2021

RESEARCH SCHOLAR DAY

17TH ANNUAL EVENT

MAY 12, 2021 | 10 AM

Ann & Robert H. Lurie Children's Hospital of Chicago
Northwestern University, Feinberg School of Medicine
Stanley Manne Children's Research Institute
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Page 142: Thank You to Our Faculty Reviewers
RSD 2021

June 2019 marked the opening of the new Louis A. Simpson & Kimberly K. Querrey Biomedical Research Center.

**Research Scholar Day Faculty Leadership**

**Matthew M. Davis, MD, MAPP**
Chair of the Department of Pediatrics
Founders' Board Centennial Professor
Executive Vice-President and Chief, Community Health Transformation - Patrick M. Magoon Institute for Healthy Communities

**Patrick C. Seed, MD, PhD**
President & Chief Research Officer, Stanley Manne Children’s Research Institute
Children’s Research Fund Chair in Basic Science

**Jennifer L. Trainor, MD**
Associate Chair for Education, Department of Pediatrics

**Meredith F. Bone, MD, MSCI**
Director, Office of Fellowship Programs, Department of Pediatrics

**Mark D. Adler, MD**
Associate Director, Office of Fellowship Programs, Department of Pediatrics

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2012 New Hospital
2019 New Simpson Querrey Research Building

What's Next?

- Total Research Studies: 1,500+
- Researchers: 550+
- Laboratories: 56
About Research Scholar Day

Every spring, the Department of Pediatrics and Stanley Manne Children’s Research Institute host an annual Research Scholar Day, where postdoctoral fellows, fellows, graduate students, senior residents and research staff present their research to medical staff and colleagues in a professional conference environment.

The 2021 Research Scholar Day Winners will be announced at the beginning of the Department of Pediatric's Grand Rounds on Friday, May 14th, 2021.

For more information, please visit: https://www.luriechildrens.org/en/research/ & https://www.pediatrics.northwestern.edu/research/rsd.html
C O N G R A T U L A T I O N S T O O U R
2 0 2 0 1 6 T H A N N U A L R E S E A R C H
S C H O L A R D A Y W I N N E R S

R S D 2 0 2 0
W I N N E R S

- Swati Antala, MD
- Colleen Badke, MD
- Sean DeLacey, MD
- Taylor Heald-Sargent, MD, PhD
- Natalie Hoffmann, MD
- Erin Klein, MD
- Anisha Kshetrapal, MD
- Peggy Murphy, MILS
- Mariana Perepichka, BA
- Brooke Pfister, MD
- Ann Prybylowski, MD
- Andrew Prigge, MD
- Lauren Rissman, MD

(Pictured above left to right alphabetically)

The 2020 Winning Research Scholar Day project information have been linked below:

2020 Winning RSD Presentations
"We are dedicated to the health and well-being of all children. As the pediatric teaching facility of Northwestern University Feinberg School of Medicine, this commitment drives us to be a leader in: pediatric healthcare delivery, research into the prevention, causes, and treatment of diseases that affect children, education for physicians, nurses and allied health professionals, and advocacy for the general well-being of all children."

10:00 AM - 10:15 AM
WELCOME & OPENING REMARKS
Matthew Davis, MD, MAPP, Patrick Seed, MD, PhD, Jennifer Trainor, MD
Join via Zoom Webinar link
https://northwestern.zoom.us/j/92234733865?
pwd=Q2wIOEtPuZmUVvYmNOZnFCMntUT09
Passcode: LurieRSD

10:15 AM - 11:45 AM
LEAVE ZOOM WEBINAR AND JOIN ZOOM ROOMS HOSTED BY REVIEWERS

Reviewers and Presenters: Please join your assigned group's Zoom Room by 10:15 am. Presenters will share their own slides using the "Share Screen" function on Zoom.

Visitors: Please use Ctrl-F to search in this booklet for the research presenter's Zoom group link and their presentation time that you would like to join. You can watch more than one presentation by leaving the Zoom and joining the next presentation.

12:00 PM - 1:00 PM
KEYNOTE SPEAKER
Join via Zoom Webinar link
https://northwestern.zoom.us/j/92234733865?
pwd=Q2wIOEtPuZmUVvYmNOZnFCMntUT09
Passcode: LurieRSD

"Developing and Implementing Evidence-based Care for Pregnant and Post-Partum Patients with Opioid Use Disorder and their Children"
by Hendree Jones, Ph.D.,
Executive Director, UNC Horizons, and Professor, Department of Obstetrics and Gynecology, School of Medicine; The University of North Carolina at Chapel Hill (UNC-CH), Chapel Hill, North Carolina; joint appointments – Professor, Department of Psychology UNC-CH and Professor, Department of Psychiatry and Behavioral Sciences at Johns Hopkins University.
Keynote Speaker
Hendree Jones, PhD

Title of Talk: “Developing and Implementing Evidence-based Care for Pregnant and Post-Partum Patients with Opioid Use Disorder and their Children”
by Hendree Jones, Ph.D.,
Executive Director, UNC Horizons, and Professor, Department of Obstetrics and Gynecology, School of Medicine; The University of North Carolina at Chapel Hill (UNC–CH), Chapel Hill, North Carolina; joint appointments – Professor, Department of Psychology UNC–CH and Professor, Department of Psychiatry and Behavioral Sciences at Johns Hopkins University.

About Dr. Jones...
Dr. Jones is a licensed psychologist and an internationally recognized expert in the development and examination of both behavioral and pharmacologic treatments for pregnant women and their children in risky life situations. She has received continuous National Institutes of Health funding since 1994 and has written more than 200 publications. Dr. Jones has also authored two books, one on treating patients for substance use disorders and the other on comprehensive care for women who are pregnant and have substance use disorders. She also has written multiple textbook chapters on the topic of pregnancy and addiction. Dr. Jones has co-authored multiple national and international guidelines on the topic of caring for pregnant and post-pregnant people with substance use disorders and their children including those published by the World Health Organization (WHO), the Substance Abuse and Mental Health Services Administration and the American Society for Addiction Medicine. She also co-authored both the women’s and children’s section of the United Nations (UN)’s International Standards for the Treatment of Drug Use Disorders and the UN guidelines on prevention and treatment for girls and women. While winning multiple awards, most recently in 2020 Dr. Jones won the American Society of Addiction Medicine (ASAM) R. Brinkley Smithers and Distinguished Scientist Award. She is a consultant for the UN and the WHO and is a member of the NIH’s HEAL multidisciplinary working group. Dr. Jones leads or is involved in projects around the world focused on improving the lives of children, women, and families.
2021 RSD Zoom Room Assignments

Suggested Order of Presentations in Zoom Breakout Rooms as Listed Below; However it is NOT Guaranteed
Each Presenter has 15 minutes to present (7 minutes for presentation, 8 minutes for Reviewer’s questions)

Zoom Room 1

**Reviewers: Mark Adler, MD and Jacqueline Corboy, MD**
https://northwestern.zoom.us/j/96141524986?pwd=anJKVVM5TVo4bjNpUDlmS1V4WHaSU09
Meeting ID: 961 4152 4986
Passcode: LurieRSD

Presenters:
10:15-10:30 am – Anisha Kshetrapal, MD, MSED; Third Year Pediatric Emergency Medicine Fellow
"Overaching: A mechanism for learning at the evolving edge of a trainee’s expertise" - Research Category: Medical Education
10:30-10:45 am – Lori Mendelsohn, MD; Second Year Pediatric Resident
"Increasing Epic MyChart Activation among children ages 12 and under at Lurie Children's Pediatrics in Uptown" - Research Category: Quality
10:45-11:00 am – Lauren Rissman, MD; Third Year Pediatric Critical Care Medicine Fellow
"Parent and Physician Report of Discussions about Prognosis for Critically Ill Children" - Research Category: Clinical
11:00-11:15 am – Matthew Rowland, MD; First Year Pediatric Critical Care Medicine Fellow
"PICU Direct - Comparing the Impact of Direct Laryngoscopy vs Video Laryngoscopy on Team Dynamics and Teaching during Endotracheal Intubation in the Pediatric Intensive Care Unit" - Research Category: Clinical
11:15-11:30 am – Matthew Shapiro, MD; Second Year Pediatric Hospital-Based Medicine Fellow
"Reducing Practice Variation in the Management of Croup" - Research Category: Quality
11:30-11:45 am – Brandon Sumida, MD; Second Year Pediatric Resident
"Assessing Pediatric Resident Comfort with Newborn Guidance at A Major Academic Tertiary Center" - Research Category: Quality

Zoom Room 2

**Reviewers: Lisa Akhtar, MD, PhD and Patrick Seed, MD, PhD**
https://northwestern.zoom.us/j/91520726969?pwd=ZKkVTVQITkQyOHkzYktFb0UzQVpDZz09
Meeting ID: 915 2072 6969
Passcode: LurieRSD

Presenters:
10:15-10:30 am – Anastasia Frank-Kamenetskii, PhD; Postdoctoral Fellow
"INHIBITION OF SOLUBLE FLT-1 DECREASES INTESTINAL INJURY AND IMPROVES SURVIVAL IN A NEONATAL MOUSE MODEL OF NECROTISING ENTEROCOLITIS" - Research Category: Basic
10:30-10:45 am – Nathaniel Henning, BS, BA; Graduate Student, Year 5
"Mapping the Physical Properties of the Bovine Ovary and Contributions of the Matrisome Towards Improved Engineered Materials" - Research Category: Basic
10:45-11:00 am – Daniel McAree, MD; First Year Pediatric Cardiology Fellow
"Echocardiographic Assessment of Diastolic Dysfunction and Strain Measurements in Multi-system Inflammatory Syndrome in Children (MIS-C) Associated with COVID-19" - Research Category: Clinical
11:00-11:15 am – Monti Sharma, MD; Third Year Neonatal and Perinatal Medicine Fellow
"RNAseq Reveals Novel Monocyte-Mediated Pathways of Placental Dysfunction" - Research Category: Translational
11:15-11:30 am – Farid Ullah, MS; Graduate Student, Year 3
"A recessive mutation in TFAM causes mtDNA depletion associated with primary ovarian insufficiency, seizures, intellectual disability and hearing loss" - Research Category: Basic
11:30-11:45 am – extra time if presenters run over/free time before keynote speaker
2021 RSD Zoom Room Assignments

Suggested Order of Presentations in Zoom Breakout Rooms as Listed Below; However it is NOT Guaranteed Each Presenter has 15 minutes to present (7 minutes for presentation, 8 minutes for Reviewer's questions)

Zoom Room 3

Reviewers: Mehreen Arshad, MBBS and Isabelle DePlaen, MD
https://northwestern.zoom.us/j/94297897954?pwd=eTRDcWxaT0fwL0ITZTRINm0vWTRQdz09
Meeting ID: 942 9789 7954
Passcode: LurieRSD

Presenters:
10:15-10:30 am – Kathryn Cherny, PhD; Postdoctoral Fellow
"Characterizing Clostridium innocuum contributions to antibiotic-associated diarrhea via the peptidoglycan hydrolase C1_{10448}" · Research Category: Basic
10:30-10:45 am – Elisa Ochfeld, MD; Third Year Pediatric Allergy and Immunology Fellow
"Evaluating Humoral Primary Immunodeficiencies using Coding Joint to Kappa-Deleting Recombination Excision Circle (CJ KREC) ratio and Serum B-cell Activating Factor (BAFF) Level" · Research Category: Translational
10:45-11:00 am – Xiaocai Yan, PhD; Research Assistant Professor
"Neonatal intestinal macrophages promote microvascular development through an IGF-1-dependent mechanism and lack of macrophage-derived IGF-1 predisposes newborn mice to necrotizing enterocolitis" · Research Category: Basic
11:00-11:15 am – extra time if presenters run over/free time before keynote speaker
11:15-11:30 am – extra time if presenters run over/free time before keynote speaker
11:30-11:45 am – extra time if presenters run over/free time before keynote speaker

Zoom Room 4

Reviewers: Meredith Bone, MD, MSci and Andrea Pardo, MD
https://northwestern.zoom.us/j/85159302841?pwd=MkZ3aFYOYVREmKRXWmFISmhxYzB3dz09
Meeting ID: 951 5930 2841
Passcode: LurieRSD

Presenters:
10:15-10:30 am – Thomas Carberry, MD; Third Year Pediatric Cardiology Fellow
"Correlations between fetal SVT and postnatal SVT" · Research Category: Clinical
10:30-10:45 am – Jeanne Frisby-Zedan, MD; First Year Pediatric Nephrology Fellow
"Evaluation of Chronic Kidney Disease, Hypertension, and Proteinuria in Pediatric Patients Following Acute Kidney Injury Requiring Continuous Renal Replacement Therapy" · Research Category: Clinical
10:45-11:00 am – Angie Onorato, MD; Third Year Pediatric Resident
"Pediatric Residency Educational Needs Assessment" · Research Category: Medical Education
11:00-11:15 am – Jana Shapiro, MD; Third Year Pediatric Resident
"Rates of Sudden Unexpected Infant Death (SUID) in Infants of U.S.-born and Foreign-born Women" · Research Category: Epidemiology
11:15-11:30 am – Selina Varma, MD, MPH; Third Year Pediatric Medicine Fellow
"Factors Associated with Revisits Among Encounters to Children at Hospitals" · Research Category: Health Services, Policy, Advocacy, & Public Health
11:30-11:45 am – Brian Wolfe, MD; Third Year Pediatric Cardiology Fellow
"Early Psychosocial Adjustment in Parents with Neonates Who Have Survived Cardiac Surgery" · Research Category: Clinical
2021 RSD Zoom Room Assignments

Suggested Order of Presentations in Zoom Breakout Rooms as Listed Below: However it is NOT Guaranteed
Each Presenter has 15 minutes to present (7 minutes for presentation, 8 minutes for Reviewer’s questions)

Zoom Room 5

Reviewer: Erica Davis, PhD and Kyle MacQuarrie, MD, PhD
https://us02web.zoom.us/j/81459900905?pwd=NVR3bUNcDVhOC83TCThSTNSbzh0UT09
Meeting ID: 814 5990 0905
Passcode: LurieRSD

Presenters:
10:15-10:30 am – Vidhi Dalal, MD; Third Year Pediatric Nephrology Fellow
"SARA in the kidney: Regulation of cell phenotype as a potential therapeutic target in renal fibrosis" - Research Category: Basic
10:30-10:45 am – Ashley Kimble, MD; First Year Neonatal and Perinatal Medicine Fellow
"Determining the Impact of miR-17-92 Haploinsufficiency on Cardiac Development and Function" - Research Category: Basic
10:45-11:00 am – Kritika Patel, MD; Second Year Pediatric Hematology-Oncology Fellow
"Alteration of Pim-1 kinase activity by HOXA9 and HOXA10" - Research Category: Basic
11:00-11:15 am – Samantha Saul, MD, MSc; Second Year Gastroenterology, Hepatology, and Nutrition Fellow
"Identifying Histologic Features Predictive of Gestational Alloimmune Liver Disease to Improve Maternal-Fetal Outcomes" - Research Category: Translational
11:15-11:30 am – extra time if presenters run over/free time before keynote speaker
11:30-11:45 am – extra time if presenters run over/free time before keynote speaker

Zoom Room 6

Reviewer: Leon Epstein, MD and Michelle Macy, MD, MS
https://northwestern.zoom.us/j/98611090007?pwd=a0KB2zd2jTUZwEWEwrc2VUVImd0TW09
Meeting ID: 986 1109 0007
Passcode: LurieRSD

Presenters:
10:15-10:30 am – Kelsey Gregory, MD; Third Year Child Abuse Pediatrics Fellow
"Intimate Partner Violence: Yield of universal vs dedicated social work screening in pediatric emergency department child physical abuse evaluations" - Research Category: Clinical
10:30-10:45 am – Vishal Naik, MD; First Year Pediatric Emergency Medicine Fellow
"Development of a structured EMS handoff tool: a QI initiative to advance transfer of information between prehospital and pediatric emergency department providers" - Research Category: Quality
10:45-11:00 am – Riana Riffle, MD; Second Year Neonatal and Perinatal Medicine Fellow
"Multisectoral factors associated with global national trends in neonatal mortality rates: a call for targeted public health intervention" - Research Category: Health Services, Policy, Advocacy, & Public Health
11:00-11:15 am – Chris Villota, BS; Research Technician/Associate
"Herpes Simplex Virus (HSV)-2 Isolated from neonates with Encephalitis Exhibit Increased Neurovirulence In Vitro and In Vivo" - Research Category: Basic
11:15-11:30 am – Amy Zhou, MD, PhD; Third Year Pediatric Emergency Medicine Fellow
"Serious diagnoses at revisits in children discharged from the emergency department with back pain" - Research Category: Clinical
11:30-11:45 am – extra time if presenters run over/free time before keynote speaker
2021 RSD Zoom Room Assignments

Suggested Order of Presentations in Zoom Breakout Rooms as Listed Below; However it is NOT Guaranteed Each Presenter has 15 minutes to present (7 minutes for presentation, 8 minutes for Reviewer’s questions)

Zoom Room 7
Reviewers: Todd Florin, MD, MSCE and Priya Verghese, MBBS, MPH
https://northwestern.zoom.us/j/99318891594?pwd=WnBZu3F0a1U1Q2y3Z0dIWFZaNIhwQT09
Meeting ID: 993 1889 1594
Passcode: LurieRSD

Presenters:
10:15-10:30 am – Jessica Christiano, MD; Second Year Pediatric Critical Care Medicine Fellow
“The impact of chloride load on chloride levels and outcomes in critically ill pediatric patients” - Research Category: Clinical
10:30-10:45 am – Christopher Costin, MD; First Year Pediatric Rheumatology Fellow
“Procalcitonin Levels in Juvenile Dermatomyositis” - Research Category: Clinical
10:45-11:00 am – Elitsa Nicolau, MD; Third Year Pediatric Critical Care Medicine Fellow
“Derivation and Validation of Vasoactive-Inotrope Score Trajectory Groups in Critically Ill Children” - Research Category: Clinical
11:00-11:15 am – Bridget Whitehead, MD; Third Year Pediatric Gastroenterology, Hepatology, and Nutrition Fellow
“Clinically Significant Portal Hypertension (CEPH) is Associated With Low IGF-1 and Fatigue in Children with Chronic Liver Disease” - Research Category: Clinical
11:15-11:30 am – Daniel York, MD; Second Year Neonatal and Perinatal Medicine Fellow
“Nailed It: Nailfold Capillaroscopy for Microvascular Assessment in Premature Neonates” - Research Category: Translational
11:30-11:45 am – extra time if presenters run over/free time before keynote speaker

Zoom Room 8
Reviewers: Carolyn Foster, MD, MSHS and Amy Johnson, PhD
https://northwestern.zoom.us/j/94197843744?pwd=ZkE3NU8iZVVTcGdTeW5tbUcrdz09
Meeting ID: 941 9784 3744
Passcode: LurieRSD

Presenters:
10:15-10:30 am – Megan Attridge, MD; Second Year Pediatric Emergency Medicine Fellow
“Exploring an Association Between Residential Redlining and Pediatric Firearm Death in Chicago” - Research Category: Health Services, Policy, Advocacy, & Public Health
10:30-10:45 am – Meredith Johnson, MD, MPH; First Year Advanced General Pediatrics and Primary Care Fellow
“Identification of factors associated with receipt of healthcare transition planning among adolescents with chronic illnesses: A cross-sectional study” - Research Category: Health Services, Policy, Advocacy, & Public Health
10:45-11:00 am – Sundes Kazmir, MD; Third Year Child Abuse Pediatrics Fellow
“Pediatric Emergency Department Testing for Gonorrhea and Chlamydia in Children” - Research Category: Clinical
11:00-11:15 am – Shaunte McKay, MD; First Year Pediatric Gastroenterology, Hepatology, and Nutrition Fellow
“Racial and Socioeconomic Disparities in Referral Rates to Pediatric Gastroenterology in Children with Functional Abdominal Pain Disorders” - Research Category: Clinical
11:15-11:30 am – Leah Utset, MD; Chief Pediatric Resident
“Hospitalizations for Pediatric Eating Disorders in US Children’s Hospitals Increased Dramatically from 2009-2018” - Research Category: Clinical
11:30-11:45 am – Caryn VandenBerg, MD; First Year Pediatric Hospital-Based Medicine Fellow
“Interventions to Improve Pediatric Ability to Swallow Solid Oral Medications: A Systematic Review” - Research Category: Clinical
2021 RSD Zoom Room Assignments

Suggested Order of Presentations in Zoom Breakout Rooms as Listed Below; However it is NOT Guaranteed Each Presenter has 15 minutes to present (7 minutes for presentation, 8 minutes for Reviewer’s questions)

**Zoom Room 9**

**Reviewers:** Craig Garfield, MD and Leena Mithal, MD

https://northwestern.zoom.us/j/8478667443
Meeting ID: 847 866 7443
Passcode: LurieRSD

**Presenters:**

10:15-10:30 am – Elizabeth Bleed, MD, MA; First Year Pediatric Critical Care Medicine Fellow
“Understanding the Experience of Providers Caring for Children with Medical Complexity in the PICU” - Research Category: Clinical

10:30-10:45 am – Anna Gutina Smith, MD; Second Year Pediatric Emergency Medicine Fellow
“Fractures in Young Children: Abuse or Accident? There’s An App For That” - Research Category: Medical Education

10:45-11:00 am – Abby Lang, MD; Second Year Pediatric Allergy and Immunology Fellow
“Investigation of TPSAB1 Genotype as Predictor of Severity of Food Allergy Reactions” - Research Category: Clinical

11:00-11:15 am – Vidya Mahavadi, MD; First Year Pediatric Critical Care Medicine Fellow
“Associations between Perceived Financial Distress and SES Among Caregivers of Critically Ill Children” - Research Category: Clinical

11:15-11:30 am – Mahati Pidaparti, MD; Second Year Pediatric Resident
“Characteristics of Mother’s Own Milk Donation to a Human Milk Bank During Bereavement” - Research Category: Clinical

11:30-11:45 am – Leah Setar, MD; Second Year Pediatric Resident
“Local Immune Response and Outcomes in Severe Respiratory Syncytial Virus Bronchiolitis” - Research Category: Translational

**Zoom Room 10**

**Reviewers:** Robert Garofalo, MD, MPH and Taylor Heald-Sargent, MD, PhD

https://northwestern.zoom.us/j/95462640472?pwd=M29tYXpKZFRJSmxEQVpicHpeWFJRUT09
Meeting ID: 954 6264 0472
Passcode: LurieRSD

**Presenters:**

10:15-10:30 am – J Whitehead, MD; Third Year Pediatric Endocrinology Fellow
“Shared decision-making for families facing adversity and the role of the medical home” - Research Category: Clinical

10:30-10:45 am – Alyssa Cohen, MD; First Year Advanced General Pediatrics and Primary Care Fellow
“Shared decision-making for families facing adversity and the role of the medical home” - Research Category: Health Services, Policy, Advocacy, & Public Health

10:45-11:00 am – Sara Holmstrom, MD; Second Year Pediatric Emergency Medicine Fellow
“Improving Emergency Contraception Eligibility Screening in the Pediatric Emergency Department” - Research Category: Quality

11:00-11:15 am – Keira Nassetta, MD; Second Year Pediatric Resident
“Adherence to Immunosuppression in Pediatric Heart Transplant Recipients: A Systematic Review” - Research Category: Clinical

11:15-11:30 am – Jessalyn Shaw, MD; Second Year Child Abuse Pediatrics Fellow
“The effects of Spanish interpreter use on the decision to report to Child Protective Services and the medical evaluation of suspected child physical abuse in Hispanic patients” - Research Category: Clinical

11:30-11:45 am – extra time if presenters run over/free time before keynote speaker
2021 RSD Zoom Room Assignments

Suggested Order of Presentations in Zoom Breakout Rooms as Listed Below; However, it is NOT Guaranteed
Each Presenter has 15 minutes to present (7 minutes for presentation, 8 minutes for Reviewer’s questions)

Zoom Room 11

Reviewers: Tracy Gertler, MD, PhD and Susanna McCollery, MD

https://northwestern.zoom.us/j/98096239439?pwd=VFJ5ME1JQla2ZWcGZJSnhDMV5Jdz09
Meeting ID: 980 9625 9439
Passcode: LurieRSD

Presenters:

10:15-10:30 am – Apoorva Aekka, MD; First Year Pediatric Endocrinology Fellow
“Establishing Newborn Screening in Nepal, Focus on Congenital Endocrinopathies (Congenital Hypothyroidism and Congenital Adrenal Hyperplasia)” - Research Category: Health Services, Policy, Advocacy, & Public Health

10:30-10:45 am – Elizabeth Kalb, MD; First Year Pediatric Cardiology Fellow
“Ten-year single center study of allosensitized pediatric heart transplant recipients” - Research Category: Clinical

10:45-11:00 am – Maxwell Mathias, MD; Third Year Neonatal and Perinatal Medicine Fellow
“Extracellular Superoxide Dismutase knockout mice increase total superoxide dismutase activity and VEGF expression after chronic hyperoxia” - Research Category: Basic

11:00-11:15 am – Casey Mehrhoff, DO; Second Year Pediatric Hematology-Oncology Fellow
“Discovering Novel Therapies for the Treatment of Osteosarcoma” - Research Category: Translational

11:15-11:30 am – Davlyn Tillman, MD; Third Year Neonatal and Perinatal Medicine Fellow
“Maternal Hypertension and Preterm Birth in non-Hispanic Black Mothers: The Effect of Maternal Nativity” - Research Category: Health Services, Policy, Advocacy, & Public Health

11:30-11:45 am – Sarah Walker, MD; Second Year Pediatric Critical Care Medicine Fellow
“Dynamic Arterial Elastance to Predict Fluid Responsiveness in Hypotensive Children” - Research Category: Clinical

Zoom Room 12

Reviewers: Aaron Hamvas, MD and Terri Laguna, MD, MS

https://northwestern.zoom.us/j/96785235419?pwd=ckvIRkFmWm1tMmxchcRTQVRhQT09
Meeting ID: 967 8523 5419
Passcode: LurieRSD

Presenters:

10:15-10:30 am – Laura Bliss, MD; Fourth Year Child Neurology Resident
“Genetic testing rates and diagnostic yield in cerebral palsy patients born at term with normal brain MRIs” - Research Category: Clinical

10:30-10:45 am – Nicholas Brown, MD; Third Year Pediatric Cardiology Fellow
“An Initial Experience of Echocardiography-Guided Percutaneous Balloon Pulmonary Valvuloplasty in Infants” - Research Category: Clinical

10:45-11:00 am – Lauren Hintz, MD; Third Year Pediatric Resident
“High-Flow Nasal Cannula Use in Infants with Bronchiolitis: Predicting Need for Early Escalation of care” - Research Category: Clinical

11:00-11:15 am – Presley Parkes, MD; Second Year Pediatric Resident
“Impact of Neonatal Hypoglycemia on Behavioral Outcomes in School Age Children” - Research Category: Clinical

11:15-11:30 am – Joyce Woo, MD, MS; Advanced Fellow for Pediatric Cardiac Non-Invasive Imaging
“Characterizing Barriers to Fetal Cardiac Care within the Greater Chicagoland Area” - Research Category: Health Services, Policy, Advocacy, & Public Health

11:30-11:45 am – extra time if presenters run over/free time before keynote speaker
2021 RSD Zoom Room Assignments

Suggested Order of Presentations in Zoom Breakout Rooms as Listed Below; However it is NOT Guaranteed Each Presenter has 15 minutes to present (7 minutes for presentation, 8 minutes for Reviewer's questions)

Zoom Room 13
Reviewers: Jami Josefson, MD, MS and Joshua Wechsler, MD, MSc
https://northwestern.zoom.us/j/98768265073?pwd=aXn1VHTFIDTgsxY241UTRYZ1FaUT09
Meeting ID: 987 6826 5073
Passcode: LurieRSD

Presenters:
10:15-10:30 am – Caitlin Cutler, MD; First Year Pediatric Gastroenterology, Hepatology and Nutrition Fellow
“Characterization of Liver Macrophage Subsets and Urinary Metabolites in Lean versus Obese Pediatric Non-Alcoholic Fatty Liver Disease Patients” - Research Category: Translational
10:30-10:45 am – Jayabrata Mukherjee, MS; Research Technician/Associate
“Clostridioides difficile induces clonal plasmablast responses in adults and children following C. difficile infection” - Research Category: Translational
10:45-11:00 am – Alexander Newman, MD; Third Year Pediatric Infectious Diseases Fellow
“LIVE VIRUS VACCINATION FOLLOWING PEDIATRIC LIVER TRANSPLANTATION: RESULTS FROM TWO ACADEMIC CHILDREN'S HOSPITALS” - Research Category: Clinical
11:00-11:15 am – Grace Schwartz, BS; Research Technician/Associate
“Generation of two induced pluripotent stem cell lines to study complete androgen insensitivity syndrome” - Research Category: Translational
11:15-11:30 am – Anne Smazal, MD, MS; First Year Neonatal and Perinatal Medicine Fellow
“Preterm infant body composition in association with preterm human milk composition in conditions of maternal overweight and obesity” - Research Category: Clinical
11:30-11:45 am – extra time if presenters run over/free time before keynote speaker

Zoom Room 14
Reviewers: Kim Kaczor, MS and Kristin Kan, MD, MPH, MSc
https://northwestern.zoom.us/j/99533887015?pwd=RDcydTVOYWNRKa1bIZ0MnNCU0pPUT09
Meeting ID: 995 3388 7015
Passcode: LurieRSD

Presenters:
10:15-10:30 am – Tonia Branche, MD, MPH; First Year Neonatal and Perinatal Medicine Fellow
“Racial disparities in infant mortality among preterm infants with congenital heart defects” - Research Category: Health Services, Policy, Advocacy, & Public Health
10:30-10:45 am – Ogochukwu (Ogie) Ezeoke, MD; Second Year Pediatric Resident
“Pediatric Cardio-Oncology: The Changing Role of Interdisciplinary Survival Care” - Research Category: Clinical
10:45-11:00 am – Rebekah Fenton, MD; Second Year Pediatric Adolescent Medicine Fellow
“Medical Home Experiences for Chicago’s Black Youth: A Qualitative Study” - Research Category: Health Services, Policy, Advocacy, & Public Health
11:00-11:15 am – Anoosh Moin, MD; Second Year Pediatric Nephrology Fellow
“Food insecurity and impact on transplant outcomes in pediatric kidney transplant recipients” - Research Category: Clinical
11:15-11:30 am – Ann Przybylewski, MD; First Year Pediatric Critical Care Medicine Fellow
“Are patient and parent demographic characteristics associated with family presence in the PICU?” - Research Category: Health Services, Policy, Advocacy, & Public Health
11:30-11:45 am – Terrance Weeden, DO; First Year Pediatric Adolescent Medicine Fellow
“Assessing Preferences of PrEP Intake Among Young MSM and Transgender Men & Women of Color” - Research Category: Clinical
2021 RSD Zoom Room Assignments

Suggested Order of Presentations in Zoom Breakout Rooms as Listed Below; However it is NOT Guaranteed
Each Presenter has 15 minutes to present (7 minutes for presentation, 8 minutes for Reviewer’s questions)

**Zoom Room 15**

**Reviewers:** Divakar Mithal, MD, PhD and Elizabeth Powell, MD, MPH
https://northwestern.zoom.us/j/96010946988?pwd=cjJkZTVxSS1CZzc5NW9ESUtLbE1jd209
Meeting ID: 960 1094 6988
Passcode: LurieRSD

**Presenters:**

10:15-10:30 am – Cara Cecil, MD; Third Year Pediatric Critical Care Medicine Fellow
"Association Between Pre-Admission Factors and Hospital Deterioration Among Children Following Transport" - Research Category: Clinical

10:30-10:45 am – Priya Edward, MD; Second Year Pediatric Infectious Diseases Fellow
"COVID-19 Surveillance and Transmission in Chicago Schools" - Research Category: Clinical

10:45-11:00 am – Natalie Hoffmann, MD; Second Year Pediatric Gastroenterology, Hepatology and Nutrition Fellow
"The clinical and pathologic impact of joint hypermobility on the pediatric eosinophilic esophagitis phenotype" - Research Category: Clinical

11:00-11:15 am – Megan Wong, BA; Second Year Graduate Student
"Characteristics of High-Powered Magnet Injuries in Youth" - Research Category: Clinical

11:15-11:30 am – Audrey Young, MD; First Year Child Abuse Pediatrics Fellow
"The Epigenetic Impact of Abusive Head Trauma: A Pilot Study" - Research Category: Translational

11:30-11:45 am – extra time if presenters run over/free time before keynote speaker

**Zoom Room 16**

**Reviewers:** Jacqueline Pongracic, MD and Anne Rowley, MD
https://northwestern.zoom.us/j/94595058815?pwd=OWtJdDy2ZmFVU1t6MGISP0lQuNQT09
Meeting ID: 945 9505 8815
Passcode: LurieRSD

**Presenters:**

10:15-10:30 am – Sean DeLacey, MD; Second Year Pediatric Endocrinology Fellow
"SARS-CoV2 and the Impact on Youth Onset Type 2 Diabetes New Diagnoses and Severity" - Research Category: Clinical

10:30-10:45 am – Lauren Gunderman, MD; First Year Pediatric Allergy and Immunology Fellow
"Investigation of Gastrointestinal Symptoms Suggestive of Eosinophilic Esophagitis in Children on Palforzia in a Clinical Setting" - Research Category: Clinical

10:45-11:00 am – Ryan Hurtado, MD, PhD; Third Year Pediatric Resident
"Impact of an Automated Multiple Emitter Whole-Room Ultraviolet-C Disinfection System on Hospital Acquired Infections: A Quasi-experimental Study" - Research Category: Quality

11:00-11:15 am – Hannah Lust, MD; Second Year Pediatric Hematology-Oncology Fellow
"Myeloid Cell Phenotype in the Setting of Chimeric Antigen Receptor T-cell Therapy" - Research Category: Basic

11:15-11:30 am – Simon Parzen-Johnson, MD; First Year Pediatric Infectious Diseases Fellow
"Fluoroquinolone (FQ) use and impact in high-risk pediatric patients" - Research Category: Translational

11:30-11:45 am – extra time if presenters run over/free time before keynote speaker
2021 RSD Zoom Room Assignments

Suggested Order of Presentations in Zoom Breakout Rooms as Listed Below, However it is NOT Guaranteed
Each Presenter has 15 minutes to present (7 minutes for presentation, 8 minutes for Reviewer’s questions)

Zoom Room 17

Reviewers: Karen Sheehan, MD, MPH and Jennifer Trainor, MD
https://northwestern.zoom.us/j/92356267733?pwd=Yk5zTVQyRmpRUIISbEx3Y2V0VHVUT09
Meeting ID: 923 5626 7733
Passcode: LurieRSD

Presenters:
10:15-10:30 am – Katherine Bean, MD; First Year Neonatal and Perinatal Medicine Fellow
"Significance of social determinants of health on usage and impact of smart phone app in a NICU population" - Research Category: Health Services, Policy. Advocacy, & Public Health

10:30-10:45 am – Jacqueline Meadow, MD; Second Year Neonatal and Perinatal Medicine Fellow
"Trial of Therapy in the NICU" - Research Category: Clinical

10:45-11:00 am – Rustin Meister, MD, MS; Second Year Pediatric Critical Care Medicine Fellow
"Pre-action Team Reflection: Exploring Effects on Shared Mental Model and Team Preparedness in Health Care" - Research Category: Medical Education

11:00-11:15 am – Mary Pilarz, MD; Third Year Pediatric Resident
"The Impact of Limited English Proficiency on Pediatric Hospital Outcomes" - Research Category: Health Services, Policy. Advocacy, & Public Health

11:15-11:30 am – Katherine Salada, MD; First Year Pediatric Hospital-Based Medicine Fellow
"Healthcare Interactions Prior to a SIDS Event" - Research Category: Clinical

11:30-11:45 am – Lindsey Tengerstrom, MD; Third Year Pediatric Hematology-Oncology Fellow
"End-of-Life Communication and Moral Distress in Pediatric Oncology Clinicians" - Research Category: Clinical

No Review—Submitted abstracts but not able to be present for RSD

Abstracts Submitted Without Review:

Ivana Brnjakovic, MD; Second Year Neonatal and Perinatal Medicine Fellow
"Impact of spatial social polarization on placental pathology among preterm births" - Research Category: Health Services. Policy, Advocacy, & Public Health

Ryan Carpenter, MD; Third Year Neonatal and Perinatal Medicine Fellow
"The Association between Pulmonary Vascular Disease and Respiratory Improvement in Infants with Type I Severe Bronchopulmonary Dysplasia" - Research Category: Clinical

Paula Magee, MD, MPH; First Year Pediatric Critical Care Medicine Fellow
"The impact of neighborhood-level social needs and the built-environment on patient disease severity on presentation to the PICU" - Research Category: Health Services, Policy. Advocacy, & Public Health

Andrew Prigge, MD; Third Year Pediatric Critical Care Medicine Fellow
"Vimentin intermediate filaments modulate regulatory T cell immunosuppressive function" - Research Category: Basic

Maggie Sebiani, DO; Third Year Pediatric Hematology-Oncology Fellow
"Development of a Novel Mouse Model of Diffuse Midline Glioma for Targeted Immunotherapy" - Research Category: Translational
Characterizing *Clostridium innocuum* contributions to antibiotic-associated diarrhea via the peptidoglycan hydrolase CI_01448

*Clostridioides difficile* is a common cause of antibiotic-associated diarrhea (AAD). *C. difficile* produces toxins A and B, encoded by *tcdA* and *tcdB*, which are responsible for its pathogenesis. Investigators in Taiwan recently described a new, emerging cause of AAD, *Clostridium innocuum*. This bacterium was previously characterized as a benign gut microorganism that only rarely acted as an opportunistic pathogen. Recently, we identified *C. innocuum* in stool culture from both pediatric and adult patients with AAD who were being evaluated for *C. difficile* infection and tested positive for *tcdB* via PCR. Unexpectedly, *C. innocuum* culture supernatants tested positive for toxin production by *C. difficile* toxin enzyme immunoassay (EIA) using two different commercial assays. Whole genome sequencing of *C. innocuum* isolates failed to identify homologues for *tcdA* and *tcdB*. To identify the EIA cross-reacting protein(s), we performed western blots on the *C. innocuum* secretome and probed with *C. difficile* anti-toxin A and B antibodies. We sent the protein bands interacting with toxin antibodies for tandem mass spectrometry and identified two ~40 kDa hypothetical proteins, CI_01447 and CI_01448. To confirm the observed EIA cross reactivity, we expressed and purified recombinant CI_01447 and CI_01448 proteins from *E. coli* and detected both proteins using multiple commercial *C. difficile* anti-toxin antibodies via Western blot. We aim to determine the functions of CI_01447 and CI_01448 and their potential role in *C. innocuum* pathogenesis. Using these predictions and previous reports of an association of *C. innocuum* with AAD, we hypothesized that these proteins were cytotoxic to human cells. We tested this by treating several human cell lines (HeLa, Caco2, and IMR-90) with recombinant CI_01448 but observed no cytopathic or cytotoxic effects indicating that CI_01448 may not target intestinal epithelial cells. We next generated structural homology models of CI_01447 and CI_01448 which suggested that both were hydrolases. The DALI Protein Structure Comparison Server determined CI_01448 to be structurally similar to peptidoglycan hydrolases and the NLPC-P60 family of proteins found in other bacteria. Peptidoglycan is the primary component of the Gram-positive bacterial cell wall. We hypothesized that CI_01448 was a hydrolase that could degrade peptidoglycan. Using a peptidoglycan zymogram, we found that CI_01448 degraded peptidoglycan from various Gram-positive bacteria including *Bacillus subtilis*, *C. difficile*, and *C. innocuum*. Furthermore, recombinant CI_01448 C-terminal domain was sufficient for the hydrolase activity. Our future directions are to determine whether CI_01448 plays a role in peptidoglycan rearrangement of *C. innocuum* through modulation of the growth state transition from spore to vegetative cell and/or acts as an antimicrobial to inhibit growth of other Gram-positive bacteria, providing a competitive advantage to *C. innocuum* in the human gastrointestinal tract.
**TITLE:** SARA in the kidney: Regulation of cell phenotype as a potential therapeutic target in renal fibrosis  

**AUTHORS:** Vidhi Dalal, Xiaoyan Liang, William Schnaper, and Tomoko Hayashida  

**BACKGROUND:** Renal fibrosis, the process by which functional tissue is replaced with extracellular matrix produced by myofibroblasts, can begin either in the glomerulus or in the tubulointerstitium. Epithelial cells play a central role in the development of fibrosis in both areas of the kidney. In the glomerulus, injury to podocytes leads to their dedifferentiation by suppressing the expression of podocyte-specific proteins such as nephrin and activating the expression of mesenchymal-specific proteins. The consequent podocyte foot process effacement and detachment of podocytes from the glomerular basement membrane result in glomerulosclerosis. Tubular epithelial cells (TECs) undergo a similar differentiation after injury. Dedifferentiated TECs influence the behavior of surrounding pericytes and resident renal fibroblasts, promoting their transdifferentiation into myofibroblasts that propagate tubulointerstitial fibrosis.

