42ND ANNUAL EDWARD L. PRATT LECTURE SERIES

Pediatric Resident Research Symposium

Keynote Speaker: Bradley P. Dixon, MD, FASN

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Wednesday, May 17, 2023
noon – 4 pm

42nd Annual Edward L. Pratt Lectures

AGENDA | WEDNESDAY, MAY 17, 2023

noon – 12:10 pm	**Introduction of Keynote Speaker** LIBBY IRESON, MD | Pediatric Chief Resident 2022–2023
12:10 – 1 pm	**Keynote Address: How I Learned to Stop Worrying and Love The Complement System** BRADLEY P. DIXON, MD, FASN Associate Professor of Pediatrics and Medicine; Section Head, Renal Section, Department of Pediatrics, University of Colorado School of Medicine
1 – 1:15 pm	**Break**
1:15 – 1:30 pm	**Prenatal Lead, Folate, and Smoking: Examining Their Associations with Child IQ in the HOME (Health Outcomes and Measurements of the Environment) Study** AIMÉE VESTER, MD, PHD | Categorical Pediatrics, PGY-2
1:30 – 1:45 pm	**Validation of a "Novel" Numeracy Screening Tool: The Number Farm** SARAH REEL, MD | Categorical Pediatrics, PGY-3 PRIYA SINGH, MD | Categorial Pediatrics, PGY-2
1:45 – 2 pm	**Macrophages from Pediatric TNFα-resistant Crohn's Disease Patients Display Differential NLRP3 Inflammasome Activation** MOLLY AHYE, MD, PHD | Categorical Pediatrics, PGY-3
2 – 2:15 pm	**Clinic-Based Hands-On Time and Time to Result for Point of Care Chlamydia and Gonorrhea Test Compared to Laboratory Based Test** KELSEY ROWE, MD | Categorical Pediatrics, PGY-3
2:15 – 2:45 pm	**Poster Session and Break**
2:45 – 3 pm	**Higher Presenting BMI Associated with Lower Odds of Medical Admission for Anorexia Nervosa in Adolescents, Independent of Physiologic Parameters** MICHELLE RECTO, MD | Categorical Pediatrics, PGY-3
3 – 3:15 pm	**A Community-Based Initiative for Reinforcing Health Equity Around Childhood Homelessness (REACH)** SAIGE CAMARA, MD | Categorical Pediatrics, PGY-2
3:15 – 3:35 pm	**Use of Urine Neutrophil Gelatinase-Associated Lipocalin for Prediction of Severe and Persistent Acute Kidney Injury in Children after Cardiac Surgery** KATHERINE MELINK, MD | Categorical Pediatrics, PGY-2 **Use of a Furosemide Challenge with a Urinary Biomarker for Prediction of Acute Kidney Injury in Children After Cardiac Surgery** EMILY SULLIVAN, MD | Categorical Pediatrics, PGY-2

Poster Submissions: **prattlectures.com**

IN MEMORY OF

Edward L. Pratt, MD
1913 – 1988

Dr. Pratt fostered the spirit of intellectual curiosity, critical thinking, perseverance, and independent research in the minds of his students.

It is a pleasure to honor Dr. Edward L. Pratt with the 42nd annual Edward L. Pratt Lecture series.

Edward L. Pratt, MD, was professor and chairman of the Department of Pediatrics at University of Cincinnati College of Medicine from 1963 until his retirement in 1979; he continued as professor emeritus of pediatrics until his death in 1988.

Dr. Pratt graduated from Harvard Medical School in 1940, followed by pediatric residency and chief residency at Boston Children's Hospital and research training at Yale University and Cambridge University. He was associate professor of pediatrics at New York University College of Medicine from 1949–1954. In 1954, he was named chairman and professor of the Department of Pediatrics at University of Texas Southwestern Medical School, chief of staff at Children's Medical Center in Dallas, and chief of pediatric service at Parkland Memorial Hospital in Dallas. Dr. Pratt joined Cincinnati Children's Hospital Medical Center and the UC College of Medicine as the B.K. Rachford Professor of Pediatrics in 1963. At that time, he also was named director of the Children's Hospital Research Foundation and chief of staff of Cincinnati Children's.

Together with the Board of Trustees, Dr. Pratt led the effort to centralize child health care services in Cincinnati by bringing together the six health care programs that form Cincinnati Children's. He encouraged pediatric research and fostered the careers of many young investigators, both in the clinical and basic science arenas. Dr. Pratt taught that pediatric research is the best and most inexpensive way of combating childhood disorders. His own research in nutrition and fluid and electrolyte metabolism forms the basis of current knowledge and much of the current practice in these areas.

Established by their peers and teachers, the Pratt lectures allow pediatric residents to present results of their research in an open forum for critical analysis.

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KEYNOTE SPEAKER

Bradley P. Dixon, MD, FASN

How I Learned To Stop Worrying and Love The Complement System

Bradley P. Dixon, MD, FASN, is currently Chief of the Section of Nephrology and an Associate Professor of Pediatrics and Medicine at the University of Colorado School of Medicine and Children's Hospital Colorado.

Dr. Dixon received his medical degree from the University of Tennessee, Memphis, in 1999, then completed his pediatric residency, chief residency, and pediatric nephrology fellowship at Cincinnati Children's Hospital Medical Center, where he remained on faculty until 2017 when he joined the faculty of the University of Colorado. Dr. Dixon's clinical and research interests focus on the diagnostic laboratory evaluation of complement-mediated renal diseases such as Atypical Hemolytic Uremic Syndrome and C3 Glomerulopathy. He has also participated in multisite collaborative clinical research studying these diseases through the Pediatric Nephrology Research Consortium (PNRC) and Glomerular Learning Network (GLEAN). Dr. Dixon is also a principal investigator in several clinical trials of novel complement-targeted therapeutics in these diseases.

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EDWARD L. PRATT LECTURE

Prenatal Lead, Folate, and Smoking: Examining Their Associations with Child IQ in the HOME (Health Outcomes and Measurements of the Environment) Study

Aimée Vester MD, PhD; Yingying Xu, PhD; Melinda MacDougall, MS;
Nicholas Newman, DO, MS, FAAP; Kimberly Yolton, PhD

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Background: Exposure to environmental toxicants has been associated with worse neurocognitive outcomes in children, including lead and tobacco smoke. Preliminary studies suggest folate may mitigate other environmental exposures through reduction of oxidative stress, but its role in mediating the relationship between lead and tobacco smoke exposure has not yet been investigated.

Objective: Examine associations between maternal lead and tobacco smoke exposure during pregnancy and offspring IQ at ages 5-12 years and investigate how maternal folate impacts these associations.

Methods: Descriptive and correlational analyses examined predictors, outcome, and covariates of interest. Multivariable linear regression models modeled the continuous outcome: full-scale IQ at ages 5-12 years. Average maternal lead was calculated from levels at 16 weeks, 26 weeks, and delivery. Average maternal cotinine (a biomarker of tobacco smoke) was calculated from concentrations at 16 and 26 weeks gestation. Average total folate was calculated from concentrations at 16 weeks gestation or birth. Covariates included maternal education, household income, HOME (Home Observation Measurement of Environment) score, and child sex.

Results: Biomarker, IQ, and covariate data were available for 258 mother-child dyads. Maternal education, income, and HOME score were highly correlated ($r > 0.60$). Maternal education was a positive predictor of child IQ ($p < 0.001$). Adjusting for maternal education, the association between maternal lead and cotinine on IQ was not significant. Total folate was a significant positive predictor of IQ ($p = 0.048$), but there was no interaction between folate and lead, or folate and cotinine.

Conclusions: Prior HOME Study analysis notes maternal lead is a significant predictor of child IQ at 8 years. However, our study suggests this association is mostly attributable to maternal education or other highly correlated sociodemographic variables. Additionally, total folate was a significant predictor of child IQ when adjusting for maternal education, but there was no interaction of folate with lead or cotinine. Further studies investigating early toxic and sociodemographic mediators of child IQ are warranted. Potentially, childhood lead – rather than prenatal lead – is more relevant in predicting child IQ.

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EDWARD L. PRATT LECTURE

Validation of a "Novel" Numeracy Screening Tool: The Number Farm

Sarah Reel, MD; John Hutton, MD, MS; Priya Singh, MD; Abigail Mills, BS; Laura Justice, PhD

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Background: Numeracy is a developmental process from basic knowledge about quantity to formal math concepts. Numeracy is vital in the global economy with wide disparities in achievement and environmental and genetic contributors. The AAP recommends screening to support school readiness. A book-based approach to literacy screening is validated for preschool-age children. Numeracy screening tools are not currently integrated into practice.

Objective: To describe development of *The Number Farm* (TNF), a book-based approach to numeracy screening for preschool-age children.

Methods: A conceptual model of TNF involves skills selected via literature review in collaboration with experts. A mockup of TNF was developed with K-level, rhyming text and illustrations featuring barnyard animals. This was first informally shown to parents to ensure clarity. Actual screening used an 11-item, scripted assessment. The Preschool Early Numeracy Screener (PENS) is a 25-item, normed measure with similar components validated for 3-5 years old, used as the gold standard.

This pilot was at Cincinnati Children's primary care clinics during well-visits. Inclusion criteria: gestation >34 weeks, age 36-59 months, no developmental disorder, fluent in English, no illness. Families received a gift card. After consent and demographics, TNF and PENS were administered in random order, noting screening time and barriers. Post-screening, the parent and child completed a Likert impression survey.

Results: 31 children were screened, mean age 50 months; 17 boys, 14 girls. Barriers were rare, most often interruption by clinic staff. Administration time was <10 min.

Mean TNF score was 11 (+3; 0-26), and PENS score was 10 (+3; 0-25), positively correlated (Pearson $r=0.94$, $p< 0.001$). All but one TNF item had >10% density per response option. Item-measure correlations were positive (0.53-0.85). Cronbach's alpha was 0.89.

Parent impression of TNF was favorable: 100% helpful at a doctor visit, 75% "just right" time spent, 94% learned about child's skills (66% had been worried), 69% surprised by score, 97% inspired to work with child at home. 97% of children reported TNF as fun.

Conclusions: TNF may be an efficient, reliable, and fun way to screen numeracy skills of preschool-aged children. Further studies are needed to expand validation and guide TNF refinement, including a children's book version.

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EDWARD L. PRATT LECTURE

Macrophages from Pediatric TNFα-resistant Crohn's Disease Patients Display Differential NLRP3 Inflammasome Activation

Molly Hritzo Ahye, MD, PhD; Ingrid Jurkovich, MD; Elizabeth Angerman; Lee Denson, MD

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Background: Crohn's disease (CD) is an auto-inflammatory disorder and part of the inflammatory bowel disease group (IBD). Pediatric CD patients generally respond to anti-tumor necrosis factor-α (TNF) therapy. However, some CD patients have persistent intestinal fibrosis and strictures despite anti-TNF therapy. Intestinal macrophages play a critical part in intestinal epithelial barrier integrity and pathogen control by activating an appropriate immune response. However, they can be inappropriately activated, leading to the inflammatory damage of CD. The Denson lab and collaborators have linked the inflammatory cytokine IL-1β and pediatric IBD. Additionally, they demonstrated that there is a likely positive feedback loop between inflammatory macrophages and fibroblasts, perpetuated by IL-1β, leading to excessive extra-cellular matrix production in stricturing anti-TNF-therapy-resistant CD patients. IL-1β activates the NLRP3 inflammasome, an immune signaling complex that drives further IL-1β production and connects innate and adaptive immune responses. Thus, NLRP3 activity in macrophages links to the IBD auto-inflammatory process.

Objective: However, the role of the NLPR3 inflammasome has not been fully explored in the pediatric IBD anti-TNF therapy response. We tested the hypothesis that the NLRP3 inflammasome is differentially activated in the macrophages from pediatric anti-TNF therapy responder (TNFR) CD, anti-TNF therapy nonresponder CD (TNFNR) patients or healthy controls (HC).

Methods: CD14 positive primary human monocytes were isolated from HC and TNFR or TNFNR CD patients. Macrophages were induced, then activated with either LPS, to mimic the inflammatory state of CD, or LPS+ATP to activate the NLRP3 inflammasome. RNA was isolated and qRT-PCR used to quantify *CASP1* and *NLRP3* gene activity.

Results: Preliminarily, TNFNR patients had 2-fold higher *CASP1* gene expression compared to TNFR patients without stimulation and increased *CASP1* expression with LPS and LPS+ATP. Additionally, TNFR patients had 2-fold higher *NLRP3* gene expression after LPS stimulation compared to TNFNR patients.

Conclusions: TNFNR macrophages had increased overall inflammasome activation compared to TNFR macrophages, as seen by increased *CASP1* expression. However, TNFR macrophages had increased *NLRP3* activity with stimulation compared to TNFNR macrophages. This preliminary data suggests that while the inflammasome may be upregulated in TNFNR macrophages, *NLRP3* is not. More samples will be analyzed in the future to further develop these findings.

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EDWARD L. PRATT LECTURE

Clinic-Based Hands-On Time and Time to Result for Point of Care Chlamydia and Gonorrhea Test Compared to Laboratory Based Test

Kelsey Rowe, MD; Hannah Woods, BA; Aaron Schuh, MD; Charlotte Gaydos, DrPH; Yukari Manabe, MD; Lea Widdice, MD

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Background: Implementing point-of-care tests (POCT) for Chlamydia and gonorrhea (CT/NG) into clinical settings may disrupt clinic flow and divert clinical staff from duties. Adoption of POCTs will depend on device operation and total assay turnaround time.

Objective: The purpose of this study was to describe clinical staff hands-on time and time-to-results for binx health io ® [Boston, MA] (binx io) CT/NG assay and compare to standard-of-care laboratory-based CT/NG testing.

Methods: This IRB-approved, continuous-operation time-motion study used video recordings of two non-laboratory operators testing vaginal swabs and urine using binx io in an adolescent primary care clinic. Milestone intervals included clinical staff hands-on time (sample preparation and starting the assay), assay time (touching "run test" to "review results" visible on screen), and time to result (sample preparation, starting the assay, and assay time). Clinical staff hands-on-time needed to operate binx io was compared to time needed to prepare and send samples for laboratory CT/NG nucleic acid amplification testing. This comparison used data obtained through direct observation by two trained observers of six clinical staff preparing and sending nine vaginal samples. Clinical staff hands-on time for urine sample preparation was not available. Electronic medical record time stamp data were used to calculate average visit time.

