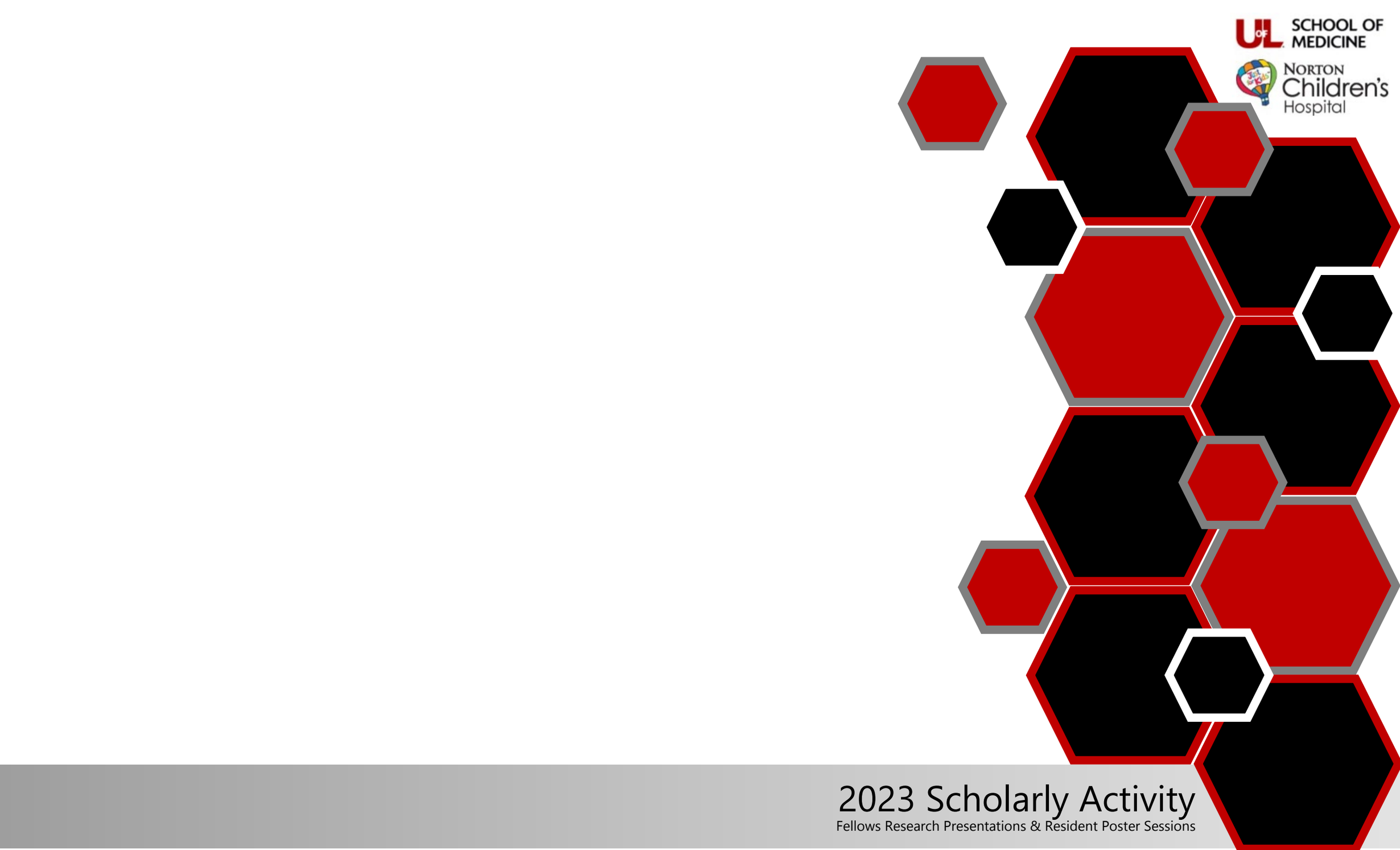
SCHOOL OF MEDICINE
NORTON Children's Hospital
2023 Scholarly Activity
Fellows Research Presentations & Resident Poster Sessions

2023 Scholarly Activity:
Fellows Research Presentations & Resident Poster Sessions

Acknowledgments

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A special thank you also goes to the many mentors and leaders who have supported our residents and fellows and who will continue to work with them as professional colleagues and friends. Finally, thank you to Dr. Kimberly Boland and Mr. Emmett Ramser for their support in making these endeavors possible.

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Program Director, Pediatric Residency

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Program Coordinator, Pediatric Residency

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Post-traumatic Headache in Children and Adolescents

Paul Gong, MD
Co-Author(s): E. Doll, MD; M. Sowel, MD; L. Evanczyk, MD
Presentation Category: Original Research

Introduction: Post-traumatic headache is a common disorder in the pediatric age group, seen both by child neurologists and non-neurologists. According to the International Headache Society ICHD-3, a post traumatic headache is defined as a secondary headache that occurs after injury or trauma to the head and/or neck with headache presenting within seven days post injury, seven days after regaining consciousness, or seven days after recovering the ability to sense and report pain. This common secondary headache disorder has significant impacts on the quality of life, not only for patients but also for families.

Methods: Literature review of post-traumatic headache in children and adolescents with aims to review the pathophysiology, risk factors, clinical features, neuroimaging, and both acute and preventive treatment options.

Results: Recent literature provides insight into current understanding of post-traumatic headache as well as, some potential future directions. The review underscores the alterations of brain structure and neurometabolic pathways with traumatic brain injury and possible underlying mechanisms of post-traumatic headache. Female sex and adolescent age were identified as important risk factors for development of post-traumatic headache. Most post-traumatic headaches are similar in clinical phenotype to migraine headaches, and management currently utilizes the treatments for primary headache disorders, such as migraine. Novel treatments are also currently being explored, such as with monoclonal antibodies to CGRP. The importance of the CDC guidelines for Return to Sport or Return to Learn were also reviewed, which recommend the benefit of a gradual return to normal activity based on symptom stability rather than a specific time period.

Conclusions: Pediatric post-traumatic headache is the most common symptom after a mild traumatic brain injury, especially in adolescent females, and is typically treated as one would a primary headache disorder, such as migraine headache or tension-type headache. Gradual return to normal activity based on symptoms is an important aspect of management in school-aged children. Future research should help to continue to expand the understanding of the pathophysiology and risk factors for post-traumatic headache, in addition to systematically investigating newer therapeutic options in the pediatric age group.

Novel Mutation in SPTLC2 Gene Presenting as a Mimicker of Spinal Muscular Atrophy (SMA)

Jaime Shoup, MD
Co-Author(s): A. Asamoah, MD
Presentation Category: Case Report

Introduction: SPTLC2 pathogenic variants have been associated with hereditary sensory and autonomic neuropathy, 1C (HSAN1C). We describe a case of motor neuropathy/neuronopathy associated with SPTLC2 gene mutation, presenting as a mimicker of spinal muscular atrophy (SMA) in a pediatric patient.

Methods and Materials: Chart review

Results: A 3-year-old male presented for neurologic evaluation due to global developmental delay and abnormal gait. Patient demonstrated gross and fine motor delay since birth, along with language and social delay. Physical exam showed high arched palate, tongue atrophy/fasciculations, proximal greater than distal weakness with Gower maneuver and hyper-lordotic gait. He had normal deep tendon reflexes except absent Achilles reflexes. Creatine kinase, fragile X, chromosomal microarray, and brain magnetic resonance imaging were normal. Electromyography and nerve conduction study demonstrated acute and chronic neurogenic changes with low motor combined muscle action potentials. Muscle biopsy findings were consistent with SMA.

Genetic testing for 5q SMA was negative. Further genetic testing with Invitae comprehensive neuropathies and neuromuscular panels showed three variants of unknown significance at ISPD, PMP22, and SPTLC2 genes. Whole genome sequencing re-demonstrated three variants of unknown significance, two of which were paternally inherited, but one was a de novo mutation in the SPTLC2 gene and predicted to be deleterious by prediction algorithms.

Conclusion: SPTLC2 gene mutation is associated with HSAN1C with presentation typically in the third decade. This case highlights a novel mutation in the SPTLC2 gene that presented as a motor neuropathy/neuronopathy in the first decade of life. It should be considered in patients who have a SMA phenotype with negative genetic testing for 5q-SMA.

The Impact of Therapy Dogs on Anxiety and Emotional Management in the Pediatric Emergency Department

Samantha Lucrezia, MD
Co-Author(s): A. Edgerton; C. Verschagin; Y. Feygin
Presentation Category: Original Research

Intro: Therapy dogs have been found to reduce anxiety in patients in various pediatric healthcare settings, but their use has not been extensively studied in the pediatric emergency department (ED).

Objectives: To determine change in emotional management in children aged 4-12 years after a visit from a therapy dog and certified child life specialist (CCLS) handler, as measured by observed CEMS scores (Children's Emotional Management Scale), and to determine change in perceived level of child anxiety reported by caregivers before and after the visit, as measured by the Subjective Unit of Distress (SUD) score.

Methods: We conducted a prospective observational study at a large, urban, emergency department in a freestanding children's hospital from May to July 2021. Children aged 4-12 years with at least mild anxiety as measured by a SUD score > 30 were eligible. Children were considered ineligible if they had evidence of active infection, were transferred from an outside facility, presented for burn care or dog bite injury, had recent history of neutropenia or oncologic process, were triaged as ESI category 1 or 2, if the patient or caregiver with a fear or allergy to dogs, or if they had already undergone a procedure. Participants received a 10-minute visit with CCLS and therapy dog. Modified CEMS (accounting for mask use) and SUD scores were recorded immediately prior and after intervention by our research team and caregiver, respectively. Participants were enrolled until a predetermined sample size was met. Differences between scores before and after the intervention were assessed for the overall sample and stratified by age group, using a paired Wilcoxon signed-rank test.

Results: 95 patients were approached, no families refused participation, and 41 met inclusion criteria and were enrolled. Demographics are described in the Table. No patients received psychoactive medications prior to the intervention. Overall results are reported in the Figure. Modified CEMS scores significantly decreased after the intervention in children ($p < 0.001$). There was a significant decrease in perceived anxiety of children via SUD score after the intervention ($p < 0.001$). Improvement of the child's emotional management was not associated with age and score differences were significant for each age group ($p < 0.001 – p = 0.024$). Mean duration of intervention was 9.10 (3.58) minutes; mean ED length of stay was 3.33 (1.50) hours.

Conclusions: An encounter with a therapy dog and CCLS handler significantly improves emotional management and decreases anxiety in pediatric patients in the ED setting. As we have previously shown that caregivers perceive therapy dogs as calming for their child and praised the intervention, these results support future prospective randomized comparative trials involving therapy dogs in managing pediatric distress in the ED.

The Use of Focused Cardiac Ultrasound in Adolescents Evaluated in the ED for Chest Pain or Syncope: Is There a Sex Discrepancy?

N. Akwesi Poteh, MD
Co-Author(s): J. Kim, DO; K. Jawad, MD; P. Khalil, MD
Presentation Category: Original Research

Introduction: Focused cardiac ultrasound is often performed in patients with chest pain or syncope in the ED. It is possible that adolescent females are less likely to receive a focused cardiac ultrasound due to provider discomfort as adolescent females develop breast tissue.

Objective: The primary aim of this study was to compare the number of focused cardiac ultrasounds obtained in adolescent males vs. females to determine if there is a difference. Secondary aims included comparing the apical four chamber (AP4C) view to determine if it was more frequently obtained in males than females because of its proximity to breast tissue. The sex of the ultrasound operator was also compared to determine if that affected whether or not the AP4C view was obtained. Finally, the quality of images was compared to see if it was better in males than females.

Design/Methods: This was a retrospective review of EMR data for adolescent patients, ages 13-19, who had a chief complaint or diagnosis of chest pain or syncope from the year 2018-2020. Focused cardiac ultrasound scans obtained on this same cohort was reviewed. The patients were then identified by sex and compared to see if there were differences in the number of scans obtained based on the sex of the patient. The quality of the overall scans was also evaluated using a modified RACE protocol and compared to see if there was a sex-based difference. Descriptive statistics was calculated and differences assessed by sex using $\chi 2$ test.

Results: A total of 2814 patients were enrolled in the study; 1096 were male and 1718 were female. Of those, 259 received focus cardiac ultrasounds; 132 (51%) were male and 127 (49%) were female. There was a significant difference in the percentage of patients who received focus cardiac ultrasounds, based on sex ($p < .0001$). There was no significant difference in the sex of the patients on whom the AP4C view was obtained. There was no significant association in the sex of the operator and whether or not they obtained the AP4C view on the patient. Finally, there was no significant difference in the sex of the patient and the quality of the images obtained. Interrater reliability between a PEM fellow who has had focused cardiac ultrasound training and a pediatric cardiologist was compared, and yielded a kappa of 0.565.

Conclusions: There was a significant difference in the sex of the patients who received a focused cardiac ultrasound for chest pain or syncope. This could suggest a bias, either conscious or unconscious, on the part of the physicians evaluating these patients in the ED. There was good interrater reliability between the PEM fellow and the pediatric cardiologist for image quality.

Clinical Features and Follow-up of Children Evaluated for Persistent Unwellness After COVID-19

Katie Weakley, MD
Co-Author(s): A. Schikler, MD; J. Green, MD; D. Blatt, MD; S. Barton, MD; V. Statler, MD; Y. Feygin; G. Marshall, MD
Presentation Category: Original Research

Introduction: Many patients experience new or persistent symptoms after COVID-19, referred to as post-acute sequelae of SARS-CoV-2 infection (PASC). Our institution established one of the first dedicated pediatric Post-Acute COVID Clinics (PACC) in the country. Little is known about the clinical features and long-term outcomes of PASC in referred children and adolescents.

Methods: One-hundred and four patients referred to Post-Acute COVID Clinic (PACC) from October 2020–December 2021 were included. Standardized intake interviews were performed, and evaluation and subspecialty referral were at the discretion of providers. A telephone interview was conducted approximately 6 months after intake.

Results: The median age was 14 years (IQR=12, 16); patients were older than those seen in the General Pediatric Infectious Diseases Clinic, but were similar in terms of gender, race, and payer mix. Most patients reported good health before developing COVID-19. More than half of patients reported moderate-to-severe disability at the time of the first PACC visit. Common post-COVID symptoms were fatigue (73%), headache (60%), shortness of breath (49%), exercise intolerance (47%), and chest pain (39%). Analysis suggested 3 symptom clusters, dominated, respectively, by fatigue alone, cardiopulmonary symptoms, and neurocognitive problems. In general, the results of routine tests did not affirm specific diagnoses, and the diagnoses that were made—most commonly anxiety, depression, and/or panic disorder; autonomic dysfunction; and migraines—were made on clinical grounds. Common subspecialty referrals were to Neurology, Cardiology, Pulmonology, Physical Therapy/Physical Medicine and Rehabilitation, and Psychiatry. Telephone interviews (N=63) showed that 79% of patients were improved, including 30% who felt back to normal; outcome was not associated with presenting symptom cluster.

Conclusions: Patients had distressing symptoms and moderate-to-severe disability weeks after acute COVID-19. Extensive laboratory evaluations did not affirm alternative causes of the presenting symptoms. Post-COVID diagnoses centered around psychological disturbance, autonomic dysfunction, and migraines. Most patients improved within 6 months.

Point-of-Care Ultrasound Confirmation of Endotracheal Tube Positioning: Accurate Enough to Have a Role in Neonates?

Diane Buckley, MD
Co-Author(s): B. Albers, MD; A. Neal, MD; Y. Feygin; M. Sharmin Sumy
Presentation Category: Original Research

Introduction: Endotracheal intubation is a common procedure in the Neonatal Intensive Care Unit (NICU) and is often needed in an emergent or semi-emergent situation for neonatal resuscitation. Appropriate depth has been estimated by various methods, however in extremely low birth weight (ELBW) infants, methods are less reliable. While the gold standard for endotracheal tube (ETT) position is chest radiography (CXR), there have been advances in point-of-care ultrasound (POCUS) making it a potential method for rapid, bedside assessment for ETT depth confirmation in the NICU. Despite these advances, there is limited literature supporting its use, feasibility, and generalizability across gestational ages and weights in the NICU. There is also little literature describing interrater reliability between non-ultrasonographer physicians with varied training and experience.

Methods: We aimed to further investigate the feasibility of POCUS for ETT depth confirmation using the differentiation of "deep" or "not deep" while also evaluating interrater reliability between two evaluators, an attending and fellow neonatologist. Thirteen infants in a level IV NICU were enrolled in the study with gestational ages ranging 222 to 373 and birth weights ranging from 365g to 2860g, with the bulk of patient enrollment within the ELBW range. Infants were imaged a maximum of 5 times to obtain a total of 35 scanning encounters. POCUS images were obtained on the same day as a previously scheduled radiograph where both physician imagers obtained individual, consecutive, and blinded POCUS images within 3 hours of radiography. Interpretations of "deep" or "not deep" were made by each evaluator on the radiograph, with respect to the carina, and individual POCUS images, using the superior border of the right pulmonary artery (RPA) as a surrogate marker for the carina. Each CXR was interpreted by a pediatric radiologist and unmarked POCUS images were reviewed by a pediatric cardiology for quality assurance.

Results: In all cases, the ETT was adequately visualized on the radiograph and POCUS images. In the case of evaluator number 1, all interpretations of ETT placement agreed with the interpretation of the pediatric radiologist. In the case of evaluator number 2, interpretations of the ETT placement agreed with the pediatric radiology with a Cohen's Kappa of 0.82, indicating an almost perfect agreement. When comparing the interpretations of the radiograph and POCUS images for evaluator number 1, there was a substantial level of agreement, with a Cohen's Kappa value of 0.72. When comparing the interpretations of the radiograph and POCUS images for evaluator number 2, there was perfect agreement, with a Cohen's Kappa value of 1.0. When directly comparing evaluator number 1 and evaluator number 2 POCUS image interpretations, Cohen's Kappa was 0.58, which is borderline moderate-to-substantial level of agreement.

Conclusion: Our study is the first to describe interrater reliability between two non-expert ultrasonographers with differing training backgrounds and experience levels. Findings support that POCUS is feasible for use in the NICU to determine ETT depth, is valid across gestational ages and birth weights, and is a generalizable technique for non-expert physician ultrasonograhers.

Improving Hypoglycemia Management in the NICU: A Quality Improvement Project

Daniel Kahn, MD
Co-Author(s): H. Fischer, MD; S. Schultz, MD
Presentation Category: Quality Improvement

Background: Severe and persistent hypoglycemia can have negative neurodevelopmental impacts. Infants experience transitional physiology involving ketone suppression and insulin dysregulation, putting them at risk for hypoglycemia. After 48 hours of life, there is a progression towards a lifelong glycemic set point. This value is the subject of vigorous debate between neonatal/perinatal specialists and pediatric endocrinologists. The lack of national consensus on neonatal hypoglycemia management in the NICU results in significant provider variation and, at times, ambiguity. An abundance of research has shown variation increases length of stay (LOS), potentially worsens outcomes, and contributes to parental dissatisfaction.

Methods: This quality improvement project used the Model for Improvement to decrease variation in management of hypoglycemia in a Level IV NICU. The SMART AIM was to increase utilization of a hypoglycemia management protocol to >85% for infants ≥35 weeks admitted to the NICU with primary diagnosis of hypoglycemia by May 2023. A multidisciplinary team including neonatologists, endocrinologists and nurses designed a hypoglycemia management protocol/algorithm, which includes automatic titration of fluid support, via glucose infusion rate (GIR), based on specific target glucose ranges. Initial PDSA cycles focused on improving protocol usability, development of order sets, and documentation templates for support. This was followed by unit wide implementation of the protocol. Statistical process control was used to evaluate measures over time and descriptive statistics were used to compare measures before and after implementation. Outcome measures included length of time of administration of dextrose containing IVF in hours and LOS. Algorithm use and compliance was followed as the process measure. Balancing measures included rate of hypoglycemia, number of glucose checks, readmission for hypoglycemia, and number of endocrinology consults.

Results: Implementation and data collection for this quality improvement project is ongoing. Algorithm compliance thus far is 92%. Initial PDSA cycles led to a decrease in length of time receiving dextrose containing fluids from 47 to 29 hours, with a significant decrease in variation. In the current implementation phase, this measure has increased, which our team is investigating. There has been no difference in number of glucose sticks and no significant difference in balancing measures pre/post algorithm.

Conclusions: As a reflection of numerous studies on standardization of practice, we were successful in increasing use of an algorithm for management of hypoglycemia and decreasing provider variation in hypoglycemia management. Initial gains of decreasing length of dextrose containing fluid exposure have not been sustained during our implementation phase, which may reflect the need for more testing cycles, education, and feedback. The use of this algorithm has not impacted our balancing measures. Therefore, our team believes that this algorithm is safe to use, decreases provider variation and may lead to improved outcomes such as length of dextrose containing fluids. We also learned there could be two distinct populations admitted for hypoglycemia: those requiring support until transition to normoglycemia and those with an underlying endocrinologic pathology. Next steps for this project are to use data for length of dextrose containing fluids and highest GIR to determine a lower threshold for subspecialty involvement to facilitate earlier diagnosis and management of pathologic process, which could potentially decreasing LOS in this population.

Disposable Pressure Transducer to Identify Central Pressure Measurements in Umbilical Lines for Preterm and Term Infants in the Neonatal Intensive Care Unit

Carrie Moore, MD
Co-Author(s): L. Devlin, DO; C. Crabtree, DO; A. Farris, MD; Y. Feygin; M. Sharmin Sumy
Presentation Category: Original Research

Introduction: PICC (peripherally inserted central catheter) lines are essential to neonatal care. Quality improvement initiatives have enhanced the safety of PICC line placement, but further efforts are needed to maximize safety. Inadvertent arterial placement is a serious complication, which may lead to compromised perfusion and an increased risk of arterial thrombosis. Chest radiographs are the standard for confirming placement, but methods for verifying placement in an artery vs. vein are lacking. A disposable pressure transducer with a digital display has been used in central line placement in adults but has yet to be tested in infants. This pilot study was designed to assess the feasibility of using the transducer to determine a pressure difference between arterial and venous systems in infants admitted to a level IV neonatal intensive care unit.

Methods: The transducer was attached to umbilical artery catheters (UAC) and umbilical venous catheters (UVC) to obtain a baseline pressure. Infants ≥23 weeks' gestation with umbilical lines placed for clinical care from February to August 2022 were enrolled. The transducer was activated, calibrated, and attached to the umbilical catheter for measurement. Forty-five patients were enrolled, and 62 measurements obtained, 31 from UACs and 31 from UVCs. A reference point of 12mmHg was chosen to differentiate between arterial and venous pressures, hypothesizing that arterial pressures would be ≥12mmHg and venous pressures would be < 12mmHg. Infants were enrolled if x-ray confirmed proper positioning of umbilical catheters and if they had an English-speaking legal guardian. Infants were excluded if they had a poor arterial waveform on UAC tracing. Descriptive statistics were used to analyze continuous variables and were compared using a Mann-Whitney U Test.

Results: Of the measurements, 100% of the UACs were ≥12mmHg and 87% of the UVCs were <12mmHg. The median device pressures for UACs and UVCs were 41mmHg (IQR 31-45mmHg) and 5mmHg (IQR 3-9mmHg) respectively (p-value <0.0001). Of the 4 UVC readings that were outside the expected range (>12mmHg), 3 of the 4 were double lumen catheters. Two of the 4 readings were infants with congenital anomalies (congenital heart disease and caudal regression syndrome).

Conclusion: This pilot study suggests that the disposable pressure transducer is likely safe and can identify a pressure difference between the arterial and venous systems in neonates. A cutoff pressure of 12mmHg appears to identify lines placed in the arterial system. This study serves as a foundation for further investigation of the device with PICC line placement.

Outcomes of Heart Transplantation in Children with Previously Palliated Hypoplastic Left Heart Syndrome

Johnna Sizemore, DO
Co-Author(s): B. Alsoufi, MD; S. Wilkens, MD; J. Furlong-Dillard, MD, D. Kozik, DO; A. Lambert, MD; J. Trivedi
Presentation Category: Original Research

Purpose: Pediatric heart transplantation (PHT) in children who fail the multistage palliation for hypoplastic left heart syndrome (HLHS) is associated with challenges related to immune, clinical, or anatomic risk factors that might decrease survival. We aim to review current outcomes of PHT in children who underwent prior palliation for HLHS.

Methods: The United Network for Organ Sharing (UNOS) transplantation database was merged with the Pediatric Health Information System (PHIS) administrative database to identify children who received PHT following prior palliation for HLHS. Multivariable regression analysis of outcomes and factors affecting survival was performed.

Results: Between 2009-19, 767 children with previously palliated HLHS underwent PHT. We divided the cohort into 3 age groups based on age at PHT: A (<1Y, n=298), B (1-5Y, n=309), C (>5Y, n=160). Infants (group A) were more likely to be on ventilator, to require inotropes and to have received ECMO support at time of listing. [Table] 1-Y survival for groups A, B, C was 81%, 96% and 91% ($p<0.1$) with the majority of death being perioperative. On follow-up, 24 patients underwent re-transplantation. 10-Y survival was 69% and was comparable between the groups: 70%, 67% and 72%, respectively, $p=0.34$. Age at time of listing was not associated with survival (HR=0.84, $p=0.54$). On multivariable analysis, the only factor associated with survival following OHT was race other than white (HR=1.72, $p=0.03$). Pre-operative ventilation, ECMO or MCS support, creatinine or bilirubin were not significant.

Conclusion: Compared to existing literature, the number of children with prior HLHS palliation who received PHT has noticeably increased in the current era. Survival following PHT in this patient population is acceptable. Patient age and palliation stage might affect early mortality but not late survival. Efforts to properly support these patients prior to PHT might decrease this early mortality and improve overall survival.

Impact of the COVID-19 Pandemic on Diabetes Control in Youth with Type 2 Diabetes

Megan Coriell, MD
Co-Author(s): K. Jawad, MD; K. Wintergerst, MD; S. Watson, MD
Presentation Category: Original Research

Introduction: This study sought to evaluate changes in BMI and glycemic control in children and adolescents with prediabetes or type 2 diabetes (T2D) during the COVID-19 pandemic, pre-, during, and post-lockdown.

Methods: A retrospective chart review was performed and included data from children ≤ 18 years of age with a diagnosis of T2D or prediabetes seen in person in clinic at least one time prior to initial stay at home orders in Kentucky (March 23, 2020) and one time after. There were 121 youth meeting inclusion criteria, mean age 14.5 years, 33 with prediabetes, 88 with T2D. At the initial visit, the mean BMI was 36.87 (SD 8.76). Of the participants, 58 (48%) were Black, 41 (34%) White, 15 (12%) Hispanic, 3 (3%) other, and 4 (3%) were not reported. Generalized linear mixed modeling was used to compare the change in BMI and HbA1c over time between three defined time periods (pre-lockdown, lockdown, and post-lockdown), with random effects used to control for the correlation within the individual visits and the interval in months from the first visit. The relationship between BMI and school type (in-person, virtual, both) was also assessed.

Results: When controlling for COVID-19 time periods, BMI and HbA1c were found to increase by 0.127 (p=<0.001) and 0.071% (p=0.013) respectively per month from the first visit. However, changes in HbA1c and BMI were not significant (pre-lockdown vs. lockdown, BMI p=0.130, HbA1c p=0.610; pre-lockdown vs. post-lockdown, BMI p=0.081, HbA1c p=0.547). There was not a significant difference in BMI change between the three school type groups. Change in BMI over time did not predict change in HbA1c (p=0.484), treatment escalation (p=0.11), or treatment de-escalation (p=0.364). Of the 121 patients in the study, only 23 (19%) were seen at least every 4 months. There was no significant difference in BMI change or HbA1c change among those seen ≤4 months versus longer intervals. Of the 33 patients with prediabetes at pre-lockdown, 19 (57.6%) of them progressed to T2D. There was no significant difference in BMI change between those that progressed to T2D and those that did not progress to T2D.

Conclusions: This study identified an increase in BMI over time and disease progression in more than half of youth with prediabetes. However, the lockdowns did not have a significant impact on the BMI or HbA1c of youth with prediabetes or T2D in our practice. While these findings may be impacted by decrease in visit frequency, further work is needed evaluating individual factors, such as diet and activity, to better understand the risk factors for disease progression.

Improving Point-of-Care Ultrasound Utilization in the Pediatric Emergency Department

Julie Klensch, MD
Co-Author(s): D. Elmore, DO; E. Wadih, MD; J. Said, DO; P. Khalil, MD; B. Hart, MD
Presentation Category: Original Research

Introduction: Numerous studies have shown that Point-of-Care Ultrasound (POCUS) utilization in the emergency department improves diagnostic accuracy, shortens length of stay, and decreases radiation exposure associated with other imaging modalities. There is also data to suggest quality improvement initiatives have successfully increased utilization of POCUS by residents. The aim of this study was to identify and address areas for improvement in POCUS use by pediatric emergency medicine (PEM) physicians. The primary objective was to increase PEM physician confidence in obtaining POCUS cardiac and lung exams and increase confidence utilizing the department's touchscreen Mindray ultrasound machine. The secondary objective was to determine whether the use of target instructional videos increases number of cardiac and lung POCUS scans performed.