Our laboratory has identified a protein called the Smad Anchor for Receptor Activation (SARA) as a key factor in maintaining cellular phenotype in the face of fibrogenesis. Cultured TECs treated with Transforming Growth Factor-β1 (TGF-β1), a fibrogenic cytokine, upregulate mesenchymal markers characteristic of changes seen during fibrosis, while overexpression of SARA protects TECs from this response to TGF-β1. Furthermore, we found that overexpressing SARA in pericytes in a mouse model of aristolochic acid (AA)-induced tubulointerstitial fibrosis prevents pericyte transdifferentiation into myofibroblasts and significantly attenuates the degree of renal fibrosis.

**HYPOTHESIS:** SARA preserves cellular phenotype. Therefore, SARA overexpression in podocytes and TECs will prevent their dedifferentiation and reduce the degree of fibrosis seen in glomerulosclerosis and tubulointerstitial disease.

**METHODS:** Two mouse models were created using SARA^{Tg} mice that our laboratory had previously generated. Crossing SARA^{Tg} mice with an NPHS2-Cre line generated a mouse in which SARA was overexpressed only in podocytes (SARA^{podo} mice). SARA^{Tg} mice were also crossed with Pax8-rtTA and Tet-O-Cre mice to create a strain in which SARA was overexpressed only in TECs (SARA^{TEC} mice) after induction with doxycycline. SARA negative controls (Ctrl^{podo} and Ctrl^{TEC} mice) with the same genotypic background (apart from the SARA transgene) as their SARA positive counterparts were also used.

SARA/Ctrl^{podo} mice were given a single tail vein injection of Adriamycin and sacrificed 3, 7, or 14 days later. SARA/Ctrl^{TEC} mice were treated with either AA or vehicle for 3 weeks and sacrificed 3 weeks after end of treatment. Urine, blood, and kidneys were harvested for histological and molecular analysis.

**RESULTS:** SARA^{podo} mice demonstrated less glomerulosclerosis histologically and a significantly lower degree of proteinuria compared to Ctrl^{podo} mice, suggesting that SARA overexpression in podocytes protected them from Adriamycin-induced injury. The degree of fibrosis and damage to TECs in SARA/Ctrl^{TEC} mice was analyzed by qPCR. SARA^{TEC} mice showed decreased upregulation of markers of fibrosis and tubular injury compared to Ctrl^{TEC} mice after AA treatment. Expression levels of markers specific for podocytes and TECs will be measured to confirm that SARA maintained cellular phenotype after injury.

Podocytes were isolated from SARA^{podo} and Ctrl^{podo} mice by flow cytometry, and their gene expression profiles are being analyzed by RNA sequencing. Kidneys from SARA^{TEC} and Ctrl^{TEC} mice were digested into single cell suspensions, and single cell RNA sequencing is being performed.

**CONCLUSION:** SARA overexpression in podocytes and TECs does protect against glomerulosclerosis and tubulointerstitial fibrosis respectively. The high throughput analyses will provide insight into the cellular mechanisms by which SARA maintains cellular phenotype and protects the kidney from fibrosis. Podocytes and TECs are more attractive therapeutic targets than pericytes, given their accessibility and specificity to the kidney compared to the systemic distribution of pericytes. We hope that elucidating the mechanisms by which SARA functions will help unearth new molecular targets for therapies directed at glomerulopathies and tubulointerstitial diseases.
INHIBITION OF SOLUBLE FLT-1 DECREASES INTESTINAL INJURY AND IMPROVES SURVIVAL IN A NEONATAL MOUSE MODEL OF NECROTISING ENTEROCOLITIS

Anastasia Frank-Kamenetskii, Xiaocai Yan, Elizabeth Managlia and Dr. Isabelle De Plaen

Necrotizing enterocolitis (NEC) is a devastating intestinal disease that affects premature infants. The mortality rate even after surgical intervention is reported to be between 20% and 47%. There is growing evidence that maldevelopment of intestinal microvasculature contributes to NEC. We previously showed that VEGF is decreased during both experimental and human NEC, and that blocking VEGFR2 signaling in neonatal mice promotes NEC. Pro-inflammatory macrophages express sFLT-1/VEGFR1 that can trap VEGF, leading to inhibition of microvascular development. In this study, we hypothesize that blocking soluble FLT-1 protects against intestinal tissue damage and improves survival of neonatal mice exposed to experimental NEC.

To test our hypothesis, neonatal mouse littermates were injected with anti-FLT-1 antibodies (5mg/kg i.p.) or with control IgG antibody and submitted one hour later to an established NEC model, which includes inoculation with adult commensal bacteria, brief episodes of hypoxic and cold stresses and formula feedings. Animals were euthanized when presenting signs of distress or after 72h. Intestinal tissues were collected for H&E staining and intestinal injury score determination. Moreover, to assess endothelial cell proliferation in intestinal villi, tissues sections were stained with antibodies against Ki67 and endomucin and immunofluorescence performed. The number of Ki67+ endomucin+ were counted and normalized per stained area.

In pups treated with anti-FLT-1 antibodies, survival was significantly improved compared to control pups (median survival of 54h vs. 36 h respectively; p≤0.05). Moreover, intestinal injury scores were significantly less in pups treated with anti-FLT-1 antibodies compared to control antibody-treated littermates (10/29 vs 18/30 with NEC score ≥2, $\chi^2=3.85$, p≤0.05). Endothelial cell proliferation was also significantly improved in sFLT-1 treated samples compared to controls (36.2 vs. 27.5 Ki67+ endomucin+ cells area, p≤0.05).

In conclusion, our data shows that blocking FLT-1 preserved intestinal endothelial cell proliferation, increased survival and protected against intestinal injury in a neonatal mouse NEC model. These results suggest a role for FLT-1 in NEC. Further investigation of this pathway may lead to identification of potential therapeutic targets to improve infants’ outcome.
Mapping the Physical Properties of the Bovine Ovary and Contributions of the Matrisome Towards Improved Engineered Materials

Nathaniel Henning1,3, Grace B. Schwartz1,3, Hana Kubo3, Elizabeth L. Tsui1,3, Ashley A. Diaz1,3, and Monica M. Laronda, Ph.D.1,3

1Department of Pediatrics, Feinberg School of Medicine, Northwestern University, Chicago, IL; 2Fertility & Hormone Preservation & Restoration Program, Department of Surgery, Ann & Robert H. Lurie Children’s Hospital of Chicago; 3Stanley Manne Children’s Research Institute, Ann & Robert H. Lurie Children’s Hospital of Chicago

Some hematologic and oncologic treatments are gonadotoxic resulting in depletion of the ovarian reserve and premature ovarian insufficiency (POI). Current fertility preservation methods include the removal and cryopreservation of ovarian tissue prior to gonadotoxic treatment. This can be transplanted back and has been found to restore hormone function and fertility, in only 26% of cases and even then, temporarily with restoration lasting 2 months to 12 years. Our goal is to understand the physical properties and biochemical components of the ovarian microenvironment and their role in maintaining the ovarian reserve to restore fertility and ovarian hormones for patients using a bioprosthetic ovary. The ovary is divided into two compartments. The cortex, containing the ovarian reserve made up of quiescent primordial follicles, while the medulla contains the majority of activated and growing follicles and vasculature. The extracellular matrix (ECM) is a network of proteins providing structural and biochemical support. We developed a new method for mapping the distribution and quantity of the ECM and associated proteins, or matrisome, across the ovary in a first-of-its-kind spatial whole-organ scale experiment to assist with designing a bioprosthetic that recapitulates the ovarian microenvironment.

To define the biochemical cues and physical properties of specific matrisome proteins, we developed a novel method to deplete proteins of interest from engineered materials.

We predict that this foundational work will allow for the informed design of bio-inks for 3D-printed scaffolds by examining both physical properties and biologically relevant endpoints, which will also allow for the future implementation of an effective scaffold for a bioprosthetic ovary transplant.

This work is supported by Mary J.C. Hendrix Outstanding Graduate Student Award (NH), the Warren and Eloise Batts Endowment (MML), a Debicki Foundation Grant (MML), the Burroughs Wellcome Fund Career Award at the Scientific Interface (MML).
Title: Determining the Impact of miR-17-92 Haploinsufficiency on Cardiac Development and Function

Authors: Ashley Kimble, Joann Taylor, Russell Moskal, Greg Waypa and Mary Robbins

Background: MicroRNAs (miRs) are small (~22 nucleotide), endogenous, non-coding single stranded RNA molecules that regulate target gene expression by promoting mRNA degradation and inhibiting of mRNA translation. miR-17-92 is a polycistronic complex which yields 6 mature miRs from a single common precursor. Precise control of miR-17-92 is required for normal development and gene regulation in a multitude of tissues. Dysregulation of miR-17-92 has been implicated in the pathogenesis of a variety of disease processes, including cancer, bronchopulmonary dysplasia, and cardiovascular disease.

Global absence of miR-17-92 in mice results in immediate postnatal death with ventricular septal defects and severely hypoplastic lungs by regulating the pro-apoptotic Bim pathway (Ventura et al, 2008). Cardiac specific overexpression of miR-17-92 in mice results in a hypertrophic cardiomyopathy with sudden death due to lethal arrhythmogenesis, potentially by regulating Pten and Cx43 (Danielson et al, 2013). Furthermore, one member of the miR-17-92 complex, miR-19b regulates cardiomyocyte fibrosis via the CTGF pathway. While tight regulation of miR-17-92 complex is critical for proper cardiac development and function, the effects of a single copy of miR-17-92 remain elusive.

Hypothesis: We hypothesize that miR-17-92 haploinsufficiency will cause alterations in heart morphology resulting from decrease in cardiomyocyte proliferation resulting in smaller heart size and congenital heart disease (VSD). We hypothesize that cardiac contractility will be decreased in miR-17-92 haploinsufficient mice due to cardiomyocyte hypoplasia and/or increased cardiac fibrosis. Lastly, we hypothesize that miR-17-92 haploinsufficiency will cause decreased pulmonary vascular development secondary to decreased angiogenesis and increased fibrosis.

Methods: As whole genome deletion of miR-17-92 results in a lethal phenotype, our mouse model utilizes a transgenic miR-17-92 using a Cre-lox system to generate in a global, heterozygous or partial knockout genotype (miR-17-92/Δ), also known as a haploinsufficient animal. The hearts of these haploinsufficient models will undergo gross and histologic examination. We will assess heart rate and contractility parameters. To evaluate pulmonary vascular development, we will measure pulmonary vessel counts, vascular medial wall thickness, and right atrial pressure. We will utilize gene panels and miR target gene panels to identify specific gene and protein targets impacted by miR-17-92 haploinsufficiency.

Results: We anticipate miR-17-92 haploinsufficiency will alter cellular pathways that regulate cardiomyocyte development and function, resulting in changes in gross and microscopic cardiac phenotype and cardiomyocyte contractility. We anticipate that the change in miR-17-92 expression will alter pulmonary vascular development. Lastly, we anticipate that miR-17-92 haploinsufficiency will impact gene regulation and protein expression.

Conclusion: miR-17-92 is known to impact cardiac development and function in what appears to be a dose-dependent effect, ranging from ventricular septal defect with global knockout and hypertrophic cardiomyopathy with overexpression. This study will elucidate the effect of miR-17-92 haploinsufficiency on cardiac development, cardiac function, and pulmonary vascular development, as well as identify underlying cellular pathways, which are currently unknown.
TITLE: Myeloid Cell Phenotype in the Setting of Chimeric Antigen Receptor T-cell Therapy

AUTHORS: Hannah Lust, MD, Stephen Miller, PhD, Sonali Chaudhury, MD

BACKGROUND: Chimeric antigen receptor T-cell therapy (CAR T) was approved in 2017 for use in children and young adults with relapsed/refractory B-cell acute lymphoblastic leukemia (ALL) and adults with relapsed/refractory non-Hodgkin lymphoma, and is being investigated for use in adults with refractory multiple myeloma (MM). CAR T offers hope for these extremely high-risk patients, leading to response in 67-90% of children with ALL and approximately 50% of adults with NHL. However, relapse and severe toxicity after CAR T remain a significant problem. Prior efforts to optimize CAR T have focused on changing the construction of the CAR T-cell, the dose, and the chemotherapy given prior to infusion. Improvements in CAR T aimed at decreasing toxicity and relapse rates will require that we consider the role of other immune cell populations, including myeloid cells. Myeloid-derived suppressor cells (MDSCs), macrophages, and monocytes contribute to the immunosuppressive nature of the tumor microenvironment in solid tumors and lymphomas. Knowledge about the interaction between suppressive myeloid cells and CAR T-cells in patients with high-risk hematologic malignancies is lacking.

HYPOTHESIS: We hypothesize that CAR T-cell expansion, persistence, and toxicity is affected by the balance of suppressive and pro-inflammatory myeloid cells and that the presence of a suppressive myeloid cell phenotype decreases the likelihood the CAR T-cells will effectively expand and persist in patients.

METHODS: In adult and pediatric patients receiving CAR T for relapsed/refractory B-cell ALL, NHL, or MM, peripheral blood samples will be prospectively collected at 5 time points (prior to conditioning chemotherapy, day of infusion, and days 7, 14, and 100). We will perform phenotypic and transcriptional analysis on blood samples using markers of inflammatory and suppressive MDSCs, M1 and M2 macrophages, and monocytes to determine the frequency and thus the balance of these myeloid cell populations.

We will compare myeloid cell phenotypes with outcomes after CAR T. We will review participants’ electronic medical record to gather information regarding primary diagnosis and disease course following CAR T. The primary endpoint will be disease relapse, defined by the presence of blasts in peripheral blood or bone marrow or extramedullary disease (ALL) or recurrence of lymphadenopathy or extra-lymphatic disease (NHL). The secondary outcome will be CAR T related toxicities and evidence of CAR T-cell persistence through demonstration of B-cell aplasia.

RESULTS: We anticipate that potentially patients who experience CAR T toxicity may have an increase in inflammatory myeloid cell populations. Patients who experience CAR T relapse may have an increase in suppressive myeloid cell populations, suggesting a suppressive effect on the infused CAR T-cells. The primary challenges in this study will be patient-related variables that could present as confounders. Additionally, patients who develop moderate or severe CAR T-related toxicity will receive treatments that may affect the myeloid cell population.

CONCLUSION & POTENTIAL IMPACT: Our findings may pinpoint key myeloid cell subsets, raising opportunities for myeloid-targeting therapies and the development of a myeloid cell profile for use as a biomarker to identify patients at higher risk of toxicity or relapse. This research investigation has the potential to lead to a more durable response to CAR T with less toxicity and thus improved patient survival.
Title: Extracellular Superoxide Dismutase knockout mice increase total superoxide dismutase activity and VEGF expression after chronic hyperoxia

Authors: Maxwell Mathias, MD; Joann Taylor, BS; Elizabeth Mendralla, BS; Marta Perez, MD

Background: Bronchopulmonary dysplasia (BPD) is a common lung disease affecting infants born prematurely. All infants with BPD receive supplemental oxygen, exposing them to excess superoxide radical, which can induce inflammation and modify protein and lipid structure. An endogenous family of enzymes called the superoxide dismutases process and sequester oxygen free radicals. The extracellular superoxide dismutase (SOD3) is highly localized to the extracellular space between pulmonary vascular endothelial cells and smooth muscle cells. SOD3 has been shown to facilitate vascular endothelial growth factor (VEGF) and nitric oxide (NO) signaling in vascular endothelium through regulation of localized redox state. We utilized a mouse model of neonatal hyperoxic lung injury and SOD3 knockout (KO) mice to evaluate its function during hyperoxia exposure.

Hypothesis: SOD3 knockout mice survive chronic hyperoxia through upregulation of alternative antioxidant pathways.

Methods: Wild-type age-matched neonatal C57Bl/6 (WT) and SOD3 -/- (KO) mice were placed in normoxia (21% O₂, RA) or chronic hyperoxia (75% O₂, CH) within 24 hours of birth for 14 days continuously and then euthanized. Lungs were inflation-fixed at 25 cm H₂O and paraffin-embedded for histologic comparison. Additional lungs were harvested for comparison of antioxidant enzyme expression and total SOD activity. Levels of nitrotyrosine, a non-specific marker of oxidant stress, were compared between groups. Lastly, we interrogated the VEGF-NO signaling pathway by measuring VEGF expression and soluble guanylate cyclase (sGC) expression and activity. Results were compared by genotype (WT vs KO) and exposure (RA vs CH) using two-way ANOVA with multiple comparisons. Western blots were normalized to β-actin and presented as fold difference from control (WT-RA). Results are presented as mean ± SEM unless otherwise specified.

Results: KO-CH mice survived without additional alveolar simplification or microvascular remodeling when compared to KO-RA mice and WT-CH mice. KO-CH mice had increased total SOD activity when compared to WT-CH mice (77.1±4.2 vs 60.0±4.5 mU SOD activity/µg protein, p<0.05). KO-CH mice also had increased nitrotyrosine levels when compared to WT-CH mice (3.1±0.8-fold vs 1.4±0.3-fold, p<0.05). In addition, KO-CH mice had increased VEGF expression when compared to both WT-CH and KO-RA mice (2.7±0.4-fold vs 1.5±0.1-fold and 1.7±0.2-fold, p<0.05 for both). No genotype differences were noted in intracellular antioxidant enzyme expression, sGC expression or sGC activity.

Conclusion: SOD3 KO mice survive CH and show increased total SOD activity and VEGF expression when compared to WT mice exposed to CH, without changes in measured SOD protein expression. This would suggest that post-translational modification to existing SOD enzymes is responsible for this adaptation. Future study of specific VEGF pathway activation in SOD3 KO mice can further elucidate SOD3 function and may reveal alternative pathways by which pulmonary vascular endothelium adapts to hyperoxia.
Alteration of Pim-1 kinase activity by HOXA9 and HOXA10

Kritika Patel, MD; Elizabeth Eklund, MD

Background: MLL rearranged AML continues to portend a poor prognosis, making it the focus of many studies to develop innovative targeted therapies. Prior studies have shown increased expression of transcription factors HOXA9 and HOXA10 in MLL rearranged AML. These transcription factors regulate expression of the ARIH2 gene, which encodes TRIAD1, an E3 ubiquitin ligase which marks its protein targets for degradation with ubiquitin. TRIAD1 plays a role in regulating proliferation and survival of hematopoietic stem cells. Previously, our lab has shown that TRIAD1 is required to terminate emergency granulopoiesis, an innate immunity process by which granulocytes are produced in response to infection. Additionally, we observed that knocking out TRIAD1 in mice with the MLL ELL gene rearrangement led to acceleration of leukemogenesis and time to relapse. Given the role of TRIAD1 in leukemogenesis and relapse in MLL rearranged AML, we hypothesize that characterizing the ubiquitination targets of TRIAD1 lead to novel therapeutic targets for this difficult to treat leukemia.

Methods: The ubiquitination pattern in U937 cells (human myeloid leukemia cell line) was characterized via PTM scan technology. Ubiquitinated proteins were then extracted from TRIAD1 competent or TRIAD1 knockdown U937 cells using anti-ubiquitin precipitation, followed by western blot against proteins identified on the PTM scan to confirm the findings. Once Pim-1 kinase was identified and confirmed as a target, nested PCR technique was used to generate a previously identified Pim1 promoter sequence from murine genomic DNA which was then subcloned into a minimal promoter luciferase reporter construct. U937 cells were transfected with plasmids using electroporation to generate combinations of conditions of HOXA9 or HOXA10 overexpression, MLL-ELL1 expression, or HOXA9, HOXA10 or TRIAD1 knockdown, following which the luciferase construct then subcloned in. Western blots were also performed for total and ubiquitinated Pim-1 kinase under these conditions.

Results: Pim-1 kinase was identified on PTM scan as a ubiquitinated protein in U937 cells. Western blot showed that the ubiquitination level of Pim-1 kinase was different in TRIAD1 competent versus TRIAD1 knockdown U937 cells. Preparations of the promoter assays are ongoing. We plan to gather data on how HOXA9 and HOXA10 alter the expression of PIM1 by measuring the luminescent activity of the different constructs.

Conclusion: Ubiquitination of the known oncogene Pim-1 kinase is altered by changes in expression of TRIAD1.
Vimentin intermediate filaments modulate regulatory T cell immunosuppressive function

Andrew Prigge, MD¹, Ruihua Ma, PhD², Bria Coates, MD¹, Karen Ridge, PhD²

¹Division of Critical Care Medicine, Department of Pediatrics, Northwestern University Feinberg School of Medicine, ²Division of Pulmonary and Critical Care Medicine, Department of Medicine, Northwestern University Feinberg School of Medicine

Background

Regulatory T cells (Tregs) play an essential role in resolving inflammation and repair of lung injury. Tregs are a specialized subset of CD4⁺ T cells that express the lineage-specifying transcription factor Foxp3 and have the capacity to directly exert tissue-reparative and immune-suppressive functions in response to lung injury and inflammation. Importantly, Tregs are causal determinants of alveolar epithelial proliferation and regenerative alveologenesis—hallmarks of lung repair. Tregs cells can generate extracellular adenosine via the expression of CD39 and CD73, which sequentially convert extracellular ATP to AMP and then AMP to adenosine. Adenosine signaling protects the lung from injury and excessive inflammation. Also, Tregs express the surface protein neuropilin 1 (NRP-1), which promotes Treg survival and sustains the suppressive function of Treg cells, further promoting their immunoregulatory activity. We hypothesize that vimentin is an independent regulator of Treg function. We will demonstrate that genetic and pharmacologic disruption of vimentin intermediate filaments (IFs) enhances Treg immunosuppressive function.

Methods

Tregs were induced from conventional CD4⁺ T cells (Tcons) isolated from wildtype (WT) and vimentin null (Vim⁻/⁻) mice using anti-CD3/anti-CD28 beads and polarizing cytokines (transforming growth factor β, interleukin-2 (IL-2), anti-interferon-γ, and anti–IL-4). Flow cytometry was used to quantify the expression of Treg effector proteins NRP-1, lymphocyte-activating gene 3 (LAG3), CD25, CD39, CD73, CD103, cytotoxic T-lymphocyte protein 4 (CTLA-4), and programmed cell death protein 1 (PD-1). The immunosuppressive function was quantified using standard in vitro suppression assays performed on CD4⁺ Tcons. Tregs treated with withaferin A (WFA) were exposed to 1 μM for 24 hours prior to suppression assay or immunofluorescence confocal microscopy.

Results

Flow cytometric analysis revealed that the expression of the suppressive marker, NRP-1, was increased in Vim⁻/⁻ Tregs, while LAG3, CD25, PD-1, CTLA-4, and CD103 were unchanged, as compared to WT Tregs. Importantly, vimentin-deficient Tregs have increased CD73 expression and adenosine production, which corresponded with enhanced suppressive function. Specifically, Vim⁻/⁻ Tregs suppressed the proliferation of CD4⁺ Tcons compared with WT Tregs using a standard in vitro suppression assay. Super-resolution imaging of Tregs revealed that the vimentin forms a cage around the distal pole complex (DPC). We reason that vimentin IFs serve as signal integrators by sequestering effector molecules, such as NRP1 and CD73. We treated Tregs with WFA, a steroidal lactone that binds to and depolymerizes vimentin or vehicle control. Immunofluorescence confocal microscopy confirmed that WFA resulted in the disassembly of the vimentin IF cage around the DPC. Additionally, WFA-treated Tregs had increased suppression of CD4⁺ Tcon cell proliferation as compared to vehicle-treated Tregs.

Conclusions

Vimentin is an essential regulator of Treg immunosuppressive function. Assembly of vimentin IFs during Treg activation restrains immunosuppressive function by modifying the effector molecules present on the cell surface. Targeting vimentin in Tregs may provide a means to augment Treg immunosuppressive activity to promote recovery from lung injury.
A recessive mutation in TFAM causes mtDNA depletion associated with primary ovarian insufficiency, seizures, intellectual disability and hearing loss

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Abstract

Mitochondrial disorders are collectively common, genetically heterogeneous disorders in both pediatric and adult populations. They are caused by molecular defects in oxidative phosphorylation, failure of essential bioenergetic supply to mitochondria, and apoptosis. Here, we present three affected individuals from a consanguineous family of Pakistani origin with variable seizures and intellectual disability. Both females display primary ovarian insufficiency (POI), while the male shows abnormal sex hormone levels. We performed whole exome sequencing and identified a recessive missense variant c.694C>T, p.Arg232Cys in TFAM that segregates with disease. TFAM (mitochondrial transcription factor A) is a component of the mitochondrial replisome machinery that maintains mtDNA transcription and replication. In primary dermal fibroblasts, we show depletion of mtDNA and significantly altered mitochondrial function and morphology. Moreover, we observed reduced nucleoid numbers with significant changes in nucleoid size or shape in fibroblasts from an affected individual compared to controls. We also investigated the effect of tfam loss in zebrafish; homozygous knockout mutants recapitulate the mtDNA depletion and ovarian dysgenesis phenotypes observed in affected humans. Together, our genetic and functional data confirm that TFAM plays a pivotal role in gonad development and expands the repertoire of mitochondrial disease phenotypes.
Herpes Simplex Virus (HSV)-2 Isolated from neonates with Encephalitis Exhibit Increased Neurovirulence In Vitro and In Vivo.

*Chris Villota, Cooper K. Hayes, Lisa N. Akhtar*

**Background:** Herpes simplex virus (HSV) infection affects approximately 14,000 neonates (newborn children within the first 28 days of life) annually. The clinical courses HSV takes in infected neonates vary from non-invasive disease of the skin, eyes, and mouth (SEM disease), to invasive disease of the central nervous system (CNS disease). Invasive CNS infection results in meningoencephalitis and is associated with significant morbidity and mortality, including permanent neurodevelopmental deficits. The factors predisposing neonatal populations to invasive HSV infections are not well understood, which prevents the development of neuroprotective therapies. While host genetic defects of adults and children outside the neonatal period have been linked to differences in clinical outcome, such host defects have not been identified in the neonatal population. However, recent studies using viral next generation sequencing techniques have mapped the variability present in the HSV genome and suggested that viral genomic variability may impact certain aspects of disease outcome in animal models. Therefore, we are taking a novel approach to determine whether HSV variability contributes to differences in the clinical outcome of neonatal disease. We recently defined the viral genetic diversity among HSV-2 isolates cultured from neonates with a range of clinical presentations. Isolates collected from neonates with CNS disease contained several unique amino acid variations in HSV proteins known to contribute to cell-to-cell spread and neurovirulence in mouse models. CNS disease-associated HSV-2 isolates demonstrated enhanced viral cell-to-cell spread in epithelial Vero cell cultures as compared to SEM disease-associated isolates, but similar evaluations in neurologically relevant models are lacking.

**Hypothesis:** CNS disease-associated HSV-2 isolates will display enhanced neurovirulence in *in vitro* and *in vivo* neurologic models, when compared to SEM disease-associated isolates.

**Methods:** To investigate the potential contribution of viral variability to clinical outcomes, CNS and SEM disease-associated HSV-2 were isolated from neonates at opposite ends of the clinical spectrum. Neuron-to-neuron spread was evaluated between these two isolates in human neuronal cell cultures (LUHMES cells). Both direct intracranial (IC) inoculation and peripheral intraperitoneal (IP) inoculation mouse models of encephalitis were then used to evaluate *in vivo* differences in neurovirulence.

**Results:** HSV-2 infection of human neuronal LUHMES cell cultures resulted in enhanced viral spread of CNS disease-associated isolates in comparison to SEM disease-associated isolates. In the more complex environment of the adult mouse brain, IC infection with CNS disease-associated isolates resulted in rapid and complete mortality. All of the brains of deceased mice contained high viral loads. Notably, half of the mice infected with SEM disease-associated isolates survived IC infection and had no detectable virus in their brains at the end of the experiment. Similar trends were observed in IC infected neonates. IP inoculation of adult mice was then used to assess neurovirulence following a peripheral route of infection. CNS disease-associated HSV-2 again demonstrated higher mortality as compared to SEM disease-associated isolates. Virus was predominantly observed in the brains of the deceased mice, highlighting the ability of CNS-associated HSV-2 to localize to the brain through a peripheral route of infection.

**Conclusion:** These data suggest that HSV-2 genomic variability affects mechanisms of neurovirulence which may contribute to different clinical outcomes in neonatal HSV disease. Experiments are ongoing to investigate differences in neurologic innate immune responses induced by CNS- and SEM-associated HSV isolates, which may explain the differences in neurovirulence identified.
Defective intestinal microvascular development has been previously shown to play a role in necrotizing enterocolitis (NEC) pathogenesis. Decreased serum levels of IGF-1 in premature infants are associated with a higher risk of developing NEC and we recently found that serum and intestinal tissue IGF-1 level are decreased in a neonatal NEC model. In the embryo, macrophages have been reported to promote angiogenesis. Here we hypothesize that neonatal intestinal macrophages promote endothelial cell proliferation and angiogenesis by producing IGF-1. Here, we first examined the role of IGF-1 on intestinal endothelial cell sprouting in vitro using IGF-1 and IGF-1R inhibitor and on intestinal endothelial cell proliferation in vivo using IGF-1R inhibitor. Secondly, using mice with IGF-1-deficient macrophages and IGF-1-sufficient littermates, we assessed whether macrophage-derived IGF-1 plays a role in perinatal microvascular development by examining endothelial cell proliferation in vivo and endothelial cell sprouting in vitro in Matrigel co-cultures. Finally, we examined whether macrophage-derived IGF-1 protects against NEC. We found that, neonatal intestinal CX3CR1+ macrophages were essential for small intestinal endothelial cells to sprout in Matrigel, which process was further enhanced by exogenous IGF-1 and inhibited by the selective IGF-1R inhibitor picropodophyllin (PPP). Intestinal endothelial cell proliferation was also inhibited by PPP in vivo, to a similar extent as observed during NEC development. Furthermore, neonatal IGF-1-deficient macrophages had significantly decreased pro-angiogenic activity in vitro. Mice with IGF-1-deficient-macrophages had less robust intestinal endothelial proliferation and decreased intestinal VEGF protein expression in vivo. Lastly, pups with IGF-1-deficient macrophages had increased incidence of severe NEC-like intestinal injury and mortality. In conclusion, neonatal intestinal macrophages are critical for promoting intestinal microvascular growth and for protecting pups from NEC development via IGF-1 production.
2021
CLINICAL RESEARCH
ABSTRACTS
AUTHORS: Elizabeth Bleed, MD MA; Megan Crowley-Matoka, Ph.D.; Seema Shah, JD; Carolyn Foster, MD, MSHS

BACKGROUND: Children with medical complexity (CMC) make up a substantial proportion of the children cared for in the hospital setting and represent a disproportionately large amount of interventions received and costs incurred. Some limited work has been done characterizing the relationships and experiences of nurses and respiratory therapists in their Pediatric Intensive Care Unit (PICU) of CMC, but little has been done to evaluate the perspective of PICU providers towards CMC. Because CMC require higher costs and longer ICU admissions than other children and have been shown to provoke moral distress in nurses and respiratory therapists, it is likely that PICU providers have different attitudes towards them than they do towards non-CMC patients, but no data about this currently exist to our knowledge. Our long-term goal is to both improve the care of CMC in the PICU as well as to promote PICU provider resilience in their care of CMC, but before interventions can be designed, we need to understand the current status quo.

HYPOTHESIS: This is a descriptive qualitative study and therefore hypothesis-generating rather than hypothesis-driven. Through this work, I will generate one or more hypotheses about how different provider beliefs or experiences regarding CMC will be associated with different care practices towards CMC.

METHODS: This is a qualitative analysis of PICU provider experiences, beliefs, and care practices of CMC in the PICU. Data will be gathered in the form of key informant interviews at a single freestanding academic children’s hospital. The interviewees will be physicians (attendings and fellows) and nurse practitioners (collectively called “providers”) who work primarily or exclusively in the PICU. Interviews will be conducted using a semi-structured interview guide which will be created for this specific study, which will contain a series of open and closed-ended questions about the interviewee’s care of CMC. We will plan to interview up to approximately 15-20 providers using rolling recruitment until we reach thematic saturation. Interviews will be digitally recorded and transcribed verbatim. Interviews will be analyzed and coded, and the research team will collaborate to come to a consensus and describe emergent themes from the interviews. CMC will be defined according to Cohen, et al and that definition will be read to participants as part of the introduction to the interview. Themes relating to each of three main categories will be covered: describing provider experiences caring for CMC, describing provider beliefs about CMC, and characterizing how those experiences and beliefs influence provider care practices towards CMC.

RESULTS: Results will be a collection of themes, insights, and connections that will be achieved via formal analysis and coding of the interviews.

CONCLUSION: Our hope is to identify important themes, phenotypes of CMC and providers, and connections that we can use to build a survey instrument which can be distributed to PICUs nationally to generalize our findings.
Title: Genetic testing rates and diagnostic yield in cerebral palsy patients born at term with normal brain MRIs.

Authors: Laura Bliss, MD and Divakar Mithal, MD/PhD

Background: Genetic diagnoses have been increasingly recognized in a subset of patients with cerebral palsy (CP) and the role of genetic testing in this population is continuously evolving. The aim of the study was to analyze current practice patterns around genetic testing in patients diagnosed with Cerebral Palsy (CP) at a large tertiary care center. Most CP patients have established risk factors such as prematurity and perinatal adversity, and many have injuries on brain MRI.

Hypothesis: We hypothesized that genetic testing would be pursued for patients with neither perinatal risk factors nor MRI findings.

Methods: We performed a retrospective cohort study of children with CP ICD codes seen at Lurie Children’s Hospital in Chicago between 2007 and 2020. Full-term patients were divided into categories based on imaging findings: 1) “image positive” if patients had any abnormalities, 2) “image negative” if MRI was reported as normal, and 3) “no imaging” if no image was available. For the “image negative” group, genetic testing rate and diagnostic yield were calculated.

Results: 5014 patients with CP were identified of whom 742 (15%) were born at full-term. MRI imaging was available for 605 (12%) full-term patients and 84 (1.7%) were found to be image negative. For the image negative subgroup, 51% (43/84) were tested with a diagnostic yield of 47% (20/43), for a total 24% (20/84) positivity.

Conclusions: Over a 13-year period, a genetic diagnosis was found in nearly one quarter of full-term CP patients with normal MRIs, representing 0.4% of our population. Despite a high diagnostic yield for this subset, half the patients were not tested. Further research to examine image-positive full-term patients and subgroups of preterm patients will help optimize testing of patients with CP.
An Initial Experience of Echocardiography-Guided Percutaneous Balloon Pulmonary Valvuloplasty in Infants  
Brown NK, Husain N, Arzu J, Ramlogan S, Nugent A, Tannous P

**Background:** Percutaneous balloon pulmonary valvuloplasty (PBPV) is the treatment of choice for isolated pulmonary valve stenosis (PS). While this procedure is highly efficacious and has an excellent safety profile, patients are exposed to the secondary risks of ionizing radiation and contrast media. To mitigate this risk, we developed a protocol for echo-guided pulmonary valvuloplasty (EG-PBPV). We present our initial experience using EG-PBPV and hypothesize that PBPV performed with echo-guidance can achieve an identical degree of technical success while significantly reducing patient exposure to ionizing radiation and iodinated contrast media.

**Methods:** This was a single center case-control study design comparing 10 EG-PBPV cases performed between 09/2019 - 11/2020 to a historical cohort of 19 patients who underwent standard PBPV (S-PBPV) between 12/2017-10/2019. Patients were included if they were less than 12 months of age with isolated PS. Primary outcomes were contrast dose (mL/kg) and total dose area product (cGy*cm²). Demographic, echocardiographic, and procedural data were collected. Wilcoxon rank sum test was used for group comparisons.

**Results:** All 10 infant cases underwent successful EG-PBPV with significantly lower radiation exposure (p < 0.001) and contrast dose (p = 0.003) compared to controls (Table 1). The efficacy of the intervention was maintained with no significant difference in post-procedure pulmonary valve gradient between the EG versus S-PBPV group. Technical proficiency improved over time with lower use of contrast and radiation with sequential cases (Figure 1). There were no immediate complications related to the case in either group.

**Conclusion:** Our early experience reveals that EG-PBPV in infants has results equivalent to S-PBPV but with less radiation and contrast.

**Table 1:** Comparison of Echo-Guided vs Standard Percutaneous Balloon Pulmonary Valvuloplasty

<table>
<thead>
<tr>
<th></th>
<th>Standard Valvuloplasty (n=19)</th>
<th>Echo-guided Valvuloplasty (n=10)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residual cath gradient (mmHg)</td>
<td>13.0 (6.0 - 19.0)</td>
<td>14.5 (8.5 – 20.8)</td>
<td>0.713</td>
</tr>
<tr>
<td>Contrast dose (mL/kg)</td>
<td>5.0 (4.5 - 8.5)</td>
<td>0.8 (0.0 - 3.5)</td>
<td><strong>0.003</strong></td>
</tr>
<tr>
<td>tDAP (cGy*cm²)</td>
<td>167.4 (82.2 - 266.8)</td>
<td>33.8 (25.9 – 60.7)</td>
<td><strong>&lt;0.001</strong></td>
</tr>
<tr>
<td># adverse events reported (n)</td>
<td>0</td>
<td>0</td>
<td>1.00</td>
</tr>
<tr>
<td>Total sheath time (min)</td>
<td>50.0 (33.5 – 56.0)</td>
<td>36.5 (30.0 – 45.8)</td>
<td>0.241</td>
</tr>
</tbody>
</table>

Table legend Mean (IQR). tDAP - dose area product (total radiation exposure), cGy - centigray.

**Figure 1:** Reduction in Contrast and Radiation Exposure over Time

**Fig 1** Technical proficiency improved over time with lower use of contrast (left) and radiation (right) with sequential cases.
**Authors:** Thomas Carberry MD; Nazia Husain MD, MPH; Nina Gotteiner MD; Gregory Webster MD, MPH

**Title:** Correlations between fetal SVT and postnatal SVT

**Background:**
Half to two-thirds of infants with a history of fetal SVT will have postnatal SVT. Current studies provide conflicting data on predictors of postnatal SVT. Understanding these predictors can improve anticipatory guidance for parents during pregnancy and after delivery.

**Objectives:**
Correlate fetal characteristics with incidence of postnatal SVT.

**Methods:**
We performed a single-center retrospective chart review of all mother-fetus pairs with fetal SVT from 1995-2020. Fetuses with significant congenital heart disease were excluded. Sustained fetal SVT was defined as tachycardia ≥ 50% of the time during fetal echocardiogram.