Results: A total of 57 binx io tests with complete milestone data were analyzed; 38 vaginal, 19 urine. On average, binx io time-to-result was 34min 3s (SD 20s) for vaginal and 34min 58s (SD 34s) for urine samples. An average of 1min 29s (SD 21s) clinical staff hands-on time was required for vaginal samples and 2min 25s (SD 34s) hands-on time was required for urine samples. For clinical laboratory standard-of-care samples, the average time to prepare and send vaginal swabs was 1min 8s (SD 33s). There was no statistically significant difference between clinical staff hands-on-time needed to operate binx io and time to prepare and send vaginal samples to the laboratory (two sample t-test, p=NS). Average visit time was 90 minutes.

Conclusions: The hands-on time required for binx io CT/NG is similar to laboratory-based testing. Binx results are available in less than 35 minutes, a feasible turn-around for within-visit POCT results.

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EDWARD L. PRATT LECTURE

Higher Presenting BMI Associated with Lower Odds of Medical Admission for Anorexia Nervosa in Adolescents, Independent of Physiologic Parameters

Michelle Recto, MD; Abigail Matthews, PhD, MHA; Kimberly Stevens, PhD; Jessica Kahn, MD, MPH; Margaret Zeller, PhD; Adi Ziv, MD; Jessica Lin, MD

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Background: Atypical anorexia nervosa (AAN) is a diagnosis mirroring features of anorexia nervosa (AN) with the exception that, despite significant weight loss, the individual remains within or above the normal weight range. A challenge for treatment of AAN is that providers often use normal weight as reassurance against illness severity.

Objective: To describe the impact of presenting BMI percentile on inpatient medical admission recommendations for AN and AAN.

Methods: Included patients were aged <20 years, seen for a new eating disorder (ED) visit at a tertiary care center between 1/1/2015-2/1/2020, and diagnosed with AN or AAN. Patients were excluded if they had previous ED treatment or were weight restored. Demographic and clinical variables were compared using independent sample t-tests between patients who were recommended for admission and those who were not. Multivariable logistic regressions were then used to assess the association between presenting BMI percentile and inpatient recommendation while controlling for age and vital signs used to determine admission.

Results: Of the overall cohort (n=292), 97 patients (33%) were recommended for admission. The most common indication was bradycardia (90%). The outpatient and inpatient recommendation cohorts were similar by age (15.8 vs. 15.2, p=0.148) and were majority female (87% vs. 84%, p=0.501), white (88% vs. 94%, p=0.561), and cis-gender (97% vs. 99%, p=0.667). The inpatient recommendation cohort had lower BMI percentile (13.3% vs. 37.7%, p<0.001), heart rate (HR; 44 bpm vs. 70 bpm, p<0.001), and systolic (SBP; 101 mmHg vs. 112 mmHg, p<0.001) and diastolic blood pressures (DBP; 61 mmHg vs. 65 mmHg, p<0.001). Logistic regression found that higher presenting BMI percentile was associated with lower odds of inpatient recommendation (adjusted OR=0.98 [95% CI 0.96-0.99], p=0.006) when controlling for age, HR, SBP, and DBP. A sensitivity analysis using bradycardia as a binary variable (using the standard admission cutoff criteria of HR≤45 bpm) showed consistent findings (aOR=0.97 [95% CI 0.96-0.99], p=0.002).

Conclusions: Patients presenting at higher BMI percentiles are less likely to be recommended for medical admission even when controlling for physiologic parameters indicating illness severity. These results suggest practitioners should take care to avoid biases regarding presenting weight when evaluating illness severity for patients with AAN.

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A Community-Based Initiative for Reinforcing Health Equity Around Childhood Homelessness (REACH)

Saige Camara, MD; Kristen Peterson, MD; Elizabeth Lendrum, MD; Nick DeBlasio, MD; Anita Shah, DO, MMS, MPH

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Background: In 2020, children accounted for 18.3% of all people experiencing homelessness. These children may have unmet health needs due to barriers accessing care and lack of resources. It is pivotal to address barriers posed by homelessness to improve health outcomes.

Objective: Our objectives were to develop and implement a new public health initiative, Reinforcing Health Equity Around Childhood Homelessness (REACH), that focused on addressing gaps in care for children experiencing homelessness during a community-based summer camp (UpSpring 360).

Methods: A needs assessment informed the development of REACH. This survey included standardized screening questions assessing child health-related needs. We surveyed guardians of children ages 5-18 years experiencing homelessness who attended UpSpring 360 between June and July 2022. An exit survey was utilized to evaluate the effectiveness of our intervention. We utilized descriptive statistics, including frequencies and proportions of categorical variables, to characterize health-related needs and to evaluate the impact of REACH.

Results: Health needs assessments were completed for about 36 children (42% white, 64% male). Nearly all children (94%) were reported to have at least one health-related need and over half (61%) had >3 needs. The most common health-related needs identified were dental hygiene and food insecurity. REACH included a mobile health clinic, a health-focused educational series, and tailored resource provision. 24 campers participated in a mobile health clinic that included fluoride application, hearing and vision screens, blood pressure and BMI evaluations, and vaccinations. Children at the camp participated in an educational series with a focus on dental hygiene, mental health, and nutrition. All families who desired assistance with reported health-related needs (73%) were connected to resources (e.g., list of local food pantries or dental offices accepting public insurance). Implementation required connection with stakeholders including mobile clinic operators, dental partners, and school leadership. Nearly all guardians surveyed (91%) agreed that REACH helped meet their children's health-related needs and that the resources provided were helpful.

Conclusions: Many children experiencing homelessness experience unmet health-related needs and desire assistance. In partnership with stakeholders, a community-based health initiative may serve as a unique opportunity to identify and address unmet health needs for this population.

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EDWARD L. PRATT LECTURE

Use of Urine Neutrophil Gelatinase-Associated Lipocalin for Prediction of Severe and Persistent Acute Kidney Injury in Children after Cardiac Surgery

Katherine Melink, MD; Kevin Pettit, MD; Emily Sullivan, MD; Katja Gist, DO, MSc; Natalja Stanski, MD

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Background: Acute kidney injury (AKI) is common in critically ill children and associated with poor outcomes, especially when severe and persistent. Children admitted following cardiac surgery are at high risk for AKI in the early post-operative period, but limited tools exist to predict which patients will develop severe and/or persistent AKI. Urine neutrophil gelatinase-associated lipocalin (uNGAL) may be useful to identify patients early.

Objective: Evaluate the predictive ability of uNGAL for (1) the presence of day 2-4 severe AKI following cardiac surgery, and (2) the persistence of early post-operative AKI in children.

Methods: A prospective observational study of children aged 0 to 18 years admitted to the cardiac intensive care unit (CICU) after cardiac surgery. uNGAL was measured ≤12 hours after surgery. Primary outcomes were (1) severe day 2-4 AKI (≥KDIGO Stage 2) and (2) severe persistent AKI (defined as early [post-operative days 0-1] serum creatinine-based AKI that persists for ≥48 hours and is ≥KDIGO Stage 2 by post-operative day 2-4).

Results: Among 377 patients, 29 (7.7%) had day 2-4 severe AKI. Patients with severe AKI experienced longer cardiopulmonary bypass (CPB) durations, CICU stays, mechanical ventilation, and increased mortality (24% vs 3.2%). On multivariate logistic regression, early AKI (aOR 8.6, 95% CI 3.6-21, $p<0.001$) and uNGAL >150ng/ml (aOR 2.5, 95% CI 1.02-6.1, $p=0.045$) retained associations with day 2-4 severe AKI. uNGAL predicted day 2-4 severe AKI with an AUC of 0.64 (95% CI 0.53-0.75, $p=0.013$), sensitivity 47% (CI 29-65%), specificity 80% (CI 76-84%), PPV 17% (CI 10-27%) and NPV 95% (CI 91-97%). Thirty-seven patients (10%) had early AKI, of which 13 (35%) had severe persistent AKI. Patients with severe persistent AKI also had longer CPB durations, CICU stays, mechanical ventilation, and increased mortality (31% vs 0%).

Conclusions: Children admitted to the CICU following cardiac surgery who develop severe and/or persistent AKI suffer worse outcomes, including higher rates of mortality. In this cohort, uNGAL was modestly predictive of day 2-4 severe AKI, with high NPV using a threshold of 150ng/ml. Further study in a larger cohort is needed to examine its predictive value for severe persistent AKI.

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Use of a Furosemide Challenge with a Urinary Biomarker for Prediction of Acute Kidney Injury in Children After Cardiac Surgery

Emily Sullivan, MD; Katherine Melink, MD; Stuart Goldstein, MD; Kevin Pettit, MD; Megan Soohoo, MD; Natalja Stanski, MD; Katja Gist, DO, MSc

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Background: Acute kidney injury (AKI) is common after cardiac surgery. Urine response to loop diuretics has been shown to predict AKI after cardiac surgery. Whether integration of a clinically available urine biomarker, neutrophile gelatinase associated lipocalin (uNGAL), improves prediction of day 2-4 AKI after cardiac surgery is unknown.

Objective: The purpose of this study was to quantify urine response to loop diuretics and uNGAL for prediction of day 2-4 AKI.

Methods: We performed a 2-center study (ages 0-18 years) in which urine was either collected as part of enrollment in a biorepository or as part of a prospective observational study. uNGAL was measured within 12 hours after cardiac surgery. The first dose of loop diuretics after surgery was recorded, and hourly urine output (UOP) for the first 6 (furosemide intermittent dosing) or 12 (bumetanide infusion) hours was quantified and indexed to weight and hours. All diuretic doses were converted to furosemide equivalents (1mg bumetanide = 40mg furosemide). The primary outcome was day 2-4 AKI. Multivariable regression analysis was used to evaluate the association between the combination of uNGAL>150 and UOP<1ml/kg/hr and day 2-4 AKI.

Results: After exclusions (missing uNGAL, no furosemide, urine not quantified, insufficient creatinine measures), 513 patients were included. Among those with day 2-4 AKI, cardiopulmonary bypass duration was longer, UOP lower, and NGAL higher. ICU length of stay and deaths were also significantly higher among those with day 2-4 AKI. After adjusting for confounders (furosemide dose, cardiopulmonary bypass duration, age at surgery), the combination of UOP<1 and uNGAL>150 was associated with a 2.73-fold increased odds of day 2-4 AKI (95%CI: 1.16, 6.42; p=0.02).

Conclusions: The combination of inadequate UOP after loop diuretic and abnormal uNGAL is associated with significantly higher odds of day 2-4 AKI after adjusting for confounders. Multicenter studies that validate these findings are needed such that real time clinical data can guide clinician management decisions in this high-risk population.

Poster Abstracts

IN ALPHABETICAL ORDER BY RESIDENT AUTHOR(S)

In-person and Virtual Cardiac Rehabilitation in Youth and Adults with Heart Disease During the COVID-19 Era
Elizabeth Aronoff, MD – Categorical Pediatrics, PGY-2

Use and Outcomes of the Medical Hybrid Procedure for Stage 1 Palliation in Infants with Hypoplastic Left Heart Syndrome and Variants
Daniel Beauchamp, MD – Categorical Pediatrics, PGY-3

Airway Endoscopy in Critically-Ill Children and Impact of Creation of a High-Risk Bronchoscopy Team (HRBT) in a High-Volume Center
Daniela Bullard Elias, MD – Categorical Pediatrics, PGY-3

Olfactomedin 4 as a Urinary Biomarker to Predict AKI and Need for Renal Replacement Therapy
Imogen Clover-Brown, MD – Categorical Pediatrics, PGY-2

Retrospective Review of Genetic Mutations and Treatments in Patients with Monogenic Diabetes of the Youth (MODY)
Lily Deng, MD – Categorical Pediatrics, PGY-3

Incidence and Severity of Adenovirus Respiratory Infections and Coinfections in a Longitudinal Birth Cohort
Adam Gailani, MD – Categorical Pediatrics, PGY-3

Gene Editing Strategies to Create Human Derived Erythroid Progenitor Cells with SC Mutation
Lubna Hamdan, MD – Categorical Pediatrics, PGY-3

Examining the Effects of Social Determinants of Health and Remote Outreach on Breast Milk Feeding Outcomes and Well Visit Completion
Laura Hardy, MD, PhD – Categorical Pediatrics, PGY-2

Carriage of Alpha-1 Antitrypsin Risk Variants is not Associated with Increased Histologic Severity of Pediatric NAFLD
Maya Khan, MBBS – Categorical Pediatrics, PGY-3

Insult During Infancy: Early Life Antibiotics Disrupt Lung Repair Following Influenza-A Infection and Injury
Kristin Lambert, MD, PhD – Categorical Pediatrics, PGY-2

Usability Testing of a Virtual Reality Communication Curriculum to Address COVID-19 Vaccine Hesitancy
Melody Lee, MD – Categorical Pediatrics, PGY-3

Perception and Practices of Breastfeeding in Dominican Mothers in the Dominican Republic
Kylie Mena, MD – Categorical Pediatrics, PGY-3

The Effects of the COVID-19 Pandemic on Pediatric Dog Bite Injuries
P. Thomas Menk, MD – Categorical Pediatrics, PGY-3

Pressure-Wire Guided Hybrid Branch Pulmonary Artery Band Placement for Palliation of Single Ventricle Congenital Cardiac Lesions
Jonathan Pacella, MD – Categorical Pediatrics, PGY-2

Needs Assessment for Labor and Delivery Nursing NRP Training and Maintenance of Skills
Franklin Privette, MD – Categorical Pediatrics, PGY-3

Long Term Kidney Outcomes in Wilms Tumor Survivors
Shannon Reinert, MD – Categorical Pediatrics, PGY-3

Emergency Department and Psychology Care Patterns That Develop Following a Traumatic Brain Injury in Children and Young Adults
Jeremy Shapiro, MD – Pediatrics/PM&R, PGY-5

Evaluation of the Use of Visual Storytelling as an Educational Intervention in the CICU
Christiana Stark, MD – Categorical Pediatrics, PGY-3

Understanding Primary Spontaneous Pneumothorax Management and Outcomes in Children: A Retrospective Case Series
Sara Touzinsky, MD – Categorical Pediatrics, PGY-3

Butorphanol and Ketamine Use in Patients with a Diagnosis of Hurler Syndrome Undergoing Bone Marrow Transplantation (BMT)
Madeline Weber, MD – Categorical Pediatrics, PGY-3

Impact of Buccal Dextrose Gel for the Treatment of Neonatal Hypoglycemia on Breastfeeding Outcomes
Praise Yorka, MD – Categorical Pediatrics, PGY-3

PEERS: Promoting Early Exposure to the Responsibilities of Seniors
Eleanor Young, MD – Categorical Pediatrics, PGY-3

In-person and Virtual Cardiac Rehabilitation in Youth and Adults with Heart Disease During the COVID-19 Era

Elizabeth Aronoff, MD; Clifford Chin, MD; Wayne Mays, MS, RCPT; Sandra Knecht, MS; Jennah Goessling, MS; Malloree Rice, MS; Alexander Opotowsky, MD, MMSc; Adam Powell, MD, MS

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Background: Cardiac rehabilitation (CR) is an important and emerging tool for improving fitness and quality of life in youth and adults with heart disease (HD). Few pediatric centers use CR in the care of these patients, and even fewer use virtual CR. Additionally it is unclear how the COVID-19 era has changed CR outcomes. **Objectives**: This study assessed for physical and psychosocial improvements in HD patients participating in either in-person or virtual CR during the COVID-19 pandemic. **Methods**: This retrospective cohort study included novel patients who completed at least 180 days of CR from March 2020 through July 2022. CR outcomes included body composition, physical, performance, and psychosocial measures. Comparison between serial testing was performed with a paired t test. $P<0.05$ was considered significant. **Results**: There were 47 patients (19±7.3 years-old; 49% male) who completed CR. The whole cohort demonstrated significant improvements in oxygen consumption (VO_2) 62.3±16.1 v 71±18.2% of predicted, p=0.0007), 6-minute walk (6MW) distance (401±163.8 v 480.7±119.2 meters, p=<0.0001), sit to stand (16.2±4.9 v 22.1±6.6 repetitions; p=<0.0001), Patient Health Questionnaire-9 (PHQ-9) (5.9±4.3 v 4.4±4.2; p=0.002), and Physical Component Score (PCS) (39.9±10.1 v 44.9±8.8; p=0.002). In-person CR enrollees were less likely to complete CR than virtual patients (33/55, 60% vs 12/15, 80%; p=0.005). Peak VO_2 increased among those that completed in-person CR (60±15.3 v 70.2±17.8 % of predicted; p=0.002) and PCS (39.5±10.9 v 45.7±8.9; p=0.004); this was not observed in the virtual group. Both in-person and virtual groups demonstrated an improvement in 6MW distance, sit to stand repetitions, and sit and reach distance. **Conclusions**: Completion of a CR program resulted in fitness improvements during the COVID-19 era regardless of location, emphasizing the importance of this component of HD care. The observed improvement was greater seen in the in-person cohort than in the virtual cohort. Larger studies are needed to better assess these differences, especially with more participants completing virtual CR.