Methods: The study was a Quality Improvement (QI) project. A pre-intervention survey was used as a needs assessment and determined areas of interest including confidence obtaining cardiac and lung POCUS scans and utilization of the Mindray ultrasound machine, a touchscreen device newer to the department. PEM fellows worked with ultrasound leadership to produce short instructional videos on the specific areas of interest. Videos were distributed via email and links were also made available via QR code which were attached to both ultrasound machines in the emergency department. To facilitate compliance, fellows performed a brief, 5-question assessment of attending to assess competence on Mindray utilization before and after intervention. Post-intervention survey to assess physician confidence before and after intervention using 5-point Likert scale was then completed. Lastly, a retrospective chart review of Qpath was completed to review ultrasound counts in the 6 months before intervention and the 6 months after intervention.

Results: The initial pre-intervention survey was sent to all PEM physicians, including fellows. With responses from 23 of 30 targeted physician's areas of interest were identified. After video intervention, 14 of 18 targeted attendings successfully completed the 5-question competency assessment on Mindray use and 12 of 18 physicians completed the follow up survey. Average physician confidence increased on 5-point Likert scale by 0.82 for performing cardiac ultrasound, 1.27 for performing lung ultrasound and 1.1 for using Mindray machine. The increase in confidence level were found to be statistically significant for cardiac ($p=0.007$) and lung ($p=0.006$) ultrasound and Mindray utilization ($p=0.01$) using Wilcoxon Signed Rank Test. Monthly cardiac ultrasounds did increase after intervention ($p= 0.019$) while lung ultrasounds did not ($p=0.57$). Interestingly while number of cardiac ultrasounds did increase, the overall proportion of emergency department patients receiving cardiac and lung ultrasound decreased.

Conclusions: Targeted POCUS educational videos can increase PEM physician confidence of certain ultrasound skills. Further investigation is needed to determine whether increased confidence in skill is truly associated with increased frequency of POCUS use.

Developing a Nursing-focused Ultrasound Guided IV Program

Dominique Elmore, DO
Co-Author(s): R. Starr, MD; F. Warkentine, MD; K. Caperell, MD
Presentation Category: Curriculum Development

Background: Upon review of the literature, typical success rates for IV access by bedside nursing is 53% on the first attempt. In pediatric patients, USGPIV access has been shown to decrease the number of attempts, time to line placement, and number of needle redirections. USGPIV also leads to significant reduction in the need for central venous catheter placement. USGPIV success rates have been shown to be equivalent to that of the adult population at approximately 70% success, which is variable depending on the operator's prior PIV placement experience. Prior studies estimated that for those who incorporate USGPIV placement into their practice, it takes 10 USGPIV attempts post-training to achieve the 70% success rate. Dedicated USGPIV training for both nurses and physicians has been shown to improve knowledge, confidence, and utilization of USGPIV placement. Current hospital protocol reflects no data collection on success rates of IV access since there is no concrete USGPIV program in the emergency department. Nurses frequently request the VAT team if they lack the confidence to stick on the first attempt or the patient is medically fragile or critically ill.

Methods: My aim is to develop a sustainable ultrasound guided nursing intravenous access program. Initially we plan to include our Trauma Nursing Leads, then expand the program to incorporate the program into nursing core competency. Hopefully, this will increase comfort and skill level by at least 20% among nurses with obtaining IV access. Nurses will complete pre-and post-surveys containing a 5-point Likert scale to assess their comfort level and 4 yes/no questions regarding their ability to utilize the ultrasound machine. My goal for this study is to develop a pathway with teaching sessions and hands on learning for nurses. Nurses should be able to obtain five successful IV sticks: two supervised and three independent successes.

Results: In total, 8 nurses completed the survey and training. Seven nurses were from the emergency department, and only one was from the IV team. Preliminary data showed only one of the nurses displayed comfort with using the ultrasound machine, had used the ultrasound machine previously, and subsequently displayed successful placements the IV. Six of the participants were able to correctly identify the machine. None of the participants were able to correctly access the worklist and only one was able to name the correct probe used to obtain USGPIV.

Conclusions: Preliminary data reflected a strong need for a program to educate our nurses on ultrasound guided intravenous access. Post-survey data collection will take place in July (2023) at the end of the pilot program. Once the eight participants achieve competency in the pilot program, additional education will expand into a core nursing-competency for all nurses.

Comparison of Prevalence of Depression in A General Pediatrics Clinic and A Pediatric Rheumatology Clinic

Lucy Aldridge, DO
Co-Author(s): K. Schikler, MD
Poster Category:

Introduction: Previous research suggests that pediatric rheumatology patients are at increased risk for anxiety and depression. The prevalence of mental health disorders in pediatric rheumatology patients is not well established, though studies suggest that prevalence of depression in the general adolescent pediatric population is between 4-10%. However, mental health screening (e.g., PHQ-9) is not routinely performed in subspecialty settings. This study compares the number of positive PHQ-9 screenings in general outpatient pediatric clinic and pediatric rheumatology clinic patients.

Methods: Data was collected using retrospective chart review of patients 12-18 years of age who have completed a PHQ-9 either in rheumatology (n = 95) or general pediatrics clinic (n = 95). Patients in rheumatology clinic required a diagnosis of rheumatologic disease. Patients in pediatric general clinic included acute visits and well child checks. Prevalence at of positive PHQ-9 scores (5 or above) at each clinic was then calculated and compared using t-test in Microsoft excel.

Results: Among patients with a documented PHQ-9, 38/95 (40.0%) patients seen in rheumatology clinic and 46/95 (48.4%) patients seen in general pediatrics clinic had a positive score (p = 0.25). Raw PHQ-9 scores were also compared across clinics, with general clinic patients scoring 550 and rheumatology patients scoring 510 (p = 0.62). Of interest, both clinics had higher prevalence numbers for depression than previously reported prevalence for this population, with nearly half of screened adolescents reporting depressive symptoms.

Conclusions: While the proportion of patients with a positive PHQ-9 and raw PHQ-9 scores were slightly higher in general pediatrics clinic patients compared to rheumatology clinic patients, there was no statistically significant difference between these groups. However, both groups had a high prevalence of depressive symptoms. Factors such as social determinants of health in this population, the COVID-19 pandemic, and its broader effects on mental health, and/or true increasing prevalence of depression, could be contributory to these results. These results indicate that both general pediatric and pediatric rheumatology populations are in need of mental health support.

Comparison of Depression Prevalence in Pediatric Rheumatology Clinic Versus General Pediatrics Clinic

Lucy C Aldridge, DO; Kenneth Schikler, MD

Norton Children's and the University of Louisville School of Medicine
Louisville, Kentucky

BACKGROUND

- Mental health screening is not regularly performed in subspecialty settings
- Pediatric rheumatology patients have increased risk of depression, but the exact prevalence of mental health disorders in pediatric rheumatology patients is not well-established.

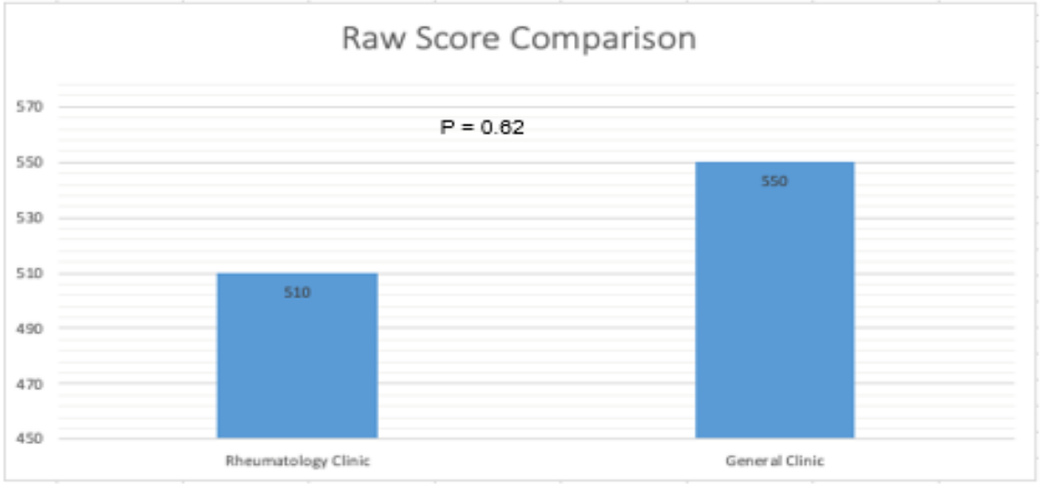
AIMS

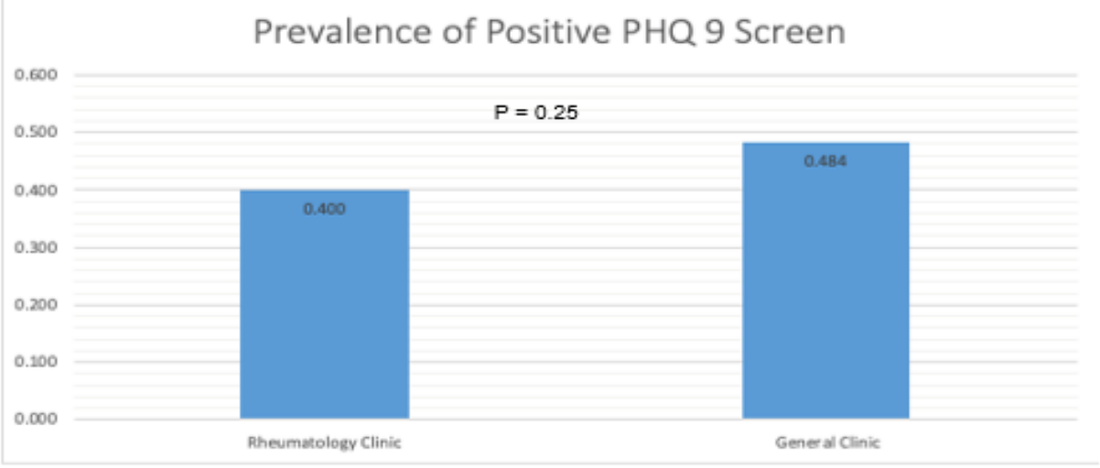
- To compare rates of positive depression screening among patients seen in a general outpatient pediatric clinic and pediatric rheumatology clinic

METHODS

- Retrospective chart review, included patients ages 12-18 with a completed Pediatric Health Questionnaire-9 (PHQ-9)
- 95 patients from general pediatric clinic
  - Selected from acute care visits, well checks
- 95 patients from pediatric rheumatology clinic
  - Required diagnosis of rheumatologic disease
- For each group, calculated:
  - Prevalence of positive PHQ-9 (score 5+)
  - Overall raw PHQ-9 score (total among all patients)
- Proportion of patients with positive screen and overall raw scores compared between groups using student's t-test
- Excluded patients with previously diagnosed depression

RESULTS





DISCUSSION

- While the proportion of patients with a positive PHQ-9 and raw PHQ-9 scores were slightly higher in general pediatrics clinic patients compared to rheumatology clinic patients, there was no statistically significant difference between these groups.
- Both groups had a high prevalence of depressive symptoms than previously reported for this population.
- Factors such as social determinants of health, the COVID-19 pandemic and its broader effects on mental health, and/or true increasing prevalence of depression, could be contributory to these results.

LIMITATIONS

- This was a random sample and thus our sample may not be truly reflective of each population
- Sometimes parents fill out screening tools for their children
- PHQ-9 is a screening tool

CONCLUSIONS

- Patients with and without chronic disease both demonstrated elevated rates of depressive symptoms than studied prevalence suggest.
- These results indicate that both general pediatric and pediatric rheumatology populations are in need of mental health support.

Assessing Impact of Hospital Sleep Environments on Parental Attitudes About Safe Sleep

Noell Conley Hamlin, DO
Co-Author(s): K. West, DO; J. Desmarais; R. Hart, MD; B. Woomer, MD
Poster Category:

Background: Despite the American Academy of Pediatrics safe sleep recommendations published in 2016, hospitalized infants often sleep in unsafe environments. Healthcare professional behavior is known to influence parental behaviors; but little is known about the modeling relationship between the sleep environment during hospitalization and home.

Aims: To describe parental sleep practices and attitudes regarding safe sleep environments for infants, sleep practices that parents witnessed during hospitalization, and how witnessed practices may affect home sleep practices.

Methods: We conducted a pilot, qualitative study using semi-structured interviews with families of infants aged 0-12 months who were admitted to a general pediatrics service. Infants admitted for suspected NAT, neurosurgical patients, prematurity < 32 weeks, chronic lung/heart disease, tracheostomy/ventilator dependence, and patients admitted for video EEG were excluded. Interviews occurred at three time points: at admission, day of discharge, and 2 weeks after discharge. The study aimed to recruit 20 parents based on feasibility of resident physician ability to complete interviews. Demographic information is reported using standard descriptive statistics. Thematic analysis identified themes regarding sleep practices and attitudes surrounding hospital stay.

Results: 30 parents were approached. 28 completed the admission interview, 19 completed the discharge interview, and 11 completed the post-discharge follow up interview. Of those who completed admission interviews, 86% identified as Caucasian and 10.7% identified as African American. 92.88% of parents had at least completed high school. Admission interviews demonstrated general knowledge of safe sleep recommendations, with reports of infant sleep in a supine position at home in a crib or bassinet. However, another key theme that emerged from admission interviews was the use of additional items in infant sleep spaces at home including blankets/pillows. Discharge and follow up interviews demonstrated themes linking observed unsafe sleep practices during admission (additional items in the crib such as blankets or unused medical devices and head of bed elevation in hospital). Some parents admitted that the witness of these behaviors, namely, elevation of the head of the bed, led them to adopt these behaviors at home.

Conclusion: Sleep practices during infant hospitalization were directly linked to parental plans to copy unsafe sleep behaviors in the home setting in this pilot cohort. Appropriate safe sleep environments during hospitalization are critical for family education and advocacy.

Assessing Impact of Hospital Sleep Environments on Parental Attitudes About Safe Sleep

A. Noell Conley Hamlin, DO; Kaitlyn West, DO; Jack Desmarais, MS4; Rebecca Hart, MD MSc; Bethany Woomer, MD
Norton Children's and the University of Louisville School of Medicine

BACKGROUND

- Despite American Academy of Pediatrics 2016 safe sleep recommendations, hospitalized infants often sleep in unsafe environments.
- Little is known about how the modeling relationship of hospital sleep environments may influence home practices.

AIMS

- To describe parental attitudes and behaviors related to:
  - Safe sleep environments
  - Sleep environments witnessed during hospitalization
  - Influence of hospital environments on home sleep practices

METHODS

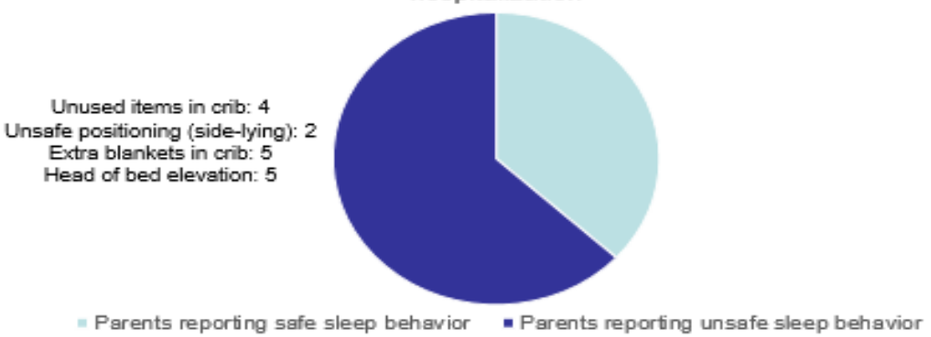
- Semi-structured interviews with families of infants up to 12 months admitted to general pediatrics service
- Exclusion criteria: non-accidental trauma, prematurity (<32 weeks), neurosurgical patients, chronic heart or lung disease, video EEG admissions, or tracheostomy/ventilator dependence
- Interviews conducted at admission, discharge, and 2 weeks after discharge

RESULTS

Table 1: Significant Themes and Quotes

Topic	Emerging Theme	Quote
Practices observed during admission	Unnecessary items in sleep space Head of bed elevation	"What I saw differed a lot from home; we are very by the book about safe sleep. I felt my son's environment was not safe.... I was also very worried about cords and patient getting tangled in them"
Planned changes to home sleep environment	Head of bed elevation	"We might prop the bed up to help with congestion" "We will elevate the head of the bed until the crud clears"
Changes in sleep practices since hospitalization	Head of bed elevation	"We tried to prop head of bed, still wouldn't sleep through the night, went back to sleeping on dad's chest or with parent in bed" "We propped the head of bed but lower than what the hospital did to help wit congestion while she was getting over RSV. Then went back to keeping it flat."

Figure 1: Proportion of unsafe sleep practices witnessed during hospitalization



CONCLUSIONS

- Sleep practices during infant hospitalization were directly linked to parental plans to copy unsafe sleep behaviors in the home setting in this pilot cohort.
- Appropriate safe sleep environments during hospitalization are critical for family education and advocacy.
- This pilot study will help direct interventions for further quality improvement initiatives in our children's hospital.

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Outcomes of Lifestyle Counseling in Nonalcoholic Fatty Liver Disease Among Rural Versus Urban Pediatric Populations

Veronica Lee, DO
Co-Author(s): K. Jawad, MD; Y. Feygin; T. Temtem, MD
Poster Category:

Background & Aims: Nonalcoholic fatty liver disease (NAFLD) is the most common liver disease in children and adolescents in the United States. First line treatment targets lifestyle counseling addressing diet and physical activity. This study aims to evaluate the outcomes of lifestyle counseling in rural versus urban pediatric patients in Kentucky, as measured by changes in alanine transaminase (ALT) and body mass index (BMI) z-score.

Approach & Results: A retrospective chart review was conducted at a gastroenterology outpatient clinic. Patients with NAFLD who received lifestyle counseling were divided into rural versus urban subgroups defined by the United States Department of Agriculture Rural-Urban Continuum Codes (USDA RUCC). Primary outcomes were defined as changes in ALT and BMI z-scores between the initial appointment and, 1st and 2nd follow-up appointments. Significant changes in the urban population included a decrease in ALT between the initial and 1st appointment and the initial and 2nd appointment, and a decrease in BMI z-score between the initial and 1st appointment. In the rural population, there was a significant decrease in BMI z-score between the initial and 2nd appointment but no significant change in ALT between any of the appointments.

Conclusions: Treatment for NAFLD with lifestyle counseling continues to show decreases in ALT and BMI z-scores in pediatric patients from urban populations. There was no significant change in ALT in the rural population.

Outcomes of Lifestyle Counseling in Nonalcoholic Fatty Liver Disease among Rural versus Urban Pediatric Populations

Veronica Lee, DO[1,2], Kahir Jawad, MD, MPH[1,2], Yana Feygin, MS[1,2], Tsega Temtem, MD[1,2]
Norton Children's[1] and the University of Louisville School of Medicine[2]
Louisville, Kentucky

BACKGROUND

- NAFLD is the most common liver disease in children and adolescents in the United States, and children with NAFLD have shorter long-term survival and a higher risk of liver transplantation.
- 1st treatment remains targeted at lifestyle counseling addressing diet, and physical activity.
- Decreases in ALT and BMI z-scores are markers of NAFLD improvement.
- Few studies compare outcomes in various populations.

OBJECTIVE

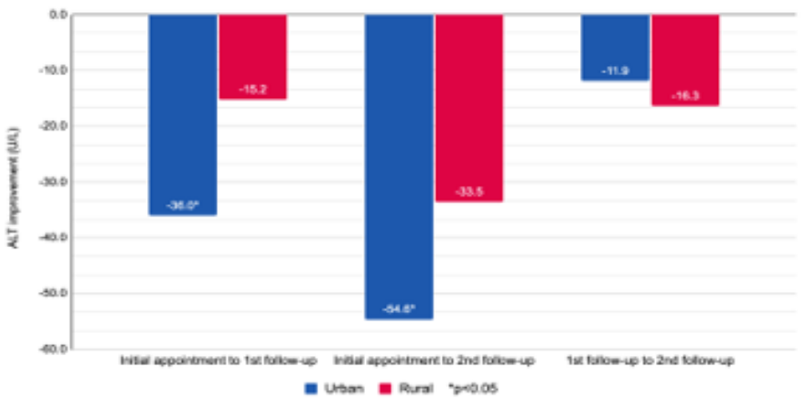
- Determine if there are differences in outcomes between rural and urban populations in pediatric patients with NAFLD who receive lifestyle counseling, as measured by change in ALT and BMI z-score.

METHODS

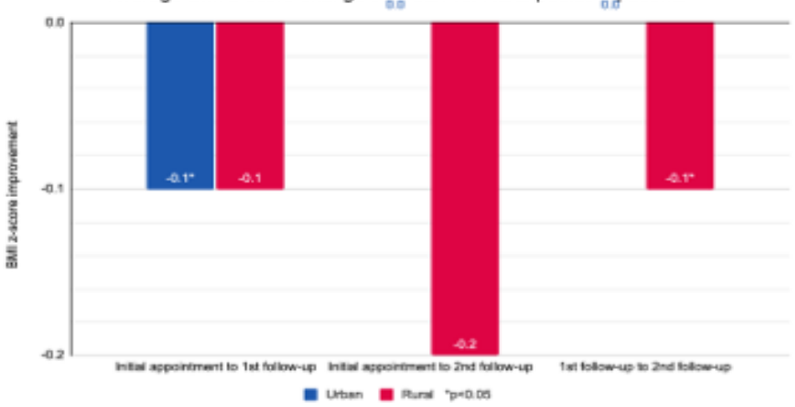
- Retrospective chart review of patients diagnosed with NAFLD who received lifestyle counseling at a single institution from Dec 2020 to Mar 2022.
  - Excluded patients with complicating comorbidities (other liver diseases, hypothyroidism, polycystic ovarian syndrome)
- Patients divided into rural vs. urban subgroups defined by the United States Department of Agriculture Rural-Urban Continuum Codes.
- Primary outcome: change in ALT and BMI z-score
- Secondary outcome: changes among all patients.
- Populations compared via paired t-tests

RESULTS

Average ALT change in Urban vs. Rural pediatric populations



Average BMI z-score change in Urban vs. Rural pediatric patients



DISCUSSION

- Significant decrease in ALT between initial and 1st (p 0.007), and 2nd (p 0.014) follow-up appointments in urban patients.
- Significant decrease in BMI z-score between initial and 1st (p 0.049) follow-up appointment in urban patients.
- No significant decrease in ALT and BMI z-scores between initial and follow-up appointments in rural patients.

Number of pediatric patients presenting to follow-up appointments

Measure	Population	Initial to 1st	Initial to 2nd
ALT	Urban	36	5
	Rural	22	4
BMI z-score	Urban	51	29
	Rural	5	2

CONCLUSIONS

- Treatment for NAFLD with lifestyle counseling continues to show decreases in ALT in pediatric patients from urban counties.
- Although there were no significant decreases in ALT or BMI z-scores in pediatric patients from rural counties, there may be a correlation with poor follow-up.
- There is a need for improved accessibility to lifestyle interventions in rural populations.
- Future steps can include collaboration with primary care providers to ensure patients have close follow-up, primary care provider education on lifestyle counseling, telehealth, transportation support and obesity prevention programs.

Comparing Rates of Lumbar Punctures Preformed on Febrile Infants 29-60 days, Pre- and Post-Implementation of Febrile Infant Algorithm

Benjamin Lyvers, MD
Co-Author(s): N. Warnick, MD, JD; C. Penrod, MD; R. Hart, MD
Poster Category:

Introduction/Background: Febrile infants 60 days and younger are at increased risk of invasive bacterial infections (IBI), and frequently undergo extensive and invasive workup. Significant variation exists when evaluating febrile infants, particularly those older than 28 days. Clinical practice guidelines (CPGs) may decrease practice variability and better identify patients at lower risk for serious infections. In 2020, a CPG for evaluation of febrile infants was implemented in the Norton Children's Hospital ED, including procalcitonin (PCT) and other lab values to determine need for lumbar puncture (LP) in infants 29-60 days old. Little literature exists to establish whether implementation of such a PCT-based algorithm has impacted clinical practice, particularly by reducing rates of LP. We compared the proportion of well-appearing, febrile patients aged 29-60 days presenting to the pediatric ED who underwent LP before and after introduction of a PCT-inclusive algorithm.

Methods: Data was collected via retrospective chart review. We included children age 29-60 days presenting to Norton Children's Hospital (NCH) ED for evaluation of fever (either documented at time of ED visit or reported by parents prior to arrival). Patients were excluded if they had no true fever (temp 100.4 or higher) either at home or in the ED, if they were ill-appearing as documented by the ED provider, or had chronic illness that may increase risk for invasive infection (e.g. immunocompromise).The proportion of patients undergoing LP 1 year before to 1 year after implementation of the CPG was compared using Chi-square testing. Descriptive statistics were utilized to assess the proportion of patients who met criteria to be low, moderate, or high-risk for IBI per the new algorithm, as well as proportion of patients for whom providers followed the recommended treatment plan per the algorithm after implementation.

Results: Of 94 patient charts reviewed, 39 were pre-CPG implementation and 52 post-implementation. Pre-implementation, LP was attempted on 28.9% (11/38) of included patients. Post-CPG, LP was attempted on 11.8% (6/51, $p = 0.053$). There were slightly more patients in the low-risk category and less in the intermediate category in the pre-CPG group (low-risk: 69.7% vs. 57.1% post-CPG, intermediate-risk: 24.2% vs. 30.6%). High-risk patients were similar in both groups (3% pre-CPG vs. 2% post-CPG). Most (94.1%) of cases followed the CPG algorithm's recommended management plan, including 96.4% of low-risk patients, 73.3% of intermediate-risk patients, and 100% of high-risk patients. Of note, the most common failure to follow the algorithm among intermediate-risk patients was the exclusion of recommended viral respiratory testing; if this test were excluded from analysis, 100% of intermediate-risk patients received the recommended management.

Conclusions: We found that use of a PCT-inclusive CPG for febrile infants ages 29-60 days old successfully decreased the use of LP in this cohort, and algorithm-based treatment recommendations were followed in a majority of cases after implementation. It is notable that the pre-implementation group had a larger proportion of lower risk patients, and even so still had a higher percentage of patients with attempted LPs. Future studies with larger sample sizes are warranted to confirm these findings. Of note, we did not establish long-term follow-up to determine if any IBI were missed in this cohort, but this is a planned avenue for future studies.

Comparing Rates of Lumbar Punctures preformed on febrile infants 29-60 days, pre and post implementation of Febrile Infant Algorithm

Benjamin Lyvers MD, Naomi Warnick MD, Cody Penrod MD, Rebecca Hart MD

BACKGROUND

Febrile infants ≦ 60 days are at increased risk of serious invasive bacterial infections (IBI) and historically undergo extensive and invasive blood, urine, and cerebrospinal fluid (CSF) testing.

Significant practice variation exists in the evaluation of febrile infants >28 days

In 2020, a clinical practice guideline (CPG) for evaluation of febrile infants was implemented in the Norton Children's Hospital ED, including procalcitonin (PCT), to more accurately predict which infants (age 29-60 days) are at low risk for serious bacterial infections while decreasing invasive testing.

There has been little investigation as to if this has had any impact on clinical practice or resulted in any reduction in rates of LPs.

METHODS

Retrospective chart review

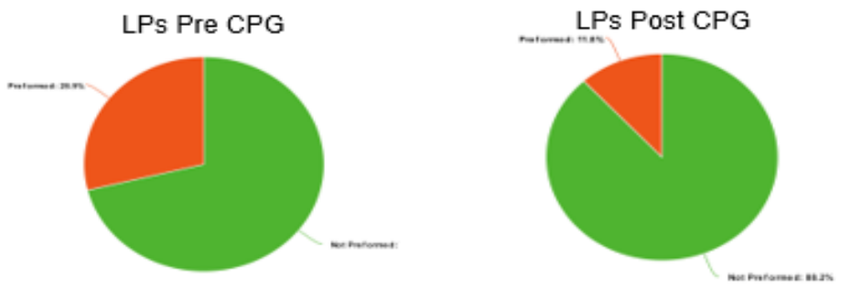
Inclusion criteria:
- Infants 29-60 days old
- Presenting to ED for evaluation of fever (documented at time of ED visit or reported by parents prior to arrival)
- 1 year before to 1 year after implementation of CPG

Exclusion criteria:
- No true fever (temp 100.4 or higher) either at home or in the ED
- Ill-appearing as documented by the ED provider
- Chronic illness that may increase risk for invasive infection (e.g. immunocompromise).

Analysis:
- Proportion of patients undergoing LP pre- and post-CPG compared using Chi-square testing.
- Descriptive statistics assessed proportion of patients who met criteria to be low, moderate, or high-risk for IBI per the new algorithm, and proportion for whom providers followed the recommended treatment plan per the algorithm after implementation.

