## Section on Critical Care

### Ureteral Placement of Indwelling Catheter in Patient with Abdominal Pseudocyst

10/21/2023

Poster Presentation

Maria Alejandra Gabela Sanchez, MD[1]; Shantaveer Gangu, MD[2], (1) UTHSC, Memphis, TN, (2) University of Tennessee, Memphis, TN

**Introduction**: We present the case of a 10-year-old girl who was admitted with an abdominal pseudocyst and ascites who developed a Foley catheter complication due to malposition in the right ureter.

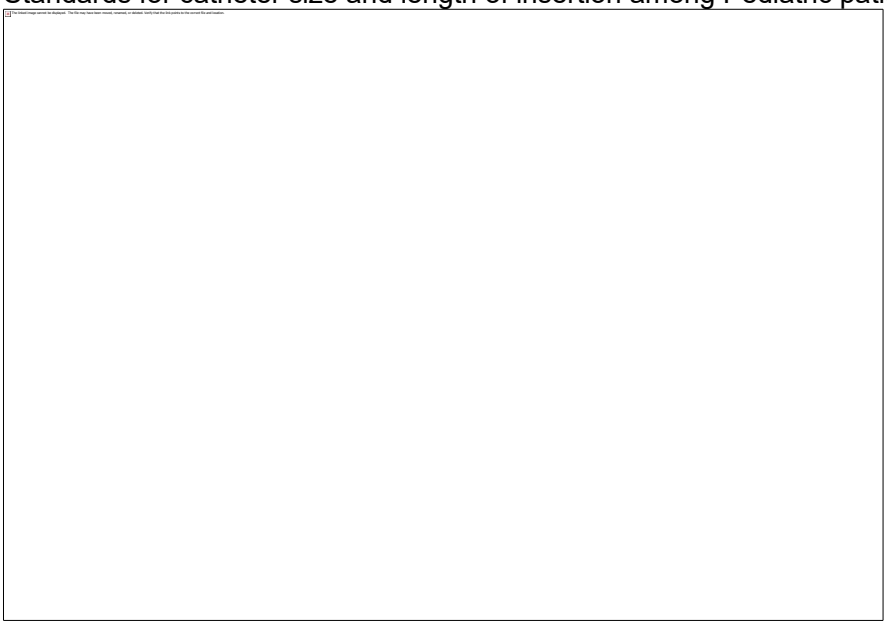
**Case Description**: 10 yr old female with ventricular-peritoneal shunt (VPS) presented with shunt infection, pseudocyst and ascites. Shunt was externalized and patient treated with antibiotics. 10Fr foley was replaced with 14 Fr for leakage with onset of hematuria and worsening abdominal pain. Hematuria cleared but pain continued leading suspicion of raised intra-abdominal pressure (IAP) and compartment syndrome (ACS). IAPs were elevated at 38-40 cmH2o which didn't improve with further drainage of abdominal ascites. Abdominal CT revealed a mispositioned Foley catheter in the proximal right ureter near the renal pelvis with an inflated balloon. The urology team retracted the foley after successful deflation of balloon under fluoroscopy to the bladder for the remainder of her stay in the PICU. A peritoneal fluid sample was sent for creatine level for extravasation of urine into the abdominal cavity (resulting creatinine level of 0.7). An improvement in the patient’s abdominal discomfort was noted, while abdominal distention secondary to ascites gradually resolved. Repeat CT of the abdomen was obtained after a week, which demonstrated bilateral hydroureteronephrosis (Right>Left); however, no contrast extravasation was evident. Oxybutynin was continued upon discharge.

**Discussion**: The size of the Foley catheter should be determined based on the patient's age, weight, sex, and catheterization purpose. Calculating the appropriate Foley catheter size for pediatric patients is challenging. Choosing a catheter that is too small can lead to leakage and inadequate drainage, whereas a catheter that is too large can cause discomfort, trauma, and even injury. While the weight- and French-based guidelines are cumbersome for clinical practice and require tools such as ultrasound, the age-based guidelines are easy to implement and take into consideration the length of insertion as well as the size of the catheter. In this case, the Foley catheter was advanced beyond the required length for the female urethra. Underlying abdominal ascites, may have changed the ureteral angle of insertion into the bladder further facilitating migration into the right ureter. Timely identification of the mispositioned catheter prevented further injury to the ureter and steered clinical decision-making away from ACS towards appropriate therapy.

**Conclusion**: In clinical practice, a tug on the catheter after inflating the balloon confirms its appropriate positioning in the bladder. In a patient with abdominal pathology such as ascites,

confirmation of optimal Foley positioning with abdominal radiography and/or ultrasonography should be routine practice for patient safety.

Standards for catheter size and length of insertion among Pediatric patients



Radiograph revealed dilated patulous proximal right ureter with abrupt caliber change in the mid right ureter. No extraluminal contrast is demonstrated in this abdominal radiograph.

**A Rare Cause of Status Epilepticus**

10/21/2023

Poster Presentation

Kevin D. Smith, MD[1]; Mindy Dickerman, MD[2], (1) University of Chicago Medicine, Philadelphia, PA, (2) Nemours Children Hospital, Wilmington, DE

**Introduction**: Status epilepticus is a common presentation to the pediatric intensive care unit. As there are many possible underlying etiologies, early diagnosis is important to properly treat the cause. Systemic Lupus Erythematosus (SLE) and lupus cerebritis is an extremely rare cause of status epilepticus.

**Case Description**: A 16-year-old female presented with new-onset tonic-clonic seizure preceded by myoclonic jerks. Her physical exam was unremarkable. Basic lab studies were unremarkable except for elevated Erythrocyte Sedimentation Rate (44 mm/hr). CSF demonstrated mild elevation of white blood cells (17) but no other signs of infection by culture or PCR. Initial electroencephalogram (EEG) showed background slowing without a clear etiology. Initial MRI of the brain was normal. Further workup revealed an elevated ANA (8.2 units), Double-Stranded DNA Antibody (225 IU/ml), Ribosome P Antibody (IgG) at greater than

8 units. The patient had progressive neurologic decline and persistent seizures despite multiple antiepileptic medications, ultimately requiring a pentobarbital infusion for burst suppression. She was initially treated for autoimmune encephalitis with pulse dose methylprednisolone for five days, four cycles of plasmapheresis, intravenous immunoglobulin (IVIg), and Rituximab without improvement. The patient was later started on cyclophosphamide after being diagnosed with fulminant lupus cerebritis. Repeat brain MRI/MRA showed edema and restricted diffusion of the entire cerebral cortex. Despite treatment, she developed signs of increased intracranial pressure and was found to have a left occipital infarction with diffuse bilateral cerebral edema. She was then transferred to a second tertiary children's hospital at the parents' request. There, the patient had an endoventricular drain placed for ICP management. She had continued status epilepticus without improvement in neurologic function. The patient died after parental request for removal of life-sustaining technology.

**Discussion**: Seizures are a common manifestation of lupus cerebritis. However, status epilepticus is an exceedingly rare complication of SLE and lupus cerebritis. While this is a rare entity, morbidity and mortality appear to be extremely high and thus providers should have a high index of suspicion for new-onset seizures, particularly in young females.

**Conclusion**: Status epilepticus is a rare and morbid complication of SLE and lupus cerebritis.

**Caring for Pediatric Intensive Care Unit Survivors: Perspective of Primary Care Pediatricians**

10/21/2023

Poster Presentation

Sarah Harris-Kober, DO[1]; Alyssa Motzel, DO[2]; Scott Grant, MD, MPH, FAAP[2]; Brian Berman, MD[3]; Lauren Yagiela, n/a[4], (1) Children's Hospital of Michigan, Phoenix, AZ, (2) Children's Hospital of Michigan, Detroit, MI, (3) University Pediatricians; Children's Hospital of Michigan, Detroit, MI, (4) Central Michigan University / Children's Hospital of Michigan, Detroit, MI

**Background**: Post Intensive Care Syndrome – Pediatrics (PICS-P) is the constellation of physical, cognitive, social, and emotional impairments experienced by patients and their caregivers after a pediatric intensive care unit (PICU) admission. Follow-up with a primary care provider (PCP) is integral in post-PICU care for identification and management of PICS-P domains. Improving care for children after a PICU admission, specifically as it relates to identification and management of PICS-P, requires an understanding of the barriers pediatric primary care providers experience while providing this care. We hypothesize that primary care pediatricians have reduced awareness of PICS-P and experience provider-level and systems-level barriers to providing care for children after a PICU admission.

**Methods**: We performed a pilot cross-sectional survey study of primary care providers. The survey included 15 questions on primary care provider demographics, comfort with and barriers (apriori defined based on prior literature) to providing care for children after a PICU admission, knowledge of and screening practice for PICS-P, and resource needs. We calculated median values for continuous data and frequencies for categorical data from the survey using STATA version 14.

**Results**: Of the 26 participants, the median age was 38.5 years and 73% were female. Median

number of years in practice was 6.5 and median number of providers in their practice was 7. In case studies of former PICU patients, 100% of participants were “very comfortable” resuming care for a patient with a straightforward bronchiolitis PICU admission while 43% of participants were “neutral to not at all comfortable” with caring for a patient after a complex acute respiratory distress syndrome PICU admission. Regarding apriori defined barriers to providing care after a PICU admission, the greatest barriers reported were care coordination with specialty providers (69%), inadequate or missing documentation (69%), and discomfort or difficulties with managing increased medical complexity (54%). Twenty-three percent of participants were familiar with the term “post-intensive care syndrome in pediatrics.” Over 50% of participants screened for four of five PICS-P domains. Screening was done by history and physical (84%) or with the pediatric symptom checklist (15%).

**Conclusion**: In this pilot study, we found that only 23% of primary care pediatricians had knowledge of PICS-P. However, over half of participants screened for nearly all PICS-P domains, mainly through history and physical exam. Participants noted decreased comfort in providing care to children after a complex PICU admission and experienced numerous care barriers. While surveying a larger sample of primary care provider pediatricians is needed, this pilot data identifies three areas of needed improvement in post-PICU care. Providing education on PICS-P for primary care providers, increased uptake of validated tools to screen for PICS-P, and systems-level efforts to reduce care barriers to ensure patient and family needs are fully addressed after a PICU admission.

Table 1: Pediatric primary care provider demographics

**Table 1: Pediatric primary care provider demographics**

| Pediatric primary care provider demographics | N=26 |
|---|---|
| Age, median (IQR) | 38.5 (34-52) |
| Gender, *n* (%) | |
| Female | 19 (73%) |
| Male | 6 (23%) |
| Prefer not to answer | 1 (4%) |
| Race, *n* (%) | |
| American Indian / Alaska Native | 0 (0%) |
| Asian | 7 (27%) |
| Black / African American | 4 (15%) |
| Multi-racial | 1 (4%) |
| White / Caucasian | 11 (42%) |
| Other | 1 (4%) |
| Prefer not to answer | 2 (8%) |
| Ethnicity, *n* (%) | |
| Hispanic | 0 (0%) |
| Non-Hispanic | 23 (88%) |
| Prefer not to answer | 3 (12%) |
| Years in practice, median (IQR) | 6.5 (3.5-23) |
| Number of providers in practice, median (IQR) | 7 (5-10) |

Table 2: Comfort, barriers, and post-intensive care syndrome in pediatrics (PICS-P) screening practices of primary care providers in care of children after a PICU admission

**Table 2: Comfort, barriers, and post-intensive care syndrome in pediatrics (PICS-P) screening practices of primary care providers in care of children after a PICU admission**

| | *n* (%) |
|---|---|
| **Case studies of comfort level with providing post-PICU care** | |
| 9-month-old child, full term and previously healthy, admitted to the PICU due to viral bronchiolitis, intubated x 3 days, discharge home at pre-hospital baseline functional and health status | |
| Not at all comfortable | 0 (0%) |
| Somewhat uncomfortable | 0 (0%) |
| Neutral | 0 (0%) |
| Somewhat comfortable | 0 (0%) |
| Very comfortable | 26 (100%) |
| 9-month-old child, full term and previously healthy, admitted to the PICU due to acute respiratory distress syndrome, required extracorporeal membrane oxygenation (ECMO) support x 14 days, unable to wean from ventilator, discharge home with tracheostomy, ventilator, and gtube. | |
| Not at all comfortable | 1 (4%) |
| Somewhat uncomfortable | 8 (31%) |
| Neutral | 2 (8%) |
| Somewhat comfortable | 14 (54%) |
| Very comfortable | 1 (4%) |
| **Barriers in caring for patients following PICU admission** | |
| Inadequate or missing documentation from the hospital stay | 15 (58%) |
| Care coordination with specialty providers | 18 (69%) |
| Discomfort or difficulties with managing new home equipment | 18 (69%) |
| Discomfort or difficulties with managing increased medical complexity | 14 (54%) |
| Discomfort or difficulties in discussing new medical complexities with child's caretakers | 5 (19%) |
| Lack of ancillary supports - social work, care management | 11 (42%) |
| **Knowledge of post-intensive care syndrome in pediatrics** | |
| Familiar with term "post-intensive care syndrome in pediatrics" | 6 (23%) |
| **Screening for post-intensive care syndrome in pediatrics domains after PICU admission** | |
| General assessment of child | 23 (88%) |
| Child's physical and functional status | 20 (77%) |
| Child's emotional and mental health | 17 (65%) |
| Child's social functioning | 7 (27%) |
| Child's return to school or educational concerns | 16 (62%) |
| Caregiver emotional and mental health | 15 (58%) |

## Rare but There: An Anastomotic Leak Status-post Gastrectomy in an Adolescent Male with a Pathologic Variant for CDH1 Gene Associated with Hereditary Diffuse Gastric Cancer

10/21/2023

Poster Presentation

Cesar Garcia-Canet, MD, MPH[1]; Amanda Alladin, MD[2]; Michael Nares, MD[2]; Asumthia S. Jeyapalan, DO, MHA[2]; Jennifer Munoz-Pareja, MD[2]; Juan P. Solano, MD[2]; Monica Alba-Sandoval, MD[2], (1) St. Louis Children's Hospital, Washington University in St. Louis School of Medicine, St. Louis, MO, (2) Holtz Children's Hospital, Jackson Memorial Medical Center, University of Miami School of Medicine, Miami, FL

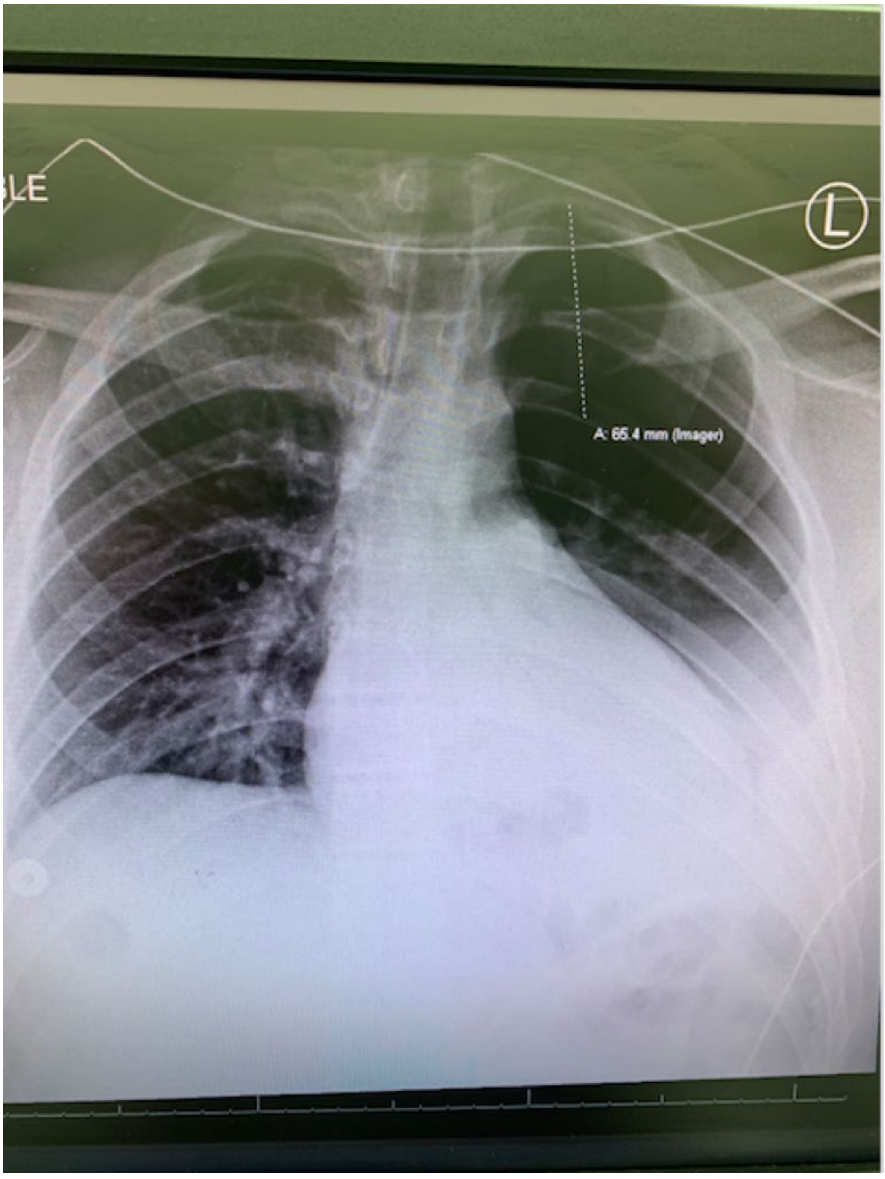
**Introduction**: Patients with a family history of gastric cancer are at risk for developing the disease and may choose to undergo prophylactic gastrectomy. Complications from the procedure are rare. Yet, this case report examines one uncommon complication – anastomotic leak.

**Case Description**: A 14-year-old male with heterozygosity for a pathogenic variant of CHD1 presents to the Pediatric Intensive Care Unit following a laparoscopic total gastrectomy, esophagojejunostomy, and jejunojunostomy in Roux-en-Y reconstruction. Biopsies taken were positive for signet ring type adenocarcinoma (invasion into the lamina propria but no lymphovascular or perineural invasions). Following the procedure, he had increased work of breathing. A CXR indicated a left-sided pneumothorax (Figure 1). Supplemental oxygen was started and a pigtail chest tube was inserted. An esophagram on the second post-operative day confirmed the presence of an anastomotic leak with extravasation of contrast in the distal esophagus at the level of the diaphragm into the left pleural space. This necessitated placement of anterior and lateral chest tubes. The patient was started on broad-spectrum antibiotics given concerns for sepsis. Due to this worsening clinical status, a CT scan was obtained and showed the presence of a large left-sided hydropneumothorax (Figure 2). Over the hospital stay, the patient's chest tubes drained (albeit slow) and interval CXRs were stable. A repeat esophagram two weeks after his surgical procedure now confirmed the resolution of the anastomotic leak.

**Discussion**: Germline CDH1 mutations confer a high risk of developing diffuse gastric cancer. Given this mortality, prophylactic total gastrectomy is advised for individuals with pathogenic CDH1 mutations.1, Kim et al found the rate of anastomotic leakage to be 1.88%. Another study estimated it to be 5.8%. Unfortunately in pediatrics, data is limited for risk of anastomotic leakage in prophylactic total gastrectomy for CDH1 mutations likely secondary to the rarity of this procedure done in this patient population. If the frequency of said procedure would increase, it is plausible that the complication would be more prevalent. For example, esophageal atresia and tracheoesophageal fistula surgical repairs are common; the incidence of leakage has been reported to be around 15%.

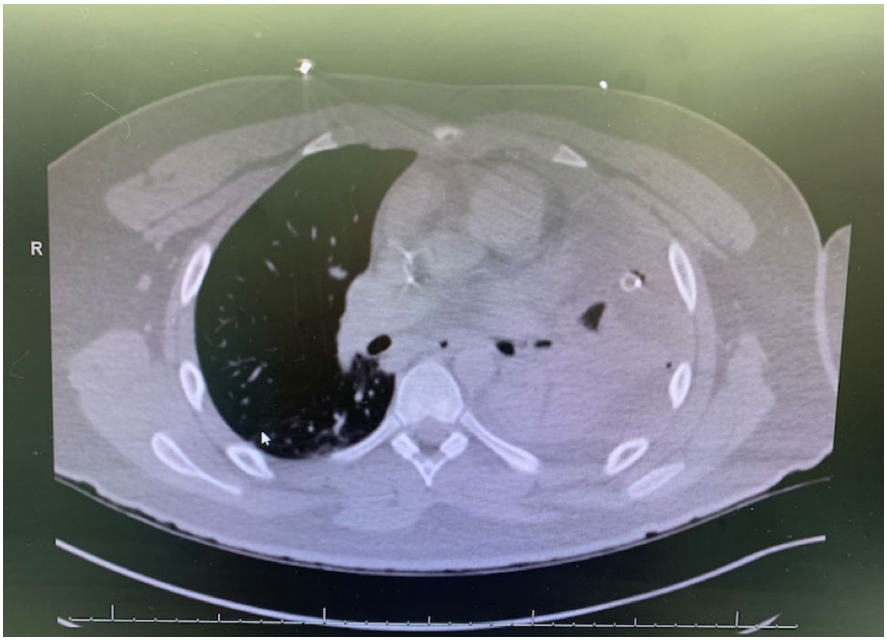
**Conclusion**: While an anastomotic leak after prophylactic total gastrectomy is rare, it should be considered in the differential diagnosis during the post-operative period in patients presenting with signs and symptoms of respiratory distress. With that said, as advances in genetic testing and counseling are made, the age at which prophylactic total gastrectomy is considered may lower and the frequency of the performed procedure may increase. This could pave the way for anastomotic leaks as complications and increase their prevalence. Therefore, they should also be explained when risks versus benefits of a prophylactic total gastrectomy are discussed to the families of children with the CDH1 mutation.

Figure 1.




Chest X-ray showing left-sided pneumothorax.

Figure 2.




CT scan showing large left-sided hydropneumothorax.

**A Case of Severe Asthma Revealing Hypertrophic Cardiomyopathy**

10/21/2023

Poster Presentation

Nadine Najjar, MD, MPH[1]; Heather Viamonte, MD[2], (1) Emory University School of Medicine, ATLANTA, GA, (2) Children's Healthcare of Atlanta, Atlanta, GA

**Introduction**: Asthma is a common condition affecting the pediatric population. We describe a patient whose presentation of status asthmaticus revealed an additional diagnosis of hypertrophic cardiomyopathy.

**Case Description**: A 14-year-old male with history of mild persistent asthma presented to the Emergency Department with difficulty breathing secondary to status asthmaticus. He received continuous albuterol, ipratropium bromide, methylprednisolone, magnesium sulfate, and was initiated on noninvasive positive pressure. After admission to the pediatric ICU, he developed profound hypotension and ventricular ectopy. Point-of-care ultrasound revealed severe left ventricular hypertrophy. He was subsequently transferred to the cardiac ICU for further care. His hypotension persisted despite volume resuscitation and initiation of phenylephrine and vasopressin infusions. Concurrently, he developed acute hypoxemic respiratory failure despite treating his asthma. Given his cardiopulmonary deterioration, he was cannulated to veno-arterial (VA) ECMO with a 25Fr venous drain in the femoral vein, 17 Fr arterial return in the femoral artery plus a 6 Fr reperfusion catheter. An additional return was placed in the right internal jugular to combat harlequin syndrome. He remained on VA-V ECMO for 6 days. His asthma was difficult to manage due to his new diagnosis of hypertrophic cardiomyopathy and the need for judicious use of beta-agonist therapy. Multiple therapies were trialed to reverse his bronchospasm. During his ECMO run, he required isoflurane with vasoactive support to prevent hypotension. Following discontinuation of isoflurane, he was started on an aminophylline

infusion for continual control of bronchospasm. He remained on aminophylline through ECMO decannulation. Throughout his course he developed persistent cardiac arrhythmias including episodes of ventricular tachycardia and supraventricular tachycardia with aberrancy, requiring chemical and electrical cardioversion as well as initiation of anti-arrhythmic agents. Following ECMO decannulation and stabilization, further investigation was conducted, including genetic testing and cardiac MRI. MRI revealed a pattern of hypertrophy and scarring concerning for Danon Disease, a rare lysosomal storage disease that causes hypertrophic cardiomyopathy, Wolff-Parkinson White, skeletal muscle weakness, and mild intellectual disability, all of which our patient exhibited.

