongly denied pica while providing history to subsequent medical personnel involved in the case. Ultimately, this case was complicated by the mother's fear that her cultural practices would not be accepted. Had it not been for the diligence of the mother's OB/GYN, FP's significantly elevated

lead level (65 µg/dl) would have gone untreated and likely would have resulted in disastrous developmental and medical outcomes. Cultural sensitivity and awareness is essential to the wellbeing of infants.

Abstract: 67
Low Milk Production Associated with Brexipiprazole (Rexulti)
Shruti K. Berlin, Karen Bodnar
Pediatrics, Inova, Fairfax, Virginia, United States

History (including chief complaint, history of present illness and relevant past and family medical history) 35 year old, G4P013, and her 23 day old son present to breastfeeding medicine clinic due to decreased breast milk production. Baby was born at 40 weeks 5 days gestation via emergency c/s after failed attempt at a home birth and 49 hours of ruptured membranes. At 5 hours of life, baby was intubated due to desaturations and seizure activity, transported to outside NICU and placed on a therapeutic hypothermia protocol for 90 hours. Baby was diagnosed with hypoxic ischemic encephalopathy. Mother began pumping following delivery. While baby was in the NICU for 18 days, his mother pumped for 20 minutes 10 times/day and by 1 week of life, was able to pump about 4 oz/day.
By the clinic visit, she was pumping for 20 minutes 8 times/day and producing 1 oz/day. She had successfully breastfed her 2 older daughters for 2 years each and had experience pumping.
Prior to pregnancy, she was treated with Rexulti for a history of bipolar 2 disorder. She stopped Rexulti in the first trimester and restarted 2mg daily during the third trimester due to increasing depressive symptoms. While baby was in the NICU, her supply of Rexulti was low and she took her pill every other day. Once back home, she was able to resume taking it daily.
Physical examination findings (including vital signs)
Laboratory or Diagnostic imaging or Procedures Prolactin 19.2 (low)
Final Diagnosis Even though this mother-infant dyad had many risk factors for breastfeeding difficulties (a difficult labor, stress, early separation and ongoing pump dependence) her previous ample production and adequate early breast emptying indicated another possible cause of her low milk production.
Rexulti is similar to another atypical antipsychotic, Abilify, that is known to interfere with prolactin and milk production. After weighing the risks and benefits to the dyad, mother decided to stop her Rexulti and use a short course of metoclopramide to increase her prolactin. On follow up, she reported within 10 days of stopping Rexulti, her milk supply increased and she was able to breastfeed almost exclusively with adequate infant weight gain and her prolactin level increased to 97, normal for lactation.
This case is the first report suggesting Rexulti may suppress breast milk production in lactating women. Furthermore, there was a restoration of milk production after discontinuing the drug. More research is required to investigate the relationship between Rexulti and milk production to provide information for healthcare providers and nursing mothers during informed consent discussions and in evaluating mothers with insufficient milk production who are being treated for mood disorders.

Abstract: 68
More Than a Rash: Identifying Child Labor Trafficking in the ED, a Case Report
Gina M. Auricchio, Dana Kaplan
Pediatrics , Staten Island University Hospital , Brooklyn, New York, United States

History (including chief complaint, history of present illness and relevant past and family medical history) The patient is a 16-year-old Spanish-speaking male with no PMHx who presented to the ED unaccompanied with complaint of a diffuse pruritic rash. The rash was present for 30 days with symptoms waxing & waning in intensity. He had no known allergies or sick contacts. Denied new exposures, medication, drug use & sexual activity. Denied fever, cough, nausea, vomiting, or diarrhea. Endorsed being an undocumented immigrant from Central America. He was smuggled into the US six months ago & stated he was residing with a group of men, none of which his legal guardian. He notes that he is indebted to his smuggler. Patient does not attend school but works handing out pamphlets and magazines to pay off his debt. He endorsed waiting on street corners for work.
Physical examination findings (including vital signs) Vitals: Temp 36C (96.8F), HR 79 BMP, BP 125/58, RR 24, SpO2 100% on RA
PE: Widespread diffuse papulo-follicular rash most significant on back, bilateral arms and cheeks. Rash was blanching, non-sloughing & spared palms, soles & mucosa. Front teeth were absent, dentures in place. Remainder of the physical exam was WNL.
Laboratory or Diagnostic imaging or Procedures Basic lab testing was sent was well as HIV, RPR, Hepatitis panel. Urine was sent for Gonorrhea and chlamydia. All results were WNL. STI testing was negative.
Final Diagnosis Patient was treated with Benadryl, systemic & topical steroids. There was significant improvement of the rash within 24hrs, making the diagnosis consistent with auto-eczematization/ID reaction with unknown trigger. Given the patient was an unaccompanied minor as well as the reports of his living & working situations, concern was raised for labor trafficking. CPS was contacted & the Child Abuse Pediatrician was consulted. Investigation revealed that the patient was actually residing with his mother & step-father, fear of deportation made him reluctant to disclose their residence in the US.
This case highlights the importance of recognizing the potential signs of labor trafficking in minors in an acute care setting.

Contributors to labor trafficking can be found in Image 1. Examples of instances when medical professionals should consider labor trafficking can be found in Image 2. Once recognized, it is important to respond & report such cases appropriately. It is estimated that only a minute percentage of US medical centers have established protocols for identifying & reporting cases of suspected labor trafficking. Increased education, awareness & guidance of medical professionals is necessary to better identify & assist minor victims of labor trafficking.

Contributing factors to child labor trafficking.
Adapted from table by Greenbaum, J. et al.

Possible Identifiers of Child Labor Trafficking
Adapted from Greenbaum, J. et al.

Abstract: 69

Red Herring

Suzanne Al-Hamad, Alison Falck, Nicholas Pietris
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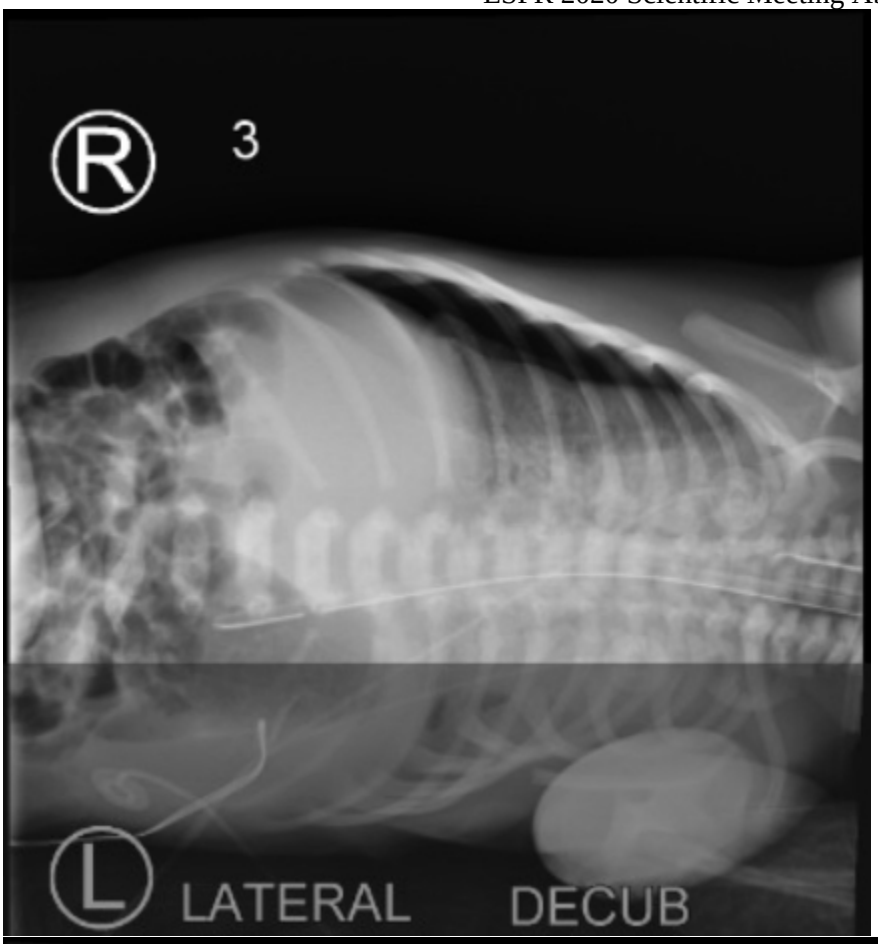
History (including chief complaint, history of present illness and relevant past and family medical history) Born at OSH at 37w2d via c section due to failure to progres after IOL for low AFI. Maternal history remarkable for 2 prior miscarriages. This is first living child. Maternal prenatal labs unremarkable. Required routine resuscitation in the DR with APGARs 8,9. At 10 minutes of life the baby turned dusky and pulse ox was placed and notable for O2 sats in the 60's. PPV initiated and O2 sats increased to 75-85%. Infant was transitioned to CPAP at 100% FiO2 and SaO2 increased to 90%. Infant transported to OSH NICU for further assessment. Chest XR revealed right sided pneumothorax and needle decompression completed. First arterial blood gas at approx 1 hour of life was 7.13/75/55/24/-5.9. Plan made for transfer to level IV NICU. At level IV NICU infant was continued NPO, continued on amp/gent for sepsis rule out, and started on fentanyl ggt. CBG on arrival was 7.22/57/62/-4/23/1.2. Infant was intubated for chest tube placement to decompress reaccumulated right sided pneumothorax. Following chest tube placement infant was placed on jet ventilator. Chest XRs trended throughout the day. In the evening and into the overnight of DOL 1 into 2 infant had increased FiO2 requirement up to 100%. Chest XR showed residual pneumothorax and infant was again needle decompressed for 240ml of air. Infant sats did not improve so was placed on iNO for suspected pulmonary hypertension and vent settings were increased. Sats improved slightly but infant still required 100% FiO2. In the morning a test was completed that revealed the diagnosis.

Physical examination findings (including vital signs) Temp: 36.4 °C (97.5 °F), Pulse: 142, Resp: (!) 66, BP: (!) 58/22, SpO2: 93 %

Physical Exam
Constitutional: He is active.
Head: Anterior fontanelle is flat. Palate intact, no preauricular pits or tags
Eyes: Conjunctivae are normal.
Cardiovascular: Normal rate and regular rhythm.
Pulmonary/Chest: Nasal flaring present. Tachypnea noted. He exhibits retraction.
Good air entry on left side. No breath sounds heard on right
Abdominal: Soft. He exhibits no distension.
Genitourinary: Penis normal. Uncircumcised.

Genitourinary Comments: Normal term male, testes descended bilaterally, anus patent
Musculoskeletal: Normal range of motion.
Neurological: He is alert. He has normal strength. Suck normal. Symmetric Moro.
Skin: Skin is warm and moist. Capillary refill takes less than 2 seconds. Turgor is normal.
Laboratory or Diagnostic imaging or Procedures Lab results and imaging are included in other sections.
Final Diagnosis Obstructed total anomalous pulmonary venous drainage beneath the diaphragm with additional pop-off vertical vein draining to the innominate vein.


R
3
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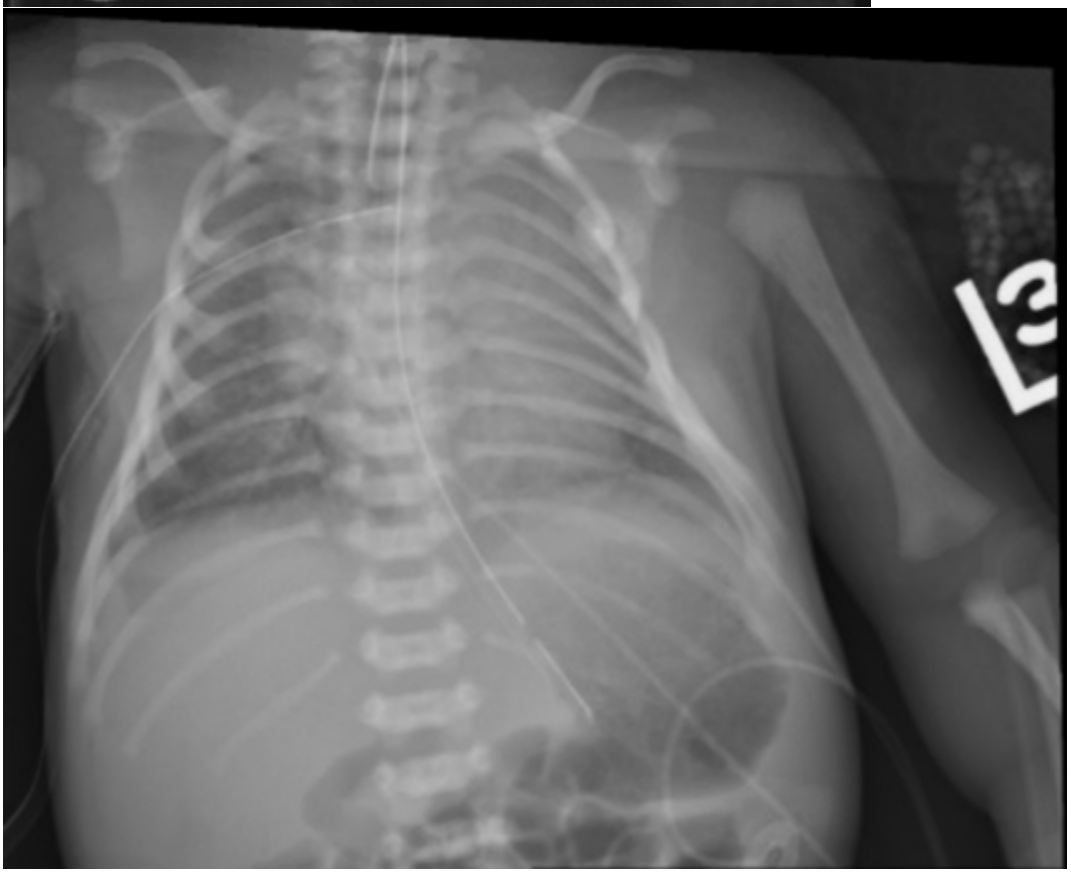
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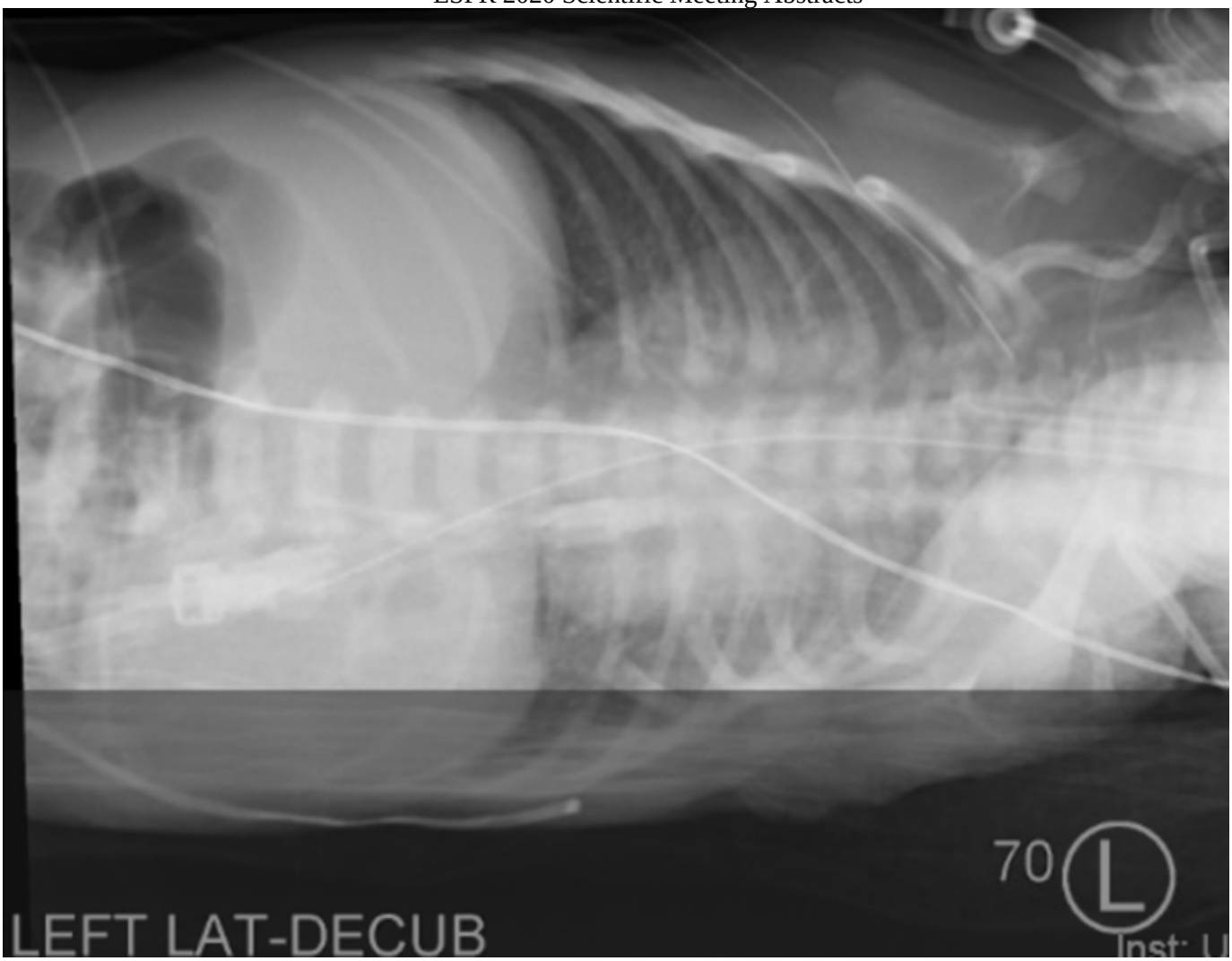
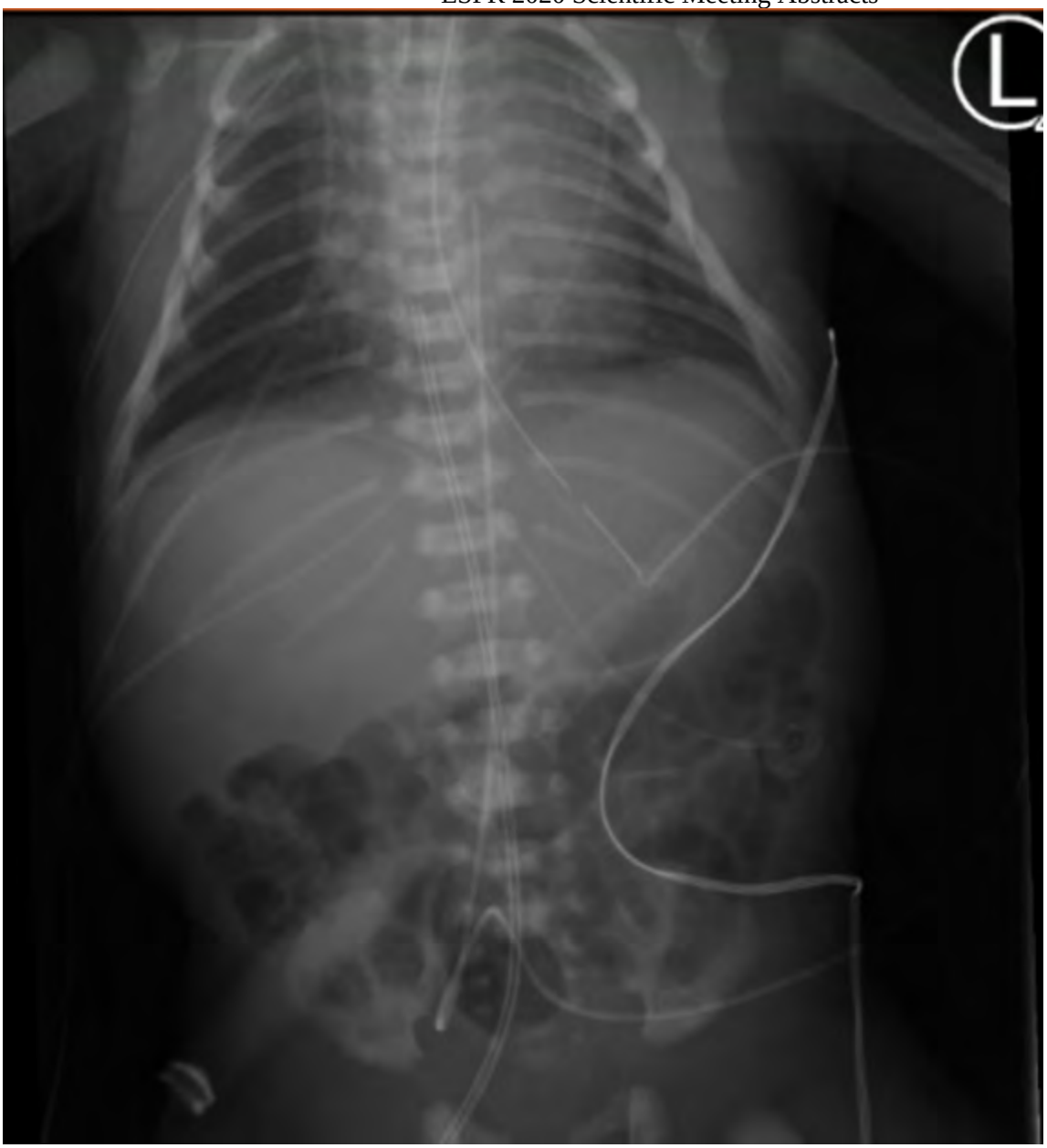

70
L
LEFT LAT-DECUB



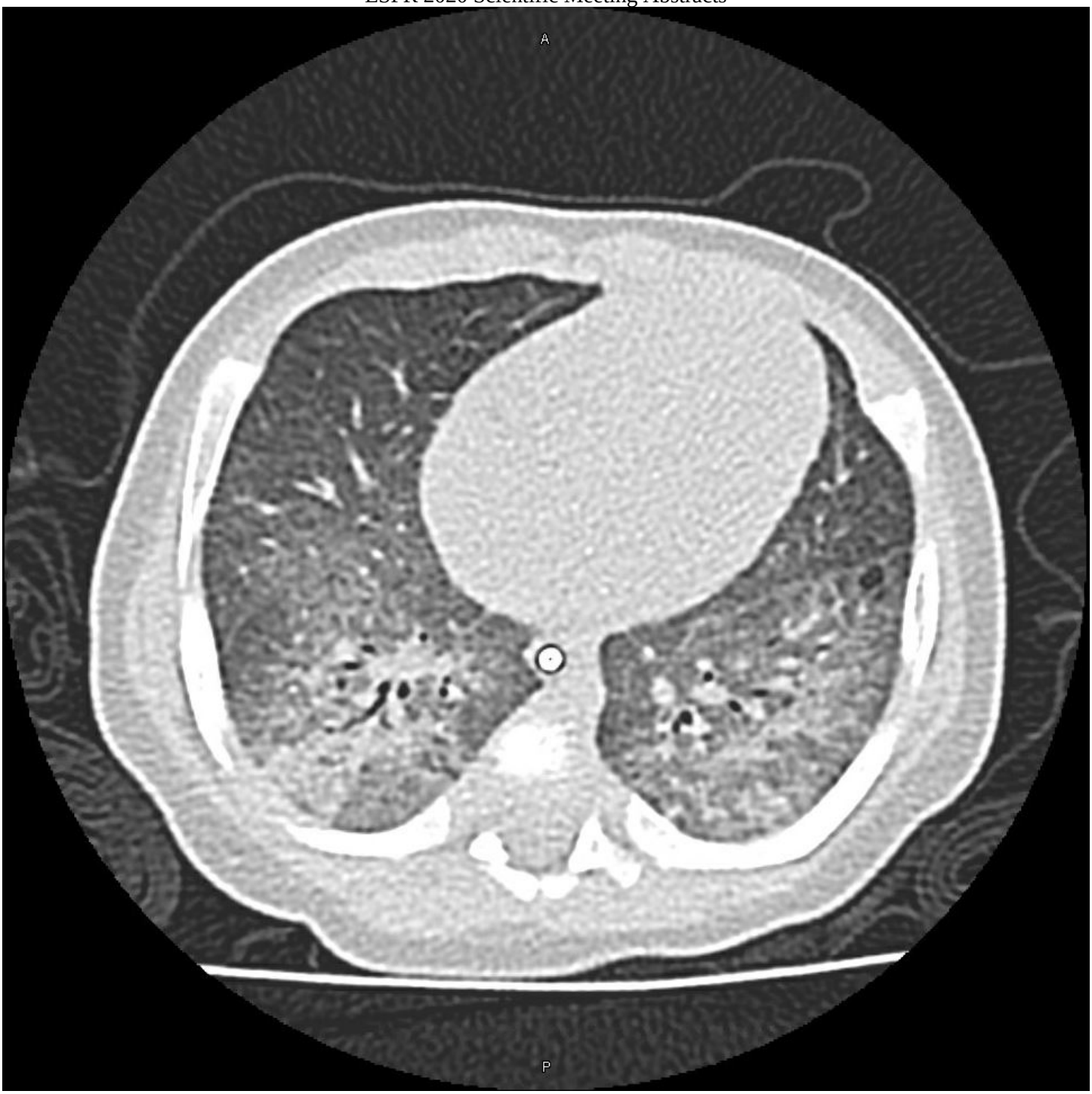
Abstract: 70

When Transient Tachypnea of the Newborn is No Longer Transient

Gregory Carlisle
Inova Children's Hospital, Annandale, Virginia, United States

History (including chief complaint, history of present illness and relevant past and family medical history) A 2 month old male was transferred from NICU to general pediatrics for ongoing care due to persistent tachypnea and hypoxia. This boy was born at 40+6 weeks to a 31 year old G2P2 mother by spontaneous vaginal delivery after a pregnancy complicated only by gestational diabetes without prolonged rupture of membranes, although he was noted to pass meconium at the time of birth. Apgars were 8/8. At 3 hours of age, he was noted to have cyanosis with hypoxia. He was transferred to the NICU with initial diagnosis of transient tachypnea of the newborn. His respiratory distress worsened, and on DOL 2 he was intubated. Echo showed moderate pulmonary hypertension, which resolved with 5 days of inhaled nitric oxide and remained normal on follow-up echo. Intubation was maintained until DOL 17, and respiratory support was weaned until on low-flow oxygen on DOL 53 during a trial of systemic steroids. Numerous chest x-rays showed varying interstitial opacities. A genetic panel for surfactant decifiencies was normal. Due to poor latch and suck associated with tachypnea, the patient had required an enteral feeding tube since admission to NICU. Transferred to general pediatrics on DOL 68 for continued management of tachypnea and ongoing oxygen demand of 0.2-0.5 LPM.

Physical examination findings (including vital signs) Blood pressure 111/66, pulse 151, temperature 97.7 °F, resp. rate 80, SpO2 94 % on 0.3 LPM.
On transfer to general pediatrics, the patient was found to be in no acute distress, with a strong cry, no dysmorphic features, although with a weak suck. He appeared comfortably tachypneic without abnormal breath sounds, retractions, flaring, or grunting. Cardiac exam exhibited a regular rate and rhythm, with normal heart sounds, and strong peripheral pulses. His abdominal exam was benign, without hepatomegaly. He exhibited no edema.
Laboratory or Diagnostic imaging or Procedures - Genetic testing for Surfactant Protein B, Surfactant Protein C, ABCA3, TTF1 were all negative
- CT chest on DOL 83 showed diffuse ground glass opacities and cystic foci, lower lobe inolvement greater than upper lobe bilaterally, consistent with interstitial lung disease, but not consistent with neuroendocrine cell hyperplasia of infancy
- BAL on DOL 91 with non-specific inflammatory cells
- Biopsy on DOL 91 consistent with pulmonary interstitial glycogenosis
Final Diagnosis Interstitial Lung Disease -- Pulmonary Interstitial Glycogenosis



Unenhanced CT scan showing ground glass opacities and cystic foci

Abstract: 71

Neonate with Fetal Hydrops and Cardiomegaly

Jeffrey Walbridge, Timothy kita, Laura S. Madore
Baystate Medical Center, Springfield, Massachusetts, United States

History (including chief complaint, history of present illness and relevant past and family medical history) Patient X is a 32 4/7 wk gestational age female infant born via C-section to a 39 year old G3P0020 mom with APGAR scores 2,3, and 4 at 1, 5 and 10 minutes. Maternal history pertinent for two fetal demises of unknown etiology at 24 and 36 weeks.
One day prior to delivery, mother admitted with diagnosis of fetal hydrops (ascites and pleural effusions) in the setting of

cardiomegaly with atrial enlargement. Fetal echocardiogram at 30 wk noted moderate mitral and tricuspid valve regurgitation with normal biventricular size and function and no evidence of hydrops. Prenatal work-up for other causes of hydrops was negative.
Echo was performed after delivery due to severe respiratory hypoxic failure managed with High Frequency Jet Ventilation. Infant was placed on inhaled Nitric Oxide due to pulmonary hypertension, dopamine due to hypotension and oliguria, and Milrinone . Respiratory and inotropic support was weaned off over time. Pt developed supra ventricular tachycardia (SVT) on day 11, treated with Adenosine and Propranolol. Due to persistent congestive heart failure despite medical management infant transferred to a Level IV center for further cardiac interventions

Physical examination findings (including vital signs) General: Non-dysmorphic, mild anasarca
Heart: 4/6 systolic regurgitant murmur with thrill
Abdomen: Soft, Liver edge palpable
Neurologic: Generalized hypotonia

Laboratory or Diagnostic imaging or Procedures Echo: Severe mitral and tricuspid regurgitation. Severe dilation of right and left atria. Mild dilation of left and right ventricles. Mild aortic insufficiency, Large patent ductus arteriosus with bidirectional flow, Very small pericardial effusion, Near systemic right ventricular pressures consistent with severe pulmonary hypertension.
Cardiac Cath: Right atrial pressure of 6, Left atrial pressure 11, atrial level shunt with pulmonary to systemic flow (Qp: Qs) 1.6, left ventricular end diastolic pressure of 8, pulmonary vascular resistance 3 WU
Renal U/s: Bilateral hydronephrosis
Chromosomal Microarray: pathogenic at least 3.1 MB deletion in 18q23

Final Diagnosis The cause of this patient's hydrops and heart failure is likely due to inherited congenital valve disease versus primary restrictive cardiomyopathy. Her symptoms are not typical of classic 18q deletion, which consists of non-cardiac malformations such as atypical facies, limb anomalies, and CNS involvement such as seizures, hypotonia and developmental delays. Deletion includes the NFATC1 gene, which is a candidate gene for cardiac anomalies. Pt is now status post valve repair but with continued heart failure and valvular regurgitation, thus remains hospitalized.

Abstract: 72

Case of Transient Adenovirus Encephalopathy and Bronchiolitis

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History (including chief complaint, history of present illness and relevant past and family medical history) A 17-month old girl presented to the emergency department (ED) due to decreased responsiveness. Her mother reports that three days prior, she began having nasal congestion, cough, and fever with a maximum temperature of 103°F. She was taken to an outside facility and diagnosed with acute otitis media and started on cefdinir. One day prior to presentation, she had increased work of breathing, decreased oral intake, decreased urine output, and two episodes of non-bloody, non-bilious emesis. On the day of presentation she continued to worsen and become less responsive, prompting her mother to bring her into the ED. She had a past medical history significant for reactive airway disease, no surgical history, allergies, or daily medications. Her family history was significant for asthma, diabetes, and hypertension.

Physical examination findings (including vital signs) Her initial physical exam showed vital signs significant for fever of 103.8 °F, heart rate of 185 beats/min, respiratory rate of 12 breaths/min, blood pressure of 100/59 mmHg, and 88% oxygen saturation of on room air. She was lethargic, localizing only to noxious stimuli. She had copious yellow nasal discharge, a bulging right tympanic membrane, dry mucous membranes, and anterior cervical lymphadenopathy. Her lungs were clear to auscultation with no wheezing or retractions. She was tachycardic with a 2/6 systolic murmur in the left sternal border, and a capillary refill of 5 seconds with warm extremities. The remainder of her exam was normal.

Laboratory or Diagnostic imaging or Procedures A computed tomography scan of her head showed no acute intracranial abnormality, but had mucosal thickening/fluid of both mastoid air cells and middle ears with opacification of paranasal sinuses. Initial laboratory evaluation showed respiratory alkalosis with a venous pH of 7.48, and pCO_2 of 37 mmHg. A complete blood count with differential was normal. She had an elevated C-reactive protein to 93.41 mg/L and her complete metabolic panel showed hyponatremia of 134 mmol/L and hypochloremia 94 mmol/L. Her chest x-ray, electrocardiogram, and urinalysis were all unremarkable. Her blood and urine cultures were negative. A lumbar puncture was performed and her cerebrospinal fluid (CSF) had a normal cell count with white blood cells (WBC) of 2 cu mm, glucose of 88 mg/dL, protein of 17 mg/dL, and enterovirus PCR negative. The CSF cultures were negative. A respiratory viral panel was sent and returned positive for adenovirus. This led us to send a PCR of her CSF which also returned positive for adenovirus.

Final Diagnosis adenovirus encephalopathy

		Day 1 Presentation	Day 2	Day 3	Day 4	Day 5	Day 6 Discharge
1	Eye contact			4	4	0	0
2	Purposeful actions			3	3	2	0
3	Awareness of surroundings			4	4	2	0
4	Communicates needs/wants			4	4	2	0
5	Restless			4	3	3	2
6	Inconsolable			4	4	3	1
7	Underactivity			4	4	3	2
8	Response time to interactions			4	4	3	1
	Total			31	30	18	6

Cornell Assessment for Pediatric Delirium Score during hospitalization

Abstract: 74

Central diabetes insipidus – a rare complication of intraventricular/periventricular hemorrhage in VLBW infants

Poonam Thakore[1], Whei Ying Lim[2], Rebecca Riba-Wolman[2], Adam Matson[1], Naveed Hussain[1]

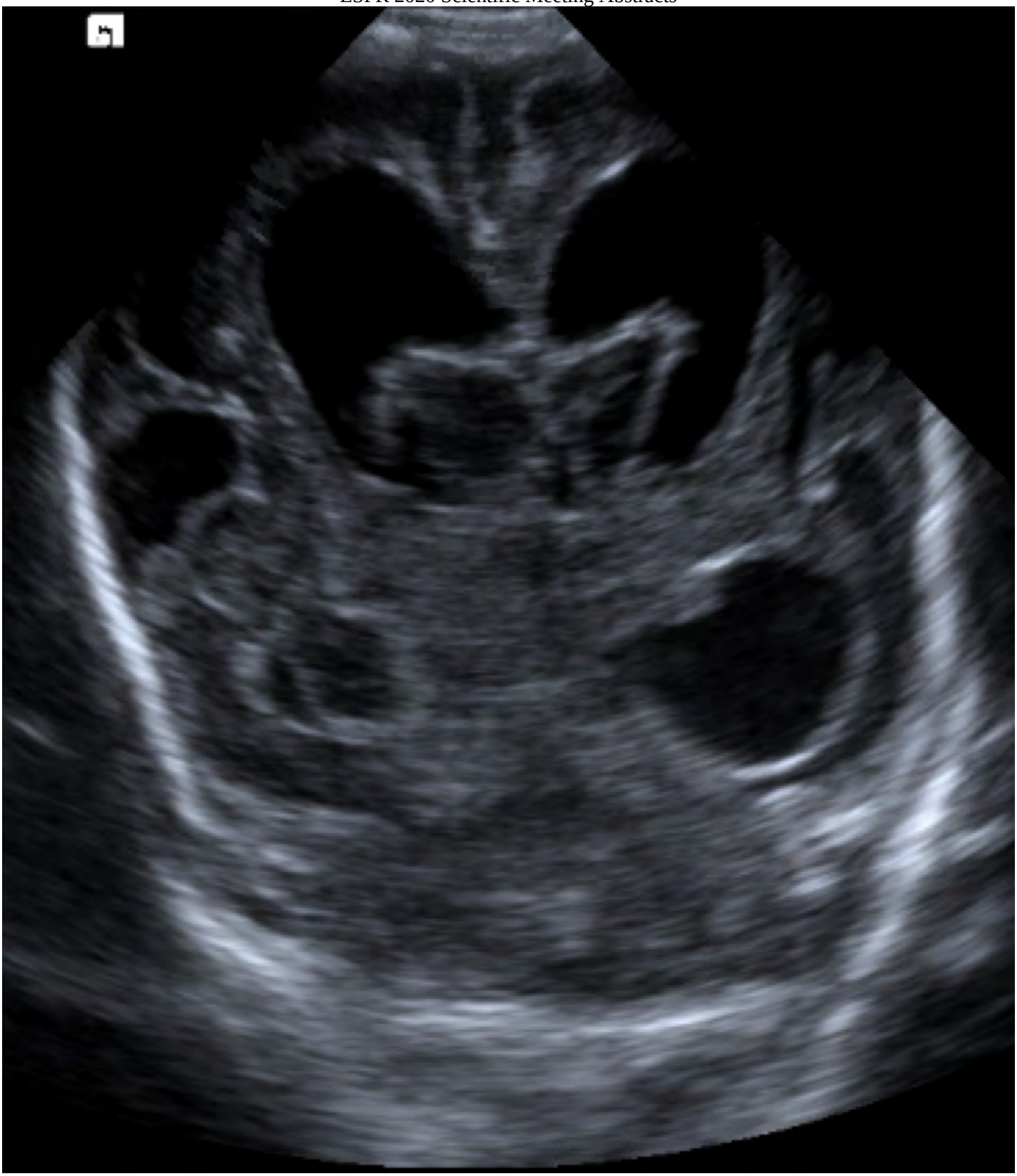
[1]Neonatal-Perinatal Medicine, University of Connecticut Health Center, Farmington, Connecticut, United States, [2]pediatric endocrinology, University of Connecticut Health Center, Hartford, Connecticut, United States

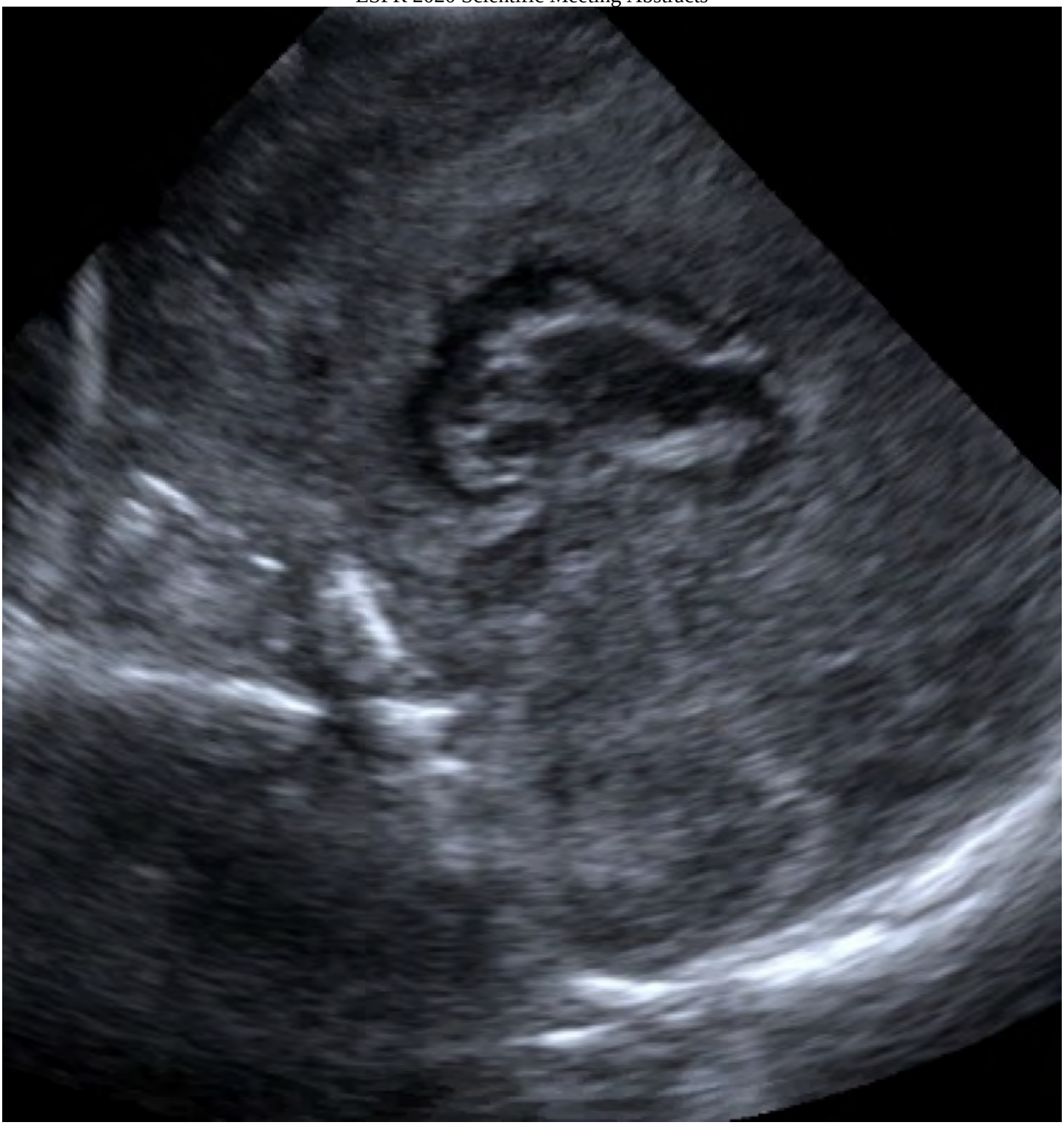
History (including chief complaint, history of present illness and relevant past and family medical history) A 650 g female infant was born at a referring hospital at a gestational age of 23 6/7 wks via c-section with breech presentation. Apgar scores 6 and 7 at 1 and 5 minutes. The mother is a 32 -year-old G6P2 with normal prenatal care and screening labs. Her past prenatal course was significant for three preterm deliveries. She presented with preterm labor at 23 1/7 wks. During labor she received magnesium sulfate, indomethacin, antenatal steroids, vancomycin and fluconazole. The infant's initial course was remarkable for respiratory distress syndrome, left pneumothorax, pulmonary hemorrhage, disseminated intravascular coagulopathy, large patent ductus arteriosus, Grade III-IV intraventricular hemorrhage (IVH), adrenal and renal insufficiency. At 30 days of life, the infant was transferred to our facility for intraventricular reservoir placement. At the time of transfer, the infant demonstrated polyuria (to 12 ml/kg/hr) and a gradual increase in serum Na necessitating an increase in total fluids to 240 ml/kg/day.

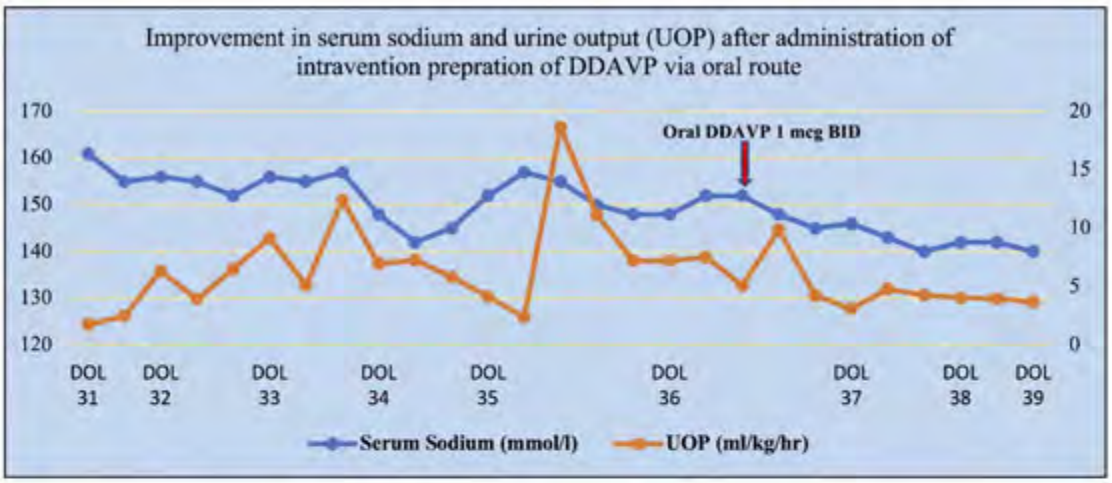
Physical examination findings (including vital signs) Vitals: T 37.2°C, HR 166, BP 50/29, RR 40, SpO2 90%. Intubated and on oscillator ventilator. Physical exam: extreme prematurity.

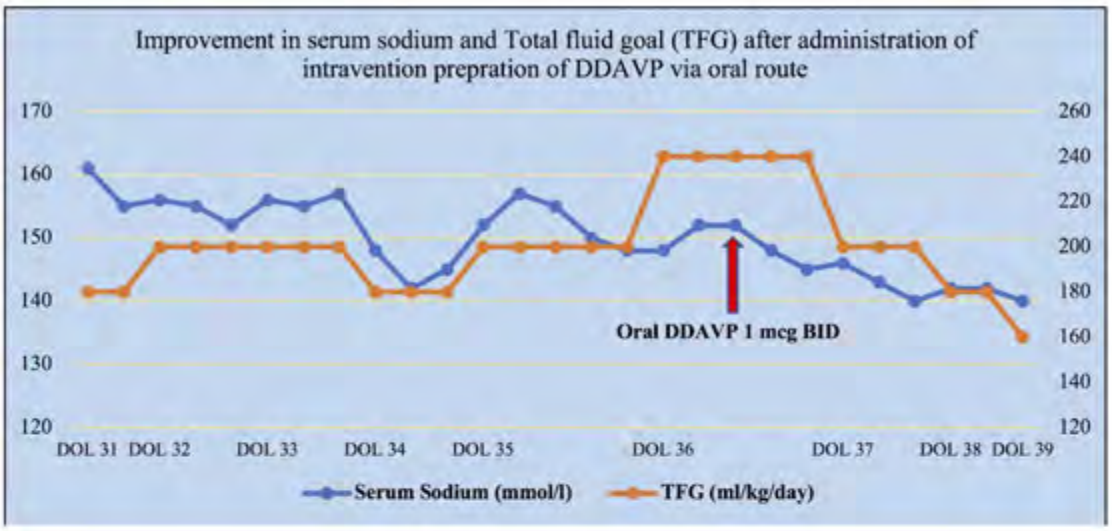
Laboratory or Diagnostic imaging or Procedures CBC, blood gas, coagulation, liver and renal functions were unremarkable. Serum chemistry: high Na (162 mmol/l) and Cl (124 mmol/l) but serum K, BUN and creatinine were normal. High serum osmolality (329 mosm/kg), low urine osmolality (155 mosm/kg) with a relatively low plasma copeptin level (<14 pmol/L). CXR: chronic lung changes. Cranial US (Image 1&2): bilateral posthemorrhagic hydrocephalus with residual clot within both lateral and 3rd ventricles and evidence of periventricular leukomalacia.

Final Diagnosis The combination of persistent high Na, polyuria, high serum osmolality, low urine osmolality and a relatively low plasma copeptin level for a stressed premature infant (J Clin Endocrinol Metab, June 2011, 96(6):E982–E985) in the setting of severe IVH confirmed a diagnosis of central diabetes insipidus (CDI). The diagnosis of CDI is extremely uncommon during the neonatal period especially in very low birth weight infants. Different preparations of desmopressin (DDAVP) are available for the management of CDI; however, there are limited data for their use in neonates. In conclusion, we report a very low birth weight infant with CDI who was successfully managed with close monitoring and administration of intravenous formulation of DDAVP via the oral route (Figure1 & 2).






Improvement in serum sodium and urine output (UOP) after administration of intravention prepration of DDAVP via oral route
Oral DDAVP 1 mcg BID
170
160
150
140
130
120
20
15
10
5
0
DOL 31
DOL 32
DOL 33
DOL 34
DOL 35
DOL 36
DOL 37
DOL 38
DOL 39
Serum Sodium (mmol/l)
UOP (ml/kg/hr)


Improvement in serum sodium and Total fluid goal (TFG) after administration of intravention prepration of DDAVP via oral route
170
160
150
140
130
120
260
240
220
200
180
160
140
120
Oral DDAVP 1 mcg BID
DOL 31
DOL 32
DOL 33
DOL 34
DOL 35
DOL 36
DOL 37
DOL 38
DOL 39
Serum Sodium (mmol/l)
TFG (ml/kg/day)

Abstract: 75

Acute rheumatic fever with an uncommon initial presentation

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History (including chief complaint, history of present illness and relevant past and family medical history) A 9-year-old fully vaccinated, healthy Hispanic boy presented to the emergency room (ER) with complaints of periumbilical abdominal pain for 1 day. There was no history of fever, rash, cough, vomiting, diarrhea or dysuria. No relevant past medical, surgical or family history.
Physical examination findings (including vital signs) In the ER: Vitals: Tmax: 101.1F; Pulse: 140/min; Resp Rate: 22/min; BP: 120/76 mm Hg. On initial examination, the patient appeared ill. Abdomen was soft to palpation with no organomegaly, regular bowel sounds and with significant McBurney's, right lower quadrant and right sided costovertebral angle tenderness but with no other signs of acute appendicitis.
Routine labs were sent (table 1). An ultrasound and CT abdomen ruled out acute appendicitis. But the ultrasound showed right sided pelvic kidney with focal cortical scarring. A presumptive diagnosis of right pyelonephritis was made based on the clinical exam and ultrasound results.
On day 5 of hospitalization, he developed left knee and ankle pain and swelling. On day 6, there was improvement in the swelling on the left side but with a new onset right knee and ankle swelling. With further investigations (table 2,3) the patient was found to meet two major revised Jones criteria for acute rheumatic fever (ARF)- migratory polyarthritis and subclinical carditis on echo in addition to elevated ASO titers. He was prescribed naproxen for the arthritis and IM Benzathine penicillin to be continued monthly.
Laboratory or Diagnostic imaging or Procedures Results of pertinent labs and imaging are shown in Tables (1,2,3) and Figure 1.
Final Diagnosis Acute rheumatic fever with rheumatic mitral valve disease.
Discussion:
Data from the last 25 years show a global decline in incidence of ARF, although sporadic outbreaks do occur. Less than 5% of patients with ARF present with acute abdominal pain initially. It is usually generalized, non-specific and precedes the classic symptoms by a few days and is due to the acute mesenteric inflammation in response to infection. A review of literature showed it could also mimic appendicitis, with patients undergoing an appendectomy, when it is severe and localized to the right lower quadrant. Our patient's presentation of fever and right lower quadrant abdominal pain before polyarthritis prompted evaluation for acute appendicitis. Though rare, acute rheumatic fever should be included in the differential diagnosis of patients with acute abdominal pain of unknown etiology and elevated inflammatory markers, which in turn warrants a thorough history to elicit a previously undiagnosed/untreated streptococcal pharyngitis.

Table 1: **Routine Labs**

Blood	WBC (k/ul)	Hb (g/dl)	Hct (%)	Plt (k/ul)	N (%)	L (%)	Culture
On admission	18.4	9.2	29.1	146	24	52	No growth

Urine	Bacteria	Blood	Nitrites	Leukocyte Esterase	Culture
	Few	Small	Neg	Small	No growth

Inflammatory Markers	CRP	ESR	LDH	Uric Acid	Ferritin
	131	121	181	2	276

Abbreviations:

WBC: White Blood Cells
Hb: Hemoglobin
Hct: Hematocrit
Plt: Platelets
N: Neutrophils
L: Lymphocyte
CRP: C-Reactive Protein
ESR: Erythrocyte Sedimentation Rate
LDH: Lactate Dehydrogenase

Table 1. **Routine Labs**

Table 2: **Serology**

Infectious panel	Lyme's		Parvo B19		ASLO	GC/Chl	EBV			
	IgG	IgM	IgG	IgM			VCA IgG	EBNA	VCA IgM	EA
	Negative		Negative		591	Negative	Positive		Negative	
Rheumatological panel	**ANA**		**C3/C4/ CH50**		**Total Complement**		**Anti CCP**		**RF**	
	1:80		Normal		Normal		Negative		Negative	

Abbreviations:

ASLO: Anti-Streptolysin O
GC/Chl: Gonococcal/Chlamydia
EBV: Epstein-Barr virus
VCA: Viral Capsid Antigen
EBNA: Epstein-Barr Nuclear Antigen
EA: Early Antigen
ANA: Anti-Nuclear Antibody
CCP: Cyclic Citrullinated Peptide
RF: Rheumatoid Factor

Table 2. **Infectious and Rheumatological Serology**

Table 3: **Imaging**

Xray Left Knee	Pre-patellar swelling with no fractures or dislocations
Xray Left Ankle	No fractures or dislocations
Ultrasound Abdomen	Focal cortical thinning/scarring along the interpolar region of the right kidney and dilation of the interpolar collecting system and renal pelvis- findings suggestive of prior pyelonephritis. Normal Left kidney Non visualization of the appendix.
CT Abdomen with contrast	Normal appendix. The right kidney is a pelvic kidney and there appears to be hydronephrosis.
Initial Echocardiogram (Fig 1)	There is evidence of subclinical carditis and a thickened anterior leaflet of mitral valve. **Mild mitral regurgitation** with posteriorly deviated jet. No mitral stenosis. Trivial aortic regurgitation. No aortic stenosis. Qualitatively normal right and left ventricular size and systolic function.
Follow up Echocardiogram as an Out-patient 6 weeks later (Fig 1)	Thickened anterior mitral valve leaflet with **moderate regurgitation, increased from prior study.** No significant mitral stenosis. Trivial aortic regurgitation, unchanged from prior study. Qualitatively normal right and left ventricular size and systolic function. No evidence of significant pulmonary hypertension. No significant pericardial effusion.

Table 3. **Imaging**

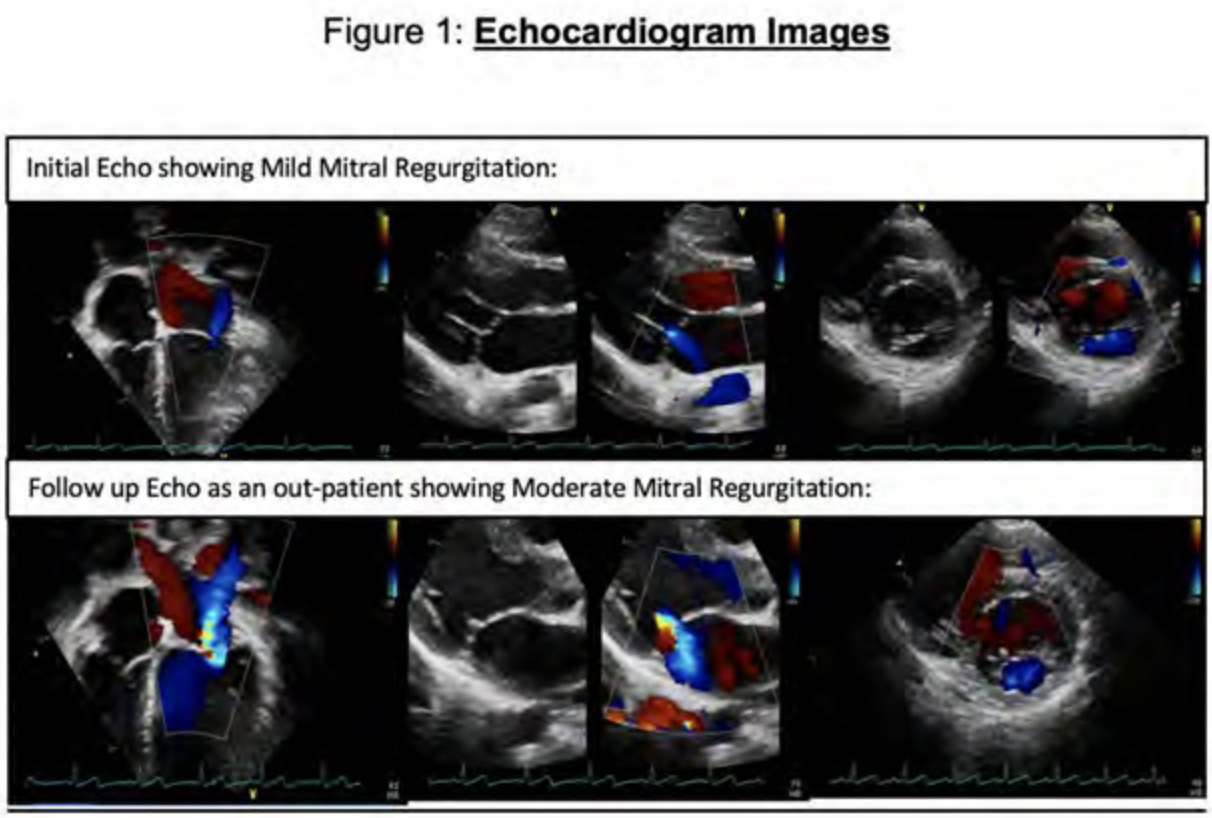

Figure 1. **Echocardiogram Images**

Abstract: 260

A Rare Cause of Lower Extremity Pain

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History (including chief complaint, history of present illness and relevant past and family medical history) A 15-year-old female without significant past medical history presented to pediatric emergency department (PED) with progressive bilateral lower leg pain in distribution behind the knees and anterior shins of 2 weeks, associated with back pain and fever. Patient denied headache, vomiting, bowel or bladder changes, weight loss, trauma, leg swelling, saddle anesthesia, or other neurological complaints. Her initial back pain had occurred 3 weeks prior, with normal lumbar-thoracic spinal x-rays. She was started on antibiotics for urinary tract infection by PCP. Her back and leg pain had resolved with ibuprofen. The next evaluation of her leg pain occurred 1 week later at PED. She had normal blood work at that time and was walking after given ibuprofen.

Physical examination findings (including vital signs) Vital signs: T 36.2 °C, BP 110/66, HR 70, RR 18, SpO2 99% RA. Patient was non-toxic appearing, interactive with family. Physical examination revealed non-focal and symmetric neurologic exam including normal reflexes, symmetric muscle tones in lower extremities. Mild tenderness elicited over bilateral anterior aspect of lower extremities. No focal midline tenderness of the back. She refused to ambulate due to pain but able to stand and bear weight. The remainder of physical examination was normal.

Laboratory or Diagnostic imaging or Procedures Pertinent laboratory finding included normal CBC and CK level. Comprehensive metabolic panel including lipase, and urine analysis were unremarkable. Tib-Fib x-rays showed no acute fracture or dislocation. Patient was able to ambulate after received morphine. She was discharged home with scheduled follow-up with pediatric orthopedist established by pediatrician in the morning.

During orthopedic evaluation, no neurologic loss of function was noted, additional rheumatologic labs including inflammatory markers were normal except for slightly elevated CRP of 25. Two days later, patient developed perineal dysesthesias prompted ED visit. Spinal MRI revealed destructive lesion at T12-L1/2 level spinous process with epidural mass compressing the conus medullaris. Patient was taken to OR by neurosurgery team for spinal cord decompression, tumor resection with laminectomy.
Pathology confirmed for Ewing Sarcoma. Pediatric oncology team was consulted, and patient started combination of radiation and chemotherapy. While Ewing cancer primarily occurs in bone but can originate in soft tissues (account for <15% of all Ewing sarcoma). In our patient's case, the tumor was located in the spinal connective tissue, which was an unusual cause of spinal cord compression.
Final Diagnosis Extraosseous Ewing Sarcoma

Abstract: 344

Case Report: An infant presenting with pyloric stenosis and autosomal recessive polycystic kidney disease at 36 weeks post-menstrual age

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Background There is an increased incidence of genitourinary anomalies in infants with hypertrophic pyloric stenosis. To date, there have been 4 previous case reports describing the potential association between pyloric stenosis and polycystic kidney disease (PKD), both dominantly and recessively inherited types.
Objective To report the case of a premature male infant, who was diagnosed with pyloric stenosis and autosomal recessive polycystic kidney disease (ARPKD) at 36 weeks post-menstrual age (PMA).
Design/Methods Case Report
Results The infant was born at 33-5/7 weeks gestation via C-section in the setting of preterm labor and oligohydramnios of unknown etiology. The prenatal ultrasounds were reported as normal, with the exception of oligohydramnios. He followed a largely uncomplicated course for the first two weeks of life. He did not have significant respiratory compromise and was weaned from non-invasive respiratory support on day of life (DOL) 2. On DOL 16 (PMA 36-1/7), he developed significant projectile emesis and metabolic alkalosis. Ultrasound demonstrated pyloric hypertrophy. The following day, he developed severe hypertension with systolic blood pressures persistently elevated above 130mmHg. A renal ultrasound revealed bilaterally enlarged kidneys (6.4cm, 6.1cm) with markedly echogenic renal cortices and numerous punctate cysts, consistent with a diagnosis of ARPKD. The infant had no family history of renal disease. His blood pressure was initially managed with a nicardipine infusion while he underwent pyloromyotomy. He remained in the Neonatal Intensive Care Unit until DOL 51 due to severe refractory hypertension. His renal function remained normal. He had mild hyponatremia requiring oral sodium supplementation. He was eventually discharged home on four oral anti-hypertensive agents – captopril, propranolol, furosemide and isradipine.
Conclusion(s) This case report provides further evidence of this unusual association between pyloric stenosis and PKD, thought to be due to a deficiency of nitric oxide synthetase, which results in a failure of relaxation of smooth muscle. To the best of our knowledge, this case is the earliest reported PMA at which pyloric stenosis was diagnosed, among this group of infants. It is also the first to describe an infant with this association, who was diagnosed with pyloric stenosis before the diagnosis of PKD was made.

Abstract: 247

Change In Leukocyte Profile Following A Leukoreduced Red Blood Cell Transfusion In Very Low Birth Weight Preterm Neonates

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Background Packed red blood cells (PRBC) are the most common blood product administered to sick neonates. Limited studies in pediatric and adult patients have observed leukocytosis after a PRBC transfusion. There are no large studies investigating whether transfusion of critically ill preterm neonates with leucodepleted red cells causes leucocytosis. Recognition of post-PRBC transfusion leukocytosis may avoid unnecessary investigations and therapies in false suspicion of sepsis.
Objective To assess changes in leukocyte and platelet profiles that occur after a transfusion of leukoreduced PRBC in very low birth weight (VLBW ≤1500 gram) preterm neonates (gestational age, GA ≤ 37 weeks).
Design/Methods A retrospective cohort single-center study of VLBW preterm infants who received PRBC transfusion at Brookdale Hospital from January 2014 to June 2019. White blood cell (WBC) and platelet count results within 24 hours pre-transfusion and up to 72 hours post-transfusion were collected. Preterm neonates who do not have complete blood counts (CBC) within 72 hours of PRBC transfusion were excluded. A subset analysis was done for the first transfusion vs. any transfusion. A comparison of laboratory data

before and after transfusion was tested for significance using the Wilcoxon signed ranks test or paired T-test as appropriate.
Results A total of 108 VLBW preterm infants with 402 PRBC transfusions were included. Subjects' mean GA was 27.2 ± 2.5 weeks and mean birth weight was 913 ± 264 grams (Table 1). There was no difference in total WBC, absolute neutrophil count (ANC), absolute monocyte count (AMC), absolute eosinophil count, and absolute lymphocyte count between pre and post-transfusion (Table 2). However, the platelet count was decreased in the post-transfusion group ($p < 0.001$). In the subset analysis for first time transfusion among the 108 infants, total WBC, AMC, ANC were increased significantly post-transfusion (Table 3, Figure 1).
Conclusion(s) Our study showed that PRBC transfusions can cause an elevation in neutrophils, monocytes, and eosinophils and a drop in platelets, within 72 hours after transfusion. These changes were only observed after the first transfusion, but not after further transfusions, except for a drop in platelet count. Awareness of these changes may avoid unnecessary evaluation of suspected sepsis, only after the first transfusion. Further studies are needed to identify factors related to PRBC transfusion induced changes in leukocyte and platelets profile.

Table 1: Demographic characteristics (n=108)

Parameter	
Gestational age, Mean (±SD)	27.2 (±2.5)
Birth weight in grams, Mean (±SD)	913 (± 264)
Sex, n (%)	Male: 58 (54%) Female: 50 (46%)

Table 2: Change of laboratory parameters before and after blood transfusions in 108 studied subjects (number of transfusion encounters =402)

Laboratory finding	Before transfusion[1]	After transfusion[1]	P value
WBC, Median (IQR)	17.1 (11.7-23.3)	17.1 (12.6-22.9)	0.625
Absolute neutrophil count, Median (IQR)	7.5 (4.1-11.9)	7.2 (4.5-11.8)	0.509
Absolute Monocyte, Median (IQR)	1.9 (1.2-3.0)	2.0 (1.2-3.1)	0.367
Absolute Lymphocyte, Median (IQR)	4.5 (3.2-6.2)	4.6 (2.9-6.1)	0.739
Absolute Eosinophils, Median (IQR)	0.6 (0.2-1.1)	0.5 (0.3-1.2)	0.724
Platelet count, Median (IQR)	205 (128-300)	181 (118-272)	<0.001

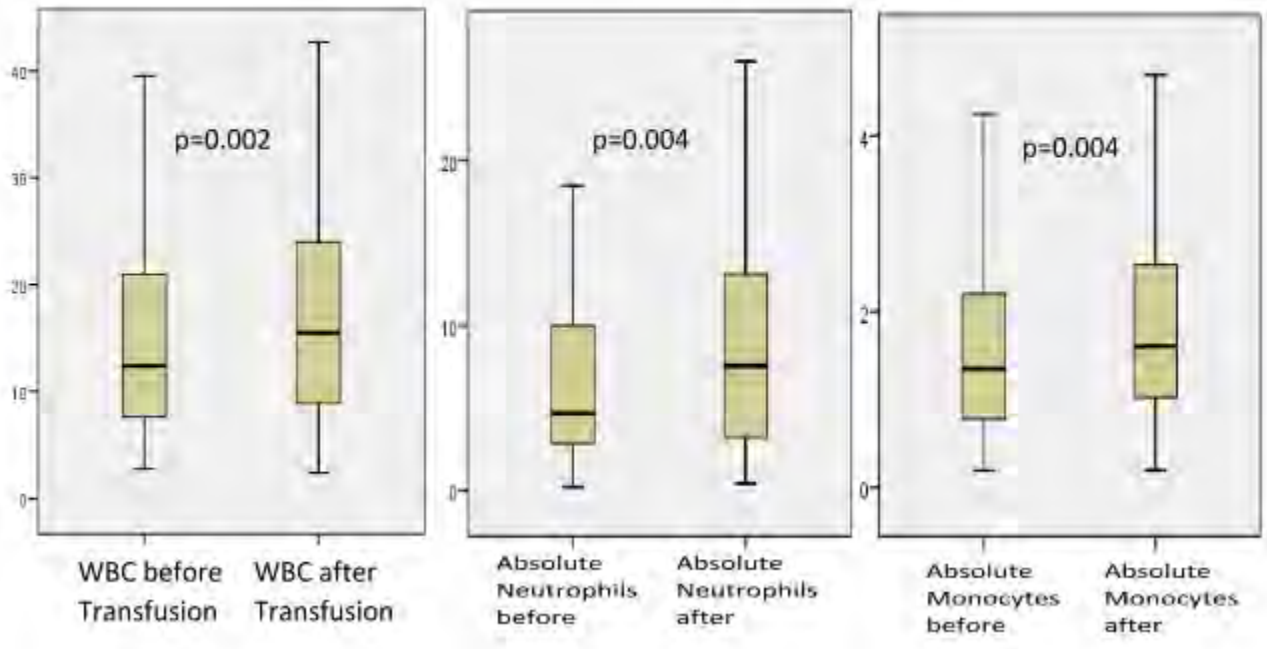
1 - all values are expressed as 10x3 / µL.

Table 3: Change of laboratory parameters before and after FIRST TIME blood transfusions (n=108)

Laboratory finding	Before transfusion[1]	After transfusion[1]	P value
WBC, Median (IQR)	12.7 (7.7-21.2)	16.0 (9.0-24.7)	**0.002**
Absolute neutrophil count, Median (IQR)	4.7 (2.8-10.6)	7.7 (3.2-13.3)	**0.004**
Absolute Monocyte, Median (IQR)	1.4 (0.8-2.2)	1.6 (1.0-2.5)	**0.007**
Absolute Lymphocyte, Mean (±SD)	4.5 (±2.3)	4.4 (±2.1	0.825
Absolute Eosinophils, Median (IQR)	0.3 (0.1-0.6)	0.3 (0.2-0.8)	0.355
Platelet count, Mean (±SD)	235 (±118)	226 (±133)	**0.007**

1 - all values are expressed as 10x3 / µL.

Figure 1: Change of laboratory parameters before and after FIRST TIME blood transfusions (n=108)



Abstract: 76

Identification of Factors Associated with Emergency Department Length of Stay > 8 Hours

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Background Nationally the length of stay (LOS) in emergency departments (ED) has been increasing, and this includes pediatric specific EDs. Identification of factors associated with extended LOSs could be used to develop predictive models that identify patients at presentation and guide patient evaluations that lead to a more acceptable LOS. It has been more than a decade since a study evaluating risk factors has been published.
Objective To evaluate risk factors for extended LOS in the PED.
Design/Methods This is a retrospective case-control study conducted in a free standing PED. Case inclusion criteria were LOS > 8 hours, age <21 years, and presentation during the 2018 calendar year. Cases were excluded if they eloped, had a LOS < 8 hours, left against medical advice, died or had a behavioral health chief complaint. With the exception of inclusion criteria of < or = 4 hours and exclusion criteria of LOS > 4 hours and 1 minute, controls had the same inclusion/exclusion criteria. Risk factors abstracted included demographics, acuity, chief compliant/comorbidities/diagnosis (categorized by system), mode of arrival, season of visit, time to be roomed and see a provider, training level of primary provider, medications administered, labs/imaging obtained, procedures performed, need for sedation and consult services involved in the care. Data was analyzed using Fisher's exact test if categorical and a Wilcoxon rank-sum test if continuous or ordinal. A multivariate analysis was also performed.
Results 939 cases and 488 controls were identified. Univariate analyses showed significant differences between cases and controls ($p<0.01$), cases were younger in age (Table 1). Spoken language, gender and race were similar between groups. Ccases were also more likely to have a higher acuity, winter arrival, arrival by ambulance, have a GI or neurologic chief compliant, have a neuro/psych diagnoses, be admitted to the hospital, receive an EEG or consult. In addition, they received more medications, lab tests, imaging and were more likely to be sedated. Number of procedures and comorbidities were similar between groups (Table 2). Multivariate analyses showed age, clinical diagnosis, season, medications, lab & imaging studies, and consults significant (Table 2).
Conclusion(s) A number of risk factors were associated with excessive LOS including demographic factors, season, number of medications administered and tests performed. Many of these factors can be further analyzed and used as the bases for improvement projects aimed at decreasing ED LOS.

Table 1: Demographic Characteristics

	Cases	Controls	Univariate p=	Multivariate
AGE	8.6±6.4	7.0±6.0	< 0.01	OR = 0.88, 95% CI: 0.83 to 0.92
SEX			0.02	
Female	411 (44%)	129 (26%)		
Male	166 (18%)	115 (24%)		
RACE			< 0.01	
White	411 (44%)	129 (26%)		
Black	166 (18%)	115 (24%)		
Other	362 (39%)	244 (50%)		
ETHNICITY			< 0.01	
Hispanic	319 (34%)	248 (52%)		
Not Hispanic	609 (66%)	231 (48%)		
INSURANCE			< 0.01	
Private	354 (38%)	107 (22%)		
Public	561 (60%)	371 (76%)		
LANGUAGE			0.75	
English	853 (91%)	443 (91%)		
Spanish	74 (8%)	41 (8%)		

Table 2: Risk Factors

	Cases	Controls	Univariate p=	Multivariate
CLINICAL DIAGNOSIS			< 0.01	
GI	245 (26%)	43 (9%)		
Neuro/Psych	120 (13%)	17 (3%)		OR = 4.91, 95% CI: 1.94 to 12.78
CHIEF COMPLAINT			< 0.01	
GI	342 (36%)	65 (13%)		
Neuro	65 (7%)	12 (2%)		
MONTH of VISIT			< 0.01	
Not Winter	319 (34%)	227 (47%)		
Winter	620 (66%)	261 (53%)		OR = 2.61, 95% CI: 1.57 to 4.42
# MEDICATIONS	4.5±3.7	0.7±1.0	< 0.01	OR = 2.61, 95% CI: 1.57 to 4.42
# LABS	7.6±6.8	0.6±2.2	< 0.01	OR = 1.35, 95% CI: 1.24 to 1.48
# IMAGING	1.4±1.3	0.3±0.5	0.01	OR = 2.11, 95% CI: 1.51 to 3.03
TIME: Arrival - Room (min)	24.7±41.7	17.1±20.7	< 0.01	
TIME: Arrival - Provider (min)	47.0±54.8	30.7±29.2	< 0.01	
# CONSULTS	0.8±0.8	0.1±0.3	0.01	OR = 10.51, 95% CI: 5.93 to 19.64
# PROCEDURES	0.1±0.3	0.1±0.2	0.06	
EEG	19 (2%)	0 (0%)	< 0.01	
SEDATION	19 (2%)	0 (0%)	< 0.01	

Abstract: 77

Sound and Air: Ultrasonographic Measurements of Pediatric Chest Wall Thickness and Implications for Needle Decompression of Tension Pneumothorax

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Background Needle decompression is potentially life-saving in cases of tension pneumothorax. While Advanced Trauma Life Support recommends an 8-cm needle for decompression for adults, no detailed pediatric guidelines exist, specifically regarding needle length or site of decompression.
Objective This study aims to inform recommendations for needle length and insertion site for tension pneumothorax decompression in the pediatric population and grouped them based on Broselow Pediatric Emergency Tape categories.
Design/Methods Point-of-care ultrasound was used to measure chest wall thickness—the distance between skin and pleural line—bilaterally at the 2nd intercostal midclavicular line and the 4th intercostal anterior axillary line in children of various ages and sizes (Figure 1). Patients were grouped based on Broselow tape weight categories. Measurements were compared between left versus right sides at the two anatomic sites. Interclass correlation coefficients were calculated to assess for interrater reliability.
Results A convenience sample of 163 patients from our emergency department were enrolled. For patients who fit into Broselow tape categories, chest wall thickness at the 2nd intercostal midclavicular line ranged from 1.11 to 1.91 cm, and at the 4th intercostal anterior axillary line ranged from 1.13 to 1.92 cm. In patients larger than the largest Broselow category, 77% had a chest wall thickness less than the length of a standard 1.25-inch (3.175 cm) catheter. There were no significant differences in the measurements of chest wall thickness based on laterality nor anatomic site (Figure 2).
Conclusion(s) The standard 1.25-inch (3.175 cm) catheters are sufficient to treat the majority of tension pneumothoraces in pediatric patients.

Figure 1. Point-of-care ultrasound was used to measure chest wall thickness (CWT), the distance between skin and pleural line, at the 2nd intercostal space's midclavicular line (2-MCL) and the 4th intercostal space's anterior axillary line (4-AAL) bilaterally.

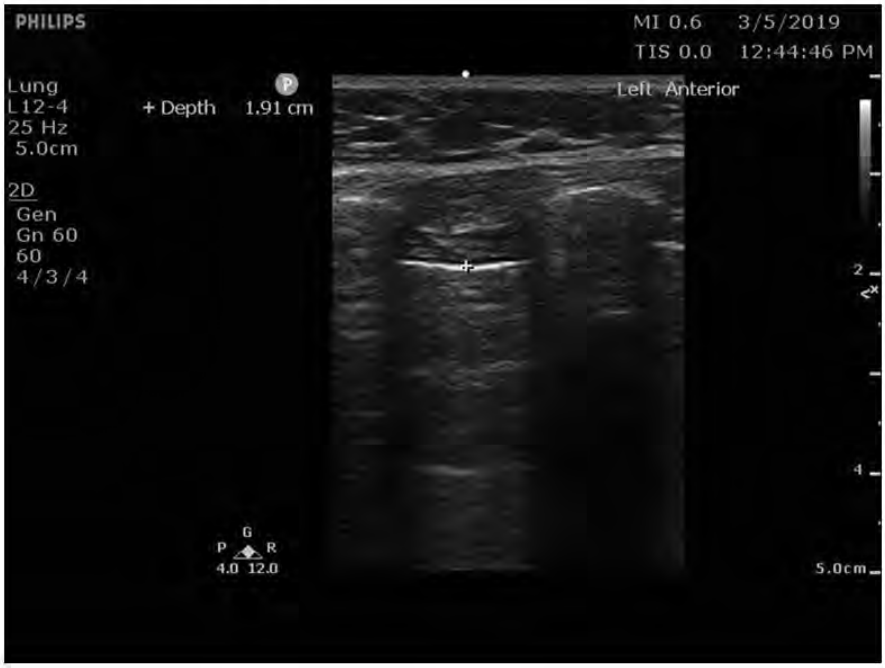
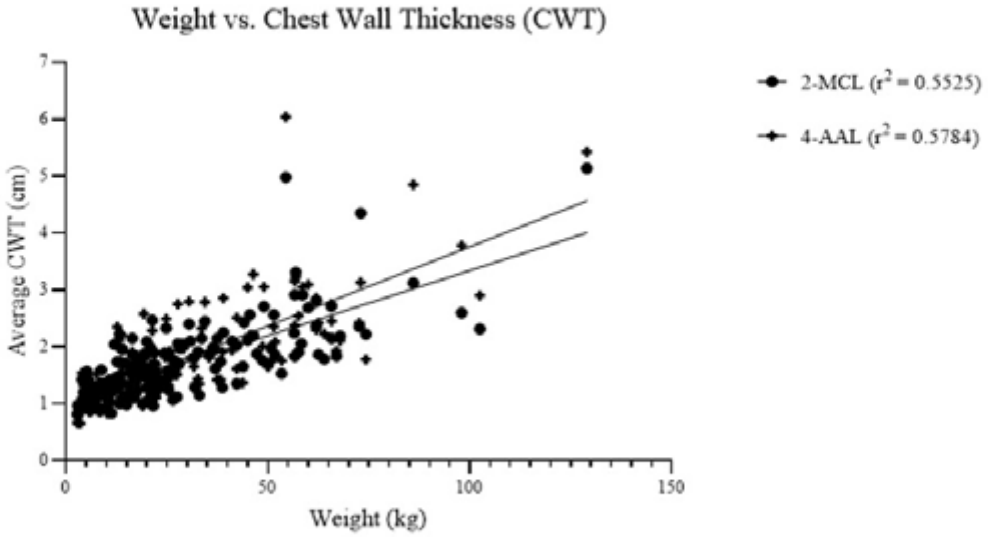


Figure 2. Scatterplot and linear regression of the relationship between weight and CWT is shows strong positive correlation between the variables.



Abstract: 78

Improving the care of croup through a clinical pathway

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Background Croup is a common respiratory illness presenting to the ED and one of the most common causes of upper airway obstruction in children under age 6. It is a clinical diagnosis and oral dexamethasone and nebulized racemic epinephrine are standard treatments. The 2018 Cochrane Systemic Review found that glucocorticoids improved croup symptoms within two hours. Past studies have defined observation periods for patients with moderate croup, admission criteria for persistent moderate or severe croup as well as not routinely indicated resources (NRIR) for the diagnosis and management of croup. Clinical pathways help standardize and expedite care of many conditions while eliminating unnecessary interventions.
Objective To determine if the implementation of a clinical pathway improves the diagnosis and management of croup by expediting ED care and decreasing the use of NRIR in the ED.
Design/Methods An evidence-based croup clinical pathway was developed with input from key stakeholders. End-users received education on the pathway prior to implementation in May 2018. Baseline data was reviewed consisting of the 7 months prior to pathway implementation for patients ages ≥ 6 months eligible for the croup clinical pathway. Patients were excluded if they had known upper airway abnormality, head or neck or lower respiratory tract bacterial infection, tracheostomy, neuromuscular disorder, or a primary or secondary diagnosis of asthma. Data collected included patient age, sex, disposition, time to dexamethasone, ED length of stay (LOS), and use of NRIR. NRIR were defined as parenteral steroids, chest or neck xray, and viral or serum testing. The same data points were tracked prospectively for 17 months after pathway implementation.
Results 1813 unique ED visits (610 pre-pathway and 1203 post-pathway) were analyzed over 24 consecutive months. Demographic data including age, sex, and admission rate were similar between the baseline and post-pathway implementation groups. Both time to dexamethasone administration and total ED LOS improved after pathway implementation, from 71.7 minutes to 55.8 minutes (Figure 1) and 139.5 minutes to 119.3 minutes (Figure 2) respectively. The total percentage of patients who received ≥1 NRIR improved from 12.8% to 8.6% nine months after pathway implementation (Figure 3).
Conclusion(s) Implementation of a clinical pathway for croup leads to sustained improvement in time to administration of dexamethasone as well as overall ED length of stay. The percentage of patients who received at least one NRIR also improved after pathway implementation.

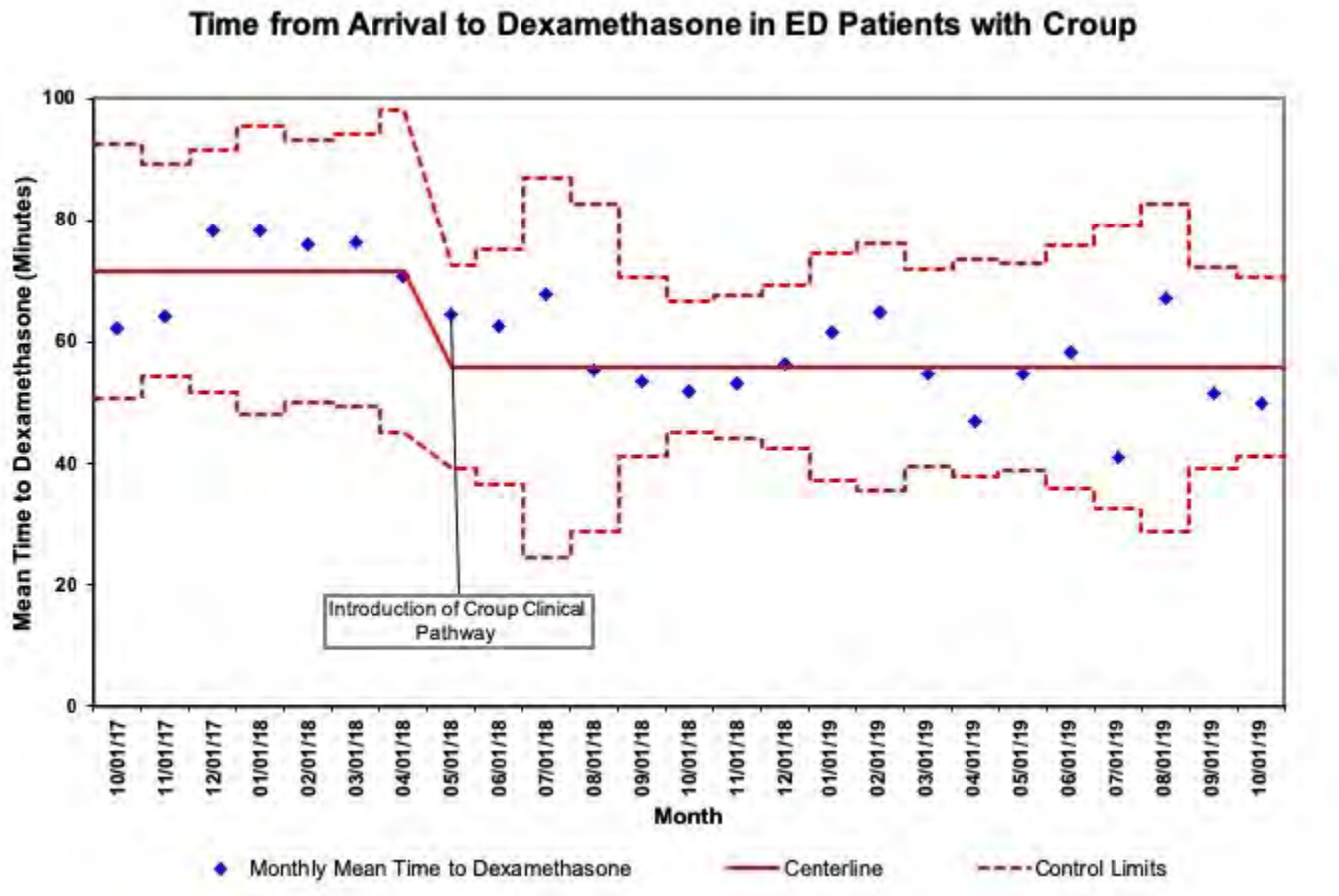
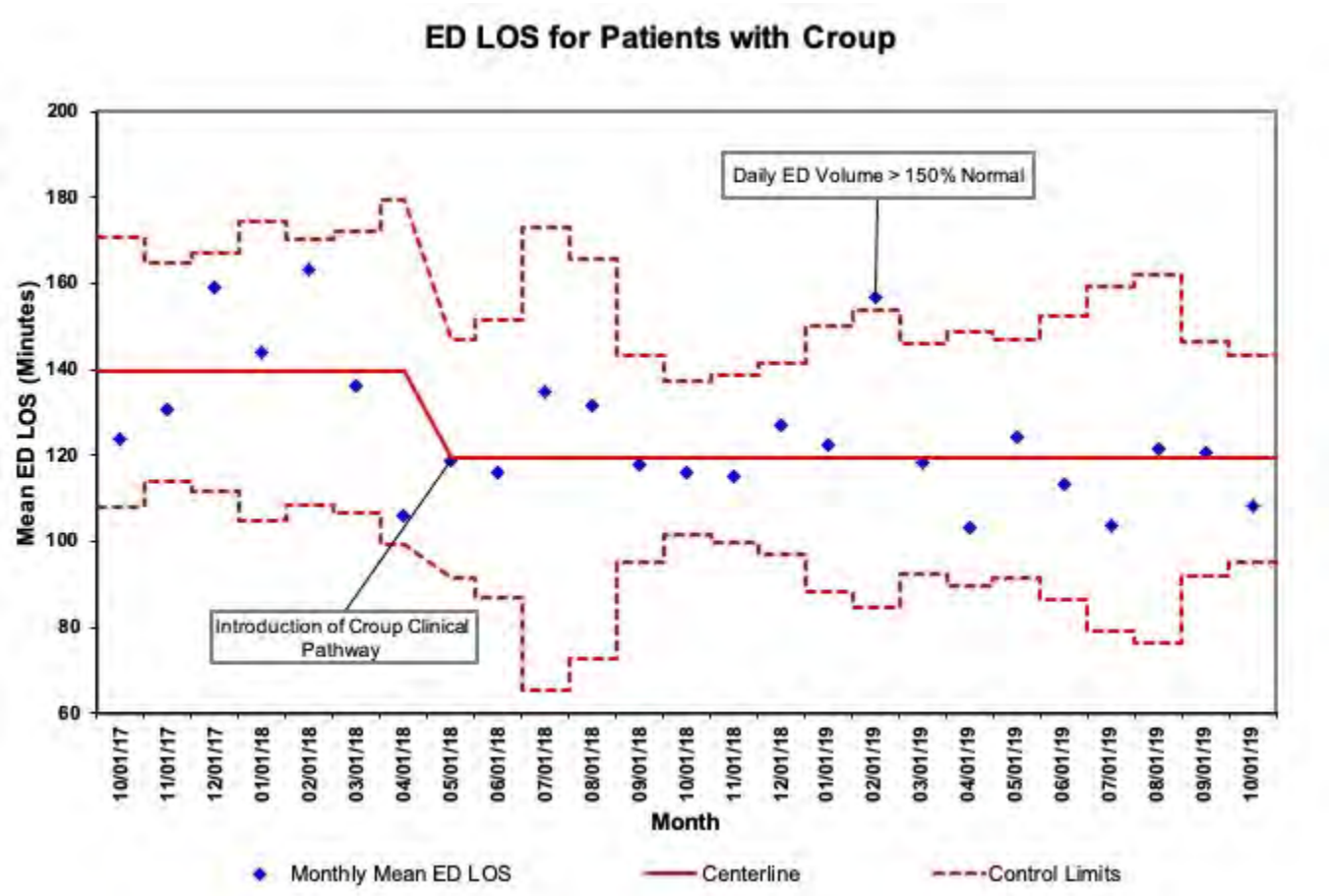


Figure 1


ED LOS for Patients with Croup
Mean ED LOS (Minutes)
200
180
160
140
120
100
80
60
Daily ED Volume > 150% Normal
Introduction of Croup Clinical Pathway
10/01/17
11/01/17
12/01/17
01/01/18
02/01/18
03/01/18
04/01/18
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03/01/19
04/01/19
05/01/19
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09/01/19
10/01/19
Month
Monthly Mean ED LOS
Centerline
Control Limits

Figure 2

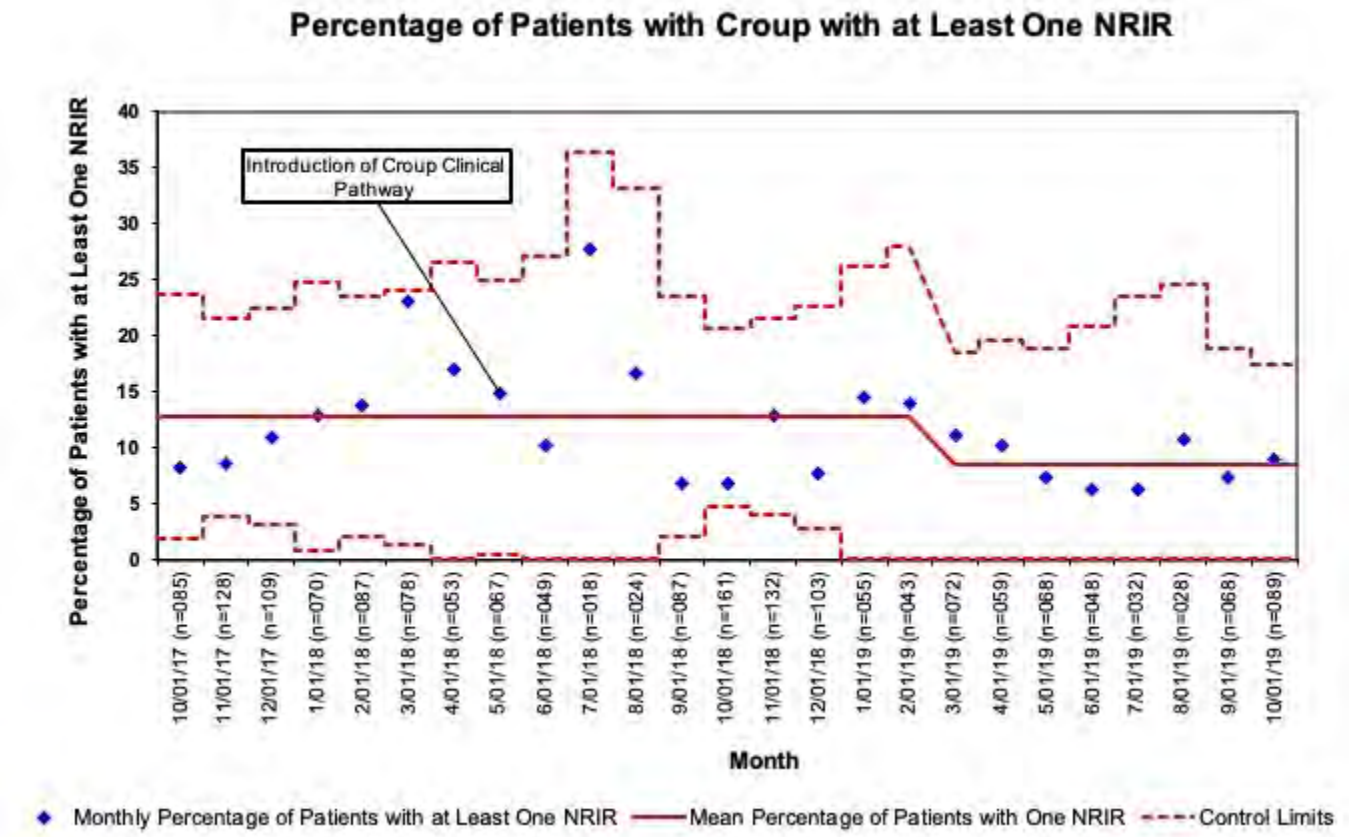

Figure 3

Abstract: 79

Assessing the Necessity for the 'Joint Above and Below' Radiography Approach for Lower Extremity Fractures in Children

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Background Fracture related visits to emergency departments (ED) account for approximately 15% of pediatric ED visits. To diagnose extremity fractures, many providers employ the 'joint above and below' (JAB) radiograph approach, which includes dedicated imaging of the joint proximal and distal to the fracture independent of clinical suspicion for an injury at this site. The incidence of concomitant bony injuries with long-bone fracture of the lower extremity in children has not been commonly reported, representing a gap in the evidence for determining a radiograph approach.

Objective To determine the frequency of and risk factors for concomitant bony injuries with lower extremity long-bone fractures.

Design/Methods A retrospective study of children 1-17 years old treated at an academic medical center ED from 2015 to 2018 with any fracture involving the tibia, fibula, or femur. Pathologic fractures, transfers, and level I trauma patients were excluded. The primary outcome was the prevalence of a concomitant bony injury (fracture or dislocation) at a distinct site in the same extremity. Differences between the concomitant bony injury group and single injury group were characterized using Fisher's Exact tests. Regression analysis was used to determine predictors of concomitant bony injuries, including age, sex, and mechanism of injury (with injuries requiring trauma activation classified as high-risk).

Results During the study period, 241 patients with lower extremity fractures were included. Complete JAB radiographs were taken in 85 of 241 patients (35.3%). Concomitant lower extremity bony injuries were found in 9 of 241 patients (3.73%, 95% CI 1.7-7.0%). No additional concomitant bony injuries were identified at follow-up. When comparing patients with and without concomitant bony injuries, there was no significant difference in age ($p = 0.34$) and gender ($p = 0.73$). However, patients with a high-risk injury were more likely to have a concomitant bony injury ($p < 0.01$, odds ratio 21.9, 95% CI 3.6-131.5).

Conclusion(s) Concomitant lower extremity bony injuries are uncommon in children and primarily occur in patients with high-risk

injuries. JAB radiographs may be beneficial for children with high-risk lower extremity injuries. However concomitant injuries are uncommon with low-risk lower extremity injuries and can typically be identified by clinical assessment and limited imaging.

Abstract: 80

Observation Times for Children after Acute Exposure to Laundry Detergent Pods

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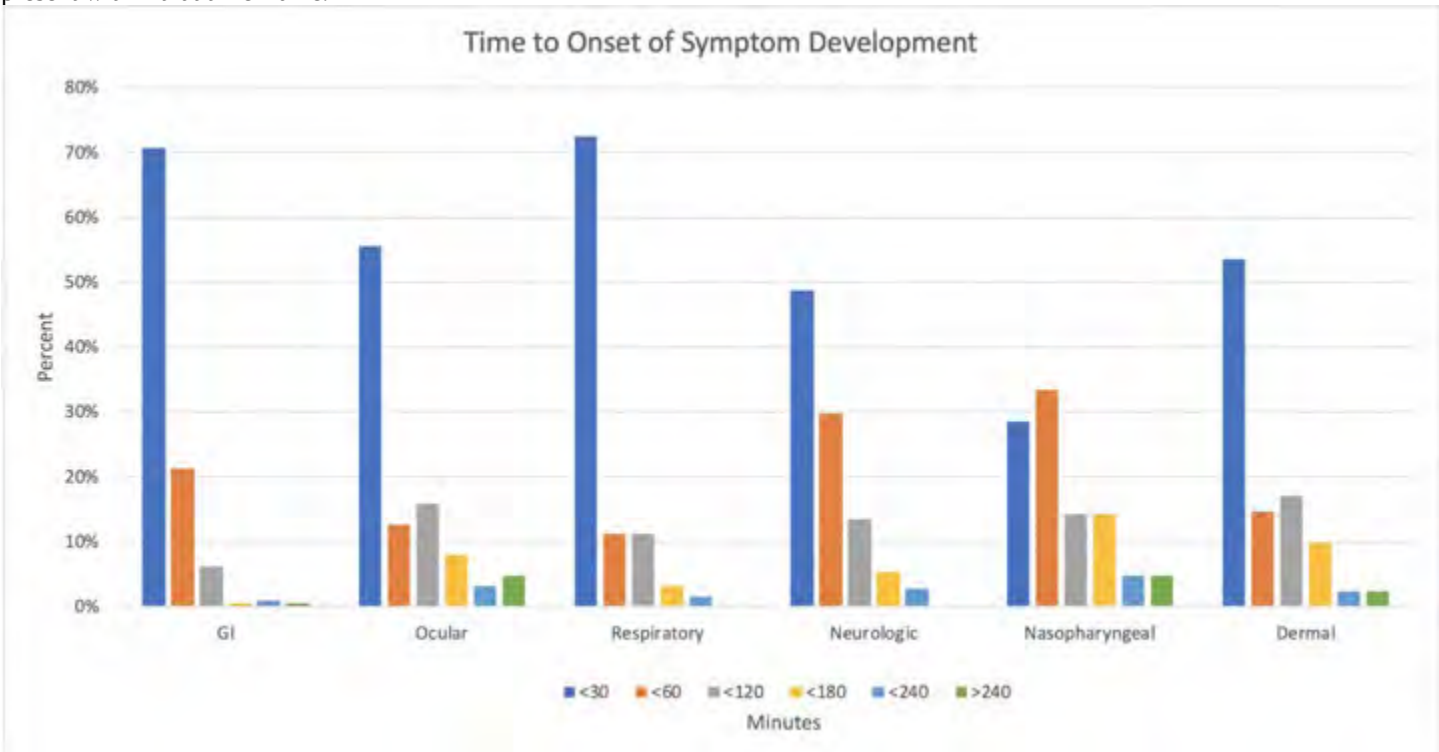
Background Laundry detergent single use pods were introduced in the United States in 2012. Following their introduction, the toxic effects on children were soon described including dermal and ocular injuries, vomiting, respiratory distress, central nervous system depression and even death. Given the significant toxic effects, children who have been exposed to laundry detergent pods require a period of observation to ensure that they do not develop medical outcomes requiring treatment. The required period for observation has yet to be defined.
Objective To determine the observation times necessary to identify the development of potentially significant symptoms for children with acute exposures to laundry detergent pods.
Design/Methods This study is a retrospective chart review of cases of laundry detergent pod exposures reported to the Connecticut Poison Control Center from January 1, 2013 to December 31, 2017. Children ages birth to 6 years exposed to laundry detergent pods in the state of Connecticut were included. Children who were exposed to more than one different substance were excluded.
Results A total of 472 cases of pediatric exposure to laundry detergent pods were identified. Of the children identified, 52.5% were male and the median age was 2 years old. The most common route of exposure was ingestion (69%) and 22% were exposed through multiple routes. The majority of children had minor effects (56%) and no deaths were reported. Of the 472 children, 15 children required admission to the hospital. The most common symptoms that occurred were vomiting (45%), conjunctival injection (14%) and cough (12%). All respiratory symptoms presented in less than three hours following time of exposure with 95% of cases occurring less than 2 hours. Gastrointestinal effects (vomiting, diarrhea, and abdominal pain) occurred within 30 minutes 71% of the time and less than 2 hours 98% of the time. If changes in neurological status were observed, they presented in less than 2 hours for 92% of the cases. Oral and nasopharyngeal irritation/edema also occurred less than 2 hours 76% of the time and less than three hours 90% of the time.
Conclusion(s) Based on this study's findings, children younger than 6 years of age with an acute exposure to laundry detergent pods should be observed for at least three hours whether at home or in the emergency department as the majority of symptoms are likely to present within that time frame.



Demographics

	Percent of Children
Gender	
Male	52.5%
Age (years)	
<1	6.6%
1	34.5%
2	31.8%
3	15.3%
4	7.2%
5	4.0%
6	0.6%

Symptoms Observed Following Exposure to Laundry Detergent Pods

Symptom	# of Children	% of Children
Gastrointestinal Effects		
Vomiting/Nausea	213	45.1%
Diarrhea	10	2.1%
Abdominal Pain	3	0.6%
Respiratory Effects		
Cough	55	11.7%
Respiratory Distress	6	1.3%
Stridor	1	0.2%
Nasopharyngeal/Oral Injury		
Oral Irritation	28	5.9%
Increased Oral Secretions	12	2.5%
Nasal Irritation	2	0.4%
CNS Effects		
Lethargy	36	7.6%
Agitation	1	0.2%
Ocular Effects		
Red Eyes	68	14.4%
Eye Pain	45	9.5%
Corneal Abrasion	14	3.0%
Dermal Effects		
Skin Irritation/Rash	21	4.4%

Abstract: 81

Utility of Lumbar Puncture and Emergent Neuroimaging in Children with Complex Febrile Seizure

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Background Seizures are associated with both acute bacterial meningitis (ABM) and intracranial pathology, though the incidence of both of these outcomes is low in children presenting with complex febrile seizure (CFS).
Objective The objective of this study was to determine a set of predictors to distinguish those children who present with CFS who also have ABM or clinically important intracranial pathology from those who do not.
Design/Methods We performed a retrospective cohort study of all children age 6 months to 6 years who presented to a single urban pediatric emergency department between January 2009 and January 2019 with a complex febrile seizure. We excluded patients who had a previous history of non-febrile seizure, an underlying medical condition that predisposed the patient to seizure, a ventriculoperitoneal shunt, or known trauma. Data extracted from each patient's electronic medical record (emr) included age, sex, ethnicity, fever height, presence or absence of focal neurologic deficit, nuchal rigidity, or altered mental status, seizure characteristics, cerebrospinal fluid (CSF) results (white blood cell count, red blood cell count, culture result), neuroimaging results, need for medical or neurosurgical intervention based on imaging results, and patient disposition.
Results We identified 240 children with complex febrile seizure who met inclusion criteria. Forty-seven (19.6%) had a lumbar puncture (LP) performed and 53 (22.1%) had neuroimaging performed, either in the emergency department or during their inpatient stay related to this illness. Zero children were found to have ABM and two (0.8%) were found to have clinically important intracranial pathology. Both patients with clinically important intracranial pathology presented with multiple seizures in a twenty-four hour period.
Conclusion(s) The risk of both ABM and clinically important intracranial pathology in children with complex febrile seizure is low, indicating that routine lumbar puncture and emergent neuroimaging may not be necessary in this group of patients. However, more studies with a larger number of patients are needed to definitively make this determination.

Abstract: 82

Repeat growth hormone stimulation test in short children to diagnose evolving growth hormone deficiency: clinical clues

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Background The average age at which growth hormone(GH) therapy is initiated in patients with isolated growth hormone deficiency(GHD) is 9.2±4.1 years. These children may not have been diagnosed with GHD if evaluated at an earlier age. Despite its many limitations, GH stimulation tests(GST) continue to play a key role in the diagnosis of GHD
Objective To document the clinical features associated with the evolution of GHD in short children who initially tested GH sufficient
Design/Methods A retrospective analysis of children with short stature(SS) who had more than 1 GST with 2 agents(arginine with glucagon, clonidine or L-dopa). Repeat GST performed due to persistence or worsening of SS, poor growth velocity and in some, in spite of puberty. SPSS was used for paired and independent sample T-test to compare the means between GHD (Peak GH </=10ng/mL) and sufficient (GH>10ng/mL) groups. Group 1= boys with GHD, Group 2= boys without GHD. Puberty defined as Testosterone >20 ng/dL and Luteinizing hormone= >0.3mIU/ml in males. Too few females for analysis.
Results 50 children (41 males) were evaluated at mean age: 9.9 years (4.6-14.5 in males, 8.8-11.9 in females) and mean height Z-score: -1.73SD in males (-2.75 to -0.12SD) and -1.96SD in females (-2.35 to -1.64SD) at first GST. Repeat GST done 0.5-4.5 years later at mean: 12years in males and 12.6years in females. 30 patients (60% total, 86% males) diagnosed with evolving GHD with no other hormone deficiencies. MRI pituitary was normal in all but 7 (23%) with GHD who had small glands. Group 1 had an initial mean peak GH level: 15.3ng/mL and subsequent peak:7.8ng/mL. 31% of the boys in Group1 were pubertal at the 2ndGST and had a mean peak GH level of 7.5ng/mL. Peak GH in Group2 was 16.6ng/mL during both GST's with a mean of 18.1ng/mL in 60% of the pubertal boys. Height Z-score in Group 1 decreased from a mean of -1.67SD to -1.83SD between the GST's ($p = 0.034$) while it remained at -1.8SD in Group 2($p=0.74$). Group 1 grew at a velocity of -1.4SD compared to Group 2 at -0.9SD ($p = 0.035$).
Conclusion(s) Repeat GST helped diagnose evolving GHD in 60% of patients. In those patients, clinical clues that were consistent with the diagnosis included decreasing height Z-scores and low growth velocities despite progression of puberty in some. We recommend repeating GST during longitudinal follow up of children with features of ongoing growth failure.

Abstract: 83

Endocrine Features of ARCN1 Haploinsufficiency Include Short Stature, Microphallus with Hypospadias (in males), and Hypoglycemia.

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Background Archain1 (*ARCN1*) mutations are associated with a rare disorder described in 2016 as in utero growth restriction (IUGR), Pierre Robin sequence, rhizomelic short stature, and transient glycosylation defects.
Objective We describe 3 patients with heterozygous mutations in *ARCN1*.
Design/Methods Medical records were reviewed. *ARCN1* mutations were detected by whole exome sequencing.
Results Patient 1 is a 4 year old male born at 32 weeks with birth weight 940g (Z -3.56), Pierre Robin sequence, cleft palate, microphallus, hypospadias, bifid scrotum, elevated liver enzymes, hyperbilirubinemia, transient glycosylation defects, and feeding difficulties. He had fasting ketotic hypoglycemia with plasma glucose (PG) 49mg/dL at 9 hours, beta-hydroxybutyrate (BOHB) 2.6mmol/L, and free fatty acids (FFA) 1.94mmol/L. Laboratory evaluation for growth was normal. Short stature persisted, so growth hormone (GH, 0.34mg/kg/week) was started at 27 months with good response (height Z -2.05 to -1.38 in 1 year).
Patient 2 is a 2 year old female born full term with birth weight 1984g (Z -2.88), Pierre Robin sequence, cleft palate, elevated liver enzymes, hyperbilirubinemia, and transient glycosylation defects. Laboratory evaluation for growth was normal. Short stature persisted, so GH (0.3mg/kg/week) was started at 19 months with good response (height Z -3.02 to -2.0 in 8 months).
Patient 3 is an 8 month old male born at 30 weeks with birth weight 770g (Z -2.93), Pierre Robin sequence, microphallus, hypospadias, bifid scrotum, elevated liver enzymes, hyperbilirubinemia, minor glycosylation changes, and feeding difficulties. Laboratory evaluations for growth and microphallus were normal. He had fasting hyperinsulinism with PG 44mg/dL at 5 hours, BOHB 0.3mmol/L, and FFA 1.66mmol/L.
Conclusion(s) These patients are similar to 5 published cases with heterozygous *ARCN1* mutations. Although not previously highlighted, microphallus with hypospadias is common in males with this disorder. This is the first description of hypoglycemia and GH therapy in patients with *ARCN1* mutations. We recommend *ARCN1* haploinsufficiency be considered in patients with Pierre Robin sequence, IUGR, elevated liver enzymes, hyperbilirubinemia, and/or microphallus. The presentation is similar to congenital disorder of glycosylation type It (PGM1-CDG), but only transient or minor glycosylation changes are detected when ill. Providers should evaluate for hypoglycemia and consider growth hormone therapy for insufficient catch-up growth.

Abstract: 84

Diabetic Ketoacidosis at Diagnosis of Type 1 Diabetes is Associated with Lower Socioeconomic Status Especially in Young Children

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Background Diabetic ketoacidosis (DKA) at diagnosis of Type 1 Diabetes (T1D) is associated with increased mortality, shorter remission and poorer long-term control. DKA at presentation is preventable; we need to better identify risk factors.
Objective To determine if socioeconomic status (SES) is associated with DKA at presentation of newly diagnosed T1D
Design/Methods We retrospectively analyzed inpatient records of patients admitted to the Children's Hospital of Philadelphia with new onset T1D from 1/1/09 -12/31/18, who were <19 years old, pH and/or bicarbonate recorded at diagnosis, positive for $\geq$ 1 diabetes autoantibody. Patient addresses were geocoded and linked with census tract derived median household income (MHI). MHI was divided into quartiles: lowest quartile <$53,863 and highest quartile >$94,784. DKA defined as pH <7.3 and/or serum bicarb <15 mmol/L. Data were analyzed using Mann-Whitney U and Kruskal-Wallis tests.
Results 341 patients were in the highest quartile MHI and had private insurance; 42% (n=145) female; 3% (n=11) non-Hispanic African American, 87% (n=294) non-Hispanic Caucasian; median age at diagnosis 11.0 yr. 181 patients were in the lowest quartile median household income and had government insurance; 48% (n=87) female, 62% (n=109) non-Hispanic African American, 17% (n=30) non-Hispanic Caucasian, median age at diagnosis 10.5 yr. Highest vs lowest quartiles MHI differed on race/ethnicity ($p<0.001$) but there was no difference in age at diagnosis, age categories, or gender. Those in the lowest MHI quartile with government insurance presented with a lower pH, 7.30 vs those in the highest MHI quartile with private insurance, 7.38 ($p<0.001$). There was no difference in initial bicarbonate at diagnosis ($p=0.08$) or hemoglobin A1c (HbA1c) at diagnosis ($p=0.23$) in the groups overall. However, children <6 yr who had government insurance in a low MHI census tract presented with a higher HbA1c at diagnosis, 10.45 compared to those in a high MHI census tract with private insurance, 9.35 ($p=0.001$).
Conclusion(s) SES defined by census tract derived MHI and individual insurance type was associated with initial pH at diagnosis at all ages. Children under 6 years of age are at high risk of DKA at diagnosis, but this risk was even higher in children of lower SES as evidence by higher HbA1c. Further studies are required to identify and address the factors associated with delayed presentation of new onset T1D in children with lower SES.

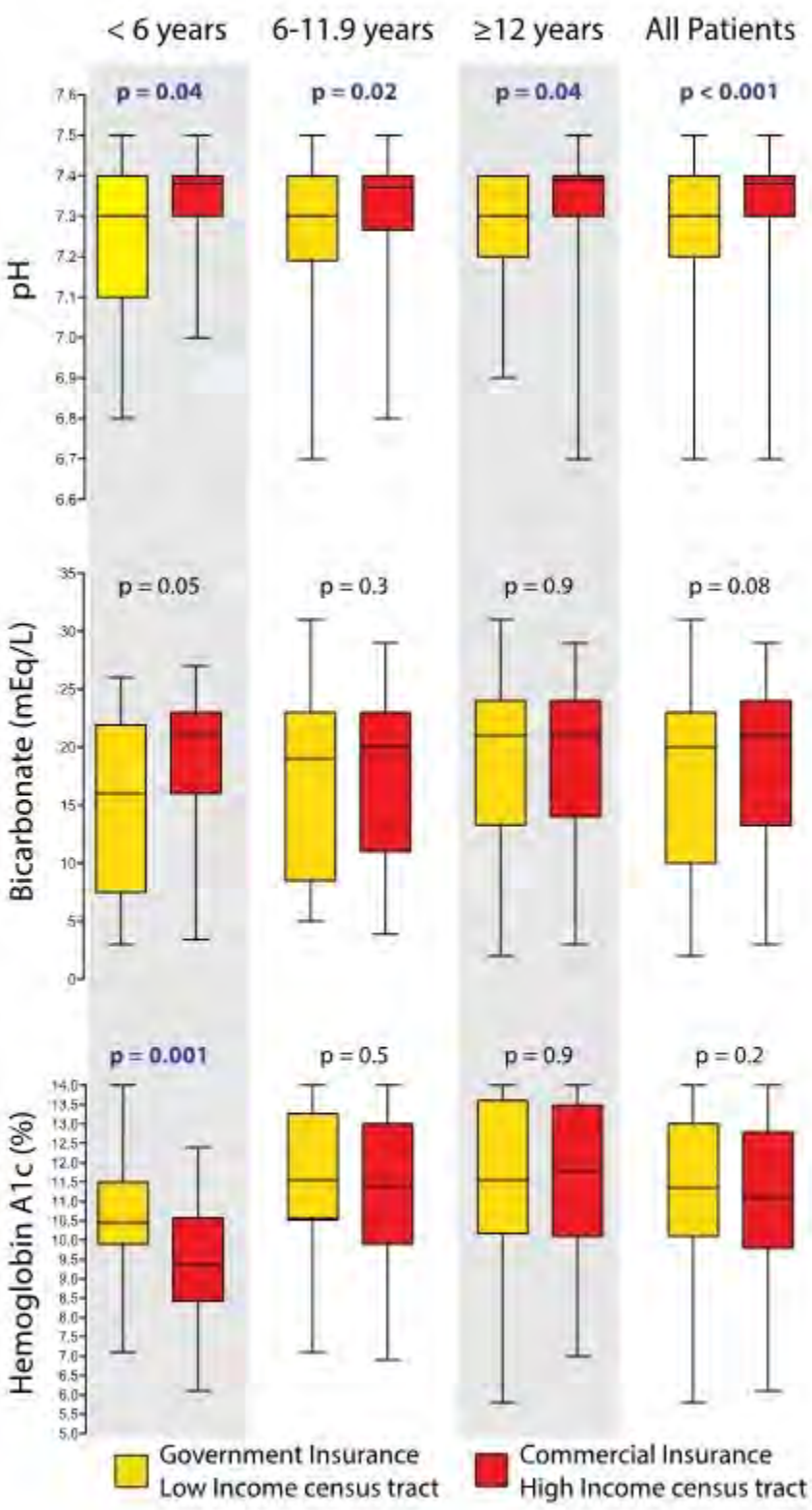

Figure 1: Initial pH, bicarbonate and HbA1c at diagnosis in patients in the highest income quartile who had private insurance compared to the lowest income quartile with government insurance across age groups

Table 1: Patient demographics at diagnosis of Type 1 Diabetes

Characteristic	Lowest Quartile Median Household Income with Government Insurance	Highest Quartile Median Household Income with Private Insurance	p-value
Age, years (median, IQR)	10.5 (7.3-13.9)	11.0 (7.3-13.3)	0.276
Age Group, n(%) <6 years 6-11.9 years 12-19 years	31 (17%) 88 (46%) 67 (37%)	45 (13%) 158 (46%) 138 (41%)	0.445
Female, n (%)	87 (48%)	145 (42%)	0.225
Race/Ethnicity, n(%) Non-Hispanic White Non-Hispanic Black Hispanic Other	30 (17%) 109 (62%) 22 (12%) 16 (9%)	294 (87%) 11 (3%) 8 (2%) 24 (9%)	<0.001
Initial pH at diagnosis (median, IQR)	7.30 (7.2-7.4)	7.38 (7.2-7.4)	<0.001
Initial Bicarbonate at diagnosis (median, IQR)	20 (10-23)	21 (13.5-24)	0.083
HbA1c at diagnosis (median, IQR)	10.45 (9.9-11.5)	9.35 (8.45-10.55)	0.234
Median Household Income of Patient's Census Tract, $ (median, IQR)	33,733 (25,703-42,094)	112,778 (103,553-126,771)	<0.001
Persons Below 18 Years Living in Poverty in Patient's Census Tract, % (median, IQR)	34.8 (21.7-48.6)	2.2 (0.5-4.5)	<0.001

Abstract: 85

Clinical and Genetic Features Associated with Y Chromosome Material in Turner Syndrome

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Background Y chromosome material is detected in approximately 12% of patients with Turner syndrome (TS). These (TS+Y) patients are at increased risk of germ cell tumor with rates of gonadoblastoma between 4 to 60%, and malignant transformation in 1 to 12%. Little is described about additional features associated with TS+Y.

Objective We aim to evaluate TS-associated features in this population, to compare SNP microarray, karyotype and FISH with regard to detection of TS+Y, and to describe patterns of germ cell tumor diagnosis. We hypothesize that there is an association between TS+Y and presence of characteristic features of TS.

Design/Methods For this retrospective study, medical records were reviewed for female patients with TS who were seen in our institution's TS Program or had gonadectomy at our institution between January 2012 and October 2019.