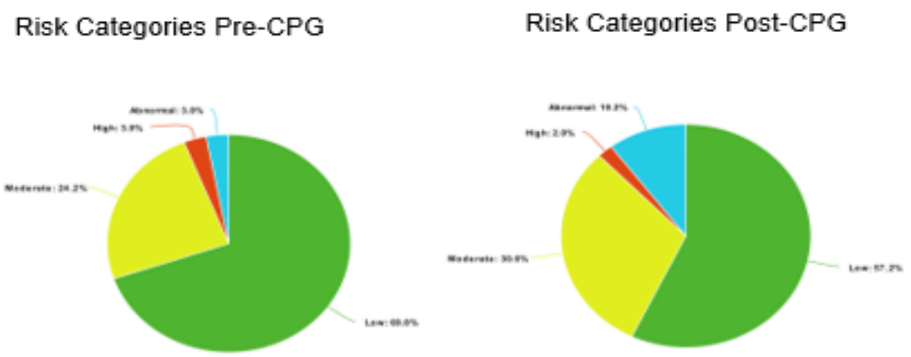
RESULTS

Proportion of Lumbar Punctures Pre vs Post CPG



Prior to implantation of CPG, there was a larger proportion of attempted LPs in this population. Though the difference was not statically significant (P=0.053)

Proportion of Patient's in Risk Categories Pre vs Post CPG



The majority of patients in both groups were categorized as low risk, however this percentage was high prior to CPG implantation. (P=0.57)

CONCLUSIONS

Despite having fewer low-risk patients, the proportion of patients receiving LP decreased after implementation of the CPG (28.9% vs. 11.8%).

CPG treatment recommendations for each risk category were followed the vast majority of the time, suggesting that the algorithm is easy to follow and decreases variations in care.
- Pre-CPG, only 71.1% of cases followed the recommendations from the new-algorithm (excluding PCT)

Inclusion of viral testing led to more variability, potentially due to the COVID-19 pandemic and variations in viral testing that were available at the time.

STRENGTHS/LIMITATIONS

Limited sample size limiting the power to detect statistical significance between the pre- and post-CPG groups.

Implementation of algorithm during the COVID-19 pandemic may have had unforeseen impacts that can not be entirely controlled for, such as an increase in use of forehead thermometers, lower patient census, etc.

Clinical Practice Guideline

Establishment of a Prognostic Immune Signature in Neuroblastoma

Laura Mims, DO
Co-Author(s): J. Chariker, PhD; K. Andrews; J. Zhao, DO; E. Rouchka, DSc; M. Angelo Huang, MD
Poster Category:

Background: Neuroblastoma (NBL) is the most common pediatric extra-cranial solid tumor and exhibits great clinical heterogeneity. High risk patients continue to have a poor prognosis despite multimodal therapy including antibody therapy. It is now well established that the immune system plays a vital role in regulating tumor proliferation as well as response to immunotherapy. Thus, we sought to characterize the immune landscape of NBL.

Objective: To characterize and determine the prognostic value of the tumor microenvironment immune phenotype in NBL.

Design/Methods: We used immune cell fraction estimation analysis to profile the tumor immune microenvironment of NBL samples using RNA-seq data in the TARGET database (N=141). We sought to further characterize the immune profiles of NBL via in silico analysis using previously identified immune signatures, namely the Immunologic Constant of Rejection (ICR), which captures an active Th1/cytotoxic response associated with favorable prognosis, and TCGA immune subtypes.

Results: We found repressed immune cell estimates in MYCN amplified NBL consistent with previous reports. In contrast to previous reports, we found increased M1 macrophages and decreased tumor-associated (TAM) and M2 macrophages in MYCN non-amplified high risk (NA HR) NBL compared to the non-high risk cohort. There was, however, no correlation between overall fractions and overall survival in the entire cohort. While a high ICR score showed no prognostic significance in the entire cohort, a high ICR score was associated with improved overall survival (OS) in HR (HR 0.6, p=0.039) as well as NA HR (HR 0.47, p=0.01), metastatic (HR 0.58, p=0.026), and non-infant NBL (HR 0.61, p=0.04). We clustered NBL samples into 6 immune subtypes (C1-C6) akin to what has been previously described in adult tumors from The Cancer Gene Atlas (TCGA) database. Inflammatory (C3) subtype was associated with best OS (median OS not reached) in NBL. Contrary to what has been described in the adult literature, worst OS was seen in the wound healing (C1) subtype (median OS 40 mos, HR 2.93, p=0.005) and is associated with increased expression of angiogenic genes. The prognostic significance of the C1 subtype held true for all NBL subgroups.

Conclusions: We demonstrate herein that NBL can be classified by ICR and immune subtype. We further provided evidence of the prognostic significance of ICR and immune subtype. Future goals are to validate our findings in larger NBL cohorts and to seek to refine NBL risk stratification by incorporating immune biomarkers.

Establishment of a Prognostic Immune Signature in Neuroblastoma

Laura Mims[1], Julia Chariker[2], Kalina Andrews[2], Jun Zhao[1,3], Eric Rouchka[4], and Michael Angelo Huang[1,3]

[1]Department of Pediatrics, University of Louisville School of Medicine, [2]Kentucky Biomedical Research Infrastructure Network Bioinformatics Core, University of Louisville, [3]Norton Children's Cancer Institute, Affiliated with the University of Louisville School of Medicine, [4]Department of Computer Science and Engineering, University of Louisville

BACKGROUND

- Neuroblastoma (NBL) is the most common pediatric extra-cranial solid tumor and exhibits great clinical heterogeneity
- High risk patients continue to have a poor prognosis despite multimodal therapy
- The immune system plays a vital role in regulating tumor proliferation and metastasis as well as response to immunotherapy
- We sought to characterize and determine the prognostic value of the tumor microenvironment immune phenotype in NBL

METHODS

- Used CIBERSORTx to obtain in silico immune cell fraction estimation of NBL samples using RNA-seq data from the TARGET database (N=140)
- Used previously identified immune signatures, namely Immunologic Constant of Rejection (ICR) and TCGA immune subtypes to further characterize immune profiles of NBL
- ICR captures active Th1/cytotoxic response

STRENGTHS/LIMITATIONS

- Small sample size, restricted to a single dataset
- Not all six TCGA immune subtypes were represented

RESULTS/DISCUSSION

Figure 1. Immune Subtype Classification for MYCN Amp and Risk Group (NBL Pediatric TARGET Samples n=140)

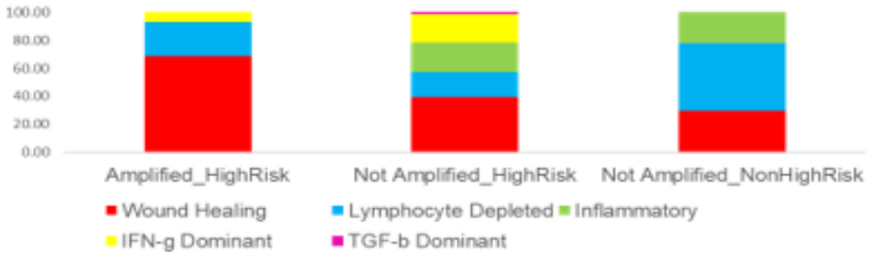
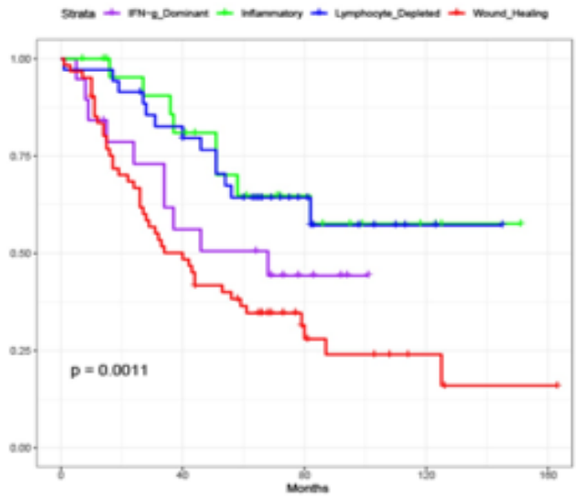


Figure 2. Overall Survival Among TCGA Immune Subtypes



- MYCN non-amplified, high risk cohort: increased M1 macrophages, decreased M2 and tumor-associated macrophages (TAM)
- No correlation between macrophage and lymphocyte immune cell fractions and overall survival in the entire cohort
- **High ICR score was associated with improved overall survival in the following NBL subgroups:**
  - **HR (HR 0.6, p=0.039)**
  - **NA HR (HR 0.47, p=0.01**
  - **Metastatic (HR 0.58, p=0.026)**
  - **Non-infant NBL (HR 0.61, p=0.04)**
- Inflammatory (C3) subtype was associated with best overall survival (OS) in NBL, worst in C1 wound-healing subtype (p = 0.005)
  - Contradicts prior adult literature, but can be explained by increased expression of angiogenic genes in this immune subtype
  - Prognostic significance of C1 subtype true for all subgroups

CONCLUSIONS

- TCGA immune subtypes are highly prognostic for NBL, with unexpected finding of worse outcomes in the wound healing (C1) immune subtype
- High ICR scores had limited prognostic value and was limited to certain NBL subgroups
- Macrophage and lymphocyte immune cell fractions fail to show prognostic relevance in our NBL cohort

Analyzing Antibiotic Use in Tracheitis

Colin Stone, MD
Co-Author(s): S. Multerer, MD; N. Vidwan, MD; J. Stahl, PharmD; V. Montgomery, MD
Poster Category:

Introduction: There has been increasing evidence in the literature showing that shorter antibiotic durations are sufficient for the treatment of bacterial tracheitis. However, there have not been any established treatment guidelines and treatment durations can vary widely. Patients with tracheostomies are at increased risk of tracheitis and can often have multiple tracheal cultures drawn per year. As such, they are often exposed to an increased number of antibiotic days. Repeated exposure to antibiotics can lead to bacterial antibiotic resistance as well as adverse secondary outcomes (acute kidney injury, *Clostridioides difficile* infections, etc.). In response to this, a Quality Improvement group was formed aiming to reduce antibiotic days in tracheitis treatment. This analysis aims to establish baseline data on recent antibiotic use practices at Norton Children's Hospital.

Methods: Culture data from sputum cultures from the years 2021-2022 were collected in a data set and analyzed. Cultures obtained from the emergency department, med-surg general floors, neonatal ICU, and pediatric ICUs were analyzed. Additionally, only cultures labeled as “trach culture” or “trach aspirate” were included in the data set; induced sputum and endotracheal tube aspirates were excluded. Patient demographics, common culture results, and type and duration of antibiotics used were documented using standard descriptive statistics and sub-analyzed by hospital unit. .

Results: 249 trach cultures from 106 unique patients were analyzed. The mean and median patient age was 9 years old. Preliminary results have shown that the most commonly used antibiotics are broad spectrum (vancomycin, cefepime, and ceftriaxone). The predominant culture result was no growth, normal respiratory flora, or mixed flora (78.3%). The units most commonly ordering cultures were the ED (45%) and PICU (36%). Continued analysis will be performed on the number of antimicrobials used per case and the total number of antibiotic days received.

Discussion: Data from the years 2021-2022 reveal that patients with tracheostomies receive an average of five days of broad spectrum antibiotics following collection of tracheal sputum culture. This range, however, is broad. Overwhelmingly, these cultures show no growth or are growing normal respiratory flora. This data will be the foundation of an ongoing quality improvement project to reduce total antibiotic days for patients with presumed tracheitis.

Analyzing Antibiotic Use in Tracheitis

Colin Stone MD, Sara Multerer MD, Navjyot Vidwan MD, MPH,
James Stahl, Pharm.D., Vicki Montgomery MD

Norton Children's and the University of Louisville School of Medicine
Louisville, Kentucky

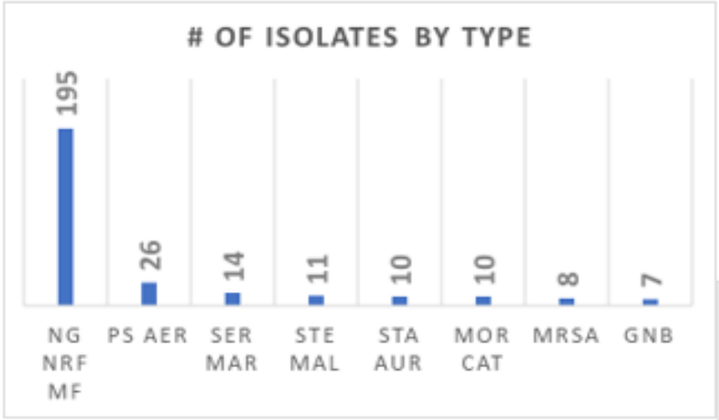
BACKGROUND

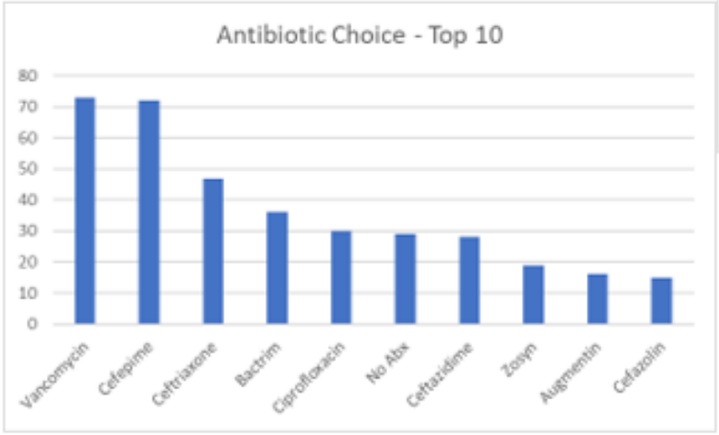
- There is increasing evidence for shorter duration of treatment for bacterial tracheitis, yet much variability remains
- Patients with tracheostomies are at increased risk of tracheitis and are exposed to antibiotics more often
- Increases risk of antibiotic resistance and adverse secondary outcomes
- This analysis aims to establish baseline data on recent antibiotic use practices at NCH

METHODS

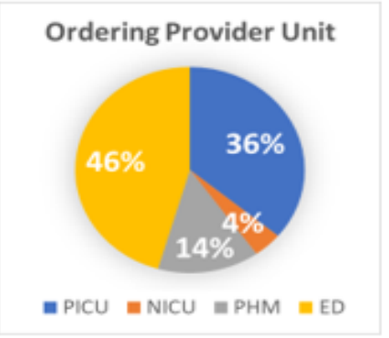
- Data from sputum cultures from the years 2021-2022 reviewed
- Cultures from ED, Med-Surg, NICU, and PICU included
- Induced sputum and ETT aspirates excluded
- SOMETHING ABOUT HOW YOU ANALYZED THE DATA HERE

RESULTS





- 246 trach cultures from 106 unique patients
- Avg # Abx days = 5 (range 0-59)
- Avg # different Abx = 2 (range 0-8)



- 78% of cultures were NG, NRF or mixed flora
- Most frequent abx used are broad-spectrum.
- No abx chosen in 29 cases

CONCLUSIONS

- Data from NCH from 2021-2022 suggest that patients with tracheostomies receive an average of 5 days of broad-spectrum antibiotics following collection of tracheal sputum culture
- Most culture results show no growth, normal respiratory flora, or mixed flora
- This data will be the foundation of an ongoing QI project to reduce total antibiotic days for patients with presumed tracheitis
- Future steps include analysis of diagnostic criteria for tracheitis, education for prescribers on reducing antibiotic usage, and PDSA cycles for reduced treatment durations for tracheitis

REFERENCES

TBD

The Significance of Electrocardiogram Abnormalities in Patients with Acute Covid-19 Infection

Andrew Van Hersh, DO
Co-Author(s): K. Jawad, MD; Y. Feygin; C. Johnsrude, MD; S. Dasgupta, MD
Poster Category:

Background: Covid-19 infection may impact the cardiovascular system resulting in abnormal electrocardiographic (EKG) findings. Anecdotally, we observed EKG abnormalities in pediatric patients with acute Covid infection without more significant cardiac disease requiring cardiology follow-up/intervention. We sought to describe EKG findings and correlations with cardiac pathology (including abnormal echocardiogram, ECMO requirement, progression to heart transplant or death) in pediatric patients with acute Covid infection. We hypothesized that EKG abnormalities do not always correlate with significant cardiac pathology in this cohort.

Methods: We conducted a retrospective chart review of 209 patients (0-21 years) diagnosed with Covid-19 by RT-PCR with an EKG during the same encounter (excluding patients with known congenital heart disease). Primary objectives included death, ECMO, and heart transplantation. Secondary objectives included description and correlation of EKG abnormalities with echocardiogram findings, hospital/ICU length of stay, and cardiac biomarkers. Descriptive analyses were utilized to summarize the derivative cohort characteristics. A measure of frequency with corresponding percentages were used for categorical data, and median and the interquartile range was utilized for continuous variables, all of which were non-normally distributed.

Results: EKG abnormalities were identified in 84 (40%) patients. Echo was performed in 28 (13.4%) patients with 1 being abnormal, considered an incidental finding. The most common EKG abnormality was non-diagnostic ST-T wave abnormalities more suggestive of underlying disease. All patients with a normal EKG had normal serum troponin and BNP values. There was 1 death with no patients requiring hospital admission, ECMO, or heart transplantation. A normal EKG had a 100% sensitivity and negative predictive value in predicting a normal echocardiogram.

Conclusion: The incidence of adverse outcomes and abnormal echocardiograms in patients with acute Covid-19 infection with EKG abnormalities was low in this cohort. A normal EKG, along with a normal serum troponin and BNP is reassuring for the absence of cardiac pathology.

The Significance of Electrocardiogram Abnormalities in Patients with Acute Covid-19 Infection

Andrew Van Hersh DO, Kahir Jawad MD MPH, Yana Feygin MS, Christopher Johnsrude MD MS, Soham Dasgupta MD

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Louisville, Kentucky

Authors have no financial relationships to disclose

BACKGROUND

- Covid-19 infection may impact the cardiovascular system resulting in abnormal electrocardiograms (EKG).
- The incidence of Covid-19 myocarditis is reported to be ~ 150/100,000 patients.[1]
- Anecdotally, we observed EKG abnormalities in pediatric patients with acute Covid-19, without significant echocardiogram abnormalities.
- Hypothesis: EKG abnormalities do not always indicate significant heart disease by echo in this cohort.

OBJECTIVES

- Determine incidence of EKG abnormalities in patients initially presenting to the ED with acute Covid-19 infection.
- Determine if EKG findings in these patients correlate with other evidence of cardiac pathology or outcomes (hospital length of stay, ICU admission, death, ECMO, or heart transplant).

METHODS

- Retrospective chart review:
  - Patients aged 0-21 years.
  - Diagnosed with Covid-19 by RT-PCR (March 2020 – November 2021).
  - An EKG during the same encounter, the initial EKG was evaluated.
- Exclusion criteria - known congenital heart disease.

RESULTS

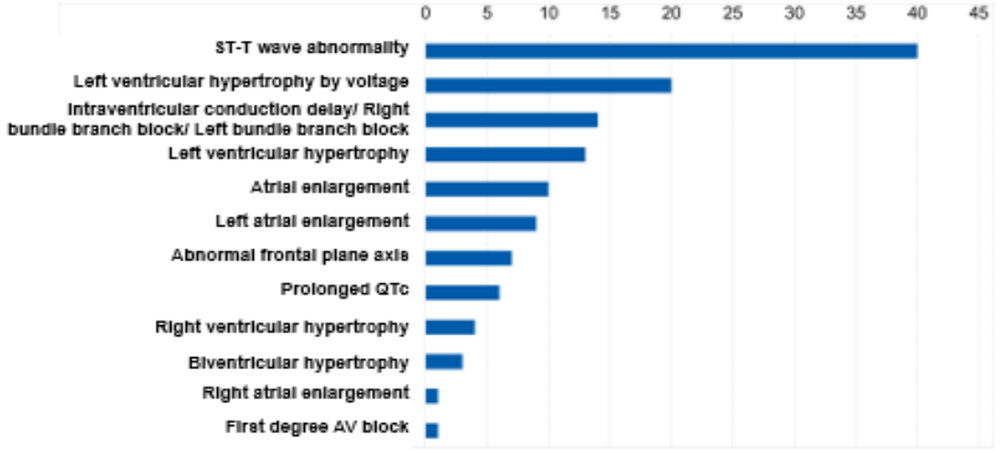


Figure 1: Relative % of EKG Findings in Acute Covid-19 Infection

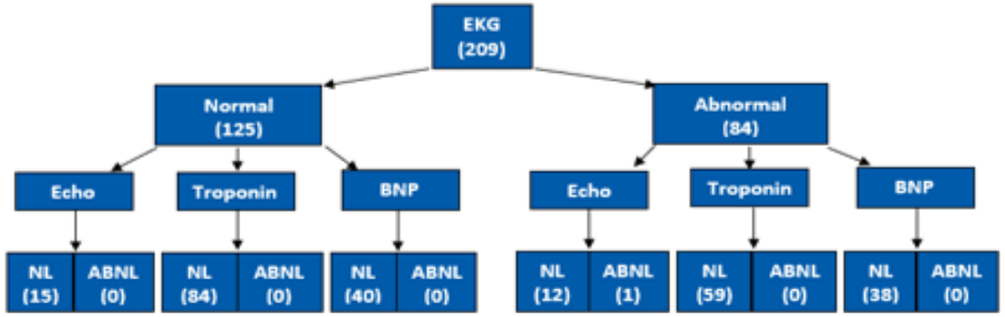


Figure 2: ECHO, troponin and BNP findings in patients with normal or abnormal EKGs

- 209 patients met inclusion criteria.
- EKG abnormalities were identified in 84 (40%) patients.
  - Most common: ST-T wave abnormality (42%) **(Fig. 1)**
- Echo was performed in 28/212 (13.4%) patients; 1 was abnormal.
  - Classified as incidental, unrelated to the EKG abnormality
    - Mitral valve prolapse with mild-moderate mitral regurgitation..
- No patients required ICU admission, ECMO, or heart transplant.
- One death due to acute respiratory failure triggering cardiopulmonary arrest in the ED.
  - No echo had been performed.
- A normal EKG in predicting normal echo findings:
  - 100% sensitivity
  - 100% NPV
- 143/209 (68%) patients had a troponin and 78/212 (37%) had a BNP level **(Fig. 2).**
- No patients had abnormal serum troponin or BNP values

CONCLUSIONS

- The incidence of adverse outcomes and abnormal echocardiograms in patients with acute Covid-19 infection with EKG abnormalities was low in this cohort.
- A normal EKG, along with a normal serum troponin and BNP is reassuring for the absence of cardiac pathology.

[1]Boehmer TK, Kompaniyets L, Lavery AM et al. Association Between COVID-19 and Myocarditis Using Hospital-Based Administrative Data — United States, March 2020–January 2021. September 3, 2021 / 70(35);1228–1232.

Assessment of Family Planning Readiness in Transgender Youth

Ryan Conard, MD
Co-Author(s): L. Folsom, MD
Poster Category:

Background: Transgender individuals identify with a gender incongruent with the sex assigned at birth. Some seek medical care in the form of gender affirming hormone therapy (GAHT) or gender affirming surgery (GAS). GAHT initiated in adolescence may include Gonadotropin Releasing Hormone (GnRH) analogues and cross-sex hormones. Barriers to family planning in this population include low utilization of cryopreservation and decisional regret. There is a paucity of data on the risk of infertility with GAHT, and on the degree to which transgender adolescents feel informed about fertility and family planning options.

Objectives: To assess knowledge regarding options for family planning and fertility preservation in transgender adolescents treated with GAHT in a pediatric endocrinology gender clinic. The goal is to enhance patient education about potential effects of GAHT on fertility and options for family planning.
Patients were divided into groups based upon the percentage of NIV days spent on bCPAP (as compared to HFNC). Group A had the lowest proportion of bCPAP days, while group D had the highest percentage. Charges were converted to cost by utilizing cost to charge ratio from the Kentucky Labor Cabinet. Potential cost savings were estimated by converting applied costs for HFNC to bCPAP. Descriptive statistics were used to compare groups.

Methods: 41 adolescent patients aged 10 years and older treated with GAHT in an urban outpatient pediatric endocrinology clinic were surveyed from January to June 2022. Survey questions were multiple choice, Likert scale, and open-ended. Participants were at least 10 years of age, actively followed in the clinic, and receiving GAHT at time of enrollment.

Results: 41 participants completed the survey. Four (10%) expressed interest in discussing family planning with their provider at the time of survey completion. 18 (45%) were open to discussion in the future; 16 (39%) were not interested at all. 13 (32.5%) participants were planning for future parenthood, and 16 (40%) participants were undecided. Of those interested in parenthood 7 (53.8%) planned to adopt or foster. Barriers to family planning expressed included financial concerns, potential need to pause GAHT, and social stigma of transgender parenthood. 20 (50%) participants reported prior family planning discussion with their endocrinologist.

Conclusions: Despite routine family planning discussions documented during visits, these may not be optimally impactful given that 50% of participants did not recall the conversations. Family planning appears to be of lower priority in this population as most desired to postpone discussions with their provider despite undergoing treatment that could influence fertility. It is essential to identify methods to engage transgender youth in family planning discussions.

Assessment of Family Planning Readiness in Transgender Youth in an Urban Multi-Disciplinary Gender Clinic

Ryan Conard MD, Lisal Folsom MD, MS

Norton Children's, University of Louisville School of Medicine
Louisville, Kentucky

BACKGROUND

- Transgender (TG) individuals identify with a gender incongruent with the sex assigned at birth.
- TG individuals may pursue medical treatment, including gender affirming hormone therapy (GAHT) or gender affirming surgery (GAS).
- Known family planning barriers include low utilization of cryopreservation and decisional regret.
- Objective: assess our local population's knowledge of family planning options; identify barriers and areas to improve.

METHODS

- 41 TG adolescent patients aged 10 years and older treated with GAHT in an urban outpatient pediatric endocrinology clinic were surveyed over a 6-month period from January 2022 to June 2022.
- Survey questions were multiple choice, Likert scale, and open-ended.

STRENGTHS/LIMITATIONS

Strengths:
- Open-ended questions
- Surveyed population reflects clinic population

Limitations:
- Self-report; lack of EMR confirmation
- Lack of parental survey responses

RESULTS

Participant Demographics	
Average Age (years)	17.8
Median Age (years)	18
Sex	**Frequency**
Male	12 (30%)
Female	28 (70%)
Gender Identity	**Frequency**
AMAB	12 (30%)
AFAB	28 (70%)
Male	21 (52.5%)
Female	9 (22.5%)
Non-Binary	10 (25%)
GAHT Use	**Frequency**
Testosterone only	24 (60%)
Testosterone and GnRHa	3 (7.5%)
Estrogen only	3 (7.5%)
Estrogen and GnRHa	9 (22.5%)

Table 1. 41 participants surveyed.

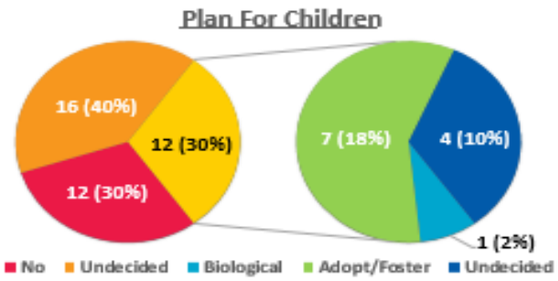


Figure 1. Only 1 participant underwent cryopreservation (sperm). TG identity did not affect family planning goals for 25 (63%) participants

Figure 2. 50% of participants recalled having had a conversation regarding family planning

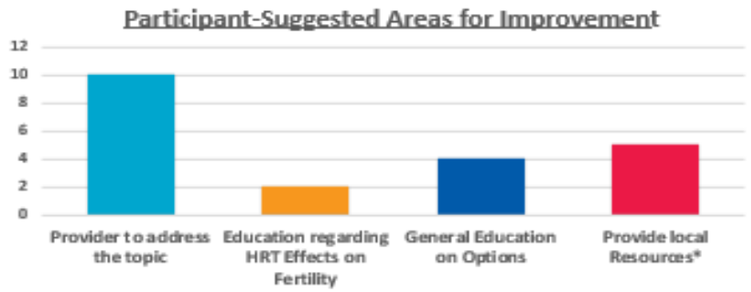


Figure 3. *Adoption agencies, support groups, parenting classes

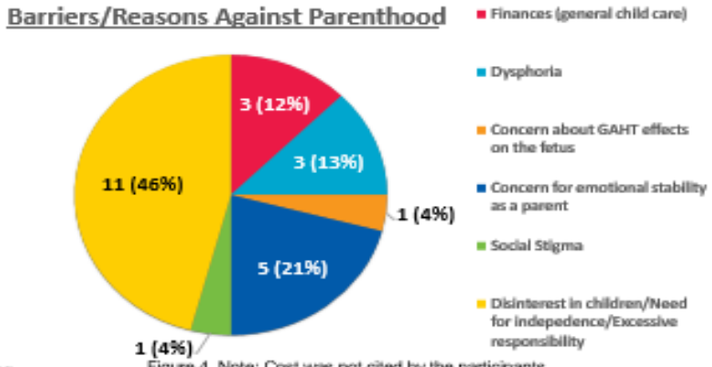


Figure 4. Note: Cost was not cited by the participants

CONCLUSIONS

- Routine family planning discussions are not optimally impactful given that 50% of participants did not recall the conversations.
- Family planning is of lower priority for TG youth, as many desired to postpone discussions despite electing for treatment that could influence fertility.
- Providers should actively identify novel methods to engage TG youth in discussions related to family planning before and during GAHT.

Acknowledgements

- Dr. Suzanne Kingery, MD
- Dr. Rebecca Hart, MD
- Ancillary staff at the PAGE Program

Improving Resident and Nursing Communication in a General Pediatric Ward

Valerie Hummel, MD
Co-Author(s): A. Power, MD; N. Vidwan, MD; E. Tan, MD
Poster Category:

Background: Effective and efficient resident and nursing communication is critical for optimal patient care. Direct communication devices, such as Vocera badges, allow for relatively quick and easy response rates. However, they also result in frequent interruptions leading to care disruption and task-switching which is known to cause errors. Having a way to communicate non-emergent needs between nurses and residents with fewer interruptions and a written task list via the EPIC chat feature may be one means of less intrusive communication. This has not yet been widely utilized at Norton Children's Hospital. However, we expect that increased use of the EPIC chat feature by nurses and residents will decrease Vocera call interruptions for non-emergent needs, increase communication satisfaction, and decrease the number of missed/forgotten tasks.