**Discussion**: Severe asthma exacerbation and hypertrophic cardiomyopathy with concomitant hemodynamic instability poses a formidable management challenge. Many effective and first-line asthma therapies such as inhaled and IV beta agonists induce tachycardia and can be arrhythmogenic, both of which are detrimental to cardiac output in the setting of hypertrophic cardiomyopathy. In the case of our patient, extracorporeal support proved beneficial in controlling both of his conditions, but not without complication. This case also highlights the additional modalities of asthma treatment and the challenges of employing them.

**Conclusion**: This case showcases the very rare condition of hypertrophic cardiomyopathy and WPW secondary to Danon Disease brought to light in the setting of a very common presentation of asthma. Our patient's course highlights the difficulties in co-managing competing physiologies while on and off extracorporeal support.

**COVID-19 with Streptococcal Infection, Hemolytic Uremic Syndrome, Hemophagocytic Lymphohistiocytosis**

10/21/2023

Poster Presentation

Nancy Chung, MD[1]; Raymond Y. Cai, MD[2]; Jacqueline Weingarten-Arams, MD[3]; Sharlene Sy, n/a[4]; Ai Itoku, MD[5]; Jessica Perfetto, MD[1]; Kristen E. Ronca, MD, MA[6]; Sara H. Soshnick, DO, MS[7], (1) Children's Hospital at Montefiore, New York, NY, (2) Children's Hospital of Philadelphia, Philadelphia, PA, (3) Children's Hospital at Montefiore/Albert Einstein College of Medicine, Bronx, NY, (4) Children's hospital at Montefiore, Yuma, AZ, (5) Children's Hospital at Montefiore, Bronx, NY, (6) Children's Hospital at Montefiore, Astoria, NY, (7) Children's Hospital At Montefiore, Bronx, NY

**Introduction**: SARS-CoV-2 can cause a spectrum of illness ranging from mild to severe and may be associated with bacterial and viral co-infection and immune-dysregulation. Factors that contribute to increased morbidity and mortality as well as optimal treatment are still being studied. We describe a complicated pediatric case of SARS-CoV-2 with bacterial coinfection, multiorgan failure, thrombotic microangiopathy, and systemic hyperinflammation. Consensus is lacking on safe treatment methods that balance antimicrobial and immunomodulatory therapies.

**Case Description**: A two-year-old healthy male presented with one week of fevers and respiratory failure. Initial chest x-ray showed bilateral dense lower lobe consolidations and left sided pleural effusion. COVID-19 and rhinovirus polymerase chain reactions were positive. He was placed on bilevel positive airway pressure due to respiratory distress, and he was given dexamethasone for COVID pneumonia and ceftriaxone for pulmonary infiltrates. Due to the

duration of symptoms prior to presentation, he was not initiated on remdesivir therapy. His blood culture drawn on admission grew pansensitive Streptococcus pneumoniae. He developed microangiopathic hemolytic anemia (hemoglobin as low as 3.0 g/dL), thrombocytopenia (platelet nadir 20 k/uL), and acute kidney injury (creatinine peak 1.12 mg/dL), consistent with a diagnosis of Streptococcus pneumoniae-associated hemolytic uremic syndrome (SP-HUS). Hemolysis and thrombocytopenia worsened despite antibiotics, thus eculizumab was added. The patient was transfused only with washed red blood cells to limit further exposure to T-antigen. He had persistent high fevers and subsequently developed pancytopenia, hypertriglyceridemia, and hyperferritinemia (peak ferritin 7,793 ng/mL), concerning for secondary hemophagocytic lymphohistiocytosis (HLH). Anakinra was chosen as HLH therapy with the hope of limiting further immunosuppression in the setting of active infections. Soon after, his hemolysis, kidney injury, and ferritin significantly improved. His illness was further complicated by necrotizing pneumonia with bilateral pneumothraces requiring multiple chest tubes. An immune workup including whole exome sequencing was unremarkable. Our patient's respiratory failure was managed exclusively with non-invasive ventilation and his renal injury with supportive care, fortunately never requiring intubation or dialysis. He improved and was discharged home on hospital day 32 on nasal cannula oxygen therapy.

**Discussion**: SARS-CoV-2 and concurrent illness can be difficult to treat due to the nuanced balance between treating active infection, hyperinflammation, and immune dysregulation. We describe a pediatric patient with COVID-19 pneumonia, bacterial superinfection, SP-HUS, and HLH, whom we successfully managed with anakinra and eculizumab in addition to standard of care antibiotics and steroids.

**Conclusion**: Our experience suggests that anakinra and eculizumab should be considered in critically ill patients with severe infections that require immunomodulating therapies for life-threatening dysregulation.

**Feasibility of Implementing a Virtual Pediatric Critical Care Follow-up Clinic**

10/21/2023

Poster Presentation

Anum K. Hussain, B.S.[1]; Juliana Romano, M.D.[2]; Chani Traube, MD, FAAP, FCCM[2]; Christine Joyce, MD, FAAP[2]; Nicole Zafonte, RN, BSN[3], (1) Weill Cornell Medical College, New York, NY, (2) Division of Pediatric Critical Care Medicine, Weill Cornell Medical Center, New York, NY, (3) New York Presbyterian, New York, NY

**Background**: With marked improvements in PICU mortality, there are increasing numbers of patients surviving to discharge with significant co-morbidities. Given the vulnerable stage patients are in their growth and development, there is an urgent need to identify the cognitive, physical, and mental health impairments that occur post-discharge. Research shows that socioeconomic and racial differences are related to worse outcomes in child survivors, thus focus on catching the most at-risk population is of utmost importance. It is possible that those risk factors that make patients less likely to adhere to follow-up appointments also put them at higher risk for poor outcomes. With an aim of further evaluating this, we first sought a process to increase accessibility to PICU follow-up clinics. It has been shown that telemedicine community clinics are associated with fewer missed appointments, particularly in chronic patients and those in metropolitan areas. Here we describe the feasibility and process of

establishing a virtual post-discharge PICU clinic for patients with length of stay >72 hours with an initial pilot over two months.

**Methods**: The pilot phase ran from October 2022 to January 2023. Divisional and departmental buy-in was obtained. A virtual clinic was created within Epic occurring bi-monthly. All patients with length of stay >72 hours were approached by our clinical case manager. Those patients that expressed interest were contacted by an administrator and appointments were made. All patients were seen by a single PICU fellow and attending. During the visit, patients were screened for physical health, mental health, cognition, impact on family and social determinants of health. Social work referrals were made when appropriate.

**Results**: Thirty patients were approached, with 57% scheduling follow-up (n=17/30). Of those that scheduled, 41% (n=7) attended while 59% (n=10) did not attend (Fig. 1). As a proxy for socioeconomic differences, we looked at median household income based on address. Our patients who did attend clinic had a median income of $68370 (IQR $23674), compared to patients who did not attend with median of $88612 (IQR $41694, p-value = 0.41, not significant). Utilizing the childhood opportunity index, we found that of the eligible patients, 63% (n=19/30) were classified as low/very low SES compared to 58% of those who scheduled (n=10/17) and 43% (n=3/7) of those who attended clinic.

**Conclusion**: We aimed to understand how the structure of a follow-up clinic is utilized with our patient population, and to apply our strategy for real-time modification of our approach to ensure equitable opportunities and access. It is possible that the virtual venue for this clinic increases accessibility for those of lower socioeconomic status and demonstrates feasibility for capturing these at-risk patients. Further steps include continuing to build our program and assessing SDOH as predictors of compliance and long-term outcomes.

Fig 1: Distribution of 30 total patients involved in pilot study.

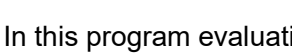



Fig 1_no caption .jpeg

In this program evaluation, we compare those patients who did attend versus those who did not attend their scheduled appointments with the follow-up clinic.

**The Use of Isoflurane in the Pediatric Intensive Care Unit to Reduce Long Term Sedation Needs and Associated Morbidity**

10/21/2023

Poster Presentation

Nawara Alawa, MD, MPH[1]; Shannon B. Leland, MD MPH[2]; Daphne Munhall, BS, RRT-NPS[3]; Chinyere Egbuta, MD[3]; Belinda H. Dickie, MD, PhD[3]; Jill M. Zalieckas, MD MPH[3], (1) Boston Children's Hospital/Harvard Medical School , Boston, MA, (2) Boston Children's Hospital, Concord, MA, (3) Boston Children's Hospital, Boston, MA

**Introduction**: Isoflurane is a potent inhaled anesthetic agent and is used in pediatrics to manage refractory status asthmaticus and status epilepticus. Less commonly, isoflurane has been used as a sedative adjunct in the intensive care unit (ICU) during complex sedation management. There is a lack of data about the risks and benefits of this therapy in pediatrics to inform clinical practice.

**Case Description**: Patient is a 6 month old child with congenital diaphragmatic hernia who was cannulated to venoarterial extracorporeal membrane oxygenation (VA-ECMO) on day of life 0 in the setting of acute hypoxic respiratory failure. He remained cannulated for 43 days. His course was complicated by multiple embolic/ischemic strokes with resultant seizures, dysautonomia, severe pulmonary hypertension and pulmonary hypoplasia. He required prolonged mechanical ventilation and had chronic sedation needs requiring escalation of multimodal regimen to capture agitation. His chronic dependence and clinical lability prevented successful deescalation of medications. He required high doses of fentanyl (11.5 mcg/kg/hr), ketamine (20 mcg/kg/min) dexmedetomidine (2 mcg/kg/hr), pentobarbital (23 mg q 4hrs) and lorazepam (1.25 mg q 4hrs). Due to intolerance of sedative weans, an isoflurane washout was conducted to minimize morbidity, minimize ICU and hospital length of stay, and work to rehabilitate and promote neurocognitive development of the patient. A starting dose of 0.5% isoflurane was titrated to a maximum dose of 1.7% to achieve the desired level of sedation which allowed for cessation of ketamine, fentanyl, dexmedetomidine, pentobarbital, and lorazepam. Isoflurane washout was conducted for a total of 17 days. The patient was able to extubate on the day of cessation of isoflurane. He remained on 2 L of nasal cannula for respiratory support and has remained off all sedatives and analgesics.

**Discussion**: The burden of prolonged sedation and severe pulmonary hypertension posed the risk for increasing morbidity, potential technology dependence (tracheostomy), increased ICU and hospital length of stay, and inability to initiate rehabilitation and promote neurocognitive development. This case is an example of the opportunities presented by employing an isoflurane washout in a particular subset of complex pediatric patients with significant sedation dependence. After an isoflurane washout, the patient was able to discontinue all sedatives and analgesics, extubate, and rehabilitate after a prolonged period of sedation and mechanical ventilation.

**Conclusion**: The use of inhaled anesthetics as an adjunctive therapy in the ICU is not commonly employed in pediatrics due to a lack of evidence. Further research is needed to determine the long-term neurologic outcomes associated with prolonged use of inhaled anesthetics. In the future, evidence-based protocols and best practice guidelines that include the utilization of inhaled anesthetics as an adjunctive therapy for complex sedative management in the ICU will allow practitioners to safely implement this treatment option into their practice.

## Pediatric Intensive Care Unit Admissions in Children with Respiratory Technology Dependence: A Single-centre Retrospective Cohort Study

10/21/2023

Poster Presentation

Marc A. Brousseau[1]; Kristina Krmpotic, Medical Doctor[2]; Jennifer R. Foster, Medical Doctor[2]; Liane Johnson, Medical Doctor[2]; Danielle Adam, Medical Doctor[2]; Sarah McMullen, Medical Doctor[3]; Samantha Boggs, Medical Doctor[4], (1) Dalhousie University Faculty of Medicine, Halifax, NS, Canada, (2) IWK Health Centre, Halifax, NS, Canada, (3) Nova Scotia Health Authority, Halifax, NS, Canada, (4) Alberta Children's Hospital, Calgary, AB, Canada

**Background**: Children with medical complexity (CMC) utilize a significant amount of healthcare resources. Compared to other children, CMC are more likely to be admitted and readmitted to the Pediatric Intensive Care Unit (PICU), have longer PICU lengths of stay, and are more likely to require invasive therapies including mechanical ventilation and other specialized care interventions. Although many of these children are dependent on respiratory technology in outpatient settings, few studies have focused on exploring PICU resource utilization in this sub-group. This study examined the prevalence of chronic respiratory technology dependence in children admitted to PICU, and described reasons for admission, severity-of-illness, nursing workload, and length of stay in comparison to children without respiratory technology dependence.

**Methods**: Retrospective database analysis of patients admitted to PICU at a Canadian tertiary care hospital between June 2016 and May 2022.

**Results**: CMC with respiratory technology dependence accounted for 128 (5.7%) of 2245 PICU admissions and 580 (5.9%) of 9895 PICU bed days. Median (interquartile range) age at admission was 4.9 years (2.4-10.4 years). The most common reason for unplanned admission was respiratory decompensation (n=62; 81.6%). Postoperative management accounted for 52 (40.6%) admissions. Underlying conditions were categorized as genetic / metabolic / syndromic (n=51; 39.8%), cerebral palsy (n=36; 28.1%), neuromuscular disease (n=23; 18%), and other (n=18; 14.1%) Types of RTD included home oxygen (n=28; 21.9%), non-invasive positive pressure ventilation (n=32; 25%), tracheostomy without ventilation (n=53; 41.4%), and tracheostomy with ventilation (n=15; 11.7%). Compared to other children admitted to PICU, children with respiratory technology dependence had significantly lower Pediatric Risk of Mortality (PRISM III) scores (18 vs 14, $p< 0.0001$) and day 1 Therapeutic Intervention Scoring System (TISS-C) scores (25 vs 22, $p< 0.0001$). PICU length of stay was similar in children with respiratory technology dependence (median 3 days; interquartile range 2-5 days) than for other children (median 2 days; interquartile range 2-4 days), $p=0.8$. Mortality in CMC with RTD was less than 1%.

**Conclusion**: CMC with respiratory technology dependence accounted for comparable proportions of all PICU admissions and bed days. Measures of predicted mortality and nursing workload within 24 hours of PICU admission were significantly lower for children with respiratory technology dependence compared to all other PICU admissions. More detailed exploration of the types of interventions these children require is needed to guide resource allocation.

## Adherence to Transfusion Thresholds in Two United States Pediatric Intensive Care Units

10/21/2023

Poster Presentation

Stephany A. Bustamante[1]; Adalberto Torres, Jr., MD, MS, FAAP[2]; Ramamoorthy Nagasubramanian, MD[3], (1) UCF College of Medicine, Altamonte Springs, FL, (2) Nemours Children's Health, Florida, Orlando, FL, (3) Nemours Childrens Hospital, FL, Orlando, FL

**Background**: A national hemoglobin transfusion threshold of 7 g/dL and platelet count threshold of 20 K/UL are indicators for RBC and platelet transfusions. However, clinicians may

transfuse without following thresholds. Therefore, we hypothesize that adherence rates to national transfusion guidelines will vary between two pediatric ICUs (PICUs) of the same health system.

**Methods**: Retrospective chart review of 212 RBC (106 FL and DE) and 112 platelet (56 FL and DE) non-prophylactic transfusions among patients < 18 years old admitted in 2017-2020 at Nemours Children's Health FL and DE was performed. EMR data (demographics, interventions, and outcomes) were collected into a REDCap survey. Chi-square testing evaluated adherence to transfusion thresholds between institutions.

**Results**: There were no significant differences between institutional threshold adherence for RBCs (50% FL vs. 55% DE, p=0.492) or platelets (46.4% FL vs. 28.6% DE, p=0.051). Comparing adherent vs. non-adherent RBC transfusions revealed significant differences in mean length of stay (19 vs. 30 days, p=0.021) and mean pre-transfusion hemoglobin (5.9 vs. 8.5 g/dL, p=< 0.001). In FL and DE, adherent transfusions revealed significant differences in mean change in hemoglobin compared to non-adherent transfusions (FL adherent vs. non adherent: 3.2 vs. 2.2 g/dL, p=0.002; DE adherent vs. non adherent: 2.7 vs. 1.6 g/dL, p=0.002). Comparing adherent vs. non-adherent platelet transfusions revealed significant differences in mean length of stay (20 days vs. 35 days, p=< 0.001) and mean pre-transfusion platelet count (12.6 vs. 52.1 K/UL, p=< 0.001). In DE, adherent transfusions revealed a significant difference in mean change in platelet count compared to non-adherent transfusions (37.0 vs. 20.2 K/UL, p=0.02).

**Conclusion**: Adherence rates to transfusion guidelines did not vary between the two PICUs, although transfusion guidelines were not well adhered to. Moreover, when clinicians were adherent to thresholds, mean hemoglobin and platelet counts were well below thresholds. Both institutions' RBC adherent groups and the DE platelet adherent group exhibited greater mean change in hemoglobin values or platelet counts. Patients experienced shorter hospital stays when clinicians adhered to national transfusion guidelines.

## When Genetics Change Management: Identification of a Novel Mutation Causing Catecholaminergic Polymorphic Ventricular Tachycardia

10/21/2023

Poster Presentation

Daniel Brooks, MD[1]; Nikki Lawson, MD[1]; Saleh Bhar, MD[2], (1) Baylor College of Medicine, Houston, TX, (2) Baylor College of Medicine, Pearland, TX

**Introduction**: Catecholaminergic polymorphic ventricular tachycardia (CPVT) is a familial syndrome that causes ventricular tachycardia, generally in the absence of structural heart disease. Defects in the cardiac ryanodine receptor (RyR2) are known to be associated with CPVT. RyR2 is primarily found in cardiac myocytes and assists with cardiac muscle contraction. Here, we present a case of CPVT caused by a novel mutation in RyR2 identified by Critical Whole Trio Exome Sequencing (Critical Trio WES) during the patient's critical care admission.

**Case Description**: A previously healthy 16 year-old male presented in cardiac arrest after moderate exertional exercise. At the scene, bystander CPR was started, emergency medical services arrived, and the patient was found to be in ventricular fibrillation. In both pre- and in-

hospital resuscitations, he received a total of five rounds of unsynchronized cardiac defibrillation and multiple resuscitation medications with return of spontaneous circulation (ROSC). During continued resuscitation in the ED, he again became pulseless, and rhythm was pulseless electrical activity. Time of death was called approximately 1.5 hours after the initial event with cardiac standstill was confirmed twice using bedside ultrasound. Approximately five minutes later, patient noted to have agonal breathing by parents. Carotid pulse was palpable, resuscitation resumed, and ROSC was achieved. Echocardiogram demonstrated normal biventricular function and coronary anatomy. As his condition stabilized, he was started on nadolol and flecainide and underwent left cardiac sympathetic denervation with plans for implantable cardiac defibrillator placement. Family history was notable for a brother who died at the age of ten years from Sudden Unexplained Death in Epilepsy as well as palpitations and syncope in his 45-year-old biological mother. Critical Trio WES was positive for an autosomal dominant variant in RYR2. The variant was a c.6957_6959deletion (exon 46 of 105), resulting in a valine deletion at position 2321 located towards the N-terminal of the RyR2 protein. This variant was also identified in his biological mother and deceased brother.

**Discussion**: This patient was previously healthy and found to have a novel RyR2 mutation on Trio WES during ICU admission. Use of Trio WES has been shown to alter therapeutic interventions in up to 81% of patients that received testing and decrease time to diagnosis when used urgently in critical care settings. This case supports the use of Trio WES for patients with unclear etiologies of cardiac arrest during their ICU admission. For this patient, there was discussion about genetic testing through other means, including channelopathy panels, which would not have yielded the ultimate diagnosis given his novel mutation. These results ultimately led to significant alterations in his treatment plan.

**Conclusion**: Providers should consider Trio WES for critically ill patients to guide management, family counseling, and utilization of critical care resources.

Figure 1

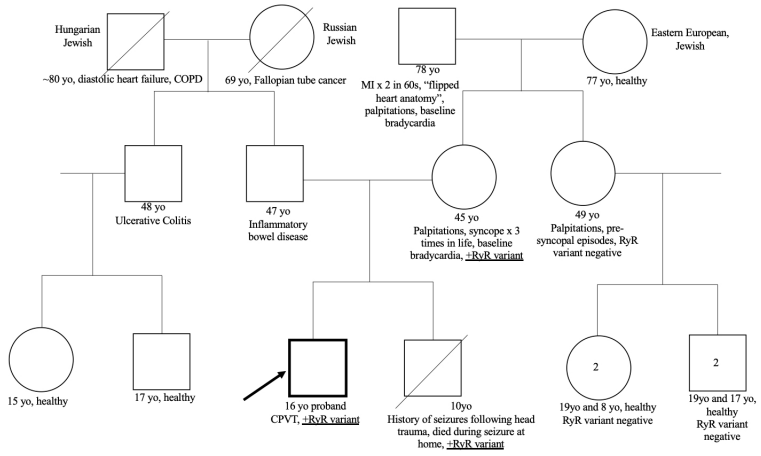



Figure 1. Pedigree of proband patient with novel RyR2 mutation

Pedigree of proband patient with novel RyR2 mutation

**Comparing Rates of Delirium Documentation for Medical versus Surgical Patients: An Observational Study at a Tertiary Care Pediatric Hospital**

10/21/2023

Poster Presentation

Gabrielle N. Horner, MD, MPH; Matthew Hazle, MD; Melissa H. Ross, MD; Nasuh M. Malas, MD, MPH; Erin Carlton, MD, MSc; Emily Jacobson, MD, University of Michigan, Ann Arbor, MI

**Background**: Delirium is a common complication of critical illness. Diagnosing and documenting delirium are important given its associations with prolonged hospital stays, long-term cognitive impairment, mood disturbances and increased mortality. Despite well-validated screening tools, such as the Cornell Assessment of Pediatric Delirium (CAPD), delirium remains under-reported. This study compares rates of delirium documentation between medical and surgical patients during transitions of care within the hospital setting.

**Methods**: At a single, tertiary care, pediatric hospital, we identified patients ages 0-21 years old admitted to the pediatric ICU (PICU) from January 2016-August 2022 who screened positive for delirium (CAPD >9). Patients with a maximum score of 9 and who screened positive for < 2 days were excluded. We considered patients to be “medical” if they transferred from the PICU to the pediatric hospital medicine service, while surgical patients were those managed by a surgical team in the PICU and then also on the floor following transfer. We collected demographic information and characteristics of the hospital stay. Four physicians on our study team reviewed patient charts for the word “delirium” in transfer and discharge notes, as well as for an ICD-10 delirium code. Univariate analysis, using chi-square and t-tests, compared patients on medical versus surgical primary teams.

**Results**: We identified 772 medical patients and 467 surgical patients. Documentation of delirium was low in both groups, with 10.1% of surgical and 14.8% of medical patients having delirium documented in discharge notes (p=0.017). The same trend was observed for documentation on transfer and for ICD-10 coding (Figure 1). On average, surgical patients screening positive for delirium were older, less likely to have a developmental delay, have a lower maximum CAPD score, screen positive for delirium for fewer days and have a shorter PICU length of stay (LOS) compared to medical patients (Table 1). There was no difference in percentage of days screening positive for delirium out of total PICU LOS (67% vs 69%, p=0.51).

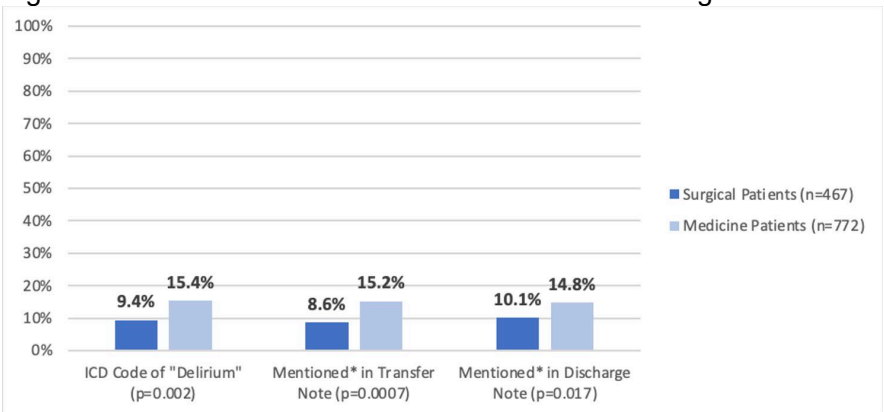
**Conclusion**: We found that medical patients were more likely than surgical patients to have delirium documented at transitions of care and recorded via ICD-10 codes. Overall, the rates of documented delirium in our study were well below prior research estimating the prevalence of delirium ranging from 20% within the general medicine PICU to as high as 65% among postoperative pediatric patients. This may reflect under-recognition and/or under-documentation of this condition. Given the long-term sequelae of delirium and risk for recurrence in future hospitalizations, more work is needed to understand the basis of these findings and further explore communication during transitions of care. Study limitations include focus on documentation only and not verbal communication, variable note templates between services, and lack of control for comorbidities that may limit the reliability of CAPD scoring.