Use and Outcomes of the Medical Hybrid Procedure for Stage 1 Palliation in Infants with Hypoplastic Left Heart Syndrome and Variants

Daniel Beauchamp, MD; Christopher Statile, MD; Huaiyu Zang, PhD; David Parra, MD; Justin Godown, MD; Natalie Jayaram, MD; Matthew Moehlmann, DO; Garick Hill, MD

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Background: Despite improvements over time, hypoplastic left heart syndrome and variants remain high risk for mortality and morbidity. Traditional staged palliation involves three surgeries: the Norwood, Glenn, and Fontan. The Hybrid Procedure, an alternative strategy for initial palliation, involves placement of pulmonary artery bands and a ductal stent. This delays cardiopulmonary bypass and arch reconstruction until after the neonatal period. Hybrid palliation is used in 13% of patients nationally and is often reserved for high-risk patients. A third strategy is the Medical Hybrid (MH), which uses prostaglandin infusion rather than stenting to maintain ductal patency. Use and outcomes of MH have not been well described. **Objective**: To describe use of MH palliation using a large multicenter database, and assess clinical outcomes of MH compared to Stented Hybrid (SH) and Surgical Stage 1 (SS1). **Methods**: Patients from the National Pediatric Cardiology Quality Improvement Collaborative (NPC-QIC) database were categorized by initial intervention: MH, SH, or SS1. Patients with other/unclear initial procedures were excluded.
Results: The study included 2423 patients from 65 centers: 277 (11.4%) MH, 133 (5.5%) SH, 2013 (83.1%) SS1. MH had the lowest birth weight, lowest gestational age, highest prevalence of non-cardiac congenital anomalies, and highest prevalence of preoperative risk factors. Most centers performed MH in a minority of cases. Over half of MH patients underwent subsequent SS1 procedure. Transplant-free survival at 1 year was 56.0% for MH, 66.3% for SH, and 80.7% for SS1 ($p<0.0001$). Suspecting that MH was preferentially used in higher risk patients, multivariable logistic regression was performed to elucidate predictors of MH palliation. Patients with a genetic syndrome, non-cardiac anomaly, or ≥4/12 preoperative risk factors had higher odds of MH. Higher gestational age and birth weight were associated with lower odds of MH. Cox proportional hazards regression was used to compare time to death/transplant while adjusting for the risk factors included in the multivariable logistic regression: MH had lower risk of one-year mortality/transplant compared to SS1, and no difference compared to SH. **Conclusions**: Poor survival after MH likely relates to underlying patient risk factors. Risk-adjusted mortality is less than SS1 and similar to SH.

Airway Endoscopy in Critically-Ill Children and Impact of Creation of a High-Risk Bronchoscopy Team (HRBT) in a High-Volume Center

Daniela Bullard Elias, MD; David Spielberg, MD, MHSc; Dan Benscoter, DO; John Brewington, MD, MS

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Background: Flexible bronchoscopy (FB) is a frequent procedure in critically ill children. There is wide practice variability in FB utilization and limited evidence for guidance. **Objective**: We aim to capitalize on high volume of cases in a single center to describe indications and findings as well as evaluate the impact of HRBT on practice and safety outcomes. **Methods:** We performed a single-center, retrospective review of all flexible bronchoscopies performed on children admitted to an intensive care unit (ICU) over an 8-year period. A central database was used to evaluate demographics, indications, findings and complications. HRBT composed of 4-6 individuals performing high volumes of procedures was created at a midpoint providing a formal system for procedural backup with on-call support and aim to concentrate experience with high-risk procedures. **Results**: 2608 procedures were recorded on 1304 patients admitted to an ICU; 42.2% in pediatric ICU, 27.8% in cardiac ICU, 20.3% in the operating rooms and 9.7% in neonatal ICU. 485 patients had multiple bronchoscopies with an average of 3.6 per patient. Average age of cohort was 5.45 years (± 7.3) and weight was 18 kg (± 21.8). 173 FB recorded on extracorporeal membrane oxygenation (ECMO). All-cause mortality of the cohort was 32.7%. Significant complications were reported in 1.1% of cases. Indications included hypoxia (37.1%), atelectasis/mucus plugging (22.0%), lower airway compression (6.6%), pneumonia (6.6%) and hemorrhage (5.7%). Findings included bronchitis (23.7%), mucus plugging (21.1%), hemorrhage (7.7%) and lower airway compression (7.8%). After HRBT was instituted ICU procedures performed by HRBT members increased from 27.3% to 53.0%. There was a 6 month decrease in average patient age ($p=0.04$), 2.7kg decrease in weight ($p=0.002$), and an increase of patients on ECMO (OR 1.44, 1.04-2.02, $p=0.035$). There was a decrease in rate of complications (OR 0.16, 0.07-0.37, $p<0.0001$) and all-cause mortality (OR 0.73, 0.59-0.9, $p=0.003$). **Conclusions**: FB is a generally safe procedure in critically ill children. Creation of a formal HRBT in a high-volume center may help to increase comfort with severity of cases such as those on ECMO, younger children and lower weights, as well as impact the rate of complications associated with the procedure.

Olfactomedin 4 as a Urinary Biomarker to Predict AKI and Need for Renal Replacement Therapy

Imogen Clover-Brown, MD; Denise Hasson, MD; Kristalynn Kempton, MS; Kelli Krallman, BSN, MS; Stuart Goldstein, MD; Matthew Alder, MD, PhD

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Background: Acute kidney injury (AKI) in the pediatric intensive care unit (PICU) is associated with increased mortality and morbidity. Furosemide stress tests (FST) can predict progression of AKI and guide the initiation of renal replacement therapy by measuring urine production following a standardized dose of furosemide. However, providers may avoid FST in hemodynamically unstable patients. Scoring tools, like Renal Angina Index (RAI), and novel AKI biomarkers, like urine neutrophil gelatinase associated lipocalin (uNGAL), identify patients at risk for AKI, but no current biomarkers are Loop of Henle (LOH) specific. As furosemide acts in the LOH, an LOH specific biomarker may predict FST response. Urinary olfactomedin 4 (uOLFM4), a glycoprotein produced by neutrophils and stressed epithelial cells, has increased expression in the LOH during AKI so it may function as a LOH specific AKI biomarker.
Objective: To assess the ability of OLFM4 to predict AKI and need for RRT. **Methods**: All PICU patients were enrolled in the Trial in AKI using NGAL and Fluid Overload to Optimize CRRT Use, had an RAI calculated 12 hours after admission, and uNGAL measured if RAI $\geq$ 8. All patients with RAI $\geq$8 and available urine samples were included. Urine samples were collected from NGAL residuals or bladder catheter waste for up to 7 days. uOLFM4 levels were measured via Abcam enzyme linked immunosorbent assay. AKI was staged using Kidney Disease Improving Global Outcomes (KDIGO) criteria, with severe AKI defined as >2x increased serum creatinine from baseline. Because OLFM4 is highly expressed in neutrophils, patients with positive urine cultures or leukocyte esterase on urinalyses were excluded (n=8). **Results**: 34 patients contributed 66 samples. Patients with severe AKI had uOLFM4 levels of 508 ng/mL (IQR 241-1180) compared to patients with without, 84 ng/mL (IQR 42, 279), $p < 0.0001$. Patients who required RRT had uOLFM4 levels of 588 ng/mL (IQR 229, 1765) compared to those who did not, 247 ng/mL (IQR 63, 424), $p < 0.013$. **Conclusion**: Patients with severe AKI and who received RRT had higher uOLFM4 levels. uOLFM4 may help ICU providers identify patients who may benefit from RRT. Enrollment is ongoing with plans to expand to multiple centers.

Retrospective Review of Genetic Mutations and Treatments in Patients with Monogenic Diabetes of the Youth (MODY)

Lily Deng, MD; Amy Shah, MD; Mansa Krishnamurthy, MD

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Background: Monogenic diabetes results from specific genetic mutations that result in diabetes mellitus. Clinical phenotypes differ based on the genetic defect, and treatment options are driven by the underlying genetic cause. Thus, accurate genetic diagnosis and evaluation of response to treatment is essential. **Objective:** To identify and characterize patients with MODY within the diabetes population at CCHMC and to compare their treatments. **Methods:** Retrospective chart review was utilized to identify patients with MODY at a single institution who had confirmed genetic mutations. Demographics, co-morbidities, initial islet cell autoantibodies, diagnosis and treatment, and current treatments were evaluated. **Results:** Patients diagnosed with MODY (n=93) comprised of 3% of the total patient population diagnosed with diabetes (78% T1DM, 19% T2DM) over the period of 10 years. For patients with MODY, the average age of diabetes diagnosis was 10 years and their mean HgbA1c was 8.0% at diagnosis. 3.3% of patients with MODY had ketoacidosis at diagnosis and 7.5% had positive islet cell autoantibodies. Among patients with MODY, the most common gene mutations were HNF1A, GCK, and HNF1B. Novel genetic mutations in PDX1, RFX6, and BLK were also identified. Current treatment modalities of patients with MODY were compared (insulin, Metformin, Sulfonylureas, Metformin-Glyburide, insulin combined with Metformin, GLP-1 receptor agonists) For each medication, reduction in HgbA1c was seen at follow-up. All medications except for insulin and Metformin-Glyburide demonstrated a reduction in BMI at follow-up. The greatest reduction in BMI was observed in patients on GLP-1 receptor agonists and insulin combined with Metformin. **Conclusion:** Our study highlights the importance of genetic testing in patients as DKA and islet cell antibody positivity (if other than insulin) does not preclude MODY diagnosis. Moreover, future investigation of GLP-1 receptor agonist as a treatment for MODY patients is warranted.

Incidence and Severity of Adenovirus Respiratory Infections and Coinfections in a Longitudinal Birth Cohort

Adam Gailani, MD; Zheyi Teoh, MD; Shannon Conrey, PhD, MS; Rachel Burke, PhD, MPH; Allison Cline, RN BSN; Marie Killerby, VetMB, MPH; Xiaoyan Lu, MS; Claire Mattison, MPH; Monica McNeal, MS; Ardythe Morrow, PhD, MSc; Daniel Payne, PhD, MSPH; Mary Allen Staat, MD, MPH

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Background: Adenoviruses (AdVs) are a common cause of acute respiratory illness (ARI) in children and are often detected with other viruses (coinfection). However, the community incidence and severity of AdV infections is poorly understood due to a lack of prospective studies outside the hospital setting. **Objective:** We aim to characterize respiratory AdV infections and coinfections in a prospective birth cohort of children. **Methods:** The PREVAIL cohort is a CDC-funded, 2-year birth cohort, conducted from 2017-2020 in Cincinnati. ARI was defined as the presence of cough or fever identified with weekly maternal text surveys and medical chart review. Mid-turbinate nasal swabs were collected weekly. Swabs were tested using Luminex Respiratory Pathogen Panel. AdV infection was defined as a swab positive for AdV and included subsequent positives <30 days apart. Coinfection was defined as detection of other virus(es) during an AdV infection. Children who submitted at least 70% of weekly samples were included. **Results:** 101 children met inclusion criteria, representing 165 child-years. 137 distinct AdV infections were identified (incidence 0.84 infections per child-year), with 98 (97%) children having ≥1 AdV infection(s). Only 40% (n=55) of AdV infections were symptomatic. Of those with symptomatic infections, 51% (n=28) sought medical care, with 42% (n=23) presenting to a primary care provider and 9% (n=5) resulting in an ED visit or hospital admission. Coinfections were detected in 67% (n=92) of AdV infections, with 45% (n=62) coinfected with 1 virus, 19% (n=26) with 2 viruses, and 3% (n=4) with ≥3 viruses. The number of coinfections virus was not associated with an increase in symptom prevalence or symptom severity (all $p>0.05$). Coinfections were less likely to have fever (25% vs 46.7%) or seek medical care (13% vs 35.6%) compared to single infections (both $p<0.05$). **Conclusion:** In this cohort of healthy children, AdVs were a common cause of respiratory infection. Most infections were asymptomatic or had mild symptoms. Two-thirds of AdV infections involved viral coinfections. Coinfection was not associated with more frequent or severe symptoms. Coinfections were associated with less fever and sought medical care less frequently. Our findings suggest studies that only include symptomatic or hospitalized patients may overestimate AdVs disease severity.