Methods: Baseline data was collected prior to intervention including: The average number of Vocera calls received by wards residents during the hours of 0800 and 1200 over 1 month prior to intervention. Survey results from nurses and residents regarding: communication satisfaction scores, reported missed/forgotten tasks, knowledge of the EPIC chat feature, and preference for Vocera call or EPIC chat message.

Results: Vocera data collection from 2/13-3/12 (Block 9), indicates residents on wards collectively received an average of 52 calls (or 13 calls per hour) during morning rounds (0800-1200). Baseline surveys were completed by 19 residents and 33 nurses. The average resident communication satisfaction score was 2.94, which is lower than the average nursing communication satisfaction score of 4. Residents report a median of 1 missed/forgotten task per day, while nurses report a median of 2 missed/forgotten tasks per day. 84% of residents would prefer an EPIC chat message rather than a Vocera call for a simple task request, while only 51% of nurses prefer EPIC chat.

Discussion/Conclusion: While the EPIC chat feature has not yet been widely utilized at Norton Children's Hospital, baseline data from our QI project indicates that the majority of wards residents would prefer to receive chat messages for simple order requests or communication. This may improve resident communication satisfaction scores which are currently a full point lower than nurses on average. This may also help to reduce missed/forgotten tasks by residents as reported by nursing staff which are currently at a median of 2 per day by providing residents with a written list of task items in their EPIC chat inbox. Further PDSA cycles with interventions for education and ease of use will likely continue to improve these process measures over time.

Improving Resident and Nursing Communication in a General Pediatric Ward

Valerie Hummel, MD; Amelia Power, MD; Navjyot Vidwan, MD; Emily Tan, MD
Norton Children's and the University of Louisville School of Medicine

BACKGROUND

- Effective resident and nursing communication is vital for patients
- Vocera is quick, but often intrusive and leads to frequent task-switching
- EPIC chat may be able to decrease interruptions in care and increase communication satisfaction

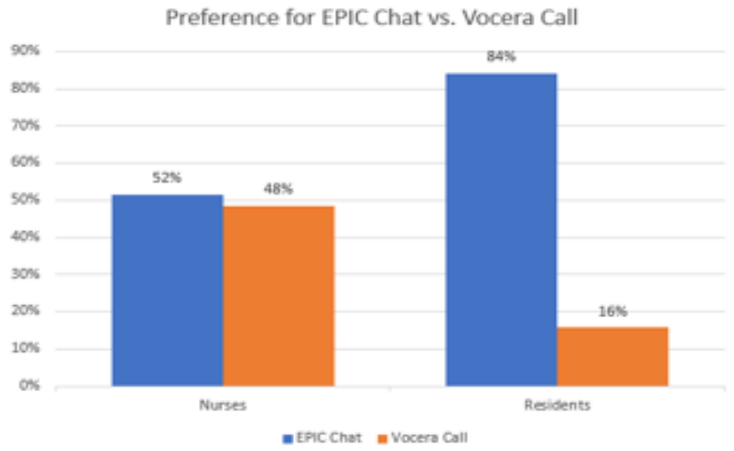
METHODS

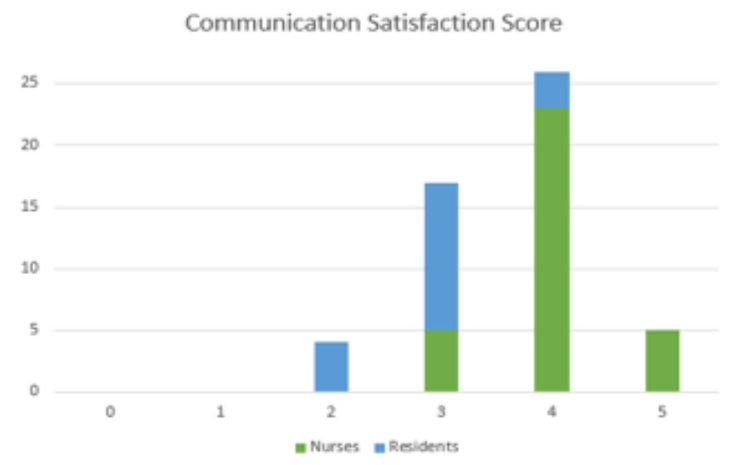
- Baseline Vocera data for calls made to wards residents was obtained
- Baseline surveys from nurses and residents were obtained regarding communication satisfaction and preference for Vocera vs EPIC chat

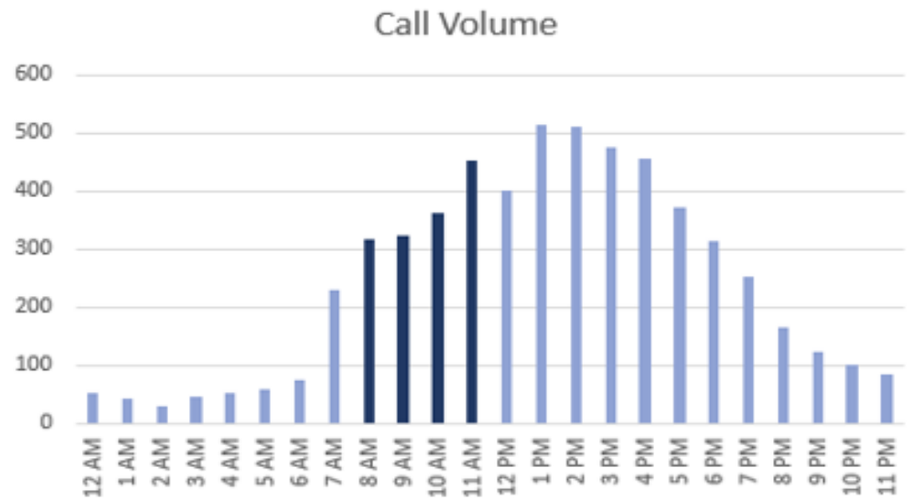
FUTURE INITIATIVES

- Further PDA cycles to increase understanding & use of EPIC chat
- Education with nursing/residents for effective & efficient communication

RESULTS







CONCLUSIONS

- Residents are burdened with a high Vocera call volume: They collectively receive an average of 13 calls per hour during morning rounds (0800-1200)
- Residents tend to prefer an EPIC chat message for simple requests from nurses, while nursing preference is split evenly
- Use of EPIC chat by nurses may improve resident communication satisfaction scores which currently average a full point lower than nursing

Improving Resident Physician Competency with Food Insecurity Screening (FIS) and Increasing Frequency of Screening in the Inpatient Setting

Kyndall Smith, MD
Co-Author(s): M. Kurbasic, MD; R. Hart, MD
Poster Category:

Purpose: Over the past decade, there has been increasing data on food insecurity (FI) and its impact on children's health. Several studies have analyzed FI screening in the outpatient setting, but data is scarce regarding screening of hospitalized patients. We sought to improve pediatric resident physician competency with FI screening, improve knowledge regarding resources available for patients living in food insecure households, and to increase the frequency of FI screening (FIS) in hospitalized patients by 10%.

Design/Methods: An initial survey including self-reported physician comfort level and competency with FIS, frequency of screening, and knowledge of resources was distributed to pediatric resident physicians in a mid-sized residency program (n=53). An educational module on FI was distributed to participants and the standardized "Hunger Vital Signs (HVS)" were added to the hospital admission note template. A follow-up survey was sent to respondents after completing the educational module. Retrospective chart review of hospitalized patients was performed both pre- and post-intervention to analyze the frequency of documentation of FIS.

Results: Of the 53 residents who completed the initial survey 37 (69.8%) completed a 3-month follow-up survey *[Table 1].* On the initial survey, zero respondents reported screening patients for FI upon hospital admission. Following the interventions, 14/37 (37.8%) respondents reported that they "always" or "usually" ask the HVS upon hospital admission. Additionally, 15 (39%) respondents reported identifying a patient who screened positive for FI in the previous month. Self-reported confidence levels also improved, with 43.2% of residents reporting they felt "very confident" with screening and discussing the topic with patients after interventions, vs. 23.1% on initial survey (p= 0.21). Knowledge assessment scores improved after completion of the educational module from 50% correct responses to 76.3% (p= 0.14) *[Figure 1].* On chart review, 0/634 (0%) inpatient admissions had documentation of FI screening in March 2020 compared to 71/665 (10.6%) in March 2022 post-interventions.

Conclusions: Implementing an educational module improved resident competency with screening for FI and subsequently led to an increase in the frequency of screening patients admitted to the hospital by 10.6%. Ongoing monitoring of screening rates will be key to continue increasing FIS over time. By increasing the frequency of FIS in hospitalized patients, we hope to be able to assist families who may not be identified in the outpatient setting.

Improving Resident Physician Competency with Food Insecurity Screening (FIS) and Increasing Frequency of Screening in the Inpatient Setting

Smith[1], Kyndall MD, Mirzada Kurbasic MD[1], and Rebecca Hart MD[1]
[1]Norton Children's and the University of Louisville School of Medicine, Louisville, Kentucky

BACKGROUND

Over the past decade, there has been increasing data on food insecurity (FI) and the subsequent health impacts on children[1].

It is crucial to provide education for medical trainees to implement regular FI screening into their patient encounters.

While studies have analyzed screening for FI in the outpatient setting, there is little data regarding screening hospitalized patients.

AIMS

Primary aim: To increase the frequency of FI screening in hospitalized patients by 10 percent.

Secondary aims:
- To improve resident physician comfort with screening
- To improve knowledge regarding resources available for patients living in food insecure households

METHODS

An initial survey was distributed to pediatric residents (n = 53) with questions including:
- Self-reported physician comfort level and competency with FIS
- Frequency of screening
- Knowledge of FI resources to distribute to patients

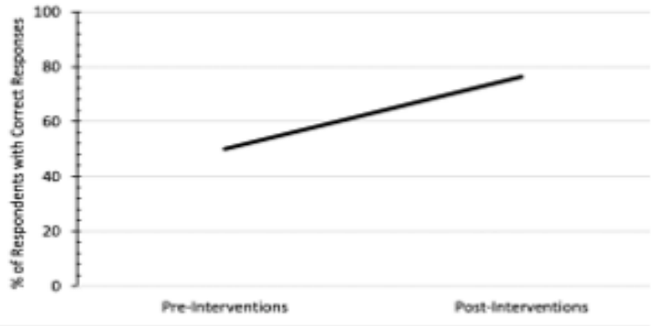
Interventions:
- Educational module on FI was distributed to participants
- Standardized "Hunger Vital Signs (HVS)" were added to the hospital admission note template.
- Follow-up survey comparable to the initial survey was sent to respondents after completing the educational module.
- Retrospective chart review of hospitalized patients analyzed frequency of documented FI screening in both pre- and post-intervention dates and rates were compared.

RESULTS

Table 1. Resident Physician Responses to Distributed Survey

	Pre-Intervention (n = 52) N (%)	Post-Intervention (n = 37) N (%)
"How often do you estimate you ask the HVS when admitting a patient to the hospital?"		
Usually	0 (0.0)	14 (37.8)
Sometimes	2 (3.8)	9 (24.3)
Rarely	15 (28.8)	11 (29.7)
Never	35 (67.3)	3 (8.1)
"Do you feel confident in your ability to discuss food insecurity with your patients?"		
Very confident	12 (23.1)	16 (43.2)
Somewhat confident	34 (65.4)	21 (56.8)
Not confident	6 (11.5)	0 (0.0)

Fig 1. Knowledge Assessment of FI Screening



53 residents completed initial survey:
- 0 reported screening patients for FI at hospital admission
- 23.1% felt "very confident" screening/discussing FI with patients
- Knowledge assessment: 50% correct

37 residents (70%) completed a 3-month follow-up survey:
- 14 (37.8%) reported that they "always" or "usually" ask the HVS upon hospital admission.
- 43.2% felt "very confident" screening/discussing FI (p = 0.21)
- Knowledge assessment: 76.3% correct (p = 0.14)
- 15 (39%) identified patient with a positive FI screen in the previous month

On chart review, documented FI screening improved from 0/634 (0%) inpatient admissions in March 2020 to 71/665 (10.6%) in March 2022.

CONCLUSIONS

Implementing an educational module improved:
- Resident self-reported competency with screening for FI
- Frequency of screening patients admitted to the hospital from 0 to 10.6%

Ongoing data will be monitored to determine if screening rates continue to increase with time in addition to better quantifying the number of patients who screen positive for FI upon admission to the hospital.

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Difficult Conversations: Addressing Microaggressions

Kaquanta Barlow, MD
Co-Author(s): J. Porter, MD; F. Jones, MD, PhD; C. Bohnert; C. Ziegler, PhD; K. Lyons, DO; A. Hanson, MD
Poster Category:

Introduction: Racism in health professions often manifests in the form of microaggressions, which communicate hostile, derogatory, or negative racial slights and insults toward minorities or marginalized groups and can be intentional or unintentional. To help trainees recognize microaggressions, discuss their impact in healthcare settings and rehearse potential responses, we developed the "Microaggressions in Healthcare" workshop.

Methods: Two video-based cases illustrating microaggressions in healthcare with facilitated debriefings were developed and presented during a one-hour workshop for two separate groups: 4th-year medical students and pediatric residents. Case selection and design were informed by personal experience, literature review and consultation with local simulation and Diversity Equity and Inclusion experts. Demographics and pre-survey data were collected prior to the workshop. Microaggressions were first introduced and described. Video cases were viewed by the group and 4 facilitators guided small-group debriefings and conversational rehearsal using the Microaggressions Triangle Model. A video demonstrating a trainee speaking-up about the microaggression was also viewed and debriefed for each case. Trainees then independently completed a post-survey, which included a 5-point Likert scale. Trainees were invited to describe personal experience with microaggressions in healthcare in their pre- and post-surveys.

Results: Participating students were majority female (52.6%) and white (94.7%). Many (68.4%) had participated in prior microaggression training; 47.4% had experienced microaggressions while 52.6% had responded to a microaggression. Before training, most residents knew the definition of microaggressions (85%), felt comfortable explaining microaggressions to colleagues (52.7%), and recognized when a microaggression occurred (52.7%), but very few participants (21%) felt comfortable responding to microaggressions in person (21%). All categories improved to 100% in post-training assessments. Most (76%) students were satisfied with the lecture material, while 100% were satisfied with the simulation training and the debriefing session. All students were interested in future opportunities for simulations responding to microaggressions.

Participating residents were majority female (75%), white (68.7%) with 12.5% Black and 18.8% Asian. Most (62%) had prior microaggressions training. Pre-training, most knew the definition of microaggressions (87.6%), were comfortable explaining microaggressions to colleagues (62.6%), could recognize microaggressions (75%), and felt comfortable responding to microaggressions in private (62.6%), but few (25%) felt comfortable responding to microaggressions in person. All of these values improved to 100% after training ($p < 0.001$ for all values). Many (75%) had experienced microaggressions and 50% had responded to microaggressions. All residents were satisfied with the lecture material, simulation, and the debriefing and would like future opportunities for simulations responding to microaggressions.

Discussion/Conclusion: The "Microaggressions in Healthcare" workshop was positively evaluated by both medical students and pediatric residents. Both groups expressed interest in future simulation training related to responding to microaggressions.

Difficult Conversations: Addressing Microaggressions

Kaquanta Barlow, MD., MS[1,2], Jennifer Porter, MD[1,2], Faye Jones, MD., PhD., MSPH.,[2], Carrie Bohnert MPA, CHSE[2], Craig Ziegler, PhD, MA., BS.[1,2], Kelly Lyons, DO[1,2] Amy Hanson, MD[1,2]
Norton Children's[1] and the University of Louisville School of Medicine[2]
Louisville, Kentucky

BACKGROUND

- The impact of systemic racism on the health and well-being of patients and their families has been documented.
- Racism in health professions often manifests in the form of microaggressions, which can be intentional or unintentional.
- Less is known about how racism affects the experiences and well-being of students, residents, house staff, and faculty.

OBJECTIVES

- Explore the impact of microaggressions in health care settings.
- Develop a workshop with simulated cases for medical students and pediatric residents to develop skills for responding to microaggressions.

METHODS

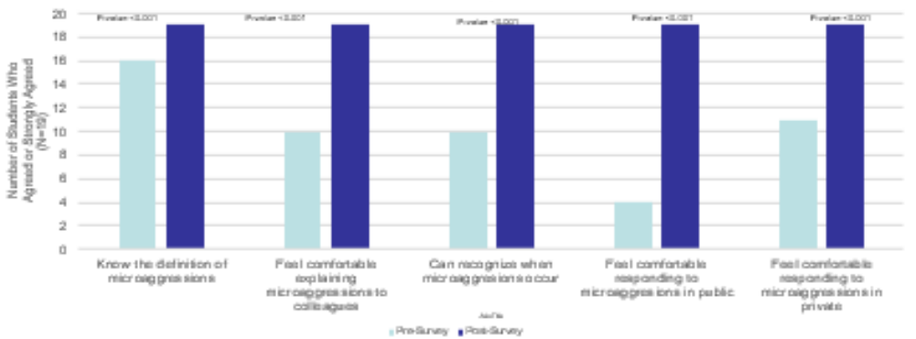
- Two video-based cases were developed for pediatrics residents, 4th year medical students
- Small-group debriefs took place with emphasis on the Microaggressions Triangle Model.
- 5-point Likert scale assessed:
  - Ability to define microaggressions
  - Comfort explaining microaggressions to colleagues
  - Ability to recognize when a microaggression occurs
  - Comfort responding to a microaggression in person or in private.
- Standard descriptive statistics and the Mann-Whitney U Exact test compared pre-simulation and post-simulation data.

RESULTS

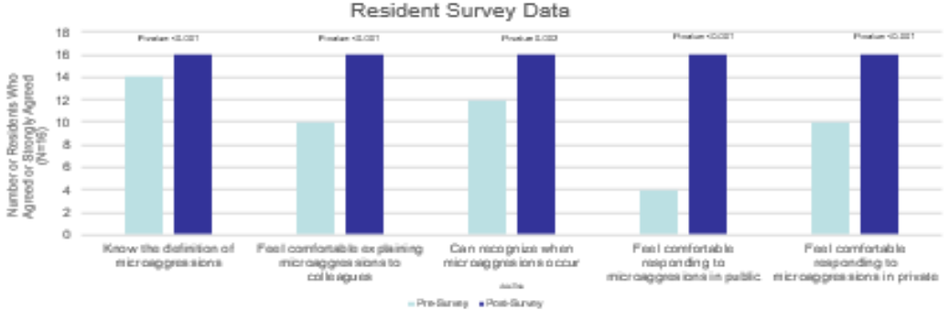
Students and Residents Demographic Table

		Students Count (%)	Residents Count (%)
Which category below is your age?	<18 years	0 (0.0%)	0 (0%)
	18-24 years	1 (5.3%)	0 (0%)
	25-34 years	18 (94.7%)	16 (100%)
How do you describe your race	Black/African American	0 (0.0%)	2 (12.5%)
	White	18 (94.7%)	11 (68.7%)
	Asian	1 (5.3%)	3 (18.8%)
How do you describe your ethnicity	Hispanic or Latino		2 (12.5%)
	Not Hispanic or Latino		
How do you describe your gender?	Female	10 (52.6%)	12 (75.0%)
	Male	9 (47.4%)	4 (25.0%)
Level of Training	MS-1 / PGY-1	0 (0.0%)	4 (25.0%)
	MS-2 / PGY-2	0 (0.0%)	7 (43.8%)
	MS-3 / PGY-3	0 (0.0%)	5 (23.2%)
	MS-4	19 (100%)	-
Have you participated in any prior training related to micro aggressions	Yes	13 (68.4%)	10 (62.5%)
	No	6 (31.6%)	6 (37.5%)

Student Survey Data



Resident Survey Data



CONCLUSIONS

- Students and residents rated this simulation positively
- Comfort level in responding to microaggressions in public and private increased with statistical significance.
- Students and residents would like to have future opportunities to rehearse responding to microaggressions
- Current plans are to offer microaggressions training to 4th year medical students and pediatric residents.
- Future directions may include extending this training to undergraduate students interested in healthcare that attend the University of Louisville or fellows or faculty physicians at the University of Louisville School of Medicine.

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Timing is Everything: Assessing Residents' Perspectives of the Residents-As-Teachers Curriculum

Clare Batty, MD
Co-Author(s): E. Noonan, PhD; A. Patterson, MD;
Poster Category:

Background: Residents play a fundamental role in undergraduate medical training through near-peer teaching in clinical and didactic settings. Given the significant impact of residents in medical education, accrediting organizations emphasize the need to develop high-quality curriculum that strengthens residents' teaching skills. Unfortunately, there is limited literature describing optimal timing and reinforcement of the residents-as-teachers curriculum throughout training. The primary aim of this study is to perform a needs-based assessment of residents' perceptions of their teaching skills and timing of curriculum.

Methods: Categorical pediatric residents from a mid-size residency program (24 residents/year) were invited to participate in focus groups assessing the residents-as-teachers curriculum. Three focus group sessions were conducted with a representative group from each pediatric residency class (3-5 residents/group). Interviews were semi-structured with pre-determined questions to guide the group discussions led by the same two authors. Sessions were audio-recorded and professionally transcribed. De-identified transcripts were inductively coded by two authors each using Dedoose, a web-based qualitative analysis program. Coded transcripts were analyzed by team members using thematic analysis to develop a theoretical model for resident perceptions.

Results: Residents had very limited teaching experience prior to residency. Residents attribute the majority of their teaching skills to their mentors' teaching styles with occasional feedback opportunities. Residents found that the formal curriculum options (e.g., modules, lectures) were less helpful and passive methods of learning. Regarding ideal timing, first and second year residents preferring formalized curriculum starting intern year, however, third year residents preferred formalized curriculum when transitioning to the upper level role.

Conclusions: Residents strongly embrace their role as teachers but feel ill-equipped with current formalized curriculum methods. They would prefer interactive small group settings as opportunities to practice teaching skills and receive constructive feedback. Residents recognize that medical education curriculum should be introduced early in their training and should be tailored as they progress through their training with more emphasis on the upper level role. These results were beneficial for our residency program to create a more comprehensive and interactive curriculum for residents starting in intern year.

Timing is Everything: Assessing Residents' Perspectives of the Residents-As-Teachers Curriculum

Clare Batty, MD, Emily Noonan, PhD, MA, Adam Patterson MD, MsC
Norton Children's and the University of Louisville School of Medicine

BACKGROUND

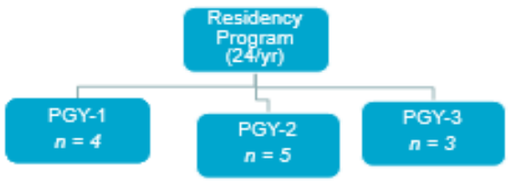
- Residents play a fundamental role as educators through near-peer teaching
- High-quality residents-as-teachers curriculum strengthens residents' teaching skills
- Limited literature exists describing optimal timing and reinforcement of the residents-as-teachers curriculum

OBEJECTIVE

- To perform a needs-based assessment of residents' perceptions of current medical education curriculum methods and timing

METHODS

- Three separate focus groups divided by residency class conducted March 2023

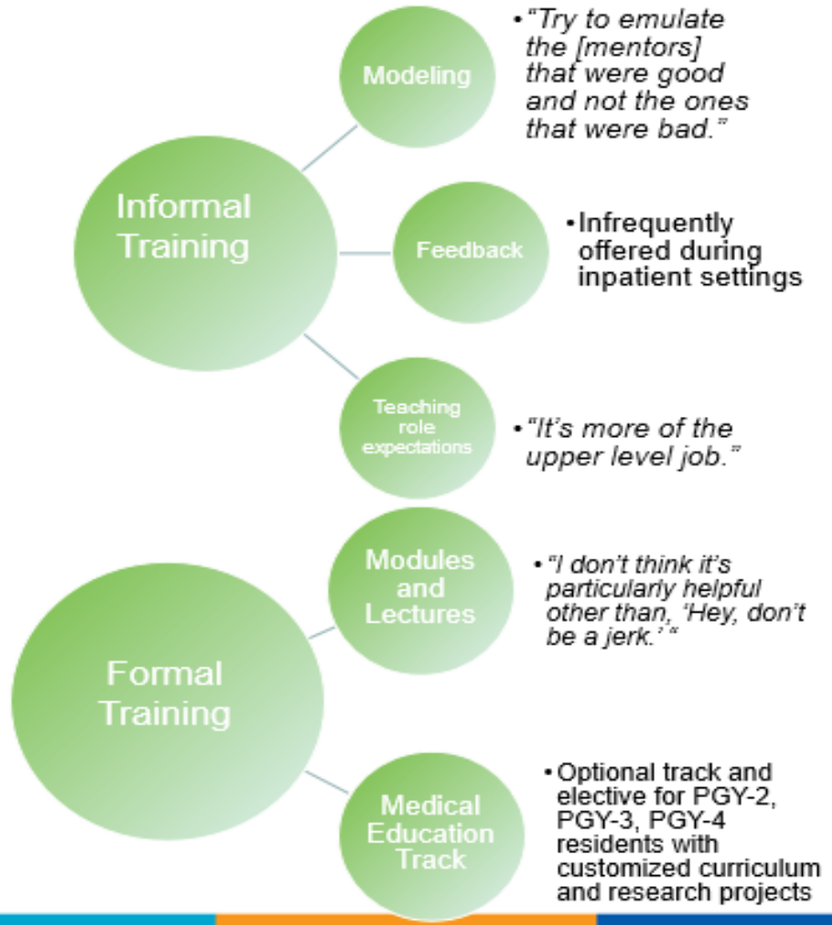


- De-identified transcripts were coded using thematic analysis to develop a theoretical model for resident perceptions of perceived needs for teaching curriculum
- Study was approved by the university IRB

RESULTS AND DISCUSSION

Current Curriculum

Teaching skills acquired via informal and formal methods, however, there is insufficient exposure to formal training



Ideal Curriculum

- Mixed consensus regarding timing:
  - Orientation prior to intern year
  - Transition period to upper level role
  - Professional Identity and Exploration block

"Day one…. You're the intern, but certain times your upper level can't be the one teaching."

"Maybe at that transition time when you have your second year, this is how to be an upper level lecture."

"Incorporating it into orientation week wouldn't be a bad thing. But then your curriculum can change based on whatever year in training you're in."

- Majority of residents preferred interactive small groups

"Getting feedback on our teaching too would be nice. Having someone observe and then give us feedback."

CONCLUSIONS

- Residents strongly embrace their role as teachers but feel ill-equipped with current formalized curriculum methods.
- Medical education curriculum should be introduced early in residency training and gradually tailored as residents progress.
- Place more emphasis and clear expectations for upper levels as teachers
- Develop comprehensive and interactive curriculum for residents starting in intern year

Competence of Pediatric Residents in Neonatal Resuscitation using High-Fidelity & Low-Fidelity Simulation Abstract

Kelley Hillman, MD
Co-Author(s): Y. Feygin; C. Crabtree, DO
Poster Category:

Introduction: Many primary care pediatricians are responsible for providing newborn resuscitation--especially in rural areas. However, current residency training may provide insufficient preparation, as the Neonatal Resuscitation Program (NRP) course needs to be renewed only every 2 years, and training varies widely among pediatric residency programs. A pediatrician should be able to care for a well newborn as well as resuscitate, initiate stabilization, and triage to align care with the severity of illness (per Entrustable Professional Activities 3 & 10). Some programs employ simulation to increase the frequency of exposure to neonatal resuscitation which has been demonstrated to improve performance, communication, and confidence level. The purpose of our study is to determine whether neonatal resuscitation competence improves with incorporation of high-fidelity simulation of neonatal, in addition to NRP training.

Methods: We are conducting a prospective interventional study among our pediatric residency program. A control cohort of residents (class of 2025) received a low-fidelity NRP refresher at the beginning of their month-long second year rotation in the neonatal intensive care unit (NICU), during which their neonatal resuscitation competence was assessed. The intervention cohort of interns (class of 2026) received an NRP refresher with high-fidelity simulation during their scheduled procedure rotation. They will also undergo the same low-fidelity NRP refresher during the beginning of their second year NICU rotation. Pediatric residents are assessed for competence in neonatal resuscitation using a tool validated by the NRP steering committee. We will also compare resident self-reported confidence level in neonatal resuscitation between control and intervention cohorts via survey.

Results: Though we are still in the data gathering phase, we have been able to incorporate these simulations into the procedure and NICU rotations. We hope that this study and future studies will better prepare residents for future practice attending deliveries and working in the newborn nursery, especially in rural areas.

Competence of Pediatric Residents in Neonatal Resuscitation using High- & Low-Fidelity Simulation

Kelley (Ballard) Hillman, MD, MBA; Cynthia Crabtree, DO; Yana Feygin
Norton Children's and the University of Louisville School of Medicine
Louisville, Kentucky

BACKGROUND

- Many primary care pediatricians provide newborn resuscitation
- Current residency training may provide insufficient preparation
  - NRP renewal only every 2 years, wide variety in delivery exposures
- Simulation has been employed to improve performance, communication, and confidence level in neonatal resuscitation
- Entrustable Professional Activities (EPAs)
  - EPA 3: care for a well newborn
  - EPA 10: resuscitate, initiate stabilization, and triage to align care with severity of illness

OBJECTIVE

To determine whether neonatal resuscitation competence and confidence level improves with incorporation of high-fidelity simulation of neonatal resuscitation during the second half of the first year of pediatric residency training, in addition to NRP training.