**Results:**
Fetal SVT was observed in 78 mother-fetus pairs (56/78 sustained SVT; 22/78 intermittent SVT), and 76 survived to delivery. By the end of gestation, 54/76 (71%) fetuses had converted to sinus rhythm. Transplacental antiarrhythmics were used in 49 fetuses, and 37/49 (76%) converted to sinus rhythm with treatment. Most fetuses with intermittent SVT (17/22) were in predominately sinus rhythm by the end of gestation without treatment.

Half of babies had SVT after delivery (37/76). Most SVT occurred in the first 2 days of life (29/37, 78%) and 95% had presented by 2 weeks of life (6/37 age 3-14 days; 2/37 age > 15 days). The following fetal characteristics were associated with a higher incidence of postnatal SVT: sustained fetal SVT at diagnosis (86% vs 56%, p<0.01), presence of ventricular dysfunction (41% vs 15%, p=0.02), and failure to convert to sinus rhythm before delivery (49% vs 10%, p<0.01). Neither the type of fetal SVT (orthodromic reentrant tachycardia, atrial flutter, ectopic atrial tachycardia) nor the presence of hydrops correlated to a higher incidence of postnatal SVT. In infants with a history of intermittent fetal SVT, 5/22 developed postnatal SVT.

**Conclusion:**
Postnatal SVT occurs in half of infants with a history of fetal SVT, nearly all within the first two weeks of life. We identified several predictors of postnatal SVT. Intermittent fetal SVT often resolves without transplacental therapy, but in infancy these patients remain at risk for postnatal SVT.
Objective: To describe the association between quantitative, sensitive echocardiographic measures of pulmonary vascular disease, the pulmonary artery acceleration time (PAAT) indexed to the right ventricular ejection time (RVET) and right ventricular free wall longitudinal strain (RV FWLS), and time to room-air or hospital discharge with minimal oxygen among infants with Type I severe bronchopulmonary dysplasia (sBPD).

Study design: We measured the PAAT/RVET (normal ≥0.31) and RV FWLS (normal ≤-17%) at 34-41 weeks’ post-menstrual age (PMA) for non-anomalous infants with Type I sBPD. The primary outcome was days from 36 weeks’ PMA until achieving room-air or hospital discharge with minimal oxygen (≤0.5 L/min). Time-to-event models quantified the unadjusted and independent relationship between the PAAT/RVET, RV FWLS, and the outcome using Cox proportional hazard ratios. Subset analyses excluded infants with a non-trivial patent ductus arteriosus.

Results: For 102 included infants, the median gestation was 26.5 weeks, 61% were male, and 10% SGA. The mean PAAT/RVET and RV FWLS were 0.27 ±0.06 and -22.63 ±4.23%, respectively, obtained at a median of 36 weeks’ PMA. An abnormal PAAT/RVET and RV FWLS were associated with an increased time to achieve the outcome in unadjusted analysis (PAAT/RVET: 51 vs. 24, p<0.0001; RV FWLS: 62 vs. 38, p=0.0006). A normal PAAT/RVET was significantly associated with more quickly reaching the outcome in multivariable analysis (aHR=2.04, 95% CI 1.11-3.76, p=0.02). The adjusted association persisted in subset analysis.

Conclusion: The PAAT/RVET independently risk-stratifies infants with Type I sBPD in whom pulmonary vascular disease prolongs the need for respiratory support.

Figure. Kaplan-Meier survival curves representing the unadjusted probability of reaching the outcome in days after 36 weeks’ PMA stratified by an abnormal vs. normal (A) PAAT/RVET and (B) RV FWLS. In both curves an abnormal measurement is significantly associated with a prolonged time to reach the outcome (A, log-rank test p<.0001; B, log-rank test p=0.0006). PAAT = pulmonary artery acceleration time; RVET = right ventricular ejection time; RV FWLS = right ventricular free wall longitudinal strain.
**Background and Objectives:** Children at risk of clinical deterioration after transport from referring emergency departments (ED) to pediatric hospitals are not well characterized. The objective was to characterize children who deteriorated following inter-facility transport and identify pre-admission risk factors associated with deterioration.

**Methods:** This retrospective cohort study of children ≤18 years transported from 1/1/16 to 12/31/19 from referring EDs and admitted to general inpatient units. Deterioration, the primary composite outcome, included a rapid response team (RRT) activation, transfer to the intensive care unit (ICU), and/or a cardiac or respiratory event within 24 hours of admission. ICU transfer was the secondary outcome. Multivariable regression was conducted for deterioration and ICU transfer.

**Results:** The cohort included 1,988 patients, median age 4.2 years; 53.9% male; and 44.1% with a respiratory diagnosis. Deterioration occurred in 135 (6.8%) children who more commonly had respiratory conditions (n=90; 66.2%). Deterioration was associated with longer stabilization time (minutes) (aOR 1.02, 95%CI 1.00,1.03), ≥2 complex chronic conditions (aOR 2.10, 95%CI 1.04,4.21), and a nebulizer treatment (aOR 2.27, 95%CI 1.06,4.84) in the multivariable regression. ICU transfer was association with ≥2 complex chronic conditions (aOR 2.17, 95%CI 1.04,4.53) use of nasal cannula (aOR 2.28, 95%CI 1.26,4.15), and nebulizer treatment (aOR 3.06, 95%CI 1.33,7.05).

**Conclusions:** Among children transported from an ED and admitted to a general unit of a pediatric hospital, 6.8% experienced deterioration. Transport teams should consider the potential for increased risk of deterioration among children with longer stabilization times, multiple complex conditions, and those receiving nebulized treatments.
The impact of chloride load on chloride levels and outcomes in critically ill pediatric patients
Jessica Christiano, MD; L. Nelson Sanchez-Pinto, MD, MBI; Matthew Barhight, MD

Background
Acute kidney injury (AKI) occurs in 27% of critically ill children and is associated with significant morbidity and mortality. Intravenous (IV) fluids are a cornerstone therapy for critically ill children as they are prescribed for resuscitation, maintenance of hydration, and carriers of IV medications. The most commonly used IV fluid is 0.9% saline, which contains 150% of the physiologic chloride concentration. Administration of chloride-rich IV fluids may increase the serum chloride levels and increase the frequency of hyperchloremia, which is independently associated with poor clinical outcomes including AKI and mortality.

We aim to define the relationship between IV chloride load and changes in serum chloride level. We further aim to evaluate the relationship between IV chloride load and clinical outcomes including AKI and in-hospital mortality. We hypothesize that a large IV chloride load will be associated with an increased frequency of hyperchloremia, higher rates of AKI, and higher mortality in critically ill children.

Methods
We performed a large retrospective cohort study assessing all patients with laboratory tests obtained who were admitted through the emergency department to the pediatric intensive care unit (PICU) at our tertiary care children’s hospital from 2012-2020. We calculated the cumulative IV chloride load inclusive of all IV fluids, medications, and blood products from presentation to the emergency department through day 1 of their PICU admission. The patients were stratified into groups based on the cumulative IV chloride load.

Our primary outcomes are the frequency of hyperchloremia and day 1 AKI. Our secondary outcomes are in-hospital mortality and ventilator-free days. Multivariable analyses using logistic regression and negative binomial regression models as appropriate were performed for our outcomes. All models were adjusted for a priori defined confounders of age, Pediatric Risk of Mortality (PRISM) III score, immunocompromised state, septic shock, and total fluid volume administered.

Results
There were 5,908 admissions from 2012 to 2020 for 3,198 different patients. 2,424 were excluded due to an absence of laboratory data. The total cohort included 3,484 patients (46% female) with a median age of 5.3 years (IQR 1.5-13.4), a median weight of 18.0 kg (IQR 10.4-41.3), a median PRISM III score of 4 (IQR 2-8), 29% were ventilated during the first three days of PICU admission, 13% presented with septic shock, and 17% were immunocompromised.

Hyperchloremia rates were 28.5%. Day 1 AKI developed in 12.17% of patients and severe day 1 AKI developed in 7.4% of patients. The in-hospital mortality rate was 3.2%. The median ventilator-free day was 28 out of 28 days (IQR 26-28). Medium and high IV chloride tertiles were associated with 1.5 (95%CI 1.2-1.8) and 2.0 (95%CI 1.5-2.5) adjusted increased odds of hyperchloremia respectively. Medium and high IV chloride tertiles were associated with 0.4 (95%CI 0.3-0.5) and 0.2 (95%CI 0.1-0.3) adjusted decreased odds of AKI. There were no differences between groups in the odds of in-hospital mortality or ventilator-free days in 28.

Conclusion
In this large cohort study of critically ill children, we found an increase in the rate of hyperchloremia associated with an increasing IV chloride load. Additionally, we found a decrease in the rate of AKI with increasing IV chloride load. There was no significant association of IV chloride load with other clinical outcomes. Future directions of our study include evaluating day 3 cumulative IV chloride load, day 3 AKI, and day 7 renal recovery. Further study is needed to determine the clinical impact of hyperchloremia and IV chloride load in critically ill children.
Procalcitonin Levels in Juvenile Dermatomyositis

Authors: Costin C, Khojah AM, Pachman LM

Background: Juvenile Dermatomyositis (JDM) is a rare, heterogeneous autoimmune disease in which infection is a common concern. Patients with JDM take varying levels of immunosuppressive medication; therefore, traditional inflammatory indicators used to gauge infection risk may be unreliable. Procalcitonin (PCT) is a biomarker with expanding use in diagnosis and ascertaining risk of bacterial infection in the pediatrics. The role of PCT for assessing the likelihood of bacterial infection in JDM remains unclear. No substantial studies regarding PCT in JDM have been published. The primary aim of this study will be to determine if PCT rises in JDM, using well established Disease Activity Scores developed at this center.

Methods: This study will be performed as a retrospective study. We will use the established Juvenile Myositis Registry and Biorepository available at our institution. The Juvenile Myositis Biorepository contains sequential biosamples from over 500 JDM patients during active and inactive disease states. PCT values will be obtained from serum samples of patient with high disease activity scores (DAS) and compared to sera from JDM with a low DAS. These values will also be compared to samples obtained from matched healthy pediatric controls. The number of samples to be tested will be determined based on a statistical power analysis. Covariates will be assessed including Myositis Specific Antibody (MSA) and the presence and the history of calcinosis, which are obtained on enrollment into the biorepository. Samples obtained from patients with suspected or active infection will be noted in subsequent independent analysis.

Hypotheses: PCT is hypothesized to elevate in bacterial infection due to the action of TNFα. TNFα is a driving factor in the JDM inflammatory response. In this context, it is a worthwhile endeavor to determine if PCT is elevated in JDM independent of bacterial infection. Furthermore, other rheumatic diseases have been shown in limited studies to have elevated PCT in the absence of infection. The primary aim of this study will be to determine if PCT rises in JDM. The secondary aims will be to determine if MSA, disease activity or the presence of calcinosis are each associated with PCT rise.

Significance: As PCT becomes more widely used in pediatrics it will be important to assess its utility as a marker of infection in JDM. This study will determine whether PCT rises in JDM and will also determine if this rise is associated with JDM clinical disease activity. Determining this will provide a context of PCT values for JDM, both with respect to detecting infection but also, possibly, as an easily accessible serum biomarker of JDM clinical disease activity.
**Title:** SARS-CoV2 and the Impact on Youth Onset Type 2 Diabetes New Diagnoses and Severity

**Authors:** Sean DeLacey, MD; Adesh Ranganna; Laura Levin, DO; Anita Swamy, MD; Monica Bianco, MD

**Background:** The link between diabetes and COVID-19 is well established both as a clinical perception and a research-based reality. Even in the pandemic’s early days, clinicians identified type 2 diabetes as a major risk factor for poor outcomes in adults infected with COVID-19 [1]. However, pediatric research has thus far primarily focused on type 1 diabetes and its changing incidence and severity [2, 3]. Less is known about COVID-19’s impact on the pediatric type 2 diabetic population. Youth with type 2 diabetes are a distinct population, and while type 2 diabetes still represents the minority of diabetes diagnoses in youth, the proportion was growing even prior to the pandemic [4]. Certainly, COVID-19 has been found to disproportionately impact patients with the comorbidities (i.e. obesity, hypertension) and within demographic groups (i.e. lower socioeconomic status, ethnic minorities) more commonly associated with type 2 diabetes [5]. Hence, understanding how COVID-19 has changed the evolution and incidence of pediatric type 2 diabetes is imperative; further characterizing the relationship may aid in future management and secondary prevention.

**Hypothesis:** The primary objective is to test the hypothesis that the incidence of youth new-onset type 2 diabetes diagnoses increased at Lurie Children’s Hospital in 2020 during the COVID-19 pandemic compared to the incidence between 2015-2019. Secondary objectives include comparing 1) the severity of initial presentation (based on initial encounter location, HgbA1C, and presence of ketosis/acidosis) 2) and the demographics of those diagnosed (based on gender, race, ethnicity, and home zip code). We hypothesize that the increase in type 2 diabetes prevalence will be disproportionately higher in lower socioeconomic families and minority groups. We also hypothesize that the severity of type 2 diabetes at diagnosis will be more severe than in previous years.

**Methods:** This is a retrospective review of electronic medical records for children 0-18 years of age who were newly diagnosed with type 2 diabetes (defined as HA1c >6.5%, OR OGTT results (Fasting >126 OR 2hr >than 200), OR a random blood glucose of >200) at Lurie Children’s Hospital or any of Lurie Children’s satellite locations between 1/01/2015 and 12/31/2020. Patient demographics will be recorded. Outcome measures will be abstracted from the medical record and include: age, height, weight, HgbA1C, basic metabolic panel, hepatic panel, venous blood gas, urinalysis, initial treatment location, length of initial hospitalization, initial treatment regimen, zip code, race, ethnicity, blood pressure, and COVID-19 testing.

**Results:** We anticipate, based on clinical experience, that the number of new onset type 2 diabetes has increased during the COVID 19 pandemic. We do not yet have results available. Currently we are in the process of obtaining a data pull through the Data Analytics and Reporting (DAR) team.

**Conclusion:** We are studying the changing number of new diagnoses of type 2 diabetes at Lurie Children’s Hospital during the COVID 19 pandemic. Based on clinical experience, we believe this number has increased.

COVID-19 Surveillance and Transmission in Chicago Schools

Priya Edward, Megan Reyna, Mary Kate Daly, Judd Hultquist, William Muller, Egon Ozer, Ramon Lorenzo-Redondo, Patrick Seed, Lacy Simons, Karen Sheehan, Jacinta Staples, Larry Kociolek

BACKGROUND: At the beginning of the COVID-19 pandemic in March 2020, schools transitioned to virtual learning and many have not yet returned to the classroom. While children have relatively mild or asymptomatic illness as compared to adults, there is concern that children could be vectors for transmission to others in the school setting, with in-person learning subsequently fueling transmission in the community.

HYPOTHESIS: We hypothesized that there would be few cases of asymptomatic positivity in children (<5%) and of the positives identified, there would be few cases of transmission to school contacts.

METHODS: In a large network of private schools in Chicago, 11 K-8 schools across 8 Chicago zip codes with high incidence of COVID-19 were selected for COVID-19 surveillance testing in asymptomatic students and staff. Between January and March 2021, oropharyngeal SARS-CoV-2 PCR testing was offered to asymptomatic remote and in-person students and staff members. Household and school contacts of participants testing positive were referred for COVID-19 testing. Additionally, epidemiologic information including history of personal and/or household COVID-19 diagnoses or symptoms was collected from participants via phone and online surveys. In all schools, positive students and all individuals in their classroom were quarantined for 10 days as per school policy. School policy also required reporting of COVID-19 diagnoses or symptoms in students and household contacts irrespective of study participation.

RESULTS: Overall, 468 participants were tested as part of surveillance testing, 346 students and 122 staff members. Proportion of eligible students who participated was 21%, ranging from 8-56% per school. At the first school visited, there were 17 positive tests: 6 staff members and 11 students (36% positivity rate). Of these 17 individuals, 4 were remote learners, 7 were in-person learners from 7 different classrooms, and 6 were staff members with minimal direct interaction; thus, no clear epidemiologic links were identified. Eleven of these individuals had a personal or household history of COVID-19 exposure, symptoms, or positive test in prior 4 months. In the subsequent 10 schools visited there were a total of 5 positive tests. All positive tests, with the exception of one remote learner, had a very high quantitative PCR cycle threshold suggesting very low SARS-CoV-2 oropharyngeal viral load. Total positivity rate from surveillance testing was 4.7% but only 1.2% when excluding the first outlier school. Of the classrooms that were quarantined following exposure, in addition to the unaffected classrooms who remained in school, no additional students or staff members reported positive tests or development of symptoms of COVID-19. Two additional schools were visited as part of outbreak investigations following a large exposure event at one school and multiple positive cases in the other. A total of 73 and 81 participants were tested at these schools, respectively, and all individuals tested negative for SARS-CoV-2.

CONCLUSIONS AND FUTURE WORK: We identified infrequent asymptomatic COVID-19 in students and staff in schools in high-risk Chicago communities, and we did not identify evidence of transmission to school staff or other students within each school. We speculate that the high number of positive SARS-CoV-2 tests in outlier school 1 was related to remote residual infections beyond the period of transmissibility, as we tested immediately after a 4-week winter break and remote learning period. These data suggest that COVID-19 mitigation procedures, including masking and physical distancing measures, are effective in preventing transmission of COVID-19 in schools. Additionally, these data raise the question of the utility and cost-effectiveness of surveillance testing in K-8 private schools. Ongoing work includes surveillance for SARS-CoV-2 variants of concern and changes in pediatric COVID-19 incidence as public schools reopen.
Title: Pediatric Cardio-Oncology: The Changing Role of Interdisciplinary Survival Care

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Background:
Pediatric cancers account for approximately 1% of US oncologic diagnoses yearly, with a described 60% of pediatric oncology patients enrolled on clinical research protocols, a significantly higher portion than in the adult oncology population. Chemotherapy remains one of the most commonly used interventions for cure-driven therapies in pediatric oncology trials. The cardiotoxicity adverse effect and subsequent late-onset cardiomyopathy, of many of these chemotherapy agents often require follow-up within Cardiology clinics. Given the increased understanding of cardiotoxic agents, ameliorating options for reducing cardiotoxicity, and evidence-based cardiomyopathy monitoring, there has been an increase in interdisciplinary Cardio-Oncology survival teams. We conducted a systematic literature review to assess the changing level of interest in Pediatric Cardio-Oncology within academic medicine over the last decade.

Methods:
We systematically searched PubMed, CINAHL, Embase, MEDLINE, Cochrane Library, Scopus and ClinicalTrials.gov for all articles and clinical trials published/established between January 1st 2010 and December 31st 2020 within the field of pediatric cardio-oncology. We used predefined MeSH Terms within a SPIDER (Sample, Phenomenon of Interest, Design, Evaluation, Research type) model, limiting our search to articles with English language translations. We selected articles assessing Pediatric Cardio-Oncology, the role of this interdisciplinary field in Pediatric Cancer and the expectation of future direction of the field. We excluded articles with specific focus on COVID-19, and studies that focused exclusively on adult Cardio-Oncology. Data were extracted from original publications by 4 independent reviewers. Risk of bias was assessed using the Cochrane Collaboration's assessment tool. Results are reported according to PRISMA guidelines. Reference Citation Manager was Mendeley Desktop Ver 1.19.8.

Results:
A total of 182 articles and trials were identified on initial title review, with 102 non-duplicated studies. Six articles were excluded due to focus on COVID-19 data. Publications and study data were only available from 2013. Within the literature published on pediatric cardio-oncology, 57.29% (55 of 96) of all published studies occurred between 2019 – 2020, while 42.7% occurred between 2018 – 2013 (41/96).

Conclusion: There is an overall rising trend in literature on pediatric cardio-oncology within academic medicine, between 2010 and 2020, with a significant increase in 2019 and 2020.

Keywords: Cardio-Oncology; Pediatrics; Pediatric Oncology; Pediatric Cardiology; Systematic Review.
Title: Evaluation of Chronic Kidney Disease, Hypertension, and Proteinuria in Pediatric Patients Following Acute Kidney Injury Requiring Continuous Renal Replacement Therapy

Authors: Jeanne Frisby-Zedan, MD, Mahima Keswani, MD

Background: Acute kidney injury (AKI) is common, affecting 25-30% of critically ill pediatric patients. Severe AKI has been shown repeatedly to be an independent risk factor for prolonged hospitalization, prolonged need for mechanical ventilation, and increased in-hospital mortality. Continuous renal replacement therapy (CRRT) is considered a mainstay of therapy for management of severe AKI in the pediatric population. While AKI has been shown to increase the risk of development of chronic kidney disease (CKD) in both adults and children, there is limited data on the risk of development of CKD, hypertension, and proteinuria after discharge in pediatric patients with severe AKI who require CRRT.

Methods: To further examine this, we will conduct a single-center, retrospective cohort study of all pediatric patients admitted to the intensive care units ages 0-17 years who received CRRT from 2010-2019 and assess for development of chronic kidney disease (CKD), hypertension, and proteinuria in those who survived to hospital discharge. This study will exclude patients over 18 years old on admission to the hospital, with pre-existing CKD, and those who died prior to discharge or who have insufficient follow-up data. We will also examine demographic and hospital admission characteristics to determine risk factors associated with an increased incidence of CKD, hypertension, and proteinuria in this patient population. The electronic health record (EHR) will be used to extract demographic and clinical data including age, sex, race, primary diagnosis, indication for CRRT, days on CRRT, number of courses on CRRT, baseline estimated glomerular filtration rate (eGFR), ICU admission eGFR, discharge eGFR, most recent eGFR, pre-existing hypertension, pre-existing proteinuria, hypertension on follow-up, proteinuria on follow-up, and identification of nephrology follow-up. Categorical data will be presented as counts and percentages. Continuous data will be presented as mean with standard deviation if data is normally distributed or median with IQR if data has a skewed distribution. Potential demographic or hospital risk factors will be analyzed using the t-test, chi-square test, Fisher’s exact test, Pearson’s correlation coefficients, and multivariate analysis where appropriate.

Hypothesis: We hypothesize that a significant percentage of pediatric patients (ages 0-17 years) who require CRRT in the setting of severe AKI will develop renal indicators of CKD in the months following hospital discharge including eGFR less than 90 mL/min/1.73m², proteinuria, and/or hypertension. We hypothesize that age, number of days on CRRT, courses of CRRT, concurrent ECMO, and discharge eGFR are potential risk factors associated with development of CKD, proteinuria, and/or hypertension after hospital discharge.

Results: We anticipate collecting data on approximately 100 patients over the 10-year study period. Through the data collected, we will calculate the incidence of CKD, stages of CKD, proteinuria, and hypertension for patients who required CRRT. Through statistical analyses we will analyze the demographic and hospital admission risk factors associated with development of CKD, proteinuria, and hypertension.

Conclusions: Successful completion of this study would help to fill the current gap in the literature regarding renal prognosis for pediatric patients who require CRRT for severe AKI. In addition, it will help to identify risk factors associated with increased risk of CKD, proteinuria, or hypertension. This study may also help to isolate a patient population who may benefit from optimization of nephrology follow-up in the future.
Intimate partner violence: yield of universal vs dedicated social work screening in pediatric emergency department child physical abuse evaluations

Kelsey Gregory, MD, Amanda Fingarson, DO, Mary Clyde Pierce, MD, Stephen Budde, PhD, LCSW, Douglas Lorenz, PhD, Stephen Furmanek, MPH, MS, Elizabeth Charleston, BA, CCRC, Norell Rosado, MD

**Background:** The association between child maltreatment and intimate partner violence (IPV) is well supported. Universal IPV screening has been recommended by the American Academy of Pediatrics and the United States Preventative Task Force, and many children’s hospitals have established screening measures. However, the yield and best methods of screening have not been explored, particularly in families where there are concerns for child physical abuse (PA).

**Objective:** To determine if there is a discrepancy in IPV disclosures between universal IPV screening completed during pediatric emergency department (PED) triage (“triage screening”) and IPV screening by a social worker (“social work screening”) in families of children who were evaluated for PA.

**Participants and Setting:** Caregivers of children who presented to an urban tertiary PED and underwent an evaluation for PA via a child abuse pediatrics consult.

**Methods:** A retrospective chart review was completed. Data collection included: caregiver responses to both triage screening and social work screening, interview setting details and participants, the child’s injuries, and details of the family’s reported IPV experiences.

**Results:** Our study (N=329) revealed a significant difference in positive IPV disclosure rates with triage screening producing significantly less positive IPV disclosures than social work screening (4.3% vs. 14.0%, p<0.001). Additionally, non-IPV violence concerns were identified in 35.7% (n=5) of the positive triage screens.

**Conclusions:** These results highlight the limitations and low yield of universal IPV screening during PED triage in high-risk scenarios such as child PA evaluations.
TITLE: Investigation of Gastrointestinal Symptoms Suggestive of Eosinophilic Esophagitis in Children on Palforzia in a Clinical Setting

AUTHORS: Drs Lauren Gunderman, Melanie Makhija, John Wechsler

BACKGROUND: Eosinophilic esophagitis (EoE) is a chronic antigen driven disease of the esophagus characterized by eosinophil-predominant inflammation (>15 eos/hpf) and symptoms of esophageal dysfunction. EoE is commonly associated with other atopic conditions such as asthma, atopic dermatitis, allergic rhinitis, and IgE-mediated anaphylactic food allergy. Food Allergy diagnosis has seen an increase over the last decade, with prevalence estimates of 5-10% in developed nations. To date, the cornerstone of management has been strict avoidance of the implicated food allergen and access to intramuscular epinephrine. Introduction of food antigen in the form of a patch, sublingual tablet and orally as a powder have been under intensive study. In January of 2020, the U.S. Food and Drug Administration (FDA) approved the first of these therapies, Aimmune’s Palforzia, for patients age 4-17. The therapy was approved as desensitization with the goal of reduction in life threatening allergic reactions upon accidental peanut exposure. While this Oral Immunotherapy (OIT) is assessed as safe and effective, the most frequently described adverse effects in clinical trials are gastrointestinal (GI) symptoms. A majority of GI symptoms resolve with slowing the biweekly up-dosing schedule, decreasing the dose or with discontinuation of therapy, but a small portion of patients with persistent symptoms have required endoscopy and been diagnosed with EoE. So the question arises: Does OIT cause de novo EoE in a patient or do these patients already have baseline eosinophilia or subclinical EoE prior to beginning therapy?

HYPOTHESIS: In children with IgE mediated food allergy to peanut taking FDA approved peanut OIT (Palforzia) and adherent to the standard of care, gastrointestinal symptoms suggestive of EoE are common and successfully measured without discontinuing therapy.

METHODS: Patients will be identified based on their participation in OIT clinic for peanut desensitization and controls identified by their history of IgE mediated food allergy to peanut and as patients in Lurie’s Allergy and Immunology Clinic. All questionnaires are outlined here: at intake and each up-dosing those taking Palforzia or proxy will complete a PEESS v2.0 questionnaire addressing symptoms specifically associated with EoE. Controls will answer surveys at initiation, at 12 month follow up with their allergist and at least 1 additional time within the 12 months. The purpose of the questionnaire is to improve the accuracy of symptom severity scoring for patients with GI symptoms suggestive of EoE. This form is administered by proxy for 2-18 year old patients and self-administered to those aged 8-18. At these visits they will also complete a Food Allergy Quality of Life Questionnaire (FAQLQ). The purpose of this questionnaire is to assess patient quality of life while on OIT.

RESULTS: Anticipated results are that GI symptoms will continue to be prevalent in those taking Palforzia, but will be treatable without discontinuation of therapy, and can be accurately assessed with validated survey.

CONCLUSION: To be determined.
TITLE: High-Flow Nasal Cannula Use in Infants with Bronchiolitis: Predicting Need for Early Escalation of care

AUTHORS: Hintz L., Florin T., Kolaitis I.

BACKGROUND: Bronchiolitis is the leading cause of hospitalization in young children, and although the overall incidence of disease has decreased in recent years, there has been an increase in the use of both invasive and non-invasive mechanical ventilation and consequently in hospital costs. In the last two decades, high flow nasal cannula (HFNC) was introduced for use in pediatric respiratory illnesses with utilization increasing substantially over that same time. Although numerous studies have evaluated the role of HFNC in acute bronchiolitis in young children, a consensus has not yet been reached on effective and appropriate use of HFNC in managing this viral illness.

Studies that compare HFNC both to non-invasive positive pressure ventilation (NIPPV) and to standard oxygen therapy (SOT) demonstrate that one of the most notable benefits over NIPPV is increased tolerability and patient comfort. However, results are inconsistent when comparing intubation rates or duration of positive pressure ventilation (PPV) in patients who are initiated on HFNC with those who are initiated on NIPPV. When compared to SOT, many studies demonstrate a reduction in rates of escalation and intubation; however, there are not statistically significant differences in hospital length of stay (LOS), ICU transfer, or duration of oxygen therapy. While mitigating the adverse effects associated with invasive mechanical ventilation (IMV) is an important benefit to consider in use of HFNC, widespread use of HFNC must be balanced with the theoretical negative implications including limited oral feedings as well as the economic impact of specialized units and equipment and higher nurse- and respiratory therapist-to-patient ratios, particularly in those patients who would otherwise have good outcomes on SOT alone.

The objective of this study is to identify factors associated with the need for escalation of care in infants with bronchiolitis who are initiated on HFNC in the Emergency Department (ED). By identifying these predictive factors, disposition and management decisions can be targeted for those at higher risk, while minimizing unnecessary use of HFNC in those at lower risk of more severe disease course.

HYPOTHESIS: While previous studies have yet to consistently identify predictive factors, day of illness >5 at presentation and improvement in tachycardia following HFNC initiation have been identified as protective factors against intubation. I anticipate similar findings in this study.

METHODS: We are conducting a retrospective cohort study of patients presenting to Ann & Robert H. Lurie Children’s Hospital ED during the study period. We identified the eligible study population through chart review, and collected data including demographics, treatments, historical features, exam findings, treatments, and response to therapy through both automated and manual chart review. Descriptive statistics will be reported for all potential predictors, and bivariable logistic regression analysis will evaluate the association between each individual predictor and the primary outcome of escalation of care.

RESULTS: Statistical analysis is pending; however, we hope to identify clinical variables either from history, physical, or response to initial therapy, that may be used to predict clinical trajectory within the first 24 hours of hospitalization. Through retrospective manual review, limitations have been identified, most notably inconsistencies in verbiage, documentation, and timing of charting in the ED as well as inherent variability and subjectivity of assessments due to multiple different providers for each encounter.

CONCLUSION: Viral bronchiolitis remains a leading cause of hospitalization in infants, with a wide range of severity in presentation. Through this study, we hope to identify predictors that can aid in disposition and management decisions targeted to those at higher risk for escalation of care.
Eosinophilic esophagitis (EoE) is a chronic, immune-mediated allergic disease of the esophagus characterized by eosinophil-predominant inflammation and esophageal dysfunction. Both genetic predisposition and environmental exposures contribute to an altered immune response that recruits eosinophils to the esophagus and results in a histologically and functionally abnormal esophageal epithelium. Over time, inflammation promotes subepithelial collagen deposition, contributing to epithelial remodeling and fibrostenotic complications, including stricturing and dysmotility.

Among patients with EoE, there exists a range of clinical phenotypes. A proposed subtype of EoE involves the association of EoE and inherited connective tissue disorders (CTDs), specifically those with joint hypermobility (JHM). Patients with CTD have an 8-fold higher risk of EoE compared with the general population. The association between CTD and EoE is thought to be mechanistically mediated by transforming growth factor-β signaling pathways, which are also implicated in esophageal fibrosis and tissue remodeling. The clinical phenotype and pathologic difference of EoE with CTD/JHM compared to EoE without CTD/JHM is not well defined.

The endoscopic functional lumen-imaging probe (EndoFLIP) is a standard of care tool used during endoscopy that calculates esophageal distensibility. Esophageal distensibility provides information about luminal narrowing and fibrosis that is not readily detected on biopsy. We propose a prospective study to determine whether patients with EoE-CTD/JHM have altered symptom severity, esophageal distensibility, and histologic abnormalities compared to patients with EoE-only. Improved clinical phenotyping of EoE patients with a potential predisposition to fibrinogenesis will improve the understanding of targeted monitoring strategies to prevent fibrostenotic complications before they occur.

HYPOTHESIS: CTD and JHM modify the EoE phenotype clinically, functionally, and pathologically compared to patients with EoE-only. Patients with EoE-CTD/JHM will have increased severity of patient-reported symptoms, decreased esophageal distensibility, and higher mast cell density on biopsy compared with patients with EoE-only.

METHODS: This study is designed as a prospective longitudinal registry. Patients with established or suspected diagnosis of EoE will be approached for participation. Patients that consent to participation in the registry will undergo standard of care evaluation, including upper endoscopy, EndoFLIP, histologic assessment of biopsies, and physical exam with Beighton scoring for JHM. Registry participation also includes completion of patient-reported questionnaires and tissue banking of biopsy specimens for histologic analysis. Primary outcome measures include patient-reported symptoms, esophageal distensibility, and mast cell density. Secondary outcome measures include Endoscopic Reference Score (EREFS), and EoE Histology Scoring System (EoE-HSS).

RESULTS: Baseline retrospective analysis of EndoFLIP data includes 33 EndoFLIPs performed on 31 unique patients. 26 patients had previously established or newly diagnosed EoE and 5 patients did not meet diagnostic criteria for EoE. We found a wide range of distensibility among patients, ranging from 1.11-8.45 mm²/mmHg (reported normal value in adults is >3 mm²/mmHg). Distensibility index had weak correlation (r=-0.32) with eosinophil count. Patients with evidence of fibrosis on biopsy had lower distensibility index than those without fibrosis (p<0.05). 11% of patients assessed for hypermobility met criteria for JHM. Beighton score (validated 9-point scale for JHM) had weak correlation with distensibility index (r=-0.23).
For the prospective longitudinal registry, we have thus far enrolled 10 subjects, 5 of whom have undergone EndoFLIP. Registry data will include patient-reported symptom scores, hypermobility features, autonomic symptoms, rates of fibrostenotic complications, and quantification of immune cell populations on biopsy.

CONCLUSION: This project aims to understand if the association between JHM and EoE modifies the EoE phenotype clinically and pathologically. An improved understanding of EoE clinical phenotypes could lead to targeted monitoring strategies to detect early signs of fibrosis before complications occur, and may inform further studies of potential mechanistic pathways driving fibrotic tissue remodeling.

References

BACKGROUND: Pediatric patients listed for heart transplantation can develop circulating antibodies against human leukocyte antigens, a condition called allosensitization. Screening for such antibodies is performed via a panel-reactive antibody (PRA), which effectively estimates the percentage of incompatible donors a patient might encounter as a result of incompatible donor antigen and patient antibody interactions. Allosensitization (defined as PRA ≥ 10%) has increased in the recent years. In 2017, 32% of pediatric heart transplant recipients were allosensitized compared to 14% of patients in 2007. Previous studies have demonstrated that risk factors for allosensitization include patients with congenital heart disease, older age of recipients, and history of prior cardiac surgery. While some studies have demonstrated that patients supported by ECMO are more likely to be allosensitized, other studies have not found this to be the case. Similarly, some have found there is an association between VAD support and development of allosensitization, but others have found there was no significant difference. Patients who are allosensitized are more likely to wait longer for transplant, and others have found that that an elevated PRA is associated with higher risk of death while waiting.

Previous studies have found that elevated PRA levels (with different studies using various thresholds) have been associated with worse graft survival. As a result, such patients are often considered “higher risk” transplant candidates. However, Lurie Children's Hospital as an institution has proceeded with heart transplants in these individuals, and anecdotally we do not believe that there appears to be a difference in outcomes. Given our relatively unique situation, we would like to review our heart transplant data from the last 10-years to compare the outcomes (analyzing graft survival, rejection incidence, and cardiac allograft vasculopathy incidence) between sensitized and non-sensitized patients.

HYPOTHESIS: The broad objective of this study is to compare the outcomes of allosensitized versus non-sensitized pediatric heart transplant recipients at Ann and Robert Lurie Children’s Hospital from the last 10 years (2010–2020). Our hypothesis is that there is no difference in outcomes between allosensitized and non-sensitized patients. The primary aim of this study will be to review graft failure (defined as either patient death or re-transplantation) in allosensitized patients compared to non-sensitized patients. Our secondary outcomes will be to review the incidence of rejection and cardiac allograft vasculopathy in allosensitized patients compared to non-sensitized patients.

METHODS: The study will be a retrospective cohort study from pediatric heart transplant recipients at Lurie Children’s Hospital from the last 10 years (2010-2020). Lurie specific data will be queried from the Pediatric Heart Transplant Society (PHTS) database. PHTS is an international event-drive database, and Lurie is a participating member. Forms are submitted by Lurie when a patient is listed for transplant, transplanted, and when certain events occur after transplant (including when patients are treated for rejection, develop cardiac allograft vasculopathy, are listed for re-transplantation, or decease). As needed, individual chart reviews will be performed if there is insufficient evidence that can be pulled from the database.

RESULTS: The Lurie-specific data from PHTS has not yet been queried. One of the potential issues that I anticipate is that although our cohort is relatively large for a single-center study (and will number ~240 patients), it may not be sufficiently powered to detect small differences in graft survival, rejection incidence, or development of cardiac allograft vasculopathy. Another potential issue is that although we will have 10-years of patients, it may be necessary to follow these patients longitudinally overtime to see if there is truly a difference in outcomes.

CONCLUSION: If we find that the graft survival between sensitized and non-sensitized patients is similar, then it may suggest that the desensitization therapies completed at Lurie prior to and/or after heart transplant improve outcomes such that our center does not follow the national trend. Conversely, if our data corroborate what has been previously demonstrated, then as a center we may need to re-examine transplant practices.
Pediatric Emergency Department Testing for Gonorrhea and Chlamydia in Children

**Objective:** This study aimed to describe trends in the utilization of nucleic acid amplification (NAAT) testing for gonorrhea and chlamydia in US pediatric emergency departments. NAAT has been recommended over invasive genital culture by the AAP and CDC for children evaluated for sexual abuse.

**Methods:** We conducted a multicenter, retrospective study of children aged 12 months to 11 years tested for gonorrhea and chlamydia between 2004-2018 at 22 hospitals in the Pediatric Health Information System (PHIS). We included patients with diagnosis codes for maltreatment concerns and/or genitourinary (GU) symptoms. The primary outcome was prevalence of testing with NAAT, culture, or both tests. We analyzed groups based on patient sex, maltreatment concerns, and GU symptoms.

**Results:** 36,312 visits were analyzed. Patient visits were 73.4% girls and 26.6% boys. During the study period, there was an increase in use of NAAT-only testing for girls (49.3% to 94.3%, p<.001) and boys (54.5% to 96.1%, p<.001). There was also a decrease in use of culture alone for girls (40% to 1.6%, p<.001) and boys (38.7% to 0.8%, p<.001). Use of both tests in the same encounter was higher among children diagnosed with maltreatment than GU symptoms, regardless of gender (p<.001).

**Conclusion:** Over a 14-year period, downtrend of culture use with increase in NAAT was observed, suggesting general adherence to evidence-based guidelines. Almost 10% of children diagnosed with maltreatment concerns continued to be tested with culture. This could indicate provider concerns regarding test accuracy, legal admissibility, or lack of test availability.