Results We identified 237 patients with TS age 4 months to 28 years. Of these, 209 had available genetic results and 24/209 (11.5%) had TS+Y. Seven of 24 (29%) patients with TS+Y had a cardiac defect and 6/24 (25%) had a renal anomaly. Of those without Y, 72/213 (34%) had a cardiac defect and 46/213 (22%) had a renal anomaly. Average TS height Z-score for age <11 years was +0.61 in TS+Y and +0.77 in those without Y. For age 11+, height Z-score was +0.98 in TS+Y and +1.40 in those without Y. On cytogenetic analysis, 17/24 (71%) patients with TS+Y had Y material detected by karyotype alone. Of 7 cases not confirmed on karyotype, 6 were identified by FISH and 1 by SNP microarray. Overall, 14 patients with TS+Y had FISH, with Y detected in 13/14 (93%), and 8 had SNP microarray, with Y detected in 7/8 (88%). Twenty of 24 (83%) patients with TS+Y had gonadectomy, 3 patients were awaiting surgery, and 1 was lost to follow-up. Seven of these (35%) had germ cell tumors, of which 6 had gonadoblastoma and 1 had dysgerminoma. Four of 7 (57%) cases were bilateral. Of 17 (70%) patients with TS+Y that had pelvic ultrasound, 1 had evidence of a mass.

Conclusion(s) In our study, 11.5% of patients had TS+Y, similar to prevalence reported previously. Rates of cardiac and renal anomalies were not significantly higher in TS+Y than in those without Y. Height Z-score was lower in TS+Y, and this difference was more pronounced in adolescence. Germ cell tumors were common. More information is needed to determine whether SNP microarray is useful for routine diagnosis of TS+Y. Overall, patients with TS+Y exhibit a distinct phenotype in TS that may extend beyond increased risk of germ cell tumor.

Abstract: 86

Standardize Acceptable Elevated DHEAS Levels in Adolescent Patients Diagnosed with PCOS

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Background Polycystic ovary syndrome (PCOS) occurs in 5-10% of reproductive age women. It is the main cause of hyperandrogenic anovulation and a leading cause of infertility in young women. The diagnosis of PCOS in adolescents is based on a combination of abnormal uterine bleeding pattern and evidence of clinical hyperandrogenism or elevated serum testosterone. The appropriate range of serum total testosterone for adolescents is derived from the adult range of 40-60ng/dL. In addition to testosterone, Dehydroepiandrosterone Sulfate (DHEAS), an adrenal gland androgen, is often evaluated. The appropriate range of serum DHEAS in female adults is 22-372µ/dL. To our knowledge, there is no literature to support an acceptable range of DHEAS for adolescents diagnosed with PCOS and those with DHEAS over 500µ/dL may require imaging of the adrenals to rule out malignancy. Further information regarding DHEAS levels in adolescents with PCOS may help provide additional guidance for clinicians.

Objective Evaluate the clinical significance of elevated DHEAS in adolescents with PCOS.

Design/Methods A retrospective chart review included women aged 13-21 who presented with irregular menses diagnosed with PCOS. Excluded those with classic and nonclassic congenital adrenal hyperplasia, adrenal tumor, ovarian tumor, and cushing syndrome. Time frame spanned from 1/2017 through 10/2019.

Results Of the 1139 charts reviewed, 223 women were included in the analysis. Of the 223 women, 22(9.86%) had DHEAS levels over 500µ/dL, figure 1. Of those 22 women, 6.72%(n=15) had DHEAS levels 500-599µ/dL prompting 4 abdominal US and 2 adrenal MRI, figure 2. Also, of the 22 women, 2.24%(n=5) had DHEAS levels 600-699µ/dL prompting 1 adrenal CT and 1 adrenal MRI. Lastly, of the 22 women, 0.89%(n=2) had DHEAS levels 800-899µ/dL both warranted abdominal US and adrenal MRI. The remaining 201 patients with DHEAS levels under 500µ/dL , only 6 had either US, CT, or MRI of the adrenals and were all negative

for pathology. All imaging studies performed were negative for adrenal pathology. Overall, 19.7%(n=44) had elevated DHEAS levels based on adult guidelines.
Conclusion(s) Adolescents with PCOS and DHEAS levels ranging from 500-800µ/dL often prompt imaging. All imaging studies in this review were negative for adrenal pathology. Adolescents with PCOS and elevated DHEAS may not require imaging as perhaps this elevation is related to the underlying pathophysiology.. Additional studies are required to determine what DHEAS level should prompt imaging in adolescents with PCOS.

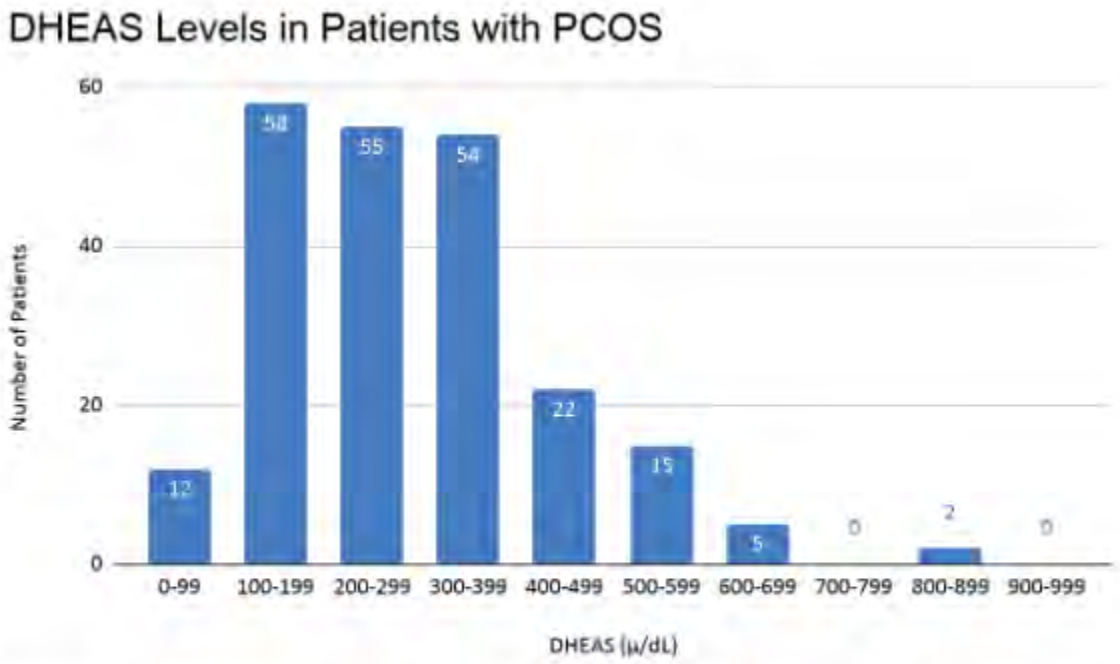

Figure 1: DHEAS Levels in Patients with PCOS. Two-hundred twenty three women with PCOS charts were reviewed. Majority of women (n=201, 90%) had DHEAS levels ranging from 100-499 µ/dL. Only 22 women (9.86%) had DHEA levels over 500 µ/dL. The mean was 272 µ/dL and the average was 291 µ/dL (range 26.1:834 µ/dL).

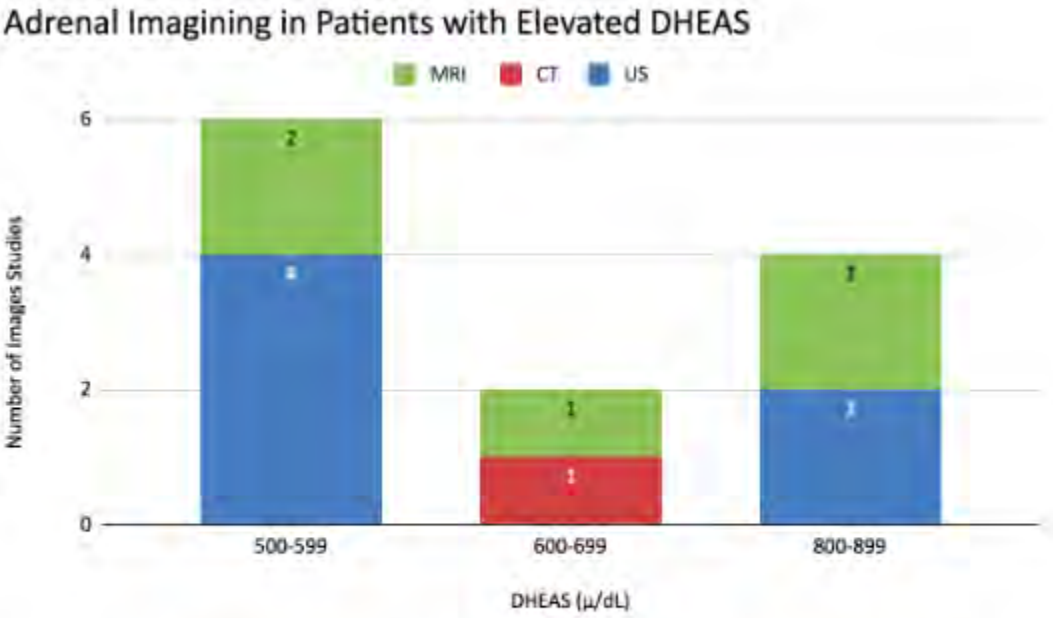

Figure 2: Adrenal Imaging in Patients with Elevated DHEAS. Those with elevated DHEAS over 500 µ/dL required US, CT, or MRI of the adrenal glands to rule out an androgen secreting tumor. All images were negative for pathology.

Abstract: 87

Height outcomes and clinical findings influencing time to menarche post GnRH agonist therapy in central precocious puberty

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Background The goal of GnRH agonist (GnRHa) treatment for central precocious puberty (CPP) in girls is to slow down the progression of secondary sex characteristics, prevent early menarche and ultimately attenuate height loss caused by advanced skeletal maturation and early epiphyseal closure. Prior studies have shown that menses begins 0.5-2.5 years after the discontinuation of GnRHa. Few studies have evaluated auxological factors that may predict the time interval to menarche after treatment.
Objective To evaluate the time interval to menarche after GnRHa discontinuation, identify factors that contribute to timing of the first period, and evaluate height outcomes of these patients.
Design/Methods We retrospectively reviewed medical records of 39 girls with CPP who had reached menarche after long-term GnRHa treatment (Leuprolide and Histrelin) at a pediatric endocrinology clinic. Predicted adult height (PAH) was estimated using the Bayley-Pinneau method; target height (TH) was calculated using parental heights if available. Bone age xray films were assessed by a radiologist using the Greulich-Pyle method. Data were presented as mean±standard deviation and analyzed using correlation coefficients and paired t-test. The study was approved by the Icahn School of Medicine IRB.
Results Mean age was 9.4±1.6 years at treatment onset and treatment length was 2.2±1.4 years. Menarche occurred at 12.6±1.1 years which was 1.04±0.5 years after end of treatment. This was negatively correlated with Tanner stage of breast development at treatment onset (R=-0.51) and bone age at treatment onset (R=-0.48). No correlation was seen between the time from the end of treatment to menarche and treatment time interval, medication or BMI. BMI did not change over the treatment course. Final height data were obtained for 17 patients. Compared with the TH (159.7±7.2 cm), the PAH at start of treatment was significantly shorter (P=0.025). PAH increased significantly from treatment onset (154.4±7.6 cm) to end of treatment (158.5±7.2 cm) (P=0.03). There was no significant difference between TH and PAH at end of treatment or with final height.
Conclusion(s) Height outcomes and time from the end of treatment to menarche were similar to prior reports. However, we identified Tanner stage of breast development and bone age at treatment onset as negative correlates to time interval to menarche. This data provides clinical correlates that assist providers during anticipatory guidance of patients after treatment of CPP with GnRHa.

Abstract: 88
Association of Adenotonsillectomy with Asthma Outcomes in Children.
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Background Asthma, the most prevalant chronic disease in childhood, has been the leading cause of hospitalization among US children under the age of 15 years. Traditionally, anti-inflammatory medications are included in the treatment regimen for management of acute asthma exacerbations. Recent studies have found asthma to be associated with several overlapping co-morbidities including gastroesophageal reflux disease, obstructive sleep apnea (OSA) and obesity. Therapies have been proven to improve these co-morbid conditions. One well-known treatment is adenotonsillectomy (AT) for OSA. Although childhood OSA is effectively treated by AT, it remains unclear whether AT also improves childhood asthma. The aim of this study was to determine if AT, the first line of therapy for OSA, would be associated with improved asthma outcomes and reduce the use of asthma rescue therapies in children.
Objective To determine the association between asthma outcomes and AT in children.
Design/Methods Retrospective chart review of asthmatic children between 1 and 18 years of age at an Urban Community Health Center. Univariate and Bivariate modalities using chi square and t-tests were utilized.
Results 117 subjects with physician diagnosis of asthma were included in the study. 69.2% were AT+ and 30.8% were AT-. Race included 45.4% Black, 46.2% Caucasians, and 8.4% other. 53.8% were males and 46.2% were females. The mean age of entire population was 7.05 +/- 3.4 years. There was no significant association found between asthma outcomes and AT when compared with age, race, sex, and BMI between the two groups. However, more subjects were found to have significant control of asthma in the AT + group in mild persistent (39.5% in TNA+ vs 50% in TNA-) and moderate persistent asthma (30.9% in TNA+ vs 44.4% in TNA-)
Conclusion(s) Adenotonsillectomy improves asthma control in mild and moderate persistent asthmatic children. Future studies should be well powered to determine the statistical significance between the adenotonsillectomy and asthma outcomes with respect to age, race, gender and BMI.

Abstract: 89
Association of Gastroesophageal Reflux Disease and Otitis Media with Effusion or Recurrent Otitis Media in Children.
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Background Otitis media with effusion (OME) has always been a public health problem due to its prevalence and potential complications. It has been estimated that by the age of 3 years, almost every child has already experienced at least one episode of

OME. Even though many of these episodes resolve on their own, at least 25% will persist for more than 3 months and 30 to 40% of children will have a recurrence of OME. Hearing loss is the most common complication of otitis media (OM) and can be conductive, sensorineural, or both. In recent years, gastroesophageal reflux disease (GERD) has been linked to OME due to eustachian tube angulation and functional immaturity in pediatric patients. Gastric reflux to the nasopharynx and middle ear is more likely to occur, thus, creating ideal conditions for obstruction and bacterial biofilm accumulation.
Objective To identify the association of gastroesophageal reflux disease and its role in the etiopathogenesis of recurrent otitis media in a Community Health Center.
Design/Methods A total of 400 charts were reviewed, of those, 88 of children were diagnosed with GER/GERD and 70 gender- and age-matched controls were identified at the specified locations from 2013 to 2018. Univariant and bivariant modalities using chi-square ant t test were utilized. Odds ratio and 95% confidence interval were estimated to determine the relation between recurrent otitis media and GER in children from 6 months to 8 years old.
Results 158 patients were included in the study; 55.7% were males, 44.3%were females; 60% Hispanics, 29.3% Blacks and 10.7% other. Children who were diagnosed with GER/GERD had an increased risk of developing recurrent otitis media with an OR of 13.3(95% CI 4.56-39.15) controlled for age, sex and race. However, there was no significant association between OME and GERD/GER (33.3% in cases vrs 66.7% in the control group)
Conclusion(s) Our study concluded that there is a statistically significant association between GER/GERD and recurrent otitis media within 1 year of the diagnosis. This finding suggests that having GER/GERD is a risk factor for developing recurrent otitis media in this population. Pediatricians should consider the presence of GERD in these patients given that this is a treatable cause leading to a decrease in development of recurrent OM and its complications. Future studies should also investigate the rate of bilateral myringotomy among groups.

Abstract: 90
Early Childhood Wellness Priorities of Urban Parents and Pediatric Primary Care Providers
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Background Early childhood is a critical period when health trajectories develop and prevention-focused intervention may be particularly effective. The AAP's Bright Futures Guidelines recommend that a broad array of wellness topics be addressed in pediatric primary care, but time constraints limit clinicians' ability to address all topics. A greater understanding of the wellness topics that are most salient to families and clinicians is needed to target wellness promotion and clinical care, yet little is known about how families and primary care pediatricians prioritize wellness topics.
Objective To identify the most salient aspects of early childhood wellness to parents and clinicians at pediatric primary care practices in urban, underserved communities.
Design/Methods We administered a cross-sectional discrete choice experiment to a convenience sample of 66 parents/guardians of 2-4-year old children and 16 pediatric clinicians from two urban primary care practices in Philadelphia (Figure 1). Participants rated the relative importance of 24 wellness attributes from across 6 domains based on a social-ecological model: child wellness – physical (e.g. diet), mental (e.g. behavior), social (e.g. relationships), and educational (e.g. learning); family wellness (e.g. parent/household factors); and community wellness (e.g. neighborhood factors). Participants responded to the prompt: "Which of the following is most important for [your child (parents)/young children (clinicians)] to be well?" We used a hierarchical Bayes model to calculate individual-level importance scores for each attribute and ranked attributes according to their average importance score separately for parents and clinicians.
Results Parents (mean age 34, 82% female, 67% black, 80% Medicaid-enrolled) and clinicians (74% female, 90% pediatricians, 10% nurse practitioners) both highly prioritized the parent/child relationship and avoiding family substance use (Figure 2). Parents more strongly prioritized child development and having health insurance while clinicians more strongly prioritized family food security and parents' mood. Neighborhood social cohesion, limiting screen time, child exercise, and parent health problems were of low priority to both groups.
Conclusion(s) This study provides an evidence-based approach for considering which wellness-related topics might be most salient to families and clinicians for young children as a part of clinical care. Results suggest the parent/child relationship and preventing family substance use as potential areas of focus.

Figure 1. Example of discrete choice experiment question (parent version). The experiment, which was administered using Sawtooth MaxDiff software, displayed 24 wellness attributes two at a time in 48 sets and asked participants to choose which was most important.

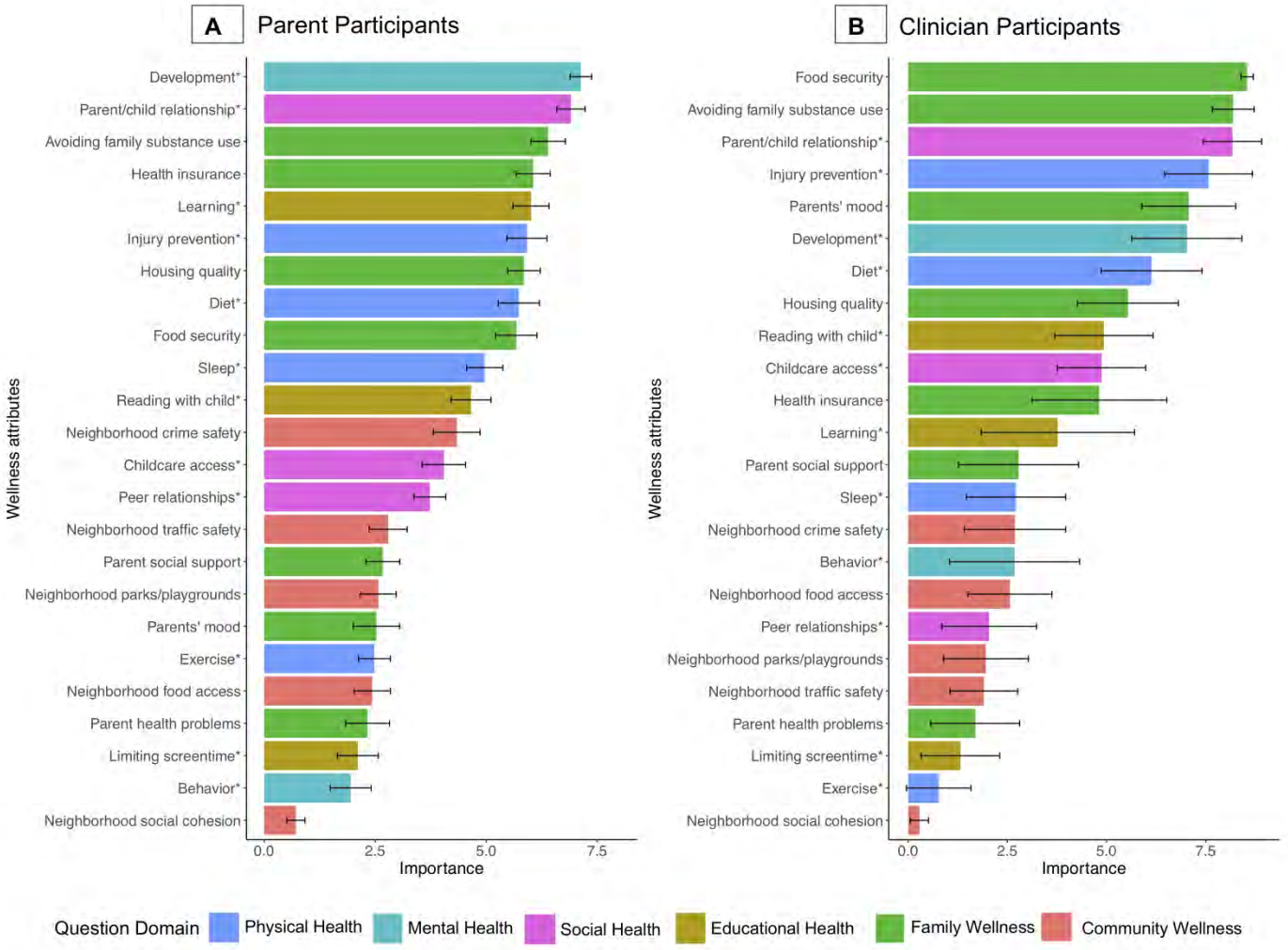

Figure 2. Ranking of child wellness attributes among parents and clinicians. Bar graph of importance scores for each group, sorted in rank order and color-coded by theme. Asterisk denotes child-level wellness attributes. Importance scores were calculated at the individual-level and range from 0 to 100, with a higher score indicating higher prioritization of a given attribute. For each person, all 24 item scores sum to 100. Scores are ratio-scaled, such that a wellness item with a score of 6 is twice as important as an item with a score of 3. Individual-level importance scores were averaged to the group-level separately for parents and clinicians.

Abstract: 91

Assessing the Relationship between Prescription Pain Medication Misuse and Suicidality in US High School Students

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Background Suicide rates among teenagers have been steadily increasing since 2007. Prior studies have linked adolescent substance use with greater odds of suicide ideation. However, little is known about the association between the nonmedical use of prescription pain medication (PPM) and suicidality in adolescents. In 2017, the CDC introduced a new question to the Youth Risk Behavior Survey (YRBS) asking US high school (HS) students specifically about lifetime PPM misuse.
Objective To assess the associations between NMUPPM and suicidality in a nationally representative sample of US HS students.
Design/Methods Data from the 2017 YRBS, a nationally representative survey of US HS students, were analyzed (n=14,765). Lifetime PPM misuse was defined as the use of PPM without a doctor's prescription or differently than how a doctor told to use it. HS students were characterized by lifetime frequency of PPM misuse and compared to the reference group of HS students who had never misused PPM. Logistic regressions tested for associations between lifetime PPM misuse and suicide ideation, planning, and attempts

in the past year. Models controlled for the following potential confounders: grade, sex, race/ethnicity, number of depressive episodes, and lifetime alcohol, marijuana, and other substance use. All analyses were conducted using R, version 3.6.1, and package *survey* to account for the complex survey design of the YRBS.
Results 17.2% of HS students had seriously considered committing suicide, 13.6% made a plan to attempt suicide, and 7.4% attempted suicide (Table 1). 14% of US HS students misused PPM during their lifetime. The prevalence of PPM misuse was substantially higher for adolescents who had ever used alcohol, marijuana, or other substances in their lifetime (Table 1). PPM misuse was significantly associated with all measures of suicidality (Table 2). Students who had misused PPM even 1-2 times in their lifetime had elevated odds of suicide ideation (aOR=1.66, 95% CI: [1.39-1.99]), planning (aOR=1.73, 95% CI: [1.41-2.12]), and attempts (aOR=2.03, 95% CI: [1.55-2.66]).
Conclusion(s) PPM misuse was significantly associated with increased odds of suicidality in HS students. Prevalence of PPM misuse was higher among HS students who had depressive episode(s) or used alcohol, marijuana, or other substances in their lifetime. Understanding reasons for PPM misuse in adolescents may help reduce suicide risk and allow physicians to better target mental health resources.

Table 1. Prevalence of the Prescription Pain Medication Misuse Among US High School Students Across Several Demographics, 2017 YRBS (n=14765)

	Overall (100%, n=14,765)		Prescription Pain Medication Misuse[a] (14%, n=2,051)	
	n	Prevalence (95%CI)	n	Prevalence[d] (95% CI)
Grade				
9	3921	27.3 (25.7-29.0)	421	10.9 (9.5-12.6)
10	3715	25.7 (24.6-26.8)	479	12.8 (10.8-15.1)
11	3602	23.9 (23.3-24.6)	523	15.4 (13.4-17.8)
12	3383	23.1 (22.0-24.2)	588	17.0 (14.3-20.0)
Sex				
Female	7526	50.7 (48.1-53.3)	1094	14.4 (12.7-16.3)
Male	7112	49.3 (46.7-51.9)	920	13.4 (12.1-14.7)
Race/Ethnicity				
White (Non-Hispanic)	6568	54.6 (49.7-59.5)	930	13.6 (12.0-15.5)
Black (Non-Hispanic)	3278	16.1 (13.4-19.3)	425	13.9 (11.6-16.5)
Hispanic	3653	22.4 (18.8-26.4)	533	15.0 (12.4-18.1)
Depressive episode[b]				
No	9896	68.5 (66.6-70.4)	892	9.1 (8.1-10.3)
Yes	4631	31.5 (29.6-33.4)	1103	24.5 (22.0-27.1)
Alcohol use[a]				
No	5528	39.6 (37.2-42.1)	156	2.9 (2.4-3.4)
Yes	8251	60.4 (57.9-62.8)	1747	21.3 (19.4-23.3)
Marijuana use[a]				
No	9160	64.4 (61.7-67.0)	527	5.5 (4.9-6.1)
Yes	5122	35.6 (33.0-38.3)	1410	28.6 (26.3-31.1)
Other substance use behavior[a, c]				
No	10183	85.2 (83.9-86.4)	865	8.4 (7.4-9.4)
Yes	1993	14.8 (13.6-16.1)	984	50.3 (47.6-53.0)
Suicide ideation[b]				
No	11982	82.8 (81.7-83.8)	1260	10.6 (9.6-11.8)
Yes	2571	17.2 (16.2-18.3)	742	29.9 (26.8-33.2)
Suicide planning[b]				
No	12511	86.4 (85.2-87.6)	1384	11.2 (10.0-12.4)
Yes	2030	13.6 (12.4-14.8)	614	31.7 (28.1-35.4)
Suicide attempt[b]				
No	9849	92.6 (91.6-93.5)	1163	12.0 (10.5-13.6)
Yes	837	7.4 (6.5-8.4)	321	39.2 (35.5-43.1)

[a] Occurrence over lifetime.

[b] Occurrence over the past 12 months.

[c] Substances include: synthetic marijuana, cocaine, heroin, meth, inhalants, ecstasy, and/or injection drugs.

[d] Prevalence shown as the percent of high school students in that demographic who misused prescription pain medication in their lifetime.

Table 2. Adjusted Logistic Regression Analyses Assessing Associations Between the Prescription Pain Medication Misuse and Suicidality Among US High School Students, 2017 YRBS (n=14,765)

Prescription Pain Medication Misuse[a]	aOR (95% CI) for Suicide Ideation[b,c]	aOR (95% CI) for Suicide Planning[b,c]	aOR (95% CI) for Suicide Attempt[b,c]
Never	ref	ref	ref
Ever	**1.66** (1.39-1.99)	**1.73** (1.41-2.12)	**2.03** (1.55-2.66)
1-2 times	**1.63** (1.30-2.06)	**1.64** (1.24-2.17)	**2.05** (1.41-2.98)
3-19 times	**1.47** (1.18-1.83)	**1.54** (1.18-2.02)	**1.75** (1.26-2.44)
20 or more times	**2.28** (1.55-3.36)	**2.54** (1.73-3.74)	**2.29** (1.28-4.08)

[a] Lifetime nonmedical use of prescription pain medication.

[b] Suicidality over the past 12 months.

[c] Adjusted for grade, sex, race/ethnicity, number of depressive episodes, lifetime alcohol use, lifetime marijuana use, and other lifetime substance use (synthetic marijuana, cocaine, heroin, methamphetamine, inhalants, ecstasy, and/or injection drugs use).

Abstract: 92

Family Resilience's Protective Effect on Bullying in Children with Adverse Childhood Experiences: Analysis of the 2016-2017 National Survey of Children's Health

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Background Bullying is a widespread problem that can take various forms and has been shown to adversely affect self-esteem and mental health. Additionally, studies have demonstrated that children with adverse childhood experiences (ACE) are at increased risk to be a victim of bullying (VoB) and/or bully others. Although parenting style and home environment are important mediating factors with respect to bullying, it is unclear whether "family resilience" may mitigate the negative effects of ACEs.
Objective Determine to what extent family resilience mitigates ACEs as a risk factor for bullying or being bullied by others.
Design/Methods A secondary analysis was performed on responses to the 2016-2017 National Survey of Children's Health (NSCH), a nationally representative survey of parents of US children, for children ages 6 to 17. In 2016, the CDC introduced "family resilience" to the NSCH as a composite measure based on caregiver responses to four questions: "*When your family faces problems, how often are you likely to do each of the following?* (a) *talk together about what to do;* (b) *work together to solve our problems*; (c) *know we have strengths to draw on;* and (d) *stay hopeful even in difficult times*." The score ranged from 0 to 4 and reflected the number of questions to which parents responded "*most of the time*" or "*all of the time.*" For nested subsets with an increasing number of ACEs, logistic regressions were used to test for associations between family resilience and either bullying others or being a VoB. These regressions were controlled for age, sex, race/ethnicity, and family income. Associations between demographic variables and bullying were also evaluated using Chi-squared tests of independence.
Results Family resilience had a significant association with a lower rate of bullying others in children with up to 3 ACEs. Family resilience also had a significant protective effect against being bullied in children with up to 2 ACEs (Table 1). Significant associations between prevalence of bullying or being a VoB and various demographic variables were identified (Table 2).
Conclusion(s) Though an increased prevalence of bullying is associated with certain demographics, these findings highlight the mitigating effect that family resilience (as measured in the NSCH) has on bullying in children with ACEs. Parents should remain cognizant of how they handle adversity and consider both the direct and indirect impact these events may have on young children.

Table 1. Prevalence of Bullying in Subsets of Children Ages 6-17 Years Defined by Number of Adverse Childhood Experiences and Family Resilience, 2016-2017 NSCH (n=51156)

Number of ACEs	N	% Bullied Others		aOR[a,b] (95% CI)	% Bullied by Others		aOR[a,c] (95% CI)
		Non-Resilient	Resilient		Non-Resilient	Resilient	
No ACE	27630	7.14	3.28	**0.44** (0.30, 0.63)	19.70	13.65	**0.64** (0.53, 0.77)
1 or more ACE	22834	12.50	6.50	**0.48** (0.38, 0.60)	33.13	26.78	**0.72** (0.62, 0.83)
2 or more ACE	11140	15.73	8.82	**0.50** (0.38, 0.65)	37.50	32.57	**0.78** (0.65, 0.93)
3 or more ACE	5817	18.99	12.08	**0.55** (0.40, 0.77)	41.31	38.72	0.88 (0.69, 1.11)
4 or more ACE	3174	21.16	17.48	0.73 (0.48, 1.10)	41.99	44.53	1.07 (0.79, 1.45)

[a]Adjusted for sex, age, race/ethnicity, and family income.
[b]aOR for bullying others.
[c]aOR for being bullied by others.

Table 2. Prevalence of Bullying in Children Ages 6-17 Years Across Several Demographics in the United States, 2016-2017 NSCH (n=51156)

	Weighted % Bullied Others (95% CI)	aOR[a,b] (95% CI)	Weighted % Bullied by Others (95% CI)	aOR[a,c] (95% CI)
Sex				
Male	6.8 (6.1, 7.6)	ref	21.7 (20.6, 22.8)	ref
Female	5.2 (4.5, 5.8)	**0.75** (0.63, 0.90)	21.6 (20.4, 22.9)	0.98 (0.89, 1.09)
Age, y				
6 to 8	6.6 (5.4, 7.8)	ref	20.1 (18.3, 21.9)	ref
9 to 11	7.1 (6.0, 8.3)	1.04 (0.80, 1.35)	24.7 (22.8, 26.6)	**1.27** (1.10, 1.48)
12 to 14	5.4 (4.6, 6.1)	**0.85** (0.76, 0.96)	23.6 (22.0, 25.3)	1.08 (1.00, 1.16)
15 to 17	4.9 (4.0, 5.8)	**0.86** (0.79, 0.95)	18.3 (16.9, 19.6)	**0.93** (0.89, 0.98)
Race/Ethnicity				
White, non-Hispanic	5.6 (5.1, 6.1)	ref	22.2 (21.3, 23.0)	ref
Black, non-Hispanic	6.6 (5.2, 7.9)	0.85 (0.65, 1.11)	22.2 (19.5, 24.9)	**0.72** (0.61, 0.85)
Hispanic	6.2 (4.8, 7.5)	0.91 (0.70, 1.19)	20.6 (18.3, 22.8)	**0.78** (0.67, 0.90)
Multi-racial/Other, non-Hispanic	6.7 (5.1, 8.4)	1.09 (0.81, 1.46)	21.3 (19.1, 23.6)	0.90 (0.78, 1.04)
Income, % Federal Poverty Level				
0-99	8.5 (7.1, 9.8)	ref	26.9 (24.4, 29.4)	ref
100-199	6.5 (5.2, 7.8)	0.82 (0.67, 1.01)	23.4 (21.3, 25.4)	0.90 (0.80, 1.02)
200-399	5.2 (4.4, 6.0)	**0.72** (0.59, 0.88)	20.4 (19.1, 21.7)	**0.83** (0.75, 0.93)
>400	4.6 (4.0, 5.2)	**0.74** (0.60, 0.90)	17.9 (16.9, 18.9)	**0.84** (0.75, 0.94)
Family Resilience[d]				
Not Resilient	10.6 (9.2, 12.0)	ref	28.8 (26.8, 30.8)	ref
Resilient	4.8 (4.2, 5.3)	**0.47** (0.39, 0.57)	19.7 (18.8, 20.6)	**0.70** (0.62, 0.78)
Adverse Childhood Experiences				
None	3.9 (3.3, 4.4)	ref	14.6 (13.7, 15.6)	ref
1 or more	8.2 (7.4, 9.1)	**1.96** (1.59, 2.41)	28.6 (27.3, 29.9)	**2.23** (1.99, 2.49)

[a]Adjusted for all other variables shown.
[b]aOR for bullying relative to reference group.
[c]aOR for being bullied relative to reference group.
[d] Composite variable defined in the NSCH, with scores ranging from 0 to 4, depending on responses to four prompts.

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Patient Satisfaction with Pediatric Group Well Child Visits vs Individual Well Child Visits

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Background In 2013, the Centers for Medicare and Medicaid Services initiated incentive payments based partly on patient satisfaction surveys. Our clinic has 2 models of well child visits: a group model (CenteringParenting^{R}) and traditional individual care. In Centering Parenting^{R}, a cohort of 6-8 infant/parent dyads come together for visits with a pediatric provider for the first 2 years of life. Group well child visits have been shown to have high parental satisfaction rates.
Objective To assess if there are differences in patient satisfaction scores between individual pediatric well child visits and CenteringParenting^{R} group well child visits in the first 2 years of life.
Design/Methods Our institution uses the National Research Center's (NRC) System to assess patient satisfaction. The hospital serves a minority, low-income inner-city population. Patients are contacted via email, SMS text message, or phone within 2 days of the healthcare visit. Patients are asked 3-5 randomized questions and a standard question. The standard question asks the patient to rate the quality of the care experience between 1 and 10, 1 being worst, 10 being best. Patients complete the survey no more than biannually. Results of the standard question for patients ages 0-25 months seen for individual well child visits were compared to results of group well child visits from 12/2017 to 12/2019. A score of 9-10 is a positive reimbursement metric and considered a "promotor", scores of 5 or below are "detractors." Scores of 6 -8 are considered "passive" scores.
Results There were 104 responses from CenteringParenting^{R} visits and 718 responses from individual well visits. The response rate was 18.3% for individual well child visits and 16.4% for group well visits. The mean scores for individual well visit responses was 8.7 (SD 2.3) vs 9.3 (SD 1.5) for the group well visits (p=0.026). 64% (458/718) of individual well visit responses were promotors vs 69% (72/104) of group well visit responses (p=NS). 9% (65/718) of individual well visits responses were detractors vs 5% (5/104) of group well visits responses (p=NS).
Conclusion(s) We found a significantly higher mean score on NRC patient satisfaction scores for group well child visits vs individual well child visits. This provides evidence of higher parental satisfaction with group well child visits. Group well child visits may increase patient satisfaction, which could translate into higher reimbursement for health care providers.

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Optimal Depth of Chest Compressions Targeting Gas Exchange in Neonatal Cardiac Arrest

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Background The goal of chest compressions (CC) during neonatal resuscitation is to increase perfusion to vital organs such as the heart, brain and lungs. With effective positive pressure ventilation (PPV) and CC, there is an improvement in gas exchange and perfusion to vital organs leading to the return of spontaneous circulation (ROSC). Noninvasive monitoring of gas exchange by measuring exhaled carbon dioxide ($ETCO_2$) may serve as a real-time feedback to provide effective PPV and CC. The relationship between the depth of CC, $ETCO_2$ and flow to vital organs is not known in perinatal asphyxia.
Objective We hypothesized that using depth of CC correlates with coronary, carotid, and pulmonary blood flow and gas exchange, as evidenced by $ETCO_2$ in an ovine model of perinatal cardiac arrest.
Design/Methods Near-term lambs were asphyxiated by umbilical cord occlusion until cardiac arrest. The diameter of the chest was measured using Vernier calipers. Resuscitation was initiated as per neonatal resuscitation program recommendations. During CC, the depth, peak blood flows, pressures, and $ETCO_2$ were recorded. A rate of 30PPV:90CC per minute was targeted. Resuscitation was continued until ROSC or until 20 min. We analyzed each CC for based on depth (<25%, 25-33%, 34-50 %, 51-75% & >75% of chest wall diameter), blood flows, blood pressures and $ETCO_2$.
Results From seventeen lambs, we analyzed a total of 11,375 CC events. Table 1 shows the baseline flows and characteristics before resuscitation. Chest compression between 33-50% chest diameter resulted in the highest $ETCO_2$, peak carotid flow and systolic BP (table 2). Higher depth of CC > ½ chest diameter did not result in increased flow to vital organs or gas exchange. We then analyzed CC based on $ETCO_2$ achieved (table 3). There was no difference in tidal volume, respiratory and CC rates based on the $ETCO_2$ level. The carotid, pulmonary, ductal flows and blood pressures were highest when $ETCO_2$ was ≥11 mmHg. However, coronary flows were lower with $ETCO_2$ ≥11 mmHg (table 3).
Conclusion(s) Gas exchange ($ETCO_2$) during resuscitation reflects perfusion to the lung. High $ETCO_2$ correlates with high pulmonary blood flow. Excessive depth of CC and targeting higher $ETCO_2$ during resuscitation may compromise coronary flow by the direct

squeezing of myocardial vessels and enhancing ductal shunt. These findings support the current NRP recommendation to target 1/3 chest diameter during CC. Clinical trials are needed to validate these findings.

Table 1 – Characteristics of complete cardiac arrest ovine model	
Characteristics	**(n=17)**
Gestational age (days)	141 ± 1
Female (N)	8
Birth Weight (kg)	4.0 ± 1.2
Chest Diameter (mm)	56 ± 12
Born by Multiplicity (N)	11
Rate of ROSC (%)	76%
Time to ROSC (mins)	9 ± 4
Baseline flows & pressures before asphyxia	
Peak Carotid flow (ml/kg/min)	59±30
Peak Pulmonary flow (ml/kg/min)	80±10
Peak Ductal flow (ml/kg/min)	357±112
Peak Coronary flow (ml/kg/min)	8±5
Systolic Blood pressure (mmHg)	40±9
Diastolic Blood Pressure (mmHg)	27±8
Before Resuscitation	
pH	6.80 ± 0.05
$PaCO_2$ (mmHg)	129 ± 31
PaO_2 (mmHg)	16 ± 8
Lactate (mmol/L)	10 ± 4

Table 1

Table 2: Parameters based on depth of compressions

Depth of CC	$ETCO_2$ (mmHg)	Peak Carotid ml/kg/min	Peak Pulmonary ml/kg/min	Peak Ductal ml/kg/min	Peak Coronary ml/kg/min	SBP mmHg	DBP mmHg	Mean BP mmHg
<25% N-469	6.9±4.5	14.5±7.8	21.3±15.5	54.9±67.3	2.6±3.4	22.0±14.2	9.5±7.2	13.1±7.1
25-32% N-1034	9.1±7.0	17.0±10.7	13.1±10.4	41.0±65.5	3.5±3.6	23.2±13.4	10.7±4.4	15.5±5.0
33-50% N-4824*	11.7±6.9*	22.3±12.6*	14.9±16.1	60.3±77.3	3.0±3.1	26.3±10.5*	10.8±4.5	14.9±5.6
51-75% N 3573	9.9±5.9	11.6±10.3	15.0±11.3	40.8±26.4	3.1±3.0	21.7±7.8	9.5±4.6	13.0±3.9
>75% N-1475	8.9±5.5	14.9±6.1	16.1±13.7	35.9±21.9	3.3±3.8	26.8±6.1	11.2±3.8	15.4±3.0

*p<0.001 denotes significance by ANOVA between the groups. BP – blood pressure, $ETCO_2$ – end-tidal carbon dioxide. Note chest compressions of 1/4 , 1/3 , 1/2 , 3/4 are represented as 25, 33, 50, 75%.

Table 3: End-tidal carbon dioxide targeted chest compressions (CC) & changes in blood flows & pressures

$ETCO_2$ (mmHg)	No of CCs (N total – 11375)	Expired Tidal Volume (per kg)	RR per min	CC rate per min	Peak Carotid Flow (ml/kg/min)	Peak Pulmonary Flow (ml/kg/min)	Peak Ductal Flow (ml/kg/min)	Peak Coronary Flow (ml/kg/min)	Systolic Blood Pressure (mmHg)	Diastolic Blood pressure (mmHg)
≤ 5 # mmHg	3254 (29%)	7.8±0.5	32±5	96±12	15.0±8.4	13.2±8.5	32.3±30.7	3.5±3.4	22.2±8.5	10.4±4.1
6-10 # mmHg	3106 (27%)	8.0±0.4	30±6	95±12	13.9±10.3	12.3±8.8	33.7±35.7	3.3±3.2	23.1±7.6	10.1±4.1
≥11* mmHg	5015 (44%)	7.6±0.9	32±6	92±16	20.5±13.6	18.2±18.2	69.4±76.1	2.6±3.1	25.8±12.2	10.7±5.2

* p<0.05 by ANOVA – the flows (other than coronary flow) & pressures were higher between ≥11 mmHg and the rest of the groups. # The coronary flows were higher in 6-10 &≤ 5 mmHg. Tidal volume, RR - respiratory rates, CC rates were not different.

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Intraosseous as Compared to Umbilical Venous Epinephrine in Perinatal Ovine Asphyxial Arrest

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Background The Neonatal Resuscitation Program recommends administration of epinephrine by umbilical venous (UV) catheter or intraosseous (IO) needle for bradycardia not responding to positive pressure ventilation and chest compressions at birth. Relative pharmacokinetics and efficacy of IO as compared to UV administration in a perinatal asphyxia model remain unknown.

Objective To determine efficacy, absorption, bioavailability and pharmacokinetics of IO as compared to UV epinephrine in a neonatal ovine asphyxia model

Design/Methods 17 term lambs were instrumented and delivered by c-section prior to umbilical occlusion to induce asphxial arrest. IO and UV access were established during asphyxia and confirmed by blood aspiration. Lambs were randomized to receive epinephrine (0.03 mg/kg followed by 2 mL flush) via IO or UV route. Resuscitation was initiated after 5 min of asystole (+ 2 min for PEA with heart rate > 40/min) following NRP guidelines. Blinded administration of epinephrine (or concurrent saline via alternative route) was performed at 5 min and every 3 min thereafter with ongoing chest compressions. Continuous hemodynamics were monitored with serial blood sampling for blood gas analysis and determination of epinephrine concentrations by ELISA. Data were analyzed by 2-way ANOVA with post-hoc Bonferroni.

Results 17 lambs were studied with comparable demographics in the IO and UV cohorts. There were no differences in rates of return of spontaneous circulation (ROSC) or average number of epinephrine doses. However, there was a trend towards earlier ROSC in the IO cohort with median time (IQR) to ROSC of 363 (353-368) and 432 (365-469) sec for IO and UV respectively (p = 0.058) (Table 1). Epinephrine levels were comparable at ROSC with IO and UV administration (Figure 1), however comparison of concentrations from lambs who received only one dose of epinephrine identified higher peak with UV administration (Figure 2). While route of administration did not impact systolic BPs, less tachycardia, higher diastolic BPs, and higher carotid artery flows were present after IO epinephrine. Slightly lower pulmonary artery flows were also noted (Figure 3).

Conclusion(s) IO epinephrine resulted in comparable pharmacokinetics and efficacy to UV administration with tendency towards early ROSC and improved hemodynamics, supporting the use of this alternative route of administration in neonatal resuscitation (particularly by non-neonatal emergency medical providers unfamiliar with UV catheter placement).

	IO (n = 8)	UV (n = 9)	p value
Weight (kg)	3.8 ± 1.4	3.7 ± 0.6	ns
Gender (F:M)	5:3	6:3	ns
Gestation *(singleton : first twin : second twin)*	1:4:3	4:2:3	ns
Baseline ABG			
pH	7.21 ± 0.16	7.17 ± 0.18	ns
$PaCO_2$ (mmHg)	67 ± 17	77 ± 28	ns
PaO_2 (mmHg)	21 ± 3	24 ± 5	ns
HCO_3 (mEq/L)	25 ± 4	26 ± 3	ns
Lactate (mM/L)	6.1 ± 5.1	5.4 ± 3.0	ns
Time to asystole (min)	11.7 (6.9-16.6)	15 (6.8-23.0)	ns
ROSC, n (%)	5 (62.5%)	6 (66.6%)	ns
ROSC with first dose of epi, n (%)	5 (62.5%)	5 (55.6%)	ns
Seconds to ROSC from onset of PPV	363 (353-368)	432 (365-469)	0.058
Seconds to ROSC from first dose of epi	39 (37-44)	98.5 (47-149)	0.060
Doses of epi	2.1 ± 1.6	2.1 ± 1.5	ns

TABLE 1: Baseline Characteristics and ROSC
Data are presented as mean ± SD or median (IQR). Epi = epinephrine, ROSC = return of spontaneous circulation, PPV = positive pressure ventilation.

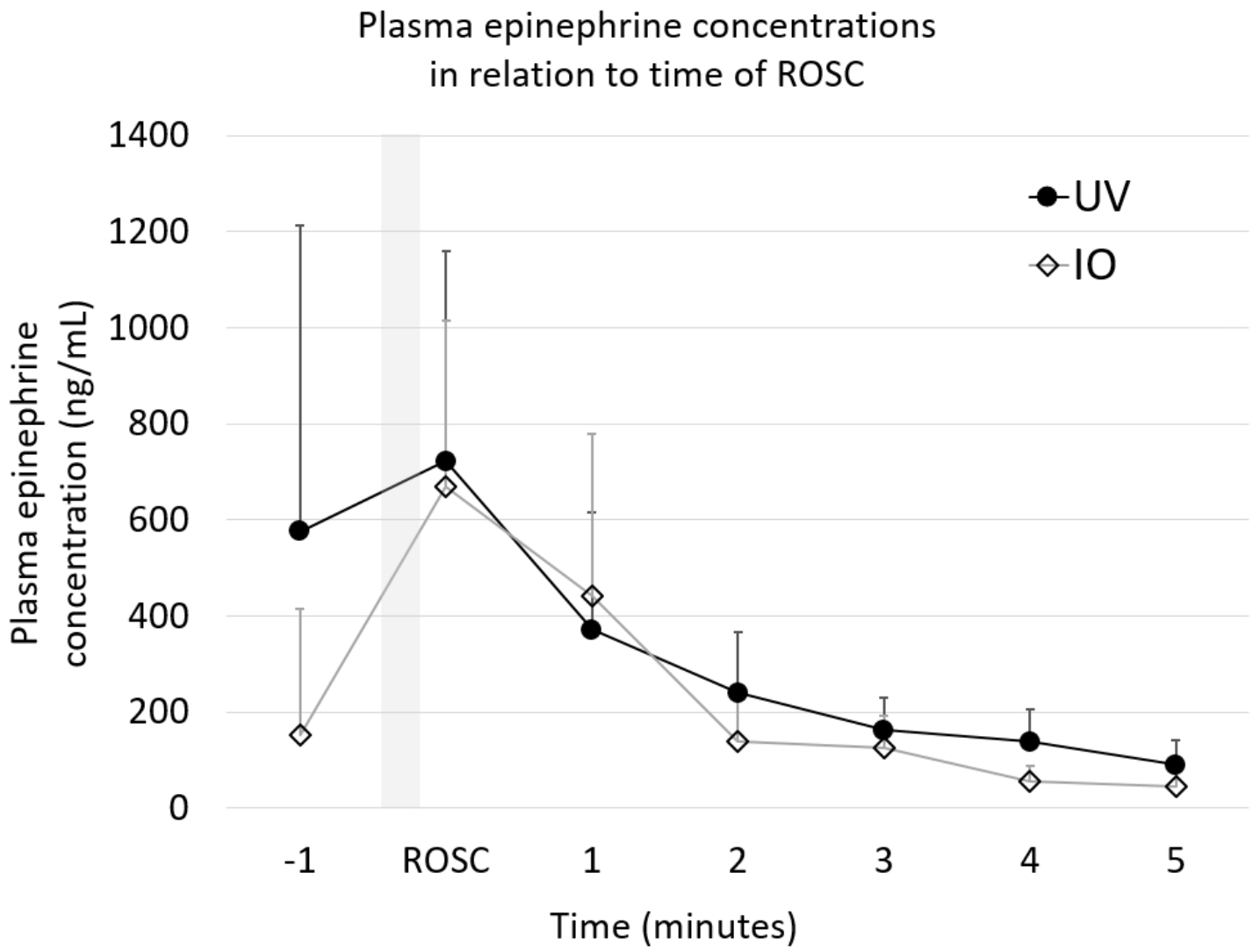

Figure 1: Plasma epinephrine concentrations in relation to time of ROSC
Data are presented as mean ± SD. Vertical grey bar denotes time of ROSC.

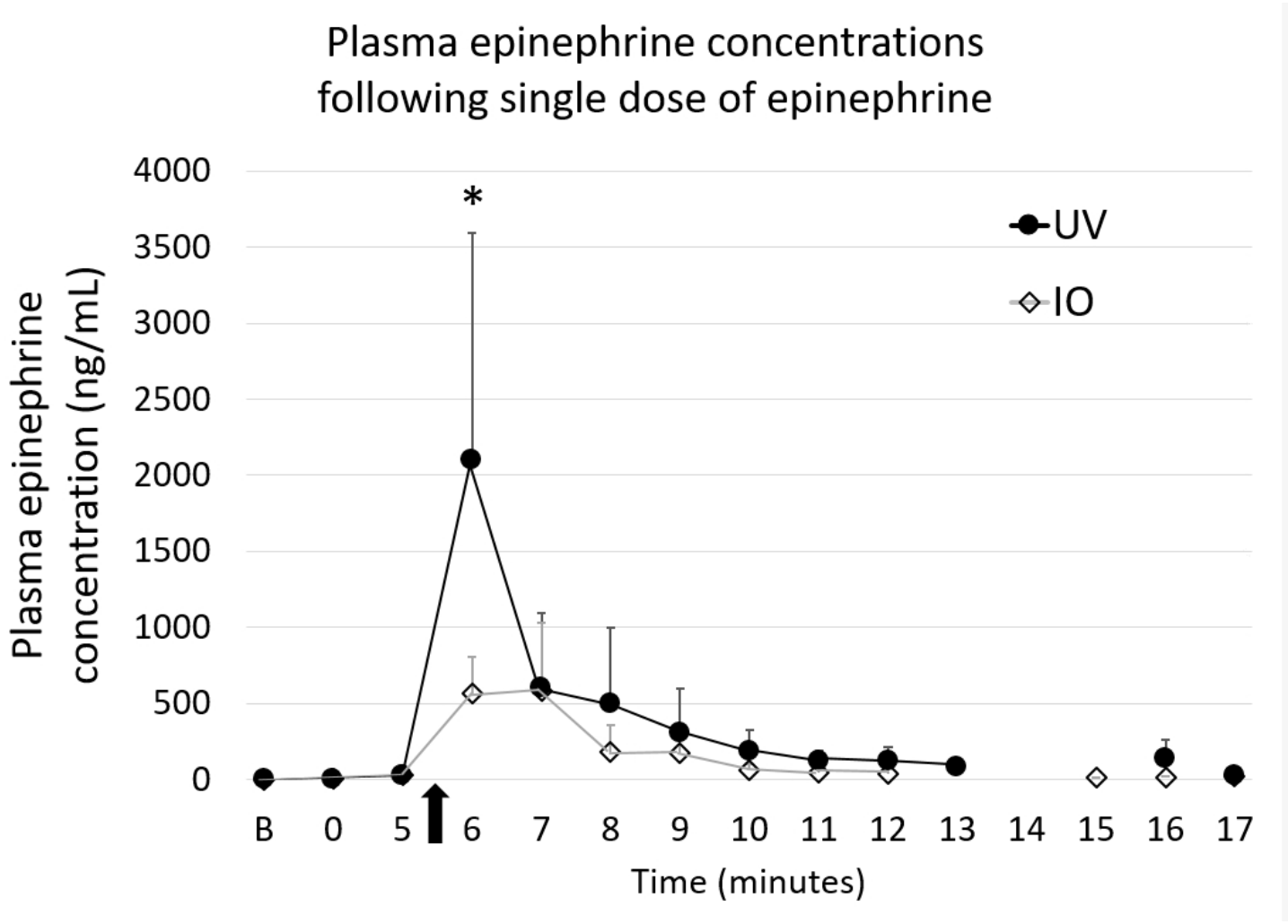

Figure 2: Plasma epinephrine concentrations following single dose of epinephrine
Data are presented as mean ± SD. * $p < 0.05$ by 2-way ANOVA with post-hoc Bonferroni.

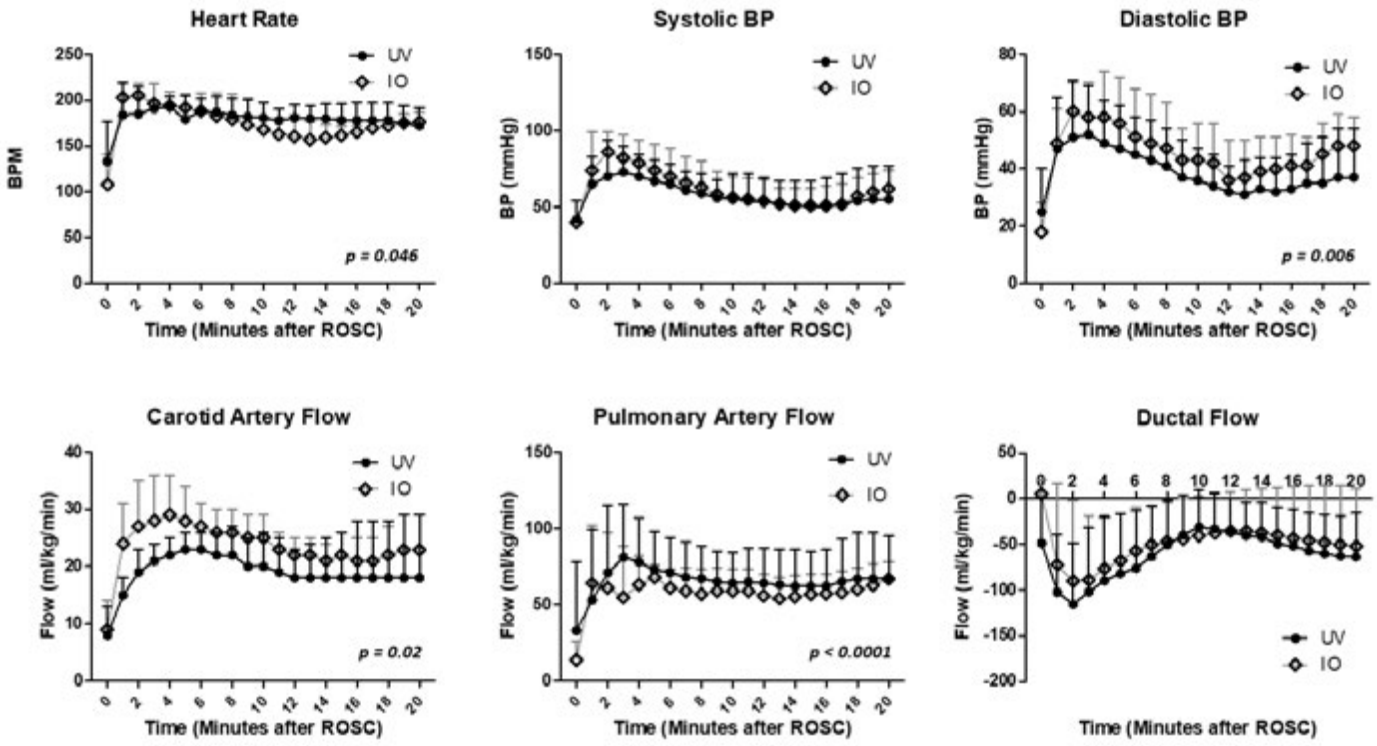

Figure 3: Hemodynamic parameters following ROSC
Data are presented as mean ± SD. p values by 2-way ANOVA. Carotid, pulmonary and ductal data represent mean flows.

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Resuscitation with an intact cord enhances pulmonary vasodilation and ventilation but reduces systemic oxygen toxicity and oxygen load in a preterm ovine model

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Background Resuscitation with an intact cord in depressed term infants has shown to improve saturation (SpO_2) and Apgar scores (NEPCORD III trial). Initiating resuscitation with 21% oxygen (O_2) has been associated with increased death from respiratory failure in extremely preterm infants (Oei et al Pediatrics 2017). We hypothesized that resuscitation with 30-60% O_2 with an intact cord would promote pulmonary vasodilation, enhance gas exchange but would reduce oxygen load (O_2L) and systemic oxygen toxicity due to continued contribution from umbilical venous flow to left ventricular preload.
Objective To study the effect of delayed cord clamping with ventilation (DCCV) and early cord clamping with ventilation (ECCV) on O_2 exposure, gas exchange and hemodynamics in an asphyxiated preterm ovine model with RDS.
Design/Methods Preterm lambs (127-128d) were randomly assigned to DCCV or ECCV. Asphyxia was induced by cord occlusion until the heart rate (HR) was <90 bpm. In DCCV, positive pressure ventilation (PPV) was initiated with an intact cord for 5 min, followed by clamping. In ECCV, the cord was clamped once target HR<90 bpm was achieved and PPV was initiated. Oxygen load per breath was calculated as [VT*FiO_2]/kg, where VT is tidal volume and the total O_2L calculated as the summation of breaths for 5 min.
Results Fifteen asphyxiated preterm lambs were randomized to DCCV (N=7) or ECCV (N=8) (fig 1). The FiO_2 (0.4 (IQR 0.3-0.4) vs. 0.6 (IQR 0.4-0.8), p<0.01) and O_2L (520 (IQR 414-530) vs. 775 (IQR 623-868), p<0.01) in the DCCV group were significantly lower than ECCV to maintain target SpO_2 (fig 2). Arterial PaO_2 and $PaCO_2$ were significantly lower (fig 3) and systolic pulmonary blood flow was higher with DCCV (fig 4).
Conclusion(s) In an asphyxiated preterm lambs, resuscitation with an intact cord decreased FiO_2 required to achieve NRP recommended target SpO_2. Ventilation was significantly better in DCCV suggesting an active contribution of the placenta for gas exchange. Lower arterial oxygenation and O_2L in the DCCV group along with higher pulmonary blood flow suggests that resuscitation with an intact cord may minimize oxidative injury while facilitating pulmonary vascular transition in asphyxiated preterm infants with RDS.

Table 1 – Characteristics of preterm ovine model

Characteristics	DCCV (N=7)	ECCV (N=8)
Gestational age (days)	128±0.84	127±0.52
Female (N)	3	4
Birth weight (kg)	3.3±0.70	3.3±0.63
Born by multiplicity (N)	Twin – 4	Twin – 6
Heart rate at asphyxia (bpm)	86±10	88±8
Mean blood pressure at asphyxia (mmHg)	34±10	36±8
pH before resuscitation	7.0±0.08	7.04±0.08
$PaCO_2$ before resuscitation (mmHg)	101±23	90±25
PaO_2 before resuscitation (mmHg)	15±11	14±6

Data presented as numbers or as average and standard deviation.

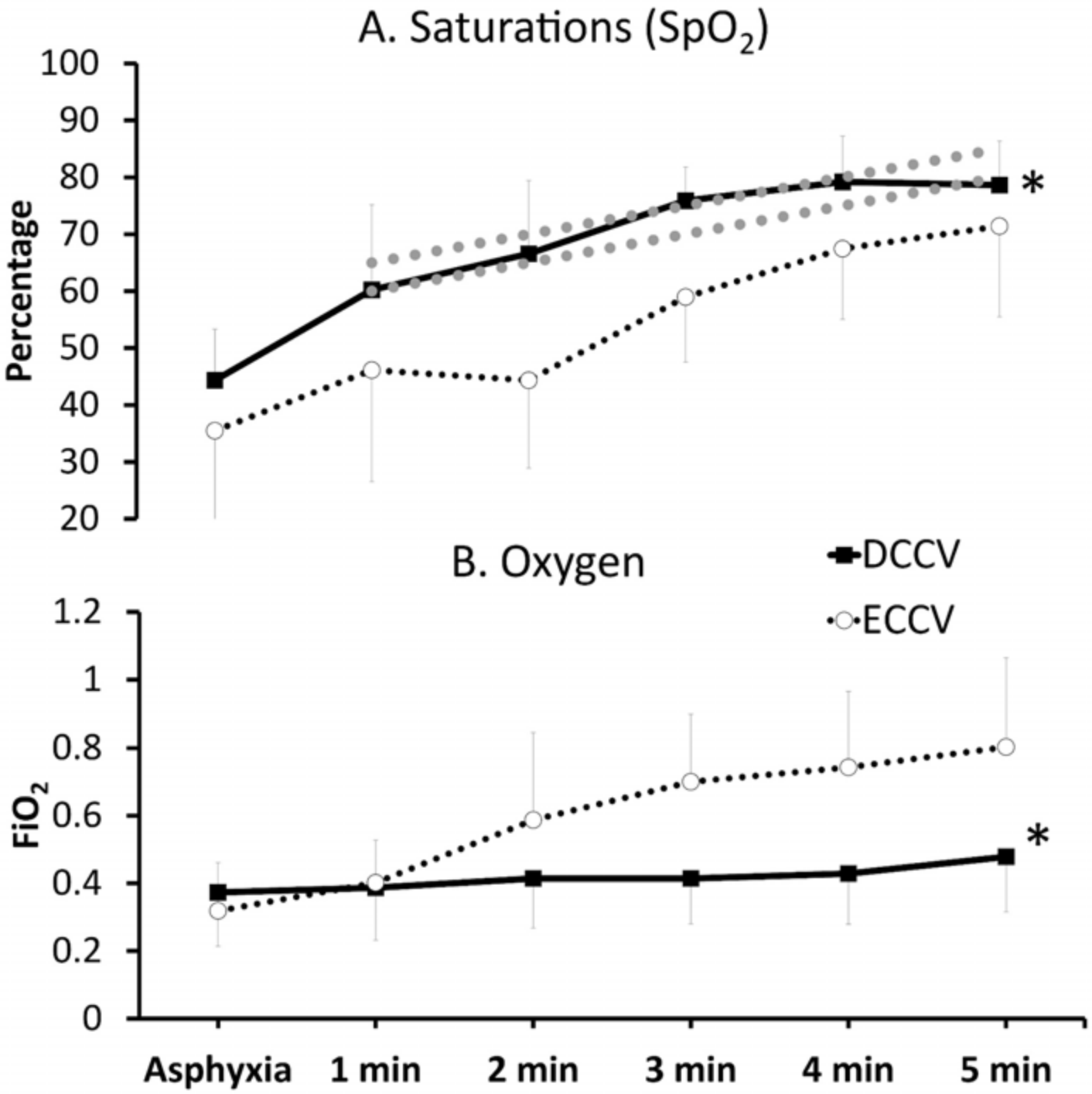

Figure 2: Saturations (SpO_2) and fraction of inspired oxygen (FiO_2) are shown during the first 5 min between DCCV and ECCV. * $p<0.05$ statistical significance by ANOVA. The grey interrupted line represents NRP recommended SpO_2 ranges.

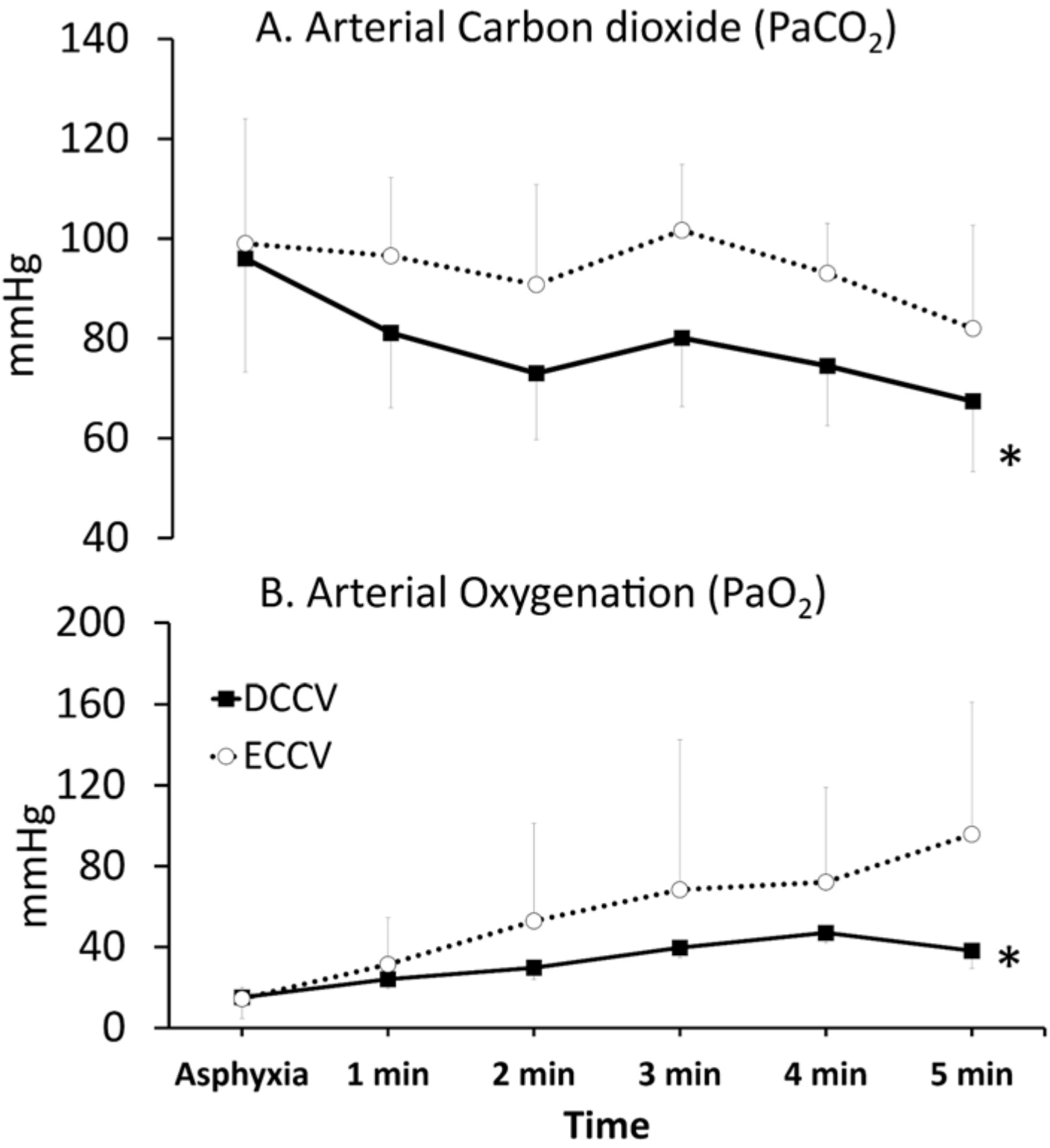

Figure 3: Gas exchange – Arterial carbon dioxide ($PaCO_2$) and arterial Oxygenation (PaO_2) are shown during the first 5 min between DCCV and ECCV. * $p<0.05$ statistical significance by ANOVA.

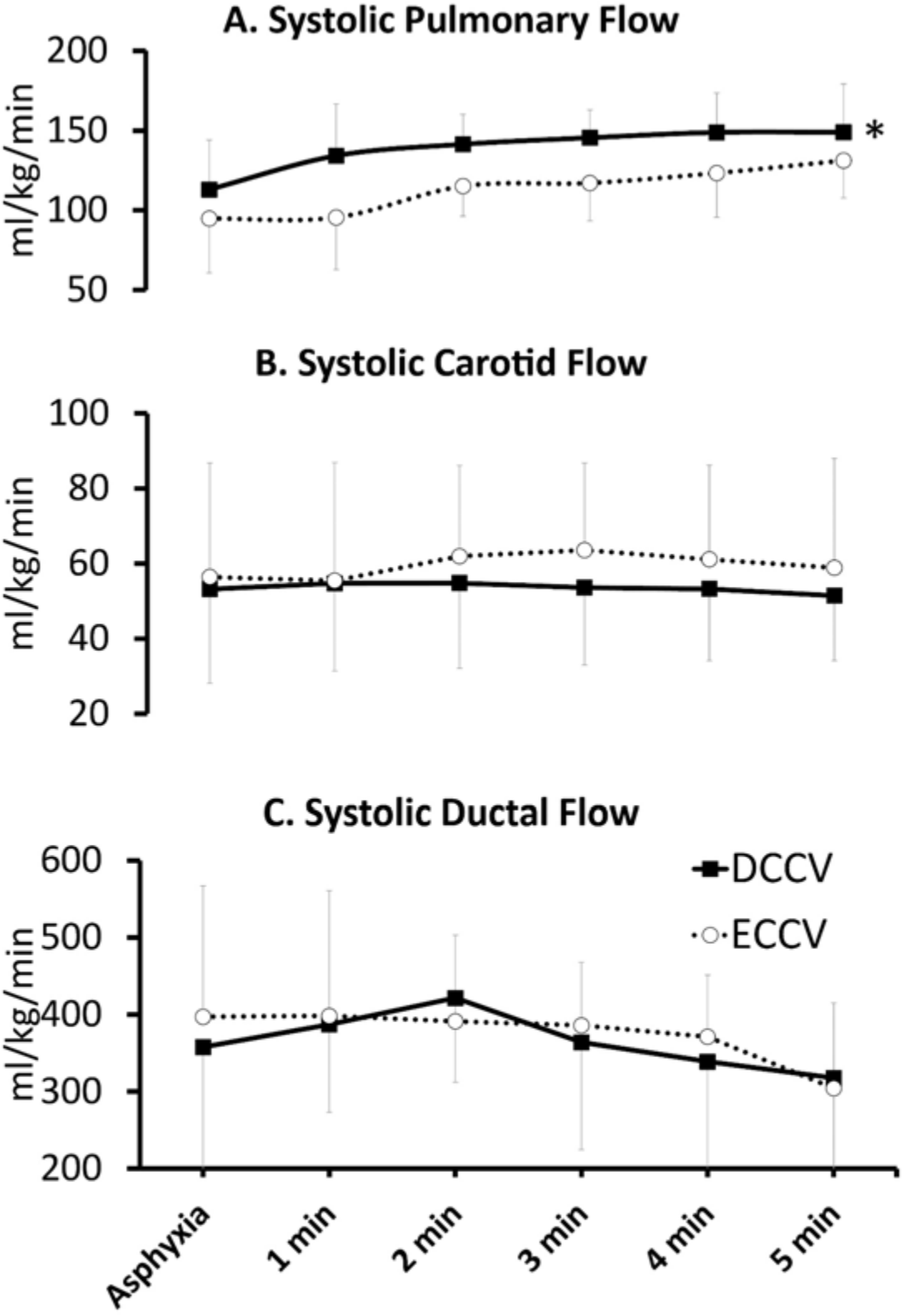

Figure 4: Hemodynamics – Pulmonary, Carotid and Ductal flow are shown during the first 5 min between DCCV and ECCV. * $p<0.05$ statistical significance by ANOVA. A positive ductal value indicated right to left ductal shunting.

Abstract: 97

Efficacy Of Laryngeal Mask Airway During Chest Compressions In Cardiac Arrest

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Background Effective positive pressure ventilation (PPV) is a critical factor in the successful resuscitation of a depressed newborn. PPV with a laryngeal mask airway (LMA) is a viable alternative to that through an endotracheal tube (ETT), especially in resource-limited settings. (1) While the current evidence suggests that LMA PPV can be a secure substitute during the initial stages of newborn resuscitation, there is limited evidence for its use during chest compression (CC). (2)

Objective To compare the efficacy of LMA and ETT during CC in an asphyxiated term lamb model of cardiac arrest. We hypothesized that PPV through LMA during CC will have similar incidence and return of spontaneous circulation (ROSC) as that through an ETT.

Design/Methods We did a randomized control trial using an asphyxiated lamb model of asystolic cardiac arrest. Time-dated near-term ewes underwent C-section. After partial exteriorization, the lambs were instrumented while in placental circulation. The umbilical cord was occluded until cardiac arrest. After delivery, lambs were randomized into the LMA or ETT ventilation groups (controls). Resuscitation was begun as per NRP and continued until ROSC or for 20 minutes, whichever came first. A respiratory profile monitor was used to measure ventilatory parameters continuously. ANOVA and paired t-test were used for analysis.

Results Six lambs (3 in each group) were randomized. The baseline characteristics of the two groups had homogeneous distribution. (Table 1) We found that LMA delivered similar tidal volumes utilizing equivalent mean airway pressures. (Fig. 1) The PaO2 and PaCO2 were comparable between the groups indicating the adequacy of ventilation. The mean blood pressure, mean carotid and pulmonary artery flows were similar between the groups across various time points during and 30 minutes after resuscitation. (Fig. 2) The incidence and the meantime to achieve ROSC were statistically equivalent between the two groups (5m 30s ± 53s vs. 5m 59s ± 145s). (Table 2)

Conclusion(s) This study demonstrates the efficacy of LMA ventilation during CC in an asphyxial cardiac arrest model as an alternative to ETT ventilation (standard of care). LMA insertion is a relatively easy skill to acquire and maintain. Our findings can impact and optimize the newborn resuscitation around the world, where the lack of expertise contributes to neonatal mortality.

Reference:

1. Yang C et al, BMC Pediatrics 2016
2. Qureshi MJ et al, Cochrane Database of Systematic Reviews 2018

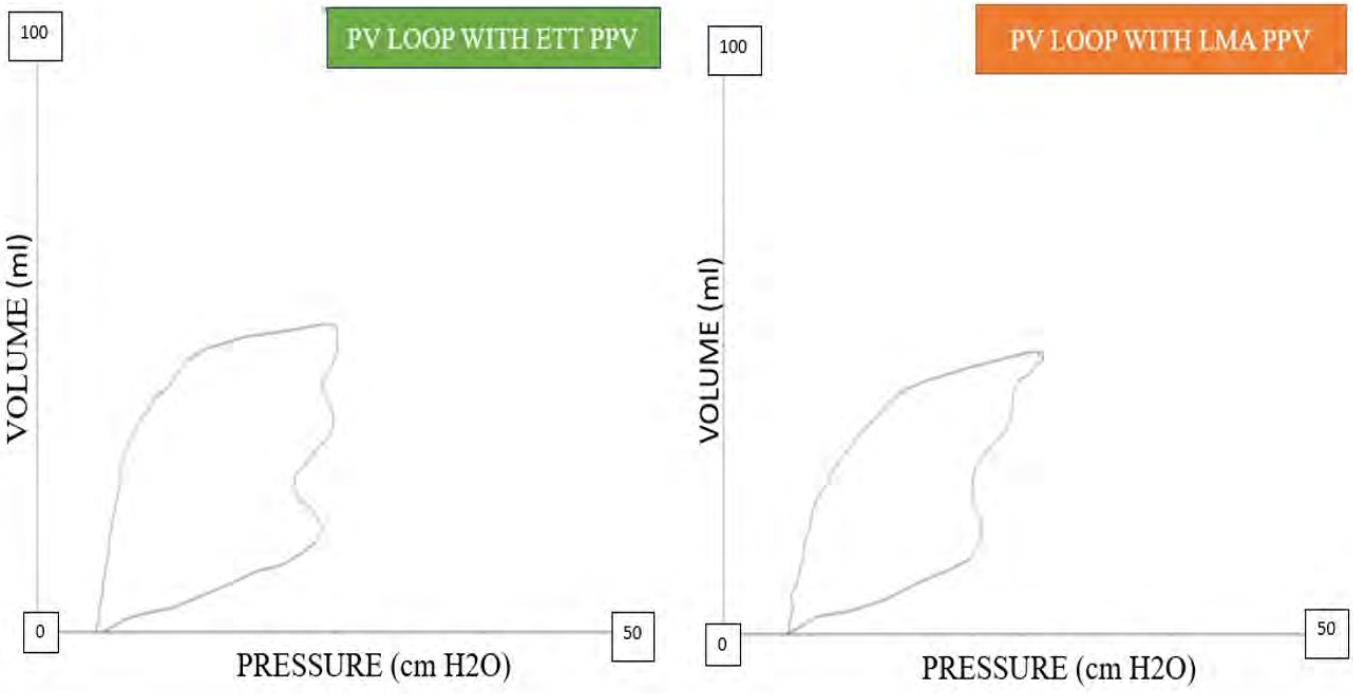

FIGURE 1: PRESSURE VOLUME LOOPS OBTAINED FROM PHILIPS RESPIRONICS NM3 RESPIRATORY PROFILE MONITOR

COMPARISON OF PRESSURE VOLUME LOOPS

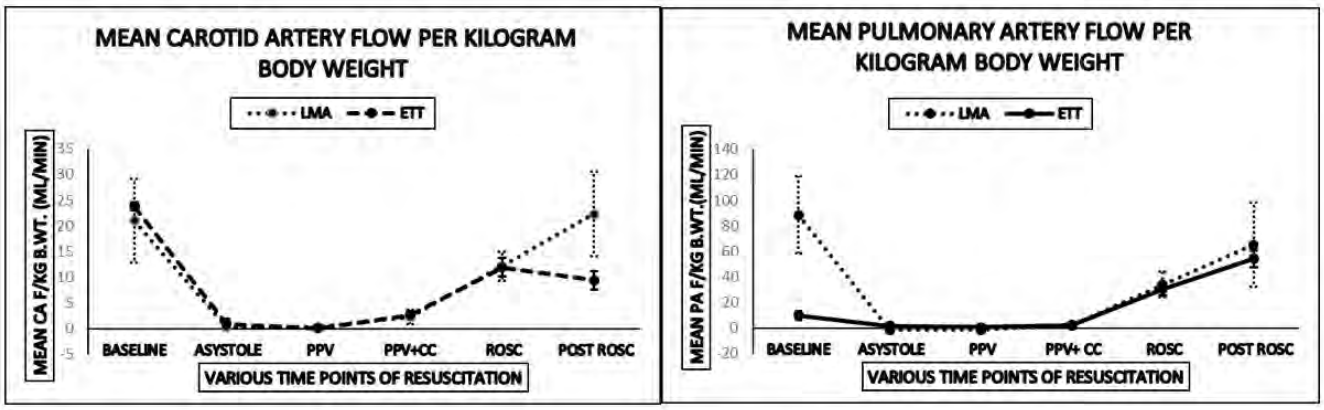

FIGURE 2: MEAN CAROTID AND PULMONARY ARTERY BLOOD FLOWS PER KILOGRAM BODY WEIGHT SHOWN ACROSS VARIOUS TIME POINTS DURING RESUSCITATION WITH LMA OR ETT OBTAINED FROM BIOPAC SYSTEMS (NOTE THE SIMILARITY IN THE ARTERIAL FLOWS).

COMPARISON OF SYSTEMIC AND PULMONARY HEMODYNAMICS

TABLE 1. BASELINE CHARACTERISTICS

VARIABLE	LMA VENTILATION GROUP (N = 3)	ETT VENTILATION GROUP (N = 3)
Gestational age (days)	140 ± 0.6	141 ± 0.6
Birth weight (kilogram)	5.4 ± 0.2	4.8 ± 0.8
Gender (male : female)	2:1	1:2
Baseline pH (pre cord occlusion)	7.12 ± 0.04	7.15 ± 0.08
Baseline lactate (mmol/litre)	10.03 ± 0.49	6.5 ± 4.31
Time to asystole (minutes)	8 min 16 sec ± 2 min 13 sec	10 min 36 sec ± 1 min 27 sec
Number of epinephrine doses required during resuscitation	1 ± 1	1 ± 1

Table 1: Baseline characteristics data presented as average ± standard deviation. Note the similar distribution of gestational age, birth weight and gender of the lambs randomized to LMA or ETT ventilation groups. Baseline acid-base status, time taken to reach asystole and the number of epinephrine doses required during resuscitation were also homogeneous between the groups.

TABLE 2. COMPARISON OF EFFICACY OF RESUSCITATION WITH LMA AND ETT

VARIABLE	LMA VENTILATION GROUP (N =3) MEAN ± STANDARD DEVIATION	ETT VENTILATION GROUP (N = 3) MEAN ± STANDARD DEVIATION
Mean airway pressure (cm H2O)	15 ± 3.2	18 ± 4.1
Expired tidal volume (ml)	51 ± 15	49 ± 36
Expired tidal volume per kilogram body weight (ml/kg)	9.5 ± 1.5	10.1 ± 3.9
Arterial partial pressure of carbon dioxide	86.5 ± 37.3	86.8 ± 33.4
Arterial partial pressure of oxygen	90 ± 110.4	65.3 ± 139.5
Mean carotid artery flow per kilogram body weight (ml/min/kg)	9 ± 11	6 ± 5
Mean pulmonary artery flow per kilogram body weight (ml/min/kg)	25 ± 36	22 ± 23
Mean blood pressure	31 ± 29	24 ± 20
Rate of occurence of ROSC (percent)	100	100
Time to ROSC (minutes)	5 min 30 sec ± 53 sec	5 min 59 sec ± 2 min 25 sec

Table 2: Statistically equivalent ventilatory parameters, adequacy of oxygenation and ventilation, systemic and pulmonary hemodynamics, rate of occurrence and time to achieve ROSC following resuscitation with LMA and ETT as airway devices with chest compressions in an asphyxiated term lamb model of asystolic cardiac arrest.

Abstract: 98

Resuscitation with an Intact Cord in Asphyxial Arrest Enhances Ventilation:Effect of Dual-Site Gas Exchange at Lungs and Placenta?

Jayasree Nair[1], Sylvia Gugino[1], Carmon Koenigsknecht[1], Justin Helman[1], Deepika Sankaran[2], Vikash Agrawal[1], Munmun Rawat[1], Praveen Chandrasekharan[1], Sara Berkelhamer[1], Satyan Lakshminrusimha[2]
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Background Current guidelines recommend immediate cord clamping for neonates requiring resuscitation (Textbook of Neonatal Resuscitation 2016), due to insufficient evidence for delayed cord clamping. Asphyxiated term lambs without arrest, resuscitated with an intact cord, demonstrated stable cerebral perfusion and reduced cerebrovascular injury (Polgase, 2018). Delaying cord clamping until after onset of spontaneous ventilation in healthy term infants reduced incidence of death or admission to NICU (Ersdal, 2014). There is limited information on resuscitation outcomes or hemodynamics with an intact cord in human/animal models with asphyxial arrest.

Objective To compare 1.Resuscitation outcomes 2.systemic and pulmonary hemodynamics 3.Gas exchange after asphyxial arrest with an intact umbilical cord (Intact cord) vs standard cord clamping (Clamped cord)

Design/Methods 30 near-term lambs at 141d gestation were partially exteriorized and instrumented in utero with right carotid(CA) and jugular venous lines and left CA and left pulmonary (PA) flow probes.Cardiac arrest was induced by umbilical cord occlusion. Lambs were randomized into intact cord (n=15 cord clamped after 5min) and clamped cord (n=15 cord clamped within 30 sec). After 2 min of asystole, resuscitation was initiated per NRP guidelines. Hemodynamic parameters were continuously collected and analyzed.

Results All 15 lambs with intact cord and 13/15 with clamped cord achieved return of spontaneous circulation (ROSC). There were no significant differences in time to ROSC or epinephrine doses required (Fig 1). All but 1 lamb with intact cord achieved ROSC while attached to placenta (Fig 2). Primary hemodynamic end points (time to achieve baseline CA flow and mean blood pressure (BP)>40 mmHg) were similar between groups (Fig 1). There was no difference in BP or flows achieved during chest compressions or after ROSC (Fig 3), however the intact cord group demonstrated improved blood gas parameters (higher pH and greater reduction of pCO_2) at 5 min and 10 min post ROSC (Table 1). Blood gas parameters were similar by 30 min.

Conclusion(s) In our model of asphyxial arrest, resuscitation with an intact cord did not change primary ROSC outcomes. However, significantly improved blood gas parameters were noted in the immediate post-ROSC phase with intact cord. We speculate that this could be reflective of dual-site gas exchange in neonatal lungs and placenta that continues when the cord is left intact until after ROSC.

Outcomes

	Intact cord (n=15)	Clamped cord (n=15)
ROSC n (%)	15 (100)	13 (87)
Time to ROSC (min)	4.10 ± 1.57	3.99 ± 0.88
Doses of epinephrine- median(IQ)	1 (0.5)	1 (1)

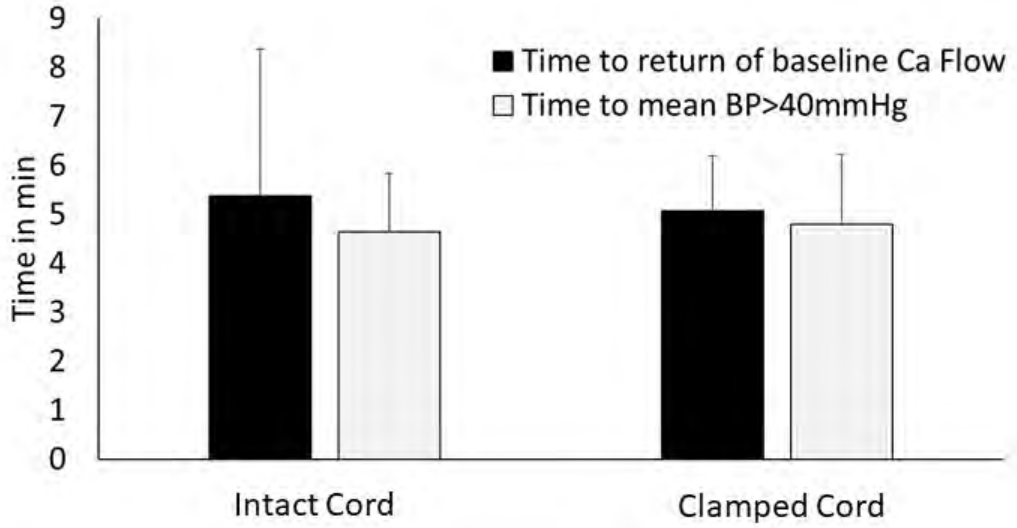

Fig 1: ROSC and hemodynamic outcomes

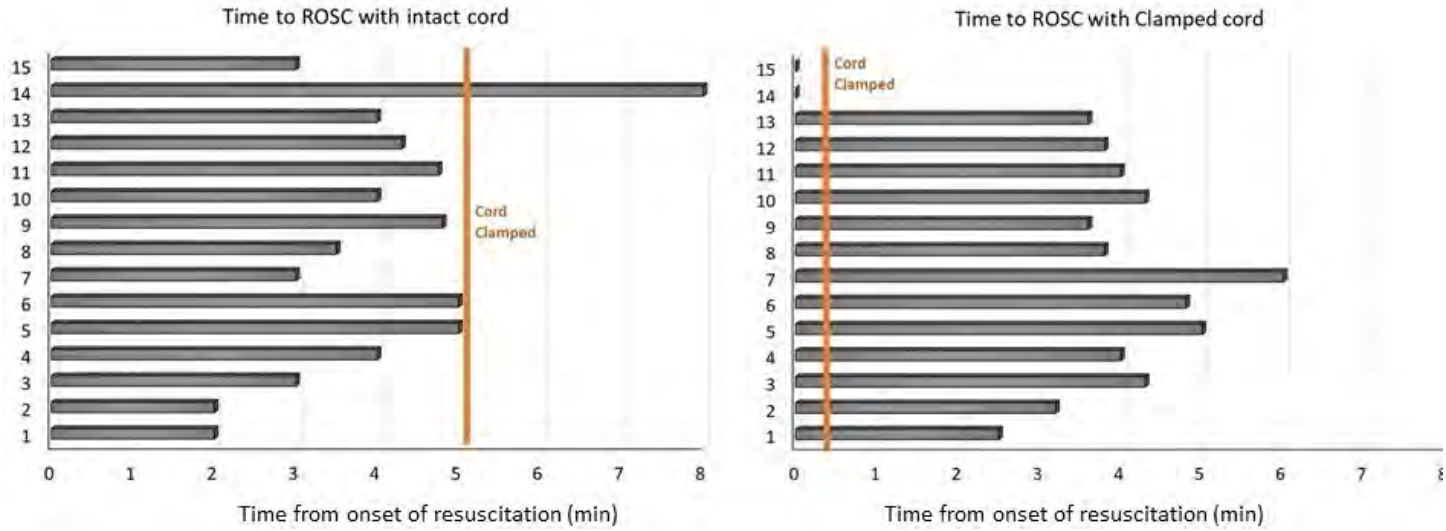

Fig 2: Time to ROSC in relation to timing of cord clamp

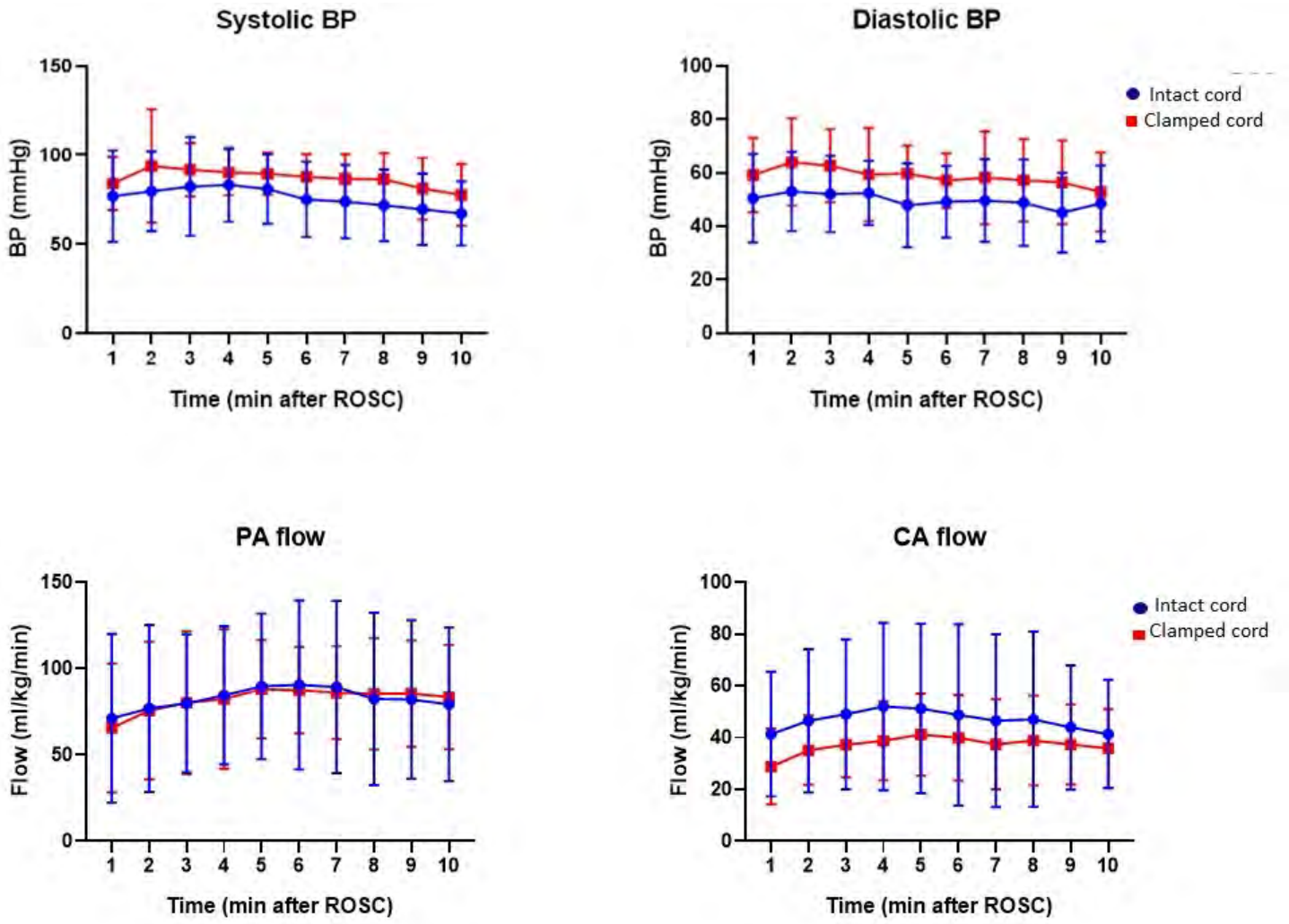

Fig 3: Hemodynamics (BP and carotid and pulmonary artery flow) after ROSC

	Intact Cord	Clamped Cord	p value
0-1 min pH	6.94±0.11	6.91±0.10	ns
(ROSC) pCO_2 (mm Hg)	90±28	89±25	ns
pO_2 (mm Hg)	112±91	106±111	ns
Lactate	10±2	12±2	0.05
5 min pH	7.12±0.18	6.98±0.19	0.02*
pCO_2 (mm Hg)	57±36	74±34	0.08
% decrease pCO_2 from ROSC	37.1%	17.5%	0.04*
pO_2 (mm Hg)	220±110	217±148	ns
Lactate	9±2	10±2	0.07
10 min pH	7.22±0.21	7.05±0.21	0.02*
pCO_2 (mm Hg)	49±38	70±43	0.05
% decrease pCO_2 from ROSC	46.1%	22.3%	0.04*
pO_2 (mm Hg)	142±67	107±42	ns
Lactate	8±2	10±2	0.08
30 min pH	7.21±0.17	7.10±0.21	ns
pCO_2 (mm Hg)	46±24	62±36	ns
pO_2 (mm Hg)	98±53	107±42	ns
Lactate	9±2	10±2	ns

Table 1: Blood gas parameters during ROSC and recovery

Abstract: 99

Rapid Accurate Assessment of Neonatal Heart Rate with Ultrasound by Novice Providers

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Background Heart rate is the critical determinant of neonatal resuscitation and defines when to initiate cardiopulmonary resuscitation (CPR) in unresponsive infants at birth. Currently HR is assessed by a combination of umbilical cord palpation, heart auscultation, pulse oximetry (PO) and electrocardiogram (ECG). These methods have significant limitations: human error (palpation, auscultation), signal artefact (PO, ECG), delay in adequate acquisition (PO), and false representation of HR with pulseless electrical activity (ECG).
Objective 1) To investigate whether a neonatal HR can accurately be determined using a handheld ultrasound (US) device by a provider without prior US experience. 2) To compare B and M-mode ultrasound.
Design/Methods Neonatal providers with no prior ultrasound experience underwent a standardized training process involving a brief video module on how to use B and M-mode ultrasound, followed by practice on a neonatal simulation mannequin. All neonates were on continuous monitoring (PO, ECG and temperature probe) for the duration of the study. Providers were timed from the moment the US probe touched the skin until a HR was established using each US mode. HR obtained with each US mode was compared to HR on ECG monitor. Providers completed a satisfaction questionnaire upon completion of the study. Findings were compared using t-tests and Wilcoxon analysis.
Results 24 providers (19 residents, 3 fellows, 1 attending, 1 nurse practitioner) were trained (median 8.5 mins, IQR 3 mins). Providers assessed a HR in 24 neonates with the following mean demographics: gestational age - 31 weeks (24-39 wks), weight - 1.9 kg (0.97 – 3.3 kg), and postnatal age - 18 days (2-85 days). There were no instances of bradycardia or desaturation during evaluation. No study

infants became hypothermic secondary to evaluation (pre-US 36.9 degrees C vs. post-US 36.9 degrees C, p=0.54). In all cases, providers were able to assess HR with both B and M-mode. Both techniques had acceptable accuracy; however M-mode showed significantly less variability (Figure 1). The time to obtain HR using B-Mode was significantly shorter than M-Mode (median 8.6 vs. 13.9 secs; p<0.001, Table 1). Provider satisfaction levels were not different between B and M-mode (Table 1).
Conclusion(s) Neonatal HR can be rapidly and accurately assessed using US by providers without prior US experience following minimal training. B-Mode is faster at obtaining a HR while M-Mode is more precise; however both modes of obtaining HR could appropriately guide providers in NRP.

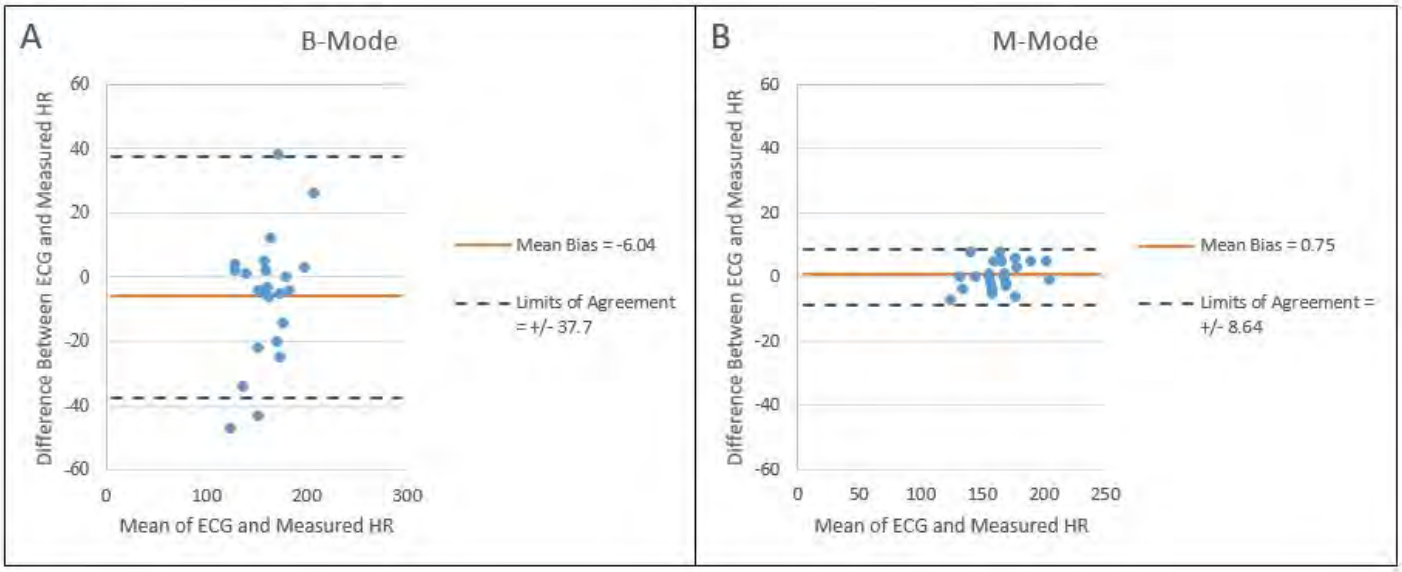

Figure 1: Bland-Altman Plots of HR Assessment with B-Mode (A) & M-Mode (B) compared to ECG HR

Table 1: Analysis with Wilcoxon Signed Ranks Test

	B-Mode	M-Mode	p-value
Median Time to Heart Rate (seconds)	8.71	13.935	<0.001
Interquartile Range (IQR)	1.8775	8.3775	
Median Provider Satisfaction (Likert Scale)	5	5	0.34
Interquartile Range (IQR)	1	1	

Abstract: 100
Temporal Trends and Outcomes for Pulmonary Hemorrhage in Premature Infants - A 28-year study.
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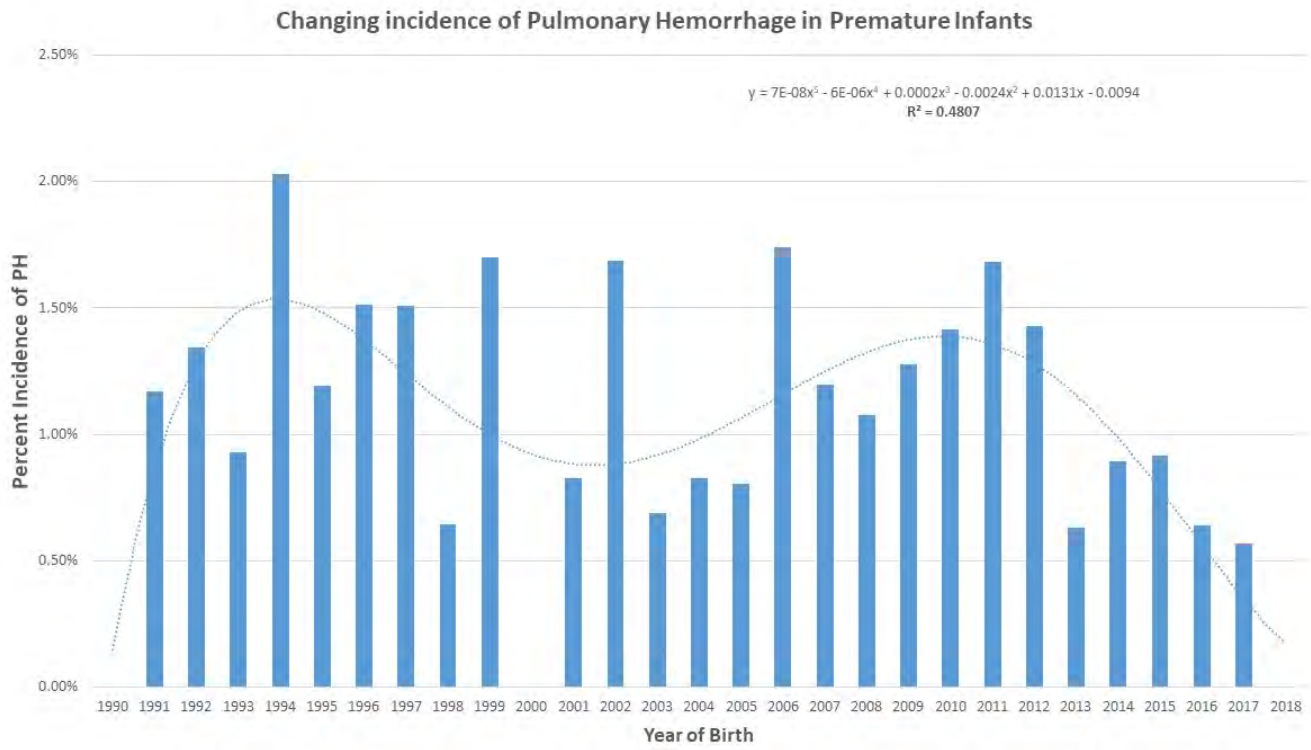
Background Pulmonary hemorrhage (PH) complicates the hospital course of about 1-12 per 1000 live births and has a high mortality rate (~50%). PH may account for up to 9% of neonatal deaths. There is little known about its temporal trends and outcomes in premature infants (≤36 wk GA at birth).
Objective To determine the temporal trends in incidence, mortality, and morbidity of premature infants who develop PH in the NICU.
Design/Methods We conducted a retrospective cohort study of PH among all infants admitted between Jan 1990 and April 2018, at Connecticut Children's NICU in Farmington, CT. Prospectively collected, computerized databases (MDS NIS-3/5, Medical Data Systems, Philadelphia, PA) with pre-defined categories were investigated for the outcome variables studied. We compared the incidence, mortality, and comorbidities during three periods, Period I (P1): 1990-1999, Period II (P2): 2000-2008, and Period III (P3): 2009-2018). SPSS (IBM) was used for statistical analyses. Univariate comparisons of variables were done using one-way ANOVA or Chi-square tests.

Results The number of infants admitted to the NICU in P1, P2, and P3 were 3189, 3286, and 1861 respectively. PH was diagnosed with decreasing incidence during the 3 periods - P1-57 (1.47%), P2- 47 (1.37%) and P3-23 (1.23%). (Fig1 and 2)

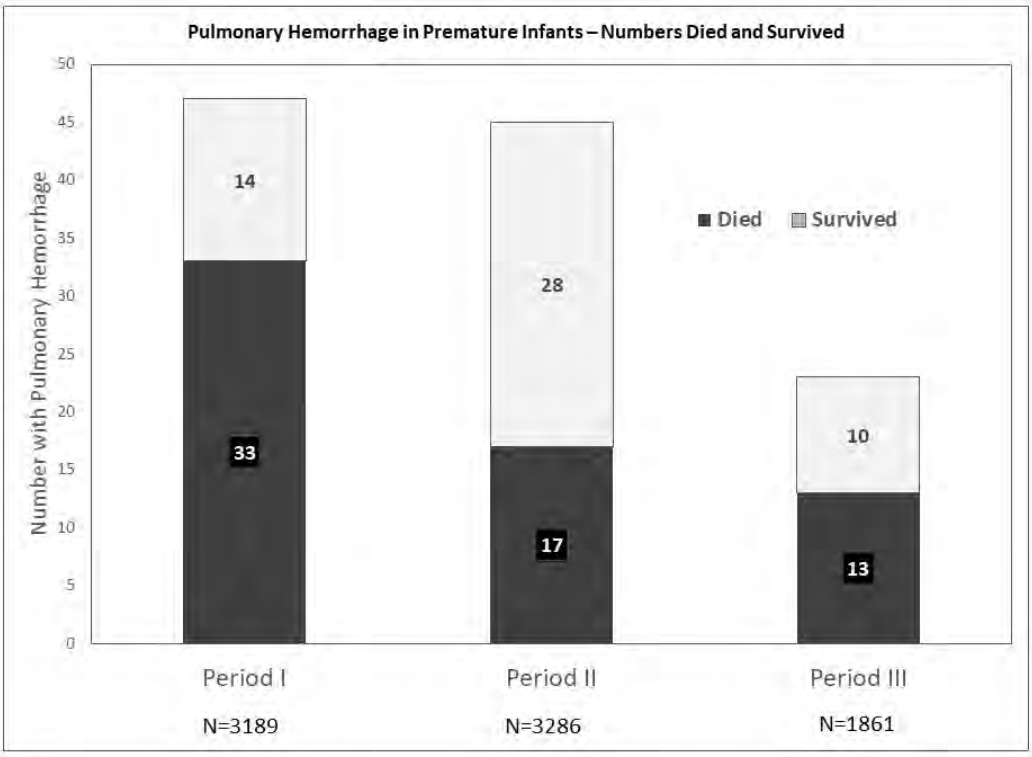
The demographics of study infants during the 2 periods were not different for GA at birth, birth-weight, race, sex, and multiple gestations. (Table 1) Surfactant was used in >88% of babies with PH and there was no correlation between the time of surfactant administration and the time of PH. The type of surfactant, Survanta® (exclusive use before the yr 2000) versus Curosurf® (exclusive use after yr 2010) did not change PH incidence. The timing of PH showed a bimodal distribution with more than 80% of the cases occurring within the first 7 days of life and another peak around days10-14. PH timing was not different between the 3 periods. (Early PH (≤ 7 days of life) was 87% in P1, 77% in the P2, and 82% in the P3.

Mortality decreased from P1 to P3. Mortality was higher with lower GA and BW and with PH onset at ≤ 7 days ($p<0.005$). However, morbidity in survivors did not change significantly for PDA, BPD, severe IVH, severe ROP, and NEC. (Table 2).

Conclusion(s) The incidence of PH has decreased over the last 3 decades. While there is a trend in decreasing mortality with PH, there has been no concomitant increase in morbidity among survivors. Our findings from a single program need to be confirmed by reports from other centers.



Pulmonary Hemorrhage in Premature Infants 1990-2018



Premature Infants who Lived or Died after PH in P1, P2, and P3

Patient Characteristics - Periods I, II and II of premature infants with PH

Variable	Period I	Period II	Period III	p-value
PH Incidence N (%)	47 (1.47%)	45 (1.37%)	23 (1.24%)	0.007
Gestational age at birth (wk)	26.17±3.4	25.6±2.8	25.1±2.5	0.352
Birth-Weight (gm)	880.3±595.6	833.9±509.7	849.6±381.8	0.912
White race	29 (61.7%)	28 (63.6%)	13 (56.5%)	0.314
Male sex	29 (61.7%)	28 (63.6%)	13 (56.5%)	0.85
Multiple Births	17 (36.2%)	10 (22.7%)	5 (21.7%)	0.272

Statistics - Pearson's Chi-Square test, Data shown as N(%) or Mean +/- standard deviation

Outcome of PH Survivors

Variables	P1 (1990-1999) N= 14	P2 (2000-2009) N=28	P3 (2010-2018) N=10	p-value
BPD	12 (86%)	26 (93%)	7 (70%)	0.191
Severe IVH (Grade 3-4)	1 (7%)	10 (36%)	4 (40%)	0.107
Severe ROP Stage 3 or more	3 (21%)	5 (18%)	1 (10%)	0.761
NEC	2 (14%)	3 (11%)	0 (0%)	0.483

PDA	9 (64%)	25 (89%)	9 (90%)	0.103

Data shown as N(%). Results of Pearson's Chi-Square Test.

Abstract: 101

Neonatal Hyperoxia Disrupts Circadian Control of Lung Inflammation in Adulthood

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Background Hyperoxia is a major risk factor for Bronchopulmonary Dysplasia (BPD). Children with BPD continue to be more susceptible to respiratory infections such as influenza later in life. The mechanisms underlying this are not well understood. Circadian rhythms are oscillations in various physiological processes with a 24hr period and help us adapt to the environment. We have previously shown that circadian rhythms control the outcomes from influenza a virus (IAV) infection. Mice infected at the beginning of the rest phase (6am) had better survival and less weight loss compared to those infected at the beginning of their active phase (6pm). We hypothesized that development of circadian rhythms is disrupted by neonatal hyperoxia and this results in increased severity of respiratory infections in adulthood.
Objective Our aim was to determine if and how neonatal hyperoxia disrupts the circadian regulation of lung injury from IAV in adulthood.
Design/Methods C57Bl6 pups were exposed to ≥ 95% oxygen postnatal days 0-5 or room air (RA). Post exposure, all pups were recovered in room air. All studies were performed on adult mice 8-10wks of age. Mice from both groups were infected with IAV (PR8; H1N1) at either 6am or 6pm. Lungs and bronchoalveolar lavage (BAL) were harvested at days 1, 5, and 8 post-infection (p.i). Further, we investigated the mechanisms by using organoid assays and infecting animals where in the core clock gene, Bmal1, was deleted in Alveolar Type 2 (AT2) or Club cells; the later were infected with IAV as above.
Results We found that unlike the RA group, those exposed to hyperoxia as neonates not only had no time of day difference in outcomes, but also demonstrated a higher severity, comparable to the 6pm RA group. This effect was not secondary to higher viral load, but instead due to more inflammation and histological injury. Further, deleting Bmal1 in club cells but not AT2 cells recapitulated the severe phenotype seen in neonatal hyperoxia exposed animals.
Conclusion(s) We conclude that circadian rhythms may provide a mechanistic basis for the life course effects of early life exposures. Targeting these novel pathways may result in new therapeutic candidates.

Abstract: 102

Phytosterols in Lipid Emulsions Downregulate Expression of 78-kD Glucose-Regulated Protein (GRP78) in Neonatal Rat Lung

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Background The lipid component of parenteral nutrition (PN) is derived from soybean oil and contains toxic plant cholesterols, known as phytosterols (PS). Cellular studies have shown that plasma PS levels 2-fold higher than normal activate intrinsic cell death; newborns receiving short-term PN can have PS levels up to 5-fold higher than normal. Animal studies have also confirmed that the neonatal lung is particularly vulnerable to PS accumulation. The physiological impact of PS accumulation in developing lungs has not been studied.
Objective To study the RNA expression of major regulators of mitochondrial and endoplasmic reticulum (ER)-stress mediated apoptotic pathways in rat pup lungs after short-term exposure to PS.
Design/Methods β-sitosterol, campesterol, and stigmasterol were dissolved in β-cyclodextrin (vehicle) to create a solution with a PS profile comparable to 20% Intralipid. Sprague-Dawley rat pups (n=5) received intraperitoneal injections of PS solution, every other day, from P0-P14; a dosing regimen that approximates 2 g/kg/d Intralipid. Saline (n=4) and vehicle (n=5) exposed pups served as controls. Plasma and lung PS concentrations were quantified by LC-MS/MS. Total RNA was isolated from lung tissue and 8 transcripts (Fig 2) were measured using QuantiGene Plex assays. Data were normalized to the SDHA gene and differences in relative gene expression between the groups were determined using Kruskal-Wallis nonparametric analysis and Mann-Whitney t-test, when appropriate. Statistical significance was set at $p < 0.05$.
Results Plasma PS concentrations were significantly elevated in pups receiving PS solution vs. vehicle (22.2 ± 0.7 vs. 13.8 ± 0.4 μg/mL, p=0.02) and comparable to PS levels found in preterm infants; the lung PS concentration was nearly doubled in treated pups (172.6 ± 1.1 vs. 96.7 ± 3.2 μg/mL) (Fig 1). Transcripts regulating mitochondrial mediated apoptosis were not different between the

groups. However, RNA expression of the 78-kD glucose-regulated protein (GRP78) was significantly downregulated in PS exposed lungs ($p < 0.05$) (Fig 2).

Conclusion(s) To our knowledge, this is the first study looking at the deleterious effects of PS in neonatal lungs. GRP78, the master regulator of ER stress and unfolded protein response, is significantly downregulated in PS exposed lungs. GRP78 is essential for lung development and decreased expression may increase susceptibility to ER stress and apoptosis, thereby contributing to the pathogenesis of bronchopulmonary dysplasia (BPD).