METHODS

- Prospective interventional study among UL pediatric residents
- All residents certified in neonatal resuscitation (NRP) during orientation
- Control cohort: class of 2025
  - Low-fidelity simulation during 2nd year NICU rotation
- Intervention cohort: class of 2026
  - High-fidelity simulation NRP refresher during procedure rotation (1st year)
  - Low-fidelity simulation during 2nd year NICU rotation
- Low-fidelity NRP refresher course
  - Competence assessed using NRP validated tool (see Surveys section)
  - Also assess resident's self-reported confidence level

GRANT APPLICATION PROCESS

- Finding the team
- Obtaining a baseline
  - Current residency and hospital education
    - NRP certification
    - Bedside teaching
  - Current tools
    - High-fidelity simulator doll
    - Many certified NRP instructors
  - Narrowing scope of project
  - Revising implementation plans and timelines

TIMELINE

RESULTS

- Acceptance of full grant application, but not funded
- Implemented multiple sessions, with associated qualitative feedback
  - Low-fidelity simulations during NICU rotation (PGY-2)
  - High-fidelity simulations during procedure rotation (PGY-1)
  - High fidelity simulations during practical pediatric sessions (MS4)

SURVEYS

NRP Low-Fidelity Refresher Course Evaluator Survey

- Were team member roles and responsibilities clearly defined at the start of the resuscitation?
- Was resuscitation equipment checked?
- Does the resident address delayed cord clamping?
- Were the 1st steps of resuscitation (warm, dry, stimulate) accomplished?
- Did resident direct supplemental O_2 administration per minute-of-life guidelines?
- Was mouth/nose suctioned before initiation of positive pressure ventilation (PPV)?
- Does resident assess breathing after initial steps and initiate PPV within the 1st 60 seconds if apneic? If breathing, does resident evaluate heart rate (HR) and initiate PPV for HR <100?
- Does resident correctly initiate MRSOPA if HR does not improve?
- Does resident call for help if needed?
- Did the resident lead the resuscitation?

NRP Low-Fidelity Refresher Course Resident Survey

- How would you rate your confidence level in performing NRP BEFORE taking this NRP refresher course?
- How would you rate your confidence level in performing NRP AFTER taking this NRP refresher course?

IMPACT & FUTURE DIRECTIONS

- This study will better prepare residents for future practice attending deliveries and working in the newborn nursery, especially in rural areas
- Future Directions:
  - Assess optimal frequency for NRP refreshers using high-fidelity simulation
  - Incorporate interdisciplinary simulations including nurses and respiratory therapists
  - Educate community pediatricians on NRP, especially in more rural settings, and assess need for and frequency of refresher courses

Implementation of A Food Insecurity Curriculum for Medical Students Volunteering in A Pediatric Emergency Department Food Pantry

Amber Hussain, MD
Co-Author(s): E. Lehto, DO; B. Anderson, MD
Poster Category:

Background: Food insecurity (FI) is associated with negative health effects. There is lack of knowledge and comfort amongst providers discussing FI with families and limited research on incorporating it into medical education.

Objective: Assess the knowledge and comfort level of medical students in discussing FI after completion of a novel FI curriculum.

Design/Methods: A curriculum was designed that included an orientation, simulation, community experiences, journal clubs, online modules, and the opportunity to volunteer in our pediatric emergency department (ED) food pantry offering food to families. The study was conducted from September 2021-September 2022. A post-experience survey developed by the study team was distributed to participants. Number of families approached in the ED was tracked. Descriptive statistics and proportions were used to describe survey results.

Results: Out of the initial cohort of 13 students, 8 met the curriculum requirements and completed the post-experience survey. Of these, 88% were female, identified as white and non-Hispanic, and in their third year of medical school training. One student responded “Yes” to questions pertaining to personal history of FI. When asked about comfort level discussing FI and available resources, 100% of participants reported feeling somewhat or very comfortable and 100% of participants agreed or strongly agreed it is a physician’s role to discuss FI and offer resources to families. Themes for barriers to discussing FI included time constraints, language barriers, and concern about offending families. 88% of participants agreed or strongly agreed that the curriculum changed perceptions on their role in asking about FI. All participants agreed or strongly agreed that they feel more comfortable and have a responsibility to discuss FI. All participants reported benefitting from volunteering, increased comfort discussing resources and more awareness of FI in the community. When asked about how they would change patient care, students identified the importance of taking a thorough social history and offering resources. All participants were able to identify 3 FI resources and 2 negative health outcomes associated with FI. The cohort approached 445 families in the ED during the study period.

Conclusions: This curriculum was well-received by participants. They demonstrated knowledge about FI, and self-reported increased comfort talking to families about FI. This activity shows promise for medical student education, and further studies preparing physicians to effectively address social determinants of health may be warranted.

IMPLEMENTATION OF A FOOD INSECURITY CURRICULUM FOR MEDICAL STUDENTS VOLUNTEERING IN A PEDIATRIC EMERGENCY DEPARTMENT FOOD PANTRY

Amber Hussain MD, Elizabeth Lehto DO, Brit Anderson MD

Norton Children's and the University of Louisville School of Medicine
Louisville, Kentucky

BACKGROUND

- Food insecurity (FI) is defined as limited or uncertain access to nutritiously adequate food.
- FI is common across the US and has an impact on both physical and mental health.
- The American Academy of Pediatrics (AAP) recommends screening for FI.
- There is a paucity of data on teaching medical students about FI.
- Experiential learning can help students understand social determinants of health (SDH).
- The objective of this study was to assess the knowledge and comfort levels of medical students discussing FI after the completion of a novel food insecurity curriculum.

METHODS

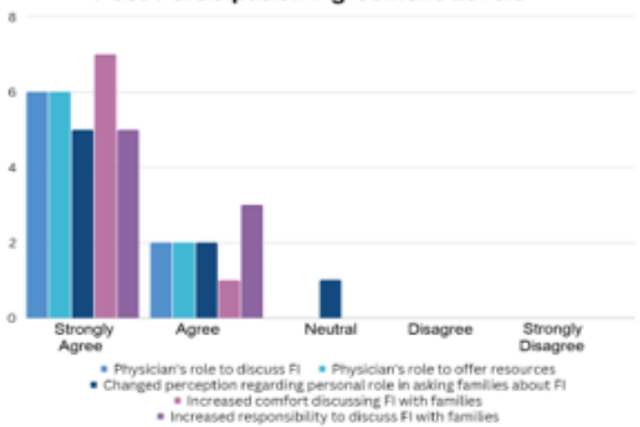
- First- and second-year medical students participated in the curriculum from 9/2021-9/2022:
  - FI didactic
  - Simulation
  - Volunteering in the pediatric ED food pantry
  - Journal clubs
  - Community experiences
- Post-experience survey developed by study team
  - Demographics
  - Likert-scale questions addressing comfort and attitudes
  - Open-ended questions to identify barriers and assess knowledge
  - Feedback
- Descriptive statistics to analyze responses

RESULTS

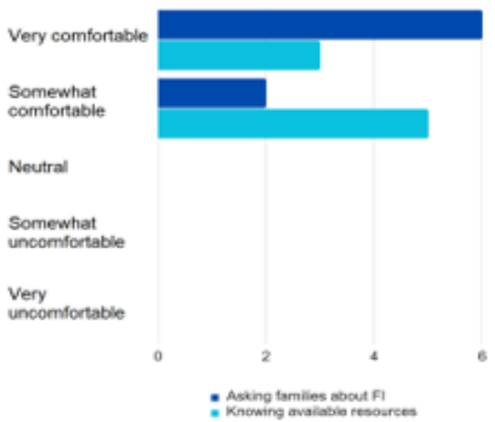
Study Population Demographics		
No of students participating	13	
No of students completed requirements/survey	8	
Measure	**Item**	**N (%)**
Gender	Female	7 (87.5%)
	Male	1 (12.5%)
Self-Identified Race	White/Non-Hispanic	7 (87.5%)
	Other race	1 (12.5%)
Personal history of FI	Yes	1 (12.5%)
	No	7 (87.5%)
Year in medical school	M2	7 (87.5%)
	M3	1 (12.5%)

- The cohort approached 445 families in the PED during the study period
- Barriers to discussing FI included time constraints, language barrier, concern about offending families and not knowing available resources
- All participants
  - Reported benefit from volunteering, increased comfort discussing FI and awareness of resources
  - Identified importance of taking a thorough social history and offering resources
  - Correctly identified 3 FI resources
  - Correctly identified 2 negative health outcomes associated with FI

Post-Participation Agreement Levels



Post-Participation Comfort Levels



CONCLUSIONS

This curriculum was well-received by participants. They demonstrated knowledge about food insecurity, and self-reported increased comfort talking to families about it. This activity shows promise for medical student education, and further studies preparing physicians to effectively address social determinants of health may be warranted.

LIMITATIONS

Limitations of the study include the small sample size and lack of a pre-survey. There were challenges with adding more content to the full medical student curriculum.

ACKNOWLEDGEMENTS

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Nicole Greenwell
Brenda O'Bryan

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Improving Interprofessional Collaborative Practice through Teamwork Education

Renuka Jain, MD
Co-Author(s): E. McRae; A. Elder,MD; E. Peterson, MD; S. Multerer, MD
Poster Category:

Introduction: In order to provide the best possible patient centered care, every patient's healthcare team is comprised of many integral members who each play an important role. In 2016, the Interprofessional Education Collaborative Expert Panel (IPEC) updated a foundational document, providing guidelines and educational strategy techniques to improve quality of care at the health team-based level. At Norton Children's Hospital, discussions with pediatric residents, nurses, and advanced providers identify the need for improvement in interprofessional relationships. This project describes ongoing creation and implementation of a communication initiatives using the TeamSTEPPS™ model and *in situ* simulations of IPCP in the pediatric academic environment to address these identified gaps.

Methods: This is a single site, curriculum implementation Quality Improvement (QI) project using the Model for Improvement with PDSA cycles. Baseline data was collected using the TeamSTEPPS™ T-TPQ instrument (a validated questionnaire) to assess knowledge and perceptions of team-ness as well as to assess levels of burnout. This instrument will also be used for ongoing assessments after each intervention. Following the pre-intervention assessment, initial interventions included: conducting a resident educational conference on IPCP, at least once each year, and improving nursing notification of family-centered rounds (FCR). Currently, the development and use of *in situ* simulations of IPCP are underway with the goal of implementation occurring yearly for all providers, at the start of each residency class cycle, and at the start of each nursing student class. Simulations include crisis management, communication, and teamwork effectiveness. Educational videos will address common misconceptions of titles and roles of each healthcare provider on a team. Pre- and post-intervention burnout data amongst residents and TeamSTEPPS™ T-TPQ responses will be analyzed after each PDSA cycle.

Results: Baseline survey data from residents (n=35) was divided into positive (strongly agree or agree) and negative (strongly disagree, disagree, or neutral) responses. Areas for improvement were identified as question topics with the highest proportion of negative responses including: staff resolve conflicts, even when the conflicts have become personal (n=19, 54.3%); feedback between staff is delivered in a way that promotes positive interaction and future change (n=17, 48.6%); staff seek information from all available sources (n=15, 42.9%); and my unit has clearly articulated goals (n=14, 40.0%). After two PDSA cycles (interventions: resident educational conference and nursing notification of FCR), and prior to implementation of curriculum, survey responses were unchanged. Resident burnout survey data indicated 19.7% experienced negative interactions with clinical staff pre-intervention and 20% post-intervention. Nursing surveys will be conducted in the future and their results will be represented as ongoing data with plans to develop curriculum to address any areas of concern.

Conclusion: This project is ongoing and curriculum development is underway. The first release of educational material will address common misconceptions of titles and roles of each player in a healthcare team. We theorize that by educating healthcare providers on each team player's role, we will promote an environment of safety so that team members can communicate more effectively, while maintaining the end goal of better patient care.
Ultimately, this curriculum will be provided to all pediatric healthcare members on a yearly basis to provide longitudinal improvement in IPCP at Norton Children's Hospital.

Improving Interprofessional Collaborative Practice through Teamwork Education

Renuka Jain, MD, Leann Baker, DNP, APRN, Emily McRae, DNP, APRN, Ellie Peterson, MD and Sara Multerer, MD. and Asope Elder, MD

Norton Children's and the University of Louisville School of Medicine
Louisville, Kentucky

BACKGROUND

- Healthcare teams are comprised of many integral members who each play an important role.
- At Norton Children's Hospital, interprofessional relationships have been identified as an area for improvement.
- This project describes ongoing creation and implementation of a communication initiatives using the TeamSTEPPS™ model and *in situ* simulations of interprofessional collaborative practice (IPCP) in the pediatric academic environment

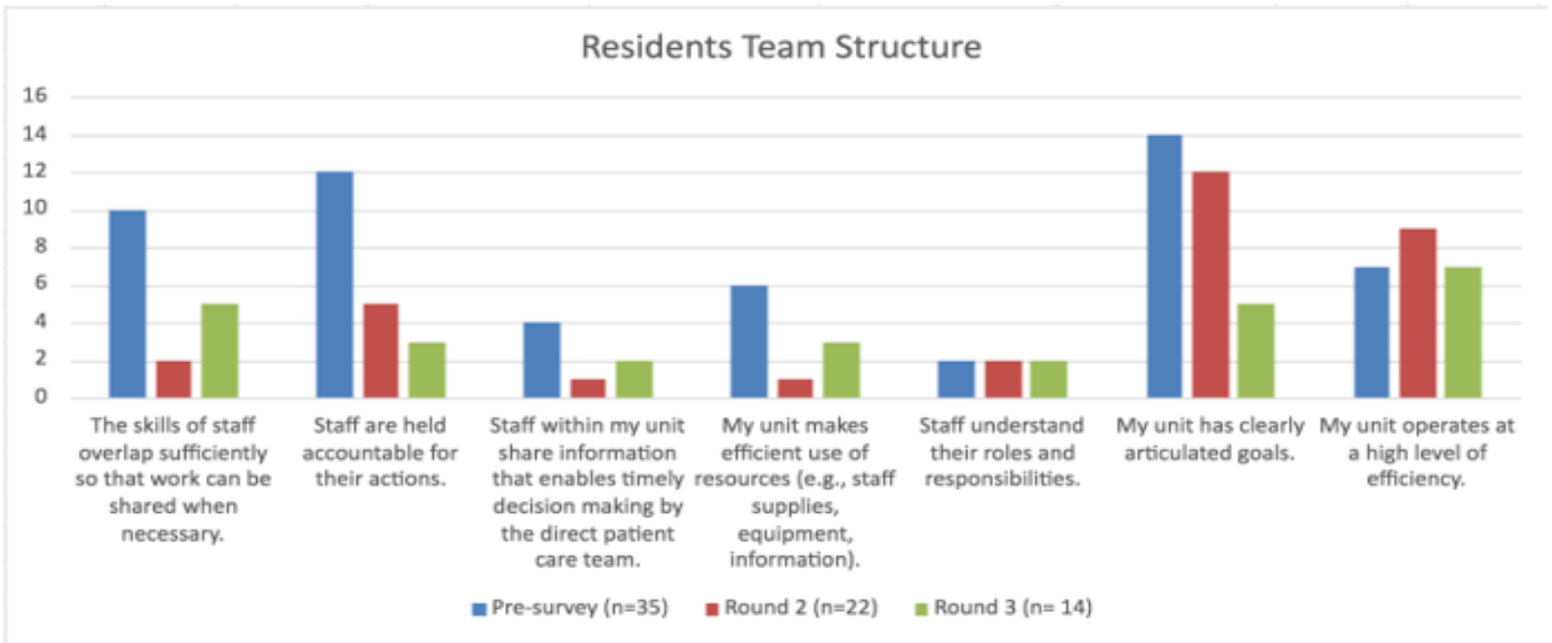
METHODS

- Single site, curriculum implementation Quality Improvement (QI) project using the Model for Improvement with PDSA cycles
- Resident educational conference on IPCP created and conducted on two occasions with pre- and post-assessments using the TeamSTEPPS™ T-TPQ instrument (a validated questionnaire) to assess knowledge and perceptions of team-ness and levels of burnout.
- Simulations include crisis management, communication, and teamwork effectiveness.
- Educational videos will address common misconceptions of titles and roles of each healthcare provider on a team.

STRENGTHS/LIMITATIONS

- Single center → small sample size
- Round 3 sample size was smaller than other rounds
- The "unit" location was not clarified to residents when taking the survey.
- A number of barriers prevented further progress on simulation and video creation

RESULTS



CONCLUSIONS

- There were no initial changes in resident survey responses after IPCP noon conferences.
- Simulation and interactive videos are in development, and may be a more active method of teaching the current material
- .
- Ultimately, this curriculum will be provided to all pediatric healthcare members on a yearly basis to provide longitudinal improvement in IPCP at Norton Children's Hospital.

FUTURE GOALS

Development and use of *in situ* simulations of IPCP are underway with the goal of implementation occurring yearly for all providers, at the start of each residency class cycle, and at the start of each nursing student class.

Development of a Non-Clinical Skills Rotation and Its Effect on Intern Professional Identity

Kaitlyn Newton, MD
Co-Author(s): A. Patterson, MD
Poster Category:

Background: The development of non-clinical skills related to mentorship, research, study planning, self-improvement goals, and literature review, are essential to successfully complete residency. Pediatric residents at the University of Louisville routinely request more robust education on these subjects early in their residency. There is no literature on how best to teach these skills, particularly in a protected/dedicated way. We sought to systematically develop and implement a rotation for Pediatric Residents to promote Professional Identity Formation and Career Exploration through non-clinical skill development.

Methods: Kern's Six-Step Approach to Curriculum Development was utilized to develop and implement a two-week non-clinical rotation for pediatric and child neurology interns. The rotation utilized workshops, didactic sessions, peer-based discussions, shadowing experiences, and guided self-reflections to foster non-clinical skills development. Pre- and post-rotation survey data was collected via Qualtrics XM™ to evaluate residents' comfort with non-clinical skills, perceptions of their own professional identity, and to provide qualitative feedback on the elective for improvement to future iterations.

Results and Discussion: 23 pediatrics and child neurology interns completed the rotation during their first semester of intern year in 2023. Almost all (22/23, 95.7%) interns completed the pre-rotation survey, 20 (87.0%) completed the post-rotation survey. Over all, residents viewed the rotation favorably with 85% of respondents satisfied with the rotation overall and the variety of experiences offered. Most commonly reported strengths of the elective were time for career exploration, networking and mentorship opportunities, and introduction to research. The most common request for future changes was the ability for more career exploration time with the ability to explore more than one career path. All respondents at least somewhat agreed that they planned to use at least one skill acquired in the curse during residency to further their professional growth. When compared to before the elective, there was a statistically significant increase in residents that felt they had a clear professional identity. There was a statistically significant increase in resident confidence at initiating a scholarly project and developing faculty mentorship from prior to the rotation.

Conclusions: This dedicated professional identity and career exploration rotation was successful in helping interns develop non-clinical skills. Interns felt the rotation provided clarity in their professional identity and improved their comfort in developing faculty mentorship and in initiating a scholarly project. This rotation can serve as a model for other programs developing curriculum to better equip interns for the non-clinical expectations of residency programs.

Development of a Non-Clinical Skills Rotation and Its Effect on Intern Professional Identity

Kaitlyn Newton, MD and Adam Patterson, MD, MSc
Norton Children's and the University of Louisville School of Medicine
Louisville, Kentucky

BACKGROUND

Successfully completing residency requires developing essential non-clinical skills:

- Mentorship
- Research
- study planning
- self-improvement goal setting
- literature review

AIM

To systematically develop, implement, and assess an elective for pediatric interns to promote Professional Identity Formation and Career Exploration

METHODS

- Kern's Approach to Curriculum Development was utilized to develop and implement a two-week rotation for pediatric interns.
- Pre- and post-rotation survey data obtained to evaluate residents'
  - Comfort with non-clinical skills
  - Perceptions of their own professional identity
  - Provide qualitative feedback on the elective

DEMOGRAPHICS

- 23 pediatric interns completed the rotation during their first semester of intern year
- 96% of interns completed pre-rotation survey, 87% completed the post rotation survey

RESULTS

Fig 1: Representative Quotes from Rotators

"I will continue to set professional goals for myself. I will use some of the communication and networking skills I used to continue to seek out mentors and other people to have as contacts in the future."

"I will utilize my study plan. I like that it is all listed out with resources attached so I can better keep track of my study habits. I feel more confident about who to reach out to to pursue research opportunities"

"I think now I recognize the importance of a good mentor. I plan to find one that can help me even though I'm not sure what my career goals are."

Describe how you will or won't utilize skills from this elective to further your professional growth in your career.

Fig 2: Comparing Professional Identity

DISCUSSION

- The rotation was viewed favorably by respondents overall, with significant increase in residents'
  - Feeling that they have clear professional identity
  - Confidence in starting scholarly activity
  - Development of faculty mentorship
- Elective strengths:
  - Time for career exploration
  - Networking and mentorship opportunities
  - Introduction to research
- Areas for improvement:
  - More career exploration time
- All respondents planned to use at least one skill acquired in the course during residency to further their professional growth.

CONCLUSIONS

This rotation can serve as a model for other programs developing curriculum to better equip interns for the non-clinical expectations of residency programs while aiding in resident professional identity formation

CITATIONS

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A Case Based Approach to Improve Resident Knowledge and Comfort with Trauma-Informed Care

Sarah England, MD
Co-Author(s): L. Bishop, MD; L. Workman, MD
Poster Category: Case Report

Intro/Background: Studies have demonstrated that early identification of these ACEs and the promotion of buffering factors and trauma-informed care can lead to a decrease in toxic stress response. However, education regarding practical interventions is somewhat limited among medical providers and trainees. A literature search discovered a workshop in MedEd Portal that provided this training to medical students. This prompted the development of an interactive case-based workshop delivered as part of a Med-Peds Elective. The purpose of this study was to evaluate pre- and post-workshop resident comfort and knowledge on a variety of related topics.

Methods: Course objectives were determined, and the presentation and surveys were developed to reflect these. A power point lecture with breakout discussion was completed during the elective, which included a lecture handout with application exercises. Pre- and post-module surveys were given. A follow-up survey (either 3 or 6 post workshop) was sent to assess retention and application of the workshop contents.

Results: A total of 24 residents participated in the in-person lecture and discussion. The pre-module survey response was 88%, and this indicated that 38.1% of participants stated that they had no prior training regarding ACEs and TIC. The post-survey response rate was 71% and demonstrated that 75% of survey respondents strongly agreed they could describe the impact that ACEs have on physical, mental, and social health. The follow-up survey response at either 3 or 6 months had a much lower response rate at 29%.

Conclusion/Discussion: Our study highlighted the need for more formal teaching regarding ACEs and trauma-informed care, as 38.1% of respondents stated they had not had any prior training regarding these topics. Based on the responses to the post-module survey, it was evident that participants gained valuable knowledge regarding ACEs and trauma-informed care. Because of poor follow-up survey response, it was difficult to ascertain the implication this had on clinical practice of participants and served as a limitation to our study. Looking forward, this module would be ideal to be completed in the first two years of training with a follow-up module in the third and fourth years to dive deeper into TIC and clinical application of these topics.

A Case-based Approach To Improve Resident Knowledge and Comfort with Trauma-Informed Care

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Departments of Internal Medicine & Pediatrics, University of Louisville School of Medicine

University of Louisville
MED-PEDS RESIDENCY PROGRAM

Background

- Adverse childhood experiences (ACEs) and their health impacts have been well-studied.[1] Early identification of ACEs and promotion of trauma-informed care (TIC) can lead to a decrease in the toxic stress response cascade.
- **Educational curricula for residents regarding practical interventions to combat ACEs and toxic stress are limited.** A literature search discovered a workshop in MedEd Portal that provided practical training aimed at medical students.[2]

Objectives

- Determining baseline UofL Med-Peds resident knowledge on the topics and comfort with interventions surrounding ACEs, buffering factors, practical delivery of TIC in a clinic setting.
- Delivering an interactive, case-based workshop aimed at increasing resident confidence to assess their patients for ACEs/buffering factors and utilizing TIC in a busy clinical environment.

Methods

- Course objectives guided by source workshop and ACGME milestones.
- **Pre-survey** distributed via QR code.
- **Workshop** consisted of:
  - Short didactic lecture
  - Case-based discussion with embedded questions as an opportunity to share personal experiences (handout accompanying this)
- **Post-survey** completed immediately and ~6m following
- Survey responses were analyzed descriptively and qualitatively for all residents and as senior (PGY-3/4) and junior (PGY-1/2) subsets.

Results

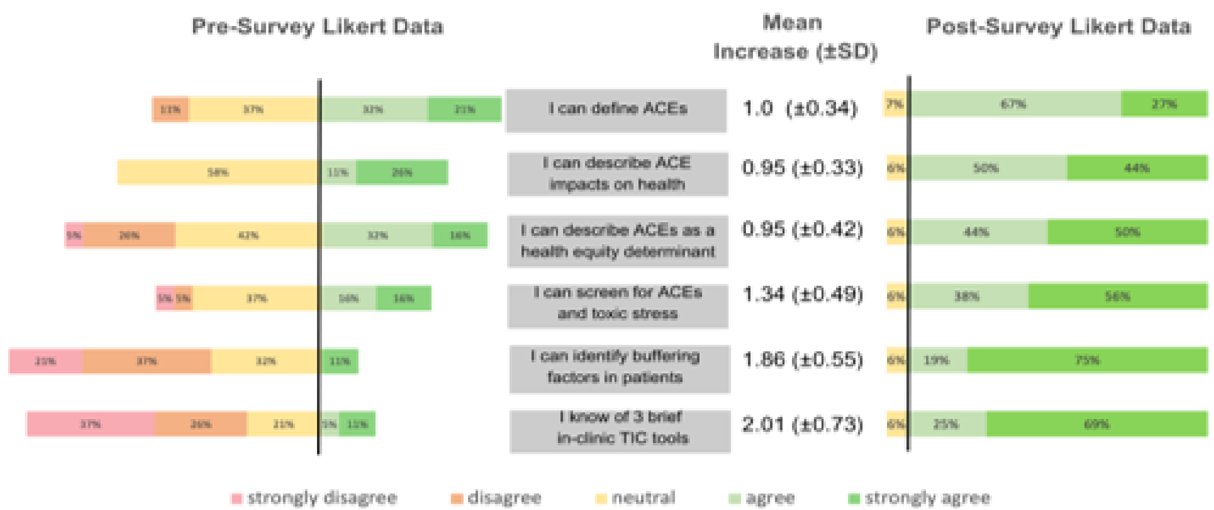

Figure 1. Likert scores were compared to generate the mean difference (±SD) for each survey question. The data was also used to construct a diverging stacked bar chart to better emphasize the amount of positive responses (agree and strongly agree pictured in green).

Table 1. Participant Data

Number of Participants	24 residents (12 PGY1/PGY2 and 11 PGY3/PGY4)
Pre-module responses	21
Post-module survey responses	17
Follow-up survey responses	7

Table 2. Post-survey responses: Intended practice changes in regards to ACEs/trauma-informed care

Using the "FRAYED" framework
Implementing more screening and further history
Trying to spend time inpatient to address those issues
Talking about resilience with patients
Start screening patients for ACEs
Identifying toxic stress

Wordcloud generated with pre-survey comments looking at what residents wanted out of the workshop:

Materials

Conclusions

38% of respondents had no prior training on ACEs and trauma-informed care, highlighting the need for more formal teaching on this topic.

Participants gained valuable knowledge during the workshop with a **Likert score mean increase of 1.34 (±0.49) in ability to screen for ACEs and 2.01 (±0.73) in knowledge of clinical TIC tools.**

Responses to the 3-6 month follow-up survey were limited, so it was difficult to assess the long-term effects of this intervention on clinical practice.

In future, we suggest this module be **completed in the first two years of training with a follow-up module / observation exercise** in the third and fourth years to dive deeper into TIC and provide feedback on the clinical application of these topics.

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1. Felitti VJ, Anda RF, Nordenberg D, Williamson DF, Spitz AM, Edwards V, Koss MP, Marks JS. Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults. The Adverse Childhood Experiences (ACE) Study. Am J Prev Med. 1998 May;14(4):245-58. doi: 10.1016/s0749-3797(98)00017-8. PMID: 9635069.

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Beyond Consults: Creations of an Advanced Palliative Elective

Helen Turner, MD
Co-Author(s): B. Trischan, MD; L. Workman, MD
Poster Category:

-Abstract Not Available-

Beyond Consults: Creation of an Advanced Palliative Elective

Helen Turner, MD, Bree Trischan, MD, Laura Workman, MD

Norton Children's and the University of Louisville School of Medicine
Louisville, Kentucky

BACKGROUND

Palliative electives for both Internal Medicine and Pediatrics residencies focus on inpatient palliative care consults, but palliative care is practiced in a diversity of settings.

Residents may have little exposure to palliative care in outpatient settings.

METHODS

- The elective was modeled after the UofL Hospice and Palliative Medicine fellowship offerings for non-consult based experiences.
- Review of AAHPM Entrustable Professional Activities to ensure exposure to fellowship level goals as set out by the Academy
- Course objectives were created using Bloom's Taxonomy of hierarchical thinking.