**Figure 1B:** Testing among children with a maltreatment concern

Girls

- NAAT only: 90.10%
- Culture Only: 39.70%
- NAAT & Culture: 40.20%

Boys

- NAAT only: 90.20%
- Culture Only: 27.70%
- NAAT & Culture: 40.20%

**Figure 2:**

Variation in NAAT testing rate among all hospitals 2004-2018

- GC/CT NAAT Testing Percentage
- Hospitals
Investigation of TPSAB1 Genotype as Predictor of Severity of Food Allergy Reactions

A. Lang, MD, R. Kumar, MD, MSc, and J.A. Pongracic, MD

**Background:** Fatal anaphylaxis in patients with food allergy is rare, but the unpredictability of reactions attributable to food significantly impacts quality of life. To date, there is no reliable or accessible biomarker that accurately distinguishes patients at risk for a severe life-threatening reaction to food versus a milder reaction. Previous studies have shown that increased copy numbers of TPSAB1 correlate with higher basal serum tryptase levels and increased risk of severe reactions in adults with Hymenoptera venom allergy and idiopathic anaphylaxis.

**Objective:** The objective of the pilot study is to determine frequency differences in TPSAB1 copy number between children with peanut allergy who have had severe anaphylaxis versus controls with more mild allergic reactions in order to determine effect size.

**Hypothesis:** We hypothesize that children with increased copy numbers of TPSAB1 are more likely to have severe reactions.

**Methods:** We will initially analyze TPSAB1 copy number in 40 subjects with documented reaction to peanut oral food challenge (OFC). We will include 20 cases with anaphylactic reactions and 20 controls with history of mild reactions, matched for age and sex. Cases and controls will be recruited from a previously well-characterized cohort of 184 subjects who underwent in-office peanut OFC at Ann and Robert H. Lurie Children’s Hospital of Chicago between January 2012 and August 2017. Parents or guardians of potential subjects will be contacted directly by phone or approached at scheduled clinic visits. Demographic and clinical characteristics, previous allergy testing results, and presence of any co-factors that may contribute to severity of reactions will be collected. This information will be compiled from chart review and a brief questionnaire completed by the parent or guardian at time of enrollment in the study. Buccal swabs will be used to obtain DNA from participants. Biological specimens will be de-identified and labeled with a study code number prior to transfer by secure tracked shipping to collaborators at the National Institutes of Health. Determination of increased copy number of TPSAB1 will be determined by digital droplet PCR (ddPCR) sequencing of the gene. We will report descriptive statistics for demographic and clinical information. For the primary analysis, we will perform logistic regression models assessing associations between TPSAB1 copy number (defined as >2 copies versus ≤2 copies) and severity of food reaction (defined as severe versus non-severe based on published consensus statements on anaphylaxis).

**Next Steps:** Following successful completion of the pilot study and determination of effect size, we intend to include a larger number of subjects to explore the magnitude of association between increased copy number of TPSAB1 and severity of food reactions. We also will conduct similar analyses in a validation cohort of children presenting to the emergency room for treatment of anaphylaxis. In addition, we plan to investigate increased copy number of TPSAB1 as a predictive measure of reaction severity in a prospective cohort of patients undergoing peanut OFC.
Title: Associations between Perceived Financial Distress and SES Among Caregivers of Critically Ill Children

Author: Vidya Mahavadi, MD

Research Mentors: Denise M. Goodman, MD, MS; Anita Murad, MSW, LCSW

Background: Admission to the Pediatric Intensive Care Unit (PICU) can be the source of many stressors for families\(^1\). Illness\(^2,3\) and critical illness\(^4\) can, specifically, increase financial stress by adding to medical costs and non-medical out-of-pocket expenses (NOOPEs), including transportation, meals, childcare, and earnings lost due to missed work\(^5,6\). The burden of critical illness and the burden of NOOPEs have been shown to disproportionately affect families of lower socioeconomic status (SES) and from lower-income neighborhoods by compounding the effects of pre-existing financial hardships\(^5,7\). What is not known, however, is the extent of pre-existing financial distress in families of children admitted to the PICU, the attributes associated with that distress, and the additive effect of critical illness. To address these gaps, we aim to study the perceived financial distress of families admitted to the Lurie Children’s PICU, explore its relationship to individual and neighborhood-level SES, and observe how this self-perception changes over the course of critical illness.

Hypothesis: Our primary hypothesis is that the perceived financial distress of families in the PICU is influenced by SES, defined not only by baseline income, but also by more nuanced criteria reflective of neighborhood-level characteristics. Our secondary hypothesis is that this perception worsens over the course of critical illness due to additional unexpected NOOPEs experienced during hospitalization.

Aim #1: To describe the perceived financial distress of families in the PICU using a validated tool and studying its association with individual-level and community-level markers of SES such as the Child Opportunity Index (COI).

Aim #2: To quantify NOOPEs using previously published categories in families admitted to the PICU for more than 72 hours.

Aim #3: To study the effect of NOOPEs on a family’s perception of financial distress and explore its evolution over the course of critical illness.

Proposed Methods: This is a single-center, prospective study using a primary survey approach. Inclusion criteria will be a minimum length of stay of 72 hours and a maximum length of stay of 2 weeks. Exclusion criteria include families of patients for whom residential addresses cannot be established, international families, and patients who reside in long-term care facilities. Families will be approached for consent approximately 72 hours into admission. Families will be asked to complete the InCharge Financial Distress/Financial Well-Being (IFDFW)\(^8\) questionnaire, a validated tool which measures the perceived levels of financial distress in individuals. We will also collect demographics and previously published NOOPEs\(^6\). Using geospatial coding we will also describe neighborhood characteristics and compute the Child Opportunity Index (COI)\(^9,10,11\). If families agree to the longitudinal portion of the study, they will be recontacted 1 week after the first survey or at the time of PICU discharge, whichever comes first. All data will be deidentified and stored in a password protected database using Research Electronic Data Capture (REDCap)\(^12,13\). Our analysis will include descriptive statistics and multivariable methods.
References:
Research Scholar Day Abstract:

Title: Echocardiographic Assessment of Diastolic Dysfunction and Strain Measurements in Multi-system Inflammatory Syndrome in Children (MIS-C) Associated with COVID-19

Authors: Daniel McAree, Amanda Hauck, Jen Acevedo, Michael Carr, Ami Patel, Nazia Husain

Background: Multisystem Inflammatory Syndrome in Children (MIS-C) is a novel disease associated with COVID-19 that involves a hyper-inflammatory state and multi-organ dysfunction. MIS-C appears to most commonly occur as a delayed post-infectious inflammatory response 4-6 weeks after a COVID-19 infection, which may have been symptomatic or asymptomatic (Matsubara et al). MIS-C can lead to acute systolic and diastolic cardiac dysfunction, often leading to hospitalization. MIS-C is currently treated with steroids +/- IVIG and in some cases, antiplatelets, anticoagulation, non-invasive or invasive respiratory support, and inotropic agents for hemodynamic support. With MIS-C cases rapidly rising globally in the midst of the SARS-CoV2 pandemic, urgent understanding of the cardiac effects for children is essential. Systolic dysfunction has been documented to improve with treatment in the vast majority of patients (Valverde et al, Matsubara et al). However, there is a paucity of data examining diastolic function and strain via transthoracic echocardiography in MIS-C patients. Matsubara et al found that global longitudinal and circumferential strain, peak left atrial strain, and peak longitudinal strain of right ventricular free wall were the strongest parameters to predict myocardial injury in a 28 patient MIS-C cohort, and the preserved left ventricular ejection fraction group showed diastolic dysfunction. In follow-up, diastolic dysfunction persisted in their cohort despite improvement in systolic function; however the interval assessed was only over a 5.2 +/- 3 day period (Matsubara et al). At this time, there are no studies to our knowledge examining echocardiographic markers of diastolic function or strain weeks after hospital discharge.

Due to lack of established guidelines, the Pediatric Cardiology, Pediatric Infectious Disease, and Program in Inflammation, Immunity, and the Microbiome (PrIIMe) services at Lurie Children’s Hospital established a protocol for outpatient follow up of MIS-C. We will examine the MIS-C patient cohort at Lurie Children’s Hospital to describe their echocardiographic findings at medium term follow up (4-8 weeks post discharge), with the goal of improving our understanding of the cardiac effects in children in the follow-up phase of MIS-C. If persistent dysfunction is present after discharge, this may indicate a need for ongoing cardiac surveillance for this patient population. We hope this will ultimately improve our recognition and management of potential complications of MIS-C.

We will retrospectively evaluate systolic and diastolic function obtained by transthoracic echocardiographic imaging in all pediatric patients age 21 or younger diagnosed with MIS-C at Lurie Children’s Hospital from March 2020-March 2021. We will describe their echocardiographic findings longitudinally, from time of diagnosis to 4-8 weeks post-discharge. We will explore potential associations between clinical presentation or serum biomarkers and persistence of echocardiographic cardiac functional abnormalities after hospital discharge.

Hypothesis: Patients with MIS-C will have evidence of significant strain and diastolic function abnormalities during hospitalization that will persist despite normalization of ejection fraction at 4-8 weeks after hospital discharge, when compared with matched controls. Higher serum inflammatory markers, higher serum markers of myocardial injury, lower ejection fraction and shortening fraction during hospitalization, higher Vasoactive-Inotropy Scores, need for intensive care, and longer lengths of hospital stay during the acute illness will be significantly associated with persistent abnormalities in strain and diastolic function at 4-8 week follow-up.

Methods: Retrospective chart review of electronic medical records and retrospective post-processing analysis of echocardiographic images. Strain will be performed using speckle tracking echocardiography on DICOM images stored at acquisition frame rates between 50-100 frames per second and evaluated using TomTec Cardiac Performance Analysis.

Results: Data collection not yet complete.

Conclusions: To be determined pending data collection and statistical analysis.
TITLE: Racial and Socioeconomic Disparities in Referral Rates to Pediatric Gastroenterology in Children with Functional Abdominal Pain Disorders

AUTHORS: Shaunte McKay, MD, Bonnie Essner, PhD, Melissa Simon, MD, John Fortunato, MD

BACKGROUND: Functional abdominal pain disorders (FAPDs) include functional dyspepsia, irritable bowel syndrome, abdominal migraine, and functional abdominal pain NOS.1 FAPDs are prevalent, affecting approximately 35% to 85% of school-aged children in the U.S.1 However, there exists limited data on the prevalence of FAPDs among racial/ethnic minority youth. In a community based study reviewing African- American children with functional gastrointestinal disorders it was shown that 19.3% of children reported these symptoms at their annual well-child check.9 Pediatricians have been shown to accurately diagnose FAPDs but further management of these disorders requires a multidisciplinary team including a pediatric gastroenterologist.2 There is limited data available on referral rates to pediatric gastroenterologists for FAPD amongst pediatric patients of differing socioeconomic, racial and ethnic groups. A recent study has shown that pediatricians in middle/high socioeconomic zip codes tend to refer patients to subspecialty clinics at higher rates than pediatricians in lower socioeconomic zipcodes.4 This may contribute to unequal access to subspecialty care for patients within lower socioeconomic groups. Unequal access to healthcare due to socioeconomic status, race, or ethnicity can have a cumulative and synergistic impact on a child’s life-course trajectory and leads to disparate outcomes in adulthood.5, 7 There are gaps in the current research addressing access to care for racial/ethnic minorities and low socioeconomic patients that have functional abdominal pain disorders.

HYPOTHESIS: There is no difference in the prevalence of functional abdominal pain disorders amongst differing racial, ethnic and socioeconomic groups. There are lower referral rates to pediatric GI clinics for racial and ethnic minority patients with functional abdominal pain disorders. There are lower referral rates to pediatric GI clinics for patients with public aid in comparison to patients with private insurance.

METHODS: We propose a retrospective study including children and adolescents 8-17 years-of-age presenting to primary care clinics with chronic or recurrent abdominal pain of at least 2 months duration, with at least 4 episodes each month. We will include patients that meet Rome IV Criteria for all categories of functional abdominal pain disorders. We will define racial/ethnic categories as Black, White, Asian/Pacific Islander, Native American, Latino-white, Latino-black. We will define insurance categories as public aid, private insurance, self-pay and unknown insurance status. We plan to obtain this data through surveys administered to primary care pediatric practices in the Chicago area to determine referral rates to gastroenterology clinic for patients who are included in these categories.

RESULTS: Anticipated results of this study include an assessment of the prevalence of functional abdominal pain disorders in racial and ethnic minority groups. An assessment of referral rates to gastroenterology clinic for functional abdominal pain disorders for racial minorities, ethnic minorities, and patients with low socioeconomic status.

CONCLUSION: Untreated functional abdominal pain disorders can lead to worsening daily functioning and quality of life. The proposed study aims to investigate possible healthcare disparities in providing equal care for at risk patients that present with functional abdominal pain disorders.

References
Title: “Trial of Therapy” in the Neonatal Intensive Care Unit

Authors: Jacqueline Meadow, Natalia Henner, Kelly Michelson

Background: Perinatal counseling often includes discussions of predicted morbidity and mortality associated with gestational age or congenital abnormalities. Such discussions are meant to allow parents opportunities for informed decision-making. If gestational viability is at the center of the decision, parents are often presented with three options: non-intervention, full intervention, or “a trial of therapy.” It is unclear what Neonatologists mean by “trial of therapy,” specifically, what is enough time for a “trial” to be completed, and what constitutes success (meriting a continuation of life-sustaining treatments) or failure (meriting a discussion of whether to discontinue or limit life-sustaining treatments). For a parent to give informed consent for a trial of therapy, the criteria used to end the trial must be clearly outlined by the counseling physician. However, there appears to be significant variability in the criteria used to end a trial of therapy among Neonatologists, which casts doubt upon the validity of the informed consent process. This study aims to describe Neonatologists’ views on criteria for ending a trial of therapy in peri-viable neonates, their clinical practices for these patients, and an initial exploration of their reasoning, in the hopes of improving the informed consent process surrounding decisions of resuscitation.

Hypothesis: We hypothesize that there is substantial variability in how Neonatologists define trial of therapy and what criteria they use for proposing the end of a trial. Furthermore, we hypothesize that Neonatologists do not consistently initiate discussions about discontinuation of life-sustaining therapies for patients whose trial of therapy has failed based on theoretical definitions. Finally, we hypothesize that there are non-medical (i.e. social) factors that influence whether a trial is considered a success or a failure.

Methods: We have administered a baseline survey to attending Neonatologists at Lurie Children’s to establish theoretical criteria for failure of a trial of therapy in peri-viable infants (22-25 weeks gestation) with significant morbidities. We are now performing weekly interviews with on-service attendings in the Prentice Women’s Hospital and Lurie Children’s Hospital NICUs to discuss care of patients who meet these criteria.

Results: We have established that there is considerable variation in criteria for what could constitute an unsuccessful trial of therapy. We will compare rates of consideration of failure of trial of therapy in theory to initiation of discussions of withdrawal of life-sustaining therapy in practice, compare rates of offers of withdrawal of life-sustaining therapy in clinically similar neonates with differing non-medical (social) factors, and describe themes from Neonatologists’ discussions of why they did or did not offer withdrawal of life-sustaining therapy.

Conclusion: Determining whether Neonatologists put their theoretical criteria of failure of a trial of therapy to practical use will allow the department to deliver a clearer and more consistent message during perinatal counseling and improve the informed consent process surrounding decisions of resuscitation for peri-viable infants. In addition, determining whether non-medical factors affect Neonatologists’ decisions on failure of a trial of therapy can help elucidate biases that can be further explored.
Title: Food insecurity and impact on transplant outcomes in pediatric kidney transplant recipients

Authors: Anoosh Moin, Priya S. Verghese, Rachel Engen, Debbie Matossian

1Pediatric Nephrology Department, Lurie Children’s Hospital, Chicago, IL

Introduction:
Food insecurity (FI), defined as inconsistent access to food or worry over shortage of food that prevents an active and healthy life, has not been studied in pediatric kidney transplant (pedsKTx) recipients. The COVID-19 pandemic increased prevalence of FI in children from 17.4% to 19.9% incentivizing this single-center retrospective cohort study in the largest pediatric hospital in Illinois, to assess for FI prevalence in pedsKTx and association with transplant outcomes.

Methods:
A 2-question survey was administered to all pediatric kidney recipients that attended the kidney transplant clinic in person or via telemedicine for the month of November 2020. All families were asked if they were ever worried that food would run out or if food ever ran out over the past year. Sociodemographic and clinical data from November 2019 to December 2020 were collected using electronic health records. Continuous variables were analyzed using the two-sample t-test. Categorical variables were analyzed using Fishers exact. All values were reported with 95% confidence intervals.

Results:
FI was identified in 12/45(26.7%) pedsKTx patients. Hispanic ethnicity (RR 3.75 (95th%ile CI 1.16-12.04), p= 0.019) was associated with FI. FI patients were more often on Medicaid vs private insurance (75% vs. 54%) and received deceased vs living donations (75 % vs. 69%), although not statistically significant possibly due to small numbers. Age, gender, race, time from transplant, good medication adherence, type of underlying renal disease and presence of hypertension were not significantly associated with FI status. Rejection episodes (25% vs. 9%) and hospital admissions (58.3% vs. 36.4%) were not significantly associated with FI although infectious hospitalizations trended towards significance (25% vs. 3%, p=0.05).

Conclusion:
Food insecurity is prevalent in pediatric renal transplant patients. Hispanic patients are more likely to be food insecure. The pandemic effect on magnifying prevalent racial and ethnic disparities in pediatric kidney transplant requires a larger sample size.
TITLE: Adherence to Immunosuppression in Pediatric Heart Transplant Recipients: A Systematic Review

AUTHORS: Keira Nassetta, MD, Tasmeen Hussain, MD MPH, Linda O’Dwyer, MA, MSLIS, Sherif Badawy, MD

BACKGROUND: After pediatric heart transplant, commitment to lifelong immune suppression is crucial to maintain graft health. Adequate adherence to these immunosuppressive medications is essential to prevent poor outcomes. A review of the current literature surrounding adherence to immunosuppression in pediatric heart transplant patient is lacking.

HYPOTHESIS: This systematic review aims to summarize the current landscape of adherence to immunosuppression in pediatric heart transplant patients, including measurements of adherence, risk factors for nonadherence, and outcomes associated with nonadherence in pediatric heart transplant patients.

METHODS: We conducted searches in PubMed MEDLINE, Embase, CENTRAL register of Controlled Trials (Wiley), and Scopus, from inception to March 2020. Studies were eligible if they outlined an aspect of adherence to immunosuppression in pediatric heart transplant patients. The heart transplant cohort had to contain at least 10 patients, and the measurement of adherence had to be performed with an objective or otherwise validated measure of adherence (eg. drug levels, adherence questionnaires). Two authors independently screened the articles for inclusion, and then reviewed the full texts of included articles. Data was extracted into standardized forms and bias evaluations were done using the Cochran, Newcastle-Ottawa or modified Newcastle-Ottawa tools depending on study type.

RESULTS: The titles/abstracts of 880 articles were reviewed. After initial screening, 106 articles underwent full text review. Ultimately, 14 articles were included in the final review. Themes identified included (1) drug levels as a marker for nonadherence and rejection, (2) impact of nonadherence on quality of life and mental health, and (3) the effect of transition programs on adherence.

CONCLUSION: Nonadherence to immunosuppression in pediatric heart transplant patients correlates with worse outcomes (rejection, hospitalizations, mortality) and decreased quality of life, but there are identifiable risk factors that may be targets for intervention. There is a need for additional studies aiming to improve adherence in pediatric heart transplant patients.
Title: Live Virus Vaccination Following Pediatric Liver Transplantation: Results from Two Academic Children’s Hospitals

Background
Guidelines for immunization following solid organ transplantation discourage live virus vaccination (LVV) in most recipients. Single-center studies support LVV as safe and effective in orthotopic liver transplant (OLT) recipients on steroid-free immunosuppression (IS). We retrospectively evaluated LVV after OLT at 2 pediatric hospitals.

Methods
Records from OLT recipients between Jan 2007 and Dec 2017 at Lurie Children’s (Chicago) and Children’s Hospital of Philadelphia were reviewed. Patients who underwent OLT at either institution, had ≥ 2 years of follow up, and had documentation of vaccination prior to OLT were included. Adverse events (AEs) within two weeks of receipt of LVV were captured. Factors that might influence the selection of patients for LVV were reviewed, including choice, dose, frequency, and levels of IS medications. IS in non-vaccinated patients was compared to vaccinated patients at two year post-transplant follow-up in both groups using Chi-Square and T-test.

Results
Data from 249 patients met inclusion criteria. Varicella zoster (VZV) vaccine was given at least once to 92 patients post-transplant, and MMR to 91 (Table 1). Compared to patients who were re-vaccinated after transplant, those who received their first LVV after OLT were transplanted at a younger age (0.8 v 2.2 years) and received LVV sooner post-OLT (649 v 907 days). AEs were rare for either LVV: 2 experienced injection site reaction, 2 localized rash, and 1 had fever. One recipient experienced worsening rejection one month after MMR and received IV steroids and increased IS, but had no clinical findings concerning for viral infection from vaccination. Most LVV recipients were on a single IS agent both at time of LVV and 2 year post-OLT (Table 2), with tacrolimus the most frequent agent. Compared to those that did not received LVV post-OLT, those that did were on one IS agent more often. Tacrolimus levels were similar among patients receiving LVV post-OLT compared with those who did not.

Conclusion
In a series of pediatric OLT recipients, post-OLT LVV was generally safe and well tolerated. Patients who received LVV post-OLT were more often on one IS agent at 2 year follow up compared to those who did not. Our study supports prospective efforts to define guidelines for patients who may safely receive LVV after OLT.
### Table 1: Characteristics of OLT recipients receiving live virus vaccines (LVV) after transplantation

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients undergoing transplantation, N</td>
<td>249</td>
</tr>
<tr>
<td>Patients with ≥1 liver transplant, N (%)</td>
<td>15 (6%)</td>
</tr>
<tr>
<td>Patients receiving ≥1 LVV</td>
<td>96 (38.5%)</td>
</tr>
<tr>
<td>VZV, N (%)</td>
<td>92 (36.9%)</td>
</tr>
<tr>
<td>MMR, N (%)</td>
<td>91 (36.5%)</td>
</tr>
<tr>
<td>Patients with 1st LVV given after OLT</td>
<td>0.77&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Age at OLT, years (median)</td>
<td>54 (21.7%)</td>
</tr>
<tr>
<td>VZV, N (%)</td>
<td>58 (23.2%)</td>
</tr>
<tr>
<td>MMR, N (%)</td>
<td>649&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Time of 1st LVV after OLT, days (median)</td>
<td>907</td>
</tr>
<tr>
<td>Patients re-vaccinated with LVV after OLT</td>
<td>2.24</td>
</tr>
<tr>
<td>Age at OLT, years (mean)</td>
<td>38 (15.3%)</td>
</tr>
<tr>
<td>VZV, N (%)</td>
<td>32 (12.9%)</td>
</tr>
<tr>
<td>MMR, N (%)</td>
<td></td>
</tr>
<tr>
<td>Time of 1st LVV after OLT, days (median)</td>
<td></td>
</tr>
<tr>
<td>Adverse events</td>
<td></td>
</tr>
<tr>
<td>Patients with 1st LVV given after OLT</td>
<td></td>
</tr>
<tr>
<td>VZV vaccine, N of AEs (% of vaccinated pts)</td>
<td>2 (3.7%)</td>
</tr>
<tr>
<td>Injection site reaction</td>
<td>1</td>
</tr>
<tr>
<td>Localized rash</td>
<td>1</td>
</tr>
<tr>
<td>MMR vaccine, N of AEs (% of vaccinated pts)</td>
<td>2 (3.4%)</td>
</tr>
<tr>
<td>Injection site reaction</td>
<td>1</td>
</tr>
<tr>
<td>Rejection episode</td>
<td>1</td>
</tr>
<tr>
<td>Patients with history of ≥1 LVV prior to OLT</td>
<td></td>
</tr>
<tr>
<td>VZV vaccine, N of AEs (% of vaccinated pts)</td>
<td>1 (2.6%)</td>
</tr>
<tr>
<td>Fever post-vaccination</td>
<td>1</td>
</tr>
<tr>
<td>MMR vaccine, N of AEs (% of vaccinated pts)</td>
<td>1 (3.1%)</td>
</tr>
<tr>
<td>Fever post-vaccination</td>
<td>1</td>
</tr>
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</table>
### Table 2: Immunosuppressive regimens in patients administered and not administered LVV

<table>
<thead>
<tr>
<th>Number of immunosuppressive medications at time of LVV</th>
<th>1</th>
<th>&gt;1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients with 1\textsuperscript{st} LVV given after OLT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VZV vaccine, N (%)\textsuperscript{c}</td>
<td>43 (81.1)</td>
<td>10 (18.9)</td>
</tr>
<tr>
<td>MMR vaccine, N (%)\textsuperscript{c}</td>
<td>46 (80.7)</td>
<td>11 (19.3)</td>
</tr>
<tr>
<td>Patients re-vaccinated after OLT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VZV vaccine, N (%)</td>
<td>33 (86.8)</td>
<td>5 (13.2)</td>
</tr>
<tr>
<td>MMR vaccine, N (%)</td>
<td>29 (90.6)</td>
<td>3 (9.4)</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Number of immunosuppressive medications 2 years after OLT</th>
<th>1</th>
<th>&gt;1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients with 1\textsuperscript{st} LVV given after OLT\textsuperscript{d}</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VZV vaccine, N (%)</td>
<td>41 (77.4)</td>
<td>12 (22.6)</td>
</tr>
<tr>
<td>MMR vaccine, N (%)</td>
<td>44 (77.2)</td>
<td>13 (22.8)</td>
</tr>
<tr>
<td>Patients re-vaccinated after OLT\textsuperscript{d}</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VZV vaccine, N (%)</td>
<td>29 (76.3)</td>
<td>9 (23.7)</td>
</tr>
<tr>
<td>MMR vaccine, N (%)</td>
<td>25 (78.1)</td>
<td>7 (21.9)</td>
</tr>
<tr>
<td>Patients who did not receive LVV after OLT\textsuperscript{d,e}</td>
<td>89 (62.7)</td>
<td>53 (37.3)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tacrolimus levels (ng/dL) 2 years after OLT, Mean (SD)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients with 1\textsuperscript{st} LVV given after OLT</td>
<td>4.84 (1.75)\textsuperscript{f}</td>
</tr>
<tr>
<td>VZV vaccine</td>
<td>4.91 (1.74)</td>
</tr>
<tr>
<td>MMR vaccine</td>
<td>4.84 (1.75)</td>
</tr>
<tr>
<td>Patients re-vaccinated after OLT</td>
<td>6.34 (3.07)</td>
</tr>
<tr>
<td>VZV vaccine</td>
<td>6.34 (3.07)</td>
</tr>
<tr>
<td>MMR vaccine</td>
<td>6.20 (2.90)</td>
</tr>
<tr>
<td>Patients who did not receive LVV after OLT\textsuperscript{e}</td>
<td>5.66 (2.31)</td>
</tr>
</tbody>
</table>

---

\(\text{a. Median for age at OLT for 1\textsuperscript{st} LVV vs re-vaccinated was significantly different (p=0.000)\)}

\(\text{b. Median for days post OLT for 1\textsuperscript{st} LVV vs re-vaccinated was significantly different (p=0.007)\)}

\(\text{c. One patient did not have any IS agents documented at the time of LVV vaccination}\)

\(\text{d. Those who received LVV post-OLT were significantly more often on one IS agent at 2 year post-OLT follow-up compared to those who did not receive LVV ( p=0.025\)}\)

\(\text{e. There was no significant difference (p=0.317) for tacrolimus levels at 2 year follow up for those receiving LVV after OLT compared to those that did not receive LVV after OLT}\)
Derivation and Validation of Vasoactive-Inotrope Score Trajectory Groups in Critically Ill Children
Elitsa Nicolaou, MD1; L. Nelson Sanchez-Pinto, MD, MBI, FAMIA1
1Ann and Robert H. Lurie Children’s Hospital of Chicago
Northwestern University Feinberg School of Medicine, Chicago, IL

Background
Cardiovascular shock is a clinically dynamic process with high morbidity and mortality, particularly amongst patients with sepsis. The vasoactive-inotrope score (VIS) is a validated measure of shock severity based on the sum of the normalized dose of vasoactive infusions a patient is receiving. We hypothesized that modeling the VIS trajectory in children with shock during the acute phase of critical illness would uncover distinct and clinically relevant VIS trajectory groups.

Methods
This was a retrospective observational cohort study of patients admitted to the PICU of two academic children’s hospitals. Patients were included if they required vasoactive infusions within 24 hours of admission. Those admitted post-cardiac surgery were excluded. An hourly VIS was calculated for the first 72 hours of admission. Group-based trajectory modeling (GBTM) was applied to a derivation set (75% of patients) and validated on the remaining 25%. Primary outcome was in-hospital mortality, secondary outcomes were multiple organ dysfunction syndrome (MODS) on day 7 and hospital-free days (HFDs) at day 28.

Results
A total of 1,828 patients met inclusion criteria and 309 (16.9%) died. GBTM identified four subgroups that were reproducible in the validation set: “Mild, fast resolving shock” (n=853 [47%], mortality 9%), “Moderate, slow resolving shock” (n=422 [23%], mortality 15%), “Moderate, prolonged shock” (n=312 [17%], mortality 21%), and “Severe, prolonged shock” (n=241 [13%], mortality 40%). There was a significant difference in mortality, MODS on day 7, and sepsis (p<.001). No significant difference was found in age (p=0.72) or HFDs at 28 days (p=0.6). The “Mild, fast resolving shock” and “Severe, prolonged shock” groups were identifiable within the first 24 hours. The “Moderate, slow resolving” and “Moderate, prolonged shock” groups were indistinguishable in the first 24 hours of admission, but differed in in-hospital mortality, MODS on day 7, and HFDs.

Conclusion
We uncovered four distinct VIS trajectory groups that were associated with different morbidity, mortality, and clinical characteristics in children with shock. Characterizing VIS trajectory groups in the acute phase of critical illness in children with shock may enable more targeted management.
Impact of Neonatal Hypoglycemia on Behavioral Outcomes in School Age Children
Presley Parkes, MD, Jennifer Arzu, MPH, Jami Josefson, MD

BACKGROUND: The definition of neonatal hypoglycemia, and degree to which it affects childhood neurodevelopmental outcomes remains controversial. Utilizing Multidimensional Assessment Profile of Disruptive Behavior (MAP-DB), a novel pediatric behavioral scoring system as part of a battery of neurodevelopmental testing, our study assessed the effect of neonatal hypoglycemia on neurodevelopmental outcomes of school age children.

METHODS: The study population consisted of children born to mothers with gestational or type 2 diabetes mellitus. Children with a history of neonatal hypoglycemia (glucose <40 mg/dL) were identified from chart review using the screening pathway developed by Northwestern University. Neurodevelopmental testing was performed at 5-10 years old. Testing consisted of Developmental Neuropsychological Assessment (NEPSY-II) as well as parental surveys including Behavior Rating Inventory of Executive Function (BRIEF), MAP-DB, and SCARED (Screen for Child Anxiety Disorders) surveys. Differences by hypoglycemic status and associations with neurodevelopmental outcomes were assessed using Chi-squared or Fisher’s exact test for categorical variables, and Wilcoxon rank sum test or Kruskal-Wallis test for continuous measures.

RESULTS: Sample size consisted of 51 children, 18 of whom were hypoglycemic in the newborn period (35%). The hypoglycemic and normoglycemic groups did not differ significantly in regard to gestational age, gender, ethnicity, maternal education, birth weight, maternal age, or family income. There were no significant differences in the MAP-DB summary score, NEPSY-II inhibition, BRIEF summary, separation anxiety, and SCARED summary score between the hypoglycemic and control populations. Furthermore, hypoglycemia severity/duration, defined as >1 episode of hypoglycemia, did not significantly affect neurodevelopmental outcomes.

CONCLUSIONS: Relatively transient, moderate neonatal hypoglycemia detected by a strict screening pathway in infants of mothers with diabetes did not significantly affect behavior in school age children as assessed by both performance based evaluations and survey studies including MAP-DB scoring, a novel clinically validated method of pediatric behavioral testing.

We acknowledge the Institute for Innovations in Developmental Sciences (DevSci) at Northwestern University for their assistance with administering and analyzing the neurodevelopmental assessments and outcomes.
<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Overall, N = 51</th>
<th>None, N = 33</th>
<th>Yes, N = 18</th>
<th>P-value¹</th>
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</thead>
<tbody>
<tr>
<td>MAP-DB Summary</td>
<td></td>
<td></td>
<td></td>
<td>0.544</td>
</tr>
<tr>
<td>Median (IQR)</td>
<td>54.6 (14.5, 108.4)</td>
<td>56.7 (20.2, 134.0)</td>
<td>40.1 (14.2, 92.0)</td>
<td></td>
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<tr>
<td>NEPSY-II Inhibition</td>
<td></td>
<td></td>
<td></td>
<td>0.329</td>
</tr>
<tr>
<td>Median (IQR)</td>
<td>10.5 (7.2, 13.8)</td>
<td>11.5 (9.0, 14.0)</td>
<td>8.0 (4.5, 11.2)</td>
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¹Wilcoxon rank sum test

Table 1. Association Between Newborn Hypoglycemic Status and School Age Behavioral Outcomes.

Hypoglycemia in the newborn period does not significantly affect behavioral outcomes in school age children as tested by Multidimensional Assessment Profile of Disruptive Behavior (MAP-DB) summary score, NEPSY-II Inhibition parental surveys, Behavior Rating Inventory of Executive Function (BRIEF) parental surveys, separation anxiety, and screen for child anxiety disorders parental and child surveys.
TITLE: Characteristics of Mother’s Own Milk Donation to a Human Milk Bank During Bereavement

AUTHORS: Mahati Pidaparti¹, Grace Knowles¹, Natalia Henner¹, Jessica Fry¹, Jinnene Hoggarth², Summer Kelly², Daniel Robinson¹
¹Lurie Children’s Hospital, ²Mothers’ Milk Bank of the Western Great Lakes

BACKGROUND: Pasteurized human donor milk is recommended for feeding preterm and critically ill infants when mother’s own milk is not available. To support these recommendations, Human Milk Banking Association of North America (HMBANA) milk banks rely on donated breast milk which undergoes screening and pasteurization prior to distribution for feeding. Bereaved mothers express positive experiences resulting from donating milk and also negative feedback when not being informed of opportunities to donate. Predictors of whether bereaved mothers will donate breast milk are unknown. Improved understanding of such predictors would be expected to inform efforts to support bereaved women and encourage donation of a valuable resource. This study aims to define characteristics of breast milk donation in the setting of bereavement, including proportions of bereaved mothers who initiate and complete the donation process, milk volumes received by the bank, milk disposition (e.g. used for feedings v. research), and clinical characteristics of donating mothers and their deceased children.

HYPOTHESIS: Select clinical features of women and their deceased children predict completion of breast milk donation.

METHODS: An IRB approved retrospective cohort study included bereaved mothers and their children if the dyad met the following criteria: death prior to 24 months of age, death occurred within Lurie Children’s Hospital, death occurred May 2016 – December 2020 and maternal breast milk labels were ordered in the last admission and/or donation was confirmed by milk bank. Exclusion criteria included a child’s death outside of the hospital. Clinical characteristics of mothers and children were abstracted from electronic medical records including maternal age, history of preterm birth and hospital unit where death occurred. HMBANA’s Mothers’ Milk Bank of the Western Great Lakes (Milk Bank WGL) provided donor demographics, donor process status (completed milk donation v. initiated but not completed), milk volume donated and final dispensation (pasteurized for infant feedings v. research utilization). Parametric testing measured distribution of clinical variables. Logistic regression measured associations between clinical variables and completed donation status. Values reported are mean ± SD or odds ratio (95% CI).

RESULTS: Of 126 eligible children who met all of the inclusion criteria, 34 mothers of 35 deceased children (28%) donated mean 742 ± 1823 oz. of milk to Milk Bank WGL. Children’s age at death did not significantly impact whether mothers donated milk (donated: 72 ± 83 days, did not donate: 91 ± 121 days; p= 0.199). Mothers completing donation were older than mothers who did not (completed: 32.3 ± 4.3 years; not completed: 30.0 ± 6.1 years; p=0.033). Of the 34 mothers who donated, 21 (62%) self-reported race and ethnicity as Caucasian, 1 (3%) African American (AA), 4 (12%) Asian and 5 (15%) Hispanic. Of those 34 donations, 20 (59%) were utilized for research and 12 (35%) were utilized for both research and feeding with 2 of the donations’ dispositions undetermined. Compared to mothers of Caucasian children, completing donation was less likely for mothers of AA children [OR 0.061 (95% CI: 0.008 – 0.482)] and mothers of Asian children [OR 0.103 (95% CI: 0.013 – 0.839)]. Compared to a child’s death in the pediatric intensive care unit (ICU), completed milk donation was more likely if a child’s death occurred in the neonatal [OR 3.96 (0.85 – 18.56)] or cardiac ICU [OR 3.91 (0.76 – 20.15)]. Compared to children born <34 weeks gestational age, milk donation was less likely for mothers of children born full-term [OR 0.32 (0.13 – 0.76)] and mothers of children born 34-36 weeks gestational age [OR 0.23 (0.06 – 0.87)].

CONCLUSION: Bereaved mothers donating milk to Milk Bank WGL most likely experienced preterm delivery and a child’s death at an older age. Variability in milk donation based on race and location of infant death suggest opportunities for future research focused on understanding influences on whether bereaved mothers donate their milk.
Objective: Parents value clear communication with providers in the pediatric intensive care unit (PICU) about possible patient and family outcomes (prognostic conversations). We describe PICU parent and attending physician reports and agreement regarding the occurrence of prognostic conversations. We queried parents and physicians about prognostic conversation content, which healthcare providers had prognostic conversations, and whether parents wanted more prognostic information.

Design: Prospective cross-sectional survey study

Setting: University-based 40-bed PICU

Participants: Parents and attending physicians of PICU patients with multiorgan dysfunction within 24 hours of PICU admission

Interventions: Surveys administered to parents and attending PICU physicians 5-10 days after PICU admission

Measurements and Main results: Surveys asked parents and physicians to report the occurrence of prognostic conversations related to: PICU length of stay, risk of PICU mortality, and anticipated post-PICU physical, neurological and psychological morbidities for patients and post-PICU psychological morbidities for parents. Of 101 participants, 87 parents and 83 physicians reported having prognostic conversations. Overall concordance between parents and physicians was fair (Kappa = .22). Parents and physicians most commonly reported prognostic conversations about PICU LOS (67.3% and 63.3% respectively) and patient post-PICU physical morbidity (48.5% and 44.5% respectively). Conversations reported less often by parents and physicians were about patient post-PICU psychological morbidity (12.9% and 19.8%, respectively). Per parent report, bedside nurses and physicians provided most prognostic information. Chaplains (50%) and social workers (60%) were more involved in conversations regarding parent psychological morbidities. Most commonly parents requested more information about LOS and their child’s physical morbidities. Parents less frequently wanted information about their own psychological morbidities.

Conclusions: Most parents and physicians report having prognostic conversations, primarily about LOS and post-ICU physical morbidities, though concordance between parents and physicians is suboptimal. Future studies should evaluate prognostic conversations at other timepoints, how information is delivered, and how these conversations impact the PICU experience.
TITLE: PICU Direct - Comparing the Impact of Direct Laryngoscopy vs Video Laryngoscopy on Team Dynamics and Teaching during Endotracheal Intubation in the Pediatric Intensive Care Unit

AUTHORS: Matthew Rowland, MD, Katie Wolfe, MD

BACKGROUND: In the last decade, video laryngoscopy (VL) has become increasingly utilized throughout medicine, including in the pediatric intensive care unit (PICU). Benefits of VL include enhanced ability for real-time teaching and improved Cormack-Lehane view. Despite the importance of strong team dynamics in achieving a successful intubation, there is a paucity of research of the impact of VL on team dynamics during intubation in the PICU. VL can also be utilized for real time procedural teaching and feedback. While increased learner satisfaction with use of VL has been previously demonstrated, little attention has been dedicated to study the impact of VL on the teacher.