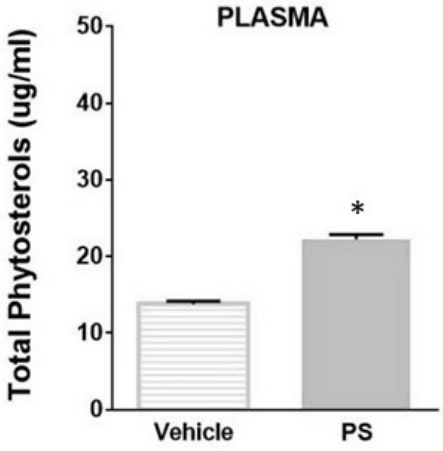

Fig 01(A). Plasma PS concentrations in rat pups after 2-week exposure to vehicle (control) or PS solution. (n = 5 rats/group, *p < 0.05)

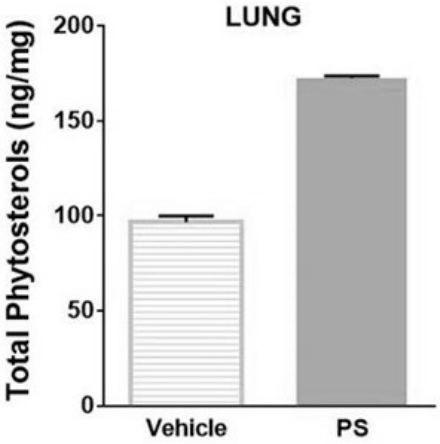

Fig 01(B). Lung PS concentrations in rat pups after 2-week exposure to vehicle (control) or PS solution. (n = 2 rats/group)

Plasma and Lung Phytosterol Concentrations in Neonatal Rats

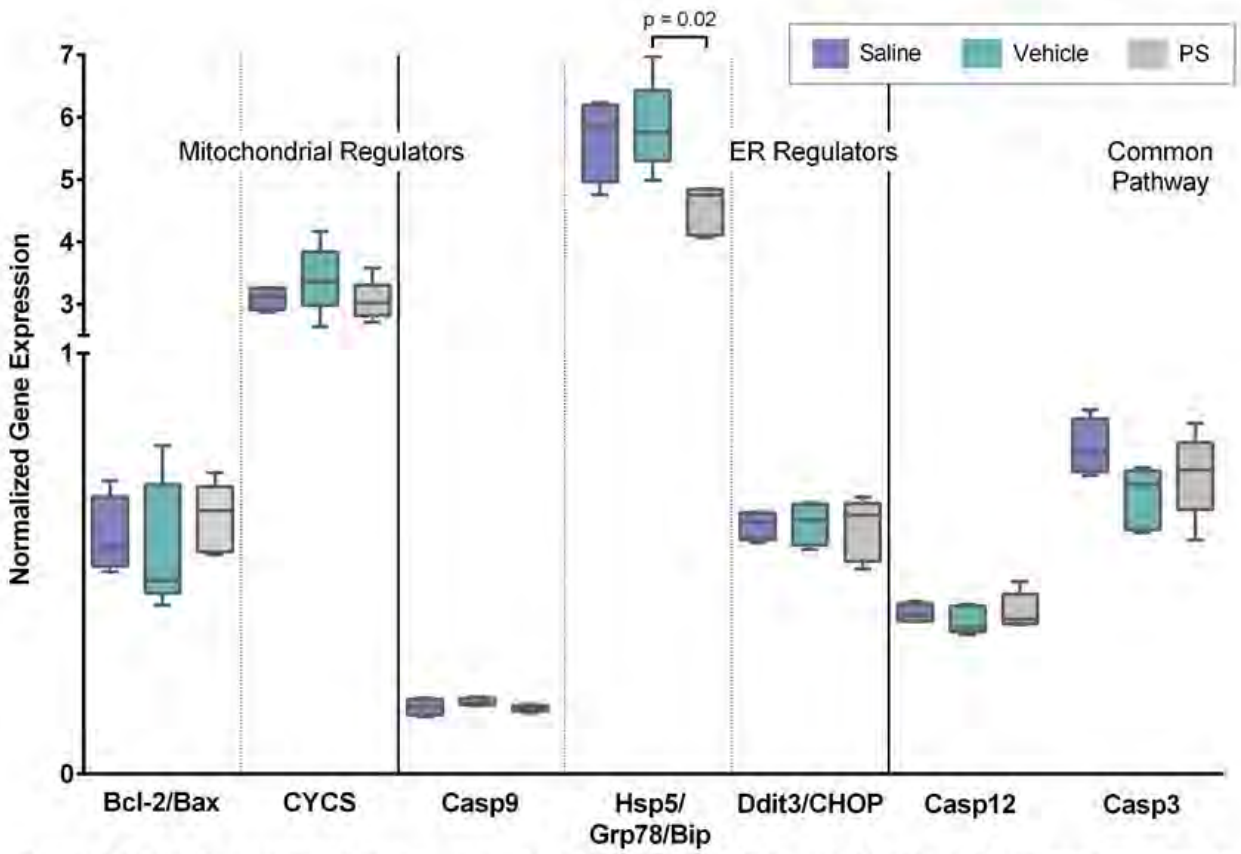

Figure 02. RNA Expression of Regulators of Mitochondrial and ER-stress Mediated Apoptotic Pathways in Neonatal Rat Lungs Exposed to Phytosterols. *B-cell lymphoma 2 (Bcl-2), Bcl-2-associated X protein (Bax), Binding immunoglobulin protein (Bip), Caspase 3 (Casp3), Caspase 9 (Casp9), Caspase 12 (Casp12), Cytochrome c (CYCS), C/EBP Homologous Protein (CHOP), DNA damage inducible transcript 3 (Ddit3), 78-kDa glucose-regulated protein (GRP78) (Grp78), Heat shock 70 kDa protein 5 (HSPA5).*

RNA Expression of Regulators of Mitochondrial and ER-stress Mediated Apoptotic Pathways in Neonatal Rat Lungs Exposed to Phytosterols

Abstract: 103

Neonatal hyperoxia disrupts circadian rhythmicity of gut microbiome in adults

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Background Circadian rhythms refer to oscillations in various physiological functions with a 24hr periodicity that help the organism maintain homeostasis. At the molecular level, the clock comprises transcriptional-translational feedback loops of the core clock genes that drive the rhythmic fluctuations of many cellular processes. Disruption of circadian rhythms leads to adverse health outcomes. Intestinal microbiota shows circadian oscillations that are perturbed when the clock is genetically disrupted in mice. Early life exposures, such as antibiotics disrupt the microbiome during a critical window of maturation and are associated with increased morbidity later in life. Hyperoxia is a frequent exposure for premature and sick neonates and while its effect on lung is well described, its systemic effect of other systems, such as the microbiome are not well known.
Objective Our aim was to determine whether neonatal hyperoxia disrupts the establishment and development of the circadian rhythmicity of gut microbiome in adulthood.
Design/Methods C57BL6 pups were exposed to >90% oxygen postnatal days 0-5. Post-exposure, all pups were recovered in room air; at 8-10wks of age. Fecal pellets from recovered pups (~ 12-14weeks) were collected every 4h for 24h (ZT0-ZT20) per mouse/per cage for gut microbiota analysis. Abundance, diversity, and key defining characteristics of circadian rhythms (phase and amplitude) were

determined.

Results Exposure was associated with abundance variations in 19 bacterial taxa, as determined by 16S rRNA marker gene sequencing (FDR-adjusted p-value < 0.05). Next, we measured phase and amplitude of the rhythms of the individual taxon. We observed a phase difference in the proportion of *Bacteriodales* family S24-7, the most abundant taxon detected. Phase differences were also observed for *Ruminicoccus*, *Tenericutes* sp. RF39, and *Sutterella*. An amplitude difference was detected in *Ocilliospora* between the two treatment groups. *Turicibacter*, a strict anaerobe and was present in all unexposed mice but completely absent in hyperoxia exposed mice, even after 3 months of recovery. Collectively, many of these changes in the microbiome have been associated with the condition of immune-metabolic derangements.

Conclusion(s) Our data indicate that neonatal hyperoxia is a systemic exposure and has persistent effects on the host health. We speculate that disruption of the circadian rhythmicity of the gut microbiome may underlie the morbidity that patient with bronchopulmonary dysplasia experience, even decades after the original insult.

Abstract: 104

ELBW Infants Who Progress to BPD Have Lower Pulmonary Expression of Latent TGF-β

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Background Bronchopulmonary Dysplasia is a chronic lung condition in ELBW infants that results in alveolar simplification and has strong genetic foundations (~80%). TGF-β is an excellent gene candidate for mediating susceptibility to BPD as its signaling plays a role in alveolarization through the regulation of branching and septation in developing lungs and during its role as a pro-inflammatory mediator. In our prior study one SNP of TGF-β (rs1800470) was found to be associated with BPD (p=0.046), while four others were not (rs1800469, rs1700471, rs1982072, rs12029576).

Objective We sought to determine whether TGF-β protein expression was increased in ELBW infants with BPD compared to those without.

Design/Methods This is an ongoing cohort study of ELBW infants (<1000g) without congenital or chromosomal abnormalities. BPD is defined as supplemental oxygen requirement at 36 weeks PMA. IRB approved parental consent was obtained and buccal swabs collected. DNA was isolated and subjected to allelic discrimination using Taqman probes for rs1800469, rs1800470, rs1700471, rs1982072, rs12029576, and rs2241712 during RT-PCR. Tracheal aspirates were collected from intubated infants within the first seven days of life. TGF-β1 protein concentrations were measured using human ELISA kits for active and latent TGF-β1. Chi-squared, Mann-Whitney, t-test, and z-test performed with $p<0.05$ denoting statistical significance.

Results For two SNPs, rs1800470 and rs2241712, there is a statistically different genotype distribution between ELBW infants who progress to BPD and those who do not (p=0.046 and $p<0.005$, respectively). Patients in the BPD group were born earlier ($p<0.001$ and p=0.003, respectively) and at a lower birth weight ($p<0.001$ and $p<0.001$, respectively). Infants with BPD had lower latent TGF-β1 isolated from their tracheal aspirates than those without BPD (p=0.02). Infants with BPD had higher active TGFβ1 isolated from their tracheal aspirates than those without BPD, however this finding was not statistically significant (p=0.11).

Conclusion(s) Genetic variations of TGF-β (rs1800470 and rs2241712) are associated with the development of BPD in ELBW infants. Pulmonary expression of latent TGF-β1 is decreased as early as the first week of life in ELBW infants who progress to BPD. We speculate that decreased latent and increased active TGF-β1 expression contributes to the development of BPD through impaired alveolarization and elastogenesis of the lung as a result early changes to the balance of this mediator in the pulmonary extracellular matrix.

Demographic data for rs1800470			
	No BPD (n=89)	BPD (n=118)	p value
Gestational Age (weeks) (median, IQR)	26 (25,27)	25 (24,26)	<0.001
Birth Weight (g) (median, IQR)	836 (735,910)	716 (608,840)	<0.001
Race (n,%)			
Non-Hispanic White	28 (31)	30 (25)	0.70
Non-Hispanic Black	25 (28)	40 (34)	
Hispanic	30 (34)	39 (33)	
Other	5 (6)	9 (8)	
Male Gender (n,%)	34 (38)	50 (51)	0.09
Prenatal Steroids (n,%)	79 (89)	97 (82)	0.32
Chorioamnionitis (n,%)	15 (17)	17 (14)	0.66
Preeclampsia (n,%)	21 (24)	21 (18)	0.31
SGA (n,%)	11 (12)	20 (17)	0.36
Surfactant administration (n,%)	79 (89)	105 (89)	0.96

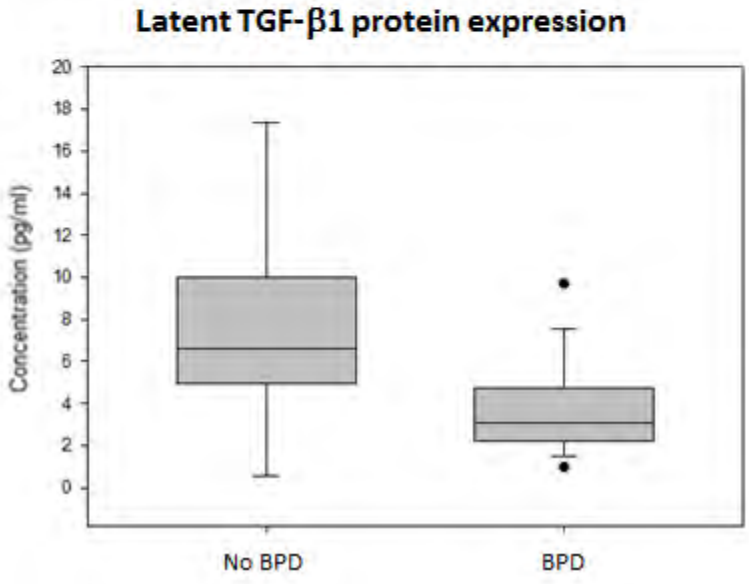
Demographic data for rs2241712			
	No BPD (n=43)	BPD (n=69)	p value
Gestational Age (weeks) (median, IQR)	26 (25,27)	25 (24,26)	<0.001
Birth Weight (g) (median, IQR)	817 (739, 895)	739 (601, 877)	0.03
Race (n,%)			
Non-Hispanic White	14 (33)	19 (28)	0.75
Non-Hispanic Black	12 (28)	23 (33)	
Hispanic	13 (30)	23 (33)	
Other	4 (9)	4 (6)	
Male Gender (n,%)	16 (37)	39 (57)	0.21

Genotype distribution for rs1800470			
	No BPD (n=89)	BPD (n=118)	p value
AA (n,%)	42 (47)	50 (42)	0.05
Ag (n,%)	22 (25)	47 (40)	
gg (n, %)	25 (28)	21 (18)	
Any g (n,%)	47 (53)	68 (58)	0.58

Genotype distribution for rs2241712			
	No BPD (n=43)	BPD (n=69)	p value
CC (n,%)	26 (60)	32 (46)	0.007
Ct (n,%)	10 (23)	34 (49)	
tt (n, %)	7 (16)	3 (4)	
Any t (n,%)	17 (40)	37 (54)	0.15

Latent TGF-β1 protein expression			
	No BPD (n=6)	BPD (n=14)	p value
Concentration (pg/ml) (median, IQR)	6.58 (4.97, 9.98)	3.09 (2.18, 4.76)	0.05

Active TGF-β1 protein expression			
	No BPD (n=4)	BPD (n=3)	p value
Concentration (pg/ml) (median, IQR)	0.84 (0.45, 1.29)	2.95 (1.19, 4.18)	0.11



Abstract: 105

Neonatal Lymphatic Flow Disorders: Impact of Lymphatic Imaging and Interventions on Outcomes

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Background Neonatal lymphatic flow disorders may present as chylothorax, chylous ascites, chylopericardium or anasarca. These disorders are historically challenging to diagnose and manage and are associated with high morbidity and mortality. Advances in lymphatic imaging have led to identification of two patterns of disruption in lymphatic flow, pulmonary lymphatic perfusion syndrome (PLPS) and central lymphatic flow disorder (CLFD), as the underlying cause of disease in this population.
Objective To determine differences in neonatal outcomes in PLPS versus CLFD after lymphatic imaging and intervention.
Design/Methods We conducted a retrospective study of 35 neonates with lymphatic abnormalities at our institution who underwent

lymphatic evaluation between 12/2015 and 9/2018. Patients with only PLPS were classified as neonatal chylothorax (NCTx) and those with multiple flow abnormalities were classified as CLFD. Demographic, clinical characteristics and outcomes were compared using t-tests/Wilcoxon rank sum tests and Fisher's exact tests.

Results All 35 patients had intranodal MR lymphangiography and 14 (40%) also had conventional fluoroscopic lymphangiography. 15 (42.8%) patients were diagnosed with NCTx and 20 (57.1%) were diagnosed with CLFD (Table 1). A majority (97.1%) had pleural effusions. None of the NCTx group had ascites, anasarca, or dermal backflow on lymphatic imaging compared to 17 (85%) ($p<0.001$), 8 (42.1%) (p 0.004), and 20 (100%) ($p<0.001$) of the CLFD group respectively (Table 2). In the NCTx group, 11 (73.3%) had ethiodized oil embolization and 4 (26.7%) received conservative therapy. In the CLFD group, 10/20 received an intervention; 2 (10%) had ethiodized oil-only embolization, 2 (25%) had embolization with glue, 3 (37.5%) underwent surgical lymphovenous anastomosis, 2 (25%) underwent thoracic duct (TD) externalization, and 1 (12.5%) had a non-TD lymphatic channel drain placed)(Table 3). Patients with CLFD were more likely to require mechanical ventilation and be diagnosed with bronchopulmonary dysplasia compared to patients with NCTx. All patients with NCTx survived to discharge as opposed to 50% of CLFD patients (Table 4).

Conclusion(s) Establishing a diagnosis of NCTx or CLFD is paramount in directing treatment and providing important prognostic information for these rare disorders. Development of lymphatic interventions in this population represents a paradigm shift in our understanding of neonatal lymphatic flow disorders and can potentially improve outcomes particularly for patients with CLFD.

Table 1. Demographics and Baseline Characteristics

	NCTx (N=15)	CLFD (N=20)	P-Value
Gestational Age, weeks (median, IQR)	36.1 (34.0, 37.4)	34.1 (28.1, 35.9)	0.049
Birth Weight, kg (mean ± SD)	2.8 ± 0.78	2.2 ± 1.21	0.098
Male (n, %)	9 (60%)	11 (55%)	1.000
5 Minute Apgar (mean ± SD) (n= 14, 20)	7.1 ± 2.2	5.9 ± 2.2	0.143
Prenatal Lymphatic Diagnosis (n, %)	12 (80%)	8 (40%)	0.037
Prenatal Lymphatic Intervention (n)	7 (46%)	5 (25%)	0.282
Hydrops Fetalis (n)	4 (26%)	7 (35 %)	0.721
Genetic Disorder (n)	2 (13%)	6 (30%)	0.419
History of Chylothorax (n)	15 (100%)	20 (100%)	n/a
History of Chest Tube (n)	13 (86%)	20 (100%)	0.176

NCTx – neonatal chylothorax
CLFD – central lymphatic flow disorder

Table 1

Table 2. Lymphatic Imaging Outcomes

	NCTx	CLFD	P-Value
T2-weighted MRI	N = 15	N = 20	
Pleural Effusion (N)	14 (93%)	20 (100%)	0.429
Pericardial Effusion (N)	1 (6%)	2 (10%)	1.000
Ascites (N)	0 (0%)	17 (85%)	<0.001
Soft Tissue Perfusion (N)	0 (0%)	8 (42%)	0.004
Mesenteric Perfusion (N)	1 (6%)	5 (25%)	0.207
Mediastinal Perfusion (N)	1 (6%)	5 (25%)	0.207
Supraclavicular Perfusion (N)	0 (0%)	6 (30%)	0.027
DCMRL	N = 14	N = 20	
Thoracic Duct (TD)			
Normal	6 (42%)	3 (15%)	0.116
Dilated	2 (14%)	13 (65%)	0.005
Occluded	2 (14%)	1 (5%)	0.555
Bilateral	2 (14%)	1 (5%)	0.555
Absent	3 (21%)	3 (15%)	0.672
Perfusion			
Lung	12 (85%)	13 (65%)	0.250
Intercostal	0 (0%)	11 (55%)	0.001
Mediastinal	6 (42%)	10 (50%)	0.738
Neck/Supraclavicular	0 (0%)	9 (45%)	0.004
Mesentery	0 (0%)	15 (75%)	0.001
Dermal Backflow	0 (0%)	20 (100%)	<0.001

NCTx – neonatal chylothorax
CLFD – central lymphatic flow disorder

Table 2

Table 3. Lymphatic Interventions

	NCTx	CLFD	P-Value
	N = 15	N = 20	
Any Intervention	11 (73%)	10 (50%)	0.296
Ethiodized Oil	11 (73%)	2 (10%)	<0.001
Other Interventions	N = 0	N = 8	
Ethiodized Oil/Glue		2 (25%)	
Surgical Lymphovenous Anastomosis (LVA)		3 (37%)	
Thoracic Duct Externalization		2 (25%)	
Non Thoracic Duct (TD) Vessel Drain		1 (12%)	

NCTx – neonatal chylothorax
CLFD – central lymphatic flow disorder

Table 3

Table 4. Survival and Other Neonatal Outcomes

	NCTx (N=15)	CLFD (N=20)	P-Value
Survival (N)	15 (100%)	10 (50%)	0.002
Respiratory Outcomes			
Mechanical Ventilation (N)	7 (46%)	20 (100%)	<0.001
High Frequency Ventilation (N)	2 (13%)	18 (90%)	<0.001
Post-natal Steroid Use (N)	1 (6%)	16 (80%)	<0.001
Maximum PEEP, cm H20 (median, IQR)	8 (6,10)	11.5 (9.3,15)	0.006
Resolution of Chylothorax (N)	15 (100%)	9 (45%)	0.001
Bronchopulmonary Dysplasia (N)	1 (6%)	12 (60%)	0.020
Feeding Outcomes			
Reached Full Enteral Feeds (N)	15 (100%)	15 (75%)	0.057
Age at Full Enteral Feeds, days (median, IQR)	24 (4,53)	85 (40,158)	0.006
Length of Hospitalization			
Age at Discharge, days (median, IQR)	67 (27,113)	194 (103,275)	0.006

NCTx – neonatal chylothorax
CLFD – central lymphatic flow disorder
PEEP – peak end expiratory pressure

Table 4

Abstract: 106
Transforming Growth Factor Beta-1 (TGFβ1) and Fibroblast Growth Factor (FGF) Correlate with Regenerative Functions of Unrestricted Somatic Stem Cell (USSC) Infusion in Premature Brain Hemorrhage

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Background The germinal matrix (GM) is a site of proliferating neuronal & glial precursor cells & the origin of intraventricular hemorrhage (IVH) - a common complication of extreme prematurity leading to white matter injury & cerebral palsy. We showed that USSCs lessen white matter injury & reduce the severity of hydrocephalus in a premature rabbit model of glycerol-induced IVH (Vinukonda et al, Stem Cell Trans Med, 8:1157, 2019). *Intrinsic* signals from the GM & *extrinsic* signals from meninges, blood vessels and cerebrospinal fluid regulate cell proliferation and differentiation during brain development (Lehtinen et al, 2011; Johansson et al, 2010). We hypothesize that intracerebroventricular (ICV) USSC administration elicits regenerative potential by modulating expression of TGFβ1, FGF, EGF and IGF1-2, enhancing progenitor cell proliferation & differentiation after IVH.
Objective
Design/Methods A single dose of ICV USSCs ($2x10^6$) were injected in premature rabbits 1d after IVH; naïve & non-treated IVH animals served as comparison groups. USSC effects were established from dissected ventricular ependyma, coronal slices and cerebrospinal fluid at postnatal days 3, 7 & 14.
Results USSC survival and migration *in vivo* was confirmed using live animal bioluminescence imaging followed by immunostaining. We quantified total proliferating cells using Ki67-DAPI in the GM zone (GM, ventricular zone [VZ] & sub-VZ) of the lateral ventricles at 3d & observed decreased cell density in IVH ($P<0.05$), whereas with USSC infusion there was a trend towards recovery showing increased total proliferation. After USSC infusion, oligodendrocyte precursor proliferation (Ki67-Olig2) in the corpus callosum & corona radiata showed increased cell density ($P<0.05$). Growth factors likely involved in the proliferation of progenitor cells were assessed: TGFβ1, FGF & IGF1-2. We quantified FGF & TGFβ1 expression via protein in CSF and total RNA in the VZ tissue. In the ependyma, mRNA expression was 37% lower for TGFβ1 & 47% for FGF in 3d IVH pups; whereas increased levels of mRNA for both occurred after USSC infusion ($P<0.05$). TGFβ1 protein levels in the CSF at 3d increased after USSC administration ($P<0.05$). IGF1-2 levels were comparable between the groups at all timepoints.
Conclusion(s) USSCs released the blockade of oligodendrocyte precursor cell division and favorably modulated TGFβ1 and FGF expression correlating with regenerative changes after IVH.

Abstract: 107
Gabapentin exposure and the time course of neonatal abstinence syndrome among methadone-exposed neonates.
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Background Gabapentin use is common among individuals receiving medications for opioid use disorder (OUD), including pregnant women. We recently reported that maternal gabapentin use in the third trimester was significantly associated with neonatal pharmacotherapy for neonatal abstinence syndrome (NAS).
Objective To determine whether the time course of NAS was different among methadone-exposed infants with and without concomitant third trimester gabapentin exposure.
Design/Methods Retrospective data were extracted from the medical records of women who delivered between January 1 and December 31, 2017 while receiving comprehensive treatment for OUD, including methadone, at a single university-afiliated treatment center. Maternal pregnancy history, methadone dose at delivery, neonatal sex, birthweight, gestational age at delivery, Apgar scores, and use of drugs were extracted. Use of Gabapentin was defined as having a prescription or positive urine toxicology in the third trimester. NAS was assessed using the MOTHER NAS (MNAS) scoring system every 3-4 hours beginning ~ 2 hours of age until discharge. Scores were averaged in 4-hour bins. The first 120 hoursof scoring are includeed in the present analysis. Maternal and neonatal characteristics were compared between gabapentin-exposed and non-exposed neonates using chi-square and *t*-tests. MNAS scores were analyzed with a two-way ANOVA (gabapentin exposure x time). Statistical significance was determined at $p < .05$.
Results Neonates had a mean gestational age (GA) 39.9 ± 2.3 weeks and mean birthweight 2760 (± 619) grams. Gabapentin-exposed (n = 5) and non-exposed neonates (n = 50) did not differ significantly in GA (36.5 vs 38.0 weeks), birthweight 2790.0 vs 2790.7 grams, 1-minute Apgar score (7.0 vs 7.4) or 5-minute Apgar (8.2 vs 8.6). There were significant main effects between gabapentin exposure ($p = .010$) and time ($p < .001$) on total MNAS scores. For both groups, MNAS scores increased significantly over time. Gabapentin-exposed neonates had higher total MNAS scores than non-exposed infants. There was no significant interaction between gabapentin exposure and time.

Conclusion(s) Gabapentin exposure was associated with exacerbated NAS among methadone-exposed infants and produced more severe NAS as measured by MNAS. The MNAS scores followed a similar time course for both gabapentin exposed and non-exposed infants, but reach a higher peak among gabapentin-exposed infants. Future research should examine gabapentin interactions with other maternal medications for OUD.

Abstract: 108

Hemoglobin volume phase index to measure dysfunctional cerebral autoregulation and brain injury in hypoxic-ischemic encephalopathy

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Background Dysfunctional cerebral autoregulation is associated with secondary brain injury in neonates with hypoxic-ischemic encephalopathy (HIE). Preclinical data from a piglet model of induced hypotension has validated the ability of a novel autoregulation metric, the Hemoglobin Volume Phase Index (HVP), to distinguish between functional and dysfunctional autoregulation with improved accuracy compared to previously described measures (Govindan et al, Dev Neurosci 2019).
Objective To examine the relationship between HVP and death or severe brain injury on qualitative and quantitative MRI in neonates with HIE.
Design/Methods This is a secondary analysis of prospectively collected data. Infants with moderate or severe HIE had frontal near infrared spectroscopy (NIRS) and continuous arterial blood pressure monitored during therapeutic hypothermia. HVP was calculated from the spectral phase shift between NIRS total hemoglobin (a surrogate measure of cerebral blood volume) and mean arterial blood pressure at 21-24 hours of life (peak of secondary injury). MRI on median day of life 4 (range 3-10) was scored for presence and severity of injury according to the NICHD Neonatal Research Network's scoring system (Shankaran et al, Arch Dis Child 2012). Adverse outcome was defined as either death or an NICHD score of >2A. In a subset of patients (n=19), DTI fractional anisotropy (FA) and mean diffusivity (MD) were measured from the thalamus and basal ganglia using a semi-automated approach with a neonatal parcellation map (Oishi et al, Neuroimage 2008). The relationship between HVP and MRI injury was evaluated using Kruskal Wallis tests, Spearman correlation and multiple linear regression analyses.
Results 27 infants (mean GA 38.4 ±1.3 wks, median pH 6.93 (range 6.55-7.18), 52% male, 30% severe encephalopathy) were included in this analysis. Higher HVP at 21-24 hours of life was significantly associated with death or greater injury on MRI (Figure 1). Higher HVP was also associated with lower FA in the globus pallidus and thalamus (Figure 2). MD was not associated with HVP.
Conclusion(s) Higher HVP at 21-24 hours of life is associated with death or greater brain injury by qualitative and increased subcortical microstructural injury on quantitative MRI. HVP may serve as a reliable biomarker of dysfunctional autoregulation and secondary brain injury in HIE.

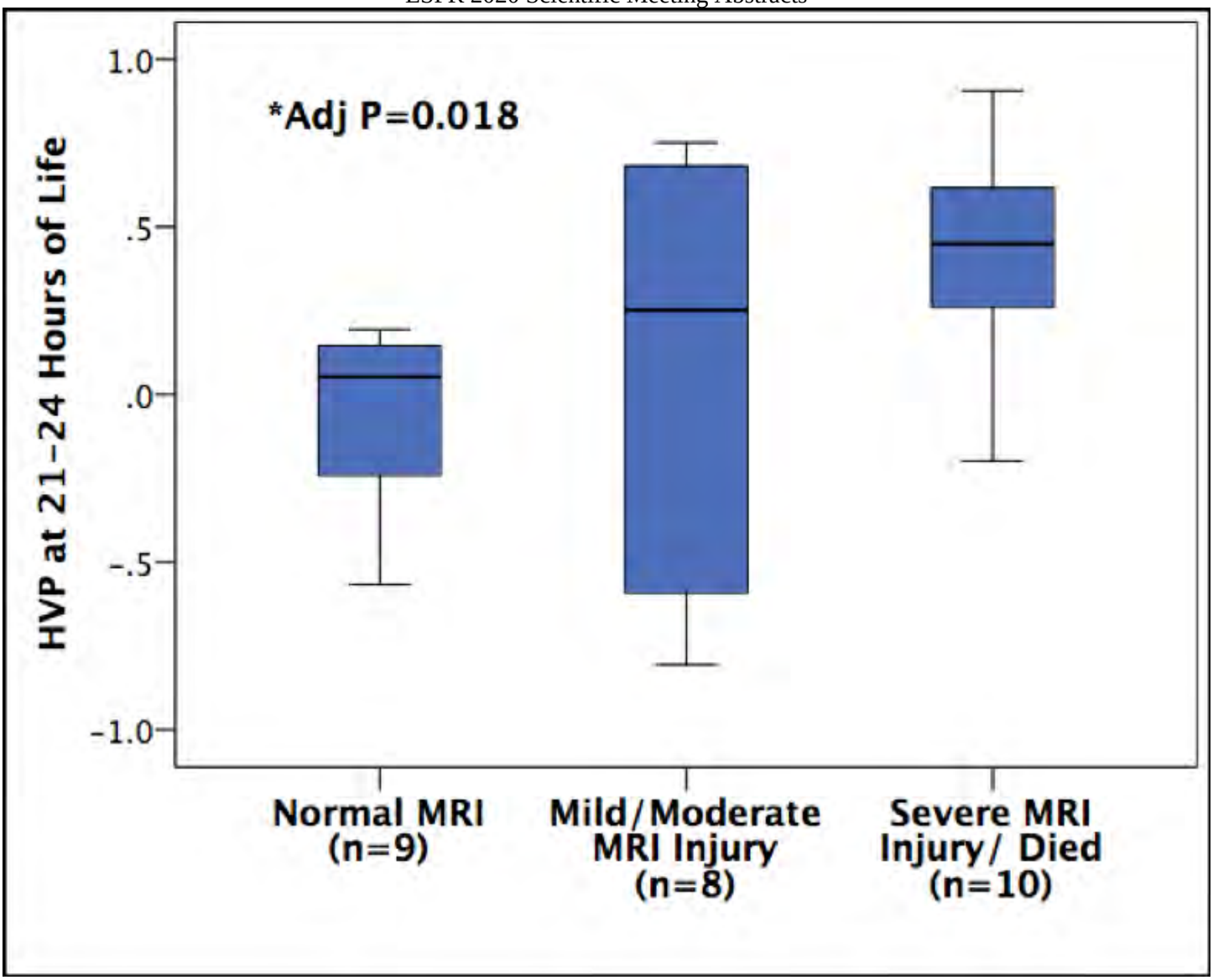

Figure 1. HVP and Brain Injury by Qualitative MRI

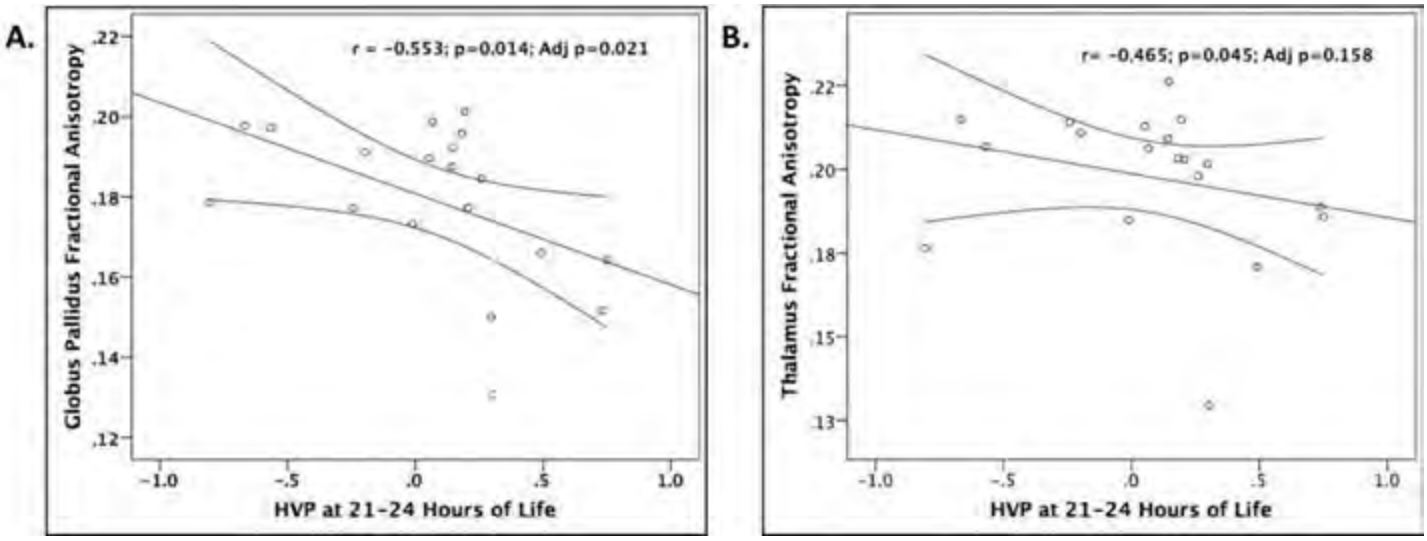

Figure 2. HVP and Microstructural Injury by DTI Fractional Anisotropy

Abstract: 109

Unrestricted Somatic Stem Cell (USSC) administration suppresses Sub-Ependymal Gliosis, Fibrosis, and Inflammation in Post-hemorrhagic hydrocephalus (PHH)

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Background Intraventricular hemorrhage (IVH) is a severe complication of preterm birth, associated with cerebral palsy, mental retardation & PHH. IVH leads to sub-ependymal gliosis, fibrosis, & disruption of the ependymal lining; only palliative therapies exist. TGF-β isoforms are multifunctional growth factors where TGFβ1 is neuroprotective (Nicole et al. 2002) & TGFβ2 & 3 are potent inducers of reactive gliosis & fibrosis (Lagord, et al 2002). Mesenchymal stem cells reduce injury & improve neurobehavioral outcomes, accompanied by CSF elevation of TGF-β1 & IL-6 (Shi et al, 2016). USSCs are less differentiated, yet can also attenuate inflammatory responses, reduce gliosis & PHH (Vinukonda et al, Stem Cell Trans Med 8:1157, 2019). Moreover, changes in AQP-1 & 4 channels correlate with reduced hydrocephalus (Purohit et al, PAS & ESPR 2019).
Objective To measure the levels of TGFβ1-3, FGF, CTGF, IL-6 & IL-10, to determine whether any correlation exists after PHH or with USSC infusion
Design/Methods Human cord blood derived USSCs ($2x10^6$) were injected x1 via intracerebroventricular route (ICV) in 3 day premature rabbits pups, 1 day after glycerol-induced IVH; naïve & non-treated IVH pups were compared at postnatal days 3, 7 & 14.
Results We confirmed USSC survival & migration using live animal bioluminescence imaging followed by USSC immunostaining for all study time-points. USSC-treated pups showed ~30% reduction in ventricular area compared with non-treated animals at 7 & 14d ($p<0.05$; n=6). The reduced ventricle size correlated with recovered AQP4 mRNA expression in the dissected ependymal wall ($p<0.05$). After PHH, TGFβ2-3 RNA increased at 7 & 14d while TGF-β3 isoforms were elevated in both USSC and PHH groups at 3d ($P<0.05$). An increase in CTGF immune-reactivity & mRNA were found after PHH, whereas CTGF was reduced after USSC treatment ($P<0.05$, n=5). IL-6 CSF protein, IL-6 & IL-10 mRNA levels were increased after USSC administration similar to MSCs ($P<0.05$). Altered cytokine levels namely IL-6, IL-10, & suppressed CTGF, TGFβ2 & 3, correlated with reduced severity of ependymal gliosis, fibrosis, inflammation & reduced PHH.
Conclusion(s) Transplantation of USSCs via the ICV route is associated with reduced inflammatory responses & attenuated magnitude of PHH affording their consideration for clinical trials.

Abstract: 110

Perinatal exposure to synthetic oxytocin in neonates with HIE and treated with therapeutic hypothermia.

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Background The protection afforded by therapeutic hypothermia (TH) to treat neonatal hypoxic ischemic encephalopathy (HIE) is incomplete. Perinatal exposures may modulate the response of the developing brain to a HI insult. The use of synthetic oxytocin (sOxy) to induce labor has more than doubled in the last 20 years, but its effects in the developing brain are understudied. sOxy crosses the placenta, and thus, could blunt the physiological release of oxytocin by the fetal pituitary gland in response to cerebral hypoxia, preventing the changes $GABA_AR$ functionality that allow an inhibitory response to prevail and to limit excitotoxicity.
Objective To test the hypothesis that perinatal exposure to sOxy is associated with worse outcomes in infants suffering of HIE treated with TH.
Design/Methods This is a secondary analysis of a cohort of infants suffering of HIE treated with TH that were followed from Sept 2010 to Jul 2015 for studies of cerebral autoregulation. A total of 82 infants were included, of which 55 had data about perinatal exposure to sOxy. All neonates had conventional MRI and DTI DOL 9 and before. ROI analysis was performed to measure ADC values in seven brain regions. Univariate analysis was performed by non-parametric methods using IBM SPSSv24.0.
Results Included infants were 63% males, 45% African American (AA), 74% outborn, 80% born via C-section, and 28.3% exposed to sOxy. The median GA was 39.1 wk, BW was 3197 g, Apgar score at 1 and 5 min were 1 and 4, cord pH was 6.94, BD was -14, and Sarnat score was 2. Exposure to sOxy was doubled in AA compared to Caucasian mothers (χ^2 p=0.03) and with more advanced GA (40.2 vs 38.4 wk, p=0.01). All other perinatal variables were similar between those exposed or not to sOxy. Indicators of multiorgan

failure (i.e Cr, AST/ ALT, and PT levels), death, need for feeding tube at discharge, and seizures were similar between groups. However, perinatal sOxy exposure was associated with longer time to reach full feeds (p=0.03) and lower ADC scalars (DTI) in the basal ganglia (p=0.008), thalamus (p=0.03), posterior limb of the internal capsule (p=0.02), and central white matter (0.02) in infants with HIE treated with TH.
Conclusion(s) In this small study, perinatal use of sOxy is associated with worse outcomes after HIE and TH. We speculate that perinatal exposure to sOxy may interfere with the physiological responses of the developing brain to hypoxia. Larger prospective cohorts are needed to determine causality and mechanisms.

Abstract: 111
CaM Kinase IV Activity following Hypoxia versus Hyperoxia 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 hyperoxia result in increased activity of tyrosine phosphorylated 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 activity as compared to hyperoxia induced activation of CaM kinase IV in the cerebral cortex of newborn piglets.
Design/Methods Anesthetized ventilated piglets (3-5days old) were grouped into hypoxia (n=6), hyperoxia (n=6) and matching controls (n=6). Hypoxia was induced by decreasing FiO2 from 0.21 to 0.07 for one hour. Hyperoxia was induced by increasing FiO2 from 0.21 to 1.0 for one hour and maintaining a PaO_2 at 400 mmHg. ATP and phosphocreatine levels were determined biochemically to document cerebral energy. Cortical fractions were isolated, and the activity of CaM kinase IV was determined in the nuclear fraction. 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 μMsyntide2, 0.2 mM 33P-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 normoxia and 1.43 ±0.28 in hypoxia, decreased by 66%. ATP (μmol/g brain) was 4.90 ±0.40 in hyperoxia, increased by 12%. PCr (μmol/g brain) was 3.73 ±0.27 in normoxia and 0.79 ±0.11 in hypoxia, decreased by 79%. PCr (μmol/g brain) was 4.0 ±0.40 in hyperoxia, increased by 7%. CaM kinase IV activity increased from 1270.8 ±126.1 in Nx to 2680.8 ±136.0 (pmol/mg/protein/min) in Hx, an increase of 110%, and from 1172±309 in Nx to 2001±703(pmol/mg/protein/min) in hyperoxia, an increase of 17%.
Conclusion(s) During hypoxia increased Cam Kinase IV activity is due to severe depletion of cerebral energy. Increased tyrosine phosphorylation of Cam Kinase IV leads to increased activation of Cam Kinase IV dependent nuclear mechanisms and active programmed cell death. The mechanism following hyperoxia is due to increased oxygen free radicals. However, the increased Cam Kinase IV activity is significantly less pronounced in hyperoxia possibly due to maintenance of the high energy phosphate versus hypoxia and may have significant implications in the clinical settings.

Abstract: 112
Perceived Impact of Transition to a Single Family Room NICU: Follow-up Survey
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Background Many institutions are transitioning to single family room (SFR) NICUs to provide more privacy, better control of environmental stimuli and possible reduced of infections. Studies have explored staff perception of job related stress, job satisfaction, workload and impact on patient care with SFRs, however the literature focuses on the RN experience. We previously demonstrated that provider type influenced the perceived impact of transition in a survey performed 1 month after relocation. In the early survey, MDs were more positive than other staff about the impacts. Whether our prior findings reflected only early impressions and the degree to which provider perceptions adapt with time remains unknown.
Objective To determine the perceived impact of move to a SFR NICU on job satisfaction, workload, communication and patient care 2 years following transition and if provider's perceptions changed over time.
Design/Methods A brief, 13 question anonymous survey was provided to caregivers present on the NICU 2 years following relocation from a multi-patient pod-style unit to a 64 bed Level 4 SFR NICU within a newly built children's hospital. The survey included questions about staff's perception of changes in physical and emotional demands, workload, patient care, parent involvement, communication, job satisfaction and patient safety (Fig 1). 57 providers completed the survey including 30 RNs, 16 MDs, 5 NP/PAs, 5 RTs and 1 support staff.
Results After 2 years in a SFR NICU, significant difference in staff's perceptions was limited to the perceived impact on physical demand, with RNs and RTs but not MDs suggesting increase (Fig 2). This contrasted with results from the early survey which

identified difference in 7 of 10 elements. Compared to the early survey (Fig 3), RNs were less negative in their perception of impacts on work demands, job satisfaction, patient care and communication. NP/PAs were also less negative in their perception of physical and emotional demands while RTs/SW were less negative in their perception of impacts on patient safety and security. Physicians similarly reported less concerns for negative impacts on patient care and safety.

Conclusion(s) While an early survey suggested provider type influenced perception of transition to a SFR unit, this difference was no longer present at 2 years. The difference in perceptions were negated by less negative responses provided by non-MD providers. These findings suggest adaptation to a SFR unit occurs. However, perception of increased physical demand for RNs and RTs persisted.

Single Family Room (SFR) Unit Survey

Position in NICU (please circle): RN PA NP Resident Attending Fellow RT MA
Other_____

Please circle one (0 = STRONGLY DISAGREE and 5 = STRONGLY AGREE)

1. My work environment has become more physically demanding since moving to a Single Family Room (SFR) unit.
   0 1 2 3 4 5
2. My work environment has become more emotionally demanding since moving to a SFR unit.
   0 1 2 3 4 5
3. My workload is more manageable since moving to a SFR unit.
   0 1 2 3 4 5
4. Patient care has improved since moving to a SFR unit.
   0 1 2 3 4 5
5. Parents are more involved since moving to a SFR unit.
   0 1 2 3 4 5
6. Communication with parents has improved since moving to a SFR unit.
   0 1 2 3 4 5
7. Communication between providers has improved since moving to a SFR unit.
   0 1 2 3 4 5
8. Work is more rewarding since moving to a SFR unit.
   0 1 2 3 4 5
9. Patient safety and security has improved since moving to a SFR unit.
   0 1 2 3 4 5
10. The quality of interaction with other members of the NICU team has improved since moving to a SFR unit.
    0 1 2 3 4 5
11. I think communication has improved.
    0 1 2 3 4 5
12. I think work environment has improved.
    0 1 2 3 4 5
13. I think patient care has improved.
    0 1 2 3 4 5
14. I think key factors which have impacted our experience in the new unit include:
    _____
    _____
    _____
    _____
    _____

Figure 1: Provider Survey

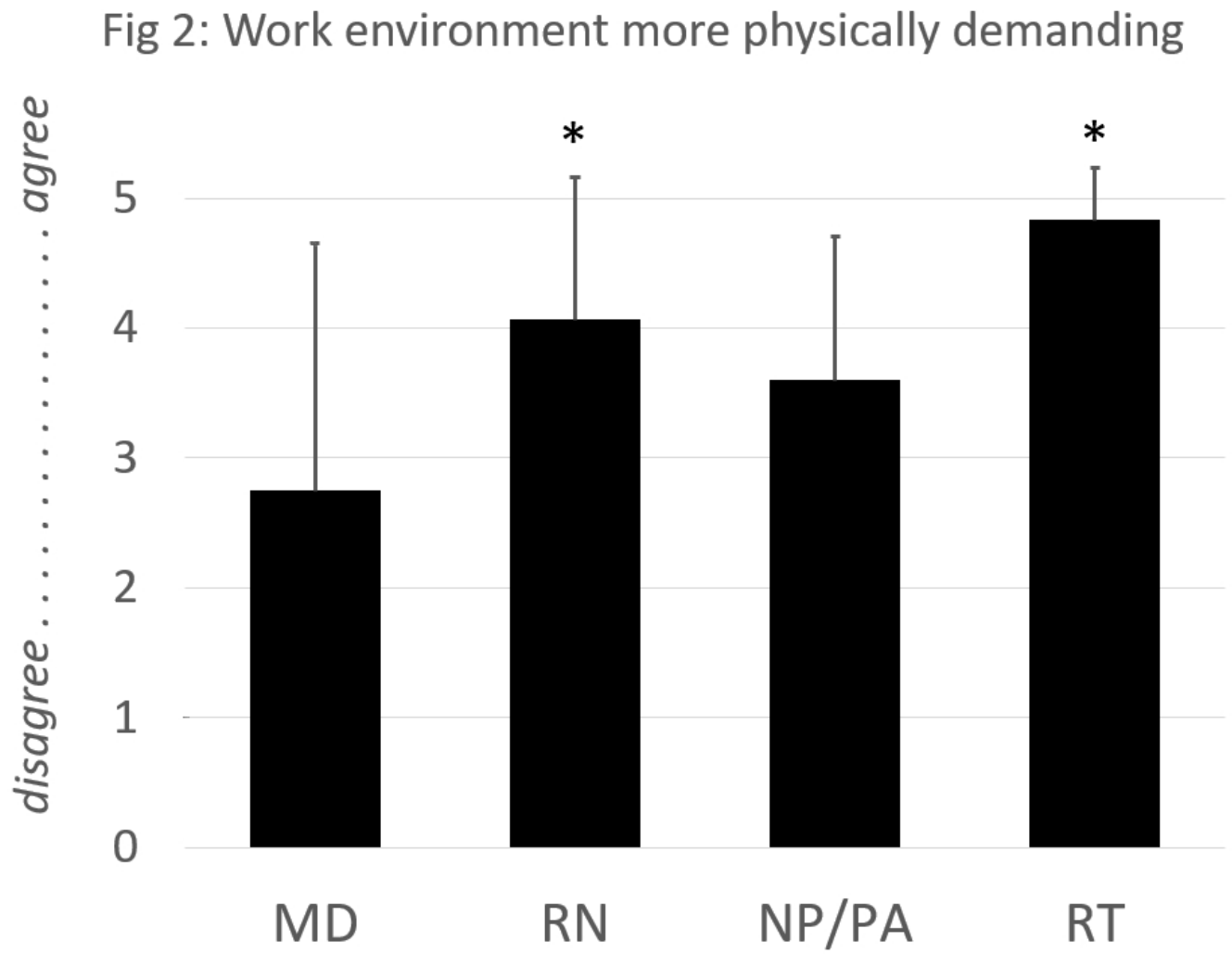

Figure 2: Perceptions of Impact on Physical Demand of Work Environment. In a follow up survey at 2 years, RNs and RTs perceived SFR as more physically demanding as compared to MDs. * $p < 0.05$ by ANOVA with post-hoc Tukeys.

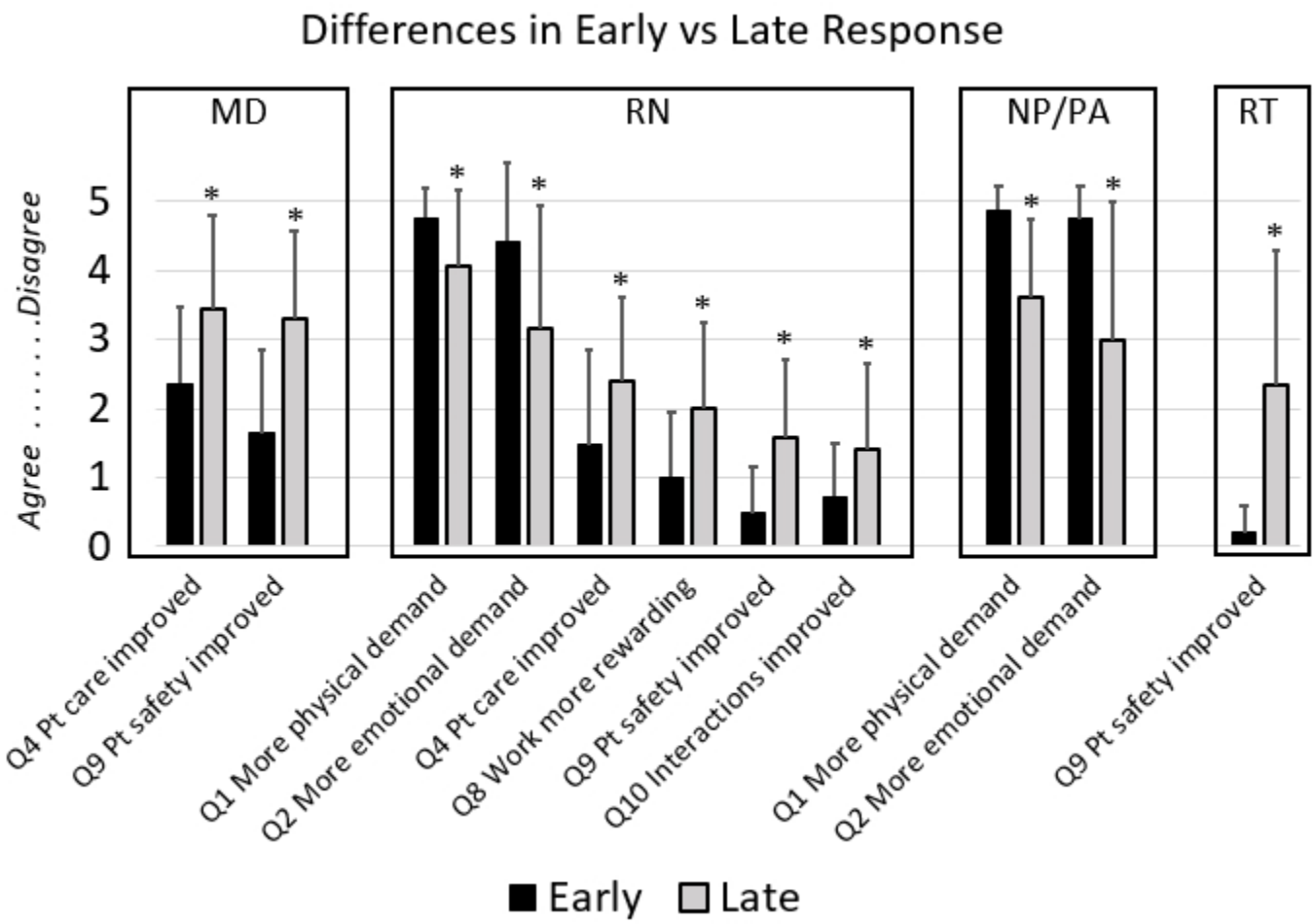

Figure 3: Differences in Early versus Late Response. Comparison of surveys performed 1 month and 2 years following the move identified less negative perceptions by staff overall with most notable changes in the number of survey elements that improved in RN surveys. Responses not presented were omited as no significant change with follow-up. * $p < 0.05$ by students t-test.

Abstract: 113

Pilot proof-of-concept, prospective, observational study of cortical activation as an indicator of pain experience and effects of maternal voice exposure in preterm neonates.

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Background Preterm infants are particularly vulnerable to pain and stress with potentially short and long-term neurodevelopmental consequences—therefore mitigation of their pain is a significant unmet need. The effects of maternal voice on pain is not well understood. The use of NIRS (near-infrared spectroscopy) to study pain perception is relatively recent and leaves many paths for further exploration. N-Pass (Neonatal Pain, Agitation and Sedation Scale) is a commonly accepted method of assessing pain in neonates.

Objective 1) To assess effects of maternal voice on N-PASS scores in preterm infants undergoing routine heel sticks or intravenous (IV) placements. 2) To assess NIRS changes in infants during and after routine heel sticks of IV placement.

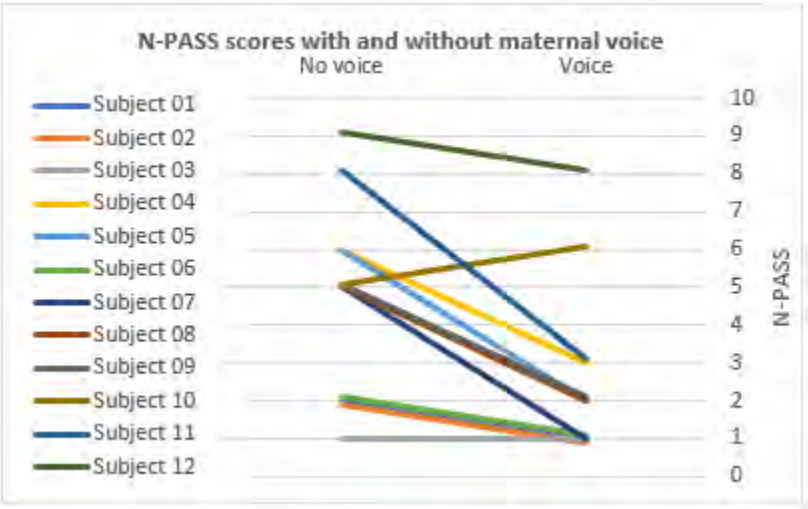
Design/Methods A prospective blinded observational study at a single center level IV NICU. A total of 25 routine procedure observations were conducted in 14 enrolled study participants with mean gestational age of 32.6 weeks at birth (range 29.1 to 35.6 weeks) and mean birthweight 1603 ± 297 grams. NIRS sensors measuring cerebral oxygenation were placed on the left and right side of infant's forehead and monitored prior to, during, and post procedure. Observed routine procedures included heel sticks (n=24) or iv placements (n=1). The study procedure was video recorded and N-PASS scores assigned by one blinded third-party trained healthcare provider. Each participant served as their own control with two measurements obtained: one with maternal recorded voice exposure and one without.

Results We found a statistically significant difference between N-PASS score with maternal voice exposure and N-PASS score without maternal voice exposure (95% CI =-3.5 to -0.6, p-value=0.007). The trend is decrease in NIRS readings during (DM (difference of means) = -2.8 to -5.3, p-values 0.21-0.46) and after (DM= -2.2 to -4.8, p-values 0.23-0.58) as compared to before the procedure.

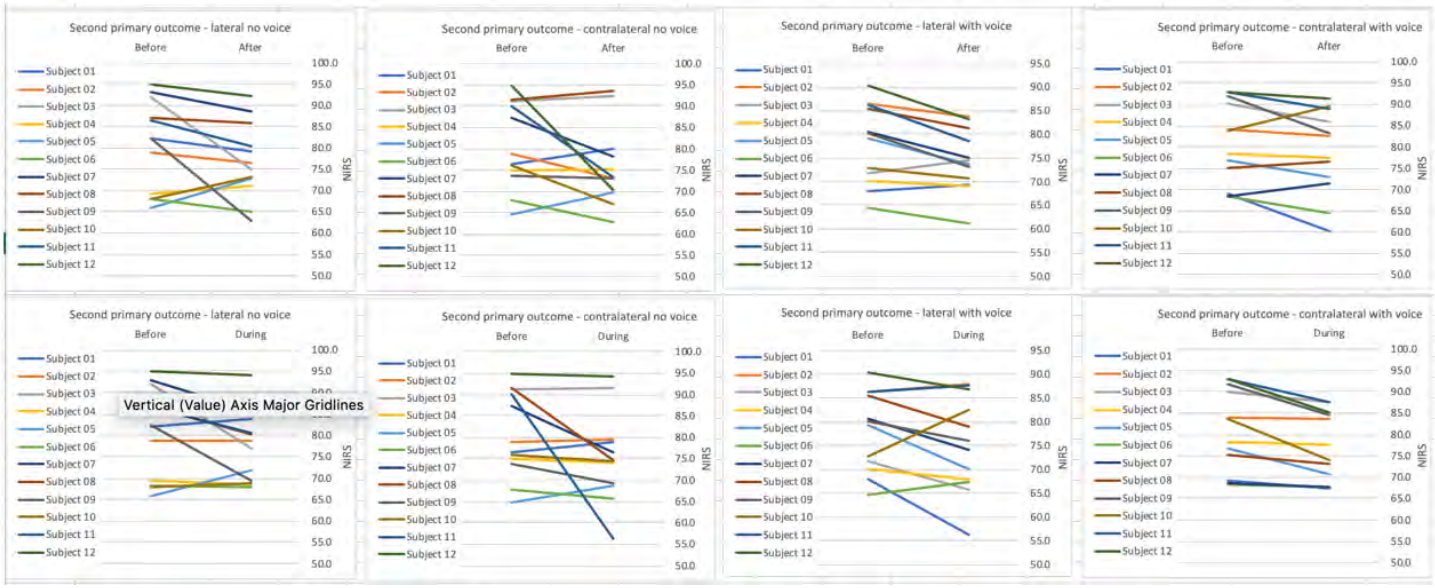
Conclusion(s) We found a statistically significant pain-relieving benefit to maternal voice exposure during painful procedures in the NICU. Cerebral oxygenation on NIRS readings trends lower during and after a painful procedure as compared to before the procedure. The NIRS trends are decreasing for both ipsilateral and contralateral sides of the site of the heel-stick or IV placement. Additional research and larger sample size may support the use of NIRS to evaluate pain in preterm infants.

	Enrolled n=14
Gestational age at birth (mean +/- SD)	32.3 +/- 2.1
Corrected age intervention 1 (mean +/- SD)	32.7 +/- 1.5
Corrected age intervention 2 (mean +/- SD)	33.1 +/- 1.7
Male	42.9%
Twin status	42.9%
Birth weight, g (mean +/- SD)	1603 +/- 297
Apgar score 1 min (median)	7
Apgar score 5 min (median)	8

Demographics



N-PASS scores with and without maternal voice



NIRS changes during and after intervention, without and with maternal voice, lateral and contralateral to site of intervention.

Abstract: 114

Optimizing the Process to Improve Oral Feeding Milestones in Convalescing Premature Infants in the Neonatal ICU

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Background Oral feeding process is a complex task for both premature infants and their providers. There is no consensus on the best approach to transition from gavage to full oral feeds. Traditionally infants have been fed using a volume driven feeding (VDF) method. The SIMPLE feeding strategy utilized at Nationwide Children's Hospital (NCH), Columbus Ohio has shown improved feeding outcomes. This strategy uses a standardized cue-based feeding (CBF) method.

Objective To determine if utilizing a CBF program allows infants to reach oral feeds earlier than VDF, by adopting the method used at NCH-NICU.

Design/Methods A retrospective study was conducted at Connecticut Children's (CC) NICU in Farmington, CT during 2 periods – Period-A, 2012-14 and Period-B, 2017-19. Study included all infants born at ≤ 33 week GA and off CPAP support by ≤34 weeks PMA. In Period-A, infants were fed using a VDF strategy, and a CBF method was used in Period-B. In Dec 2014, a multidisciplinary team from CC attended a 3-day intensive course at NCH. This was followed by implementation at CC after a mandatory educational in-service and training of all NICU caregivers. CBF were then put into practice at CC-NICU in 2015. To ensure adherence to this new strategy, designated feeding coaches availability and weekly feeding rounds were instituted. Monthly *tele-consults* were also done with the Feeding Disorders Program at NCH.

Data were collected daily for infants in Period-B and compared with retrospectively obtained data from infants in Period-A. Infants with incomplete data, anomalies or gastrointestinal disorders were excluded. Data were analyzed using 2-tailed unpaired t tests. Key outcome variables were adjusted for birth-weight and GA at birth using multiple logistic regression (MLR) analysis.

Results Data from 246 infants (n=106 Period-B and n=140 Period-A) were included. Infants in Period-B were more mature and larger. (TABLE) However, even after adjusting for GA at birth, infants in Period-B (CBF) were able to take their 1st oral feeds earlier than those from Period-A (VDF). Infants in Period-B also attained *ad libitum* feeds earlier and were discharged home at an earlier PMA. These differences remained significant on MLR after adjusting for birth-weight and GA at birth.

Conclusion(s) 1) Utilization of CBF in premature infants results in earlier establishment of oral feeds and discharge from hospital. 2) Additionally, the novel method of program support using *tele-consults* may be an effective implementation strategy for the future.

Comparison of Feeding Outcomes.- Volume Feeds (VBF) vs. Cue-Based Feeding (CBF)

Variables	VDF Period A 2012-2014 N=140	CBF Period B 2017-2019 N=106	P Value
GA at birth (wk)	28.43±2.30	29.24±2.33	0.007
Birth-Weight (gm)	1140.08±324.22	1244.48±389.62	0.023
CPAP (days)	8.99±10.22	9.05±10.51	0.963
*PMA - 1st oral feed (wk)	34.40±1.06	33.92±0.71	0.000
PMA ad lib feeds (wk)	36.93±1.86	36.29±1.52	0.006
*PMA at discharge (wk)	38.44±2.39	37.85±2.01	0.048

*Differences significant after adjusting for Birth weight and GA at birth in Multiple Regression Analyses. GA - Gestational age, CPAP - Continuous positive airway pressure, PMA - Post-menstrual age.

Abstract: 115

Factors related to passing the safety fast among neonates with hypoglycemia in the NICU

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Background Hypoglycemia is a common event in newborns that can be managed to prevent adverse neurodevelopmental outcomes. AAP recommends screening at-risk neonates with a high incidence of hypoglycemia; infants of diabetic mothers, preterm neonates, large and small for gestational age neonates. Recently, the Pediatric Endocrinology Society recommended at-risk neonates with hypoglycemia should have a “safety” fast of 6-8 hours prior to discharge. This practice is at provider discretion. Our policy for management of newborns with hypoglycemia is depicted in Figure 1 including criteria for NICU admission. To the best of our knowledge, there are no current studies of potential clinical or neonatal factors that predict a successful safety fast in hypoglycemic neonates.
Objective To investigate the success rates and predictors of safety fast. We hypothesized that neonates requiring higher glucose infusion rates in order to achieve normoglycemia would be less likely to pass the fasting challenge
Design/Methods Retrospective chart review of neonates transferred from the newborn nursery unit to level IV NICU for IV dextrose therapy for hypoglycemia from January 2016- December 2018. Independent measures (gestational age, birth weight, age, gender, mode of delivery, APGAR scores, at-risk status, any pharmacological treatment of hypoglycemia, length of stay, maximum GIR to achieve normoglycemia, total glucose infusion and central line use) were abstracted from the medical record. A successful safety fast was defined by blood glucose that remained >60mg/dl at 3, 4, 5 and 6 hours after a feed (Passed safety fast). Continuous variables were compared between those who passed and failed the safety fast using the Wilcoxon rank sum test. Categorical variables were analyzed using the Chi-square or Fisher’s exact test.
Results Of the seventy-six newborns that had a safety fast, 80% passed on the first attempt (Table 1). There was no significant difference in gestational age, maternal diabetes, birth weight or glucose levels between those neonates who passed and failed the safety fast. Those neonates who passed the challenge were less likely to be premature/SGA (p=0.03), required less maximum GIR (6 vs 7 mg/kg/min; p=0.04), were younger at fasting challenge (5 vs 9 days; p=0.02) and required lower overall intravenous glucose load (24 vs 9 gm/kg; p=0.01).
Conclusion(s) In our cohort of newborns with hypoglycemia, neonates that passed the safety fast for discharge had a lower maximum glucose infusion rate and lower overall intravenous glucose load.

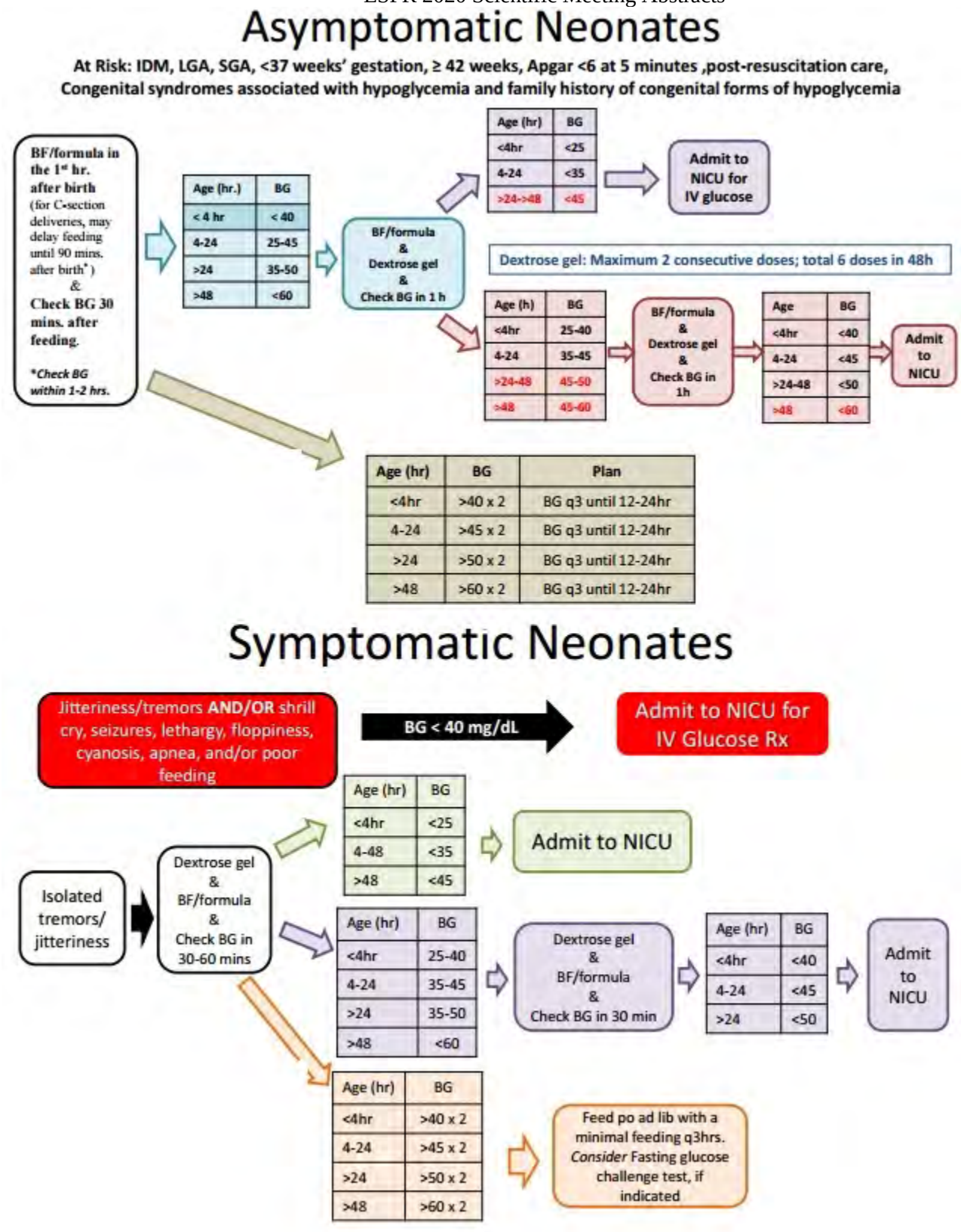

Figure 1: Newborn hypoglycemia management protocol

	Total (N=76)	Failed (N=15)	Passed (N=61)	p-value*
Male	42 (55.3)	10 (66.7)	32 (52.5)	0.32
Delayed cord clamping, n (%)	29 (41.4)	4 (26.7)	25 (45.5)	0.19
Gestational age, median (IQR)	38 (36.5, 39.0)	37 (36.0, 38.0)	38 (37.0, 39.0)	0.14
Birthweight, median (IQR)	2883(2403.0, 3572.5)	2700 (2455.0, 3220.0)	2890 (2396.0, 3605.0)	0.80
Diabetic mother, n (%)	26 (34.2)	5 (33.3)	21 (34.4)	0.94
Risk status: Preterm/SGA	46 (61.3)	13 (92.9)	33 (54.1)	0.03
Mean POCT glucose before test, median (IQR)	68.9 (65.9, 72.1)	68.6 (66.9, 70.5)	69.1 (65.6, 72.6)	0.95
Age at test (days), median (IQR)	6 (4.0, 9.0)	9 (6.0, 11.0)	5 (4.0, 8.0)	0.02
Max GIR, median (IQR)	6.6 (5.3, 7.9)	7 (6.7, 9.0)	6 (5.1, 7.0)	0.04
Glucose infusion/kg, median (IQR)	13.4 (8.9, 25.2)	24.0 (13.2, 29.6)	11.9 (7.5, 19.6)	0.01

Table 1: Patient characteristics by safety fast status

Abstract: 116

Autonomic Regulation Associated with Retinopathy of Prematurity Eye Examinations

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Background Retinopathy of prematurity eye examinations (ROPEE), although necessary, have been shown to be stress/pain inducing. Repeated stress/pain exposures lead to alterations in the regulatory stress response and recovery system and may contribute to long-term neurodevelopmental sequelae. Less is known regarding non-invasive autonomic measures to identify infants who may be more vulnerable to the deleterious effects of these exposures. Skin conductance (SC) measures sympathetic-mediated sweating, while high frequency heart rate variability (HF-HRV) is an index of parasympathetic activity. HF-HRV is positively associated with health and stress resiliency in adults. Thus, our interest is whether HF-HRV can be used to estimate neonates' ability to tolerate and recover from stress.
Objective Test the hypotheses: 1) Sympathetic activation during ROPEE would be detected by SC, 2) Illness acuity would be inversely associated with HF-HRV, and 3) HF-HRV would be directly associated with stability (less need for intervention) after ROPEE.
Design/Methods In this cross-sectional cohort, 33 preterm (29 ± 0.4 weeks' PMA) infants excluding those with cardiac or neurological anomalies were studied. HRV was done in the afternoons post-feeding/care the day prior to ROPEE, while SC was

measured continuously prior to, during, and after ROPEE. All subjects received swaddling, 24 % oral sucrose, and topical tetracaine. HF-HRV power was analyzed in the 0.3 – 1.3 Hz spectrum, while SC was analyzed as mean of peaks (MPs) in uSiemens. Clinical data were reviewed for apnea, bradycardia, and desaturation (A/B/D) events requiring intervention during the 72 hours post-ROPEE.
Results Skin conductance MPs increased 56% from pre-exam to ROPEE (p= 0.001) and remained higher post-exam (p= 0.016) (Fig 1.). Subjects with higher illness acuity measured by level of respiratory support, had lower HF-HRV (r^s = -0.61, p <0.01) at 24 hours prior to ROPEE. These subjects with lower HF-HRV required intervention (higher respiratory support and/or oxygen) for A/B/D events post-ROPEE compared to those with higher HF-HRV (r^s = -0.40, p = 0.02).
Conclusion(s) We found that ROPEE induced a 2-fold increase in sympathetic activation which did not return to baseline levels in recovery. Preterm infants with higher illness acuity had lower HF-HRV and severe A/B/D events that required intervention post-exam. Thus, these infants may be more vulnerable to the stress associated with ROPEE, and require closer monitoring post-exam.

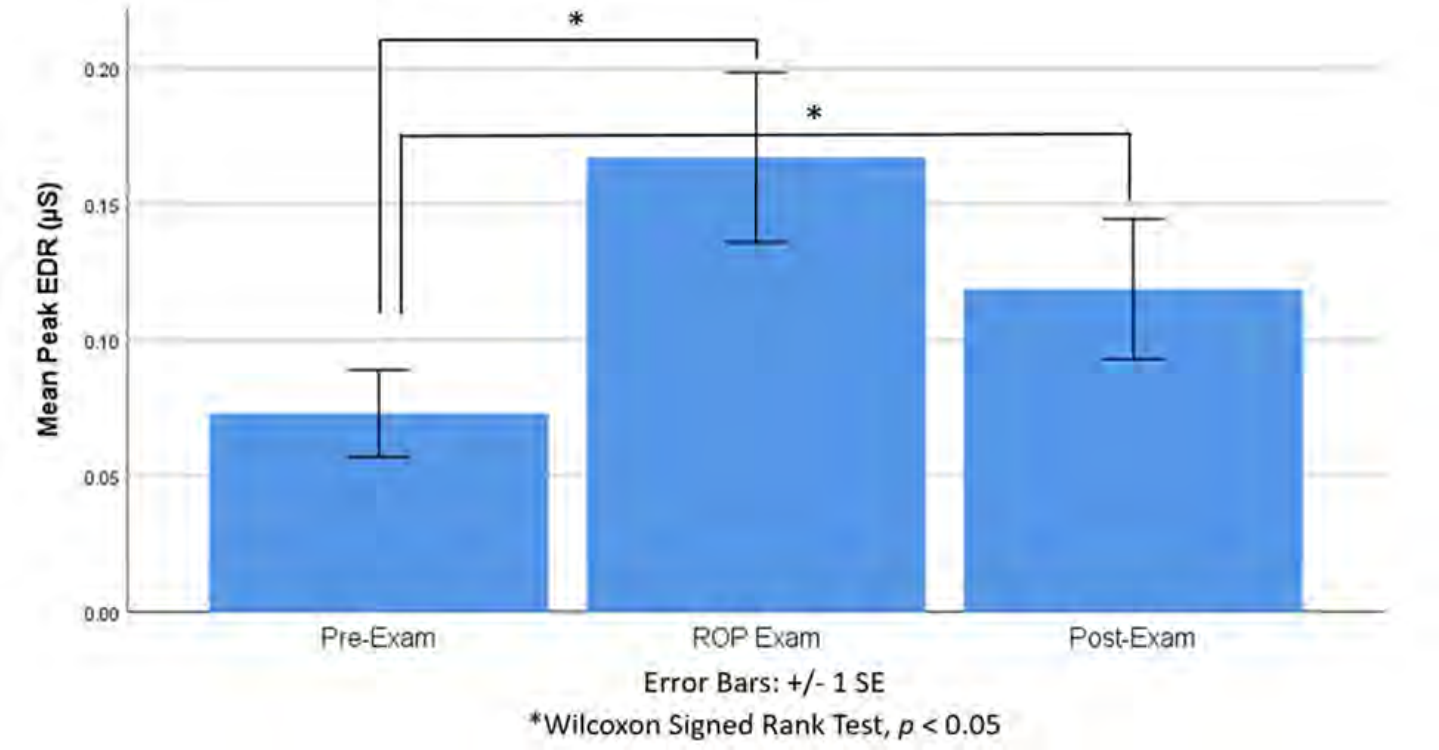

Fig. 1

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Early Enriched Nutrition Should Be Given to 34 Week Gestation Infants
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Background Late preterm infants, especially at 34 weeks gestation, have increased length of stay (LOS) when compared to more mature infants, likely due to increased morbidities and need for nutrition support. Without a specific nutrition guideline for late preterm infants, we previously observed a relationship between LOS and time of initiating enriched nutrition for 34 week infants suggesting earlier provision facilitates an earlier discharge and improves weight gain. We hypothesize that a standardized early enriched nutrition guideline is associated with shorter LOS and improved in-hospital weight gain.
Objective The aim of this study was to evaluate the outcome of an early enriched nutrition feeding guideline for 34 week gestation infants.
Design/Methods A pre- and post- intervention study using retrospective chart review was performed on all appropriate-for-gestational age preterm infants born at 34 weeks gestation in 2017, a year when there was no standardized practice of nutrition support for 34 week infants, and in 2019, after implementation of a standardized practice guideline which recommends starting enriched nutrition from day one. Enriched nutrition was defined as milks other than unfortified human milk or term formula. We collected data on demographics, morbidities, milk type and composition, intake, mode of feeding, and growth parameters at birth and discharge (Fenton percentiles and z-scores). Length of stay and in-hospital weight gain (grams/day) were primary outcomes.
Results A total of 192 infants (n=118 pre-intervention and n=74 post-intervention) were included. Thirty-two infants (27%) received enriched nutrition pre-intervention and 45 infants (61%) received enriched nutrition post-intervention (p < 0.001) (Table). Enriched

nutrition was initiated significantly earlier post-intervention (6.2 ± 3.9 vs 2.6 ± 1.9 days, p < 0.001). We found that length of stay was no longer different between enriched and non-enriched infants post-intervention, but weight gain was significantly greater pre- and post-intervention for infants who received enriched diets.
Conclusion(s) An enriched nutrition support intervention in 34 week infants was associated with a reduction in length of stay, especially for those with lower birth weights, and improved in-hospital weight gain. These data support the use of a standardized nutrition support guideline in late preterm infants.

	Pre-Intervention		Post-Intervention	
	Enriched (n=32 [27%])	Non-Enriched (n=86 [73%])	Enriched (n=45 [61%])	Non-Enriched (n=29 [39%])
Gestational Age	34 ± 0.2	34 ± 0.2	34 ± 0.2	34 ± 0.2
Birth Weight (g)*	2156 ± 258	2349 ± 251	2195 ± 299	2356 ± 233
Admit Weight (Z-score)	-0.32 ± 0.6	0.12 ± 0.6	-0.2 ± 0.7	0.2 ± 0.5
Admit Weight (Percentile)	38.8% ± 19.8	54.2% ± 21.1	44% ± 24.3	56% ± 19.2
Time to full oral feeding (d)	3.1 ± 2.8	2.7 ± 1.9	3 ± 1.7	2 ± 1.7
Length of Stay**	11.3 ± 4.7	7.9 ± 3.0	9.1 ± 2.7	8.0 ± 3.1
Median Weight gain (g/day)*	0	-12.9	-3.0	-17.5

Mean ± SD
*p<0.005 between groups pre-intervention and between groups post-intervention
** p<0.001 between groups pre-intervention

Characteristics of 34 Week Infants Pre- and Post-Intervention

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Do Guidelines Make a Difference? Developmental Screening Practices of Pediatric Subspecialists
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Background Children with chronic medical conditions (**CMC**) are at increased risk for developmental delays (**DD**), academic challenges (**AC**) and mental health conditions (**MHC**) compared to other children and they often have more interaction with their subspecialists than their general pediatricians. Condition specific guidelines (**CSG)** recommend screening for these concerns in children with congenital heart disease as well as children who have received intrathecal (**IT**) chemotherapy/central nervous system radiation, but do not exist not for children with other cardiac, hematologic or oncologic diseases.
Objective To test whether: 1) the presence of CSG is associated with higher rates of inquiring about, screening and referring subspecialty patients for DD, AC and MHC compared to subspecialty patients without clinical guidelines; and 2) the presence of CSG is associated with greater feelings of responsibility for screening.
Design/Methods In this cross sectional study a survey was emailed to practicing Pediatric Hematology/Oncologists (**PHO**) and Pediatric Cardiologists (**PC**) by a commercial company. The survey asked about self-reported responsibility for inquiring/screening and how often they or someone in their practice inquires, screens and refers patients for DD, AC and MHC. These questions asked about patients they see for ≥ 3 visits per year who have CMC for which there are screening guidelines and for patients with CMC for which there are no guidelines. Chi-square analysis was used to compare groups.
Results 217 subspecialists responded (table 1). Significantly more PHOs than PCs felt that DD, AC and MHC were their responsibility and were more likely to inquire about and refer patients (table 2). Few providers were using formal screening instruments (<22%), although PHOs were more likely to screen. For PCs, CSG improved the rate of inquiring about DD (70.9% vs 42.9%; p=.005) and learning disabilities (48.2% vs. 24.1%; p=.02). CSG did not improve the feelings of responsibility or frequency of inquiring, screening or referring by PHOs.
Conclusion(s) Despite both specialties seeing patients at increased risk of DD, AC and MHC and the presence CSG for some patients, PHOs were more likely to address these issues, suggesting that PHOs may see themselves more as a medical home than PCs do. Both

PHOs and PCs usually inquire about DD, yet the presence of CSG increased the rate in which PCs inquired about DD. This suggests that guidelines can help to encourage providers to ask about specific concerns.

Table 1: Subspecialist Demographics

Demographics	Cardiologists (n=115)	Hematology/Oncologists (n=102)
Male %	69	45
Primary Employment Setting %		
- Academic	83	81
- Private Group	6	2
- Multi-specialty	6	11
- Solo	2	0
- Other	3	6
Practice Location %		
- Urban	76	77
- Suburban	17	17
- Rural	7	6
Patients covered by public insurance %		
- Less than 25%	2	9
- 25 – 75%	89	84
- Greater than 75%	6	7
- Other (Don't Know)	3	
Average years out of fellowship	16.7	14.5
Board Certification %	93	94
% who precept residents	78	87
% who precept fellows	67	70

Table 1: Subspecialist Demographics

Table 2: Comparison of responsibility and inquiring, screening and referring practices between Pediatric Cardiologists and Pediatric Hematology/Oncologists

	% cardiologists (n = 115)	% hematology oncologists (n = 102)	P -Value
Developmental Delay			
- Usually Their Responsibility	41.0	72.1	<0.001*
- Usually Inquires about	65.2	76.2	0.066
- Usually Screens	11.2	21.6	0.029*
- Usually Refers	54.6	68.0	0.036*
Behavior Management Problem			
- Usually Their Responsibility	24.8	38.5	0.021*
- Usually Inquires about	29.0	41.6	0.040*
- Usually Screens	6.7	16.8	0.169
- Usually Refers	37.7	61.2	<0.001*
Learning Disabilities			
- Usually Their Responsibility	32.1	60.6	<0.001*
- Usually Inquires about	42.3	64.0	0.001*
- Usually Screens	6.7	20.8	0.001*
- Usually Refers	45.7	75.8	<.001*
Anxiety/Depression			
- Usually Their Responsibility	20.6	59.3	<0.001*
- Usually Inquires about	24.5	57.4	<0.001*
- Usually Screens	5.2	22.8	<0.001*
- Usually Refers	31.2	71.4	<0.001*

Table 2: Comparison of responsibility and inquiring, screening and referring practices between Pediatric Cardiologists and Pediatric Hematology/Oncologists

Table 2: Comparison of Pediatric Cardiologists reported rates of responsibility, inquiring and screening and referring for developmental and behavioral concerns for patients with and without guidelines.

	% total (n = 115)	%Without Guidelines (n = 28)	%With Guidelines (n = 110)	P-Value
Developmental Delay				
- Usually Their Responsibility	41.0	25.9	44.4	0.78
- Usually Inquires about	65.2	42.9	70.9	0.005*
- Usually Screens	11.2	14.8	10.3	0.504
- Usually Refers	54.6	46.4	56.6	0.331
Behavior Management Problem				
- Usually Their Responsibility	24.8	19.2	26.1	0.464
- Usually Inquires about	29.0	17.2	33.0	0.097
- Usually Screens	6.7	11.1	5.6	0.307
- Usually Refers	37.7	39.3	37.3	0.844
Learning Disabilities				
- Usually Their Responsibility	32.1	19.2	35.1	0.118
- Usually Inquires about	42.3	24.1	48.2	0.020*
- Usually Screens	6.7	11.1	5.6	0.307
- Usually Refers	45.7	46.4	45.5	0.932
Anxiety/Depression				
- Usually Their Responsibility	20.6	19.2	20.9	0.849
- Usually Inquires about	24.5	21.4	25.2	0.676
- Usually Screens	5.2	14.8	5.6	0.104
- Usually Refers	31.2	33.3	30.6	0.786

Table 3: Comparison of Pediatric Cardiologists reported feelings of responsibility and rates of inquiring and screening and referring for developmental and behavioral concerns for patients with and without guidelines.

Table 2: Comparison of Pediatric Hematology/Oncologists reported rates of responsibility, inquiring and screening and referring for developmental and behavioral concerns for patients with and without guidelines

	% total (n=102)	% Without Guidelines (n = 54)	% With Guidelines (n = 48)	P-Value
Developmental Delay				
- Usually Their Responsibility	72.1	65.5	79.2	0.107
- Usually Inquires about	76.2	72.2	80.9	0.310
- Usually Screens	21.6	25.9	16.7	0.256
- Usually Refers	68.0	71.2	64.6	0.482
Behavior Management Problem				
- Usually Their Responsibility	38.5	39.7	37.3	0.797
- Usually Inquires about	41.6	44.4	38.3	0.532
- Usually Screens	16.8	14.8	19.1	0.516
- Usually Refers	61.2	63.5	58.7	0.629
Learning Disabilities				
- Usually Their Responsibility	60.6	56.1	65.4	0.324
- Usually Inquires about	64.0	63.0	65.2	0.815
- Usually Screens	20.8	18.5	23.4	0.546
- Usually Refers	75.8	73.1	78.7	0.513
Anxiety/Depression				
- Usually Their Responsibility	59.3	59.6	58.8	0.931
- Usually Inquires about	57.4	55.6	59.6	0.684
- Usually Screens	22.8	25.9	19.1	0.418
- Usually Refers	71.4	75.0	67.4	0.405

Table 4: Comparison of Pediatric Hematology/Oncologists reported feelings of responsibility and rates of inquiring and screening and referring for developmental and behavioral concerns for patients with and without guidelines

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Assessing Preferred Methods of Parent-Provider Communication for Children Receiving Therapy Services

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Background Parent-provider communication is often key to better outcomes for children with developmental delays receiving therapy services. In order for children to progress efficiently, therapists must communicate with parents to establish continuity of care in the

household setting.
Objective To examine the relationship between parent satisfaction (PS) with therapy provider communication and therapist communication method (oral (OC) vs. written (WC)), frequency of communication (daily, multiple times per week, weekly, every 2 weeks, monthly or less, and never), therapy location (home vs. school vs. other vs. combination), and payment method (insurance/out of pocket vs. school/state vs. combination).
Design/Methods Recruitment of children receiving therapy services was conducted during regularly scheduled developmental pediatrician visits. Pearson correlations and ANOVA tests were used to evaluate relationships between PS and communication method, communication frequency, service location, and payment.
Results There were over 100 eligible surveys received for patients aged 0-17 years (n=118). Mean age 7.72 years, with 76.4% male and 51.7% white. PS was positively associated with amount of WC ($r=0.431$, $p<0.001$), and did not vary based on location (SST=0.369, p=0.479) or payment (SST=0.128, p=0.777). A direct association was identified between PS and amount of OC ($r=0.344$, $p<0.001$), and did not vary based on location (SST=1.01, p=0.127) or payment (ANOVA 0.421, p=0.429). 71.7% of parents preferred a combination of both WC and OC, 15.1% preferred OC only, and 13.2% preferred WC only (Fig. 1). Reported frequency of communication was less than weekly in 70.9% of cases for OC and 67.3% for WC (Fig. 2). The highest percent of parents were satisfied with daily written communication (85.7%) and weekly verbal communication (90.0%). Parents were unsatisfied with, and requested more, communication 41.8% of the time for OC and 43.6% of the time for WC. No parents (0%) responded that they wanted less communication.
Conclusion(s) Both parental satisfaction with child therapies and parent-perceived improvement in child skills were positively associated with increased communication between therapist and family. Preferred communication method was a combination of both oral and written communication. Parents state they are most satisfied with daily therapist communication. Therapists should communicate with families daily through both written and oral methods in order to increase skills attainment and satisfaction.

Figure 1: Parent-Reported Preferences and Satisfaction with Verbal and Written Communication

Measure	n (%)
Satisfaction with Oral Communication (OC)	
Satisfied	64 (58.2%)
Dissatisfied	46 (41.8%)
Satisfaction with Written Communication (WC)	
Satisfied	62 (56.4%)
Dissatisfied	48 (43.6%)
Preferred Method of Communication	
Oral	16 (14.5%)
Written	14 (12.7%)
Both	76 (69.2%)
No Answer	4 (3.6%)
Total	**110**

Figure 2: Parent-Reported Frequency of Verbal and Written Communication

Communication Frequency	n (%)
Oral Communication (OC)	
Never	11 (10.0%)
Monthly or less	57 (51.8%)
Every 2 weeks	10 (9.1%)
Weekly	10 (9.1%)
Multiple times per week	10 (9.1%)
Daily	12 (10.9%)
Written Communication (WC)	
Never	24 (21.8%)
Monthly or less	44 (40.0%)
Every 2 weeks	6 (5.5%)
Weekly	16 (14.5%)
Multiple times per week	13 (11.8%)
Daily	7 (6.4%)
Total	**110**

Abstract: 120

Parental Perceptions on the Use of Cannabidiol Oil in Children

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Background Cannabidiol (CBD) is a compound derived from the hemp plant that contains <0.3% tetrahydrocannabinol, the psychoactive component of marijuana. Although federally legalized in Dec. 2018, CBD is still shrouded in uncertainty, as state laws vary and production is unregulated. Regardless, the market has grown rapidly and is expected to be worth $20 billion by 2024. Despite a lack of research supporting CBD use, parents have already begun giving it to their children. To better inform physicians, it is necessary to understand parental perceptions and uses of CBD oil.

Objective To examine parental practices and perceptions of giving children CBD oil and to characterize changes in use and opinion after legalization.

Design/Methods Parenting blogs were analyzed for “CBD oil” AND “child.” Posts were included if they were written by a parent and mentioned using CBD oil in children. Posts were assessed for child age and sex, ailment treated, safety concerns, perception of CBD oil, and physician awareness of CBD oil use. Responses were categorized as pre- or post-legalization in Dec. 2018. Chi-squared tests and Kendall’s rank correlation were used to detect any significant associations between variables of interest and CBD legality.

Results 307 parental posts about CBD oil use in children were analyzed. Of all posts, most were from parents of children with ADHD (26%), ASD (25%), and anxiety (19%) (Table 1). While 59% of posts supported giving children CBD, only 16% consulted their physicians. Older children were correlated with more favorable posts ($t=0.17$, $p<0.01$). Taking CBD legalization as a temporal pivot point, no changes in the number of ADHD, ASD, or anxiety posts were detected, though a decrease in epilepsy posts after legalization was observed ($p=0.03$). Physician involvement did not significantly change after legalization. An increase in posts against CBD oil use in children ($p<0.01$), posts concerned with a lack of research ($p=0.03$), and posts citing nonmedical sources as evidence was identified ($p<0.01$) (Table 2).

Conclusion(s) Though the FDA states that many “questions remain regarding CBD’s safety [...] and there are real risks that need to be considered,” most parental posts continue to support CBD use in children. Most parents still choose not to discuss CBD use with their child’s doctor. Physicians must be aware of this rising practice and counsel patients accordingly. Given the widespread infiltration of unregulated CBD products into the everyday market, studies need to be done to gauge the possible benefits and side effects of CBD oil.

Table 1: Reasons for Parental Use of Cannabidiol Oil in Children

	Number of Responses Before Legalization (n=193)	Number of Responses After Legalization (n=114)	p-value
Condition Treated			
ADHD	53 (27%)	28 (25%)	0.672
Autism Spectrum Disorder	48 (25%)	30 (26%)	0.884
Anxiety	35 (18%)	24 (21%)	0.633
Epilepsy/Seizures	25 (13%)	5 (4%)	**0.025**
Pain Relief	8 (4%)	3 (3%)	0.710
Sleep	2 (1%)	7 (6%)	0.027*
Other	42 (22%)	12 (11%)	**0.003**
Unspecified	35 (18%)	41 (36%)	**0.001**

*Though $p<0.05$, due to the small ($n<9$) number of responses both before and after legalization, we are unable to establish significance.

Table 2: Parental Perceptions of and Concerns with Administering Cannabidiol Oil to Children

	Number of Responses Before Legalization (n=193)	**Number of Responses After Legalization (n=114)**	**p-value**
Parental Perceptions			
Favorable	117 (61%)	66 (58%)	**0.001**
Unfavorable	13 (7%)	25 (22%)	
Unspecified	63 (33%)	23 (20%)	
Parental Concerns			
Lack of research	26 (13%)	27 (24%)	**0.033**
Lack of regulation	7 (4%)	1 (1%)	0.276
Safety for children	10 (5%)	7 (6%)	0.923
Unstandardized dosage guidelines	8 (4%)	6 (5%)	0.865
Fear of discussing with physician	2 (1%)	4 (4%)	0.278

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The Ability of U.S. Children to Make and Keep Friends Benefits from Family Resilience in Early Childhood

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Background While parenting styles play a direct role in childhood development, it is less clear if development can be affected by the way a family responds to problems. The degree of resilience demonstrated by families during adversity may impact a child's development. In 2016, the CDC introduced a new term to its National Survey of Children's Health (NSCH) to measure family resilience as a composite score based on parental responses to four questions.
Objective To assess the relationship between family resilience and a child's ability to make/keep friends.
Design/Methods A secondary analysis was performed on responses to the 2016-2017 NSCH, a nationally representative survey of parents of US children, for children ages 3 to 8, excluding those with ID, ASD, and ADHD (n=19204). Family resilience was quantified as a composite score ranging from 0 to 4 by the number of *most* or *all of the time* responses to the following four prompts: "*When your family faces problems, how often are you likely to do each of the following?* (a) *talk together about what to do;* (b) *work together to solve our problems*; (c) *know we have strengths to draw on;* and (d) *stay hopeful even in difficult times*. The association between family resilience and difficulty making/keeping friends was determined using a series of nested multinomial logistic regressions (Table 1). For model 1, the independent variable was family resilience. Model 2 included all variables in model 1 plus child-level variables. Model 3 included all variables in model 2 plus family-level factors. Model 4 included all variables in model 3 plus community-level characteristics. Associations between demographics and difficulty making/keeping friends were evaluated using Chi-squared tests.
Results A significant negative association between family resilience and difficulty making/keeping friends was identified ($P<.001$). The magnitude and significance of this relationship remained robust even after adjusting for potential confounders (Table 1). Significant associations between prevalence of difficulty making/keeping friends, household income, parent structure, community support, and community safety were also observed (Table 2) ($P<.001$, $P<.001$, $P<.001$, $P<.001$).
Conclusion(s) These findings highlight the role that family environment plays in early childhood development. Parents should remain cognizant of how they handle adversity and consider both the direct and indirect impact these events may have on young children.

Table 1. Multinomial Logistic Regression Models for the Prevalence of Difficulty Making and Keeping Friends

Model	Confounders controlled for[a]			aOR for 1 unit increase in Family Resilience[b] (95% CI)	P-value
	Child Level	Family Level	Community Level		
Model 1				0.69[c] (0.63 to 0.75)	<0.001
Model 2[d]	•			0.69 (0.63 to 0.75)	<0.001
Model 3[e]	•	•		0.69 (0.63 to 0.76)	<0.001
Model 4[f]	•	•	•	0.72 (0.65 to 0.79)	<0.001

[a] • indicates that the level is controlled for

[b] Composite variable defined in the NSCH, with scores ranging from 0 to 4, depending on responses to four prompts.

[c] Unadjusted Odds Ratio

[d] Controls for child-level demographics: race, sex, and age.

[e] Controls for child-level demographics, plus family-level demographics: income, parent structure (single, married, etc), highest level of education in the household, and number of family members living in the home with the child.

[f] Controls for child-level and family-level demographics, plus community-level demographics: neighborhood is supportive, neighborhood is safe, neighborhood has amenities, and number of detracting features in neighborhood.

Table 2. Prevalence of Difficulty Making and Keeping Friends Across Several Demographics, 2016-2017 NSCH (n=19204)

	Difficulty Making and Keeping Friends		No Difficulty Making and Keeping Friends		P
Variable	N	%[a] (95% CI)	N	%[a] (95% CI)	Value[b]
Age, y					
3-4	989	32.5 (28.5, 36.6)	6012	33.0 (31.4, 34.6)	0.3742
5-6	1031	30.6 (27.1, 34.3)	5585	32.9 (31.2, 34.6)	
7-8	1355	36.9 (33.2, 40.8)	5436	34.1 (32.4, 35.8)	
Gender					
Female	1405	42.5 (38.5, 46.6)	8437	49.9 (48.1, 51.6)	0.0511
Male	1970	57.5 (53.4, 61.5)	8596	50.1 (48.4, 51.9)	
Race/ethnicity					
Hispanic	423	25.8 (21.4, 30.6)	1897	24.9 (22.9, 26.9)	
Non-Hispanic white	2219	47.9 (43.9, 51.8)	11811	52.3 (50.5, 54.1)	.872
Non-Hispanic black	212	15.4 (12.3, 18.9)	992	11.7 (10.5, 12.9)	
Other/Multiracial	521	11.0 (9.3, 12.8)	2333	11.1 (10.2, 12.1)	
Household income level, % of federal poverty level					
0-99	484	27.6 (23.5, 32.0)	1814	20.8 (19.1, 22.6)	
100-199	671	25.9 (22.0, 30.0)	2776	21.9 (20.4, 23.6)	<.001
200-399	1044	24.8 (21.9, 27.8)	5377	27.0 (25.6, 28.4)	
>400	1176	21.8 (19.4, 24.2)	7066	30.3 (28.8, 31.7)	
Parent structure					
2 parents, married	2315	59.8 (55.7, 63.9)	12758	70.1 (68.4, 71.7)	
2 parents, unmarried	260	8.8 (6.9, 11.1)	1224	9.2 (8.2, 10.3)	<.001
Single mother	461	18.0 (15.0, 21.3)	1781	13.5 (12.2, 14.8)	
Other	288	13.4 (10.3, 16.9)	1022	7.2 (6.4, 8.2)	
Supportive Neighborhood	1521	42.1 (38.1, 46.2)	10688	58.2 (56.4, 60)	<.001
Safe Neighborhood	1848	50.3 (46.2, 54.4)	11693	65.6 (63.8, 67.3)	<.001

[a] Percentages weighted to be nationally representative

[b] From Rao-Scott corrected chi-squared test for independence

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Familial Educational Attainment and Racial Disparities in Low Birthweight Infants

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Background Compared to white women, black women are 1.5 times more likely to deliver a premature infant and 2 times more likely to deliver a low birthweight (LBW) infant. Social determinants of health are likely responsible for the majority of racial disparities in pregnancy outcomes, potentially mediated by epigenetic mechanisms and best studied with intergenerational models. Studies from the early 1990s suggest that education has less of an impact on pregnancy outcomes of black women compared to white women. The effect improved education has on pregnancy outcomes of black women over generations has been poorly studied.
Objective To evaluate the effect of grandparent and parent educational attainment on low birthweight in children and grandchildren.
Design/Methods The National Longitudinal Study of Adolescent to Adult Health is a multi-generational study that collected survey data from 1994-2018. Using this database, we constructed a cohort of 5,735 grandparent-parent-child triads to evaluate how education impacts the likelihood of having LBW children and grandchildren, while adjusting for socioeconomic and maternal health factors using multivariate logistic regression.
Results Participant characteristics stratified by race and education are shown in Table 1. The prevalence of LBW descendants was lower in women with college education regardless of race (Figure 1). Irrespective of race, parent and grandparent college education was associated with decreased odds of LBW children and grandchildren (OR 0.52, p-value <0.0001, 95% CI 0.39-0.70 and OR 0.61, p-value 0.002, 95% CI 0.46-0.84, respectively). Similar to prior studies, black women were more likely to have LBW descendants. In multivariate analysis, grandparent and parent college education were associated with a decreased odds of LBW after adjusting for individual, community, and health factors. There was no statistically significant difference in this effect between non-Hispanic white and non-Hispanic black populations. When grandparent and parent education were examined together, each remained associated with lower odds of LBW (Table 2).
Conclusion(s) Educational attainment across generations leads to decreased odds of LBW descendants regardless of race. The positive impact of education persists after adjusting for multiple individual, community, and health covariates. Targeting improvements in education may ameliorate adverse pregnancy outcomes that disproportionately affect minority communities and cause significant lifelong consequences.

Table 1

Grandmother Individual Factors		Grandmother With No College Education			Grandmother With Any College Education		
		White Race	Black Race	P-value	White Race	Black Race	P-value
Marital status	Married	97.69%	76.23%	<0.001	98.95%	86.89%	<0.001
	Unmarried	2.18%	23.77%		0.90%	13.03%	
	Missing	0.13%	0%		0.15%	0.078%	
Household Income Quartile	First Quartile	25.73%	51.54%	<0.001	12.97%	25.66%	<0.001
	Second Quartile	28.64%	21.65%		19.40%	28.68%	
	Third Quartile	24.96%	9.89%		34.62%	20.13%	
	Fourth Quartile	9.62%	2.92%		25.97%	11.57%	
	Missing	11.05%	14.00%		7.04%	13.96%	
Employment	No	13.14%	12.45%	0.39	7.55%	2.86%	0.06
	Yes	51.00%	46.78%		59.01%	66.79%	
	Missing	35.85%	40.76%		33.45%	30.35%	
Grandmother Community Factors		Grandmother With No College Education			Grandmother With Any College Education		
		White Race	Black Race	P-value*	White Race	Black Race	P-value*
Educational Achievement (Proportion > 25 with college degree)	Mean +/- SD	0.18 +/- 0.10	0.16 +/- 0.11	0.03	0.24 +/- 0.13	0.20 +/- 0.11	0.02
Community Income (Median household income)	Mean +/- SD	$27,722 +/- $9,250	$20,690 +/- $10,221	<0.0001	$31,293 +/- $10,633	$22,025 +/- $10,459	<0.0001
Community Unemployment (Proportion)	Mean +/- SD	0.08 +/- 0.05	0.12 +/- 0.06	<0.0001	0.06 +/- 0.04	0.11 +/- 0.06	<0.0001
Community Poverty (Proportion of households living below federal poverty level)	Mean +/- SD	0.14 +/- 0.10	0.27 +/- 0.14	<0.0001	0.11 +/- 0.09	0.25 +/- 0.15	<0.0001
Parent Individual Factors		Grandmother With No College Education			Grandmother With Any College Education		
		White Race	Black Race	P-value	White Race	Black Race	P-value
Education	No	36.91%	43.94%	0.07	14.78%	20.17%	0.13
	Yes	63.09%	56.06%		85.22%	79.83%	
	Missing	0%	0%		0%	0%	
Marital status	Married	74.56%	37.15%	<0.0001	82.64%	44.34%	<0.0001
	Unmarried	25.22%	62.85%		17.36%	55.66%	
	Missing	0%	0%		0%	0%	
Household Income Quartile	First Quartile	32.36%	53.42%	<0.0001	23.47%	37.15%	0.0001
	Second Quartile	39.26%	27.68%		39.30%	33.46%	
	Third Quartile	15.17%	6.25%		17.33%	9.12%	
	Fourth Quartile	7.91%	3.23%		15.59%	10.63%	
	Missing	5.30%	9.42%		4.32%	9.64%	
Employment	No	23.00%	25.26%	0.20	20.24%	13.73%	0.12
	Yes	61.08%	57.83%		66.65%	74.54%	
	Missing	15.93%	16.63%		13.11%	11.74%	
Parent Community Factors		Grandmother With No College Education			Grandmother With Any College Education		
		White Race	Black Race	P-value*	White Race	Black Race	P-value*
Educational Achievement (Proportion > 25 with college degree)	Mean +/- SD	0.19 +/- 0.12	0.17 +/- 0.10	0.014	0.26 +/- 0.16	0.22 +/- 0.14	0.002
Community Income (Median household income)	Mean +/- SD	$48,608 +/- $17,228	$36,941 +/- $15,064	<0.0001	$54,396 +/- $20,108	$42,636 +/- $19,659	<0.0001
Community Unemployment (Proportion)	Mean +/- SD	0.08 +/- 0.05	0.12 +/- 0.07	<0.0001	0.07 +/- 0.04	0.12+/- 0.08	<0.0001
Community Poverty (Proportion of households living below federal poverty level)	Mean +/- SD	0.13 +/- 0.09	0.24 +/- 0.14	<0.0001	0.12 +/- 0.08	0.20 +/- 0.12	<0.0001

*P-values obtained after log transformation

Table 1

Figure 1

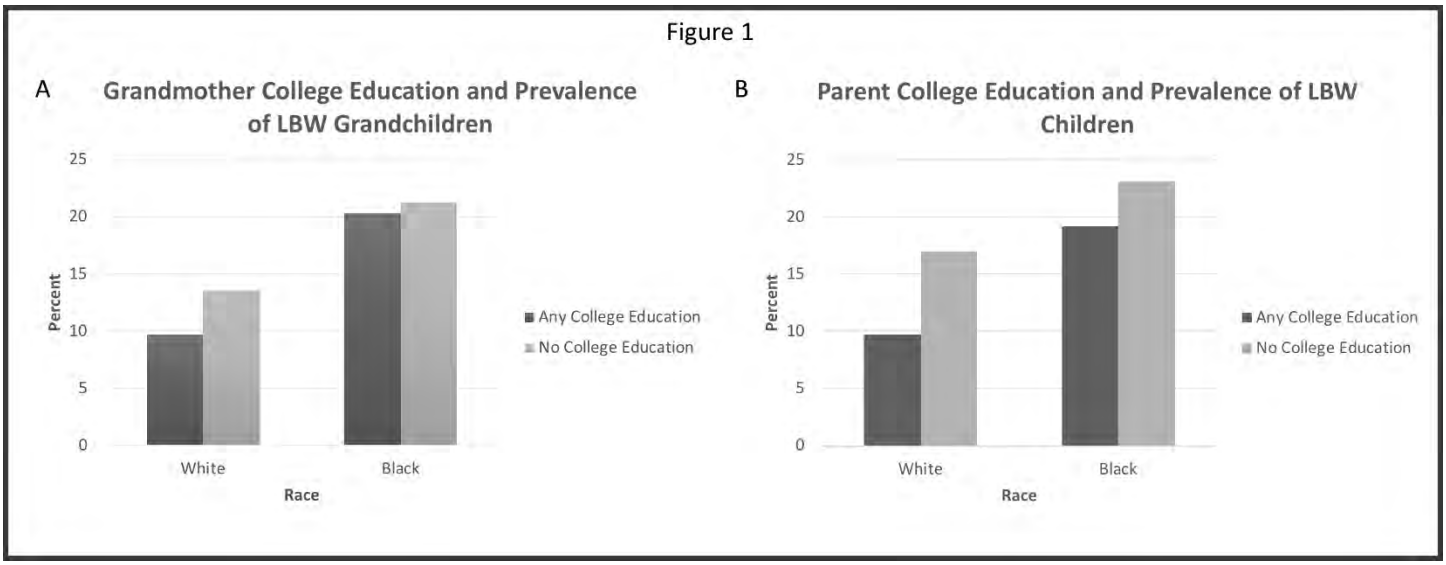

Figure 1

Table 2

Multivariable Logistic Regression LBW Grandchild: Grandparent Individual, Community and Health Factors	Any College Education		
	OR	P-value	95% CI
Individual Variable Model[1]	0.67	0.006	0.51, 0.89
Community Variable Model[2]	0.70	0.02	0.51, 0.95
Individual and Community Variables[3]	0.71	0.02	0.53, 0.95
Individual, Community and Health Variables[4]	0.72	0.03	0.54, 0.97
Multivariable Logistic Regression LBW Child: Parent Individual, Community and Health Factors	Any College Education		
	OR	P-value	95% CI
Individual Variable Model[5]	0.56	<0.0001	0.42, 0.75
Community Variable Model[6]	0.57	<0.0001	0.43, 0.76
Individual and Community Variables[7]	0.59	<0.0001	0.45, 0.79
Individual, Community and Health Variables[8]	0.58	0.001	0.42, 0.78

Multivariable Logistic Regression LBW Child/Grandchild: Parent and Grandparent Individual, Community and Health	Any College Education Grandparent			Any College Education Parent		
	OR	P-value	95% CI	OR	P-value	95% CI
Individual Variable Model[9]	0.75	0.05	0.56, 0.99	0.61	<0.0001	0.46, 0.79
Community Variable Model[10]	0.78	0.12	0.57, 1.07	0.62	<0.0001	0.47, 0.81
Individual and Community Variables[11]	0.79	0.12	0.58, 1.07	0.64	0.001	0.49, 0.83
Individual, Community and Health Variables[12]	0.81	0.18	0.60, 1.10	0.61	0.001	0.45, 0.81

[1] Individual Variables: grandparent education, race, income, Hispanic
[2] Community Variables: grandparent community education, income, unemployment, poverty
[3] Variables from models 1 and 2
[4] Variables from models 3 and the following health variables: insurance, hypertension, diabetes, hypercholesterolemia, gum disease, overweight, depression, cigarette/alcohol during pregnancy, adequate prenatal care
[5] Individual Variables: parent education, race, income, Hispanic
[6] Community Variables: parent community education, income, unemployment, poverty
[7] Variables from models 5 and 6
[8] Variables from model 7 and the aforementioned health variables
[9] Variables from models 1 and 5
[10] Variables from models 2 and 6
[11] Variables from models 9 and 10
[12] Variables from model 11 and the aforementioned health variables

Table 2

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Resilience During Pregnancy: Evidence of A Hispanic Immigrant Advantage

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Background Non-Hispanic black women experience disproportionately high rates of poor birth outcomes like preterm birth and low birth weight compared to white and Hispanic women. The similar socioeconomic positions of black and Hispanic women coupled with better birth outcomes among Hispanic women has been termed the "Hispanic Paradox." However, disparities exist by maternal nativity, with foreign-born Hispanic women often exhibiting the lowest rates of poor outcomes. Persistent exposure over time to stressors due to socioeconomic disadvantage and discrimination has been cited as an important contributor of these disparities. Variation in maternal resilience (i.e. the ability to tolerate and respond to stress) may exist by race, ethnicity and nativity.
Objective We explored differences in prenatal resilience that might exist by nativity, within Hispanic women and in a broader cohort encompassing women of all races and ethnicities.
Design/Methods We used data from the Spontaneous Prematurity and Epigenetics of the Cervix prospective cohort of pregnant women. Resilience was measured between 10-20 weeks gestation using the Connor Davidson Resilience Scale 25. We assessed for resilience differences by nativity within the entire cohort (n=802) and within a Hispanic sub-cohort (n=81). We analyzed associations of ethnicity and nativity with tertiles of resilience using Poisson regression models. We also assessed for risk of low resilience among foreign-born women by region of origin. Models were adjusted for maternal age, education and insurance status.
Results US-born Hispanic women were more likely to be in the low resilience tertile compared to their foreign-born Hispanic counterparts (adjusted RR 3.76, 95% CI 1.32-10.70, Fig.1). Although there were no significant findings in the models assessing risk of low resilience by race/ethnicity and nativity combined in the full cohort, foreign-born Hispanic women had the lowest risk of being in the low resilience tertile compared to US-born Non-Hispanic white women (aRR 0.34, 95% CI 0.12-1.00, Table 1). Immigrant women from Europe and Africa were more likely to be in the lowest resilience tertile than Latin American women (Fig. 2).
Conclusion(s) Foreign-born Hispanic women appeared to possess a resilience advantage in this cohort. Given that this group often exhibits the lowest rates of adverse birth outcomes, our findings suggest a deeper exploration of what leads to resilience among immigrant Hispanic women and whether these factors can be fostered among all women at risk of poor birth outcomes.

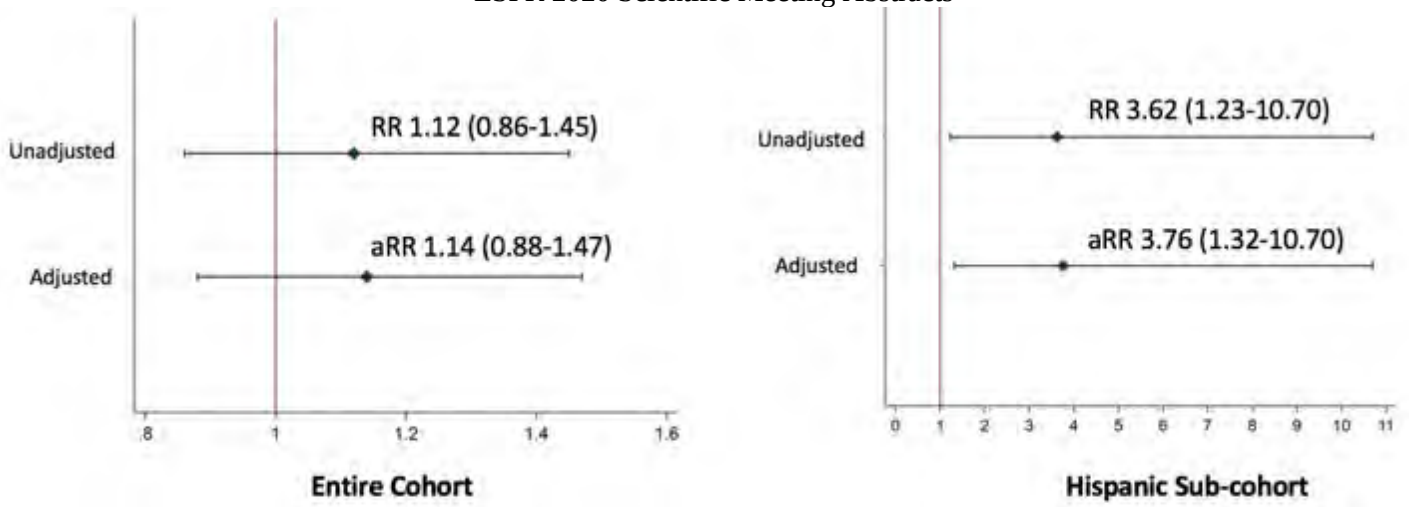

Figure 1. Risk of low resilience among US-born (versus foreign-born) women

Full models adjusted for insurance, education and age.

◆ Adjusted Relative Risk ⊢—⊣ 95% Confidence Interval

Table 1. Risk of low resilience by combined race/ethnicity/nativity*

	Sample Size	Relative Risk (95% Confidence Interval)	Adjusted Relative Risk† (95% Confidence Interval)
Non-Hispanic (NH) White US-born	432	Ref	Ref
NH White Foreign-born	51	1.19 (0.82, 1.74)	1.17 (0.80-1.71)
NH Black US-born	77	0.95 (0.66, 1.36)	0.92 (0.62 -1.36)
NH Black Foreign-born	29	0.63 (0.28, 1.44)	0.62 (0.27-1.40)
Asian US-born	22	0.69 (0.28, 1.69)	0.70 (0.29-1.71)
Asian Foreign-born	62	0.98 (0.66, 1.45)	0.98 (0.66-1.45)
Hispanic US-born	55	1.27 (0.91-1.79)	1.26 (0.86-1.84)
Hispanic Foreign-born	26	0.35 (0.12, 1.03)	0.34 (0.12-1.00)
Other US-born	36	0.93 (0.56, 1.55)	0.91 (0.53-1.54)
Other Foreign-born	12	1.01 (0.45, 2.28)	0.95 (0.41-2.22)

*Low resilience tertile defined as a score of < 72 in our cohort. Modified Poisson regression models were used.

† Adjusted for insurance status, age and education.

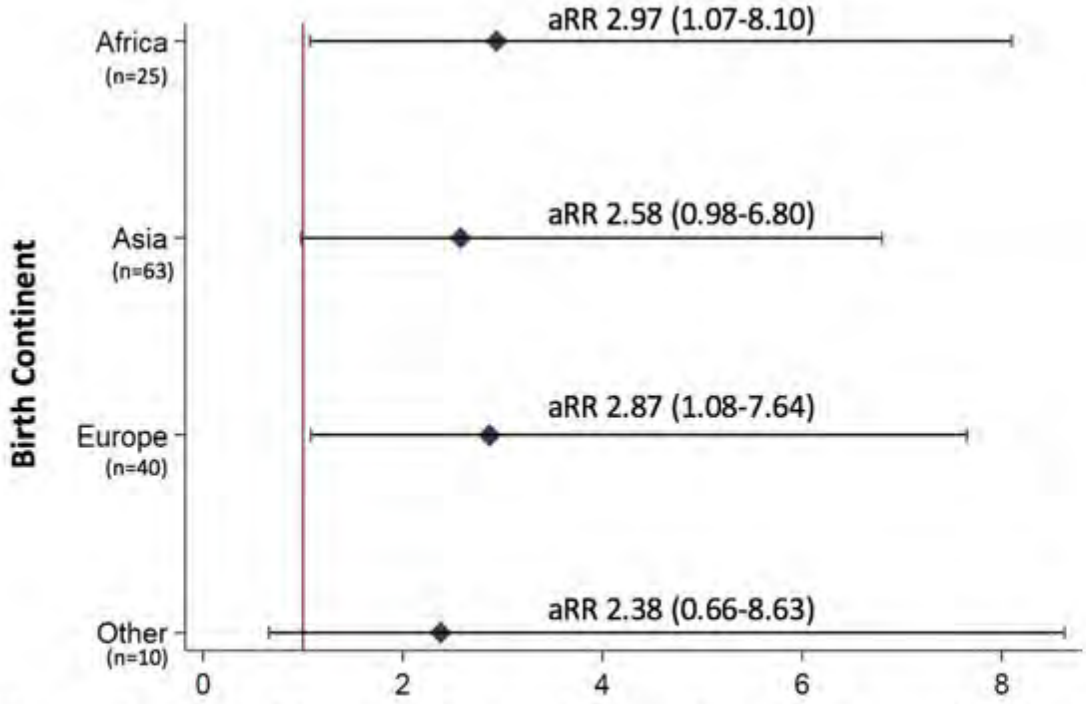

Figure 2. Risk of low resilience by continent among foreign-born women

Women born in Latin American were reference group. Full models adjusted for insurance, education and age.