COURSE OBJECTIVES

By the end of the elective, residents should:

- Have experienced multiple practice settings of palliative and hospice medicine
- Be able to elaborate on the different care environments during goals of care discussions.
- Demonstrate an understanding of different modalities of pain management and medication delivery systems for use in hospice and palliative patients.
- Describe the roles of various members of the palliative care team and have some experiential knowledge of their professional contributions.
- Create an assessment of symptoms and plan for improvement of symptom burden.

RESULTS

Advanced Palliative Elective Schedule

Monday	Tuesday	Wednesday	Thursday	Friday
Pediatric Palliative with Dr. Dillon	Med-Peds Continuity Clinic	Called in to cover Night Float	Post Nights	Brown Cancer Oncology Palliative Clinic with Dr. Dunn
Hosparus Hospice Home Visits with Dr. Lally	UofL Chronic Pain Clinic Dept of Anesthesiology Dr. Bautista	UofL Chronic Pain Clinic Dept of Anesthesiology Dr. Bautista *No Palliative Didactics	Palliative Fellowship Exploration Med-Peds Continuity Clinic	Brown Cancer Oncology Palliative Clinic with Dr. Trischan
Pediatric Palliative with Dr. Dillon	Jewish Hospital, Dr. Trischan Med-Peds Continuity Clinic	Chaplain Shadow Day Palliative Didactics	Jewish Hospital Ethics Conference	Travel Day of conference
Internal Medicine Chief Resident Conference	Vacation	Vacation	Vacation	Vacation

Longitudinal efforts: As a result of the rotation another academic project was created with the opportunity for the resident to work alongside faculty to rework the medical student teaching case used at Jewish Hospital.

An unanticipated consequence included the resident getting to interact with staff and attendings who do not often have residents as they do not round in the hospital. HPM is unique as a specialty in that more specialists work outside of the academic hospitals than in them and often have medical students and fellows that rotate but rarely interact with residents.

CONCLUSIONS

A new and needed elective course for those interested in a career in Hospice and Palliative Medicine was created and executed with learning objectives achieved.

Giving residents the option to create a new elective gives those interested in a career in academic medicine an opportunity to participate in course and curricular design while also adding to the breadth of future elective rotation offerings.

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Dental Fluoride Application in Resident Continuity Clinics: A Quality Improvement Project

Amelia Balderston, MD
Co-Author(s): J. Stiff, MD
Poster Category: Quality Improvement

Background: Dental caries are a persistent problem in the pediatric population. It is well-established that dental fluoride can help prevent tooth decay, and the American Academy of Pediatrics (AAP) recommends that pediatricians apply fluoride varnish to all eligible patients according to a periodicity schedule. This billable procedure provides both financial benefit to clinics and improves overall preventative health of patients. However, since the COVID-19 pandemic, there has been an overall decline in well child visits, availability of fluoride in clinics, and oral procedures performed by general pediatricians. Across the three resident continuity clinics within the Norton Children's system, fluoride application currently occurs in less than 20% of eligible patients.

Aim Statements: Increase frequency of dental fluoride application to 50% of eligible patients seen by pediatric residents by March 2023. Improve tested resident knowledge about the indications for and application process of dental fluoride by March 2023. Implement changes that result in long term improvement in fluoride application rates in future post- graduate years.

Methods: PDSA cycles were completed every 2-3 months with 8 distinct interventions. Attempted interventions in three different categories: provide education to residents on the benefits of fluoride application, increase visibility of fluoride in clinics, and create competition amongst residents to increase application. Data was collected by reviewing 1,982 eligible patient charts from July 2021 to February of 2023. Eligible patients included children presenting for a well child check from ages 6 months to 5 years. Exclusion criteria included: active COVID-19 infection, no teeth, and fluoride applied within the last 3 months. Eligible patient well child check notes were reviewed, and responses were recorded from built-in dot phrase stating, "fluoride applied."
Resident knowledge was evaluated with a pre-module quiz. Residents then completed an educational module and completed a post-module quiz. Percentage of correct responses were compared pre and post education.

Results: Dental fluoride application rates approved across all three clinics. At initiation of project in July of 2021, the average application rate for eligible patients across all three clinics was approximately 20%. By February of 2023, Stonestreet clinic had an average application rate of 61% of eligible patients, Downtown clinic had an average application rate of 52% of eligible patients, and Germantown clinic had an average application rate of 44% of eligible patients. Per discussion with residents at Germantown clinic, there were barriers to incorporating interventions when compared to other clinics. There was an improvement in resident "correct responses" to educational modules from 55% to 95%. There are higher rates of fluoride application in the "younger" PGY classes suggesting long-term implementation of interventions.

Conclusions:

1. Dental fluoride application rates are higher when there is "buy in" amongst clinic staff and attendings at resident continuity clinics.
2. Dental fluoride application rates are higher among residents with educational, timesaving, and competition-based interventions.
3. Implementing systemic changes to the periodicity schedule, note templates, and overall clinic flow may establish new expectations for dental fluoride application for incoming residents.

Dental Fluoride Application in Resident Continuity Clinics: A Quality Improvement Project

Amelia Balderston, D.O., Jennifer Stiff, M.D.

Norton Children's and the University of Louisville School of Medicine
Louisville, Kentucky

BACKGROUND

Dental caries are a persistent problem in the pediatric population.

The AAP recommends that pediatricians apply fluoride varnish to all eligible patients according to a periodicity schedule, but fluoride application currently occurs in less than 20% of eligible patients in Norton Children's academic clinics.

AIM STATEMENT

1. Increase frequency of dental fluoride application to 20% of eligible patients seen by pediatric residents by March 2023

1. Improve tested resident knowledge about the indications for and application process of dental fluoride by March 2023

2. Implement changes that result in long term improvement in fluoride application rates in future post- graduate years

METHODS

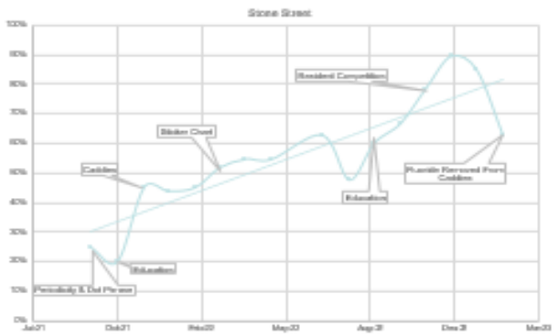
Interventions: PDSA cycles every 2-3 months

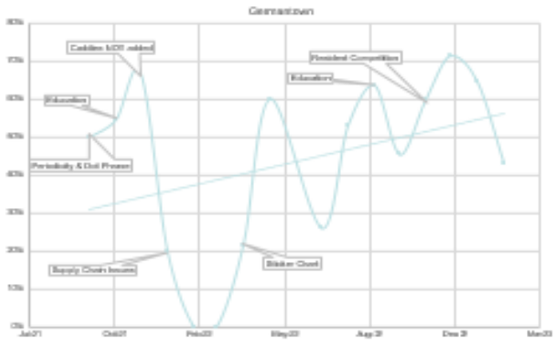
Data collection: Reviewed "dot phrase" for "fluoride applied" response in eligible well child check notes: 6 months to 5 years old. 1,982 charts reviewed.

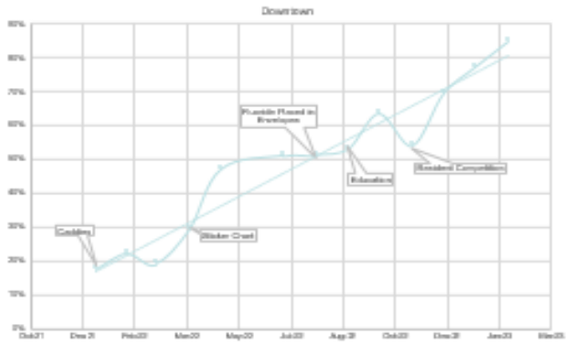
Exclusion criteria: COVID-19 infection, no teeth, fluoride applied within last 3 months

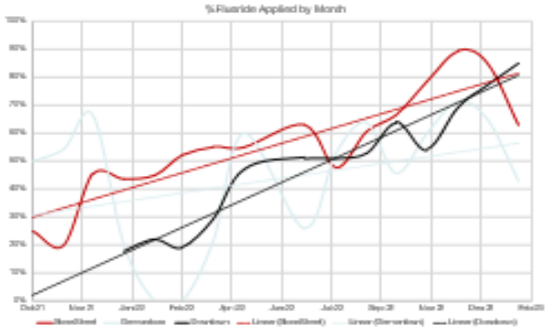
Resident knowledge: tested with pre and post educational module quiz. Percentage of correct answers compared.

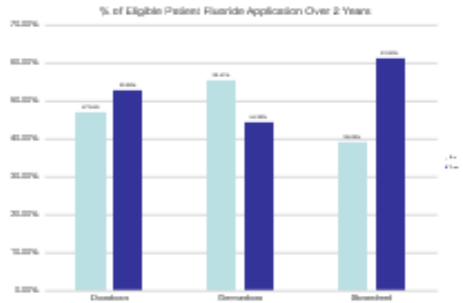
RESULTS











% Fluoride Applied by PGY	First 6 Months	Second 6 Months
Current PGY1		68%
Current PGY2	45%	58%
Current PGY3	42%	61%
Graduated PGY3	29%	

CONCLUSIONS

1. Dental fluoride application rates are higher when there is "buy in" amongst clinic staff and attendings at resident continuity clinics

2. Dental fluoride application rates are higher among residents with educational, time-saving, and competition-based interventions

3. Implementing systemic changes to the periodicity schedule, note templates, and overall clinic flow may establish new expectations for dental fluoride application for incoming residents

Implementing an Inpatient Postpartum Depression Screening and Community Referral Program in Mothers of Infants with Prenatally Diagnosed Congenital Heart Defects and Prolonged Hospitalizations

Juan Gallegos, DO
Co-Author(s): J. Gallehr, MD; D. Tzanetos, MD; S. Hartlage; A. Rhinehart; A. Black, MD
Poster Category: Quality Improvement

Background: Maternal postpartum depression (PPD) is the leading complication of childbirth. Mothers of infants with congenital heart defects (CHD) are at increased risk for emotional burdens and stressors. Untreated PPD is known to negatively impact the maternal-infant dyad, childhood development, and behavioral patterns. Current recommendations by the American Academy of Pediatrics (AAP) suggests screening mothers for PPD at regular intervals during the infant's well-child checks. However, infants with complex CHD may require prolonged hospitalizations, making them ineligible for attending well-child visits and increasing risk for undiagnosed PPD.

Objective: To increase screening for PPD among mothers of infants with prenatally-diagnosed CHD from a baseline of 0% to a goal of 80% from March 2022 to March 2023, and connect mothers with PPD to inpatient and community mental health providers.

Design/Methods: Multidisciplinary stakeholders identified 6 key drivers to impact tests of change. A screening and referral protocol was implemented using the Edinburgh Postnatal Depression Scale (EPDS) at AAP recommended intervals starting at 14 days postpartum. Mothers with PPD were referred to our inpatient psychiatry team during hospitalization and to a community mental health provider prior to the infant's discharge. Our process measure, screening for PPD, was tracked via an annotated statistical process control (SPC) p-chart. Our outcome measure, referral to mental health provider, was tracked via run chart.

Results: Thirty patients were identified with prenatally diagnosed CHD. A centerline shift occurred following screening implementation increasing the proportion of mothers being screened for PPD at AAP recommended intervals from a baseline of 0% to 87%. Approximately 47% of mothers had a positive screen on the EPDS. Of those mothers with PPD, approximately 92% were connected to a community mental health provider prior to discharge, 79% opted for additional acute inpatient referral, and 100% were given a provider resource sheet.

Conclusion: Our PPD Screening and Referral Program established a feasible protocol to improve screening and increase referral rates to support maternal mental health. More importantly, it raised awareness of the mental health needs of families highlighting gaps in existing services and referrals. Our program distinguishes itself by connecting mothers with community/outpatient mental health providers thereby ensuring continued support after discharge and ultimately benefitting the mother-infant dyad.

Implementing an Inpatient Postpartum Depression Screening and Community Referral Program in Mothers of Infants with Prenatally Diagnosed Congenital Heart Defects and Prolonged Hospitalizations

Juan Gallegos, DO; John Gallehr, MD; Deanna Tzanetos, MD; Stacie Hartlage, RN; Ashley Rhinehart, RN; Allison Black, MD

Norton Children's and the University of Louisville School of Medicine
Louisville, Kentucky

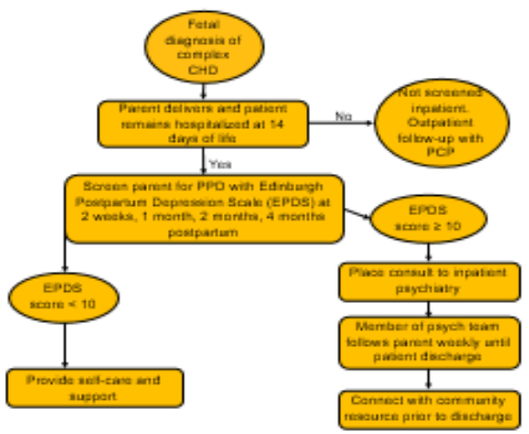
BACKGROUND

- Maternal postpartum depression (PPD) is the leading complication of childbirth.
- Mothers of infants with congenital heart defects (CHD) are at an increased risk for emotional burdens and stressors.
- Untreated PPD negatively impacts the maternal-infant dyad, childhood development, and behavioral patterns.
- The American Academy of Pediatrics (AAP) recommends screening mothers for PPD.
- Infants with complex CHD often require prolonged hospitalizations, making them ineligible from attending well-child visits and increasing the risk for undiagnosed PPD.

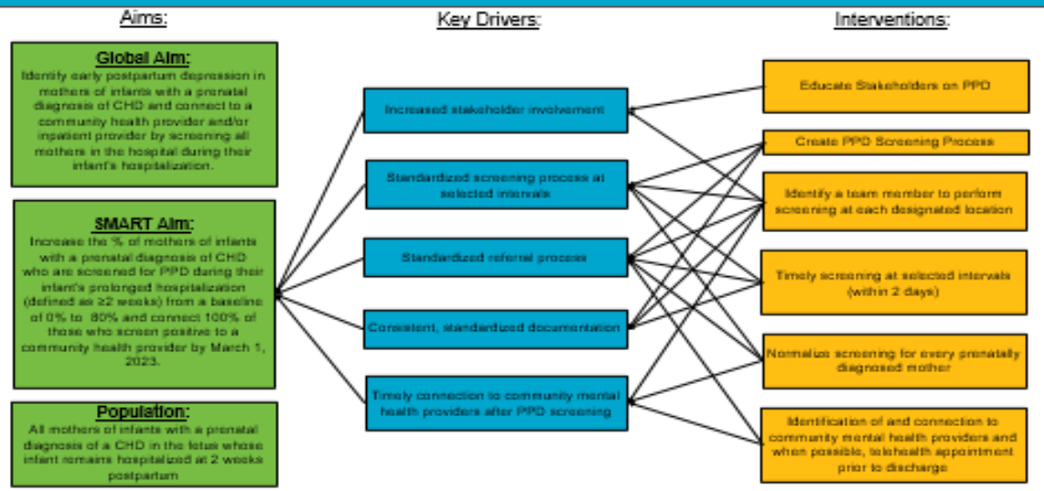
GLOBAL AIM AND MEASURES

- **Global Aim:** Identify mothers of prenatally diagnosed CHD infants with PPD and connect them to mental health resources
- **Process Measure:** Screening for PPD at regular intervals
- **Outcome Measure:** Referral to an inpatient mental health provider and connection to a community mental health provider

PROCESS MAP



KEY DRIVER DIAGRAM



RESULTS

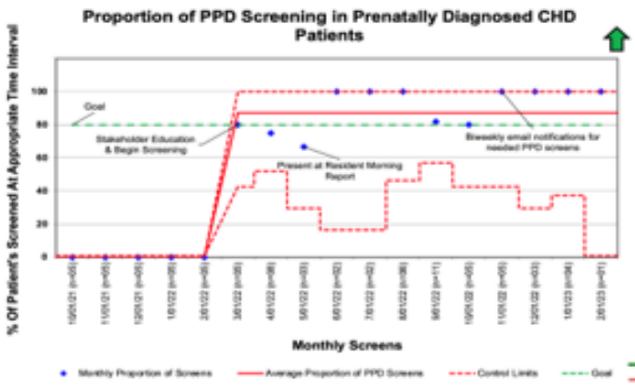


Figure 1: Annotated Statistical Process Control Chart (P-chart) showing proportion of mothers screened for postpartum depression (PPD)

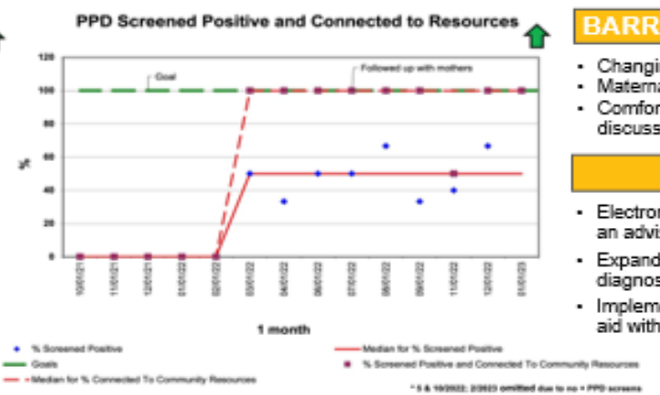


Figure 2: Dual line run chart of mothers screened positive for postpartum depression (PPD) and connected to resources

*Control charts courtesy of Cincinnati Children's Hospital I2S2 Course

RESULTS

- 30 patients were identified to have a prenatal diagnosis of CHD and a prolonged hospitalization ≥14 days
- The proportion of mothers screened for PPD increased from a baseline of 0% to 87%
- Approximately 47% of mothers had a positive screen on the EPDS
- 79% of mothers who screened positive opted for additional acute inpatient referral
- 92% of mothers who screened positive were connected to a community health provider prior to discharge
- 100% of mothers who screened positive received a community resource sheet

CONCLUSIONS

- Implementing a PPD Screening and Referral Program highlighted the mental health needs of a vulnerable population in the inpatient setting
- Inpatient screening programs can be implemented in hospital units to support maternal mental health and benefit the mother-infant dyad
- It is important to consider outpatient resources to continue support after discharge

BARRIERS AND LESSONS LEARNED

- Changing the mindset of maternal mental health
- Maternal refusal of screening or referral
- Comfort of staff with performing screen and discussing referral

NEXT STEPS

- Electronic standardization of screening methods via an advisory notice on electronic health record
- Expand screening into patients outside of prenatally diagnosed CHD infants
- Implementation of new hospital fetal social worker to aid with screening

Visual Diagnosis: Looking Beyond the A1c

Colleen Allen, DO
Co-Author(s): M. Corielle, MD; P. Heirs, MD
Poster Category:

Introduction: Lipodystrophy syndromes are a group of rare diseases characterized by the absence or loss of adipose tissue, that can result in potentially serious metabolic complications, including diabetes, hypertriglyceridemia, and steatohepatitis. We present a case of a 15-year-old female who presented for hyperglycemia in the setting of previously diagnosed type 2 diabetes mellitus (T2DM) and polycystic ovarian syndrome (PCOS). Closer inspection on her physical exam reveals more to the story.

Case Description: A 15-year-old female with previously diagnosed PCOS, hirsutism, T2DM, and acanthosis nigricans presents to the emergency department (ED) for evaluation of hyperglycemia. She had been intermittently followed by multiple pediatric endocrinologists and taken Metformin inconsistently, but was serially lost to follow up. Routine lab testing identified a glucose of 330 mg/dL and A1c 8.7% which prompted referral to the ED. Physical examination demonstrated increased muscularity and loss of fat in the limbs, excess fat accumulation in her face and neck, diffuse hirsutism, and multiple skin tags along with velvety, hyperpigmented, poorly-defined patches of skin around her neck and in her axillae. She was admitted to the hospital and started on basal insulin with hyperglycemia corrections. Exam findings, combined with her significant family history of diabetes, raised the concern for a lipodystrophy. Therefore, genetic testing was obtained. Testing revealed heterozygosity for *LMNA (c.1445G>A)*. The patient was ultimately diagnosed with familial partial lipodystrophy type 2 (FPLD2), the Dunnigan variety.

Discussion: Lipodystrophy syndromes are uncommon, and presenting symptoms may have significant overlap with more common diagnoses such as PCOS or T2DM, as experienced by this patient. A high level of suspicion for the diagnosis in patients with abnormal subcutaneous fat distribution or loss of subcutaneous fat, particularly when combined with multiple skin tags in the neck and axillae is critical to identify the correct diagnosis. While there is no curative treatment for lipodystrophy syndromes currently, treatment is aimed at preventing and/or correcting metabolic abnormalities [8]. Metreleptin (a leptin analogue) is the only drug approved specifically for the treatment of lipodystrophy, for use in patients with generalized lipodystrophy along with hypoleptinemia patients with partial lipodystrophy and severe metabolic abnormalities [6, 7, 8]. In this case, the family was given contact information for the National Institute of Health to pursue metreleptin therapy.

Conclusions: While certain diagnoses, such as type 2 diabetes, are made based on laboratory criteria, it is important to maintain suspicion for less common diagnoses based on critical exam findings, lab workup, and past medical history when making a diagnosis. Ultimately, this patient had an underlying genetic syndrome, which opens the door for possible further specific treatment.

Visual Diagnosis: Looking Beyond the A1c

Colleen Allen, DO, Megan Corielle, MD, Paul Heirs, MD
Norton Children's and the University of Louisville School of Medicine
Louisville, Kentucky

UofL SCHOOL OF MEDICINE

Norton Children's

INTRODUCTION

- Lipodystrophy syndromes are a group of rare diseases characterized by the absence or loss of adipose tissue.
- Can result in potentially serious metabolic complications, including diabetes, hypertriglyceridemia, and steatohepatitis.
- We present a case of a 15-year-old female who presented for hyperglycemia in the setting of previously diagnosed type 2 diabetes mellitus (T2DM) and polycystic ovarian syndrome (PCOS). Closer inspection on her physical exam reveals more to the story.

CASE PRESENTATION

- A 15-year-old female with previously diagnosed PCOS, hirsutism, T2DM, and acanthosis nigricans presents to the emergency department (ED) for evaluation of hyperglycemia.
  - Intermittently seen by multiple pediatric endocrinologists
  - Inconsistent Metformin use
  - Serially lost to follow up
- Routine lab testing: Glucose 330 mg/dL, A1c 8.7%
- Physical examination:
  - Increased muscularity and loss of fat in the limbs
  - Excess fat accumulation in her face and neck
  - Diffuse hirsutism
  - Multiple skin tags
  - Velvety, hyperpigmented, poorly-defined patches of skin around her neck and in her axillae
- Hospital Course:
  - Admitted on basal insulin with hyperglycemia corrections
  - Genetic testing for lipodystrophy obtained
- Results: heterozygosity for *LMNA (c.1445G>A)*
- Diagnosis: familial partial lipodystrophy type 2 (FPLD2), Dunnigan variety

EXAM FINDINGS

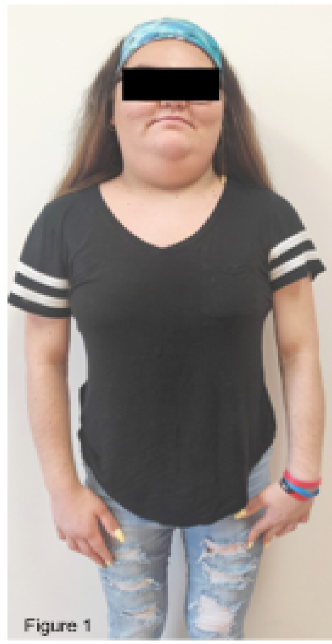


Figure 1: Thin, muscular extremities with increased fat deposition in the torso, neck, and face.

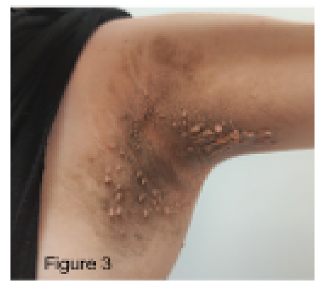


Figure 2: Arm-span view of the fat loss of the upper extremities.
Figure 3: Acanthosis and skin tags in the left axilla.
Figure 4: Acanthosis nigricans and skin tags around the neck.

CONCLUSION

- While certain diagnoses, such as type 2 diabetes, are made based on laboratory criteria, it is important to maintain suspicion for less common diagnoses based on critical exam findings, lab workup, and past medical history when making a diagnosis.
- Ultimately, this patient had an underlying genetic syndrome, which opens the door for possible further specific treatment.

DISCUSSION

- Lipodystrophy syndromes are uncommon, and presenting symptoms may have significant overlap with more common diagnoses such as PCOS or T2DM.
- A high level of suspicion is critical for the diagnosis, especially in patients with:
  - Abnormal subcutaneous fat distribution
  - Loss of subcutaneous fat
  - Multiple skin tags in the neck and axillae
- Other possible findings:
  - Signs of insulin resistance (acanthosis nigricans) [5]
    - High insulin requirements (> 2 U/kg/day or > 200 U/day)
    - Not fully understood, may relate to disruption of insulin signaling due to defective adipose tissue
  - Hyperphagia due to leptin deficiency [1].
    - Serum leptin levels may be low
    - No defined leptin level to rule in or rule out lipodystrophy [4,5].
- No curative treatment for lipodystrophy syndromes currently available
- Treatment aimed at preventing and/or correcting metabolic abnormalities [6].
  - Metreleptin (a leptin analogue) is the only drug approved specifically for the treatment of lipodystrophy [4, 5, 6].
- In this case, the family was given contact information for the National Institute of Health to pursue metreleptin therapy.

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2. [illegible]
3. [illegible]
4. [illegible]
5. [illegible]
6. [illegible]

Intussusception in an Infant Admitted with Gastrointestinal Manifestations of COVID-19

Maggie Chang, MD
Co-Author(s): D. Foley, MD; C. Harris, MD
Poster Category:

Case Presentation: A previously healthy 4-month-old male was admitted with vomiting, diarrhea and dehydration associated with COVID-19 infection. Three days prior to admission he developed fever to 102.1, cough, and was seen in an urgent care where he tested positive for COVID-19. Forty-eight hours prior to admission non-bloody diarrhea began with multiple episodes per day. Nonbilious emesis began on the day of admission with nine episodes over 24 hours. He had multiple sick contacts at home; his father had respiratory symptoms and tested positive for COVID-19 the week prior and his sister had respiratory symptoms but had not yet been tested for COVID-19.

On physical examination, our patient presented pale and ill-appearing and was difficult to arouse. Vital signs revealed tachycardia to the 150s, apyrexia, normal blood pressure and normal pulse oximetry. Lungs were clear and there was no rhinorrhea. Mucous membranes appeared moist and capillary refill was less than two seconds. Abdomen was soft without distension or tenderness and normal bowel sounds were present. Admission laboratory testing showed a normal white blood cell count, renal, liver function tests and electrolytes were normal as well. Urinalysis was consistent with dehydration but showed no signs of urinary tract infection. Blood and urine cultures were sent. Following Zofran and a 20 ml/kg saline bolus the patient had additional nonbilious emesis and was admitted for rehydration.

Over the first 12 hours of hospitalization a lack of improvement in both tachycardia and clinical exam findings with intravenous rehydration prompted abdominal x-ray and ultrasound imaging. These revealed a massive ileocolic intussusception with fluid-filled dilated small bowel loops. A subsequent contrast enema, using Gastrografin diluted with saline, was successfully performed reducing the invagination. No complications occurred during the procedure. Respiratory symptoms remained mild with no shortness of breath and nonproductive cough. Following reduction of the intussusception, emesis and diarrhea resolved. Our patient was observed overnight, and prior to discharge was tolerating his normal diet and appeared clinically improved.

Discussion: Through the course of the COVID-19 pandemic it has been noted that children may have an asymptomatic or mild clinical presentation of infection. Gastrointestinal symptoms including diarrhea and vomiting have been frequently reported as presenting symptoms in children (1). Intussusception is the most common pediatric cause of gastrointestinal obstruction. Prompt reduction of intussusception is imperative to prevent bowel ischemia, necrosis and bowel perforation (2). A strong causal association of intussusception with viral illnesses has been described (3). Emerging data describes an association between COVID-19 infection and intussusception, with intussusception the presenting symptom particularly in infants.

Conclusions: We report a case of a male infant admitted to the hospital with vomiting, diarrhea and dehydration with COVID-19 infection, subsequently found to have ileocolic intussusception. This report adds to growing evidence of an association between COVID-19 infection and intussusception in children. Given the potential morbidity associated with delayed diagnosis and treatment of intussusception, it is prudent to consider intussusception in children admitted to the hospital with COVID-19 infection and gastrointestinal symptoms.

Intussusception in an infant admitted with gastrointestinal manifestations of COVID-19

Maggie Chang MD[3], David Foley MD[1,3], Corrie Harris MD[2,3]

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CHIEF COMPLAINT

Vomiting and diarrhea.