Gene Editing Strategies to Create Human Derived Erythroid Progenitor Cells with SC Mutation

Lubna Hamdan, MD; Mengna Chi, PhD; Punam Malik, MD

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Background: Sickle cell disease (SCD) is caused by homozygous Beta-sickle mutation on both alleles or compound heterozygous with Hemoglobin (Hb)S on one allele and HbC or a Beta-thalassemia mutation on the second allele. Hemoglobin sickle-Hemoglobin C disease (HbSC) accounts for 30% of SCD genotypes. HbS results from A→T mutation in the sixth codon of the HbB gene while HbC results from G→A mutation in the same codon of the HbB gene. HbSC patients also have substantial morbidity and mortality. Hence, creating HbSC cell models is crucial to understand disease pathophysiology and developing novel therapies. **Objective**: The aim of the project is to optimize a CRISPR/Cas9 gene editing strategy in Human Umbilical Cord Blood-Derived Erythroid Progenitor (HUDEP)-S cell line from a sickle patient to create HUDEP-C and HUDEP-SC cell line. **Methods**: Two different single stranded oligonucleotide templates (ssODN donor A and B) were trialed with at least 2 different concentrations (Figure 1). Delivery of ribonucleoprotein (RNP) complex of CRISPR guide RNA (gRNA) and Cas9 with ssODN templates was done through electroporation. Transfected cells were cultured and incubated for recovery before harvested for examination. Two methods were used for confirming gene editing: 1) PCR with a digestion reaction using a restriction enzyme (HhaI): If editing is successful and homology directed repair (HDR) occurs, two bands (250 and 207 Bp) should be detected during gel electrophoresis. 2) TIDE (Tracking of indels by Decomposition) assay coupled with sanger sequencing to examine if non-homologous end joining (NHEJ) occurs. **Results**: Figure 2 shows a gel electrophoresis of samples after digestion. No cutting was achieved which is likely due to absence of successful HDR. Figure 3 shows TIDE assay with indels in RNP control samples indicating successful electroporation and cutting but not HDR in transfected samples. **Conclusion**: Our experiment did not result in HDR in HUDEP-S cells while resulted in indels in RNP control groups. This could be attributable to ssODN toxicity, instability or electroporation conditions. Further experiments are needed to optimize gene editing in HUDEP-S cells.

Examining the Effects of Social Determinants of Health and Remote Outreach on Breast Milk Feeding Outcomes and Well Visit Completion

Laura Hardy, MD, PhD; Chidiogo Anyigbo, MD; Melinda MacDougall, MS; Shelly Ehrlich, MD, MPH; Michelle Costanzo, MBA; Benjamin Foley, BA; Becky Haehnle, RN; Robin Steffen, RN; Kyle Kaplan, MPH; John Egbo, MPH; Kristy High; Lakeya McNary; Sheela Geraghty, MD

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Background: Breastmilk is the normative standard for infant nutrition and is linked to positive health benefits for both the infant and mother. During the start of the COVID-19 pandemic, there were decreased in-person well and follow-up visits. The fewer visits raised concern about insufficient support for newborns, especially those receiving breastmilk in a pediatric clinic where 72% of patients were African American and 72% had Medicaid insurance. Thus, a remote breastfeeding support program was created and caregivers completed social risk screening to help identify barriers that may impact of their infant. **Objective**: To examine the effect of social risk on breastmilk feeding rates, engagement in BF support, and well visit completion rates at the 2 and 4 month well visit. **Methods**: Breast milk feeding (BMF) support intervention was provided to mothers of infants seen for newborn well visits (NWVs) from 9/28/20 – 2/22/21. Infants seen for NWVs with a completed social risk screen and receiving any breastmilk were contacted for remote breastfeeding outreach. Follow-up data was collected on BMF status and well-visit completion rates at 2, 4, and 6 months of age and data was analyzed using logistic regression. **Results**: In this study population comprising 246 infants, 145 (60%) were receiving breastmilk at their newborn visit and 61 (25%) were in households with at least one positive social risk domain. Community health workers were able to contact 100% of mothers who were providing breastmilk to their newborn and 88% of mothers confirmed their phone number, 60% confirmed the feeding status, and 45% participated in remote BMF support. There was no statistical difference in social risk between BMF and formula feeding families. **Conclusion**: This study demonstrates a novel approach integrating community health worker text-based outreach and remote lactation support within an academic primary care clinic to assist breastfeeding mothers. There was no statistical difference in social risk between BMF and formula feeding families. This was a surprising finding and suggests we need to look deeper into the factors influencing BMF in our study population. Ongoing analysis will examine the effect of social risk on remote outreach participation and well visit completion rates.

Carriage of Alpha 1 Antitrypsin Risk Variants is not Associated with Increased Histologic Severity of Pediatric NAFLD

Maya Khan, MBBS; Ana Catalina Arce-Clachar, MD; Kristin Bramlage, MD; Lin Fei, PhD; Corie Klepper, MD; Sarah Orkin, MD; Alexander Miethke, MD; Rohit Kohli, MD; Stavra Xanthakos, MD, MS; Marialena Mouzaki, MD

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Background: Among adults with nonalcoholic fatty liver disease (NAFLD), alpha-1 antitrypsin (A1AT) heterozygosity for the PiZ and PiS variants has been linked to an increased risk of advanced liver disease. The role of the A1AT gene as a modifier of pediatric NAFLD is not clear. **Objective**: Determine whether A1AT PiZ or PiS variants are associated with liver disease severity in youth with NAFLD. **Methods**: After obtaining IRB approval, we performed a retrospective study of patients ages 2-21 years with histologically confirmed NAFLD followed at our Steatohepatitis Center from January 01, 2010 to June 30, 2021. Patients with A1AT deficiency were excluded. Clinical, demographic, laboratory and histologic data, including NAFLD Activity score (NAS) and fibrosis stage, were collected from the electronic medical record. The cohort was characterized using descriptive statistics (medians with interquartile ranges [IQR]), Student's t-test and chi squared testing when appropriate. Multivariable logistic regression was used to determine whether A1AT variants were associated with histologic severity (NAS ≥5 and/or significant fibrosis [stage ≥2]) whilst controlling for confounders such as age, sex and ethnicity. Statistical significance was set at $P < 0.05$. **Results**: The cohort included 269 patients, mean age 12 [± 3] years with NAFLD and A1AT phenotyping (n=260) and/or A1AT levels (n=261). The mean NAS of the cohort was 4.2 [±1.5]; 50% had any, and 18% had significant fibrosis. Most (86%) had the MM A1AT phenotype, while 7% had the MS and 3% the MZ phenotype (the rest had other, non-pathogenic variants). Mean A1AT level was 123 mg/dl [±20]. A1AT levels did not differ by low vs. high NAS (122±2 vs 126 ±19 mg/dl, p=0.12) or by no/mild vs. significant fibrosis (123±20 vs 126±20 mg/dl, p=0.23, respectively). Carriers and non-carriers of the PiS or PiZ variants had similar NAS (mean NAS 3.8 ±1.6 vs 4.2 ±1.4; p=0.25, respectively). Fibrosis severity did not differ by carrier vs non-carrier group: 38% vs 52% had any fibrosis (p=0.17) and 14% vs 18% had significant fibrosis (p=0.80, respectively). Multivariable modeling showed no association between A1AT risk variants and histologic severity. **Conclusions**: While not uncommon, carriage of the A1AT PiZ or PiS risk variants was not associated with histologic severity in children with NAFLD. Larger studies, including children with more advanced fibrosis, are needed to investigate this further.

Insult During Infancy: Early Life Antibiotics Disrupt Lung Repair Following Influenza-A Infection and Injury

Kristin Lambert, MD, PhD; Jerilyn Gray, MS; Hitesh Deshmukh, MD, PhD

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Background: Infants with early life exposures to antibiotics have greater susceptibility to respiratory infections and increased risk for chronic respiratory diseases like asthma over a lifetime. A significant proportion of infants are exposed to antibiotics as a routine part of the birthing process. However, the exact biologic costs and consequences of fetal dysbiosis are not yet understood. Our group has previously demonstrated that early life antibiotic exposure interrupts the maturation of intestinal commensal bacteria and, as a consequence, perturbs the pulmonary immune system in infant mice. Infant mice exposed to perinatal antibiotics experience non-resolving lung inflammation and impaired repair of the alveolar-capillary barrier after viral infection. Alveolar type 2 (AT2) cells are critical players in lung homeostasis and enable regeneration after injury by proliferating and differentiating into new alveolar type 1 (AT1) cells. We hypothesized that early life antibiotics impair repair of the alveolar-capillary barrier after viral insult due to delays in transition between alveolar type 2 (AT2) to alveolar type 1 (AT1) cells. **Objective**: Determine mechanisms by which AT2 differentiation is altered following influenza-induced lung injury in individuals exposed to early life antibiotics. **Methods**: Pregnant mouse dams were treated with ampicillin, the most commonly used antibiotic in pregnant women and human newborns, beginning 5 days before delivery and discontinued upon birth. Antibiotic exposed or control infant mice were then challenged postnatally (day of life 14) with a sublethal dose of murine-adapted influenza A H1N1 strain-PR8. To investigate our hypothesis that delayed airway repair and regeneration after IAV is a result of stalled AT2-to-AT1 differentiation, we utilized ABX-exposed or ABX-free *Sftpc*^{CreERT2}*R26*^{YFP} animals to track AT2 cell differentiation. Populations of AT1 and AT2 cells were quantified via spectral flow cytometry. **Results**: The frequency of AT2-derived AT1 cells was significantly decreased in ABX-exposed infant mice as quantified by flow cytometry. Data and statistical analysis is ongoing. **Conclusions**: Antibiotic exposure mimicking current clinical practices disrupts AT2-AT1 transition, resulting in impaired regeneration and delayed recovery from influenza A. Insult during infancy to the developing gut microbiota- lung axis from antibiotic exposure permanently alters pulmonary health beyond infancy.

Usability Testing of a Virtual Reality Communication Curriculum to Address COVID-19 Vaccine Hesitancy

Melody Lee, MD; Brittany Rosen, PhD, MEd, CHES®; Andrea Meisman, MA; Francis Real, MD, MEd

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Background: The COVID-19 vaccine is recommended for adolescents, yet only 58% of U.S. adolescents have completed the series. COVID-19 vaccine hesitancy presents unique challenges as evidence-based counseling practices are lacking. Training pediatricians to effectively recommend the vaccine and address vaccine hesitancy requires training in collaborative decision-making skills. Motivational interviewing (MI) may offer an effective framework to provide patient education on the COVID-19 vaccine. **Objective**: To assess the usability of a virtual reality (VR) curriculum for pediatricians to deliberately practice addressing COVID-19 vaccine hesitancy. **Methods**: We used Intervention Mapping, a systematic process of engaging stakeholders in intervention development, to co-create the VR curriculum with community partners. A 40-minute VR curriculum was subsequently developed in which a learner verbally counseled graphical caregivers (avatars) hesitant to vaccinate their adolescent against COVID-19. The curriculum was operationalized using a screen-based teleconferencing service. A facilitator controlled the verbal and non-verbal language of the avatars who responded to the learner's counseling using a specific algorithm. The curriculum included four cases focused on common sources of COVID-19 vaccine hesitancy. After each case, the learner received immediate feedback regarding their use of specific MI skills (Table 1). The curriculum was piloted individually with a cohort of senior pediatric residents. Semi-structured interviews were conducted to assess overall perceptions of the curriculum. Interviews were transcribed and rapid qualitative analysis procedures were used to characterize the data. **Results**: Nine residents participated; most identified as White (78%) and female (89%) with a mean age of 29 years. We identified three themes related to usability (Table 2). Residents reported an appreciation for the scaffolding of MI skills within the curriculum that included "bite-sized pieces" with the opportunity to practice skills in the virtual environment. Multiple residents felt "more equipped" to address COVID-19 vaccine concerns following the training. All residents would recommend the curriculum to a colleague. **Conclusions**: These preliminary findings suggest that MI might be an appropriate framework to scaffold training on addressing COVID-19 vaccine hesitancy with VR providing a safe environment for practicing prior to clinical application. Next steps include evaluating the curriculum's impact on COVID-19 vaccination rates.

Perception and Practices of Breastfeeding in Dominican Mothers in the Dominican Republic

Kylie Mena, MD; Rafael Mena, MD; Laura Ward, MD, IBCLC; Javier Gonzalez del Rey, MD, MEd; Amy Rule, MD, MPH

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Background: Breastfeeding has been shown to provide the optimal nutrition, offering many benefits for both infants and their mothers. As a result, exclusive breastfeeding for the first 6 months is the recommendation of many health organizations, including the AAP and the WHO. In the 2013 report from Encuesta Demográfica y de Salud, six-month exclusive breastfeeding rates within the Dominican Republic (DR) were only 7% despite report that 82% of babies less than two months had received breast milk. Multiple studies suggest early initiation of complementary foods in the DR could be contributing to the low exclusivity rates. **Objective**: To explore mothers' feeding practices and perceptions in the DR to help inform appropriate local interventions to promote exclusive breastfeeding. **Methods**: We performed a cross-sectional survey of mothers in the NICU and post-partum unit in a public women's hospital in Santo Domingo, DR. Eligible participants were mothers who spoke Spanish or English. **Results**: In total, 103 mothers were approached to participate. Twenty-three mothers who spoke a language other than Spanish or English were excluded; one mom declined participation and two surveys were partially completed which left final N=79. Dominican born mothers comprised 87% with 11% of Haitian origin. First time moms accounted for 31.6% of the study population, and 90% of mothers had history of c-section. We found 86% of the mothers endorsed having breastfed or were actively breastfeeding. The exclusive breastfeeding rate was 32.6% and 46% of all moms surveyed used formula. Introduction of complementary intake prior to 6 months was 54.5%, with 44% of mothers giving infants water between 0-3 months. Further analysis to evaluate practices and perceptions by demographics is underway. **Conclusions**: This population had a higher exclusive breastfeeding rate than previous reported national average as evidenced by duration of feeding, supplementation and appropriate introduction of complementary foods. This could be due to sample bias or methodology, or evidence that exclusive breastfeeding rates have improved over the last decade. Congruent with prior studies, majority of mothers introduced complementary foods and beverages prior to 6 months which suggests that as an area of educational intervention at this hospital.