◆ Adjusted Relative Risk ⟷ 95% Confidence Interval

Abstract: 124

Providing Warmed IV Fluids to Neonates for Out-Of-Hospital Transport

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Background Neonatal hypothermia is one of the major contributors to neonatal morbidities. Being prone to rapid heat loss, low-birth-weight neonates are at highest risk. Providing intravenous (IV) fluids that are not above hypothermic temperatures may lead to inadvertent cooling of neonates, resulting in an increased chance of hypothermia and therefore increased morbidity.
Objective This study looks at the most effective means to provide warmed IV fluids to very low-birth-weight neonates during out-of-hospital transport.
Design/Methods Three methods of providing warmed IV fluids were studied: no warming method (control) (n=10), applying the enFlow™ IV fluid and blood warmer to the IV tubing (n=10), and applying the Belmont® buddy lite™ IV fluid and blood warmer to the IV tubing (n=10). The end of the IV tubing was elevated five inches to simulate typical venous back pressure. The fluid was released at a rate of 10 mL/hr, a common rate used for low-birth-weight neonates. The temperature of the IV fluid as it exited the tubing was measured every 10 seconds for 42 minutes (the average out-of-hospital transport time) using a temperature data logger. We compared the average temperature of the IV fluid, the temperature of the IV fluid at the end of each trial, and the percentage of time that the temperature was above 36.3ºC (considered the baseline temperature for neonatal hypothermia) across the three methods.
Results Both the enFlow and the Belmont buddy lite IV fluid and blood warmers yielded a greater average temperature of IV fluid ($p<0.0001$ for both), greater temperature of IV fluid at the end of each trial ($p<0.0001$ for both), and greater percentage of time above 36.3ºC ($p<0.0001$ for both) than no warming method. No statistically significant difference was seen between the two warmers. The 95% confidence intervals of the enFlow for the average temperature of the IV fluid and the temperature at the end of each trial were 37.4ºC to 38.5ºC and 37.5ºC to 38.7ºC, respectively, with both intervals being above 36.3ºC. The 95% confidence intervals of the Belmont buddy lite for the average temperature of the IV fluid and the temperature at the end of each trial were 37.6ºC to 39.5ºC and 37.9ºC to 40.2ºC, respectively, with both intervals also being above 36.3ºC.
Conclusion(s) Both the enFlow and Belmont buddy lite IV fluid and blood warmers were effective in providing warmed IV fluids throughout out-of-hospital transport. These findings may be influential towards modifying protocols to include using either warmer to prevent neonatal hypothermia.

Abstract: 125

Treatment of Sepsis in Medically Complex Children Seen in the Pediatric Emergency Department

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Background Research demonstrates that timely recognition and treatment of sepsis can significantly improve patient outcomes, especially regarding time to intravenous fluid (IVF) and antibiotic administration.Further research suggests that underlying chronic disease in a septic pediatric patient puts them at higher risk for poor outcomes, underscoring the importance of aggressive, early treatment in this patient population.
Objective To compare treatment time for sepsis in pediatric patients with chronic disease versus those without chronic disease seen in the Pediatric Emergency Department (PED).
Design/Methods We reviewed patient data from a pediatric sepsis outcomes dataset collected at two Nemours Health System hospital sites from January 2017 - December 2018.Patients were stratified into two groups: those with and those without chronic disease, defined as any patient with at least one of eight chronic health conditions, as categorized in the dataset.Inclusion criteria: patients seen in the PED ultimately diagnosed with sepsis or septic shock and time zero for identification of sepsis in the PED.Exclusion criteria: time zero unavailable, inability to determine time of first IVF or antibiotic administration or patient death within the PED. Primary analysis included comparison of time zero to first IVF and antibiotic administration between each group.
Results 312 patients met inclusion criteria. 169(54.2%) individuals had chronic disease and 143(45.8%) did not. Mean time to antibiotics in those with chronic disease was 56.1 minutes versus 76.7 minutes in patients without chronic disease ($p<0.05$, 95% CI -39.9,-1.6). Time to first IVF in those with chronic disease was 50.5 minutes versus 36.5 minutes in those without ($p=0.36$, 95% CI -15.8,43.9).There was no significant difference in meeting the goal of antibiotic and IVF administration within 60 minutes between those with chronic disease (68.8% and 81.7%, respectively) and those without (66.4% and 87.4%, respectively). Those with an indwelling line/catheter (n=40) received faster IVF administration than those without (n=272) which was a significant difference ($p<0.05$, 95% CI -27.2,-2.3). The difference in time to antibiotic administration by indwelling line/catheter status was not significant ($p=0.20$, 95% CI -45.1, 9.6).
Conclusion(s) Study findings suggest pediatric patients with chronic disease diagnosed with sepsis or septic shock in the PED have a faster time to antibiotic administration but a slower time to IVF administration compared to patients without chronic disease.

Abstract: 126

Prevalence of Asymptomatic Intraperitoneal Fluid in Children on Focused Assessment with Sonography in Trauma (FAST) Ultrasound

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Background Focused Assessment with Sonography in Trauma (FAST) exam is a commonly used ultrasound in pediatric patients to assess for intra-abdominal injuries in cases of blunt trauma. The detection of free fluid in the abdomen in these clinical scenarios is presumed to be intraperitoneal bleeding, however small amounts of fluid can be present physiologically, which introduces uncertainty in interpreting FAST exams. Classic teaching is that this occurs mostly in menstruating females, though it has also been reported in males and younger children. Information regarding prevalence and amount of physiologic free fluid in different age groups and genders is not well studied.
Objective To study the prevalence, location, and amount of free fluid on FAST exams in asymptomatic children.
Design/Methods A convenience sample of children ages 2 to 18 years presenting to the pediatric emergency department for non-abdominopelvic complaints from August to December 2019 was enrolled. Potential subjects were excluded if they had recent abdominal trauma, surgery, or a known medical condition that could predispose to intraperitoneal free fluid. Three FAST exam views (right upper quadrant, left upper quadrant, and pelvis) were obtained using a Sonosite X-Porte (FUJIFILM Sonosite, Inc., Bothell, Washington) with a curvilinear probe to determine presence of free fluid. The amount of free fluid was calculated using the volume function on the ultrasound machine. Presence of free fluid was determined as a prevalence with 95% confidence interval (CI).
Results We enrolled 52 children, and 50 were included. Two were excluded for incomplete ultrasound examinations. The average age of children enrolled was 10.1 years, the average weight was 21.6 kilograms, and 31 (62%) were male. Free fluid was identified in the pelvis in 8 children (16%; 95%CI 8.3%-28.5%), 5 of whom were male, with an average age of 8.1 years old (95% CI 5.5-10.7 years). The average volume of fluid was 0.6mL with the maximum of 1.6mL. Examples of pelvic free fluid are shown in Figures 1 and 2. No free fluid was identified in the upper quadrants in any subject.
Conclusion(s) Small amounts of pelvic free fluid is common in asymptomatic children, including in males. Prospective study is warranted in trauma patients to determine if such small amounts of pelvic free fluid are significant in pediatric abdominal trauma.

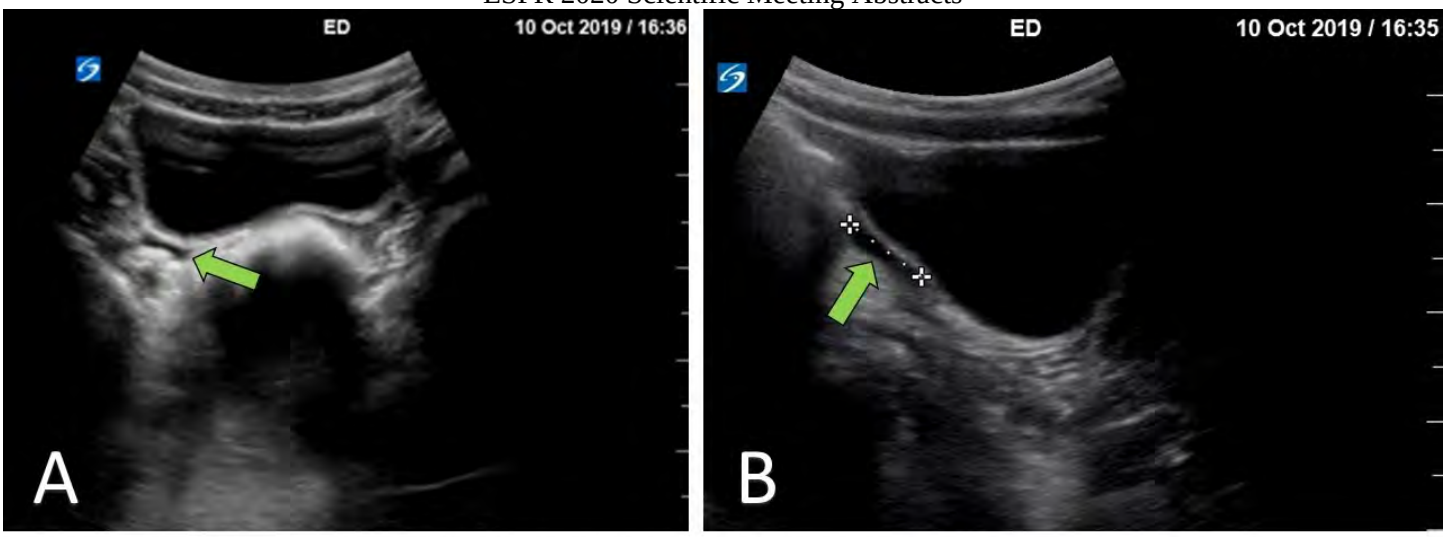

Figure 1: Pelvic free fluid (green arrows) with volume <1mL in a 6 year old female
A- Transverse view. B- Sagittal view.

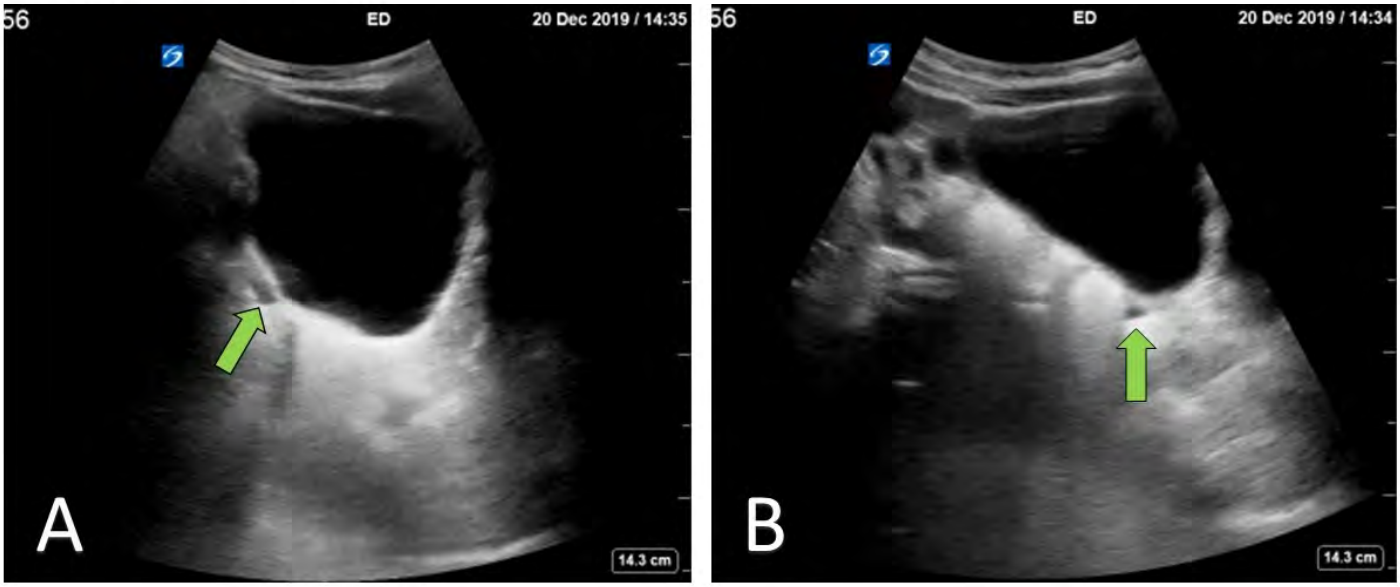

Figure 2: Pelvic free fluid (green arrows) with volume <1mL in a 4 year old male
A- Transverse view. B- Sagittal view.

Abstract: 127

Outcomes of patients discharged from the pediatric emergency department with abnormal vital signs

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Background Vital signs (VS) are used to triage and identify children at risk for severe illness. Few studies have examined the association of pediatric VS at emergency department (ED) discharge with patient outcomes.
Objective To determine if children discharged from the ED with abnormal VS have high rates of return visits, admission or adverse outcomes.
Design/Methods We conducted a retrospective cohort study of children discharged from 2 pediatric EDs with abnormal VS between July 2018-June 2019. We queried electronic health records (EHR) for children ages 0-18 years discharged from the ED with abnormal last recorded VS (heart rate, blood pressure or respiratory rate outside of 5^{th} and 95^{th} percentiles for age, oxygen saturation < 95%, temperature < 97 F or > 100.4 F). VS were considered erroneously entered and thus excluded from analysis if heart rate was <30 or $\geq$300, respiratory rate was 0 or $\geq$100 or oxygen saturation was < 50. Patients who were declared deceased at index visit were excluded. Demographic, clinical, and outcome data including return visits within 48 hours after the initial ED discharge were

obtained. Morbidity was defined as requiring cardiopulmonary resuscitation (CPR), endotracheal intubation or admission to the critical care unit (PICU).
Results Of the 97824 children evaluated in the EDs during the study period, 17661 (18.1%) were discharged with abnormal VS. 404 (2.28%) returned to the ED and 95 (23.5%) were admitted for the same chief complaint within 48 hours. In comparison, the 48-hour return rate for children discharged with normal VS was 2.45% (p=0.219). Children discharged with abnormal VS were more likely to return if they had 2 or more abnormal VS (OR 1.6; 95% CI 1.23-2.07) or their initial acuity level was high (OR 1.34; 95% CI 1.1-1.63). Higher initial acuity level was also associated with admission at revisit (OR 2.58; 95% CI 1.59-4.2). Four of the children who returned required PICU admission, but none died, required CPR or endotracheal intubation.
Conclusion(s) Although many children were discharged from the ED with abnormal VS, few returned and required admission. Having 2 or more abnormal VS and higher acuity increased odds of revisit. No child suffered serious morbidity/mortality.

Abstract: 128

Epinephrine worsens cortical microcirculatory blood flow after experimental pediatric cardiac arrest

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[1]Pediatrics, UPMC Children's Hospital of Pittsburgh, Pittsburgh, Pennsylvania, United States, [2]Pediatrics, University of Pittsburgh, Pittsburgh, Pennsylvania, United States, [3]Critical Care Medicine, University of Pittsburgh, Pittsburgh, Pennsylvania, United States

Background Hypoxic ischemic brain injury after cardiac arrest (CA) is the principal factor limiting intact neurological recovery. Epinephrine (EPI), the fundamental therapy that facilitates restoration of spontaneous circulation (ROSC) after CA, has been identified as potentially contributing to brain injury. EPI's detrimental effects are often attributed to cerebral microvascular constriction, however its effects on cortical microcirculatory blood flow after pediatric asphyxial CA have not been defined.
Objective Administration of EPI compared to normal saline (NS) produces vasoconstriction and capillary stasis after pediatric asphyxial CA.
Design/Methods Anesthetized and tracheally intubated immature 16-day old rats had arterial and venous catheters placed. CA of 9.5 min was induced by cessation of mechanical ventilation. Rats were then resuscitated with chest compressions and received EPI or an equal volume of NS at resuscitation (n=8/group). Cortical microcirculatory blood flow was evaluated *in vivo* using multiphoton laser scanning microscopy through a 5-mm cranial window. We assessed vessel diameters, the presence of capillary stasis (absence of red blood cell flow), and the capillary transit time (plasma flow through the capillaries) from baseline to 75 min post-ROSC. Repeated measures ANOVA was used for statistical analysis.
Results All rats were successfully resuscitated. CPR time was shorter in EPI-treated rats (34±12s vs 63±26s, EPI vs. NS, $p<0.05$). However, post-ROSC, pial arteriolar vasoconstriction was worse in EPI-treated rats (-17% vs -1% at 75 mins post-ROSC, % changed from baseline, EPI vs NS, fig 1). Capillary diameters were increased in NS-treated rats vs EPI-treated rats (17±6% vs 2±7% at 75 mins post-ROSC, % changed from baseline, $p<0.05$, fig 2). Capillary stasis was worse in rats treated with EPI vs. NS, (26±6% vs 15±5% at 45 mins, and 23±4% vs 10±3% at 75 mins, $p<0.05$, fig 2). Capillary transit time was markedly prolonged at 30 mins post-ROSC vs baseline in EPI-treated rats (76±13% vs 13±11%, EPI vs NS, $p<0.05$, fig 3).
Conclusion(s) EPI administered at resuscitation produced vasoconstriction and disrupted capillary blood flow: blunted compensatory vasodilation and worse stasis. The compromised cortical microcirculatory blood flow likely contributes to the worse neurological outcome previously observed in our model in EPI-treated rats. Further studies evaluating therapies to mitigate the deleterious effect of epinephrine on the cortical microcirculation are underway.

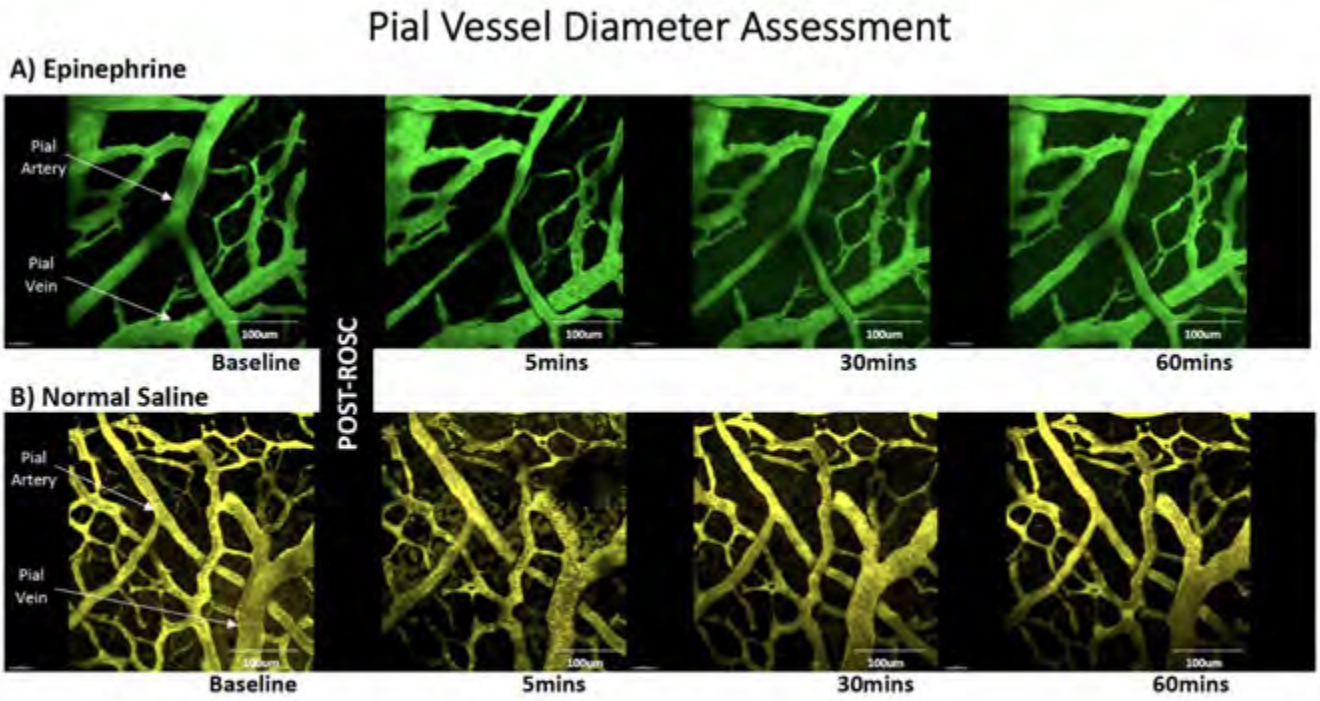

Figure 1: Pial arteriolar vasoconstriction after CA treated with epinephrine vs. normal saline. One representative epinephrine-treated rat **(a)** demonstrating the decrease in pial arteriolar diameter post-ROSC compared to baseline. One representative normal saline-treated rat **(b)** demonstrates minimal to no changes in arteriolar diameter post-ROSC compared to baseline. *Both rats received FITC dextran as intravenous fluorescent contrast. The vessels are color coded in green (epinephrine) and yellow (normal saline).*

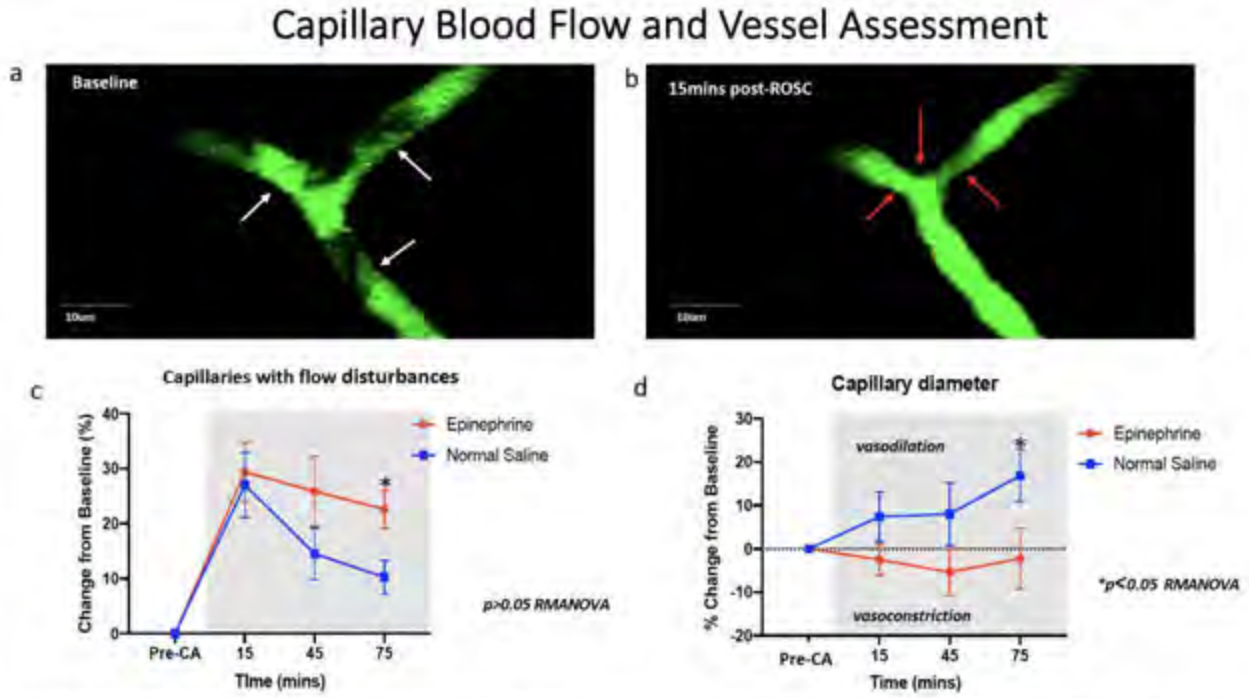

Figure 2: Capillary blood flow assessment at baseline and after CA in epinephrine and saline-treated rats. a) Normal capillary flow at baseline is indicated with white arrows. Plasma is labeled green with fluorescent dextran, and the red blood cells (RBC) appear as dark negative contrast. **b)** Post-ROSC capillary stasis (no RBC flow) and constriction of capillaries are indicated with red arrows in this representative rat treated with epinephrine. **c)** Rats treated with epinephrine had more capillaries with disturbed blood flow (no flow or sluggish flow) compared to saline-treated animals at 75 mins post-CA (* $p<0.05$). **d)** Rats treated with epinephrine had no compensatory vasodilation post-CA, while rats treated with saline had vasodilation post-CA (*$p<0.05$). *Plasma is labeled with FITC dextran. RBCs are seen as dark contrast. Epinephrine-treated rats are represented in red circles, while normal saline-treated rats are illustrated in blue squares.*

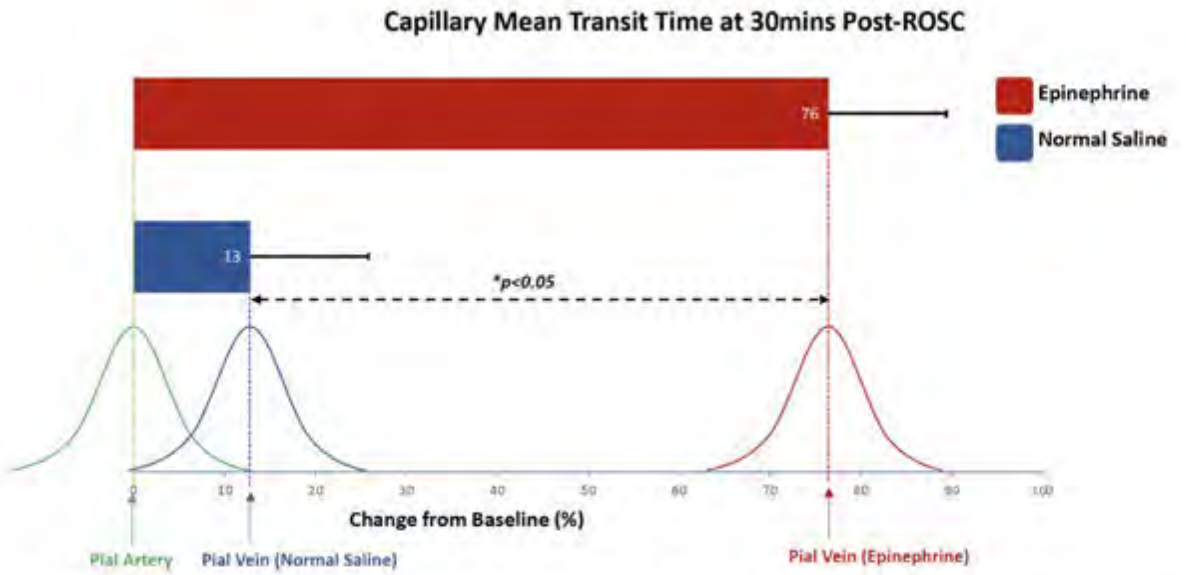

Figure 3: Capillary Mean Transit Time. Percent change in the capillary transit time from baseline to 30mins post-ROSC. Capillary transit time is measured from the contrast peak in the pial arteriole to the peak time in the pial vein, as indicated by γ-fit Intensity-time curves (artery-green, saline-treated vein blue and epinephrine-treated vein-red). Capillary transit time increased by 76±13% in epinephrine-treated rats vs 13±11% in saline-treated rats, *p<0.05. *Epinephrine-treated rats are represented in red, while normal saline-treated rats are illustrated in blue.*

Abstract: 129

Reducing Time between Emergency Department Arrival and Head Computed Tomography Scans in Pediatric Stroke Patients

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Background Pediatric stroke is more common than primary childhood brain tumors. Though rates are low, occurring in 2-13 children per 100,000, death following stroke continues to be a leading cause of mortality within this population. Of those who survive, 60% have permanent neurological deficits. While there is no FDA approved treatment for children with acute stroke, 2% receive intravenous tissue-type plasminogen activator and 1% receive a thrombectomy. Though these treatments are time sensitive, among children presenting between 2009 and 2013 in the United States, the median time from the emergency department (ED) arrival to magnetic resonance imaging was 17 hours and continues to be a major problem and barrier to timely therapy initiation. Improving awareness of pediatric stroke among physicians and caregivers and decreasing time to diagnostic neuroimaging are key priorities for effective intervention.
Objective Increase the percent of stroke alerts activated from 50% to 80% and reduce the time between ED arrival and head computed tomography (CT) scan from a baseline (October 2014 through May 2018) of 303 minutes to less than 60 minutes.
Design/Methods A multidisciplinary team, the Pediatric Stroke Task Force, was formed in 2016 to evaluate barriers to timely initiation of therapy in pediatric stroke patients. The task force developed a stroke pathway (Fig.1) for both ED and inpatient pediatric stroke populations in May 2018. Compliance with the pathway was tracked by two outcome measures: percent of stroke alerts activated and time between ED arrival and head CT scan and analyzed using statistical process control charts.
Results The median age at presentation was 11.5 years old. Following the deployment of the stroke alert pathway, the percent of stroke alerts activated reached 80% for 5 consecutive timepoints, in comparison to a baseline average of 50% (Fig. 2). The average time between ED arrival and head CT scan was reduced from a baseline of 303 minutes to 36 minutes (88%) (Fig. 3).
Conclusion(s) The development and deployment of a stroke pathway reduced the time between ED arrival and receipt of imaging. The implementation of a stroke alert system was a successful intervention to ensure compliance with the stroke pathway and the timely completion of CT scans. The team continues to track stroke alert activation rates to ensure compliance remains at or above goal.

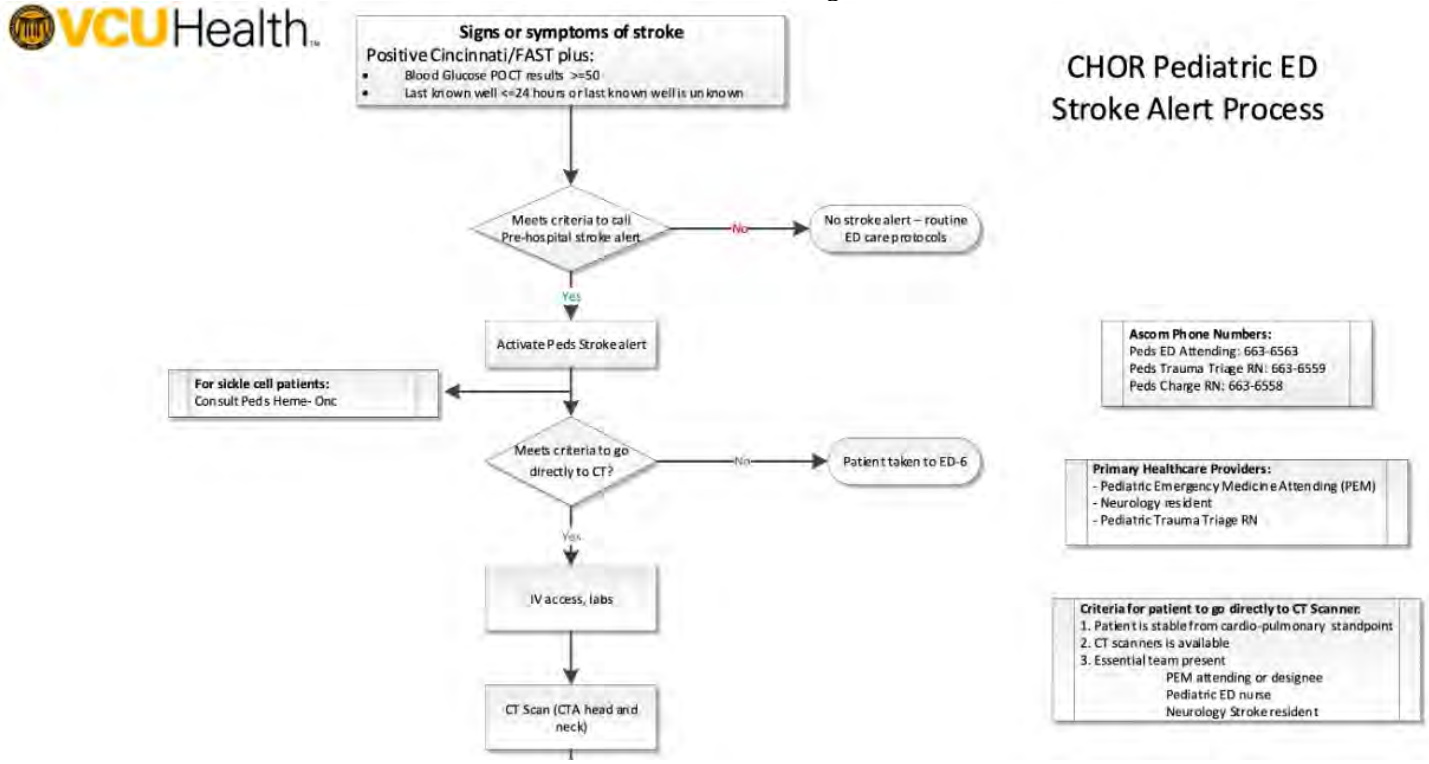

Figure 1: Children's Hospital of Richmond at VCU Pediatric ED Stroke Alert Process (partial)

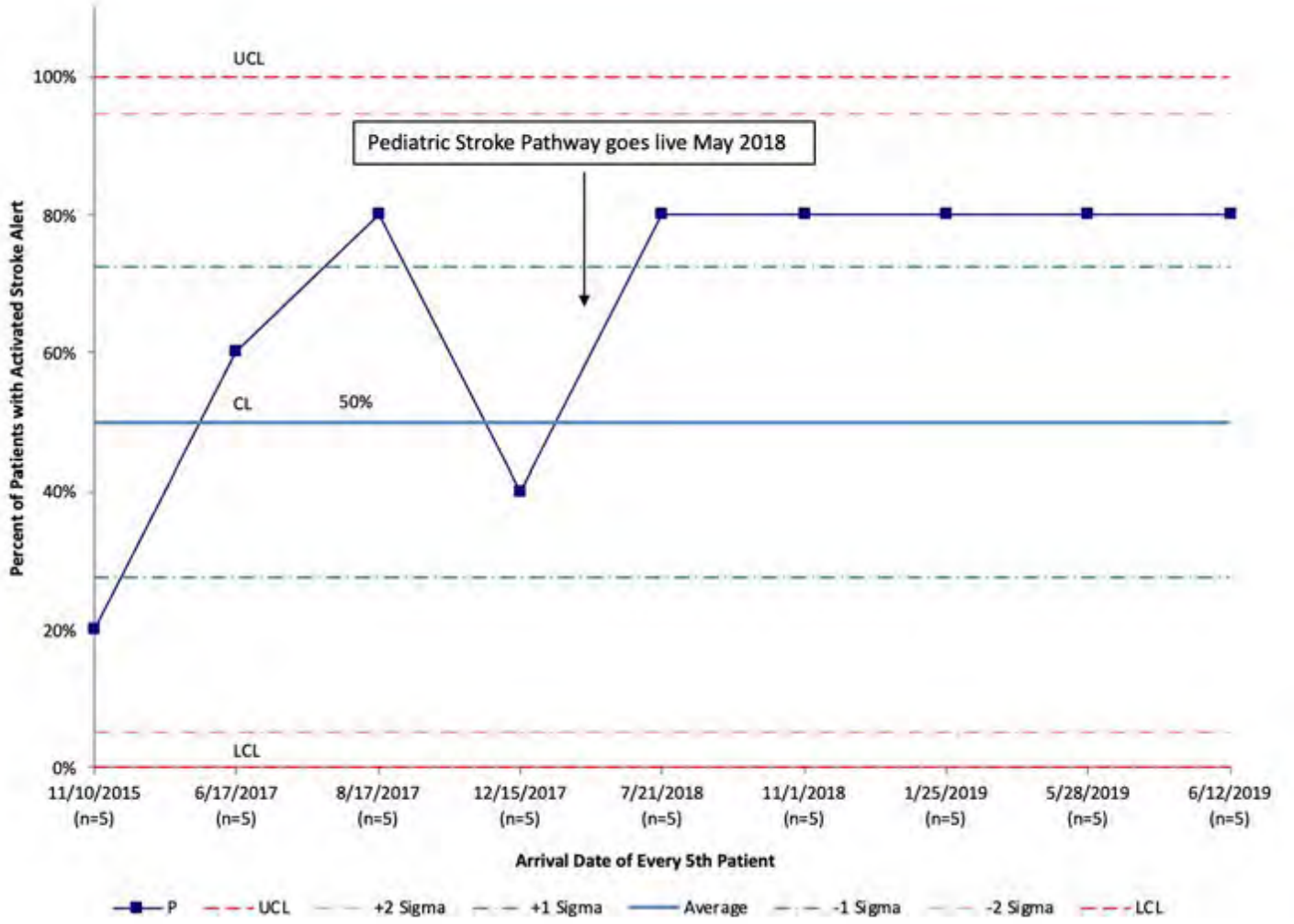

Figure 2: Percent of Stroke Alerts Activated by Arrival Date - Chart

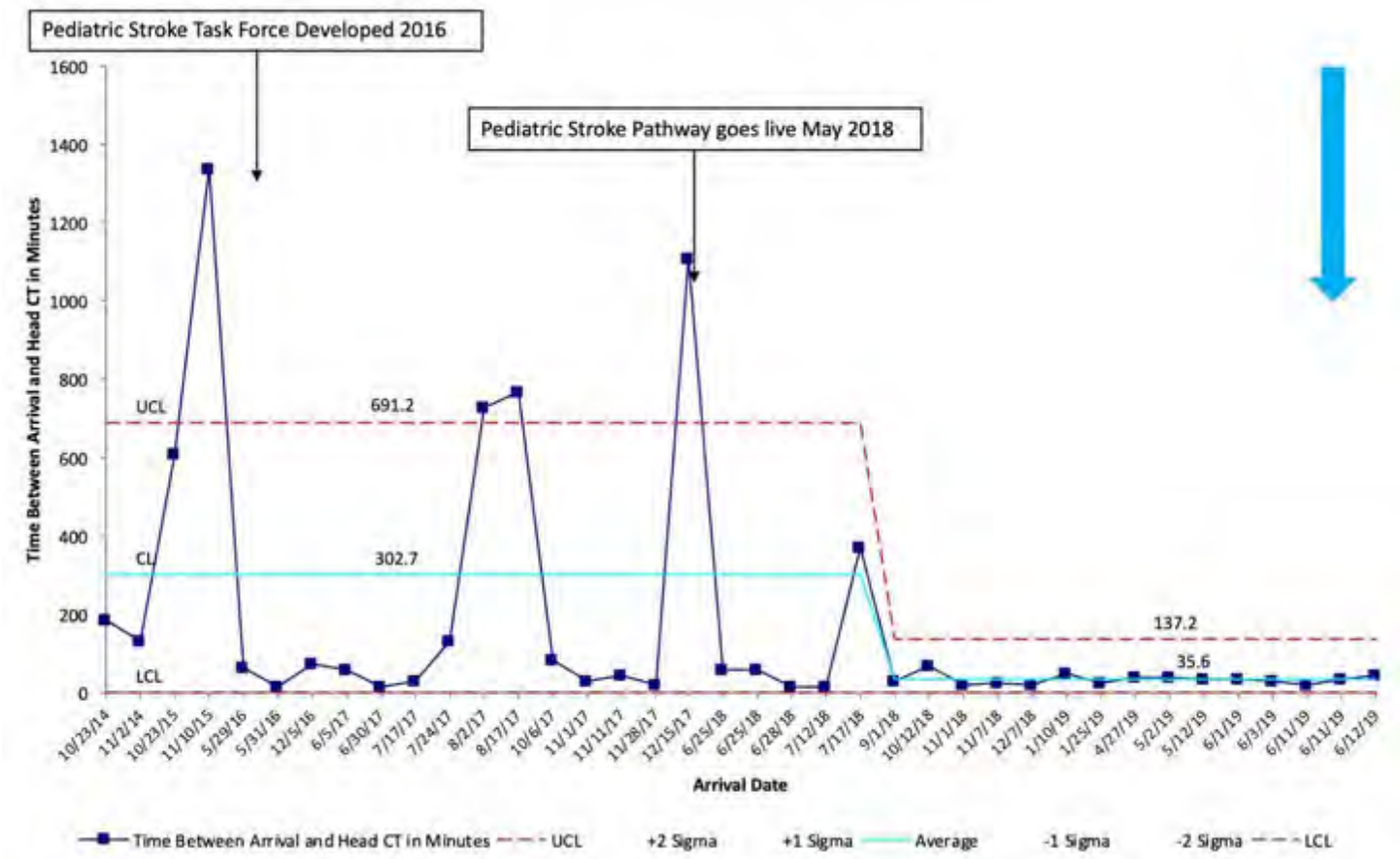

Figure 3: Time Between Arrival and Head CT in Minutes – Individuals (X) Chart

Abstract: 130

Neurodevelopmental outcomes and postnatal growth in infants fed expressed breast milk compared to donor breast milk

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Background Preterm infants have increased nutrient demands met through human milk (HM) which consists of either expressed breast milk (EBM) or donor breast milk (DBM), formula and total parenteral nutrition (TPN). HM can fail to meet caloric, protein and electrolyte needs and infants can have slower rates of growth. Macronutrient analysis shows DBM has significantly lower levels of protein compared to EBM and preterm formula. Our previous study of this cohort showed increased incidence of metabolic bone disease in infants fed DBM. There is a substantial evidence on the benefit of HM on improved cognitive outcome in infants, this may be due to long chain polyunsaturated fatty acids, or other components of HM.
Objective 1. To compare the neurodevelopmental (ND) outcomes of infants fed EBM as compared to DBM at 12-24 months corrected gestational age (CGA).
2. To compare postnatal growth parameters for premature infants fed EBM as compared to DBM at birth, 34 weeks, discharge and at follow between 12-24 months CGA.
Design/Methods This was a retrospective observational study. We included all preterm infants who were born < 1500 grams and <32 weeks and thus eligible for DBM as per unit policy at NYU Langone Health or Bellevue Hospital from 1/1/2014 to 1/1/2018. The infants were divided into two groups, those who received > 70% of all enteral feeds with either EBM or DBM. Infants fed <70% of any feed or who were fed formula were excluded. Demographic and clinical characteristic were collected. Postnatal growth and ND outcomes utilizing the Bayley 3 were analyzed using SPSS 25.
Results 156 infants were fed EBM and 54 infants were fed DBM. Their birth demographics were similar except the DBM group had smaller HC and length. There was no significant difference in their growth outcomes at 34 weeks CGA, at discharge, or at follow up with a mean 18.7 months CGA. At follow-up, the infants fed DBM had significantly lower motor ($p<0.05$), language ($p<0.01$), and cognitive ($p<0.01$) composite scores. However, when adjusted for their smaller HC at birth there was no significant difference.
Conclusion(s) Infants who had a majority of DBM intake had no significant difference in their growth as compared to their peers fed

a majority of EBM diet, and they did show catch up growth in their length and HC. This is possibly due to our unit's nutritional policy of supplementing with microlipids and liquid protein. ND outcomes were the same when adjusted for the smaller HC of the DBM group at birth.

Table 1. Demographics			
	EBM	DBM	p-value
	N=156	N=54	
GA, mean ± SD	28.65 ± 2.1	28.02 ± 2.3	NS
SGA, n (%)	14 (9)	4 (7)	NS
IUGR, n (%)	13 (8)	7 (13)	NS
Sex, (n (%)			
Male	81 (52)	28 (52)	NS
Female	75 (48)	26 (48)	NS
Mode of Delivery, n (%)			
Spontaneous Vaginal Delivery	39 (25)	15 (39)	NS
C-section	117 (75)	24 (62)	NS
Apgars, median			
1 MOL	6	8	NS
5 MOL	8	8	NS
Resuscitation at birth, n (%)	81 (51)	24 (44)	NS
Length of Stay (days), mean ± SD	69.8 ± 32.4	78 ± 40.5	NS
Time to initiate feeds (days), mean ± SD	4.7 ± 4.8	5.4 ± 5.8	NS
Time to advance feeds (days), mean ± SD	10.8 ± 8.5	11.0 ± 9.3	NS
Time to fortification (days), mean ± SD	19.1 ± 12.9	20.6 ± 12.6	NS
Time to full feeds (days), mean ± SD	41.0 ± 27.8	35.3 ± 24.5	NS
Days of TPN (days), mean ± SD	24.2 ± 19.7	20.8 ± 13.6	NS
Feeding Intolerance n (%)	58 (37)	19 (35)	NS
Vitamin D Supplementation, n (%)	138 (88)	44 (81)	NS
Additional supplementation n (%)			NS
Microlipids, n (%)	15 (10)	10 (18)	NS
Liquid protein, n (%)	47 (30)	18 (33)	NS

Table 1: Demographics

Table 2. Growth Parameters			
	EBM	DBM	p-value
	N=156	N=54	
Birth, (mean ± SD)			
Weight (g)	1178.9 ± 349.1	1108.3 ± 372.9	NS
Weight Z-score	0.248 ± 0.90	0.407 ± 1.03	NS
Length (cm)	37.1 ± 4.2	35.16 ± 4.8	< 0.01
Length Z-score	0.258 ± 1.45	-0.177 ± 1.74	NS
HC (cm)	26.2 ± 2.4	25.1 ± 2.5	<0.01
HC Z-score	0.415 ± 1.30	0.055 ± 0.93	NS
34 weeks, (mean ± SD)			
Weight (g)	1721.7 ± 310.0	1655.9 ± 281.4	NS
Weight Z-score	-0.741 ± 0.77	-0.820 ± 0.73	NS
Length (cm)	28.5 ± 1.9	27.6 ± 1.7	<0.01
Length Z-score	-0.953 ± 1.25	-0.965 ± 0.88	NS
HC (cm)	41.2 ± 3.0	41.2 ± 2.2	NS
HC Z-score	-1.11 ± 1.21	-1.75 ± 1.21	<0.01
Discharge, (mean ± SD)			
Weight (g)	2549.0 ± 518.2	2722.2 ± 856.7	NS
Weight Z-score	-1.018 ± 1.13	-0.756 ± 1.16	NS
Length (cm)	46.1 ± 3.0	46.2 ± 3.9	NS
Length Z-score	-0.983 ± 1.35	-1.211 ± 1.59	NS
HC (cm)	32.4 ± 2.0	32.8 ± 2.5	NS
HC Z-score	-0.667 ± 1.18	-0.705 ± 1.18	NS
Follow up, (mean ± SD)	N= 98	N= 23	
Weight (kg)	11.0 ± 1.7	10.5 ± 1.9	NS
Weight Z-score	-0.005 ± 1.10	-0.220 ± 1.18	NS
Length (cm)	81.8 ± 5.7	81.4 ± 7.2	NS
Length Z-score	-0.147 ± 1.28	-0.024 ± 1.30	NS
HC (cm)	47.5 ± 1.9	46.7 ± 2.1	NS
HC Z-score	0.368 ± 1.3	0.011 ± 1.2	NS

Table 2: Growth Parameters

Table 3. Neurodevelopmental Outcomes					
	EBM	**DBM**	**p-value**	**OR***	**p- value**
	N=98	N=23			
Motor Composite (mean ± SD)	96.6 ± 9.7	91.0 ± 11.1	<0.05	0.956	NS
Language Composite (mean ± SD)	97.7 ± 10.4	90.4 ± 11.8	<0.01	0.950	NS
Cognitive Composite (mean ± SD)	101.4 ± 8.7	93.7 ± 12.5	<0.01	0.930	NS
*Adjusted for birth head circumference					

Table 3: Neurodevelopmental Outcomes

Abstract: 131

Heterogeneity of maternal milk antibacterial immunoglobulin A responses

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Background Necrotizing enterocolitis (NEC) is a disease of preterm infants, characterized by damage to the intestinal tract. NEC affects ~7% of preterm infants and has a mortality rate of 30%. The etiology of NEC is not well understood, but it is associated with invasion of the intestine by bacteria. Feeding infants with maternal milk has significantly reduced NEC, but it is not 100% protective. Immunoglobulin A (IgA) antibodies are an antibacterial mechanism found in maternal milk. In the days prior to the development of NEC, affected infants have decreased IgA-bound bacteria in their intestine. We hypothesize that differences in the IgA repertoire between different mothers affect the antibacterial function of maternal milk.
Objective We will test the hypothesis that the maternal IgA repertoire of different mothers is heterogeneous.
Design/Methods We have carried out two studies. First, we compared IgA samples collected from mature maternal milk captured from 12 donors. Second, we collected colostrum, transitional, and mature maternal milk samples from 3 donors and tested whether IgA shifted over time. IgA was isolated, concentrated with peptide-M columns, quantified, and normalized. Maternal milk-derived IgA was then used to stain the arrayed bacterial cultures followed by detection with an anti-human IgA antibody and flow cytometry (Figure 1). IgA binding data was compiled and compared in a heatmap.
Results We observed a significant variation in IgA binding between different donors, particularly amongst bacterial strains from *Enterobacteriaceae*, where the binding of IgA was stronger in some donors compared to others. Longitudinally captured samples grouped together, indicating that the IgA repertoire of one mother is stable. We also saw that there was strain level variation in IgA binding within a donor. For example, some donors bind only some strains of *Escherichia coli* (Figure 2).
Conclusion(s) We have described a novel technique for the evaluation of the antibacterial IgA repertoire of maternal milk. We have shown that the IgA antibacterial repertoire was unique to each donor, maintained over time, and that it shows strain-level specificity. Together our data indicates that the maternal milk IgA repertoire may be dependent upon the individualized immune history of the maternal donor. We propose that targeting pre-tested donor samples to the most at-risk infants or augmenting maternal milk such that it binds the bacteria best associated with NEC may be prophylactic to the development of disease.

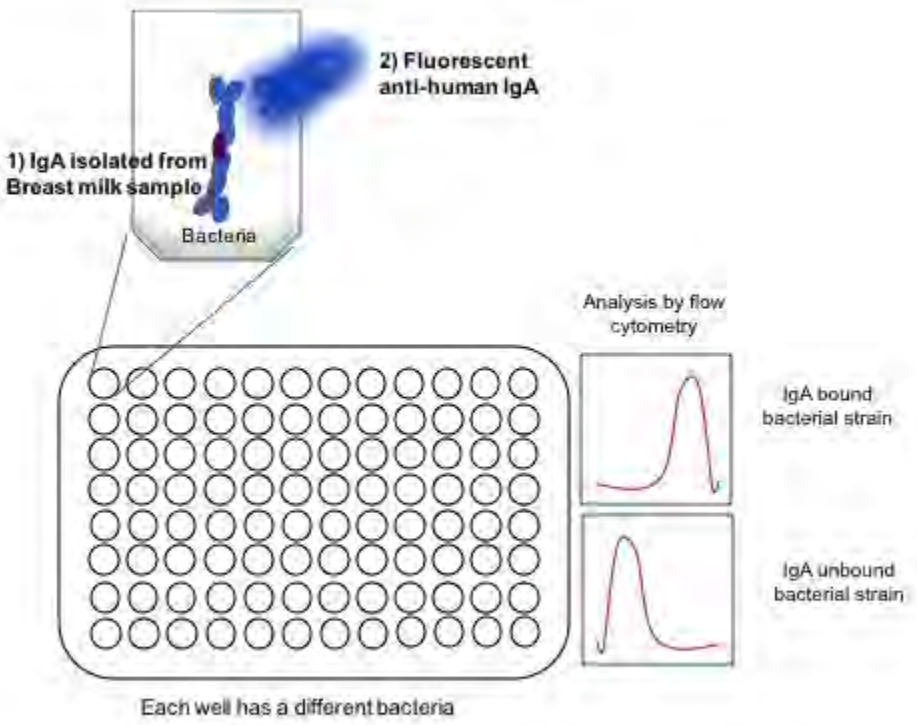

Figure1. Schematic representation of the experimental procedure

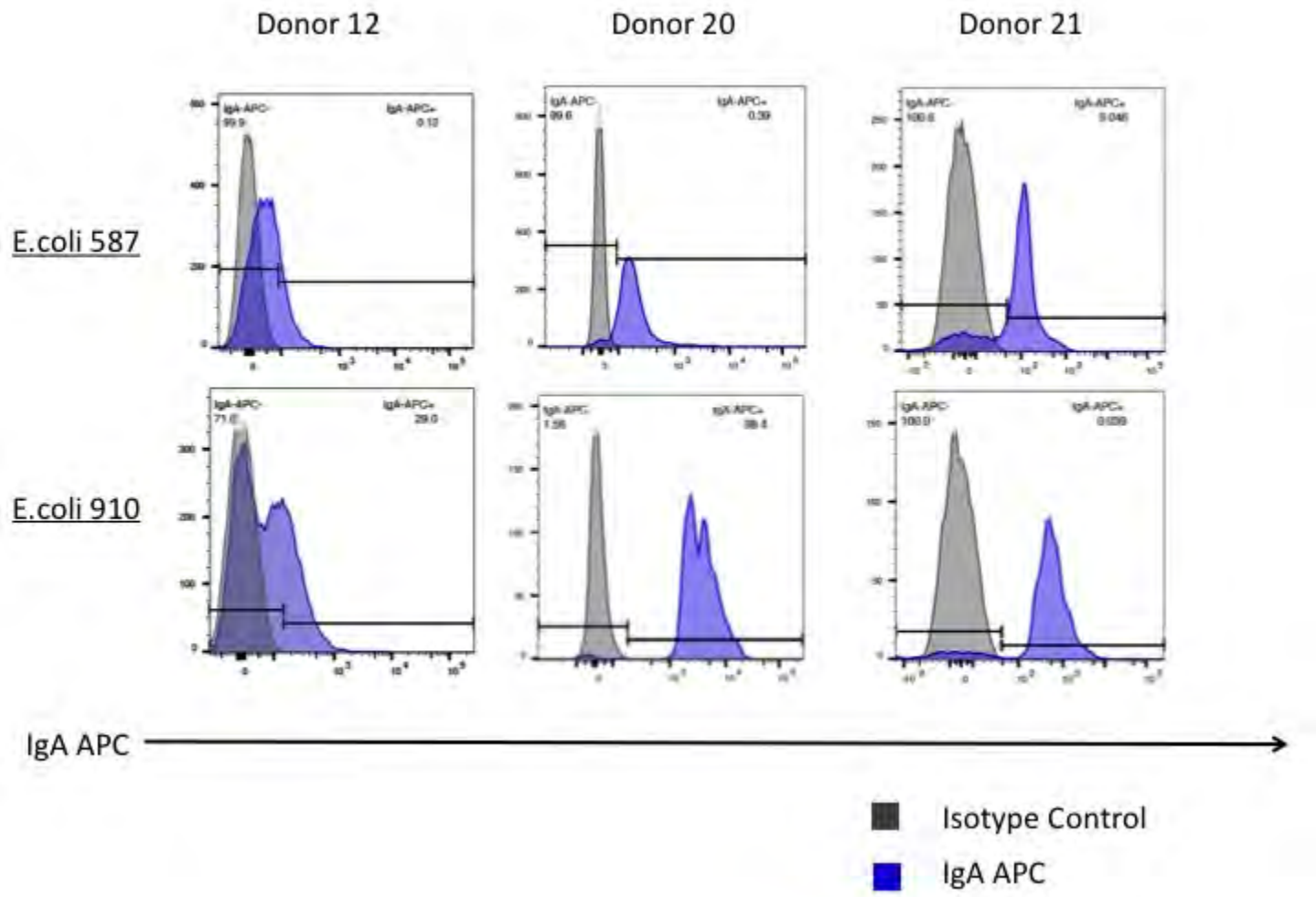

Figure 2. Histogram depicting the differences in maternal IgA binding to *Esherichia coli* strains from three donors

Abstract: 132

Antimicrobial resistance gene burden decreases over time in preterm infants receiving breast milk

Keriann M. Schulkers[1], Melena Robertson[1], Hayley DeHart[2], Keylie Gibson[2], Jyoti Mani[3], Nicholas Lee[4], Varsha Deopujari[1], Shira Levy[1], Rajiv Baveja[5], Robin Baker[5], Keith Crandall[2], Suchitra Hourigan[1]

[1]Inova Children's Hospital, Fairfax, Virginia, United States, [2]George Washington University, D.C., District of Columbia, United States, [3]Children's National Hospital, D.C., District of Columbia, United States, [4]University of Virginia, Charlottesville, Virginia, United States, [5]Fairfax Neonatal Associates PC, Fairfax, Virginia, United States

Background Dysbiosis in the preterm infant gut microbiome has been well described. However there is paucity of data regarding longitudinal changes in antimicrobial resistance (AMR) genes in preterm infants in Neonatal Intensive Care Unit (NICU) and related clinical factors. The aim of this study was to investigate changes in AMR genes over time in preterm infants in the NICU receiving breast milk.

Objective

Design/Methods Serial stool samples were collected from preterm infants in the NICU receiving maternal and/or donor breast milk and categorized into three groups based on the time of collection: 1-2 weeks, 2-4 weeks and more than 4 weeks after initial sample**.** Clinical data was recorded including gestational age, antibiotic use and delivery mode. Shotgun metagenomic sequencing was performed on stool samples. AMR was characterized using AmrPlusPlus and the MEGARes database. The association between calculated relative AMR abundances and categorized samples was analyzed using Linear Mixed Effect (LME) model analysis.

Results A total of 74 serial stool samples were collected from 36 preterm infants. Mean gestational age was 29 weeks. 7/36 infants

had no antibiotic exposure during their NICU admission. 11 were delivered vaginally and 25 by Caesarean section (6 scheduled, 19 unscheduled). AMR genes were detected in all stool samples. No infant had a clinical infection with an AMR organism during the course of the study. Overall AMR abundances were significantly higher in initial samples when compared to later longitudinal samples (p=0.02). Initial samples also had a higher relative abundance of multidrug resistance (MDR) genes (23%) than later samples (14.5%) (p=0.004) [Figure 1]. There was also a significant decrease in aminoglycoside and Fosfomycin resistance genes over time (<0.05). There was no difference found in overall AMR or MDR genes with infant antibiotic use, maternal vs donor breast milk, gestational age or delivery mode.

Conclusion(s) Overall AMR gene burden including MDR genes decrease over time in the preterm infant gut microbiome in those receiving breast milk, irrespective of gestational age, antibiotic use and delivery mode. Further exploration is needed to investigate whether this is also seen in formula fed preterm infants or whether breast milk is protective. Additional research will aid in developing strategies to mitigate intestinal microbiome perturbations and alterations in detrimental AMR genes in preterm infants.

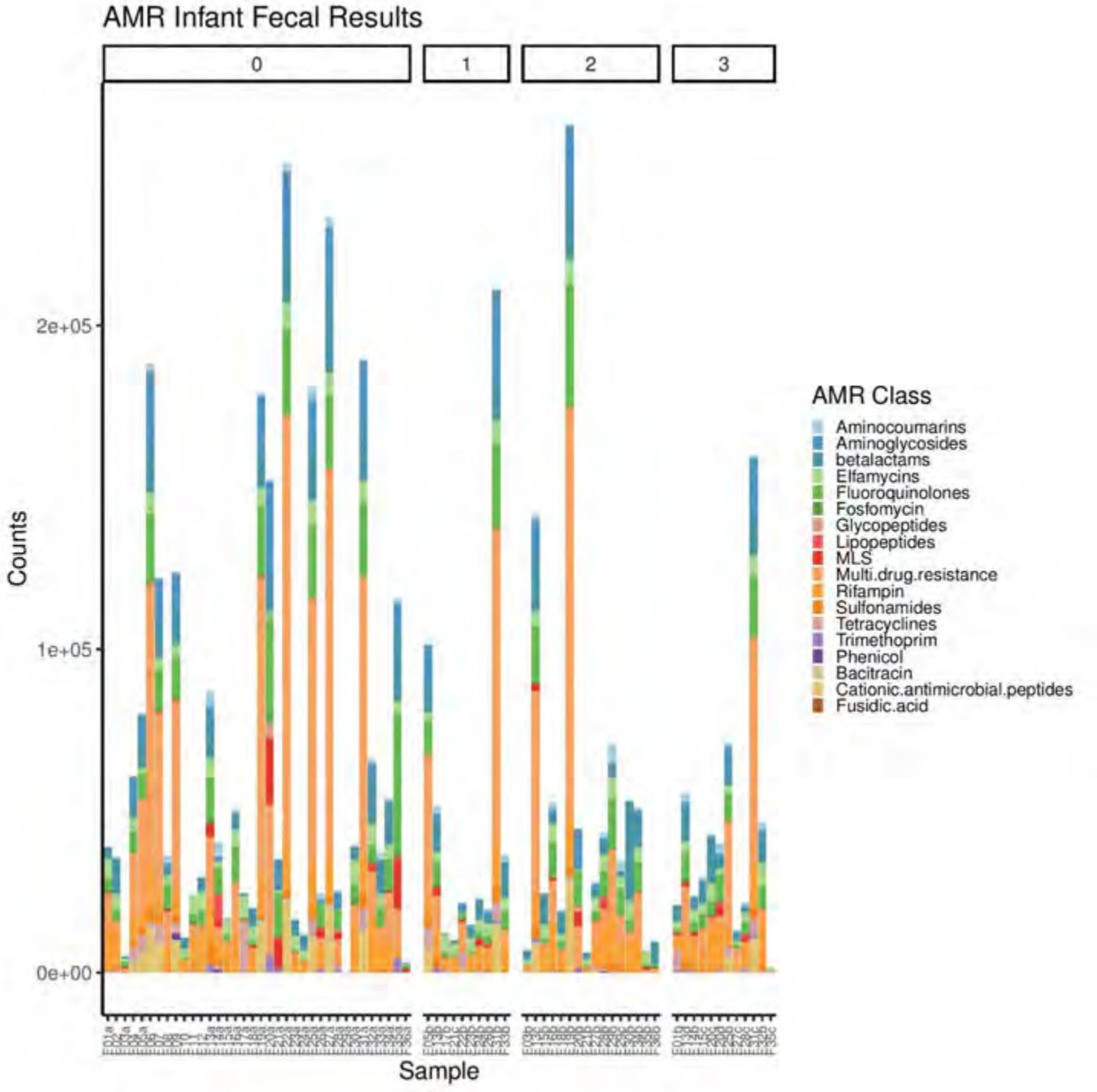

Figure 1: Relative abundances of AMR genes in longitudinal stool samples. 0= initial stool sample; 1= 1-2 weeks after initial sample; 2= 2-4 weeks after initial stool sample; 3= more than 4 weeks after initial sample. AMR abundances (including MDR genes) were significantly higher in initial samples when compared to later longitudinal samples (p=0.02).

Abstract: 133

Relationship between intracranial abnormalities in premature infants with intrauterine growth restriction and fetal Doppler patterns

Faith Kim, Jean-Ju Sheen, Donna Garey
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Background Intrauterine growth restriction (IUGR) is a leading cause of perinatal and neonatal morbidity and mortality. Although abnormal umbilical artery blood flow has been associated with poor outcomes, it is unclear if Doppler patterns are associated with a higher risk of intracranial abnormalities.
Objective To determine the primary composite outcome of death, severe intraventricular hemorrhage (IVH) or periventricular leukomalacia (PVL) in premature IUGR infants stratified by fetal Doppler patterns.
Design/Methods This is a retrospective cohort study of infants < 32 weeks' gestation born between January 2016 and December 2018 with fetal IUGR (weight ≤ 10th % or abdominal circumference ≤ 3rd %) admitted to a level IV NICU. Singleton and twin gestations were included; fetuses with congenital malformations or chromosomal abnormalities were excluded. Fetuses were stratified by their most severe Doppler pattern including group 1: normal, group 2: elevated systolic/diastolic ratio (S/D) or absent end diastolic flow (AEDF) in the umbilical artery (UA) and group 3: reversed end diastolic flow (REDF) in the UA or abnormal flow in the ductus venosus (DV). Severe IVH was defined as grade 3 or 4. Logistic regression models were used to determine the primary outcome while other results were analyzed using standard bivariate testing.
Results Of 158 fetuses with IUGR, 127 infants met inclusion criteria (mean GA 30.3 ± 1.9 weeks, mean BW 1000 ± 313 grams) (Table 1). The incidence of fetal demise was 4%, while postnatal mortality was 3%. Of 23 sets of twins, 11 sets included one infant with IUGR. The majority of infants had evidence of AEDF in the UA (Figure 1). There was no significant association between abnormal Doppler patterns and the composite outcome, but there was a trend towards severe IVH or PVL (P=0.06) (Table 2). In a logistic regression model, a higher birthweight was associated with a decreased risk of the composite outcome (OR 0.99, P=0.04) while plurality suggested a higher risk, but was not significant (OR 3.2, P=0.06). Infants in group 3 required a significantly higher number of days with parenteral nutrition, longer time to reach full feeds (Table 3) and a significantly higher incidence of necrotizing enterocolitis (NEC) (P=0.02; Table 2).
Conclusion(s) In this group, a more severe Doppler pattern was associated with increased risk of NEC and potentially increased risk of IVH or PVL. Long-term follow-up is needed in a larger cohort to determine neurodevelopmental outcomes.

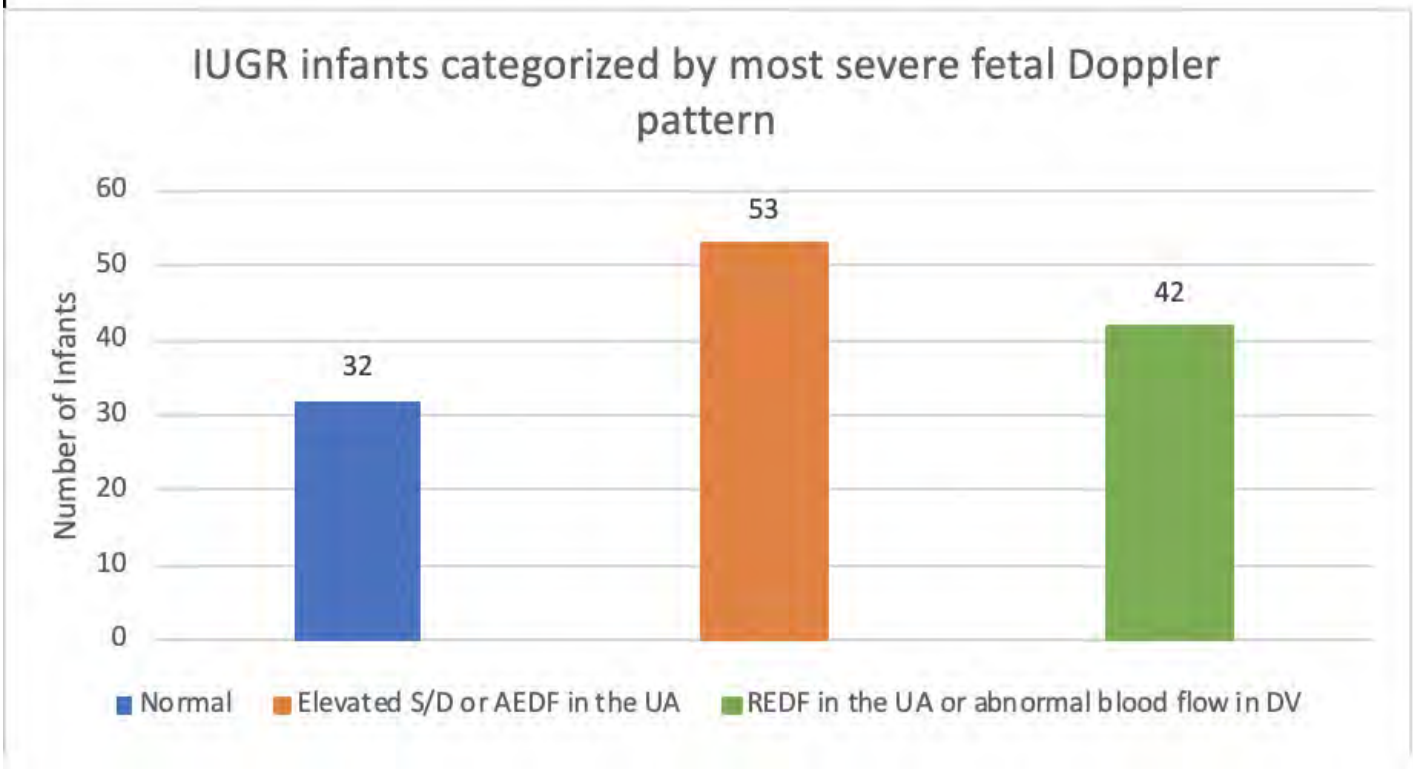

Figure 1: Infants stratified into one of three groups based on their most severe fetal Doppler pattern in utero.

Table 1: Major perinatal and neonatal clinical characteristics of all infants included in this cohort.

Characteristic	Total N = 127 (%)
GA at time of diagnosis of IUGR (weeks)*	26.3 ± 3.7
GA at birth (weeks)*	30.3 ± 1.9
Birth weight (grams)*	1000 ± 313
Birth weight Z-score*	-1.30 ± 0.6
Small for gestational age (≤ 10th percentile)**	71 (56)
Small for gestational age (≤ 3rd percentile)**	24 (19)
Number of female infants	72 (57)
Cesarean Section	123 (97)
Antenatal steroids	120 (94)
Race	Total N= 114 (%)
Caucasians	36 (32)
African American	30 (26)
Hispanic	31 (27)
Asian	10 (9)
Other/not reported	7 (6)

*Mean ± standard deviation (SD) **Based on Fenton Preterm Growth Charts

Table 2: Univariate analysis for composite and separate outcomes of death, abnormal cranial ultrasound findings (IVH or PVL) and necrotizing enterocolitis comparing those with normal Doppler patterns versus any abnormal Doppler patterns

Outcome	Group 1 N=32 (%)	Groups 2-3 N=95 (%)	P value*
Composite: Death, severe IVH or PVL	1 (3)	12 (13)	0.18
Severe IVH or PVL	0	10 (11)	0.06
All IVH	5 (16)	10 (11)	0.98
Death	1 (3)	3 (3)	0.82
Necrotizing Enterocolitis (NEC)	0	15 (16)	0.02

*Using Fisher's exact test

Table 3: Pertinent in-hospital outcomes stratified by groups according to their fetal Doppler parameters compared to those with normal Doppler parameters

In-Hospital outcomes	Group 1 (N=32)	Group 2 (N=53)	Group 3 (N=42)

Birth weight (g)	1104 ± 320	1148 ± 279	754 ± 248**
Gestational age (weeks)	30.6 ± 1.5	30.6 ± 1.9	29.6 ±2.1*
Time to full enteral feeds (days)	11.3 ± 3.1	16.3 ± 12.3*	19.2 ± 11.1**
Duration of Total Parenteral Nutrition (TPN) throughout hospitalization (days)†	8.7 ± 3	15.6 ± 11.5**	21.1 ± 13.3**
Age when regained birth weight (days)	9.9 ± 3.3	8.9 ± 3.4	9.8 ± 4.5
Feeding tube at discharge	0	5 (9)	3 (7)
Culture positive sepsis	0	2 (4)	1 (2)
Oxygen at discharge	0	2 (4)	1 (2)
Length of stay (days)‡	36 (26, 97)	61 (30, 214)**	72 (46, 185)**
Growth velocity from regain of birth weight until discharge (g/kg/day) ††	18.8 ± 2.8	17.8 ± 5	19.1 ± 9.1

*p <0.05, **p <0.01 † One baby not included because had fulminant NEC and short bowel syndrome, TPN dependent at discharge ‡ Median (IQR range) † † Estimated growth velocity using formula (1000 X ln(Weight at discharge/birth weight)) / (Length of stay- day when birth weight regained). All other numbers expressed Mean ± SD or N (%).

Abstract: 134

Effectiveness of Infant-Driven Feeding in Very Preterm Infants

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Background Oral feeding is often the final barrier to discharge in preterm infants. PDF is being supplanted by cue-based feeding in many neonatal intensive care units, although there is limited evidence of its effectiveness.

Objective To determine if infant-driven feeding (IDF) results in preterm infants achieving complete oral nutrition earlier than traditional practitioner-driven feeding (PDF).

Design/Methods Infants born at ≤32 weeks GA from 1/1/2014 to 12/31/2015 who received PDF (**Fig 1**) were compared to infants admitted from 4/1/2016 to 12/31/2018 who received IDF (**Fig 2**). Infants admitted during the 3-month transitional period were excluded. Demographic information, severity of IVH, PDA, NEC, BPD, postmenstrual age (PMA) at first breast feed, first bottle feed, full oral feeds, at discharge, and final feeding disposition were compared in infants subdivided into 2 groups: <28 and 28-32 weeks GA, using Wilcoxon Rank sum, chi-squared, and Fisher Exact tests.

Results Ninety-seven infants in the PDF period were compared with 134 in the IDF period (**Table 1**). Infants born at <28 weeks GA were larger in the IDF period (p=0.04). There was no difference in GA at birth or sex in the two periods. There were more infants with moderate or severe BPD in the IDF period (p=0.03) in infants born at 28-32 weeks GA, but there were no differences in the incidences of severe IVH, PDA, or NEC

Infants born <28 weeks GA fed by IDF achieved full oral feedings earlier (p=0.013) and were discharged earlier than infants fed by PDF (p=0.01) (**Table 2**). However, infants born at 28-32 weeks GA fed by IDF achieved full oral feeds later (p=0.028) and were discharged later (p=0.004) than infants fed by PDF. Multivariate analysis showed moderate/severe BPD affected the time to full oral feeds, total LOS, and age at discharge (p<0.0001). Adjusting for BPD, IDF was still associated with earlier time to full oral feeds (p=0.006) and discharge (p=0.003) in infants born at <28 weeks, but there was no difference in outcomes between IDF and PDF in infants born at 28-32 weeks.

Conclusion(s) When compared to PDF, IDF was associated with earlier achievement of full oral feeds and age of discharge in infants born at <28 weeks GA, even after adjusting for BPD. However, IDF was associated with later achievement of full oral feeds and later discharge in infants born between 28-32 weeks GA, although there was no difference in outcomes between IDF and PDF after adjusting for BPD. Moderate/severe BPD had a significant effect on time to achievement of full oral feeds and age at discharge.

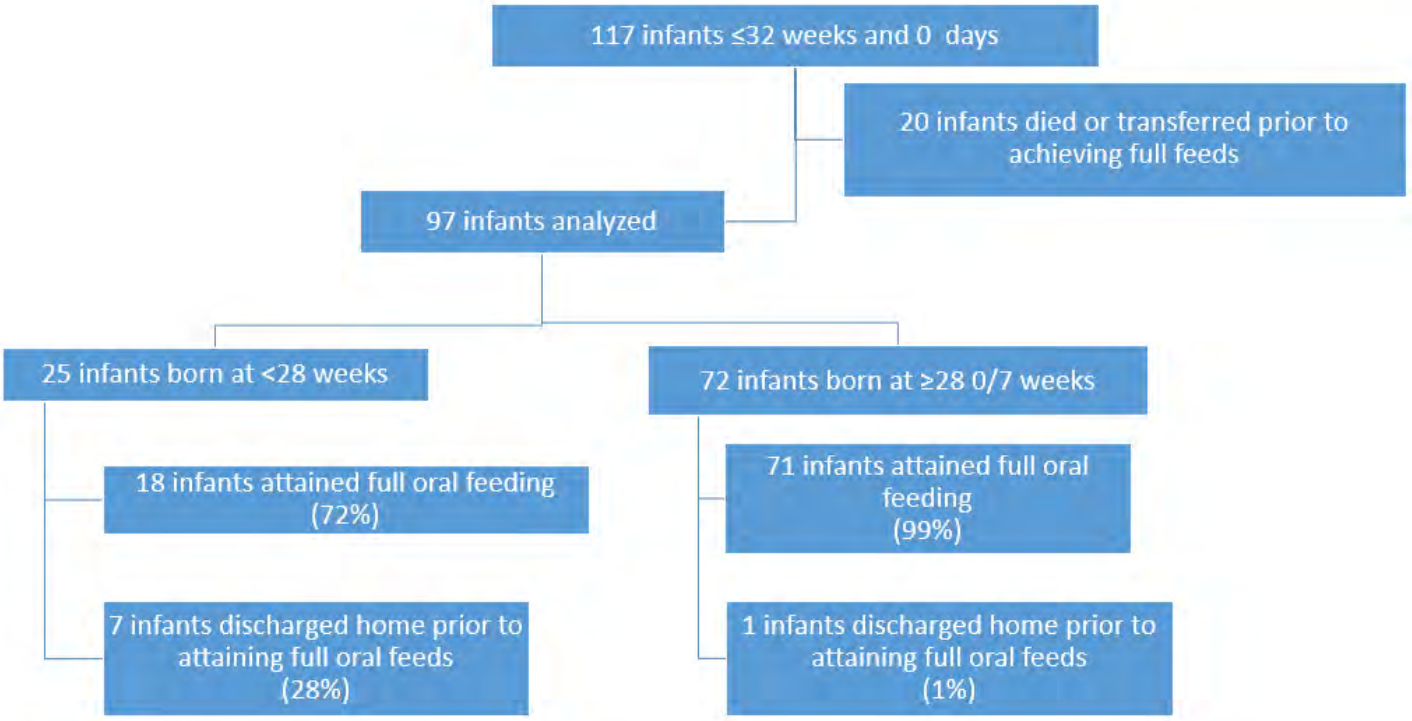

Fig 1 PDF algorithm

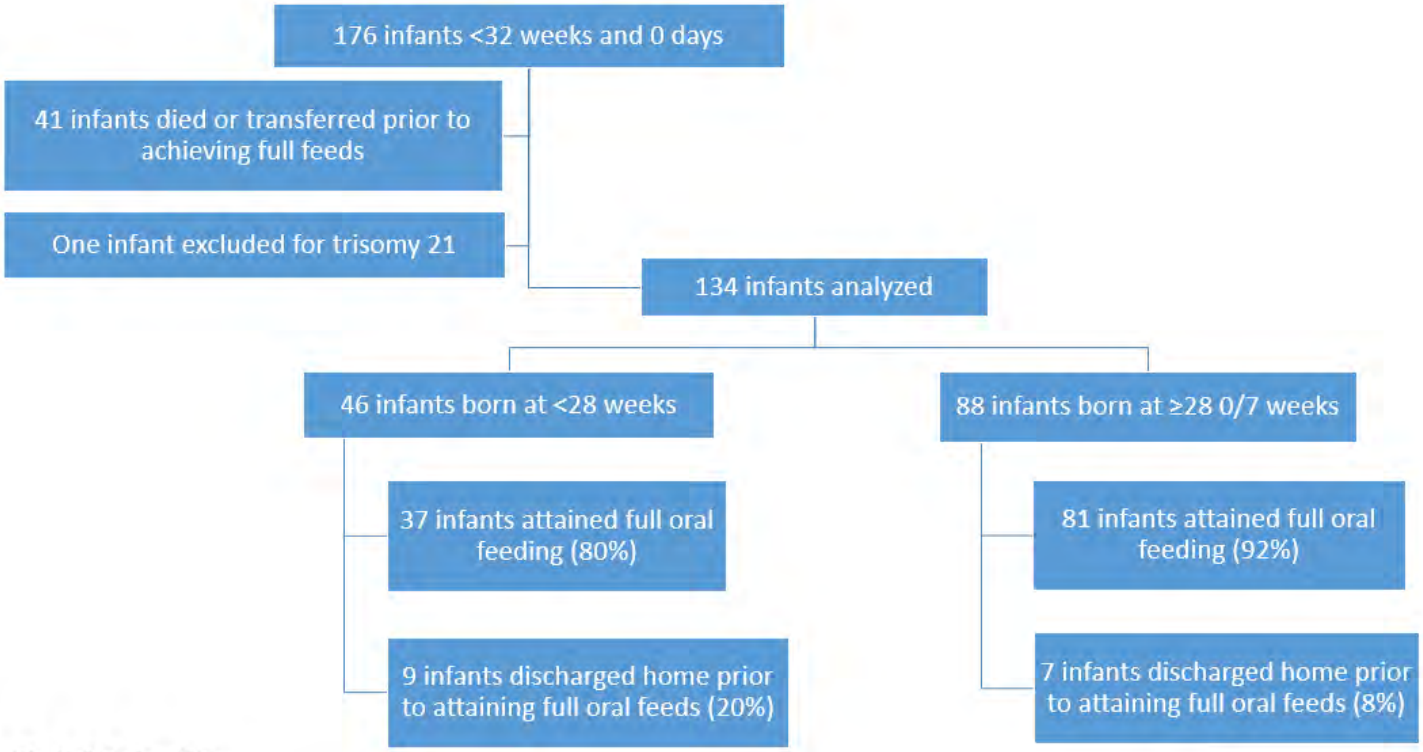

Fig 2 IDF algorithm

	<28 weeks GA		28-32 weeks GA	
	PDF (n=25)	IDF (n=46)	PDF (n=72)	IDF (n=88)
GA in weeks at birth	25.4 ± 1.4	26.0 ± 1.2	30.6 ± 1.2	30.3 ± 1.3
Birth weight, g	766 ± 182*	864 ± 193*	1486 ± 324	1420 ± 349
Male sex, n(%)	14 (56)	25 (54.3)	38 (52.8)	47 (53.4)
IVH, grade 3 or 4, n(%)	4 (16)	3 (6.5)	1 (1.4)	1(1.1)
NEC grade 2 or 3, n(%)	1 (4)	0	0	1 (1.1)
PDA treated medically or surgically, n(%)	17 (68)	21 (45.7)	3 (4.2)	6 (6.8)
BPD, moderate or severe, n(%)	13 (42)	15 (32.6)	2 (2.8)	10 (11.4)

Table 1. Demographics of study population
*p-value <0.05

	<28 weeks GA		28-32 weeks GA	
	PDF (n=25)	IDF (n=46)	(PDF (n=72)	IDF (n=88)
cGA in weeks at initiation of breast feeding	35.5 ± 1.7*	34.2 ± 2.0*	33.5 ± 1.1*	33.9 ± 1.2*
cGA in weeks at initiation of bottle feeding	35.3 ± 1.3	35.5 ± 2.4	33.7 ± 0.9*	34.3 ± 1.4*
cGA in weeks at achievement of full oral feeding	39.3 ± 2.9*	37.5 ± 1.8*	36.2 ± 2.0*	36.6 ± 1.7*
Length of stay in weeks	16.6 ± 4.8*	14.1 ± 4.0*	6.5 ± 2.5*	7.8 ± 3.1*
cGA in weeks at discharge	41.9 ± 3.8*	39.9 ± 3.4*	37.0 ± 2.1*	37.9 ± 2.5*
cGA in weeks at discharge of infants who attained full nipple feeds	40.5 ± 2.6*	38.6 ± 1.9*	36.9 ± 2.0*	37.4 ± 1.8*
Number of infants who attained full nipple feeds (%)	18 (72)	37 (80)	71 (99)	81 (92)
cGA in weeks at discharge of infants who were discharged with NG/GT feeding	45.6 ± 4.1	45.3 ± 2.7	42.3	43.9 ± 2.4

Table 2. Outcomes of study population.
cGA corrected gestation age
*p-value <0.05

Abstract: 135

Lactation Bundle and Breastfeeding Rates in Mother's of Extremely Low Birth Weight Infants (ELBW) in a Regional Perinatal Center (RPC).

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Background ELBW mothers face great barriers to breastfeeding (BF) due to biological, sociodemographic, and healthcare related factors, such as health complications, delayed normal physiologic adaptations, physical separation, and inadequate support by family and medical providers. An exclusive human milk (HM) diet with mother's own milk (MOM) and pasteurized donor human milk (PDHM) for all premature infants is recommended to improve outcomes. In 2016, we implemented a comprehensive lactation bundle ("Liquid Gold" (LG)). Our bundle consists of ante- and postnatal lactation counseling, skin to skin care, staff education, colostrum oral care, PDHM and HM fortifier. The newest interventions were lactation consultants (LC) in L&D and postpartum, Spanish-speaking LC, HM cream, and preterm PDHM from our milk bank.
Objective To assess the ongoing effects of the LG bundle and the additional interventions on BF rates in our RPC.
Design/Methods Quality improvement BF project of ELBW mother-infant dyads with gestational age ≥23 weeks at our RPC between Jan 2015 and Apr 2019 in four epochs: Baseline (B; Jan 2012- July 2013), Transition (T: provision of HM derived fortifier; Aug 2013 – Dec 2014), Liquid Gold (LG; full bundle; Jan 2015 – Feb 2016), and Now (N; March 2016 – April 2019). Rates of initiation of BF and exclusive MOM diet at discharge were assessed by race. χ^2, t-test and ANOVA were used with significance of $p < 0.05$.
Results 423 mother-infant dyads were assessed - 102 in B, 84 in T, 75 in LG, and 162 in N epochs. The maternal and neonatal

characteristic were similar over time [Tables 1,2]. Survival to discharge improved significantly since LG [Table 2]. Between LG and N, the use of HM at first feed increased significantly [93% vs 100%, p <0.0001). The rate of exclusive BF at discharge was sustained overall. Although, African American (AA) mothers did not sustain their initiation BF rates (78% in LG vs 30% in N), their rates of exclusive formula use declined (68% in LG vs 46% in N, p< 0.0001) [Graph1]. Spanish speaking LC did not improve BF rates in Hispanic mothers. BF rates in white mothers remained the same [Graph 1].

Conclusion(s) Our lactation bundle worked in supporting mothers of ELBW infants, and in particular AA mothers, to achieve BF rates similar to full term infants at 3 months. BF goals and support need to be tailored for each mother with consideration of racial and ethnic background. Such an approach may alleviate the biological limitations imposed by premature birth.

Table 1. Maternal demographics of study population

	B (N=102)	T (N=84)	LG (N=75)	Now (N=164)	p value
Maternal age (yrs) (mean±SD)	31±6	30±6	30±6	30±6	.910
Black %	31	36	36	24	
White %	34	32	29	40	
Hispanic %	26	25	23	22	
Other %	9	7	12	13	

Table 2. Neonatal characteristics of study population

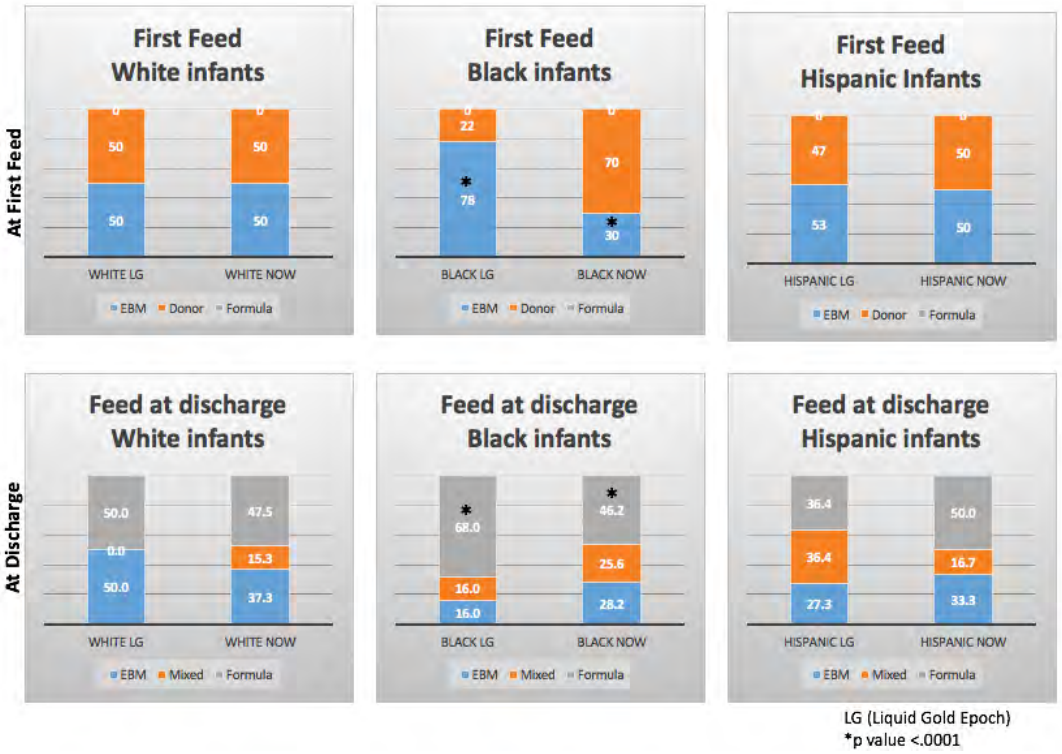
	B (N=102)	T (N=84)	LG (N=75)	Now (N=164)	p value
GA (wk) (mean±SD)	26±2	26±2	25±1	26±2	.281
BW (g) (mean±SD)	759±139	751±161	747±179	746±149	.929
5min APGAR <3 (%)	9%	12%	17%	15%	
SGA (%)	11%	12%	14.60%	14%	.828
Male (%)	46%	44%	51%	52%	.624
Inborn (%)	84%	82%	87%	82%	
Survived to DC (%)	83%	85%	88%	96%	.0001
PMA at DC [wks] (mean±sd)	38±6	39±7	39±4	41±6	

Table 3. Breastfeeding outcomes

Variable	B (N=102)	T (N=84)	LG (N=75)	R (N=162)
*HM First (%)	39%	46%	93%	100%
HM Full Feed (%)	36%	35%	96%	100%
Exclusive MOM at DC (%)	18%	13%	29%	30%

HM – human milk; MOM or PDHM
MOM – mother's own milk
PDHM – pasteurized donor human milk
*p value <.0001

Graph 1.
Breastfeeding Rates by Race



Abstract: 136

Point-of-Care Ultrasound Education in a Neonatal-Perinatal Medicine Fellowship

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Background Point-of-care ultrasound (POCUS) is a promising diagnostic and procedural aid. Absent formalized curricula and insufficient time, personnel, and equipment are barriers to consistent POCUS training in pediatric subspecialty fellowships. Over the past three years, the Children's Hospital of Philadelphia (CHOP) Neonatal-perinatal Medicine (NPM) Fellowship program created a bedside ultrasound curriculum to train providers in diagnostic and procedural uses of POCUS.
Objective To describe a novel neonatal-perinatal fellowship POCUS training curriculum and to characterize current use and interest in this program across fellowship class years.
Design/Methods In 2017, The CHOP NPM Fellowship Program began a formalized curriculum that starts midway through the first year with the completion of CHOP's Neonatology and Critical Care Medicine Bedside Ultrasound Course. This is then followed by monthly two-hour long didactic and hands-on sessions. In the second and third years, fellows complete self-directed studies reviewed weekly by three ultrasound-trained faculty, and have the opportunity for monthly hour-long review with these faculty (Figure 1). To examine the current use of ultrasound, a brief, seven-item survey assessing fellow use, competence, and interest was completed by the CHOP NPM fellows in the fall of 2019 (immediately following the first-years' completion of the ultrasound course, but before beginning the didactic curriculum).
Results A total of 18 (100%) of the current NPM fellows completed the survey; 12 responded after the curriculum and 6 responded before curriculum completion. The majority of fellows used POCUS for guiding (14/18, 78%) and assessing vascular access position (13/18, 72%). Use for access increased over the years of fellowship (Figure 2). While fellows perceived competency in a variety of skills, guiding vascular access (11/18, 61%) was the skill for which they endorsed the highest competence (Figure 3). There was widespread interest in gaining diagnostic and procedural competence (Figure 4). In addition, four fellows have taken a specialized neonatal echocardiography course and two fellows have acted as instructors at the multidisciplinary CHOP Bedside Ultrasound Course. Future directions include introduction of high-fidelity simulators.
Conclusion(s) A formalized ultrasound curriculum for fellows was successfully implemented and resulted in the highest perceived competency for vascular access skills. This structure could be generalized to other programs at large, academic centers.

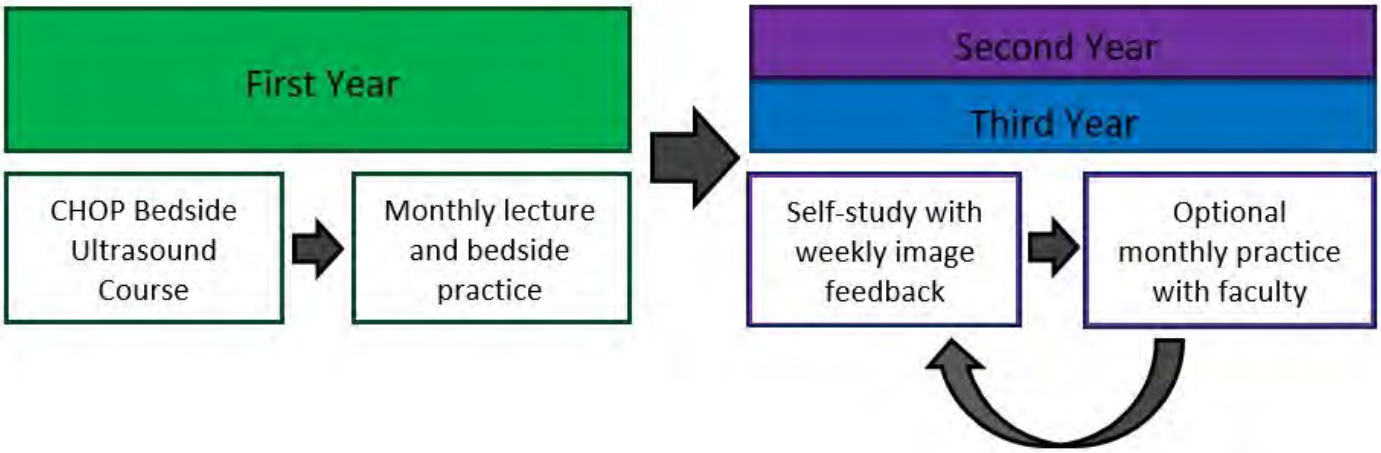

Figure 1. Schematic diagram of fellowship curriculum structure.

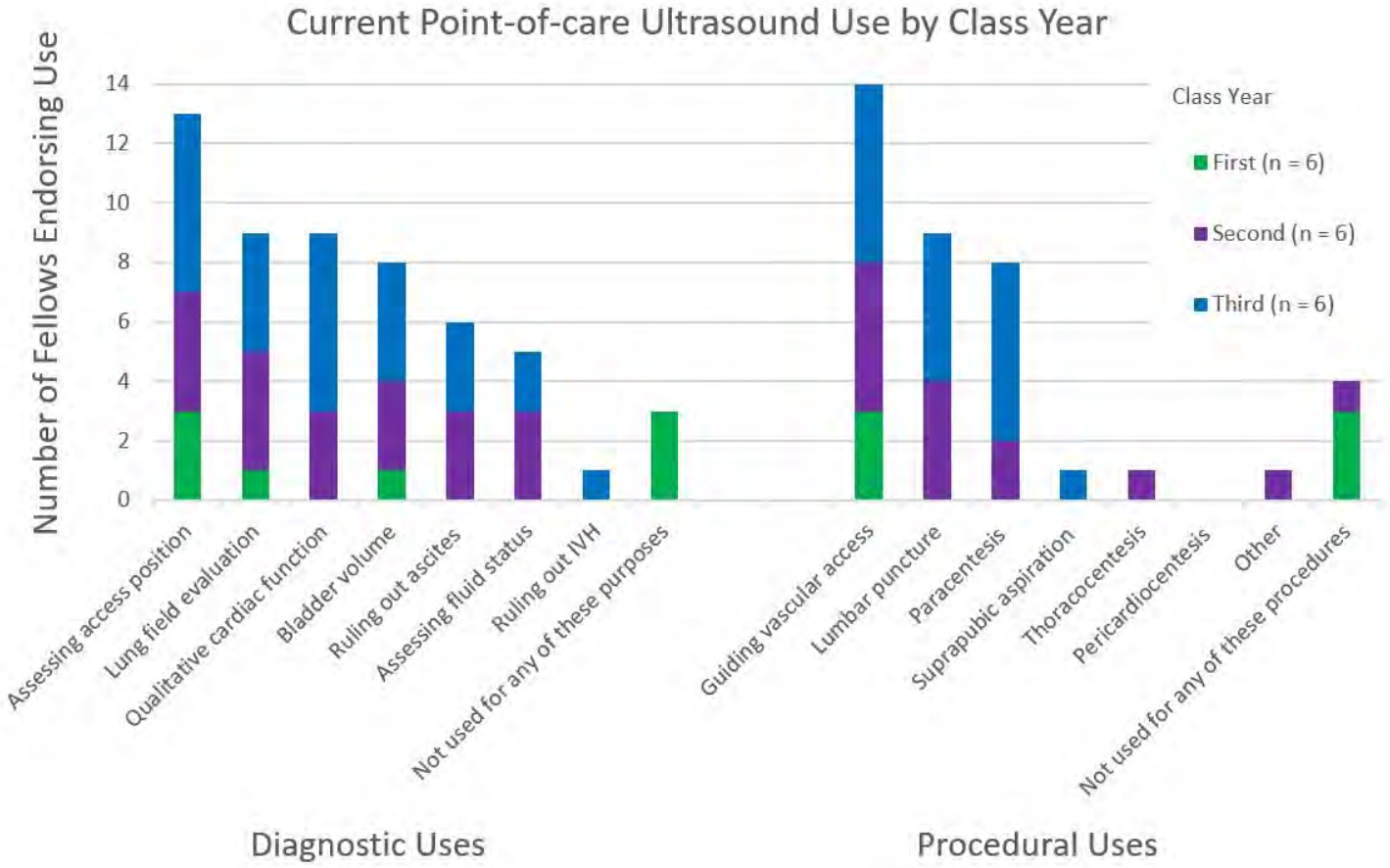

Figure 2. Fellow responses to survey questions asking about current diagnostic and procedural uses of ultrasound by class year.

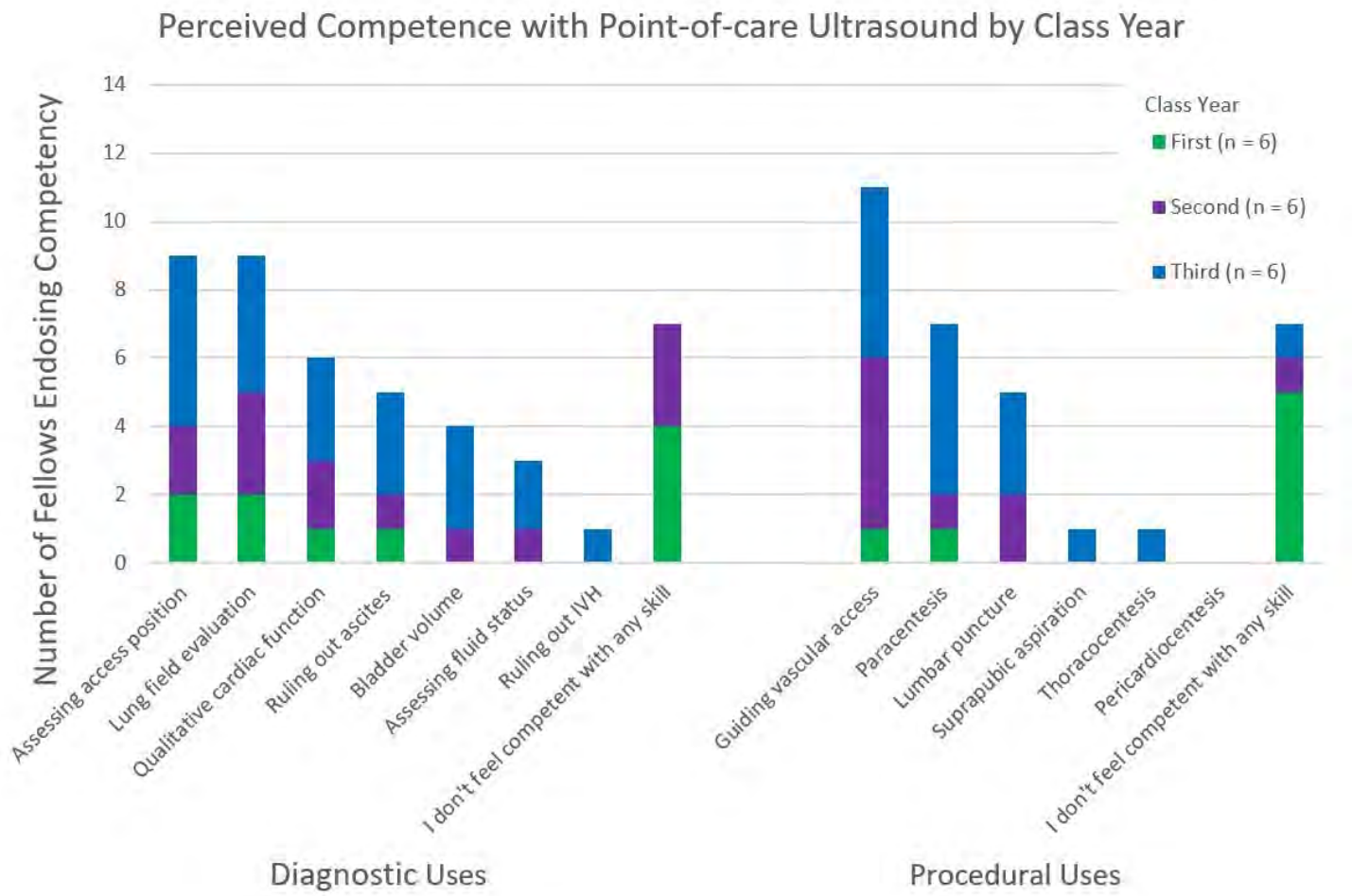

Figure 3. Fellow responses to survey questions asking about perceptions of competence in diagnostic and procedural uses of ultrasound by class year.

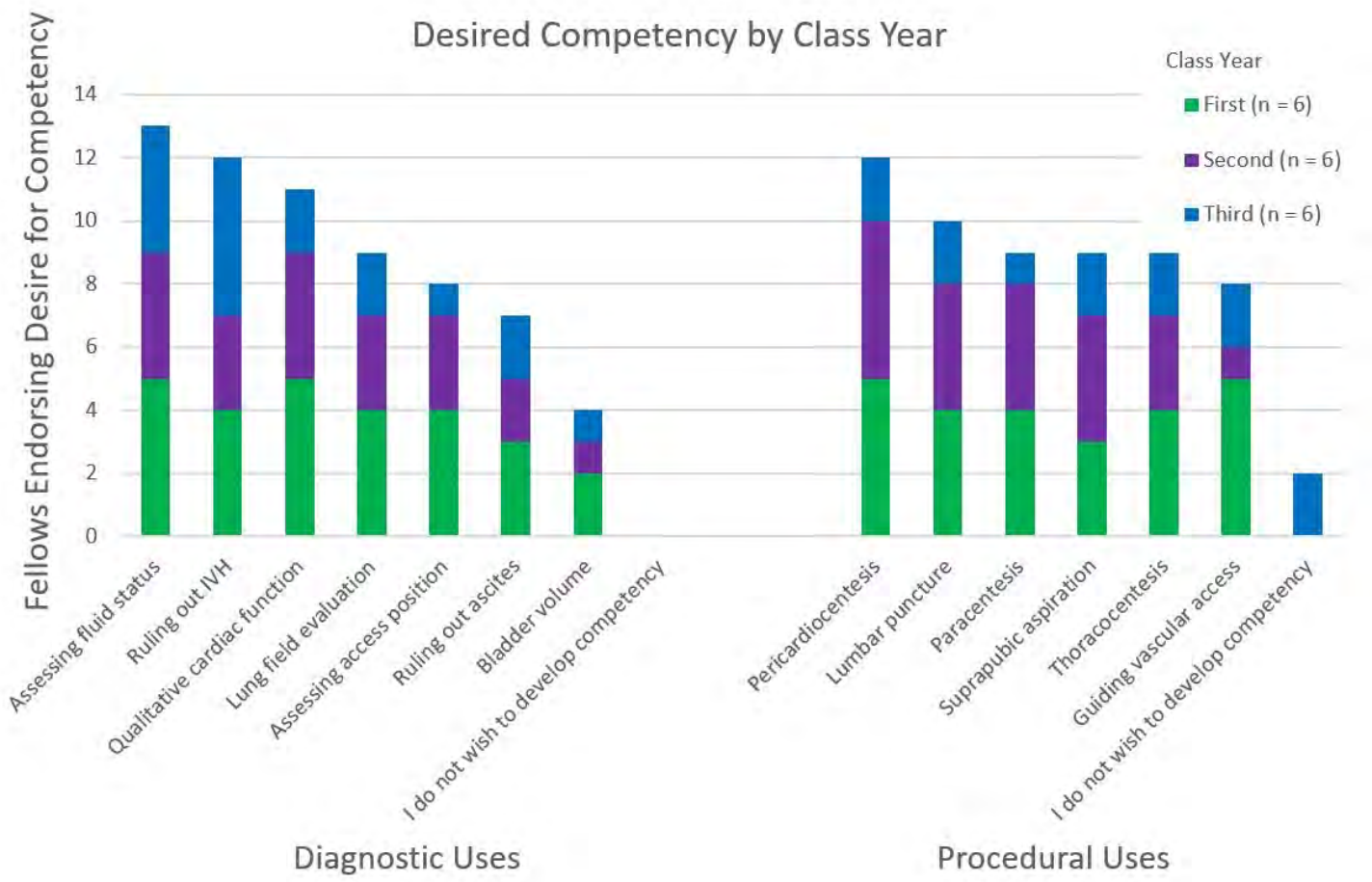

Figure 4. Fellow responses to survey questions asking about desire to gain competency in skills where they do not perceive current competency.

Abstract: 137

Implementation of a Neonatal Quality Improvement Simulation Program for Pediatric Residents

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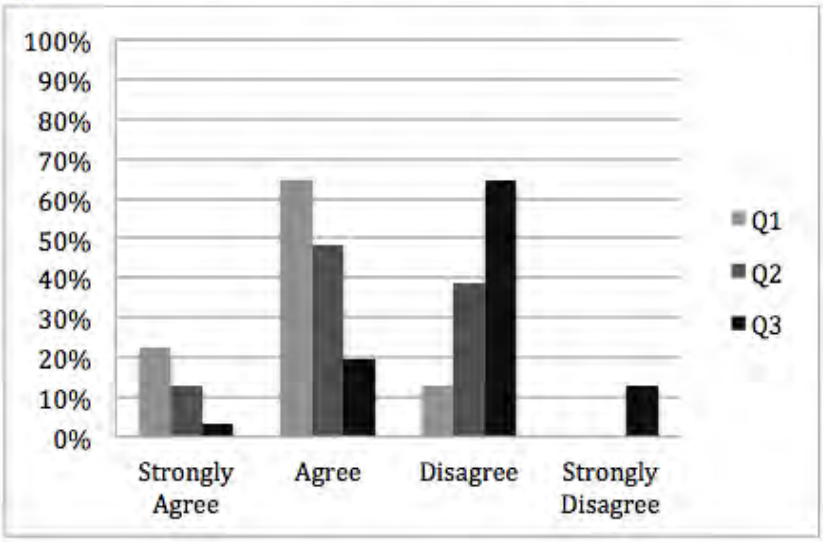
Background Simulation-Based Medical Education is important in curriculum development and training in order to promote teaching and learning for trainees. At Connecticut Children's, simulation training is incorporated into the inpatient curriculum for pediatric residents with the exception of the neonatal intensive care unit (NICU). By implementing delivery room (DR) simulations during their NICU rotation, we hope to improve residents' confidence in neonatal resuscitation skills.
Objective From November 2018 to December 2019, we aimed to improve pediatric resident confidence as assessed by serial surveys by 40% and improve Neonatal Resuscitation Program (NRP) skill proficiency measured by the number of correctly performed NRP steps by 25%.
Design/Methods Residents completed an anonymous survey before and after their NICU rotation asking the following: I am confident in my ability to 1) perform bag mask ventilation, 2) participate in neonatal mock codes (NMCs), and 3) be team leader during NMCs. We implemented twice monthly DR simulations using standardized cases. Three PDSA cycles were completed. To begin cycle 1, DR simulations were implemented using laminated cards to present clinical information. A digital app was used in cycle 2 to present vital signs. The 2016 NRP algorithm card was provided at the beginning of cycle 3 as a tool for residents to reference. Proficiency was assessed by counting the number of correctly performed NRP steps and time to initiate positive pressure ventilation (PPV).
Results A total of 31 residents (17 PL-1 and 14 PL-2) participated in the project. Residents' confidence in ability to participate in NMCs increased by 17% and 18% and confidence in ability to lead NMCs increased by 27% and 20% for PL-1 and PL-2, respectively. Overall, residents reported increased confidence in neonatal resuscitation skills when comparing pre and post-survey results (Figure 1). There was no difference in number of correctly performed NRP steps. There was improvement in time to correctly initiate PPV. Mean time to initiate PPV during the first simulation was 99±36.7s and 65.5±46.3s during the second simulation, giving

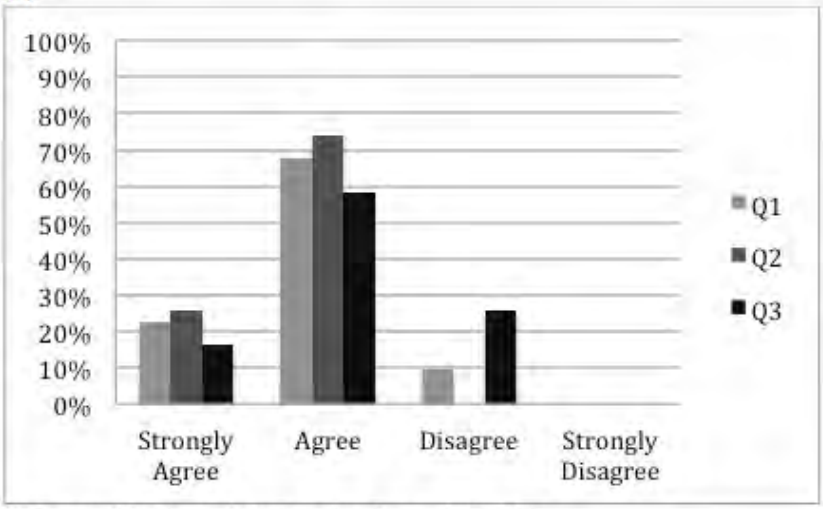
an average decrease in time to initiate PPV of 33.5±44s, ($p<0.01$) between first and second simulation experiences (Figure 2).
Conclusion(s) DR simulations increase resident confidence in ability to participate in and lead NMCs. Simulation may increase residents' proficiency in NRP skills demonstrated by improvement in time to initiate PPV.

Figure 1. Pediatric Resident Survey Responses Regarding Confidence Participating in Neonatal Mock Codes. A. Pre-Rotation Responses B. Post-Rotation Responses

A.

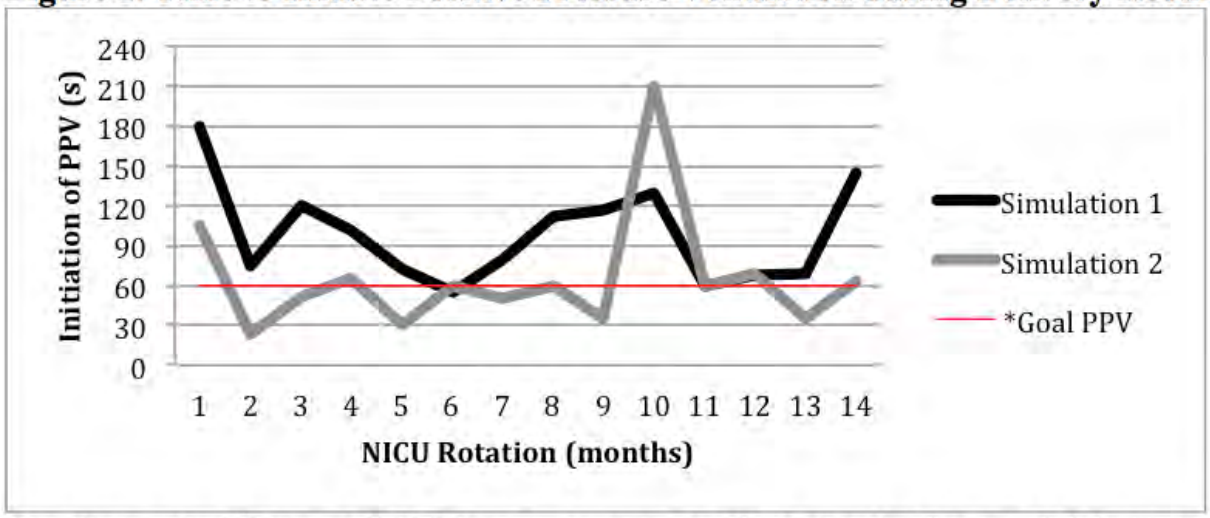


B.



Q1 I am confident in my ability to perform bag mask ventilation
Q2 I am confident in my ability to participate in neonatal mock codes
Q3 I am confident in my ability to be team leader during neonatal mock codes

Figure 2. Time to Initiate Positive Pressure Ventilation during Delivery Room Simulations



*Goal time to initiate PPV based on 2016 NRP algorithm recommending PPV be initiated by 60 seconds of life for infants meeting criteria

Abstract: 139

Improving Resident Code Choreography Using High-Fidelity Simulation in the Setting of Pediatric Advanced Life Support Training

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Background Simulation-based resuscitation programs have shown to increase resident confidence and improve outcomes in pediatric cardiopulmonary arrests (CPAs); however, less evidence exists on its use in teaching code choreography to prioritize interventions and communicate clearly within Pediatric Advanced Life Support (PALS) courses.
Objective To determine if additional instruction in specific code choreography and action-linked phrases (ALPs) during initial PALS certification courses is associated with improved skill acquisition and retention when compared to residents taking the traditional course. Secondary aims include assessing resident confidence and medical knowledge in pediatric resuscitation.
Design/Methods First-year pediatric and emergency medicine residents completing the PALS course in summer 2019 participated in this prospective, randomized, pilot study. During the course, intervention groups were given a brief additional didactic session introducing specific code choreography and ALP techniques. Participants completed pre-/post-tests evaluating medical knowledge and a self-assessment regarding perception of one's confidence during codes and effectiveness of the training. PALS testing scenarios used high-fidelity simulation and were recorded for review by blinded faculty. Resident groups were re-evaluated using similar assessment tools and recorded simulation scenario at 6 weeks and 3 months. Comparative tests for data analysis included independent t-test and ANCOVA.
Results 20 pediatric and 14 emergency medicine interns participated. Resuscitation medical knowledge increased in all residents upon completion of the course (P=0.005). However, this was not sustained at 6 weeks or 3 months, as demonstrated in prior studies. Confidence assessment was similar between groups. Videos revealed shorter time to certain critical steps by the pediatric intervention groups. Mean time to start of compressions in pediatric control and intervention groups was 55 seconds and 32 seconds, respectively, though not statistically significant (P=0.168, Fig. 1). Mean time to administration of first dose of cardiac arrest reversal agent was significantly shorter among pediatric intervention groups at 107 seconds, compared with the control groups at 183 seconds (P=0.025, Fig. 2).
Conclusion(s) PALS training courses represent a unique opportunity to incorporate high-fidelity simulation to teach residents choreography and communication skills for the management of pediatric cardiopulmonary arrests.

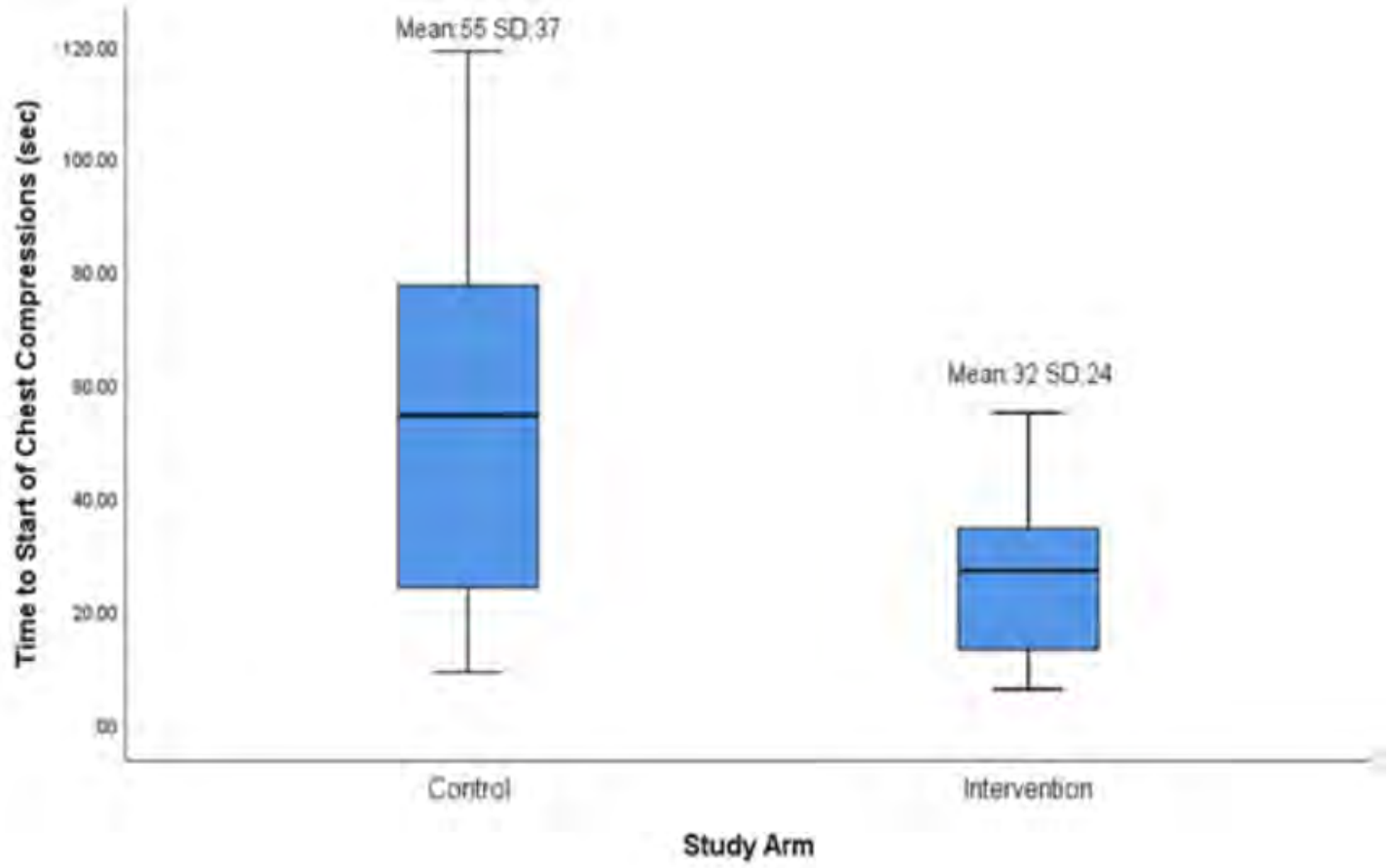

Figure 1: The time (in seconds) to when the pediatric residents started compressions after recognition of no pulse during the initial PALS certification course.