Table 1. Demographic Information and Characteristics of Patients Meeting Inclusion Criteria for Delirium in the PICU among Surgical versus Medicine Services

| | Surgical Patients* (n=467) | Medicine Patients (n=772) | p-value |
|---|---|---|---|
| **Comorbid condition**** | 132 (28.3%) | 231 (29.9%) | 0.53 |
| **Developmental delay** | 142 (30.4%) | 370 (47.9%) | <0.00001 |
| **Final CAPD score prior to transfer** | 8.5 + 5.6 | 9.1 + 6.2 | 0.09 |
| **Age (years)** | 7.1 + 6.4 | 5.9 + 6.4 | 0.001 |
| **Sex** | | | 0.22 |
| **Female** | 195 (41.8%) | 350 (45.3%) | |
| **Male** | 272 (58.2%) | 422 (54.7%) | |
| **Delirium positive days** | 4.5 + 5.5 | 6.0 + 7.1 | <0.0001 |
| **Max CAPD score** | 15.4 + 4.6 | 16.8 + 4.5 | <0.0001 |
| **ICU LOS (days)** | 8.5 + 9.9 | 10.0 + 10.6 | 0.01 |
| **Hospital LOS (days)** | 20.5 + 25.7 | 21.0 + 26.3 | 0.74 |
| **Psychiatry consult in the ICU** | 89 (19.1%) | 182 (23.6%) | 0.06 |
| **Psychiatry consult on the floor** | 75 (16.1%) | 146 (18.9%) | 0.20 |
| **Neurology consult** | 102 (21.8%) | 344 (44.6%) | <0.00001 |
| **Exposure to mechanical ventilation** | 265 (56.7%) | 448 (58.0%) | 0.66 |

*Includes patients from the following Surgical Services: Neurosurgery, Orthopedics, Burn, Otolaryngology, Oral Maxillofacial Surgery, General Surgery, Plastic Surgery, Transplant Surgery, Urology **Includes traumatic brain injury, refractory epilepsy, Autism Spectrum Disorder, hydrocephalus

Figure 1. Documentation Rates of Delirium between Surgical and Medicine Patients



*Includes mention of delirium in the Problem List, Assessment & Plan or Follow-Up sections

**Racial Disparty in Pediatric Sepsis Mortality**

10/21/2023

Poster Presentation

Macey Feimster[1]; Sanjiv Pasala, MD, FAAP[2]; Michele Moss, MD, FAAP[2]; Michael H. Stroud, MD, FAAP[3], (1) University of Arkansas for Medical Sciences, Little Rock, AR, (2) University of Arkansas for Medical Sciences; Arkansas Children's Hospital, Little Rock, AR, (3) University of Arkansas for Medical Sciences; Arkansas Children's Hosptial, Little Rock, AR

**Background**: Despite improvements in early recognition and resuscitation, sepsis remains a major pediatric health issue with an estimated 40,000 hospitalizations and 5,000 deaths every year in the US. Many centers now use automated, real-time, algorithm-based detection of sepsis, severe sepsis, and septic shock incorporated into the electronic medical record (EMR). This method leads to earlier recognition, resuscitation, and improved outcomes. Recent data shows a continued discrepancy in sepsis outcomes based on race, despite improvements in outcomes among children overall. We hypothesized that mortality rates remain higher in black children with sepsis, severe sepsis, and septic shock compared to white children, despite incorporation of automated screening tools into the EMR.

**Methods**: A retrospective analysis of all patients at Arkansas Children's Hospital (ACH) with sepsis, severe sepsis, or septic shock between January 2018 and April 2022 was conducted. ACH uses a best practice advisory (BPA) in the EMR for early detection in all hospital areas including the emergency department, all medical-surgical wards, all Intensive Care Units (ICU), and interfacility transport. EMR activation leads to a bedside huddle, followed by institution of clinical interventions. A sepsis episode (SE) was defined as BPA activation or a diagnosis of sepsis, severe sepsis, or septic shock in the EMR. Mortality rates, as well as demographic information and clinical outcome measures for children who died were compared between Black(B) and White(W) children. Student's t-test was used for categorical variables, chi-square for proportions, and odds ratio for overall mortality comparison.

**Results**: 3,514 patients had a SE during the study period; 2126(W) and 736(B). Overall mortality was 1.65% (40%(B); 47%(W)). Mortality was 3.13% (23/736) in Black children versus 1.27% in White children; OR 2.51 (1.43,4.40), p=0.001. Basic demographics including gender (Female-56.52%(B), 55.56%(W); p=0.95) and age in years (8.00+/-2.78(B), 7.87+/-2.66; p=0.97) were similar. Clinical interventions including total IV antibiotic days (23.83+/-8.36(B), 21.56+/-9.59(W); p=0.38), vasoactive infusion days (2.17+/-1.44(B), 2.63+/-0.90; p=0.18), and percent requiring Extracorporeal Membrane Oxygenation (26.07%(B), 18.52%(W), p=0.52) were similar. Black children who died had a longer length of hospitalization (16.70+/-6.47(B), 12.70+/-5.85(W) days; p=0.03) and longer ICU stay (7.57+/-2.57(B), 5,70+/-2.27(W) days; p=0.01). Percent over threshold for antibiotic administration (21.74%(B), 18.52%(W); p= 0.78; 1h-septic shock, 3h-sespis) and IV fluid bolus administration (8.70%(B), 14.81%(W); p=0.51; 20 minutes-septic shock, 1h-sepsis) were similar.

**Conclusion**: This single center, retrospective study shows that hospitalized Black children have a 2.5 times greater risk of death from sepsis compared to White children. Interestingly, this preliminary data suggests similar rates of timely resuscitation including antibiotic administration and IV fluid boluses. Further investigations are needed to identify biases

(conscious and unconscious), potential socio-economic factors, and genetic predispositions leading to racial disparities in outcomes of children with pediatric sepsis, severe sepsis, and septic shock.

**Improving PICU Length of Stay for Bronchiolitis Patients by Introducing the High Flow Nasal Cannula Challenge**

10/21/2023

Poster Presentation

Craig F. Pymento, MD, Baylor College of Medicine, Spring, TX

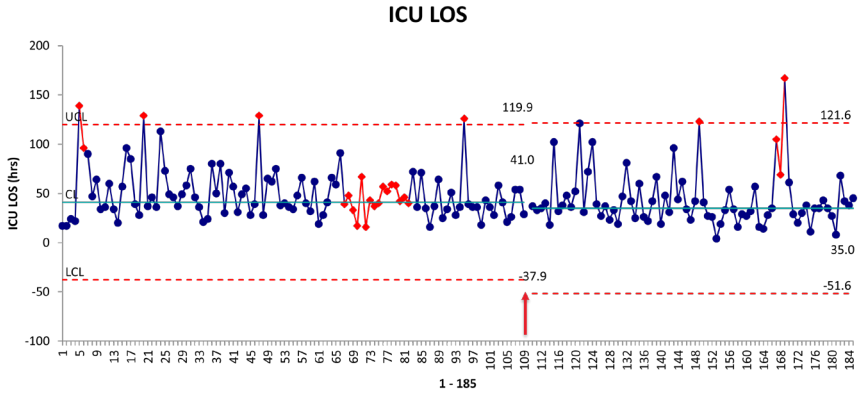
**Purpose/Objectives**: The care for bronchiolitis patients requiring continuous positive airway pressure (CPAP) in the pediatric intensive care unit (PICU) is frequent and highly variable across PICUs. Our institution does not have standardization of weaning CPAP support once children improve. The utilization of CPAP is not without consequences, as such usage increases time spent without nutrition (NPO) and overall PICU length of stay. Our aim in introducing the “high flow nasal cannula challenge” weaning protocol in our community PICU, is that previously healthy infants less than one year of age using CPAP will have a median 20% reduction in CPAP utilization, time spent NPO, and ICU medical length of stay within six months of introduction.

**Design/Methods**: Retrospective chart review identified patients between April 2021 and August 2022 for pre-intervention baseline data. Exclusion criteria included chronic respiratory support needs, chronic medical conditions, progression to intubation, and BiPAP utilization. Meetings were held amongst key operational leadership stakeholders prior to providing this option for weaning respiratory support to clinicians. Once a patient was ready to wean CPAP, the medical team elected whether to use the “high flow nasal cannula challenge” to wean. Post intervention data was collected retrospectively following discharge from the ICU. Balancing measures included resumption of CPAP support following HFNC challenge and readmission to the ICU.

**Results**: A total of 230 patients were initially identified from April 2021 to February 2023. Of 137 pre-intervention patient encounters, 28 encounters were excluded, leaving 109 for review. Post intervention, 93 patient encounters were initially identified and 17 were excluded, leaving 76 for review. The weaning protocol was adopted for 40 encounters (53% of post intervention group). Overall median time on CPAP decreased by 41%, from 27 to 16 hours. Median time spent NPO decreased from 39 to 25.5 hours (35%). Median medical ICU length of stay decreased from 41 to 35 hours (15%). One patient had to resume CPAP following initiation of the high flow nasal cannula challenge, and one patient was readmitted to the ICU.

**Conclusion/Discussion**: Despite 53% adoption of the weaning protocol, our ICU was able to meet two out of the three goals on our first PDSA cycle safely, without a significant risk of readmission or weaning failure. We hypothesize that increasing adoption of the weaning protocol will continue to improve all three metrics. Our goal is to introduce this weaning protocol to other PICUs across our health care system. In doing so, we will provide safe, timely, and efficient health care to the most commonly admitted patient population in our PICUs.

ICU Length of Stay




ICU length of stay improved post intervention of the High Flow Nasal Cannula Challenge.

Outcomes Summary Post Intervention

| | Pre-Intervention (n = 109) | Post-Intervention (n = 76) | Percent Reduction |
|---|---|---|---|
| Median time on CPAP (hrs) | 27.0 (IQR 25) | 16.0 (IQR 18.3) | 40.7% |
| Mean time on CPAP (hrs) | 31.8 | 21.5 | 32.4% (p = 0.001) |
| Median time NPO (hrs) | 39.0 (IQR 26) | 25.5 (IQR 18.3) | 34.6% |
| Mean time NPO (hrs) | 47.3 | 31.7 | 33% (p < 0.001) |
| Median ICU LOS (hrs) | 41.0 (IQR 25) | 35.0 (IQR 21) | 14.6% |
| Mean ICU LOS (hrs) | 49.1 | 43.5 | 11.4% (p = 0.163) |

All outcome measures improved, with CPAP utilization and time spent NPO statistically significant.

**Initial End-tidal Carbon Dioxide: A Novel Evaluation for the Pediatric Trauma Patient in Shock**

10/21/2023

Poster Presentation

Abhinav Singh, MD[1]; Nell Weber, MD[2]; Jared Rieck, n/a[1]; Ann M. Kulungowski, MD[3], (1) Children's Colorado, Aurora, CO, (2) University of Colorado School of Medicine, Auora, CO, (3) Division of Pediatric Surgery, Department of Surgery, University of Colorado School of Medicine, Children's Hospital of Colorado, Aurora, CO

**Background**: Reliable early recognition of severely injured children in the prehospital setting remains challenging. ETCO2 has a specific range of standardized values and does not vary based on a patient's age. We hypothesized that initial ETCO2 would predict mortality and the need for transfusion in traumatically injured children as well as perform comparably to other measures of shock such as shock index, pediatric age-adjusted and reverse shock index multiplied by Glasgow Coma Scale (rSIG).

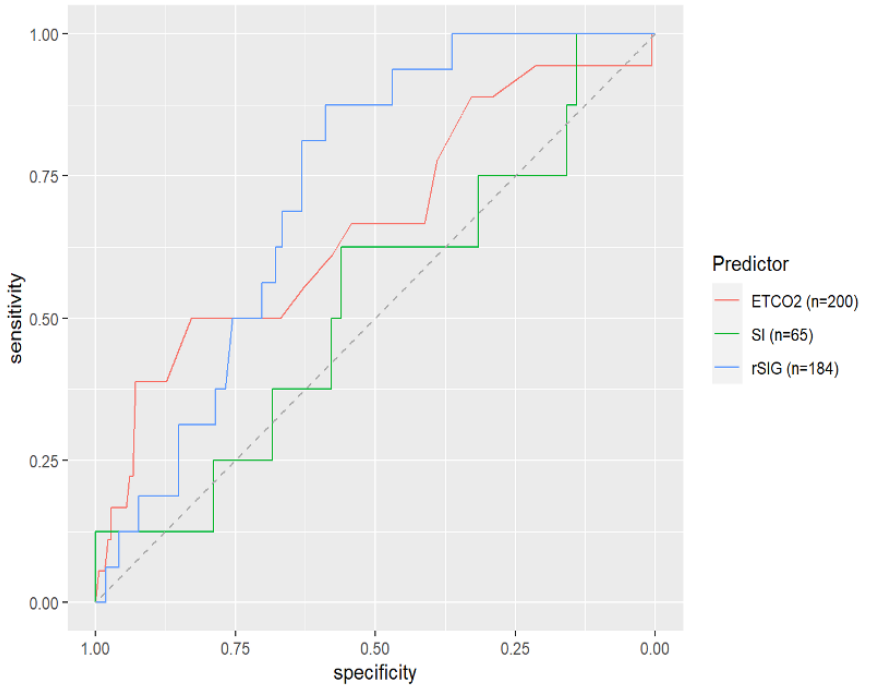
**Methods**: A retrospective review was conducted from 2012-2022 of trauma patients ages 0-18 admitted to a quaternary children's hospital. Patients were divided into two groups: ≥ 4 years of age < 4 years of age to allow for comparison with heart rate (HR) and systolic blood pressure

(SBP). SIPA has only been validated in patients ≥ 4 years age. Variables collected included: ETCO2, SIPA, rSIG, HR, SBP, mortality, and need for blood transfusion. Receiver operating characteristic curves were created and used for comparison.

**Results**: A total of 308 patients were available for analysis: 200 patients ≥ 4 years of age and 108 patients < 4 years of age. For children ≥ 4 years of age, ROC curves utilizing rSIG , ETCO2, and SIPA as predictors of mortality yield respective AUCs of 0.725, 0.665, and 0.529. Pairwise comparison of the AUC corresponding to the ETCO2 ROC curve with AUCs of the rSIG and SIPA curves were not statistically significant (p = 0.319 [ETCO2 vs SI], p=0.505 [ETCO2 vs rSIG]). For children ≥ 4 years of age, ROC curves utilizing ETCO2, rSIG, and SIPA as predictors of transfusion resulted in AUROCs of 0.669, 0.625, and 0.614 respectively. Pairwise comparison of the AUC were not statistically significant (p = 0.686, [ETCO2 vs SI], p=0.550 [ETCO2 vs rSIG]). For < 4 years of age, ETCO2 outperformed heart rate (HR) and systolic blood pressure (SBP) and was predictive of mortality with AUROC of 0.812, 0.706, and 0.626, respectively. Pairwise comparison of the AUC corresponding to the ETCO2 ROC curve with AUCs of the SBP and HR curves was statistically significant (p = 0.022, [ETCO2 vs HR], p = 0.193 [ETCO2 vs SBP])/ Finally, no variable was helpful in determining transfusion need for children < 4 years of age (AUROC's of 0.579 HR, 0.509 ETCO2, and 0.531 SBP, p = 0.736, [ETCO2 vs HR], p=0.858 [ETCO2 vs SBP].

**Conclusion**: ETCO2 is an adequate marker of shock in pediatric trauma patients. It is predictive of mortality in young children. ETCO2 has a standardized range that does not vary by age and can be measured non-invasively. ETCO2 as a marker for mortality and transfusion needs to be validated prospectively.

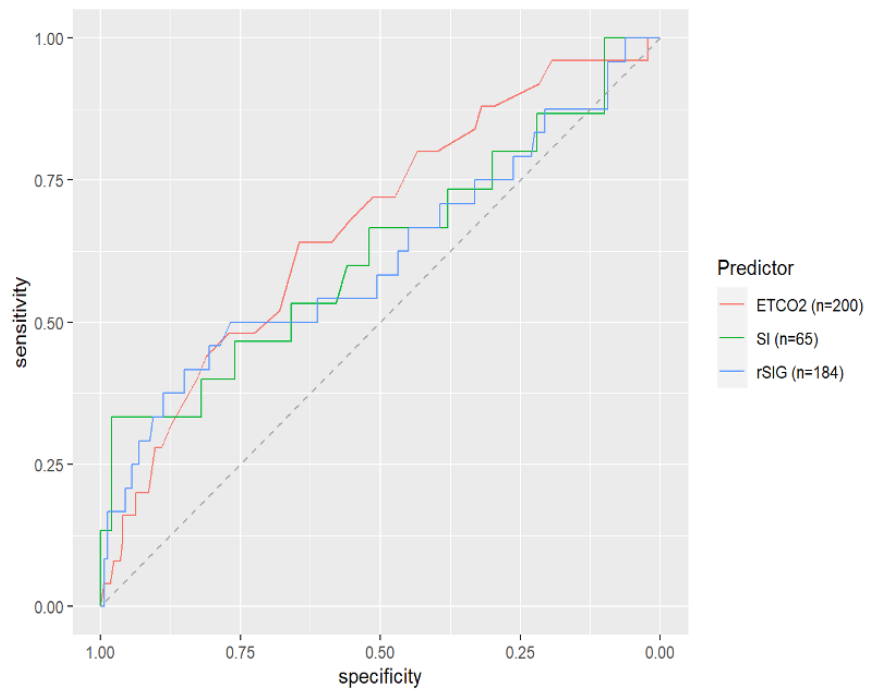
Mortality Age ≥ 4 year




This is AUC evaluating mortality of trauma patients ≥ 4 years of age evaluating the variables of rSIG, EtCO2, and SI. AUC was highest for rSIG (0.725) as compared to ETCO2 (0.665) and SI

(0.529). Pairwise comparisons of ROC curves did not indicate significance at a confidence level α=0.05. Of note, because of age cut offs, the variables rSIG and SI did not include the total patient population.

Transfusion Age ≥ 4 year




This is AUC evaluating the need for transfusion of trauma patients ≥ 4 years of age evaluating the variables of rSIG, EtCO2, and SI. AAUC was highest for ETCO2 (0.669) as compared to SI (0.625) and rSIG (0.614). Pairwise comparisons of ROC curves did not indicate significance at a confidence level α=0.05. Of note, because of age cut offs, the variables rSIG and SI did not include the total patient population.

**Trends in non-covid-19 Respiratory Diagnoses in Infants from 2019-2020**

10/21/2023

Poster Presentation

Rachel A. Wyand, MD[1]; Whitney Marvin, MD[2]; Kit N. Simpson, DrPH[2]; Carolyn K. Barnes, MS CCC-SLP[3], (1) Medical University of South Carolina, Charleston, SC, (2) MUSC, Charleston, SC, (3) College of Health Professions, Medical University of South Carolina, Johns Island, SC

**Background**: Acute lower respiratory tract infections (ALRTI), frequently presenting as bronchiolitis caused by RSV, are a common cause of hospitalization and death in children. Younger ages are the most at-risk, experiencing higher rates of hospitalization and mortality from bronchiolitis. The COVID-19 pandemic resulted in changes to viral patterns and severity, pediatric hospitalizations, and pediatric intensive care unit (PICU) admissions. The aim of this study was to compare infants hospitalized with non-COVID-19 respiratory diagnoses in 2019 and 2020. Outcomes during these two years include frequency of hospitalizations, diagnoses,

mortality, hospital length of stay (LOS), and cost.

**Methods**: Retrospective national data was extracted from MarketScan database. Infants age < 1 year hospitalized with a variety of non-COVID-19 respiratory diagnoses based on ICD-10 codes from 2019 and 2020 were analyzed. These codes include viral and bacterial illness, structural airway diagnoses, chronic respiratory conditions, and dependence on respiratory support. Statistical analysis included descriptive statistics for categorical and continuous data, Wilcoxon rank sum test for nonparametric data, logistic regression for death outcomes, and multivariable modeling with transformations for LOS and cost outcomes.

**Results**: A total of 54,805 infant admissions coded for non-COVID-19 respiratory conditions were included, with admission falling from 37,332 in 2019 to 17,473 in 2020. Of these, 5,578 were readmissions. There was a significant difference from 2019-2020 regarding admission type ($p< 0.0001$) as well as discharge destination ($p< 0.0001$) (Table 1). Significant differences were observed in ICD-10 code diagnoses except those for dependence on respiratory support (Table 2). Overall death rate decreased from 7.2% in 2019 to 2.91% in 2020. Mortality was significantly higher in 2019 compared to 2020 for children diagnosed with RSV ($p< 0.0001$) and other respiratory illnesses ($p< 0.0001$). There was a significant difference in LOS, increasing nearly 1 full day in 2020 ($p< 0.0001$). Cost was also significantly different, with 2020 resulting in a cost of nearly $8,500 USD more ($p< 0.0001$).

**Conclusion**: Admissions and death rates for non-COVID-19 respiratory diagnoses in infants aged < 1 year significantly decreased in 2020 compared to 2019. LOS and cost increased in 2020. These findings may reflect a variation in healthcare utilization, shifting viral epidemiology, and/or transmission of respiratory viruses due to the pandemic. Ongoing data collection and dissemination is warranted to fully understand the impact of COVID-19 on viral transmission and severity patterns and will aid in the creation of public health recommendations aimed at reducing infant mortality and decreasing healthcare burden.

Table 1. Cohort Characteristics

| **Table 1. Cohort Characteristics** | Total Cohort (N=54,805) | 2019 (n=37,332) 68.12% | 2020 (n=17,473) 31.88% | P-value |
|---|---|---|---|---|
| Sex: n (%) | | | | |
| Female | 24,041 (43.87) | 16,482 (44.15) | 7,559 (43.26) | 0.0507 |
| Male | 30,764 (56.13) | 20,850 (55.85) | 9,914 (56.74) | |
| *Admission types: n (%) | | | | |
| Newborn | 46,503 (84.86) | 31,703 (84.93) | 14,800 (84.71) | <0.0001 |
| Medical | 7,344 (13.40) | 5,067 (13.57) | 2,277 (13.03) | |
| Surgical | 945 (1.72) | 551 (1.48) | 394 (2.26) | |
| Other | 7 (0.01) | 6 (0.02) | 1 (0.01) | |
| Discharge Destination: n (%) | | | | |
| Home | 50,356 (91.88) | 33,880 (90.75) | 16,476 (94.29) | <0.0001 |
| Transfer | 1,036 (1.89) | 646 (1.73) | 390 (2.23) | |
| Other | 217 (0.40) | 118 (0.32) | 99 (0.57) | |
| Died | 3,196 (5.83) | 2,688 (7.20) | 508 (2.91) | |
| Region: n (%) | | | | |
| Northeast | 7,631 (13.92) | 5,417 (14.51) | 2,214 (12.67) | <0.001 |
| North Central | 15,080 (27.52) | 10,311 (27.62) | 4,769 (27.29) | |
| South | 24,651 (44.98) | 16,482 (44.15) | 8,169 (46.75) | |
| West | 7,057 (12.88) | 4,774 (12.79) | 2,283 (13.07) | |
| Unknown | 386 (0.70) | 348 (0.93) | 38 (0.22) | |

Table 2. Diagnosis by year

| Table 2. Diagnosis by year | Total Cohort (N=54,805) | 2019 (n=37,332) 68.12% | 2020 (n=17,473) 31.88% | P-value |
|---|---|---|---|---|
| RSV n (%) | 2,992 (5.46%) | 2,161 (5.79%) | 831 (4.76%) | <0.0001 |
| RSV died n (%) | 221 (7.39%) | 187 (8.65%) | 34 (4.09%) | <0.0001 |
| Other respiratory n (%) | 8,041 (14.67%) | 5,378 (14.41%) | 2,663 (15.24%) | 0.0101 |
| Other respiratory died n (%) | 596 (7.41%) | 464 (8.63%) | 132 (4.96%) | <0.0001 |
| Airway diagnoses n (%) | 106 (0.19%) | 57 (0.15%) | 49 (0.28) | 0.0015 |
| Airway died n (%) | 10 (9.43%) | 7 (12.28%) | 3 (6.12%) | 0.2795 |
| Respiratory support n (%) | 537 (0.98%) | 369 (0.99%) | 168 (0.96) | 0.7654 |
| Resp support n (%) | 46 (8.57%) | 37 (10.03%) | 9 (5.36%) | 0.073 |

**Patient- and Family-centered Outcomes During Inter-facility Transfer of Critically Ill Children to the Pediatric Intensive Care Unit**

10/21/2023

Poster Presentation

Claire Stucky, BA[1]; Aaron Scherer, PhD[2]; Aditya Badheka, MBBS, MS[2]; Shilpa C. Balikai, DO[2]; Madhuradhar Chegondi, MBBS, MD[2]; Mitchell A. Luangrath, MD[2]; Nehal R. Parikh, DO[2]; Priyadarshini Pennathur, PhD[3]; Heather S. Reisinger, PhD[2]; Christina L. Cifra, MD, MS[4], (1) University of Iowa College of Liberal Arts and Sciences, Iowa City, IA, (2) University of Iowa Carver College of Medicine, Iowa City, IA, (3) University of Texas at El Paso, El Paso, TX, (4) Boston Children's Hospital, Harvard Medical School, Boston, MA

**Background**: The inter-facility transfer of a critically ill child from a frontline care setting to the pediatric intensive care unit (PICU) is stressful for families. Parents often travel to the PICU separate from their child, childcare for siblings may need to be arranged, and families have to navigate an unfamiliar hospital environment, all while contemplating the potential consequences of their child's illness. Our objective was to generate consensus on a prioritized list of outcomes important to patients/families related to the inter-facility transfer of children to a higher level of care.