OBJECTIVE: To assess if VL improves team dynamics via reduction in team stress and increased team member confidence while also improving teaching satisfaction for both the teacher and trainee in the PICU.

ANTICIPATED METHODS: We will conduct a prospective cohort study in an academic pediatric ICU, comparing team dynamics and educational methods associated with DL vs VL. We will include all intubations for pediatric (\leq 18 years old) patients in the PICU performed by a pediatric critical care medicine fellow or attending. Intubations performed by the hospital’s difficult airway team or by pediatric anesthesia will be excluded. We will also exclude intubations on COVID-19 positive patients and persons under investigation for COVID-19 who are intubated by the anesthesia team per hospital protocols at the time of this study. Providers will have the choice of using DL or VL. Formal VL teaching will be performed prior to initiation of the study for the benefit of PICU attendings and fellows.

The primary outcomes will be team member stress during the intubation and confidence in endotracheal tube placement. Secondary outcomes will be supervisor (attending) and learner/proceduralist (fellow) satisfaction with teaching during the procedure. Confidence assessment completed by fellows, attending physicians, nurses, and respiratory therapists will be self-reported as not confident, slightly confident, confident, very confident, extremely confident. Stress level will be assessed via self-reported rating of high, moderate, or low stress. For the secondary outcome, teaching-specific questions will be completed by the fellow and attending regarding device use, ability to give and receive real-time feedback, and adjustments made if a second attempt was required. These questions will be assessed by self-report on a yes, no, or neutral scale. To capture all participants, a QR code will be attached to the airway cart and charge nurses and fellows will advocate for completion of the form. Based on power calculations, the study duration is anticipated to be 6-8 months with the goal of analyzing at least 40 procedures.
Title: Healthcare interactions prior to a SIDS event  
Authors: Katherine Salada MD; Colleen Badke MD, MPH

Background:

Sudden infant death syndrome (SIDS), a sub-category of sudden unexplained infant death (SUID), is the leading cause of death in children 28 days to 1 year of age. Although the cause of SIDS is likely multifactorial, several risk factors have been identified that are associated with an increased risk of death. To help reduce SIDS risk factors, the AAP recommends infant safe sleep practices referred to as the ABCs: Alone, on the Back, and in an empty Crib. Hospitalized infants rarely meet AAP guidelines for safe sleep. In a pre-post study performed at Lurie Children’s Hospital from 2015-2019, only 10% of infants slept in a safe environment, an improvement from 1% following multiple hospital-level interventions. There is no literature describing healthcare interactions prior to a SIDS event. We seek to investigate where and how patients interact with the healthcare system prior to their SIDS death. This information will inform future educational and advocacy initiatives and may help identify at-risk patients prior to their devastating SIDS event.

Hypothesis:

Patients who died from SIDS interacted with the healthcare system on average ≥ 1 time prior to their death, representing an area of missed opportunity for family education on SIDS and safe sleep.

Methods:

This is a retrospective chart review of infants who died from SIDS over the last 10 years (December 2010 through December 2020). The study population includes all patients aged 0-12 months presenting to Lurie Children’s Hospital emergency room or admitted to the PICU, NICU, or general inpatient team with a diagnosis of SIDS or SUID. Patient charts will be reviewed to determine baseline descriptive characteristics, as well as prior presentations to our hospital network including outpatient clinics, urgent cares, emergency rooms, hospitalizations, etc. Healthcare interactions prior to the SIDS event will be described in detail, including dates of admission, diagnoses, location of admission, comorbid conditions, and any identifiable risk factors for SIDS. Chart review from the SIDS admission will include risk factors for SIDS, autopsy results (if available) and diagnoses. Data will be analyzed using descriptive statistics, chi-square analysis, and multivariable methods.

Anticipated Results:

We will create a local database of SIDS patients in order to evaluate healthcare interactions with infants prior to a SIDS event. Once identified, these encounters will be described to identify areas of potential future parental education.

Conclusion:

Healthcare professionals should educate parents about SIDS risk factors at all times of patient interaction as families are more likely to practice safe sleep techniques when they are modeled in the hospital by providers. If hospitals do not model safe sleep practices, it is possible that we are missing opportunities to provide safe sleep education that may ultimately impact SIDS outcomes.
TITLE: The effects of Spanish interpreter use on the decision to report to Child Protective Services and the medical evaluation of suspected child physical abuse in Hispanic patients

AUTHORS: Jessalyn Shaw, MD; Amanda Fingarson, DO; Mary Clyde Pierce, MD; Mark Adler, MD; Elizabeth Charleston, BA, CCRP; Norell Rosado, MD

BACKGROUND: There were 41.5 million Spanish-speaking people in the U.S. in 2018, 16.3 million of whom spoke limited English. The non-English-speaking population is a vulnerable one in the U.S., particularly in the healthcare setting. These families must rely on medical interpreters to navigate healthcare encounters, including when young, non-verbal children present with injuries concerning for physical abuse. In such cases, interpreters must represent caregivers’ histories which are critical to establishing a medical provider’s level of concern for physical abuse. The completeness and accuracy of these histories are therefore of utmost importance.

Despite the large number of Spanish-speaking families, there is currently no standard for conducting child physical abuse interviews with families that require a medical interpreter. The use of an interpreter inevitably alters the provider-patient dynamic and poses inherent risks. Providers lose critical non-verbal data such as timing of affective responses, and the presence of a third party may introduce further biases. In addition, research has shown that medical interpretation errors are common. Misinterpretation could lead to either overdiagnosing or underdiagnosing abuse, and the stakes are high as each error leads to significant consequences such as family separation or escalating abuse, respectively.

OBJECTIVE: The primary purpose of this study is to determine whether the rate of reporting to Child Protective Services (CPS) in cases of suspected child physical abuse differs for families utilizing a Spanish interpreter as compared to families not requiring a Spanish interpreter. Our secondary goal is to determine whether the frequency of additional medical evaluation (using skeletal survey imaging as a marker) and/or the frequency of abuse determinations varies between interpreter-mediated cases as compared to non-interpreter-mediated cases of suspected child physical abuse.

HYPOTHESIS: Prior studies of suspected child abuse have shown differential reporting rates to CPS among families of various racial/ethnic and socioeconomic backgrounds. We hypothesize that families with limited English proficiency will similarly experience differential CPS reporting rates as compared to English-speaking families.

METHODS: This study will be completed via a retrospective chart review. Study subjects will include Hispanic families identified by self-report whose child ≤24 months of age underwent evaluation of physical abuse by the Child Abuse Pediatrics (CAP) team between June 2017 and December 2020. We will use an existing REDCap database maintained by the CAP division to identify potential study subjects. A linked REDCap database was created to track primary language and interpreter use.

We will use the score test of two proportions to compare each of the outcomes between the two groups as defined by interpreter use – CPS reports, skeletal surveys, and abuse determinations. We will explore the relationship between each of these outcomes and several additional factors using logistic regression. Candidate predictor variables for the logistic regression models include the following: patient age/gender/race, maltreatment type (physical abuse or physical abuse plus another maltreatment type), interpreter type, and language spoken by the medical provider.

IMPLICATIONS: If this study reveals a difference in CPS reporting, skeletal surveys or abuse determinations between interpreter-mediated vs. non-interpreter-mediated cases, further studies would be needed to determine whether this represents an inequity. If so, we would also need to identify potential interventions or tools to close this gap. Future directions could include creating standardized tools to brief interpreters prior to sensitive family meetings such as those that occur in CAP to help mitigate the challenges inherent with medical interpretation.
Title: Preterm infant body composition in association with preterm human milk composition in conditions of maternal overweight and obesity

Authors: Anne Smazal, Linda Van Horn, Jami Josefson, Lauren Balmert, Daniel Robinson

Background: Preterm infants show increased adiposity as compared to reference term infants. Increased adiposity in early childhood suggests increased long-term risks of disordered metabolism including insulin resistance and metabolic syndrome. Influences on lean versus fat mass development in preterm infants are poorly defined. We identified independent associations between increasing maternal pre-pregnancy body mass index (BMI) and accelerated weight gain in preterm infants. However, weight gain does not describe quality of infant growth, i.e. proportional gains of lean versus fat mass, or percent body fat. Also, while human milk is the recommended form of nutrition for preterm infants, we detected alterations in human milk composition associated with maternal BMI. Specifically, numerous milk fatty acids (FA) are altered including linoleic acid, a regulator of adipocyte differentiation. We have also shown preterm milk FA to be sensitive to maternal diet. Others report associations between maternal BMI and human milk adipokines. Whether alterations in preterm human milk attributable to maternal metabolism and diet impact preterm infant body composition is unknown.

Defining these relationships will be expected to reveal opportunities to optimize and augment health benefits of preterm human milk, ultimately mitigating risk of disordered metabolism in children and adults born preterm.

Hypothesis: Preterm human milk linoleic acid as well as other FA and adipokines, differentially affected by maternal BMI, are associated with preterm infant percent body fat.

Methods: A prospective cohort study will enroll mothers of infants born at 28 0/7-31 6/7 weeks gestation who choose to provide their own breast milk as the primary source of their infants’ nutrition, and their infants (n=42 dyads). Enrollment will achieve equal distribution of women into three groups based on maternal pre-pregnancy BMI: normal (BMI 18-25), overweight (BMI 25-30), obese (BMI ≥30). Air displacement plethysmography will be performed at 36 weeks postmenstrual age to measure infant percent fat mass (primary outcome). A reference group of mothers who deliver at 34-36 weeks of gestation and their infants will also be enrolled to evaluate the effects of longer intrauterine exposure to maternal metabolism (n=30 dyads). Comprehensive anthropometric measurements will also include weekly skin folds thickness and mid-arm circumference.

Serial preterm human milk samples will be collected through the 5th week of lactation. Milk FA including linoleic acid (primary exposure), insulin, leptin, adiponectin, insulin-like growth factor 1 and total energy will be analyzed using standard methods of mass spectrometry, radioimmunoassay, ELISA and near infrared spectrometry. Detailed infant nutrient intake will be measured daily.

Linear regression models will be used to assess for associations of maternal milk LA and other components with infant percent body fat, adjusting for maternal BMI. Sample size calculations accounted for the inclusion of relevant covariates in multivariable models.

Conclusion: This prospective cohort study will define preterm infant body composition in context of maternal BMI and preterm human milk composition. These results will contribute to refining definitions of nutritional requirements for preterm infants, accounting for maternal health factors that influence the composition of these infants’ primary form of nutrition.
End-of-Life Communication and Moral Distress in Pediatric Oncology Clinicians

Lindsey Tengerstrom MD

Mentors: Jennifer Reichek MD, MSW, Sabrina F. Derrington MD, MA (Bioethics), HEC-C

Background:
Discussing goals of care and end-of-life (EOL) decisions for children with incurable cancer is challenging for families and clinicians. Data is lacking for how ambiguity or conflict about goals of care contributes to moral distress and burnout for pediatric oncology clinicians.

Hypotheses:
To elicit clinician perspectives on communication and EOL decision-making and explore factors contributing to moral distress when caring for pediatric oncology patients at EOL.

Methods:
Pediatric oncology clinicians at our institution completed validated measures for compassion satisfaction, burnout, and secondary trauma (Professional Quality of Life Scale (ProQOL)) and moral distress (Measure of Moral Distress-Healthcare Professionals (MMD-HP)). Respondents answered questions about a hypothetical patient with osteosarcoma at four timepoints: diagnosis, relapse, progression, and terminal decline, eliciting opinions about prognostic disclosure and advanced care planning. Kruskal-Wallis tests compared MMD-HP and ProQOL scores across disciplines and years of experience. Relationships between MMD-HP and ProQOL scores were assessed using Pearson’s correlation. Directed content analysis was used to analyze free text responses to the patient case.

Results:
93 respondents (46.5% response rate) included 17 attendings, 8 fellows, 11 advanced practice nurses (APNs), 48 nurses, 4 social workers and 5 other staff. 52% of nurses, 20% of physicians, and 9% of APNs had ≤5 years experience. Moral distress differed significantly by discipline: nurses scored higher (mean MMD-HP 123.1, SD 58) than physicians (89.4, 60.4), APNs (93.3, 51.8) or other staff (71.0, 33.7), p=0.012. MMD-HP scores varied by years experience with higher scores for clinicians with ≤5 and >20 years experience, p=0.003. MMD-HP scores mildly correlated with ProQOL subscales for burnout (r=0.25) and secondary trauma (r=0.35). Case responses emphasized realistic prognostication, anticipatory guidance, palliative care consultation, and including the patient in decision-making. Respondents were most troubled by intrafamilial conflict, not honoring patient wishes, and parents denying a poor prognosis. Ethics consultation was identified as the primary resource to address conflict.

Conclusion:
Among oncology clinicians at our institution, moral distress was higher for nurses and for clinicians with 0-5 years or >20 years of experience, correlating with burnout and secondary trauma. Providing aggressive care at EOL and intrafamilial conflict are significant sources of distress.
Hospitalizations for Pediatric Eating Disorders in US Children’s Hospitals Increased Dramatically from 2009-2018

**Background:** Eating disorders in children and adolescents are common and serious. A majority of children and adolescents with severe eating disorders are hospitalized at least once during their illness due to significant psychiatric and medical comorbidities. Many countries have seen an increase in hospitalizations for eating disorders in the last two decades.

**Objective:** To determine trends in pediatric eating disorders (PED) hospitalizations in the US from 2009 to 2018; To characterize PED hospitalizations in the most recent 5 years, from 2014 to 2018.

**Design/Methods:** We used data from the Pediatric Health Information System (PHIS) database, a national dataset including clinical and resource utilization data from 50 US children’s hospitals. We included all patients 8 to 19 years of age, discharged from the emergency department or inpatient setting with a primary or secondary diagnosis of an eating disorder. We analyzed the trends in hospital visits between 2009 and 2018. We then analyzed characteristics of visits from 2014 through 2018. We determined which hospitals had formal PED programs via direct contact and/or the hospital’s website.

**Results: Trends:** PED visits increased more than 2-fold, from 1,252 in 2009 to 2,860 in 2018 (Figure 1). During this time, the percentage of visits for non-Hispanic whites decreased significantly (p<0.001).

**Characteristics:** There were 14,166 hospital visits for PED between 2014 and 2018; mean age 14.6 years (range among diagnoses 14.4 to 15.5). The majority of patients were female (87%, range 84-91%), non-Hispanic white (65%, range 60-67%) with private insurance (67%, range 58-72%). The mean length of stay (LOS) for inpatient visits was 10.5 days (95% CI 10.3-10.7); patients with anorexia nervosa had the longest LOS (11.7 days (95% CI 11.4-12.0). LOS was significantly longer for those with government-funded insurance compared to those with private insurance (11.2 vs 10.3 days, respectively, p<0.001). The mean hospital charge for inpatient visits was $64,216 (95% CI 63,158-65,274). 15% of patients were treated in facilities without a formal inpatient or outpatient program for eating disorders.

**Conclusion:** There is a growing number of hospitalizations for pediatric eating disorders in the US, many of which are occurring in hospitals without formal PED programs. Understanding the causes underlying this trend and providing adequate resources to treat and prevent this growing public health problem is essential.
Table 1. Characteristics of hospital visits for eating disorders between 2014 and 2018, divided by diagnosis including anorexia, bulimia and “other eating disorders.”

*Includes diagnoses of “other eating disorders,” “unspecified eating disorders,” and “eating disorder – not otherwise specified”

**Data includes only inpatient and observation unit visits, excluding emergency department visits
Interventions to Improve Pediatric Ability to Swallow Solid Oral Medications: A Systematic Review

Caryn VandenBerg MD, Andrea Fawcett MLIS, and Ravi Jhaveri, MD

Background:
Solid oral medications (tablets or capsules) remain the preferred formulation compared to IV or liquid based on: better safety profile, lower cost, better drug stability, and more convenient storage. However, inability to swallow solid oral medications is a common barrier to medication adherence for many pediatric and adult patients. Factors that contribute to a patient’s inability to swallow solid medications include unpleasant taste, rough texture, large size, oral motor dysfunction, fear and anxiety.

Hypothesis: Prior research has demonstrated that various interventions can minimize or eliminate solid oral medication swallowing difficulties. The objective of this project was to evaluate the published literature since the last systematic review on interventions for improving ability to swallowing solid oral medications in the pediatric population since 2013.

Methods: We performed a comprehensive search of the PubMed and OVID databases to identify articles for our review. Articles included were published in English from January 2014 through March 2021 and included participants aged 0 to 21 years with difficulty swallowing solid oral medications without a comorbid condition affecting swallowing ability. Relevant information from each article was reviewed and the quality of each study was rated as “poor”, “fair,” or “good” based on patient sampling and study design.

Results: Out of 119 articles, 19 were screened for relevance to the review question and ultimately 4 were included in the final review: 1 randomized control study, 1 cohort study, 1 case series, and 1 quality improvement initiative. Interventions included a flavored throat spray, behavioral therapies, and a novel type of solid oral medication (minitablets). Quality ratings differed between the studies, with 2 articles rated as “good”, 1 article as “fair”, and 1 article as “poor.” Studies ranged in size from a case series of 4 patients to a large trial of 372 children and included children as young as 6 months and as old as 18 years. All 4 papers showed the study intervention to be successful in improving a child’s ability to swallow solid oral medications.

Conclusions: Difficulty with swallowing solid oral medications is a barrier that can be overcome with several different types of interventions across a broad range of ages, including very young children. Additional research is needed to determine the lasting benefit of various interventions, as well as to determine the efficacy of various interventions in comparison to each other.
Title: Dynamic Arterial Elastance to Predict Fluid Responsiveness in Hypotensive Children

Authors: Sarah B. Walker, MD; Kyle S. Honegger, PhD; Michael S. Carroll, PhD; Debra E. Weese-Mayer, MD; L. Nelson Sanchez-Pinto, MD, MBI

Organization: Divisions of Critical Care Medicine and Autonomic Medicine, Department of Pediatrics, Ann & Robert H. Lurie Children’s Hospital of Chicago; Stanley Manne Children’s Research Institute; Northwestern University Feinberg School of Medicine Department of Pediatrics, Chicago IL

Background: Fluid bolus administration in the setting of hypotension is common but does not consistently reverse hypotension in children. Lack of a predictive measure to determine blood pressure (BP) response to bolus in critically ill children may delay vasoactive infusion and worsen fluid overload, increasing morbidity. Dynamic arterial elastance (EAdyn) is a measure of ventriculo-arterial coupling described by the ratio of pulse pressure variation (PPV) to stroke volume variation (SVV) during the respiratory cycle and can be calculated by analyzing arterial pressure waveforms. Pre-bolus EAdyn is predictive of BP increase after bolus in hypotensive adults, but it has not been adequately studied in hypotensive children.

Objective: To determine if pre-bolus EAdyn is associated with BP response after fluid bolus in hypotensive children.

Methods: This was a retrospective observational cohort study of children with mean arterial pressure (MAP) <10th%ile for age and an arterial line who received an intravenous crystalloid fluid bolus of ≥10 ml/kg between 2013 and 2018 at a large, urban pediatric intensive care unit. Boluses that occurred ≥ 2hrs after prior boluses and had ≥ 30sec of adequate pre-bolus arterial waveform data were included. Age-normalized heart rate (HR), SVV, PPV, and EAdyn were calculated in 10sec intervals in the 20min pre-bolus. Fluid responsiveness was defined as a MAP increase by ≥10% from the pre-bolus hypotension MAP to the average MAP in the 20min post-bolus. The Kruskal–Wallis test was used to assess association between average pre-bolus EAdyn and fluid responsiveness.

Results: During the study period, 925 boluses were administered to children with recorded arterial waveforms. Of these, 209 (23%) met criteria for study inclusion (hypotensive children, no other recent bolus). Adequate waveform data were identified in 139 (67%) of these boluses across 112 patient admissions. Patient characteristics are presented in Table 1. Fluid response was found in 48% of boluses. Pre-bolus EAdyn was higher in responders vs non-responders (1.41 [IQR 1.15, 1.90] vs. 1.20 [IQR 0.85, 1.67], p=0.036), especially among mechanically ventilated (MV) children (n=115, p=0.006) vs. non-MV (n=24, p=0.49). HR, SVV, and PPV did not differ (Table 2).

Conclusion: EAdyn may be a useful measure for predicting fluid responsiveness in hypotensive, mechanically ventilated children. Further validation of EAdyn is needed to determine its clinical utility for guiding fluid resuscitation.
Table 1. Demographics and Clinical Characteristics

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<td>Mechanical Ventilation, n (%)</td>
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<td>Vasoactive Infusion, n (%)</td>
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<td>Length of stay, days (IQR)</td>
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<tr>
<td>Mortality, n (%)</td>
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Data are presented as median and interquartile range (IQR) or total n and percentage (%).

Table 2. Pre-Bolus Arterial Waveform Measures Stratified by Fluid Response

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<tr>
<th>Variable</th>
<th>All Boluses (n=139)</th>
<th>Bolus with Fluid response (n=67)</th>
<th>Bolus with No Fluid response (n=72)</th>
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<td>Age Normalized HR, * (IQR)</td>
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<td>PPV, % (IQR)</td>
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<td>0.18 (0.11, 0.3)</td>
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<td>SVV, % (IQR)</td>
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<td>0.16 (0.11, 0.28)</td>
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<td>EAdyn (IQR)</td>
<td>1.31 (0.97, 1.79)</td>
<td>1.41 (1.15, 1.90)</td>
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<td></td>
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<tr>
<td>On MV (n=115)</td>
<td>1.34 (0.99, 1.79)</td>
<td>1.57 (1.19, 1.91)</td>
<td>1.20 (0.85, 1.62)</td>
<td>0.006</td>
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<tr>
<td>Not on MV (n=24)</td>
<td>1.26 (0.94, 1.71)</td>
<td>1.31 (0.93, 1.44)</td>
<td>1.21 (1.10, 1.97)</td>
<td>0.49</td>
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Data are presented as median and interquartile range (IQR). HR, heart rate; PPV, pulse pressure variation; SVV, stroke volume variation; EAdyn, dynamic arterial elastance; MV, mechanical ventilation. * Age-normalized HR presented as number of IQRs above or below a normalized median of zero based on age.
Assessing Preferences of PrEP Intake Among Young MSM and Transgender Men & Women of Color

Dr. Terrance Weeden, Dr. Lisa Kuhns, Dr. Amy Johnson, Dr. Rob Garofalo

Background: Oral pre-exposure prophylaxis (PrEP) has been proven to be highly effective in reducing HIV transmission when taken as prescribed. However, many barriers to adherence exist such as lack of healthcare access, PrEP-related stigma, and the daily burden of taking a pill. Despite advances in HIV prevention, these barriers disproportionately affect young men who have sex with men (MSM) of color (who are at highest risk of acquiring HIV) and transgender individuals (who are often overlooked in HIV prevention efforts) which contribute to the low intake of PrEP among MSM and transgender women.

Alternative delivery methods of PrEP are currently being studied such as cabotegravir, a long-acting injectable form of PrEP, and Islatravir, which could be offered as a weekly oral pill or a long-acting implant. A longer-acting form of PrEP is preferred in South African cis-gender young adults (both implant naïve and those with previous implants) over a daily pill and in young Americans who frequently engage in sex with men, are PrEP-naïve, and who perceive that they would have trouble with daily adherence with an oral pill, and believe a longer acting form of PrEP would offer more discretion and lessen stigma associated with taking PrEP. When paired with different methods of HIV prevention, MSM had a slight preference for a long-acting non-visible implant over a daily pill. Transgender men also prefer a long-acting injectable form of PrEP over a daily pill and agree that a longer acting form of PrEP would help improve adherence. Attitudes and preferences of high risk individuals of color towards longer acting formulations of pre-exposure prophylaxis have not been well studied. Alternative forms of PrEP might be more appealing to these high-risk populations.

Given the knowledge gap about preferences for HIV prevention among high risk youth of color, the purpose of this study is to describe knowledge of, attitudes towards, and preferences for initiating various methods of HIV prevention alone and in combination, including condoms, oral pill (Truvada or Descovy, either taken daily or on demand), long-acting injectable (cabotegravir), and implant among these youth.

Hypothesis: Young MSM and transgender individuals of color seeking HIV prevention will be more receptive towards initiating a longer acting injectable form of PrEP as opposed to oral daily PrEP. Barriers to healthcare, PrEP-related stigma, and resistance to pill-taking will be positively associated with preference for long-acting version of PrEP.

Methods: We will be conducting an online survey of MSM and transgender youth of color to assess PrEP preferences and related factors. Participants will be 18-30 years old, HIV-negative, PrEP-naïve, cisgender or transgender men or transgender women of color at risk of HIV, with a recent history of sex with men. Recruitment will be carried out in the local Chicago metropolitan area through outreach on Instagram and Twitter and via posted materials in local health, community and other locations serving the target population. Data will be analyzed to estimate the percentage of preferences by gender identity and age and multiple regression will be used to identify associated demographic, social and other factors.

Results: The study protocol is currently being drafted for submission to the local IRB. Study recruitment and enrollment is expected to begin in January 2022 with results available by July 2022.

Conclusion: We conclude that given the gap in prevention science related to HIV behavioral and biomedical prevention approaches in high risk youth of color, research is needed to identify their preferences for prevention intervention in order to optimally reach them and reduce related HIV incidence.
References:


Clinically Significant Portal Hypertension (CEPH) is Associated With Low IGF-1 and Fatigue in Children with Chronic Liver Disease

Bridget Whitehead MD, Saeed Mohammad MD, Susan Kelly RN, Jami Josefson MD MS, Leena B Mithal MD MSCI, Estella M Alonso MD

Background: Children with chronic liver disease exhibit growth hormone resistance with low levels of IGF-1, which has been associated with multiple negative effects in other pro-inflammatory conditions. While the specific triggers are not entirely known, patients with liver disease have increased levels of pro-inflammatory cytokines. Bacterial translocation and the inflammatory response has been implicated in decompensations of chronic liver disease, but the impact during periods of relative stability is unknown. The growth hormone axis is fundamental for normal growth in children, and dysfunction of this system poses an additional risk factor for malnutrition and sarcopenia in this vulnerable population. Low IGF-1 has been associated with increased fatigue in children in inflammatory bowel disease and PELD score in children with cirrhosis awaiting liver transplant. However, the impact of chronic inflammation and IGF-1 in children with and without clinically evident portal hypertension (CEPH) has not yet been studied.

Methods: Children ages 3 months to 18 years with chronic liver disease were enrolled from 05/2015-03/2021 in the ambulatory hepatology clinic at Ann and Robert H. Lurie Children's Hospital of Chicago. Patients with comorbidities affecting intestinal inflammation or the growth hormone axis were excluded. Patients were categorized by the presence or absence of portal hypertension using published criteria for CEPH. Clinical data, nutritional assessment, and serum samples were obtained for measurement of IGF-1. IGF-1 Z scores were analyzed as both continuous and categorical variable with low IGF-1 defined as Z score < -2. For children >5 years, both child and guardian completed the PedsQL Multidimensional Fatigue Scale (PedsQL MF) and were compared with a published cohort of 157 healthy children. Continuous variables between groups were analyzed using Mann-Whitney U test.

Results: 48 patients with median age 12.4 years were enrolled with the most common diagnoses being AIH/PSC and biliary atresia. 40% (n=19) of the patients had CEPH. The median IGF-1 level was -1.15. Children with CEPH had lower IGF-1 compared to patients without CEPH (p <.001). Median weight, length and MUAC Z scores in our cohort were close to 0 and when tested linearly, had no association with IGF-1. Median PedsQL MF scores from child and parent proxy were 70.60 and 75.00 respectively. Both were significantly lower compared to healthy children. Low IGF-1 was significantly associated with child (p 0.047) and parent (p 0.036) reported fatigue. After correcting for multiple comparisons, there were no individual cytokine differences between patients with and without CEPH.

Conclusions: Children with CEPH have low IGF-1 even in this population of stable patients with preserved linear growth. Children with chronic liver disease have a greater burden of fatigue compared to healthy children and increased fatigue is associated with low IGF-1 levels. There are no individual cytokine differences in patients with CEPH but future analysis plans to identify specific patterns of pro versus anti-inflammatory networks. Next steps include principal component analysis of cytokines and measurement of LPS binding protein (LBP) as a marker of bacterial translocation.
TITLE: Prenatal Detection and Evaluation of Differences of Sex Development: Parental Perspectives and Unmet Needs

AUTHORS: J Whitehead, MD; Josephine Hirsch, BA; Ilina Rosoklija, MPH; Emilie K Johnson, MD, MPH

BACKGROUND: Differences of sex development (DSDs) are a diverse group of rare and complex conditions which require multidisciplinary collaboration for optimal management. Historically, diagnosis of a DSD most frequently occurred at birth, but prenatal diagnoses are increasing due to the availability of non-invasive prenatal screening such as cell-free fetal DNA (cffDNA). It is known that prenatal diagnoses of other medical conditions can be stressful for families, but little is known about the unique experiences of families whose children were prenatally diagnosed with DSD.

HYPOTHESIS: The current study was designed to explore the experiences of parents who have undergone prenatal testing and counseling for a possible DSD, or who in retrospect would have reasonably qualified for such testing and counseling based on prenatal findings. This study was designed to identify areas for improvement in current counseling practices and inform potential interventions or supports to reduce parent-reported anxiety and other distressing symptoms.

METHODS: Potential participants were identified through chart review of patients seen pre- or postnatally for consultation in the multidisciplinary DSD clinic at Lurie Children’s Hospital. Demographics and details of medical history were collected from the medical record and from self-report. Parents were interviewed one-on-one about the following broad topic areas: decision-making around prenatal testing, impact of suspected DSD diagnosis, utilization of support systems, considerations about disclosure of diagnosis, and suggested improvements for the future. Interviews were recorded, transcribed verbatim, de-identified, and coded for thematic analysis using MAXQDA software. Each participant completed the following measures of symptomatology and coping: Brief Symptom Inventory, Pediatric Inventory for Parents, Coping Health Inventory for Parents, Parent Traumatic Stress Screening Questionnaire, and the Decisional Regret Scale regarding cffDNA testing and/or amniocentesis/chorionic villous sampling as applicable.

RESULTS: Eighteen interviews were completed with parents of 13 children: six children with Klinefelter syndrome (KS), and one child each with Swyer syndrome, complete androgen insensitivity syndrome, Denys-Drash. Turner syndrome with Y chromosome material (TS+Y), an NR5A1 mutation, SRY+46,XX DSD, and a 46,XY DSD of unknown etiology. Of the six patients without KS or TS+Y (which were detected based on cffDNA alone), four had genotype/phenotype discordance when comparing the results of cffDNA and ultrasound, and two had non-binary genitalia visualized on ultrasound. Two of the six were not offered additional prenatal testing or counseling based on the discordance or ultrasound findings.

Through qualitative analysis, several themes emerged including need for improvements in provider education, improvements in pre- and post-test counseling, streamlined referrals, additional peer support, and additional formal psychological support for parents. Quantitative data from psychometric measures is undergoing analysis and results will be compared to population means.

CONCLUSION: Interviewees described a wide variety of experiences and identified multiple potential areas for improvement in the prenatal period. Their responses provide the basis for future work targeting these areas for improvement with the overall goal of advancing care for patients with differences of sex development across the lifespan.

REFERENCES:


Title: Early Psychosocial Adjustment in Parents with Neonates Who Have Survived Cardiac Surgery

Authors:
Brian L. Wolfe1, Amy Cassedy2, Michelle Steltzer1, Amy S. Lay1, Kiona Y. Allen1, Bradley S. Marino3
1Ann & Robert H. Lurie Children's Hospital of Chicago, Chicago, IL
2Cincinnati Children’s Hospital Medical Center, Cincinnati, OH
3Cleveland Clinic Children’s, Cleveland, OH

Background:
Survival after congenital heart disease (CHD) surgery has significantly improved. Optimization of caregiver psychosocial adjustment (PSA) is critically important to family functioning and infant and parent quality of life. Infancy is a vulnerable period for parents of children with CHD. The aim of this study is to assess the relationship between demographics, perioperative factors, and discharge care requirements and parental PSA.

Methods:
This was a single-center observational study of parents of neonates who had CHD surgery on or before 30 days corrected gestational age. Demographic, perioperative, and discharge care requirement data were obtained. PSA was assessed using Beck Depression Inventory-II (BDI-II); State-Trait Anxiety Inventory (STAI-Y); PTSD Diagnostic Scale for DSM-V; Maternal Postnatal Attachment Scale; Pediatric Inventory for Parents (PIP), administered one month after discharge. Associations between predictor variables and PSA were analyzed using Pearson’s and point-biserial correlation.

Results:
Of 48 parents, 44 (92%) were female and 12 (25%) had a history of prescribed psychotropic medication. Over half of the infants [25 (53%)] had a STAT Mortality Risk category of 4 or 5, and 10 (21%) had at least one complication. STAT category was associated with worse STAI-Y score (r=0.54, p<0.01). The presence of any complication was associated with worse BDI-II (r=0.35, p=0.02) and PIP (r=0.34, p=0.02) scores. Specifically, CNS injury was associated with worse STAI-Y (r=0.35, p=0.017) and PIP (r=0.47, p<0.001) scores. A greater number of discharge medications was associated with worse STAI-Y (r=0.32, p=0.029) score. Nasogastric feeding at discharge was associated with worse BDI-II (r=0.30, p=0.043), STAI-Y (r=0.45, p<0.001), and PIP (r=0.34, p=0.018) scores. Perinatal factors including birthweight, gestational age, or timing of diagnosis were not associated with PSA.

Conclusions:
Higher STAT category, complications, CNS injury, greater number of medications, and nasogastric feeding were associated with worse PSA. Future studies should assess how parental PSA evolves over time and whether PSA is associated with outcomes such as child quality of life.
Characteristics of High-Powered Magnet Injuries in Youth

Author: Megan Wong, Medical Student, Northwestern University Feinberg School of Medicine

Mentor: Jennifer Hoffmann, MD, Division of Emergency Medicine, Ann & Robert H. Lurie Children’s Hospital of Chicago

Background: Ingestion of magnets by youth can lead to serious injuries and hospitalizations. Since the Consumer Product Safety Commission lifted the ban of toys containing these magnets, case rates have increased.

Hypothesis: In this study, we aim to explore characteristics of youth injuries due to high-powered magnets to better understand the circumstances surrounding the injuries, subsequent health care utilization, and health outcomes. We hypothesized that the majority of youth would require surgery and hospitalization as a consequence of their high-powered magnet injury.

Methods: We conducted a retrospective cross-sectional analysis of youth ages 0-21 seen at Ann & Robert H. Lurie Children’s Hospital of Chicago for injuries due to high-powered magnets from 2017-2019. Cases were identified using ICD-10 diagnosis codes followed by manual review. Demographic and clinical data were abstracted from the electronic medical record. Phone interviews were conducted with parents and guardians of these youth. We analyzed local site data collected as a part of a larger multicenter study. Fisher’s exact test was used to compare procedure rates and morbidity rates between age groups (<10 years, ≥10 years).

Results: We identified 16 visits related to high-powered magnets (75% male, 87.5% Caucasian, median age 10, age range 2-15). 7 parents completed the phone interview. Of these, 1 (14%) of injuries were witnessed by an adult, and the most frequent location of injury was the home in 4 cases (57%), followed by school for 3 cases (43%). 5 (71%) of magnets were marketed as toys. 5 (71%) of youth and parents were aware of the danger of these magnets. Of the 16 cases reviewed via the medical record, 5 (31%) presented with symptoms of abdominal pain and/or vomiting. 13 (81%) patients were admitted, with a median hospital length of stay of 2 days (range 0-4 days). 11 (69%) patients required surgery: 1 had a cystoscopy, 4 had esophagogastroduodenoscopy, and 6 had intestinal surgery. 3 had subsequent morbidity due to the magnets: a bowel mucosal injury, fistula, and fistula with perforation. There was no statistically significant difference in procedure rates or morbidity rates between age groups (P>.05 using Fisher’s Exact).

Conclusion: High-powered magnets pose a risk to youth, with many cases resulting in hospitalizations and surgery. The commercial availability of these magnets serves to enhance youth access to them, as these high-powered magnets are often marketed as toys. Reinstating a ban on these magnets will be an important first step to prevent future injuries and hospitalizations.
Title: Serious diagnoses at revisits in children discharged from the emergency department with back pain

Authors: Amy Z Zhou MD, PhD授予, Jennifer R Marin MD, MSc授予授予授予, Robert W Hickey MD授予授予, Sandi K Lam MD, MBA授予授予授予, Sriram Ramgopal MD授予授予

Objectives We sought to estimate the rate of serious diagnoses on revisits among children initially diagnosed with back pain and discharged from the index emergency department visit.

Methods We performed a multicenter retrospective cohort study of patients from 45 pediatric hospitals in the Pediatric Health Information System database from October 1, 2015 to March 31, 2019. We included patients discharged from the emergency department with a principal diagnosis of back pain and excluded patients with concurrent or previously known serious diagnoses, neurosurgeries, or orthopedic surgeries. We identified the rates and types of serious diagnoses made within 30 days of the index visit. We examined the rates of diagnostic tests at the index visit in patients with and without serious diagnoses made within 30 days.

Results Of the 25,310 patients with a diagnosis of back pain, 88 (0.4%, 95% CI 0.3-0.4%) had serious pathology diagnosed within 30 days. The most common diagnoses were in the anatomic (40%) and non-neurologic (39%) categories such as vertebral fracture and nephrolithiasis; infectious (19%) and neoplastic etiologies (3%) were less common. Serious pathologies requiring acute intervention such as cauda equina syndrome (N=2) and intraspinal abscess (N=3) were rare. Patients with serious diagnoses on revisits underwent more blood tests and back ultrasound at the index visit compared to patients without serious diagnoses.

Conclusions In pediatric patients discharged from the ED with a diagnosis of back pain, there is a low rate of serious pathology on revisits. Of the serious diagnoses identified, high-acuity diseases were rare. For the subset of patients with clinical suspicion for serious pathology but none identified at the index visit, this represents an opportunity for further research to optimize their management.
2021
EPIDEMIOLOGY
ABSTRACTS
Rates of Sudden Unexpected Infant Death (SUID) in Infants of U.S.-born and Foreign-born Women
Jana Shapiro, MD; James W. Collins, MD

Background: It has been previously demonstrated that there is a maternal nativity (country of birth) disparity in adverse birth outcome in the United States. Additionally, the widespread racial disparity in U.S. infant mortality rates is well known. However, the extent to which rates of SUID (including its’ subcategories) differ between births to US-born foreign-born women is incompletely understood.

Hypothesis: We hypothesize that the rates of SUID subcategories, including accidental suffocation and strangulation in bed (ASSB), sudden infant death syndrome (SIDS), and other ill-defined and unspecified causes of mortality, differ between infants with U.S.-born and foreign-born mothers. We also postulate that the disparity SUID rates is widest among births to African-American (compared to non-Latinx White and Mexican-American) women.

Methods: Stratified and multivariable binominal regression analyses were performed on the National Center for Health Statistics linked 2016-2017 live birth-infant death database. Inclusion criteria included infants born to non-Latinx White, African-American, and Mexican American women. Individual level characteristics examined included maternal nativity, age, education, insurance status, marital status, parity, prenatal care usage, alcohol usage, cigarette smoking, and infant gestational age.