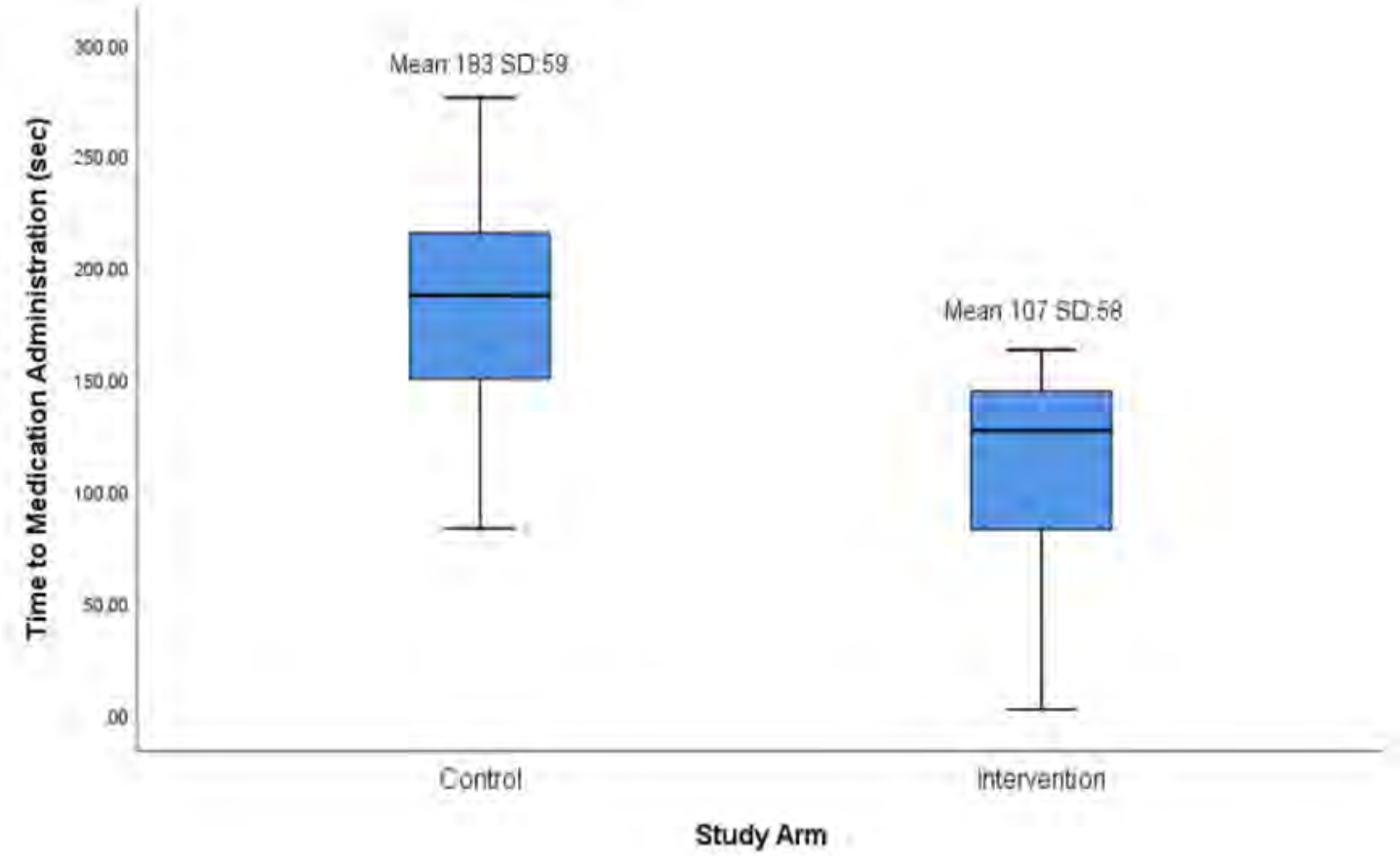

Figure 2: Time (in seconds) to when the pediatric residents administered the first dose of a cardiac arrest reversal medication (such as epinephrine) during the initial PALS certification course.

Abstract: 140

Pediatric Residents' Perspectives of CenteringParenting Group Well Child Visits

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Background CenteringParenting^{R} is an innovative model of group well child visits. A growing number of pediatric centers provide group well child visits. Little is known about pediatric residents' experience with and perspectives of this model.
Objective To explore pediatric residents' perspectives of CenteringParenting^{R} as compared to individual well baby visits.
Design/Methods In 12/2014, we initiated CenteringParenting^{R} at our pediatric clinic in an academic medical center serving an urban low-income minority community. All pediatric residents receive initial and on-going training on the model and facilitated group discussions. By the start of their second year, each resident is assigned a cohort of 6-8 newborns for their group well visits. In 11/2016 and 11/2019, two non-overlapping cohorts of residents were invited to participate in an anonymous online survey. Questions asked included preparedness as facilitator, continuity of care, quality of medical care and anticipatory guidance, learning value, and rating of overall experience for group vs individual well baby care. Responses were on a 5-point Likert scale.
Results In 2016, resident response rate was 82% (28/34) and the 2019 response rate was 90% (27/30). At the time of the surveys, 71% of the 2016 residents had participated in 6 or more Centering sessions vs 56% of 2019 residents. Over 90% of residents felt comfortable facilitating groups. Half (50%) of 2016 residents vs 80% of 2019 residents felt more enjoyment and satisfaction providing care in group than in individual well visits (p=0.014). 85% of 2016 residents and 90% of 2019 residents felt continuity of care and provision of anticipatory guidance was better in group vs individual care (p=NS). 75% of 2016 residents and 93% of 2019 residents felt group care was the same or better as a learning experience for residents (p=NS). 65% of 2016 residents and 89% of 2019 residents agreed Centering was a model that provided benefit to patients and families and should be continued in primary care settings (p=0.049).
Conclusion(s) Pediatric residents perceive group well child visits provide better continuity of care and anticipatory guidance for families than individual well child visits and are a positive learning experience for residents. Our experience shows

CenteringParenting^{R} group well child visits is an innovative primary care model with high educational value that can be sustainably implemented in a pediatric residency program.

Abstract: 141

Does rapid cycle deliberate practice during simulated emergencies improve perceived competency in pediatric residents?

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Background Resuscitation during pediatric code events is a rare but important clinical experience during resident training. Simulation may be utilized as both a training and assessment tool in medical education to teach skills such as resuscitation, procedures, and team training. Rapid Cycle Deliberate Practice (RCDP) is a simulation-based training method that cycles between deliberate practice and directed feedback until mastery is achieved. Subjective and objective assessments of competencies required by The Accreditation Council for Graduate Medical Education (ACGME) for resident training using RCDP is limited.
Objective The aim of this study was to assess both subjective and objective resuscitation competency in pediatric residents in RCDP when compared with traditional simulation and reflective debriefing (RD).
Design/Methods In this retrospective cohort study of prospectively collected data, pediatric residents participated in simulation code events throughout the academic year. Data collection took place from January 2016 to November 2019. RCDP was implemented into the curriculum in October 2016. Primary outcome measures included subjective assessment of competency, using both a self-assessment tool and the modified Tool for Resuscitation Assessment using Computerized Simulation (TRACS). Statistical analysis included chi-square test for categorical variables and Mann-Whitney U test for continuous variables.
Results A total of 459 surveys were completed by individual residents, representing 58 mock codes. Overall, residents reported agreement with perceived improvement in patient care *(n*=456, 99.6%), medical knowledge *(n*=452, 98.7%), communication skills *(n*=447, 97.2%), systems-based practice *(n*=440, 96.1%), and professionalism *(n*=420, 91.7%). Residents who participated in RCDP sessions reported higher agreement with comfort level *(n*=175, 49.9%, *P*=.04). There was no significant difference in overall objective resuscitation skills between the RCDP and RD group (*P*=.68), although performance variability decreased with RCDP.
Conclusion(s) A simulation-based code blue curriculum may improve pediatric trainees' perceptions of achieving ACGME competencies regardless of RCDP implementation. RCDP pediatric resuscitation training may increase resident comfort level in simulated emergencies, but its impact on objective performance measures is unclear when compared to RD. Further research should focus on the impact of an-RCDP-guided code blue curriculum on patient outcomes.

Table 1: Demographic Characteristics

Characteristic	RD Group *n*=107, (%)	RCDP Group *n*=352, (%)	*P*
Gender, Female	17 (73.9%)	156 (63.2%)	.16
Age (years)			.22
20-29	18 (78.3%)	165 (66.8%)	
30-39	4 (17.4%)	165 (30.5%)	
40+	1 (4.3%)	7 (2.8%)	
Year of Training			.96
PGY-1	41 (38.3%)	139 (39.5%)	
PGY-2+	66 (61.7%)	213 (60.5%)	
Simulation Location			.01
In-Situ	45 (42.1%)	85 (24.2%)	
Simulation Lab	61 (57.0%)	260 (74.1%)	

PGY = postgraduate year

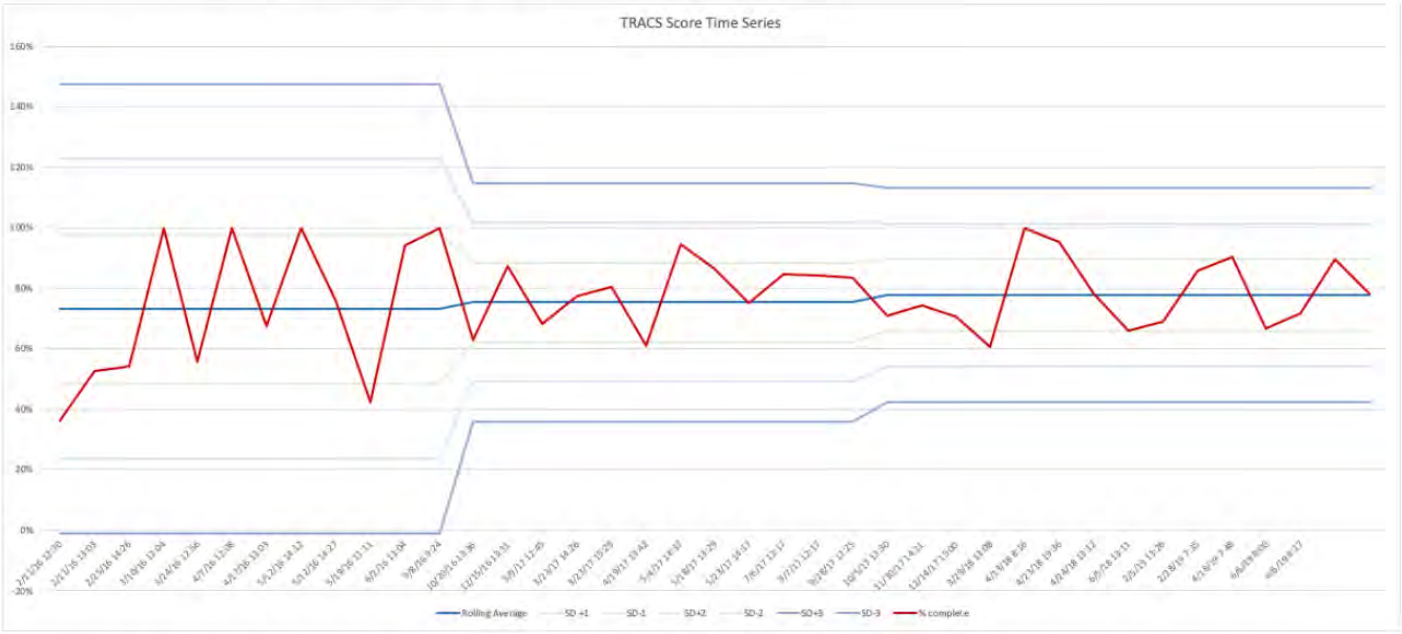
Table 2: Subjective Resident Assessment

Question	RD Group *n*=107, (%)	RCDP Group *n*=352, (%)	*P*
1. The session is a valuable learning experience for my practice (Agree)	106 (100%)	350 (99.4%)	.73
2. The session helped improve my patient care (Agree)	105 (99.1%)	351 (99.7%)	.65
3. The session increased my medical knowledge (Agree)	104 (98.1%)	348 (98.9%)	.80
4. This session improved my interpersonal and communication skills (Agree)	103 (97.2%)	344 (97.7%)	.88
5. This session improved my systems-based practice (Agree)	100 (94.3%)	340 (96.6%)	.51
6. This session improved my professionalism (Agree)	95 (89.6%)	420 (91.7%)	.52
7. I feel comfortable in a pediatric code (Agree)	44 (41.5%)	175 (49.9%)	.04
8. Simulation sessions in holding difficult conversations would be helpful (Agree)	78 (75.7%)	268 (76.1%)	.23
9. More simulation sessions with a multidisciplinary team (i.e. Pediatric Emergency Medicine, Trauma team) would be helpful (Agree)	100 (97.1%)	331 (94.0%)	.44

Table 3: TRACS Competency

Competency Components	% Completion in RD Group (Median, Interquartile Range)	% Completion in RCDP Group, 1st Attempt (Median, Interquartile Range)	*P*
Basics	88% (0-100)	75% (3-100)	.13
Breathing	100% (64-100)	73% (50-100)	.01
Circulation	59% (19-100)	83% (50-100)	.20
Teamwork	100% (100)	80% (40-100)	.04
Overall	66% (44-100)	73% (61-82)	.68

Table 4: TRACS Time Series Analysis on In-Situ Simulations



Abstract: 142

Chest Compressions for Neonatal Bradycardia Does not Enhance Flow to Vital Organs but Reduces Inherent Cardiac Activity

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Background Circulatory failure in neonates is often secondary to asphyxia. Ventilation (PPV) during neonatal resuscitation, improves gas exchange, enhances cerebral, pulmonary and cardiac blood flow. Chest compressions (CC) are indicated in neonatal bradycardia (heart rate-HR<60 bpm) after 30 sec of effective PPV. The effect of CC asynchronous with the patient's own cardiac activity on perfusion to vital organs is not known.
Objective In an ovine model of perinatal asphyxia, we compared the effect of CC during bradycardia (HR<60 but >0 bpm) and complete cardiac arrest (HR=0) on coronary, cerebral and pulmonary hemodynamics. We hypothesized that the coronary, carotid and pulmonary blood flows will be higher when CC is initiated during bradycardia compared to after complete cardiac and circulatory arrest.
Design/Methods Near-term fetal lambs were asphyxiated by umbilical cord occlusion until they were a) persistently bradycardic (HR<60 bpm) or b) until complete arrest. The resuscitation was initiated with PPV, followed by CC and intravenous epinephrine (EPI) until the return of spontaneous circulation (ROSC) or until 20 min. In the bradycardia model, the resuscitation was initiated

immediately after target HR <60bpm was achieved. While in the cardiac arrest model, resuscitation was initiated after 2 min of no detectable HR to ensure complete circulatory arrest.
Results Six out of the 7 lambs with cardiac arrest and 5 out of 6 lambs with bradycardia achieved ROSC (fig 1). The time to ROSC was significantly longer with cardiac arrest (fig 1). The changes in flow during resuscitation are shown in fig 2. Compared to PPV alone, CC did not enhance coronary, carotid or cerebral flow in the bradycardia model. Blood flows achieved during CC were similar between the two models (fig 3). In the bradycardia model, we observed a loss of innate cardiac activity during CC in 5/6 lambs (fig 4). Epinephrine use was similar in both models.
Conclusion(s) Chest compressions increased flow to vital organs in complete circulatory arrest but time to ROSC was longer compared to bradycardia. There was no difference in hemodynamics during CC in both models. The initiation of CC during bradycardia did not enhance flow to vital organs but led to the loss of innate activity before recovery. More translational studies are needed to study the optimal cut-off (HRs of 60 vs. 30) for initiation of CC and its effect on the cerebral and cardiac injury during resuscitation in a bradycardia model of perinatal asphyxia.

Table 1 – Characteristics of cardiac arrest and bradycardia model

Characteristics	Cardiac arrest model (N=7)	Bradycardia model (N=6)
Gestational age (days)	141±1	140±2
Female (N)	4	3
Birth weight (kg)	4.4±1.8	3.1±1.2
Born by multiplicity (N)	Twins -3, Trip - 1	Twins -3, Trip-1
Target heart rate before resuscitation (bpm)	0	63±8
Time to target HR & initiation of resuscitation (min)	15±5	9±2*
pH before resuscitation	6.79±0.04	6.85±0.04*
$PaCO_2$ before resuscitation (mmHg)	135±13	127±21
PaO_2 before resuscitation (mm Hg)	14±9	24±10
Lactate before resuscitation	14±2	11±2*
Number of lambs that received Epi (N)	7	4
Number of Epi doses (N)	1 dose (N-5) 2 doses (N-1) 4 doses (N-1)	1 dose (N-3) 4 doses (N-1)
Achieved ROSC (HR≥100 bpm) (N)	6	5
Time to ROSC (min)	7.8±1.3	3.5±1.7*
Loss of perfusing rhythm after CC (N)	NA	4

* $p<0.05$ denotes statistical significance. HR - heart rate, bpm - beats per minute. Data presented as numbers or as average and standard deviation.

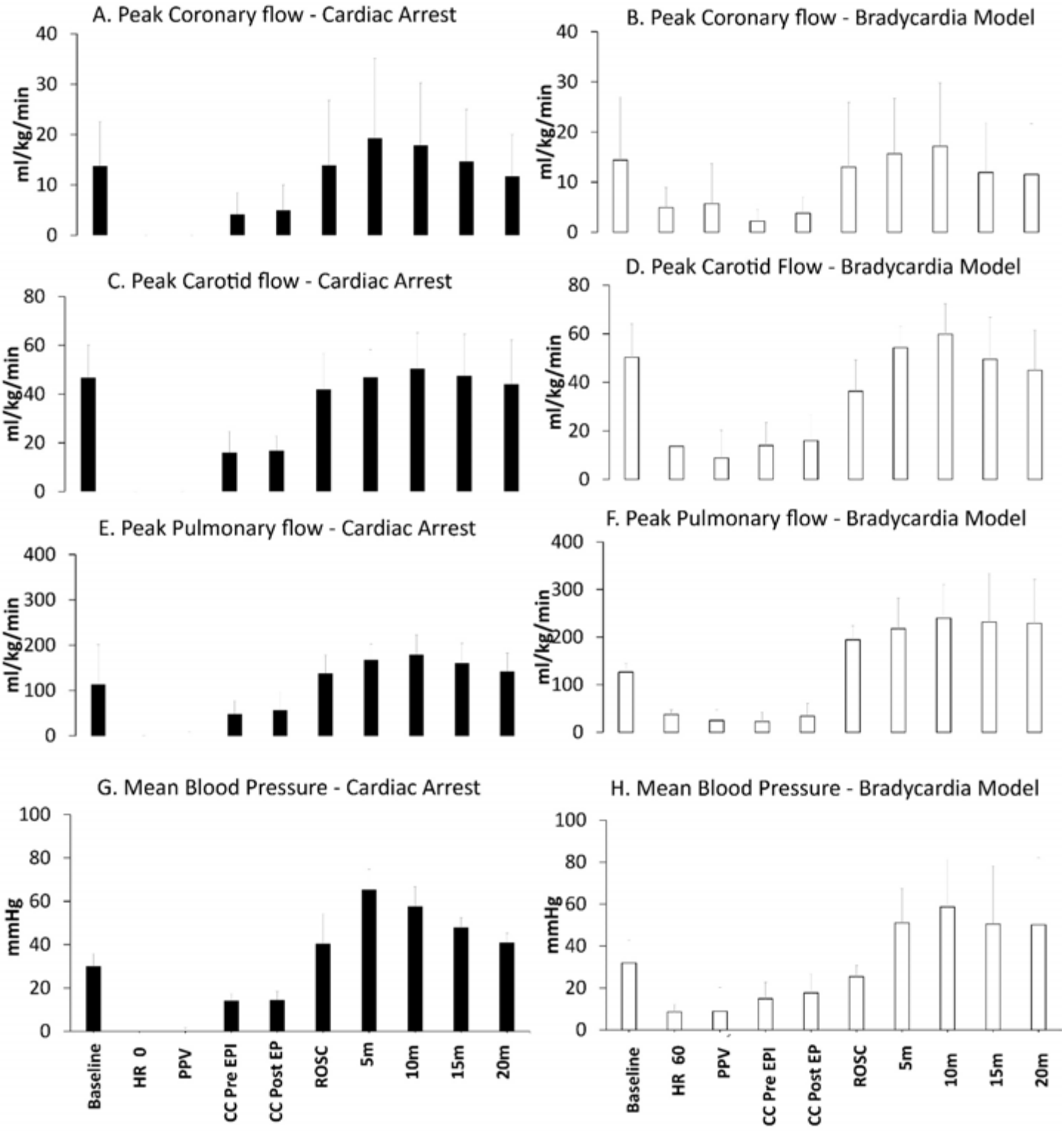

Figure 2: The peak coronary, carotid, pulmonary flows and mean blood pressure are shown before, during & after resuscitation in both models. Once chest compressions were initiated, the flows were not different between the models.

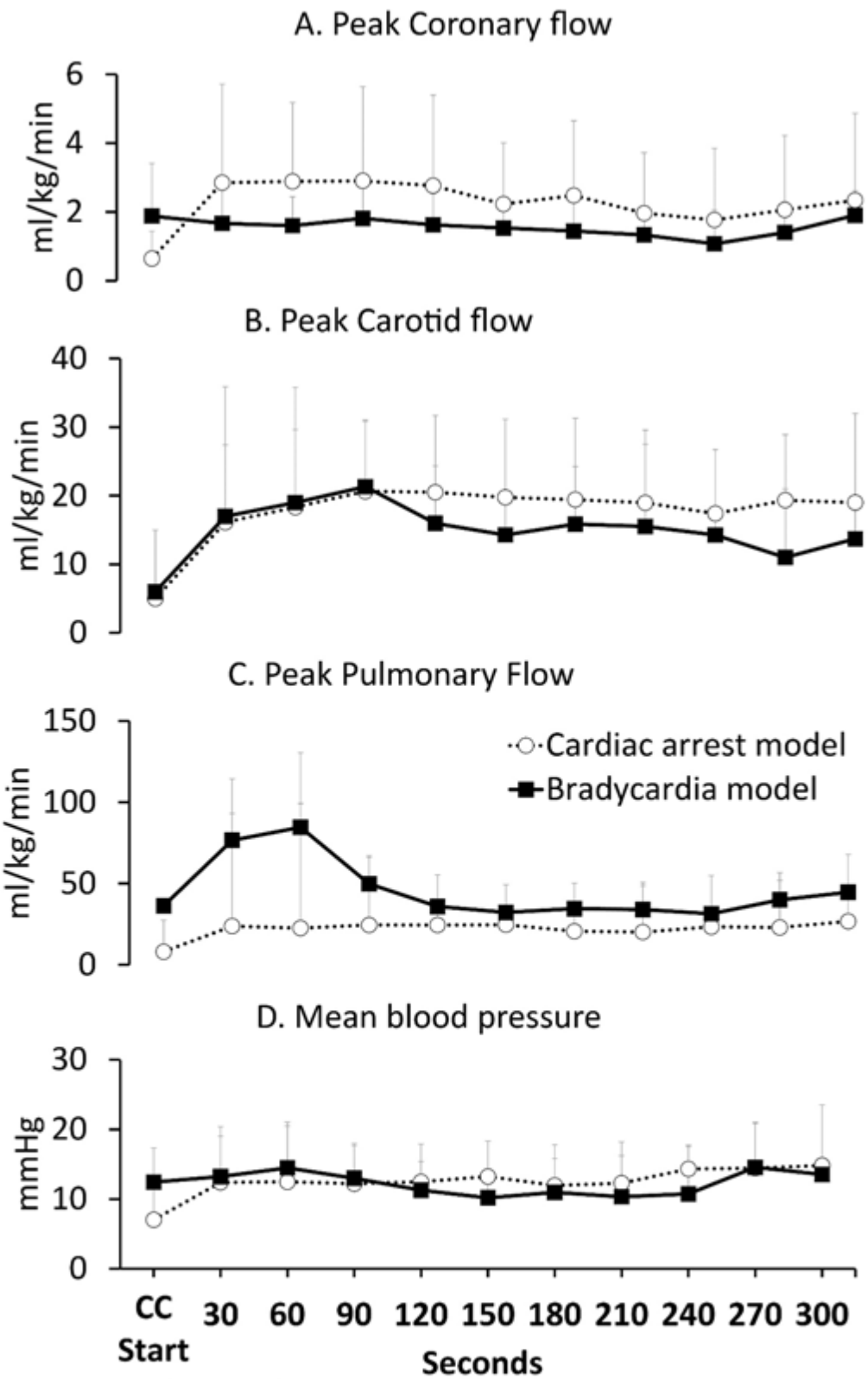

Figure 3: The peak coronary, carotid, pulmonary flows & mean blood pressure are shown during the chest compressions (CC) alone. Coronary, carotid & pulmonary flows trended lower from initial values in bradycardia model. The flows & pressures were not different between models.

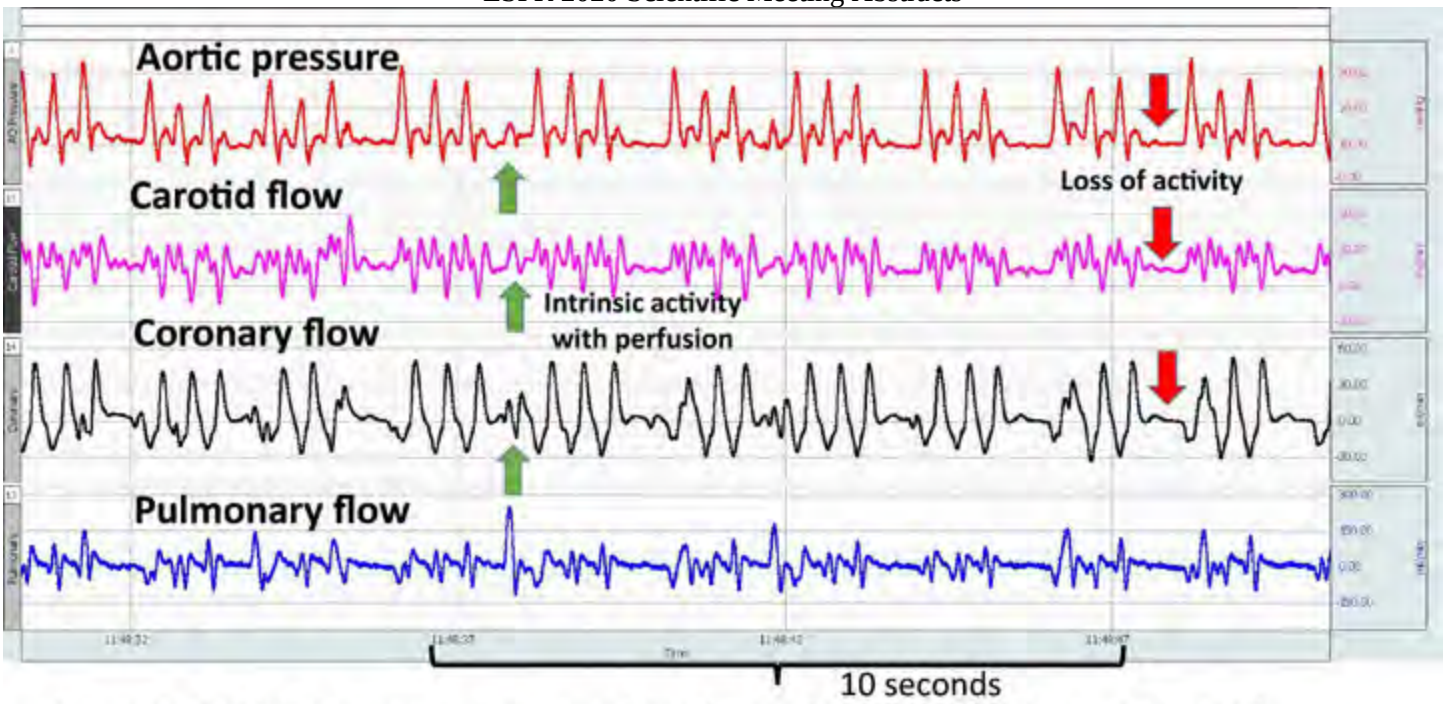

Figure 4. BIOPAC computer snap shot shows loss of intrinsic activity with perfusion after initiation of chest compression during bradycardia.

Abstract: 143

Role of AP-1 in Adverse Chromatin Remodeling and Pathogenesis of Occlusive Vascular Disease

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Background Endothelial cells (EC) play a critical role in vascular homeostasis with barrier functions against harmful pathogens, regulation of blood pressure, and release of inflammatory mediators, such that EC dysfunction may lead to the development of occlusive vascular disease. Along relatively straight segments of the vasculature, endothelial cells are exposed to laminar shear stress (LSS), which is associated with vasoprotective gene profiles linked to EC survival. By contrast, sites of vessel curvature or branching are exposed to shear stress induced by disturbed flow (DSS), which is associated with gene profiles linked to adverse remodeling events, resulting in EC dysfunction and death.
Through initial Immunoprecipitation-Mass Spectrometry studies, differentially accessible sites that are open under DSS conditions, but not under LSS conditions, were found to be enriched for binding motifs for members of the AP-1 family, leading to active transcription of genes involved in inflammation and the pathogenesis of vascular disease. However, the mechanism by which AP-1 may serve as a regulator of the chromatin landscape to mediate these differentially accessible sites is not known.
Objective We aim to demonstrate that under DSS conditions exclusively, members of the AP-1 family activate and colocalize with members of the SWI/SNF nucleosome remodeling complex, BRG1 and BAF170, to the nucleus to mediate accessibility to the chromatin landscape and promote transcription of pro-inflammatory genes.
Design/Methods Using pulmonary arterial ECs, ATF2 was selected as the top candidate of the AP-1 family through an RNA interference study and immunocytofluorescence. By contrast, BRG1 and BAF170 of the SWI/SNF nucleosome remodeling complex were screened through BioGRID. A proximity-ligation assay (PLA) was then performed to detect colocalization of ATF2 with BRG1 or BAF170 under confocal microscopy.
Results Using PLA, we reveal that ATF2 colocalizes into the nucleus with central catalytic component BRG1 and core component BAF170 of the SWI/SNF nucleosome remodeling complex under DSS conditions exclusively.
Conclusion(s) Shear stress induced by disturbed flow leads to preferential expression of ATF2 and nuclear colocalization with BRG1 and BAF170. By uncovering the interaction between AP-1 and SWI/SNF nucleosome complex components, we propose one mechanism by which adverse chromatin remodeling events may drive EC pathological gene expression that leads to occlusive vascular disease.

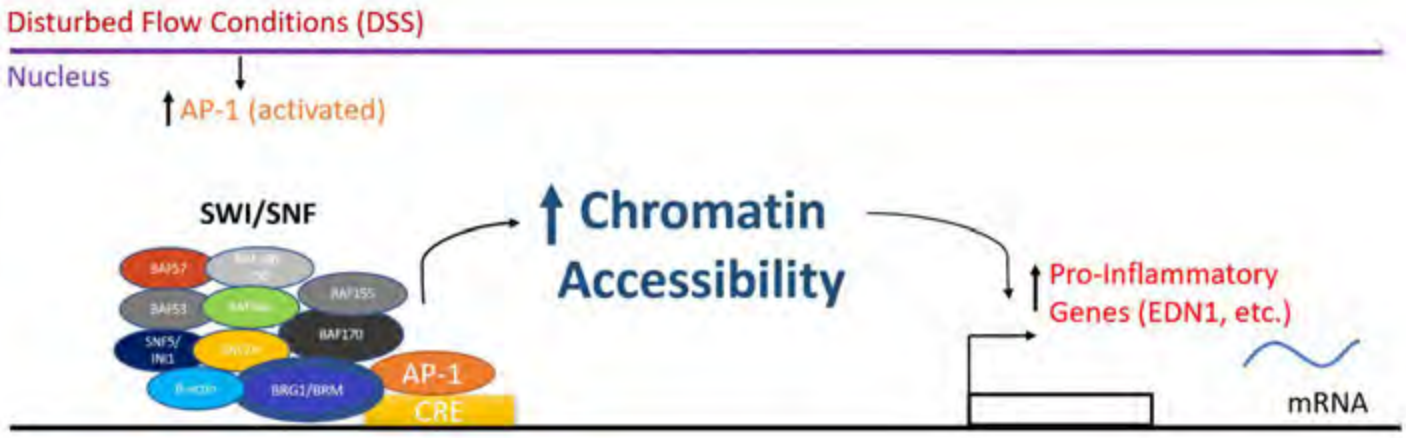

FIGURE 1. Hypothesized Model of AP-1 and SWI/SNF Interaction Under DSS Conditions.

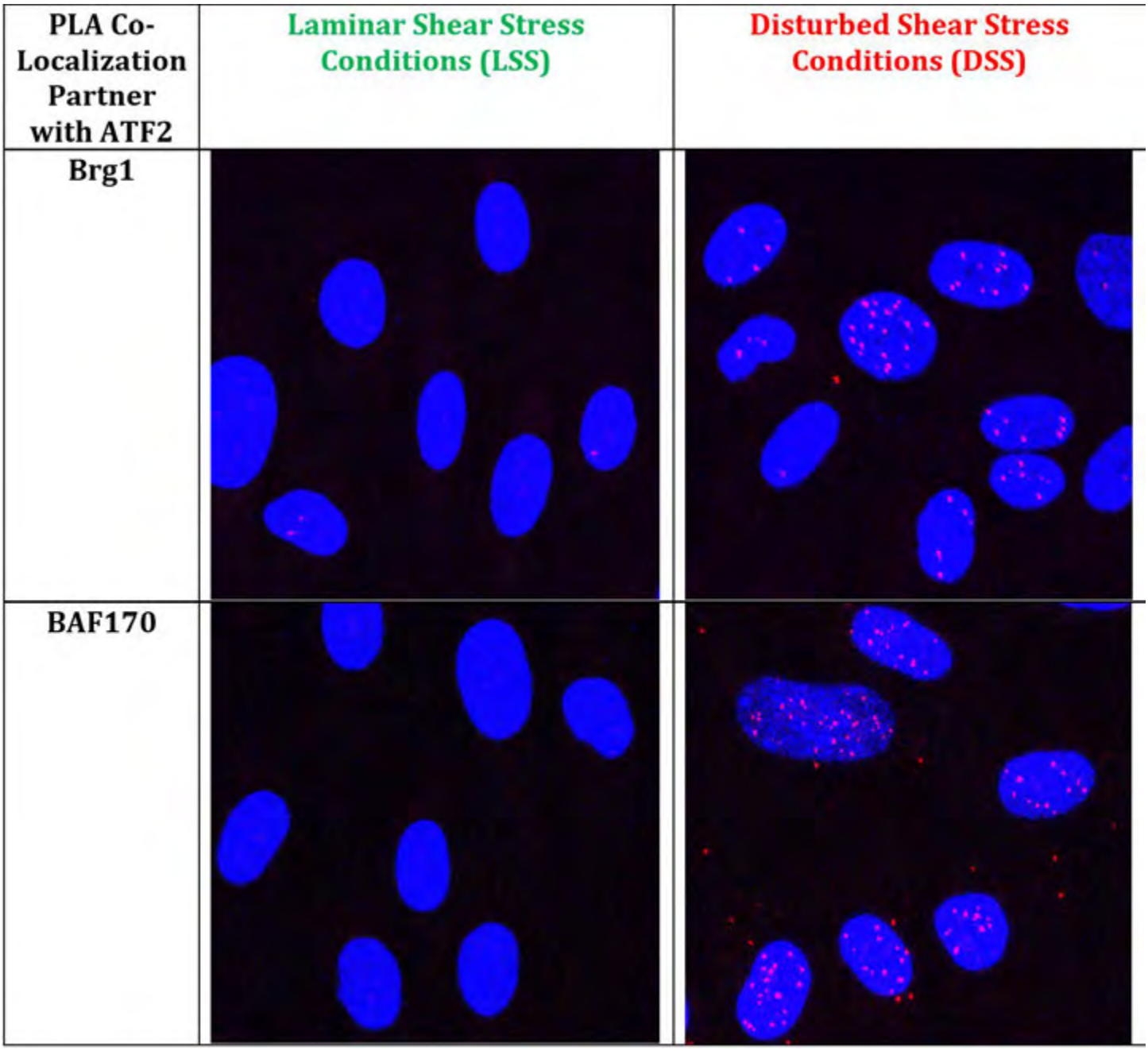

FIGURE 2. Differential Nuclear Co-Localization of ATF2 with BRG1 and BAF170 under LSS and DSS Conditions.

Abstract: 144

Triglyceride to Direct High Density Lipoprotein Cholesterol (TG/HDL-C) Ratio and Risk for Elevated Systolic Blood Pressure among Adolescent - Results from the 2005–2016 National Health and Nutrition Examination Survey (NHANES).

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Background The plasma concentration ratio of triglyceride to direct high-density lipoprotein cholesterol (TG/HDL-C) predicts systolic hypertension (HTN) and other cardiometabolic diseases in adults. However, the association with elevated systolic blood pressure (SBP) in adolescents has not been adequately studied.
Objective We endeavor to elucidate if an elevated plasma TG/HDL-C ratio correlates independently with systolic HTN in adolescent.
Design/Methods Data came from the National Health and Nutrition Examination Survey (NHANES) for the period 2005-2016.

Eligible subjects were adolescent aged 13–20 years. Elevated SBP was defined as BP ≥120mmHg. The cut-off point for high and low TG/HDL-C was 1.28 for Non-Hispanic whites and 0.9 for blacks. Subjects were stratified by TG/HDL- based on the race-specific tertiles for lean subjects with BMI <85th percentile. Demographic variables and other co-variables weight, height, BMI, total cholesterol, waist circumference and fasting glucose were extracted. Mean and percentages were analyzed for significance using T-test and Chi-squared. We used a multiple logistic regression model to determine the odds of elevated BP among those with high TG/HDL-c. Statistical analysis was conducted using SAS 9.4.

Results A total of 3,657 individuals (52% males) had lab values for TG and HDL-C. The mean age at screening for elevated SBP and dyslipidemia was 16.6 ± 2.4. 42.6% of the study population had high TG/HDL-C and there were more males with high TG/HDL-C compared to females (55.4% vs 44.6%, P = 0.0004). In the unadjusted analysis, high TG/HDL-C was associated with elevated SBP (OR, 1.51: 95% CI 1.13, 2.01). However, after adjustment for sex, age, race, body mass index, waist circumference, total cholesterol and fasting glucose, the risk was not significant (OR,1.27: 95% CI 0.88, 1.84).

Conclusion(s) In our study, the prevalence of high TG/HDL-C ratio was higher in males. High TG/HDL-C was not associated with the risk of systolic HTN in adolescents. Though TG/HDL-C has been shown to independently predict cardiometabolic conditions including HTN in adults, it does not appear to strongly correlate with presence of systolic HTN in adolescents. More studies are needed to evaluate the usefulness of this parameter, or if other metabolic or anthropometric parameters are independently useful in predicting or identifying HTN and cardiometabolic diseases in this age group.

Table 1. Baseline characteristics of the study population (3657 participants age 13 -20)

Variables	Values
Age at Screening	16.6 ± 2.4
Standing Height (cm)	167.1 ± 9.6
Weight (kg)	69.4 ± 20.2
Body mass index (kg/m^2)	24.7 ± 6.4
Waist circumference (cm)	83.7 ± 15.7
Systolic blood pressure (mmHg)	111.2 ± 10.5
Diastolic blood pressure (mmHg)	60.2 ± 12.0
Total cholesterol (mg/dL)	159.1 ± 31.4
Triglyceride (mg/dL)	83.9 ± 58.2
High density lipoprotein cholesterol (mmol/L)	53.1 ± 12.6
Fasting glucose (mg/dL)	94.6 ± 15.9
TG/HDL-C ratio	1.8 ± 1.8
Sex	
Male	1901 (52.0%)
Female	1756 (48.0%)

Table 2. Baseline characteristics of the participants by adolescent TG/HDL-C ratio

	Low TG/HDL-C group (2099) (57.4%)	High TG/HDL-C group (1558)(42.6%)	*p*-value
Age	16.4 ± 2.4	16.9 ± 2.5	<.0001
Height (cm)	166.9 ± 9.7	167.4 ± 9.6	0.0692
Weight (kg)	66.6 ± 19.7	73.3 ± 20.1	<.0001
Body mass index (kg/m^2)	23.7 ± 6.2	26.0 ± 6.4	<.0001
Waist circumference (cm)	80.2 ± 14.5	88.5 ± 16.0	<.0001
Systolic blood pressure (mmHg)	110.8 ± 10.4	111.6 ± 10.6	0.0131
Diastolic blood pressure (mmHg)	59.8 ± 12.3	60.9 ± 11.5	0.0048
Total cholesterol (mg/dL)	154.6 ± 29.0	165.1 ± 33.4	<.0001
Triglyceride (mg/dL)	58.7± 41.1	117.7 ± 60.6	<.0001
High density lipoprotein cholesterol (mg/dL)	57.9 ± 12.3	46.7 ± 9.9	<.0001
Glucose (mg/dL)	93.2 ± 12.3	96.5 ± 19.5	<.0001
Sex			
Male	1038 (49.5)	863 (55.4)	0.0004
Female	1061 (50.6)	695 (44.6)	

Table 3. Odds of elevated systolic blood pressure in adolescents with high TG/HDL-C using logistic regression

TG/HDL-C	Total population	Systolic ≥120mmHg (%)	Unadjusted model	P value	Adjusted model [a]	P value	Adjusted model [b]	P value
Low	2099	279 (8.77)	1.00 (ref)	P < 0.001	1.00 (ref)	P < 0.001	1.00 (ref)	P = 0.19
High	1558	227 (7.14)	1.51(1.13–2.01)		1.74 (1.23–2.5)		1.27 (0.88–1.84)	

TG: triglyceride, HDL-C: high density lipoprotein cholesterol; Data presented as odds ratio (95% confidence interval). [a]Adjusted for sex and age and race; [b] Adjusted for sex, age, race, body mass index, waist circumference, total cholesterol and fasting glucose

Abstract: 145

Effects of a Hemodynamically Significant Patent Ductus Arteriosus on Regional Tissue Oxygenation and Blood Pressure in the First 4 Days of Life

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Background Hemodynamically significant patent ductus arteriosus (hsPDA) has been associated with significant morbidity and mortality due to pulmonary over circulation and systemic hypoperfusion via increased left to right shunting. However, there is no consensus definition or treatment of a hsPDA. Limited data exists on the early effect of a hsPDA on regional perfusion and blood pressure in premature infants.
Objective To review and analyze the differences in continuous hemodynamic parameters such as heart rate, blood pressure and regional tissue oxygen saturations (rSO2) in preterm infants with a hsPDA vs. non-hsPDA diagnosed within the first 2 weeks of life.
Design/Methods This is a secondary analysis of a prospective observational cohort of 61 infants born at <30 weeks gestation in the University of Maryland Medical Center level IV neonatal intensive care unit that had continuous invasive blood pressure and regional saturation (near-infrared spectroscopy) monitoring in the first 96 hours of life. Infants were included if had a screening echocardiogram for clinical concerns of a hsPDA within the first 2 weeks of life. Hemodynamic parameters were averaged over 24-hour intervals and compared between infants with a hsPDA and a non-hsPDA. A hsPDA was defined based on the size and shunt directionality. Groups were compared by day of life using T-tests.
Results Of the 61 infants, 52 had echos within 2 weeks of life, 26 with hsPDA vs. 26 with non-hsPDA. Systolic, diastolic and mean arterial blood pressures were significantly lower in subjects with hsPDA in the first 3 days of life ($p < 0.02$). Heart rate values were significantly higher in subjects with hsPDA in days of life 3 and 4 ($p < 0.01$). There was no significant difference in pulse pressure, cerebral and renal saturations, or the ratio of cerebral to renal saturation on any of the first 4 days of life between groups.
Conclusion(s) Subjects with a hsPDA are more likely to have lower blood pressure in the first 4 days of life, but a higher heart rate may maintain cardiac output and preserve tissue perfusion.

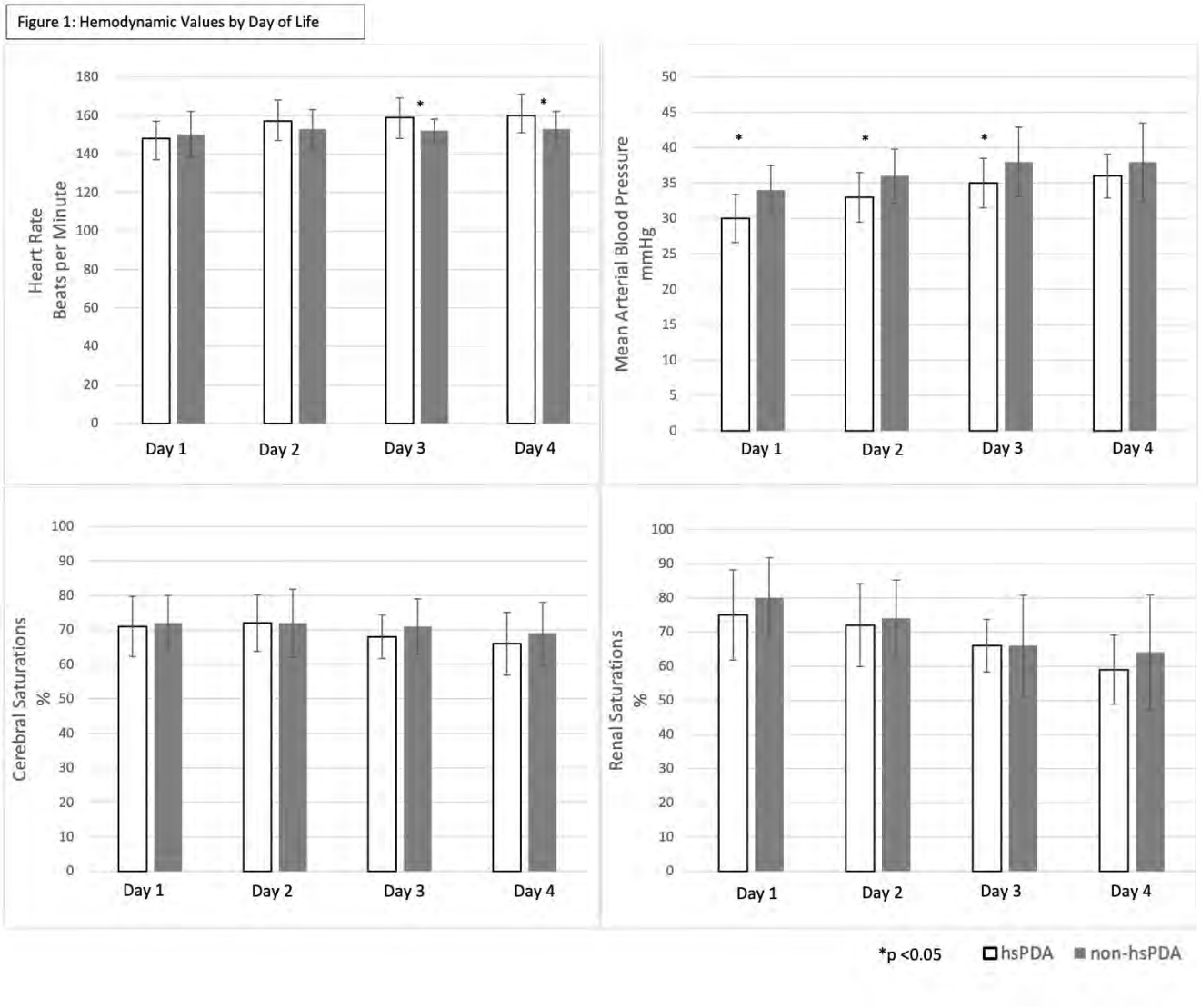

Figure 1: Hemodynamic Values by Day of Life

Abstract: 146

Arterial Stiffness in Infants Born to Preeclamptic Mothers

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Background Preeclampsia is associated with intrauterine growth restriction and preterm birth. Children born to preeclamptic mothers have been shown to have an increased likelihood of developing hypertension. The association between preeclampsia and neonatal vascular architecture remains unclear. Arterial stiffness, as measured by pulse wave velocity (PWV), is an independent predictor of cardiovascular risks. As arteries become stiffer, the propagation of arterial pulse and PWV increase. The relationship between infant arterial stiffness and maternal preeclampsia has not been explored.

Objective To assess the cardiovascular risk of infants born to preeclamptic mothers by measuring arterial stiffness using pulse wave velocity compared to infants born to non-preeclamptic mothers.

Design/Methods Infants 29-40 weeks gestation born to mothers with preeclampsia (defined as new onset hypertension ≥140/90 mmHg] and proteinuria that developed after 20 weeks of gestation) and healthy controls born to mothers without preeclampsia were enrolled between 2-7 days of life. Infants with congenital anomalies of heart and kidneys, intubated infants, infants of diabetic mothers, infants of mothers with hypothyroidism, and infants with evidence of active infection were excluded. Carotid-femoral PWV was measured in duplicate using applanation tonometry. T-test and multiple linear regression adjusting for gestational age and sex

were used to compare the two groups.

Results Clinical characteristics did not significantly differ between the preeclamptic and control groups (Table). The average PWV in the preeclamptic group (3.43 ± 1.2 m/s) was greater than the control (2.87 ± 0.73 m/s) group; however, the difference was not statistically significant (p=0.29). In regression analysis adjusting for gestational age and sex, there was no significant association between preeclamptic vs. non-preeclamptic group and PWV (β=0.3 95%CI -0.83-1.43, p=0.58).

Conclusion(s) In this pilot study, infants born to preeclamptic mothers did not have greater arterial stiffness as measured by PWV compared to infants born to non-preeclamptic mothers, although the sample size was likely not large enough to detect a statistically significant difference. Larger studies are needed to further evaluate the cardiovascular risk in this population.

Table. Clinical Characteristics

Characteristics	Preeclamptic (n=12)	Non-Preeclamptic (n=7)	P
Male	5 (42%)	3 (43%)	0.96
Gestational age (weeks)	35.0 ± 3.6	37.3 ± 2.3	0.16
Birth weight (kg)	2.29 ± 0.96	3.07 ± 0.67	0.08
Systolic Blood Pressure (mmHg)	66.0 ± 12.9 (n=11)	70.6 ± 17.9 (n=5)	0.57
Diastolic Blood Pressure (mmHg)	43.2 ± 12.3 (n=11)	38.8 ± 7.19 (n=5)	0.48
Heart rate (bpm)	137 ± 14.9	129 ± 10.8	0.28
Pulse wave velocity (m/s)	3.43 ± 1.2	2.87 ± 0.73	0.29

Abstract: 147

Defining transitional oxygen physiology for newly born infants with cyanotic congenital heart disease

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Background Established minute to minute pulse oxygen saturation (SpO_2) ranges during the immediate postnatal period are used to guide delivery room (DR) resuscitation. These SpO_2 ranges were established in non-anomalous infants. Transitional oxygen saturation trends in newborns with cyanotic congenital heart disease (CCHD) have not been characterized.

Objective To define SpO_2 trends during the first twenty minutes after birth among newborns with CCHD causing abnormal mixing of oxygenated and deoxygenated blood. Secondarily, to characterize the resuscitative interventions performed during DR stabilization of infants with CCHD.

Design/Methods Retrospective single-site study of infants with gestational age ≥ 32 weeks and prenatally diagnosed transposition of the great arteries (TGA) or hypoplastic left heart syndrome (HLHS) delivered between March 1, 2016 and December 31, 2018. Neonates were excluded for major non-cardiac congenital anomalies or missing resuscitation records. Infants intubated in the first 20 minutes of life (MOL) were excluded from pulse oximetry analyses. Demographic information, pulse oximetry values, and resuscitative interventions were abstracted from DR records, which include vital signs documented in real-time. Smoothed curves of the 25th, 50th, and 75th percentiles for pre-ductal SpO_2 values measured in the first 10 MOL were plotted. Normative SpO_2 values for non-anomalous infants published by Dawson et al. (*Pediatrics*, 2010) were overlaid for comparison.

Results Among 112 eligible infants, 51 had TGA and 61 had HLHS (Table 1). Among infants with HLHS, the median SpO_2 value was 76% (IQR 71-80%) at 5 MOL and 82% (IQR 77-87%) at 10 MOL (Fig.1). Among infants with TGA, the median SpO_2 value was 61% (IQR 53-66%) at 5 MOL and 71% (IQR 63-78%) at 10 MOL (Fig.2). Median SpO_2 curves for both groups were below the median values in Dawson et al. Among all infants, 53 (47%) were given supplemental oxygen and 60 (54%) required non-invasive respiratory support, of which 83% received Continuous Positive Airway Pressure and 33% received non-invasive Positive Pressure Ventilation. 1 infant with HLHS and 30 infants (59%) with TGA were intubated (Table 2).

Conclusion(s) Pulse oximeter values for newborns with HLHS and TGA do not follow those developed in non-anomalous newborns. Newborns with CCHD frequently require respiratory interventions in the DR. Understanding the different pulse oximeter curves, saturation goals, and high need for respiratory support will inform optimal DR resuscitation of these patients.

Table 1. Demographic data and clinical characteristics

	All (N=112)	HLHS (N=61)	TGA (N=51)
Gestational age (GA), weeks, av. (SD)	38.8 (1.0)	38.9 (0.9)	38.8 (1.0)
Preterm (32-36 wk), N (%)	5 (5)	2 (3)	3 (6)
Birth weight, grams, mean (SD)	3325 (502)	3257 (475)	3406 (525)
Birth weight < 10th percentile corrected for GA, N (%) *based on Fenton Growth chart	8 (7)	6 (10)	2 (4)
Male sex, N (%)	80 (71)	43 (70)	37 (73)
Race/ethnicity Black or African-American White Hispanic All others	 9 (8) 69 (62) 14 (13) 34 (30)	 8 (13) 37 (61) 7 (11) 16 (26)	 1 (2) 32 (63) 7 (14) 18 (35)
Singleton, N (%)	111 (99)	61 (100)	50 (98)
Non-epidural opioid or benzodiazepine administered to mother during labor, N (%)	3 (3)	2 (3)	1 (2)
General anesthesia administered to mother during labor, N (%)	3 (3)	3 (5)	0 (0)
Birth type, N (%) Vaginal Caesarean section	 54 (48) 58 (52)	 27 (44) 34 (56)	 27 (53) 24 (47)
TGA: Ventricular septum intact? N (%)	N/A	N/A	Intact septum: 32 (63) Septal defect: 19 (37)

Table 2. Delivery room interventions

	All (N=112)	HLHS (N=61)	TGA (N=51)
Supplemental oxygen FiO_2 >21% used, N (%*)	53 (47)	10 (16)	43 (84)
Subjects receiving any non-invasive respiratory support, N (%*)	60 (54)	16 (26)	44 (86)
Type of non-invasive respiratory support used, N (%**) Blow by oxygen Nasal cannula CPAP PPV	 20 (33) 10 (17) 50 (83) 20 (33)	 4 (25) 2 (13) 13 (81) 3 (19)	 16 (36) 8 (18) 37 (84) 17 (38)
Indication for non-invasive respiratory support, N (%†) Bradycardia Hypoxemia Increased work of breathing Other/not reported	 9 (9) 37 (37) 23 (23) 39 (39)	 2 (9) 6 (27) 6 (27) 10 (45)	 7 (9) 31 (40) 17 (22) 29 (37)
Intubation, N (%*)	31 (28)	1 (2)	30 (59)
Indication for intubation, N (%‡) Persistent bradycardia Apnea/irregular respiration Hypoxemia Hypercarbia Other/not reported	 1 (3) 5 (16) 16 (52) 1 (3) 15 (48)	 0 (0) 0 (0) 0 (0) 0 (0) 1 (100)	 1 (3) 5 (17) 16 (53) 1 (3) 14 (47)
Apgar 1 min, median (IQR)	8 (8-8)	8 (8-8)	8 (7-8)
Apgar 5 min, median (IQR)	8 (8-9)	9 (8-9)	8 (8-8)
Prostaglandin administered, N (%)	111 (99)	61 (100)	50 (98)

HLHS= Hypoplastic left heart syndrome
TGA= Transposition of the great arteries

*% of total cohort
**% of subjects using any respiratory support (total exceeds 100% because individuals may have had multiple respiratory interventions)
† % of all instances of non-invasive respiratory support use
‡ % of all intubations

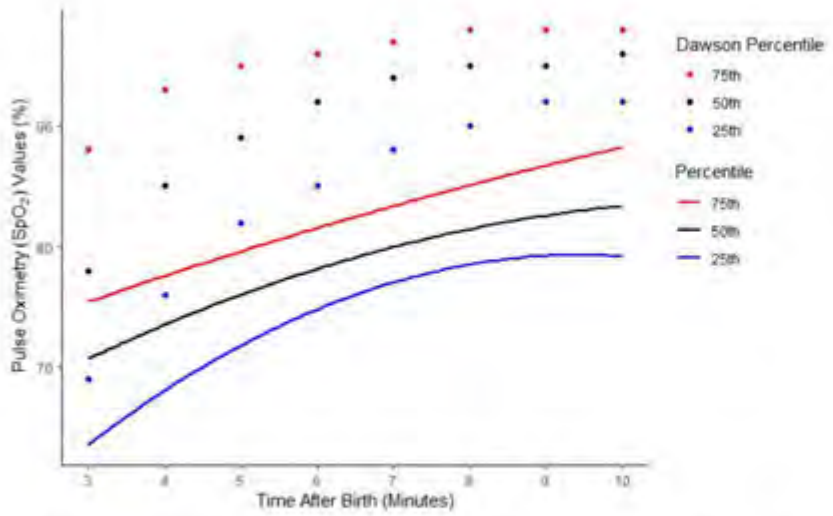

Fig 1. Pulse oximetry trends in HLHS patients (N=61) in the first 10 minutes after birth.
Overlying dotted lines represent values published by Dawson et al., 2010.
Individual subjects may have received respiratory support or supplemental oxygen.

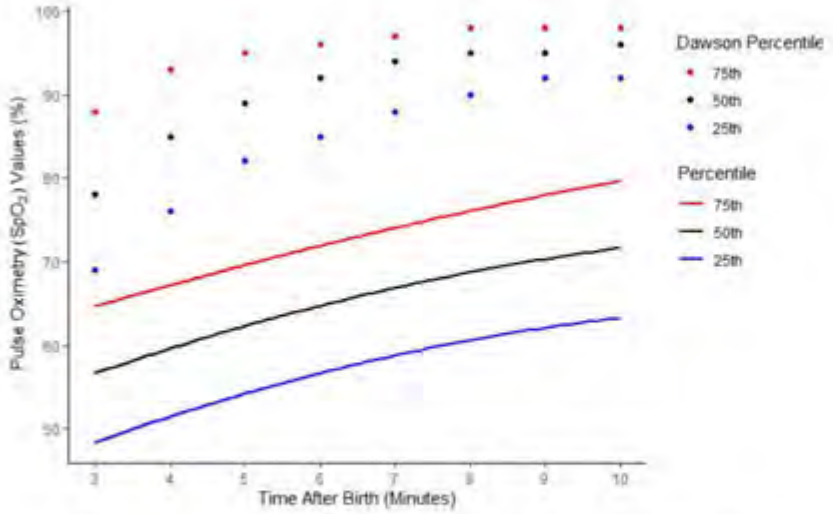

Fig 2. Pulse oximetry trends in TGA patients (N=42) in the first 10 minutes after birth.
Overlying dotted lines represent values published by Dawson et al., 2010.
Individual subjects may have received respiratory support or supplemental oxygen.

Abstract: 148

MFG-E8 May Protect Preterm Infants from Intestinal Inflammation

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Background Milk fat globule-epidermal growth factor 8 (MFG-E8) is a secretory glycoprotein that is known to suppress inflammation in the gastrointestinal tract. In preterm infants, this suggests a potential role for MFG-E8 in protection against intestinal inflammation. Previously, we found that MFG-E8 concentration is significantly higher in preterm mother's own milk (MOM) compared with other milks fed to preterm infants, and preterm infants fed MOM had greater fecal concentrations of MFG-E8. We hypothesized that there is a negative relationship between MFG-E8 and markers of intestinal inflammation in preterm infants.
Objective To compare the concentrations of fecal MFG-E8 and cytokine markers of intestinal inflammation.
Design/Methods Milk and fecal samples were collected serially for 30 days from preterm infants in the NICU. MFG-E8 concentration was analyzed using human MFG-E8 Quantikine ELISA (R&D Systems, Minneapolis, MN), and cytokine concentrations were analyzed using Human Cytokine Array Pro-Inflammatory Focused 13-plex (Eve Technologies, Calgary, AB, Canada). Data were log transformed for analysis.
Results We studied 40 preterm infants (birth weight 1071±260 g, gestational age 28±2 weeks, mean±SD). MFG-E8 concentrations in fecal samples were positively correlated with MFG-E8 concentration in respective milk samples ($r=0.42$, $p < 0.001$). High exposure (MOM >60 ml/kg/d) vs. low exposure (other milks or less intake) to milk MFG-E8 was negatively correlated with pro-inflammatory cytokines interleukin-8 (IL-8: 21 vs. 33 pg/g stool, $r=0.32$ $p=0.001$), tumor necrosis factor-α (TNF-α: 1.3 vs. 1.6 pg/g stool, $r=0.28$, $p=0.016$) and monocyte chemoattractant protein-1 (MCP-1: 11 vs. 21 pg/g stool, $r=.33$, $p=0.002$, median). High exposure positively correlated with the anti-inflammatory cytokine IL-4 (11 vs. 6 pg/g stool, $r=0.24$, $p=0.026$). During the study interval we noted 3 infants with necrotizing enterocolitis and all had low fecal concentrations of MFG-E8.
Conclusion(s) MFG-E8 concentration is significantly higher in fecal samples reflective of a higher milk concentration of MFG-E8. A higher exposure of MFG-E8 is negatively correlated with markers of intestinal inflammation. This suggests a protective role for MFG-E8 in preterm infants.

Abstract: 149

During Extreme Anemia (Hct <28%), Splanchnic Fractional Tissue Oxygen Extraction (FTOE) Inversely Correlates with Lowest Gestational Age Rather than Severity of Anemia

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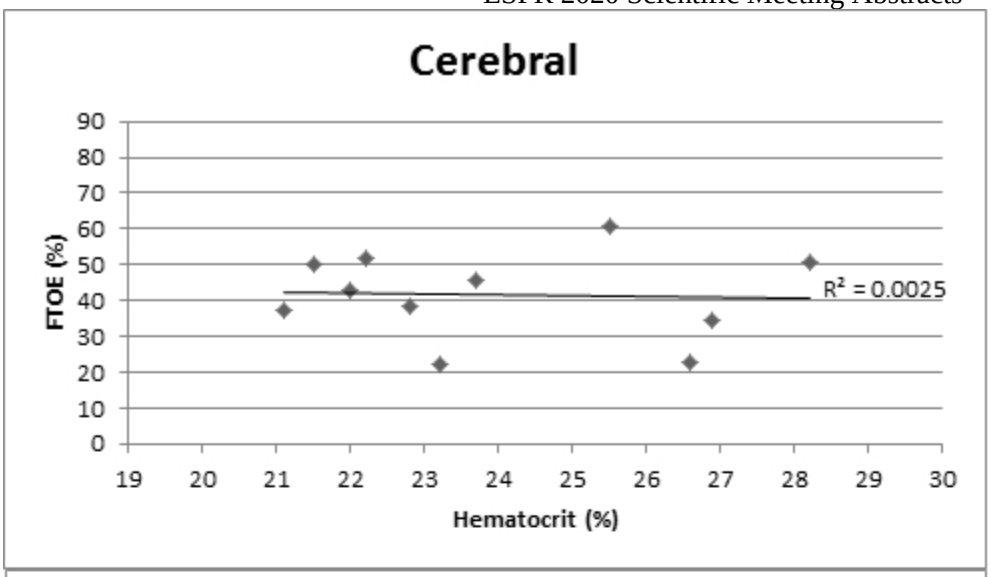
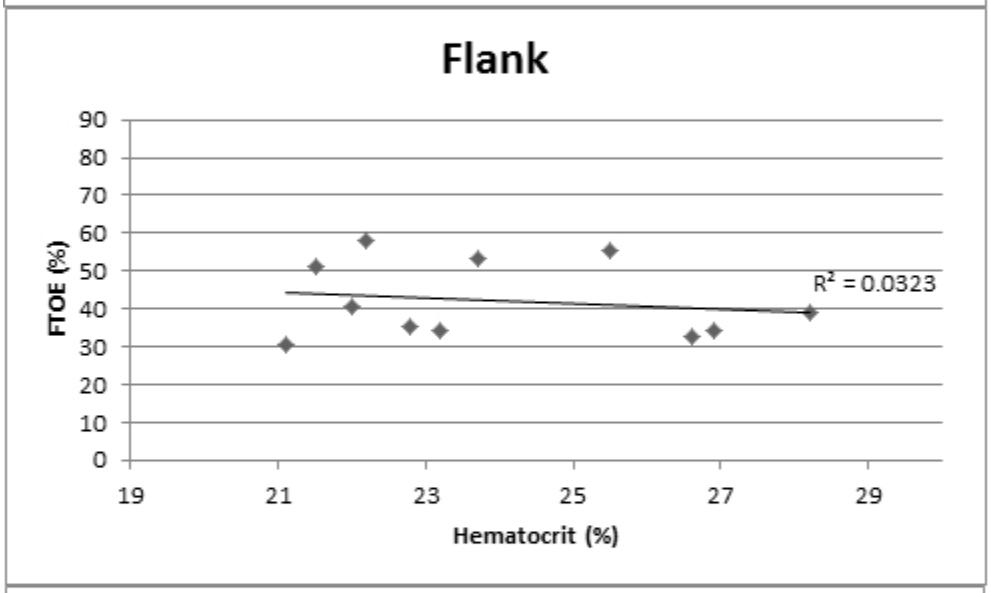
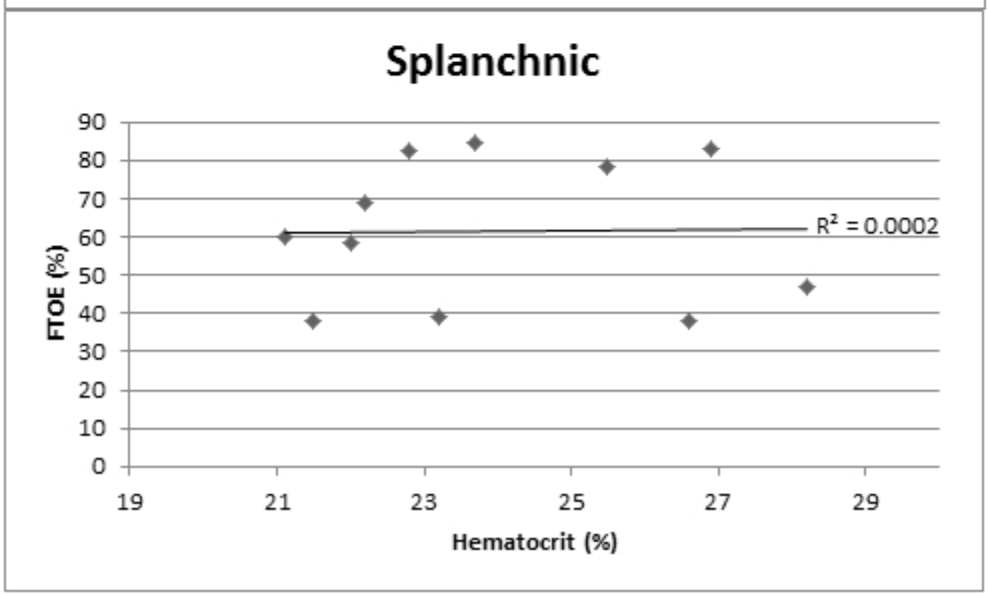
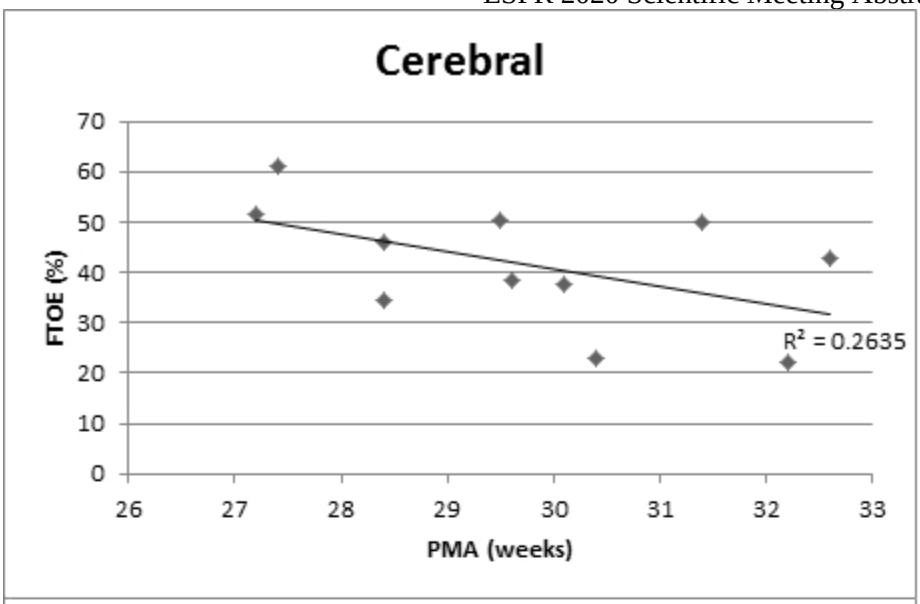
Background Extreme anemia is identified as an independent risk factor for NEC (Patel JAMA '16; Singh J Perinatol '11), however a safe transfusion threshold for anemic ELGANs has yet to be determined (LaGamma, Sem Perinatol. 2012). FTOE increases as a compensatory mechanism to maintain O_2 delivery & consumption homeostasis & is shown to be elevated in otherwise asymptomatic anemic neonates. Therefore, FTOE may provide additional information apart from the falling Hct & rising reticulocytes to identify those neonates most at risk for adverse outcomes.
Objective To evaluate the relationship between regional FTOE & Hct in ELGANs.
Design/Methods Neonates [LE1] born <28 wks gestation age (GA) with a subsequent Hct <28% were evaluated. Near Infrared Spectroscopy (NIRS) sensors were placed to assess cerebral, flank and splanchnic tissue oxygenation (primarily venous O_2 saturation). FTOE was correlated with SpO2 signal (arterialized capillary saturation) from a right radial pulse oximeter to calculate the FTOE.
Results 11 infants were evaluated with an average GA of 25 ± 1 wks (mean ± SD), birth weight 713 ± 141g, PMA of 30 ± 2 wks & Hct of 24 ± 2. FTOE averaged 42 ± 12, 42 ± 10, and 62 ± 19 in the cerebral, flank, and splanchnic regions, respectively. While there was no correlation between FTOE & Hct values (Fig.1), there was a negative correlation between degree of FTOE & PMA (Fig. 2), most pronounced in the splanchnic circulation. Surprisingly, there were no identifiable changes in vital signs or clinical characteristics that correlated with the magnitude of FTOE at each of the three sites.
Conclusion(s) Our data suggests that Hct alone is not an accurate representation of the risk for inadequate O_2 delivery. Increased FTOE specific to the splanchnic region during periods of extreme anemia was more pronounced at younger PMA $\leq$ 31 wks; the maturational age beginning the most rapid growth in bowel length & corresponding intestinal villi microvasculature. We speculate that prior to this, the ability of a neonate to compensate for anemia by increased splanchnic flow is limited relying more heavily upon increasing FTOE; less so in the cerebral & flank due to more collateral flow. We suggest FTOE & PMA be considered as combinatorial factors for identifying at risk ELGANs in need of PRBC. The disproportionate effect of anemia on the splanchnic region with lower PMA may predispose to increased risk of NEC or transfusion related acute gut injury (TRAGI).

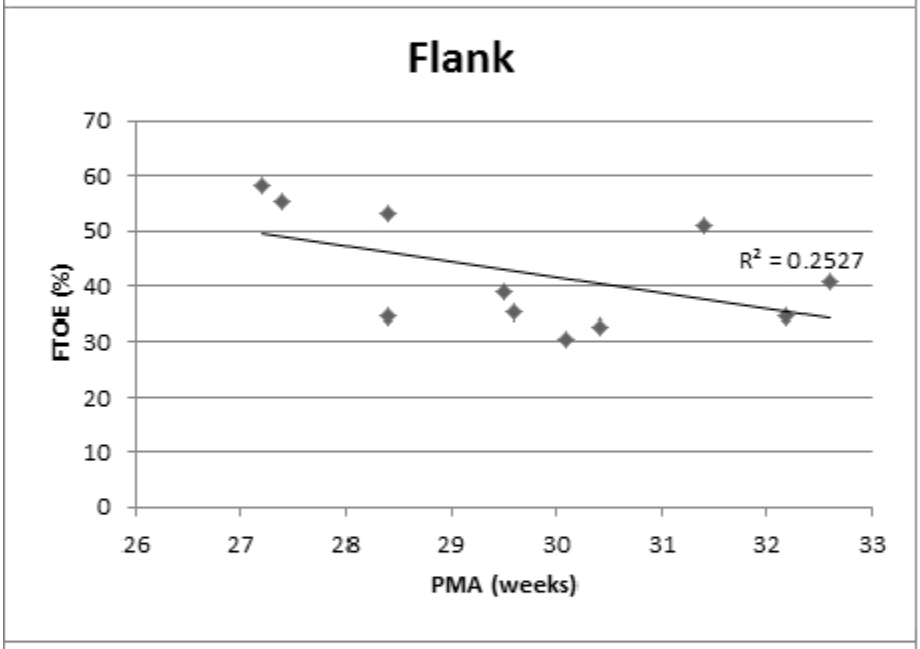

Cerebral
FTOE (%)
Hematocrit (%)
R² = 0.0025

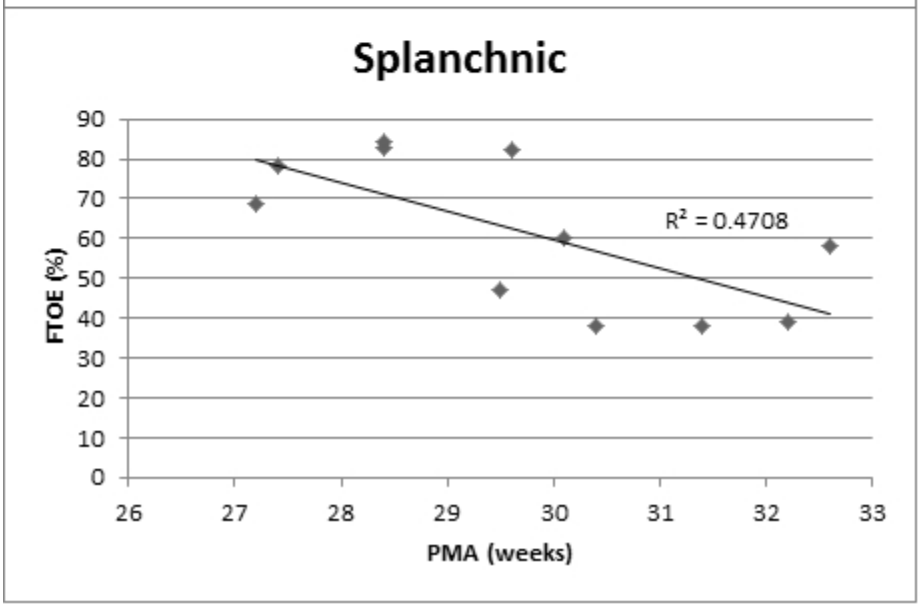

Flank
FTOE (%)
Hematocrit (%)
R² = 0.0323


Splanchnic
FTOE (%)
Hematocrit (%)
R² = 0.0002

Correlation between FTOE and Hct


Cerebral
FTOE (%)
70
60
50
40
30
20
10
0
26
27
28
29
30
31
32
33
PMA (weeks)
R² = 0.2635


Flank
FTOE (%)
70
60
50
40
30
20
10
0
26
27
28
29
30
31
32
33
PMA (weeks)
R² = 0.2527


Splanchnic
FTOE (%)
90
80
70
60
50
40
30
20
10
0
26
27
28
29
30
31
32
33
PMA (weeks)
R² = 0.4708

Correlation Between FTOE and PMA

Abstract: 150

Next Generation Sequencing and Mass Cytometry Reveal Unique Mucosal and Peripheral Immune Signatures and Expansion of Specific Public TCRβ Clones in NEC.

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Background Necrotizing Enterocolitis (NEC) is a devastating complication of prematurity. Advances in diagnosis and treatment are limited by a poor understanding of disease pathogenesis. Current therapy is non-specific. Mortality is highest in surgical cases and studies on biomarkers distinguishing medical and surgical NEC are sparse.

Objective An in-depth analysis of mucosal and circulating immune cells in NEC to identify biomarkers and potential therapeutic targets.

Design/Methods Small intestine from initial surgery (n=12, gestational age (GA) 23-39 weeks, wks) and at reanastomosis for NEC (PostNEC, n=4, GA 31-33 wks) was compared to neonates with congenital anomalies (Neonatal n=4, GA 36-40 wks) and fetal tissue (n= 3, GA 16-20 wks). Peripheral blood from neonates with medical (mNEC, n=12, GA 24-41 wks) and surgical (sNEC, n=3, GA 28-39 wks) NEC was compared to GA-matched controls (CTRLs, n=16, GA 26-41 wks). Next generation sequencing of T and B cell receptors (T and BCR) from intestinal tissue and mass cytometry (CyTOF) of intestinal tissue and blood was performed.

Results Abnormalities in musosal and peripheral immunity were noted. Neutrophils and monocytes were enriched in NEC tissue and normalized PostNEC, while $CD103^{+}$DCs, $CCR6^{+}CD16^{-}$NK cells and $ckit^{+}$ILCs were decreased in NEC with some PostNEC recovery (Fig1). A decrease in CD4 and CD8 T cells in NEC persisted in PostNEC compared to fetal tissue (Fig2A-E). Notably, TCR clonality was more than double in NEC compared to fetal and neonatal controls (Fig2F,G). We saw shorter CDR3β length with fewer insertions and deletions in NEC compared to neonatal cases and a 3.5 fold enrichment of 3 *in utero* derived specific public TCR clones ($p = 2.45e^{-5}$) in NEC compared to controls. CyTOF of blood showed less neutrophils and more $CD163^{+}CD16^{+}$ monocytes in blood of sNEC compared to CTRLs suggesting intestinal translocation. Fewer regulatory T cells (T regs) were observed in sNEC compared to mNEC and controls. Finally, central memory CD4 T cells were increased and naïve CD4 T cells were decreased in sNEC compared to CTRLs and mNEC suggesting active memory generation (Fig 3).

Conclusion(s) We highlight unique mucosal and peripheral immune signatures and give a novel report of significant expansion of *in utero* derived T cell clones in NEC implying a potential pathogenic role. We observed peripheral CM:naïve CD4 T cell ratio, Tregs and $CD16^{+}$ monocytes are altered in sNEC and are potential biomarkers for prospective studies.

Figure 1

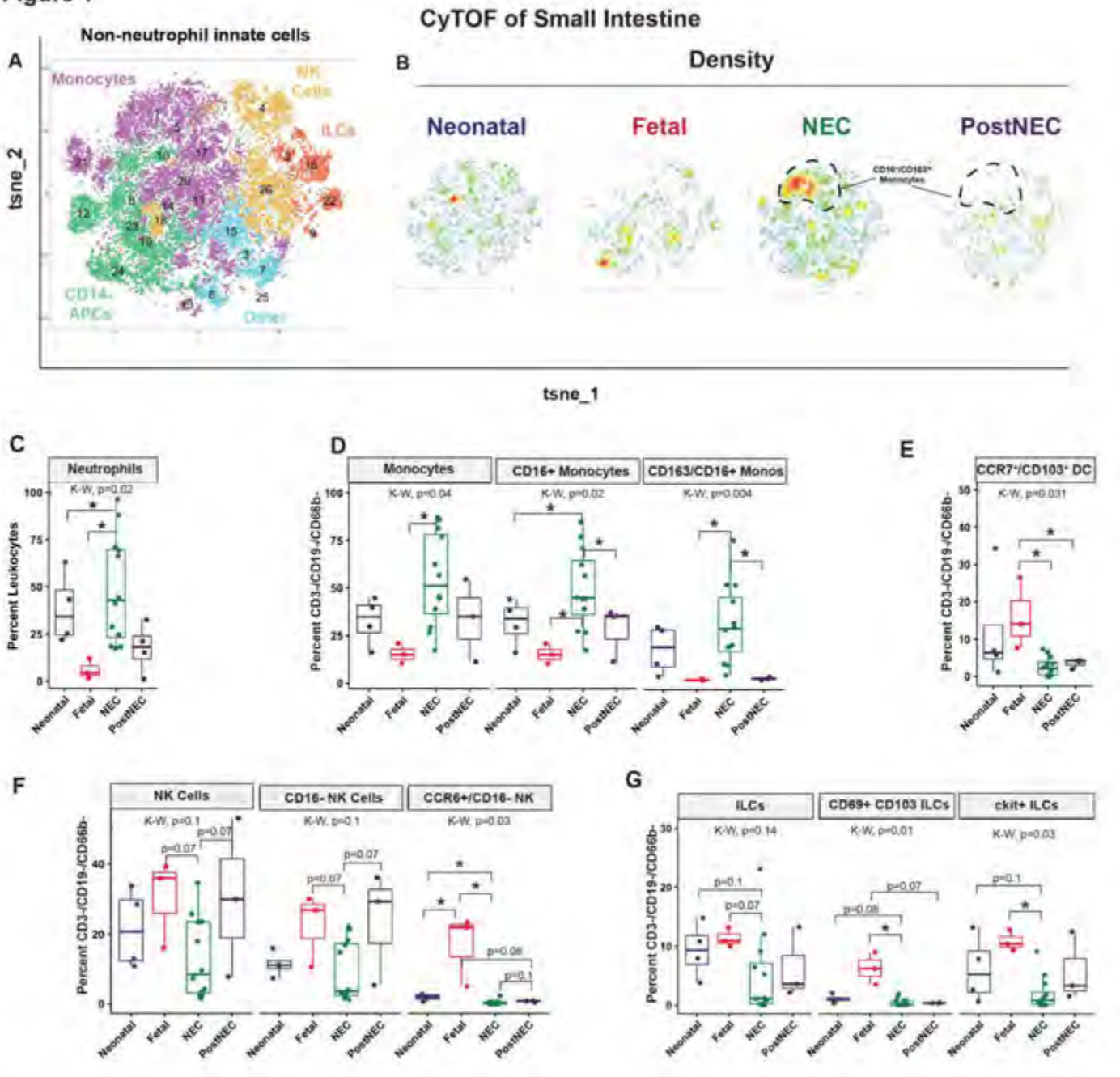

Figure 1 Mass cytometry of immune cells small intestine reveals dysregulation in innate mucosal immunity in NEC that persists Post recovery (A) Automated clustering of CD3-/CD19-/CD66b- (non-neutrophils) revealed 26 unique populations of monocytes, natural killer (NK) cells,innate lympohid cells (ILCs), CD14- antigen presenting cells (APCs) (B) Density plots revealed unique landscapes in NEC with an abundance of CD163^{hi}/CD16^{+} monocytes. (C) Due to neutrophilic influx in NEC affected intestine compared to fetal and neonatal controls these cells were excluded from the innate analysis. (D) Influx of all monocytes specifically CD163/CD16+ monocytes noted in NEC tissue compared to fetal and controls with resolution in PostNEC tissue. (E) CCR7+/CD103+ dendritic cells (DCs, cannonical antigen presenting cells) wre notably decreased in NEC and post NEC tissue compared to fetal cases. (F) NK cells are decreased in NEC with recovery in PostNEC tissue. (G) ckit+ ILCs are down in NEC with some recovery in PostNEC.
p-value < 0.05, K-W: Kruskal-Wallis test.

Figure 2

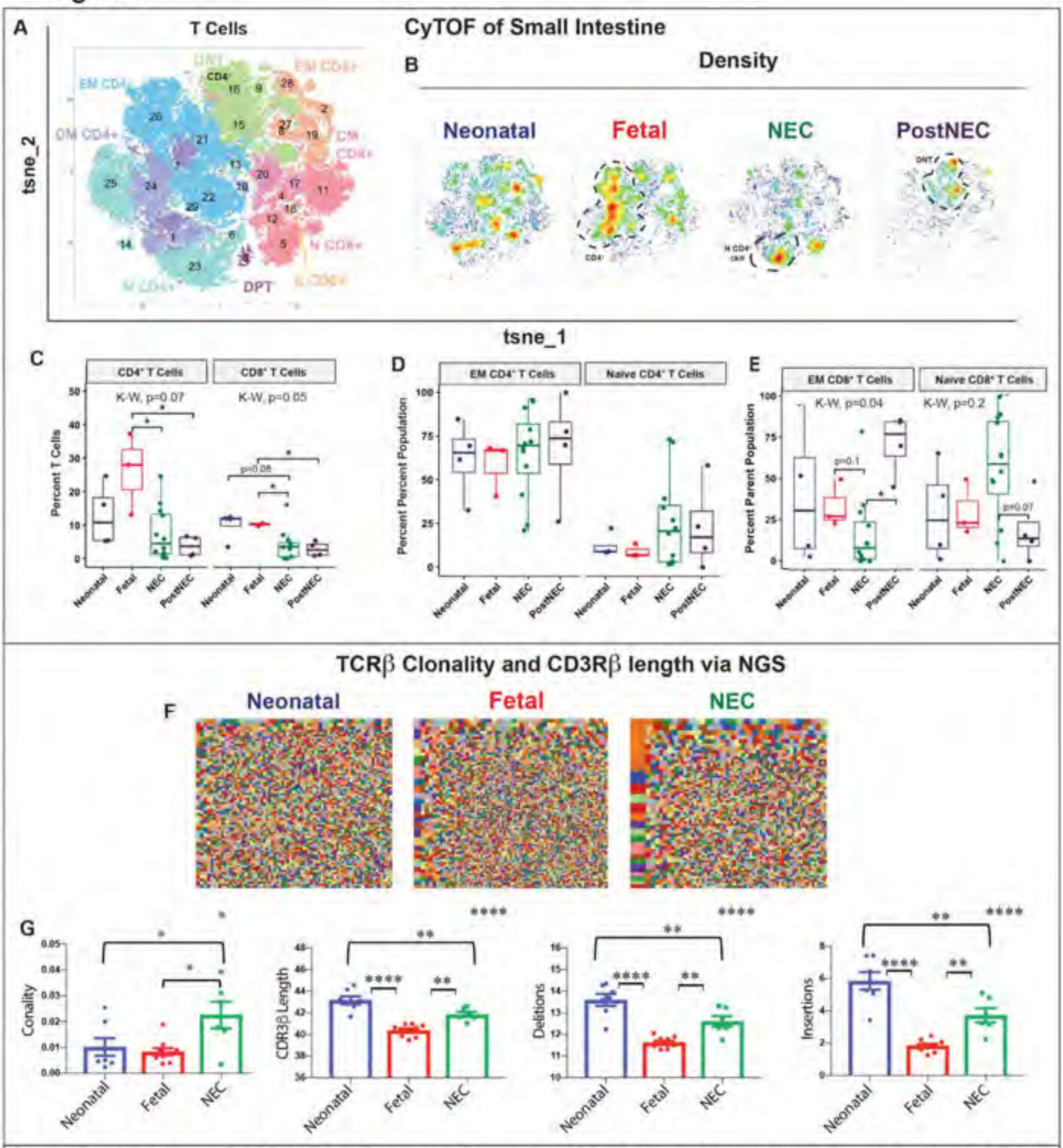

Figure 2 Mass cytometry (CyTOF) and Next Generation Sequencing(NGS) of intestinal tissue reveals dysregulation in the T Cell compartment. (A) Automated clustering (Phenograph) of intestinal T cells(CD3+/CD19-) revealed over 25 uniquepopulations including Naive (N, CD45RA+/CCR7+), central memory (CM, CD45RA-/ CCR7+), effector memory (EM, CD45RA-/CCR7-) and effector (CD45RA+/CCR7-) CD4 and CD8 T cells as well as CD4-/CD8- (double negative, DNT) and CD4+/CD8+ (double positive, DPT). (B) Density plots of groups identified a distinct landscape in NEC and PostNEC tissue. (C) CD4+ and CD8+ T cells were decreased in NEC. (D) No differences in CD4 T cell subsets were identifed. (E) Trend towards fewer EM CD8 T cells in NEC compared to fetal cases with recovery in PostNEC tissue. NGS of neoantal, fetal, NEC intestine revealed increased TCRβ clonailty in NEC cases compared to neonatal and fetal cases (F). (G) Though overall T cells were decreased, there was significantly increased clonailty in NEC (3 fold) compared to neonatal and fetal cases. CDR3β length was shorter in NEC compared to neonatal cases. SImilarly, there were fewer deletions and insertions in NEC compared to neonatal cases. p values: *$p<0.05$, **$p<0.01$, ***$p<0.005$, ****$p<0.001$, *K-W: Kruskal- Wallis test.*

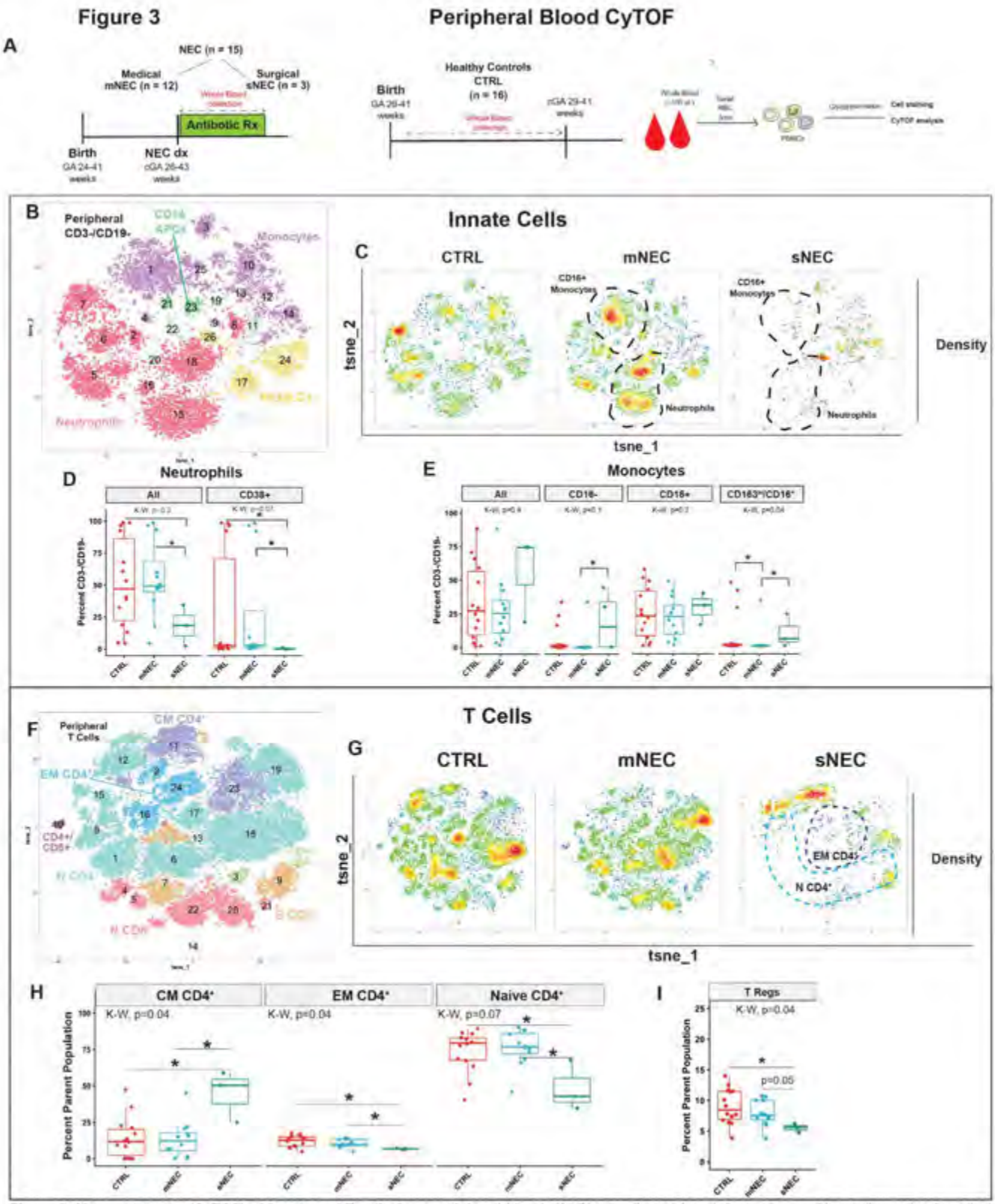

Figure 3: Mass cytometry (CyTOF) of innate and T cells from peripheal blood. (A) Blood collected from infants after confrimed diagnosis of medical (mNEC) and surgical NEC (sNEC) as well as gestaional age-matched controls (n=16), processed and stained to identify components of innate and adaptive immunity via CyTOF. (B) Automated clustering(Phenograph) analysis of innate cells (CD3-/CD19-) revealed over 20 unique populations of monocytes, neutrophils, CD14- antigen presenting cells (APCs, Mϕ), natural killer (NK) cells and innate lymphoid cells (ILCs). (C) Density maps of respective groups revealed a distinct innate landscape that distingushes sNEC from mNEC and controls. (D) Peripehal neutrophils were decreased in sNEC compared to mNEC and CTRLs while there were increased $CD16^-$ and $CD163^{hi}/CD16^+$ monocytes (E). (F) Phenograph of peripheral T cells (CD3+/CD19-) revealed 24 unique populations and unique landscape in sNEC compared to mNEC and CTRLs (G). (H) Fewer naive and effector memory (EM) T cells with more central memory (CM) CD4+ in sNEC compared to mNEC and CTRLs. (I) Regulatory T Cells (CD25+/CD127-) are decreased in sNEC comapred to mNEC and CTRLs.
**p -value <0.05, K-W Kruskal-Wallis test*

Abstract: 151

Unique Mucosal Immune Signatures Revealed by Mass Cytometry of Intestinal Tissue from Infants with Necrotizing Enterocolitis and Spontaneous Ileal Perforation

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Background Necrotizing enterocolitis (NEC) and spontaneous intestinal perforation (SIP) are devastating complications of prematurity. The complete etiology of NEC is unknown, but it is thought to be immune driven, yet the etiology of SIP is unclear. No specific therapy or prevention for either NEC or SIP exists. New data shows a robust mucosal immune system *in utero*by 14 weeks' gestational age (GA) with abundant tissue resident memory (TRM) T cells. Intestinal TRM T cells confer protective immunity and mount a rapid, tissue-specific immune response but can be pathogenic.

Objective NEC and SIP can be distinguished by their intestinal immune phenotype.

Design/Methods Deep immunophenotyping via mass cytometry (CyTOF) of small intestinal mucosa obtained at initial surgery for SIP (GA 24-28 weeks, n=9) or NEC (GA 23-39 weeks, n=12) was compared to fetal controls (GA 16-20 weeks, n=3). Automated clustering and predictive modeling were performed.

Results Our data show immune dysregulation in both NEC and SIP and we delineate innate and adaptive mucosal signatures unique to the two diseases. On the innate side, NEC is characterized by an influx of neutrophils (Fig 1C) and $CD163^{hi}$monocytes with a reduction of $CCR7^{+}CD103^{+}$dendritic cells (DCs, canonical antigen presenting cells) (Fig 2 A-E). On the adaptive side, NEC tissue contains fewer T cells, with a loss of effector memory (EM) $CD8^{+}$T cells. Although the TRM T cells were preserved (Fig 2 F-K). Conversely in SIP, the innate dysregulation was limited to a reduction in $CCR7^{+}CD103^{+}$DCs (Fig 2F). From the adaptive perspective, SIP was characterized by an influx of naïve CD4 T cells skewed towards a Th2 phenotype and naïve CD8 T cells with a decrease in CD4 and CD8 TRMs T cells (Fig 2 H-K). Interestingly, predictive modeling with the random forest classifier differentiated between NEC and SIP with high accuracy (Fig 1).

Conclusion(s) We enhance existing data showing innate and adaptive immune dysregulation in NEC and are the first to demonstrate immune dysregulation in SIP. Given T cells are differentially dysregulated in the two diseases it is possible that dysregulation in NEC is driven by failure of antigen presentation while SIP is due to a lack of immediate protective response conferred by TRM T cells. We propose that disease-specific immune dysregulation contributes to the development and/or progression of inflammatory intestinal diseases of prematurity and targeted therapeutics can be developed in the future.

Figure 1

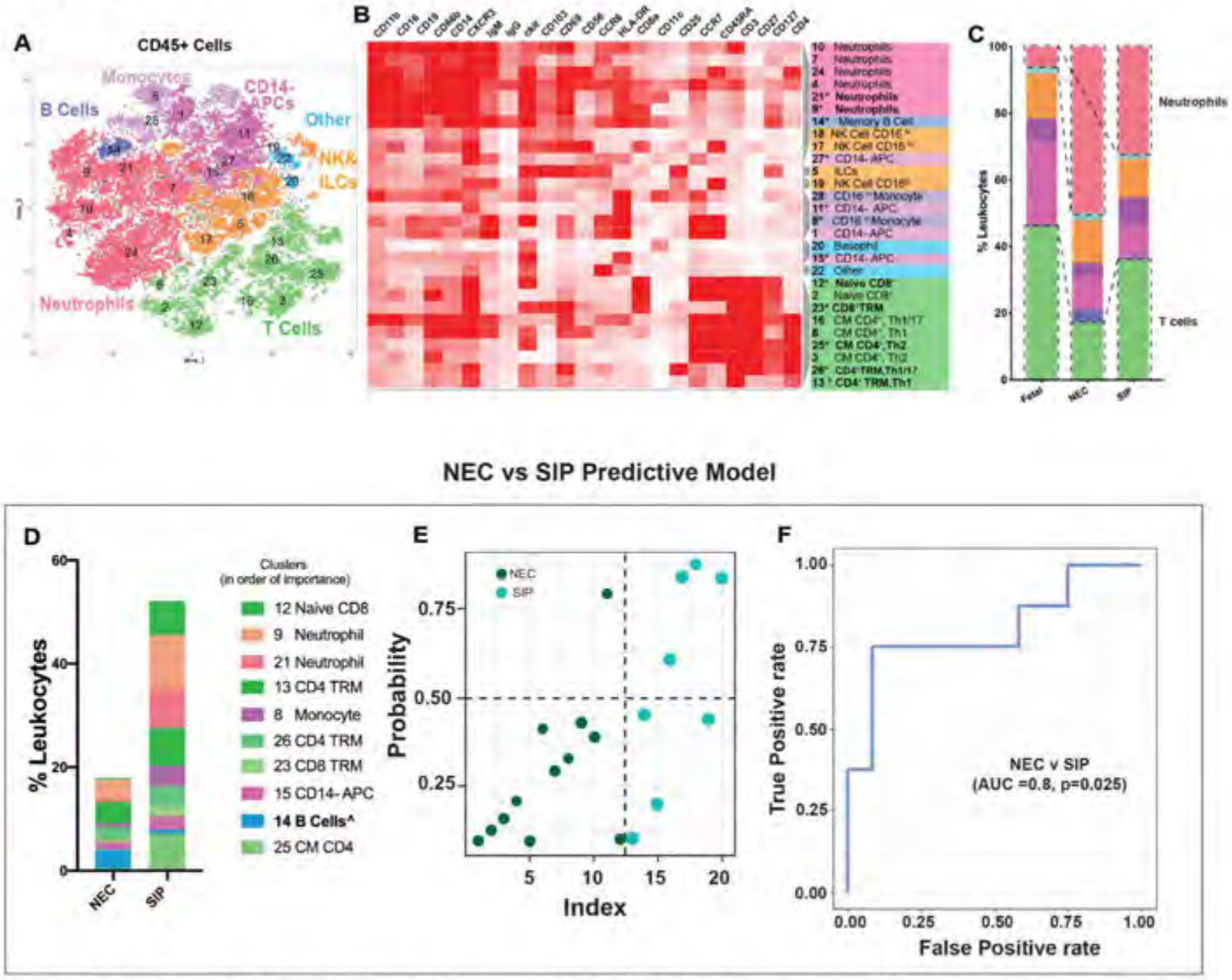

Figure 1: CyTOF reveals distinct mucosal signatures in NEC and SIP. (A) Automated clustering of immune cells (CD45+) from small intestinal tissue revealed more than 25 distinct populations (Neutrophils, Monocytes, natural killer (NK) cells, innate lymphoid cells(ILCS), CD14- antigen presenting cells (APCs)). (B) Heatmap showing markers used in cluster identification. (C) Graph of mean percentages of major populations: T cells (green), B cells (dark blue), Neutrophils (light red), CD14- APCs(pink), Monocytes(purple), NK/ILCs (orange), Other(light blue). T cells are significantly decreased in NEC compared to Fetal and SIP (dashed black lines) while neutrophils are signifiantly increased in both NEC and SIP compared to fetal cases. (D) In a predictive model (random forest plot) to distinguish NEC and SIP 9 clusters were identified as being significant contributors and are listed in order of importance. All but one cluster (14, B cells) were enriched in SIP (D). (E) Propablity plot showing were NEC (green, n=11) and SIP (blue, n=8) cases fell in the model. (F) Area Under the Curve (AUC) of the receiver operating curve was statistically significant.
*^enriched in NEC, *clusters contributing to predictive model*

Figure 2

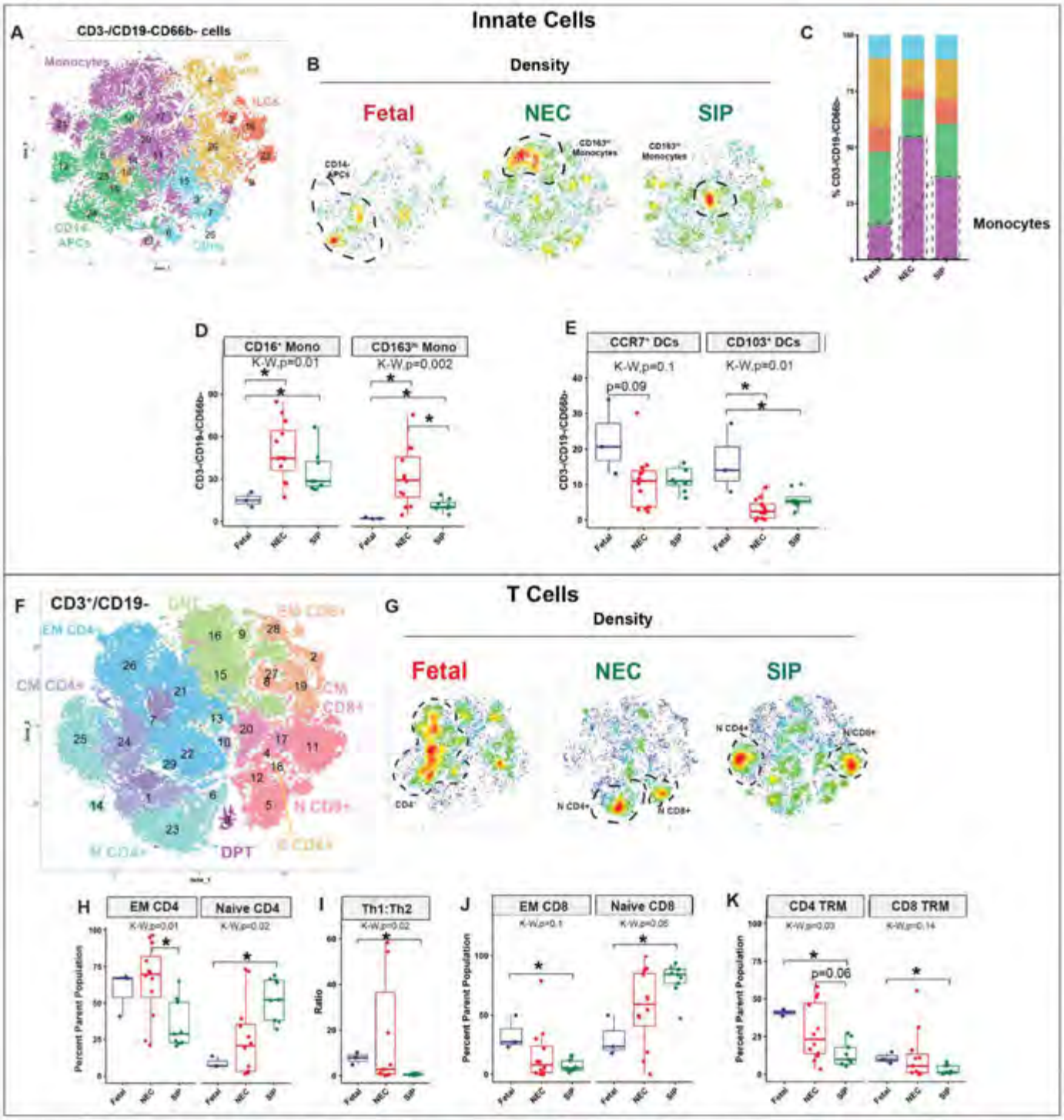

Figure 2: Mass cytometry reveals distinct signature in Innate and T cells. (A) Automated clustering (Phenograph) of non-neutrophils (CD3-/CD19-/CD66b-) identifed over 25 unique populations of monocytes, natural killer (NK) cells, innate lymphoid cells (ILCs), CD14- antigen presenting cells (APCs). (B) Density plot revealed unique landscape that distingushes NEC and SIP with CD163^{hi} monocytes being abundant in NEC. (C) Stacked bar graph of average percentages of population groups from (A) showed all monocytes (purple) are significantly increased in NEC compared to fetal and SIP (dashed lines), p<0.05. (D) CD16+ and specifically CD163^{hi} monocytes were increased in NEC compared to fetal and SIP cases. (E) CD103+Dendritic cells (DCs) canonical antigen presenting cells were decreasedin NEC and SIP. (F) Phenograpy of T cells (CD3+/CD19-) revealed almost 30 unique populations of naive (N, CD45RA$^+$/CCR7$^+$), central memory (CM, CD45RA$^-$/ CCR7$^+$), effector memory (EM, CD45RA$^-$/CCR7$^-$) and effector (CD45RA$^+$/CCR7$^-$) CD4 and CD8 T cells as well as CD4-/CD8- (double negative, DNT) and CD4+/CD8+ (double positive, DPT). (G) Density plots revealed distinct T cells signature in NEC and SIP. (H) EM CD4 T cells were decrased in SIP compared to NEC while SIP was characterized by an abundance of naive CD4 T cells. (I) Helper T cells were skewed towards at Th2 phenotype. (J) Naive CD8 T cells were enriched in SIP. (K) CD4 and CD8 TRMs were notably deceased in SIP compared to fetal cases. **p-value <0.05 K-W: Kruskal Wallis comparison for non-parametric variables.*

Abstract: 152

Premature Twins Associated with Spontaneous Intestinal Perforation

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Background Factors involved in spontaneous intestinal perforation (SIP) are distinct from those involved in NEC with additive effects of post-natal steroids and indomethacin being the best known. The roles of other factors in SIP are not well characterized.
Objective Identify perinatal factors associated with SIP.
Design/Methods This was a retrospective case-control study. A clinical database was queried for SIP cases in infants born at ≤28 weeks of gestation and admitted between 1995-2016 at a single tertiary care NICU. Infants with necrotizing enterocolitis (NEC) or other GI abnormalities were excluded. 25 cases were matched with 25 controls. Each case was matched with a gestational age-matched control with the closest birth date. Risk factors for SIP were calculated using univariate (T-test and Chi-square test) analyses and variables with $p < 0.1$ were evaluated using multiple logistic regression.
Results Being a twin increased the odds of SIP 12 to 13-fold. Use of epinephrine for resuscitation increased the risk four to five-fold. Birth-order or weight-discrepancy in twin pairs were not significant factors. No maternal factors evaluated reached statistical significance.
Conclusion(s) Twins are at a significantly higher odds for SIP. This was not related to birth order or birthweight discrepancy in twins. The reason for this association is not related to antenatal indomethacin or magnesium sulfate use and needs to be further studied.

Table 1. Maternal Factors in SIP

Variable	SIP Cases N=25	Controls N=25	p Value
Received antenatal steroids	23 (92%)	24 (84%)	0.3025
Received antenatal magnesium sulfate	18 (72%)	16 (53%)	0.1719
Received antenatal indomethacin	10 (40%)	7 (23%)	0.0812
Other factors tested were maternal age, Gravida, Para, Cocaine, Tobacco, Marijuana use, GBS status, Chorioamnionitis, PPROM, Preterm Labor and PIH were not statistically significant.			

Table 2. Infant Factors in SIP

	SIP Cases N=25	Controls N=25	p Value
Gestational age (wk)	24.9	24.9	Matched
Weight (gm)	822 (251)	891 (241)	0.8104
Twin birth	14 (56%)	1 (4%)	<0.0001*
White race	21 (84%)	19 (76%)	0.0796
Apgars at 5 mins <5	7 (28%)	8 (32%)	0.9312
Chest Compressions	9 (36%)	6 (24%)	0.0886
Epinephrine use for Resuscitation	4 (16%)	1 (4%)	0.0345*
Postnatal Indomethacin within 16 days	11 (44%)	16 (64%)	0.0756
Postnatal Dexamethasone within 16 days	0 (0%)	3 (12%)	0.0111*
*- Significant; Values expressed as N (%) or Mean (SD)			

Table 3. Multiple Regression Analysis

Variables	Unadj. OR (95% CI)	p Value	Adj. OR (95% CI)	p Value
Twins	12.08 (2.61-62.46)	0.0017	13.13 (2.68-64.35)	0.0015
Epinephrine use during Resuscitation	4.44 (1.05-22.19)	0.0433	4.98 (1.08-22.91)	0.0391

Unadj. OR – Unadjusted odds ration from univariate analyses; Adj. OR – Adjusted odds ratio from multiple logistic regression analysis using both significant variables.

Abstract: 153

Effectiveness of LED spotlight phototherapy bulbs in comparison to LED phototherapy units for the treatment of neonatal hyperbilirubinemia.

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Background Neonatal indirect hyperbilirubinemia is a common physiological occurrence. For decades, different modes of phototherapy including halogen, fluorescent and LED have been used to help reduce serum bilirubin levels. LED phototherapy has recently become a favorable choice with less frequent side effects, less energy consumption and longer life span. Among the available LED phototherapy sources, there are bank units and spotlight bulbs. The effectiveness of sources depends on the irradiance, footprint and distance from the light. Previous studies have compared different modes of phototherapy, but no data is available to compare LED unit vs LED spotlight bulb.
Objective To evaluate the effectiveness of LED spotlight bulb vs LED unit phototherapy for the treatment of indirect hyperbilirubinemia.
Design/Methods Premature neonates with indirect hyperbilirubinemia receiving phototherapy in NICU were randomized into two groups: (1)receiving LED unit and (2)receiving spotlight LED bulb. Study duration was from Nov 2017 to Dec 2018. Sample size included N=23 in LED unit group and N=14 in the spotlight group. Parameters included for comparison were irradiance, phototherapy duration, footprint exposed and serum bilirubin levels at the start and the end of phototherapy treatment.
Results Independent samples t-test analyses were run to analyze the difference between the means for the two groups. On average, babies experienced longer durations of phototherapy for the LED spotlight bulb treatment group ($M = 120.21$, $SE = 15.68$) than for the LED unit treatment group ($M = 46.78$, $SE = 4.24$). This difference was statistically significant $t(35) = 5.52$, $p<.05$. On average, babies experienced lower levels of irradiance for the LED spotlight phototherapy treatment group ($M = 23.96$, $SE = 2.91$) than for the LED unit phototherapy treatment group ($M = 29.99$, $SE = 1.66$). This difference was not statistically significant $t(35) = -1.94$, $p>.05$; however, it did represent a medium-sized effect, $r = .35$. Qualitatively, 100% (N = 23) of the babies from the LED spotlight group had full footprint, while only 14% (N = 2) of the babies from the LED spotlight group had full footprint; 86% (N = 12) had incomplete footprint.
Conclusion(s) In conclusion, LED units were found to be a more effective mode of phototherapy as compared to spotlight bulbs based on the results of this study. Further study is warranted to evaluate the effectiveness of using spotlight bulbs in multiples or as an adjunct with LED units.

Group Statistics

	Light	N	Mean	Std. Deviation	Std. Error Mean
Irradiace	spotlight	14	23.964	10.9066	2.9149
	LED	23	29.987	7.9437	1.6564
Distance	spotlight	14	13.114	2.3098	.6173
	LED	23	12.991	1.6602	.3462
Duration	spotlight	14	120.214	58.6517	15.6753
	LED	23	46.783	20.3514	4.2436
Bili	spotlight	14	5.693	.9754	.2607
	LED	23	8.191	2.9343	.6118
End	spotlight	14	2.157	.5983	.1599
	LED	23	3.704	1.7055	.3556

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Irradiace	Equal variances assumed	1.289	.264	-1.940	35	.060	-6.0227	3.1040	-12.3240	.2787
	Equal variances not assumed			-1.796	21.430	.087	-6.0227	3.3526	-12.9884	.9410
Distance	Equal variances assumed	.073	.788	.188	35	.852	.1230	.6533	-1.2033	1.4492
	Equal variances not assumed			.174	21.222	.864	.1230	.7078	-1.3479	1.5939
Duration	Equal variances assumed	10.717	.002	5.524	35	.000	73.4317	13.2941	46.4431	100.4202
	Equal variances not assumed			4.522	14.928	.000	73.4317	16.2396	38.8033	108.0601
Bili	Equal variances assumed	13.763	.001	-3.070	35	.004	-2.4984	.8139	-4.1508	-.8461
	Equal variances not assumed			-3.757	29.091	.001	-2.4984	.6651	-3.8585	-1.1384
End	Equal variances assumed	7.394	.010	-3.259	35	.002	-1.5472	.4747	-2.5109	-.5835
	Equal variances not assumed			-3.968	29.739	.000	-1.5472	.3899	-2.3438	-.7506

Abstract: 154

Dynamic ultrasound-assisted arterial cannulation in the neonatal intensive care unit

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Background In critically ill infants, arterial cannulation is an essential procedure for monitoring blood pressure and performing frequent sampling of blood. Previous studies have documented low rates of successful cannulation in pediatric patients using anatomic landmarks and pulse palpation prior to needle insertion with a first attempt success rate between 14 and 36% and a first or second attempt success rate between 29 and 60% [Cochrane Database Syst Rev. 2016;9:CD011364]. While dynamic ultrasound guidance has been shown to improve success rates of arterial cannulation in older children and adults, there are limited data in infants.
Objective We hypothesized that the use of dynamic ultrasound guidance for arterial cannulation in infants increases the success rate and reduces the number of attempts per patient when compared to historical controls.
Design/Methods This was a retrospective review of infants younger than one year of age in the neonatal intensive care unit (NICU) who underwent arterial cannulation using dynamic ultrasound guidance between January 2015 and April 2019. Procedural data from 5 neonatologists with expertise in ultrasonography were reviewed and the overall success rate, number of attempts, location of cannulation (radial, dorsalis pedis, or posterior tibial artery) and weight at time of procedure were reviewed.
Results A total of 341 arterial cannulations were performed over the study period. An overall success rate of 88% was achieved with a first attempt success rate of 66% and a first or second attempt success rate of 82%. Successful arterial cannulation and first attempt success rates were highest when performed in the radial artery (92%, 70%) and lowest when performed in the posterior tibial artery (71%, 47%) [Table I]. Infants who weighed more than 2,500g had higher overall success rates and first attempt success rates (92%, 70%) when compared to smaller infants and though the sample size is limited, overall success and first attempt success were lowest in infants weighing less than 1,000g (64%, 43%) [Table II].
Conclusion(s) Dynamic ultrasound guidance improves overall success and first attempt success when compared to historical landmark/palpation technique for arterial cannulation in NICU patients. This is the largest cohort of NICU patients reported using ultrasound-assisted arterial cannulation. This method has the potential to reduce unnecessary attempts and minimize procedure related harm in infants requiring arterial cannulation.