**Methods**: We conducted a consensus-based study at a single PICU using a modified Delphi method including 2 rounds of electronic/mailed surveys (completed) followed by semi-structured interviews (ongoing). Patients urgently transferred to the PICU from another institution and their parents/guardians were purposively sampled to include a diverse racial/ethnic/socio-economic cohort living at various geographic distances from the PICU. We compiled a list of inter-facility transfer-related patient- and family-centered outcomes (PFCOs) drawing on literature, practice guidelines, our prior work, and our experience as PICU clinicians. We included these PFCOs in the round I survey under 5 categories: patient/family understanding of need for transfer, communication with patient/family, family presence, patient needs, and family needs. The survey instrument was reviewed by a parent research partner

and revised accordingly. Participants rated PFCOs on a 4-point Likert scale (1-unimportant to 4-very important). PFCOs rated as important/very important by 75% or more of participants and not rated as unimportant by any participant were retained for round II. PFCOs with opposing ratings were noted for further discussion at interviews.

**Results**: Twenty-six patient-parent dyads consented with 3 withdrawing before data collection. Patients had a median age of 2 (IQR 0.7-10) years and 57% had a chronic medical condition. Most patients were white (61%) and non-Hispanic (87%). Most (65%) lived in a zipcode area with a median household income of $50,000-$74,999/year (36th-52nd U.S. income percentile) and located a median of 73 (IQR 41-84) miles from the PICU. Round I surveys were completed by 13 (57%) and round II by 11 (48%) participants. After round I, 9 PFCOs were retained for round II. After round II, 2 PFCOs emerged as most important to families: 1) parents/guardians are informed about their child's condition throughout transfer and 2) the patient can request for parents/guardians at any time during transfer (Table). Information from semi-structured interviews is pending.

**Conclusion**: The most important outcomes to families related to inter-facility transfers of critically ill children include keeping parents informed about their child's condition and the child's ability to request for parents throughout transfer. These PFCOs should be integrated into future work intending to improve the inter-facility transfer of critically ill children needing a higher level of care.

Table. Outcomes Most Important to Patients and Families During Inter-facility Transfer of Critically Ill Children

**Table. Outcomes Most Important to Patients and Families During Inter-facility Transfer of Critically Ill Children**

| Outcomes[a] | Description |
|---|---|
| **Patient/Family Understanding of Need to Transfer Care** | |
| Understanding Reason for Transfer | Parents/guardians understand the reason for their child's transfer to a higher level of care. |
| Understanding Emergent Nature of Transfer | Parents/guardians understand why transfer is emergent and can be potentially life-saving for their child. |
| **Communication with Patient/Family** | |
| *Verbal Information Provided* | *Parents/guardians are verbally informed about their child's condition at both referring and accepting hospitals.* |
| Immediate Contact with Status Change | Parents/guardians are immediately contacted at any time that their child's condition deteriorates. |
| Information on Procedures Provided | Parents/guardians are given adequate information regarding any emergency procedures performed on their child immediately before or after the procedure at both referring and accepting hospitals. |
| **Patient Needs** | |
| *Ability to Request for Parents/Guardians* | *The child has the option to request that their parent/guardian be at the bedside at any time at both referring and accepting hospitals.* |
| **Family Needs** | |
| Transport Assistance Provided | Parents/guardians are given assistance in arranging transportation to the accepting PICU if needed. |
| PICU Information on Family Resources Provided | Parents/guardians are given information on arrival regarding the PICU's available facilities and resources for families. |
| Housing Resources Provided | Parents/guardians are given resources for housing as needed within the first 24 hours of PICU transfer. |

[a]All outcomes presented were rated as important/very important by ≥75% of participants and were not rated as unimportant by any participant in the round I survey. Outcomes that were rated similarly in the round II survey are italicized.

## Methemoglobinemia and Cerebral Venous Sinus Thrombosis in a Neonate with Dehydration

10/21/2023

Poster Presentation

Amber Gasparini[1]; Ji-Yeon Kim, MD[2], (1) Ross University School of Medicine, Shelby Township, MI, (2) Children's Hospital of Michigan, Detroit, MI

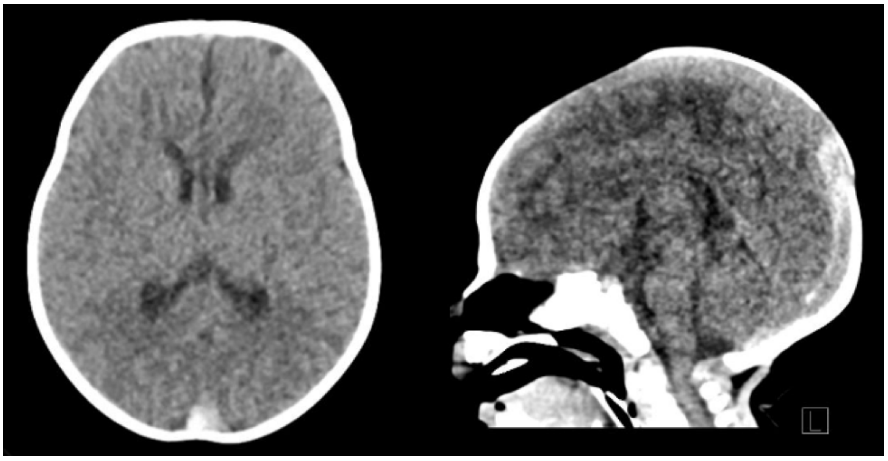
**Introduction**: Feeding difficulties and dehydration is a common chief complaint in neonates presenting to the emergency room. A rare but well described neonatal complication of diarrhea and dehydration with hypoxemia is acquired methemoglobinemia. Many of the signs in these patients, including severe dehydration, acute systemic illness, and sepsis, are also risk factors associated with cerebral venous sinus thrombosis (CSVT). We present a unique case of a critically ill neonate presenting with severe dehydration caused by diarrhea, resulting in methemoglobinemia and CSVT.

**Case Description**: A 4-week-old full term female with an unremarkable prenatal history presented with several days of diarrhea, emesis, and tactile fever. Physical exam noted a weak infant with delayed capillary refill, tachycardia, and tachypnea. Initial blood gas was pH 6.8, bicarbonate 3.8 mmHg, lactate 5, and methemoglobin 19%. Electrolyte panel was consistent with dehydration. Patient was intubated and empiric antibiotics were initiated. Initial head CT was significant for thrombosis in superior sagittal sinus. Clinically, patient had signs of coagulopathy including early clotting of the blood samples and immediate femoral thrombus extending from the central line. Initial coagulation profile and platelets were unremarkable. On hospital day 5, patient had focal seizures with repeat CT showing intraparenchymal hemorrhage in frontoparietal lobes with surrounding vasogenic edema. Due to concerns of the new hemorrhage originating from the sagittal sinus thrombosis and now extending anteriorly, heparin was started with monitoring of the levels and daily head ultrasound. To note, work up for methemoglobinemia included Hg F 85%, urine blood culture positive for Escherichia Coli, and normal cytochrome b5 reductase activity. Thrombophilia and iron deficiency was negative for work up for CSVT.

**Discussion**: Red blood cells (RBC) in neonates are at a higher risk of oxidation leading to methemoglobinemia. This is due to easily oxidized hemoglobin F and immature erythrocyte cytochrome b5 reductase activity. Neonates with gastroenteritis are more critically ill given increased bacterial production of nitrite leading to hemoglobin oxidation and metabolic acidosis decreasing the rate of methemoglobin reduction. The most common risk factors of CSVT in neonates are perinatal complication and dehydration. Literature on adult population have proposed dehydration causing rheological changes from increased hematocrit and RBC aggregation. We question whether our patient’s thrombosis was a consequence of both dehydration and methemoglobinemia. Basic science research indicate that methemoglobin is a potent activator of endothelial cells by stimulating IL-6 and IL-8 production, increasing coagulation.

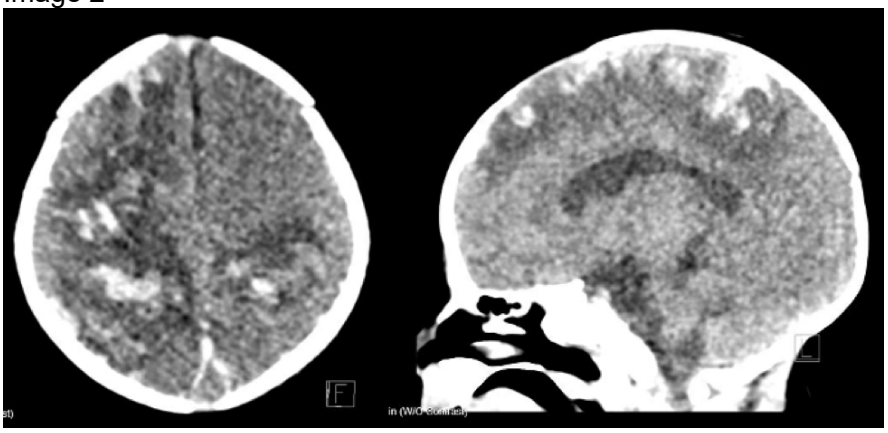
**Conclusion**: Methemoglobinemia and CSVT are two extremely uncommon conditions in neonates that can present critically ill. Severe dehydration has been linked to both conditions, but to our knowledge, no case with both sequelae has been reported until now. Further research will need to explore if hypoxia secondary to methemoglobin could trigger CSVT in otherwise previously healthy neonates.

Image 1



Initial Head CT with superior sagittal sinus thrombus

Image 2



Follow up Head CT with acute intraparenchymal hemorrhage involving bilateral frontoparietal lobes with surrounding edema. Note the anterior extension of superior sagittal sinus thrombosis.

**A Neonate with Cytokine Storm Managed with Steroids, Plasmapheresis, and Tocilizumab**

10/21/2023

Poster Presentation

Amy LiKamWa, BS[1]; Kaitlin Kobaitri, DO, FAAP[2]; Balagangadhar R. Totapally, MD, FAAP[2], (1) FIU Herbert Wertheim College of Medicine, Miami, FL, (2) Nicklaus Children's Hospital, Miami, FL

**Introduction**: Cytokine storm in neonates is a known but uncommon condition. There is an increased report of neonatal inflammatory conditions during the COVID-19 pandemic. An increase in interleukin-6 (IL-6) levels may lead to hyperinflammation in neonates leading to multiple organ failure. Tocilizumab is a humanized monoclonal antibody that can prevent

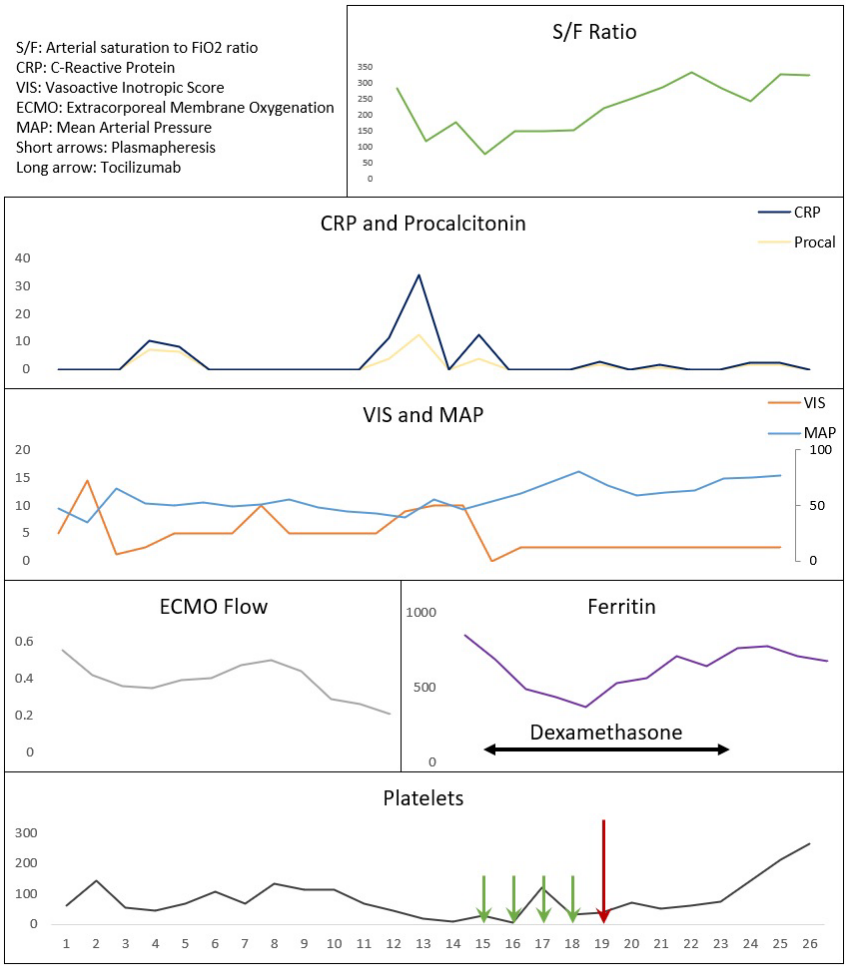
systemic inflammatory responses by blocking IL-6-mediated proinflammatory signaling. We report a case of a neonate with hyper IL-6 treated with steroids, plasmapheresis, and tocilizumab that led to a favorable outcome.

**Case Description**: A male neonate born at 39 weeks gestation via elective C-section was transferred to the PICU for initiation of extracorporeal life support in the setting of persistent pulmonary hypertension, cardiogenic shock, transaminitis, and metabolic acidosis due to meconium aspiration syndrome. Upon arrival, the patient was started on extracorporeal membrane oxygenation (ECMO) support and was transitioned to conventional mechanical ventilation after 12 days. Due to worsening thrombocytopenia and oxygenation (decreasing S/F ratio) and elevated C-reactive protein and ferritin (851 micg/L), steroids and plasmapheresis were initiated 3 days after the ECMO run (Figure). Since the patient was showing signs of severe inflammation, including IL-6 levels of 400 pg/ml, 56 mg of tocilizumab was administered intravenously after 4 days of plasmapheresis. Microbiological cultures and Karius test were negative. He was treated with multiple courses of antibiotics and antifungals for presumed sepsis. Following the infusion of tocilizumab, there were marked improvements in platelet levels, S/F ratio, and CRP. COVID-19 testing was negative. Genetic and metabolic testing were normal. The patient was discharged home two months later in stable condition. Maternal history was significant for positive Group B Strep and negative COVID-19.

**Discussion**: We present a neonate who developed thrombocytopenia, worsening organ failure, and hyperinflammation and improved clinically with steroids, plasmapheresis, and tocilizumab. IL-6 level was measured before starting the plasmapheresis and was found to be elevated which prompted us to give a dose of tocilizumab. IL-6 is a known mediator of inflammation in neonates. It is also increased in fetal inflammatory response syndrome. Hyperinflammation may be due to sepsis, an autoimmune condition, or an innate response. We ruled out active infection leading to hyperinflammation in this neonate. Steroids act at various stages of inflammatory cascade. Plasmapheresis is an accepted therapy for thrombocytopenia-associated multiple organ failure in children. Tocilizumab, an IL-6 receptor blocker is approved for many conditions with elevated IL-6 levels and has been used in hyperinflammation associated with COVID-19.

**Conclusion**: Neonates with multiple organ failure should be evaluated for hyperinflammatory conditions. Potential therapeutic options in children with hyperinflammation such as steroids, plasmapheresis, and cytokine-blocking medications may be considered depending on the underlying cause and cytokine profile.

Outcomes of neonate from initiation of ECMO support to 7 days post tocilizumab infusion




Plasmapheresis started on day 15 and ended on day 18 (green short arrows). Tocilizumab was administered on day 19 (red long arrow). Dexamethasone was administered on days 15-23 (black horizontal arrow). Patient showed an improvement in laboratory values and vital signs, most notably in S/F ratio and levels of platelets and ferritin.

**A Novel Case of Germline RANBP2 Mutation Associated with Refractory Very Early Onset Inflammatory Bowel Disease and Aggressive Acute Necrotizing Encephalopathy**

10/21/2023

Poster Presentation

Judy Jasser, MBBS[1]; Elizabeth Haworth-Hoeppner, MD[2]; Joseph DJ Fakhoury, MD[3]; Tanbeena Imam, MD[3]; Hayley Hardin, DO[3]; Mandeep Takhar, MD[1]; Taylor Cable, MD[4], (1) Western Michigan University, Kalamazoo, MI, (2) Bronson's Children Hospital, kalamazoo, MI, (3) Bronson's Children Hospital, Kalamazoo, MI, (4) Western Michigan University, Kalamzoo, MI

**Introduction**: Acute Necrotizing Encephalopathy (ANE) is a rare disease that induces rapidly progressive encephalopathy triggered by a viral illness. ANE is associated with missense mutations in the RANBP2 that have incomplete penetrance. Common symptoms include altered mental status, headache, and seizure. Very early onset inflammatory bowel disease (VEO-IBD) is a severe form of inflammatory bowel disease that presents before the age of 6 years and is linked to several genes but has not previously reported with RAN Binding Protein 2 (RANBP2). Here, we report the case of a 3-year-old female with germline RANBP2 mutation who developed both refractory VEO-IBD and aggressive ANE.

**Case Description**: A three-year-old female with a VEO-IBD minimally controlled with infliximab was admitted to the hospital due to severe anemia and perianal cellulitis. Over the course of hospitalization, she developed shoulder pain and purpuric rash but was otherwise clinically improving. On day 6 of admission, she complained of headache and shortly afterwards she developed status epilepticus and became unresponsive and hypoxic, necessitating intubation. An MRI of the brain revealed significant swelling and T2 hyperintense signal abnormality in the bilateral thalami. The upper cervical spinal cord showed extension of the abnormality, with possible involvement of the basal ganglia bilaterally. With the radiologic impression concerning for venous infarct versus infectious encephalitis, the patient was started on Amphotericin, Meropenem, and Vancomycin. Extensive infectious workup was unremarkable. Repeat MRI showed progressing encephalitis. Considering the severe injury to the brain she sustained and her poor prognosis, her parents chose to withdraw life sustaining therapies and she died. Genome sequencing revealed a germline mutation in the RANBP2 gene, which can be associated with Genetic Acute Necrotizing Encephalopathy (ANE). No other mutations were found.

**Discussion**: Genetic ANE is often overlooked and results in delayed treatment, despite a high mortality rate and most surviving patients having persistent neurologic deficits. The RANBP2 mutation associated with ANE causes an incompletely penetrant predisposition to encephalopathy. However, the exact mechanism of which other factors contribute to disease penetrance remains poorly understood. VEO-IBD is a severe form of chronic inflammation of the colon and rectum linked to several genes, including IL-10, IL-10RA, IL-10RB, and MSH6. Our case is the first report of RANBP2 linked to both ANE and VEO-IBD. Additionally, our patient had an aggressive clinical course of both diseases; a treatment-resistant form of VEO-IBD and a rapidly progressive ANE.

**Conclusion**: Our case highlights a potential novel association between RANBP2 and both ANE and VEO-IBD. Further studies are necessary to elucidate the exact genetic mechanisms underlying VEO-IBD and the possible link between these two diseases. Clinicians should be aware of this rare association to facilitate earlier diagnosis and treatment.

## Acute Disseminated Encephalomyelitis Presentation with Penile Pain and Acute Urinary Retention: A Case Report

10/21/2023

Poster Presentation

Tiffany Truong, MD[1]; Sara Farran, MD[1]; Lubaina Ehsan, MD[2]; Gregory Tiongson, MD[1], (1) Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI, (2) Western Michigan University Homer Stryker M.D. School fo Medicine, Battle Creek, MI

**Introduction**: Acute disseminated encephalomyelitis (ADEM) is rare in childhood. It is a demyelinating disease of the central nervous system that appears to result from a cell-mediated delayed hypersensitivity reaction and primarily managed with high-dose corticosteroids. The classic presentation of this disease is meningoencephalitis. We present a unique pediatric case where penile pain and acute urinary retention were the initial presenting symptoms.

**Case Description**: 4-year-old male with no significant past medical history presented with penile pain and acute urinary retention of one-day duration following a five-day history of cough, congestion, and rhinorrhea. On examination, he exhibited irritability with palpation of the head and shaft of the penis. 320 mL of retained urine was detected on subsequent bladder scan. Straight catheter placement resulted in return of normal urine without resistance, followed by immediate relief of pain. Pertinent preliminary labs included: procalcitonin of 0.51 ng/mL, leukocytosis of 23.3 10*9/L, blood and urine cultures with no growth, and urinalysis with trace ketones and small blood. Shortly after catheterization, bilateral lower extremity pain with refusal to bear weight, irritability, listlessness, and continued urinary retention were noted. Magnetic Resonance Imaging (MRI) of the brain and spine with and without contrast demonstrated scattered supratentorial and infratentorial signal abnormalities and hyper-intense signal abnormalities throughout the spinal cord (Figures 1 and 2, respectively). Pertinent subsequent labs included: positive serum myelin oligodendrocyte glycoprotein immunoglobulin and negative cerebral spinal fluid (CSF) studies. Treatment with a five-day course of intravenous (IV) methylprednisolone and two doses of IV immunoglobulin (IVIG) were initiated at the recommendation of pediatric neurology. Retinal exam performed by ophthalmology was unremarkable. Neurologic symptoms, including penile pain secondary to urinary retention, significantly improved after treatment. Following completion of the corticosteroid and IVIG course, the patient was discharged to an inpatient rehabilitation facility with return to his neurologic baseline.

**Discussion**: ADEM typically presents with symptoms of meningoencephalitis. Penile pain and urinary retention are unusual presenting signs. While supportive techniques, such as straight catheterization, were initially performed for symptomatic relief, MRI and CSF studies were ordered immediately following neurologic deterioration on physical exam, confirming the diagnosis of ADEM. Rapid recognition of these acute changes is imperative for initiation of life-saving intervention.

**Conclusion**: This case highlights that atypical symptoms, such as penile pain and acute urinary retention, can constitute the initial presentation of ADEM. We also emphasize the importance of immediate further work-up for these patients, especially if the symptoms are persistent or accompanied by signs of early neurologic deterioration.

Figure 1
Figure 1.jpeg



T2-weighted MRI Brain with contrast demonstrating prominent right cerebellar peduncle changes.

Figure 2
Figure 2.jpeg



T2-weighted MRI Spine with contrast demonstrating thoracic changes throughout the spinal cord.