The Effects of the COVID-19 Pandemic on Pediatric Dog Bite Injuries

P. Thomas Menk, MD; Melinda Mahabee-Gittens MD, PhD; Wendy Pomerantz MD, MS

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Background: Shortly after the onset of the COVID Pandemic, when many schools and outside activities were suspended, dog adoption rates increased. It is unknown if increased dog adoption rates along with stay-at-home orders resulted in increases in the prevalence of dog bites in children. **Objective:** To examine the incidence and characteristics of dog bites in children seen in a pediatric emergency department (PED) during the COVID-19 pandemic compared to before the pandemic. **Methods:** A retrospective review of children aged 0-18 yrs. evaluated in a level 1 pediatric trauma center and its satellite PED from March 1, 2018 through February 28, 2022 who had a discharge diagnosis of dog bite (ICD-10 W54.0XXA) was conducted. Subsequent patient visits for the same diagnosis were excluded. Pre-pandemic cases, March 2018 through February 2020, were compared to those that occurred during the pandemic, March 2020 through February 2022. All data was analyzed using chi-square analysis and student's t-tests. **Results:** During the study months, 2,222 children (3.4% of all injury visits) were for dog bites. Compared to pre-pandemic cases, the incidence rate for the first year of the pandemic was 1.5 times higher than the 2 pre-pandemic years; the incidence returned closer to the pre-pandemic rate during the second year. There were no differences between the pre-pandemic and during pandemic groups regarding age, sex, race, or ethnicity. For both groups, children ages 5 to 9 years were most affected (33.6% pre-pandemic vs 35.2%). However, more patients had private insurance during the pandemic (60.2% vs. 49.8%, $p<0.001$). More patients were admitted during the pandemic vs before (6.1% vs 3.7%, $p < 0.05$). Facial injuries and multiple injuries occurred more frequently during the pandemic (face 35.9% vs 33.5%, respectively and multiple 18.5% vs. 15.6%, respectively, $p<0.05$). **Conclusions:** There was a higher incidence of pediatric ED visits, higher admission rates, more privately insured patients, and an increase in facial and multiple body part injuries in children who were seen for dog bites during the COVID pandemic compared to pre-pandemic. These results will help with target injury prevention efforts in the event of a future pandemic.

Pressure-Wire Guided Hybrid Branch Pulmonary Artery Band Placement for Palliation of Single Ventricle Congenital Cardiac Lesions

Jonathan Pacella, MD; Shabana Shahanavaz, MD; Eimear McGovern, MD; Russel Hirsch, MD; David Lehenbauer, MD; David Winlaw, MD; James Tweddell, MD; David Morales, MD; Sarosh Batlivala, M.D

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Background: Historically, bilateral pulmonary artery band (bPAB) placement was guided by surrogate markers for pulmonary blood flow including systemic blood pressure (BP) and arterial saturations. These metrics alone may result in suboptimal bPAB placement. **Objective:** We present a novel hybrid bPAB (hPAB) procedure employing intraoperative angiography and pressure wire assessment to evaluate pulmonary hemodynamics and improve procedural outcomes. **Methods:** We performed hPAB procedures on 23 patients between August 2015 and May 2022. Procedures involved main pulmonary artery (PA) angiography followed by selective branch PA pressure-wire assessment. Goal mean PA pressure was 18-25mmHg. Standard surrogates BP and arterial saturation were also recorded. **Results:** Median total hPAB procedure time was 190 minutes [IQR 156.5-224.5 minutes]. During the procedure, 10 cases (43%) involved adjustments of at least one overly restrictive band. Five patients (22%) required 12 PA interventions after hPAB of which 11 (92%) were transcatheter and 1 (8%) operative. Fifteen patients (68%) have undergone the next operation. Five (22%) patients underwent branch PA intervention after the subsequent operation, at a median of 7 days [IQR 7 – 73 days] post-operatively including two patients with (8.7%) PA stents. **Conclusions:** Hybrid bPAB procedures, guided by angiographic and pressure-wire data help identify patients with restrictive bands. Most patients (~ 80%) undergoing this procedure did not require future PA intervention and demonstrated appropriate bilateral PA growth, regardless of circulation type or repair pathway. When required, PA reintervention was almost exclusively transcatheter.

Needs Assessment for Labor and Delivery Nursing NRP Training and Maintenance of Skills

Franklin Privette, MD; Michael Zujkowski, MD; Matthew Zackoff, MD, MEd; Jennifer Brady, MD; Beth Ann Johnson, MD; Shanmukha Sai Niranjan Mukthapuram, MD

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Background: Approximately 10% of US newborns require basic resuscitative measures while 1% require advanced measures such as positive-pressure ventilation (PPV), at birth. These measures dramatically decrease rates of birth asphyxia. Yet, up to 16% of initial resuscitation steps are not compliant with Neonatal Resuscitation Program (NRP) guidelines and there is a 55% non-compliance rate with advanced NRP measures, such as PPV. Labor and delivery (L&D) nurses are often asked to start initial NRP steps and provide PPV if necessary. **Objective**: We aim to identify areas of deficit in adherence to NRP protocol by L&D nurses in the delivery room setting. **Methods**: Adherence to NRP protocol was assessed using a validated tool based on a neonatal resuscitation curriculum. Resuscitations were evaluated using a modified simulation tool scored by trained study investigators. Adherence assessments were reviewed by all examiners. L&D nurses reported confidence in effective NRP via 6-point Likert scale. **Results**: Thirty-seven L&D nurses participated, with 2.5 years of median experience. Median time since initial NRP training was 3 years; median years since last NRP training was 1 year. L&D nurses washed their hands and checked equipment in 40.5% of resuscitations. PPV was started by one minute in 56.8% of encounters, but was only effective in 32.4%. Median time to initiate PPV was 55 seconds. Median time to achieve effective PPV was 108 seconds. L&D nurses rated confidence in performing an effective NRP as 4 out of 6, but only 57.1% of all evaluated steps were performed accurately. **Conclusions**: There is a gap between effective performance of NRP, but adherence to NRP has been proven feasible in previous studies. Less than half of nurses performed all steps of basic NRP, indicating simple reminders could be effective. Only one-third achieved effective PPV within the one minute goal which improves outcomes. The majority did not achieve effective PPV until almost 2 minutes. These rates did not vary after controlling for L&D nursing confidence, indicating additional training to teach rapid and accurate assessments is needed.

Long Term Kidney Outcomes in Wilms Tumor Survivors

Shannon Reinert, MD; Stefanie Benoit, MD, MPH; Nagarajan Rajaram, MD, MS

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Background: Wilms tumor (WT) is the most common renal malignancy of childhood. Survival rates have steadily increased over the past few decades, and WT now holds an excellent prognosis. Long-term kidney outcomes in WT survivors remain unclear. Previous studies have reported varying rates of decreased kidney function, hypertension, proteinuria, and compensatory hypertrophy (CH), with some studies reporting a low risk for long term renal dysfunction. **Objective**: This study's aim was to investigate long-term kidney outcomes of WT survivors at our institution, using updated combination GFR estimation equations and including survivors with risk factors that put them at higher risk for kidney dysfunction. **Methods**: This retrospective study included 49 WT survivors who were >5 years off therapy. We estimated the GFR using the CKiD U25 equations with and without cystatin C. Additionally, charts were reviewed for evidence of hypertension, proteinuria, and CH of the remaining kidney. **Results**: At a median follow up time of 11.1 years after completion of treatment (range 5 – 19.3 years), 18 patients had a decreased eGFR (<90 mL/min/1.73 m2) based on creatinine + cystatin C. An additional 3 patients had no cystatin C, but had decreased eGFR based on creatinine alone. Three patients had eGFR <60 mL/min/1.73 m2. A decreasing trend in eGFR was observed with longer follow-up. Compensatory hypertrophy was observed in 28 of the 45 patients (62%) who underwent a unilateral radical nephrectomy. At their most recent blood pressure check, 22 patients (45%) had an abnormal blood pressure (1 with stage 2 HTN, 6 with stage 1 HTN, 15 with elevated blood pressure). Four patients with abnormal clinic blood pressures subsequently had ambulatory blood pressure monitoring, two were found to have hypertension and two had no evidence of hypertension. Twenty-seven patients were evaluated for proteinuria with a random UPC ratio. Eight of the patients (30%) were found to have proteinuria. There was no relationship between kidney dysfunction and radiation to the contralateral kidney or age at diagnosis. **Conclusions**: Adverse kidney outcomes are common in survivors of WT, and they should be monitored carefully for the development of decreased GFR, hypertension, and proteinuria.

Emergency Department and Psychology Care Patterns That Develop Following a Traumatic Brain Injury in Children and Young Adults

Jeremy Shapiro, MD; Surbhi Bhatnagar, PhD; Alexis Mitelpunkt, MD; Bruce Aronow, PhD; Brad Kurowski, MD, MS

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Background: Traumatic Brain Injury (TBI) is the leading cause of morbidity and mortality in individuals under 45 years of age globally. Previous research indicates that mental health and psychiatric disorders are common sequelae following a brain injury. After a TBI, 48.3% of people develop a psychiatric disorder within 30 years, with 35% of these new diagnoses occurring in the first year after a TBI. **Objective**: The purpose of this study is to characterize the follow-up patterns following a TBI with a focus on emergency department visits and psychology visits. **Methods**: A database was formed via a retrospective extraction of information from the electronic health record. Patients included those who presented to Cincinnati Children's Hospital Medical Centers with a TBI (all severities: mild through severe injuries) from 2006-2022 and 21 years of age or younger at time of initial TBI diagnosis. Using the program Alteryx, the data were parsed through to find demographic data, diagnoses, emergency department visits, and psychology appointments. **Results**: 27,485 patients met initial inclusion criteria with close to 75% having a diagnosis of a concussion without loss of consciousness. The most common age at injury was 15 years with 42% of patients being female. About 67% of this patient group had visits to the Emergency Department and 23% of this patient group had visits to Psychology during the first 7 years following their TBI. There was a large increase in the number of visits in the initial year following the TBI to both the Emergency Department and Psychology compared to prior to the injury. The number of Emergency Department visits returned to pre-injury levels 1 year after injury and Psychology visits returned to pre-injury levels after 3 years. **Conclusions**: TBI in children is associated with an initial increase of visits to the Emergency Department and Psychology appointments, with the number of visits returning to baseline levels one year after injury and 3 years after injury for the Emergence Department and Psychology respectively. Future research should further delineate the nature of these visits and consider ways to optimize care for these individuals, especially during the initial years after injury.

Evaluation of the Use of Visual Storytelling as an Educational Intervention in the CICU

Christiana Stark, MD; Nadine Kasparian, PhD, MAPS; Julia Baenziger; Philip Khoury;
Meghan Chlebowski, MD, MHPE

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Background: Children and their parents often experience anxiety and traumatic stress after intensive care unit (ICU) admissions that can interfere with longer-term child and family psychosocial outcomes[1,5]. While providing information on expectations after ICU discharge reduces parental anxiety[8], there is limited data on the use of proactive educational interventions to prevent or reduce traumatic stress during cardiac ICU (CICU) admission. **Objective**: To evaluate the safety and acceptability of educational videos utilizing graphic storytelling to provide information to caregivers on the CICU environment and post-operative care. The videos aim to empower caregivers to engage in their child's care and address common sources of distress including feeling helpless, exposure to environmental triggers (e.g. medical equipment, alarms), and ongoing uncertainty. **Methods**: Two educational videos and an online survey were sent to 29 families previously admitted to the CICU (April 2020 to March 2021). Caregivers' views of the videos in terms of quality, quantity, format, and relevance of information were assessed, as were caregivers' emotional responses and views on whether the videos would empower parents to partner in their child's care, improve their CICU experience, or reduce traumatic stress. Quantitative thresholds for safety and acceptability were set *a priori*. An inductive approach to content analysis was utilized to identify themes in qualitative data. **Results**: 16 parents participated in this pilot (response rate: 55%) and 13 parents completed all survey items (participation rate: 45%). All acceptability and safety thresholds were met; 92% of parents indicated the videos were helpful and 85% indicated they were "very" or "extremely likely" to recommend the videos to other families. Regarding safety, no parents reported significant distress after viewing the videos. Expressions of parental empowerment were common, with 92% indicating the videos made them feel like an important member of the care team. In qualitative responses, parents perceived the videos as helpful in mitigating emotions if viewed prior to CICU admission. **Conclusions**: Proactive use of educational videos utilizing graphic storytelling to orient families to the CICU environment and address common sources of stress are important complementary interventions to mitigate traumatic stress and encourage parental empowerment during CICU admission.

Understanding Primary Spontaneous Pneumothorax Management and Outcomes in Children: A Retrospective Case Series

Sara Touzinsky, MD; Beth Rymeski, DO; William Hardie, MD; Adam Vukovic, MD, MEd; Paria Wilson, MD, MEd

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Background: Recent literature describes variability in management of pediatric primary spontaneous pneumothorax and evolving evidence that conservative management is non-inferior to intervention. **Objective**: We sought to describe patient characteristics, management strategies and outcomes of children with primary spontaneous pneumothorax. **Methods**: We conducted a retrospective case series of all primary spontaneous pneumothorax cases presenting to the two emergency departments at Cincinnati Children's Hospital Medical Center between 2014 and 2021. Participants included patients < 21 presenting to the emergency department with first time episode of primary spontaneous pneumothorax. We measured percentage of tube thoracostomy, length of stay, recurrence rates, rate of tension pneumothorax, and disposition. **Results**: Of the ninety-five cases of primary spontaneous pneumothorax reviewed, 82 received oxygen therapy and 48 underwent tube thoracostomy. Length of stay was seven times longer for patients who underwent tube thoracostomy compared to those who did not. Recurrence rate in our study sample was 31%. No patients developed tension physiology. There was significant variability in the decision to perform tube thoracostomy and caliber of tube placed, use of oxygen, and final disposition. **Conclusions**: With recent evidence supporting the safety of observation for patients with primary spontaneous pneumothorax, these results highlight the importance of standardizing care in this population and limiting unnecessary procedures associated with prolonged hospital length of stay and potential complications.

Butorphanol and Ketamine Use in Patients with a Diagnosis of Hurler Syndrome Undergoing Bone Marrow Transplantation (BMT)

Madeline Weber, MD; Alexa Svoboda, BA; Brittney Whitford, MD; Rachel Thienprayoon, MD

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Background: Hurler syndrome is rare lysosomal storage disease caused by deficiency in the activity of the lysosomal alpha-L iduronidase (IDU) enzyme. Bone marrow transplantation (BMT) is the only treatment with known efficacy in halting the aggressive features of this disease and is most advantageous when performed early in disease course in hopes of optimizing preservation of neurocognitive function. However, management of mucositis pain during BMT in patients with Hurler syndrome is challenging because of respiratory depression from opioid medications in the setting of known upper airway and pulmonary manifestations of Hurler syndrome. In this retrospective review, we detail our experience with butorphanol (a mu agonist/antagonist) and ketamine as an alternative form of analgesia when compared to traditional mu agonist opioid medications for management of mucositis pain in patients with Hurler syndrome undergoing BMT. **Objective**: To evaluate the safety of butorphanol and ketamine compared to traditional opioid analgesics for management of mucositis pain during BMT in patients with Hurler Syndrome. **Methods**: A retrospective review of sixteen children with diagnosis of Hurler Syndrome who underwent BMT requiring opioid pain management at a single pediatric institution was completed. Clinical course and pain management characteristics were obtained using a standardized data extraction tool. **Results:** Four patients (25%) were rotated to butorphanol from traditional opioid medications as compared to twelve patients (75%) who received traditional mu agonists only. As compared to the group of patients who received traditional opioid medications, patients who received butorphanol utilized less oxygen support and had zero MRT events, transfers to the ICU, intubations, or code events. In patients who received traditional opioid medications, six (50%) had MRT events, six (50%) required transfer to the ICU, four (33.3%) required intubation and two (16.7%) had code events. Ketamine was used as an adjunctive pain medication without adverse safety effects in 2 patients in this study (12.5%). **Conclusions**: Butorphanol is a safe medication in treating mucositis related in pain in patients with underlying respiratory disease. Ketamine should be considered as an adjunctive pain medication for mucositis-related pain in patient populations.