Table I: Success by location

Location	Overall success / events	First attempt success	Two attempts to success	Three attempts to success
All locations	299 / 341 (88%)	225 (66%)	56 (16%)	18 (5%)
Radial a.	191 / 208 (92%)	146 (70%)	35 (17%)	10 (5%)
Dorsalis pedis a.	60 / 78 (89%)	53 (68%)	9 (12%)	7 (9%)
Posterior tibial a.	39 / 55 (71%)	26 (47%)	12 (22%)	1 (2%)

Table II: Success by weight

Weight	Overall success / events	First attempt success	Two attempts to success	Three attempts to success
≤1000g	9 / 14 (64%)	6 (43%)	3 (21%)	0
1001 – 2500g	61 / 77 (79%)	43 (56%)	11 (14%)	7 (9%)
>2500g	229 / 250 (92%)	176 (70%)	42 (17%)	11 (4%)

Abstract: 155

Blood-out among VLBW infants in the first 3 days after birth: contribution of blood cultures inoculates

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Background Very low birth weight infants (VLBW, birth weight <1500 grams) require intensive care after birth that includes multiple blood tests. Our center policy requires that 2 ml blood be inoculated into 1 aerobic and 1 anaerobic blood culture bottle when evaluating for early onset sepsis. Clinicians are concerned about blood loss from testing and impact on hemodynamic stability among VLBW infants.
Objective To determine the total volume of blood sent for tests (blood-out) in the first 3 days after birth and the proportion contribution of blood cultures. To determine association of blood-out volume, as a percentage of estimated total body blood volume with incidence of blood transfusion and inotrope use in <3 days after birth.
Design/Methods Retrospective cohort study of all VLBW infants born at a single center from 12/1/17 to 12/31/18. Tests sent in first 72 hours after birth, inotrope use and transfusions administered were manually extracted from medical records. Blood-out was calculated based on required minimum for each test: 2 ml for blood culture; 0.5 ml for basic metabolic panel (BMP)/bilirubin, complete blood count (CBC) and newborn screen (NBS); 1 ml for type and screen and 0.2 ml for a blood gas. We did not count volume for blood glucose checks. Total body blood volume was estimated as 100 times birth weight (kilograms).
Results An average of 9.5 ml (range: 3-18 ml) of blood was sent for tests <3 days among the 64 eligible VLBW infants (Table). Calculated as a proportion of the total body estimated blood volume, 51% infants had >10% of their total blood volume sent for tests (Figure 1). Proportion contributions of test types to total blood-out are shown in Figure 2. Overall, BMP/bilirubin (33%) and CBC (13%) were the greatest contributors to blood-out; among infants with a blood culture, 16% of the total blood-out was from the culture. A rising percent of blood-out from the total estimated blood volume was associated with increased incidence of blood transfusion and inotrope support (Figure 3).

Conclusion(s) A substantial blood-out volume occurs in the care of preterm infants in the first 3 days after birth, with less proportion contribution from blood cultures than repeated CBC and BMP tests. Quantifying drivers of early testing and impact on hemodynamic status are first steps towards optimizing blood testing in preterm infants. Stewardship in testing may minimize hemodynamic instability, and real-time documentation of blood-out may inform management decisions.

Table 1: Demographics of study infants

Characteristics	**N=64**
Birth weight, grams, n (%)	
--<750	16 (25)
--751 to <1000	16 (25)
--1000 to <1250	9 (14.1)
--1250 to <1500	23 (35.9)
Gestational Age, weeks, Mean (SD)	28.6 (2.8)
Blood tests frequency in 3 days[a]	
--Blood culture, n (%)	39 (60.9)
--Newborn screen, Median (IQR)	2 (2-2)
--Basic metabolic panel/bilirubin, Median (IQR)	5.5 (5-7)
--Complete blood count, Median (IQR)	2 (1-4)
--Type and screen, Median (IQR)	1 (1-1)
--Blood gas, Median (IQR)	6 (2-13)
Total blood volume out, Mean (SD)	9.3 (3.5)
Infants receiving packed red cells transfusion within 3 days after birth	17 (26.6)
Infants receiving Inotropes within 3 days after birth	20 (31.3)

a-median blood cultures per infant among infants with a blood culture is one; all infants had at least one of the other tests drawn in the first 3 days of life

Table 1: Demographics and description of tests using blood in first 3 days of life

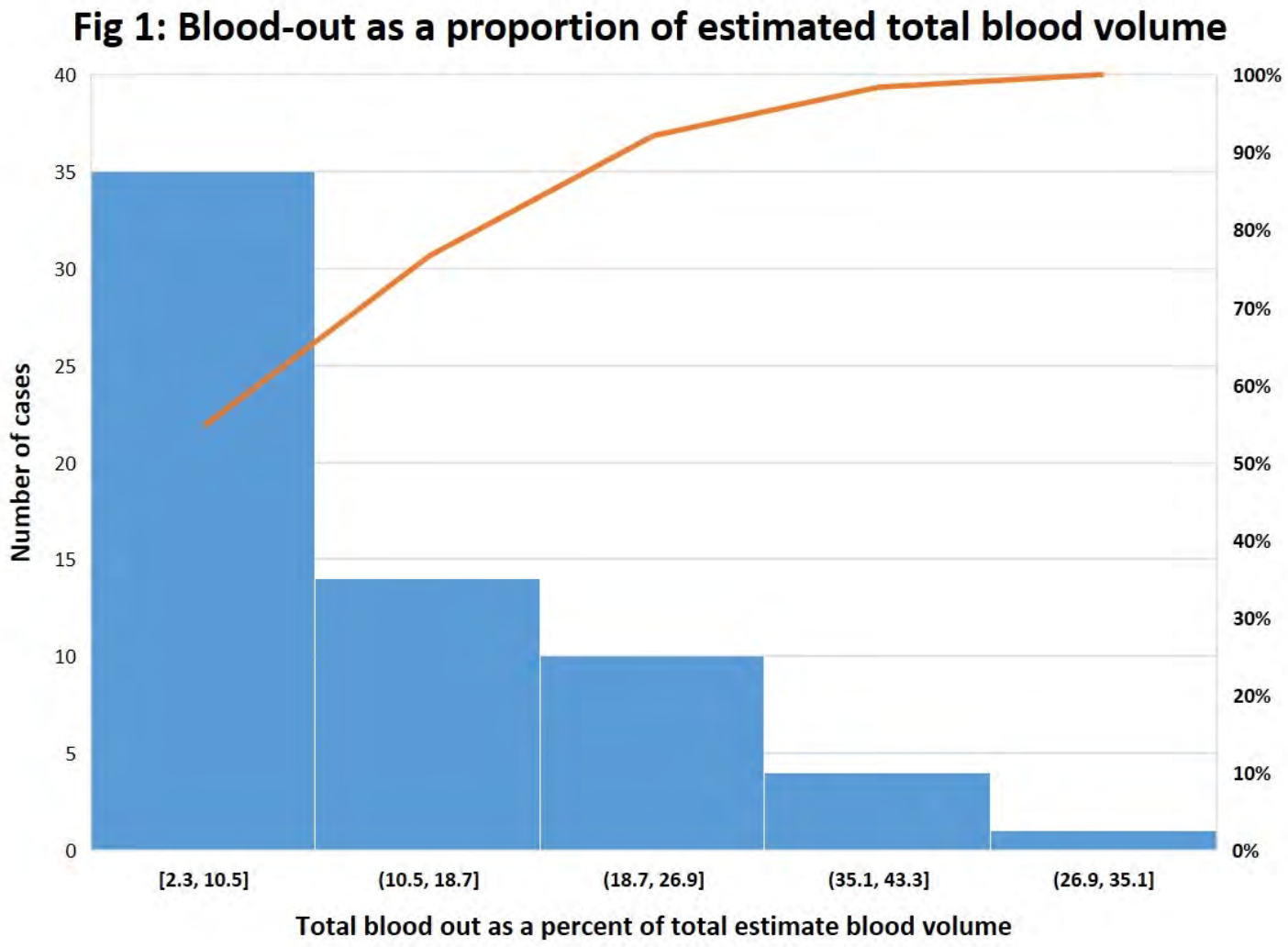

Figure 1: Blood-out as a proportion of estimated total body blood volume

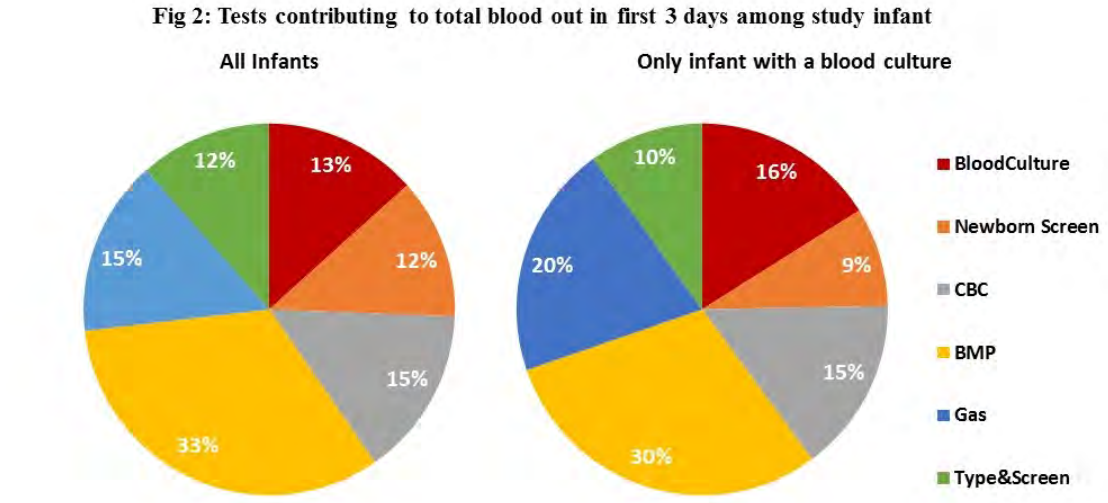

Figure 2: Tests contributing to total blood-out in first 3 days among study infants

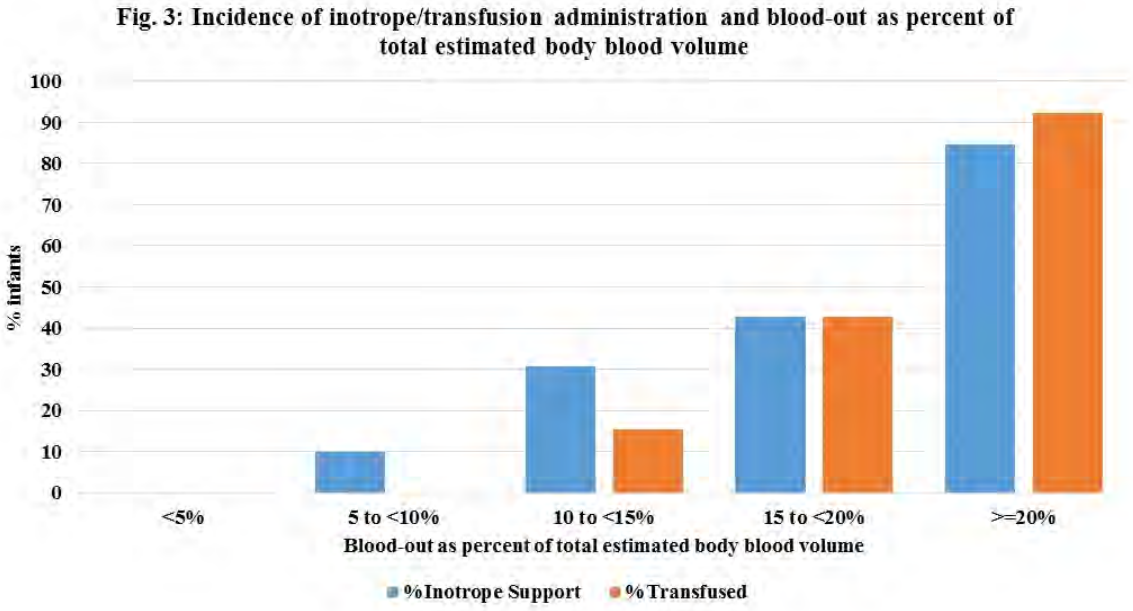

Figure 3: Incidence of inotrope/transfusion administration and blood-out as percent of total estimated body blood volume

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Accuracy of Transcutaneous Bilirubin Measurement in Preterm Neonates

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Background The American Academy of Pediatrics recommends the use of a transcutaneous bilirubin (TcB) device for evaluation of jaundice in infants born in the hospital at or beyond the 35th week of gestation. Utilization of the TcB has not been validated in neonates born <35 weeks gestational age (GA) or who have undergone phototherapy. We hypothesize that TcB will correlate with total serum bilirubin (TsB) regardless of gestational age and will vary based on time on and off phototherapy.
Objective To correlate TcB and TsB in preterm infants < 35 weeks determined by last menstrual period or first trimester ultrasound, who were never on phototherapy, on phototherapy, and recently off phototherapy.
Design/Methods Parents of infants fulfilling inclusion criteria provided informed consent. Infants getting a TsB as a part of routine care had a TcB measurement within 15 minutes of the serum being drawn using the JM-103 transcutaneous bilirubin device. Preterm infants born at GA <35 weeks were stratified into 3 groups: pre-phototherapy, during phototherapy and post-phototherapy. Correlation between TcB vs TsB was determined by the Pearson correlation coefficient test and means of TcB-TsB were compared by ANOVA.
Results Data from 42 subjects (GA 27 2/7-34 6/7 weeks) consisting of 32 with 63 measurements pre-phototherapy, 25 with 64 measurements on phototherapy, and 20 with 48 measurements post-phototherapy were evaluated. Of the 42 subjects, 12 were <32 weeks and 30 were ≥32 weeks; 24 were male. Mean TcB-TsB of 0.42 ± 3.74 before or never on phototherapy and 0.34 ± 3.74 after phototherapy were significantly different from the mean of -1.3 ± 4.46 during phototherapy ($p < 0.5$). TcB correlated with TsB for the total population before (Figure 1a; TcB vs TsB: $r = 0.78$, $p < 0.05$), during (Figure 1b; TcB vs TsB: $r = 0.55$, $p < 0.05$) and after (Figure 1c; TcB vs TsB $r = 0.72$, $p < 0.05$) phototherapy as well as for both gestational age subpopulations.
Conclusion(s) Our data demonstrate a correlation between TsB and TcB before, during, and after phototherapy. The correlation, which is seen in both the total population and the two premature subpopulations, is strongest at baseline, decreased under phototherapy and improved post phototherapy. There is a significantly larger and more negative mean TcB-TsB while under phototherapy, suggesting lower skin levels before requilibriation with serum. A larger population is needed to determine variation with time on and off phototherapy and narrower GA subpopulations.

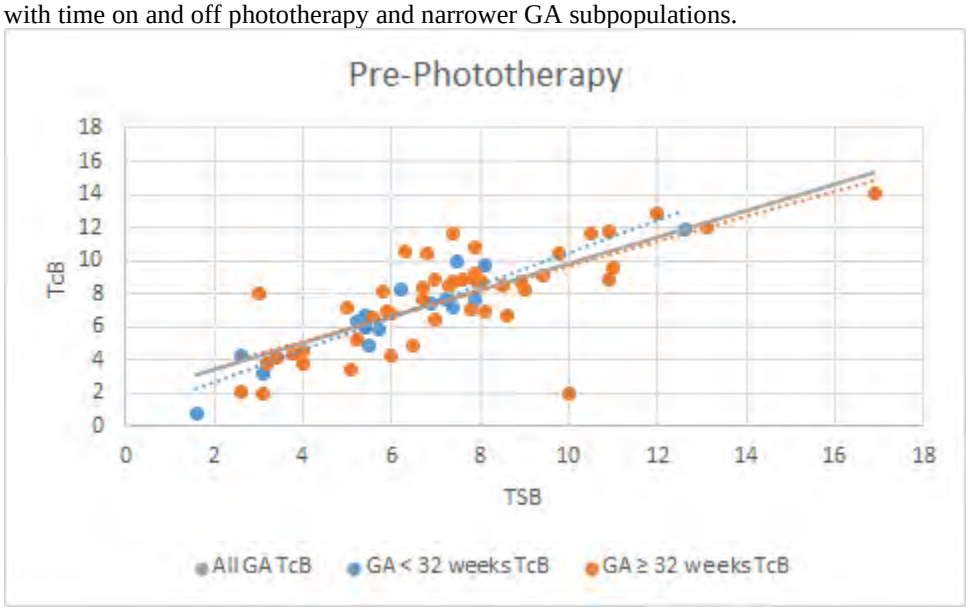

Figure 1a

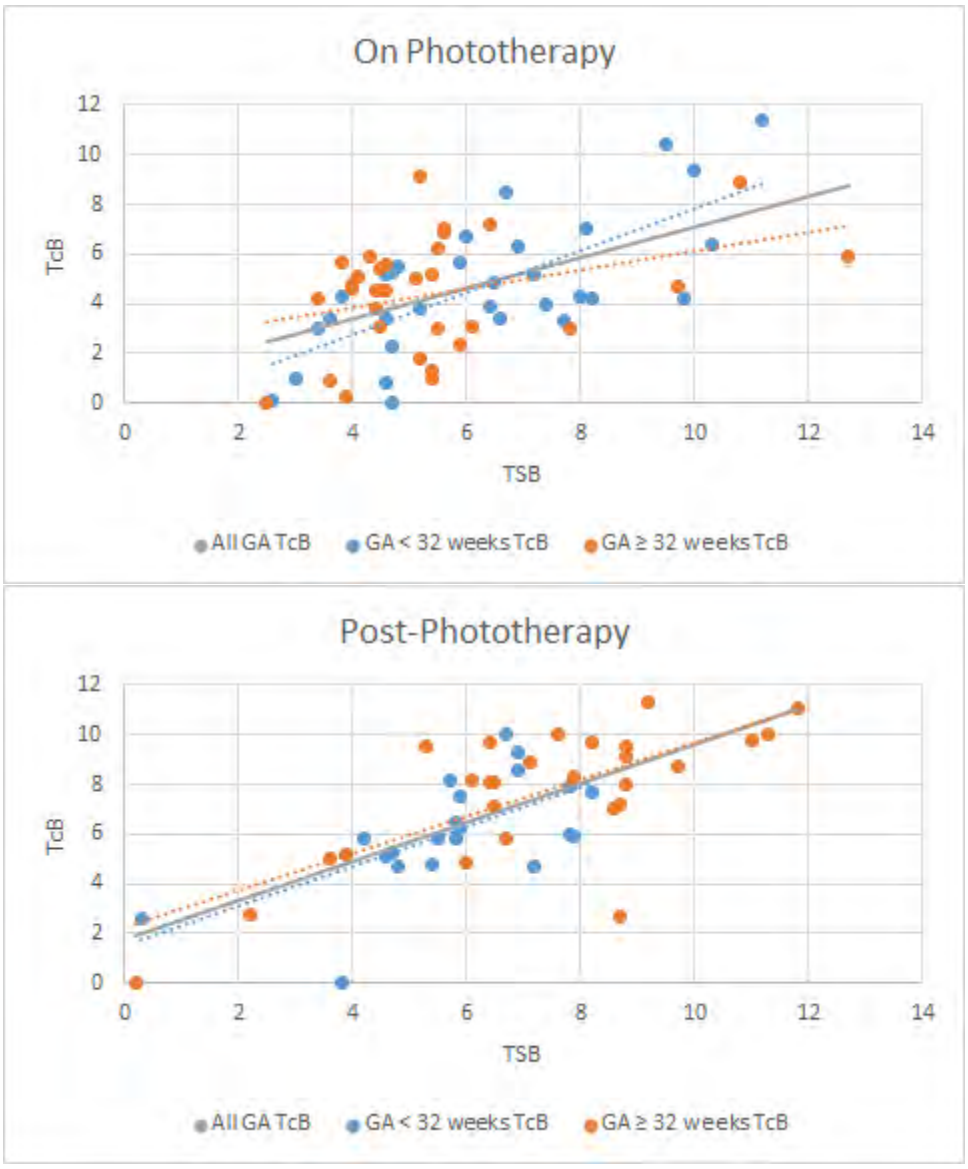

Figure 1c

Abstract: 157

Incidence of Developmental Dysplasia of the Hip is Not Associated with Breech Presentation in Preterm Infants

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Background Breech presentation (Br) of term infants is associated with developmental dysplasia of the hip (DDH). Most fetuses undergo version from Br to vertex position (Vtx) after 34 weeks' gestation (GA).
Objective We aimed 1) to determine the incidence of DDH in preterm infants born prior to 35 completed weeks GA in a Br; 2) to see if the association between Br and DDH holds true for preterm infants.
Design/Methods Charts of infants born between January 1, 2008 and December 31, 2017 who completed less than 35 weeks' GA and were admitted to the NICU at Penn State Health Children's Hospital were reviewed. Infants had hip ultrasounds (US) at 4-6 weeks' corrected age if they were born in the Br or had findings consistent with DDH (clicks/clunks). Data were also collected on mode of delivery and ultimate diagnosis of DDH (based on both hip US and physical exam). Patients were excluded if they were born in a position other than breech (i.e. transverse), had no documentation of position at birth, as well as if they died within the first year of life.
Results A total of 1799 infants were reviewed. There were 266 infants excluded because the position was not documented in the medical record. The mean ± standard deviation GA was 31 ± 3 weeks (range 23-34). As shown in Table 1, preterm infants born in the

Br had an incidence of DDH of 0.47% (2/428) and preterm infants born in the Vtx position had an incidence of DDH of 0.36% (4/1105). There was no significant difference in the incidence of DDH between infants born in the Vtx or Br (Chi square). The sensitivity of Br in detecting DDH was 33% with a specificity of 72%. The positive predictive value of Br was 0.47%. The negative predictive value was 99.6%.
We then analyzed the data for an association between clinical diagnoses of DDH (hip clicks/clunks) and Br or Vtx at birth (Table 2). There was no significant association between presentation at birth and presence or absence of hip clicks/clunks (Chi square). The sensitivity of Br in the clinical diagnosis of DDH (detection of hip clicks/clunks) was 19% with a specificity of 73%. The positive predictive value of Br was 0.8%. The negative predictive value was 98.7%.
Conclusion(s) Tthere is no association between Br and DDH in preterm infants. Using Br to screen for either clinical signs or hip US is not reliable with very low sensitivity, specificity and extremely low positive predictive value. The practice of obtaining hip ultrasounds on preterm infants born in the Br is not recommended.

Table 1

	DDH	no DDH	Totals
Breech	2	426	428
Vertex	4	1101	1105

Table 2

	Hip click/clunk	No click/clunk	Totals
Breech	3	358	361
Vertex	13	972	985

Abstract: 158
Reduction of Phenobarbital Use During Hypothermic Therapy in Neonates with Hypoxic Ischemic Encephalopathy
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Background Therapeutic hypothermia (TH) is associated with improved outcomes in neonates with moderate Hypoxic Ischemic Encephalopathy (HIE). Even with the introduction of TH, seizures (Sz) continue to be the most common neurological sequelae. In the absence of continuous video electroencephalogram monitoring (vEEG) during TH, patients are often started on phenobarbital (PB) for abnormal movements despite the association of PB with neuronal cell apoptosis. As a result, recommending continuous vEEG during TH may improve diagnosis of Sz and thereby minimize excessive use of PB.
Objective We aimed to decrease PB use by replacing selective head cooling (SHC) with whole body cooling (WBC) and initiating continuous vEEG prior to starting TH.
Design/Methods A three phase quality control study was conducted at our tertiary care NICU. Retrospective data assessment (phase 1) revealed 93% use of PB in HIE neonates treated with SHC. This led to implementation of WBC and discussion with the pediatric neurology team of the need for prompt placement of vEEG prior to initiating TH (primary intervention). This was followed by phase 2, i.e. prospective data collection for 1 year. At the end of phase 2, interim analysis revealed a decline in PB use, prompting phase 3, i.e. a more comprehensive educational session with constructive feedback to NICU and pediatric neurology staff (secondary intervention), followed by an additional 1 year of data collection for 1 year.
Results Diagnosis of Sz significantly improved after implementation of WBC and continuous vEEG during TH (phase 2) when compared with phase I ($p<0.001$). Interim analysis after phase 2 revealed that PB use decreased by 35% and Sz control was markedly better than phase 1. Secondary intervention (education plus feedback) maintained significant improvement in Sz diagnosis and PB use. Diagnosis of electrographic Sz without clinical symptoms did not increase the overall diagnosis of Sz and had no impact on PB use. PB continues as first-line treatment of neonatal Sz during phase 3 with no increases in use of alternative anti-Sz medications.
Conclusion(s) A well collaborated educational intervention coupled with changes in treatment management improved diagnosis of neonatal Sz during TH and decreased PB use in neonates with moderate HIE.

Abstract: 159

Quality Improvement- Assessing compliance of Neonatal Intensive care unit (NICU) teams to standard feeding protocol using an enteral nutrition audit tool.

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Background Having established a safe and effective standard feeding guideline for our unit, we wanted to further investigate how well it is executed into daily practice.
Objective Primary outcome was to assess compliance across six crucial transition points as part of the standard unit feeding advancement protocol. Secondary outcomes examined rates of Necrotizing Enterocolitis (NEC) and the percentage of babies discharged small for gestational age (SGA).
Design/Methods Single center, retrospective chart review of babies born <31 weeks gestational age over a 2 year period from 2017 to 2018 were included and data analyzed using Plan-do-study-act (PDSA) cycles. In 2017, new guidelines for the use of donor milk were implemented along with a total parenteral nutrition (TPN) weaning protocol. In 2018, a new brand of preterm formula was adopted along with monthly multi-disciplinary tracking of growth parameters.
NEC was defined by one of the following clinical signs (bilious gastric aspirate or emesis, abdominal distension, occult or gross blood in the stools) and at least one of the radiographic findings (pneumatosis intestinalis, hepato biliary gas, pneumoperitoneum). Growth was evaluated on the Fenton 2013 growth charts, with infants <10th percentile termed as SGA**.** For protocol compliance, subjects were excluded if they died or were transferred from the unit. However, for analyzing NEC and SGA outcomes, all subjects were included.
Results Of 150 infants, 20 were transferred out or died before discharge. Compliance to the protocol was generally maintained or improved in all areas except using the correct days of trophic feeds (see table). Trophic feeds were found to sometimes be advanced too early in the 2018 group. We found a declining trend in the rate of NEC, 11.4% (9/79) in 2017 v. 2.8% (2/71) in 2018. The same trend was also observed in the percentage of patients discharged SGA, 41.7% (33/79) in 2017 compared to 28.1% (20/71) in 2018.
Conclusion(s) Overall, we found improved compliance in following the nutrition guideline. Despite advancing feeds sometimes early and although likely multifactorial, we found a major trend of a decreased rate of NEC and a decreased rate of SGA babies in the second year of implementation, with p values near significant. We will continue to review our practices further for better understanding of any barriers, and use this to design strategies addressing our efforts to improve compliance and sustainability of this nutrition guideline.

Feeding advancement transition points compliance	2017 n(69)	2018 n(61)	P value
Correct volume of trophic feeds	67/69 (97%)	61/61 (100%)	NS
Correct days of trophic feeds received	69/69 (100%)	55/61 (90%)	<0.01
Feeds fortified @80ml/kg/day	37/69 (53.65%)	45/61 (73.7%)	0.02
Central line removed @100-120 ml/kg/day feed	55/69 (79.7%)	47/61 (77%)	NS
Goal enteral feeds @160 ml/kg/day achieved in 13-16 days	34/69 (49%)	32/61 (52.4%)	NS
Feeds run over correct duration of time	66/69 (95.6%)	58/61 (95%)	NS

The *Eunice Kennedy Shriver* National Institute of Child Health and Human Development (NICHD) Strategic Plan and Pediatric Research at the NIH

Rohan Hazra
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Abstract: 160

Tachypnea in the Newborn Nursery

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History (including chief complaint, history of present illness and relevant past and family medical history) A full term, LGA infant receiving routine care in the newborn nursery developed tachypnea and increased work of breathing on day of life four. He was born via C-section for failure to progress to a 28-year-old G1P1 mother with normal prenatal labs, GBS negative. Maternal fever during labor with maximum temperature 38.5 degrees Celsius and rupture of membranes 51 hours; per the Kaiser Permanente sepsis calculator, this did not warrant a sepsis evaluation at birth. He had been exclusively breastfeeding and had adequate urine and stool diapers. His tachypnea warranted transfer to the NICU where he was found to be profoundly acidotic and hypernatremic, with other lab values shown below. He was started on empiric antibiotics, given two normal saline boluses, and began IV fluids with D10W at 150 ml/kg/day until resolution of his hypernatremia, though mild acidosis persisted. Despite improving labs, he began to have seizures, requiring multiple loading doses of phenobarbital and transfer to a quaternary care center for further management.
Physical examination findings (including vital signs) Weight down 14% from birth weight, HR 156, RR 68, T 36.9 C, BP 80/57, SpO2 99%
Lethargic but responsive to exam; dry mucus membranes; tachypnea with deep subcostal retractions and nasal flaring, lungs clear to auscultation bilaterally; heart with regular rate and rhythm, normal S1, S2; capillary refill < 3 seconds; abdomen soft, nontender, without HSM; slight hypotonia throughout with otherwise normal reflexes
Laboratory or Diagnostic imaging or Procedures Na 156, K 5.1, Cl 128, HCO3 5.3, BUN 54, Cr 3.8, Glucose 52
pH 7.10, pCO2 17, pO2 70, HCO3 5.3
WBC 17.2, Hgb 15.1, Hct 44.4, Platelets 250, Normal differential
Lactate 1.0, Betahydroxybutyrate 8.98, Ammonia 125
Urine pH 6.5, specific gravity 1.015, protein 1+, Glucose negative, Ketones 3+, Blood 3+, Nitrite negative, Leukocyte esterase negative, WBC 2, RBC 2
AST 44, ALT 135
After other labs normalized, uric acid 14.2
Final Diagnosis Metabolic acidosis and acute kidney injury secondary to dehydration in the setting of Lesch-Nyhan Syndrome. The infant's electrolytes continued to stabilize at the quaternary center, and his seizures stopped after starting maintenance phenobarbital. Cultures were negative. Typical studies to evaluate for inborn errors of metabolism did not discover a cause of his severe illness, so whole exome sequencing was sent and discovered a mutation which causes Lesch-Nyhan Syndrome. This may account for his refractory seizures. The buildup of uric acid in the setting of dehydration may explain the severity of AKI seen in this infant, though it does not account for the metabolic acidosis.

Abstract: 161

Intrauterine HSV Causing Cystic Encephalomalacia

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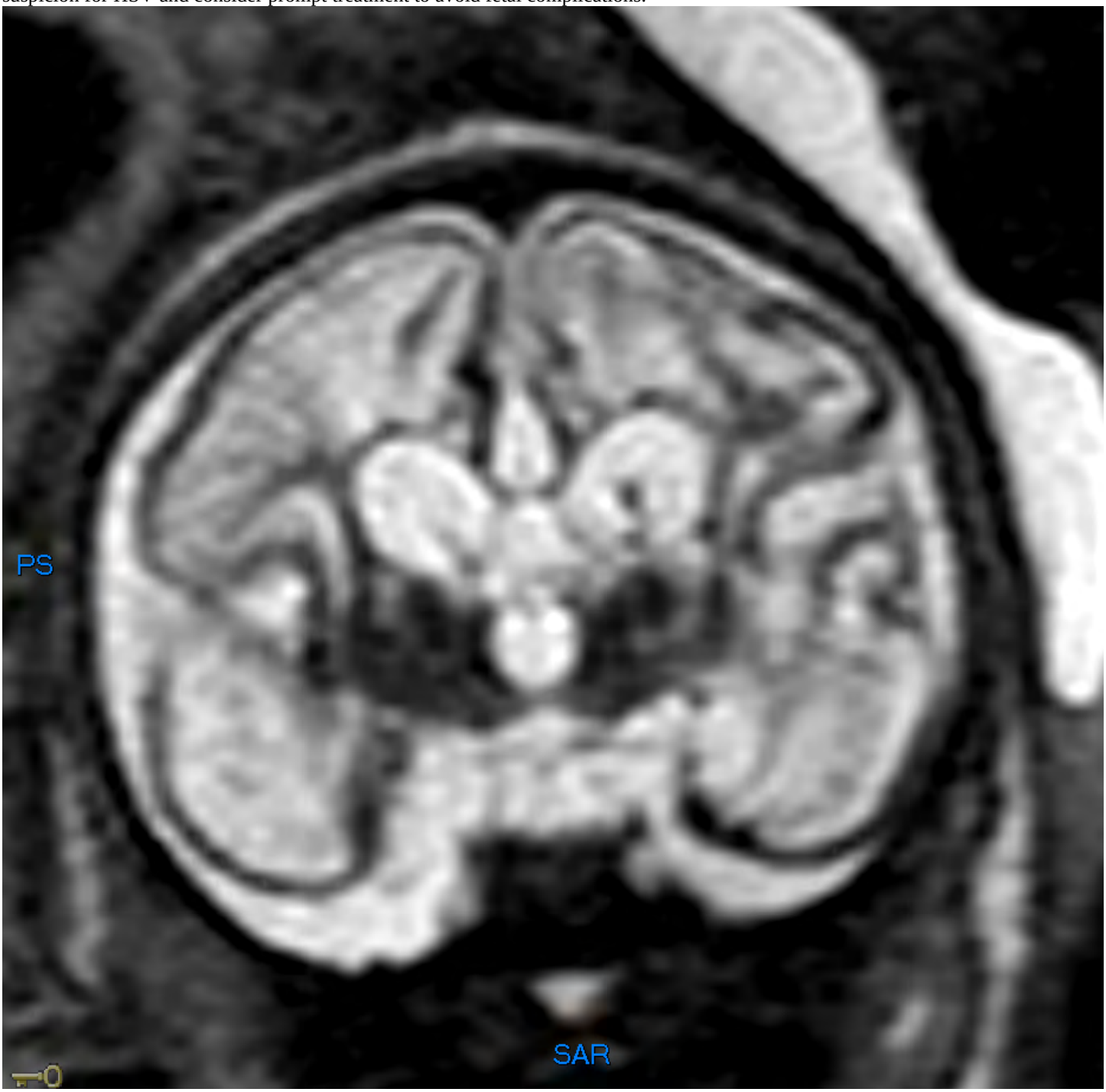
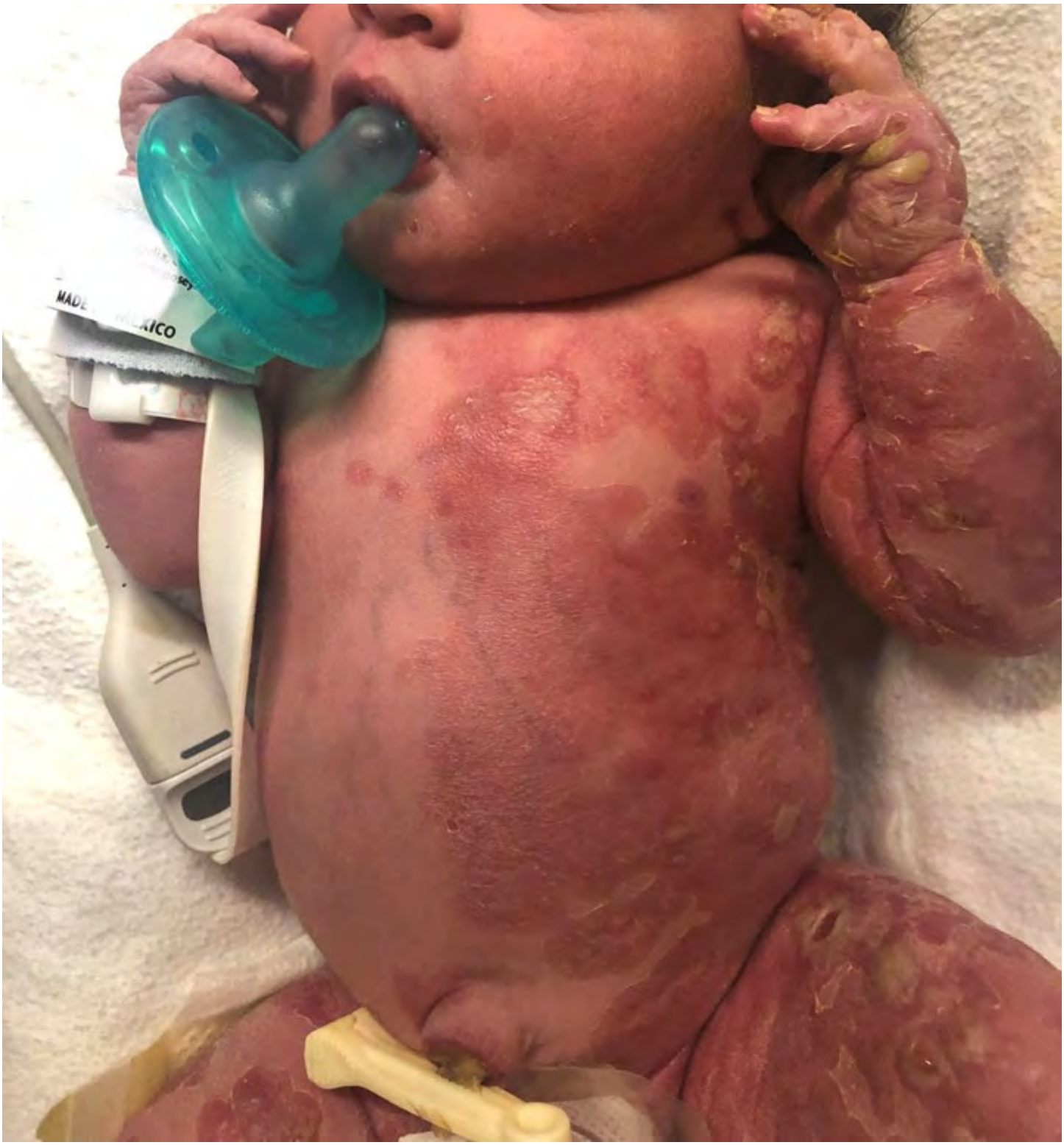
History (including chief complaint, history of present illness and relevant past and family medical history) A 30-year-old G3 P2 woman initially presented at 30 2/7 weeks gestation due to possible rupture of membranes, which was ruled out. She re-presented at 32 3/7 weeks gestation for the same concern. An ultrasound showed an interim decreased AFI from 18 to 7.9, and new bilateral lateral and third ventricle dilation, concerning for fetal hydrocephalus. Fetal MRI showed extensive cystic encephalomalacia of the brain parenchyma involving the supratentorial and infratentorial brain, consistent with a subacute to chronic in utero vascular event. She returned at 33 0/7 weeks and infant was delivered via repeat c-section. Opaque white amniotic fluid was noted at delivery and the umbilical cord was severely macerated.
Physical examination findings (including vital signs) Infant had scattered flaccid blisters and multiple clear fluid vesicles on an erythematous background over the left hemi- trunk, left arm, lower bilateral limbs, scalp, and palate. Nikolsy sign was negative. There was a sharp midline demarcation over trunk with bright red mildly scaly erythematous confluent patches and extensive areas of denuded skin.
Laboratory or Diagnostic imaging or Procedures Skin swabs sent for PCR returned positive for HSV-2. Placental pathology showed acute chorioamnionitis with necrosis, acute neutrophilic and plasmacytic funisitis, intervillous thrombus consistent with focal early infarction, and HSV positive immunohistochemical stains of the umbilical cord.
Final Diagnosis This infant had congenital, intrauterine HSV with cystic encephalomalacia and skin lesions. Congenital Herpes Simplex Virus (HSV) infection is a rare with an incidence between 1 in 3,000 to 1 in 20,000 live births. Vertical transmission usually occurs peripartum, through contact with an infected genital tract, but it may be caused by an ascending infection through ruptured or intact membranes. The risk of transmission is higher in primary HSV, is often asymptomatic, and infection occurs near the time of delivery. Rarely, transplacental transmission may occur, which accounts for less than 5% of all cases. Transplacental transmission is associated with an increased risk of spontaneous abortion, preterm birth, intrauterine growth restriction, and significant brain

destruction. Given the devastating effects of transplacental HSV in primary HSV infections, obstetricians should have a high index of suspicion for HSV and consider prompt treatment to avoid fetal complications.



Fetal MRI T2 weighted coronal image



Skin lesions present at birth

Abstract: 162

Term Infant with Cardiorespiratory Depression at Birth

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History (including chief complaint, history of present illness and relevant past and family medical history) A 39-week, 3576 grams male is born via midwife assisted vaginal delivery to a healthy 30-year-old Amish woman in her 9th pregnancy. Uneventful pregnancy with limited prenatal care. Unremarkable delivery, but as soon as the umbilical cord is clamped the infant becomes apneic and bradycardic. Bag-valve mask ventilation and chest compressions are started. Details of resuscitation are limited but the resuscitative measures continue for 15 minutes. Emergency Medical Services arrive and the infant is taken to the nearest Emergency Department. The outside provider contacts our hospital for transfer.
Physical examination findings (including vital signs) The physician reports a normal level of consciousness and activity, normal posture, tone, and reflexes. Reactive pupils, breathing without distress, strong pulses, and good perfusion. The cardiac exam reveals a systolic murmur. His vital signs are stable but he is requiring 100% of face mask oxygen to maintain saturations of 81% to 85%. There is no pre- or postductal saturation gradient.
Laboratory or Diagnostic imaging or Procedures The chest radiograph (Figure 1) shows an enlarged cardiac silhouette. Venous blood gas shows: pH, 7.26; partial pressure of carbon dioxide, 62 mm Hg; partial pressure of oxygen, 34 mm Hg; base excess, –1.8 plasma lactate; glucose, 60 mg/dL. Intravenous access is obtained with a full blood count and blood culture; antibiotics are administered. After a review of the available workup, prostaglandins are started and the patient is transferred. Upon arrival, an echocardiogram rules out a ductus dependent lesion but shows right atria and ventricular dilation, dilated head and neck vessels, and marked retrograde flow in the transverse aorta. This prompts an MRI/MRA of the brain (Figure 2 and 3) that confirms the presence of a large predominantly right-sided posterior fossa dural arteriovenous malformation.
Final Diagnosis Symptomatic cerebral AVMs are a rare find in newborns and only 10% are located in the posterior fossa. Neonatal presentation of AVMs is rare but large lesions usually manifest with signs of congestive heart failure. Rapid identification and treatment is crucial due to the risk of severe and possibly irreversible cardiac and brain lesions that can lead to negative neurodevelopmental outcomes. The goal is to obliterate the AVM completely and requires a multidisciplinary approach to accomplish the best possible outcome. Due to the size and location of the lesion, multiple complex surgeries were needed. The family decided not to have any surgical intervention and to provide comfort care for the infant.

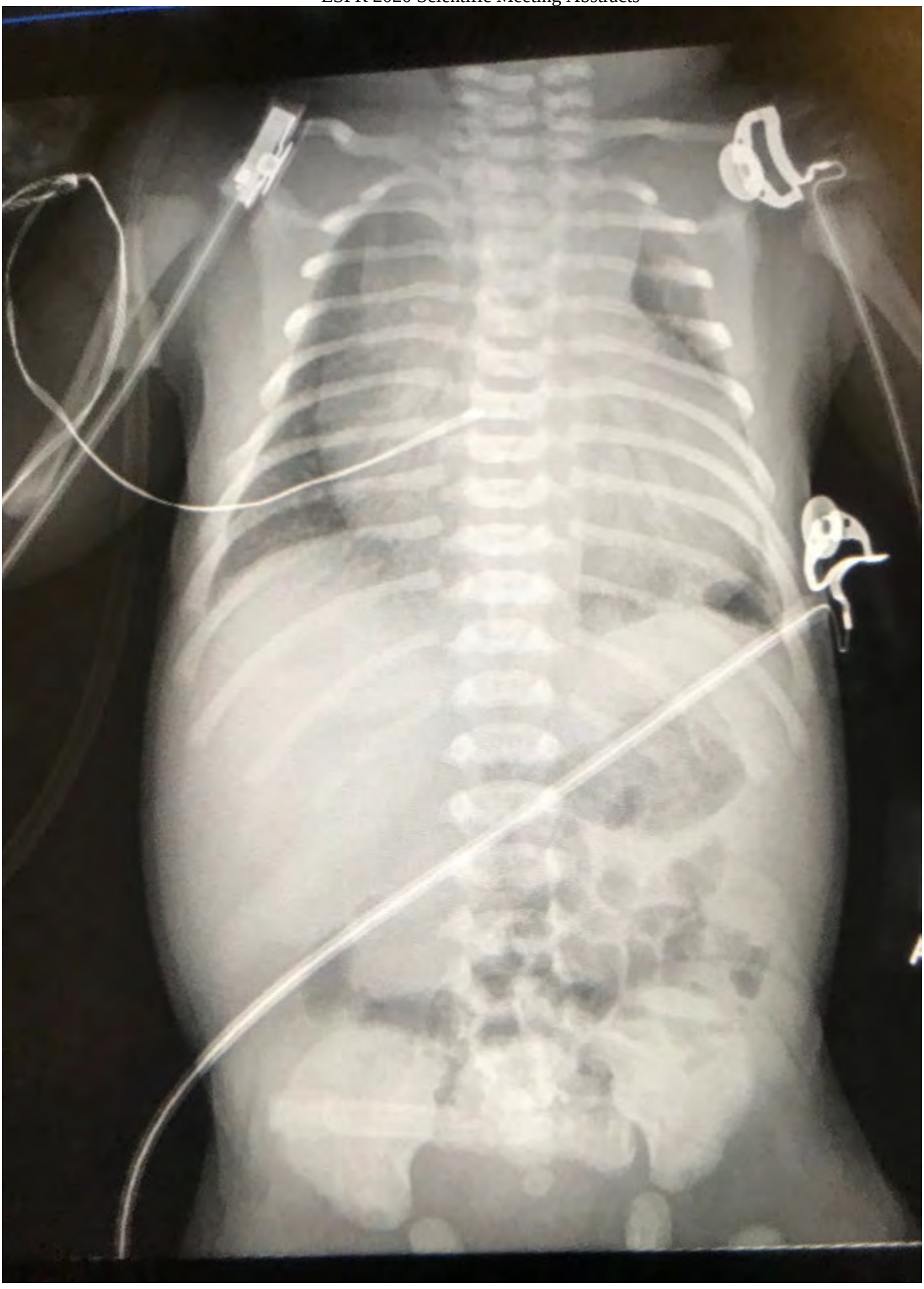

Figure 1: Chest and abdomen radiography with cardiomegaly.

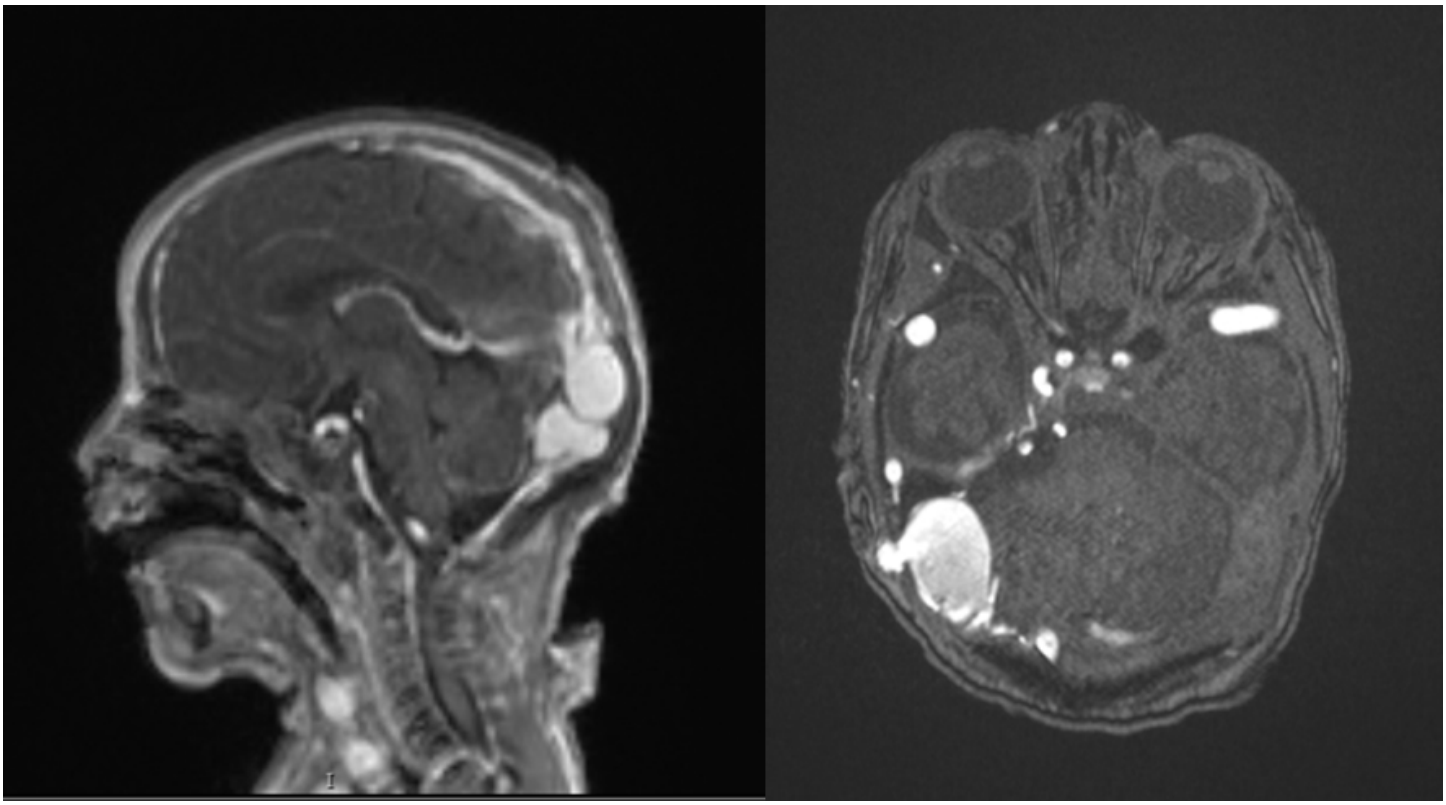

Figure 2: MRI shows a large predominantly right-sided posterior fossa dural arteriovenous malformation.

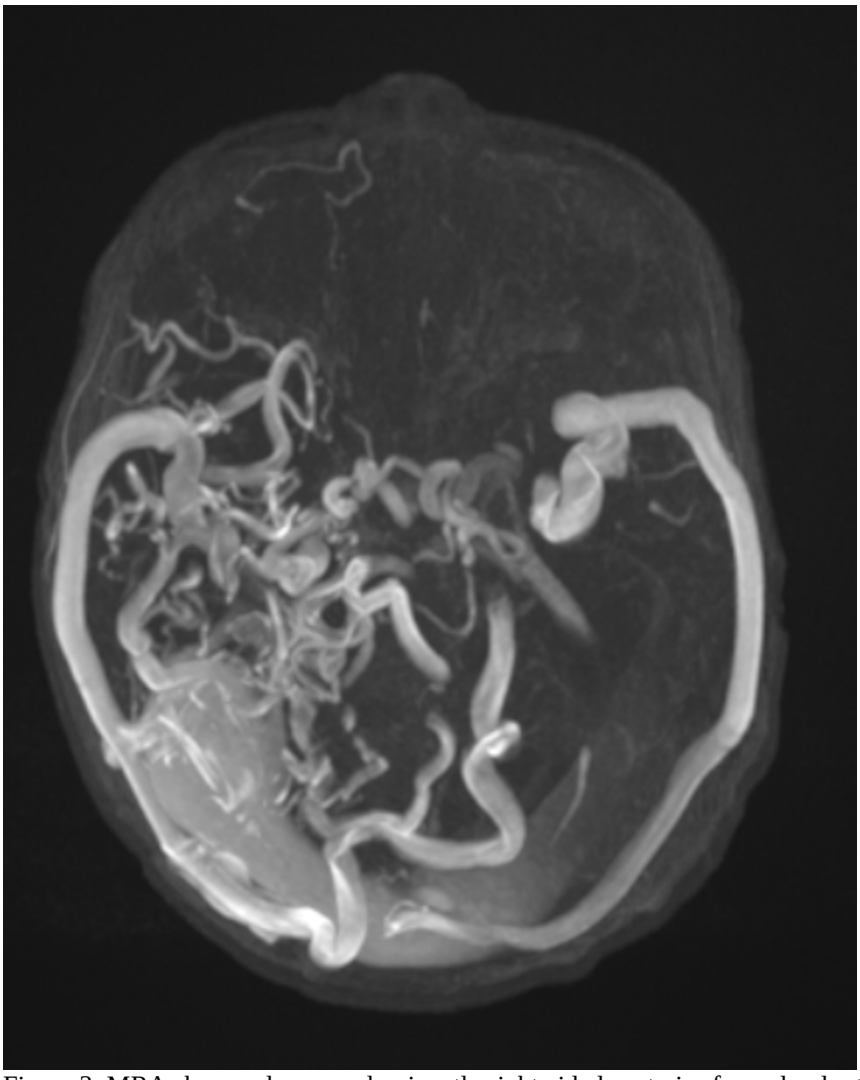

Figure 3: MRA shows a large predominantly right-sided posterior fossa dural arteriovenous malformation with multiple feeding arteries.

Mentor of the Year Lecture: Azithromycin to Prevent BPD in Ureaplasma-infected Preterms: Lessons Learned from a Clinical Trial

Rose M. Viscardi
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Abstract: 163

Tropomyosin 1 genetically constrains in vitro hematopoiesis

Christopher Thom[1], Chintan Jobaliya[1], Kimberly Lorenz[2], Jean Ann Maguire[1], Alyssa Gagne[1], Paul Gadue[1], Deborah French[1], Benjamin Voight[2]
[1]Childrens Hospital of Philadelphia, Philadelphia, Pennsylvania, United States, [2]University of Pennsylvania, Philadelphia, Pennsylvania, United States

Background Donated platelet supplies cannot meet clinical demand, and platelet transfusions *increase* morbidity and mortality in preterm infants. Novel approaches are needed to increase safely transfusable platelet supplies. *In vitro*-derived products from cultured induced pluripotent stem cells (iPSCs) could address these clinical needs, but current methods are cost-inefficient. Genetic manipulation could enhance efficiency of *in vitro* hematopoiesis and megakaryopoiesis. While genome wide association studies (GWAS) have linked hundreds of DNA loci with altered human platelet traits, related genes and mechanisms that impact *in vitro* production are largely unknown.

Objective To identify and validate loci and related genes that impact hematopoiesis and megakaryopoiesis.

Design/Methods We used penalized regression (the least absolute shrinkage and selection operator, LASSO) to create a quantitative prediction model, querying which of 860 epigenetic features best discriminated 700 platelet trait GWAS loci from matched controls. We then identified high-priority loci and related genes, and validated hematopoietic impact using established induced pluripotent stem cell (iPSC) culture protocols.
Results Our LASSO model, comprising 38 epigenetic features, specified platelet trait GWAS loci more accurately than any other computational approach (area under the receiver operating characteristic curve [AUC] = 0.80; next highest model AUC = 0.75). Our LASSO model highlighted exact genetic variants known to regulate platelet traits and function, as well as putatively functional sites and genes.
Among nominated loci was rs11071720, a common variant that decreases *Tropomyosin 1 (TPM1*) gene expression and increases platelet count in human cells. TPM1 regulates cytoskeletal biology in many cell types, but its role in human hematopoiesis was unknown. We created *TPM1*-knockout human iPSCs using CRISPR/Cas9. *TPM1KO* iPSCs were healthy and early hematopoietic development was normal. However, *TPM1KO* hematopoietic progenitor cell (HPC) was enhanced (2.4±0.3-fold increase vs controls for 3 distinct *TPM1KO* iPSC clones, $p<0.001$). *TPM1KO* HPCs produced normal megakaryocyte quantities, more than doubling megakaryocyte yield overall. *TPM1KO* megakaryocytes had normal morphology, gene expression patterns, and functional responses to platelet agonists, suggesting that *TPM1KO* platelets would also function normally.
Conclusion(s) Our findings help explain human platelet trait genetics, and identify *TPM1* manipulation as a novel strategy to enhance *in vitro* hematopoiesis and megakaryocyte production.

Abstract: 164
Dexmedetomidine compared to intermittent morphine for sedation of neonates undergoing therapeutic hypothermia
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Background Therapeutic hypothermia (TH) initiated within six hours of the insult has improved outcomes in neonates with hypoxic-ischemic encephalopathy (HIE). However, TH and other procedures during cooling require appropriate analgesia and sedation to minimize loss of therapeutic benefit. There is lack of literature on a single appropriate sedative agent. Opiates can cause respiratory depression and hypotension. Dexmedetomidine has a potential role for sedation and has fewer side effects. Thus, we hypothesize that dexmedetomidine could be an alternative and safe agent for sedation during TH.
Objective To evaluate the efficacy and safety of dexmedetomidine compared to morphine in neonates that qualified for TH at our Regional Perinatal Centers.
Design/Methods We conducted a retrospective chart review of patients who completed TH at NYU Langone or Bellevue Hospital Center from January 2018 to December 2019. Eligible neonates either received morphine (every 4 hours) based on previous practice or continuous dexmedetomidine via new protocol (started March 2019) for sedation/analgesia. Efficacy of dexmedetomidine versus morphine was determined by total morphine dose over 72-hour period and NPASS scores. Safety outcomes evaluated include changes in hemodynamics, tolerance of enteral feeds, and changes in cerebral background activity on video EEG. T-test and chi-square test were used to compare groups.
Results Of the 30 infants included in the study, 18 received dexmedetomidine and 12 received morphine. There were no significant differences in baseline characteristics with the exception of PPHN incidence being higher in the dexmedetomidine group ($p = 0.04$). Dexmedetomidine use resulted in lower cumulative opiate administration (0.27 vs 1.7 mg/kg, $p<0.001$) and lower NPASS scores at 6 hours of cooling initiation (Table 2). Heart rate at 30 hours and MAP at 24 hours were significantly lower in the morphine group (Graph 1). There were no differences in feeding tolerance after re-warming or cerebral background attenuation (Table 3).
Conclusion(s) Decreased total opiate use and equivalent NPASS scores in dexmedetomidine patients suggest similar efficacy with decreased opiate burden. Dexmedetomidine patients did not have significant bradycardia and had improved hemodynamics at 24-30 hours into TH, which may highlight the impact of morphine accumulation in morphine group. We conclude that dexmedetomidine is an equally efficacious sedating agent that minimizes side effects seen with opiates during TH.

Graph 1. Changes in A. heart rate, B. mean arterial pressure (MAP), and C. respiratory rate in dexmedetomidine group compared to morphine group

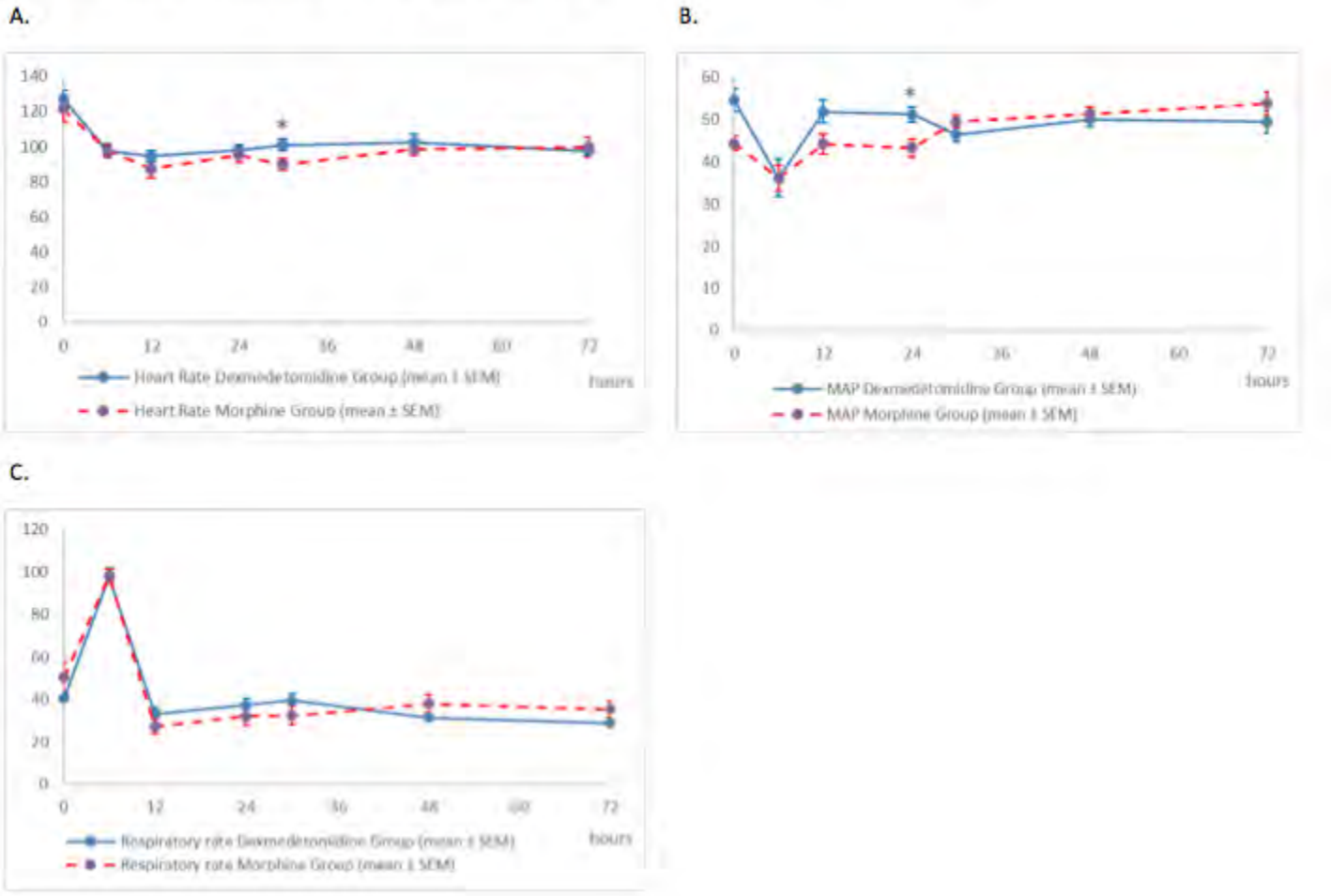

Table 1: Neonatal characteristics

	Dexmedetomidine group (n=18)	Morphine group (n=12)	p-value
BW (g), mean (SD)	3332 (533)	3410 (284)	NS
GA (weeks), mean (SD)	39.0 (1.4)	39.4 (1.4)	NS
Sex (male), mean (SD)	13 (72.2)	9 (75.0)	NS
Cesarean delivery, n (%)	9 (50.0)	7 (58.3)	NS
Apgar scores, median (range): 1 min 5 min 10 min	 2 (0-7) 4 (1-8) 4 (1-8)	 2 (1-5) 5 (3-8) 5 (3-8)	 NS NS NS
Initial blood gas: pH, mean (SD) base deficit, mean (SD)	 7.00 (0.2) 15.04 (5.2)	 6.96 (0.1) 17.10 (5.2)	 NS NS
Sarnat scores: Mild, n (%)	 6 (33.3)	 2 (16.7)	 NS

Moderate, n (%) Severe, n (%)	10 (55.6) 2 (11.1)	10 (83.3) 0 (0)	NS NS
Present of seizures, n (%)	6 (33.3)	4 (33.3)	NS
Brain MRI: Normal, n (%) HIE, n (%) Hemorrhage, n (%)	 13 (72.2) 4 (22.2) 1 (5.6)	 8 (66.7) 3 (25.0) 1 (8.3)	 NS NS NS
NICHD HIE Severity: Normal, n (%) Grade 1A, n (%) Grade 1B, n (%) Grade 2B, n (%)	 10 (55.6) 4 (22.2) 0 (0.0) 4 (22.2)	 8 (66.7) 1 (8.3) 2 (16.7) 1 (8.3)	 NS NS NS NS
MAS, n (%)	4 (22.2)	1 (8.3)	NS
PPHN, n (%)	5 (27.8)	0 (0)	0.046
Vasopressor use, n (%)	7 (38.9)	3 (25.0)	NS
Mortality, n (%)	1 (5.6)	1 (8.3)	NS

BW= birth weight, GA = gestational age, NICHD= The National Institute of Child Health and Human Development, HIE= Hypoxic Ischemic Encephalopathy, MAS= meconium aspiration syndrome, PPHN= persistent pulmonary hypertension of the newborn

Table 2: Efficacy of dexmedetomidine compared to intermittent morphine

	Dexmedetomidine Group (n=18)	Morphine Group (n=12)	p-value
NPASS scores, mean (SD): Baseline 6 hours 12 hours 24 hours 48 hours 72 hours	 0.75 (1.54) 0 (0.0) 0.4 (1.22) 0.27 (0.96) 0.13 (0.50) 0.06 (0.24)	 0.25 (0.87) 1.2 (1.9) 0.2 (0.6) 0 (0.0) 0 (0.0) 0 (0.0)	 NS 0.02 NS NS NS NS
Total morphine dose (mg/kg), mean (SD)	0.27 (0.23)	1.70 (0.27)	<0.01

NPASS = neonatal pain, agitation and sedation scale

Table 3: Effect of dexmedetomidine compared to intermittent morphine on feeding and VEEG

	Dexmedetomidine Group (n=18)	Morphine Group (n=12)	p-value
Days to full feeds, mean (SD)	3.67 (1.08)	3.18 (0.87)	NS
VEEG Cerebral Background: Continuous, n (%) Attenuated, n (%) Discontinuous, n (%) Burst suppression, n (%)	 7 (38.9) 2 (11.1) 4 (22.2) 3 (16.7)	 6 (50.0) 4 (33.3) 1 (8.3) 0 (0.0)	 NS NS NS NS

Low voltage, n (%)	1 (5.6)	1 (8.3)	NS
Flat, n (%)	1 (5.6)	0 (0.0)	NS

VEEG=video electroencephalogram

Abstract: 165

GABAergic disruption correlate with fluorothyl seizure susceptibility after neonatal hypoxic-ischemic brain injury in male mice.

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Background Disruption of the hippocampal GABAergic network after neonatal hypoxia-ischemia (HI) in the mouse is characterized by lower numbers of parvalbumin (PV)+ interneurons (INs), simplified PV+ dendritic arbors, and decrease GAD65/67 8d after the insult. In this model, worse hippocampal HI injuries correlate with increased fluorothyl seizure susceptibility in male mice. Therapeutic hypothermia (TH) provides minimal protection against hippocampal injury, fluorothyl seizure susceptibility and GABA disruption.
Objective To test the hypothesis that GABAergic disruption correlate with fluorothyl seizure susceptibility in a sex-specific manner in a mouse model of neonatal HI.
Design/Methods C57BL6 mice injured with HI (Vannucci) at P10 were randomized to normothermia (NT, 36°C) or TH (31°C) for 4h, and exposed to fluorothyl at P18 to study seizure susceptibility prior to brain dissection for histology. Sham controls were anesthesia-exposed littermates. Using z-stack 3D imaging reconstruction (Zeiss L700), we evaluated in the pyramidal cell layer (Py) of the CA1 and CA3 subfields: i) the number of INs expressing PV, and calretinin (CAL), and ii) the % area of somatostatin (SST), GAD65/67, GABAB R1 and R2 and GABAR α1 subunit, expression. Correlation with seizure susceptibility (stage [S] 3 and 5) after fluorothyl exposure was then calculated. Non-parametric analysis was applied (SPSSv24.0).
Results In both sexes, the number of PV+INs was decreased in the CA1 and CA3 8d after HI (p=0.01 and 0.03 vs. sham, respectively). This effect was not documented in the M1 motor cortex and was not attenuated by TH. Only in males, latency to tonic seizures (S5) directly correlated with the number of PV+INs in CA1 (p=0.006) and CA3 (p=0.008). Unlike in non-fluorothyl exposed HI injured mice, GAD65/67 IR did not decrease and did not predicted seizure susceptibility. Similar to PV + INs, CAL+ INs were also decreased in CA1 and CA3 after neonatal HI. Conversely SST IR in the Py remained unchanged. Lastly, while GABAB R2 subunit was decreased 8d after neonatal HI, GABAB R1 was unchanged, and GABAR α1 was markedly increased in the Py 8d after HI in fluorothyl exposed mice.
Conclusion(s) Disruption of the hippocampal GABAergic network, specifically deficit of PV+INs after neonatal HI may explain seizure susceptibility in a sex-specific manner. Preservation of GAD65/67, SST+ boutons, GABAB R1 and overexpression of GABARα1 may be a compensation of the injured brain to delayed seizures induced by fluorothyl.

Abstract: 166

Establishing the role of HSF1 signaling in hepatoblastoma

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Background Hepatoblastoma is the most common pediatric liver cancer with severe cases often requiring liver transplantation as there are no hepatoblastoma-specific pharmacologic therapies available. In the cancer field, there is a growing appreciation for the role in tumorigenesis for heat shock factor 1 (HSF1), a transcription factor which modulates proteotoxic stress. HSF1's role in hepatoblastoma development is unclear.
Objective We investigated the role of HSF1 in hepatoblastoma by examining both human transcriptomic data and our lab's mouse model of hepatoblastoma. We hypothesize HSF1 levels would be increased in tumors relative to normal livers and inhibiting HSF1 would prevent tumoriogenesis.
Design/Methods We compiled transcriptomic data from publicly available databases (Gene Expression Omnibus and ArrayExpress) and analyzed average expression levels. Next, we investigated HSF1's role in our hepatoblastoma model which is based on injecting mice with constitutively active forms of β-catenin and Yap1 (Fig. 1). We inhibited HSF1 by injecting a dominant negative plasmid (dnHSF1) along with YAP1 and β-catenin. We measured mouse body and liver weights. Livers were stained for PCNA to assess proliferation and to determine the relative tumor burden.
Results HSF1 expression was elevated in hepatoblastoma samples compared to normal livers, p-value<0.01, unpaired t test (Fig. 2A). Next, we looked at relative HSF1 expression levels in tumors. Nearly 60% of patients in the highest quantile of HSF1 expression died,

but only 20% in the lowest 3 quantiles died, p-value<0.01, Fisher's Exact Test (Fig. 2B). We also found less differentiated, more embryonic tumors had higher HSF1 levels compared to fetal appearing tumors, p-value<0.01, unpaired t test (Fig. 2C).
Injecting dnHSF1 along with β-catenin and Yap1 resulted in no grossly visible tumors on inspection (Fig. 3A). Normally, injection of β-catenin and Yap1 leads to significant tumor burden and increased liver/body weight ratio by 10 weeks post-injection but dnHSF1 resulted in liver/body weight ratios similar to wild type animals (Fig. 3B). PCNA immunohistochemistry showed no tumors in the dnHSF1 samples (Fig. 4). Livers from Yap1-β-catenin mice without dnHSF1 showed large PCNA-positive tumors with increased PCNA staining in surrounding tissue.
Conclusion(s) Levels of HSF1 expression correlated with hepatoblastoma severity. Second, inhibiting HSF1 in our mouse hepatoblastoma model prevents tumor formation. These findings collectively suggest HSF1 inhibition as a potential therapeutic target for hepatoblastoma.

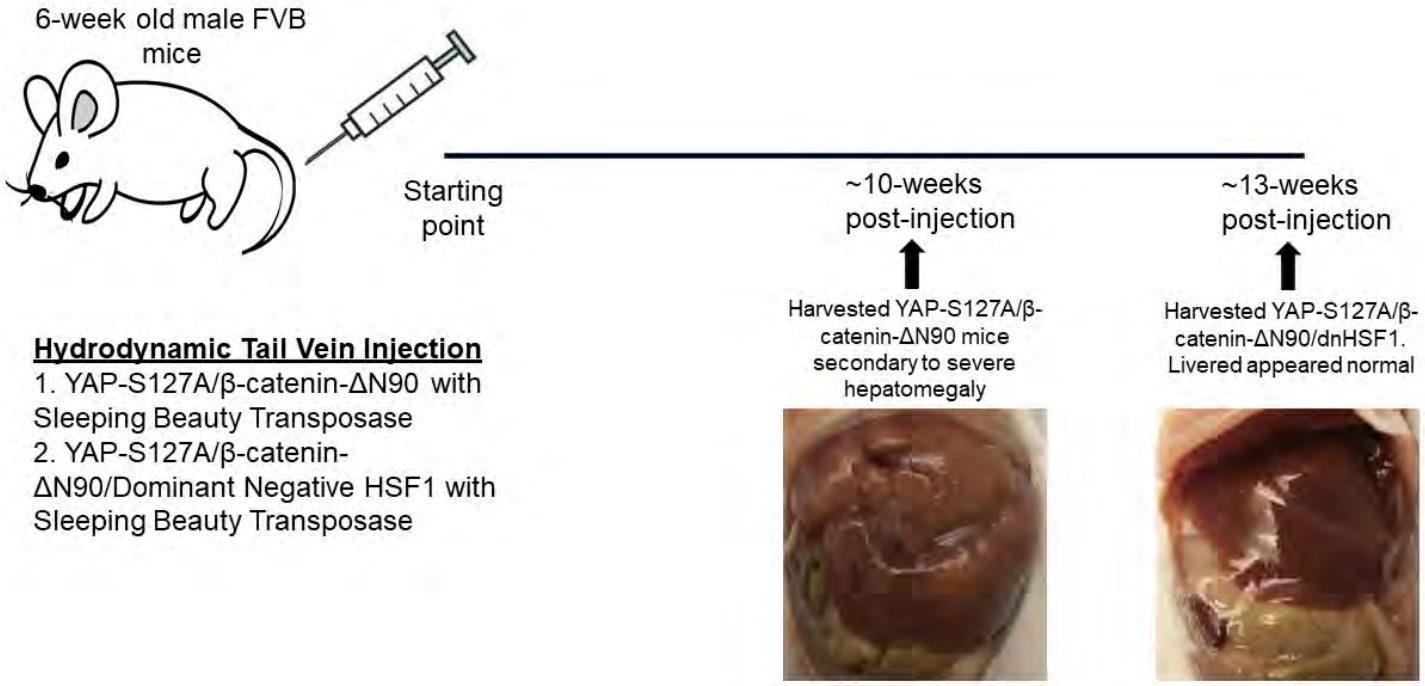

Figure 1: Schematic of mouse model experiment. 6-week old male FVB mice were injected via hydrodynamic tail vein injection with the Sleeping Beauty transposase and plasmids containing constitutively active β-catenin (ΔN90) and Yap1 (S127A). These mice had to be harvested at 10 weeks post-injection secondary to severe hepatomegaly. Other mice were injected with dominant negative HSF1 (dnHSF1) plasmid along with β-catenin and Yap1. These mice appeared grossly normal at 10 weeks post-injection. They were harvested for evaluation at approximately 13 weeks post-injection.

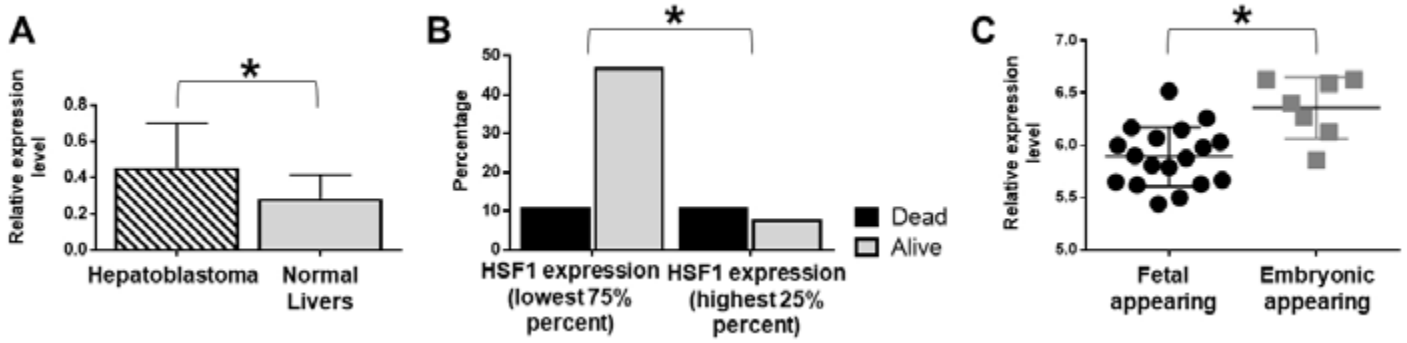

Figure 2: HSF1 expression increased in hepatoblastoma samples and correlates with death and more embryonic appearing tumors. A. HSF1 expression is increased in hepatoblastoma vs. normal liver, *=p-value<0.01, unpaired t test. **B.** Patients with high levels of HSF1 in their tumors (top 25%) were more likely to die than patients with tumors with lower expression, *=p-value<0.01, Fisher's Exact Test. **C.** HSF1 expression for more differentiated, fetal appearing tumors and for less differentiated, embryonic appearing tumors, *=p-value<0.01, unpaired t test. Sources= Cairo et al (E-MEXP-1851) and Hiyama et al (GSE131329).

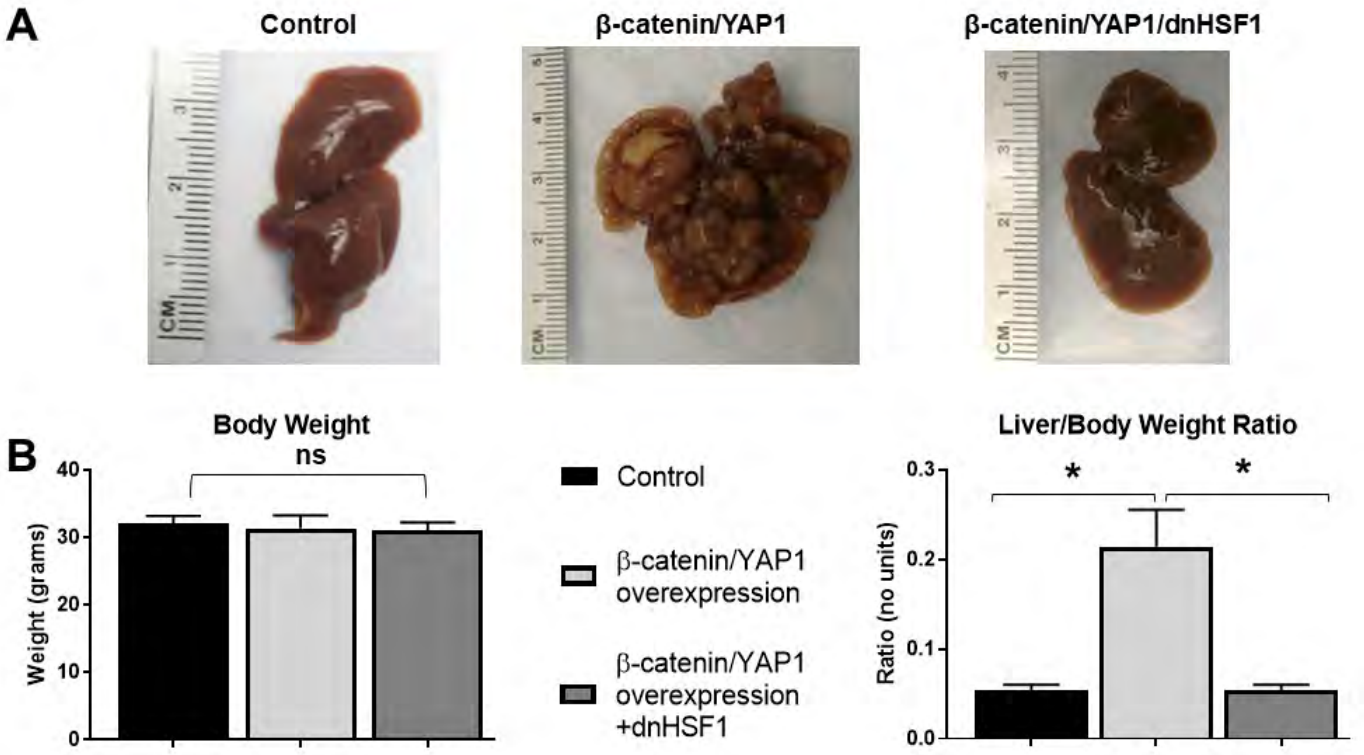

Figure 3: HSF1 inhibition significantly decreases tumor burden in β-catenin-YAP1 overexpression model. A. Gross appearance of livers from wild type mice (no injection), livers from mice receiving tail vein injection of β-catenin and YAP1 plasmids and livers from mice injected with β-catenin, YAP1 and dnHSF1 plasmids. **B.** Mice had similar body weights with each experimental condition. Co-transfection with dnHSF1 resulted in liver to body weight ratios similar to controls. * = p-value <0.01, unpaired t test.

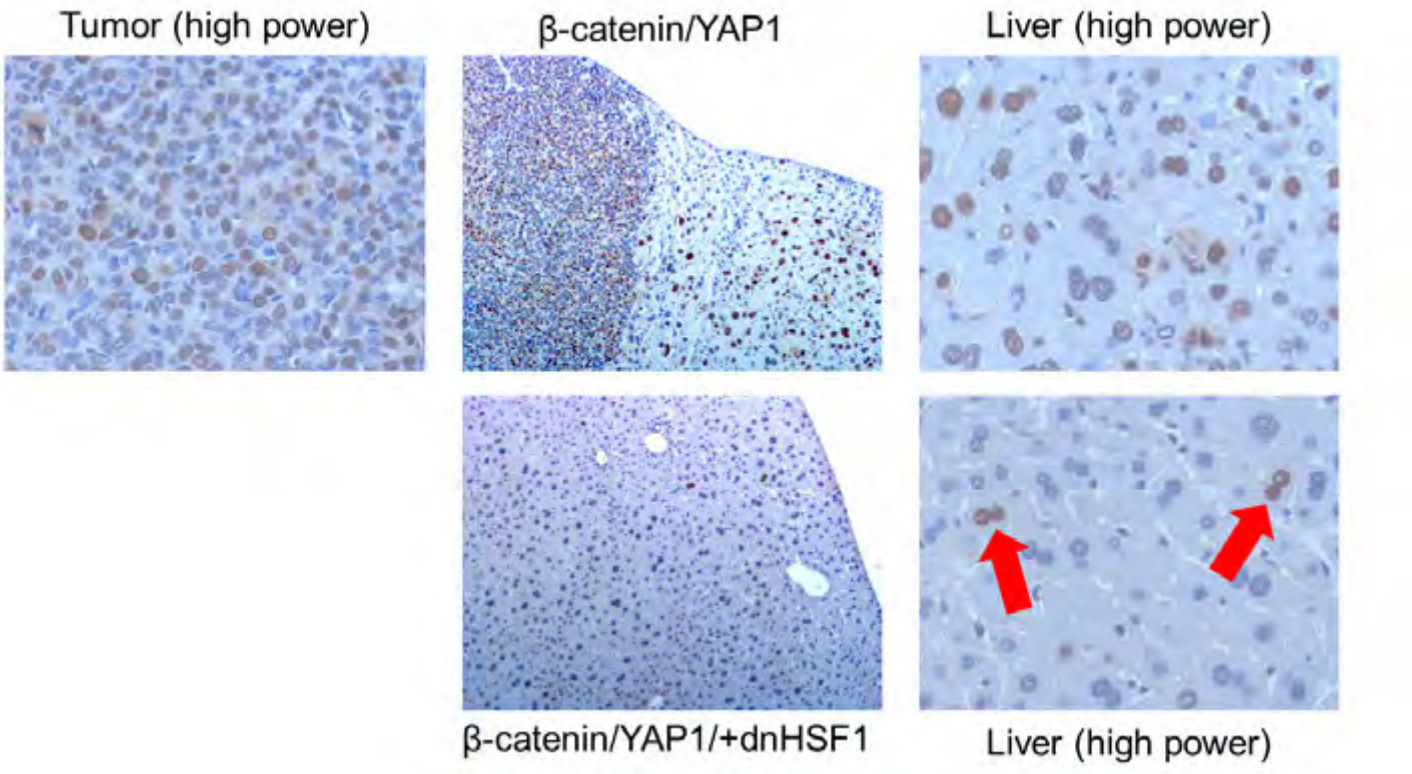

Figure 4: Decreased PNCA staining in mice injected with β-catenin/YAP1 and dominant negative HSF1 (dnHSF1). No visible tumors were visualized in samples co-injected with dnHSF1 when performing immunohistochemistry with an antibody against proliferating cell nuclear antigen (PCNA), a marker of cell proliferation(representative image shown in bottom middle panel). In these animals, only isolated cells showed positive staining for PCNA (see red arrows in bottom right panel). In samples injected just with β-catenin and YAP1, there was increased PCNA staining in both the tumors (top left panel) and in the surrounding liver (top right panel).

Abstract: 167

Randomized Trial of Supplemental Intravenous (IV) Acetaminophen on Post-Surgical Opioid Use in Preterm Infants

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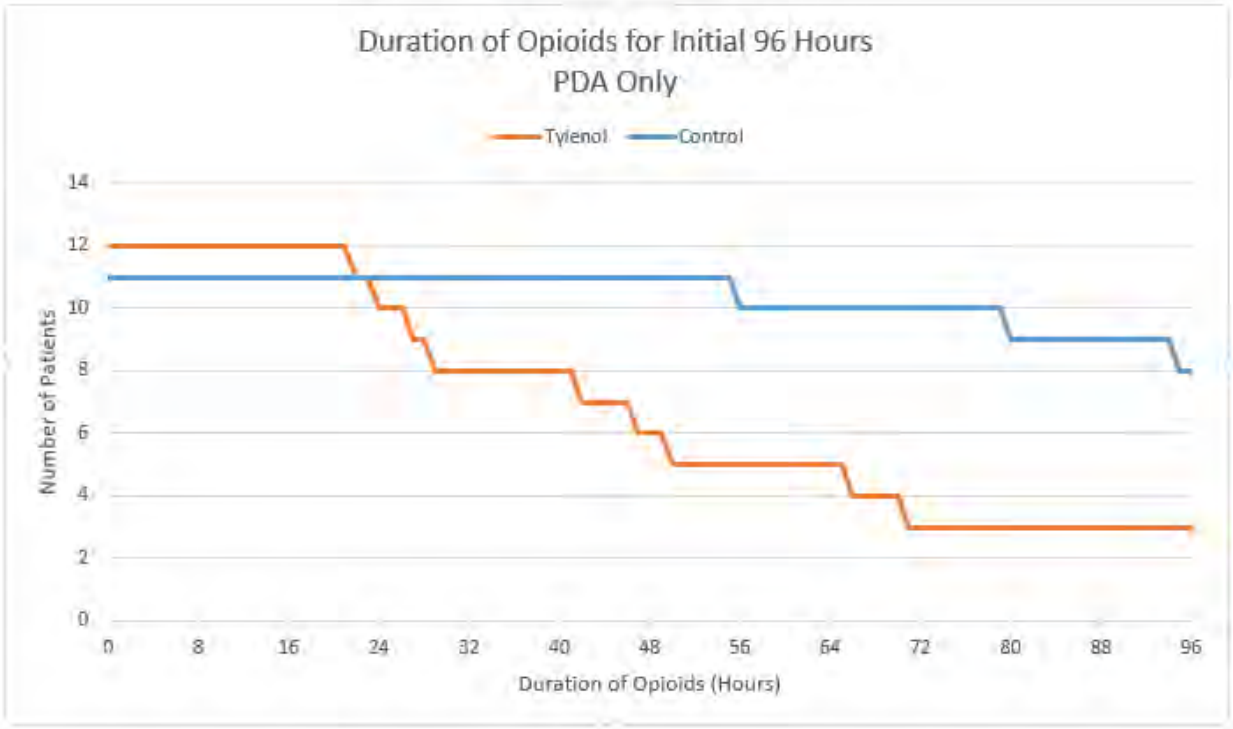
Background Opioids are a mainstay of post-surgical analgesia in preterm infants but are associated with adverse effects. As an adjunct analgesic, IV acetaminophen reduces opioid burden in postoperative pediatric patients. However, the efficacy and tolerance of supplemental intravenous acetaminophen for post-operative pain in preterm infants has not been well characterized.
Objective To determine the effect of a 96-hour regimen of post-operative, adjunct IV acetaminophen on opioid exposure in post-operative preterm infants. Secondary outcomes included subgroup analyses of specific surgeries and measures of hepatic tolerance.
Design/Methods This was an unblinded, block randomized, control trial of infants 24-36 weeks gestational age who required continuous opioid infusions for post-surgical analgesia. Study infants received IV acetaminophen (loading dose 20mg/kg; maintenance dose 10mg/kg for 96 hours) plus standard care opioid infusions compared to non-intervention, controls infants, who received only opioid infusions. Secondary outcomes include: subgroup analyses of specific surgeries, measures of hepatic tolerance (transaminase levels), pain scores, duration of post-surgical mechanical ventilation (days), time to reach enteral feedings (days), & adverse events, including re-intubation. Student's t test and Mann Whitney U were used for analysis.
Results We enrolled 76 infants (38 Study, 38 Control) who were 31±3 weeks corrected ages at time of study. There were no differences between groups in cumulative or duration of opioid exposures. There were no absolute or percent-change in transaminase levels between groups or other secondary outcomes.
Study group (n=17) analysis of infants undergoing Omaya placement or Patent Ductus Arteriosus (PDA) closure had significantly lower duration of opioid use than the control group (n=14) (55±44 vs 110±63hrs, $p<0.01$). Among infants undergoing PDA ligation, duration of opioid use was lower in the IV acetaminophen group (n=12) compared with controls (n=11), (58±37hrs vs 131±54hrs, $p<0.002$) and cumulative opioids received in the 1st 96 hrs after surgery was reduced (Study group: n=12, 79±46μg/kg vs Control: n=10, 131±54μg/kg, $p<0.05$). There were no differences in pain scores with the decreased opioid use.
Conclusion(s) A 96-hr regimen of IV acetaminophen is clinically well tolerated in post-operative preterm infants receiving opioid infusions for analgesia & may reduce the opioid burden of patients undergoing select surgical procedures.



Duration of Opioids Over First 96 Hours in Infants After PDA Ligation

Abstract: 168

Femoral occlusion during neonatal CPR – A simple technique to improve Coronary perfusion and hasten recovery in perinatal cardiac arrest

Munmun Rawat[1], Praveen Chandrasekharan[1], Srinivasan Mani[1], Sylvia Gugino[1], Carmon Koenigsknecht[1], Justin Helman[1], Lori Nielsen[1], Jayasree Nair[1], Sara Berkelhamer[1], Satyan Lakshminrusimha[2]
[1]Pediatrics, University at Buffalo, Buffalo, New York, United States, [2]Pediatrics, UC Davis, Sacramento, California, United States

Background Majority of 1 million deaths from perinatal asphyxia in the world occur in low-resource settings. During asphyxial arrest, chest compressions (CC) and epinephrine increase cerebral and coronary perfusion by increasing BP resulting in return of spontaneous circulation (ROSC). Bilateral femoral occlusion in a neonate (including flexing of lower limbs) can increase afterload and promote carotid/coronary flow similar to administration of epinephrine and/or volume through the umbilical venous catheter (UVC) (Figure 1). Femoral occlusion can be performed rapidly (within a few seconds of initiation of CC) and requires less skill and resources than UVC epinephrine/volume.
Objective To determine the impact of bilateral femoral occlusion during CC on incidence and timing of ROSC, systemic and pulmonary hemodynamics and gas exchange.
Design/Methods In this prospective randomized study, 15 term fetal lambs were asphyxiated by umbilical cord occlusion resulting in asphyxia leading to cardiac arrest. Lambs were resuscitated based on NRP guidelines and randomized to 2 groups: Femoral Occlusion during CC or Controls. Bilateral femoral arteries were occluded by applying pressure using two fingers during chest compression. Blood gases and hemodynamic parameters were obtained. Lambs were resuscitated for 20 minutes or till the ROSC was achieved, whichever was earlier.
Results 6 out of 9 lambs in femoral occlusion group achieved ROSC in 5.3±1.7 min as compared to 2 out of 6 in controls in 13.2±5 min (Table). Achievement of ROSC was significantly earlier in femoral occlusion group. Three lambs achieved ROSC without epinephrine in the femoral occlusion group and all control lambs received epinephrine. Lambs with femoral occlusion had higher peak carotid, pulmonary, and coronary flows during CC. Femoral occlusion resulted in higher systolic and diastolic blood pressures. (Figure 2)
Although ventilatory parameters were similar among the two groups, femoral occlusion group had lower $PaCO_2$ and lactate levels.
Conclusion(s) Femoral occlusion during CC resulted in faster and higher incidence of ROSC with lower need for epinephrine most likely secondary to higher carotid and coronary perfusion. Femoral occlusion is a low-tech approach that can be easily adapted during CPR in resource-limited settings to enhance survival and neurodevelopmental outcomes of over 75,000 births worldwide that require extensive resuscitation in the delivery room.

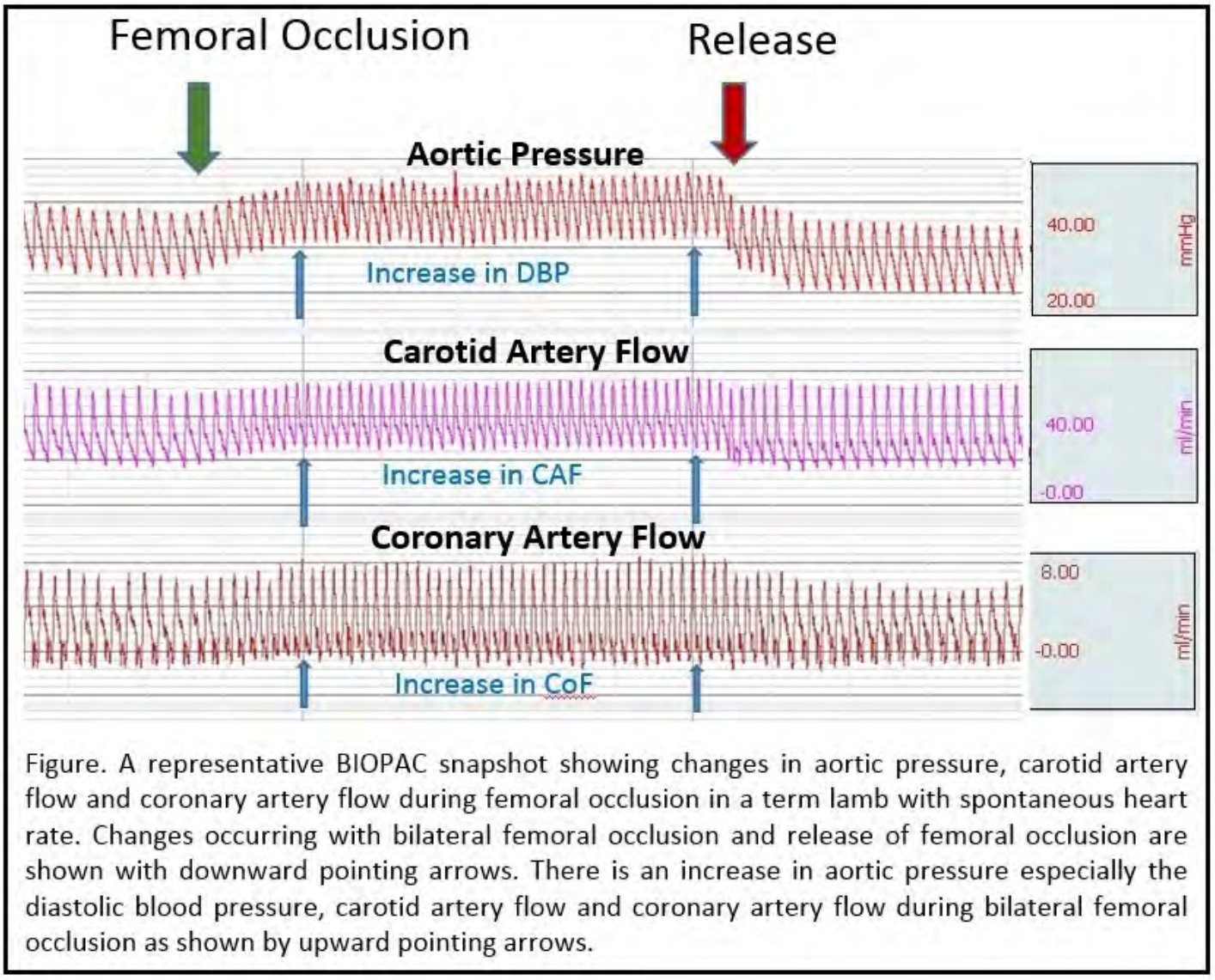


Figure. A representative BIOPAC snapshot showing changes in aortic pressure, carotid artery flow and coronary artery flow during femoral occlusion in a term lamb with spontaneous heart rate. Changes occurring with bilateral femoral occlusion and release of femoral occlusion are shown with downward pointing arrows. There is an increase in aortic pressure especially the diastolic blood pressure, carotid artery flow and coronary artery flow during bilateral femoral occlusion as shown by upward pointing arrows.

Figure 1: BIOPAC snapshot showing changes in aortic pressure, carotid artery flow and coronary artery flow with femoral occlusion

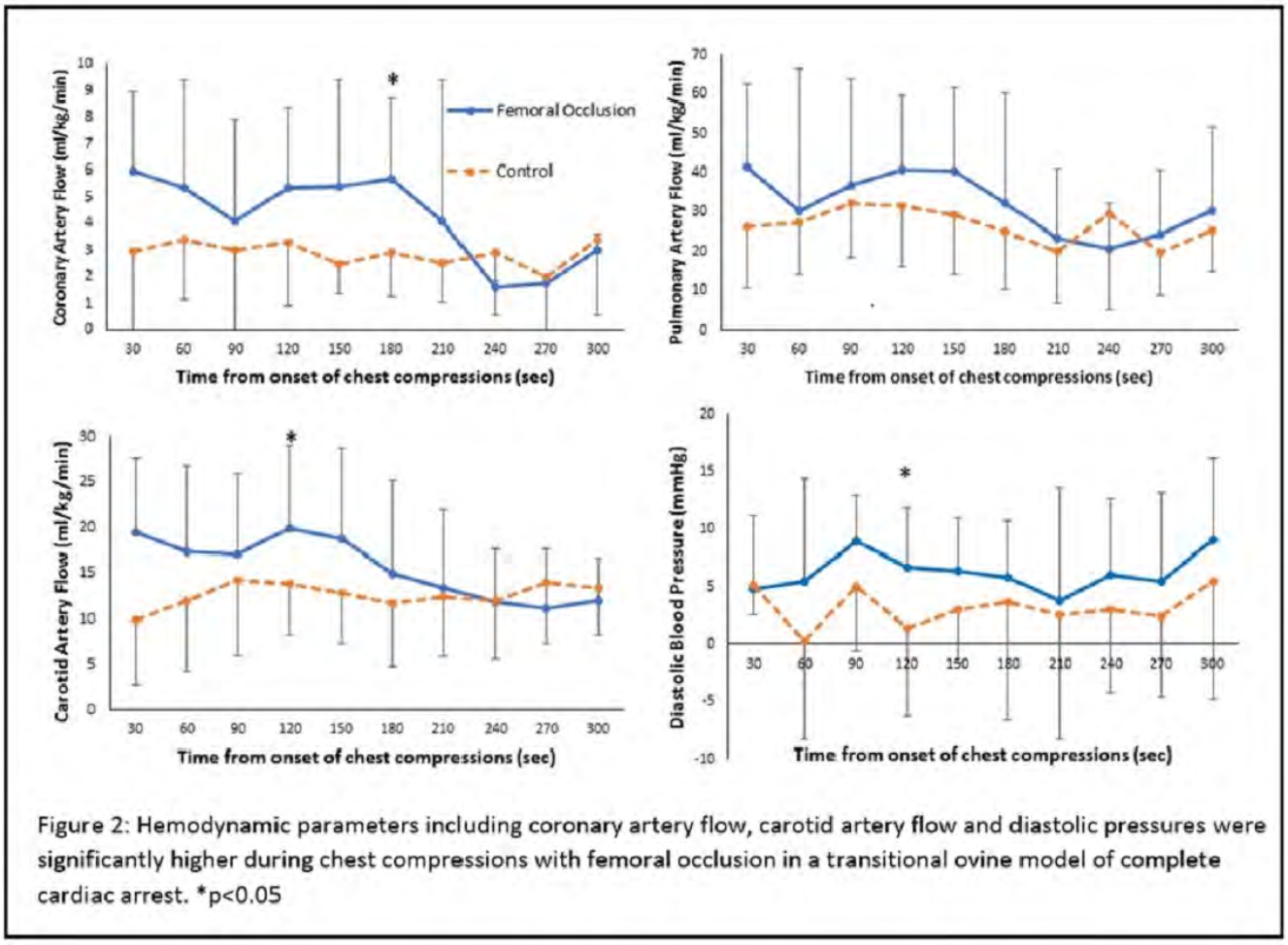


Figure 2: Hemodynamic parameters including coronary artery flow, carotid artery flow and diastolic pressures were significantly higher during chest compressions with femoral occlusion in a transitional ovine model of complete cardiac arrest. *p<0.05

Figure 2: Hemodynamic parameters - coronary artery flow, carotid artery flow and diastolic pressures were significantly higher in femoral occlusion group.

Outcomes following resuscitation of term lambs with bilateral femoral occlusion during chest compressions(data as mean ± SD)

Characteristics	Femoral Occlusion (n=9)	Controls (n=6)
Gestational Age (Days)	141± 0.8	141± 1
Weight (Kg)	4.2± 0.8	3.9± 1.3
Return of Spontaneous Circulation (ROSC %)	6(67%)	2(33%)
Time to ROSC (min)	5.3± 1.7	13.2± 5*
Epinephrine Doses	1.7± 1.7	3.6± 0.8*
ROSC without epinephrine (%)	3 (33%)	0 (0%)
Carotid artery flow during Chest compression (ml/kg/min)	12.5±10	11±6.7*
Pulmonary artery flow during Chest compression (ml/kg/min)	28±34	25±22*
Coronary artery flow during Chest compression (ml/kg/min)	5.3±6.4	3.1±3*
Systolic Blood pressure (mm Hg)	27.3±10	23.5±12*

Diastolic Blood Pressure (mm Hg)	8.9±6.4	7.2±8.1*
PaO2 during Chest Compression (mmHg)	33±15	40±17*
PaCO2 during Chest Compression (mm Hg)	99±25	110±36*
Lactate (mmol/L)	11.2±2	13.2±2*

*p<0.05

Abstract: 169

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

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Background Prevalence of food allergy and anaphylaxis from food allergy has increased over the years in the United States. Children with food allergy are at particular risk of life-threatening anaphylaxis. Once diagnosed with a food allergy, avoidance of the allergen and carrying an epinephrine auto-injector (EpiPen®) are recommended. There are no studies of knowledge, attitude and practices of EpiPen® use in parents of children with food allergy.
Objective To explore knowledge, attitude and practices of EpiPen® use in parents of children with food allergy in an urban multiethnic community.
Design/Methods A cross-sectional study by questionnaire was conducted in English or Spanish in parents of children with food allergy followed at Flushing Hospital Medical Center. The questionnaire included demographic questions (age, gender, ethnicity), questions on knowledge, attitude and practices about EpiPen® use in food allergy reaction and anaphylaxis. Responses were tabulated using percentages.
Results Of 54 participants, the mean age of the child with food allergy was 6.9±2.45 years with 56% male and 70% Hispanic. Family history of food allergy was present in almost half (46%). Diagnosis of food allergy by reaction was in 93% and by blood test (IgE) in 87%. Most common reaction type involved the skin, either pruritus (100%) or urticaria (96%). Most common food allergen was peanut (93%) followed by egg (44%). Parents gained knowledge of anaphylaxis from their physician (80%). Only 61% knew EpiPen® was the best therapeutic option for anaphylaxis and 43% used EpiPen® before. Most parents (89%) incorrectly used allergy pills to treat anaphylaxis. EpiPen® was prescribed by a physician in 65%. More than half (57%) knew the correct number of doses per pen, 76% knew the location of injector, 57% knew the side effects of EpiPen®, 32% knew method of discarding EpiPen® properly and 56% used EpiPen® for difficulty in breathing. Location of where to inject was correctly identified in 85%.
Conclusion(s) Most parents have fair to good general knowledge of food allergy and food allergy induced anaphylaxis. Healthcare providers need to further educate their parents on anaphylaxis and the correct use of EpiPen®.

Abstract: 170

Evaluation and Improvement of Peanut Allergy Screening and Anticipatory Guidance in the Primary Care Setting

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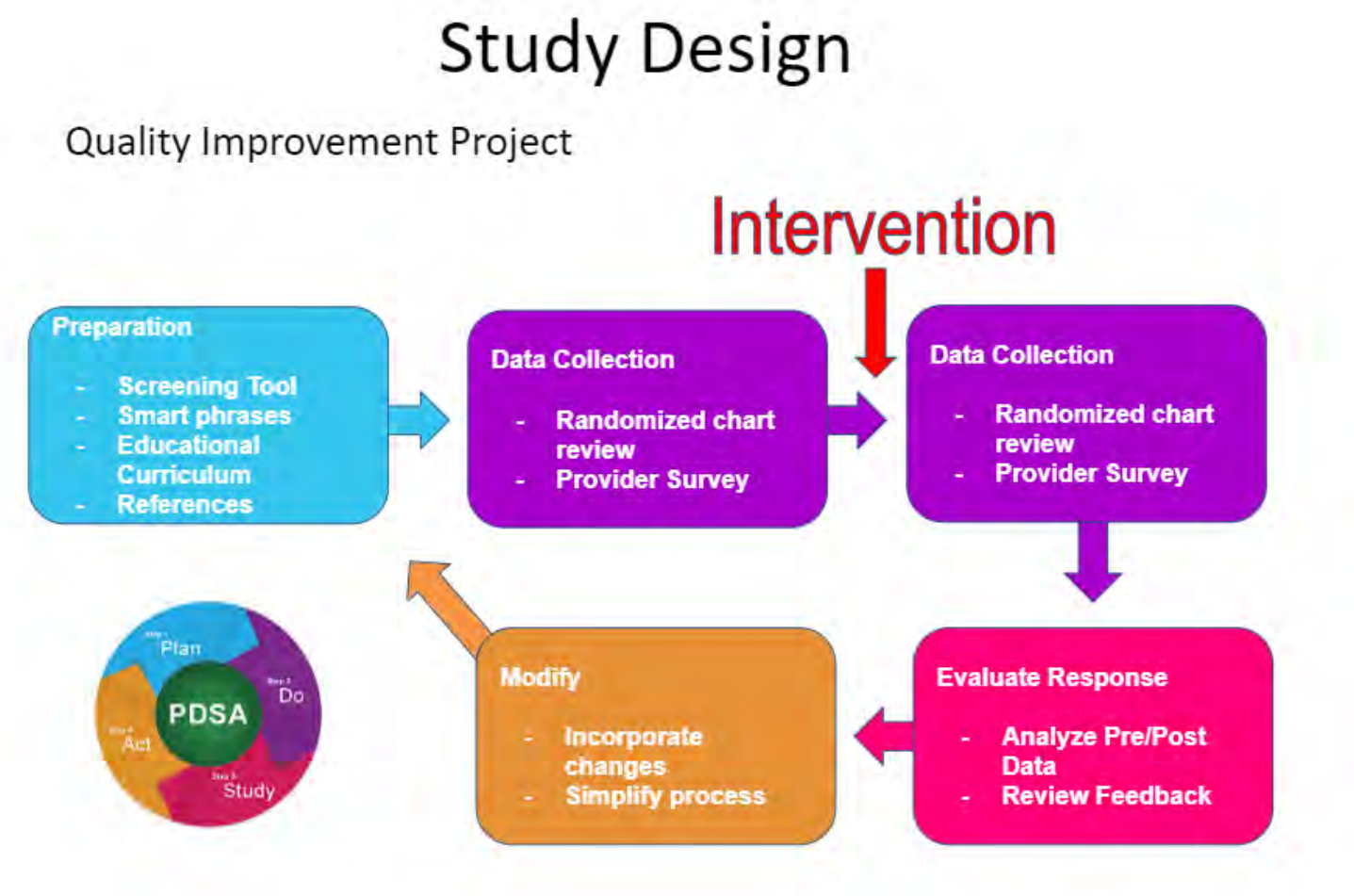
Background The recommendation for peanut introduction within primary care has been updated, creating a potential gap in clinical education and current practice. Our objective was to evaluate provider perceptions regarding peanut introduction, current practice within a primary care clinic and potential improvements in clinical practice following an educational curriculum.
Objective
Design/Methods We conducted a baseline survey among providers to assess practice perspectives related to peanut introduction recommendations. Additionally, we conducted a randomized chart review to identify medical documentation of peanut risk screening and anticipatory guidance in infants aged 4-18 months. We delivered an educational curriculum to update providers on current practice followed by a chart review to assess changes in documentation post-curriculum.
Results From September 2018 through January 2020 we identified 196 pre-intervention and 67 post-intervention encounters meeting inclusion criteria. Surveys (n=48) indicate that providers ask about peanut/egg introduction at 29% of visits and peanut/egg introduction was documented at only 4.6% of encounters (8/175). Chart review revealed improvement in documenting peanut/egg exposure (4.1% to 25%), documenting peanut introduction in assessment/plan (3.1% to 13.4%), inclusion of peanut introduction instructions (0% to 3%) and documentation of peanut specific interventions (2% to 11.9%) after curriculum delivery.

Conclusion(s) Baseline survey and chart review data indicate that current guidelines for peanut screening and anticipatory guidance are not effectively being implemented at this primary care clinic. Potential improvements in documentation following the curriculum justify further education efforts on new recommendations in order to improve both documentation and patient care.



Abstract: 171

Infections in children with juvenile onset systemic lupus erythematosus, a retrospective study

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Background Infections are a serious complication of juvenile systemic lupus erythematosus (jSLE). Problems with innate and adaptive immunity and immunosuppression are likely contributing factors.
Objective To determine the number and type of infections over a 5-year period in jSLE patients.
To determine the relationship between number of infections (from diagnosis to 6-month visit), and complements (C3, C4), and SLE disease activity (SLEDAI) at diagnosis.
Design/Methods We reviewed the charts of 20 jSLE patients that were diagnosed before age 18 followed by Pediatric Rheumatology between 1/2011 -1/2016. Data collected included SLEDAI, stage of renal disease, complement levels, physician-diagnosed-infection-related data at diagnosis, 6 months, 1 year, and yearly intervals up to five years. We conducted independent sample T-test between number of infections (diagnosis to 6-month visit), and C3, C4, and SLEDAI at diagnosis.
Results Out of the 20 patients, 17 were female. The average age of diagnosis was 13 ± 3 years. Ethnicity was as follows: 50% Hispanic, 20% Black, 20% Asian, and 10% Caucasian. At diagnosis, the mean SLEDAI was 15 ± 9 (5 – 42, median 12), and mean C3 was 50 ± 32 (5 -138, median 43), and C4 was 13 ± 8 (5-60, median 8). Thirteen had lupus nephritis with the following staging: class II (5%), class III (25%), class IV (25%), and class V (10%).
A total of 21 infections (n=9) were noted over a 5-year period. Infections were as follows: pneumonia (n=6, 29%), sinusitis (n=2,

9.5%), pharyngitis (n=3, 14%), oral thrush (n=1, 4.8%), gastroenteritis (n=2, 9.5%), acute otitis media (n=2, 9.5%), shingles (n=1, 4.8%), mucositis (n=1, 4.8%), upper respiratory infection (n=1, 4.8%), viral exanthem (n=1, 4.8%), and urinary tract infection (n=1, 4.8%). Fifteen infections were treated with antibiotics, one with an antifungal, and 2 with antivirals. Between diagnosis and 6-months, there were 11 infections and from diagnosis to 1-year there were 16 infections. Six infections (diagnosis to 1 year) led to hospital admissions. Complement level C3 was lower in patients with infections compared to those without (p=0.07)
Conclusion(s) Patients with jSLE need to be monitored closely for infection. Low C3 has been shown to be related to increased infections in previous literature. Aggressive control of disease activity is critical as worsening jSLE can be associated with low complements. Further analysis is underway examining other factors such as renal staging and medication use.

Abstract: 172
Neonatal Intensive Care Unit demographics and subsequent development of food allergy
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Background Many studies have reported an inverse relationship between gestational age (GA), birth weight (BW) and Neonatal Intensive Care Unit (NICU) length of stay (LOS) and the later development of atopic disease, including asthma. Evidence from studies on early exposure to allergens and varied microbiota as well as an incidental finding by Mitselou points to the possibility of an association between NICU LOS and subsequent decrease in development of food allergies (FA). However, limited literature exists. Given the alarming increase in incidence of FA, these studies are needed, and may help determine additional risk factors for this diagnosis.
Objective We aimed to determine the association between GA, BW and NICU LOS and the later diagnosis of FA. We hypothesized that infants with longer NICU LOS and lower GA would have a lower prevalence of FA than a control group.
Design/Methods We utilized retrospective chart analysis for patients in the Northwell Health System from 2008-2018 for any child admitted to the NICU who had a subsequent visit between the ages of 2-10 years old. Term neonates not admitted to the NICU who had similar follow up served as a control group. The primary outcome variable was the development of FA, as categorized by ICD 9/10 codes for allergic reactions to food ingestion, or an EMR reference to a FA. We used chi-squared analysis to compare NICU patients with newborns admitted to a well baby nursery. Predictive variables included GA, BW and NICU LOS. All statistical tests were two-sided and P-value <0.05 was considered statistically significant.
Results A total of 29,876 infants were included in our study, 24,170 (81%) of which were term neonates without NICU admission. There was no statistical difference between term and preterm infants (p=0.526), BW (p=0.139) or NICU LOS (p=0.686) and subsequent diagnoses of FA.
Conclusion(s) No previous study has examined NICU LOS and later development of FA. Our study did not show that increased LOS resulted in a lower incidence of FA. While this initial hypothesis was based off an incidental finding by Mitselou, others have hypothesized that NICU patients are more likely to later develop FA. Multiple studies have documented higher rates of asthma among preterm neonates than term infants, with other research showing an association between asthma and other atopic diseases such as FA. However, our study indicates that despite these correlations, there is no statistically significant increase or decrease in FA; regardless of a baby's GA, BW, or NICU LOS.