**Atypical Subcutaneous Fat Necrosis Occurring After Therapeutic Hypothermia and Extracorporeal Membrane Oxygenation**

10/21/2023

Poster Presentation

Allison C. Lure, MD; Susan Lopata, MD, Nationwide Children's Hospital, Columbus, OH

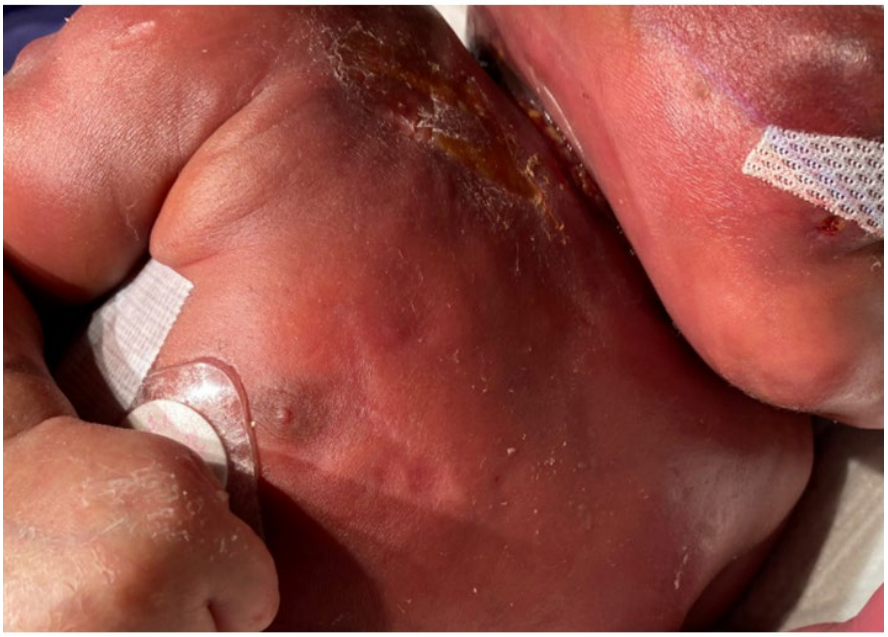
**Introduction**: Subcutaneous fat necrosis of the newborn (SCFN) is a rare panniculitis typically affecting term and post-term neonates, theorized to be secondary to decreased skin perfusion, and known to be associated with vasoconstrictive processes such as ischemic injury and therapeutic hypothermia (TH). Though usually self-limited, it can cause life-threatening hypercalcemia. To our knowledge, only one other case of SCFN occurring after TH and extracorporeal membrane oxygenation (ECMO) has been reported in the literature. We present the second case.

**Case Description**: A 37-week male infant was admitted to the NICU for respiratory failure. He was born to a Gravida 4 Para 1, serology negative mother with a history of fetal demise. Decreased fetal heart tones resulted in a failed vacuum extraction and subsequent stat cesarean section. APGARs were one, two, and four at one, five, and ten minutes, respectively. The infant required positive pressure ventilation and intubation in the delivery room. In the NICU, he was placed on conventional mechanical ventilation and TH was initiated for severe hypoxic ischemic encephalopathy. He also received volume and vasopressors for hypotension and antibiotics for presumed sepsis. Shortly after admission, he experienced cardiopulmonary arrest requiring chest compressions, epinephrine, calcium, and bicarbonate. An echocardiogram showed severe biventricular dysfunction, necessitating placement on veno-arterial (VA) ECMO. TH was continued for a total of 72 hours through the ECMO circuit. On day of life 15, multiple erythematous and indurated skin lesions appeared on the left heel, concerning for SCFN versus an infectious etiology. In following days, similar lesions also appeared on the back, occiput, chest, abdomen, face, and extremities (Figures 1 and 2). A skin biopsy was performed and revealed scanty subcutaneous adipose tissue with adipocytes demonstrating needle-like crystals, fibrotic dermis with a histiocytic and patchy neutrophilic infiltrate, scattered ectatic vessels, and negative infectious stains; consistent with SCFN. At 3.5 months, he was discharged on room air with a gastrostomy tube. He never had hypercalcemia or other sequelae of SCFN. At his 5-month follow-up visit, all skin lesions were resolving.

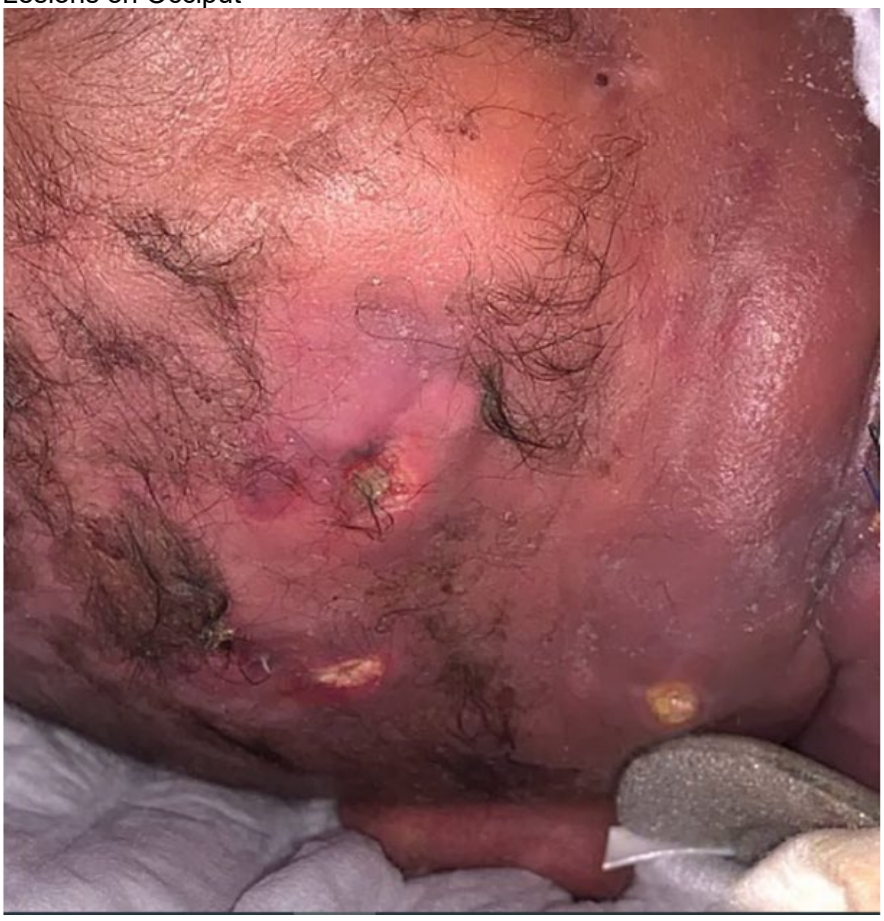
**Discussion**: This is the second reported case of SCFN occurring after TH and ECMO and the first with an atypical lesion location. ECMO is a form of cardiopulmonary support that aids perfusion to tissues, including the skin. This, in theory, should mitigate the risk of developing SCFN. SCFN typically occurs over bony prominences of the buttocks and back with sparing of the chest and abdomen. However, our patient had uniquely located lesions on his chest and abdomen.

**Conclusion**: SCFN should remain in the differential diagnosis for erythematous and indurated skin nodules and plaques occurring after TH and ECMO, even if they occur in atypical locations.

Lesions on Chest



Lesions on Occiput



**A Novel Surgical Model of Acute Kidney Injury in Neonatal Rats Results in Pulmonary Inflammation**

10/21/2023

Poster Presentation

Alyssa E. Vaughn, MD[1]; Bailey D. Lyttle, MD[2]; Gregory Seedorf, BS[3]; Brianna Liberio, MD[4]; Anisha Apte, MD[5]; Carlos Zgheib, PhD, MS[5]; Kenneth Liechty, MD[5]; Jason Gien, MD[2], (1) University of Colorado Anschutz Medical Campus, Denver, CO, (2) University of Colorado Anschutz Medical Campus, Aurora, CO, (3) University of Colorado, Aurora, CO, (4) Indiana University School of Medicine, Bloomington, IN, (5) University of Arizona Tucson College of Medicine, Tucson, AZ

**Background**: Acute kidney injury (AKI) commonly affects critically ill neonates, particularly those with pathologies that induce ischemia-reperfusion injury such as hypotension, sepsis, and acute blood loss. Premature neonates are at higher risk of AKI due to incomplete nephrogenesis. AKI produces a systemic pro-inflammatory state that can lead to dysfunction of other distant organs through complex biological communications known as “organ crosstalk.” Clinically, AKI in critically ill neonates has been associated with significant pulmonary morbidity and mortality. However, this relationship has yet to be replicated in a preclinical neonatal model. Adult models have described the association between AKI-induced lung injury and systemic inflammation, but there is little known about the interaction between the developing lungs and kidneys in neonates. We therefore hypothesized that upregulation of inflammatory pathways secondary to AKI in a neonatal rat model would produce increased pulmonary proinflammatory gene expression and subsequent inflammation.

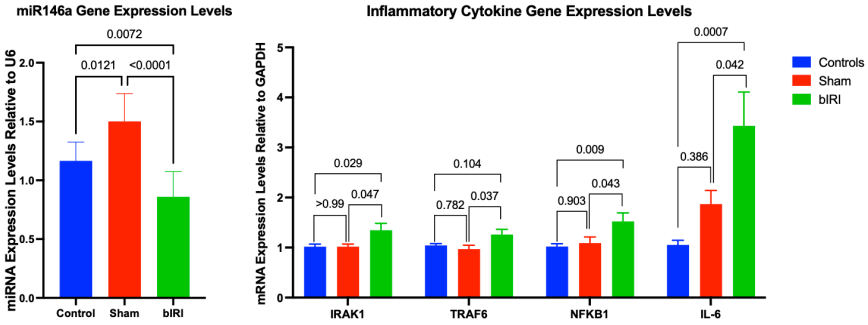
**Methods**: Sprague-Dawley rat pups underwent either bilateral ischemia-reperfusion injury (bIRI) (n=13) or sham surgery (n=11) on day of life (DOL) 5 to replicate premature neonatal physiology. First, each kidney was surgically isolated. In the bIRI cohort, a microvascular clamp was applied to the renal vascular bundles for 40 minutes. In the sham cohort, kidneys were left exposed for 40 minutes but without vascular clamping. Control pups (n=15) underwent no surgical intervention. On DOL6, the pups were euthanized, and the lungs were collected and processed for total RNA extraction. AKI was confirmed by elevated plasma BUN and creatinine and positive KIM-1 immunohistochemical staining. Real-time quantitative polymerase chain reaction (RT-qPCR) analysis was performed to evaluate gene expression levels of microRNA(miR)146a, a “regulatory brake” that inhibits the NFkB inflammatory pathway, as well as the pro-inflammatory cytokines IRAK1, TRAF6, NFkB, and IL-6.

**Results**: We found that pulmonary gene expression levels of miR146a were significantly lower in the bIRI model compared to both shams ($p < 0.0001$) and controls ($p=0.007$). Pulmonary gene expression levels of pro-inflammatory cytokines were also significantly elevated in the bIRI model compared to both shams and controls, consistent with a state of increased inflammation (Figure). There was no significant difference in inflammatory cytokine levels when comparing shams to controls, suggesting that the ischemia-reperfusion injury is responsible for subsequent pulmonary inflammation.

**Conclusion**: We have demonstrated that AKI induced in a neonatal rodent model is associated with dysregulation of miR146a and subsequent increased expression levels of pulmonary inflammatory mediators, which may in part explain the mechanism through which AKI contributes to distant organ injury. Additionally, the dysregulation of miR146a offers a target for

potential therapies that could suppress the inflammatory response produced by AKI.

Pulmonary Gene Expression Levels Following Acute Kidney Injury




Lungs from neonatal rat pups that underwent surgical bilateral ischemia-reperfusion (bIRI) injury demonstrated significantly lower expression levels of miR146a compared to shams and controls. Additionally, lungs from bIRI pups demonstrated significantly elevated inflammatory cytokine expression levels compared to shams and controls.

**Variation in Regional Pediatric Brain Death Policies**

10/21/2023

Poster Presentation

Daniel H. Kim, MD[1]; Jonna D. Clark, MD, MA[2], (1) University of Washington / Seattle Children's Hospital, Seattle, WA, (2) University of Washington, Seattle Children's Hospital, Seattle, WA

**Background**: Approximately 20% of pediatric deaths in pediatric intensive care units (PICU) in the United States are declared as death by neurological criteria (DNC), defined as the irreversible cessation of clinical brain function. A review of adult brain death (BD) policies demonstrated wide variability and many policies were incongruent with contemporary practice parameters. Even though expert guidelines for DNC in children exist, variability in hospital policies for pediatric DNC continue to persist.

**Methods**: Sixteen pediatric BD policies from referral hospitals under a single organ procurement organization (OPO) were collected and analyzed. Referral center characteristics such as status as a stand-alone children's hospital versus pediatric unit, presence of pediatric and neonatal intensive care units, and presence of pediatric-trained intensivists/neurologists/neurosurgeons were captured. Policies were evaluated across four categories: (1) clinical prerequisites for brain death testing, (2) components of the clinical exam, (3) apnea testing, and (4) ancillary testing. It was also noted if a separate pediatric policy existed and whether the last update was consistent with either pediatric guidelines by Nakagawa, et al. (2011) or the World Brain Death Project guidelines (2020).

**Results**: Of the sixteen hospitals, one was a stand-alone children's hospital and twelve had pediatric-specific units. Nine centers had dedicated PICUs. Eight and five centers had pediatric neurologists and neurosurgeons respectively. Notably, only six (38%) hospitals had separate pediatric BD policies. The remaining ten either had a section within their adult guidelines specifying differences in pediatrics or did not have a pediatric-specific section, utilizing the adult

BD checklist with few optional points for pediatric-specific details. Only five (31%) policies were updated 2020 and beyond, meaning most policies were not up to date with the current World Brain Death guidelines. Twelve (75%) policies required two separate clinical exams, with eleven (69%) specifying age dependent distinction in timing between two exams. Variability was noted in the clinical prerequisites for brain death testing, namely waiting 24 hours after cardiac arrest (44%), maintenance of core body temperature of equal or greater than 36 degrees for 24 hours (56%), need for normotension based on age-specific guidelines (31%), and ensuring five elimination half lives of all sedatives and anesthetics have passed (19%). Only nine (56%) policies mentioned which providers (e.g., level of training and specialty) could perform the apnea test . Variability was noted in required criteria for apnea test, namely - four policies did not require both pCO2 >60 mmHg AND >20 mmHg rise from baseline. Most policies named the radionuclide cerebral blood flow study and electroencephalography (EEG) as acceptable ancillary tests.

**Conclusion**: If available, pediatric-specific BD policies were widely variable and incongruent with the current practice standard. Streamlining institutional policies to align with these international guidelines may lead to improved consistency in declaring pediatric death by neurologic criteria.

Table 1. Referral Hospital Characteristics

| **Table 1. Referral Hospital Characteristics (N = 16)** | |
|---|---|
| States Represented | |
| Washington | 8 (50%) |
| Montana | 5 (31%) |
| Alaska | 3 (19%) |
| | |
| Standalone Children's Hospital | 1 (6%) |
| Pediatric Unit | 12 (75%) |
| No Inpatient Pediatric Service | 3 (19%) |
| | |
| Dedicated Pediatric Intensive Care Unit | 9 (56%) |
| Dedicated Neonatal Intensive Care Unit | 15 (94%) |
| Presence of Pediatric Neurologists | 8 (50%) |
| Presence of Pediatric Neurosurgeons | 5 (31%) |

Table 2. Pediatric Brain Death Policy Review

| Table 2. Pediatric Brain Death Policy Review (N = 16) | | |
|---|---|---|
| Last updated | | |
| Before 2020 | 11 (69%) | |
| 2020 and after | 5 (31%) | |
| Prerequisites | | |
| | **Yes** | **No** |
| At least 24 hours after cardiac arrest? | 7 (44%) | 9 (56%) |
| Rule out paralytic, anesthetic, toxin effects? | 16 (100%) | 0 (0%) |
| Rule out severe hepatic or renal dysfunction, toxic metabolites? | 8 (50%) | 8 (50%) |
| Rule out severe electrolytes or metabolic disturbances | 16 (100%) | 0 (0%) |
| How long must core temperature be maintained? | 9 (56%) | 7 (44%) |
| Normotension based on age-appropriate guidelines? | 5 (31%) | 11 (69%) |
| At least 5 elimination half-lives should pass for anesthetics or sedatives? | 3 (19%) | 13 (81%) |
| Clinical Brain Death Exam | | |
| | **Yes** | **No** |
| Fixed, non-reactive pupils | 15 (94%) | 1 (6%) |
| Pupillary light reflex | 14 (88%) | 2 (12%) |
| Oculocephalic reflex | 15 (94%) | 1 (6%) |
| Oculovestibular reflex | 16 (100%) | 0 (0%) |
| Grimacing or facial movement to painful stimuli | 13 (81%) | 3 (19%) |
| Corneal, Gag, Cough Reflexes | 16 (100%) | 0 (0%) |
| Sucking and Rooting Reflex (<3 months age) | 5 (31%) | 11 (69%) |
| Apnea Test | | |
| | **Yes** | **No** |
| Mentions who can perform the test? | 9 (56%) | 7 (44%) |
| Mentions timing of test (e.g. right after BD exam)? | 9 (56%) | 7 (44%) |
| Mentions preoxygenation? | 14 (88%) | 2 (12%) |
| Mentions pCO2 must be >=60 mmHg | 15 (94%) | 1 (6%) |
| Mentions there must be 20 mmHg rise in pCO2 above baseline in addition to pCO2 target? | 12 (75%) | 4 (25%) |
| Ancillary Testing | | |
| | **Yes** | **No** |
| Mentions reasons why ancillary testing may be performed? | 15 (94%) | 1 (6%) |
| Mentions radionuclide cerebral blood flow study? | 16 (100%) | 0 (0%) |
| Mentions four vessel angiography? | 11 (69%) | 5 (31%) |
| Mentions electroencephalography (EEG)? | 14 (88%) | 2 (12%) |
| Mentions ancillary testing not recommended such as transcranial doppler, CT angiography? | 3 (19%) | 13 (81%) |

Policy review in four categories: clinical prerequisites, clinical exam, apnea testing, ancillary testing

## Delayed Recognition of Posterior Urethral Valves in a Patient with Constipation, Urosepsis, Chronic Kidney Disease and Hypertension: A Case Report

10/21/2023

Poster Presentation

Veronica Bustos[1]; Georgina Todd, n/a[2]; Maria Saba, MD[3], (1) Ross University School of Medicine, Katy, TX, (2) Ross University School of Medicine, Plantation, FL, (3) Broward Health Medical Center, Margate, FL

**Introduction**: Posterior urethral valves (PUV) are growths of membranous folds in the urethra that can cause obstruction, acute urinary retention, and chronic kidney disease (CKD). Symptoms include delayed voiding, urosepsis, and palpable bladder. PUV are typically diagnosed via ultrasound during prenatal screening with signs of bilateral hydroureteronephrosis, dilated urethra, and a distended bladder, but in some cases, they are diagnosed postnatally. There has been an increasing interest in the utility of surgical intervention in an attempt to preserve kidney function. We present a patient with a delayed diagnosis of PUV with evidence of end-organ damage.

**Case Description**: A 3-year-old boy with a history of constipation presented with abdominal pain and distension. He was managed for these symptoms as an outpatient. On initial presentation to the emergency department, he was febrile, hypertensive, and tachycardic with a soft yet distended abdomen. Abdominal X-rays revealed a moderate amount of stool. He received an enema and was discharged home with outpatient follow-up. He returned with worsening abdominal distension and diffuse abdominal tenderness with guarding. Laboratory studies revealed increased inflammatory markers, urosepsis secondary to E. coli, as well as acute-on-chronic CKD. Abdominal and renal ultrasounds revealed bilateral hydronephrosis, cortical loss, and bladder wall thickening. Patient received appropriate management and was admitted to the pediatric intensive care unit (PICU) for further care of acute pyelonephritis, hydronephrosis, hypertension as well as acute-on-chronic CKD. PICU evaluation included a multisystem approach. Cardiology workup revealed chronic hypertension and left ventricular hypertrophy. Urology workup included an unsuccessful attempt at voiding cystourethrogram (VCUG) to evaluate for PUV. Patient was taken in for valve ablation to confirm and obliterate the PUV. Pancystoscopy revealed an abnormal bladder with large diverticula and edematous changes in the mucosa. Patient remained in the PICU until clinical improvement and was discharged with appropriate follow-up.

**Discussion**: Children with PUV will develop CKD in approximately 50% of cases and 20% will develop end-stage renal disease. Due to increased prenatal screening, PUV are typically diagnosed in utero and are oftentimes managed after birth. This patient had a delayed diagnosis of PUV at 3 years old and by that time was already having signs of multi-organ damage. Although he was evaluated by multiple providers, he never received the proper workup likely due to a low index of suspicion. PUV management is centered around managing bladder dysfunction and CKD to slow progression of irreversible kidney damage. This case illustrates the vital role of pediatricians and medical providers in recognizing serious symptoms and recommending further evaluation.

**Conclusion**: Immediate evaluation and intervention with proper imaging could have prevented this patient’s progression to mild-to-moderate CKD. Due to the high proportion of children with PUV progressing to CKD, the high index of suspicion and use of imaging for patients should be re-established.

**Patient Characteristics, Resource Use, and Clinical Outcomes of Status Asthmaticus in Two Different Models of PICU Care**

10/21/2023

Poster Presentation

Meer S. Hossain[1]; Adalberto Torres, Jr., MD, MS, FAAP[2], (1) UCF College of Medicine, Orlando, FL, (2) Nemours Children's Health, Florida, Orlando, FL

**Background**: Status Asthmaticus is a major cause of illness in children and is one of the main indications of PICU admissions. Nemours Children Hospital- Delaware (NCH-DE) is a well-established teaching hospital and Nemours Children Hospital- Florida (NCH-FL) is a newly established teaching hospital. Patients admitted to NCH-FL (pre-residency) and NCH-DE were compared to demonstrate the effects of hospital teaching status and location on status asthmaticus management.

**Methods**: A retrospective chart was performed on status asthmaticus patients ages 2-18 who received care between 07/2017-07/2019 (NCH-FL n=90, NCH-DE n=90). Variables collected include: characteristics (age, sex, severity of illness [asthma score, PIM-2], comorbidities), resource usage (chest radiographs, blood gases, arterial catheter, central venous catheter, noninvasive and invasive ventilation), and outcomes (mortality rate, length of stay).

**Results**: Patients at NCH-DE had higher asthma severity on admission compared to NCH-FL (6.43 vs 4.69 [p< 0.001]). There were no other significant differences in patient characteristics or outcomes. However, differences in resource utilization were noted. Twice as many patients at NCH-DE received BIPAP and terbutaline infusions than at NCH- FL (Terbutaline: 25.6% vs. 11.1%) [p = 0.012], BIPAP 65.6% vs 34.4% [p< 0.001]). Patients at NCH-FL had significantly more magnesium and chest x-ray usage than at NCH-DE. (Magnesium: 85% vs 60% [p< 0.001], 1 chest x-ray: 60% vs 41.1% [p=0.002]). Most patients at both PICUs received continuous albuterol (NCH-FL: 88.9% vs NCH-DE 95.6%). The mortality rate at both hospitals was 0%. Mean LOS had no significant difference.

**Conclusion**: Despite the differences in teaching status, geographic location, asthma severity on admission, and resource utilization, characteristics and outcomes were similar in status asthmaticus patients treated in these two distinct PICUs.

## T-cell Acute Lymphoblastic Leukemia Presenting as Gout and Acute Renal Failure Requiring Dialysis in Setting of Spontaneous Tumor Lysis Syndrome

10/21/2023

Poster Presentation

Joie O. Cavazos, MD[1]; Denise A. Lopez Domowicz, MD[1]; Tung Wynn, MD[2], (1) University of Florida Division of Pediatric Critical Care, Gainesville, FL, (2) University of Florida Division of Pediatric Hematology & Oncology, Gainesville, FL

**Introduction**: Acute renal failure (ARF) and hyperuricemia secondary to leukemia are common but usually result from rapid lysis of tumor cells after beginning treatment with chemotherapeutic agents. Spontaneous tumor lysis syndrome (STLS) can occur, albeit rarely, and is more commonly associated with non-Hodgkin lymphomas such as Burkitt and T-cell lymphoblastic lymphoma or T-cell acute lymphoblastic leukemia (ALL). Additionally, gout is not common in childhood leukemia, seen more often in adults with chronic leukemia. We present a severe pediatric case of ARF and hyperuricemia manifesting as gout requiring emergent dialysis with delayed diagnosis of T-cell ALL with additional dialysis needed upon initiation of chemotherapy.