Results: Infants with US-born mothers (N=5,266,192) had SUID rate of 110.6/100,000 compared to only 32.0/100,000 for infants of with foreign-born mothers (N=939,870); RR= 3.7 (3.2, 4.1). The distribution of maternal demographic, medical, and behavioral characteristics differed by maternal nativity. US-born (compared to foreign-born) women were more likely to be non-Latinx White, college-educated, and receive early prenatal care. Notwithstanding, the maternal nativity disparity persisted across each measured risk factor. Infants with US-born college educated mothers (N=3,407,226) had a SUID rate of 62.6/100,000 compared to 25.9/100,000 for their counterparts with foreign-born mothers (N=424,821); RR= 2.4 (2.0, 2.9). Most striking, the nativity disparity existed among births to non-Latinx White (N=4,043,739), African-American (N=1,115,001), and Mexican-American (N=1,047,322) women: RR = 4.0 (3.1, 5.2), 5.3 (4.2, 6.6), and 2.4 (2.0, 2.9), respectively. The overall adjusted (controlling for maternal race/ethnicity, age, education, insurance status, marital status, parity, prenatal care usage, alcohol usage, cigarette smoking, and infant gestational age) RR of SUID for all infants with US-born (compared to foreign-born) mothers equaled 2.6 (2.3, 3.0). The adjusted RR of SUID for infants with US-born (compared to foreign-born) non-Latinx white, African American, and Mexican American women were 2.7 (2.1, 3.6), 3.8 (2.9, 4.9), and 2.3 (1.8, 2.8); respectively. Similar trends occurred with respect to the SUID subcategories of SIDS, ASSB, and unknown causes.

Conclusions: We conclude that births to US-born (compared foreign-born) women have higher rates of SUID and its subcategories independent of traditional demographic, medical, and behavioral risk factors. This intriguing phenomenon appears largest among African-American (compared to non-Latinx White and Mexican-American) women. These findings warrant greater investigational and public health attention.
2021 HEALTH SERVICES, POLICY, ADVOCACY, & PUBLIC HEALTH ABSTRACTS
Research Scholar Day Abstract

Title: Establishing Newborn Screening in Nepal—A Focus on Congenital Endocrinopathies (Congenital Hypothyroidism and Congenital Adrenal Hyperplasia)

Authors: Apoorva Aekka, MD

Mentor: Janine Yasmin Khan, MD

Background: The development of newborn screening has allowed for the timely detection of numerous treatable conditions—including congenital hypothyroidism and congenital adrenal hyperplasia—that would otherwise result in irreversible neurodevelopmental impairment and/or death among children. Lack of newborn screening among low-income countries contributes to the disproportionate burden of infant and mortality and morbidity seen among these populations. Nepal is one such nation without established universal newborn screening. The current study is a multiphase and longitudinal initiative in establishing universal newborn screening in Kathmandu, Nepal and ultimately understanding and addressing the local burden of these conditions. The initial phase hopes to assess the feasibility and acceptability of local health providers in establishing wide-based newborn screening.

Hypothesis: We hypothesize that in partnering with amenable local academic, government, and private institutions, can establish a sustainable and scalable system for reliable sample collection and timely processing and reporting.

Planned Methods: Plan to collect and process 850 samples from newborns gestational age > 36 weeks born in an academic hospital in Kathmandu, Nepal, looking at metrics including reliability and accuracy of specimen collection, time for specimen processing, and reporting of results. Will conduct surveys assessing local provider knowledge and acceptability of newborn screening.

Anticipated Results: Anticipate that with buy-in of local providers, will be able to successfully collect and analyze initial 850 samples and begin to identify and address logistical barriers in accurate and timely processing of results.

Next Steps: Begin sample collection in June 2021 and analyze aforementioned outcomes. Develop and administer surveys for local providers assessing opinions regarding and readiness to implement newborn screening on larger scale.
Exploring an Association Between Residential Redlining and Pediatric Firearm Death in Chicago

Megan Attridge MD, James Collins MD MPH, Karen Sheehan MD MPH

BACKGROUND: Firearm violence is the leading cause of injury-related death in youths 0 to 19 years of age.¹ Black children are disproportionately affected experiencing the highest rates of firearm death.² Firearm assaults are also geographically clustered.³ Individual and community-level risk factors have been identified that contribute to geographic variation and racial disparities; however, these disparities remain incompletely explained.⁴ Mortgage lending discrimination or residential redlining is an example of institutional racism that has been associated with poor health outcomes⁵⁻⁷ To date, there have been no investigations into an association between modern residential redlining and rates of pediatric firearm death.

HYPOTHESIS: The purpose of this study is to examine the association between modern residential redlining and pediatric deaths due to firearms in Chicago at the level of the community area. We hypothesize that the presence of residential redlining will be associated with increased rates of pediatric firearm death in the city of Chicago after adjusting for demographic and socioeconomic risk factors at the level of the community area.

METHODS: This is a retrospective, cross-sectional, observational study of firearm death among Chicago youths aged 0 to 19 years of age within community areas from January 1, 2015 to December 31, 2019. Negative binomial regression models generated incidence rate ratios to compare community areas with the presence or absence of redlining, with adjustment for demographic and socioeconomic characteristics. Youth firearm deaths data were obtained from the Gun Violence Archive. A redlining index was calculated using the Home Mortgage Disclosure Act database. Sociodemographic variables of each community area were pulled from the Chicago Metropolitan Agency for Planning.

RESULTS: In unadjusted analysis of youth firearm death rates by Chicago community area characteristics, the presence of redlining was associated with a 71% lower rate of youth firearm death (IRR 0.29, 95% CI 0.13 – 0.66). As a continuous variable, every 1 unit increase in redlining index was associated with a 78% lower rate of youth firearm death (IRR 0.22, 95% CI 0.13 – 0.36). After adjusting for Chicago community area socioeconomic and demographic characteristics, the association between the presence of residential redlining and lower rates of youth firearm death was no longer significant (aIRR 0.91, 95% CI 0.60 – 1.39). The sensitivity analysis suggests that every 1 unit increase in redlining index was associated with a 13% higher rate of youth firearm death, however this finding is not significant (aIRR 1.13, 95% CI 0.73 – 1.77).

CONCLUSION: We found that the presence of residential redlining is associated with a lower rate of youth firearm death in Chicago; however, after adjustment for sociodemographic characteristics at the level of the community area, this association is no longer significant. These results suggest a continued need for research to determine community level factors that can be intervened upon to eliminate youth firearm death disparities and decrease rates of youth firearm death overall.
REFERENCES:


Title: Significance of social determinants of health on usage and impact of smart phone app in a NICU population

Authors: Katherine Bean, Craig Garfield

Background: Each year, over half a million babies are born prematurely in the United states. Parents of these children are under tremendous emotional stress – they are thrust into a foreign environment, staring at an unexpectedly fragile newborn, and having to adjust their expectations of their anticipated parental role. Information is a key source of support parents seek to reduce the emotional impact or to gain some sense of control over this unanticipated situation. Providing parents with timely information across different phases in the NICU is crucial and has also been shown to increase parental feelings of control while decreasing stress.

Hypothesis: We plan to investigate how social determinants of health effect app utilization as well as parental sense of competence scores and mental health metrics.

Methods: Data was obtained from April 2019 through February 2020 for a quasi-experimental non-randomized time-lagged study design to investigate the intervention of a smartphone application designed to support parents of NICU infants. Parents of premature infants (<37 weeks gestational age) admitted to the Prentice NICU during that time and expected to stay a minimum of 1 week were eligible for the study. The families were assigned to the usual care or the smartphone app (intervention) group based on date of birth. Surveys were collected throughout the study to assess parental sense of competence, perceived stress, patient experience, anxiety, and depression. Demographic data was also obtained, including age, race/ethnicity, education, and income.

Results: During the course of the study, 298 families were enrolled; 123 were allocated to the control group and 163 received the intervention. We will investigate the effects of the intervention (i.e. smart phone app usage) on measures of parental sense of competence, patient experience, anxiety, depression, social support, and perceived stress. We will investigate the relationship between social determinants of health and the effects of the intervention on these measures.

Conclusions and Relevance: Technology can be a powerful tool to allow connection and information sharing with parents during their child’s NICU stay. By investigating how social determinants of health effect app utilization as well as Parental Sense of Competence scores and mental health metrics, we can better optimize tools to help all our families feel supported, informed, and prepared.
TITLE: Impact of spatial social polarization on placental pathology among preterm births

AUTHORS: Ivana Brajkovic, MD, James Collins, MD, MPH, Nana Matoba, MD, MPH, Karen Mestan, MD, MSCI

BACKGROUND: In the United States, racial differences in birth outcomes continue to be a major public health problem. In 2018, 14.13% of non-Hispanic African American births were preterm (<37 weeks), compared to 9.09% of non-Hispanic white births1. Likewise, in 2017, African American infants were approximately twice as likely to die before the age of one in comparison to non-Hispanic white infants2. Despite several decades of research investigating these disparities, the mechanisms contributing to disparities in birth outcomes remain incompletely understood, but likely are influenced by a complex milieu of biological, environmental, psychosocial, and epigenetic factors.

The placenta serves as an interesting topic for research as it functions as a vehicle for which in utero exposures are transmitted from the mother to the fetus. Several pregnancy complications, including preterm delivery, can be causally linked to placenta dysfunction. Studies have demonstrated racial differences in placental pathology; specifically, higher incidences of inflammation3,4 and higher rates of maternal vascular malperfusion5 in African American women. This pathology may be a marker for adverse outcomes that contribute to racial differences in birth outcomes.

There have been no studies, to our knowledge, that have studied the relationship between spatial social polarization and placental pathology. It is well described in the literature that neighborhood poverty, interpersonal racial discrimination, and lack of upward economic mobility are associated with adverse birth outcomes6-9. The Index of Concentrations at the Extremes (ICE) is a novel and useful metric for assessing both race/ethnicity and income at the larger community level, and can be used as a measure of spatial social polarization. ICE employs a mathematical equation to assess polarity in race/ethnicity and household income, independently, as well as concurrently, within geographic regions and suggests directional tendency toward either extreme. It has been used in population-based health studies to explore associations between racial and economic segregation and adverse birth outcomes10-11. Investigating the relationship between spatial social polarization and placental pathology may help elucidate associations that could inform possible interventions for improving birth outcome disparities.

HYPOTHESIS: We hypothesize that increasing severity of neighborhood economic/social disadvantage in Chicago (as measured by Index of Concentrations at the Extremes) will be associated with higher rates of placental inflammation or vascular pathology.

METHODS: Five-year retrospective cohort study at Prentice Women’s Hospital of placentas from preterm births (<34 weeks) of women who delivered between January 2013 and December 2018. Pathology diagnoses of 1) acute inflammation, 2) chronic inflammation, 3) fetal vascular pathology, and 4) maternal vascular pathology will be compared with maternal ICE. Maternal ICE will be determined by first abstracting maternal residence from the electronic health record, which will then be cataloged within certain ICE-indexed Census available from the US Census America Community Survey (ACS). ICE-indexed Census tracts within Chicago will be then stratified into quintiles based on the neighborhood’s concentration of race/ethnicity, income, and combined effects of both variables. Stratified and multivariable logistic regression analyses will be performed to explore the relationship between maternal ICE and placental inflammation and vascular pathology.
REFERENCES:
Title: Racial disparities in infant mortality among preterm infants with congenital heart defects

Authors: Tonia Branche, James Collins, Nana Matoba

Background: Racial disparity in infant mortality rate due to congenital heart disease exists among African American and white term infants with US born mothers. The post neonatal survival disadvantage of African American infants has been shown to be a key driver of this disparity. Maternal risk factors also play a role. A similar analysis of racial disparity in infant mortality rate due to congenital heart disease among preterm infants has not yet been explored. This study aims to determine the impact of maternal demographics, timing of prenatal care onset and infant risk factors on racial disparity in preterm infants with congenital heart disease.

Hypothesis: We hypothesize that a racial disparity in infant mortality exists between preterm infants with congenital heart disease born to Mexican American, African American and white infants. We posit that there is a racial disparity in the mortality outcomes of preterm infants with congenital heart disease born to US born and foreign born mothers. We also hypothesize that there are social factors that affect the outcome of infant mortality in this subset of preterm infants.

Methods: We will construct a cross-sectional study of national birth and death data to evaluate the outcomes of overall infant mortality rate, neonatal mortality and post neonatal mortality and mortality due to congenital heart defects in preterm infants stratified by race, maternal birthplace and timing of onset of prenatal care.

Results: We will determine the significant differences in infant mortality rate, including neonatal and post neonatal mortality, between preterm infants of different races with congenital heart defects and mothers born both domestically and abroad. We will demonstrate the effect of maternal and infant risk factors and access to prenatal care on the mortality of preterm infants of different races with congenital heart disease.

Conclusion: Acknowledging the racial disparity that exists between preterm infants with congenital heart disease will provide an opportunity to further explore ways to reduce the gap in outcomes. Additionally, identifying the time frame with greatest prevalence of infant mortality for preterm infants with congenital heart disease will create an opportunity for interventions at the appropriate stage of care to reduce the differences in mortality between preterm infants of different racial groups.
Title: Shared decision-making for families facing adversity and the role of the medical home

Authors: Alyssa Cohen MD, Kristin Kan MD MPH MSc, Meredith Johnson MD MPH, Kelly Michelson, MD MPH, Nia Heard-Garris MD MSc

Background: Shared decision-making (SDM) is a key component of patient-centered care and is encouraged for children with special health care needs (CSHCN) to improve communication and treatment outcomes. Families of children with adverse childhood experiences (ACEs) may represent another vulnerable population that could benefit from collaborative clinical SDM. The relationship between ACEs and SDM has not been explored, and we hypothesize may be moderated by access to a medical home, a comprehensive and coordinated approach to high-quality primary care.

Objectives/Hypotheses:

1) Describe the association between ACEs and SDM among a national sample of children.
   a. We hypothesized that children with ACEs may be less likely to experience SDM than children without ACEs.
2) Examine the relationship between ACEs and SDM with and without medical home access
   a. We hypothesized that children with ACEs receiving care in a medical home are more likely to experience SDM than children with ACEs who do not have a medical home.

Methods: Data were analyzed from the 2018 National Survey of Children’s Health (NSCH), an annual survey of randomly sampled US households answered by parents of children ages 0-18. The primary outcome, experiencing SDM (yes/no), was based on 3 survey items among respondents needing medical decisions made in the last 12 months. The independent variable of interest was ACE exposure, comprising 9 maltreatment and household dysfunction experiences, and was categorized as 0, 1, or 2 or more ACEs. We modeled the relationship between ACEs and SDM as a multivariable logistic regression stratified by medical home access, measured as a yes/no variable based on the presence or absence of 5 key components. We controlled for child age, race/ethnicity, household federal poverty level, parental education, health insurance type, household language, and CSHCN status.

Results: Among 30,530 NSCH households, the analysis sample included 7,778 participants that made medical decisions. In unadjusted analysis, parents of children with 2 or more ACEs reported less SDM than those of children with 0 or 1 ACE (p<0.001)(Table 1). In adjusted analysis, parents of children with 2 or more ACEs were less likely to experience SDM (adjusted odds ratio (aOR)=0.61, 95% confidence interval: 0.41-0.91) if they did not have a medical home. In the presence of a medical home, the relationship between 2 or more ACEs and SDM was no longer significant (Table 2).

Conclusion: The findings suggest that families of children with higher ACE scores are less likely to experience SDM; however, medical home access attenuates this relationship. This difference in patient-centered care delivery may have implications for healthcare utilization and outcomes among children with ACEs. As we strive for health equity, it will be critical to understand what SDM means to families facing adversity and how medical homes may support SDM.
Table 1: Unadjusted Association of Shared Decision-Making and Adverse Childhood Experience (ACE) Exposure (n=7778)1

<table>
<thead>
<tr>
<th>ACEs</th>
<th>Did shared decision-making occur?</th>
<th>Total n (% of sample)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes n (%)</td>
<td>No n (%)</td>
</tr>
<tr>
<td>0</td>
<td>4090 (90.2)</td>
<td>373 (9.8)</td>
</tr>
<tr>
<td>1</td>
<td>1410 (86.8)</td>
<td>191 (13.2)</td>
</tr>
<tr>
<td>2+</td>
<td>1432 (80.1)</td>
<td>282 (19.9)</td>
</tr>
</tbody>
</table>

Pearson Chi² = 113.42 p<0.001²

1Tabulation was survey weighted
²Significance level p<0.05

Table 2: Adjusted Odds Ratio (aOR) of Shared Decision-Making by Adverse Childhood Experience (ACE) Exposure, Stratified by Medical Home Access1

<table>
<thead>
<tr>
<th>ACEs</th>
<th>Care does meet medical home criteria</th>
<th>Care does not meet medical home criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>aOR of SDM (95% CI)²</td>
<td>p-value</td>
</tr>
<tr>
<td>0</td>
<td>reference</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1.62 (0.75-3.52)</td>
<td>0.22</td>
</tr>
<tr>
<td>2+</td>
<td>0.81 (0.37-1.76)</td>
<td>0.59</td>
</tr>
</tbody>
</table>

1Models adjusted for child age, race/ethnicity, household federal poverty level, parental education, health insurance type, household language, child with special health care needs status
²Confidence interval
³Significance level p<0.05
Medical Home Experiences for Chicago’s Black Youth: A Qualitative Study
Rebekah Fenton, MD; Amy Johnson, PhD; Lisa Kuhns, PhD, MPH; Dr. Karen Sheehan, MD, MPH

Background:
Despite American Academy of Pediatrics’ recommendation that adolescents have annual preventive care visits, only 48% of adolescents aged 10-17 complete them.\textsuperscript{12} In a recent study, Black and brown youth, youth from low-income backgrounds, youth without insurance, and male gender were all less likely to report recent preventative visits.\textsuperscript{3}

The medical home model has only recently been applied to adolescent care with the goal of increasing preventive visit rates and screening. In a research study to examine its effectiveness and accessibility, teens receiving care from a designated medical home were more likely to receive STI screening, contraceptives, and vaccines for meningococcal and human papillomavirus than adolescents seeking care elsewhere with no difference in preventative visits.\textsuperscript{4} However, only 51% have access to a patient-centered medical home and those who identify as Black or Latinx, live four times below the poverty level, or have multiple special health care needs are less likely to have access.\textsuperscript{5}

Both adolescents and adolescent health experts believe that the medical home is a care model that has potential to serve the unique needs of adolescents with some concerns. Focus groups of racially/ethnically diverse adolescents identified three important characteristics of medical homes: relationship with a consistent, respectful primary care provider, comprehensive care, and confidentiality. Providers do not yet understand how to effectively apply the medical home model to meet the preventive needs of adolescents.\textsuperscript{6}

Aims:
- To describe the health seeking behavior of a sample of Black adolescents in Chicago, to provide context for exploration of care within the medical home model (e.g., frequency of receipt of care, health services sought/received, type of clinics where care received, general accessibility, acceptability and satisfaction with care)
- To describe Black adolescents’ experiences of counseling and access to confidential conversations with providers
- To examine how Black adolescents perceive the core concepts of the medical home model and their desires for navigating preventive care needs, family-centered care, and confidentiality

Methods:
Semi-structured interviews will be conducted among a sample of youth who attend Chicago Youth Program, but who do not receive medical care services therein (given the clinic’s comprehensive clinical services and increased accessibility to patients due to free transportation). Participants will be 20-25 youth who are ages 12-18 and self-identify as Black or mixed race (i.e., Black and something else). Interviews will be preceded by a brief demographic survey to characterize the sample, including standard questions regarding age, highest level of education, race, and ethnicity. The sample will be stratified by gender, age (ages 12-14, 15-18), and engagement in preventive healthcare (within 12 months, greater than 12 months).

The sample will be described using frequencies of categorical variables as well as measures of central tendency and dispersion based on responses to the demographic survey. Analyses will be carried out using content analysis, employing both inductive and deductive approaches to identify emergent themes or trends from interview transcripts centered on both adolescents’ experiences and needs. Then, Dedoose will be used to further categorize and visualize the data; organizing codes into frequency tables by participant descriptors to determine the occurrence of codes in the sample.

Conclusions:
Since last year, I have completed an IRB application, had support building REDCAP software, and built a relationship with the leadership of my community organization. While I have not yet started data collection, I learned a great deal from these processes. I selected this project because I wanted to practice engaging with communities well. This task meant more time between tasks and dedicated effort to find common ground between academic research and non-profit leadership. I will now focus on building a similar partnership with staff members and youth participants at Chicago Youth Program. I am hopeful these efforts will lead to a stronger partnership, successful participant enrollment, and rich findings.
References:


6. Tebb, K.P., Pica, G., Peake, K., Diaz, A., Brindis, C.D. Adolescent and Health Professional Perspectives on the Medical Home: Improving Health Care Access and Utilization Under the Affordable Care Act: Philip R. Lee Institute for Health Policy Studies and Division of Adolescent and Young Adult Medicine, Department of Pediatrics, University of California, San Francisco; July 2016.
**Title:** Identification of factors associated with receipt of healthcare transition planning among adolescents with chronic illnesses: A cross-sectional study

**Authors:** Meredith Johnson, MD MPH, Angela Berger, LCSW, & Parag Shah, MD MPH

**Background:** Healthcare transition planning includes the supports or interventions put into place to improve transition readiness for adolescent patients. However, at present, many adolescents fail to receive transition planning. The aim of the present study is to identify predictors for receipt of healthcare transition planning with respect to identification of a personal healthcare provider and obtainment of a written care plan.

**Hypothesis:** We hypothesize that individuals who have an identified healthcare provider and a written care plan are more likely to receive healthcare transition planning than those who do not have an identified healthcare provider or written care plan.

**Methods:** A secondary data analysis was conducted on adolescents ages 12-17 with a chronic health condition using results from the 2017-18 National Survey of Children’s Health. The primary outcome, healthcare transition planning, was dichotomized (yes/no) with “yes” occurring if all elements of discussing shift to adult provider, actively working to gain skills, discussing changes that occur with age, and having time alone with the provider were met. Identification of healthcare provider (HCP) was determined by participant response to “Do you have one or more persons you think of as this child’s personal doctor or nurse?” Possible categorical responses were “yes, one person”, “yes, more than one person”, and “no”. Obtainment of written care plan (WCP) was determined by participant response to “has this child’s doctors or other health care providers worked with you and this child to create a written plan to meet his or her health goals and needs?” Responses were dichotomized as “yes” or “no”. Chi-square tests and multivariable logistic regression examined the unadjusted and adjusted associations, respectively. Covariates included child’s age, sex, race/ethnicity, special health care needs status, and highest parental education level.

**Results:** A total of 14,194 adolescents were included in analyses. Most individuals (n = 7914, 56%) identified one person as his/her personal healthcare provider. Conversely, 20% (n = 2184) had no identified healthcare provider and 24% (n = 3400) had more than one healthcare provider. Only 22% (n = 3179) had a written care plan.

Results of unadjusted analyses suggest that there is a statistically significant association between identification of an HCP with a written care plan and report of complete transition planning. Specifically, on average, those who lack identification of an HCP and written care plan have an 81% reduced odds of complete transition planning than those who have an identified HCP and written care plan (OR = 0.19; 95% CI: 0.13, 0.27; p < 0.001). After adjusting for all covariates, the odds of receipt of healthcare transition planning were still lower for those without identification of an HCP and no written care plan compared to those with an HCP and written care plan (aOR = 0.17; 95% CI: 0.11, 0.25; p <0.001).

**Conclusion:** In general, most adolescents with medical conditions are not receiving complete healthcare transition planning. More specifically, those without a healthcare written plan, whether a personal HCP has been identified or not, are less likely to receive complete healthcare transition planning compared to those individuals who have a HCP and a written care plan. It is important to ensure adolescents can identify an HCP, WCP, and receive complete transition planning.
Title: The impact of neighborhood-level social needs and the built-environment on patient disease severity on presentation to the PICU

Authors: Paula Magee, MD, MPH, Erin Paquette, MD, JD, MBe

Background: Geographic variations in health disparities have long been studied, but more recently health research has shifted its focus from individual-level causes of health disparities to neighborhood-level causes. Neighborhoods capture the social and physical attributes experienced by its residents, which have been postulated to impact a patient’s overall health. Moreover, individuals are commonly clustered into neighborhoods based on their socioeconomic status. Understanding spatial patterns associated with health disparities can help inform neighborhood-level interventions and policy.

Despite the more recent attention to the impact of neighborhood-level characteristics on health, there remains a dearth of research on the relationship between pediatric intensive care unit (PICU) utilization and outcomes and spatial variations. Moreover, there are few identified studies focused on examining the relationship between neighborhoods and disease severity on admission to the PICU. Of the few studies, none use indices focused on multi-organ dysfunction (MOD) as a measure for disease severity. Understanding what specific characteristics within a neighborhood affect disease severity upon admission to the PICU has yet to be explored.

Hypothesis: Given our knowledge of the impact of the social determinants of health and built environments on overall health, we hypothesize that there will be spatial patterns associated with disease severity at presentation to the PICU. Moreover, patients from neighborhoods with fewer resources addressing the social determinants of health will have worse disease severity on admission.

Methods: This study will explore the spatial patterns (using census tracts) of disease severity at presentation to the PICU and the association between neighborhood resources and disease severity on presentation to the PICU. Using Lurie and Comer Children’s Hospital electronic medical records (EMR), retrospective data collection will be conducted for all patients admitted to the PICU for non-elective admissions over a five-year period (pre-Covid-19, January 2015 to December 2019). Residential address data will be geocoded into census tracts using geographic information system (GIS) techniques and will be linked to 2020 US census data, census-tract level neighborhood resource indices, and PICU data. The Pediatric Logistic Organ Dysfunction-2 (PELOD-2) score will be collected at 24 hours of ICU admission and will serve as the primary outcome. Peak PELOD-2 scores within the first 72 hours of admission will serve as a secondary/exploratory outcome. Neighborhood resource indices will include the Childhood Opportunity Index (COI), Social Vulnerability Index (SVI), and the Primary Care Physician Mapper. A multiple linear regression analysis will be used with the PELOD-2 score as the dependent variable and the SVI, COI, and neighborhood disorder scores as independent variables.

Results: We anticipate our study results will show whether there is an association between neighborhood resource availability and disease severity on presentation to the PICU. We also expect to learn whether there is a spatial pattern associated with a patient’s neighborhood and disease severity on presentation to the PICU.

Discussion: We foresee the possibility of incomplete data causing a barrier to data collection given the multiple databases employed. To reduce bias, we will exclude patients with incomplete data. Additionally, two neighborhood indices we will use are focused on Chicagoland area census tracts, which could limit the total number of patients in the study population that are served by the two institutions but live outside of the Chicagoland area. To account for this, we will use multiple indices, some of which expand beyond the borders of Chicago, to better understand the impact.
The Impact of Limited English Proficiency on Pediatric Hospital Outcomes
Mary Pilarz, MD; Karen Rychlik, MS; Giselle Rodriguez, MD; Victoria Rodriguez, MD

Background:
Urban children’s hospitals care for a diverse patient population, including patients with limited English proficiency (LEP). However, there is little information on how LEP affects inpatient pediatric outcomes.

Hypothesis:
We hypothesized that limited English proficiency would be associated with adverse clinical outcomes.

Objectives:
To characterize the relationship between English proficiency and clinical outcomes, including hospital length of stay (LOS), time of discharge (TOD), Emergency Department return visits, all-cause readmissions, and cost for pediatric general medicine patients.

Methods:
This study included all patients ages 0 to 18 admitted to the general medicine service at Ann & Robert H. Lurie Children’s Hospital of Chicago between January 1, 2017 and December 31, 2019. Patients were divided into two main language categories: English proficient (EP) and LEP; the LEP category was further divided into Spanish speaking (SS), and non-English, non-Spanish speaking (NENSS). The data were analyzed for association between limited English proficiency and clinical outcomes using regression analysis. As technology dependence impacts healthcare costs, analysis was also adjusted for technology dependent status.

Results:
Limited English proficiency was significantly associated with a longer length of stay, later time of discharge, and an increased number of ED return visits. 5625 patients met inclusion criteria; 804 (14%) were limited English proficiency, 674 (12%) were Spanish speaking, and 130 (2%) were non-English, non-Spanish speaking. NENSS patients had significantly longer LOS than EP and SS patients (English proficient: 152 hours, Spanish-speaking: 164 hours, non-English, non-Spanish speaking: 232 hours, \( p = 0.001 \)). After adjusting for technology dependence, the LOS for NENSS patients remained significantly higher (\( p = 0.04 \)). LEP patients were also discharged later in the day, with English proficient patients discharged earliest (mean 3:37 PM), followed by SS patients (mean 3:59 PM, \( p = 0.01 \)), then NENSS patients (mean 4:37 PM, \( p = 0.001 \)). LEP patients were also more likely to return to the ED within 30 days after admission. 578 out of 4821 (12%) of English proficient patients returned to the ED, versus 102 of 672 (15%) SS patients, versus 22 out of 130 (17%) NENSS patients (\( p = 0.02 \)). LEP patients are significantly more likely to have technology dependence (\( p < 0.001 \)). Differences in readmissions and cost were not statistically significant between the groups.

Discussion:
Limited English proficiency was associated with multiple negative outcomes. Prolonged length of stay, discharges late in the day, and unplanned return visits to the ED can have a profound impact on families and hospital workflow. The most pronounced differences occur in the NENSS population, which also had a higher level of medical complexity and more limited access to interpreter services than SS patients. These findings may motivate further efforts to improve quality of care and language services for LEP patients.
**Title:** Are patient and parent demographic characteristics associated with family presence in the PICU?

**Authors:** Ann Prybylowski, Kelly Michelson, Karen Rychlik, Erin Paquette

**Background:** Family-centered care (FCC) is a technique to improve health outcomes promoted by the American Academy of Pediatrics, the American College of Critical Care Medicine, and the Institute of Medicine (1-3). It gives the family access to the medical staff to improve their child's care. A study completed by Drago et al. explored demographic differences between families that participate in family centered rounds (FCR) and those that do not in the PICU, however, there is no research that has explored these characteristics for global family presence at the bedside during a PICU admission. Small scale studies have found that factors like childcare, work, and distance from the hospital are barriers to participation in FCR. However, these factors have not been studied on a larger scale to see if they are distributed differently among families at the bedside and those that are not.

**Specific Aims:**
1) Determining the association between patient and parent demographic characteristics and global family presence in the PICU.
2) Describe the primary ways that families receive communication in the PICU.

**Methods:**

**Aim 1:**
1) Retrospective study from 2015-2020.
2) Inclusion criteria: All patients admitted to Lurie’s PICU over a 5-year period.
3) Exclusion criteria: PICU admissions less than 72 hours.
4) Predictor variables: Using DAR we will collect various predictor variables on patient and parent demographic characteristics
5) Outcome variables: Total number of hours a family member is at the bedside in the first 72 hours of an admission and the last 24 hours of an admission.
6) Statistical Analysis: Nested multivariable logistic models.

**Aim 2:**
1) Prospective study over 12 months.
2) Inclusion criteria: Convenience samples of all patients admitted to Lurie’s PICU over a 12-month period.
3) Exclusion criteria: PICU admissions less than 72 hours.
4) Descriptive variable: One week a month, we will discuss with front line providers how families receive updates.
5) Statistical Analysis: Average number of communication encounters. Prevalence of different forms of communication.

**Results/Conclusions:** TBD. We anticipate that certain predictor variables like preferred language and distance from the hospital will be associated with global family presence while other variables like race will not. We anticipate that families who participate in family centered rounds will have more communication encounters than families that do not participate.
The United Nations’ 2030 Sustainable Development Goals target an end to preventable newborn deaths and a reduction in neonatal mortality rate (<28 d, NMR) to 12/1,000 live births for all countries. Understanding concurrent trends in country-level, multisectoral factors associated with NMR trends may illuminate opportunities for intervention strategies.

To explore country-specific trends in NMR from 1990-2019 and identify those countries which contribute to the largest percentage of neonatal deaths in order to focus efforts on reducing NMRs in those specific countries.

We created a comprehensive global database of NMR and associated variables that were selected based on literature review and categorized into Population Health, Health Systems, Maternal, Neonatal, and Social factors from 1990 to 2019. Data were compiled from publicly available sources including UNICEF, World Bank, WHO, and OECD. Data were collected and analyzed for 195 countries. NMR trends were analyzed from 1990 to 2019 with more targeted analysis of trends in the last 2 decades from 2000 to 2019.

In terms of total deaths, 20 countries contributed 75% of the total 2.5 million neonatal deaths (Table 1). All of these 20 countries showed decreases in NMR since 1990 (Figure 1). However, only China and Egypt accomplished the UN goal of reducing NMR to 12/1,000 live births. We compared variables associated with NMR in our 20 target countries to the remaining countries. Significant differences were noted between the means for the target countries compared to the means for the remaining countries for most variables including disparities in other health outcomes, gender equality, resource availability, and share of population in urban areas (Table 2).

Since 20 countries contribute 75% of the neonatal deaths worldwide, we propose that targeting these 20 countries would have the greatest impact on global neonatal deaths. Future research will focus on identification of country specific barriers and evaluating the countries with greatest NMR improvements to propose effective focused strategies for reducing NMRs in high burden countries.
### Table 1: Countries with highest contribution to total global neonatal deaths (N=2,562,166)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>India</td>
<td>574,788</td>
<td>22.43</td>
<td>23.71</td>
<td>18.48</td>
</tr>
<tr>
<td>Nigeria</td>
<td>268,009</td>
<td>10.46</td>
<td>36.58</td>
<td>7.41</td>
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<tr>
<td>Pakistan</td>
<td>256,294</td>
<td>10.00</td>
<td>43.21</td>
<td>11.81</td>
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<tr>
<td>Ethiopia</td>
<td>103,241</td>
<td>4.03</td>
<td>29.63</td>
<td>16.78</td>
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<tr>
<td>Democratic Republic of the Congo</td>
<td>96,828</td>
<td>3.78</td>
<td>28.51</td>
<td>9.16</td>
</tr>
<tr>
<td>China</td>
<td>78,136</td>
<td>3.05</td>
<td>4.58</td>
<td>13.84</td>
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<td>Indonesia</td>
<td>65,479</td>
<td>2.56</td>
<td>13.43</td>
<td>8.00</td>
</tr>
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<td>Bangladesh</td>
<td>61,270</td>
<td>2.39</td>
<td>20.73</td>
<td>18.84</td>
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<tr>
<td>Afghanistan</td>
<td>45,650</td>
<td>1.78</td>
<td>38.01</td>
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<td>United Republic of Tanzania</td>
<td>42,950</td>
<td>1.68</td>
<td>21.17</td>
<td>10.11</td>
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<tr>
<td>Sudan</td>
<td>37,632</td>
<td>1.47</td>
<td>28.31</td>
<td>7.26</td>
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<tr>
<td>Angola</td>
<td>35,771</td>
<td>1.40</td>
<td>29.05</td>
<td>18.81</td>
</tr>
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<td>Uganda</td>
<td>33,869</td>
<td>1.32</td>
<td>21.10</td>
<td>9.18</td>
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<td>Mozambique</td>
<td>32,340</td>
<td>1.26</td>
<td>29.75</td>
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<td>Kenya</td>
<td>32,295</td>
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<td>Egypt</td>
<td>31,082</td>
<td>1.21</td>
<td>11.98</td>
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<td>Philippines</td>
<td>30,890</td>
<td>1.21</td>
<td>13.92</td>
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<td>Côte d'Ivoire</td>
<td>30,169</td>
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<td>Mali</td>
<td>26,109</td>
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<td>Niger</td>
<td>25,543</td>
<td>1.00</td>
<td>25.37</td>
<td>15.00</td>
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<tr>
<td><strong>20 Country Summary</strong></td>
<td><strong>1,908,344</strong></td>
<td><strong>74.48%</strong></td>
<td><strong>25.43</strong></td>
<td><strong>11.93</strong></td>
</tr>
</tbody>
</table>
Figure 1: NMR trends in 20 countries with highest contribution to total neonatal deaths
Table 2: Comparison of 20 countries with highest contribution to total neonatal deaths to remaining countries based on analysis of related variables

<table>
<thead>
<tr>
<th>Category</th>
<th>Variables</th>
<th>175 other countries (SD)</th>
<th>20 countries with most neonatal deaths (SD)</th>
<th>P value</th>
</tr>
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<tbody>
<tr>
<td>Population Health</td>
<td>Literacy level (n=113)</td>
<td>91.9 (1.4)</td>
<td>81.0 (3.4)</td>
<td>.003</td>
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<td></td>
<td>Healthcare dollars per person (n=165)</td>
<td>1375.6 (759.7)</td>
<td>565.5 (271.7)</td>
<td>0.699</td>
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<td>Health Systems</td>
<td>Relative number of nurses (n=179)</td>
<td>4.6 (0.3)</td>
<td>1.1 (0.2)</td>
<td>&lt;0.001</td>
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<td></td>
<td>Relative number of physicians (n=163)</td>
<td>2.0 (0.1)</td>
<td>0.4 (0.2)</td>
<td>&lt;0.001</td>
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<td></td>
<td>Proportion of births attended by skilled health personnel (n=102)</td>
<td>91.3 (1.6)</td>
<td>63.5 (5.8)</td>
<td>&lt;0.001</td>
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<td></td>
<td>In-Hospital birth (n=84)</td>
<td>85.1 (2.3)</td>
<td>64.9 (4.3)</td>
<td>&lt;0.001</td>
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<tr>
<td>Maternal Factors</td>
<td>Maternal mortality ratio (n=183)</td>
<td>141.0 (17.8)</td>
<td>362.1 (52.9)</td>
<td>&lt;0.001</td>
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<tr>
<td></td>
<td>Antenatal care (&gt;4 visits) (n=77)</td>
<td>75.3 (2.2)</td>
<td>51.2 (4.0)</td>
<td>&lt;0.001</td>
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<td>Neonatal Factors</td>
<td>Prematurity (n=183)</td>
<td>9.9 (0.2)</td>
<td>12.4 (0.6)</td>
<td>&lt;0.001</td>
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<td></td>
<td>Low birth weight (n=147)</td>
<td>9.5 (0.4)</td>
<td>14.1 (2.0)</td>
<td>0.002</td>
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<td></td>
<td>Sepsis / infection (n=194)</td>
<td>10.4 (0.4)</td>
<td>16.2 (1.0)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>Intrapartum events / birth asphyxia (n=194)</td>
<td>17.8 (0.7)</td>
<td>26.3 (0.9)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>Congenital anomalies (n=194)</td>
<td>20.8 (0.7)</td>
<td>10.7 (1.0)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Social Factors</td>
<td>Share of population in urban areas (n=197)</td>
<td>61.2 (1.7)</td>
<td>39.1 (2.9)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>Gender equality (n=146)</td>
<td>0.70 (.01)</td>
<td>0.67 (0.02)</td>
<td>.04</td>
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</tbody>
</table>
TITLE: Maternal Hypertension and Preterm Birth in non-Hispanic Black Mothers: The Effect of Maternal Nativity
AUTHORS: Davlyn Tillman MD, James W. Collins, Jr. MD, MPH, Nana Matoba, MD

BACKGROUND: Preterm birth (< 37 weeks) is a significant contributor to infant mortality, with known racial disparities in this outcome. Non Hispanic black mothers and infants are at the highest risk, with a PTB rate of 14.1%, above the national average of 10.0%. Theories on contributing factors have explored social, environmental, and genetic causes of this increased risk. Studies have shown that foreign born black mothers have birth outcomes more closely related to US born white mothers than their US born black counterparts. This suggests that social contexts of long term residence in the US are significant contributors to preterm birth disparities. Maternal chronic and pregnancy related hypertension are known medical risk factors increasing the risk of preterm birth, also with increased rates found in black mothers. The interaction between maternal nativity (foreign vs US born), comorbid conditions such as hypertension, and preterm birth has received limited attention in the literature. This study will investigate the differences in maternal hypertension and preterm birth outcomes among US born and foreign born black mothers to provide a focus for further social environment research and public health intervention.

HYPOTHESIS: The aim of this study is to determine the risk of maternal hypertension and adverse outcomes of preterm birth in US born vs foreign born black mothers. The hypothesis is that US born Non Hispanic black women will have a higher risk of maternal hypertension complications and related preterm birth than foreign born Non Hispanic black women, suggestive of increased risk with increasing duration of residence in the US.