All p-values > 0.05	GA (weeks) Mean ± SD	BW (grams) Mean ± SD	LOS (days) Mean ± SD
NICU	33 6/7 ± 6 2/7	2296 ± 1158	20.4 ± 28.7
Control	39 3/7 ± 2 2/7	3228 ± 862	N/A

Abstract: 173
Abnormal Chest X-ray Findings in Mild, Moderate and Severe Asthma Exacerbation and the Impact on Acute Asthma Management in Pediatric Patients
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Background The National Heart and Lung Institute's guidelines advise against routine use of chest x-ray (CXR) for acute asthma exacerbation. Despite this recommendation, unnecessary CXR are still being performed. There is paucity of literature regarding the

association of abnormal CXR with severity of asthma and its impact on clinical outcomes.
Objective To assess whether there is an association between abnormal CXR findings and severity of asthma exacerbation and its impact on acute asthma management.
Design/Methods Data obtained from electronic health records included age, gender, abnormal CXR as reported by radiologist, severity of asthma exacerbation based on pediatric asthma score, supplemental oxygen therapy, Bi-level positive airway pressure (Bi-PAP), continuous albuterol, magnesium sulphate (MgSO4), terbutaline, epinephrine, antibiotics, endotracheal intubation, chest tube placement, cardiopulmonary resuscitation and death.
Patient with congenital heart disease, bronchopulmonary dysplasia, cystic fibrosis, sickle cell anemia, congenital or acquired immunodeficiency, CXR done outside our ED or having incomplete data leading to inability to classify them into different categories of severity of asthma exacerbation were excluded. The data were analyzed using SPSS software (IBM, Chicago, IL, USA).
Results A total of 197 patients were included. Patient characteristics are summarized on Table 1: 62.4% male, 56.9% 5-12 years of age, 39.6 % had abnormal CXR, 53.3% had a mild exacerbation.
There was no significant association between abnormal CXR and severity of asthma ($p=0.104$) (Table 2). Need for supplemental oxygen and epinephrine was higher in patients with normal CXR ($p=0.036$ and $p=0.033$, respectively), while more patients with abnormal CXR required antibiotics and longer length of stay ($p=0.000$ and $p=0.042$ respectively) (Table 3).
Conclusion(s) Abnormal CXR has no significant association with severity of asthma exacerbation. Children with normal CXR required more oxygen and epinephrine therapy. Those with abnormal CXR received more antibiotics and had longer hospital stay.

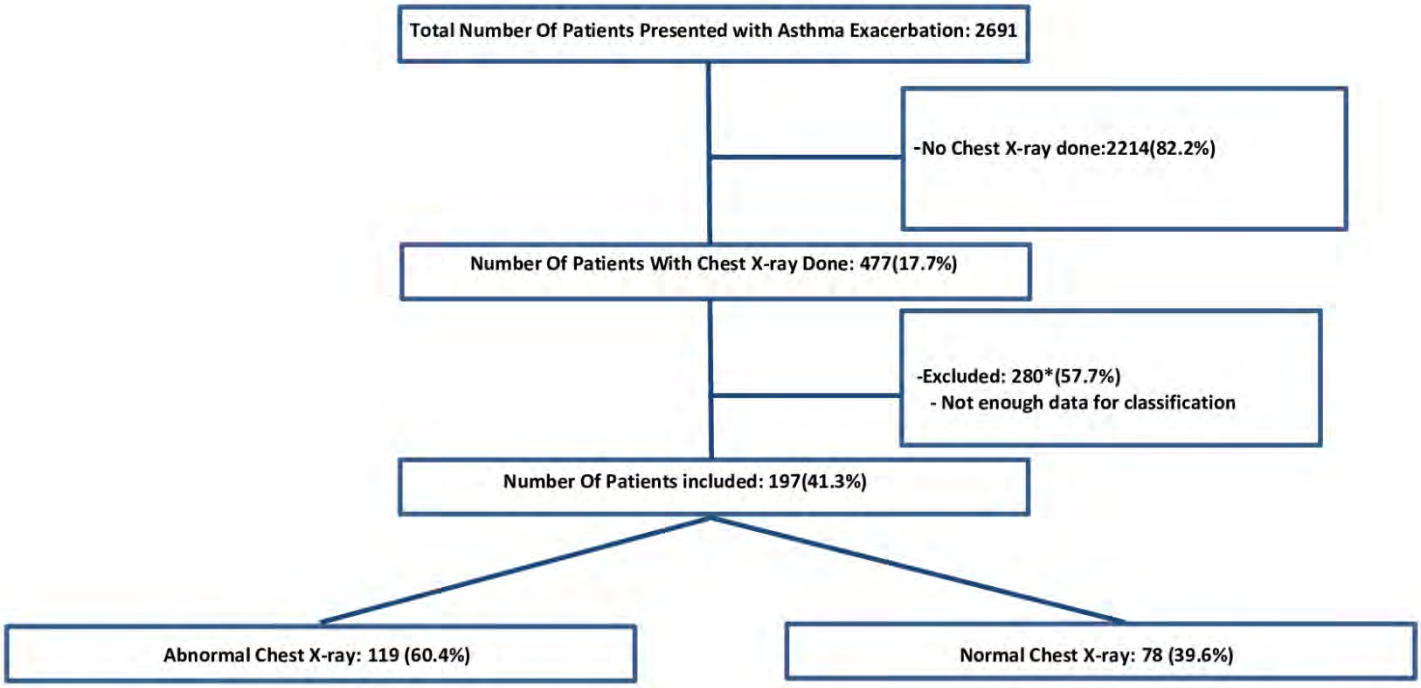

Figure 1.
Study Flow Diagram

Table 1. Demographic characteristics and frequencies of variables

Characteristics	Findings
Male, n (%)	123 (62.4%)
Age group	
2 to 5 years, n (%)	51 (25.9%)
5 to 12 years, n (%)	112 (56.9%)
12 to 18 years, n (%)	34 (17.3%)
Severity of Asthma Exacerbation based on PAS[a]	
Mild Exacerbation, n (%)	105 (53.3%)
Moderate Exacerbation, n (%)	83 (42.1%)
Severe Exacerbation, n (%)	9 (4.6%)
Chest X-ray Findings	
Normal, n (%)	119 (60.4%)
Abnormal, n (%)	78 (39.6%)
Infiltrates, n (%)	26 (33.3%)
Peribronchial Cuffing, n (%)	28 (35.9%)
Consolidation, n (%)	12 (15.4%)
Others, n (%)	12 (15.4%)
Management	
Supplemental Oxygen, n (%)	88 (44.7%)
Continuous Albuterol, n (%)	60 (30.5%)
BiPAP, n (%)	44 (22.3%)
MgSO4, n (%)	142 (72.1%)
Terbutaline, n (%)	25 (12.7%)
Epinephrine, n (%)	11 (5.6%)
Antibiotics, n (%)	88 (44.7%)
Intubation, n (%)	1 (0.5%)
Length of stay beyond 2 days, n (%)	90 (45.9%)

[a]Paediatric Asthma Score

Table 2. Association of abnormal chest X-ray with severity of asthma

	Abnormal CXR, n (%)	Normal CXR, n (%)	*p* value
Mild	36 (18.3%)	69 (35%)	.104
Moderate to Severe	42 (21.3%)	50 (25.4%)	

Table3. Association of abnormal chest x-ray findings with asthma management

	Abnormal CXR, n (%)	Normal CXR, n (%)	*p* value
Supplemental oxygen therapy	42 (47.7%)	46 (52.3%)	0.036
Bi-level positive airway pressure (BiPAP)	20 (45.5%)	24 (54.5%)	0.367
Continuous albuterol treatment	29 (48.3%)	31 (51.7%)	0.097
Magnesium sulphate	61 (43.0%)	81 (57.0%)	0.121
Terbutaline	7 (28.0%)	18 (72.0%)	0.205
Epinephrine	1 (9.1%)	10 (90.9%)	0.033
Antibiotics	52 (59.1%)	36 (40.9%)	0.000
Endotracheal intubation	0 (0.0%)	1 (100.0%)	0.417
Length of hospital stay in days, Mean	2.86	2.22	0.042

Table 4. Use of antibiotics in different age groups with abnormal chest x-ray findings

	Abnormal CXR, n (%)	Normal CXR, n (%)	*p* value
2 to 5 years, n (%)	17 (81.0%)	4(19.0%)	0.002
5 to 12 years, n (%)	32 (58.2%)	23 (41.8%)	0.000
12 to 18 years, n (%)	3 (25.0%)	9 (75.0%)	0.881

Abstract: 174

The Association of Lung Function Test, Sleep Study and Hemolytic Markers with Acute Chest Syndrome in Pediatric Sickle Cell Patients

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Background Sickle Cell Disease (SCD) had been related to multiple pulmonary complications like Acute Chest Syndrome (ACS), which is highly associated with morbidity and mortality. It is controversial whether lung function measurements are associated with ACS. Limited studies have shown the relationship of ACS with sleep study in the pediatric SCD population.
Objective To compare clinical characteristics, hemolytic markers and sleep studies and to identify changes in lung function parameters over time between pediatric patients with SCD with and without an episode of ACS.
Design/Methods Retrospective chart review of all SCD patients seen at the pediatric hematology clinic or admitted to pediatric floor at Brookdale Hospital from October 2013 until May 2019. Patients who had lung function tests or sleep studies available for review were included.
Subjects were divided based on whether they did or did not develop an episode of ACS during the study period. We compared clinical factors, baseline hemolytic markers and sleep studies as well as changes in lung function parameters over time between the 2 groups.
Results Of a total of 31 subjects, 13 (42%) experienced ACS episodes during the study period(Table 1). There was no significant differences in sickle cell type, gender, use of hydroxyurea, history of asthma, use of inhaled steroid, history of tonsilectomy and adenoidectomy and , presence of snoring or obstructive apnea and treatment with bilevel positive airway pressure or continuous positive airway pressure between the 2 groups. There was no significant difference in baseline laboratory data, such as hemoglobin, hematocrit, reticulocyte, LDH and total bilirubin(Table 2). In addition, there was no significant difference in Apnea-Hypopnea Index (AHI).
sPO2 mean was significantly lower ($p = 0.03$) and desaturation index (DI) ($p = 0.015$) was significantly higher during the sleep study of the group who experienced an ACS episode(Table 3).
When all lung function tests parameters were analyzed, there was no significant interaction between group and time. However, there was significant decreasing trend for time in predicted FVC% ($p = 0.007$) and VC% regardless of group ($p = 0.034$).
Conclusion(s) No difference in laboratory indicators, clinical characteristics or changes in lung function parameters over time were observed in ACS group. However, during the sleep study, ACS group had lower mean sPO2 and higher DI. Nocturnal hypoxia shown in the sleep study should be aggressively evaluated and treated.

Table 1. Characteristics of Patients with SCD with History of ACS

	Mean±SD or %
Age at ACS (years)	14.1±4.1
Height at ACS (feet)	1.5±0.19
Weight at ACS (pound)	108.1±61.0
BMI at ACS (kg/m^2)	21.3±7.0
sPO2 at ACS (%)	95.5±3.5
WBC at ACS (10^9/L)	16.6±6.5
Hb at ACS (mg/dL)	7.8±1.3
Hct at ACS (%)	22.9±4.1
Platelet at ACS (10^3/μL)	422.8±126.0
MCV at ACS (fL)	90.3±6.3
Reticulocyte at ACS (%)	11.8±6.0
LDH at ACS (U/L)	1487.7±551.5
Bilirubin at ACS (mg/dL)	3.0±2.0
Length of stay (days)	4.4±3.0
PICU (%)	38.5 (5 cases)
Transfusion (%)	61.5 (8 cases)
Exchange transfusion (%)	23.1 (3 cases)

Table 2. Comparison between 2 groups

	Children with SCD with History ACS (n=13)	Children with SCD without History ACS (n=18)	P value
Sickle cell type	13 SS	14 SS, 2 SC, 1 Sbeta+, 1 Sbeta0	0.345
Clinical factors			
Male (%)	53.8	33.3	0.253
HU (%)	100	94.4	0.388
Asthma (%)	46.2	50	0.833
ICS (%)	46.2	38.9	0.686
Monteleukast (%)	11.1	30.8	0.172
T&A (%)	38.5	33.3	0.927
Snoring (%)	76.9	61.1	0.353
OSA (%)	53.8	50.0	0.833
BiPAP or CPAP overnight (%)	30.8	22.2	0.592
Laboratory markers			
Baseline WBC (10x3/µL)	9.4±3.9	8.1±3.1	0.322
Baseline Hb (g/dL)	8.8±1.3	9.2±1.5	0.554
Baseline Hct (%)	29.0±15.4	27.0±4.7	0.606
Baseline platelet (10^3/µL)	470.8±187.7	382.8±207.1	0.235
Baseline MCV (fL)	92.6±10.2	90.9±14.7	0.731
Baseline reticulocyte (%)	8.3±4.8	5.7±3.6	0.100
Baseline LDH (U/L)	1364.4±552.3	1051.8±512.9	0.181
Baseline bilirubin (mg/dL)	3.2±1.7	2.4±2.2	0.316
HbA (%)	9.3±16.7	4.6±9.1	0.341
HbS (%)	77.3±16.3	78.4±10.6	0.819
HbF (%)	10.6±6.5	11.0±8.6	0.886
HbA2 (%)	3.9±1.0	8.6±15.8	0.321
VitD (IUs)	24.3±4.6	28.5±8.5	0.390
Echocardiogram			
BMI at echo (kg/m²)	22.5±6.3	21.7±6.1	0.762
EF (%)	66.6±13.0	71.0±5.8	0.395
FS (%)	40.1±6.9	40.6±4.7	0.866
LVEDV (ml)	184.4±67.6	131.3±51.3	0.108

Table 3. Sleep study comparison between 2 groups

	Children with SCD with History ACS (n=13)	Children with SCD without History ACS (n=18)	P value
BMI at sleep study (kg/m²)	24.6±9.9	22.0±8.9	0.560
RDI (events/hour)	12.8±7.4	10.7±5.7	0.546
Total AHI (per hour)	10.2±7.9	9.5±5.8	0.821
REM AHI (per hour)	14.0±12.2	20.1±13.0	0.364
sPO2 min	78.1±11.3	86.6±9.2	0.090
sPO2 max	95.3±3.3	97.6±1.3	0.057
sPO2 mean	90.2±4.3	95.5±2.2	0.003
sPO2 mean wake	91.8±4.7	95.9±2.8	0.032
Desaturation index	7.5±6.0	2.1±2.3	0.015

Abstract: 175

Effect of High Flow Nasal Cannula Use on Initiation of Enteral Feeding in Pediatric Patients with Acute Respiratory Failure

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Background Traditional non-invasive respiratory support systems like continuous positive airway pressure (CPAP) or bilevel positive airway pressure (BiPAP) delay enteral feeding since they require the use of face masks and a closed respiratory circuit. High flow nasal cannula (HFNC) is an open circuit system that allows patients to feed orally even while on respiratory support. It was introduced at BronxCare Hospital in October 2014.

Objective The use of HFNC allows for shorter NPO time in patients with acute respiratory failure in comparison to the use of BiPAP or CPAP alone.

Design/Methods Retrospective electronic medical chart (EMR) review was done for patients admitted to the pediatric intensive care unit (PICU) in acute respiratory failure aged 1 day to 21 years old who received noninvasive ventilation from January 1, 2012 to December 31, 2018.

Subjects who received BiPAP/CPAP support after elective tonsilloadenoidectomies, had an order for BiPAP/CPAP on standby in the EMR, underwent mechanical ventilation, had no NPO order in the EMR or had readmissions were excluded.

The time period from entering the NPO order to its discontinuation on the EMR was taken as the NPO time and was compared between subjects admitted prior to and after October 2014.

The primary and secondary outcomes are the reduction in both mean NPO time and mean length of hospital stay (LOS).

Statistical significance was set at $p<0.05$. All analyses were performed using SAS v9.4.

Results Of the total 845 admissions, 528 subjects were included in the study (Table 1). 101 subjects were admitted before October 2014 and received only BiPAP/CPAP. Of the remaining 427 who were admitted after, 105 received BiPAP only, 122 received both BiPAP and HFNC and 200 received only HFNC. The mean NPO time for admissions before and from October 2014 were 41.05 hours versus 31.83 hours respectively ($p<0.0001$) (Table 2). The mean LOS for PICU admissions pre and post October 2014 were 154.53 and 119.86 hours respectively ($p<0.0001$).

Discussion: To the best of our knowledge, very few studies have looked into the impact of HFNC use on feeding in children. Two single center studies on patients aged ≤ 24 months have looked into the safety of enteral feeding while on HFNC. Our study is a first to show that the introduction of HFNC led to earlier oral feeding and decreased overall hospital LOS.

Conclusion(s) The introduction of HFNC for pediatric patients in acute respiratory failure was associated with a shorter NPO time and a hospital LOS.

Table 1. **SUBJECT CHARACTERISTICS**

Demographics	Before HFNC (n= 101)	After introduction of HFNC (n= 427)	p-value
Median Age, years (interquartile range)	2 (0-6)	1 (0-7)	0.65
Gender, N (% of subjects in group) • Male • Female	 58 (57.42%) 43 (42.57%)	 256 (59.95%) 171 (40.05%)	0.64
Ethnicity, N (% of subjects in group) • Non- Hispanic • Hispanic	 52 (51.5%) 49 (48.5%)	 190 (44.5%) 237 (55.5%)	0.21

Table 1. Subject Characteristics

Table 2. **NPO AND LENGTH OF STAY (HRS) AFTER ADJUSTING FOR CONFOUNDING FACTORS**

Adjusted Means (interquartile range)	Admissions before HFNC available (n= 101)	Admissions with HFNC available (n= 427)	p-value
Time of NPO status, Hours	41.05 (34.76-48.48)	31.83 (29.41-34.44)	<0.0001
Length of Stay, Hours	154.53 (140.11 - 170.44)	119.86 (114.49 - 125.49)	<0.0001

Table 2. NPO and Length of Stay (hrs) after adjusting for confounding factors

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Relative effect of severe hypoxia versus severe hypercapnia caspase 9 and 3 expression in the cerebral cortex of newborn piglets.

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Background Following hypoxia, activation of calcium calmodulin (Cam) Kinase IV in the neuronal nucleus leads to CREB phosphorylation resulting to transcription of apoptotic proteins. We have Previously we shown that following hypoxia and Hypercapnia there is an increase in Caspase 9 and 3 expression in the piglet brain, thus regulating the pathways of programmed cell death.
Objective The present study aims to assess the relative toxicity of the hypoxia induced expression of caspase 9 and 3 as compared to the toxicity of the hypercapnia induced expression of caspase 9 and 3 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 normoxic control groups. Hx was induced by decreasing FiO_2 from 0.21 to 0.07 for 1 hour. Hypercapnia was induced by inhaled CO_2 to achieve maintaining $PaCO_2$ of 80mmHg for 6 hours while maintaining a normal PaO_2. Cerebral energy metabolism was documented by ATP and PCr levels.Cerebral cortical fractions were isolated and the expression (ODxmm2) of caspase 9 and 3 was determined. The cytosol was separated by centrifugation and the caspase 9 and 3 expression were measured by Western Blot analysis.
Results ATP levels (µmol/wet brain) were 4.3±0.23 in normoxia, 1.43±0.28 inHx decreased by 66% and 4±1.4 in hypercapnia, decreased by 13%. PCr levels (µmol/wet brain) were 3.73±0.27 in Nx 0.79±011 in Hx decreased by 79%, and 3.18±0.17 in hypercapnia decreased by 17%. Caspase-9 expression was 18.52±1.89(Nx) in Normoxia and 32.36±5.03(Hx) in Hx, increased by 74%, and 92±9(Nx) in Normoxia and 125±9 in Hypercapnia, increased by 35%. Caspase 3 expression measures were 56 ± 9 (Nx) in Normoxia, 94.1±12.05 in Hx, increased by 67%, and 105±5(Nx) in Normoxia and 173±4 in Hypercapnia, increased by 64%.
Conclusion(s) The data show that increased expression of Caspase-9 during hypercapnia via increased hydrogen ion concentration is significantly lower than that during hypoxia. Unexpectedly the expression of Caspase-3 increase during hypercapnia remained as high as during hypoxia while during Hx the apoptotic cascade leads to cell death through intrinsic and extrinsic pathways , It appears that during hypercapnia, in addition, there may be an induction of additional necroptotic pathways sensitive to hydrogen ion concentration activating caspase 3 in the newborn brain.

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Acetylation of cyclophilin D increases calcium sensitivity of the permeability transition pore.

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Background The mitochondrial matrix protein cyclophilin D (CypD) is key regulator of mitochondrial function. It controls electron transport chain activity and ATP synthesis by regulating the permeability transition pore (PTP). The activity of CypD is tuned by several post-translational modifications including acetylation of lysine 166 in the mouse.
Objective
To investigate how acetylation at lysine 166 modifies the ability of CypD to regulate the PTP and the ATP synthesis.
Design/Methods We generated a knock-in mouse model, were specifically in the heart, lysine 166 has been mutated into glutamine ($CypD^{K166Q}$) to mimic permanent acetylation of CypD. The mice were either +/+, +/- or -/- for the expression of CypD. Calcium retention capacity (CRC) was measured with Arsenazo III in the absence or presence of cyclosporine A (CsA) or ADP. The ability of the ATP synthase to create dimers or oligomers was accessed western blotting and by the hydrolysis of ATP in an in-gel assay.
Results The CRC decreased significantly in mice when $CypD^{K166Q}$ mutation was expressed, while cyclosporine A or NIM811 increased the CRC. ADP increased the CRC in heart mitochondria from all mice in all experimental groups significantly ($p \leq 0.001$). In-gel assays and western blotting after clear native electrophoresis show that in mitochondria from mice expressing CypD K166Q the ATP synthase is less likely to form dimers or oligomers.
Conclusion(s) Our data show that the expression of CypD mutant of CypD increases the sensitivity to calcium and limits the generation of ATP synthase oligomers.

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Association of Genetic Ancestry Admixture and Early Childhood Obesity

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Background Understanding the influence of genetically determined ancestry may give insight into the disparities of obesity seen in different ethnic groups. Increased Body Mass Index (BMI) in preschool age children is associated with adult obesity; however the influence of genetic admixture, in relation to other obesogenic risk factors, on BMI in preschool age children is unknown.
Objective This study aimed to investigate the relationship between children's genetic admixture proportions and BMI at 3 years of age.
Design/Methods Children of 3 years of age with whole genome sequencing and anthropometrics available were included in this cross-sectional study. Their genetic admixture was estimated using the ancestry and kinship tool kit by projecting the samples into the 1000 Genomes principal component database. The genetic admixture super groups were used: European (EUR), admixed Americans (AMR), African (AFR), South Asian (SAS), and East Asian (EAS). 5 simple linear regressions assessed the association of Body Mass Index (BMI) and EUR, AMR, AFR, SAS and EAS. Multiple linear regression models were performed to control for effects of the confounding variables including sex, physical activity, screen time, sugary beverage and fast food consumption.
Results 472 children of 3 years of age from 45 maternal countries of birth were included. 52% were males. The mean (SD) of BMI was 16.6 (2.2). There was a significant positive correlation between BMI and greater AMR proportion (p=/<.0001) (Figure 1). After adjusting for confounding variables, AMR was still significantly associated with increased BMI (p=/<.0001). No correlations were found between BMI and EUR, AFR, SAS and EAS (p>0.05).
Conclusion(s) After adjusting for known obesogenic risk factors, increased AMR proportion was positively associated with a higher BMI in studied 3-year-olds, suggesting that this ancestral genetic background may contribute to the disparities seen in early childhood obesity.

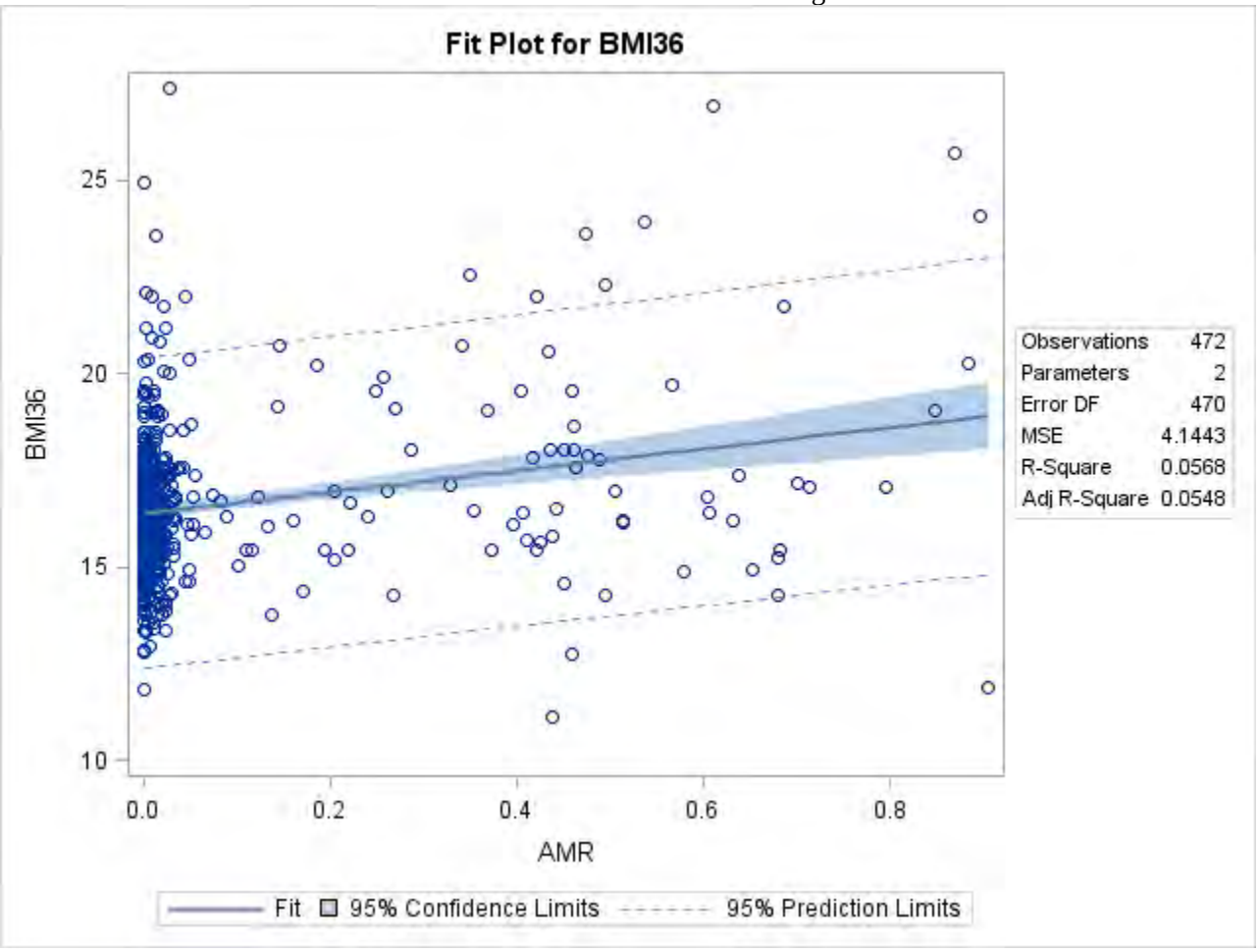

Figure 1: Fit Plot Showing Association Between BMI and AMR at 3 Years of Age.

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TIMP Genetic Variants are Associated with BPD and PDA in ELBW infants

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Background Imbalances in the proteolytic/antiproteolytic ratio have been implicated in pulmonary diseases including BPD, COPD, and asthma. The balance between metalloproteinases (MMPs) and tissue inhibitors of metalloproteinases (TIMPs) has been found to affect extracellular matrix (ECM) degradation and remodeling. ECM turnover can be especially important in ELBW infants who face inflammatory pressures pre-, peri-, and neo-natally.

Objective To determine if SNPs of TIMP are associated with susceptibility to BPD and PDA in ELBW infants.

Design/Methods This is an ongoing cohort study enrolling ELBW infants without major congenital or chromosomal anomalies. DNA was isolated in infants following IRB-approved parental consent from buccal swabs, and underwent allelic discrimination with specific Taqman probes using RT-PCR for: rs5906435, rs1062849, rs620279, and rs4898. BPD was defined as the need for supplemental oxygen at 36 weeks PMA. PDA was present if medical or surgical treatment were given. Statistical analyses included chi-square, z-test, t-test, Fisher exact, and Mann-Whitney U test, and multiple logistics regression analysis, with $p \leq 0.05$ significant.

Results Infants with both BPD and PDA had earlier gestational ages and lower birth weights; other demographic characteristics were comparable (Tables 1 & 2). rs5906435 had significantly different genotype frequencies for BPD compared to non-BPD. rs6520279 had significantly different genotype frequencies for PDA compared to non-PDA, with the MAF being lower in those with PDA (Table 2). These differences were independent of prematurity and BPD for the TIMP variant rs6520279 and PDA (OR 1.95; 95%CI 1.13-3.39; p=0.017). The differences were not different for BPD and the TIMP variant rs5906435 (OR 1.50; 95%CI 0.99- 2.27; p=0.054).

Conclusion(s) TIMP intronic variants rs5906435 and rs6520279 showed differences in genotype distributions for BPD and PDA, respectively, with the distributions for PDA being independent of prematurity. We speculate that these differences may interfere with ECM turnover and remodeling, placing ELBW infants at altered risk for developing BPD and PDA.

Table 1: Infant Demographics and Genotype Distribution in ELBWs with and without BPD

Infant characteristics		No BPD (n=73)	BPD (n=134)	p-value (*denotes significance)
Gestational age in weeks, mean (SD)		26 (2)	25 (2)	< 0.001*
Birth weight in grams, mean (SD)		832 (130)	709 (148)	< 0.001*
Male gender n (%)		31 (42)	71 (53)	0.193
Race n (%)	Non-Hispanic White	27 (37)	37 (28)	0.097
	Non-Hispanic Black	19 (26)	43 (32)	
	Hispanic	22 (30)	35 (26)	
	Other	2 (3)	15 (11)	
Genotype		No BPD n (%)	BPD n (%)	p-value (*denotes significance)
rs5906435	CC	16 (22)	27 (20)	0.031*
	Ct	14 (19)	10 (7)	
	tt	43 (59)	97 (72)	
	Any t	30 (41)	37 (28)	0.068
	MAF	0.32	0.24	0.307

Table 1: Infant Demographics and Genotype Distribution in ELBWs with and without BPD

Table 2: Infant Demographics and Genotype Distribution in ELBWs with and without PDA

Infant characteristics		No PDA (n=32)	PDA (n=77)	p-value (*denotes significance)
Gestational age in weeks, mean (SD)		26 (3)	25 (2)	0.003*
Birth weight in grams, mean (SD)		834 (238)	730 (232)	0.021*
Male gender n (%)		19 (59)	33 (43)	0.173
Race n (%)	Non-Hispanic White	5 (16)	23 (30)	0.062
	Non-Hispanic Black	12 (38)	21 (27)	
	Hispanic	11 (34)	17 (22)	
	Other	1 (3)	13 (17)	
Genotype		No PDA n (%)	PDA n (%)	p-value (*denotes significance)
rs6520279	TT	20 (63)	27 (35)	0.028*
	Tc	4 (13)	21 (27)	
	cc	8 (25)	29 (38)	
	Any c	12 (38)	50 (65)	0.089
	MAF	0.32	0.24	0.015*

Table 2: Infant Demographics and Genotype Distribution in ELBWs with and without PDA

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Altered gene expression in rat lung with sequential intra-amniotic LPS and hyperoxia exposure

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Background Chorioamnionitis and oxygen exposure in the perinatal period are believed to adversely affect cell function in lung tissue. We have previously shown altered gene expression in rat pup lungs following either intra-amniotic lipopolysaccharide (LPS) injection or postnatal hyperoxia exposure. Sequential exposure to both LPS followed by hyperoxia may act as a double hit to the lung, adversely affecting cellular function and protein synthesis; which in turn may play a role in pathogenesis of diseases such as bronchopulmonary dysplasia and asthma.

Objective To study the alteration of gene expression in lung tissue in a rat model of chorioamnionitis with subsequent hyperoxia exposure

Design/Methods In timed pregnant rats, on E20, we injected LPS in the test group (LPS-O2) or normal saline in control group (NS-RA) into the amniotic cavity. After birth, the LPS-O2 group was exposed to 7 days of 85% oxygen, while the NS-RA group was kept in room air. Pups were then sacrificed and lung tissue was collected. RNA was isolated using the Qiagen miRNeasy mini kit. Affymetrix WT-plus Rat Clariom S Gene chip was used to perform genome-wide microarray screening. Transcriptome Array Console and GeneSpring softwares were used to analyse the data.

Results We found an alteration of expression in 1958 genes in the LPS-O2 group compared to the NS-RA group, with up-regulation

of 904 genes and down-regulation of 1054 genes - refer Table 1 and 2 for top 10 up and down-regulated genes respectively. (fold change > 1.5, p-value < 0.05). Ingenuity Pathway Analysis (IPA) software identified 548 canonical pathways. Important pathways were Communication between Innate and Adaptive Immune Cells, Th1 and Th2 Activation, Neuroinflammation Signaling, IL-6 signaling, IL-15 production and Toll Like receptor signalling. Important diseases and functions affected were Organismal Development, Cellular Movement, Inflammatory Response, Cell Death and Survival and Molecular Transport. Two important networks relevant to our study were Cell-To-Cell Signaling and Interaction, Cellular Movement and Hematological System Development and Function (Network 1, figure 1) and Cellular Movement, Hematological System Development and Function, Immune Cell Trafficking (Network 2, figure 2)

Conclusion(s) Sequential exposure to LPS followed by hyperoxia causes differential gene expression in rat lungs in genes related to inflammation and immune regulation, which may alter cellular function and contribute to pathogenesis of long-term disease processes.

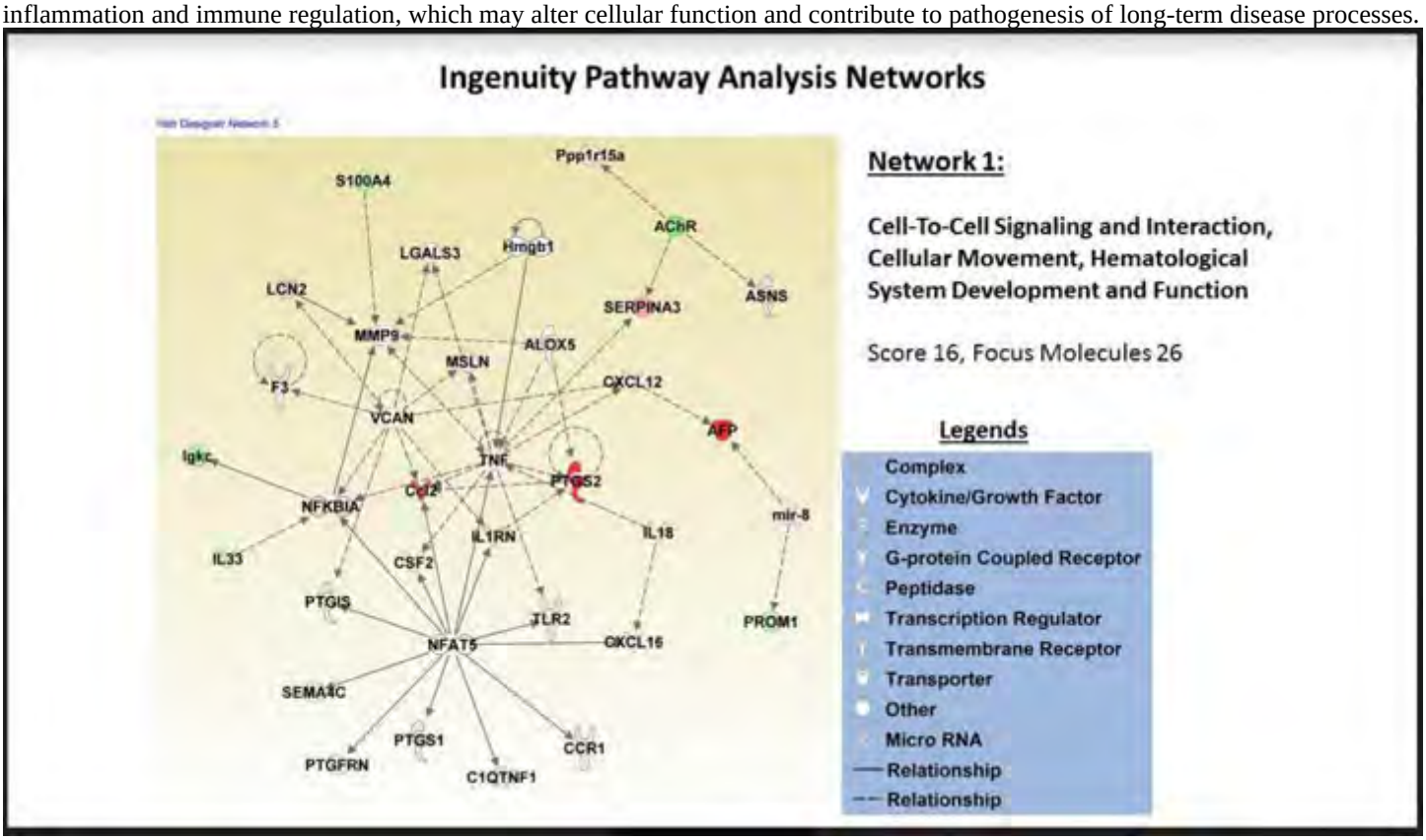

Figure 1 - Network 1

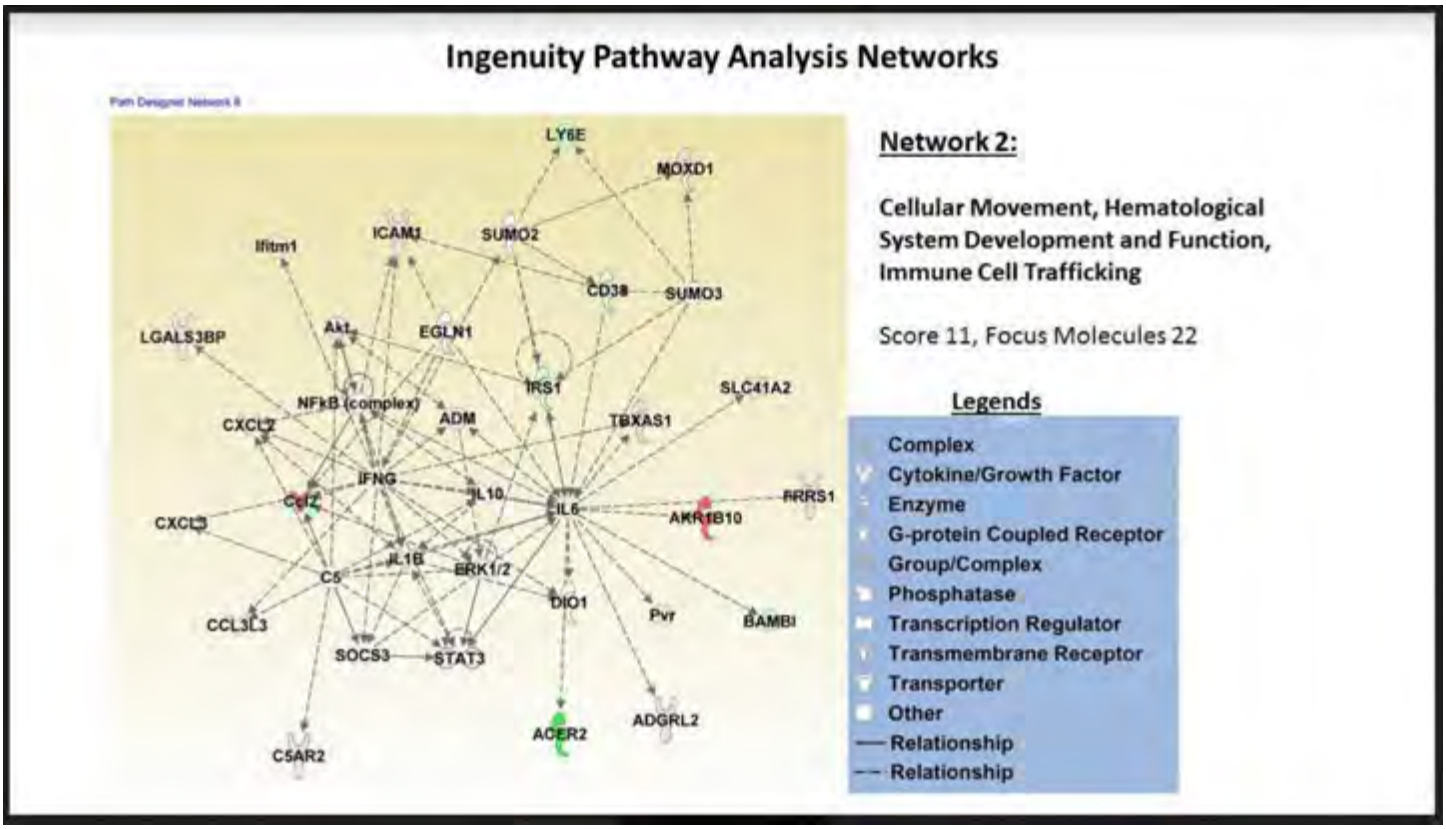

Figure 2 - Network 2

Top 10 up regulated genes

Number	Gene symbol	Gene description	Fold change
1	Alb	Albumin	606.9
2	Ahsg	Alpha-2-HS-glycoprotein	148.1
3	Ptgs2	Prostaglandin-endoperoxide synthase 2	143.7
4	Gdf15	Growth differentiation factor 15	54.7
5	Serpina1	Serpin peptidase inhibitor, clade A (alpha-1 antiproteinase, antitrypsin), member 1	48.8
6	Eda2r	Ectodysplasin A2 receptor	41.6
7	Serpine1	Serpin peptidase inhibitor, clade (nexin, plasminogen activator inhibitor type1), member 1	31.3
8	Cdkn1a	Cyclin-dependent kinase inhibitor 1A	30.8
9	Afp	Alpha-fetoprotein	28.7
10	Ccl2	Chemokine (C-Cmotif) ligand 2	23.2

Top 10 down regulated genes

Number	Gene symbol	Gene description	Fold Change
1	Glp1r	Glucagon-like peptide 1 receptor	-18.9
2	Tnfsf10	Tumor necrosis factor (ligand) superfamily, member 10	-14.8
3	Ntrk2	Neuro trophic tyrosine kinase, receptor, type 2	-11.5
4	Aplnr	Apelin receptor	-10.6
5	Scn7a	Sodium channel, voltage-gated, type VII, alpha subunit	-9.8
6	Vipr1	Vasoactive intestinal peptide receptor 1	-8.7
7	Gpr182	G protein-coupled receptor 182	-8.5
8	Hpgd	Hydroxy prostaglandin dehydrogenase 15 (NAD)	-8.4
9	Far2	Fatty acyl CoA reductase2	-8.2
10	Ly6c|LOC102552732	Interacts with 26-dinitrotoluene AND all-trans-retinoic acid AND ammoniumchloride|lymphocyteantigen6B-like	-8.2

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Biochemical Effects of Toxic Stress on Inflammation During Pregnancy

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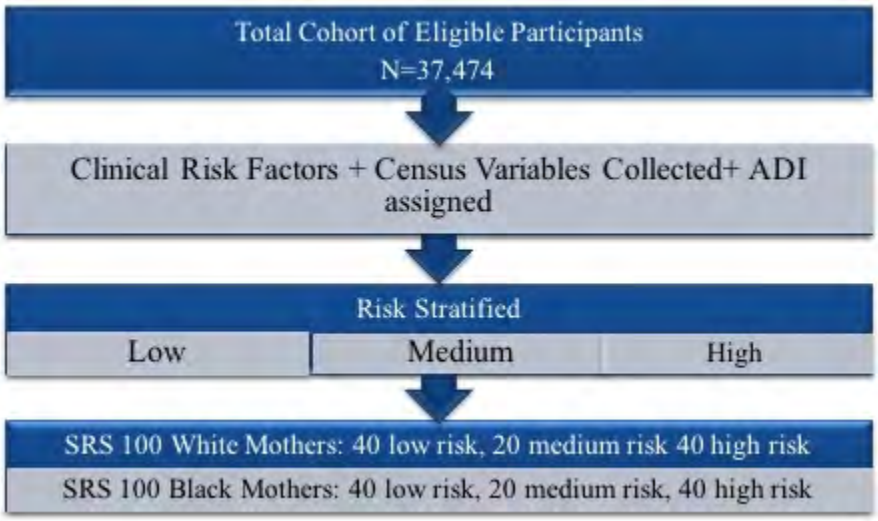
Background There is a persistent racial disparity in preterm births that disproportionately affects Black women. Several contributing factors have been identified, but controlling for individual-level risk factors, such as smoking, chronic medical conditions, access to prenatal care, and socioeconomic status does not fully explain the disparity seen in preterm births. [1-3] Exposure to chronic stress and lifelong social disadvantage can become toxic to the health of Black women. Physical, environmental, or psychological toxic exposures can affect the body's stress response and may lead to prolonged activation of the hypothalamic-pituitary(HPA) axis and inflammatory stress response which has been implicated in the preterm birth pathway via immunologic dysregulation [4].

Objective The primary aim was to determine if the women identified as high risk for toxic stress had higher median inflammatory cytokine levels compared to moderate and low risk women. We hypothesized that levels of inflammatory cytokines in the first trimester differ by risk group and race.

Design/Methods We conducted a cross-sectional study on 37,454 women aged 15-45 years old who delivered a live, singleton infant at Magee Women's Hospital in Pittsburgh, PA. Participants were assessed for risk of toxic stress using a combination of individual level factors and Messer area deprivation index(ADI) and assigned a risk group. Women were classified as low risk with 0-1 risk factors, moderate risk with 2 risk factors, or high risk with 3 or more risk factors . A stratified random sample was taken of 100 Black and 100 White mothers(40 high risk, 20 moderate risk, 40 low risk for each race) for further analysis.

Results We found that Black women were more likely to be at risk for toxic stress and had lower median levels of IL-6 compared to White women(8.80 vs 10.56, p=0.037). IL-6 had a weak negative correlation with area deprivation (R=-0.155, p-value 0.029), suggesting as area deprivation increased, IL-6 levels decreased. When stratified by risk group and race, low risk Black women had lower levels of IL-10 compared to low risk White women and high-risk Black women had lower levels of IL-6 compared to high-risk White women.

Conclusion(s) Our results suggest the relationship between toxic stress and inflammatory cytokines is modified by race. It is our theory that exposure to repetitive stress due to racism and lifelong social disadvantage, results in desensitization of the stress pathway and a blunted adaptive response to future stressors.



	Black Women Median(p25,p75)	White Women Median(p25,p75)	p-value
IL-6	8.80(5.28, 25.48)	10.56(7.51,23.30)	0.037*
IL-8	13.57(8.04, 40.23)	12.23(8.00, 24.62)	0.429
IL-10	35.99(25.23, 47.71)	34.85(23.84, 58.04)	0.393
IL-13	7.74(5.15, 15.46)	8.29(5.60, 14.49)	0.349
TNF-a	7.73(6.12, 10.44)	8.45(6.35, 10.76)	0.390

	Low Risk	Moderate Risk	High Risk	p-value[1]
IL-6				
White	10.30(7.60, 20.47)	8.16(6.36, 17.71)	13.86(8.59, 26.44)	0.404
Black	8.87(5.65, 25.44)	8.91(5.82, 26.89)	7.85(4.18, 19.80)	0.895
***p-value*[2]**	p=0.237	p=0.792	p=0.054*	
IL-8				
White	10.17(7.49, 29.95)	12.28(8.95, 46.35)	12.72(8.60, 20.52)	0.452
Black	15.15(10.84, 30.49)	13.57(10.52, 28.42)	9.65(6.96, 59.44)	0.433
***p-value*[2]**	p=0.067	p=0.713	p=0.436	
IL-10				
White	42.31(28.94, 67.60)	28.40(16.34, 58.04)	32.07(22.07, 49.39)	0.114
Black	31.47(22.77, 47.00)	37.65(20.82, 45.21)	38.42(26.88, 48.57)	0.293
***p-value*[2]**	p=0.018*	p=0.571	p=0.330	
IL-13				
White	8.48(5.80, 14.01)	7.40(5.20, 13.48)	8.29(6.62, 14.49)	0.676
Black	7.40(5.00, 14.07)	7.82(5.65, 16.07)	7.87(4.76, 15.82)	0.982
***p-value*[2]**	p=0.347	p=0.832	p=0.511	
TNFa				
White	8.47(6.45, 11.07)	8.45(6.02, 10.30)	8.39(6.72, 10.44)	0.957
Black	7.73(5.94, 8.97)	7.40(6.26, 10.81)	7.83(6.72, 11.31)	0.339
***p-value*[2]**	p=0.191	p=0.777	p=0.984	

Racial Differences in Baseline Characteristics of Entire Eligible Cohort (N=37, 474)

	White Women	Black Women	p-value
Teen	1113(3.9%)	1373(18.5%)	<0.0001
Preterm	2614(9.0%)	911(12.2%)	<0.0001
SGA(Small for Gestational Age)	5027(8.3%)	2694(16.4%)	<0.0001
Age(yrs)	29.6	24.8	<0.0001
Hypertension	1861(6.4%)	683(9.2%)	<0.0001
Diabetes	1813(6.3%)	358(4.9%)	<0.0001
Smoking	3258(19.8%)	1160(14.5%)	<0.0001
History of Depression	2565(8.8%)	825(11.1%)	<0.0001
Marital Status(Committed, Married or Life Partner)	18,977(66.7%)	875(11.9%)	<0.0001
High School Diploma or less	9965(34.5%)	5726(77.1%)	<0.0001
Professional Degree	1679(5.8%)	77(1.0%)	<0.0001
Pre-pregnancy weight(kg)	68.6(SD 16.8)	73.7(SD 20.2)	<0.0001
Weight at Delivery(kg)	83.6(SD17)	87.6(SD20.5)	<0.0001
BMI	25.4(SD 5.9)	27.4(SD 7.1)	<0.0001
Infant Birth Weight	3349(SD 580)	3097(SD 636)	<0.0001

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The Impact of Dating Violence Victimization on Prescription Pain Medication Misuse in U.S. Adolescents

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Background Adolescents who use alcohol, drugs, and other substances are more likely to experience dating violence. However, associations between prescription pain medication (PPM) misuse and dating violence victimization (DVV) in adolescents have yet to be studied in a large, nationally representative sample.
Objective To investigate the relationship between PPM misuse and DVV in a sample of US high school students (HSS).
Design/Methods Data were analyzed from the 2017 Youth Risk Behavior Survey (YRBS), a nationally representative survey of US HSS. Those who dated someone in the year prior to the survey were included. Student experience with DVV in the past year was split into 4 categories: no DVV (nDVV), physical DVV only (pDVV), sexual DVV only (sDVV), and both physical and sexual DVV (psDVV). PPM misuse was defined as the use of PPM without a prescription or differently than instructed by a doctor. Logistic regressions tested for associations between lifetime PPM misuse and DVV, using nDVV as a reference group. Analyses were stratified by sex to account for potential differences in types of DVV experienced by different sexes. Partially adjusted models controlling for demographic measures (grade level, race/ethnicity, and sexual identity) and fully adjusted models also controlling for lifetime substance use (use of alcohol, drugs, and other substances) were calculated. Chi-squared tests were used to detect differences in sex distribution across demographic factors. R, version 3.6.1, and the package *survey* were used for all analyses to account for the complex survey design of the YRBS.
Results 68.3% of HSS reported having dated in the past year and were included in analyses. 16.7% of HSS in the sample reported lifetime PPM misuse (Table 1). Relative to nDVV boys, those who had experienced pDVV were more likely to have misused PPM (OR=3.97, 95%CI: [2.74, 5.73]) (Table 2). This finding was robust to all modeling approaches. psDVV was also associated with higher odds of PPM misuse for boys. For girls, pDVV, sDVV, and psDVV were all associated with PPM misuse. These associations were significant in the partially adjusted model. The association with psDVV remained significant for all modeling approaches.
Conclusion(s) DVV was significantly associated with higher odds of PPM misuse among both male and female HSS. Understanding the relationship between DVV and PPM misuse may help physicians more effectively provide substance abuse resources and access to counseling for victims of dating violence.

Table 1: Prevalence of Dating Violence Victimization, Prescription Pain Medication Misuse, and Demographic Characteristics Among High School Students Who Dated in the 12 Months Prior to the 2017 YRBS (n=9103)

Characteristics	Males (n=4386)		Females (n=4717)		p- value[a]
	n	% (95% CI)	n	% (95% CI)	
Race/ethnicity					0.86
White (Non-Hispanic)	1991	54.9 (49.7-60.0)	2157	55.1 (49.9-60.2)	
Black (Non-Hispanic)	1017	17.1 (13.8-21.1)	1114	17.4 (14.3-20.9)	
Hispanic	1108	23.5 (19.9-27.5)	1177	22.9 (19.3-26.9)	
Grade					0.78
9	1021	24.7 (22.7-26.7)	1103	23.7 (21.6-26.0)	
10	1069	24.8 (23.1-26.6)	1165	25.2 (23.7-26.7)	
11	1164	25.5 (23.9-27.1)	1222	25.7 (24.2-27.1)	
12	1106	25.0 (23.2-27.0)	1210	25.4 (23.5-27.4)	
Sexual Identity					**<.0001**
Heterosexual	3938	93.2 (92.2-94.1)	3646	79.8 (77.4-82.0)	
Gay, lesbian, bisexual	180	4.3 (3.4-5.3)	779	16.5 (14.5-18.8)	
Not sure	103	2.5 (1.9-3.3)	172	3.7 (2.9-4.6)	
Experienced DVV during the past 12 months					**<.0001**
None	4041	92.7 (91.7-93.5)	3985	84.2 (82.6-85.7)	
Physical only	205	4.6 (4.0-5.4)	265	5.1 (4.2-6.2)	
Sexual only	66	1.4 (1.0-1.9)	306	7.2 (6.2-8.4)	
Both physical and sexual	74	1.3 (1.0-1.7)	161	3.4 (2.7-4.4)	
Ever used prescription pain medication without a doctor's prescription	652	16.0 (14.5-17.6)	793	17.1 (15.2-19.2)	0.29

[a] P-values correspond to χ_2 test.

[b] Data for other race and ethnicity subgroups are not presented due to limited sample size.

Table 2: Associations Between Prescription Pain Medication Misuse and Dating Violence Victimization Among US High School Students, 2017 YRBS (n=9103)

	Prescription Pain Medication Misuse[a]		
	OR	aOR[b]	aOR[c]
Males			
Experienced DVV in the past 12 months			
None	[Ref]	[Ref]	[Ref]
Physical DVV only	**3.97** (2.74, 5.73)	**3.93** (2.72, 5.69)	**2.38** (1.37, 4.13)
Sexual DVV only	1.48 (0.95, 2.30)	1.42 (0.91, 2.22)	1.13 (0.76, 1.69)
Both physical and sexual DVV	**2.15** (1.67, 2.77)	**2.02** (1.60, 2.55)	1.17 (0.82, 1.67)
Females			
Experienced DVV during the past 12 months			
None	[Ref]	[Ref]	[Ref]
Physical DVV only	**1.73** (1.30, 2.29)	**1.56** (1.15, 2.11)	0.64 (0.42, 1.00)
Sexual DVV only	**1.51** (1.30, 1.75)	**1.47** (1.25, 1.73)	1.21 (0.97, 1.50)
Both physical and sexual DVV	**1.67** (1.46, 1.91)	**1.54** (1.36, 1.75)	**1.29** (1.05, 1.58)

[a] Student took prescription pain medication without a doctor's prescription or different than how a doctor told to use it one or more times during their lifetime

[b] Adjusted for race/ethnicity, grade level, and sexual identity

[c] Adjusted for race/ethnicity, grade level, sexual identity, and lifetime alcohol, marijuana, synthetic marijuana, cocaine, heroin, methamphetamine, inhalants, ecstasy, and/or injection drugs use

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Residents' Attitudes and Comfort Level towards Firearms Safety Counseling in High Risk Area

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Background Firearm related deaths and injuries are a national public health crisis and a leading cause of death among black children. Most families are willing to discuss gun safety with physicians but few routinely provide this guidance to families. It is unclear if differences in subspecialty and region of medical education affect this.
Objective Assess attitudes, beliefs and comfort level of residents of different subspecialties regarding firearms safety counseling in a community hospital in a high risk area.
Design/Methods A cross-sectional online survey hosted on SurveyMonkey was sent to all residents at Brookdale Hospital. The questionnaire design was based on previously used instruments. Number and percentage of responses to each question were reported. Contributing factors for positive responses were estimated using Chi–squared or Fisher's exact test, as appropriate. A logistic regression model was performed to test most significant factors including: being a US graduate, female gender, raised with firearm at home, and being a pediatric (peds) resident.
Results Of 244 residents who received the survey, 134 (55%) responded; 51% were male, 34% were peds residents (Table 1). All residents reported gun violence as a problem around their practice location.
Compared to other specialties, peds residents were statistically more likely to believe that firearm injuries (FI) pose a safety threat to children, removing guns from homes is the most effective measure to prevent FI, and that physician should advocate for better legislation and discuss firearms anticipatory guidance (FAG) (Table 2).
Similarly, more international graduates agree that FI pose safety threat to children, absence of guns and strict legislation to prevent injuries, and believe that physician should routinely ask about firearms and provide FAG (Table 3).
Residents who grew up in household with firearms were statistically more likely confident and comfortable in providing counseling and less likely to agree that removing guns from house and advocating for strict legislation can reduce firearms related injuries compared to residents with having no firearms in the house (Table 4A).
Multivariate analysis shows growing up in home with no firearms was a significant predictor for agreeing that FI pose significant threat to children and removing guns from home is most effective measure to prevent injuries (Table 4B).
Conclusion(s) Personal background, training specialty and geographic region shapes the attitude and comfort level about firearms safety counseling.

Table 1: Demographic characteristics of residents taking survey (N=134)

Characteristic	Frequency	Percent (%)
Female	65	49
Male	69	51
Age group:		
25-34	92	69
35-44	37	28
45-54	4	3
Raised in:		
Africa	17	12
Asia	52	39
Caribbean	2	1
Europe	8	6
North America	50	37
South America	5	4
Grad school:		
United States	28	21
International	106	79
Specialty:		
Pediatrics	45	34
Dentistry	12	9
Emergency Medicine	18	13
General Surgery	10	7
Internal Medicine	33	25
Psychiatry	16	12
Year of residency:		
First Year Resident	46	34
Second Year Resident	30	22
Third Year Resident	52	39
Fourth year	6	4
Own firearm	4	3
Grew up in a home with firearms	23	17

Demographic characteristics of residents taking firearms safety counselling survey

Table 2: Comparison in responses to firearm safety survey among residents in pediatrics vs other specialties (N=134)

	Non-Peds residents (n=89; 66%)	Peds residents (n=45; 36%)	*p*-value
Residents' Attitude towards Firearms Safety Counselling: Residents answered as STRONGLY or SOMEWHAT AGREE with the following			
Firearm injuries can be prevented	89 (100%)	44 (98%)	0.336
Firearm injuries pose a very significant safety threat to children.	79 (88%)	**45 (100%)**	0.019*
Unlocked guns in the home increases the risk firearms related injuries	88 (99%)	45(96%)	1.000
Absence of guns from homes and communities is the most effective measure to prevent firearm related injuries and death	74 (83%)	**44 (98%)**	0.014*
Screening about gun access during clinical encounter helps identify at-risk patients	77 (87%)	41 (91%)	0.439
Counselling on prevention of firearm injuries can reduce the risk of firearm related injury/death	73 (82%)	42 (93%)	0.076
Strict legislation restricting the use, sale or handling of firearms will reduce the risk of injury	78 (88%)	44 (98%)	0.052
Residents' beliefs regarding firearms safety counselling: Residents answered as STRONGLY or SOMEWHAT AGREE with the following			
It is physician responsibility to advocate for better legislation to reduce the risk of firearm injury to youth	71 (80%)	**43 (96%)**	0.015*
Physician should routinely ask patient about their experiences with firearms and provide appropriate counseling and referral.	54 (61%)	**43 (95%)**	<0.001*
Anticipatory guidance between physician and patient/caregivers should always include a discussion on the presence of firearms and associated safety precautions.	60 (67%)	**43 (96%)**	<0.001*
I may offend the patient/caregiver if I ask about guns in the home.	42 (47%)	20 (46%)	0.850
Respondents ALWAYS or OFTEN ask about firearms during clinical encounter in following age groups:			
Infants	5 (5%)	0 (0%)	0.155
Preschool	6 (7%)	2 (4%)	0.576
Elementary school	8 (9%)	4 (9%)	0.598
Middle school	10 (11%)	5 (11%)	0.774
High school	15 (17%)	9 (20%)	0.675
College and above	12 (14%)	8 (18%)	0.492
Residents' Confidence and comfort level: Respondents answered as EXTREMELY or VERY to the following:			
I have the ability to change firearm safety behavior through proper counseling techniques.	12 (14%)	**17 (40%)**	0.001*
I feel confident in my ability to counsel parents and youth in firearm injury prevention.	11 (12%)	8 (19%)	0.310
I feel comfortable asking parents and youth about the presence of firearms in the home or exposure to firearms elsewhere.	23 (26%)	8 (19%)	0.375
I feel confident that I can describe safe storage devices or make appropriate referrals when patient/parents need more information or help dealing with firearms injury prevention.	16 (18%)	9 (21%)	0.660
I have ready access to written information that can help families prevent firearm injury.	8 (9%)	8 (19%)	0.106
Families with guns in the home are unlikely to change their storage behaviors as a result of my counseling.	12 (14%)	2 (5%)	0.127

* statistically significant

Comparison in responses to firearm safety survey among pediatric residents vs other specialties.

Table 3: Comparison in responses to firearm safety survey among residents graduated in US graduate school vs non-US graduate school (N=134)

	International graduate (n=106; 79%)	US graduate (n=28; 21%)	*p*-value
Residents' Attitude towards Firearms Safety Counselling: Residents answered as STRONGLY or SOMEWHAT AGREE with the following			
Firearm injuries can be prevented	105 (99%)	28 (100%)	1.000
Firearm injuries pose a very significant safety threat to children.	**102 (96%)**	22 (79%)	0.002*
Unlocked guns in the home increases the risk firearms related injuries	106 (100%)	27 (96%)	0.209
Absence of guns from homes and communities is the most effective measure to prevent firearm related injuries and death	**98 (93%)**	20(71%)	0.002*
Screening about gun access during clinical encounter helps identify at-risk patients	**98 (93%)**	20(71%)	0.002*
Counselling on prevention of firearm injuries can reduce the risk of firearm related injury/death	92 (87%)	23 (82%)	0.530
Strict legislation restricting the use, sale or handling of firearms will reduce the risk of injury	**101 (95%)**	21 (75%)	0.001*
Residents' beliefs regarding firearms safety counselling: Residents answered as STRONGLY or SOMEWHAT AGREE with the following			
It is physician responsibility to advocate for better legislation to reduce the risk of firearm injury to youth	93 (88%)	21 (75%)	0.093
Physician should routinely ask patient about their experiences with firearms and provide appropriate counseling and referral.	**84 (79%)**	13 (46%)	0.001*
Anticipatory guidance between physician and patient/caregivers should always include a discussion on the presence of firearms and associated safety precautions.	85 (80%)	18 (64%)	0.076
I may offend the patient/caregiver if I ask about guns in the home.	50 (48%)	12 (43%)	0.654
Respondents ALWAYS or OFTEN ask about firearms during clinical encounter in following age groups:			
Infants	5 (5%)	0 (0%)	0.308
Preschool	7 (7%)	1 (4%)	0.565
Elementary school	10 (9%)	2 (7%)	0.561
Middle school	12 (11%)	3 (11%)	0.552
High school	21 (20%)	3 (11%)	0.294
College and above	18 (17%)	2 (7%)	0.208
Residents' Confidence and comfort level: Respondents answered as EXTREMELY or VERY to the following:			
I have the ability to change firearm safety behavior through proper counseling techniques.	24 (23%)	5 (18%)	0.554
I feel confident in my ability to counsel parents and youth in firearm injury prevention.	14 (14%)	5 (18%)	0.570
I feel comfortable asking parents and youth about the presence of firearms in the home or exposure to firearms elsewhere.	22 (21%)	9 (33%)	0.194
I feel confident that I can describe safe storage devices or make appropriate referrals when patient/parents need more information or help dealing with firearms injury prevention.	18 (18%)	7 (26%)	0.321
I have ready access to written information that can help families prevent firearm injury.	14 (14%)	2 (7%)	0.384
Families with guns in the home are unlikely to change their storage behaviors as a result of my counseling.	10 (10%)	4 (15%)	0.446

* statistically significant

Comparison in responses to firearm safety survey among residents graduated in US graduate school vs non-US graduate school.

Table 4A: Comparison in responses to firearm safety survey among residents who has a firearm at home or raised in home with a firearm, vs those who are not (N=134)

	NO Firearm at home (n=111; 83%)	Firearm at home (n=23; 17%)	*p*-value
Residents' Attitude towards Firearms Safety Counselling: Residents answered as STRONGLY or SOMEWHAT AGREE with the following			
Firearm injuries can be prevented	110 (99%)	23 (100%)	1.000
Firearm injuries pose a very significant safety threat to children.	**108 (97%)**	16 (70%)	<0.001*
Unlocked guns in the home increases the risk firearms related injuries	111 (100%)	22 (96%)	0.172
Absence of guns from homes and communities is the most effective measure to prevent firearm related injuries and death	**107 (96%)**	11 (48%)	<0.001*
Screening about gun access during clinical encounter helps identify at-risk patients	**101 (91%)**	17 (74%)	0.022*
Counselling on prevention of firearm injuries can reduce the risk of firearm related injury/death	**99 (89%)**	16 (70%)	**0.014***
Strict legislation restricting the use, sale or handling of firearms will reduce the risk of injury	**108 (97%)**	14 (61%)	<0.001*
Residents' beliefs regarding firearms safety counselling: Residents answered as STRONGLY or SOMEWHAT AGREE with the following			
It is physician responsibility to advocate for better legislation to reduce the risk of firearm injury to youth	**100 (90%)**	14 (61%)	<0.001*
Physician should routinely ask patient about their experiences with firearms and provide appropriate counseling and referral.	**88 (79%)**	9 (39%)	<0.001*
Anticipatory guidance between physician and patient/caregivers should always include a discussion on the presence of firearms and associated safety precautions.	**92 (83%)**	11 (48%)	<0.001*
I may offend the patient/caregiver if I ask about guns in the home.	51 (47%)	11 (48%)	0.898
Residents' Confidence and comfort level: Respondents answered as EXTREMELY or VERY to the following:			
I feel confident in my ability to counsel parents and youth in firearm injury prevention.	**12 (11%)**	7 (30%)	0.017*
I feel comfortable asking parents and youth about the presence of firearms in the home or exposure to firearms elsewhere.	22 (20%)	**9 (41%)**	0.039*
I feel confident that I can describe safe storage devices or make appropriate referrals when patient/parents need more information or help dealing with firearms injury prevention.	16 (15%)	**9 (41%)**	0.005*
Families with guns in the home are unlikely to change their storage behaviors as a result of my counseling.	8 (7%)	**6 (27%)**	0.006*

Table 4B: Multivariate analysis for contributing factors of residents agreeing on some of the statements in firearm safety counseling survey.

Contributing factor	*p*-value	Contributing factor	*p*-value
More residents agree on statement **"Firearm injuries pose a very significant safety threat to children"**			
Female	0.397	Peds resident	0.997
US graduate	0.321	**No Firearm at home**	**0.001 ***
More residents agree on statement **"Absence of guns from homes and communities is the most effective measure to prevent firearm related injuries and death"**			
Female	0.511	Peds resident	0.155
US graduate	0.561	**No Firearm at home**	**<0.044***
More residents agree on statement **"Physician should routinely ask patient about their experiences with firearms and provide appropriate counseling and referral."**			
Female	0.990	**Peds resident**	**0.004***
US graduate	0.120	**No Firearm at home**	**0.004***

* statistically significant

Table 4A. Comparison in responses to firearm safety counseling survey among residents who has a gun at home or raised in home with a firearm, vs those who are not.
Table 4B. Multivariate analysis for contributing factors of residents agreeing on some of the statements in firearm safety counseling survey.

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The Practice of Lethal Means Restriction Counseling to Reduce Suicide Risk: a Systematic Review of the Literature

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Background Suicide is the second leading cause of death in individuals aged 10 – 34 years in the United States. Lethal means restriction (LMR) counseling, which encourages limiting access and reducing lethality of particular methods of suicide, has been identified as a viable prevention strategy. For this approach to be successful, adequate education about risks and means must be communicated to families and individuals at risk for suicide. This systematic review aims to identify methods of LMR most commonly communicated by healthcare providers, and barriers to the delivery of such counseling.
Objective This systematic review aims to identify methods of LMR counseling most commonly communicated by healthcare providers, and barriers to the delivery of such information.
Design/Methods The protocol for this systematic review is registered with PROSPERO (CRD42018076734). Included studies were identified through searching four databases (PubMed, Scopus, Psych-Info, and EBSCO). Studies were selected and coded independently by two researchers. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines were used to assess the quality of reporting for observational studies.
Results A total of 1,254 studies were screened; 9 met the inclusion criteria. Included studies were published between 1998-2018. Study participants were majority female, and safe firearm storage was the most common form of lethal means restriction education provided. Just two studies included education on multiple forms of lethal means (e.g. alcohol, medication, and firearm storage). Barriers limiting healthcare providers' delivery of LMR counseling included lack of specific skills to address LMR and skepticism regarding the effectiveness of LMR counseling.
Conclusion(s) There is limited published evidence that identifies the most effective methods and target populations for LMR education. Given the growing literature providing evidence of gender differences in suicide modality (e.g., guns, medications, suffocation), lethal means restriction education should be multifaceted, to address common means of suicide in both males and females. A majority of suicide attempts and many completed suicides amongst youth do not involve firearms, regardless of gender. This highlights the need to include discussion of multiple forms of lethal means during counseling to reduce risk of suicide. Further prospective studies should identify the most effective methods of providing lethal means counseling.

Appendix A. Sample search strategy for study inclusion:
(TITLE-ABS-KEY (sucid* OR self-harm)) AND (((lethal* OR toxic*)) AND (education OR counseling OR intervention OR restriction OR reduction OR prevention)) AND (control OR lmr OR lethal-means OR lethal-method)

Table 1: Characteristics of included studies

First author	Year	Type of Delivery	Recipient of Intervention
Asarnow, J.	2017	Counseling by therapists in ED, home, and clinic; multiple sessions	Parent/caregiver; patient
Fendrich, M.	1998	Education by nurses & physicians in ED; focus on home firearm removal; single session	Parent/caregiver
Kruesi, M.J.P.	1999	Education by ED staff during mental health assessment; single session	Parent/caregiver
Miller, I.W.	2017	Self-administered safety plan, counseling by nurse, follow-up phone calls; multiple sessions	Patient, optional involvement of significant other
Parast , L.	2018	Counseling by ED and inpatient staff; single session	Parent/caregiver
Runyan	2018	Counseling by ED staff; single session	Patient and family
Runyan	2016	Counseling by behavioral health staff and physicians in ED; optional provision of lockbox; single session	Parent/caregiver
Sale, E.	2017	Counseling by mental health providers; single session	Patient and family
Stanley, B.	2012	Brief intervention including safety planning by clinician in ED; single session	Patient

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TEEN HEED: A Community-Based Adolescent Diabetes Prevention Study

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Background Rates of type 2 diabetes in youth are projected to quadruple by the year 2050 without new interventions. However, few prevention programs have been developed and tested among at-risk youth.
Objective 1) Modify an effective adult diabetes prevention program for youth (ages 13-19) from East Harlem, NY; 2) Screen at-risk youth for pre-diabetes and related lifestyle and biological measures; 3) Pilot and evaluate outcomes for the intervention with 90 pre-diabetic youth.
Design/Methods We screened 149 youth with BMI>85th percentile for pre-diabetes using oral glucose tolerance testing and also

obtained other clinical measurements and administered a health and lifestyle survey. Pre-diabetic youth were randomized into intervention (n=41) and waitlist control groups (n=49). Intervention participants were asked to attend a 12 week peer education program, and both groups completed 5 month follow-up evaluations. We compared baseline and follow-up measures within intervention and control groups using Wilcoxon signed rank test for continuous and ordinal variables, and McNemar's test for dichotomized variables. We used generalized linear models to test the intervention effect (with $p<0.05$ for statistical significance).
Results We had an overall retention rate of 72% at follow up. Baseline and follow up clinical outcomes are presented in Table 1. Within group analyses found maintenance (no increase or decrease) in BMI percentile and % body fat in both groups and an increase in waist circumference in the control group. Fasting glucose and hemoglobin A1c decreased significantly in the intervention group and remained the same in the control group. Blood pressure percentiles remained stable in the intervention group and increased significantly (within the normal range) in the control group. Total cholesterol and HDL also both decreased in the control group. There were also a number of significant changes in behavioral outcomes including an improvement in portion control scores for both groups, decreased junk food intake in the intervention group, and decreased time spent doing chores and mild physical activity in the control group. There were no significant differences between intervention and control groups from baseline to follow up for any outcome.
Conclusion(s) Our pilot diabetes prevention program resulted in several changes in clinical and behavioral outcomes with trends favoring the intervention group. Future work aims to increase youth access and engagement by incorporating mHealth and delivering the program in community settings.

	Intervention (n=28)			Control (n=37)		
Clinical Measure	Baseline Mean (sd)	Follow Up Mean (sd)	P value	Baseline Mean (sd)	Follow Up Mean (sd)	P value
BMI percentile	97 (3.9)	97 (4.1)	0.68	96 (3.8)	96 (3.9)	0.55
% body fat	38 (9.5)	38 (10)	0.25	37 (9.1)	37 (8.8)	0.27
Waist circumference (cm)	100.2 (17)	102.6 (16)	0.05	97.8 (15)	102.3 (16)	<0.0001
Fasting glucose (mg/dL)	108 (12)	103 (11)	0.0005	106 (8.8)	106 (11)	0.25
2 hour glucose (mg/dL)	120 (27)	125 (27)	0.84	128 (25)	128 (29)	0.44
Insulin (uIU/mL)	21 (11)	22 (11)	0.60	18 (12)	21 (18)	0.69
Hemoglobin A1c (%)	5.5 (0.8)	5.1 (0.7)	0.0003	5.1 (0.7)	4.8 (0.8)	0.05
Systolic BP percentile	43 (29)	47 (25)	0.35	36 (28)	46 (26)	0.025
Diastolic BP percentile	61 (29)	60 (24)	0.62	50 (22)	57 (24)	0.035
Total cholesterol (mg/dL)	167 (35)	151 (44)	0.05	157 (28)	145 (27)	0.005
Triglycerides (mg/dL)	109 (45)	105 (57)	0.41	127 (42)	112 (52)	0.25
LDL (mg/dL)	104 (27)	96 (31)	0.07	86 (25)	86 (21)	0.49
HDL (mg/dL)	42 (13)	40 (11)	0.39	47 (14)	39 (12)	0.015

Table 1: TEEN HEED Baseline and 5 month Clinical Outcomes

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Value Based Care versus Resource Utilization: An Experience from a Level II NICU
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Background Modern neonatology practices are shifting focus from volume to value-based care to improve quality and decrease cost, which relies on appropriate utilization of resources. Historically, a significant number of level II & III NICU admissions come from presumed early onset neonatal sepsis (EONS) evaluation and hypoglycemia. These diagnoses accounted for 24.8% and 11.7% of total admissions respectively in our level II NICU in 2017. New management guidelines for these infants have reduced the need for NICU admissions. Revenue reduction from these 'lost' admissions may impact the ability to staff and maintain operations in lower level NICUs.

Objective To determine the impact of two quality improvement (QI) initiatives and value-based care on a level II NICU admissions for infants born at ≥34 weeks of gestational age (GA) from 2018-2019.

Design/Methods Two concurrent QI projects were conducted in a level II NICU from 2018-2019. First, we implemented new EONS management guidelines for infants born at ≥34 weeks GA with maternal suspected Triple-I starting Jan. 2018. Second, we changed management of infants with neonatal hypoglycemia born at ≥34 weeks GA by using glucose gel (40%) starting in April 2019. A data collection tool was developed to review the possible 'lost' NICU admission days based on previous practices in 2017. Financial data was estimated based on the standard charges for a newborn admitted to level II NICU.

Results All (100%) of the infants born with maternal suspected Triple-I were admitted to NICU and treated with antibiotics irrespective of their clinical status prior to January 2018, which was decreased to 19.7% (15/76) after implementation of new EONS management guidelines (Table 1 & 2). None of these infants developed significant clinical illness, had a culture proven sepsis, or required readmission for sepsis within a month after discharge. A total of 22 infants received glucose gel from April to Dec. 2019, of which two (9.1%) required admission to NICU for persistent hypoglycemia (Table 3). A total of 51 NICU admissions were avoided for EONS, and at least 15 for neonatal hypoglycemia (Table 3), equivalent to nearly 130 patient days, which significantly reduced the overall charges by >$700,000 for our level II NICU.

Conclusion(s) As clinical advancement in medical practice reduces patient census in level II NICUs, a change in practice and revenue model will be necessary to sustain the staffing and operations in these NICUs, so they can respond appropriately to acute delivery emergencies.

Table 1: Effect of implementation of new EONS Management Guidelines

	2017	2018-2019
Number of infants born with suspected Triple-I	N=34	N=76
Number of infants admitted to NICU for Sepsis evaluation	34 (100%)	15 (19.7%) **
Total Number of NICU admission >34 weeks of GA	138	261
% of NICU admission for r/o sepsis >34 weeks GA	24.8%	5.8%**
Total Number of antibiotic days	74	30
Number of antibiotic days/infant with suspected Triple-I	2.36	0.39**
Number of CBC/infant with suspected Triple-I	1.61	0.30**
Number of BCx/infant with suspected Triple-I	1	0.41**

** p value <0.01 compared to phase 1

Effect of implementation of new EONS Management Guidelines

Table 2: Characteristics of Infants admitted to NICU after implementation of new EONS guidelines

	Number of Infants (n=15/76)
Term Infants	12 (78%)
Late Preterm Infants	3 (22%)
Asymptomatic	5 (33%)
Symptomatic at Birth	3 (22%)
Symptoms developed 2-24 hrs	7 (46%)
Symptoms developed 24 hr - Discharge	0 (0%)
Positive Blood culture	0 (0%)
Abnormal CBC	3 (22%)
Readmissions for sepsis within one month after discharge	0 (0%)

Characteristics of Infants admitted to NICU after implementation of new EONS guidelines

Table 3: Effect of Glucose Gel (40%) use for Neonatal Hypoglycemia on NICU admissions

	Number of Infants received Glucose Gel	Number of NICU admissions for persistent Hypoglycemia	'Lost' NICU admissions due to Glucose Gel Use
May 2019	5	0	3
June 2019	2	0	2
July 2019	2	0	1
August 2019	4	1	3
September 2019	2	0	2
October 2019	3	1	1
November 2019	1	0	1
December 2019	3	0	2
Total	22	2 (9.1%)	15

Effect of Glucose Gel (40%) use for Neonatal Hypoglycemia on NICU admissions

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Effects of Morphine and Caffeine on Rat Pup Brain Expression of Endothelin Receptors and Mitochondrial Markers

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Background Rapid brain growth spurt occurs during early postnatal life in preterm infants with potential vulnerability to effects of CNS acting drugs. Morphine is administered to ventilated or postoperative neonates as a continuous infusion or intermittent bolus for days to weeks to alleviate pain. Caffeine citrate, a treatment for apnea of prematurity, is administered daily for several weeks to improve respiratory drive and prevent apnea in the extremely premature infants. Simultaneous use of morphine and caffeine is common in the NICU. Prior studies showed acute neurotoxicity with this combination, however chronic effects remain unknown. Little information is available on the molecular mechanisms mediating the potential neurotoxic effects.
Objective To determine the effects of morphine (MSO4) and caffeine administration, independently and combined on central nervous system (CNS) proteins: endothelin receptors (ET_A, ET_B); mitochondrial fission mediator (Drp1), mitochondrial fusion mediator (Mfn2); and pro-apoptotic (BAX) and anti-apoptotic markers (BCL-2).
Design/Methods Preclinical animal study involving subcutaneous administration of MSO4 (2mg/kg), caffeine (100mg/kg), and MSO4 + caffeine daily to rat pups (N=192) during postnatal day (PND) 3-6. CNS protein expression at 3 developmental stages (PND7, PND14, and PND28) measured using Western blot and immunofluorescence analyses. Statistical analysis performed using one-way ANOVA followed by Tukey's test.
Results MSO4 + caffeine group showed greater augmentation of BAX expression compared to MSO4 and caffeine groups at PND 7, 14, 28 which is statistically significant ($p<0.05$). MSO4, caffeine, MSO4 + caffeine groups compared to saline group had increased expression of Drp1, BAX at PND7, PND14, PND 28 and suppressed expression of Mfn2, BCL-2 at PND7, PND14, PND28 in male and female pups with statistical significance ($p<0.05$). No significant difference was noted between groups for expression of ET_A, ET_B receptors at 3 developmental stages. Further immunofluorescence analyses are currently in progress.
Conclusion(s) Concurrent use of Caffeine and Morphine may increase apoptosis at different postnatal developmental stages compared to use of Caffeine and Morphine alone.

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High Blanket Temperature During Therapeutic Hypothermia is Associated with Death or Disability for Infants with Hypoxic Ischemic Encephalopathy

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Background Recent trials of therapeutic hypothermia (TH) for infants with hypoxic ischemic encephalopathy (HIE) demonstrate improved but persistent rates of death or disability near 30%. Blanket temperature (BT) necessary to maintain a sub-physiologic target temperature of 33.5ºC has not been studied as a biomarker of outcome. Because body temperature is centrally regulated, BT necessary to maintain 33.5ºC is a plausible indicator of brain injury.
Objective Determine whether BT during maintenance phase of TH associates with death or disability at 18-22 months for infants with HIE.
Design/Methods Retrospective study of infants who received TH at 33.5ºC for 72h in the Neonatal Research Network's Induced Hypothermia and Optimizing Cooling trials. Maintenance phase of TH began when infant esophageal temperature was 33.5±0.1ºC after equilibration from any overshoot in the first 4h. BTs were recorded during TH: at baseline, every 15 min during the first 4-5h, hourly until 12h, and then every 4h through rewarming. We rank ordered each infant's BTs and divided them into quartiles. The mean of the upper quartile (Q4, ≥ 75%) was used as the highest BT. Logistic regression was used to determine if death or moderate/ severe disability was associated with high BT, adjusting for initial Sarnat stage, center, trial, and maternal education. Similar analyses examined associations between outcome and BT using: the overall median; mean of the lowest quartile; and, burden of consecutive blanket temperatures above 33.5ºC in the first 24 and 48h of TH.
Results 197 infants received TH at 33.5ºC for 72h (Table 1); 187 had adequate data. Of these, 37% (69/187) died or survived with disability. Results from analysis of BT quartiles appear in Table 2. Each 0.5ºC increase above 33.5ºC in the upper quartile mean was

associated with a 58% increase in the adjusted odds of death or disability (aOR 1.58, 95% CI 1.14-2.19). aOR of death/ disability based on persistence of high BTs appear in Table 3. Infants with ≥8 consecutive BTs above 33.5ºC in the first 48 hour of TH had an aOR of death/ disability of 7.51 (95% CI 2.42-23.2). Figure 1 depicts rates of death/ disability based on number of consecutive BTs above 33.5ºC in the first 24 and 48h of TH.

Conclusion(s) Higher BT during maintenance phase of TH is associated with death or moderate/ severe disability among infants with HIE and may be an early, clinically useful biomarker to inform prognosis and treatment.

Table 1: Neonatal characteristics stratified by trial of enrollment

Characteristic	NICHD Induced Hypothermia (IH) Trial 2005, n=102	Optimizing Cooling (OC) Trial 2014, n=95	Total n=197
Age at baseline (hours)	5.0 ± 1.2	5.2 ± 1.1	5.1 ± 1.1
Transferred from birth hospital *	48 (47%)	59 (62%)	107 (54%)
Male sex	51 (50%)	52 (55%)	103 (52%)
Apgar score ≤ 5			
At 5 min	92/101 (91%)	79 (83%)	171/196 (87%)
At 10 min *	80/95 (84%)	54/78 (69%)	134/173 (77%)
Birthweight	3385 ± 617	3230 ± 528	3310 ± 579
Continued resuscitation at 10 MOL	95 (93%)	82 (86%)	177 (90%)
Time to respirations ≥ 10 min*	69/97 (71%)	41/89 (46%)	110/186 (59%)
Cord blood			
pH *	6.9 ± 0.2 (N=72)	6.9 ± 0.2 (N=77)	6.9 ± 0.2 (N=149)
Base deficit *	18.5 ± 6.7 (N=62)	15.7 ± 8.1 (N=59)	17.1 ± 7.5 (N=121)
Seizures at <6h	43 (42%)	27 (28%)	70 (36%)
Anticonvulsants			
Prior to intervention *	49/99 (49%)	25/92 (27%)	74/191 (39%)
At time of intervention	41 (40%)	16 (17%)	57 (29%)
Severity of HIE at <6h of Age			
Severe	32/101 (32%)	21 (22%)	53/196 (27%)
Moderate	69/101 (68%)	74 (78%)	143/196 (73%)
Outcomes			
Primary Outcome			
Death or moderate or severe disability*[1]	45 (44%)	27/92 (29%)	72/194 (37%)
Secondary Outcomes			
Death during intervention *	15 (15%)	1 (1%)	16 (8%)
Death prior to discharge *	19 (19%)	7 (7%)	26 (13%)
Death through 18-22 months *	24 (24%)	8/93 (9%)	32/195 (16%)
Moderate disability[1]	2/78 (3%)	1/84 (1%)	3/162 (2%)
Severe disability[1]	19/78 (24%)	18/84 (21%)	37/162 (23%)
Cerebral Palsy	19/77 (25%)	16/85 (19%)	35/162 (22%)
Blindness	5/75 (7%)	7/85 (8%)	12/160 (8%)
Severe hearing impairment	4/77 (5%)	4/85 (5%)	8/162 (5%)

*Significant at P<0.05.

[1]Moderate disability was cognitive score 70-84 (Bayley III in OC or MDI Bayley II in IH) and gross motor function classification system level (GMFCS) 2, active seizures or hearing with amplification. Severe disability was cognitive score or Bayley II MDI <70, GMFCS 3-5, blindness or profound hearing loss.

Table 2: Logistic regression model of death/ disability by blanket temperature

Blanket Temperature	aOR (95% Confidence Interval)		
	Death or Disability	Death	Moderate to Severe Disability
Highest quartile*	1.58 (1.14-2.19)	1.40 (0.92-2.12)	1.46 (1.02-2.09)
Median**	1.30 (1.02-1.65)	1.03 (0.82-1.30)	1.58 (1.10-2.28)
Lowest quartile***	1.15 (1.00-1.32)	1.11 (0.92-1.34)	1.16 (0.97-1.38)

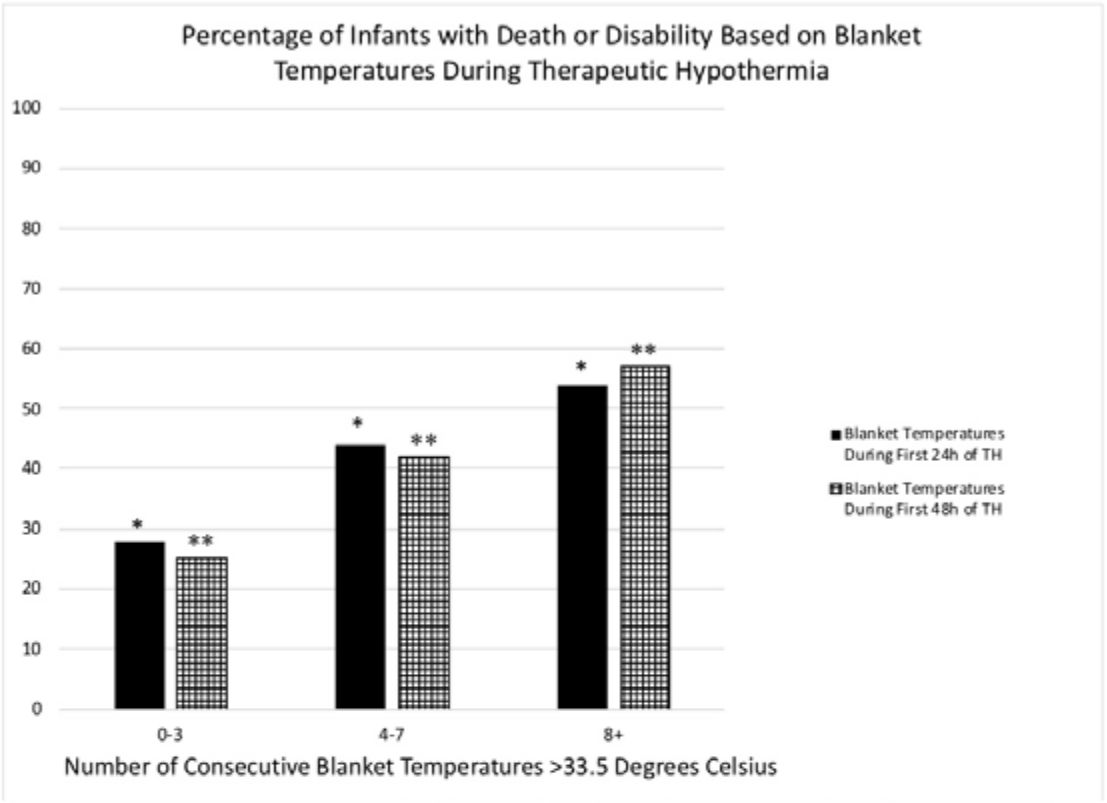
Report aOR for each 0.5°C that the blanket is above 33.5°C.
Adjusted for: Sarnat stage, center of enrollment (as a random effect), maternal education, trial enrolled.
*Highest quartile temperature was defined as the average of the highest quartile of blanket temperatures per infant; **Median was the median of blanket temperatures for each infant; ***Lowest quartile was defined as the average of the lowest quartile of blanket temperatures per infant.

Table 3: Logistic regression model of death/ disability by persistence high blanket temperature

Time blanket temperature trends above 33.5°C	Adjusted OR	95% Confidence Interval	P-value	# of infants
Within first 24 hours*				
0-49% > 33.5	REF			98/185
50-74% >33.5°C	3.84	1.52-9.67	0.005	62/185
75-100% >33.5°C	2.82	0.75-10.7	0.13	25/185
0-3 consecutive >33.5	REF			93/185
4-7 consecutive >33.5°C	2.39	0.95-6.00	0.06	64/185
8+ consecutive >33.5°C	5.25	1.60-17.2	0.007	28/185
Within first 48 hours*				
0-49% > 33.5	REF			113/187
50-74% >33.5°C	7.59	2.75-21.0	0.0001	55/187
75-100% >33.5°C	1.92	0.39-9.45	0.42	19/187
0-3 consecutive >33.5	REF			85/187
4-7 consecutive >33.5°C	2.45	0.96-6.23	0.06	67/187
8+ consecutive >33.5°C	7.51	2.42-23.2	0.0006	35/187

Report aOR for each hour that blanket is above 33.5°C. *Temperatures during induction of hypothermia would be excluded.
Adjusted for: Sarnat stage, center of enrollment (as a random effect), maternal education, trial enrolled.

Figure 1



Depicts death or moderate/ severe disability stratified by number of consecutive blanket temperatures above 33.5ºC in the first 24 hours of TH (solid) as well as the first 48 hours of TH (checkered). Trends for greater number of consecutive blanket temperatures associating with increased death or disability were significant for both the first 24h of TH (*p=0.006) as well as the first 48h of TH (**p=0.0005) by Cochrane-Armitage trend tests.

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Observational study in preterm infants of splanchnic and cerebral tissue oxygenation in relation to tolerance of a feeding advancement protocol

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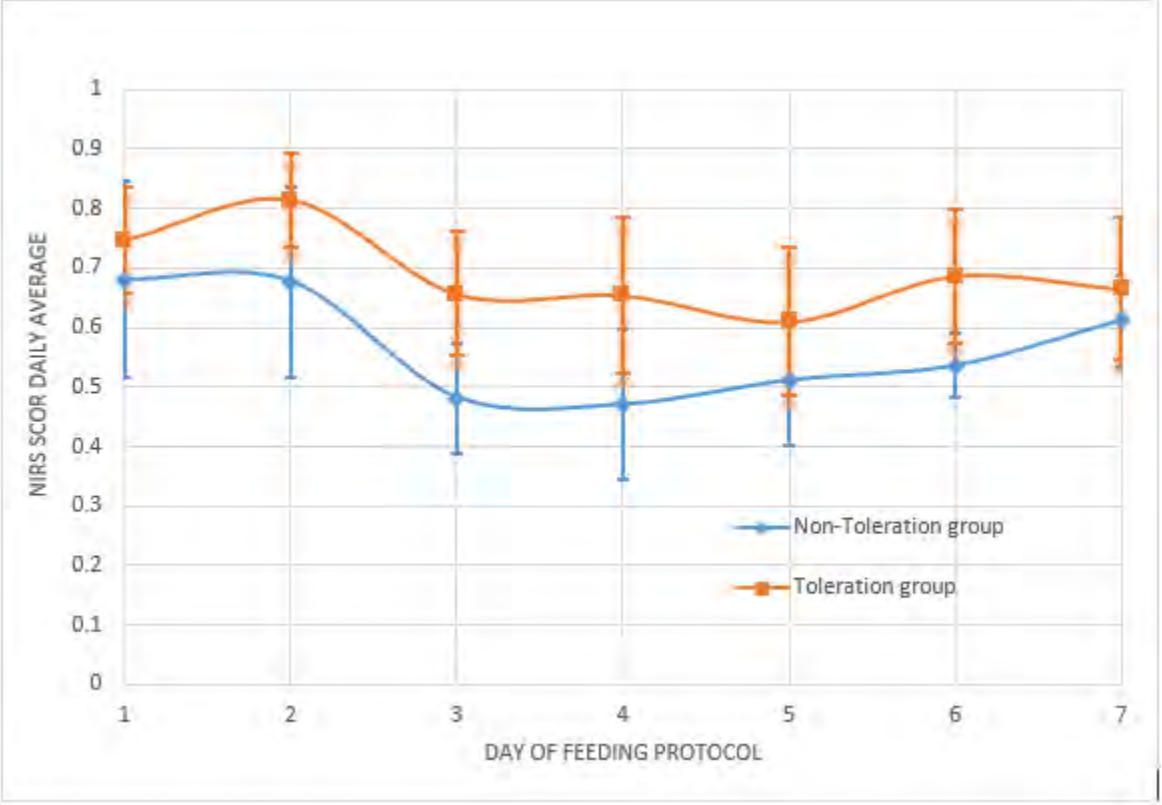
Background Near-infrared spectroscopy (NIRS) has been shown effective in screening for splanchnic ischemia by detecting changes in splanchnic tissue oxygenation (SrSO2) in comparison to cerebral tissue oxygenation (CrSO2). This measure is known as the splanchnic-cerebral oxygenation ratio (SCOR). At present, the use of NIRS as a monitoring tool for predicting feeding intolerance in preterm infants has not been investigated extensively.
Objective Our primary aim was to determine mean SCOR values in preterm infants that do and do not tolerate a standardized feeding advancement protocol. The secondary aim was to assess if SCOR values in the first days of life correlate with toleration of feeding advancement.
Design/Methods Prospective observational double-blinded pilot study in which SrSO2 and CrSO2 were continuously monitored throughout a standard unit feeding protocol for preterm infants. Infants born between 26 and 30 wks GA and 500 to1500 grams were enrolled following parental consent at Bellevue hospital and NYU Langone Health Center. Subjects were categorized as having tolerated the feeding protocol if they achieved at least 120ml/kg/day of bolus feeds by 14 days of life.
Results 14 subjects included in the study, with 2 subjects being withdrawn early because of parental request, without any complications/side effects to report. During the first week of life, the mean daily SCOR in subjects that did not tolerate the feeding protocol was significantly lower than the mean daily SCOR in subjects that tolerated it, 0.56 ± 0.26 v. 0.71 ± 0.25 ($p=0.02$), respectively. We did not find a correlation with SCOR values during the first few days of life and eventual tolerance of the feeding protocol.
Conclusion(s) From this pilot data, SCOR values on average appear lower in preterm infants that do not tolerate a standard feeding advancement protocol compared to those that do. However, it seems that the SCOR has more potential as a monitoring tool than as a predictor tool of which patients will tolerate their feeding plan. This study shows that it is feasible clinically to monitor even ELBW infants using NIRS, and can help serve as a basis of future, larger trials that may further focus on ways to determine if NIRS can help individualize a customized feeding protocol in preterm infants.

Demographics	Non Tolerated n(5)	Tolerated n(7)	P-Value
Maternal Age(Years),Mean ± SD	34.2 ±6.7	28.7 ±4.5	NS
Pre-eclampsia (%)	60	42.9	NS
Prolonged premature rupture of membranes (%)	20	14.3	NS
Antenatal steroids (%)	80	57.1	NS
Gender (%) Male Female	 40 60	 71.4 28.6	NS
Gestational age (weeks) mean ± SD	26.8 ±0.8	28 ±1.4	NS
Birthweight (grams) mean ± SD	838.6 ±175	1117.1 ±196	P=0.03
Feed,(%) >50% EBM <50% EBM	 100 0	 57.1 42.9	NS
IVH <Grade 2 >Grade 2	 100 0	 85.7 14.3	NS



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Correlation Between Neonatal Abstinence Syndrome (NAS) Scores and Cerebral and Peripheral Muscle Fractional Tissue Oxygen Extraction (FTOE) in Term Neonates at Risk for NAS

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Background The incidence of NAS has worsened in recent years. Finding better management strategies is critical, as NAS causes physiologic disturbances and prolongs hospital stays. Near-infrared spectroscopy (NIRS) is a noninvasive tool that estimates tissue oxygenation. It is unknown whether NIRS-derived FTOE data correlate with NAS severity assessed using modified Finnegan NAS scoring. We hypothesized that, among opiate-exposed term neonates at risk for NAS, those with elevated NAS scores (≥ 8) would demonstrate 10% higher cerebral and peripheral muscle FTOE, indicative of increased tissue oxygen utilization, compared to similarly at-risk neonates without elevated NAS scores.

Objective

Design/Methods This prospective cohort study was funded by an AAP Resident Research Grant and IRB approved at Stony Brook Children's. Term 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. Infants received NAS scores from nursery staff blinded to NIRS monitoring following data collection sessions. Subjects were divided into groups based on elevated (≥ 8) or non-elevated NAS scores, and raw NAS scores were also analyzed. Cerebral and peripheral muscle FTOE were compared between groups in addition to analyses comparing within-group pre-swaddling and swaddling data.

Results Twenty-eight neonates with mean (± SD) GA 39 ± 1.3 wk and BW 3126 ± 457 g were enrolled. Seventeen (61%) had at least 1 elevated NAS score while eleven (39%) had all NAS scores < 8 during hospitalization. Regardless of DOL and swaddling/holding status, absolute NAS score was not correlated with FTOE, as displayed in Tables 1 (cerebral) and 2 (peripheral). When stratified by elevated vs. non-elevated NAS score, however, increased peripheral FTOE was observed on DOL 3 during swaddling/holding for those infants with elevated NAS scores (pre-swaddling 0.22 ± 0.08 vs. swaddling 0.27 ± 0.12, p = 0.03). Individual data for each site and DOL are displayed (Table 3).

Conclusion(s) Tissue oxygenation monitoring demonstrates potential to provide objective physiologic information on acute withdrawal among infants at risk for NAS. Further studies with larger sample sizes are required to best determine correlations with currently accepted NAS scoring strategies.

Table 1: Correlations Between Neonatal Abstinence Syndrome (NAS) Scores and Cerebral Fractional Tissue Oxygen Extraction (FTOE)

	Pearson Correlation	p-value
Day of Life 3 Pre-Swaddling	-0.12	0.54
Day of Life 3 Swaddling	0.045	0.82
Day of Life 5 Pre-Swaddling	0.075	0.70
Day of Life 5 Swaddling	-0.021	0.92
Day of Life 7 Pre-Swaddling	0.38	0.12
Day of Life 7 Swaddling	0.42	0.09

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

Table 2: Correlations Between Neonatal Abstinence Syndrome (NAS) Scores and Peripheral Muscle Fractional Tissue Oxygen Extraction (FTOE)

	Pearson Correlation	p-value
Day of Life 3 Pre-Swaddling	-0.064	0.74
Day of Life 3 Swaddling	0.37	0.05
Day of Life 5 Pre-Swaddling	-0.21	0.29
Day of Life 5 Swaddling	-0.14	0.49
Day of Life 7 Pre-Swaddling	0.31	0.22
Day of Life 7 Swaddling	0.38	0.12

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

Table 3: Effects of Swaddling on Cerebral and Peripheral Fractional Tissue Oxygen Extraction (FTOE) Stratified Based on Modified Finnegan Neonatal Abstinence Syndrome (NAS) Scores

	Cerebral FTOE Pre-Swaddling	Cerebral FTOE Swaddled	p-value	Muscle FTOE Pre-Swaddling	Muscle FTOE Swaddled	p-value
Ever Elevated NAS Score DOL3	0.18 ± 0.06	0.19 ± 0.05	0.32	0.22 ± 0.08	0.27 ± 0.12	0.03*
Ever Elevated NAS Score DOL5	0.21 ± 0.06	0.20 ± 0.06	0.18	0.22 ± 0.07	0.25 ± 0.11	0.14
Ever Elevated NAS Score DOL7	0.18 ± 0.04	0.18 ± 0.04	0.84	0.18 ± 0.39	0.18 ± 0.39	0.49
Never Elevated NAS Score DOL3	0.20 ± 0.07	0.18 ± 0.06	0.22	0.24 ± 0.05	0.26 ± 0.10	0.52
Never Elevated NAS Score DOL5	0.17 ± 0.05	0.19 ± 0.07	0.25	0.30 ± 0.15	0.33 ± 0.20	0.37
Never Elevated NAS Score DOL7	0.64 ± 0.50	0.64 ± 0.50	0.49	0.64 ± 0.50	0.64 ± 0.50	0.76

FTOE data expressed as mean $\pm$ SD

*p-value ≤ 0.05 indicates statistical significance

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Impact of Antenatal and Delivery Room Strategies on Morbidity and Mortality at the Limits of Viability

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Background The limits of viability (LOV: 23 0/7 through 25 5/7 weeks gestational age (GA); the GA at which resuscitation is offered) for preterm infants continues to lower over time as strategies develop to improve survival. Antenatal care and delivery room cardiopulmonary resuscitation (DR-CPR) policies for infants born at the LOV vary by institution and range from resuscitating all above a certain GA to using clinician and parental involvement making individual decisions on a case by case basis.
Objective To assess the impact on morbidity and mortality for infants born at the LOV by institutional policy, comparing selective antenatal care and DR-CPR to a trial of life among all infants above a designated GA. A trial of life includes antenatal treatment: maternal steroids, magnesium, fetal monitoring, antibiotics when appropriate, and cesarean section delivery when indicated. All live infants are provided complete DR-CPR. Secondarily, to evaluate associations with antenatal and DR conditions and survival, NICU and long term morbidities, and neurodevelopment up to 3 years of age.
Design/Methods Interim, retrospective cohort study of infants born at the LOV in a single center between two time epochs: Epoch 1 (E1): January 1, 2006 to June 30, 2011: antenatal obstetrical management and DR-CPR was varied on individual basis with clinician and parental input. Epoch 2 used (E2): July 1, 2011 to December 31, 2018: all infants with impending delivery at 23 0/7 GA and beyond were given a trial of life. Statistics: chi square for categorical variables and t test or Mann Whitney U test used for continuous variables to compare E1 to E2. Future data collection and analyses will compare NICU and long term morbidities and neurodevelopmental outcomes to 3 years of age by epoch. $P < 0.05$ is statistically significant.
Results 428 neonates included in the study (E1: 185, E2: 243; table 1). Survival rates increased significantly in E2 (E1: 57% v E2: 71%; table 2). Neonates born at 24 weeks GA received the most benefit. Improved survival was not associated with an extended time to death. However, among survivors, the overall length of stay (LOS) was extended in E2 (table 3).
Conclusion(s) A trial of life among infants born at the LOV appears to improve survival without increasing pain or suffering as evidenced by no increased time to death in E2 among those infants who went on to die. However, LOS was extended for survivors which may be a product of other unmeasured conditions.

Table 1. Demographics of neonates

Gestational age	Epoch 1 (n=185)	Epoch 2 (n=243)	Total (n=428)
23 weeks	37 (20%)	60 (25%)	97
24 weeks	71 (38%)	99 (41%)	170
25 weeks	77 (42%)	84 (34%)	161
Sex			
Female	89 (48%)	108 (44%)	197
Male	96 (52%)	135 (56%)	231
Delivery Type			
Cesarean Section	107 (58%)	146 (60%)	250
Vaginal Delivery	78 (42%)	97 (40%)	175
IUGR			
Yes	23 (12%)	28(12%)	51

Table 2. Survival Rates to Discharge

Gestational Age	Epoch 1 n=185 (%)	Epoch 2 n=243 (%)	p-value
Overall (n=428)	105 (56.8%)	173 (71.2%)	0.002
23 weeks (n=97)	13 (35.1%)	32/60 (53.3%)	0.62
24 weeks (n=170)	39/71 (54.9%)	75/99 (75.8%)	0.004
25 weeks (n=161)	53/77 (68.8%)	66/84 (78.6%)	0.110

Table 3. Length of time to death in days for those who did not survive and length of stay in days for survivors

Length of time to death (in days)	Epoch 1	Epoch 2	p-value
Median	3	3	
IQR (25-75%)	0-15.75	1-10	0.605
Length of stay for survivors (in days)			
Median	103	118.5	
IQR (25-75%)	89.5-118.5	98-138.25	<.001

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Leukopenia results in early termination of valganiclovir CMV prophylaxis in pediatric transplantation recipients highlighting a need for alternative therapies

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Background Cytomegalovirus (CMV) is a major cause of morbidity and mortality in solid organ transplant (SOT) recipients. The effectiveness of valganciclovir (VGCV) prophylaxis may be limited by myelosuppressive or renal toxicity. These complications may result in premature discontinuation of VGCV or other myelosuppressive agents such as trimethoprim-sulfamethoxazole (TMP-SMX). Letermovir is approved for CMV prophylaxis in adult stem cell transplants, and works by a distinct mechanism that is not myelosuppressive. However, there are no data for this drug in pediatric SOT recipients and its potential role is unknown, highlighting a need for further study.
Objective To assess rates of neutropenia and lymphopenia during VGCV prophylaxis, frequency of early discontinuation of VGCV or other myelosuppressive drugs, and associated complications including CMV DNAemia or disease in SOT patients.
Design/Methods In preparation for a multi-center retrospective study, we conducted a pilot study at CHAM and Lurie Children's Hospital to optimize data collection methods. Electronic medical record data from pediatric (<18 years at time of transplant) SOT recipients treated with VGCV prophylaxis and transplanted between 1/1/2016-12/31/18 were reviewed from time of transplant to 12 months post-transplant. Data from 41 patients followed at CHAM (17 liver, 13 heart, 9 kidney, 2 kidney-liver) and 39 patients at Lurie (9 liver, 19 heart, 11 kidney) are included.
Results At least one episode of neutropenia (defined as absolute neutrophil count <1000 cells/mm^3) was documented in 46/80 (58%) of patients (24 at CHAM; 22 at Lurie) while on VGCV prophylaxis. At CHAM, 37/41 (90%) had at least one episode of lymphopenia (defined as absolute lymphocyte count <1000 cells/mm^3) while on VGCV. The number of patients for whom VGCV was discontinued prior to their planned duration of prophylaxis was 37/80 or 46% (21 at CHAM; 16 at Lurie). Moreover, 12/41 (29%) patients at CHAM were switched from TMP-SMX to alternative *Pneumocysitis jiroveci* prophylaxis. CMV DNAemia after early discontinuation of v/GCV was observed at CHAM in 10/21 patients (48%).
Conclusion(s) Our pilot data suggest that VGCV or TMP-SMX are frequently discontinued because of leukopenia, which may increase risk of subsequent CMV DNAemia or disease. Full data from our multicenter study will also include changes in renal function, differences in immunosuppression, frequency of other infections and graft rejection.

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Addition of pentoxifylline to antibiotics enhances cerebral anti-inflammatory IL-10 production in neonatal mice with Escherichia coli sepsis

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Background Neonatal sepsis triggers an inflammatory response that contributes to high mortality and brain injury, for which no effective treatment exists. Pentoxifylline (PTX), a phosphodiesterase inhibitor which suppresses pro-inflammatory cytokines and enhances anti-inflammatory interleukin-10 (IL-10), is a candidate adjunctive therapy for newborn sepsis that has shown improved survival in small clinical studies. However, the anti-inflammatory efficacy of PTX on sepsis-induced cerebral inflammation and the effect of timing of PTX treatment in relation to sepsis remain unknown.

Objective We aimed to compare the effects of simultaneous (0 hour (H)), early (1.5H) and late (4H) PTX and gentamicin (GENT) vs GENT alone on pro- and anti-inflammatory cytokines in blood and brain tissue of newborn mice infected intravenously with *Escherichia coli.*

Design/Methods Newborn C57BL/6J mice (<24H old) were injected via the external jugular vein with bioluminescent *E. coli* K1 (strain A192PP-lux; Witcomb et al., *Infect Immun* 2015;83:4528) 10^5 colony forming units (CFUs)/g body weight. Adequacy of intravenous injections was validated using *in vivo* imaging and Evans blue dye, wherein successful injections were associated with increased recovery of *E. coli* CFUs and TNF production. Pups were treated with GENT, (GENT+PTX) or saline (SAL) at 0H, 1.5H or 4H after sepsis initiation, and euthanized after an additional 4H. CFUs and cytokines were measured from blood and homogenized brain tissue. Comparisons employed t-tests and Wilcoxon rank-sum tests as indicated.

Results Although recovery of *E. coli* CFUs in brain tissue was low to absent (median CFUs/mg tissue <125 for SAL, <3 for GENT and (GENT+PTX)), cerebral pro-inflammatory cytokines were relatively high (>450 pg TNF/mg protein in brain tissue for SAL). GENT alone decreased plasma TNF with 0H and IL-1β with 4H delayed treatment, while (GENT+PTX) inhibited plasma TNF with 0H and 1.5H and IL-1β with 4H, and enhanced plasma IL-10 compared to GENT alone with 4H delayed treatment. By contrast, (PTX+GENT) enhanced cerebral IL-10 production 2- to 3-fold at all 3 time points compared to SAL and/or GENT alone, without affecting pro-inflammatory TNF and IL-1β. Furthermore, addition of PTX did not increase CFUs in blood and brain tissue.

Conclusion(s) Addition of PTX to antibiotics in newborn mice with *E. coli* sepsis enhances production of the anti-inflammatory cytokine IL-10, potentially providing protection from sepsis-induced inflammatory brain injury.

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Early-Onset Sepsis Risk Calculator Recommendation for Routine Neonatal Care for Management of Infants Born to Mothers with Chorioamnionitis

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Background Based on the most recently published recommendations from the Committee on the Fetus and Newborn (COFN), three approaches currently exist to identify infants who are at increased risk of early-onset sepsis (EOS). Categorical risk factor assessments recommend laboratory testing and empiric antibiotic therapy for all infants born to mothers with a clinical diagnosis of chorioamnionitis. Risk assessments based on clinical condition recommend frequent examinations and close vital sign monitoring for infants born to mothers with chorioamnionitis. The Kaiser Permanente EOS calculator is an example of the third approach, multivariate risk assessments, but it does not consistently recommend evaluation or close vital sign monitoring for infants exposed to chorioamnionitis.

Objective To evaluate the monitoring recommendations of the EOS calculator for infants born to mothers with a clinical diagnosis of chorioamnionitis.

Design/Methods This is a retrospective study of neonates born ≥35 weeks gestation to mothers with chorioamnionitis between 11/2006 and 04/2019 and admitted to a Level III NICU. The risk and clinical management recommendations for all neonates were calculated using the Kaiser Permanente EOS calculator with an incidence of 0.5/1000 live births.

Results There were 22,415 deliveries during the study period, and 1,429 (6.4%) women were diagnosed with clinical chorioamnionitis. Data was available for 1,165 (82%) women. Six infants (0.5%) had culture positive sepsis. The EOS calculator recommended routine care only without laboratory evaluation or frequent vital sign monitoring for 511 (43.9%) infants, including one infant with culture positive sepsis. A blood culture and empiric antibiotics were only recommended for 3 out of 6 (50%) infants with culture-positive EOS.

Conclusion(s) The Kaiser Permanente EOS calculator does not consistently recommend laboratory evaluation and antibiotic therapy or even close vital sign monitoring for infants exposed to chorioamnionitis, and may miss cases of culture positive EOS.

Table 1: Demographics and clinical characteristics of the study subjects (n=1165)

Gestational age (weeks) (mean±SD)	39.4±1.3
Birth weight (kg) (mean±SD)	3.37±0.44
Male sex (%)	580 (49.8)
Race African American (%)	454 (39.0)
GBS colonization (%)	265 (22.7)
Duration of ROM (hours) (med, IQR)	13 (8-20)
Apgar at 5 min (med, IQR)	9 (9-9)

Asymptomatic (%)	887 (76.1)
Equivocal signs (%)	103 (8.9)
Clinical illness (%)	175 (15.9)
Risk of EOS after birth (med, IQR)	0.87 (0.49-1.56)
Risk of EOS after exam (med, IQR)	0.47 (0.24-1.65)
Positive blood cultures (%)	6 (0.51)

Table 2. Management recommendations based on the EOS calculator (n=1165)

Calculator Recommendations	**Total (%)**	**Culture-positive EOS**
Routine care (no blood culture, no antibiotics, no vital signs every 4 hours) (%)	511 (43.9)	1 (16.7)
Blood culture and empiric antibiotics (%)	241 (20.7)	3 (50)
Blood culture and vital signs every 4 hours (%)	112 (9.6)	1 (16.7)
Strongly consider antibiotics (%)	8 (0.7)	0 (0)
No blood culture, no antibiotics; vital signs every 4 hours (%)	293 (25.2)	1 (16.7)

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Human neonates retain CD31 on Cytotoxic T Lymphocytes (CTLs) upon activation

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Background The underlying mechanisms which regulate neonatal immune suppression are poorly characterized. CD31 (PECAM1) is highly expressed on neonatal lymphocytes and is a known inhibitor of T-cell receptor (TCR) signaling. We previously demonstrated with our murine neonatal model of influenza viral infection that 3-day old murine neonates retain CD31 expression on the majority of their pulmonary viral-specific cytotoxic T lymphocytes (CTL), while the adult mice have decreased CD31 expression. This increased CD31 expression was directly linked to decreased effector function of the pulmonary viral-specific CTLs.

Objective To develop an in vitro human T cell assay to simulate an in utero inflammatory environment to determine if there are developmental differences in increased CD31 expression on activated CTLs from preterm and term neonatal cord blood versus adult peripheral blood mononuclear cells (PBMCs).

Design/Methods This study was approved by the Institutional Review Board of Drexel University College of Medicine (15080038). PBMCs were isolated from peripheral blood of healthy adult donors, and from preterm and term cord blood. PBMCs were activated using human CD3/CD28 dyna beads for 24 hours. Cells were stained with fluorescent attached antibodies for CD3, CD4, CD8, CD31, CD69 and IFN gamma (IFNG) and analyzed using the BD-LSRFortessa flow cytometer. Flow Jo software was used to interpret the results.

Results After 24 hours of activation, the percentage of activated CTLs (CD8+CD69+) was similar among the neonatal and adult samples, respectively (33±4% vs 25±3%, p=0.18). However, the percentage change in CD31 expression, as measured by Mean Fluorescence Intensity (MFI), on activated versus resting neonatal CTLs is 74±13%, in contrast to activated versus resting adult CTLs (50±24%) (p=0.002). Therefore, neonates are 1.4 times more likely to retain CD31 on CTLs upon activation compared to adults. To investigate developmental differences in effector function, IFNG production was measured by intracellular staining. Despite similar levels of activation of neonatal CTLs and adult CTLs, neonatal CTLs produce significantly less IFNG than their adult counterparts

(7% versus 18%, respectively).

Conclusion(s) Altogether, these data indicate that neonatal CTLs upon activation may retain elevated levels of CD31 to maintain peripheral T cell suppression during the bridge to ex utero life. Neonatal CTLs produce much less IFNG compared to adults. Future studies will focus on differences in effector function between CD31+ and CD31- neonatal CTLs.

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Acute Kidney Injury Associated with Late-Onset Neonatal Sepsis: A Matched Cohort Study

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Background The epidemiology of late-onset sepsis (LOS)-associated acute kidney injury (AKI) in the neonatal intensive care unit (NICU) is not well described. Sepsis places infants at risk for acute kidney injury (AKI) due to altered hemodynamics, inflammation, and nephrotoxic medication exposure.

Objective To determine AKI incidence and severity in LOS within 7 days of sepsis evaluation (SE). To assess for association between AKI and 30-day mortality in infants with LOS.

Design/Methods Retrospective matched cohort study of infants >72 hours old admitted to a single-center level IV NICU from 2013-2018 who underwent SE (concurrent blood culture and antibiotics). Cases included infants with culture-proven bacteremia, fungemia, or meningitis and antimicrobial duration ≥5 days. Controls were matched 1:1 to cases based on gestational and corrected gestational age and had negative SEs with antibiotic duration ≤48 hours. We analyzed all available creatinine (Cr) values within 7 days pre-SE and 30 days post-SE. AKI was defined by the neonatal Kidney Disease Improving Global Outcomes (KDIGO) guidelines, based on fold-change in Cr from baseline. Analysis included summary statistics, chi-square and Mann-Whitney tests, and logistic regression.