**Case Description**: A 16 year old female presented with fever, chills, and back and abdominal pain treated as a UTI. However, upon development of debilitating left toe pain, further workup revealed a uric acid of 57.6 with signs of ARF including K: 6.1, HCO3: 15, BUN: 116, Cr: 20.79,

and Ph: 15.5. CBC was normal besides thrombocytopenia of 118. She was admitted to the PICU and was started on hemodialysis with oncology consult. The peripheral flow cytometry was negative at that time. She improved with hemodialysis and was discharged on gout treatment including allopurinol and prednisone. After discharge she developed cervical lymphadenopathy and was treated for cat scratch disease. She followed with nephrology with creatinine normalizing to 0.87. Due to continued fatigue and body aches, two months later, another peripheral flow cytometry was performed showing 1% blasts followed by a bone marrow biopsy consistent with T-cell ALL. She began chemotherapy and developed TLS symptoms, again requiring hemodialysis.

**Discussion**: Hyperuricemia in pediatrics can be due to both acute and chronic causes, most commonly due to gastroenteritis and dehydration. Malignancies such as leukemia and lymphoma are also frequent causes but are related to large tumor burden or occur once treatment starts. However, a few reports have shown an association of STLS with T-cell ALL and acute renal failure, even in cases of low tumor burden. This is the first case of T-cell ALL STLS found in the literature with such severe hyperuricemia manifesting as gout coinciding with severe ARF necessitating hemodialysis with insidious progression in the setting of a very low tumor burden.

**Conclusion**: While STLS is rare for pediatric patients, it should be considered in clinical cases of acute renal failure and gout especially when there is no other reason for hyperuricemia. Clinicians should have a high index of suspicion for malignancy and consider repeat peripheral flow cytometry or bone marrow investigation, even with non-concerning initial peripheral blood testing to facilitate timely diagnosis. Additionally, this case highlights the risk of brisk TLS progression upon treatment in the setting of known renal dysfunction even when the tumor burden itself predicts a lower risk profile.

## COVID-19 Pandemic Duplicates Cases of Diabetic Ketoacidosis in Hispanic Patients Admitted to a Teaching Hospital

10/21/2023

Poster Presentation

Natalia Carambot[1]; Gilberto Puig, MD[2]; Anabel Puig, Ph.D[3], (1) Department of Pediatrics, UPR-RCM School of Medicine, San Juan, Puerto Rico, Canovanas, Puerto Rico, (2) Department of Pediatrics, UPR-RCM School of Medicine, San Juan, Puerto Rico, Carolina, Puerto Rico, (3) University of Puerto Rico-School of Medicine, Carolina, Puerto Rico

**Background**: Since COVID-19 pandemic, different countries have identified an increase in cases of children with Diabetic Ketoacidosis (DKA). Access to primary care physicians and subspecialties were limited during the pandemic and most of them gave telemedicine care to their patients. We evaluated the impact of COVID-19 pandemic on DKA admissions in a Pediatric Intensive Care Unit (PICU) in a teaching hospital on the prevalence and clinical outcome of patients admitted with the disease.

**Methods**: In this retrospective study, we evaluated patients from 0-21 years of age with an official diagnosis of DKA 18 months before pandemic (August 2018-February 2020), and 18 months during pandemic (March 2020-October 2021) from PICU patients logbook. Data were expressed as medians ± SD as appropriate. To compare the prevalence of DKA before and during COVID-19 pandemic, a Fisher Exact Test was used for proportions and categorical data.

A Mann-Whitney test was used to analyze quantitative variables. A p-value < 0.05 was established as statistically significant.

**Results**: A total of 128 patients were evaluated. Pre-pandemic, the median age was 15 ± 4.7 years and the median PICU total length of stay was 1 ± 2 days. During the pandemic, the median age was 14 ± 4.5 years and the PICU total length of stay was 1 ± 1.3 days. Previous COVID-19 pandemic there were 42% of DKA patients admitted to PICU vs 58% during COVID-19 pandemic (p=0.01). There was a significant difference between DKA cases before and during pandemic.

**Conclusion**: The lockdown and limited access to medical care services due to the COVID-19 pandemic produced delayed treatment, leading to increased cases of DKA and severely affecting the health of chronic diseases such as diabetes. Physical encounters with physicians contribute to an appropriate follow-up of patients. Since there was no severity trend in pediatric patients in the first few months, medical care strategies should be considered for this population. It's not excluded that the severity of DKA disease was due to the lack of compliance by children with respect to their feeding and stabilization with medications in the pandemic period. Future management of chronic disease in children could include appropriate coordination between patient and primary care physician to ensure the availability of medications, adherence to treatment regimens, and knowledge of which hospitals can appropriately treat the disease.

**Atypical Presentation of Juvenile Myelomonocytic leukemia in a Pediatric Patient**

10/21/2023

Poster Presentation

Gabriela L. Navarro, MD[1]; Debora Silva, MD[2]; Leslie Soto, MD[3]; Hilda Diaz, MD[4]; Ines Esquilín, MD[5]; Grecia Arroyo, MD[2], (1) Department of Pediatrics, University of Puerto Rico School of Medicine, University Pediatric Hospital, Guaynabo, Puerto Rico, (2) Department of Pediatrics, University of Puerto Rico School of Medicine, University Pediatric Hospital, San Juan, Puerto Rico, (3) Pediatric Hematology and Oncology, Department of Pediatrics, University of Puerto Rico School of Medicine, University Pediatric Hospital, Guaynabo, Puerto Rico, (4) Pediatric Intensive Care Unit, Department of Pediatrics, University of Puerto Rico School of Medicine, University Pediatric Hospital, Guaynabo, Puerto Rico, (5) Department of Pediatrics, University of Puerto Rico School of Medicine, University Pediatric Hospital, Guaynabo, N/A, Puerto Rico

**Introduction**: Juvenile Myelomonocytic Leukemia (JMML) is an extremely rare disorder in pediatric patients. Patients classically present with fever, cough, infections, pallor, hepatosplenomegaly, lymphadenopathy, and rash. Diagnosis is achieved by typical clinical picture and hematological findings.

**Case Description**: 1 y/o female with non-significant past history presents with 1.5 months of intermittent hesitance to sustain weight on the left leg after trauma and limping associated with fever and irritability for 48 hours. Patient with history of rash in back and red conjunctiva 1 week prior to ER arrival. Patient admitted with suspected left ankle septic arthritis, fever, leukocytosis and increased inflammatory markers with edema, erythema, and warmth of left ankle. Arthrocentesis performed and Clindamycin started. Despite antibiotic therapy and negative

synovial fluid culture, high fever persisted and 48 hours later developed edema and pain of the left elbow. Working diagnosis was Atypical Kawasaki due to prolonged fever, increased CRP and ESR, leukocytosis, thrombocytosis, rash, and conjunctival injection, swelling and redness of the left ankle and bilateral elbows. Echocardiogram was suggestive of coronary artery dilation. Blood cultures, U/A, CXR, and abdominal ultrasound were negative. Patient had irritability and severe joint pain. Received one dose of IVIG with decreased leukocytosis and inflammatory markers, symptoms resolution and discharged home on Aspirin. Febrile episodes and polyarthralgia recurred 48 hours after discharge. She had leukocytosis, increased inflammatory markers, admitted to PICU with suspected Macrophage Activation Syndrome (MAS) vs. severe infection vs. malignancy vs. JIA. Second dose of IVIG and Solumedrol pulse administered without resolution of fever or leukocytosis. Bone marrow biopsy revealed JMML. Upon diagnosis, patient found with hepatomegaly and splenomegaly, pain, irritability, fever, night sweats with leukocytosis, and mild thrombocytopenia. Patient started on Hydroxyurea, Mercaptopurine, and Azacytidine. By day #3 of treatment, patient was clinically stable with resolved fever, no pain, and improved irritability.

**Discussion**: JMML is characterized by abnormal production of myeloid progenitors and monocytes, deregulation of intracellular RAS signal transduction pathway, aggressive clinical course, and poor outcomes. Clinical presentation includes splenomegaly (prerequisite for diagnosis), hepatomegaly, lymphadenopathy; interstitial infiltrates on CXR; abdominal symptoms, and cutaneous signs. Peripheral blood smear findings: anemia with presence of nucleated red blood cells, leukocytosis, monocytosis, immature granulocytes shift, and thrombocytopenia. Bone marrow findings: myeloid predominance and hypercellularity from myelomonocytic proliferation, reduction of megakaryocytes, and moderate increase of blasts (< 20%). Due to similarities in clinical presentation to other diseases, a diagnostic approach is crucial. Allogeneic hematopoietic stem cell transplantation is curative treatment.

**Conclusion**: JMML can present without typical signs and symptoms. The atypical presentation of this disorder, with the diversity of symptoms, can delay diagnosis and early treatment. This case demonstrates that a high index of suspicion is of foremost importance to reach a diagnosis and provide treatment.

## Acute Subarachnoid Hemorrhage in a Pediatric Patient with Klippel-trenaunay-weber Syndrome

10/21/2023

Poster Presentation

Nayeem M. Chowdhury, M.S, B.S.[1]; Marianne Cortes, B.S.[2]; Lisa Nguyen, D.O.[3]; Evelyn D. Tamayo, M.D.[3]; Jacqueline C. Machado, M.D.[3], (1) NSU-KPCOM, Germantown, MD, (2) NSU-KPCOM, Davie, FL, (3) Broward Health Medical Center, Fort Lauderdale, FL

**Introduction**: Klippel-Trenaunay-Weber Syndrome (KTWS) is a very rare, congenital malformation syndrome involving lymphatic and blood vessels. The classic triad includes capillary malformation, venous malformation, and limb overgrowth. We present a case of a 14-year-old female with a history of KTWS who presented with a sudden, severe headache with altered mental status and found to have a subarachnoid hemorrhage (SAH). KTWS is considered a vascular anomaly with a potential for morbidity and mortality in the case of central nervous system (CNS) involvement, making it crucial for clinicians to have a high index of

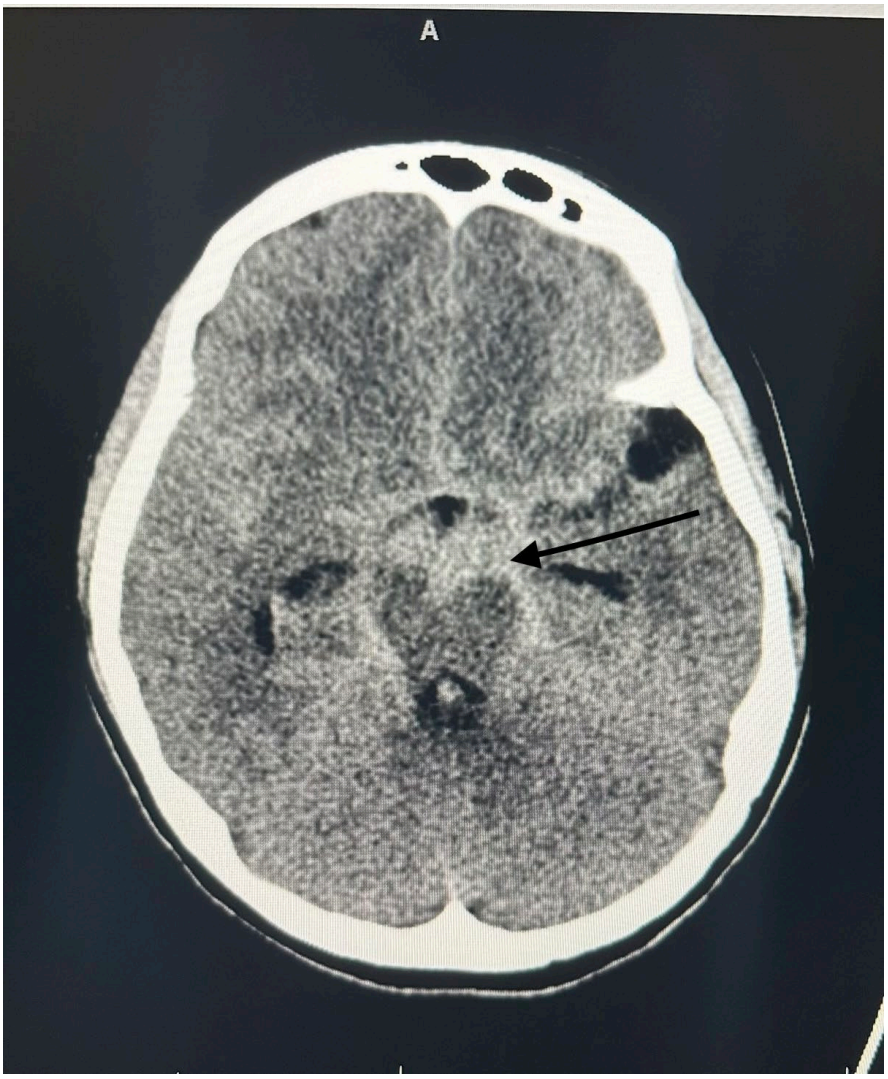
suspicion if presented in a pediatric patient with acute neurologic symptoms.

**Case Description**: A 14-year-old female with history of KTWS presents to the emergency department via EMS for severe sudden onset occipital headache prior to becoming unresponsive. CT brain without contrast was obtained, revealing diffuse SAH in the basal cisterns as well as 3rd and 4th intraventricular hemorrhage. In the pediatric intensive care unit, an external ventricular drain (EVD) was placed to monitor intracranial pressure and facilitate therapeutic drainage. Transcranial doppler was used to detect and monitor cerebral vasospasm and the patient was treated for ongoing vasospasm with Nimodipine and Milrinone. Angiography ruled out aneurysm and arteriovenous malformation. Throughout her hospitalization, she endorsed moderate to severe headaches. After undergoing several EVD clamp trials, the patient's intracranial pressure normalized, EVD was removed, and she was discharged with no residual neurologic sequelae.

**Discussion**: One of the primary concerns of KTWS is increased risk of bleeding due to intracranial capillary and venous malformation. There are limited cases linking KTWS and SAH, all of which are associated with positive findings on cerebral angiography. Arteriovenous malformation and cavernous angioma of brain and spinal cord, intracranial aneurysms, and anomalies of the circle of Willis are the CNS manifestations reported in KTWS. However, neither intracranial vascular malformation nor aneurysm was demonstrated in this case. Therefore, we hypothesize perimesencephalic nonaneurysmal SAH (PMSAH) as a possible diagnosis. PMSAH is defined as hemorrhage in the cisterns surrounding the brainstem and negative cerebral angiogram. Imaging in our patient showed bleeding in the subarachnoid and basal cisterns, specifically in the suprasellar and interpeduncular cisterns. This finding is in line with the radiographic pattern of PMSAH, with hemorrhage centered anterior to the midbrain or pons with possible extension into the suprasellar cistern.

**Conclusion**: KTWS rarely presents with CNS involvement. Our patient presented with acute SAH with negative angiography. One should consider PMSAH, a rare subtype of SAH, in the evaluation of KTWS patients with acute neurologic symptoms.

CT Brain Without Contrast of Subarachnoid Hemorrhage




Large subarachnoid hemorrhage involving the basilar cisterns extending into the sylvian fissures.

**Infant with a Hereditary Blistering Disorder, an Interesting Case in the NICU**

10/21/2023

Poster Presentation

Rifkatou Tchignaha, MD[1]; Jessica Restivo, MS, OTR/L, NTMTC[2]; Christina Szi, MS, CGC[2]; Oksana Nulman, MA[2]; Abhinav Parikh, MD, MSc[3], (1) New York Presbyterian Brooklyn Methodist Hospital, Department of Pediatrics, Brooklyn, NY, (2) Department of Pediatrics, New York Presbyterian Brooklyn Methodist Hospital, Brooklyn, NY, (3) New York Presbyterian, Brooklyn, NY

**Introduction**: Inherited blistering disorders, including Epidermolysis Bullosa (EB) is a rare group of genetic skin blistering disorders affecting the underlying structural proteins. This is a

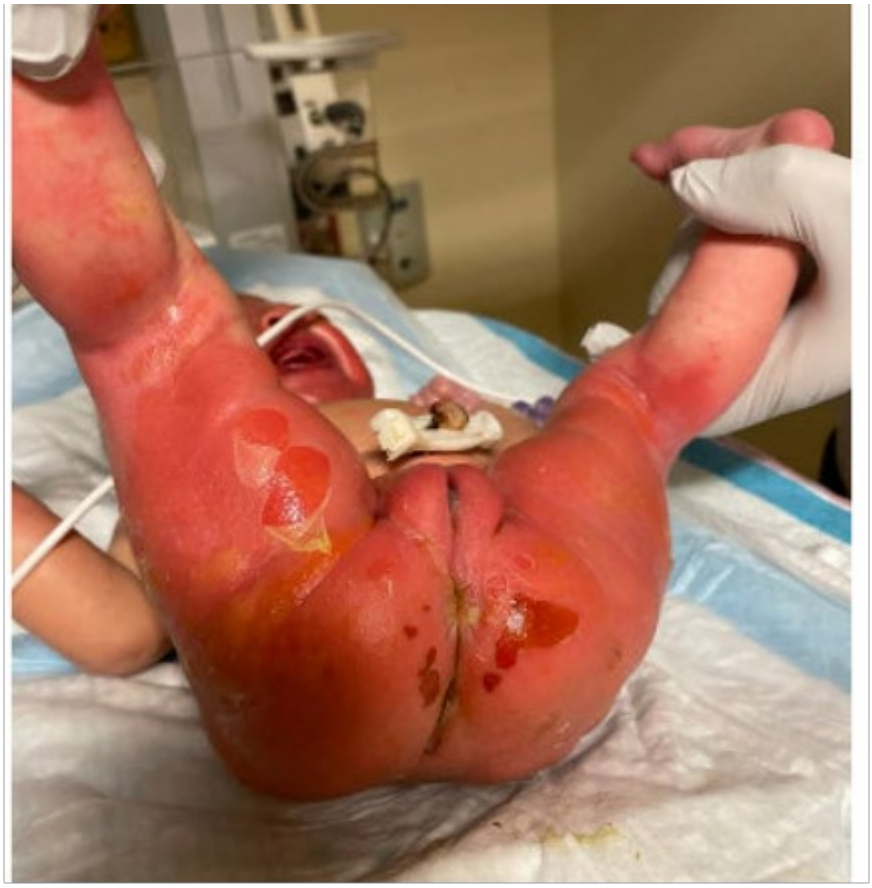
lifelong condition requiring consistent and dedicated care to prevent further complications. As such, the burden on caregivers is significant enough to warrant a standard of care. There are available recommendations for the management of these disorders, but currently no gold standard of acute symptomatic treatment exists, as the disease management is actively under investigation with a focus on gene targets [2, 3]. The goal of this case report is to give a detailed account of a hereditary blistering disorder with genetic variant of unknown significance (VUS) and provide management recommendations which could be applied to similar cases and settings in the newborn period.

**Case Description**: Full term female with reported family history of EB, developed skin blisters (Figure 1) on the first day of life (DOL) without mucosal or ocular involvement. Multidisciplinary approach was taken to prevent worsening skin blistering and associated complications. The patient was placed on a rigorous wound care regimen with topical antibiotics, two layers of emollients, gauze, and z-flo mattress. On DOL 7, infant was discharged home without blisters (figure 2) with close dermatology and genetic follow up. Genetic testing revealed variants of unknown significance (VUS) in two genes: KRT1 c. 1012T>C (p.S338P) (autosomal dominant inheritance) and PLEC c.7269G>A (p.Q2423=) (autosomal recessive or dominant inheritance). The patient is heterozygous for both variants. The KRT1 variant was determined to be maternally inherited from a parent with history of skin blistering and hyperkeratosis. To the best of our knowledge, these variants are new and will provide an opportunity to further explore their clinical implications.

**Discussion**: Multidisciplinary care including dermatology, wound care, and occupational therapy, lead to full recovery in our patient within six days of life. Although these results are encouraging, more studies are needed to establish a standard of care for acute skin blistering disorder management. Home care instructions are needed for caregivers in order to prevent skin trauma and lifelong complications.

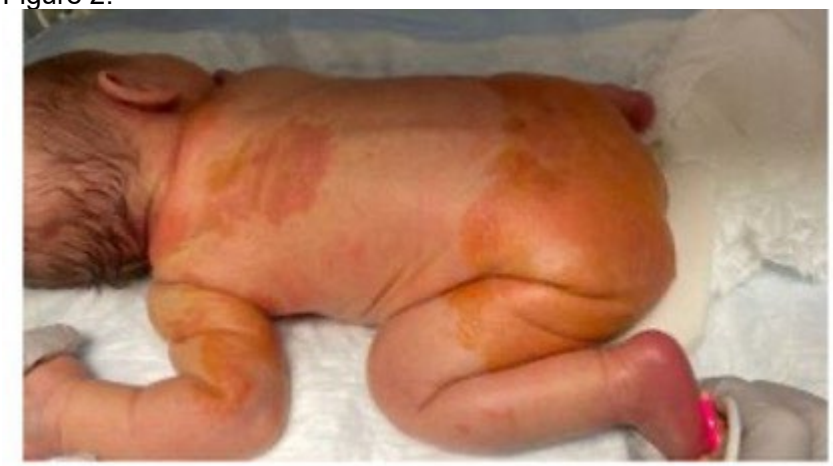
**Conclusion**: From a genetics perspective, pathogenic variants in the KRT1 gene are typically associated with epidermolytic ichthyosis; a condition which presents at birth with erythroderma, blisters, large areas of denuded skin and subsequent hyperkeratosis [3]. This variant is classified as a VUS by the laboratory based on the American College of Medical Genetics (ACMG) variant classification criteria; however, inheritance from a symptomatic family member and a previously published case report increase suspicion that this is a disease-causing variant (4, 5). Further investigation into the segregation of the KRT1 variant within this family may help provide additional information to reassess the clinical significance of the patient’s genetic findings.

Figure 1



Unroofed blisters visible on the left, right thigh, and buttocks with surrounding erythema; evolving blisters on the right thigh.

Figure 2.



Skin on the back, thighs, and legs appears to be healing, no new blisters noted

**Designing and Implementing a Novel Post-onboarding Curriculum for Pediatric Cardiac Intensive Care Advanced Practice Providers Directed Towards Continuing Education and Professional Development**

10/21/2023

Poster Presentation

Michelle Medchill, CPNP-AC[1]; Jamie H. Andre, PA-C[2]; Shauna di Bari, CPNP-AC[1]; Jennifer A. Mauney, DNP, APRN, CPNP-AC[3], (1) Baylor College of Medicine, Houston, TX, (2) Baylor College of Medicine / Texas Children's Hospital, Houston, TX, (3) University of Florida, Gainesville, FL

**Background**: Advanced practice providers (APPs), comprised of both nurse practitioners and physician assistants, are essential in providing comprehensive care in Pediatric Cardiac Intensive Care Units (PCICUs). APPs deliver continuity of care, provide clinical expertise, and provide education and mentorship to nurses and trainees. While there has been a nation-wide effort to implement APP onboarding curriculums which provide foundations in cardiac physiology and critical care management, there are gaps in APP continuing education and professional development opportunities after completion of the orientation process. A novel PCICU APP Education 201 Curriculum was developed to address this need with focused peer-to-peer APP education on clinically significant topics and facilitated APP professional development mentorship.

**Methods**: The PCICU APP Education Committee developed a 12-month peer-led curriculum with monthly presentations on cardiac critical care topics with related objectives. Curriculum objectives focused on expansion of complex physiology and evidence-based management strategies of key clinical topics for practicing APPs. Topics included single ventricle population, heart transplantation, coagulopathies, and electrophysiology. The curriculum design aimed to improve APP knowledge and provide APP professional development opportunities as faculty educators. Presentation selection was facilitated by each APP within the group ranking their preferred teaching topic and selected a teaching modality. Each APP was paired with two faculty mentors (attending and APP) for the development of the presentation. To improve accessibility and participation, presentations were available virtually and in-person. APP participants completed anonymous evaluations on the quality of the educational content and the effectiveness of the educator after each presentation. At the completion of the curriculum, APP participants completed post surveys for curriculum evaluation.

**Results**: The 12-month curriculum was implemented from January 2022 to December 2022. Twelve of fourteen APPs participated as faculty educators for the peer-led presentations. 95% of the APP participants reported that the APP faculty educator presentations promoted learning and expanded knowledge of new concepts. Of the twelve APP faculty educators who participated, ten responded to the post-curriculum survey. 100% “strongly agreed” that the PCICU Education 201 Curriculum increased their foundation of cardiac critical care knowledge and advanced their teaching skills.