METHODS: This study used public use birth certificate data from the 2017 and 2018 U.S. natality files from the National Center for Health Statistics. Our population of interest is singleton live births to mothers identifying as black, non Hispanic. Mother’s nativity was defined as US- or foreign-born. Maternal hypertension and gestational age are variables available in birth certificate data. Maternal characteristics and behaviors with known effects on adverse pregnancy outcomes were identified as covariates. Our final analytic sample was N = 855,410 births. Chi-square tests were used to determine risk differences for the relationship between maternal nativity and rates of PTB. In both nativity subgroups, we determined prevalence and risk differences for a maternal diagnosis of hypertension (defined as pre-pregnancy, gestational, or eclampsia). Risk differences were calculated for the relationship between maternal HTN and PTB rates within each maternal nativity subgroup. We built Oaxaca-Blinder decomposition models to assess the independent contribution of maternal hypertension to the difference in PTB rates between US-born and foreign-born Black women.

RESULTS: US born mothers had a higher risk of preterm birth and maternal hypertension than foreign born mothers. In evaluating the effect of maternal hypertension on preterm birth within each nativity group, it is anticipated there was increased risk of preterm birth among hypertensive, US born black mothers compared to foreign born mothers. It is anticipated that the Oaxaca-Blinder analysis will show a significant contribution of hypertension diagnosis to the maternal nativity disparity in PTB rates.

CONCLUSION: Maternal hypertension is a risk factor for preterm birth, with higher rates of this complication in non Hispanic Black women. This study attempts to demonstrate a difference in risk patterns among US born and foreign born black mothers with a goal to shift the focus of public health interventions to socioeconomic contextual processes related to residence in the United States. A better understanding of maternal medical risks and their determinants among major racial/ethnic and immigrant groups is vital to improve perinatal health outcomes in the US.
Predictors of 3-day revisits to pediatric emergency departments

**Background.** 3-5% of pediatric emergency department (PED) encounters represent patients returning for care within 3 days of their index visit. The improved identification of risk factors for pediatric revisits and medically necessary revisits may facilitate predictive modeling and improve the quality of care while minimizing burden to the healthcare system.

**Objectives.**

1. To characterize the type of revisits to the PED within 3 days of their index visit among patients discharged from the ED
2. To identify predictors of revisits within 3 days and medically necessary revisits in this population

**Methods.** We performed a retrospective cohort study from 44 contributing hospitals to the Pediatric Hospital Information System. We included encounters of patients ≤18 years of age discharged from the ED between 01/01/2019 to 12/31/2019, excluding interfacility transports. Our primary outcome was patients with a return visit to the same ED within 3 days of the index visit. Our secondary outcome was a 3 day medically necessary revisit, defined as 1) hospitalization with length of stay > 1 day, 2) operating room charge, 3) ICU charge, 4) provision of supplemental oxygen, or 5) in-hospital mortality. We performed multivariable logistic regression to identify independent risk factors for each outcome.

**Results.** Of 2,716,982 included encounters, 116,407 (4.3%) had a revisit within 3 days. The most common diagnoses at the index visit were general medical (27.3%) and respiratory (25.2%). Of the revisits, 19.5% were categorized as medically necessary revisits (Table 1). Patient age <1 year (OR 95% CI), complex chronic conditions (OR 1.68, 95% CI 1.64-1.72), and blood (OR 1.75, 95% CI 1.72-1.78) and CSF testing (OR 2.6, 95% CI 2.33-2.91) at the index visit were strongly associated with 3-day and medically necessary revisits. Having a neoplastic diagnosis (OR 1.58, 95% CI 1.50-1.66) was also a strong predictor for 3-day revisits (Tables 2 and 3).

**Conclusion.** We identified multiple patient and visit level predictors of 3 day revisits and medically necessary revisits. This may help identify opportunities for improvement in PED management and communication, modeling with clinical decision support, anticipatory guidance at discharge, and ensuring follow-up for at risk patients.
Table 1. Demographics of overall cohort, patients with any 3-day return visit (outcome 1) and patients with a 3-day return visit leading to hospitalization (outcome 2)

<table>
<thead>
<tr>
<th>Variable</th>
<th>All patients (N= 2716982, %)</th>
<th>3-day return visit (N=116407)</th>
<th>Medically necessary return visit (N=22713)</th>
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<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;1 year</td>
<td>413443 (15.2)</td>
<td>24746 (21.3)</td>
<td>5568 (24.5)</td>
</tr>
<tr>
<td>1 to &lt;4 years</td>
<td>782621 (28.8)</td>
<td>35299 (30.3)</td>
<td>5434 (23.9)</td>
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<tr>
<td>4 to &lt;12 years</td>
<td>972764 (35.8)</td>
<td>34665 (29.8)</td>
<td>5835 (25.7)</td>
</tr>
<tr>
<td>12 to 18 years</td>
<td>548154 (20.2)</td>
<td>21697 (18.6)</td>
<td>5876 (25.9)</td>
</tr>
<tr>
<td>Male sex*</td>
<td>1428654 (52.6)</td>
<td>61160 (52.3)</td>
<td>11833 (52.1)</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>White</td>
<td>1256064 (46.2)</td>
<td>54355 (46.7)</td>
<td>11955 (52.6)</td>
</tr>
<tr>
<td>Black</td>
<td>720144 (26.5)</td>
<td>27796 (23.9)</td>
<td>4100 (18.1)</td>
</tr>
<tr>
<td>Other, multiple, not stated</td>
<td>740774 (27.3)</td>
<td>34256 (29.4)</td>
<td>6658 (29.3)</td>
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<tr>
<td>Ethnicity</td>
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<tr>
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<td>839783 (30.9)</td>
<td>37040 (31.8)</td>
<td>6188 (27.2)</td>
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<td>Non-Hispanic or Latino</td>
<td>1716124 (63.2)</td>
<td>72491 (62.3)</td>
<td>14670 (64.6)</td>
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<td>Unknown</td>
<td>161075 (5.9)</td>
<td>6876 (5.9)</td>
<td>1855 (8.2)</td>
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<td>Primary Payor</td>
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<td>Private</td>
<td>721299 (26.5)</td>
<td>29636 (25.5)</td>
<td>8368 (36.8)</td>
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<tr>
<td>Public</td>
<td>1758047 (64.7)</td>
<td>78090 (67.1)</td>
<td>12922 (56.9)</td>
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<tr>
<td>Other</td>
<td>237636 (8.7)</td>
<td>8681 (7.5)</td>
<td>1423 (6.3)</td>
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<tr>
<td>Census region</td>
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<td>Midwest</td>
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<td>25418 (21.8)</td>
<td>4631 (20.4)</td>
</tr>
<tr>
<td>Northeast</td>
<td>300729 (11.1)</td>
<td>12405 (10.7)</td>
<td>1889 (8.3)</td>
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<tr>
<td>South</td>
<td>1148029 (42.3)</td>
<td>45511 (39.1)</td>
<td>8687 (38.2)</td>
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<tr>
<td></td>
<td>Visit</td>
<td>Stay</td>
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</tr>
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<td>----------------</td>
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<td>------------------</td>
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<tr>
<td>West</td>
<td>661578 (24.3)</td>
<td>33073 (28.4)</td>
<td>7506 (33.0)</td>
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<tr>
<td>Weekend index</td>
<td>775520 (28.5)</td>
<td>34133 (29.3)</td>
<td>6385 (28.1)</td>
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<tr>
<td>Season</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winter</td>
<td>729341 (26.8)</td>
<td>31754 (27.3)</td>
<td>6355 (28.0)</td>
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<td>Spring</td>
<td>651747 (24.0)</td>
<td>27281 (24.3)</td>
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<td>Summer</td>
<td>594269 (21.9)</td>
<td>24590 (21.1)</td>
<td>4629 (20.4)</td>
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<tr>
<td>Fall</td>
<td>741625 (27.3)</td>
<td>32782 (28.2)</td>
<td>6670 (29.4)</td>
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### Primary diagnosis

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<tr>
<th>Category</th>
<th>Count</th>
<th>Percentage</th>
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<th>Percentage</th>
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<td>General medical</td>
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<td>23.0</td>
<td>31756</td>
<td>27.3</td>
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<td>Behavioral</td>
<td>44776</td>
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<td>1711</td>
<td>1.5</td>
<td>560</td>
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<td>Circulatory</td>
<td>9771</td>
<td>0.4</td>
<td>562</td>
<td>0.5</td>
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<td>Central nervous system</td>
<td>34356</td>
<td>1.3</td>
<td>2018</td>
<td>1.7</td>
<td>594</td>
<td>2.6</td>
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<td>Eye/ear</td>
<td>181501</td>
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<td>6084</td>
<td>5.2</td>
<td>558</td>
<td>2.5</td>
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<td>Gastrointestinal</td>
<td>154992</td>
<td>5.7</td>
<td>7542</td>
<td>6.5</td>
<td>1750</td>
<td>7.7</td>
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<td>Infection</td>
<td>176767</td>
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<td>8083</td>
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<td>1124</td>
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<td>Neoplastic/immunological</td>
<td>15044</td>
<td>0.6</td>
<td>1924.17</td>
<td>1.7</td>
<td>755</td>
<td>3.3</td>
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<td>Respiratory</td>
<td>581314</td>
<td>21.4</td>
<td>29341</td>
<td>25.2</td>
<td>5611</td>
<td>24.7</td>
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<tr>
<td>Trauma/poisoning</td>
<td>547591</td>
<td>20.2</td>
<td>12074</td>
<td>10.4</td>
<td>1609</td>
<td>7.1</td>
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<tr>
<td>Other</td>
<td>346454</td>
<td>12.8</td>
<td>15312</td>
<td>13.2</td>
<td>3128</td>
<td>13.8</td>
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<tr>
<td>Complex chronic condition</td>
<td>123353</td>
<td>4.5</td>
<td>10481</td>
<td>9.0</td>
<td>4118</td>
<td>18.1</td>
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<tr>
<td>Any blood testing</td>
<td>349243</td>
<td>12.9</td>
<td>26199</td>
<td>22.5</td>
<td>9757</td>
<td>43.0</td>
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<tr>
<td>Any urine testing</td>
<td>384092</td>
<td>14.1</td>
<td>21908</td>
<td>18.8</td>
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<td>26.0</td>
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<tr>
<td>CSF test</td>
<td>2210</td>
<td>0.1</td>
<td>402</td>
<td>0.3</td>
<td>184</td>
<td>0.8</td>
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<tr>
<td>Any imaging</td>
<td>765761</td>
<td>28.2</td>
<td>34559</td>
<td>29.7</td>
<td>9221</td>
<td>40.6</td>
</tr>
</tbody>
</table>

*Sex was unavailable for 339 encounters.

Medically necessary return visit defined as leading to admission for >1 day, operating room charge, or intensive care unit charge
Characterizing Barriers to Fetal Cardiac Care within the Greater Chicagoland Area

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1Division of Pediatric Cardiology, Ann & Robert H. Lurie Children’s Hospital of Chicago
2Division of Pediatric Cardiology, Advocate Children’s Hospital
3Division of Maternal-Fetal Medicine, Northwestern University Feinberg School of Medicine

Background: Congenital heart disease (CHD) is the most common birth defect, affecting ~1 in 100 live births. In the treatment of CHD, accurate prenatal diagnosis (PND) is key: it prepares families and directs patients to the appropriate center for timely intervention. Despite ~90% sensitivity of fetal echocardiography in detecting severe CHD, national and statewide PND rates remain only ~50%. As a pilot study to understand barriers to PND among those infants who receive surgical intervention, we aimed to identify sociodemographic differences in CHD PND within the Greater Chicagoland Area.

Methods: Infants ≤ 12 months of age with CHD that (1) could feasibly be diagnosed by fetal echocardiography, and (2) received their first cardiac surgery between January 1, 2016 and December 31, 2020, were identified from the Society of Thoracic Surgeons (STS) database at Lurie Children’s Hospital. Sociodemographic variables of infants and their mothers were collected from both STS and electronic medical records. ZIP codes were linked with U.S. Census Bureau data. Chi-square tests were used for univariable comparisons between pre- and postnatally diagnosed groups, and multivariable logistic regression was used for the adjusted analysis.

Results: In total, 558 mother-infant dyads met inclusion criteria. Of these, 58% were PNDs. Of all critical CHD, 77% were PNDs. In univariable analysis, pregnant individuals residing within the city of Chicago demonstrated lower PND prevalence compared to those living outside Chicago (53% vs. 62%, p=0.03). Mothers residing in urban areas (i.e. the city and suburbs) demonstrated higher PND prevalence compared to those residing in rural areas (60% vs. 47%, p=0.04), however, these findings were not significant in the adjusted analysis. Following adjustment, prenatal public insurance status (OR 0.55, 95% CI 0.34-0.90) and need for transportation and parking aid postnatally (OR 0.60, 95% CI 0.30-0.90) were found to be independent predictors of lower odds of PND (Table 1). There were no differences in PND by maternal race or ethnicity.

Conclusion: We found that prenatal public insurance status and need for transportation and parking aid postnatally were independently associated with lower odds of PND of CHD. Ongoing analysis will include data from other STS-reporting pediatric heart centers within Illinois, and prospective collection of more granular data on utilization of prenatal cardiac care services. Identification of these key barriers in fetal cardiac care is paramount for actionable changes that could increase CHD PND rates.

Table 1: Factors Associated with Prenatal Diagnosis of Congenital Heart Disease

<table>
<thead>
<tr>
<th>Variable</th>
<th>Adjusted OR</th>
<th>95% CI</th>
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<tbody>
<tr>
<td>Maternal race</td>
<td>0.9</td>
<td>0.6-1.3</td>
</tr>
<tr>
<td>Maternal ethnicity</td>
<td>1.0</td>
<td>0.6-1.7</td>
</tr>
<tr>
<td>Maternal multiparity (prenatal)</td>
<td>1.2</td>
<td>0.8-1.7</td>
</tr>
<tr>
<td>Maternal public insurance (prenatal)</td>
<td>0.5</td>
<td>0.3-0.9</td>
</tr>
<tr>
<td>Need for transportation and/or parking aid (postnatal)</td>
<td>0.6</td>
<td>0.3-0.9</td>
</tr>
<tr>
<td>Infant with genetic or non-chromosomal defect</td>
<td>1.1</td>
<td>0.7-1.6</td>
</tr>
<tr>
<td>Maternal ZIP code of residence within Chicago (prenatal)</td>
<td>0.7</td>
<td>0.5-1.1</td>
</tr>
<tr>
<td>Median household income (in dollars) of maternal zip code (prenatal)</td>
<td>1.0</td>
<td>0.9-1.0</td>
</tr>
</tbody>
</table>
Fractures in Young Children: Abuse or Accident?
There’s An App For That
Anna G. Smith, Mary Clyde Pierce, Kirsten V. Loftus, Kim Kaczor,
Douglas J. Lorenz, Mark D. Adler, Jennifer L. Trainor, Richmond Castillo, and Avni Singh

BACKGROUND: Child abuse is a public health epidemic and the leading cause of trauma-related deaths among children younger than 4 years old. Fractures are the most common serious injury from physical abuse. General pediatricians have difficulty differentiating abuse-related fractures from those associated with an accident. Despite receiving dedicated training in child abuse, pediatric residents report feeling underprepared to accurately identify and report abuse when it is suspected. Physician use of technology-supported clinical decision instruments is widespread. Currently, no validated clinical application (app) exists to assist general pediatricians in differentiating abuse-related versus accidental injury fracture patterns in children. To address this gap, our Lurie team built an evidence-based 3D Fracture Injury Plausibility Model (FxIPM) app and targeted pediatric residents for beta testing in a simulated setting. We aimed to examine the impact of the FxIPM app on pediatric resident performance in distinguishing abuse-related from accidental fractures. HYPOTHESIS: We predicted that use of the FxIPM app will improve accuracy in differentiation of abuse-related from accidental fractures among pediatric residents.

METHODS: A target study population of 60 pediatric residents equally distributed across all years of training was eligible to participate in this study. An expert panel of pediatric emergency medicine (PEM) and child abuse physicians selected 7 cases involving children ages 0-3 years old with fractures from an existing database. Their injuries were classified as abuse-related or accidental by expert consensus. A panel of PEM physicians and medical educators, blinded to expert consensus, created 6 simulation cases based on the 7 selected cases. Case 4 was dropped due to complexity of injuries. Study participants were randomized into app-assisted and app-unassisted groups. Residents in the app-assisted group had access to a smartphone with a decision-aid tool that took the user through a series of simple questions and interactive images to help arrive at a conclusion of whether accidental injury is plausible or not plausible. Residents completed all 6 simulation cases with a series of documented assessments following each case. Performance measures on history taking, critical exam maneuvers, and accuracy in classification of fractures as abuse or accident were collected. RESULTS: 41 pediatric residents (PGY1: 20; PGY2: 9; PGY3: 12) participated in this study, with 21 randomized to the app-assisted group. 18% of participants had completed a child abuse elective by this point in their training. Two of the six cases were determined to be abusive fractures by expert consensus (Case 5 and Case 7). The overall accuracy rate for the two abuse cases was 100% and 88%, respectively. The median number of correctly identified cases was 4 in both app-assisted and app-unassisted groups (p = 0.44). For 4 of the 6 cases, participants in the app-assisted group had a higher percent accuracy in distinguishing abuse-related from accidental fractures, compared to those in the app-unassisted group. Differences in percent accuracy were greatest for cases that simulated accidental fractures. Residents in the PGY1 app-assisted group had higher percent accuracy compared to PGY1s without app-assistance. Most commonly missed history questions included: impact surface, height of the fall, whether an adult fell on the child, and delay in seeking care. Most commonly missed exam maneuvers included: examination of the child’s back, buttocks, and initiation of splint take down for assessment of further injuries. Comparisons between training years were omitted as sample sizes were prohibitively small for statistical testing. CONCLUSION: Among this group of pediatric residents, the median overall correct number of identified cases was equal between app-assisted and app-unassisted groups. However, for cases with accidental fractures, participants in the app-assisted group had higher percent accuracy in identifying fracture etiology. PGY1 residents demonstrated the greatest improvement in percent accuracy with app-assistance compared to PGY2s and PGY3s. These preliminary results suggest that the FxIPM app may be most beneficial in scenarios where abuse is not certain, especially for clinicians with the least experience in pediatric abuse patterns. Additional education in history taking and physical exam maneuvers is required to correctly identify fracture etiology. Future directions include implementation across additional key stakeholder groups who are relied on to recognize pediatric injury patterns: general emergency medicine, surgery, and orthopedic residents.
Overreaching: A mechanism for learning at the evolving edge of a trainee's expertise
Anisha Kshetrapal MD, MSEd; Pim Teunissen, MD, PhD; Walter Eppich, MD, PhD

**Purpose**

Despite significant efforts, graduate medical education (GME) may inadequately prepare physicians for unsupervised practice. Progressive autonomy and steps toward unsupervised work represent a fundamental aspect of GME. Currently, clinical educators rightly place increased emphasis on patient safety, and measures to support this may limit progressions in autonomy. Little is known about how trainees experience trust and autonomy in this landscape. Although many aspects of entrustment may lie outside of trainees’ locus of control, recent work has shown that physicians-in-training actively shape how they earn trust and may influence their supervisors’ decision making through specific behaviors. The authors sought to advance this understanding of how trainees experience caring for patients with increasingly less supervision as they progress in training.

**Methods**

Using a constructivist grounded theory approach, the authors conducted semi-structured interviews from June 2019-November 2020 with trainees from various specialties and levels of training to solicit their accounts of experiences that influenced their progressions in autonomy. Through constant comparison and iterative analysis, key themes and their conceptual relationships were identified.

**Results**

Seventeen trainees from four specialties reported encountering novel clinical situations that required them to “go beyond” current knowledge and skill into the realm of uncertainty about their capabilities. The authors labeled as “overreaching” this move beyond the edge of their evolving expertise. The authors also identified a spectrum of overreaching based on the reported locus of control, with one end of that spectrum being: (a) deliberate overreaching driven by trainees, and the other end being (b) forced overreaching driven by supervisors, patients, or environmental factors. Deliberate overreaching captured trainees’ negotiations with supervisors and presumed familiarity with the task at hand. In contrast, forced overreaching occurred when clinical situations demanded that trainees step up and fill a need whether or not they felt ready. The distillations of the deliberations performed by trainees about whether or not to overreach: (a) Can I do it? (b) Must I do it? (c) Do I want to do it? and (d) Is it safe to do it? Trainees further along their developmental trajectory towards unsupervised practice asked themselves a fifth question: (e) Am I missing something?

Trainees regularly used learning cues such as feedback, role models, clinical outcomes, patient or family responses, and comparisons with peers to make judgments about when and to what extent to overreach along the spectrum described.

**Conclusions**

The decision to move beyond certainty into the realm of uncertain capabilities looms large for trainees across specialties. In making these deliberative judgments, they attempt to balance training needs, capability, urgency, and patient safety. Trainees actively participated in entrustment processes, which required mindful negotiations with supervisors to take advantage of opportunities to overreach and move the needle towards unsupervised practice. Their judgments to stretch themselves beyond current unsupervised capabilities arose from deliberate intention or situational demands. This overreaching appears to extend just beyond what their zone of proximal development (ZPD), but must remain within limits of safe and appropriate patient care.
Title: Pre-action Team Reflection: Exploring Effects on Shared Mental Model and Team Preparedness in Health Care
Authors: Rustin Meister, Mary McBride, Jan Schmutz, Mark Adler, Walter Eppich

Background: Acute care pediatrics poses unique challenges including ambiguous, dynamic patient care situations in which children suffer if clinical teams fail to adapt appropriately. Previous interventions to improve patient safety largely focused on reviewing past harm events and suffer from hindsight bias, largely ignoring complex team dynamics and adaptation processes. For example, team reflection (TR) is a team’s capacity to consciously reflect on their objectives, strategies, and processes and to adapt to complex and unpredictable circumstances. TR contributes to team success; previous studies showed that TR improved team performance and promotes team functioning and learning. Although previous TR data focused on post-action debriefs, recent work investigated team reflection during patient care (i.e. in-action TR) to reveal similar empiric benefits on performance and functioning. While TR occurs on a continuum, the benefits of pre-action TR before patient arrival remain underexplored. While surgical safety checklists and handover tools improve patient outcomes, these strategies focus on optimizing mundane, everyday tasks. TR is most impactful for teams completing complex tasks in dynamic environments, such as caring for rapidly deteriorating patients with evolving critical illness or injury. Our project seeks to describe (a) how teams experience pre-action TR before patients arrive and active hands-on patient care begins; and (b) what benefits teams gain through pre-action TR. We expect our findings to enhance our understanding of how teams prepare for patient care episodes, to inform concrete strategies to improve preparedness using TR, and to guide future research.

Hypothesis: We hypothesize that TR behaviors immediately before patient care episodes improve development of shared mental models and team preparedness while decreasing cognitive load.

Methods: Multidisciplinary, interprofessional critical care and emergency teams participate in in situ simulations in the clinical settings. Teams of 4-6 people are comprised of pediatric physicians (residents, critical care and emergency medicine fellows and attendings), nurses, and respiratory therapists. The simulation session involves several steps: (a) through simple randomization, half of teams receive a brief description of team reflection and its benefits; (b) all teams receive verbal handoff about a patient with imminent arrival in their clinical space in 5 minutes and collectively plan for patient care they deem important; (c) after 5 minutes, the simulation ends as the patient arrives; (d) each team member completes a brief shared mental model assessment and NASA task load index (TLX) to assess cognitive load; and (e) teams are interviewed to explore their perspectives of the experience in general and pre-action TR in particular.

Results: Using a grounded theory approach, qualitative analysis occurs iteratively alongside data collection using a constant comparative approach to identify themes and their interrelationship. Ongoing data collection and analysis will support theoretical sampling until sufficiency is achieved. Quantitative measure of TR is being assessed with a modified Team Reflection Behavioral Observation System Tool (TuRBO) to measure team reflection dialogue moments. Multivariable regression modeling will be used to assess the relationship between TR and shared mental model, TR and cognitive load (TLX) scores, and TR and team preparedness.

Conclusions: If we confirm our hypotheses, we will provide additional evidence to the benefits of using TR for team functioning and performance. Our qualitative analysis will create a foundation for future work in the realm of pre-action TR as we seek to optimize team planning prior to arrival of critically ill children.
Title: Pediatric Residency Educational Needs Assessment
Authors: Onorato A, Carol H, Migotsky M, Spewak M.

Background:
Pediatric residency programs train future pediatricians through a complex educational curriculum that consists of clinical experiences, case conferences, didactics, and other related opportunities. However, the nature of this training has changed over time with the introduction of duty-hour restrictions, altered inpatient and outpatient care needs, evolving structural changes of American healthcare, and more recently, response measures to the COVID-19 pandemic. Data from peer institutions indicate that these changes have impacted resident education, but these studies predate COVID-19. This study aims to perform an educational needs assessment of Ann & Robert H. Lurie Children’s Hospital of Chicago’s pediatric residency educational curriculum.

Hypothesis: The authors hypothesize that while the current curriculum largely meets the needs of pediatric residents, case conferences and other experiences may not be evenly distributed in accordance with the American Board of Pediatrics content areas, and there may be opportunities in these sessions and during night-time shifts to address gaps in the curriculum.

Methods:
Case conference content and attendance data was surveyed from June 2018 through March 2021, and surveys were completed of pediatric residents, fellows, and faculty. Statistical analysis was performed to compare data before and during the COVID-19 pandemic, as well as overall.

Results:
Conference data show that 66.2% of case topics presented in conferences cover only 20% of the board exam, while an additional 10% of topics on the board exam are covered by only 1.6% of case topics. Specialty conferences (general pediatrics, emergency, and critical care reports) increase the emphasis placed on these areas, though residents still report “too little emphasis” placed on general pediatrics topics. General pediatrics topics were covered significantly less often “post-COVID-19” than “pre-COVID-19” (p=0.002), despite no significant change in overall or general pediatrics faculty attendance. Residents surveyed indicate that there is currently little and poor-quality formal night-time education, but that report-style conferences are much higher quality. Fellows and faculty reported much more time spent in day-time resident educational activities than night-time educational activities. Most fellows and faculty reported a desire to be more involved in resident education overall, though half or less than half of respondents were interested in participating in night-time education, citing time, interest, and not being “in-house” as major barriers.

Conclusions:
Overall, this needs assessment will guide educational interventions targeted at gaps in the current educational curriculum, such as general pediatrics coverage and night-time education.
2021
QUALITY IMPROVEMENT
ABSTRACTS
Improving Emergency Contraception Eligibility Screening in the Pediatric Emergency Department
Sara Holmstrom, MD, Liz Humphrey MD, Cherie Priya Dhar MD, Jacqueline Corboy MD, MS

BACKGROUND: Adolescent pregnancy is unintended in about 80% of cases. Teen pregnancy has significant physical, social and emotional consequences and disproportionately affects minority and low-income youth. Adolescents presenting to the emergency department (ED) for care have a higher unintended pregnancy risk. Studies have shown that adolescents are interested in receiving sexual healthcare in the ED, regardless of their reason for visit. A 2019 American Academy of Pediatrics policy statement affirmed emergency contraception (EC) as safe and effective for adolescents. We are not routinely assessing eligibility for emergency contraception (EC) in the ED.

OBJECTIVE: To address this gap in care, we plan to improve emergency contraception screening and prescribing for eligible and interested adolescent patients in the emergency department. We hypothesize that following implementation of our quality improvement interventions, we will increase EC screening for sex-assigned female adolescent patients (age 14 years and older) in the ED from 21% to 40% within 6 months.

METHODS: Needs assessment surveys of ED providers were performed and used to inform improvement interventions. Our target population is sex-assigned female patients age 14 years and older presenting to the LCH Emergency Department. The primary outcome is documentation of EC screening. Secondary outcomes include pregnancy testing, sexual history documentation, risk for unintended pregnancy (based on condom and contraception use), EC administration and prescriptions. ED length of stay will be monitored as a balancing measure. Multiple electronic health record (EHR) based interventions aimed at improving access to information about EC, ease of documentation, and improved patient confidentiality were created. These include an ED Sexual and Reproductive Health Orderset, ED Confidential Note, Sexual History Template that includes EC screening questions, and an ED Sexual Health and Emergency Contraception Algorithm. A separate educational intervention for providers will be scheduled soon.

RESULTS: Baseline data showed that 21% of sex-assigned females have emergency contraception screening documented during their ED visit. We anticipate that each individual EHR based intervention may have small, potentially cumulative impacts on EC screening documentation, but the educational interventions will increase knowledge and utilization of the EHR resources and ultimately improve EC screening significantly. We also anticipate that more patients will receive EC in the ED and/or prescriptions for home and receive pregnancy and STI testing during the ED visit.

CONCLUSION: Based on needs assessment surveys, we know that the most common perceived barriers to prescribing EC in the ED include lack of knowledge about emergency contraception among providers, lack of time for providers, and confidentiality issues for patients. We have implemented multiple interventions aimed at decreasing these barriers. We do not know the impact of these interventions yet, which will be monitored on a monthly basis.
TITLE: Impact of an Automated Multiple Emitter Whole-Room Ultraviolet-C Disinfection System on Hospital Acquired Infections: A Quasi-experimental Study

AUTHORS: Molly Steele, MS MT(ASCP) CIC*, Ryan R. Hurtado, MD PhD*, Karen Rychlik, MS, Molly Steele, MS MT(ASCP) CIC, MS, Joshua Perryman, BA, and Larry K. Kociolek, MD MSCI

BACKGROUND: UV-C radiation, established as an antimicrobial for nearly a century, is the short wave (100-280nm) highest energy portion of the UV spectrum. UV-C prevents microbial DNA replication, inactivating viruses and bacteria in a dose-dependent manner. Because contaminated patient room surfaces are vectors for microbial transmission in healthcare settings, automated UV-C disinfection systems were designed to reduce nosocomial pathogen acquisition.

The objective of this quasi-experimental study was to assess impact of an automated multiple emitter whole-room UV-C disinfection system on incidence density of three HAIs in a pediatric hematology-oncology unit: healthcare-associated viral respiratory infections (HA-VRI), healthcare facility-onset *Clostridioides difficile* infections (HO-CDI), and central line-associated bloodstream infections (CLABSI).

HYPOTHESIS: We believe the automated multiple emitter whole-room UV-C disinfection system will reduce the incidence density of three HAIs: healthcare-associated viral respiratory infections (HA-VRI), healthcare facility-onset *Clostridioides difficile* infections (HO-CDI), and central line-associated bloodstream infections (CLABSI) in the pediatric hematology-oncology unit.

METHODS: A UV-C disinfection system, consisting of three light-emitting robots, was used for standard discharge cleaning in the pediatric hematology-oncology unit. We intended to treat all hematology-oncology unit rooms following discharge. Data were collected using an automated surveillance system throughout the 42-month pre-intervention (1/2015-6/2018) and 18-month post-intervention periods (8/2018-1/2020). To control for impact of confounding factors of continual hospital-wide infection prevention work, we conducted identical analyses in our pediatric intensive care unit (PICU). A series of generalized estimating equation models with unstructured covariance were used to assess changes in level (i.e., overall rate) and trend (i.e., changes in rate over time) of HAI incidence density between pre- and post-intervention periods for both the hematology-oncology unit (UV-C group) and PICU (control group).

RESULTS: UV-C was associated with a significant reduction (p[level] = 0.008, p[trend] = 0.006) in incidence density of HO-CDI (pre-intervention incidence density 2.40, post-intervention 1.74) when compared to PICU control (pre-intervention incidence density 0.50 to post-intervention 0.27). There was no significant reduction in HA-VRI or CLABSI when compared to PICU control.

CONCLUSION: Whole-room UV-C disinfection of hospital rooms in the pediatric hematology-oncology unit at time of patient discharge was associated with a significant reduction in HO-CDI.
Title: Increasing Epic MyChart Activation among children ages 12 and under at Lurie Children's Pediatrics in Uptown

Authors: Lori Mendelsohn MD, Sarah Peters MD, Tomitra Latimer MD, Preethi Raghupatruni MD

Background: Epic Systems’ MyChart is the patient portal platform currently utilized by Lurie Children’s Pediatrics in Uptown. Patient portals are secure web-based platforms managed by health care organizations which provide patients with direct, secure access to their personal health information. The implementation and popularity of these platforms within the United States was initially spurred by the meaningful use criteria included within the 2009 American Recovery and Reinvestment Act. The rollout of the 21st Century Cures Act (2016) only further incentivized healthcare organizations to develop effective patient portal systems. Historically, uptake of MyChart among the Lurie Children’s Pediatrics in Uptown patient population has been poor. As of August 21st 2020, only 33% of the 0 through 12 years old patient population had an activated MyChart account. It is well demonstrated in the literature that patient portal utilization is associated with increased patient engagement and improved patient satisfaction as well as some reports of improved management of chronic disease. Given the many well-established benefits of patient portals and our desire to improve communication options with our patients, we sought to increase MyChart usage as measured by MyChart activation status among the Lurie Children’s Pediatrics in Uptown patient population.

Aim Statement: Attending physicians, residents, patient service representatives and nurses will work together to successfully increase MyChart enrollment and activation of resident and attending patients ages 0 through 12 at Lurie Children's Pediatrics at Uptown from 33% to 50% by the end of April 2021.

Methods: Using quality improvement methodology, we identified time constraints, routine workflow issues, and patient family awareness as current barriers and implemented progressive Plan, Do, Study, Act cycles aimed at developing standard processes for activating families on MyChart. Various interventions included provider education via formal didactic sessions, informational flyers and clinic room desktop reminders. We tracked progress through regular Epic data analysis, as well as qualitative feedback and check-ins with key stakeholders. Trends were analyzed using linear regression on Microsoft Excel.

Results: Data analysis is currently in process, but we anticipate mild improvement in MyChart activation without statistical significance. We anticipate final results to be available in the coming weeks and the need for continued progressive PDSA cycles to identify areas for further process improvement.

Conclusions: We hope that MyChart activation among caregivers of patients aged 0 through 12 years at Lurie Children’s Pediatrics in Uptown has increased secondary to the implementation of multi-faceted provider education efforts. This aligns with current data suggesting that physician enthusiasm and engagement with the process of patient health portal activation promotes adoption of online patient health portals. This quality improvement project will require further PDSA cycles to maximize efficacy. Areas for future expansion include a focus on activation of MyChart among our adolescent population. One study in particular, by Ramsey et al (2018), provides evidence in favor of the use of trained “MyChart Genius staff” as a successful workflow option among the adolescent patient population. This could be one option worth exploring in our teen population.
Development of a structured EMS handoff tool: a QI initiative to advance transfer of information between prehospital and pediatric emergency department providers
Vishal Naik MD, Mark Adler MD, Jackie Corboy MD, Erica Popovsky MD

Background
Information handoff of ill children between EMS providers to emergency medicine staff in the resuscitation bays can be incomplete or inefficient leading to delays in care and potential negative outcomes. Few models exist that have shown that standardization can improve transfer of information, however, none are pediatric specific.

Objectives
To improve transfer of information between prehospital and pediatric emergency department providers this project has developed two aims: 1) to develop a standardized EMS handoff tool by June 2021 and 2) to achieve use of this process in 75% of EMS hand-offs and/or perform 50% of the overall process July 2022

Methods
This interventional quality improvement project will take place at a tertiary care pediatric children’s hospital and will encompass all patients transported by EMS personnel to the trauma bays for medical resuscitations, new trauma patients, and trauma transfers. Phase 1 of this project will focus on the preparation of our intervention by further identifying the gaps in the transfer of information in the trauma bay and their associated key drivers; the creation of an EMS handoff tool via a delphi review of current handoffs by relevant stakeholders; and the acquisition of baseline data prior to tool implementation. Phase 2 will see the first PDSA cycles begin and will include the distribution, training, and implementation of this tool to prehospital and hospital providers.

Results
Following creation of the handoff process, data will be gathered via video review and will include adherence to the checklist items amongst other metrics that qualify handoff experience and prove useful in the development of process and balance measures. Following the implementation of our intervention, we will seek improvement in these measures from those teams that received training as well as data on overall use of the process by both our ED staff and EMS personnel.

Potential Barriers
This quality improvement project, due to its impacting many different departments (ED, surgery, multiple EMS groups) requires large buy in from stakeholders which may prove to be a significant barrier. Further, by impacting the training of one EMS group’s function at our hospital - there may be potential for further downstream impact at their function at other institutions. Great care must be taken to be as inclusive as possible in intervention development and dissemination.
Reducing Practice Variation in the Management of Croup
Matthew H. Shapiro MD, Kelly Heyrman RN, Nicholas Zessis MD, Ann-Marie Tantoco MD

Background
Croup is a common clinical diagnosis in children associated with stridor, hoarseness, a barky cough, and respiratory distress. Croup affects more than 1.4 million children under the age of six in the United States annually, and up to 6% of children with croup are hospitalized at an estimated annual cost of $56 million. There is significant variation in both Emergency Department (ED) and inpatient management of croup with variation in resource utilization and outcomes. While there is evidence to support individual aspects of treatment, including nebulized racemic epinephrine (RE), there is little evidence regarding efficient and effective hospital management of croup. Additionally, the majority of children admitted to the hospital with croup do not receive further medical intervention after admission.

Methods
We formed a multidisciplinary team of pediatric hospitalists, ED physicians and nurse practitioners, registered nurses, respiratory therapists, pharmacists, and quality improvement consultants. We began with a review of peer guidelines, then completed a literature review and evaluation using the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) criteria. We completed an external benchmark with 15 peer institutions using the Pediatric Health Information System (PHIS) database and internal data analysis of patients with croup between 2016 and 2019 to identify specific areas of improvement. We completed department-specific process maps and barrier assessments with stakeholders from the ED and acute care floor and found that admission and discharge criteria varied because of individual provider uncertainty. 2385 patients met our cohort criteria. Our admission rate was 13%, placing us in the top quartile of the benchmarked hospitals. 69% of admitted patients did not receive further medical intervention with nebulized racemic epinephrine (RE) after admission. The mean time between the last dose of RE and discharge was 17 hours with a standard deviation of 10 hours, higher than peer recommendations which range from six to eight hours. We utilized our multidisciplinary panel to form consensus recommendations that focused on reducing variation in length of stay (LOS) and the proportion of patients that did not receive RE after admission. We then created care algorithms for the ED and acute care floor, order sets, and note templates. The two algorithms emphasized the aims defined as most relevant to the delivery of care in the ED and on the acute care floor.

Results
The outcome metrics were inpatient LOS and the proportion of patients that do not receive RE after admission. The process metrics were the total doses of RE in the ED and the number of hours between the last dose of RE and discharge. With the decrease in volumes related to the COVID-19 pandemic, ED patients diagnosed with croup decreased by more than 90%, and patients admitted with croup decreased by more than 95%. With this large decrease in volume, we were not able to power our Statistical Process Control (SPC) charts and thus were limited in our interpretation of the data. We intend on further evaluating the impact of our interventions next winter and will continue Plan-Do-Study-Act cycles then.

Conclusions
We were able to increase stakeholder buy-in and create institutionally relevant metrics and goals through external benchmarking and internal data review. The exploration of the literature and our current practices, and comparison to peers, allowed us to focus our improvement efforts and create guidelines that were relevant to and supportive of providers at our institution.
Title: Assessing Pediatric Resident Comfort with Newborn Guidance at A Major Academic Tertiary Center

Authors: Brandon E. Sumida, MD1; Ogochukwu M. Ezeoke, MD1; Presley Parkes, MD1; Caren Mangarelli, MD1; Ruchi S. Gupta, MD, MPH1,3; Robert H. Listernick, MD1,2

1 Department of Pediatrics, Ann and Robert H. Lurie Children’s Hospital, Chicago, Illinois
2 Stanley Manne Children’s Research Institute, Ann and Robert H. Lurie Children’s Hospital, Chicago, Illinois
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Background: Pediatric residency training occurs across both the inpatient and outpatient setting, with larger programs generally dedicating more time to in-hospital experiences than outpatient primary care. Within the in-hospital training setting, the Newborn Nursery block serves an opportunity for residents to gain critical knowledge for outpatient clinic practice, providing parents of newborns with appropriate anticipatory guidance. This opportunity alone, however, may not provide sufficient training for early-stage residents to approach the newborn visit with confidence. Residency training is constantly evolving to meet the needs of new physicians as they support their patient population. In the setting of a major, urban academic tertiary center, we aimed to assess the current level of comfort amongst residents in approaching newborn questions from parents.