HISTORY OF PRESENT ILLNESS

A previously healthy 4-month-old male presented to the emergency department with a 2-day history of vomiting and diarrhea. Three days prior to admission he had fever to 102.1F and mild cough, was seen at an urgent care where he tested positive for COVID-19 and discharged with supportive management of mild upper respiratory symptoms. Over 48 hours prior to admission, our patient experienced multiple episodes of non-bloody diarrhea and non-bilious emesis and decreased urine output.

No additional fevers had been noted, and upper respiratory symptoms had resolved. Of note, the patent's father had also recently tested positive for COVID-19.

PHYSICAL EXAM

Our patient presented pale, ill-appearing and was difficult to arouse. Vital signs revealed tachycardia to the 150s, apyrexia, and normal blood pressure and oxygen saturation. ENT exam with no rhinorrhea and mucous membranes appeared moist. Capillary refill was less than 2 seconds. Lungs were clear to auscultation. Abdomen was soft without distension or tenderness and normal bowel sounds were present.

ADMISSION LABS

Admission laboratory testing revealed a normal white blood cell count, normal renal function, normal liver function, and normal electrolytes with a bicarbonate of 15. Urinalysis was consistent with dehydration but no signs of urinary tract infection.

HOSPITAL COURSE

Following Zofran and a saline bolus in the emergency department our patient had additional emesis and was admitted for rehydration with a diagnosis of gastroenteritis and dehydration caused by acute COVID-19 infection. After the first 12 hours of admission, a lack of improvement in tachycardia and clinical exam findings despite rehydration along with increasing fussiness prompted abdominal x-ray (figure 1) and ultrasound (figure 2) imaging which revealed a massive ileocolic intussusception with fluid-filled dilated small bowel loops. Pediatric surgery was consulted and an air contrast enema (figure. 3) was successfully performed reducing the invagination. No complications occurred during the procedure. Following reduction of the intussusception, emesis and diarrhea resolved. Our patient was observed overnight, and prior to discharge was tolerating his normal diet and appeared clinically improved.

IMAGING

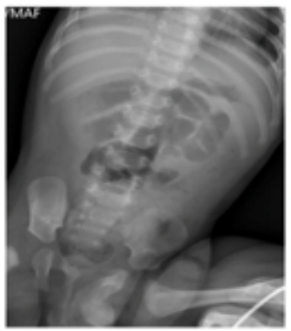


Figure 1. Abdominal radiograph shows tubular dilated loops of bowel in the mid upper abdomen. A paucity of gas is seen in the right lower quadrant along the periphery of the right hemiabdomen.

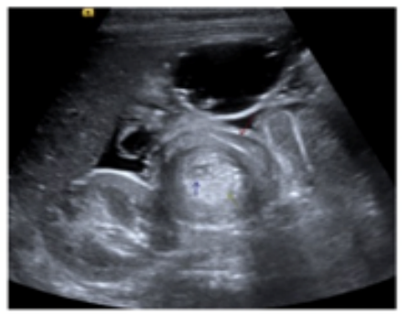
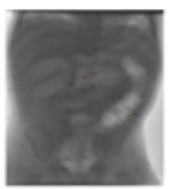
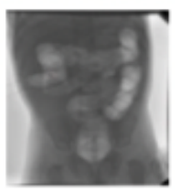


Figure 2. Sonography at the right upper quadrant showed the classic "target sign" of an ileocolic intussusception. The inner small bowel (blue arrow) has telescoped into the large bowel (red arrow). Echogenic (bright) tissue between the telescoped small and large bowel corresponds to peritoneal fat (yellow arrow), a typical sign of ileocolic intussusception.

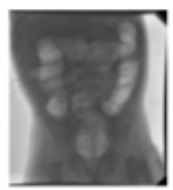
Figure 3. Fluorograph air contrast enema



(A) Initial fluorograph obtained at the start of the air contrast enema for intussusception reduction.



(B) Obtained during the enema showing the intussusceptum (red arrow) being reduced towards the RLQ.



(C) Obtained at the completion of the procedure, confirming reduction of the intussusception. Air is now seen throughout the colon and within the small bowel.

DISCUSSION

Through the course of the COVID-19 pandemic it has been noted that children, particularly infants, may have an asymptomatic or mild clinical presentation of infection. Gastrointestinal symptoms including diarrhea, vomiting and abdominal pain have been frequently reported as presenting symptoms in children (1). Intussusception is the most common cause of gastrointestinal obstruction in infancy. A prompt reduction of the intussusception is imperative to prevent bowel ischemia, necrosis, bowel perforation and peritonitis (2). A strong causal association of intussusception with viral illnesses, in particular adenovirus, enterovirus, norovirus, rotavirus and human herpes virus 6 has been described (3). Emerging data describes an association between COVID-19 infection and intussusception, with intussusception the presenting symptom particularly in infants.

CONCLUSIONS

We report a case of a male infant admitted to the hospital with vomiting, diarrhea and dehydration with COVID-19 infection. Lack of improvement with intravenous rehydration prompted abdominal imaging which showed ileocolic intussusception. This report adds to growing evidence of an association between COVID-19 infection and intussusception in children. Given the potential morbidity associated with delayed diagnosis and treatment of intussusception, it is prudent to consider intussusception in children, particularly infants, admitted to the hospital with COVID-19 infection and gastrointestinal symptoms.

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Bless Your Heart: Cardiac Changes After Illicit Drug Use

Andrea Nicholson, DO
Co-Author(s): G. Rodgers, MD; D. McOmber, MD; C. Harris, MD
Poster Category: Curriculum Design/QI

Introduction: Illicit drug use is a significant problem among United States youth, with 21.7% of adolescents reporting substance use in 2022.[1] While cocaine and amphetamines are well known for cardiac toxicity, other recreational drugs can also have adverse cardiovascular effects. We present a case of a teen with a history of long-term marijuana (THC) use who experienced myocardial ischemia after ingestion of psilocybin containing mushrooms (PCM) and d-lysergic acid diethylamide (LSD).

Case Description: A 17-year-old non-binary individual (pronouns she/her), with history of gender dysphoria and depression, presented to the emergency department five hours after self-reported ingestion of four "acid gel tablets" (presumed LSD) and one psychedelic mushroom. The patient has a history of daily illicit drug use including THC and hallucinogens. On the day of admission, she vomited multiple times and became acutely agitated; swinging from the light fixture and attempting to climb out the window. EMS evaluation revealed a disoriented teen who was responsive to external stimuli but unable to answer questions coherently. In the emergency department she was afebrile, heart rate 143, and blood pressure 150/78mmHg. Pupils were dilated, lungs clear, and cardiac exam with tachycardia but otherwise normal. Labs included potassium of 3.1 mmol/L but otherwise normal comprehensive metabolic panel, normal creatine kinase, elevated lactic acid of 3.1 mg/dL and leukocytosis. Urine toxicology screen was positive for cannabinoids. EKG showed diffuse ST depression primarily in the inferior lateral leads with ST elevation in lead aVR, V1 and V2 leading to concern for coronary insufficiency. Troponin I was elevated to 0.099 ng/ml. Echocardiogram was normal. Throughout the evaluation the patient denied chest pain and had no change in her respiratory status. She was placed on oxygen and given sublingual nitroglycerin, repeat troponin showed only a mild increase. Daily aspirin was initiated. Over the following 48 hours our patient was monitored on telemetry. She had improvement in her EKG tracings with resolution of ST depression and elevation and normalization of her troponin level.

Discussion: Cardiovascular complications of hallucinogens including LSD and PCM ("magic mushrooms") typically correspond to general sympathetic arousal and include hypertension and tachycardia. Alteration of serotonin induced platelet function and sympathetically induced arterial vasospasm may contribute to more serious reported complications including tachyarrhythmias and myocardial ischemia or infarction as in our patient.[2,3] Although widely viewed as safe, THC has been linked to various cardiovascular adverse events including myocardial infarction, arrhythmias, and cardiomyopathy. THC mainly exerts its effects via the sympathetic and parasympathetic nervous system and studies have shown that marijuana plays a role in thrombosis, inflammation, and atherosclerosis.[4]

Conclusion: Cardiovascular complications should be considered when evaluating teens with illicit drug ingestion. This case highlights the cardiac risk with street drug use, particularly hallucinogens and THC.

Bless Your Heart
Cardiac Changes After Illicit Drug Use

Andrea Nicholson MS, DO[3], George Rodgers MD[3], Delwyn McOmber MD[1,3], Corrie Harris MD[2,3]
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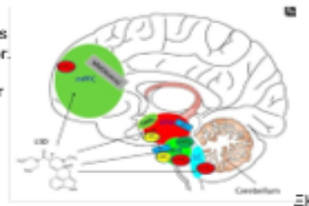
INTRODUCTION

Illicit drug use is a significant problem among United States youth, with 21.7% of adolescents reporting substance use in 2022.[1] While some drugs such as cocaine or amphetamines are well known for cardiac toxicity, many other recreational drugs can have adverse cardiovascular effects. We present a case of a teen with a history of long-term marijuana (THC) use who experienced myocardial ischemia after ingestion of psilocybin containing mushrooms (PCM) and lysergenic acid diethylamide (LSD).

MECHANISM OF ACTION

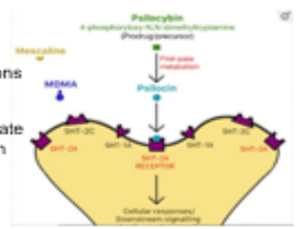
LSD binds strongly to serotonin receptors 5HT1a, 2A, and 2C, as well as the D2 dopamine receptor.

Once bound, the 5HT2A receptor is stimulated and activates glutamate transmission in the frontal cortex.



Psilocin
Acts on 5HT2A and 5HT21A serotonin receptors which enhance excitatory pyramidal neurons, glutamatergic neurons as well as GABA-ergic interneurons.

Decreases receptor binding in the caudate nucleus and putamen consistent with an increase in endogenous dopamine concentrations in the striatum.



STRENGTHS AND LIMITATIONS

The patient's ingestion was self-reported and not confirmed with a comprehensive drug screen. Additionally, the fact that the patient was positive for THC, which has known cardiac effects, is another limitation. However, shining light on the importance of monitoring for cardiac effects when LSD or PCM have been ingested.

CASE DESCRIPTION

A 17-year-old non-binary individual (pronouns she/her), with history of gender dysphoria and depression presented after self-reported ingestion of four "acid gel tablets" (presumed LSD), and psychedelic mushrooms. The patient has a history of long-term daily THC use.

On the day of admission, she vomited multiple times and became acutely agitated; swinging from the light fixture, attempting to climb out the window, and throwing objects. EMS evaluation revealed an agitated, disoriented teen who was responsive to external stimuli but unable to answer questions coherently. In the emergency department she was afebrile, heart rate 143, and blood pressure 150/78. Pupils were dilated, lungs clear, and cardiac exam with tachycardia but otherwise normal.

138	104	16	205
3.1	22	0.75	

Toxicology Screen

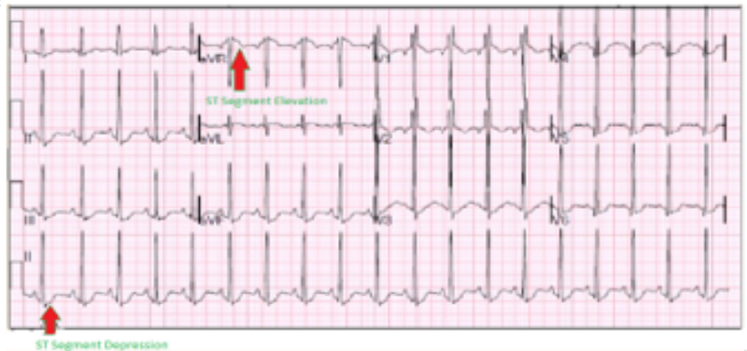
Acetaminophen <18
Ethylalcohol < 10
Salicylate < 5
THC Positive

16.5	12.8		218
	38.9		

Anion gap 12
Total Protein 7.8
Albumin 3.0
Calcium 10
Total Bilirubin 1.0

AST 29
ALT 19
Alkaline Phos 109
Lactic Acid 3.1

EKG showed diffuse ST depression primarily in the inferior lateral leads with ST elevation in lead aVR, V1 and V2 leading to concern for coronary insufficiency:



The patient denied chest pain, shortness of breath and dizziness. Cardiology was consulted, troponin I level and echocardiogram ordered. Troponin I was elevated to **0.099 ng/ml (0 and 0.04 ng/mL)**, echocardiogram revealed no gross pathology.

Cardiology recommended PICU admission, administration of nitroglycerin, oxygen and beginning maintenance IVF.
At the time of transfer to the PICU, the patient had returned to neurological baseline. Daily aspirin was initiated, and troponins were trended. On day of discharge her troponin was **< 0.010 ng/ml** and her EKG showed sinus arrythmia but was otherwise normal. The patient was discharged on daily aspirin and scheduled to follow up with cardiology in 1 month.

Cardiac Effects of LSD and PCM

- 5HT receptors located in circulating platelets and atrium
- Positive chronotropic, inotropic and lusitropic effects
- Platelet hyperaggregation can cause coronary artery occlusion

Cardiac Effects of THC

- CB1R is a G-protein coupled cannabinoid receptor in the heart and vascular smooth muscle
- CB1R activation activates sympathetic nervous system causing tachycardia
- Tachycardia increases myocardial O2 demand which can cause transient myocardial ischemia

DISCUSSION

Cardiovascular complications of hallucinogens typically correspond to general sympathetic arousal and include hypertension and tachycardia. Alteration of serotonin induced platelet function and sympathetically induced arterial vasospasm may contribute to more serious reported complications including tachyarrhythmias and myocardial ischemia or infarction as in our patient.[1,2]

Although widely viewed as safe, THC has been linked to various cardiovascular adverse events including myocardial infarction, arrhythmias, and cardiomyopathy. THC mainly exerts its effects via the sympathetic and parasympathetic nervous system and studies have shown that marijuana plays a role in thrombosis, inflammation, and atherosclerosis.[3]

CONCLUSION

Cardiovascular complications should be considered when evaluating teens with illicit drug ingestion. This case highlights cardiac risk with street drug use, particularly hallucinogens and THC.

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Cronobacter Sakazakii Infection of a Cephalohematoma in a Breast-Fed Newborn

Patrick O'Donnell, MD
Co-Author(s): D. Blatt, MD
Poster Category: Case Report

Introduction: *Cronobacter Sakazakii* is a gram-negative bacillus causing severe invasive infections in infants, with fatality rates between 40 and 80%.[1] *Cronobacter* is resistant to osmotic stress and dryness, and has been detected in powdered infant formula even after 2.5 years of storage.[3] Cephalohematoma is a subperiosteal hemorrhage not crossing suture lines, occurring in 1-2% of all live births, but spontaneous infection is rare. We present a case of an infected cephalohematoma from an exceedingly rare source: *Cronobacter sakazakii*, with no identified risk factors for infection.

Case Report: A 2-week-old previously healthy male born at full-term via spontaneous vaginal delivery with a small scalp mass began having increased fussiness, fevers, poor feeding, and expansion of mass at 16 days of life. Inflammatory markers were elevated, but all other infectious workup was normal and showed no growth on culture. Head ultrasound and brain MRI confirmed right parietal cephalohematoma and surrounding edema, but no abscess formation or osteomyelitis. Despite empiric IV antimicrobials, fevers continued for 4 days. The cephalohematoma was then surgically evacuated with resolution of fevers shortly thereafter. Universal bacterial PCR and culture of cephalohematoma fluid returned positive for *Cronobacter sakazakii*.

Patient completed 2 weeks of IV cefepime, and an additional 2 weeks of oral ciprofloxacin when repeat brain MRI showed no CNS or bone involvement and marked improvement. The patient improved appropriately with no residual deficits or complications.

Discussion: The patient's presentation matched those commonly seen in cephalohematoma infections, including age of onset, symptomatology, and inflammatory marker elevation. However, he did not have typical risk factors that predispose cephalohematoma formation. Further, common bacteria causing cephalohematoma infection include E. Coli (57%), staph aureus (18%), among others.[2] *Cronobacter sakazakii* is an extremely uncommon source of cephalohematoma infection. He had no exposure to the classic reservoir of powdered infant formula, which has been linked to 90% of cases of invasive *Cronobacter*.[4] Recent studies have shown major shifts in demographics of *Cronobacter* infection - the majority of invasive cases since 2004 have occurred in term neonates with symptoms originating at home.[4] We therefore encourage reporting of all cases of *Cronobacter sakazakii* to public health officials.

Cronobacter Sakazakii Infection of a Cephalohematoma in a Breast-Fed Newborn

Patrick O'Donnell MD, Daniel Blatt MD
Norton Children's and the University of Louisville School of Medicine
Louisville, Kentucky

INTRODUCTION

Cronobacter Sakazakii

- Gram-negative bacillus
- Causes severe invasive infections in infants
- Fatality rates between 40 and 80%[1]
- Resistant to osmotic stress and dryness, thus detected in powdered infant formula after 2.5 years of storage[3]

Cephalohematoma

- Subperiosteal hemorrhage not crossing suture lines
- 1-2% of all live births, 3-4% of assisted births[2]
- Spontaneous infection is rare

We present a case of an infected cephalohematoma from an exceedingly rare source: *Cronobacter sakazakii*, with no identified risk factors for infection.

METHODS

Information was obtained through retrospective chart review from electronic medical records. Written informed consent was obtained from the parents of the patient for publication of this case report and accompanying images.

CASE REPORT

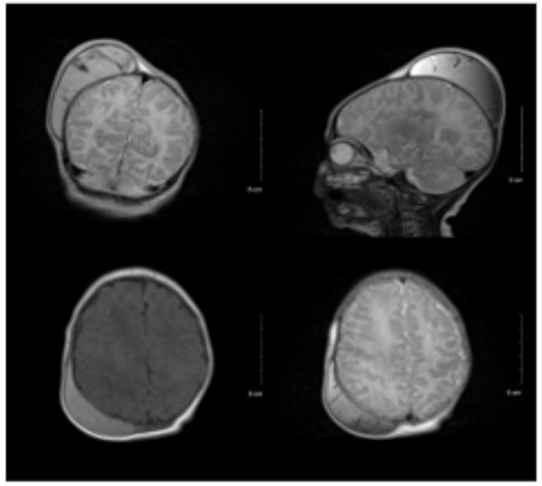
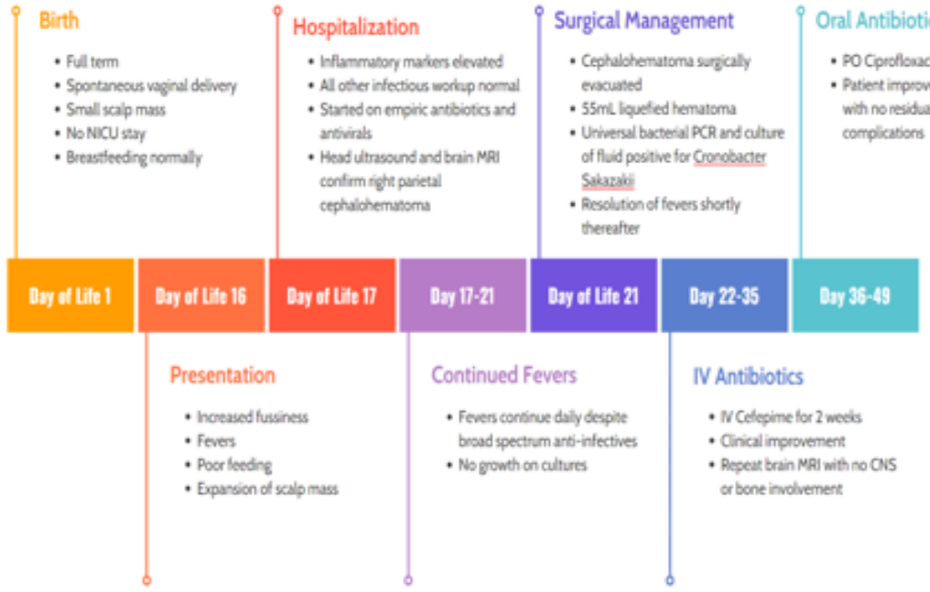


Figure 1. MRI Brain displaying very large right parietal cephalohematoma with surrounding scalp edema. No abscess formation, no skull abnormality to suggest osteomyelitis.



CONCLUSIONS

This case draws attention to the presentation of infected cephalohematoma in a patient without significant known risk factors (macrosomia, prolonged delivery, forceps/vacuum delivery, or scalp electrode use). Infants with infected cephalohematoma may present with fevers, poor feeding, expanding size of hematoma, and inflammatory marker elevation

Cronobacter sakazakii is an extremely uncommon source of infected cephalohematoma, and this patient was not exposed to the classic reservoir of Cronobacter growth, powdered infant formula, which has been linked to 90% of cases of invasive disease.[4]

We encourage pediatric caregivers to report all cases of Cronobacter sakazakii to public health officials.

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Child Abuse or Medical Mimic? A Neonate with a Femur Fracture

Ethan Wall Varner, MD
Co-Author(s): S. Barton, MD; K. Weakley, MD; C. Harris, MD
Poster Category: Case Report

Introduction: Presenting symptoms of neonatal osteomyelitis may overlap with more common bony abnormalities in children, including trauma. We present a 13-day-old infant with presentation concerning for physical abuse ultimately diagnosed with neonatal osteomyelitis.

Case Description: A 13-day-old female presented for a routine two-week weight check with her pediatrician. Physical examination revealed pain and decreased movement of her left leg. X-ray was concerning for left distal femur corner fracture (figure 1b), and the child was referred to the emergency department for evaluation of suspected non-accidental trauma. The infant was born at term and had no complications of pregnancy or delivery; maternal prenatal labs were negative (including syphilis testing). Birth weight was normal and the infant had remained afebrile. Parents noted increased fussiness and that the left leg had been maintained in a frog-leg position since birth (figure 1a), initially attributed to colic and in utero positioning. In the ED, exam revealed an alert infant with no skin bruising, left leg held in a flexed position at the hip and knee with intermittent pain on palpation, and no spontaneous leg movement. Trauma labs were normal but inflammatory markers were elevated. Skeletal survey demonstrated irregularity of the left femoral medial metaphysis with subtle adjacent periostitis concerning for remodeling fracture versus infection. The femur was stabilized with a Pavlik harness.

Following admission, the patient developed a fever, warmth of the left leg, and worsening discomfort with left hip and knee extension. Blood culture was negative. MRI of the left femur (figure 2) demonstrated septic arthritis of the knee and osteomyelitis of the distal femur with intraosseous abscess. Empiric vancomycin and ceftazidime were started, and orthopedics performed surgical debridement. Thereafter, the patient clinically improved, and labs normalized. Joint fluid cultures were negative, but a universal bacterial PCR of necrotic tissue was positive for *Streptococcus pneumoniae*. Antibiotics were narrowed to clindamycin. A four-week total antibiotic course, two weeks intravenous and two weeks oral, was completed. Following this, bony abnormalities resolved on x-ray and the patient regained full range of motion.

Discussion: *Streptococcus pneumoniae* is a rare cause of neonatal osteomyelitis. Initial symptoms of neonatal osteomyelitis often include fussiness or change in limb positioning without systemic signs which may mimic typical newborn concerns. Delayed appearance of X-ray abnormalities and confounding appearance to that seen in cases of abuse may delay diagnosis.

Conclusion: Neonatal osteomyelitis should be considered when an infant presents with bone abnormalities, especially if associated with systemic signs of inflammation. This case highlights the importance of avoiding premature closure when evaluating potential abusive injuries.

Child Abuse or Medical Mimic? A Neonate With a Femur Fracture

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INTRODUCTION

- Presenting symptoms of neonatal osteomyelitis may overlap with more common bony abnormalities in children including trauma.
- We present a 13-day-old infant with presentation concerning for physical abuse ultimately diagnosed with neonatal osteomyelitis.

CASE PRESENTATION

- 13-day-old female presented for 2-week weight check
- **PE**: pain and decreased movement of left leg
- H/O LLE maintained in frog-leg position since birth (figure 1)
- **X-ray** concerning for femur corner fracture (figure 2)
- Referred to the ED for suspected non-accidental trauma
- **Birth Hx**: Term by induced for preeclampsia. Prenatal labs negative. No PROM or maternal fever. Placental pathology no infection. Birth weight normal, infant afebrile.

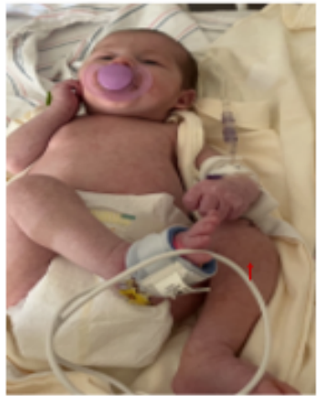


Figure 1. Left leg noted to be held in frog-leg position since birth while right leg moves freely.

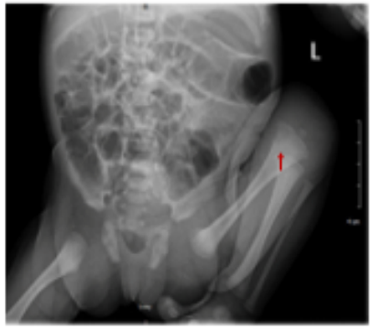


Figure 2. Asymmetry of the distal medial femoral metaphysis concerning for corner fracture (red arrow).

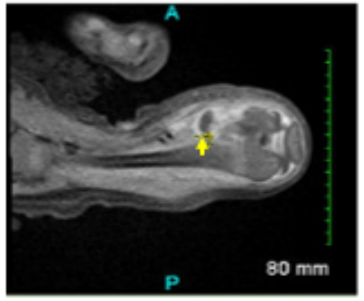
HOSPITAL COURSE

ED
- Trauma labs normal
- Inflammatory markers elevated
- Skeletal survey: irregularity of the left femoral medial metaphysis with subtle adjacent periostitis concerning for remodeling fracture versus infection
- Femur was stabilized with a Pavlik harness

Hospital Course
- Fever, left leg warmth and worsening pain developed
- MRI of the left femur: septic arthritis and osteomyelitis (figure 3)
- Vancomycin and ceftazidime were started
- I & D by orthopedics

Post-Op
- Joint fluid cultures negative
- Blood cultures negative
- Universal bacterial PCR of necrotic tissue positive for *Streptococcus pneumoniae*
- Antibiotics were narrowed to clindamycin
- A four-week total antibiotic course, two weeks intravenous and two weeks oral, was completed
- Splenic U/S normal

OP F/U
- Bony abnormalities resolved on x-ray
- Patient regained full range of motion



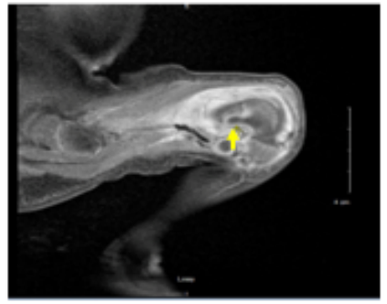


Figure 3. Large knee effusion with edema and synovial enhancement concerning for septic arthritis. There is an intraosseous abscess within the distal medial femoral metaphysis which may communicate with the joint space and involve the growth plate (yellow arrows).

NEONATAL OSTEOMYELITIS FACTS

Incidence: 1.2-13 cases per 100,000 children per year

Risk Factors
- Complicated pregnancy, labor, or delivery
- Central venous catheter
- Late-onset neonatal sepsis
- Skin infection
- Urinary tract abnormalities

Pathogen:
- *Staphylococcus aureus* (78%)
- GBBS (5%), *Streptococcus pneumoniae*, coagulase negative staph.

Clinical features:
- Early infection: Most afebrile with mild symptoms such as fussiness
- 77-100% localized limb swelling, erythema, tenderness
- 50-89% reduced movement or pseudo-paralysis

Lab Features: CRP and ESR elevation, most have normal WBC at presentation

DISCUSSION

- The diagnosis of neonatal osteomyelitis can be difficult, yet early recognition is essential to prevent damage such as joint destruction or growth failure.
- Clinical symptoms in a newborn are often unspecific and mild, including fussiness or reduced movement without systemic signs.
- Delayed appearance of X-ray abnormalities and confounding appearance to that seen in cases of abuse may delay diagnosis.

CONCLUSION

- Neonatal osteomyelitis should be considered when an infant presents with bone abnormalities, especially if associated with systemic signs of inflammation.
- This case highlights the importance of avoiding premature closure when evaluating potential abusive injuries.

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No Walking, No Talking, and No Vitamin C and D

Justin Chu, MD
Co-Author(s): A. Etling, MD; K. Boland, MD
Poster Category: Case Report

Intro/Background: Vitamin C deficiency, or scurvy, is a rare diagnosis in developed countries. However certain patient populations are at a higher predisposition: these include patients with severe malnutrition, alcohol dependence, substance use disorder, and children with underlying neuropsychiatric conditions such as autism with a highly selective diet. We present a case of a 4 year old male with non-verbal autism who presented to the emergency department for persistent bilateral lower leg pain who was ultimately diagnosed with scurvy.

Case: The patient is a 4 year old male with history of non-verbal autism. He initially started complaining of pain in his right foot one month prior to presentation with no known trauma or sick symptoms. X-rays of bilateral foot and ankle (obtained as outpatient, prior to ED presentation) were negative and he was treated with a boot for a presumed toddler's fracture. He then developed left lower leg pain and was unable to bear weight which prompted his ED evaluation and subsequent hospital admission.