**Conclusion**: Innovative APP educational and faculty development initiatives are essential in the fast-paced, interprofessional clinical practice environment of the PCICU. The PCICU Education 201 Curriculum provided an innovative curriculum which emphasized expanded knowledge of complex physiology and management for practicing APPs. Additionally, the curriculum facilitated APP professional development opportunities as faculty educators with supportive faculty mentorship. The implementation of this curriculum can be used for

enhancement of PCICU APP knowledge and professional development which are essential to improving comprehensive patient care and APP career satisfaction.

**Association Between Dopamine Use in MIS-C and Clinical Outcomes**

10/21/2023

Poster Presentation

David Charles Rosario, MD, Children's National Hospital, Derwood, MD

**Background**: Multisystem Inflammatory Syndrome in Children (MIS-C) is a serious illness temporally associated with SARS-CoV-2 presenting with features similar to incomplete Kawasaki disease and toxic shock syndrome, believed to be caused by a cytokine storm. For severe cases of MIS-C, vasoactives are often used for the treatment of vasoactive shock. Dopamine has potential immunomodulatory effects under septic shock that may lead to inhibition of IL-6 within monocytes/macrophages and endothelial cells. The cytokine IL-6 has been heavily implicated in the disease process of MIS-C. This preliminary study looks to assess if dopamine administration in patients admitted to our Pediatric Intensive Care Unit (PICU) in pediatric patients diagnosed with MIS-C is associated with improved clinical outcomes.

**Methods**: Charts were reviewed for all pediatric patients 21 years old and younger admitted to AMC's PICU with a diagnosis of MIS-C requiring vasoactive therapy from March of 2020 to November of 2022. Demographic, clinical, laboratory data, treatment information, and outcome data was extracted into RedCAP ©, an online anonymized database. Chi square test, Fisher exact test, or Wilcoxon rank sum tests were used to study differences between those patients who had received dopamine versus those who had not.

**Results**: 21 patients were identified who were admitted to the PICU and required vasoactive therapy during the study period, 4 of whom were excluded for not meeting MIS-C criteria. 6 patients received dopamine during the length of their stay while 11 received other vasoactives. Baseline characteristics were similar between the groups except for the dopamine group consisting of only male patients ($p = 0.035$). Outcomes including mortality, readmission, or transfer to another center for escalating care showed no differences between the groups.

**Conclusion**: Our preliminary study suggests that despite theorized immunomodulatory effects of dopamine, there appear to be no significant differences in outcomes for patients with MIS-C who receive dopamine versus those who do not. While this preliminary study is limited by a relatively small sample size, it may be advised to select vasoactives other than dopamine in children with MIS-C in the setting of recent Surviving Sepsis guidelines. Further studies with larger sample sizes may be beneficial to better assess the role of dopamine in MIS-C.

Table 1

**Table 1.** Baseline Characteristics

| | | Other Vasoactives (n=11) | Dopamine (n = 6) |
|---|---|---|---|
| Age (years) | | 11.96 ± 4.45 | 10.57 ± 3.44 |
| Weight (Kg) | | 57.04 ± 31.71 | 56.42 ± 40.29 |
| Gender * | | | |
| | Female | 7 (64%) | 0 (0%) |
| | Male | 4 (36%) | 6 (100%) |
| Hispanic or LatinX | | 0 (0%) | 1 (17%) |
| Race | | | |
| | Indigenous or Native American | 0 | 0 |
| | Asian | 0 | 0 |
| | Black | 3 (27%) | 2 (33%) |
| | Hawaiian or Pacific Islander | 0 | 0 |
| | White | 5 (45%) | 2 (33%) |
| | Declined | 3 (27%) | 2 (33%) |
| Admission Location | | | |
| | Floor | 7 (64%) | 3 (50%) |
| | PICU | 4 (36%) | 3 (50%) |
| Days of Fever on Admission | | 4.91 ± 1.97 | 4.83 ± 1.60 |
| Total Days of Fever | | 5.9 ± 2.08 | 5.67 ± 1.75 |
| Presenting Symptoms | | | |
| | Edema of Hands or Feet | 0 (0%) | 0 (0%) |
| | Chest Pain | 0 (0%) | 1 (17%) |
| | Non-Vesicular Rash | 3 (27%) | 1 (17%) |
| | GI Symptoms | 8 (73%) | 5 (83%) |
| | Bilateral Conjunctivitis without Exudate | 6 (55%) | 1 (17%) |
| | Lymphadenopathy | 4 (36%) | 2 (33%) |
| | Neurologic Symptoms | 6 (55%) | 4 (67%) |
| | Oral Mucosal Changes | 5 (45%) | 2 (33%) |
| Diagnostic Classification | | | |
| | COVID 19-like illness | 1 (9.1%) | 0 (0%) |
| | SARS-CoV-2 PCR or Ab (+) | 9 (82%) | 6 (100%) |
| | close contact with SARS-CoV-2 (+) patient | 1 (9.1%) | 0 (0%) |
| Organ Systems Involved on Admission | | | |
| | Cardiovascular | 7 (64%) | 2 (33%) |
| | Pulmonary | 8 (73%) | 2 (33%) |
| | Renal | 3 (27%) | 2 (33%) |
| | GI | 8 (73%) | 5 (83%) |
| | Hematologic | 3 (27%) | 4 (67%) |
| | Endocrine | 1 (9.1%) | 0 (0%) |
| | Rheumatologic | 5 (45%) | 4 (67%) |
| | CNS | 5 (45%) | 4 (67%) |
| Organ Systems Involved During Stay | | | |
| | Cardiovascular | 9 (82%) | 5 (83%) |
| | Pulmonary | 9 (82%) | 3 (50%) |
| | Renal | 6 (55%) | 2 (33%) |
| | GI | 9 (82%) | 5 (83%) |
| | Hematologic | 5 (45%) | 5 (83%) |
| | Endocrine | 1 (9.1%) | 0 (0%) |
| | Rheumatologic | 5 (45%) | 5 (83%) |
| | CNS | 7 (64%) | 5 (83%) |

* $p < 0.05$

[1] Numerical data presented as Mean ± Standard Deviation. Tested by two-tailed, two-sample t-

Baseline Characteristics

Table 2

**Table 2.** Outcomes

| | Other Vasoactives (n=11) | Dopamine (n = 6) |
|---|---|---|
| PELOD-2 Score | 3.45 ± 2.25 | 3.5 ± 1.76 |
| Max VIS Score | 42.85 ± 97.88 | 10.75 ± 3.22 |
| Transfer | 1 (8.3%) | 0 (0%) |
| Readmission | 1 (8.3%) | 0 (0%) |
| Reescalation from Floor to PICU | 0 (0%) | 0 (0%) |
| PICU Length of Stay (days) | 3.53 ± 2.20 | 4.96 ± 3.00 |
| Hospital Length of Stay (days) | 5.76 ± 2.17 | 7.29 ± 2.86 |
| Mortality | 0 (0%) | 0 (0%) |
| Survival to Discharge | 12 (100%) | 6 (100%) |
| Cost of Hospitalization ($) | 32,047 ± 8,414.09 | 36,230.29 ± 13,115.62 |

[1] Numerical data presented as Mean + Standard Deviation. Tested by two-tailed, two-sample t-test.

[2] Categorical data presented as n (%). Tested by Chi-square, Fisher exact, or Wilcoxon rank sum test.

[3] Pediatric Intensive Care Unit (PICU)

[4] Pediatric Logistic Organ Dysfunction-2 (PELOD-2) score ranges from 0 to 33, with higher scores indicating increasing organ dysfunction.

[5] Vasoactive-Inotropic Score (VIS) is a measure of level of vasoactive support, with higher scores indicating increasing support.

Outcomes

**Diagnosis of Congenital Hyperinsulinism After Escherichia Coli Urosepsis in an Infant**

10/21/2023

Poster Presentation

Mohammad Tayliakh, MD[1]; Lubaina Ehsan, MD[2]; Nourhan Shafeey, MBBCh[1]; Lyndsey Reynolds, MD[1], (1) Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI, (2) Western Michigan University Homer Stryker M.D. School fo Medicine, Battle Creek, MI

**Introduction**: Congenital hyperinsulinism (CHI) is the most common cause of persistent hypoglycemia in infants and children. The presentation may be vague as it mimics the presentation of other pathologies such as sepsis and metabolic diseases. The association between CHI and a predisposition to severe sepsis has not yet been clearly established. We present a case of an infant with persistent hypoglycemia after Escherichia Coli (E. Coli) urosepsis found to have CHI.

**Case Description**: 3-week-old male ex 35-week infant presented with hypothermia (95.4-degree Fahrenheit), apnea, and respiratory failure. On arrival to pediatric intensive care unit, he

was on CPAP but was quickly intubated. Point-of-care (POC) blood glucose was 221 mg/dL but down trended after initial presentation. Blood and urine cultures resulted positive for E. Coli. Cerebral fluid cultures were negative. Patient received cefepime and gentamycin. Patient was eventually transferred to the floor when hemodynamically stable. Blood glucoses were followed, and he continued to have intermittent hypoglycemia (POC < 70 mg/dL) even when antibiotics were completed. When POC and serum venous blood glucose were 47 and 50 mg/dL, respectively, C-peptide was low at 0.4 ng/mL, insulin was low at 0.9 uU/mL, and beta-hydroxybutyrate (BHB) was normal at 0.16 mmol/L. A glucagon challenge after 0.5 milligram of intravenous glucagon showed POC blood glucose of 77, 103, 111, and 128 mg/dL at 1-, 10-, 20-, and 30-minutes post glucagon, respectively. Although, his c-peptide and insulin levels were low at time of critical sample, he had a significant response to glucagon. This in conjunction with normal BHB supported a diagnosis of CHI. He was started on diazoxide and diuril, which were titrated till patient had euglycemia pre-feeds. We have since followed the patient for almost four months and he continues to do well. Whole genome sequencing showed a hemizygous pathogenic variant of BRWD3 c.4006-1G>A.

**Discussion**: Even though CHI has known monogenic mutations, genetic etiology remains unknown in approximately 40–50% children. Hypoglycemia in our patient was initially suggested to be secondary to urosepsis. Since it was persistent, further investigation was completed and determined it to be secondary to CHI. Currently, the BRWD3 gene is not thought to be related to our patient's CHI and is thought to be associated with X-linked intellectual developmental disorder-93, macrocephaly, and potentially overgrowth; our patient had macrocephaly since birth. However, it is worth noting that CHI is common in other overgrowth syndromes, such as Beckwith-Wiedemann syndrome, that can be linked to BRWD3 mutation.

**Conclusion**: Our case highlights the importance of continued blood glucose monitoring even after events such as sepsis, as illness can mask underlying causes for hypoglycemia, such as CHI. It also provides further phenotypic information for a rarely reported BRWD3 gene mutation.

**Outcomes of Nemours Children's Hospitals COVID-19 Treatment Algorithm Among COVID-19 Pneumonia Patients**

10/21/2023

Poster Presentation

Brandon Simons, BS[1]; Adalberto Torres, Jr., MD, MS, FAAP[2], (1) University of Central Florida College of Medicine, Orlando, FL, (2) Nemours Children's Health, Florida, Orlando, FL

**Background**: On August 20th, 2021, Nemours Children's Hospitals introduced a treatment algorithm for moderate to severe pediatric COVID-19 cases. The guidelines recommended treatment according to the extent of the patient's respiratory support, which was divided into Group 1 – Group 4 of increasing severity. Currently the existing literature evaluating outcomes in relation to COVID-19 pneumonia pediatric cases is limited. Patient outcomes do not significantly differ between adherence vs. nonadherence to the 2021 Nemours COVID-19 Treatment Algorithm.

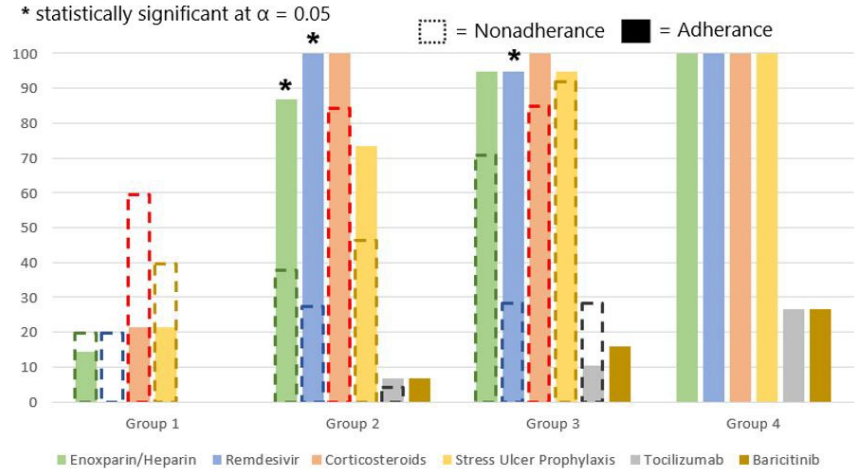
**Methods**: Retrospective chart review of 129 patients ≤18 years old diagnosed with COVID-19 pneumonia between January 1st, 2020 and July 1st 2022 at Nemours Children's Health Florida

and Delaware. Outcomes were evaluated through chi-squared and t-tests.

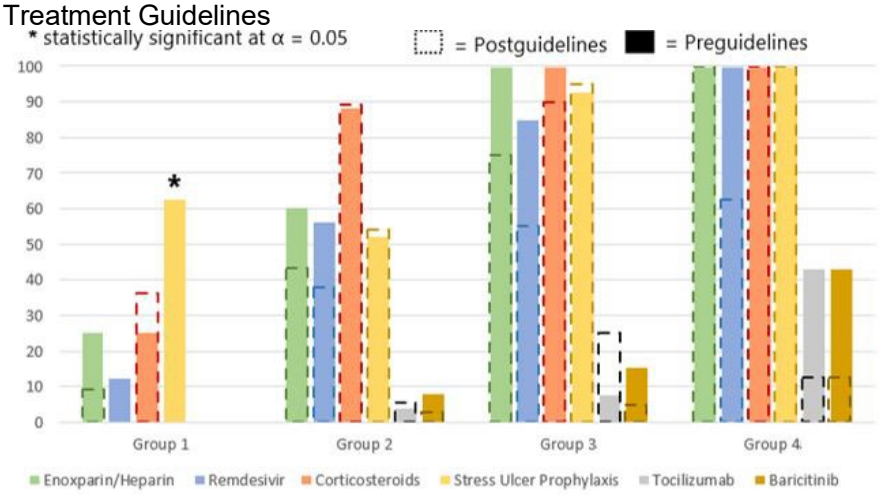
**Results**: The mortality rate of the study was 3.1%; 95% CI (0.9% - 7.7%). Comparing adherence (N=63) vs. non-adherence (N=66) to the guidelines revealed significant differences in mean length of stay (10.9 vs. 6.7 days, p=0.05), pediatric risk of mortality (PRISM III) score (8.7 vs. 6.8, p=0.04), group 2 remdesivir usage (100% vs. 27.7%, p< 0.001), group 3 remdesivir usage (94.7% vs. 28.6%, p< 0.001), and group 3 enoxaparin usage (86.7% vs. 38.3%, p=0.002), respectively. Comparing pre- (N=53) vs. post-guidelines (N=76) revealed a non-significance difference in the mean length of stay (10.7 vs. 7.3 days, p=0.124), PRISM III score (8.06 vs. 7.55, p=0.601), and a significant difference in group 1 stress ulcer prophylaxis (62.5% vs. 0.0%, p=0.005), respectively.

**Conclusion**: A longer length of stay and more severe disease was associated with greater adherence to the treatment guidelines. However, a greater severity of disease in the adherence group may account for the longer length in stay. Treatment that was adherent to the guidelines used more antiviral medication.

Comparison of Medication Usage Between Adherence and Nonadherence to NCH COVID-19 Treatment Guidelines




Comparison of Medication Usage Before and After Implementation of NCH COVID-19 Treatment Guidelines



**Serum Phosphorous Dynamics in Children with Diabetic Ketoacidosis**

10/21/2023

Poster Presentation

Rashed A. Hasan, MD, FAAP[1]; Jacob Hesen, n/a[2], (1) Michigan State University, Troy, MI, (2) Michigan State University, East Lansing, MI

**Background**: Objectives of this study were to assess dynamics of serum phosphorus (P) in children during therapy for diabetic ketoacidosis (DKA). We evaluated factors associated with nadir serum P (lwstP), the time to development of hypophosphotemia (hypophos), length of hypophos, and length of hospital stay (LOS).

**Methods**: Children 1-17 years of age hospitalized for DKA between January 1 to December 31, 2022 were included: Age, sex, years with diabetes, hemoglobin A1C (A1C), initial (i) blood pH (ipH), glucose (iG), serum electrolytes including phosphorus (iP), calcium (iCa) and Magnesium (iMg) were recorded. LwstP, and nadir serum potassium (lwstK) and the numbers of hours to reach lwstP (lwstPhrs) and lwstK (lwstKhrs) following initiation of therapy were documented. Hypophos was defined as the serum phosphorus level below the lower limit for age and gender. Severe hypophosphatemia was defined as a level < 1.5 mg/dL regardless of age. Cardiac arrhythmias were defined via bedside continuous monitoring of lead II of the electrocardiography (EKG). Data are presented as mean +/- SD. t test used for continuous data and chi-squared for discrete data. Stepwise regression analysis was performed to evaluate for variables most closely associated with lwstP, lwstPhrs, and length of hypophosphetemia (lngthhypo). A p-value < 0.05 was considered statistically significant.

**Results**: 95 patients (64% male, age 12.2 +/- 4.8 yrs, years with diabetes: 3.8 +/- 3.1 with A1/C 12.9 +/- 2%) experienced 101 episodes of DKA with the following initial parameters: ipH 7.1 +/- 0.1, iG 468 +/- 178 mg/dL, iphos 5.5 +/- 1.8 mg/dL, iNa 133 +/- 4.7 mEqL, iK 5+/-0.75 mEq/L, iCl 99 6.9, bicarbonate 8 +/-3.8 mEq/L, iBUN 22 +/- 12, iCr 1.5 +/- 2 mg/dL and iMg 2.2 +/-0.40. Initial serum P was elevated (5.5 +/- 1.8 mg/dL), declined during therapy and reached a nadir at 12 +/- 8 hrs into therapy. Initial serum P correlated with iK ($r=0.52$, $p< 0.05$), iCr ($r=0.61$, $p< 0.01$) and iMg ($r=0.52$, $p< 0.01$). Hypophos for age and gender occurred in 62 cases (61.4%), however, severe hypophos occurred only in 3 cases (3%) and non of these 3 cases developed arrhythmias. patients with hypophos had a lower ipH (7.07 +/- 0.1 vs. 7.14 +/- 0.06, $p< 0.001$) and a lower nadir potassium (3.4 +/- 0.4 vs 3.6 +/- 0.33, $p < 0.04$) compared to patients without hypophos. Variables that had the most impact on nadir serum P included ipH ($b=3.1$,$p< 0.001$), female gender ($-0.3$,$p=0.03$) and iCalcium ($b=0.3$,$p=0.006$). Length of time to development of hypophos was affected by ipH and iphosphorus. Length of hypophosphatemia was associated with a longer LOS.

**Conclusion**: Hypophosphetemia occurs commonly during therapy for DKA in children. Most children are asymptomatic and severe hypophosphetemia is rare in this clinical setting.

**Encephalopathy: An Unusual Presentation of MRSA Osteomyelitis and Sepsis**

10/21/2023

Poster Presentation

Kaydeen V. Morris-Whyte, MD[1]; Robert Reid, MD[2]; Jason Adler, MD[1], (1) Joe DiMaggio Children's Hospital, Hollywood, FL, (2) Memorial Healthcare System, Hollywood, FL

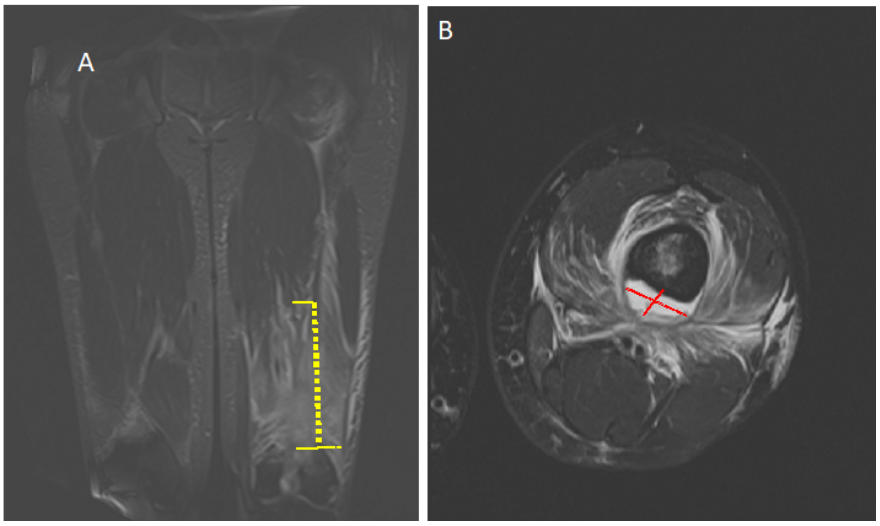
**Introduction**: Sepsis-associated encephalopathy (SAE) is diffuse brain dysfunction that occurs secondary to an infection not directly in the CNS and is an unusual presentation of sepsis. We present a case of SAE caused by methicillin-resistant Staphylococcus aureus (MRSA) osteomyelitis and sepsis.

**Case Description**: A 15-year-old female volleyball player presented with 2 days of fatigability that progressed to decreased alertness and monosyllabic speech. Within the week of presentation patient was treated for left lower extremity tendonitis. On admission, patient was febrile and tachycardic. Physical examination remarkable for an obtunded female and mild edema of left knee. Laboratory investigations showed: leukocytosis, anemia, thrombocytopenia, hyponatremia, elevated creatinine, transaminitis, raised creatinine kinase and inflammatory markers. Knee radiograph was normal. Chest radiograph had findings suggestive of embolic phenomenon and venous Doppler ultrasound of left lower extremity showed non-occlusive thrombus in the left common femoral vein. Imaging of the brain and neck along with cerebrospinal fluid studies, video EEG and echocardiogram with bubble study were normal. MRI of the lower extremity demonstrated left distal femur osteomyelitis with subperiosteal abscess and surrounding myositis (Fig. 1). Blood culture and tissue sample from incision and drainage grew MRSA. The patient was treated with ceftaroline and clindamycin. Lovenox was administered to treat the deep vein thrombosis. The patient was managed in the pediatric intensive care unit for septic shock with SAE and subsequently discharged to inpatient rehabilitation. The patient was discharged home after a 1-month hospital course to complete 6-weeks of IV antibiotics with continued outpatient rehabilitation due to impairment in cognitive perceptual skills.

**Discussion**: SAE is an unusual diagnosis in children. It manifests with alteration in mental status that ranges in severity from confusion to coma without an alternative underlying explanation beyond sepsis. It is hypothesized that inflammatory cytokines contribute to microscopic brain injury, impaired blood-brain barrier, mitochondrial dysfunction and altered neurotransmission and cerebral metabolism. The treatment is supportive as for any patient with sepsis, with a focus on maintaining end–organ perfusion, oxygenation and timely reversal of shock. In this case the patient presented with encephalopathy prior to the onset of fever. Evaluation excluded: primary CNS infection, endocarditis, paradoxical embolism, seizure, ingestion and Macrophage Activation Syndrome which was considered due to the marked hyperinflammatory state. Elevated muscle enzyme raised suspicion for necrotizing fasciitis, a surgical emergency, leading to urgent MRI which established the presence of osteomyelitis with subperiosteal abscess. Rapid source control was achieved through surgical drainage which along with early rehabilitation may have contributed to a favorable patient outcome.

**Conclusion**: SAE though uncommon may be the first sign of evolving sepsis. Serious bacterial infection is a differential diagnosis to be considered in any patient presenting with altered mental status. The management focuses on treatment of infection, supportive care and rehabilitation.