Impact of Buccal Dextrose Gel for the Treatment of Neonatal Hypoglycemia on Breastfeeding Outcomes

Praise Yorka, MD; Afshin Taleghani, PharmD; Jennifer McAllister, MD, IBCLC;
Laura Ward, MD, IBCLC; Henry Akinbi, MD

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Background: Neonatal Hypoglycemia is often encountered in the newborn period. It is frequently managed with buccal dextrose gel (BDG) to mitigate separation of the mother/infant dyad, which might enhance breastfeeding success. In 2018, University of Cincinnati Medical Center (UCMC) implemented BDG as an ongoing effort to improve exclusive breastfeeding. **Objectives:** To assess the impact of BDG on neonatal hypoglycemia requiring dextrose infusion. To evaluate the impact of BDG on rates of exclusive breastfeeding and breastfeeding at hospital discharge. **Methods:** We included infants > 35 weeks gestation and/or birthweight > 2200g born between 2015-2022 with an initial glucose of ≤ 45 mg/dL. The outcomes of infants born between 2015-2017 (Pre-BDG epoch) were compared to those of infants born between 2018-2022 (Post-BDG epoch) with respect to neonatal and maternal demographics, need for admission to the NICU, need for IV fluids, any breastfeeding or use of human milk, exclusive breastfeeding, and breastfeeding status at discharge. **Results:** 1961 infants were included in this study with 815 and 1146 babies in the Pre-BDG epoch and Post-BDG epoch respectively. There was a higher proportion of large for gestational age infants in the Post-BDG epoch. Otherwise, there were no significant differences in maternal and infant characteristics of demographics between the two epochs. There were also no significant differences in NICU admissions for hypoglycemia, breastfeeding initiation, exclusive breastfeeding, or breastfeeding at discharge pre or post- BDG. **Conclusions:** Contrary to previous studies which reported a decreased need for dextrose infusion and improved breastfeeding outcomes associated with use of BDG, these were not consistent with our results specific to our institution. There are likely seemingly small and intangible benefits to this intervention that we were unable to assess given our study design and outcomes included therein. Further exploration of outcomes in infants who received BDG compared to those who did not may be beneficial in understanding the impact of BDG in our population.

PEERS: Promoting Early Exposure to the Responsibilities of Seniors

Eleanor Young, MD; Taylor Trussell, MD; Richard Taylor, MD; Angela Statile, MD, MEd; Karen Jerardi, MD, MEd

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Background: Acquisition of effective clinical leadership skills is a recognized priority of post-graduate medical education. Many successful residents indicate difficulties in transitioning to more senior level clinical positions due to abrupt changes in responsibility and lack of prior exposure to the tasks of a supervisory role. **Objective**: To create a formal experience for intern trainees to assume the senior resident role and evaluate its impact on self-efficacy and knowledge of necessary senior resident supervisory behaviors. **Methods:** This study included PGY-1 pediatric residents during their final month on an inpatient Pediatric Hospital Medicine service. Interns were assigned a date to function as the supervising senior, while the true senior resident on each team was asked to assume role of intern for the day. Following review of current literature and consensus of physician leaders in graduate medical education, eight necessary skills expected of senior resident inpatient team leaders were selected for assessment. Interns completed a survey evaluating perceived self-confidence in ability to perform each pre-defined supervisory task before and after their experience, distributed via REDCap database. A 4-point Likert scale for confidence was utilized for comparison. Participants shared feedback regarding their understanding of the senior resident role and how this experience would impact future preparation. Analysis included descriptive statistics and standard paired t-test for confidence score comparison, with a significance value of $p<0.05$. Qualitative feedback was reviewed for commonality. **Results:** Forty-five interns participated in the experience, with survey completion rate of 84% (n=38) included in analysis. Pre-intervention confidence scores were low, however there was a statistically significant increase in confidence scores across all domains in the post-participation group (Figure 1). Most participants found this experience to be helpful, with 76% indicating it would change the way they prepare for senior rotations in the future. **Conclusions:** While this study was limited to a single site, our findings highlight an opportunity for continued improvement in development of proficient leadership skills amongst trainees, as pre-intervention confidence scores were low across all domains. This study suggests a feasible and effective intervention to provide early exposure to leadership skills and improve preparedness for expectations during advancement in residency training.

Additional Submitted Abstracts

IN ALPHABETICAL ORDER BY RESIDENT AUTHOR(S)

Standardizing Feeding Strategies in Moderately Preterm Infants
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Differences in Pulse Oximetry Screening for CCHD in Black versus White Newborns
Kiran Bandi, MD – Categorical Pediatrics, PGY-3

Effect of Chest Wall Composition and Thickness on Electrocardiogram
Daniel Beauchamp, MD – Categorical Pediatrics, PGY-3

Impact of mTOR Inhibitors on Progression and Comorbidity Associated with Cardiac Rhabdomyomas in Tuberous Sclerosis
Katherine Boyer, MD – Categorical Pediatrics, PGY-2

Learning about Community Trauma and Healing from Community Wisdom and Action
Kathryn Davis, MD – Categorical Pediatrics, PGY-3

Examining Disparities in Skin-to-Skin Care and Parental Visitation in the NICU
Sara Grant, MD – Categorical Pediatrics, PGY-2

The Impact of Blood Product Irradiation on Allosensitization in Patients Receiving Solid Organ Transplants
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Treatment of Refractory Acute Rejection with Local Graft Irradiation in Pediatric Kidney Transplant Patients: A Case Series
Corinne Hite, MD – Categorical Pediatrics, PGY-3

Palliative Management of a Patient with Occipital Encephalocele: Unforeseen Changes after Discontinuing Artificial Nutrition
Gabrielle Latremouille, MD – Categorical Pediatrics, PGY-3

Optimization of Diagnostic Criteria to Best Distinguish Children with Hemophagocytic Lymphohistiocytosis (HLH) from Relevant Controls
Sarah McCormack-Spivey, MD – Categorical Pediatrics, PGY-3
Anisha Gopu, MD – Categorical Pediatrics – PGY-2

Improving Communication for Families with Limited English Proficiency in a Level III NICU
Kylie Mena, MD – Categorical Pediatrics, PGY-3

Three-axis Classification of Mouse Lung Mesenchymal Cells Reveals Two Populations of Myofibroblasts
Odemaris Narváez del Pilar, MD, PhD – Categorical Pediatrics, PGY-1

Characterization of Emergency Transfers from the Hospital Floor to the ICU
Olivia Post, MD – Categorical Pediatrics, PGY-2

Primary Care Physician Reported Perceived Benefits and Advantages of Microbicides and PrEP for Youth
Ginny Russell, MD – Medicine/Pediatrics, PGY-3

Higher Childhood Body Mass Index is Associated with Adult Obesity in Patients with Fontan Circulation
Maria Siow, MD – Medicine/Pediatrics, PGY-3

The Impact of Social Determinants of Health on Readmission to an Inpatient Pediatric Cardiology Unit
T. Miller Sisson, MD – Categorical Pediatrics, PGY-2

Improving Obesity Management through Resident Education
Christiana Stark, MD – Categorical Pediatrics, PGY-3

Standardizing Feeding Strategies in Moderately Preterm Infants

Maame Arhin, MD; Ting Ting Fu, MD; Ashley Schulz; Laura Ward, MD, IBCLC; Stacie Chapman, MS, RDN, LD; Abigail Adamchak, RD, LD, CNSC; Jae Kim MD, PhD

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Background: Standardized feeding protocols and donor breast milk (DBM) as supplementation to maternal breast milk (MBM) are associated with reduced incidence of necrotizing enterocolitis and improved feeding tolerance in very low birth weight (VLBW) infants born <1500 g. It is unknown if these two strategies impact clinical outcomes or growth in moderately preterm infants. **Objective**: To evaluate the impact of a standardized feeding protocol and provision of DBM on central venous line (CVL) placement, feeding tolerance, growth, and provision of MBM in MPT infants (29 to 33 6/7 weeks gestational age). **Methods**: We retrospectively identified infants born 18 months before and after clinical implementation of a feeding protocol for MPT infants born >1500 g that was introduced at a level 3 NICU in January 2019. This protocol was designed to standardize feeding advancements faster than the existing VLBW protocol that necessitates a CVL. Enteral feedings were initiated at 20 ml/kg/day and advanced 15 ml/kg/day every 12 hours. At 110 ml/kg/day, IV fluids were stopped, human milk was fortified to 24 kcal/oz, and feedings were advanced by 10 ml/kg/day every 12 hours until goal. DBM was offered to infants <33 weeks for up to 30 days. Growth velocities and anthropometric z-scores were calculated from birth to discharge and birth to 28 days. Pre- and post-implementation outcomes were compared by Chi-squared, Mann Whitney U, and t-tests. **Results**: 131 and 144 infants were identified in the pre- and post-implementation eras respectively. 82/131 and 99/144 were born <33 weeks. Days to full enteral volume (FEV) and need for CVL placement were similar between eras, but there was a narrower range of days to FEV post-implementation. No CVLs were in place at time of sepsis diagnoses. There was a higher incidence of human milk at first feeding (89.9% vs. 67.1%, $p<0.001$) and percentage of DBM intake (17.5% vs 1.4%, $p<0.01$) post-implementation. Length velocity was modestly decreased in the first 28 days (0.86 cm/week vs. 1.05 cm/week, $p=0.08$) with the availability of DBM, but this was not observed out to discharge. **Conclusions**: Implementation of a feeding protocol for MPT infants is associated with more consistent time to FEV, but further opportunities exist to improve compliance and reduce CVL placements. With monitoring and fortification, DBM use in this population is not associated with worse growth outcomes.

Differences in Pulse Oximetry Screening for CCHD in Black versus White Newborns

Kiran Bandi, MD; Shelley Ehrlich, MD, ScD, MPH; Allison Divanovic, MD; Henry Akinbi, MD; Christopher Statile, MD

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Background: Congenital heart defects (CHDs) are the most common congenital malformations and are responsible for up to 10% of all infant deaths. Critical Congenital Heart Defects (CCHDs) are life-threatening in the immediate postnatal period. However, prenatal care may be not sufficiently sensitive to capture all CCHDs, and infants may not be clinically symptomatic at birth. Therefore, 2-extremity pulse oximetry is a well-established and widely used screening in newborns to assess for subtle oxygenation differences, possibly indicating CCHD. Because timely intervention can improve infant morbidity/mortality, the state of Ohio mandates CCHD screening prior to infant's discharge to decrease risk of out-of-hospital cardiac collapse in infants with unrecognized CCHD. However, CCHD screening algorithms are derived from pulse oximetry measurements which were originally calibrated on predominantly white patient populations. Reports in adults indicate that using pulse oximetry to triage patients may be misleading because pulse oximetry in the black population falsely overestimates arterial oxygen content. Whether this racial bias in pulse oximetry measurements is true for newborn babies is unknown. **Objective**: To compare the sensitivity and specificity of pulse oximetry testing guidelines when screening for CCHD in black newborns versus white newborns. **Methods**: We performed a retrospective cohort study by chart review between January 2013 and December 2022. The study includes all black and white newborns without prenatal or family history of CHD at birth hospitals within the referral network for Cincinnati Children's Hospital Medical Center (CCHMC) Heart Institute. Additionally, the study includes all infants admitted to Cardiac Intensive Care Unit (CICU) at $\leq$ 4 weeks of age due to postnatally diagnosed CCHD. The Fisher's exact test will be calculated to compare the sensitivities & specificities of the pulse oximetry screening in the black versus white populations. Additional analyses will be completed by plotting ROC curves to test sensitivity and specificity of CCHD screening at various pulse oximetry thresholds for white versus black infants. **Results**: Pending completing data collection and statistical analysis. On preliminary review, there are ~200 subjects that failed CCHD screen and meet inclusion criteria. And ~30 subjects that had postnatally diagnosed CCHD. **Conclusions**: Pending.

Effect of Chest Wall Composition and Thickness on Electrocardiogram

Daniel Beauchamp, MD; Nicholas Szugye, MD; Shankar Baskar, MD, FHRS, CEPS-P

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Background: Electrocardiogram (ECG) is the most frequently used screening tool for left ventricular hypertrophy (LVH), using QRS voltage-based criteria. However, there is not a clear correlation between QRS voltage and LVH. The reason for this finding is unclear. **Objective**: To study the effects of chest wall composition and chest wall thickness on QRS voltages in pediatric patients, to provide a mechanistic basis for the non-specificity of QRS voltage criteria for diagnosing LVH, and to clarify the dependence of ECG signals on non-cardiac factors. **Methods**: This retrospective study included patients ≤18 years old who had chest computed tomography (CT), ECG, and echocardiogram performed within a 1-month period. Patients with structural heart disease, chest wall abnormalities, or conduction abnormalities were excluded. The maximal amplitude of the R wave and S wave were recorded from the surface leads digitally. CT image segmentation and measurements were performed using Mimics software. For each patient, a three-dimensional mask of the anterior body wall was selected (Figure 1). The boundaries of this mask were the level of the cardiac apex inferiorly, the level two rib spaces above the apex superiorly, and the midaxillary line posteriorly (approximating the region where precordial ECG leads are placed). Pre-defined Hounsfield unit thresholds were used to determine volumes of adipose and lean tissue in the selected region. Linear measurements of chest wall thickness from pleura to skin were done at the level of the cardiac apex. Linear regression was used to compare continuous variables. **Results**: A total of 82 patients were included in the study, and data collection is ongoing. A preliminary analysis of 13 patients is presented here. The mean age of these patients was 14 ± 4 years, with a mean body surface area of 1.6 ± 0.5 m^2. There was no significant correlation with R wave amplitude in V6 or S wave amplitude in V1 for any of the variables analyzed, including left ventricular (LV) mass by echocardiogram, chest wall thickness, and chest wall composition. **Conclusions**: The QRS amplitude on precordial leads might not be significantly affected by chest wall thickness or composition, similar to LV mass.