Hospital admission lab work demonstrated anemia and elevated inflammatory markers with Erythrocyte Sedimentation Rate (ESR) 49 mm/Hg, C-reactive protein (CRP) 2.4 mg/dL. In conjunction with his dietary history and physical exam, this warranted further investigation for vitamin deficiencies. Further workup was notable for Vitamin C level of <5µmol/L (normal 23-114), Vitamin D 6ng/mL (normal: >30).

Discussion/Conclusion: One of the challenging aspects to the diagnosis of scurvy/vitamin C deficiency is that its symptoms frequently mimic other more common etiologies such as infectious, autoimmune, or malignancy. Given the rare prevalence of the disease, it is often delayed in diagnosis and at the expense of invasive and costly medical workups, and unnecessary subspecialist consultations. This case highlights the clinical importance of considering scurvy as a diagnosis in the appropriate clinical context.

No Walking, No Talking, and No Vitamin C and D

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UofL SCHOOL OF MEDICINE

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Objectives

- Scurvy can present as a myriad of symptoms, and should be on the differential for patients with bone pain or refusal to bear weight, especially if they have an underlying neuropsychiatric condition.
- It is important for clinicians to understand the typical presentation of scurvy, be familiar with the common physical exam findings, and obtain a thorough dietary history to avoid severe complications and delay diagnosis.

Patient History

- 4yo male with history of non-verbal autism presented after 1 month of progressive bilateral lower extremity pain and inability to bear weight
- No known preceding trauma or constitutional symptoms, but has lost 2 teeth in the past 2 months
- Had been comanaged by his pediatrician and orthopedics and treated as a toddler's fracture
- Diet limited to pasta due to texture aversions

Pertinent Physical Exam

Vitals: Temp 36.6 C | HR 142 | BP 135/94 | RR 28 | BMI 15.65

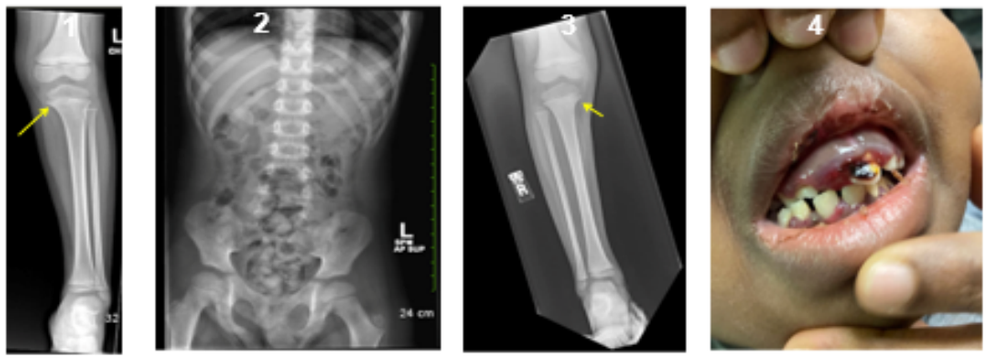
- **General:** Non-verbal, appears comfortable when laying in bed
- **HEENT:** Erythematous and inflamed gingiva, small hematoma of superior midline gingiva
- **Neuro**: sensation intact, downgoing Babinski, and intact Achilles tendon reflex bilaterally
- **MSK**: Full passive range of motion of all 4 extremities, although visible discomfort with movement of lower extremities. No obvious joint swelling. Refuses to stand. No erythema, edema, or joint deformities.

Labs

ESR	**49** (nl 0-20mm/Hr)
CRP	**2.4** (nl <0.5mg/dL)
Procalcitonin	0.12 (0.1-0.5ng/mL)
Vitamin C	**<5** (23-114µmol/L)
Vitamin D	**6** (>30ng/mL)

Hgb	**10.4g/dL**
MCV	**65µm³**
Iron	**22** (16-128 ug/dL)
TIBC	**266** (69-240 ug/dL)
Ferritin	40 (12-100ng/mL)

Imaging



- Figures: 1.) Left Tib-Fib XR with mild metaphyseal hypolucency, 2.) Lumbar Spine XR with mild osteopenia 3.) Right Tib-Fib XR with mild metaphyseal hypolucency, 4.) Gingival swelling and bleeding

Differential Diagnosis

- Infectious: Chronic Multifocal Osteomyelitis, septic arthritis
- Autoimmune: Juvenile Idiopathic Arthritis, vasculitis
- Hematologic: Acute Myelogenous Leukemia
- Neurologic: Transient synovitis
- MSK: Bone contusion, toddler's fracture
- Vitamin Deficiency

Discussion

- Vitamin C deficiency (Scurvy) is rare in developed countries, but is more prevalent among specific populations, including those who are severely malnourished, alcohol dependence, substance use disorder, and children with underlying neuropsychiatric conditions such as autism with a highly selective diet
- Vitamin C deficiency presentation can vary, but is frequently associated with myalgias, gingivitis, follicular hyperkeratosis, and corkscrew hairs
- Vitamin D deficiency is also associated with hypocalcemia, Rickets, osteomalacia
- Hospitalists must consider vitamin deficiencies in the differential to facilitate earlier initiation of treatment, avoid costly work-up, and unnecessary subspecialist consultation
- **Use of anesthetics in patients with Scurvy is associated with dyspnea, hypotension, and sudden death**

Patient Follow-up

- Established care with pediatric endocrinology after hospital discharge and evaluated in Pediatric Bone Clinic
  - Started on Vitamin C, Vitamin D, and calcium supplementation
- 3 month follow-up: Vitamin C level 13, Vitamin D level 15.9
  - Has seen dentistry with resolution of his gingivitis

Acknowledgements

- Dr. Kim Boland for support and poster review
- UofL Pediatrics and Med-Peds Departments, & Norton Children's Hospital

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EVALluating Uncommon Causes of Fever

Ryan Mughmaw, MD
Co-Author(s): C. Giles, MD; O. Mittel, MD
Poster Category:

Introduction: According to a study sponsored by the Centers for Disease Control and Prevention (CDC) and the Food and Drug Administration, 1 in 4 high school students and 1 in 10 middle school students vaped in the last 90 days. Vaping causes both long- and short-term health effects. E-cigarette and Vaping Associated Lung Injury (EVALI) peaked in incidence in the United States in September 2019. We present a patient with an unusual presentation of EVALI.

Case. The patient initially presented with fatigue, fever, and general malaise that had been ongoing for the past few days. The initial exam was significant for only a few pertinent positives such as high fever and tachypnea while the pertinent negatives included lungs clear to auscultation, soft and non-tender abdomen, and a clear oropharynx. Due to the broad differential with presentation, an initial workup included a blood count, basic chemistry, inflammatory markers, and blood cultures. The initial workup revealed only inflammatory markers. Infectious disease was consulted and additional lab including tick panel, viral panels and an oncologic workup that also failed to demonstrate a clear diagnosis. A CT Chest was performed which ultimately led to the diagnosis of EVALI.

Discussion/Conclusion: EVALI is a diagnosis of exclusion. The pathophysiology of EVALI is not fully understood, but one suggested mechanism is that the Vitamin E acetate found in vaping products can affect lung tissue and lead to serious lung injuries. EVALI is not only limited to the lung as its name implies but can have constitutional and gastrointestinal effects as well. Steroids have been the gold standard of treatment, however, there are no official recommendations for a standard regimen. The long-term effects of EVALI are still being evaluated. This case stressed the importance of taking a thorough history while also not being anchored to one diagnosis. EVALI should be on the differential for all providers who take care of patients who use vaping or E-cigarette products present with any sick visit.

EVALluating Uncommon Causes of Fever

Cristina Giles, MD[1,2,3]; Olivia Mittel, MD[2,3]; Ryan Mughmaw, MD[1,2,3]
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University of Louisville
MED-PEDS RESIDENCY PROGRAM

Background

As of 2017, 1 in 4 high school students and 1 in 10 middle school students had vaped in the last 90 days.

Vaping products are heterogenous in their composition and include both legal and illicit products. Vitamin E acetate, an additive in some vaping products, has been strongly associated with EVALI.

Objectives

To discuss the epidemiology, clinical manifestations, diagnosis, laboratory and imaging findings, and treatment of EVALI.

Pertinent History

HPI: A 16 year old male with extensive recent travel history and use of THC and nicotine vaping products, presented with 9 days of fever up to 103° accompanied by malaise and myalgias.

2 days prior to presentation, the patient developed sore throat, vomiting, and diarrhea.

Initial Presentation: Febrile to 103.1, persistent hypotension
Extensive fluid resuscitation → PICU admission

Initial evaluation unrevealing aside from:
Mildly elevated ESR, CRP, and LDH.
Chest x-ray: parabronchial thickening (viral vs reactive process), no pneumonia or mass.

CT of the patient's chest, abdomen, and pelvis was performed to evaluate for occult malignancy or infectious process due to ongoing fevers after 2 days of hospitalization.

Centrally located ground glass densities involving the bilateral upper and lower lobes with sparing of the subpleural lung → dx EVALI

Treated supportively, with ongoing waxing/waning symptoms: intermittent fevers associated with myalgias, malaise, and gastrointestinal symptoms over a period of 40 days.

Physical Exam

Vitals:	Temperature: 103.1 °F, Blood Pressure: 103/58, HR 65, RR 18-24, Wt 66.6 kg, 98% on RA
Gen:	Ill-appearing, fatigued, uncomfortable
HEENT:	No OP ulcers, TMs normal
Neck:	No LAD, no meningeal signs
Resp:	CTAB, intermittent tachypnea up to 24
CV:	Regular rate and rhythm, no murmur, gallop, or edema
GI:	No tenderness, rebound or guarding
Skin:	Warm, dry and pink with no rashes or lesions
Lymph:	No lymphadenopathy
Neuro:	Nonfocal, AAOx3, CN II-XII intact.

Data

Initial Laboratory Studies:
- **CBC w/ diff:**
  - WBC: 9.7 w/ neutrophilic predominance
- **CMP**
  - Within normal limits
- **Respiratory pathogen panel:**
  - Negative
- **Monospot:** negative
- **Rapid strep:** negative
- **Urinalysis:** normal
- **Urine tox screen:** positive for THC
- **ESR: 53, CRP: 20.2**
- **Procalcitonin:** normal
- **LDH: 843, Uric acid:** normal
- **CK:** normal
- **HIV, syphilis:** negative
- **Gonorrhea, chlamydia:** negative

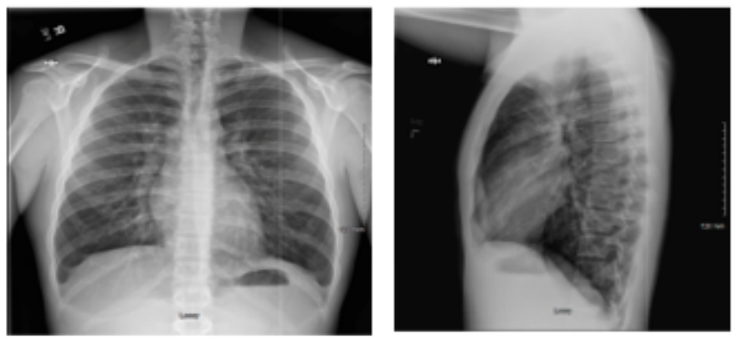

Figure 1: Our patient's chest x-ray showed parabronchial thickening consistent with viral vs reactive process, but no pneumonia or mass.

Continued Hospital Work Up:
- **Peripheral smear:**
  - 0% blasts BUT "3% atypical cells concerning for blasts present. If neutrophilia and fever persist, a bone marrow examination and/or flow is recommended."
- **Flow cytometry:**
  - Immunophenotyping did not reveal an abnormal cell population (inconsistent with malignancy)
- **EBV/CMV titers:** negative
- **Fungal panel:** negative
- **Tick panel:** negative
- **Arbovirus panel:** negative
- **Quantiferon Gold:** negative
- **Bartonella:** negative
- **Fecal ova and parasites:** negative
- **Adeno- and enterovirus PCR:** negative
- **C diff toxin:** negative
- **Strep :** negative

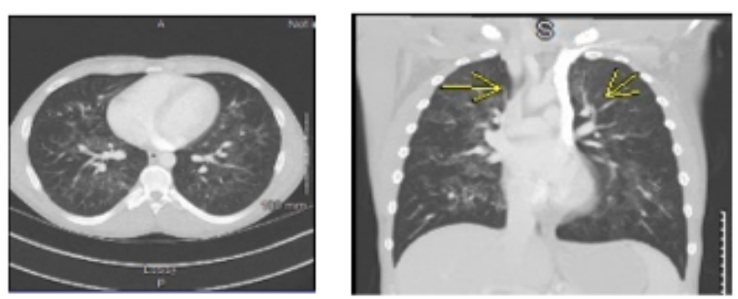

Figure 2: Our patient's CT showed centrally located groundglass densities involving bilateral upper and lower lobes with relative sparing of the subpleural lung. Subcentimeter hilar and mediastinal lymph nodes were noted without evidence of pneumonia, mass, cavitary lesion.

Discussion, cont.

Diagnostic Criteria
To be diagnosed with EVALI, a patient must have:
- Used a vaping product within the last 90 days
- Pulmonary infiltrate on plain film or CT
- Absence of pulmonary infection on initial work up, including negative respiratory pathogen panel and influenza testing
- Absence of plausible alternative diagnoses

Symptomatology
91% of patients had symptoms in 2 of the following 3 categories:
- **Constitutional:** fever, chills, weight loss
- **Respiratory:** cough, shortness of breath
- **Gastrointestinal:** nausea, vomiting, diarrhea, abdominal pain

Only 30% of patients had an SpO2 of <95% on presentation.
A small clinical study published in Pediatrics showed prominent GI symptoms in adolescents.

Imaging Findings
- 96% of patients had abnormal CT and chest x-ray findings that were typically bilateral and symmetric
- 100% of patients had an abnormal CT scan. 63% had an abnormal chest x-ray
  - Common CT findings include:
    - Ground glass opacities with subpleural sparing
    - Inter- and intralobular thickening
    - Bronchiectasis
    - Diffuse alveolar damage

Pathophysiology
- Vitamin E acetate, which is found in many vape products, has been associated with the development of EVALI.
  - An NEJM study isolated Vitamin E acetate in BAL fluid from 48 of 51 EVALI cases, and in none of the healthy comparators.
- Vitamin E acetate does not cause harm when applied to the skin or ingested. A mechanism by which Vitamin E acetate causes EVALI has not yet been elucidated.
  - Other substances may play a role in the development of EVALI given the heterogeneity of vape products.
- Removal of Vitamin E acetate from many vape products is thought to be link to the decline in incidence.

Treatment
- Treatment with corticosteroids is recommended, but there is no recommended regimen.
- Hospitalized patients should be clinically stable 24-48 hours prior to discharge.
- Patients should follow up with their PCP within 48 hours of discharge and with pulmonology within 2-4 weeks of discharge.
  - Follow up imaging is recommended.

Conclusions

This case demonstrates that EVALI can present in the absence of respiratory symptoms in an adolescent patient. Patients with EVALI may present with a combination of constitutional, respiratory and GI symptoms and providers must maintain high suspicio

Severe Cystic Lung Disease in a Child with Proteus Syndrome

Rose Hawkins, MD
Co-Author(s): J. Hersh, MD; R. Morton, MD; S. Bickel, MD
Poster Category:

Introduction: Proteus syndrome is a rare genetic disorder characterized by vascular malformations and asymmetric connective tissue overgrowth, typically associated with an activating mutation in *AKT1* oncogene which promotes growth while limiting apoptosis. While Proteus syndrome is known to cause skeletal and soft tissue overgrowth, as well as vascular malformations, it is increasingly recognized as a cause for bullous or cystic lung disease.

Case Presentation: 14-year-old male with a history of asthma, abnormal soft tissue growths, and developmental delays initially admitted at age 4 to the inpatient wards for status asthmaticus, during which a chest radiograph showed incidental findings of bilateral cystic lung changes. High resolution chest CT confirmed cystic lung changes. A diagnosis of Proteus Syndrome was made based on phenotypic features in consultation with Genetics. Initial testing of AKT1 and FLCN from a biopsy of a cerebriform cutaneous tissue nevus was negative but repeat testing through the NIH confirmed the diagnosis. Spirometry and IOS data were followed closely over time, and the patient continued to be treated with bronchodilators due to obstructive and restrictive patterns. Oxygen therapy was initiated for worsening hypoxemia. Despite this, he had progressive worsening of lung function in conjunction with worsening emphysematous changes seen in the lungs, ultimately leading to bilateral lung transplantation. He is now over one year post transplant with significant improvement in multiple clinical domains.

Discussion: Proteus syndrome is a mosaic syndrome and rare cause of cystic lung disease, with lung lesions found in < 10% of individuals. Diagnosis can be difficult, as each case may have a different constellation of symptoms. Additionally, many pulmonary manifestations are not recognized until adolescence or adulthood. Other case reports of children with Proteus syndrome-associated lung lesions note that pulmonary manifestations were often found incidentally on chest radiographs when obtained for reasons other than respiratory complaints. Our patient, along with one other reported pediatric case, suggest that such cystic changes may be progressive. Despite this, only one other case of lung transplantation for a patient with Proteus Syndrome is described in the literature.

Conclusion: While rare, Proteus syndrome is a significant and potentially lethal cause of bullous or cystic lung changes. There is little known about the natural course of the disease and treatments available. Patients with this diagnosis should be followed closely by pulmonologists to monitor for pulmonary manifestations of the disease.

Severe Cystic Lung Disease in a Child with Proteus Syndrome

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INTRODUCTION

- Proteus syndrome is a rare genetic syndrome characterized by vascular malformations and asymmetric connective tissue overgrowth
- Proteus syndrome is increasingly recognized as a cause for bullous or cystic lung disease

CASE PRESENTATION

Now 14yo male with a history of asthma, abnormal soft tissue growths, and developmental delays

2014
- Initial admission at age 4 for status asthmaticus
- CXR showed incidental findings of bilateral cystic lung changes, confirmed on HRCT chest

2015 – 2016
- Repeat CT chest showed worsening emphysematous changes

2018
- Genetics consulted and diagnosis of Proteus Syndrome made based on phenotypic features

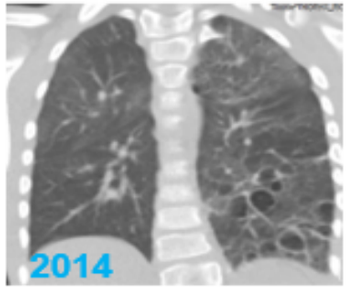
2019
- AKT1 testing through the NIH confirmed the diagnosis
- Initial referral for lung transplant consultation

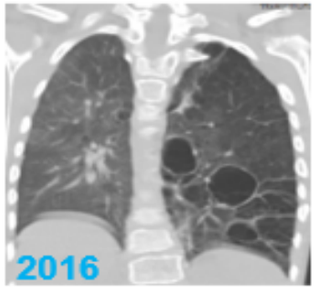
2020 – 2021
- PFTs showed severe obstructive defect

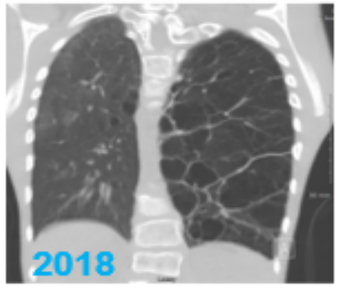
2022
- Bilateral lung transplant completed

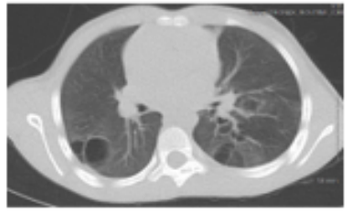
2023
- Now >1year post-transplant with improvement in multiple clinical domains

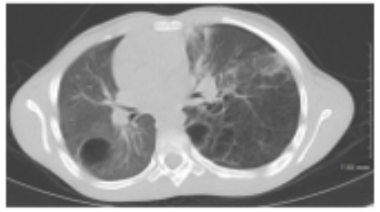
SERIAL CHEST CT

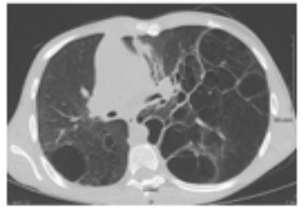






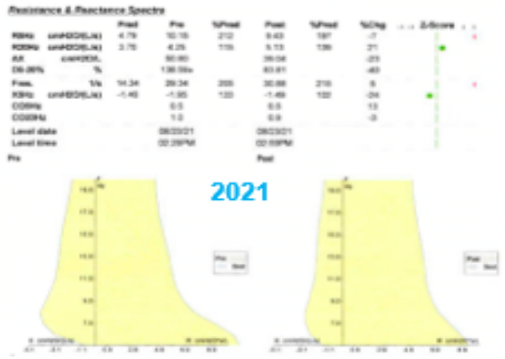






PRE-TRANSPLANT PFT & IOS MEASUREMENTS

	7/2018	3/2018	4/2017	11/2020	5/2021	11/2021
FVC	55	57	43	45	33	24
FEV1	42	47	39	35	25	18
FEV1/FVC	0.7	0.75	0.82	0.65	0.62	0.61
FEF 25-75%	24	30	30	43	43	27



DISCUSSION

- Proteus syndrome is a mosaic syndrome and rare cause of cystic lung disease
  - Lung lesions found in < 10%
  - Many pulmonary manifestations not recognized until adolescence or adulthood
  - Proteus syndrome-associated lung lesions have been found incidentally on chest radiographs
- Diagnosis can be difficult, as each case may have a different constellation of symptoms
- This patient's course suggest that such cystic changes may be progressive
- Only one other case of lung transplantation for a patient with Proteus Syndrome is described in the literature

CONCLUSIONS

- Proteus syndrome is a rare, but significant and potentially lethal cause of bullous or cystic lung changes
- Patients with this diagnosis should be followed closely by pulmonologists to monitor for pulmonary manifestations of the disease

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The Impact of Reading on Pediatric Patients and Their Caregivers in the Intensive Care Unit: A Scoping Review

Megan Lloyd, MD
Co-Author(s): S. Multerer, MD; G. Genova
Poster Category: Curriculum Design/QI

Background: Pediatric patients in intensive care units including Pediatric Intensive Care Units (PICU) and Neonatal Intensive Care Unit (NICU) settings undergo procedures that can induce acute pain and stress. In addition, time spent in the ICU can place the patient at risk for long term complications like delirium, developmental delay, or bonding deficiencies with caregivers, who are also not immune to these effects. Several interventions have been sought to alleviate these negative experiences. Reading to pediatric patients in other settings has shown to be beneficial to both the well-being of the child in addition to promoting healthy bonding between child and caregiver.

Objective: This scoping review aims to explore reading by caregivers as an intervention in PICU and NICU settings, and analyze its effects as reported in the literature.

Methods: PubMed, Cochrane Library, EMBASE, CINAHL, ProQuest Dissertations and Theses Global, and Open Access Theses and Dissertations were searched for items published in English through 2022 that included outcomes data. Once articles were extracted, screening by two reviewers took place at the title, abstract, and full text levels using Rayyan software. Discrepancies between reviewers were reconciled and data were then compiled into Microsoft Excel spreadsheet for further analysis.

Results: Initially, 2126 articles were returned for review. After duplicates were removed, a total of 1513 items were screened at the title and abstract level. Of those, 38 were selected for full text review for eligibility. Ultimately, 10 were included for the purposes of this paper. Most studies were small, single-center, and of either quasi-experimental or pre-post survey design. Outcomes can be grouped into 6 major categories (in order of decreasing frequency): (1) Parental Stress and Attachment, (2) Physiological Parameters, (3) Reading Frequency, (4) Pain Response, (5) Sleep Parameters, and (6) Development. Nine articles discussed patients admitted to the Neonatal ICU, while one article discussed patients in the Pediatric ICU.

Conclusions: There is limited quality literature on the overall impact of reading to patients in the ICU setting. However, it does appear that reading is a cost effective, non-invasive intervention that can be adapted to Neonatal and Pediatric Intensive Care Units for a variety of measures including, but not limited to, parent-infant bonding, pain control, and cardiorespiratory stability. This scoping review identified 6 major domains for which reading as an intervention has been studied with largely positive outcomes. Additional research is required for further assessment of the effectiveness and breadth of outcomes for reading as an intervention.

The Impact of Reading On Pediatric Patients And Their Caregivers In The Intensive Care Unit: A Scoping Review

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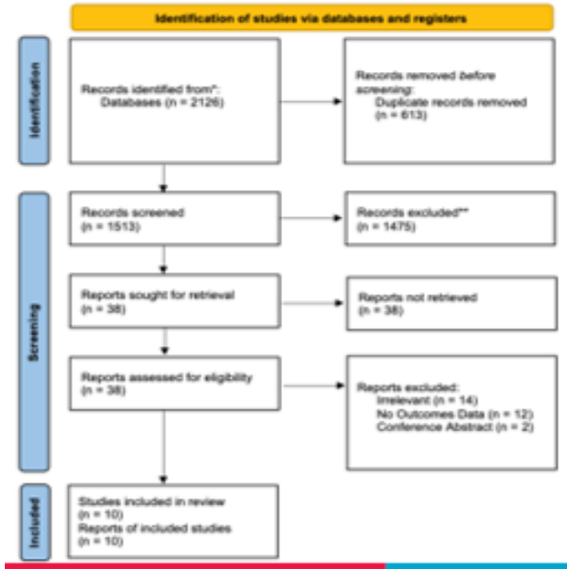
BACKGROUND

- Time spent in the ICU can place the patients at risk for developmental delay, delirium, or bonding deficiencies with caregivers.
- Reading to pediatric patients in other settings has shown to be beneficial to child well-being and promotes healthy bonding between child and caregiver.
- The purpose of this study is to review the existing literature on reading to pediatric patients in the ICU setting.

METHODS

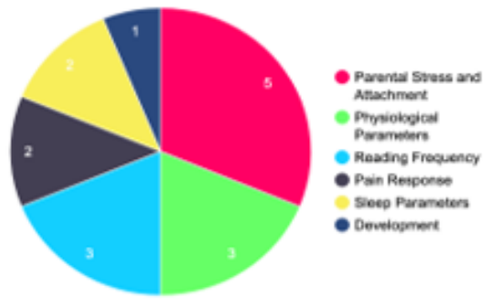
- Literature searches of PubMed, Cochrane Library, EMBASE, CINAHL, ProQuest Dissertations and Theses Global, and Open Access Theses and Dissertations were performed and limited to items published in English to 2022, with included outcomes data.
- Two reviewers screened title, abstract, and full text using Rayyan software.
- Discrepancies between reviewers were reconciled and data compiled into Microsoft Excel for further analysis.



RESULTS

1st Author, Publication Year	Setting	Study Design	# Subjects	Measures Category	Results Summary
Scala, 2018	NICU	Prospective RCT	17	Physiologic	No adverse effects. Significantly fewer desaturation periods with effect lasting 1 hour. Fewer desaturations in live reading vs. recorded reading.
Yu, 2022	NICU	RCT	64	Parental Stress and Attachment; Physiologic; Pain Response.	Significant difference between groups' heart rates at 1 minute post-heel stick. Decreased pain score at 1 minute post-heel stick.
Jain, 2021	NICU	Quasi-Experimental	317	Reading Frequency	Among parents who did not enjoy reading, significant difference in reading frequency in NICU and home. No significant difference between groups of attitudes about reading.
Lorenzi Quigly, 2020	NICU	Quasi-Experimental	40	Parental Stress and Attachment	No significant difference between pre- and post- intervention Maternal Attachment Index scores or Parental Stressor Scale scores
Levesque, 2018	NICU	Quality Improvement Initiative	98	Reading Frequency	On parental survey: 100% enjoyed reading; 80% said they noted change in infants when they read to them
Almarode, 2019	NICU	Quasi-Experimental	15	Parental Stress and Attachment; Physiologic	Significant reduction of EPDS scores pre- and post reading intervention. Significant difference in SpO2 during and after reading. No significant difference in self-reported stress scores or heart rate
Shellhaas, 2019	NICU	Quasi-Experimental	47	Sleep	Sleep probability higher during maternal voice exposure. Apnea-hypopnea index not altered by maternal voice recording exposure.
Lariviere, 2011	NICU	Non-randomized Participant Blinded Intervention Study	136	Parental Stress and Attachment; Reading Frequency	Reading positively affected interactions with their infant in 3 main ways: 1) sense of control; 2)sense of intimacy; 3) sense of normalcy. Increase in reading at 3 months.
Neri, 2021	NICU	Longitudinal Study	100	Development	No difference in hearing and language scores at 9 and 12 months but reading group significantly higher at 18 and 24 months for language scores. Reading group with significantly higher change scores.
Rennick, 2018	PICU	Non-blinded Pilot RCT	20	Parental Stress and Attachment; Pain Response; Sleep	95% of parents and nurses felt children responded positively to reading and touch. Intervention group COMFORT scores decreased (positive response) 6 more points over intervention period and reported less anxiety on the wards and at home.

Distribution Of Articles Among Themes



STRENGTHS/LIMITATIONS

- There are few published studies, including only one publication examining reading in the PICU.
- Studies are mostly small and single center in nature
- Caregiver literacy level and language barriers were a limitation in several studies which could impact generalizability of data.

CONCLUSIONS

- 10 research studies that have evaluated reading by caregivers as an intervention to improve outcomes for pediatric patients in the PICU and NICU.
- Although there are significant limitations, the literature supports a positive or neutral effect of reading on cardiorespiratory stability, pain control, reading frequency, development, and sleep.
- Further studies would be helpful in further characterizing the quality, extent, and validity of these relationships.