Methods: We developed an 8-section survey to assess resident overall comfort with managing key aspects of newborn parental guidance. Our survey was sent to PGY-1 and PGY-2 residents only. On a 5-point scale between Strongly Disagree and Strongly Agree, residents were queried on level of comfort addressing the topics, “Feeding,” “Sleep,” “Safety,” and “Physical Exam and Milestones,” with parents, based on general residency exposure. We additionally assessed resident stage of training at the time of the survey, specifically whether the Newborn Nursery rotation had been completed prior to completing the survey. We asked for resident overall comfort with newborn well-child visits, based on PGY-1 residency exposure. Finally, we requested free responses to elicit suggestions for improvements in training that would engender increased comfort in managing newborn visits.

Results: We received 36 total responses in the first month of our survey submission, which included 73.5% of the total PGY-1 class. Of those interviewed, 64.1% of all respondents were at the PGY-1 stage of training. Half of residents responding (50%) agreed with being comfortable discussing questions on Feeding, as well as Sleep, with parents of newborns. The majority of residents, (80.5%) either agreed or strongly agreed with overall comfort answering questions from parents of newborns regarding Safety. Less than half of the responding residents, (47.2%) agreed or strongly agreed with being comfortable with parental questions on newborn Physical Exams and Milestones. Only 36.1% of all respondents reported agreeing or strongly agreeing with overall comfort with approaching newborn well-child visits. All survey participants (100%) had completed the Newborn Nursery block of residency prior to completing the survey. Upon reviewing the respondent suggestions for addressing resident comfort leading newborn visits, the majority of residents proposed a dedicated, “clinic bootcamp,” during the intern year of residency.
**Conclusion:** Our results indicate variations in resident comfort regarding different aspects of newborn well-child visits; although at least half of the survey participants express comfort with addressing questions regarding newborn Feeding, Sleep and, Safety, there is a decreased comfort amongst early-stage residents in navigating questions surrounding newborn Physical Exam findings and developmental Milestones. Despite the completion of a month-long Newborn Nursery block in residency, there appears to be a desire for focused training on newborn clinic management. As we repeat the survey through the course of the year, we hope to gain a clearer understanding of how resident training in newborn care is perceived by residents at a tertiary academic center. Further investigation is needed to understand how resident comfort in well-child management evolves as training advances, particularly when the majority of training occurs in the in-patient, often complex-care setting.

**References:**


2021
TRANSLATIONAL SCIENCE
ABSTRACTS
**TITLE:** Characterization of Liver Macrophage Subsets and Urinary Metabolites in Lean versus Obese Pediatric Non-Alcoholic Fatty Liver Disease Patients

**AUTHORS:** Caitlin Cutler MD, Sarah A. Taylor MD, Saeed Mohammad MD.

**BACKGROUND:** Non-Alcoholic Fatty Liver Disease (NAFLD) is a leading cause of liver disease in pediatrics. It is characterized by the accumulation of fat in the liver that ranges from simple steatosis without associated inflammation (NAFLD), to steatohepatitis (NASH or nonalcoholic steatohepatitis) and fibrosis or cirrhosis\(^1\). Its prevalence has more than doubled in the pediatric population in recent decades\(^2\) There has also been increasing recognition of NAFLD in non-obese populations, referred to as lean NAFLD. This subtype is associated with less severe disease, better prognosis, and a different metabolomic signature. The anti- versus pro-inflammatory phenotype of liver macrophages (MΦ) has also been associated with metabolic changes in NASH and NAFLD\(^3\)\(^-\)\(^7\). However, the presence of specific hepatic MΦ subtypes has never been compared to metabolic changes and disease severity. We have previously identified 3 MΦ subsets in diseased pediatric liver: lipid-associated MΦ (LAM), adaptive MΦ (AM), and monocyte-like MΦ (MLM)\(^8\)\(^,\)\(^9\). In the present study we will define how differences in the number of these MΦ subsets relate to clinical and metabolic profiles in pediatric lean versus obese NAFLD/NASH\(^8\). There remains an unmet need to predict disease severity and reduce hepatic injury.

**HYPOTHESIS:** We hypothesize that LAM are protective whereas AM are pro-inflammatory and damaging in liver disease. We thereby expect children with lean NAFLD/NASH to have a unique MΦ-driven metabolic profile as compared to obese NAFLD/NASH. More specifically, we anticipate lean NAFLD/NASH to have higher numbers of hepatic LAM and lower AM, less severe histologic inflammation on liver biopsy, reduced systemic metabolic derangements, and a distinct urinary metabolite profile.

**METHODS:** We will perform a retrospective review of liver biopsies from 20 children with obese (BMI ≥ 85\(^{th}\) percentile) and 20 with lean (BMI < 85\(^{th}\) percentile) NAFLD/NASH. Biopsies will be assessed for histologic severity based on NAFLD activity score (NAS)\(^1\)\(^0\) and the number of each MΦ subset based on our established cell markers and staining protocol\(^9\). Correlation between MΦ number, NAS, and clinical/laboratory data will be assessed within and between the lean and obese NAFLD groups by logistic regression. In parallel, we will prospectively perform metabolomic analysis on urine collected from patients undergoing liver biopsy for presumed lean NAFLD, obese NAFLD, and healthy controls without liver biopsy (n = 10 per group). We will obtain the same data from these patients as in the retrospective arm. By unsupervised principal component analysis we will define which metabolites/pathways relate to patient cohort and specific histologic/clinical features of NAFLD.

**RESULTS:** The retrospective arm will achieve 90% power with alpha level 0.05 and the prospective arm will serve as a pilot metabolomic study in addition to the histologic and clinical analyses. Overall we anticipate that levels of specific metabolites involved in lipid metabolism will correlate with higher numbers of LAM on histology, reduced inflammatory injury, and more favorable metabolic clinical parameters (Figure 1).

**CONCLUSION:** MΦ quantification and urinary metabolomics analyses will identify differences in lean versus obese NAFLD/NASH, and provide insight into pathways responsible for a favorable clinical phenotype. Our research will lay the foundation for future mechanistic studies to modulate the MΦ-driven metabolic phenotype and identify new treatment strategies for pediatric lean and obese NAFLD.
References
**TITLE:** Discovering Novel Therapies for the Treatment of Osteosarcoma

**AUTHORS:** Casey Mehrhoff DO, MS, Xiao-Nan Li MD, PhD, Yuchen Du MD, PhD

**BACKGROUND:** Osteosarcoma is the most common primary bone malignancy in children, adolescents, and young adults. Approximately 75 percent of these cases occur in patients between the ages of 15-25 years old, with the median age being 16 years. A standard three drug chemotherapy regimen consisting of high dose methotrexate, doxorubicin and cisplatin is used to treat localized osteosarcoma. This approach has improved 5 year event free survival (EFS) in osteosarcoma from approximately 11% to around 60%. However, for patients who present with metastatic disease, there is <30% chance of a 5 year EFS. Patients with relapsed osteosarcoma have <20% chance of survival. Addition of chemotherapy agents such as Ifosfamide, Etoposide, and Topotecan have been studied in clinical trials, as well as dose escalation of standard chemotherapy. Despite efforts to improve rates of survival in patients with osteosarcoma, it has been over 3 decades since there have been any significant improvements.

Osteosarcoma has proven difficult to treat due to genetic diversity of the tumor and difficulty with systemic chemotherapy penetrating bone. Therefore, a diverse approach to therapeutics has been adopted for research purposes. This approach looks at a multitude of targets, including growth factor inhibitors, signaling pathway inhibitors, immune modulation, and angiogenesis inhibitors. Germline mutations, such as TP53 and RB1 inactivation, are commonly seen in osteosarcoma. With the use of next generation sequencing, MYC amplification has been seen in 40% of cases of osteosarcoma. Studies also point to the role of phosphoinositide 3-kinase/mTOR pathway in osteosarcoma cell survival, implying that inhibition of this signaling pathway could prove therapeutic. Angiogenesis inhibitors, such as through the inhibition of vascular endothelial growth factor (VEGF) receptor with the use of sorafenib, have shown some promising results both in vitro and in a clinical trial. Immune checkpoint inhibitors have become increasingly more popular in the study of osteosarcoma therapeutics, with agents such as mifamurtide and denosumab making it to clinical trials, but with some controversial results. The use of these more predictive biomarkers for therapeutic trials are needed. With such a large spectrum of potential targets for osteosarcoma treatment, a vast amount of testing with multiple drug agents is needed.

**HYPOTHESIS:** Through high throughput drug screening with the use of the Echo® 650 Series Next-Generation Acoustic Liquid Handler allowing for the testing of thousands of drug combinations, specifically focusing on a new LEDGF inhibitor as well as treatment with the use of cannabinoid derivatives, a novel therapeutic approach for the treatment of osteosarcoma will be discovered.

**METHODS:** Five cell lines (LM7, Saos2, MG63, 143B, HOS) have been populated by growth in 10% Fetal Bovine Serum. Each cell line has over one trillion cells frozen in liquid nitrogen, which will be used for in vitro high throughput drug screening with the Echo 650 machine. With access to a drug library of over 17,000 agents, combination testing on cell lines will be used to filter agents for in vivo drug testing on patient derived orthotopic xenograft mouse models (PDOX). Two cell lines and four patient tumor models have been implanted intratibially into mice to establish orthotopic PDOX models for drug testing.

**RESULTS:** Preliminary results have shown that testing a new LEDGF inhibitor in combination with the standard chemotherapy backbone agents (Methotrexate, Cisplatin, Doxorubicin) shows synergy and a higher rate of tumor cell death in all five cell lines. Additionally, preliminary testing with a cannabinoid derived agent, WIN 55,212-2, as monotherapy has proven to be a more potent tumor cell killer than a previously used clinical investigation drug, Cabozantinib.

**CONCLUSION:** Further testing is ongoing, but with preliminary results showing promising novel therapies for the treatment of osteosarcoma. Additionally, establishment of PDOX models from Ann & Robert H. Lurie Children’s Hospital patient tumor samples is underway, which will allow for more clinically relevant results.
*Clostridioides difficile* induces clonal plasmablast responses in adults and children following *C. difficile* infection

Mukherjee J, Muscat E, Rowley AH, Arrollo D, Cherny KE, Kociolek LK

**Background:** *Clostridioides difficile* infection (CDI) is a diarrheal illness that is associated with significant morbidity and excess healthcare costs in children and adults, as well as mortality in adults. Immunological agents, such as monoclonal antibodies and vaccines against *C. difficile* toxins A and/or B, are a promising strategy for CDI prevention. Toxin-based immunizations may prevent CDI, but not *C. difficile* colonization, which likely contributes to transmission. The natural immune response to non-toxin antigens, which may prevent colonization, is poorly understood. In this feasibility study, we aim to characterize the breadth of antibody responses following CDI and to identify specific immunogenic antigens.

**Methods:** Blood was collected from patients with CDI 1-3 weeks after onset of CDI symptoms. Peripheral blood plasmablasts, which are plasma cell precursors that produce antibodies against antigenic components of a pathogen to which they were recently exposed, were single cell sorted by flow cytometry using a CD3-CD19+CD27++CD38++ gating strategy. Patients who were immunocompromised, had an identified concomitant infection, or were previously diagnosed with CDI within the past 8 weeks were excluded. Light and heavy chain immunoglobulin sequences of individual plasmablasts were amplified by nested PCR, followed by reverse transcription, and the nested PCR products were sequenced via Sanger sequencing. The immunoglobulin variable region sequences from each plasmablast, which vary depending on the target antigen, were compared to identify sets of clonally related plasmablasts in each patient (i.e., presence of multiple plasmablasts that are likely responding to the same antigen).

**Results:** Plasmablasts from six patients at 8-18 days following onset of CDI (3 children and 3 adults) were single cell sorted from the peripheral blood. Patient characteristics and results of plasmablast antibody heavy chain amplification are described in the table below.

<table>
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<th>Patient number</th>
<th>Age (years)</th>
<th>Gender</th>
<th>Day of illness at time of plasmablast collection</th>
<th>Number of plasmablasts sequenced</th>
<th>Number of clonal sets of plasmablasts identified</th>
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**Conclusions and Future Work:** Our preliminary data support a clonal plasmablast response in adults and children with CDI. This likely represents a robust humoral immune response against specific *C. difficile* antigens. We plan to clone the light and heavy chain immunoglobulin variable region sequences from the clonally expanded plasmablasts into immunoglobulin expression vectors and produce the antibodies by transfection of HEK 293 cells in tissue culture. Using protein extracts from *C. difficile* stool isolates from stool of each patient and the purified plasmablast antibodies, we will confirm specificity of the antibodies for *C. difficile* by ELISA and identify the specific immunogenic antigens targeted by each antibody by immunoprecipitation and/or protein array. Through this work we can potentially identify immunogenic antigens for potential immunization candidates to prevent CDI.
Evaluating Humoral Primary Immunodeficiencies using Coding Joint to Kappa-Deleting Recombination Excision Circle (CJ:KREC) ratio and Serum B-cell Activating Factor (BAFF) Level

Elisa Ochfeld MD, Wil Marin, Najah Ahsan, Gabrielle Morgan, Lauren Pachman, MD, Amer Khojah MD

**Background:** Humoral primary immunodeficiencies are the most common form of primary immunodeficiency diseases (PIDs). Currently, there is not a clinically useful way to measure a person’s number of newly formed B cells. Formation of new B cells requires B cell receptor V(D)J recombination and involves production of Kappa-deleting recombination excision circles (KRECs). KRECs are circular excision products that do not replicate during B cell division. The KREC remains only in one B cell and not in that cell’s progeny. The site of DNA recombination after KREC excision is termed the coding joint (CJ), and contrastingly, is found in all B cell progeny. The ratio of CJ to KREC DNA can be determined via real-time quantitative PCR (qPCR). This ratio can be utilized to estimate the number of B cell divisions that have occurred in a B cell population, and to measure the number of newly formed B cells. This could be used as a clinical marker to assess severity of B cell immunodeficiencies, and potentially to help predict risk of disease complication including autoimmunity or susceptibility to infection. B Cell Activating Factor (BAFF) is a cytokine produced by activated dendritic cells and macrophages that promotes B cell survival and proliferation.

**Hypothesis:** Our aim was to evaluate the quantity of KREC DNA and CJ DNA in patients with humoral primary immunodeficiencies, to assess B cell output in these patients and to evaluate this ratio as a potential marker of disease severity. Our hypothesis is that the ratio of CJ:KREC DNA in patients with humoral primary immunodeficiencies will be elevated compared to healthy controls, and that the CJ:KREC ratio will be higher in patients with more severe forms of humoral primary immunodeficiency, such as common variable immunodeficiency (CVID), compared to those with less severe forms including antibody deficiency syndromes.

**Methods:** This IRB approved study was conducted at Lurie Children’s Hospital. Patients with humoral primary immunodeficiencies aged 6 months to 22 years were eligible for inclusion in the study. CJ and KREC levels were measured via real-time quantitative PCR from DNA extracted from PBMCs. Serum BAFF levels were measured using Mesoscale® technology. Similar analysis was performed in healthy controls (using de-identified samples from a healthy control repository). Study protocol was adapted from prior research, with PCR assays designed for detection of these coding joints and signal joints.

**Results:** 16 patients with primary immunodeficiency were included in the analysis. Mean age of patients was 10.66 years. Patients were separated by their humoral PID diagnosis into two groups, either antibody deficiency syndrome (including specific antibody deficiency and/or hypogammaglobulinemia) or common variable immunodeficiency (CVID). Mean CJ:KREC ratio in the overall humoral PID cohort was 9.15, vs. 4.83 in healthy controls. Mean CJ:KREC ratio in the antibody deficiency syndrome group was 5.25, vs. 13.04 in the CVID group. Significance was not achieved due to low sample size, but approached significance (p=0.059). Mean serum BAFF level in the overall PID group was 165.70 vs. 50.85 in healthy controls. Mean serum BAFF level in the antibody deficiency syndrome group was 107.88, versus 216.30 in the CVID group (p=0.271).

**Conclusions:** Patients with humoral primary immunodeficiencies including CVID and antibody deficiency syndromes have increased CJ:KREC ratios and serum BAFF levels compared to healthy controls. Furthermore, patients with more severe forms of humoral primary immunodeficiency such as CVID have increased CJ:KREC ratios and increased serum BAFF levels, compared to those with less severe humoral PIDs such as antibody deficiency syndromes. The CJ:KREC ratio can be utilized to evaluate B cell output and as a marker of disease severity in patients with humoral primary immunodeficiency, in conjunction with serum BAFF levels. Limitations include the low number of patients, which requires validation in further studies.
Fluoroquinolone (FQ) use and impact in high-risk pediatric patients
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Background:
Due to historical concerns about FQ toxicity, they are used sparingly in pediatrics. The American Academy of Pediatrics recommends using them for (1) MDRO infections without an acceptable alternative or (2) when there is no alternative oral agent for an infection that does not require IV therapy. Due to increases in ESBL resistance, especially in UTI’s, FQ’s have emerged as important options for MDRO infections. Judicious FQ use is key to prevent the emergence of resistant bacteria, especially in a population with limited prior exposure. However, in the past 10 years, there is new literature about the benefits of levofloxacin prophylaxis in select patients receiving chemotherapy leading to expanded use of levofloxacin. Based on these findings, the most recent IDSA guidelines for pediatric cancer patients has a strong recommendation for use of levofloxacin as the preferred agent for prophylaxis.

While recommendations for FQ prophylaxis were made to reduce incidence of bacteremia and other severe infections, long term impacts on antibiotic resistance in pediatric populations are unknown. Means of assessment of antibiotic use and its impact on rates of FQ resistance has been difficult to quantify, and a more systematic approach is needed.

Hypotheses: (1) Since the expansion of FQ indications in 2016, there has been a significant increase in overall pediatric utilization beyond indications recommended by the AAP. (2) There will be an increase in clinically significant FQ resistant bacterial infections in pediatric patients with prolonged/recurrent exposure to FQ’s. (3) There will be an increase in resistance to FQ in the microbiota of the GI tract in oncology patients on FQ prophylaxis for greater than 3wks

Methods: H1: The Pediatric Health Information Systems database (PHIS) will be utilized. PHIS is a pediatric database for clinical and resource utilization that includes more than 49 children’s hospitals. Inclusion criteria will be patients aged <18, admitted from 2015-2019. Proposed outcomes include days of therapy of FQ use, prolonged FQ use (>10 days). Covariates will include age, diagnoses, clinical service provider, receipt of other antimicrobials, days of hospitalization, and days of ICU hospitalization. H2: Data source will be AMR data from participating institutions extracted using a shared data stewardship and infection control surveillance software. The primary outcome will be incidence of FQ resistant Enterobacteriaceae and gram-positive cocci over the last 5 years. H3: Stool collected at diagnosis and in 3-5wks will be plated on selective growth media containing levofloxacin for FQ resistant Gram-negatives. Identification of clinically important Enterobacteriaceae will be done using the growth media CHROMagar™ Enterobacteria. To identify Pseudomonas isolates we will use Pseudomonas Isolation Agar. Confirmatory identification based on morphology will be done using matrix-assisted laser desorption ionization–time of flight mass spectrometry.

Results: Results that suggest increased resistance with increased FQ exposure are expected, but the degree of their impact will be the most interesting component. Weighing the risk reduction for clinically significant disease and the long-term impacts of increased resistance will be a difficult part of the discussion of the results. I also anticipate that stool resistome analysis will yield not only a means to measure broad resistance pattern changes but also a potentially useful technique for anticipating future MDRO organisms in individual patients.

Conclusion: FQ use is expanding rapidly, and we need to assess the risks and benefits of their use before it becomes routine. Although many clinicians are writing about this need, there are limited rigorous studies addressing it.
TITLE: Identifying Histologic Features Predictive of Gestational Alloimmune Liver Disease to Improve Maternal-Fetal Outcomes

AUTHORS: Samantha A. Saul, MD, Catherine A. Chapin, MD, Hector Melin-Aldana, MD & Sarah A. Taylor, MD

BACKGROUND: Gestational alloimmune liver disease (GALD) is the leading cause of neonatal acute liver failure (ALF), comprising 60-90% of cases. Establishing a diagnosis of GALD is imperative to improve outcomes as untreated GALD carries a mortality of 82% whereas treatment with intravenous immunoglobulin (IVIG) and double volume exchange transfusion can reduce mortality to 45%. Additionally, maternal IVIG in subsequent pregnancies reduces the incidence of clinical liver disease by 94%. Unfortunately, there is no screening test to diagnose GALD before the index case and accurate diagnosis relies on clinical-pathologic findings. Distinct histologic features in GALD reflect the established disease-specific in utero alloimmune liver injury and includes the presence of parenchymal neotubules and fibrosis. Maternal antibody targets an unknown fetal antigen on young hepatocytes leading to severe hepatocyte injury with a compensatory increase in biliary progenitors and neotubule formation. Injury begins in mid-gestation demonstrated by deposition of C5b-9 complex, the end product of the complement cascade, resulting in fibrosis. However, despite our understanding of the pathologic features, there is no consensus on criteria that confirm a diagnosis of GALD. We will overcome this gap in knowledge and develop a GALD-specific histologic scoring system in the current study.

HYPOTHESIS: We hypothesize that GALD-specific histologic features will improve diagnostic precision in GALD versus non-GALD neonatal ALF and ultimately improve patient outcomes.

METHODS: We reviewed the pathology of prior cases of GALD and non-GALD etiologies of neonatal ALF, diagnosed by expert consensus at Ann & Robert H. Lurie Children’s Hospital of Chicago, to identify the major and minor histologic features of GALD. We assigned a 3-point scale for major features and a 2-point scale for minor features. Complete scoring of 30 GALD and 20 non-GALD cases was performed. The relationship between each feature and diagnosis of GALD was evaluated by Pearson Chi-Square analysis for multi-level variables with Fisher’s Exact Test for dichotomous variables with significance defined as p < 0.05. Additionally, we applied classification and regression tree (CART) analysis to generate a prediction model using all histologic features. Future analysis with two blinded pathologists will determine the inter-observer reliability and accuracy.

RESULTS: We identified fibrosis, neotubules, and the absence of mature hepatocytes as major features of GALD whereas portal sparing, and absence of extramedullary hematopoiesis (EMH) and inflammation were minor features to establish a 9-point scoring system. Analysis of the importance of all histologic features showed that neotubules and fibrosis were the most significant diagnostic features on histology for GALD with p-values of <0.001 and 0.002 respectively. Paucity of mature hepatocytes and lack of EMH were also significant with p-values of 0.015 and 0.023 respectively. Total score per case for patients with GALD averaged 7.21±0.366 as compared to 3.89±0.269 in non-GALD cases. Lastly, CART analysis demonstrated that a score of 2 for neotubules alone accurately predicted GALD 83% of the time.

CONCLUSIONS: Our analysis identifies neotubules and fibrosis as the most prominent histologic features of GALD. More specifically, our tiered scoring system for neotubules alone has high accuracy and may thereby facilitate histologic diagnosis. This data demonstrates the ability to define histology score thresholds that predict which patients are likely to have GALD versus other etiologies of neonatal ALF. Future work will include transcriptional analyses of GALD and non-GALD etiologies of neonatal ALF to identify the pathways most associated with GALD and establish candidate diagnostic and prognostic biomarkers.
References

TITLE: Generation of two induced pluripotent stem cell lines to study complete androgen insensitivity syndrome.

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BACKGROUND: Complete androgen insensitivity syndrome (CAIS) is an X-linked difference in sexual development (DSD) and is most often caused by loss of function of the androgen receptor (AR) gene. Patients with CAIS typically identify as female and have labia and a vaginal opening but lack a uterus, upper vagina, and ovaries. Testes form because of the presence of SRY but remain undescended and carry significant risk of malignancy. For that reason, patients have testes removed after puberty and hormone replacement therapy (HRT) with estrogen is the current standard treatment for CAIS patients after gonadectomy. Importantly, the hormone signature of patients with CAIS is inconsistent with the typical hormone levels associated with XY individuals and the typical hormone levels associated with XX individuals. Granulosa cells exist in the ovaries and are crucial to the conversion of androgens to estradiol. CAIS individuals do not have ovaries and therefore lack these critical endocrine cells.

Further research of hormone production, utilization, and function in CAIS individuals is needed. We have created two induced pluripotent stem cell (iPSC) lines from a study participant with CAIS as a resource to perform this research and to develop better methods of treatment which are autologous and personalized.

HYPOTHESIS: We hypothesize that the iPSCs of an individual with CAIS can be differentiated into granulosa-like cells, and used as a transplant to act as an autologous, personalized treatment providing necessary hormone replacement.

METHODS: We collected peripheral blood mononuclear cells from a CAIS participant. We expanded these cells and used Sendai virus to create multiple lines. Two induced pluripotent stem cell lines (iPSCs) from a participant with CAIS with AR mutation c. 2698A>T (p.Ile900Phe) were characterized and selected for future research.

RESULTS: Both iPSC lines presented typical morphology, expressed stem cell markers, demonstrated the ability to differentiate into three germ layers, carried a normal 46,XY karyotype, were free of mycoplasma, and carried the expected mutation in AR. We expect will differentiate these lines down the granulosa-like cell differentiation protocol developed in our lab. We will determine if 46,XY karyotypes can be differentiated into granulosa-like cells that express FOXL2 and produce estradiol in the presence of androstenedione.

CONCLUSION: In order to create granulosa-like cell we may need to create a 46,XX line. We will use CRISPR/Cas-9 to eliminate the Y chromosome and then microcell mediated chromosome transplantation (MMCT) to introduce a donor X chromosome. Just like expression patterns in individual cells throughout the body, individuals have different hormone signatures which range a broad spectrum. Classical hormone replacement therapies have been employed for decades based on assumptions of what typical “female” and “male” hormone signatures look like. We plan to remove these assumptions and target hormone therapies to the specific needs of the individual. We believe that the iPSC lines which we have created from a participant with CAIS will provide a dynamic model for this.
TITLE: Development of a Novel Mouse Model of Diffuse Midline Glioma for Targeted Immunotherapy

AUTHORS: Seblani, M., Zannikou, M., Becher, Oren, Balyasnikova, I.

BACKGROUND: Diffuse midline gliomas are a devastating group of brain tumors affecting younger children without durable response to conventional treatment. Much effort has been directed to the development of novel agents and radiation strategies, yet median survival remains less than 12 months. Integration of immunotherapies in pediatric brain tumors hold promise, with preclinical and early clinical trials utilizing various modalities. However a consideration for any immunologic approach is the tumor microenvironment which captures the interplay between tumor, stoma and cells of the immune system, fostering tumor growth and metastases. Nevertheless, the paucity of immunocompetent models which recapitulate this microenvironment is an obstacle in the development of effective targeted therapies and their success upon clinical translation.

HYPOTHESIS: We hypothesize an immunocompetent mouse model can be engineered to overexpress interleukin 13 receptor alpha 2 (IL13Rα2), a tumor-associated antigen overexpressed by glioma cells to provide a survival benefit through evasion of apoptosis. This model would allow for a thorough evaluation of antitumor activity of IL13Rα2-targeting CAR T cell and bispecific T cell engager antibody (BiTE) therapies in preclinical studies, within the context of an intact immune system.

METHODS: Our model expands upon a previously described system, incorporating recognized drivers of tumorigenesis in gliomas such as loss of p53 and constitutive expression of platelet derived growth factor receptor A (PDGFRA), with the addition of IL13Rα2. We utilized the virus-vector RCAS-Tva delivery system to induce de novo tumors in mouse pups through targeted infection of progenitor cells by delivery of plasmid constructs into proliferating cells. Pups underwent fourth ventricle injection of the combined construct RCAS:PDGB+ IL13Rα2, in tandem with the previously described construct of RCAS:PDGB. Upon transgene expression, p53 loss is induced through the Cre-Lox system promoting malignant potential, compounded by amplification of the PDGFRA ligand, PDGFB, alongside IL13Rα2 overexpression. Tumor growth dynamics were established through survival curves. Tumor samples were processed, with histology characterized through immunohistochemistry and haematoxylin and eosin staining. Cell lines were generated from processed tumor-bearing tissue, then injected orthotopically into pups to generate tumors which were further characterized by histopathology and flow cytometry.

RESULTS: We confirmed successful transgene expression of PDGFB and IL13Rα2 by flow cytometry and western blot in our transfected fibroblast cells prior to injection. Comparing tumor growth dynamics between the two models, there was no statistically significant difference in median survival with 40 days for RCAS:PDGFB (N = 25) and 39 days for RCAS:PDGFB+IL13Rα2 (N = 32). Histology of de novo tumors demonstrated characteristic glioma features including infiltration, pseudopalisading necrosis and microvascular proliferation. Immunohistochemistry demonstrated proliferative nature with robust Ki-67 positivity as well as heterogeneous expression of IL13Rα2, similar to diffuse midline gliomas. Initial assessment of the microenvironment was consistent with an overall non-immunosuppressive environment, with limited involvement of macrophages and T cells. Generated cell lines from tumor-bearing tissue were confirmed to express both PDGFB and IL13Rα2. Upon orthotopic injection of these cell lines, tumors reliably formed and demonstrated similar histologic features as the de novo tumors.

CONCLUSION: We demonstrated engineered de novo tumors possess histopathologic features common to diffused midline gliomas, cell lines generated from tumor-bearing tissue retain IL13Rα2 expression and when orthotopically implanted, will lead to tumor generation. Our work in developing a model reflecting the complex microenvironment of diffuse midline gliomas can serve for preclinical assessment of immunotherapeutic approaches incorporating IL13Rα2, with the potential for clinical translation.
Title: Local Immune Response and Outcomes in Severe Respiratory Syncytial Virus Bronchiolitis

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Background: Respiratory syncytial virus (RSV) is the most common cause of viral bronchiolitis in children. While most children will require no medical interventions for RSV bronchiolitis, some will progress to life-threatening respiratory failure. The RSV hospitalization rate is estimated to be 5.2 per 1000 children less than 2 years of age. Despite its prevalence, the mechanisms associated with severe RSV disease are poorly understood. While there are well-established risk factors for severe disease including age, prematurity, and underlying pulmonary or cardiovascular disease, the variation in disease among children without risk factors requires further investigation of host genetic and immunologic differences.

Hypothesis: We hypothesize that differences in the immune response at the primary site of infection are associated with disease severity during RSV infection.

Methods: Clinical outcomes and gene expression were analyzed in children admitted to the Pediatric Intensive Care Unit (ICU) with RSV-associated respiratory failure and healthy pediatric controls. Children were eligible if they had a positive viral test for RSV, lower respiratory tract infection symptoms requiring admission to the pediatric ICU, and age less than 2 years. Exclusion criteria included viral coinfection and concern for primary bacterial pneumonia. Healthy pediatric controls were eligible for inclusion if they were less than 2 years of age and without signs or symptoms of viral infection at time of sample collection. Subjects were not eligible for inclusion if they had any significant medical comorbidities, including pre-existing lung disorders, cardiac disease, immunodeficiency, malignancy, or neurologic disorders increasing the risk of aspiration or respiratory failure. Following informed consent, nasal mucosa samples were collected by superficial curettage of the inferior turbinate. RNA was extracted and next generation RNA sequencing performed. Data extracted from the electronic medical record included demographics, laboratory values (CBC, bacterial co-detection, inflammatory markers), and therapeutic interventions (antibiotics, steroids, albuterol and hypertonic saline treatments), as well as markers of disease severity and outcomes including type and duration of advanced respiratory support and hospital length of stay. Digital deconvolution was performed to evaluate cellular composition of the samples. Weighted Gene Correlation Network Analysis (WGCNA) was performed to assess correlation between clinical variables and gene expression in the nasal mucosa. Gene modules identified were further characterized through evaluation for Gene Ontology term enrichment using GOrilla. Differentially expressed genes between groups of interest were identified by pairwise comparison utilizing EdgeR.

Results: Decreased abundance of ciliated cells and increased presence of immune cells were estimated in samples from RSV-infected participants and healthy controls. Accordingly, genes differentially expressed between RSV-infected participants and healthy controls were enriched for pathways involved in inflammation and the immune response. In participants with RSV, WGCNA identified multiple gene modules correlating with clinical characteristics, including severity of illness markers (respiratory support), therapeutic interventions (steroids), and outcomes (hospital length of stay). Prolonged hospitalization correlated with early enrichment for cilium organization, suggesting cellular composition and epithelial cell damage may predict length of hospitalization in RSV bronchiolitis.

Conclusion: Our findings support the hypothesis that differences in immune response at the primary site of RSV infection correlate with clinical outcomes and disease severity. Further investigation may provide insight into potential therapeutic targets for severe disease and may identify differentially expressed genes that could serve as early biomarkers of infection outcomes in RSV bronchiolitis.
RNAseq Reveals Novel Monocyte-Mediated Pathways of Placental Dysfunction

Background: The placenta plays a critical role in modulating the fetal response to in utero stress and inflammation. Four domains of placental histopathology that influence the placenta’s roles include acute inflammation (AI), chronic inflammation (CI), maternal vascular malperfusion (MVM), and fetal vasculopathy (FVP). Fetal monocytes arise from the fetal liver, come into direct contact with the placental microenvironment, and eventually give rise to various tissue macrophage populations during fetal development and perinatal-neonatal transition. These monocytes exist in three functionally distinct subsets: classical, intermediate, and non-classical. Thus, the monocyte subsets have the potential to be differentially programmed by placental factors and influence postnatal outcomes. We hypothesize that different domain of placental dysfunction program gene expression in monocyte subsets.

Objective: To identify gene expression modules in monocyte subsets linked to specific placental pathology.

Design/Methods: We performed transcriptomic and clinical profiling of 60 preterm and 10 term mother-infant dyads enrolled through an ongoing cord blood and placental tissue biorepository (NU Cord, Prentice Women’s Hospital, Chicago, IL). Cord blood monocyte subsets were flow-sorted, followed by RNA-seq and bioinformatics analysis.

Results:
1) While cell type composition of the cord blood was similar across domains of placental pathology, we found that monocyte subsets demonstrated changes in gene expression profiles in subset- and placental pathology-specific manner.

2) Weighted gene network correlation analysis revealed that gestational age and placental pathology correlate with specific gene expression modules.

3) Within the classical monocyte subset, the AI group contained modules involved in platelet activation and antigen presentation. The FVP and CI groups comprised of modules involved in thrombosis and stress response. (See: Figure 1)

4) Within the intermediate monocyte subset, the AI group contained modules associated with the activation of neutrophils and inflammation. Intermediate monocytes exposed to FVP contained modules involved in endothelial cell migration. (See: Figure 2)

Conclusion(s): Gene expression profiles in fetal monocytes subsets are influenced by placental inflammation and vasculopathy. Therefore, fetal monocytes may serve as markers and mediators of neonatal outcomes arising from placental dysfunction.

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Neonatal Nailfold Capillary Analysis to Predict Complications of Prematurity

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**Background:** Abnormal microvascular development contributes to the pathogenesis of several diseases of prematurity such as BPD, NEC and ROP. However, there is currently no established non-invasive method for assessing and monitoring systemic microvascular development in premature infants. **Hypothesis:** Nailbed capillaroscopy with advanced microvascular imaging analysis can be used in premature infants of different racial backgrounds to assess development of capillary networks from 24 weeks GA through term corrected age in order to predict complications of prematurity e.g. ROP. **Methods:** After obtaining parental consent, hand nailfold capillary network images were captured using an Optilia capillaroscope in infants with PMA of 24-40 weeks. Images were processed at high-resolution using advanced thresholding available through Image J. Nailfold capillary skeletal length per area and branch point per area were determined using Autotube and Reaver programs. In infants with pigmented skin, pigment from nailbed images were selectively filtered using imageJ subtraction feature to capture capillary network skeletons. **Results:** We found that in premature infants, nailbed capillary networks evolve postnatally from a thin “honeycomb-like” network to a more organized network with larger parallel vessels and rudimentary capillary loops. With increasing maturation, there was a significant decrease in nailfold capillary skeletal length per area (15.45 ± 0.31, vs. 18.22 ± 0.56; p<0.001) and branch points per area (127.4 ± 3.8, vs. 166 ± 4.4; p<0.01), consistent with regression of capillary density. **Conclusions:** Nailbed capillary networks undergo significant changes during the postnatal period in premature neonates and neonatal nailbed capillaroscopy may be a promising non-invasive tool to evaluate the microvascular health of premature newborns that warrants further investigation.
TITLE: The Epigenetic Impact of Abusive Head Trauma: A Pilot Study

AUTHORS: Audrey Young, MD; Kim Kaczor, MS; Mary Clyde Pierce, MD; Todd Everson, PhD

BACKGROUND:
Traumatic brain injury (TBI) is the leading cause of pediatric morbidity and mortality, affecting 1 in every 3000 children. Often a result of blunt trauma or shaking, these injuries frequently result in death or permanent neurologic impairment. Though research has consistently demonstrated poorer outcomes among children exposed to early life adversity such as family dysfunction, low socioeconomic status, or abusive head trauma as the injuring mechanism, the biological pathways that translate these risk factors into worse outcomes have not yet been discovered. Epigenetic modifications such as DNA methylation and microRNA signaling are known to be affected by early childhood adversity and have also been implicated in long-term disease processes. With respect to pediatric TBI, epigenetic alterations offer a potential mechanism by which differential outcomes based on abusive versus accidental injury may be realized.

METHODS:
To explore this further, we will conduct a prospective study of children up to 3 years of age presenting to a pediatric emergency department with TBI. Injuries will be characterized by a medical expert panel as abusive, accidental, or indeterminate. We will also enroll a control population presenting to the ED with atraumatic chief complaints and no brain injury. In addition to reviewing each child’s medical and family history, psychosocial risk factors, exam findings and associated lab/imaging results, we will collect saliva samples at the time of initial presentation and again at follow-up appointments of varying intervals. We will also test blood and/or CSF if samples are being collected for clinical purposes. Epigenetic analyses will include testing for differential DNA methylation as well as microRNA signaling. We will then correlate these biological measures with clinical outcomes including survival, development of seizures or infantile spasms, functional impairments including physical and intellectual disabilities, follow-up neuroimaging, and validated neurological outcomes scales.

HYPOTHESIS:
We aim to 1) identify distinctive patterns of DNA methylation and microRNA expression among children with abusive head injury compared to those with accidental head injury and others with no head injury, and 2) determine whether these patterns of epigenetic modification correspond to differential clinical outcomes. We hypothesize that in comparison to the other two populations, children with abusive head injury, as determined by expert panel consensus, will have significantly different epigenetic profiles of DNA methylation and microRNA signaling that correlate with inferior clinical outcomes.

RESULTS:
We anticipate collecting biological specimens from approximately 200 children for this pilot study. Through this process, we will be able to establish a cohesive multidisciplinary research team, troubleshoot any challenges in the study design, and refine the study protocol from enrollment and sampling to epigenetic analysis and interpretation. Findings from this pilot study will then be used to support future applications for federal grants to continue our investigation of these critical questions.

CONCLUSION:
Successful completion of our long-term study aims would overcome current limitations in our mechanistic knowledge of the link between early adversity and long-term health consequences. Illumination of the pathway by which these effects occur would facilitate earlier diagnosis of abusive head trauma, inform risk stratification, and contribute to the creation of therapeutic plans to improve neurodevelopmental trajectories.
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