Impact of mTOR Inhibitors on Progression and Comorbidity Associated with Cardiac Rhabdomyomas in Tuberous Sclerosis

Katherine Boyer, MD; Allison Divanovic, MD; Maftuna Khudoykulova; David Ritter MD, PhD

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Background: Cardiac rhabdomyomas (CR) are a common manifestation of Tuberous Sclerosis (TSC). Although many can be asymptomatic and regress on their own, some may lead to obstruction, arrythmias, valvular disease, or systolic dysfunction requiring intervention. Dysregulation of the mTOR pathway plays a role in the development of CRs in TSC and is an important therapeutic target. mTOR inhibitors may play a valuable role in reducing morbidity and mortality related to CRs. **Objective:** To create a descriptive analysis of demographic characteristics, cardiac findings, and mTOR therapy usage in patients with known TSC. To explore the impact of mTOR inhibitor therapy on the progression of rhabdomyomas and other cardiac comorbidities, such as arrythmias, systolic dysfunction, valvular disease, and obstruction. **Methods**: A retrospective chart review was completed on a total of 139 patients aged 0-60 years old with known tuberous sclerosis who followed with Cincinnati Children's Medical Center (CCHMC).
Demographic data, mTOR inhibitor therapy status and duration, presence of non-cardiac TSC comorbidities, and specific genetic mutation were collected from chart review. Echocardiogram and electrocardiogram data was reviewed and screened for systolic function, obstruction, arrythmias, valvular disease, and rhabdomyoma number and size. **Results**: Patients (n=139) were 49% female, 92% white, 96% non-Hispanic, and reported other TSC related disorders such as developmental concerns (76%), epilepsy (82%), renal involvement (76%), and CNS lesions (89%). At least one round of mTOR inhibitor therapy was used in 75% of patients and started at a mean age of 6.52 years +/- 7.17 years. Cardiac data has been reviewed on 86 patients. 80% of these patients had CRs with the largest tumors most commonly located in the right ventricle free wall (rFW) and interventricular septum (IVS). Other associated comorbidities in patients with CRs included valvular regurgitation (23%), obstruction (11.5%), and right/left ventricular dysfunction (7.0% and 4%). **Conclusions**: CRs were commonly identified in our patient population with many receiving at least one round of mTOR inhibitor therapy. Tumors were most often located within the IVS and rFW with infrequently associated cardiac comorbidities. Awaiting further data analysis exploring mTOR inhibitor impact on cardiac comorbidities and CR progression.

Learning about Community Trauma and Healing from Community Wisdom and Action

Kathryn Davis, MD; Kristen Gasperetti, BSHS; Constance Stewart, MBA; Kathy Hale; Ebony Washington, BS; Carley Riley, MD, MPP, MHS, FAAP

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Background: The effects of trauma on the health and well-being of individuals are well described. Research shows exposure to trauma in childhood alters development, impairs cognitive and emotional functioning, and increases risk of poor health outcomes in adulthood, including heart disease, diabetes, and cancer. However, much less is understood about how trauma is experienced at a community level. As a result, we know little about how trauma impacts the health and well-being of whole communities or about how communities can heal from trauma. **Objective:** In response to calls from community partners for greater understanding and action to address community effects of trauma in Cincinnati, we created a pilot initiative to explore how community members across Cincinnati understand community trauma and seek to promote healing. **Methods:** With funding from the Center for Clinical & Translational Sciences & Training, Cincinnati Children's All Children Thrive Learning Network, and Cincinnati Children's Community Relations, we offered Community Healing Action Grants for Everyone (CHAnGE) to fund small projects promoting community healing from community trauma. Projects were conceived, designed, proposed, completed, and evaluated by community members. Project leads presented their projects and learnings at a sharing session in April 2021. Our community-academic team is preparing to analyze the project proposals, project report materials, and the transcription of the sharing session to identify common language and themes related to community trauma and healing. **Results & Conclusions:** Five projects were funded (total: $22,000; range: $3000 to $5000 per project). Recipients included Black Women Cultivating Change, Cincinnati Public School's Project Connect, Elementz, Hirsch Recreation Center, and The Heights Movement. Example interventions included a hip-hop youth orchestra, healing therapeutic art program, trauma-informed youth programming, and networking events on mental health. We are completing the qualitative analysis and anticipate results will add to our collective understanding of community trauma and healing.

Examining Disparities in Skin-to-Skin Care and Parental Visitation in the NICU

Sara Grant, MD; Jennifer McAllister, MD, IBCLC; Emily Miller, MD, MS; Laura Ward, MD, IBCLC

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Background: Skin-to-skin care (STS) provides many benefits for infants and parents including improved breastfeeding, improved bonding, decreased crying, improved temperature regulation, and decreased morbidity and mortality. For newborns who spend time after birth in the Neonatal Intensive Care Unit (NICU), STS is even more beneficial. Previous studies have demonstrated disparities in STS among neonates by race, language, and socioeconomic status. **Objective**: To compare average maternal STS sessions and average maternal visits between non-Hispanic White (NHW), non-Hispanic Black (NHB), and Hispanic families within a Level 3 NICU to determine whether disparities exist and evaluate possible etiologies. **Methods**: A retrospective chart review included neonates < 32 weeks' gestation who were discharged from the University of Cincinnati Medical Center from February to October 2022. The number of maternal visits was determined using paper logs signed by every parent upon entering and exiting the NICU. The number of STS sessions was extracted from nursing flowsheet documentation in the neonate's chart. Demographic data was collected by chart review. T-tests were used to compare differences between groups. **Results**: A total of 66 neonates were included in this pilot study. Average gestational age of neonates included in the study was 28 weeks (range of 23-31 weeks). 30 (45%) were NHW, 28 (42%) were NHB, and 5 (7.5%) were Hispanic, with the remaining listed as Unknown. Non-Hispanic White mothers averaged 6.4 visits per week with 1.1 STS sessions per week. Non-Hispanic Black mothers averaged 6.8 visits per week with 1.1 STS sessions per week. Hispanic mothers averaged 7.7 visits per week with 1.4 STS sessions per week. There were no significant differences in the number of visits per week or STS sessions by race. **Conclusions**: There was no significant difference when comparing the average number of maternal STS sessions and average number of maternal visits by race. However, the data is limited by the small population size. Other limitations of this study include the inability to factor in external measures such as length of STS, patient stability, or parental understanding of STS benefits. Overall, this study demonstrates a low incidence of STS throughout our entire population as an area for future intervention.

The Impact of Blood Product Irradiation on Allosensitization in Patients Receiving Solid Organ Transplants

Corinne Hite, MD; Kyle Merrill, MD; David Hooper, MD, MS; Charles Varnell, MD, MS; Teresa Ambrosino, BBIS

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Background: Allosensitization with anti-HLA antibodies prior to transplantation has been associated with adverse outcomes in solid organ transplant recipients. A common source of this allosensitization is blood product transfusion. At our institution, all red blood cells and platelets are leukoreduced as the default preparation. However, it has been demonstrated that 30% of patients will develop a detectable anti-HLA antibody after a single transfusion with leukoreduced packed red blood cells. At present, there is some belief that gamma-irradiation may reduce the risk of allosensitization, but the effects in clinical practice have not been well defined in the present literature. Due to this potential yet uncertain benefit, the solid organ transplant teams agreed in 2020 to provide only gamma-irradiated blood products to solid organ transplant candidates as standard of care and evaluate the effect of this change on rates of allosensitization. **Objective**: To compare allosensitization rates in solid organ transplant candidates exposed only to gamma-irradiated blood products to a cohort of patients who were not exposed to any blood products and to a cohort of patients exposed to any leukoreduced blood products. **Methods**: A retrospective review of all solid organ transplant candidates between January 2010 and July 2022 was done to identify patients with two or more PRA results prior to their transplantation date. Patients were included if the first PRA was 0% and the second PRA was drawn at least 30 days after the first and at least 30 days after a packed red blood cell transfusion, if a transfusion was received. The patients were divided based on type of preparation: leukoreduction alone v gamma-irradiation plus leukoreduction v no transfusion received. Sensitizing events and/or desensitizing treatments during the time between the two PRA were obtained via chart review. The rates of de novo allosensitization will be compared between the three groups while controlling for number and type of sensitizing and/or desensitizing treatments through multivariate analysis. **Results & Conclusion**: Data collection and data analysis have not been fully completed.

Treatment of Refractory Acute Rejection with Local Graft Irradiation in Pediatric Kidney Transplant Patients: A Case Series

Corinne Hite, MD; David Hooper, MD, MS; Charles Varnell, MD, MS; Katherine VandenHeuvel, MD; Steeve Woodle, MD

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Introduction: Intravenous corticosteroids and anti-thymocyte globulin (ATG) are mainstays of treatment in patients with acute T-cell Mediated Rejection (TCMR). However, a subset of patients experience dose limiting side effects such as serum sickness or TCMR refractory to these therapies. Management of refractory TCMR is not well studied, especially in the pediatric population. Prior to widespread use of ATG, local graft irradiation (LGI) was used for treatment of refractory acute rejection in adults but studies were poorly done and lacked biopsy assessment. In our center, we have used LGI in 3 patients with refractory rejection and report our results. **Case Presentation**: We report 3 pediatric patients with cases of biopsy proven TCMR that were refractory to steroids and ATG on repeat biopsy since 2015. In 2 of the 3 cases, use of ATG was limited by development or history of serum-sickness reaction. All three patients were treated with LGI (1.5 Gy X 3 treatments) after either steroids or steroids & ATG, depending on above limitations in use of ATG. In 2 of 3 cases, the rejection resolved completely on follow up biopsy. In the remaining case, Banff grade 1A TCMR persisted after LGI but the patient was ultimately able to achieve complete resolution on biopsy after prolonged course of high-dose tacrolimus. For 1 of the 3 patients, the post-LGI biopsy indicated new acute endothelial injury concerning for possible irradiation-induced kidney injury which correlated to a rise in serum creatinine after irradiation. All 3 patients maintained graft function through follow up of 4 months, 1 year, and 7 years. **Conclusions**: LGI may be a viable salvage therapy in pediatric patients experiencing acute TCMR refractory to traditional treatments or for those at risk of serious side effects. However, we are the first to report biopsy evidence of possible acute endothelial injury that may limit widespread use of LGI. Given our data, we suggest further studies to fully assess the efficacy and risk of this therapy in clinical practice.

Palliative Management of a Patient with Occipital Encephalocele: Unforeseen Changes after Discontinuing Artificial Nutrition

Gabrielle Latremouille, MD; Luke Mosley, MD; Krista Nee, MD; Brittney Whitford, MD

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Background: Infants born with occipital encephalocele carry a high morbidity and mortality risk, with a poor prognosis if surgical intervention is not feasible. Palliative care plays a central role in management of these patients; however, a lack of literature on comfort care measures in rare pediatric disorders including encephaloceles makes it difficult to predict clinical course and possible complications. **Objective:** This study aims to highlight the potential complexities of end of life management by describing a case in which an infant with occipital encephalocele exhibited clinical improvement and prolonged survival following discontinuation of artificial nutrition. **Case Description:** A term female newborn with a prenatally diagnosed occipital encephalocele was admitted to the neonatal intensive care unit for further management. Her encephalocele was deemed inoperable by the neurosurgical team after review of brain imaging, which demonstrated extensive brain tissue and possible brainstem within the encephalocele sac. Despite the family's desire for surgical intervention at another institution, transfer was not possible initially because the infant was clinically unstable, and later due to progression of the encephalocele and risk of surgical morbidity. The patient remained admitted to the hospital for comfort care due to the complexity of her care needs. At 18 months of age, after progressive decline in mental status and quality of life, her family made the decision to stop enteral nutrition. Following feed discontinuation, the patient became increasingly alert and agitated with notable improvement in mental status. Simultaneously, her encephalocele significantly decreased in size. Despite initial projection of death within two weeks, the infant died 33 days after discontinuing feeds. **Conclusions:** The patient's prolonged survival with signs of sustained hydration despite no provision of sustenance, along with improved mentation and encephalocele size reduction, suggest that fluid within the defect was systemically resorbed. The need for escalation in symptom management and associated medical team distress illustrate how this case significantly deviates from the expected course when withdrawing artificial nutrition in a child. Additional studies describing pediatric end of life care are needed in order to optimize patient care and accurately counsel caregivers.

Optimization of Diagnostic Criteria to Best Distinguish Children with Hemophagocytic Lymphohistiocytosis (HLH) from Relevant Controls

Sarah McCormack-Spivey, MD and Anisha Gopu, MD; Bethany Verkamp, MD;
Adi Zoref-Lorenz, MD; Dafna Brik Simon, MD; Joanne Yacobovich, MD; Michael Jordan, MD

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Background: Hemophagocytic lymphohistiocytosis (HLH) is a disorder of immune dysregulation that presents with relatively nonspecific features of severe inflammation often seen in viral illness, rheumatologic diseases, and severe sepsis. Current diagnostic criteria are based on enrollment criteria established for the HLH-2004 clinical trial despite their unknown sensitivity or specificity. **Objective**: We aim to optimize the discriminatory power of the HLH-2004 parameters using a large cohort of curated controls, and validation cohort from a contributing tertiary pediatric referral institution, to define optimized thresholds of parameters or combinations of parameters with strong discriminatory ability in identifying patients with HLH. **Methods**: A bioinformatics query was performed to identify patients younger than 21 years in whom three or more HLH-related parameters (CBC, ferritin and one additional parameter) were obtained or recorded within a narrow time window from 2010-2020. Similar multi-institutional data from patients with confirmed HLH (defined as fulfilling ≥5 HLH-2004 diagnostic criteria or a known genetic defect) was collected for comparison, with results validated using patients with known genetic defects (gold standard for diagnosis). Peak values of various diagnostic measures in HLH patients (complete blood count panel, inflammatory markers, coagulation factors, cerebral spinal fluid, etc.) will be obtained by retrospective chart review within 14 days of presentation for comparison to peak pre-treatment values in our curated control group. Once all relevant data is collected, receiver-operative curves will be created to identify useful diagnostic parameters and their optimal threshold for identifying patients with HLH. **Results**: The CCHMC query identified a control group of over 20,000 possible control patients. Review of a compiled database of patients treated for confirmed HLH identified our cohort of patients to comprise the HLH group, approximately half of which have identified genetic mutations known to cause HLH. Although initial data analysis is pending, we hypothesize that certain biomarkers at defined optimal thresholds may be more sensitive and/or specific for early diagnosis of HLH, the discriminatory power of which may be increased when combined. **Conclusions**: Diagnosis of HLH is often delayed due to variability in clinical presentation and similarity to other hyperinflammatory states. Our large multi-institutional study aims to define the sensitivity and specificity of current and novel diagnostic criteria and optimize diagnostic thresholds to allow more accurate and prompt diagnosis in children with HLH.