Figure 1. Multiplanar multi-sequence non enhanced magnetic resonance imaging (MRI) of the left thigh and femur




A. Subperiosteal abscess to posterior aspect of distal femur measuring 17.2x3.4x1.5cm(yellow dashed line) B. Cross sectional view of distal femur subperiosteal abscess measuring 3.4cm mediolateral, and 1.5cm AP(red dashed line)

**Efficacy of Novel Articulating Video Intubation Device (AVID) for Pediatric Airway versus the Glidescope Video Laryngoscopy (VL)**

10/21/2023

Poster Presentation

Brianna L. Spencer, MD[1]; Derek Krinock, MD[2]; Laura McCormick, n/a[3]; Sabina M. Siddiqui, MD[4]; Samir K. Gadepalli, MD, MBA[5], (1) University of Michigan, ann Arbor, MI, (2) University of Arkansas for Medical Sciences/Arkansas Children's Hospital, Little Rock, AR, (3) Brio Device, LLC, Ann Arbor, MI, (4) Arkansas Children's, Springdale, AR, (5) University of Michigan/CS Mott Children's Hospital, Ann Arbor, MI

**Background**: The introduction of video technology represents a major advancement in devices used for intubation but represents a new host of challenges in successful airway securement. Pediatric emergency airways have been documented to have a high failure rate and newer technologies have not largely improved outcomes. We have designed a unique video stylet to help mitigate these challenges and compared its ease of use to video laryngoscopy.

**Methods**: Using an iterative design model, a pediatric video intubation device unique in its ability to articulate and housing a recessed camera was tested in a randomized controlled fashion against video laryngoscopy, using a commercially available Glidescope. A total of 33 participants from a single institution were recruited from anesthesia, surgery and critical care. All had previous experience with intubation and had privileges to intubate at their hospital. Participants were randomized to intubate with the VL and AVID or AVID and VL for a total of 5 times each. Successful intubation was defined as air inflation of the lungs on the model. Acceptable and unacceptable failure rates for the AVID were set at 16% and 32%, respectively, for CUSUM analysis and creation of a learning curve. We deployed a validated survey methodology (in publication review) for evaluation of the new tool (EIS).

**Results**: A total of 330 intubations were observed for this study; 165 with the AVID and 165 with the VL. There were 326 successful intubations. There were 4 failed intubations, 3 in the AVID group and 1 in the VL group with no statistical difference in the number of failed intubations (p=0.31). The mean time to intubation with the AVID was 18.62s (+/- 5.22s) and the VL 19.16 (+/- 6.91s) (p=0.19). There was a negative trend on CUSUM analysis consistent with the high number of successful intubations (Figure 1). Survey data showed all users found the new tool efficacious and felt confident in its use with only five intubation attempts.

**Conclusion**: The introduction of a recessed camera and articulating tip to a video guided intubation device appears to improve the time to intubation and provides an improved learning curve and user-confidence in pediatric airway management and manipulation. Further investigation is needed to show superiority and determine criteria for proficiency in intubation using the AVID.

Table 1. Calculations of CUSUM analysis

| Variables | Equations | Numeric values |
|---|---|---|
| α (type 1 error) | False positive | 0.1 |
| β (type 2 error) | False negative | 0.1 |
| p0 | Acceptable failure | 0.16 |
| p1 | Unacceptable failure | 0.32 |
| a | ln((1-β)/α) | 2.19722458 |
| b | ln((1-α)/β) | 2.19722458 |
| P | ln(p1/p0) | 0.69314718 |
| Q | ln((1-p0)/(1-p1)) | 0.21130909 |
| CUSUM | Q/(P+Q) | 0.23363108 |
| h0 (lower decision boundary) | -b/(P+Q) | -2.429332 |
| h1 (upper decision boundary) | a/(P+Q) | 2.42933201 |

Table 1. Calculations of CUSUM analysis

Figure 1. CUSUM Graph

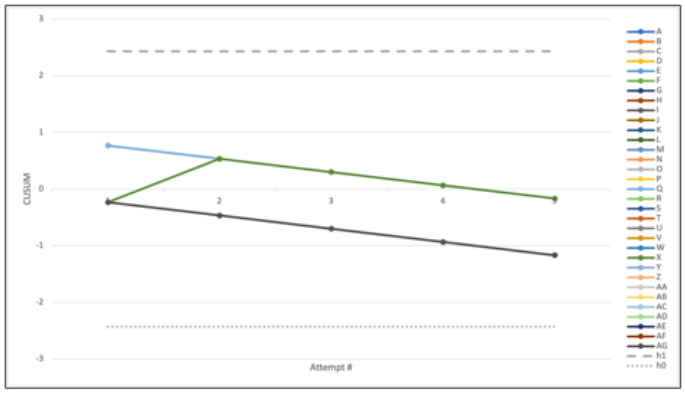


Figure 1. CUSUM of each participant intubation attempts

**Assessing Resident Preparedness for the Pediatric Intensive Care Unit Rotation**

10/21/2023

Poster Presentation

Mitchell A. Luangrath, MD[1]; Katharine Robb, MD, MME[2], (1) University of Iowa Carver College of Medicine, Iowa City, IA, (2) University of Iowa, Iowa City, IA

**Background**: Throughout medical training, residents rotate through varying clinical environments at a rapid pace. The pediatric intensive care unit (PICU) is one of high acuity, heterogeneity, and complex pathophysiology. As such, the learning curve for pediatric residents is steep, and it is even more notable for off-service residents from anesthesiology or emergency medicine programs who have less pediatric experience. Thus, it is imperative that residents can

start their PICU rotations with some understanding of expectations and basic clinical concepts. We therefore sought to assess current perceptions of resident preparedness for PICU rotations and develop methods to improve unit orientation.

**Methods**: Pediatric, anesthesiology, and emergency medicine residents who rotated through the PICU over a single academic year (July 2021 – June 2022) were surveyed regarding their orientation and readiness to start the rotation. Beside PICU nurses were also surveyed about their perceptions of resident preparedness for the PICU.

**Results**: Of 42 residents who rotated through the PICU, 23 (55%) responded to our survey. Of those, 52% (12) were pediatric residents, 35% (8) were anesthesiology interns, and 13% (3) were emergency medicine interns. Six residents had rotated through the PICU previously, and 15 residents (65%) rotated through another ICU prior to their PICU rotation. Residents endorsed general discomfort with the care of critically ill patients of any age, with 61% (14) reporting feeling somewhat or very uncomfortable and none feeling very comfortable. Only 35% of residents reported satisfaction with their orientation to the PICU, and 44% reported understanding faculty expectations. Despite this, 77% of residents endorsed understanding how to place orders in the PICU, and 59% reported understanding the PICU daily schedule, tasks, and structure. In regard to basic clinical concepts, very few residents expressed comfort with management of vasopressors (23%), sedation (22%), or mechanical ventilation (14%). Surveys were completed by 53% (63/120) of bedside PICU nurses. Only 36% agreed that residents were well-prepared for their PICU rotation, with 51% somewhat or strongly disagreeing. Specifically, nurses commented that residents should understand dosing of medications, how to place orders, and how to communicate effectively with nurses at the bedside or via messaging applications.

**Conclusion**: Residents and nurses agree that improvements to resident orientation to the PICU are needed and are of critical importance given the high acuity and complexity of our patient population. To achieve this, a video series was created to introduce residents to the PICU and relevant clinical concepts, including order entry and basics of vasoactive medications, sedation, and mechanical ventilation. The video orientation series was implemented this past academic year, and data collection regarding resident and nursing perspectives on preparedness for the PICU is ongoing.

**Case-based Medical Ethics Education for Pediatric Residents in the Critical Care Unit**

10/21/2023

Poster Presentation

Chinyere O'Connor, MD[1]; Margarita Ortiz, JD MA[2]; Alvaro Coronado Munoz, MD[2]; Terri Major-Kincade, MD, MPH[3]; Madelene Ottosen, PhD, RN[3]; Emma A. Omoruyi, MD, MPH[3], (1) The University of Texas Health Sci Center at Houston, Houston, TX, (2) The University of Texas Health Science Center at Houston, houston, TX, (3) The University of Texas Health Science Center at Houston, HOUSTON, TX

**Background**: The accelerated growth of technology sits against a backdrop of a morally pluralistic society. When values collide and communication is weak, many healthcare providers struggle. Despite the 1997 mandate from the Accreditation Council for Graduate Medical Education to provide education in ethics, many pediatric residency programs have yet to

implement an ethics curriculum. Decision-making and ethical reasoning are essential skills during resident's training, especially in the critical care environment. Pediatric critical care practice often entails challenging and emotional communication with patients' legal guardians. The continual interface with legal guardians on goals of care, quality and end of life discussions extends beyond the pediatric intensive care unit (PICU) into all dimensions of pediatric care, thereby making communication not just a practical skill, but an indispensable tool necessary for residents' futures as practicing pediatricians. Poor ethics education is linked to low confidence in the end-of-life care decision-making. Pediatricians are also more likely than their peers to experience moral distress on issues surrounding death. No true consensus exists regarding the content of a resident ethical training program, nor how to best implement it into practice. Thus, in our PICU we devised and implemented a pedagogical, practical case-based teaching approach for trainees that also addresses moral distress. We hypothesize that our program creates not only improved attendance and participation but a more sustainable, and valuable curriculum that gives trainees essential tools they immediately incorporate into their daily practice.

**Methods**: This prospective pre-post mixed methods study utilizes proven tools including Kern's framework, a moral distress map and Kirkpatrick's levels of evaluation while implementing Jonsen et al.'s "Four-Box method" framework for ethical analysis. Multiple educational strategies were employed including problem and team-based learning, reflection, learner led discussions and clinical experience to create a curriculum based on established cases known to residents. These one-hour monthly sessions were designed to be freestanding. Focus group questionnaires and pre/post session questionnaires using a 5-point Likert scale were implemented assessing: • Baseline knowledge and comfort in navigating ethical dilemmas • Level of moral distress and potential for moral residue related to the case We analyzed the differences between 2nd and 3rd year residents with chi square for binomial variable and Mann-Whitney U test for ordinal variables.

**Results**: In the focus group questionnaire, some words trainees use to describe ethical conflict included: "lose-lose situation," "consuming," and "challenging" (Fig 1). In the pre survey questionnaire, we evaluated 22 residents. No statistically significant differences were seen between classes (Table 1).

**Conclusion**: Our application of practical tools to build a curriculum centered around typical trainee patient encounters provides structure while allowing learners to navigate an ethical reasoning pathway. This enriches their future careers, in addition to fulfilling their educational requirements in their professional identity formation.

Fig 1: Trainee Words to Describe Thoughts towards Ethical Conflict and/or Dilemmas

Fig 1: Trainee Words to Describe Thoughts towards Ethical Conflict and/or Dilemmas


Table 1: Survey Questionnaire from Residents on a Likert-type Scale from 1 to 5, where 1 was 'Not Important/Not confident/Not well,' 3 was 'Somewhat Important/Confident/Well,' and 5 was 'Extremely Important/Confident/Well.'

**Table 1: Survey Questionnaire from Residents on a Likert-type Scale from 1 to 5, where 1 was 'Not Important/Not confident/Not well,' 3 was 'Somewhat Important/Confident/Well,' and 5 was 'Extremely Important/Confident/Well.'**

| Survey Questions | PGY 2 & 3 (N=22) | PGY 2 (N=12) | PGY 3 (N=10) | P - value |
|---|---|---|---|---|
| Understanding the difference between moral distress and ethical concerns N (%) * | Yes 7 (32%)<br>No 15 (68%) | Yes 4 (33%)<br>No 8 (67%) | Yes 3 (30%)<br>No 7 (70%) | 0.86 |
| Familiarity with ethical principles§ | 3 (3 – 3.25) | 3 (2 – 3) | 3 (3 – 4) | 0.1 |
| Confidence to apply ethical considerations into practice§ | 3 (2 – 3) | 2.5 (2 - 3) | 3 (3 – 3.25) | 0.12 |
| Confidence in discussing end of life issues with families§ | 2 (2 – 3) | 2 (1.25 – 2.75) | 2.5 (2 – 3.25) | 0.07 |
| Importance of Ethics Education for trainees§ | 5 (4 – 5) | 5 (4.25 – 5) | 5 (4 – 5) | 0.57 |
| Management of distress in caring for dying patients§ | 3 (2 – 4) | 3 (2 – 3) | 3 (2 – 4) | 0.41 |

N, number of trainees
*Categorical, total and percentage, Chi-square test; §Ordinal, median and interquartile range ($25^{th}$-$75^{th}$ percentile), Mann-Whitney U test

## Extensive Pleural Effusion – a Rare Complication of Peripheral Intravenous Catheter Infiltration in a Pediatric Patient – a Case Report

10/21/2023

Poster Presentation

Scarlett Olejnik-Brzusek, MD[1]; Richard Johnson, MD[2]; Jordan Schneider, MD[2]; Jocelyn Y. Ang, MD[2], (1) Children's Hospital of Michigan, Shelby Township, MI, (2) Children's Hospital of Michigan, Detroit, MI

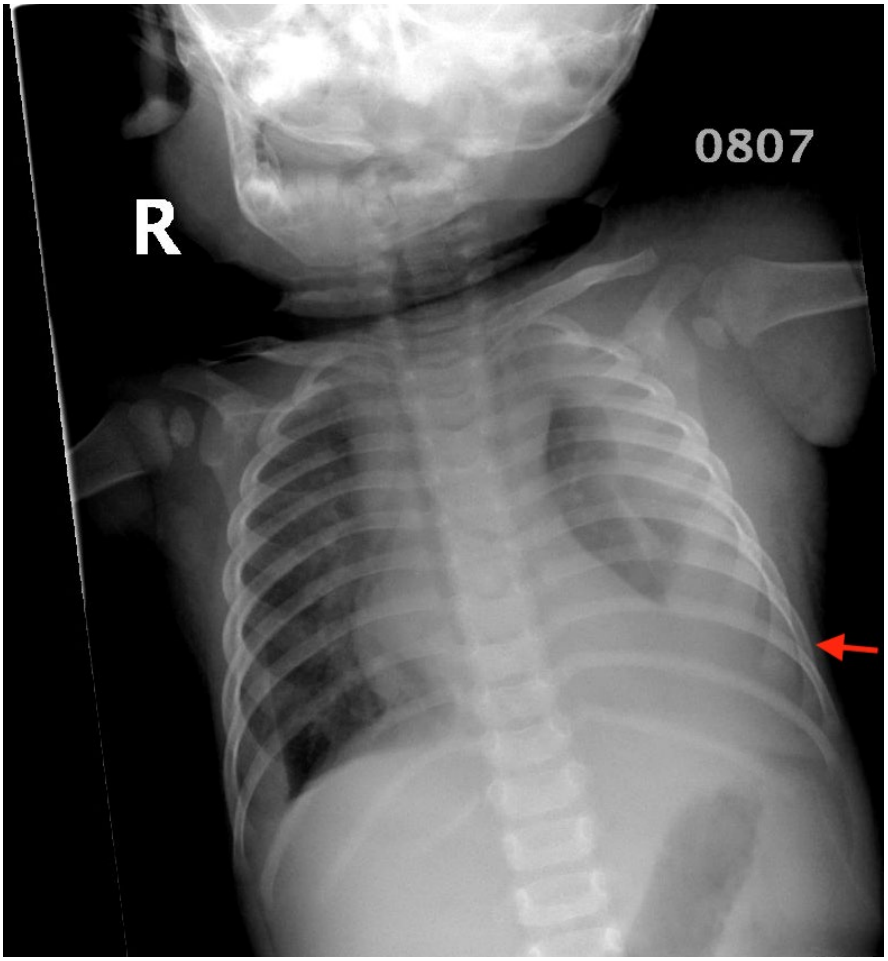
**Introduction**: Peripheral intravenous (IV) catheterization is a commonly performed procedure in hospitalized pediatric patients for the administration of intravenous fluids, drugs, nutrients and blood products. Complications associated with IV catheterization can occur including infiltration, occlusion and infections. The vast majority of IV complications are minor and require minimal intervention, however, we present a rare case in which severe IV infiltration led to bilateral pleural effusions, a pericardial effusion and respiratory failure requiring urgent tube thoracostomy.

**Case Description**: A 9-month-old female presented to the emergency department with 10 days of fevers and 5 days of worsening right sided neck swelling. She was diagnosed with lymphadenitis secondary to methicillin-resistant Staphylococcus aureus and treated with incision and drainage and IV clindamycin. Maintaining reliable IV access was persistently challenging, so an ultrasound guided IV was placed in the left upper arm. About 24 hours later, patient was noted to be in progressive hypoxic respiratory failure with oxygen saturations of 85% on room air. On examination, she had extensive left arm and anterior chest wall edema with significantly diminished breath sounds over the left thorax in addition to signs of respiratory distress: tachypnea, nasal flaring and costal retractions. Chest X-ray showed a bilateral pleural effusion (figure 1) and a small pericardial effusion present on echocardiogram. The patient was transferred to the pediatric intensive care unit, where a tube thoracostomy was performed, resulting in drainage of over 400 mLs of serous fluid. Laboratory analysis of fluid (table 1) was consistent with the patient’s maintenance fluids of dextrose and normal saline. Following unilateral drainage and IV diuresis, patient’s respiratory status improved, and residual effusions resolved.

**Discussion**: Bilateral pleural and pericardial effusions as a result of peripheral IV infiltration are not yet a reported complication of peripheral IV use in pediatric patients. The most common cause of pleural effusions in pediatrics is an infectious etiology although other causes include malignancy, trauma and heart failure. Given this patients discovery of pleural effusions as well as the results of the pleural fluid analysis, we hypothesize that an imbalance of Starling forces and possible remnants of embryologic connections account for the etiology. Abnormal connections between these spaces have been reported in the literature. Prevention and early recognition are essential to limit serious complications. Many hospitals have established protocols to prevent these injuries from occurring including frequent nursing examination of sites. Treatment includes immediate discontinuation of any infusions, aspiration of any remaining medication and administration of local antidote if indicated.

**Conclusion**: Pleural effusion secondary to peripheral IV infiltration is a rare occurrence but potentially life threatening. It is thus important to thoroughly assess all sites of vascular access in order to prevent and promptly recognize IV infiltrates and therefore avoid serious complications.

Figure 1




Initial chest X-ray demonstrating the severe left pleural effusion as well as significant soft tissue swelling of the left shoulder.

Table 1

| | |
|---|---|
| Appearance | CLEAR |
| Color | COLORLESS |
| Red Blood Cells (RBC) | 689 CUMM |
| Nucleated cells | 11 CUMM |
| Glucose | 665 mg/dL |
| Chloride | 114 mMol/L |
| Lactate Dehydrogenase (LD) | <25 Units/Liter |
| Sodium | 134 mMol/L |
| Protein | <3.0 gm/dL |

Demonstrates the fluid analysis obtained after drainage of the pleural space via tube thoracostomy consistent with normal saline and dextrose content.

**Peripheral Vascular Access as Exclusive Access Mode in Pediatric Intensive Care Unit (PICU)**

10/21/2023

Poster Presentation

Sonya Armstrong Hayes, RN[1]; Thomas Spentzas, MD, MS[2]; Shantaveer Gangu, MD[2]; Alina N. West, MD, PhD[2], (1) LeBonheur Childrens Hospital, Memphis, TN, (2) University of Tennessee, Memphis, TN

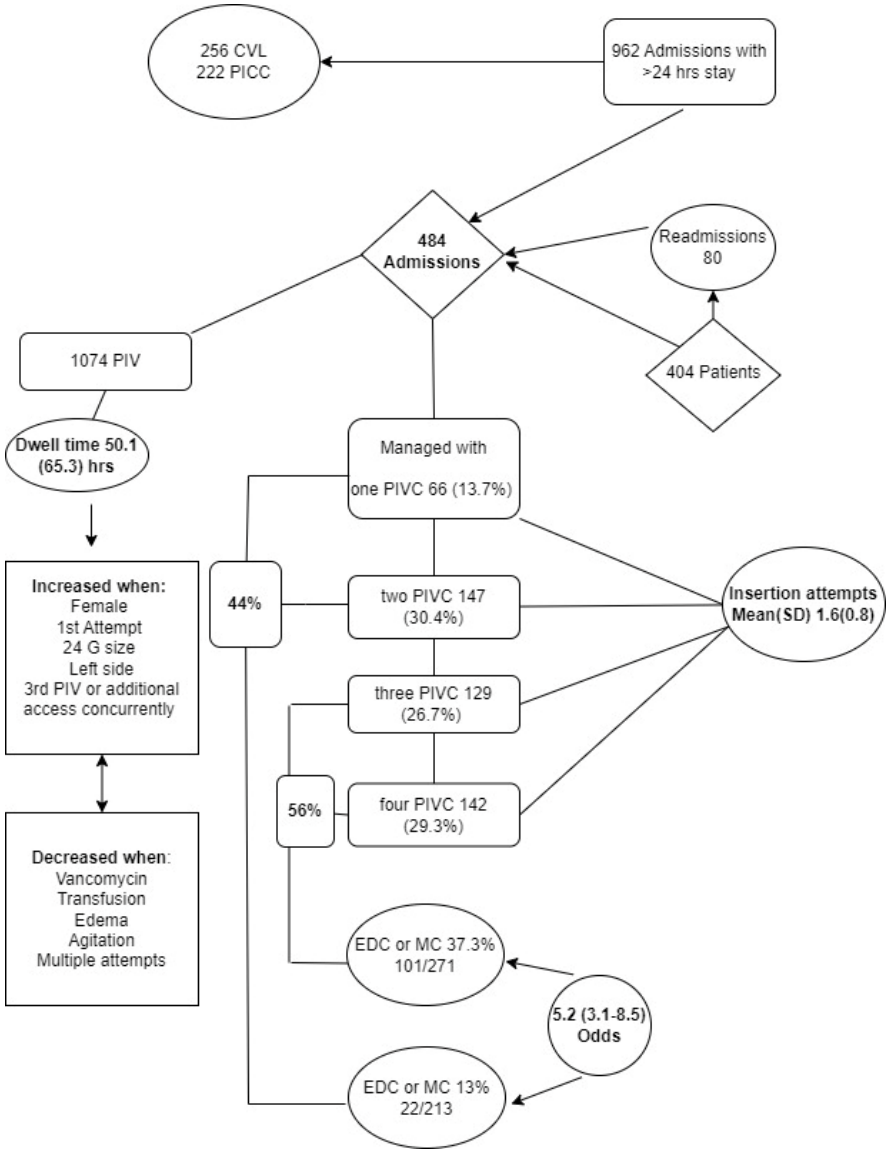
**Background**: The current recommendations for vascular access are based on the length of treatment, the osmolarity or vesicant properties of the infusion, and the need for hemodynamic monitoring. Due to the complications of central vascular access, some patients are managed in the PICU environment exclusively by peripheral intravascular (PIV) access and with extended dwell (ED) or Midline Catheters (MC). This study examines the factors influencing the dwell time of PIVs and the need for ED or MC placement.

**Methods**: Retrospective cohort analysis in a tertiary academic PICU. We enrolled patients aged 0-18 years admitted to PICU for over 24 hours and managed with peripheral access exclusively between January 1, 2019, and December 31, 2021.

**Results**: There were 404 patients (484) admissions. Overall, patients with peripheral access as exclusive mode had a lower pediatric risk of mortality (PRISM) mean scores and PICU length of stay, 18 (SD 8.5) and 9.5 days (SD 6.4) vs. 8.9 (SD 5.9) and 5.7 days (SD 3.6), respectively. The PIV mean dwell time was 50.1 hours (SD 65.3) and required a mean of 1.6 insertion attempts (SD 0.8). Up to two PIV insertions were sufficient for 44 % of the admissions, but 56% required three or more. Of the patients with three or more insertions, 37 % needed vascular consultation for ED or MC, with an increased odds ratio of 5.2 (3.1-8.5) over the patients needing up to two insertions. Prolonged dwell time was associated with females, 24G catheter size, first attempt insertion, left-sided insertion, lack of edema, and less agitation. Still, no prolonging factors could extend the time above 1.5 times the average PIV dwell hours. Vancomycin and blood transfusion were associated with diminished time.

**Conclusion**: The PIV limited dwell time can quickly lead to repeated attempts and insertions, and the modifying factors cannot prolong it sufficiently. Consideration for ED or MC placement consultation might be helpful after the third PIV insertion.

Flow of the analysis


256 CVL
222 PICC
962 Admissions with >24 hrs stay
484 Admissions
Readmissions 80
404 Patients
1074 PIV
Dwell time 50.1 (65.3) hrs
Managed with one PIVC 66 (13.7%)
Increased when:
Female
1st Attempt
24 G size
Left side
3rd PIV or additional access concurrently
44%
two PIVC 147 (30.4%)
Insertion attempts Mean(SD) 1.6(0.8)
three PIVC 129 (26.7%)
56%
four PIVC 142 (29.3%)
Decreased when:
Vancomycin
Transfusion
Edema
Agitation
Multiple attempts
EDC or MC 37.3% 101/271
5.2 (3.1-8.5) Odds
EDC or MC 13% 22/213

1