Results 213 case and 213 control SEs were identified (table 1). Baseline Cr was similar between groups. 31% cases and 22% controls developed AKI in the 7 days post-SE (p=0.08), with a trend toward increased AKI severity among cases (p= 0.05, table 2). Median peak Cr and day of Cr return to baseline post-SE did not differ between groups. Logistic regression modeling predicted a trend towards an increased probability of AKI in the setting of LOS (OR 1.5, p=0.09). In a model using AKI classification, sepsis was associated with increasing AKI severity (OR 1.6, p=0.05). In unadjusted analyses, sepsis and AKI were both independently predictive of 30-day mortality (OR 1.96, p = 0.04 and OR 4.08, p=0.04, respectively). The sepsis-AKI interaction in adjusted models had an elevated but non-significant odds ratio for 30-day mortality (OR 5.6, p=0.46).

Conclusion(s) This is the first study to demonstrate a trend toward increased AKI incidence and severity associated with LOS. Substantial AKI rates among cases and controls underscore the role of critical illness predisposing to renal dysfunction. Further study in larger cohorts is needed to assess contributing effects of concurrent cardiorespiratory dysfunction, antimicrobials, and other medical therapies on AKI development in infants with LOS.

Table 1: Baseline Demographics

	Case (median, IQR)	Control (median, IQR)	p-value
	N=213	N=213	
Gestational Age (weeks)	30 0/7 (25 0/7 – 36 0/7)	30 0/7 (25 0/7 – 36 0/7)	0.71[a]
Corrected Gestational Age (weeks)	40 0/7 (34 4/7 – 46 0/7)	40 0/7 (34 4/7 – 46 0/7)	0.93[a]
Day of life at time of sepsis evaluation	43 (19 - 110)	44 (20 - 109)	0.95[a]
Sex (% male)	54%	60%	0.24[b]
Birth Weight (kg)	1.22 (0.67 - 2.55)	1.33 (0.74 - 2.70)	0.22[a]
Race			
% White	39%	47%	0.37[b]
% Black	25%	25%	
% Unknown	30%	23%	
Comorbid conditions present at sepsis evaluation[d]			
History of NEC or SIP[c]	21%	31%	**0.02[b]**
KDIGO baseline Cr[e] (mg/dl)	0.30 (0.20 - 0.40)	0.30 (0.20 - 0.40)	0.73[a]
Mortality (overall)	29%	10%	**<0.001[b]**
Mortality (within 30 days of sepsis evaluation)	11%	4%	**0.003[b]**

a: Wilcoxon rank-sum test
b: Pearson's chi-squared test
c: NEC = necrotizing enterocolitis; SIP = spontaneous intestinal perforation
d: Comorbid conditions not significantly different between cases and controls: chronic lung disease, cardiac disease, surgical conditions (congenital diaphragmatic hernia, gastroschisis, omphalocele, etc), intraventricular hemorrhage
e: Cr = serum creatinine

Table 2: AKI Incidence and Severity among Cases and Controls

	Case (n=213*)	Control (n=213*)	p-value
AKI present within 7 days of SE (%, n)	31% (66)	22% (47)	0.08[a]
Maximum AKI severity within 7 days[c] (%, n)			**0.05[a]**
Stage 1 (≥1.5x Cr increase from baseline)	57% (38)	60% (28)	
Stage 2 (≥2-2.9x Cr increase from baseline)	26% (17)	36% (17)	
Stage 3 (≥3x Cr increase from baseline)	17% (11)	4% (2)	
Peak Cr within 7 days of SE (mg/dl) (median, range)	0.30 (0.1 – 4)	0.30 (0.1 – 2.3)	0.09[b]
Day of Cr return to baseline, among patients with AKI (median, quartiles)	7.5 (4 - 22)	9 (6 – 17)	0.71[b]
Patients with AKI not returning to Cr baseline within 30 days post-SE (%, n)	23% (15/66)	19% (9/47)	0.82[a]

*Creatinine data available for 203 cases and 193 controls. If insufficient creatinine data present to assess for AKI, it was imputed that no AKI was present.
a: Pearson's chi-squared test
b: Wilcoxon rank-sum test
c: AKI definitions as per the neonatal KDIGO (Kidney Disease Improving Global Outcomes) definitions (Jetton JG, Askenazi DJ. *Clin Perinatol* 2014; 41(3): 487-502).

Abstract: 198

Reduction of Fluconazole Use in Extremely Low Birth Weight (ELBW) Infants in a Level IV Neonatal Intensive Care Unit (NICU)

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Background Fluconazole prophylaxis has been routinely used in some institutions for the prevention of invasive candidiasis in ELBW infants (birth weight <1000g). Early studies conducted in NICUs with a high burden of candida colonization and infection demonstrated efficacy in reducing invasive candidiasis in ELBW infants. However, there are inherent risks of prophylaxis. More recent studies have questioned the necessity of fluconazole prophylaxis in NICUs with a lower burden of disease.
Objective To determine if discontinuation of fluconazole prophylaxis in ELBW infants has a concomitant rise in disseminated candidiasis in our level IV NICU.
Design/Methods St. Christopher's Hospital for Children is a 189 bed free standing children's hospital, with a 38 bed level IV NICU, which has an average annual admission of 220. Use of fluconazole prophylaxis in all infants admitted to the NICU was evaluated by chart review over an 18-month period (January 2017-June 2018). There was significant variation and inconsistencies in the duration of fluconazole prophylaxis in ELBW. Cultures were evaluated and it was found that the rate of disseminated candidiasis in ELBW patients was 0%. Based on a low burden of candidal infections, fluconazole prophylaxis was discontinued in ELBW infants. A new institutional policy was implemented requiring antimicrobial stewardship input when fluconazole prophylaxis was considered. An alert was placed in the computer that notified the antimicrobial stewardship team when fluconazole was ordered. Fluconazole use and incidence of disseminated fungal infection was monitored during the subsequent 18-month time period (July 2018-December 2019).
Results Prior to implementation of the new policy 100% (24/24) of ELBW infants admitted were placed on fluconazole prophylaxis. There was significant variation in duration with 33% of infants receiving unnecessary doses. Multiple measures in place ensured adherence, including alerts when fluconazole was ordered and routine surveillance by antimicrobial stewardship team. After the institutional policy was in place, rate of fluconazole prophylaxis decreased to 11% (3/27). The incidence of disseminated candidiasis did not increase after intervention. However, there was a higher rate of candiduria (2/27) among ELBW infants after implementation of policy.
Conclusion(s) The use of fluconazole for prophylaxis was effectively decreased without a concomitant rise in disseminated candidiasis. An increase in candiduria warrants continued surveillance.

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Unraveling the Genotype to Phenotype Correlation: A Child with PH1 and a Novel Mutation Responsive to Pyridoxine Therapy (This abstract was presented at the American Society of Nephtology Conference 2019)

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Background Primary hyperoxaluria type 1 (MIM 259900) is a rare genetic disease with an estimated prevalence of 1-3 cases per 1 million population worldwide. Primary hyperoxaluria type 1 (PH1) is an autosomal recessive disorder, caused by a mutation in the *AGXT* gene, and characterized by an accumulation of calcium oxalate in various body tissues, particularly the kidney. Disease expression is variable, ranging from nephrocalcinosis during infancy to recurrent or infrequent nephrolithiasis in childhood or adulthood and renal failure in 20-50% of patients. Over 175 mutations have been identified to date. About 10 to 30% of patients with PH1, particularly those with p.Gly170Arg or p.Phe152lle mutations, respond to pyridoxine therapy with a significant reduction of urinary oxalate excretion. We present a patient with PH1, found to have a previously undescribed mutation in the *AGXT* gene, who showed excellent response to pyridoxine therapy.

Objective

Design/Methods AS, now a nine-year-old male, born in Afghanistan to consanguineous parents, initially presented with a history of flank pain, failure to thrive and bilateral nephrolithiasis at the age of five years. He underwent several rounds of extracorporeal shock wave lithotripsy (ESWL) for significant stone burden. Upon establishing care with nephrology in the U.S., his workup revealed hypocitraturia, elevated 24-hour oxalate level at 127mg/day (normal range 20-40) and a urine glycolate level of 249 mg/gram of creatinine (normal range <75), raising concern for PH. He was empirically started on vitamin B6, potassium citrate and advised to increase hydration. Genetic testing confirmed PH1 with a homozygous mutation in *AGXT* (c.352C>T; p.Arg118Cys), reported as a variant of uncertain significance.

Results Follow up urine testing at 3 and 7 months showed a reduction in oxalate levels by 35% and 58%, respectively. He remains asymptomatic, has normal GFR, with no evidence of systemic oxalosis and stable right-sided nephrolithiasis since last ESWL in 2017.

Conclusion(s) We conclude that in this patient with classic PH1 phenotype, the homozygous variant in *AGXT* is not only pathogenic but also responsive to pyridoxine therapy. We hope this case will add to the knowledge base of PH1 and help guide management in patients with similar genotypes. Pyridoxine therapy has been life-changing for AS and his family.

Abstract: 200

Banff Inflammatory Indices May Be Superior to the NIH Scoring in Predicting CKD Progression in Lupus Nephritis

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Background Chronic kidney disease/end stage renal disease (CKD/ESRD) from lupus nephritis (LN) is a major cause of morbidity and mortality. Advanced tubulo-interstitial disease (TID) in LN is a better predicor of renal outcome than glomerular lesions. However, the current NIH classification is heavily weighted towards glomerular lesions and only provides a semi-qualitative assessment of TID. In contrast, the Banff classification of renal allograft pathology provides 6 reproducible scores for TID (inflammation, fibrosis and atrophy). Therefore, Banff scoring may better predict CKD/ESRD in LN than the NIH classification

Objective We compared Banff grading vs. NIH scoring as predictors of CKD progression at 5 years, defined as a decline in estimated glomerular filtration rate (eGFR) of ≥30%, a strong risk factor for ESRD and mortality

Design/Methods We included lupus patients with LN class III, IV, V on the index biopsy between Jan 1, 2005 and Dec 31, 2018. H&E and PAS-stained slides were reviewed and scored by an experienced pathologist. Six TID Banff scores (0/1 vs. 2/3), NIH activity/chronicity (AI/CI); and NIH interstitial fibrosis/tubular atrophy (IF/TA), tubulo-interstitial inflammation (TII) scores (none/mild vs. moderate/severe) were evaluated as predictors of CKD progression using survival analyses

Results Of the 125 patients, 46 had CKD progression and 20 subsequently developed ESRD. There were no differences between progressors and non-progressors in terms of baseline demographic, clinical or lupus-specific characteristics (Table 1). The Banff ti score (total inflammation) was associated with CKD progression in bivariate analyses and in time-dependent analyses. However, the NIH TII score and the corresponding Banff i score were not predictive (Table 2, Fig 1). The overall NIH AI and CI were not predictive of CKD progression. Moderate-to-severe NIH IF/TA was associated with CKD progression as was the Banff ci (interstitial fibrosis) score (Table 2, Fig 2). Banff scores for atrophy were not predictive. Importantly, in a subset of 92 patients with preserved or only mildly impaired renal function at the time of biopsy (eGFR≥60ml/min/1.73m^2), only the Banff ti score (but not the i score or the NIH TII or IF/TA) was predictive of CKD progression (Fig 1)

Conclusion(s) Banff inflammation scores may be superior predictors of CKD/ESRD progression at 5 years, compared to the currently used NIH classification. Detection of inflammation by Banff scores may allow earlier interventions to prevent ESRD

Table 1: Baseline demographic, clinical and renal histology data in patients who did and did not progress to CKD within 5 years

	Progressors[1] (n=46)	**Non-progressors** (n=79)	p value
Demographic			
Female, n (%)	36 (78)	69 (87)	0.182
Age (years) at renal biopsy, median (IQR)	26 (20-41)	29 (21-43)	0.525
Age at renal biopsy < 18 years, n (%)	7 (15)	13 (16)	0.855
Race, n (%)			0.817
White	4 (9)	4 (5)	
Black	18 (39)	35 (44)	
Asian	1 (2)	1 (1)	
Other/unknown	23 (50)	39 (50)	
Ethnicity, n (%)			0.726
Hispanic	19 (41)	32 (41)	
Non-Hispanic	21 (46)	40 (51)	
Unknown	6 (13)	7 (8)	
Clinical data			
Diabetes, n (%)	5 (11)	3 (4)	0.119
Hypertension, n (%)	33 (72)	55 (70)	0.802
Baseline eGFR ml/min/1.73m^2 median (IQR)	96.05 (56.6-117.8)	88.9 (47-117)	0.509
C3 (mg/dL), median (IQR)	71 (52-88)	67.5 (43-94)	0.58
C4 (mg/dL), median (IQR)	12.65 (9-23)	12 (7-20)	0.476
Anti-ds DNA titer (IU), median (IQR)	108.7 (36.6-194.9)	151.3 (39.2-200)	0.57
Total SLEDAI score, median (IQR)	11 (8-16)	12 (8-16)	0.47
Renal SLEDAI score, median (IQR)	8 (4-12)	8 (4-12)	0.96
LN class, n (%)			0.152
Proliferative GN[2] (class III, IV)	18 (39)	30 (38)	
Non-proliferative GN (class V)	9 (20)	27 (34)	
Mixed GN (class V and III or IV)	19 (41)	22 (28)	

[1] Progressors were defined as LN patients with an estimated glomerular filtration rate (eGFR) decline of ≥30% at 5 years post index biopsy. [2] GN: glomerulonephritis

Table 1: Baseline demographic, clinical and renal histology data in patients who did and did not progress to CKD within 5 years

Table 2: NIH and Banff scores in patients who did and did not progress to CKD within 5 years

NIH scores	**Progressors** (n=46)	**Non-progressors** (n=79)	p value
Overall NIH AI, median (IQR)	1 (0-4)	1 (0-3)	0.609
NIH AI cut-off ≥ 11, n (%)	1 (2)	3 (3.8)	0.619
Overall NIH CI, median (IQR)	3 (0-5)	2 (0-3)	0.33
NIH CI cut-off ≥ 3, n (%)	24 (52)	28 (35.44)	0.067
NIH TII score, n (%)			0.053
None-to-mild NIH TII	39 (84.78)	75 (94.94)	
Moderate-to-severe NIH TII	7 (15.22)	4 (5.06)	
NIH IF/TA score, n (%)			0.049
None-to-mild NIH IF/TA	30 (65.22)	64 (81.01)	
Moderate-to-severe NIH IF/TA	16 (34.78)	15 (18.99)	
TID Banff scores	**Progressors** (n=46), n (%)	**Non-progressors** (n= 79), n (%)	p value
Tubulitis (t score)	0	0	
Interstitial inflammation (i score) 2/3 (vs. 0/1)	3 (6.52)	5 (6.33)	0.966
Total inflammation (ti score) 2/3 (vs. 0/1)	16 (34.78)	12 (15.19)	0.011
Tubular atrophy (ct score) 2/3 (vs. 0/1)	16 (34.78)	16 (20.25)	0.073
Interstitial fibrosis (ci score) 2/3 (vs. 0/1)	17 (36.96)	15 (18.99)	0.026
Inflammation in area of interstitial fibrosis and/or tubular atrophy (i-IFTA score) 2/3 (vs. 0/1)	(n= 26)* 18 (69)	(n=51)* 25 (49)	0.091

* Total number of biopsies is smaller, due to inability to apply score to biopsies without areas of fibrosis and tubular atrophy.

Table 2: NIH and Banff scores in patients who did and did not progress to CKD within 5 years

Figure 1: Association of NIH and Banff inflammation scores with ESRD progression

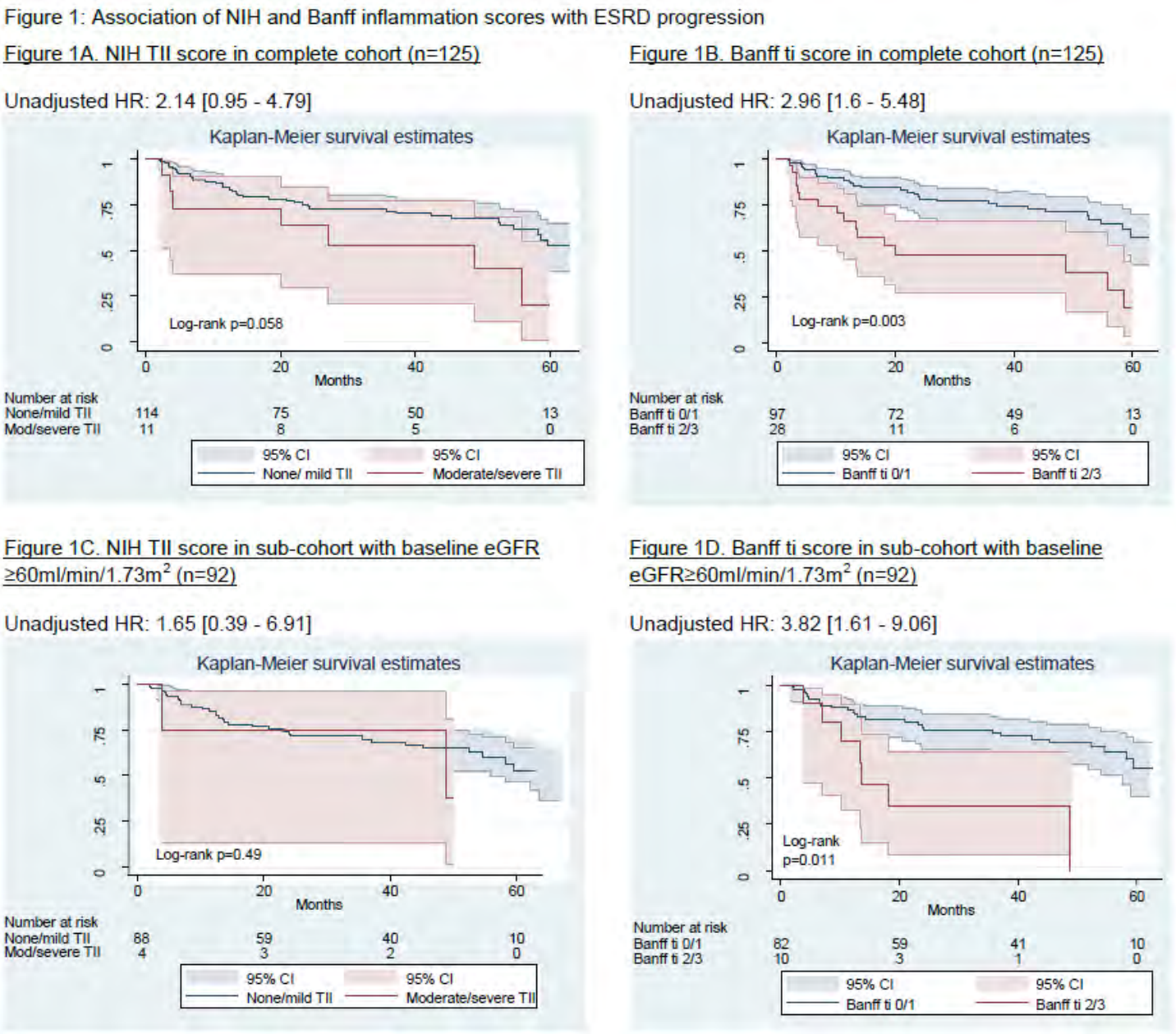

Figure 1: Association of NIH and Banff inflammation scores with ESRD progression

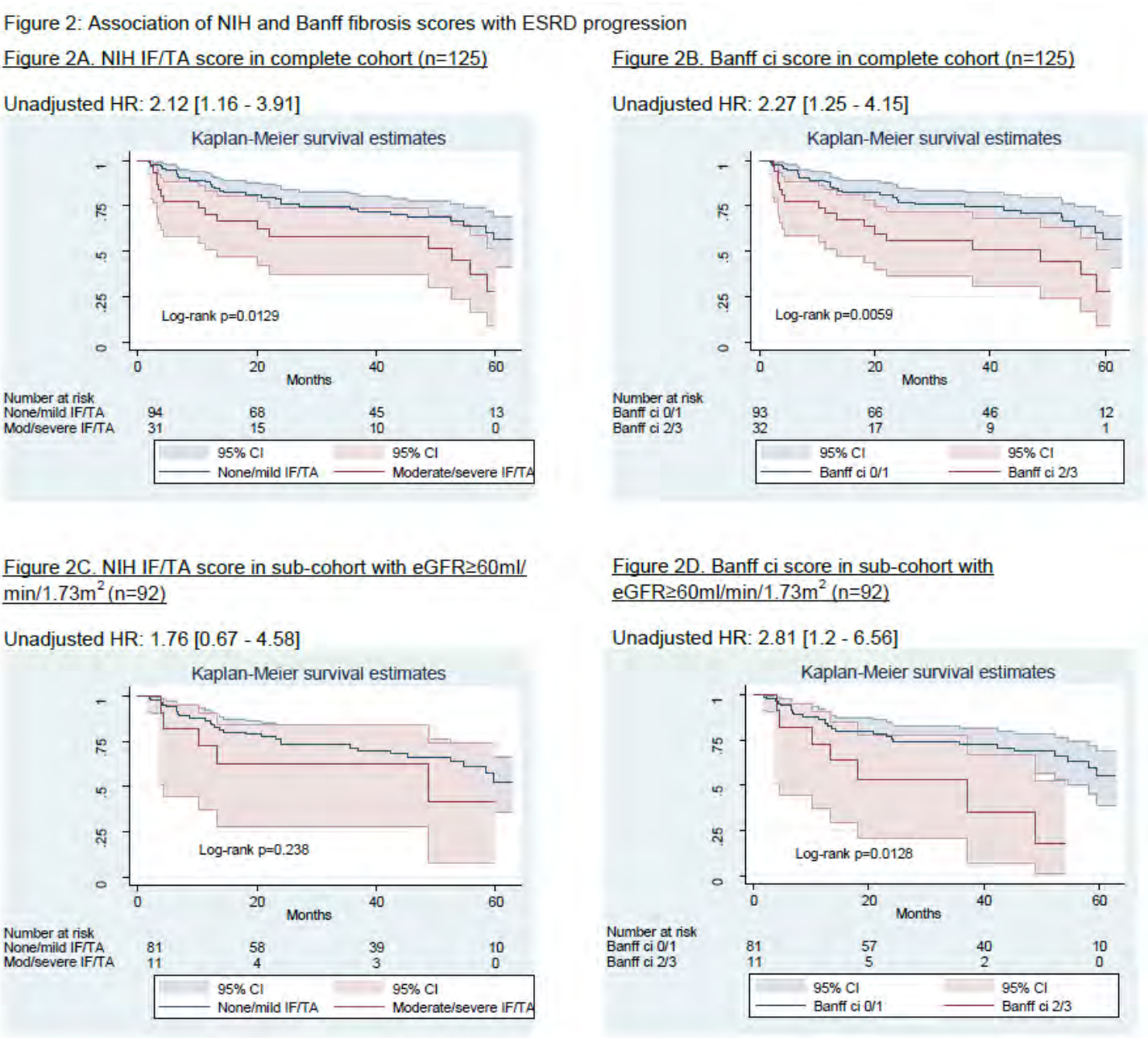

Figure 2: Association of NIH and Banff fibrosis scores with ESRD progression

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Novel Biomarkers in Autosomal Recessive Polycystic Kidney Disease (ARPKD)

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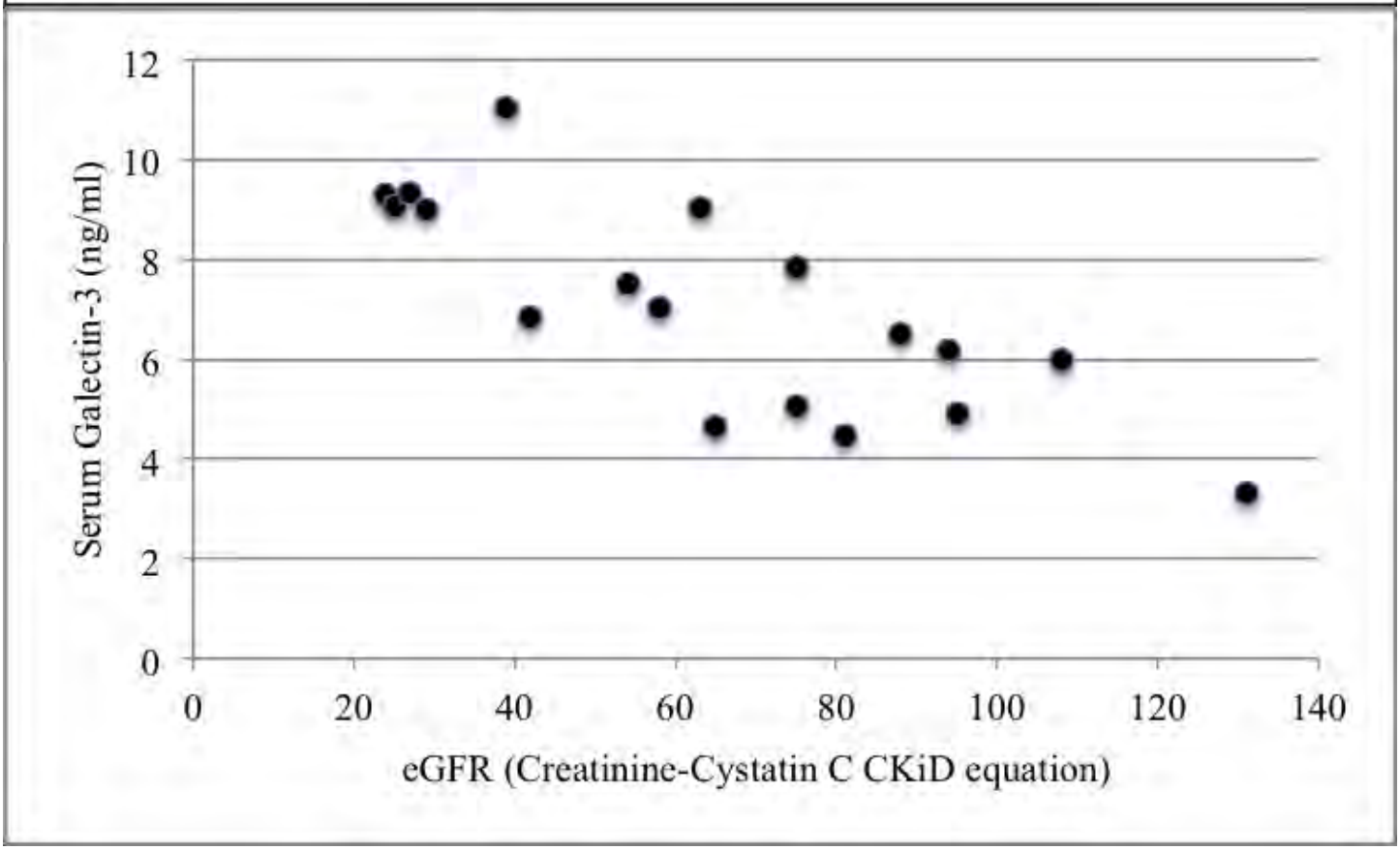
Background The clinical phenotype of ARPKD includes fibrocystic kidney disease, liver fibrosis, and portal hypertension of varying severities. Recent preclinical data suggest that serum Galectin-3 (Gal-3) and Intestinal Fatty Acid Binding Protein (I-FABP) levels are associated with kidney fibrosis and portal hypertension, respectively, and may potentially serve as biomarkers for kidney and liver disease severity in ARPKD.

Objective To determine whether 1) serum Gal-3 level is associated with the severity of ARPKD-related kidney disease; and 2) serum I-FABP level is associated with the severity of ARPKD-related liver disease.

Design/Methods Prospective, cross-sectional study of 21 participants with clinical diagnosis of ARPKD and presence of native kidneys (for Gal-3 analyses) and/or native livers (for I-FABP analyses). Serum Gal-3 and I-FABP levels were analyzed using enzyme linked immunosorbent assay. Kidney disease severity was determined by estimated glomerular filtration rate (eGFR) calculated using the 2012 Creatinine-Cystatin C based CKiD equation. Liver disease severity was characterized using ultrasound ARFI elastography [average shear wave speed (SWS) of the right and left lobes of the liver], spleen length index (actual spleen length/90th percentile for height), and platelet count. All variables were operationalized to a normalized z-score based on mean and standard deviation (SD). Multivariate linear regression was performed to examine the association between serum Gal-3 and eGFR (adjusted for liver disease severity variables) and between I-FABP and liver disease severity variables (adjusted for eGFR). Normality and regression diagnostic tests were conducted, and from them, sensitivity analyses were conducted to determine the impact of potentially violated assumptions.
Results Clinical and demographic characteristics are shown in Table 1. There was a significant negative association between serum Gal-3 level and eGFR (Fig1), specifically 1 SD lower eGFR was associated with 0.7945 SD higher Gal-3 level (95% CI -1.116, -0.473; $p<0.001$). When adjusted for markers of hepatic disease severity, the association remained significant. There was no significant association between serum I-FABP level and any liver disease severity variables in either unadjusted or adjusted models.
Conclusion(s) Serum Gal-3 level was found to be associated with the severity of kidney disease, suggesting its value as a possible novel biomarker in ARPKD. Serum I-FABP level did not appear to be associated with the severity of ARPKD-related liver disease.

	Gal 3	I-FABP
Number of participants	18	21
Age*	6.0 [0.8, 13.2]	6.1 [2.3,13.2]
Male sex**	13 (72%)	14 (67%)
eGFR (mL/min/1.73m^2)*	64 [39,88]	65 [42,81]
Platelet Count (x10^3/uL)*	271 [144, 322]	269 [144, 315]
Spleen Length Index*	0.94 [0.86,1.40]	1.10 [0.89, 1.40]

*median [IQR]
**N (%)



Abstract: 202

Loss of podocyte glucocorticoid receptor results in up regulation of Wnt signaling and pro-fibrotic endothelium in a mouse model of diabetes

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Background Proteinuria and diabetic nephropathy (DN) are inevitable complications of long-standing diabetes, both Types 1 and 2, though their mechanisms are poorly understood. Recent data indicate that the canonical Wnt/β-catenin signaling pathway is an important mediator of renal disease, including proteinuric diseases such as diabetes. We have used a novel mouse model with tissue-specific podocyte glucocorticoid
receptor knockout (pGR KO) and demonstrated that this receptor is critical in limiting proteinuria in settings of renal injury.
Objective To investigate the effect of podocyte GR loss on Wnt signaling and endothelial cell phenotypes.
Design/Methods Diabetes was induced in pGR KO mice and littermate controls with the administration of streptozotocin. After 16 weeks, animals were sacrificed and kidneys were isolated for histologic analysis. In some animals primary podocytes were isolated and subjected to qPCR for Wnt-dependent genes and inflammatory cytokines. Conditioned media from primary podocytes was transferred to glomerular endothelial
cells that were isolated from diabetic controls.
Results Histologic analysis of kidneys isolated at 16 weeks post-STZ from diabetic control and pGR KO mice showed worsened fibrosis, increased collagen deposition and increased glomerulomegaly in pGR KO mice. Immunohistochemistry for markers of fibrosis including TGFβ1 and p-smad2 revealed increased expression in pGR KO mice. Immunofluorescent staining for collagen I, and TGFβ1/nephrin co-staining in kidney sections from both genotypes also showed increased expression in the diabetic pGR KO mice compared to diabetic controls, indicating more severe renal fibrosis. Diabetic pGR KO mice had greater expression of β-catenin compared to diabetic controls. Podocytes isolated from diabetic pGR KO mice demonstrated significantly higher expression of collagen I, β-catenin, axin2, IL-1β, and IL-6 compared to those from diabetic control mice. Endothelial cells treated with conditioned media from GR KO podocytes showed increased expression of α-
smooth muscle actin, TGFßR1 and ß-catenin. mRNA expression of several EndMT markers and canonical Wnt signaling genes was also higher in endothelial cells treated with conditioned media from GR KO podocytes.
Conclusion(s) 1. Loss of podocyte GR leads to up regulation of Wnt signaling in this diabetic model
2. Podocyte-endothelial cell crosstalk, mediated through GR, likely contributes to diabetic nephropathy

Abstract: 203
Electrolytes Measured by Blood Gas Sample Analysis – Are the Values Comparable with Results Obtained from Simultaneously Drawn Serum Samples?
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Background Blood gas analysis is an indispensable tool of patient care in current practice, especially in the ICU setting. With technological advances, modern blood gas analyzers have electrodes that can measure electrolytes in gas samples, thus playing a critical role in timely patient management. However, it remains questionable whether these measurements are accurate. Several studies that compared electrolyte levels in gas samples versus chemistry serum samples have reported different results.
Objective To evaluate the accuracy of electrolyte measurements in gas samples in comparison to serum samples simultaneously obtained from newborns admitted to a neonatal intensive care unit.
Design/Methods Our study included preterm and full-term newborns admitted to Brookdale NICU (May 2018 - May 2019) with at least one blood gas sample obtained during admission in addition to a simultaneously obtained serum sample. Hemolyzed samples were excluded. Siemens RapidLab 1265 gas analyzer was used in our study
Sodium, potassium, and chloride levels were compared from both serum and blood gas samples by student T-test. Correlation analyses were employed to examine the association between certain factors (i.e. corrected gestational age, source of the gas sample, whether arterial or capillary) with the possible difference between electrolyte values in serum samples versus gas samples. A p-value of <0.05 was used as a cutoff of statistical significance.
Results A total of 209 gas samples obtained from 21 neonates were included in our study. No statistically significant difference was detected in potassium values between serum samples and simultaneous gas samples (whether capillary or arterial). However, sodium gas measurements were, on average, 3.6 mEq/L lower than comparative values in serum samples (95% CI -4.1 to -3.1; $p<0.001$), whereas chloride gas measurements were, on average, 1.59 mEq/L higher than paired serum measurements (95% CI +1.1 to +2.07; $p<0.001$). The difference for both sodium and chloride levels had no correlation with either corrected gestational age or source of the gas sample.
Conclusion(s) We conclude that blood gas potassium measurements can accurately reflect serum values, whereas significant differences exist between gas and serum measurements for both sodium and chloride. Our study is a single-center experience and the study results may vary with the use of a different blood gas analyzer, and therefore this area of interest remains to be explored with further studies.

Paired Samples Correlations

	N	Correlation	Sig.
Gas Na & Serum Na	209	0.830	< 0.001
Gas K & Serum K	209	0.823	< 0.001
Gas Cl & Serum Cl	209	0.908	< 0.001

Paired Samples Test

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Gas Na - Serum Na	**-3.660**	3.543	0.245	-4.143	-3.177	-14.936	208	< **0.001**
Gas K - Serum K	**0.038**	0.535	0.037	-.035	.111	1.035	208	**0.302**
Gas Cl - Serum Cl	**1.593**	3.536	0.245	1.111	2.075	6.514	208	< **0.001**

Paired Samples Test (Arterial Samples only)

Arterial Gas	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Gas Na - Serum Na	**- 4.113**	4.264	.586	-5.288	-2.938	-7.023	52	**< 0.001**
Gas K - Serum K	**0.0755**	0.5132	.0705	-0.0660	0.2169	1.071	52	**0.289**
Gas Cl - Serum Cl	**0.943**	3.122	.429	0.083	1.804	2.200	52	**0.032**

Paired Samples Test (Capillary Samples only)

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Gas Na - Serum Na	**-3.471**	3.244	.261	-3.986	-2.956	-13.321	154	**< 0.001**
Gas K - Serum K	**0.0323**	0.5380	0.0432	-0.0531	0.1176	0.746	154	**.457**
Gas Cl - Serum Cl	**1.806**	3.659	.294	1.226	2.387	6.146	154	**< 0.001**

Abstract: 204

Prevalence and utility of low mean corpuscular volume in infants admitted to the neonatal intensive care unit

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Background Mean Corpuscular Volume (MCV) is used in children and adults to evaluate anemia; however, MCV is often underutilized in infants in the Neonatal Intensive Care Unit (NICU). The two common causes of low MCV in neonates are alpha thalassemia and iron deficiency. Alpha thalassemia is diagnosed by the presence of Hemoglobin (Hb) Barts on newborn screen.
Objective The objective of this study was to determine the prevalence and utility of low MCV in neonates admitted to the NICU and to correlate low MCV with Hb Barts.
Design/Methods
Retrospective analysis of all neonates admitted to the NICU between 01/2010 and 10/2018 for which a complete blood count (CBC) was performed within 3 days after birth. Neonates with a low MCV (<98 fL) were compared to neonates with a normal MCV. Low MCV was correlated with the presence or absence of Hb Barts in newborn screening.
Results A total of 3851 infants (1529 preterm, 2322 term) met the inclusion criteria, 808 (21%) had a low MCV. Low MCV was more common in term (76.2%) compared to preterm infants (23.8%). Hb Barts was positive in newborn screening in 133 infants (3.5%). Hb Barts was positive in 11% of infants with low MCV compared to 1.4% with normal MCV ($p<0.001$). The odds ratio for a newborn screen positive for Hb Barts in neonates with low MCV was 7.6 (95 CI, 5.3-11.0, $p < 0.001$). Hb Barts was negative in 89% of infants with low MCV.
Conclusion(s) About 21% of neonates admitted to the NICU have low MCV. Neonates with a low MCV are more likely to be positive for Hb Barts and therefore have alpha thalassemia. A large number of neonates with low MCV were negative for Hb Barts. Neonates with low MCV and negative Hb Barts should be investigated and treated for iron deficiency.

Table 1. Comparison of neonates with normal MCV and low MCV (mean±SD)

	Normal MCV (n=3043)	Low MCV (n=808)	p
Preterm <37 weeks (%)	1337 (43.9)	192 (23.8)	<0.001
Black race (%)	1040 (34.2)	367 (45.4)	<0.001
Male Sex (%)	1605 (52.7)	479 (59.3)	0.001
Smoking exposure	349 (11.5)	85 (10.5)	0.5
SGA	396 (13.0)	82 (10.1)	0.03
IDM	320 (10.5)	92 (11.4)	0.5
Hemoglobin (gm/dl)	16.9±2.8	16.3±2.8	<0.001
MCV (fL)	105±5.9	93±4.7	<0.001
MCH (pg)	36.5±2.0	32.2±2.3	<0.001
MCHC (gm/dl)	34.7±1.2	34.8	0.1
RBC count (millions)	4.6±0.8	5.0±0.8	<0.001
RDW (%)	17.1±1.7	17.1±2.0	0.6
Infants with positive Hb Barts (%)	44 (1.4)	89 (11.0)	<0.001

Table 2. Comparison of neonates negative and positive for Hemoglobin Barts (mean±SD)

	Barts negative (n=3718)	Barts positive (n=133)	p
Preterm <37 weeks (%)	1463 (38.0)	66 (49.6)	0.02
Black race (%)	1335 (35.9)	72 (54.1)	<0.001
Male Sex (%)	2010 (54.1)	74 (59)	0.8
Hemoglobin (gm/dl)	16.8±2.8	16.3±2.8	0.04
MCV (fL)	103±7.3	92.5±9.2	<0.001
Number of infants with low MCV (<98 fL)	719 (19.3)	89 (66.9)	<0.001
MCH (pg)	35.7±2.5	31.0±3.4	<0.001
MCHC (gm/dl)	34.8±1.2	33.5±1.2	<0.001
RBC count (millions)	4.7±0.8	5.3±0.8	<0.001
RDW (%)	17.1±1.8	18.1±2.2	<0.001

Abstract: 205

Maternal Factors and Infant Adiposity at Birth in the Bronx Mother and Baby Health Study

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Background Epidemiological data demonstrate increased risk for obesity, cardiovascular disease and type 2 diabetes in low birth weight infants. Importantly, low birth weight/ intrauterine growth restricted (IUGR) infants who demonstrate rapid 'catch-up' growth during infancy are at increased risk of having increased abdominal fat, centralized fat distribution, and increased insulin resistance biomarkers.
Objective We present preliminary descriptive data from our ongoing longitudinal study. We are evaluating the effects of in utero exposure to an adverse developmental milieu on DNA methylation profiles and functional changes in $CD3^+$ T-cells from appropriate for gestational age (AGA) and IUGR infants. We describe the effects of maternal and infant factors on (1) anthropometric measurements, and (2) measures of adiposity at birth.
Design/Methods Healthy term AGA and IUGR infants who deliver at the Weiler Division of Montefiore Medical Center are enrolled. Maternal data included age, race/ethnicity, mode of delivery, BMI (pre-pregnancy and at delivery), weight gain during pregnancy, and co-morbidities. Infant data included birthweight, gestational age, sex, and type of feeds (breast milk vs. formula). Skinfold (suprailiac, triceps, biceps, subscapular) thickness was measured and fat mass calculated using validated formulas by Catalano et al. and Aris et al. at birth. We compared IUGR vs. AGA groups using one-way ANOVA for means and chi-square for categorical variables.
Results To date, we have enrolled a total of 124 mother-infant dyads (102 AGA and 22 IUGR) in this study. An equal number of male and female infants have been enrolled. Mothers of IUGR infants were younger as compared to mothers of AGA infants ($p<0.001$). IUGR infants had a lower mean gestational age and had significantly lower mean birth weight, head circumference, length and ponderal index as compared to AGA infants ($p<0.001$). Furthermore, biceps, triceps and suprailiac skinfold thickness measured at birth were significantly lower in the IUGR group as compared to the AGA group ($p<0.001$). Fat mass (calculated by the Catalano and the Aris equations) was significantly lower in the IUGR group ($p<0.001$).
Conclusion(s) In this ongoing longitudinal study cohort of healthy term AGA and IUGR infants, we have observed that IUGR infants are born to mothers who are younger. Infants born IUGR had lower GA, birthweight, head circumference, length, ponderal index, skin fold thickness and fat mass as compared to AGA infants. Enrollment, follow-up and molecular studies are ongoing.

Table 1. Maternal Characteristics

Maternal Characteristics	IUGR infants (n=22)	AGA infants (n=102)	p value
Maternal age (yrs)	26±6	29±6	0.028
Pre-pregnancy BMI	30.2±9.8	29.5±6.1	0.73
BMI at delivery	39.8	34.2±5.8	0.105
Weight gain during pregnancy	23.7±12.2	23.7±14.2	0.992

Table 2. Infant Characteristics

Infant Characteristics	IUGR Infants (n=22)	AGA Infants (n=102)	p value
Gestational age (weeks)	38±1	39±0.9	<0.001
Birth weight (kg)	2.5±0.2	3.4±0.3	<0.001
Length (cms)	44.8±6.6	48.9±2	<0.001
Head circumference (cms)	32.8±1.2	34.7±1.2	<0.001
Ponderal index	2.6±0.6	2.9±0.4	<0.001
Biceps skinfold thickness	2.7±0.5	3.4±0.6	<0.001
Triceps skinfold thickness	2.8±0.6	3.6±0.6	<0.001
Subscapular skinfold thickness	2.7±0.5	3.6±1.4	0.076
Suprailiac skinfold thickness	2.9±0.6	3.5±0.5	<0.001

Abstract: 206

Health Literacy and Parental Perception of Childhood Obesity in an Urban Multiethnic Community

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Background Prevalence of childhood obesity has tripled since 1970's and has reached epidemic levels. Obesity is a body mass index (BMI) ≥95%ile for age and gender. Obesity is associated with comorbidities which carry a financial burden on society and healthcare system. The American Academy of Pediatrics defines health literacy (HL) as "the degree to which individuals have the capacity to obtain and understand basic health information and services needed to prevent or treat illness." There are no studies on parental HL and perception of childhood obesity in a multiethnic community.
Objective To explore association between parental perception of child's BMI and HL.
Design/Methods Cross sectional study by questionnaire given to parents of children aged 2 to 18 years visiting Flushing Hospital Medial Center between July 1, 2019 and October 31, 2019. Self-administered questionnaire included demographic data, BMI percentile, BMI perception and Newest Vital Sign (NVS), a six item HL assessment. BMI for age between 5 and <85%ile was identified as healthy weight, 85 to <95%ile as overweight and >95%ile as obese. NSV score ≤1 was recorded as limited literacy, 2-3 as possible limited literacy and 4-6 as adequate literacy. Data were analyzed using student t-test and chi-square, $p<0.05$ was considered significant.
Results Of 200 completed questionnaires, 81% of the participants were mothers. Majority of respondents were Hispanic (82%) with mean age of 36 years and married (66%). Annual income <$40,000 in 81% and 72% had high school education or less. Half of the children had healthy BMI (50%), 18% were overweight and 29% obese. Parents knew their child's weight and height (65%), were unable to understand concept of BMI (55%), and tend to underestimate their child's BMI, $x^2=101.7$, $p<0.001$. Only 22% were of limited literacy and over half (57%) possible limited literacy. Parents' knowledge of their child's BMI was not related to parent's NVS score, $x^2=9.62$, $p=0.14$. Healthcare providers discussed BMI in 63% and 44% saw a nutritionist.
Conclusion(s) In our small sample, most parents were aware of their child's weight and height and not aware of their child's BMI. Parents who did not correctly identify their child's BMI did not necessarily have limited HL.

Abstract: 207

Use of Multichannel intraluminal impedance studies to diagnose Gastroesphageal reflux in infants

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Background Gastroesophageal reflux (GER) is commonly diagnosed on the basis of symptomatology, often leading to empiric therapy with acid suppression. Multichannel intraluminal impedance studies with pH probe monitoring (MII-pH) are now being increasingly used in the pediatric population to study GER, as it offers the ability to differentiate acidic from non-acidic reflux, detect the height of the refluxate and determine symptom association. There is limited information on normative MII-pH data during infancy
Objective To generate normative data on MII-pH study using a large cohort of infants; and to determine symptom association in infants suspected to have GER
Design/Methods This is a retrospective review of data on infants who underwent MII-pH studies between 01/2009 and 07/2019. During the MII/pH study, the infants were observed for clinical behaviors (shown in Figure 1). An abnormal MII-pH study was defined as total reflux episodes >100 and/or acid exposure time >20% A descriptive statistical analysis was performed. Established indices were used to establish correlation between reflux symptoms and reflux events: Symptom Index (SI - % symptoms related to GER, abnormal >50), Symptom Sensitivity Index (SSI - % GER episodes associated with symptoms, abnormal >10) and Symptom Association Probability (SAP - statistical measure of probability that the symptoms and GER episodes are unrelated, abnormal >95).
Results 176 infants (116 preterm, 60 term) were evaluated during the study period. The median (IQR) age at study time was 60 (34-109) days. A total of 3,842 hours of recording were analysed (median duration of study 22.5 hours). A total of 8,241 reflux episodes and 2,777 clinical reflux behaviors were recorded. Nonacidic reflux episodes were more common (5286, 64.1%) than acidic reflux (2955, 35.9%). Similarly, episodes of high reflux (63.3%) were more common than mid (29.3%) and low reflux (7.3%). Only 8 infants (5.7%) had an abnormal MII study, as defined above (Table 1). Symptoms association was poor for bradycardia and desaturation and fair for choking and gagging (Table 3, Figure 2.)
Conclusion(s) Nonacidic and high reflux is more common in preterm and term infants. The 95th percentile for reflux events and acid exposure time in our cohort is closer to previously reported in normal preterm infants. The prevalence of GER as detected by MII-pH was very low (6%) in symptomatic preterm and term infants. The majority of suspected clinical reflux behaviours did not correlate with reflux events.

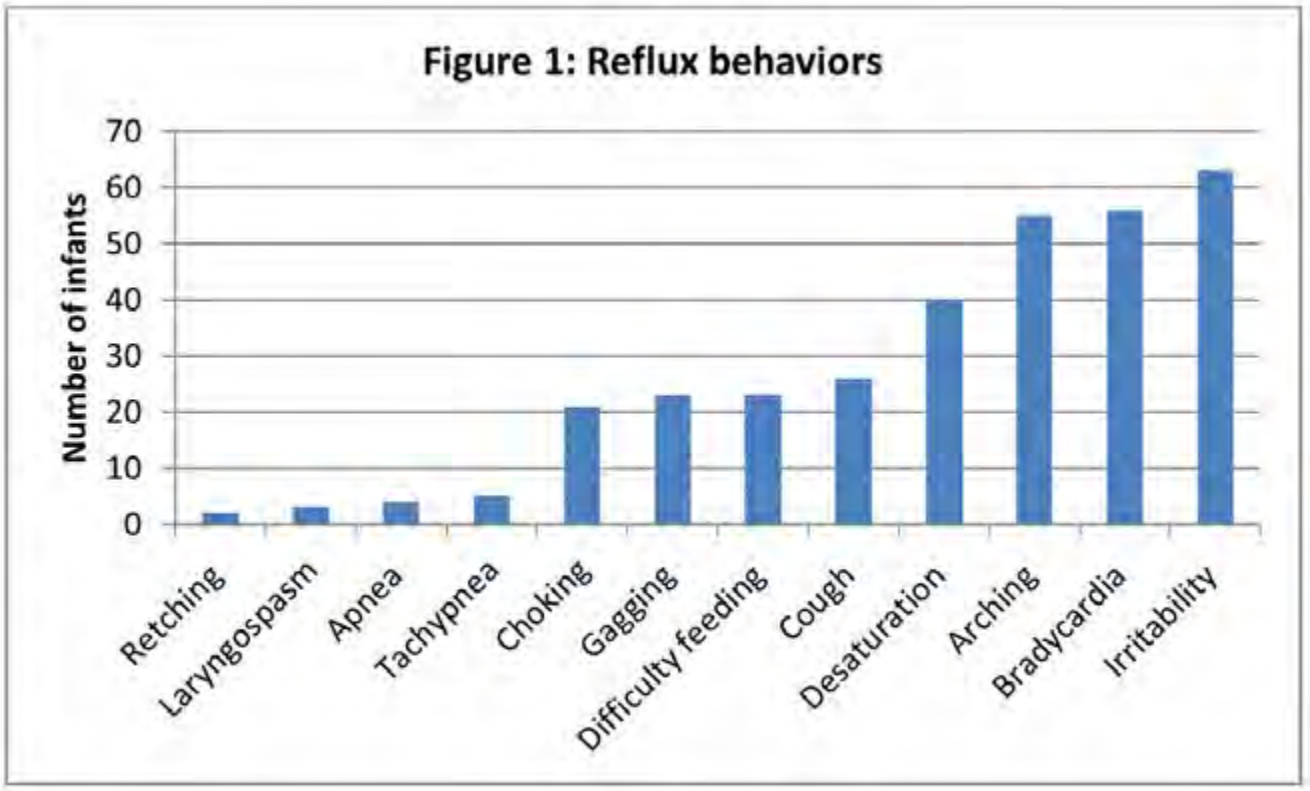

Figure 1: Reflux behaviors

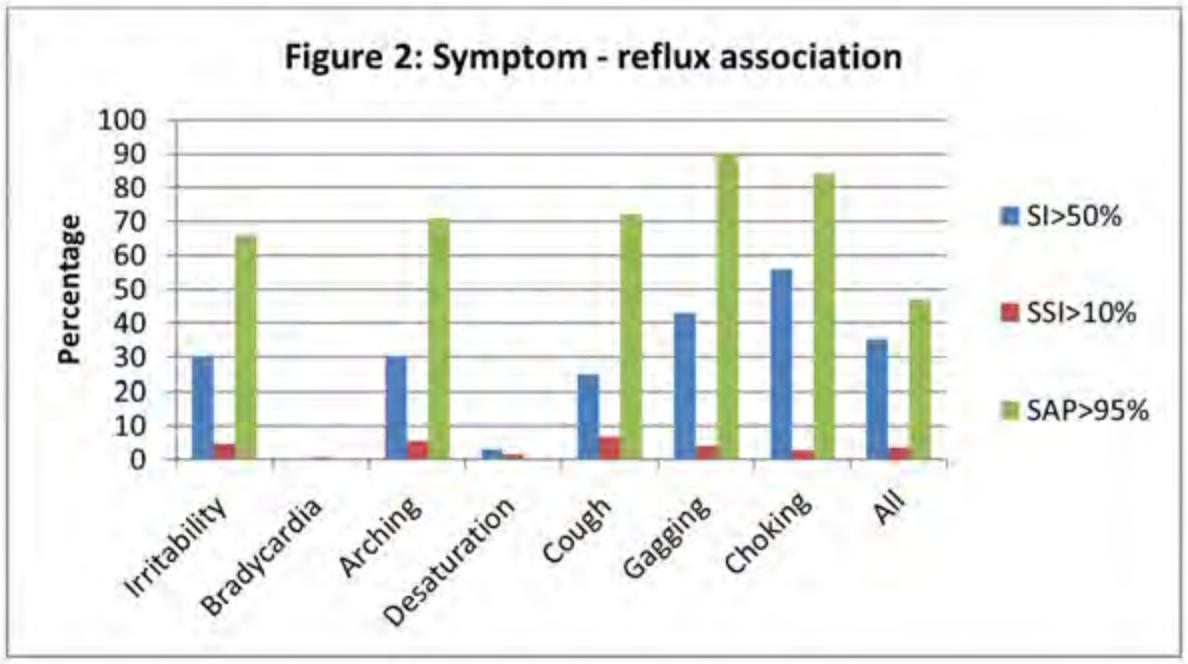

Figure 2: Symptom - reflux association

Table 1: GER events recorded during MII-pH study (number of infants = 176)

	Median (IQR)	Number (%)	95th percentile
Number of acid reflux episodes	14 (7-24)	NA	41
Number of non-acid reflux episodes	24 (14-40)	NA	75
Total (acid + non-acid reflux episodes)	41 (27-62)	NA	95
Number of low reflux episodes	2 (1-5)	NA	11
Number of mid reflux episodes	11 (7-16)	NA	34
Number of high reflux episodes	25 (14-41)	NA	69
% of time pH<4	2.5 (0.9-5.6)	NA	15.6
Infants with total episodes >55	NA	51 (29.0)	NA
Infants with total episodes >100	NA	6 (3.4)	NA
Infants with acid exposure time >5%	NA	53 (28.4)	NA
Infants with acid exposure time >20%	NA	3 (1.7)	NA
Infants with total episodes >100 or acid exposure time >20%	NA	8 (5.7)	NA

Table 2: Relationship between symptoms and reflux events reported as symptom index (SI), symptom sensitive index (SSI) and symptom association probability scores (SAP).

Symptoms	No. of infants (No. of events)	SI Med (IQR)	SSI Med (IQR)	SAP Med (IQR)
Irritability	63 (759)	30 (15-50)	4.8 (2.3-12.3)	66 (0-93)
Bradycardia	57 (237)	0 (0-33)	0.6 (0-3.1)	0 (0-59)
Arching	55 (630)	30 (18-50)	5.5 (1.9-11.9)	71 (92-100)
Desaturation	40 (196)	3 (0-69)	1.5 (0-3.6)	0 (0-90)
Cough	26 (297)	25 (4-50)	6.7 (1.8-12.8)	72 (0-96)
Gagging	23 (140)	43 (25-67)	4.2 (0.84-10.3)	90 (0-98)
Choking	21 (100)	56 (25-67)	2.8 (1.3-5.7)	84 (68-97)
All symptoms	176 (8241)	35.2 (12.4-51.8)	3.5 (1.3-7.2)	47 (0-78)

SI>50%, SSI > 10%, and SAP > 95% were considered abnormal

Abstract: 208

Effects of Neonatal Abstinence Syndrome on Long Term Growth Parameters

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Background With increasing rates of neonatal abstinence syndrome (NAS) in the past several years, there is mixed data on whether chronic opioid exposure in neonates affects long term growth outcomes due to a withdrawal-induced hypermetabolic state. In addition, studies have shown that chronic opioid exposure correlates with smaller head circumference at birth.
Objective Our objective was to see if lagging growth at birth persisted through 9 and 18 months of age.
Design/Methods This is a retrospective data analysis of all infants ≥35 weeks gestation diagnosed and admitted with NAS to a single center Neonatal Intensive Care Unit in Philadelphia, Pennsylvania between September 2006 and May 2018 that were then followed at an outpatient pediatrics practice associated with the same center. Growth parameters including weight, length and head circumference were measured at birth, 9 and 18 months. Z-scores and percentiles were calculated using the WHO growth chart. Pearson coefficient was used to evaluate correlation. Infants with growth parameters of $<10^{th}$ percentiles were compared with those $\geq 10^{th}$ percentile.
Results Growth parameters for 307 infants were analyzed during the study period. There was no correlation between weight percentiles at birth, 9 and 18 months. The head circumference (HC) and length percentiles at birth correlated with HC and length percentiles at 9 months ($r=0.39$, $p<0.001$ and $r=0.34$, $p<0.001$) and 18 months ($r=0.31$, $p<0.001$ and $r=0.33$, $p<0.001$). Table 1 shows the median weight for small for gestational age (SGA defined as $<10^{th}$ percentile) and appropriate for gestational age (AGA) infants at birth, 9 and 18 months. There was a significant difference in weight percentiles in SGA and AGA infants at birth and at 9 months which disappeared by 18 months. However, median HC and length percentiles remained significantly lower at 9 and 18 months in infants with HC and length at $<10^{th}$ percentile compared with infants with HC and length at $\geq 10^{th}$ percentile at birth (Table 2 and Figure 1).
Conclusion(s) Infants with NAS who were born SGA continued to have poor weight gain through 9 months but caught up with their AGA counterparts by 18 months. However, infants with HC and length at $<10^{th}$ percentile continue to have smaller heads and shorter length at 9 and 18 months. This suggests SGA infants with NAS may have different nutrition needs than those born AGA in the first year of life. In addition, future studies may be helpful to look at neurodevelopmental outcomes and linear growth in infants $<10^{th}$ percentile for HC and length at birth.

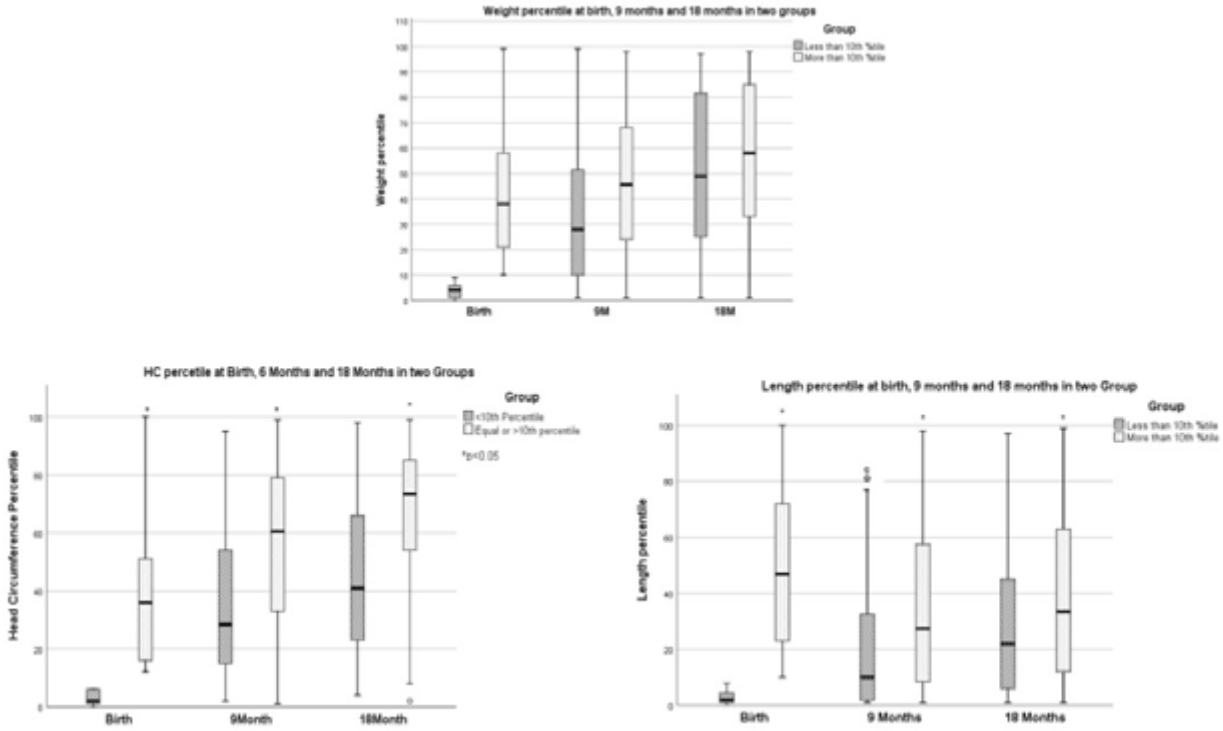

Figure 1: Growth parameter percentiles at birth, 9 months and 18 months in <10th percentile and ≥10th (weight, HC and length)

Table 1: Infant weight <10th percentile and ≥10th at birth (Median and IQR)

	SGA (<10th percentile) (n=89)	AGA (n=218)	p
GA in weeks (mean±SD)	38.9±1.4	37.4±1.3	<0.001
BW in kg (mean±SD)	2.4±0.2	3.2±0.3	<0.001
Birth length	47 (45-48)	48.5 (47-50.5)	<0.001
Birth HC	32.5 (31-33)	33 (32-34)	0.001
9 Months (n=262)			
	N=79	N=183	
Weight (kg)	8.05 (7.22-8.56)	8.58 (7.87-9.13)	<0.001
Weight percentile	28 (10-51)	46 (24-68)	<0.001
Weight Z score	-0.57 (-1.27, 0.04)	-0.12 (-0.69, 0.46)	<0.001
18 Months (n=221)			
	N=68	N=153	
Weight (kg)	10.6 (9.9-11.9)	10.9 (10.1-12.1)	0.1
Weight percentile	49 (25-81)	59 (33-85)	0.1
Weight Z score	-0.01 (-0.66, 0.88)	0.23 (-0.44, 1.03)	0.1

Table 2: Infant head circumference and length <10th percentile and ≥10th at birth (Median and IQR)

	<10th percentile	≥10th Percentile	p
9 Months Head Circumference (n=262)			
	N=112	N=195	
HC (cm)	43.5 (43-44.5)	44.5 (44-45.7)	0.008
HC percentile	28.5 (15-53.5)	60.5 (33-79)	<0.001
HC Z score	-0.59 (-1.02, 0.42)	0.3 (-0.41-0.84)	0.001
18 Months Head Circumference (n=221)			
HC (cm)	46.5 (45.7-47.9)	47.6 (47-48.5)	<0.001
HC percentile	41 (23-66)	73.5 (54.2-84.7)	<0.001
HC Z score	-0.23 (-0.73, 0.49)	0.64 (0.09-1.14)	<0.001
9 Months Length			
	N=75	N=232	
Length (cm)	67.9 (66-71)	69.9 (67.5-72)	0.05
Length percentile	10 (2-32)	27.5 (9.0-57)	<0.001
Length Z score	-1.35 (-2.16, -0.45)	-0.6 (-1.36, 0.17)	<0.001
18 Months Length			
Length (cm)	79.4 (76.5-81.3)	81 (78.3-83)	0.3
Length percentile	22 (6-45)	33.5 (12-63)	0.03
Length Z score	-0.87(-1.87, -0.16)	-0.45 (-1.23, 0.3)	<0.001

Abstract: 209

Does Feeding Elemental Formula Reduce Gastroesophageal Reflux in Infants?

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Background A short trial of elemental formula (extensively hydrolysed or amino acid based) is recommended for infants who have alarm signs and symptoms attributed to gastroesophageal reflux (GER). Multi-channel intraluminal impedance with pH probe (MII-pH) is considered the gold standard for evaluation of GER. Elemental formulas (EF) are expensive and may have no clinical benefit to reducing reflux.

Objective To compare reflux events in term and late preterm infants feeding regular formula/breast milk versus elemental formula using MII-pH.

Design/Methods This is a retrospective data analysis of infants ≥35 weeks gestation who were referred for evaluation of potential GER; and underwent MII-pH studies between October 2009 and August 2019. Infants feeding elemental formula (EF) were compared with those feeding regular formula or breast milk (RF/BM) at the time of the study. During the study, nurses marked the time of occurrence of symptoms, and these were correlated with reflux events noted by the probe, if noted within 5 minutes of each other. Symptom index (SI, or percent of symptoms related to GER), symptom sensitivity index (SSI, or percent of GER episodes associated with symptoms), and symptom association probability (SAP, or statistical measure of probability that the symptoms and GER episodes are unrelated) were calculated. SI > 50%, SSI > 10%, and SAP > 95% were considered positive. The number of reflux events, height of reflux, percent of time pH<4 and symptom association was compared in the two groups.

Results 76 infants underwent MII-pH study during the study period. 51 infants (67%) received bolus RF/BM feeding and 25 infants (33%) received EF feedings. There was no significant difference in demographics and clinical characteristics between the two groups except for the use of acid suppression (Ref Table). Total number of reflux events, acidic reflux and high reflux events were higher in in the EF infants. There was no difference in acid exposure time, frequency of symptoms, and symptom association between the two groups.

Conclusion(s) In this study using MII-pH, we found that using elemental formula was not associated with a decrease in reflux events, height of reflux, acid exposure time, number of symptoms and symptom association. We speculate that the use of EF in infants with more severe symptoms may have contributed to our finding. A larger randomized trial is needed to assess the usefulness of EF in infants

Elemental Formula and Reflux

	Regular Formula/Breast Milk (n=51)	Elemental Formula (n=25)	p-value
Birthweight (kg)	2.93 (2.69-3.44)	3.06 (2.69-3.29)	0.87
Gestational age (weeks)	39 (37-40)	39 (37-39)	0.99
Sex (% male)	27 (52.9)	12 (48)	0.8
Race (% black)	23 (45.1)	11(44.0)	1.0
On acid suppression (n, %)	1 (2.0)	4 (16)	0.04*
Duration of study (hours)	22.2 (21.1-23.2)	22.5 (21.5-23.4)	0.29
Total reflux events	40 (27-53)	58 (39-47)	0.007*
Acidic events	13 (7-20)	23 (14-29)	0.04*
Non-acidic events	24 (13-35)	26 (18-63)	0.08
Low reflux	3 (1-4)	1 (1-2)	0.83
Mid reflux	11 (7-15)	9 (6-14)	0.72
High reflux	27 (13-39)	40 (26-53)	0.01*
Time with pH < 4 (%)	2.1 (0.65-4.4)	1.8 (0.7-3.6)	0.52
Total number of symptoms	11 (3-21)	12 (9-25)	0.40
Symptoms related to reflux	2 (1-6)	6 (3-12)	0.28
Symptoms unrelated to reflux	8 (2-13)	8 (4-13)	0.95
Symptom index (positive if >50%)	32 (7-50)	45 (35-70)	0.04*
Symptom sensitivity index (positive if > 10%)	2.7 (1.1-6.3)	5.4 (2.0-8.8)	0.94
Symptom association probability (positive if > 95%)	32 (0-80)	70 (31-86)	0.07

Data expressed as median (IQR), unless specified otherwise.

Abstract: 210

Parenteral Nutrition Light Protection and Premature Outcomes

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Background Parenteral nutrition (PN) preparations form oxidants when exposed to light. These free radicals have been attributed to the development of bronchopulmonary disease (BPD), retinopathy of prematurity (ROP), necrotizing enterocolitis (NEC) and increased mortality in infants. Oxidant imbalance may also contribute to the development of PN-associated cholestasis. There are limited data regarding the effect of light protection on neonatal PN-associated cholestasis.
Objective The primary outcome is to evaluate the effect of PN light protection on the development of cholestasis in preterm infants. Secondary outcomes include evaluation of the incidence of feeding tolerance, BPD, ROP, NEC and mortality.
Design/Methods Our NICU recently implemented measures to protect PN from light using an amber bag to cover the PN solution while its administration (the tubing) and lipids remained exposed to light. In this retrospective study, we reviewed patient charts before and after the implementation of the new policy. A total of 50 infants were included: 25 patients in the no-light-protection group and 25 in the light-protection group (Fig. 1). Patient characteristics are described in Table 1. To evaluate for PN-associated cholestasis, serum levels of direct and total bilirubin, liver enzymes and triglycerides were analyzed. The groups were compared using

the Fisher's exact and Mann-Whitney U tests.
Results There was a statistically significant decrease in median peak direct bilirubin (1.7 vs. 0.9 mg/dL, p=0.02) and peak alkaline phosphatase (512 vs. 315 IU/L, p=0.01) in the light protection group vs. no-light-protection group (Fig. 2). Enteral feeds were initiated earlier in infants who received light protected PN (Fig. 3A). There was a downward trend in NEC incidence and AST/ALT levels in the light-protection group when compared to the no-light-protection group (Fig. 3B) but no significant difference in BPD, ROP or mortality.
Conclusion(s) Our study demonstrated that PN light-protection reduced the incidence of PN-associated cholestasis in premature infants. We speculate that light protecting the PN tubing and lipids will further decrease free radical-related neonatal diseases. The next phase is to fully light protect PN and evaluate for additional benefit(s). Moreover, we plan to collect saliva and urine to measure oxidative stress in patients with light protected PN bag and compare it to patients with fully light protected PN.

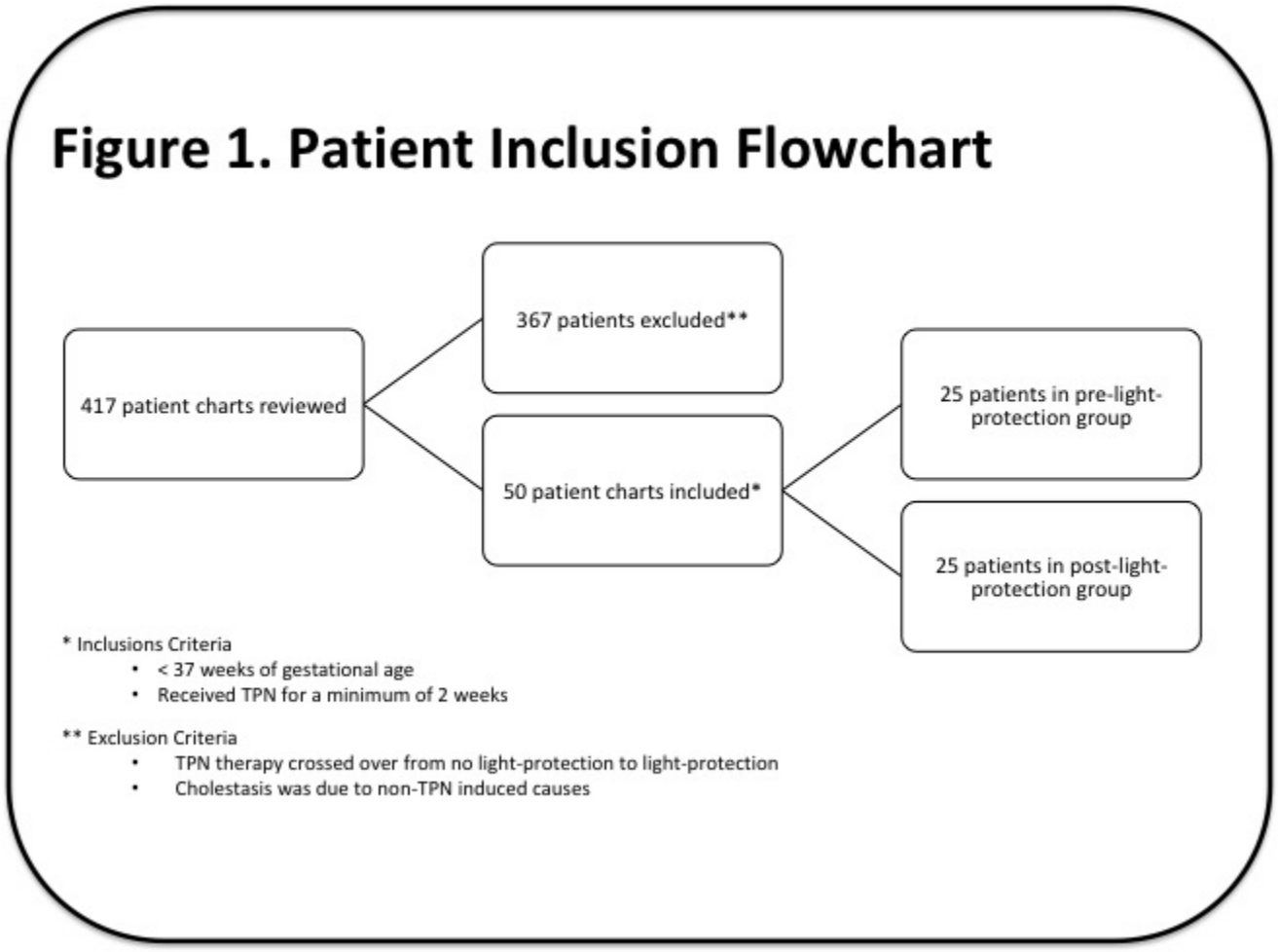

Figure 1 - Inclusion Criteria

Table 1. Patient Characteristics and Outcomes

Patient Characteristics			
	No light-protection (n=25)	**Light-protection (n=25)**	**P-value**
Gender, female (%)	11 (44%)	15 (60%)	---
Birth Weight (kg)	0.7 (0.5-2.1)	0.8 (0.4-3.7)	0.15
Gestational age (wks)	26.4 (23.1-33.4)	26.7 (23.9-36.1)	0.30
Postmenstrual age (wks) at peak direct bilirubin	29.1 (24.3-38.4)	28.9 (26.1-36.6)	0.34
Weight (kg) at peak direct bilirubin	0.9 (0.5-3.0)	1.0 (0.5-3.8)	0.95
DOL when patient started enteral feeding	6 (2-26)	3 (1-13)	0.004
DOL when patient reached full feeds	31 (17-99)	25.5 (5-44)	0.07
Sepsis (n)	16	14	0.77
ROP (n)	19	17	0.75
NEC (n)	11	5	0.13
BPD (n)	25	25	1.00
Death (n)	2	1	1.00
PDA (n)	11	10	1.00

Table 1 - Descriptive Characteristics

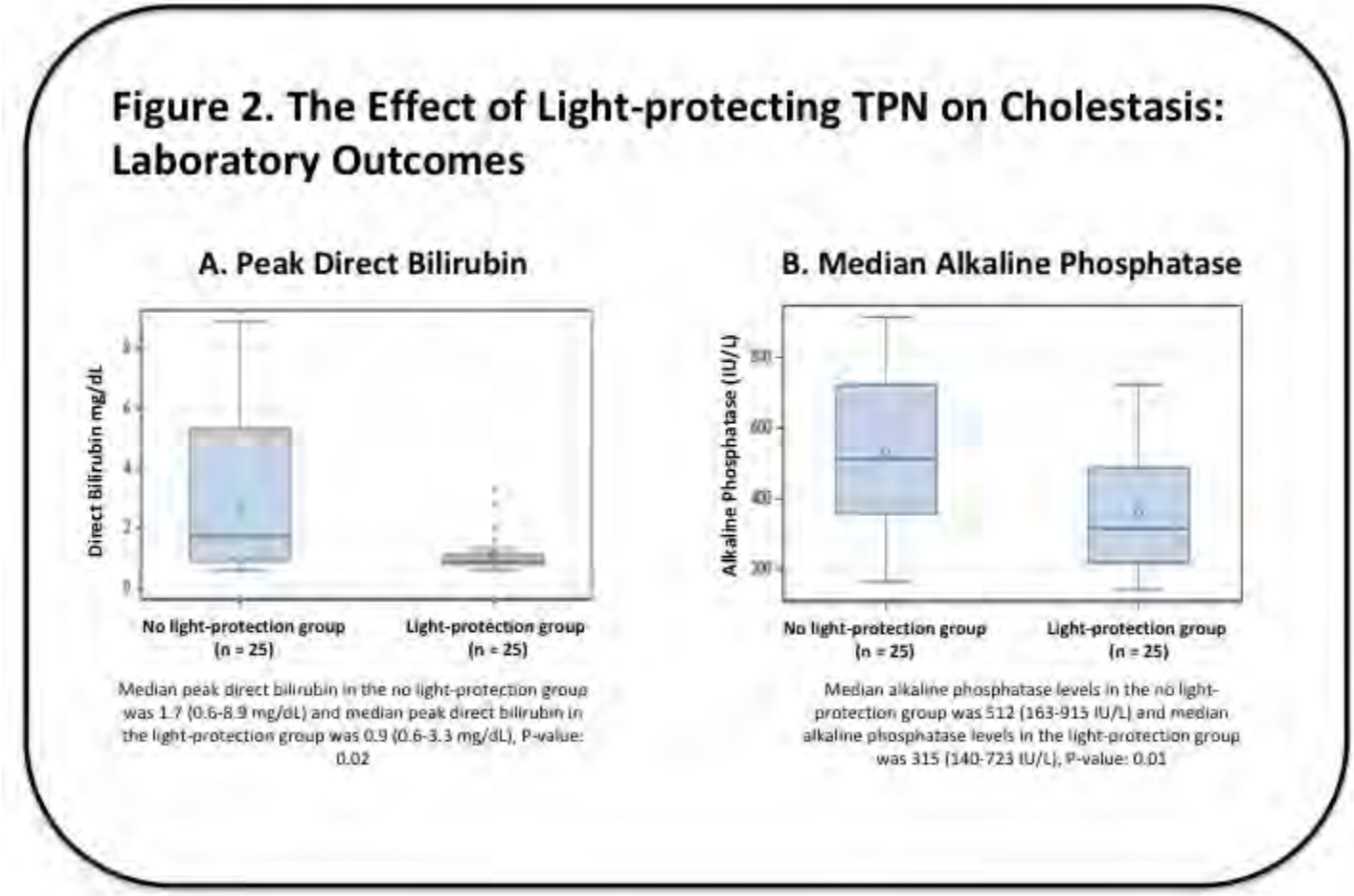

Figure 2 - Laboratory Outcomes

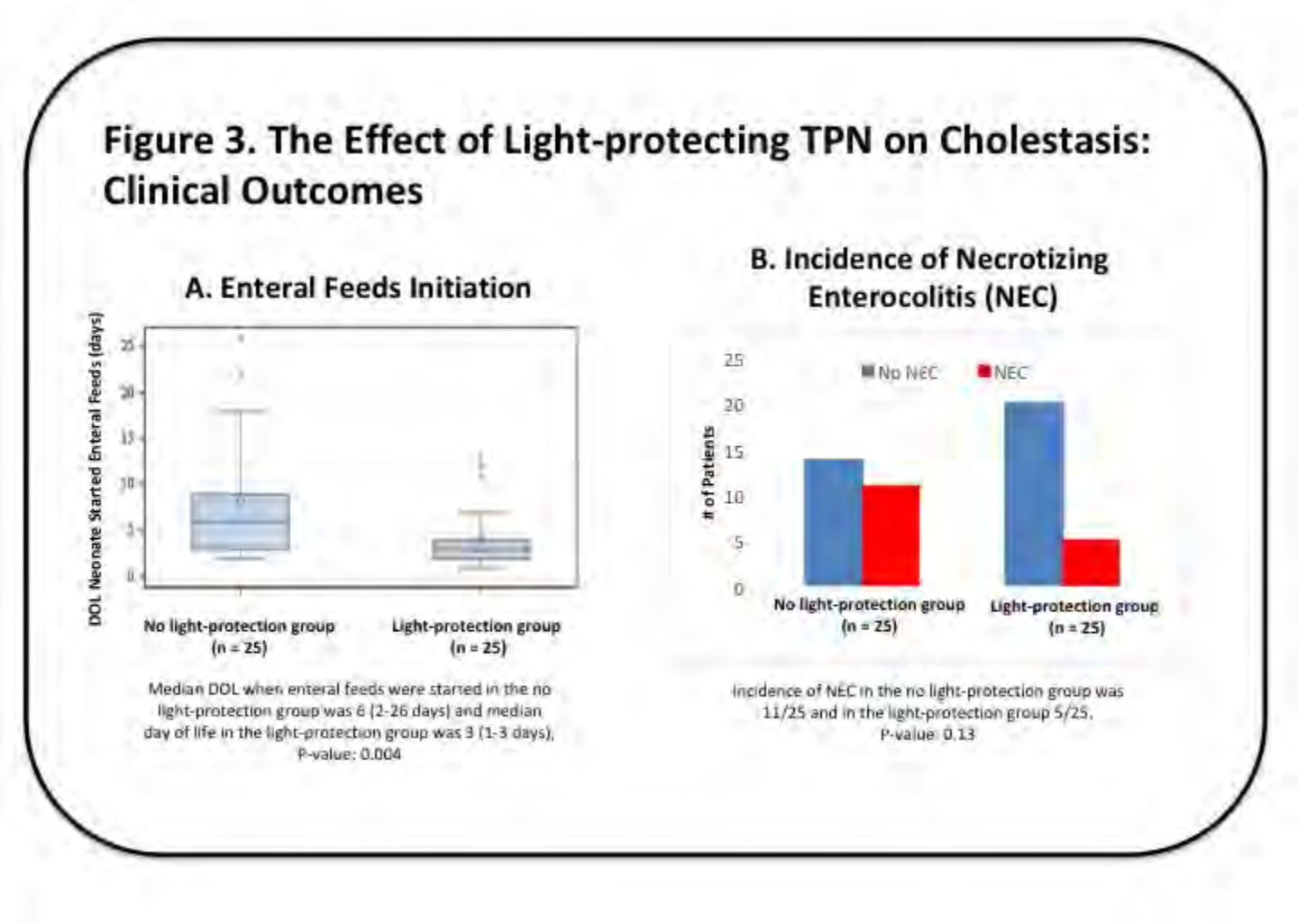

Figure 3 - Clinical Outcomes

Abstract: 211

Use of Donor human milk for minimal enteral feeds at a tertiary care NICU.

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Background AAP recommends mother's own milk (MOM) as the primary enteral diet for premature infants and pasteurized donor human milk (PDHM) as an effective alternative (Pediatrics 2017). Use of exclusive human milk diet in premature infants has been shown to decrease the rate of Necrotizing enterocolitis compared to formula. In our Regional Perinatal Center level 4 NICU, PDHM has been available for 2 years, but is often only offered when MOM production tapers or is not enough to keep up with increasing feeds.

Objective 1) Assess usage of PDHM as early minimal enteral feeds in Very Low Birth Weight (VLBW) babies in our NICU.
2) Assess awareness of the care-giver team about the availability and usage of PDHM as minimal enteral feeds in VLBW babies.

Design/Methods We did a retrospective chart review of all babies born at our NICU with birth weight $\leq$ 1500 grams from January 2018 to December 2018 (n=141). Exclusion criteria: 1) Infants with surgical diagnosis which led to delayed initiation of feeds. 2) Hemodynamically unstable infants on pressors. After initial data collection, we sent out a survey to all care-givers to identify baseline knowledge and practices regarding offering PDHM to eligible babies. A 14 question survey was sent to Pediatric residents, APPs, Neonatology fellows, Neonatologists, lactation & nutrition staff and NICU nurses.

Results There were 141 VLBW babies in our NICU in 2018, out of which 116 babies were eligible. The demographic data and results are as seen in Table 1. Almost half (46%) of the babies received formula, either in addition to MOM or exclusively for the minimal

enteral feed. 108 care givers responded to the survey. There were knowledge gaps and barriers to using PDHM as noted in Table 2. Significantly, only 1/3rd of the respondents routinely discuss or offer PDHM to mothers who plan to provide MOM.

Conclusion(s) We have a high incidence of formula use in this high risk population inspite of PDHM availability. We have identified knowledge gaps and practice deficiencies in offering and using PDHM in VLBW babies, especially during initial days when mother's supply is still building up. Based on the above data, we are creating a QI program to reduce the formula usage and the time to initiate feeds in VLBW babies (Figure 1).

Baseline Data	
Average gestation	28.5 weeks
Average birth weight	1038 grams
AGA	94 (81%)
SGA	19 (16.4)
LGA	3 (2.6%)
Average time to initial feed	70 hours
Average days to full feeds	19.3 days

Table 1

N=108	
Question	**% respondents that answered yes**
Do all babies <1500g qualify for PDHM?	77%
Should PDHM be offered as an alternative when mother desires to provide her own milk?	66%
Do you PDHM to eligible patients?	57%
Do you routinely discuss or offer PDHM to mothers who plan to provide MOM?	34%
Do you routinely obtain consent for use of PDHM for VLBW babies within 24 hrs?	38%

Table 2

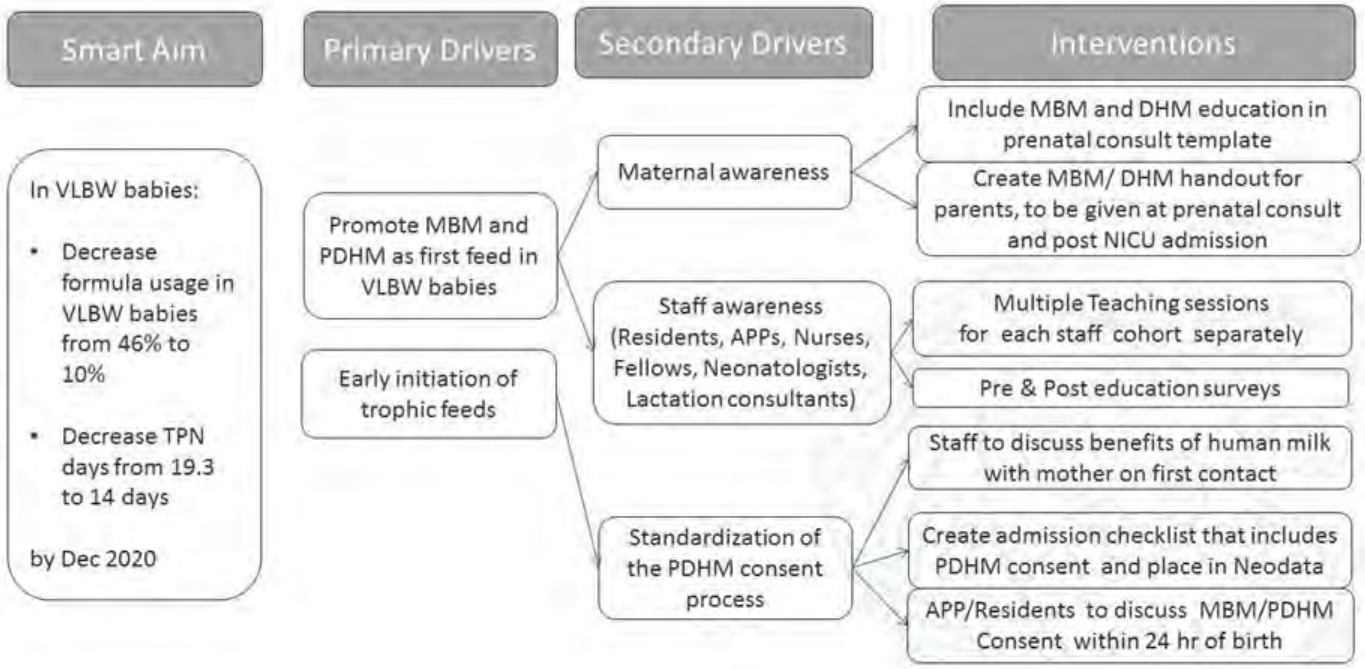

Figure 1

Abstract: 212

Comparison of teaching interventions to improve breastfeeding

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Background Breast milk is superior to any other enteral feeding infant formulation due to its proven health benefits. Both antenatal and postnatal breastfeeding (BF) education improve rates of exclusive breastfeeding (EBF). Verbal teaching has been the standard method of education, with no conclusive comparative evidence showing superiority of other teaching methods.
Objective To compare standard BF education with written, verbal and video education among mothers of different age groups.
Design/Methods We conducted a prospective randomized control study of EBF in mothers who gave birth at Brookdale Hospital, from January 1, 2019 to November 15, 2019. Mothers of infants with standard contraindications to BF, not able to read and/or understand English, refusing to breastfeed or to provide contact details were excluded. A convenience sample was randomized into 4 groups: Group 1 control received standard care, group 2 written education, group 3 verbal teaching, and group 4 video education (Table 1). Mothers were contacted over the phone or by email at 2, 4 and 6 weeks by a group of blinded investigators, to collect outcome data, which included duration of any BF and EBF. We stratified sample by maternal age groups, used Chi-square test and repeated measures analyses of variance to assess differences among the 4 groups.
Results Out of 722 mothers who delivered during the study period, 217 were excluded (Fig. 1). Of the remaining 505, convenience samples of 80 mothers were enrolled; 92.5% were African-Americans and a majority had low socio-economic status (Table 1). EBF

decreased over time: 45.1%, 38.8% and 34.8% at 2, 4 and 6 weeks, respectively. Although not statistically significant video education showed the highest percentage of exclusive breastfeeding over time when compared with other groups among all mothers (Fig.2; p= 0.891).

Chi-square analyses done between maternal age groups (17 to 29 years and 30 44 years) showed significant differences by format of education at each time point in 17-29-year-old mothers (Fig. 3). Amongst these young mothers, video education group showed higher EBF compared to other groups at all time points (p= .013, p= .021, p=.041). It was observed that none of the young mothers in the control group exclusively breastfed their infants. It was evident that older mothers were more likely to EBF; however, comparison between different methods was not significant (P= >.05).

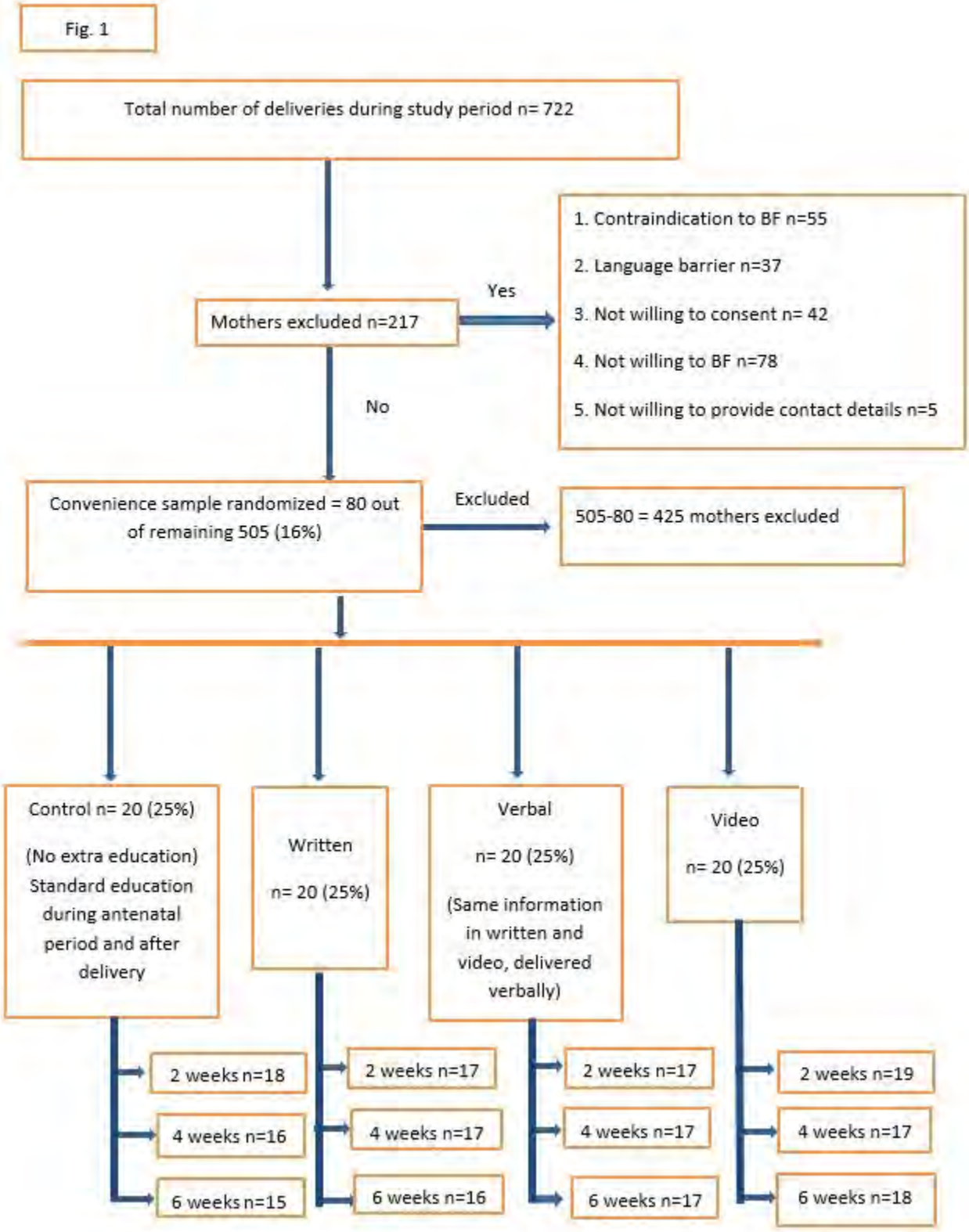
Conclusion(s) We conclude that video BFE was overall better than other methods and was the best method to significantly improve EBF among younger mothers.

Table 1

Socio-Demographic Information

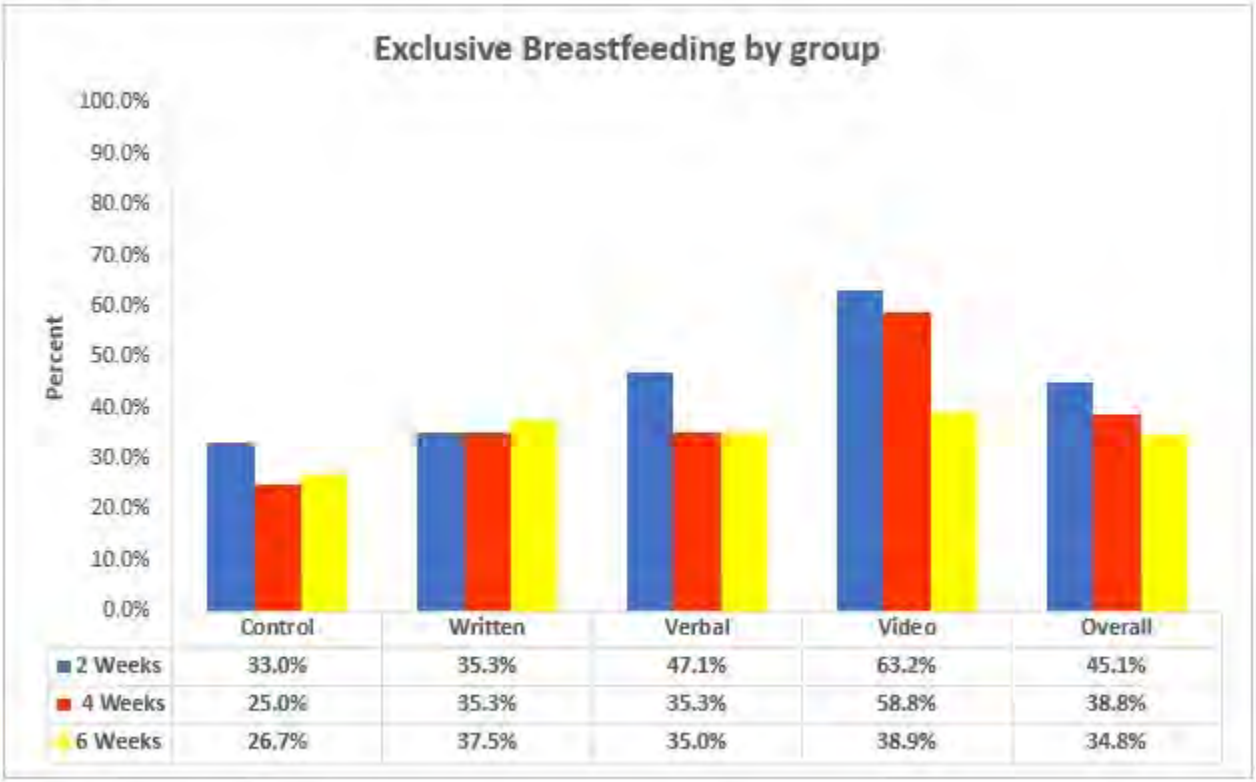
	Range	Mean (SD)	Median
Age	17-44	28.7 (6.79)	29
Household Income	14,400-90,000	42553.8(22326.47)	35,000
Maternity Leave (Months)	1.5-12.0	3.6 (2.74)	3
Gestational Age	24-41	37.4 (3.88)	39
Birthweight	555-4415	2956.78(851.14)	3170
	%	n	
Race/Ethnicity			
African American	92.5%	74	
Latino	7.5%	6	
Married	30.0%	24	
High School Education	72.5%	58	
Employed	45.0%	36	
Planned Pregnancy	35.0%	28	
Smoking	7.5%	6	
Medications	18.8%	15	
Depression	15.0%	12	
Antenatal Education	72.5%	58	
Multiple Pregnancy	6.3%	5	
Delivery Mode			
CS	38.8%	31	
NSVD	61.3%	49	
Previous Breast Feeding	47.5%	38	
Maternal Desire prior to education			
Both	45.0%	36	
Exclusive BF	53.8%	43	
Formula	1.3%	1	

Socio-demographic data



Consort flow diagram

Figure 2

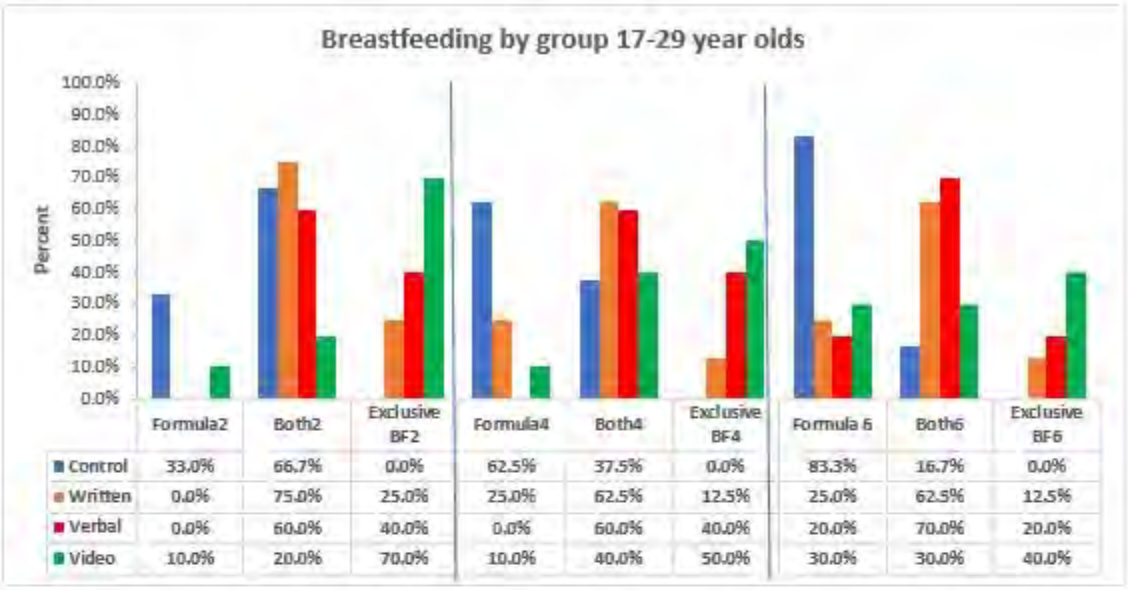


	Control	Written	Verbal	Video	Overall
2 Weeks	33.0%	35.3%	47.1%	63.2%	45.1%
4 Weeks	25.0%	35.3%	35.3%	58.8%	38.8%
6 Weeks	26.7%	37.5%	35.0%	38.9%	34.8%

Chi-square test- p = 0.891

Exclusive breastfeeding by educational groups

Figure 3

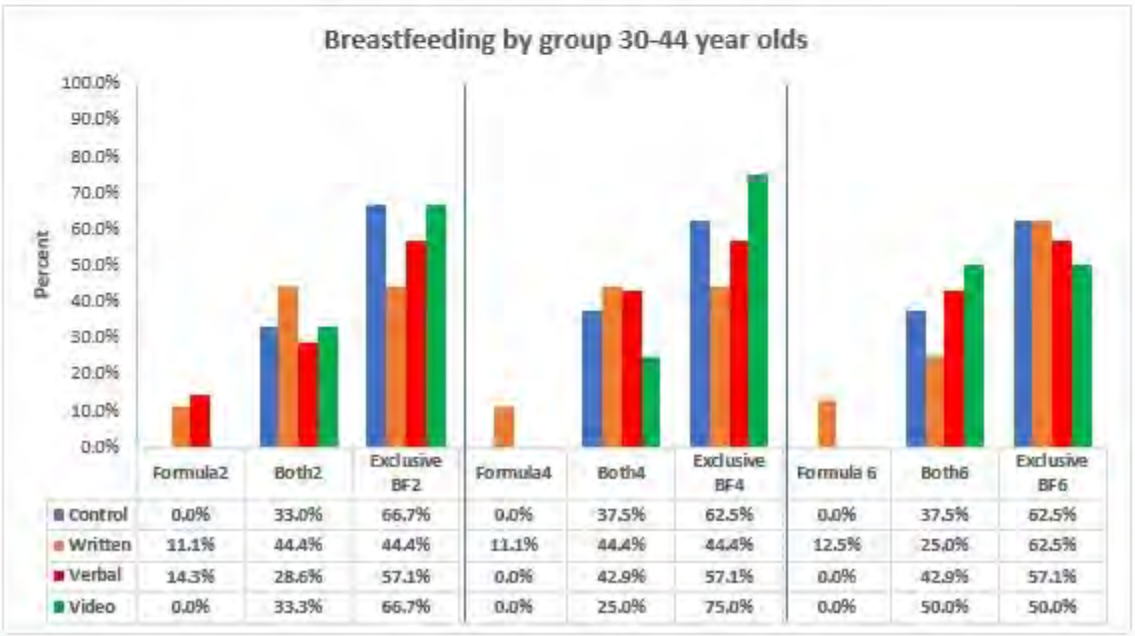


	Formula2	Both2	Exclusive BF2	Formula4	Both4	Exclusive BF4	Formula 6	Both6	Exclusive BF6
Control	33.0%	66.7%	0.0%	62.5%	37.5%	0.0%	83.3%	16.7%	0.0%
Written	0.0%	75.0%	25.0%	25.0%	62.5%	12.5%	25.0%	62.5%	12.5%
Verbal	0.0%	60.0%	40.0%	0.0%	60.0%	40.0%	20.0%	70.0%	20.0%
Video	10.0%	20.0%	70.0%	10.0%	40.0%	50.0%	30.0%	30.0%	40.0%

For 2 Weeks, Chi-square (6, N=71) = 16.223, p=.013

For 4 Weeks, Chi-square (6, N=68) = 14.873, p=.021

For 6 Weeks, Chi-square (6, N=65) = 13.156, p=.041



	Formula2	Both2	Exclusive BF2	Formula4	Both4	Exclusive BF4	Formula 6	Both6	Exclusive BF6
Control	0.0%	33.0%	66.7%	0.0%	37.5%	62.5%	0.0%	37.5%	62.5%
Written	11.1%	44.4%	44.4%	11.1%	44.4%	44.4%	12.5%	25.0%	62.5%
Verbal	14.3%	28.6%	57.1%	0.0%	42.9%	57.1%	0.0%	42.9%	57.1%
Video	0.0%	33.3%	66.7%	0.0%	25.0%	75.0%	0.0%	50.0%	50.0%

Breastfeeding by maternal age group

Abstract: 213

Effects of a Donor Human Milk Program on Maternal EBM Rates

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Background Human milk is the optimal source of nutrition for premature neonates, significantly decreasing rates of late-onset sepsis (LOS) and necrotizing enterocolitis (NEC). In 2017 the AAP recommended the use of DHM for the VLBW population. As more NICUs begin utilizing DHM, it is unclear if this new practice has an effect on maternal pumping and EBM rates.
Objective The primary objective is to retrospectively compare the rates of EBM feeding prior to and after the implementation of a DHM program in the Level 3 NICU at Staten Island University Hospital in 01/2017. The secondary objective is to compare rates of LOS and NEC pre- and post-implementation of the DHM Program.
Design/Methods A retrospective chart review was conducted for newborns with a gestational age (GA) ≤ 32 weeks and/or birth weight (BW) ≤ 1500 grams admitted to the NICU. The pre-intervention cohort (N=83) was admitted from 03/2014 – 12/2016 and the post-intervention cohort (N=80) from 07/2017 – 06/2019. A six month "wash-out" period occurred after the program began in 01/2017 to allow for adequate staff education and culture change after the implementation of the new program. Chart review evaluated the type of enteral feeding the infant received on day of life (DOL) # 7, 28 and day of discharge. Feeds were recorded as EBM, DHM or formula. Proportions of the types of enteral feeds were also noted.
Results The following chart details the demographics of the two cohorts (Table 1).
Of the 25% of charts reviewed thus far, exclusive EBM rates at discharged increased after the DHM program began. This trend approached statistical significance.
Conclusion(s) This increase in exclusive EBM may reflect maternal desire to avoid formula in the absence of a DHM program after discharge. Further chart review and analyses are ongoing to determine exclusive EBM rates before discharge and the association of the DHM program with incidence of LOS and NEC.

* p-value < 0.05	Pre-DHM Program	Post-DHM Program
Gestational Age (weeks) Mean ± SEM	29 ± 0.3	28 ± 0.3
* Birth Weight (grams) Mean ± SEM	1387 ± 62	1257 ± 50
Length of Stay (days)	44	41.6
Mean Gender	60%	58%
C-Section	54%	66%

Table 1: Demographics

Abstract: 214
Practice Makes Proficient: Examining the Assignment of Homework by Developmental Therapists
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Background Therapy services are important for children diagnosed with developmental disabilities. Most skills learned cannot be retained without practice. Homework exercises (HE) may help children retain new skills through repetition and active parental involvement.
Objective To examine the relationship between HE and parent satisfaction with services, parent-perceived child skills improvement, location of service (home/center vs. school vs. combination) and payment method (insurance/out of pocket vs. school/state vs. combination).
Design/Methods Patients were recruited while waiting for their regular scheduled developmental pediatric appointment. The survey gathered information pertaining to parent and child demographics, as well as information about the services utilized by the child, including Physical Therapy, Occupational Therapy, Speech Therapy, Special Instruction, Feeding Therapy, and Applied Behavioral Analysis. ANOVA, Chi-square, and Mann-Whitney U tests were used to evaluate relationships between HE and parent satisfaction, parent-perceived improvement, location of services, and payment method.
Results 118 surveys were received for patients age 0-17 years (mean 7.72 y; 76.4% male; 51.7% white). 31.4% of the children were reported to receive HE. For patients receiving more than one therapy, a random service was selected for inclusion in data analysis. Parents of children with HE reported greater satisfaction with therapy services (U=1065.5, p=0.026). HE were also positively

associated with parent-perceived child skills improvement (X^2=5.18, p=0.023) (Fig. 1). Location of services was also significantly associated with HE assignment (p<0.001), with children receiving therapy at home or a center being more likely to receive HE than those receiving therapy at school. Children whose therapy was paid for by a combination of methods (state, insurance, out of pocket) received HE more often than children who received therapy from only state-paid services (t=-3.17, p=0.002) (Fig. 2).
Conclusion(s) Given that HE are associated with significantly increased parent satisfaction and parent perceived child skills improvement, it is concerning that only 31.4% of families report receiving HE. Additionally concerning was the lack of HE given in the school setting. As therapies given in school are impossible for parents to view, it is essential that parents receive concise HE in order for them to be involved in the therapy process and reinforce skills learned during the time limited therapy sessions.

Figure 1: Parent Reports of Satisfaction and Child Improvement Levels

Measure	n (%)
Parent Satisfaction	
Extremely Satisfied	44 (37.3%)
Moderately Satisfied	60 (50.8%)
Moderately Dissatisfied	6 (5.2%)
Extremely Dissatisfied	3 (2.5%)
No Answer	5 (4.2%)
Child Improvement	
Child Improved	87 (77.0%)
Child Did Not Improve	18 (15.9%)
No Answer	8 (7.1%)
Total	**118**

Figure 2: Parent Reports of Homework Assignment, Locations of Service, and Payment Methods

Measure	n (%)
Homework	
Child receives homework	36 (30.5%)
Child does not receive homework	77 (65.3%)
No Answer	5 (4.2%)
Location	
School	81 (68.6%)
Home or Center	21 (17.8%)
Combination	16 (13.6%)
Payment Method	
State/School	84 (71.2%)
Insurance or Out of Pocket	17 (14.4%)
Combination	17 (14.4%)
Total	**118**

Abstract: 215

Assessing the Consistency of Essential Oil Recommendations for Attention and Relaxation from Aromatherapy Stores Across the U.S.

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Background Essential oils (EOs) have recently become particularly popular amongst parents wishing to help their child “focus” or” relax.” EOs are concentrated oils derived from plants, with every EO having a specific set of “therapeutic qualities” (e.g. the calming properties of lavender). Even though EOs are sold widely, they are not approved by the Food and Drug Administration (FDA). Moreover, research on benefits, properties and side effects are minimal. However, parental anecdotal evidence suggests vendors provide conflicting information on EO recommendations and properties.
Objective To characterize the consistency of EO recommendations for children from employees of stores selling essential oils.
Design/Methods Stores selling EOs across the United States were identified by searching for “essential oil stores in [state name]” in Google and contacted. Employees were asked which EOs they recommended to help children relax, which to help focus, how long they think it takes to start feeling the effects, and how long until said effects begin to wear off. Responses were analyzed.
Results A total of 72 stores across all 50 states were surveyed. The top EOs recommended for relaxing for children were lavender (97.2%), chamomile (33.3%) and bergamot (23.6%) (Figure 1). The top EOs recommended for attention were rosemary (55.8%) and peppermint (47.2%) (Figure 2). Of the 40 unique EOs mentioned for either purpose, 25 oils were suggested for both. Almost half (44.7%) of stores claimed the effects of EOs could be felt immediately upon inhalation. A majority of vendors (70.2%) reported that the duration of effects was user dependent (Table 1). Of all stores, only 12.5% mentioned any kind of risks associated with using EOs.
Conclusion(s) Despite some shared beliefs in the growing industry, the many inconsistencies in EO recommendations indicate the need for a more rigorous, scientific exploration of the field. Although the FDA prohibits sellers from marketing EOs as cures or drugs, most store employees and websites continue to tout the therapeutic uses of EOs and neglect to mention any associated risks. Physicians must become aware of this rising practice and counsel patients accordingly.

Figure 1: Frequency of Essential Oils Recommended for Children by Store Employees for Relaxation

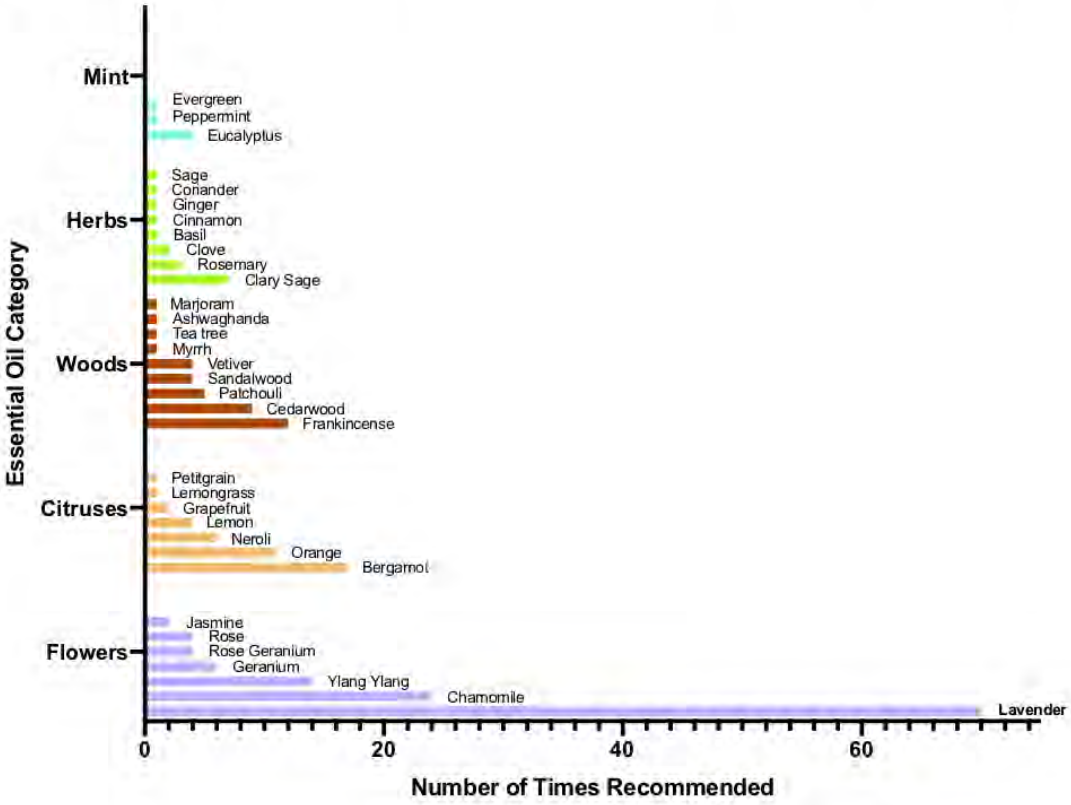

Figure 2: Frequency of Essential Oils Recommended for Children by Store Employees for Attention

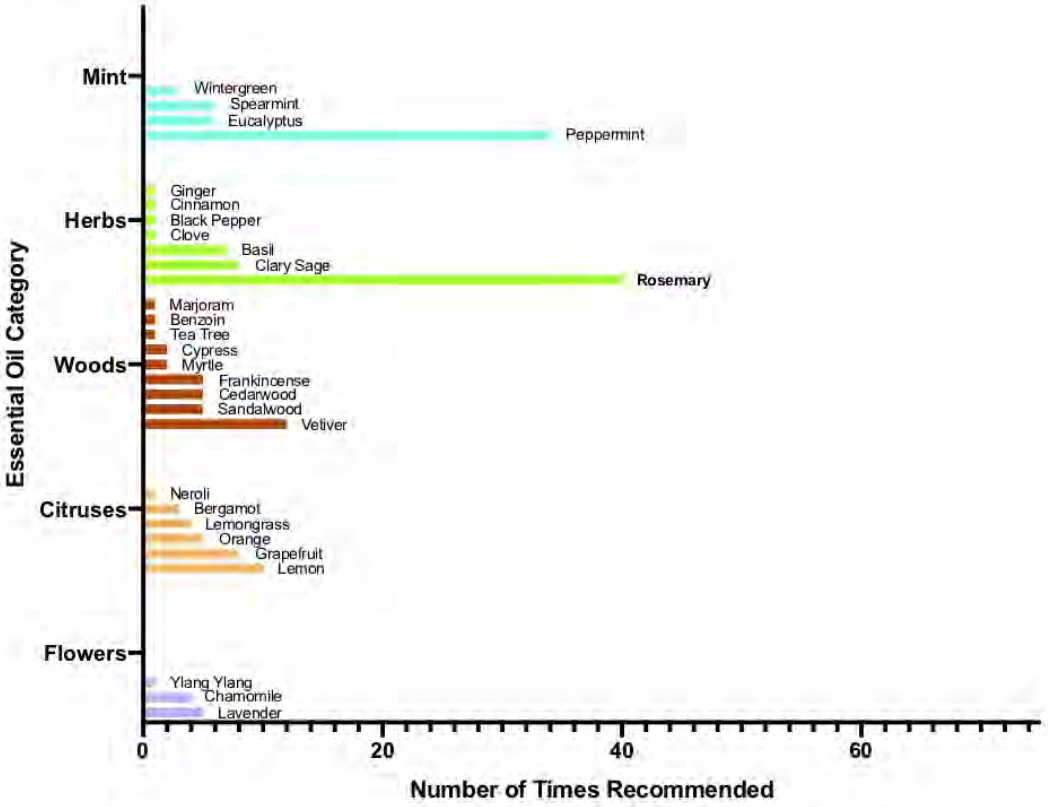

Table 1: Store Employee Perceptions of Essential Oils: Effect Initiation Time, Effect Duration, and Potential Risks for Children

	Number of Responses (n=72)
How long does it take to start feeling the effects?	
Immediately	30 (42%)
5-10 minutes	13 (18%)
10-30 minutes	4 (6%)
1+ hours	1 (1%)
Depends	19 (26%)
I don't know	5 (7%)
How long do the effects last?	
Immediately	2 (3%)
5-10 minutes	0
10-30 minutes	5 (8%)
1+ hours	7 (10%)
Depends	33 (46%)
I don't know	25 (35%)
Risks Mentioned	
Respiratory Sensitivities	3 (4%)
Clash of scents	2 (3%)
Some oils dangerous for children	1 (1%)
Some oils dangerous for pets	3 (4%)
No risks	56 (78%)
I don't know	8 (11%)