Improving Communication for Families with Limited English Proficiency in a Level III NICU

Kylie Mena, MD; Laura Rangel Rodriguez, MD; Nicole Boswell, MSN, RNC-NIC; Emily Miller, MD, MS, FAAP

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Background: Limited English proficiency (LEP), defined as persons who do not speak English as their primary language and who have a limited ability to read, speak, write, or understand English, affects 8.6% of the US population and 2.3% of Ohioans. LEP in healthcare settings is associated with increased hospital length of stay and readmissions, delayed diagnosis, inappropriate or excessive testing, and safety events. Access to professional interpreters improves communication, patient satisfaction, therapeutic compliance, and decreases mortality. Recent research has demonstrated infants in the neonatal intensive care unit (NICU) are affected by racial and ethnic disparities in quality of care, and communication in preferred language can partially mitigate these disparities.
Objective: Improve communication between NICU staff and patient families through multimodal intervention tracked by QI measures. **Methods**: Study was conducted at the University of Cincinnati Level III NICU. Through a multimodal approach, we sought to conduct a needs assessment, develop targeted interventions, and track process and outcomes measures. Survey of residents and nurses highlighted the need for improved access to interpretation, written materials for family, and training for staff. Interventions included informational fliers, family call-in cards, family calendars, monthly resident orientation, and a mandatory nursing education module. We retrospectively reviewed patient charts with a preferred language other than English to determine if documented encounters changed with interventions. We did not instruct staff to use this spreadsheet prior to data collection as to not bias the data. **Results**: Baseline data from January-July 2022 demonstrated an average of 0.05 interpreted encounters per patient admission day. Following interventions, this increased to 0.47 interpreted encounters per patient day. **Conclusions**: The interventions developed based on the initial needs assessment appeared to have a positive impact on documentation of interpreted encounters. This does not, however, account for those encounters not documented which is substantial. The median shift was significantly impacted by several patients who had zero documented encounters, which could be affected by mislabeling of preferred language. Anecdotal feedback from NICU staff and the Language Department all indicate improvement in the culture and discussion of the needs of the LEP population. Interventions are ongoing.

Three-axis Classification of Mouse Lung Mesenchymal Cells Reveals Two Populations of Myofibroblasts

Odemaris Narváez del Pilar, MD, PhD; Maria José Gacha-Garay, BSc, MS; Jichao Chen, PhD

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Background: The lung mesenchyme consists of heterogeneous cell populations that support neighboring structures and are integral to intercellular signaling but are poorly defined morphologically and molecularly. The limited availability of molecular markers for the lung mesenchyme has delayed its research advancement in comparison to its counterparts – the epithelial, endothelial and immune cell lineages. Thus, the mesenchymal cell players in healthy lung development and pathogenesis such as the group of childhood interstitial lung diseases are poorly understood, calling for a better understanding and further cellular characterization. **Objective**: The purpose of this study is to delineate mesenchymal cells in the healthy mouse lung and to provide a conceptual and experimental framework applicable to other organs. **Methods**: Leveraging single-cell RNA-sequencing, 3D imaging and lineage tracing, we classify the mouse lung mesenchyme into three proximal–distal axes that are associated with the endothelium, epithelium and interstitium, respectively. **Results**: From proximal to distal: the vascular axis includes vascular smooth muscle cells and pericytes that transition as arterioles and venules ramify into capillaries; the epithelial axis includes airway smooth muscle cells and two populations of myofibroblasts – ductal myofibroblasts, surrounding alveolar ducts and marked by CDH4, HHIP and LGR6, which persist post-alveologenesis, and alveolar myofibroblasts, surrounding alveoli and marked by high expression of PDGFRA, which undergo developmental apoptosis; and the interstitial axis, residing between the epithelial and vascular trees and sharing the marker MEOX2, includes fibroblasts in the bronchovascular bundle and the alveolar interstitium, which are marked by IL33/DNER/PI16 and Wnt2, respectively. **Conclusions**: Single-cell imaging reveals a distinct morphology of mesenchymal cell populations in the mouse lung. This classification paves the way for future studies in human lungs and associated pathologies related to the mesenchyme.

Characterization of Emergency Transfers from the Hospital Floor to the ICU

Olivia Post, MD; Eleanor Young, MD; Kristen Peterson, MD; Laura Brower, MD MSc; Patrick Brady, MD MSc

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Background: Pediatric patients who require emergency transfer (ET) to a critical care unit have worse outcomes, longer length of stay (LOS) post-transfer, and higher in-hospital mortality than matched controls. An ET is a floor to ICU transfer in which one of the following interventions occurs within one hour of transfer: intubation, receipt of inotropes, or at least three fluid boluses (60 mL/kg). Implementation of processes that identify and address risk factors for clinical deterioration have successfully decreased the rate of safety events. **Objective:** The aim of this study was to evaluate predictors of clinical deterioration by reviewing vital signs 4 hours prior to transfer, as well as ordered studies and interventions in the 24 hours preceding transfer. **Methods:** We conducted a retrospective case control study. Controls were patients who transferred to the critical care unit but did not require an ET, matched on age, unit, and season. Exposure variables included vital signs, oxygen requirement, laboratory studies, and interventions (e.g., fluid boluses, administration of blood products). We used age-adjusted z-scores to normalize vital signs by age for accurate comparison. T-tests were used to determine bivariate associations. **Results:** There was no significant difference in heart or respiratory rates 4 hours prior to transfer between the control and ET group once randomized for age (p=0.76 and 0.69 for HR and RR, respectively). The proportion of patients in each group who had various laboratory tests performed in the 24 hours prior to transfer, including blood/urine cultures and blood gases, was not statistically different. However, a significantly higher proportion of patients in the ET group received a fluid bolus (p=0.038). **Conclusions:** We did not find that vital signs in the 4 hours preceding transfer and the ordering of specific laboratory studies were associated with more significant deterioration. Interestingly, patients who underwent emergency transfer were more likely to receive a fluid bolus in the 24 hours prior to transfer. Our next steps include analyzing vital sign data from the entire 24 hours including blood pressures to assess whether other time points may be more predictive.

Primary Care Physician Reported Perceived Benefits and Advantages of Microbicides and PrEP for Youth

Ginny Russell, MD; Jessica Kahn, MD, MPH; Gregory Zimet, PhD; Tanya Kowalczyk Mullins, MD, MS

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Purpose: Current patient-controlled HIV prevention strategies include condoms and pre-exposure prophylaxis (PrEP); topical microbicides are in development. Because PrEP requires prescription by a physician, understanding physician attitudes toward PrEP use in youth may help improve the currently suboptimal uptake of PrEP among youth. We examined physicians' perceived benefits of prescribing or recommending topical microbicides or PrEP to adolescents and perceived advantages of topical microbicides and PrEP over condoms. **Methods:** Thirty-eight semi-structured individual interviews of Midwestern U.S. physicians who care for adolescents and young adults were conducted from August 2014-June 2016. Physician specialties included adolescent medicine, pediatrics, internal medicine-pediatrics, family medicine, and obstetrics/gynecology. The interview assessed perceived benefits of microbicides and PrEP, and perceived advantages of microbicides and PrEP over current HIV prevention methods. Transcripts were analyzed using a framework analysis approach consisting of familiarization, theme identification, indexing, and interpretation. We then determined the percentage of participants whose responses aligned with each theme. **Results:** Participants were mostly female (71%) and white (84%); mean age was 44 years. Most physicians reported reduction of HIV infections as a benefit of microbicides (82%) or PrEP (63%). The most commonly reported perceived benefits of microbicides included increased education of patients about sexual health (39%) and increased risk awareness among patients (24%). An additional benefit of microbicides was potential to be part of multipurpose prevention technology (i.e., preventing other STIs, HIV, and/or pregnancy). The most commonly reported perceived benefits of PrEP included increased education of patients about sexual health (24%) and user-friendliness (18%). Perceived advantages of microbicides over condoms included being patient-controlled (29%) and user-friendliness (18%). Perceived advantages of PrEP over condoms included ability to use in advance of sexual encounters (50%) and user-friendliness (42%). In contrast, over one-quarter of participants reported condoms having advantages over microbicides (29%) and PrEP (29%). One quarter (24%) of participants reported that condoms have no advantages over microbicides. **Conclusions:** Many physicians reported benefits of both microbicides and PrEP for prevention of HIV among youth and noted some advantages over condoms. Discussing the benefits and advantages of available methods may lead to improved uptake of HIV prevention methods among youth.

Higher Childhood Body Mass Index is Associated with Adult Obesity in Patients with Fontan Circulation

Maria Siow, MD; Anjali Chadayammuri, MD; Adam Powell, MD; Nicole Brown, MD;
Craig Alexander, MD; Samuel Wittekind, MD; James Cnota, MD; Alexander R. Opotowsky, MD; Adam Lubert, MD

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Background: Obesity is associated with adverse outcomes in patients with Fontan circulation. We assessed the prevalence of obesity in adults with Fontan circulation and evaluated the hypothesis that early childhood weight gain is associated with adult obesity. Finally, we analyzed how childhood body mass index (BMI) was impacted by the development of an interstage home monitoring program. **Objective:** To evaluate the prevalence of and risk factors for overweight and obesity in adult Fontan patients in a single center cohort. **Methods:** Retrospective cohort study of patients with Fontan circulation age 18-32 years old (Earlier Era cohort) and a comparison Contemporary cohort born after January 2013. The study excluded patients with an atriopulmonary Fontan or a genetic diagnosis known to affect growth. For the Earlier Era cohort, anthropometric data, results of recent cardiac testing, and most recent blood pressure (BP) were recorded. For the Contemporary cohort, anthropometric data were recorded. **Results:** Obese adults had higher BMI percentiles than non-obese adults at Fontan (71st [57-94.6] vs 35th [6.9-62.6]). Obese adults had lower peak VO2 (18.7 ± 5.5 vs. 25.5 ± 6.7 mL/kg/min, $p < 0.001$), higher resting systolic BP (121.3 ± 17.2 vs. 113.8 ± 11.9 mmHg, $p=0.018$) and higher ventricular end-diastolic pressure (EDP) (11.4 ± 3.4 vs. 9.1 ± 3.2 mmHg, $p=0.03$). BMI percentiles at Fontan were similar between the Contemporary and Earlier Era cohort (43rd [16.8-68.4] vs 43rd [9.1-74.7], $p=0.98$). **Conclusions:** Higher childhood BMI percentile is associated with increased probability of obesity in adults with Fontan circulation. In adulthood, obesity is associated with worse exercise capacity, higher BP, and higher EDP. We found no significant change in BMI percentile after January 2013 despite increasingly proactive feeding protocols.

The Impact of Social Determinants of Health on Readmission to an Inpatient Pediatric Cardiology Unit

T. Miller Sisson, MD; Jewel Park, MD, MPH; Sarah de Loizaga Carney, MD; Brittany Frakes, RN; Myra Saeed, MPH;
Sam Hanke, MD, MS, MBA; Elisa Marcuccio, MD

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Background: Pediatric hospital readmissions are common and are estimated to cost roughly $1.5 billion annually. Approximately 10-20% of patients undergoing surgery for congenital heart disease (CHD) are readmitted within 31 days of discharge. Evaluating preventability of readmissions is challenging, but up to 30% of pediatrics admissions may be preventable. Both medical and socioeconomic factors are associated with readmission after congenital heart surgery. Many studies have established the relationship between social determinants of health and clinical outcomes in pediatric cardiology. Poverty, housing instability, parental educational attainment, minority status, food insecurity, and transportation barriers have been associated with higher mortality, less frequent prenatal diagnosis of CHD, higher incidence and prevalence of CHD, adverse post-surgical outcomes, impaired neurodevelopmental outcomes, and poorer quality of life. **Objective:** To assess inequalities among preventable and urgent/emergent readmissions to the acute care cardiology unit (ACCU) at our institution on the basis of individual and community-level social determinants of health. **Methods:** We will perform a retrospective analysis of all patients readmitted to the ACCU at our institution within 7 days of index admission from 2019-2022. Reason for each readmission as well as preventability and urgency of readmission was assessed by a multidisciplinary provider team. Descriptive statistics will assess demographic and clinical characteristics of readmitted patients. Chi-square or Wilcoxon rank sum tests will be used to evaluate demographic differences in readmission status. A community-level deprivation index (DI) will be determined based on patient's home address and the American Community Survey. One-way analysis of variance model will be used to determine association of DI and preventability or urgency of readmission. **Results/Conclusions:** This study is ongoing, and results are not yet available. We hypothesize that patients who are readmitted within 7 days of index admission and readmission is identified as preventable or urgent/emergent are more likely to identify as minority race/ethnicity, utilize public insurance, and/or identify a language other than English as their primary language in the home. We also hypothesize these patients are more likely to have a higher DI.

Improving Obesity Management through Resident Education

Christiana Stark, MD; Jeffrey Zhang, MD; Jessica Walters, MD; Nick DeBlasio, MD, MEd; Melissa Klein, MD, MEd; Robert Siegel, MD; Kristin Stackpole, MD

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Background: Childhood obesity has been identified as a global public health crisis due to rapidly increasing rates and associated long term physical and mental health consequences. Primary care pediatricians are essential to address this growing concern; however, data on clinician preparedness to discuss weight management with families suggests that providers across all levels of training lack the sense of self-efficacy. **Objective**: Evaluate the change in pediatric resident self-efficacy and comprehensive documentation on obtaining pertinent history, providing counseling, and proper management of patients with obesity after an educational intervention in the Pediatric Primary Care Center (PPCC). **Methods**: This is a prospective educational study of residents with continuity clinic at the PPCC. During three pre-clinic teaching sessions residents learned about utilizing a multidisciplinary approach for obesity management, discussing a healthy lifestyle, collecting pertinent history items, creating goals to increase healthy habits, and other treatment components including appropriate lab testing, referral criteria, and follow-up time frames. Immersive education utilized interactive presentations and a video of a patient encounter with required responses to parent and patient dialogue. Residents rated their self-efficacy on topics relating to management of patients with obesity using a retrospective pre-post anchored response scale completed following the final educational session. Retrospective chart review was performed on participating residents' charts for patients ages 6-18 with BMIs >95th percentile presenting for well child checks. Resident documentation on history details, health goal creation, and management items was collected for comparison before and after the education. **Results**: A total of 67/78 residents participated in the pre-post self-efficacy survey (response rate 86%). Residents rated their self-efficacy in all aspects of the management of patients with obesity significantly higher following the education compared to pre-education scores (p-value <.0001). Improvement in self-efficacy scores did not vary with year of residency training. Changes in documentation following the education are currently under analysis with data collection ending mid-March. **Conclusions**: A continuity clinic-based educational intervention improved pediatric resident self-efficacy on the management of patients with obesity. Next steps include final data collection and evaluation of the impact on comprehensive resident documentation following the educational intervention as compared to prior.

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