Pediatric Research Day

September 18, 2019
7:45 a.m. – 4 p.m.
Children’s Foundation Research Center • Memphis, TN
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Welcome

Welcome to the 11th Annual Pediatric Research Day, hosted by the Department of Pediatrics at the University of Tennessee Health Science Center and the Children’s Foundation Research Institute within Le Bonheur Children’s Hospital.

Our research portfolio has continued to strengthen year over year. We are excited about the work presented at Pediatric Research Day, as it highlights the diversity and depth of basic and clinical research being performed at Le Bonheur Children’s Hospital, UTHSC and our academic and clinical partner institutions, including St. Jude Children’s Research Hospital and the University of Memphis. It also demonstrates the exciting progress and significant advances that our researchers are making towards uncovering molecular mechanisms underlying pediatric diseases, preventing childhood illness and improving the quality of pediatric healthcare.

The theme for this year is Gastroenterology. This forum is intended to both showcase the work of our researchers and trainees, and allow us to learn from our distinguished guests, all of whom are leaders in their field. Dr. Thomas Weinberg, the Pediatric Research Day keynote speaker and recipient of the James Hunt Distinguished Visiting Professorship, will talk about patient diagnosis and treatment. Dr. Dennis Black will describe his years of discovery into the function of Apo A-IV protein in lipid absorption. Dr. Ellie Margolis from St. Jude Children’s Research Hospital will delve into the gut microbiome while Dr. Stacey Schultz-Cherry also from St. Jude will update us on the latest research on astroviruses and other virus infections as they pertain to gut health. Rounding out the GI theme, Dr. Ankush Gosain, will discuss the latest research in Hirschsprung disease and Dr. Ellie Margolis also from St. Jude will share her work on the gut microbiome.

This year too, we have a record number of Pediatric Research Day participants, reflecting a strong and enthusiastic commitment to research, collaboration and innovation. I hope that you will enjoy this opportunity to interact and discuss your work with fellow researchers.

Enjoy the Day!

Jon McCullers, M.D.
Chair, Department of Pediatrics, UTHSC
Pediatrician-in-Chief, Le Bonheur Children’s Hospital
Senior Executive Associate Dean of Clinical Affairs
Welcome to the eleventh annual Pediatric Research Day! Le Bonheur Children’s Hospital, along with its major partners, the University of Tennessee Health Science Center, the Children’s Foundation Research Institute of Memphis and St. Jude Children’s Research Hospital, has supported cutting edge basic, clinical and translational research for many years, leading to several major breakthroughs impacting on the health and well-being of children. Activities surrounding Pediatric Research Day are designed to showcase our pediatric researchers and their work. We are extremely proud of the high-quality, state-of-the-art research produced by these talented individuals.

This year, Pediatric Research Day spotlights accomplishments in the area of Pediatric Gastroenterology, Hepatology and Nutrition. The keynote speaker, Dr. Richard Weinberg, Gastroenterologist and Professor of Internal Medicine, Physiology & Pharmacology, and Clinical Translational Science Institute, Wake Forest School of Medicine, and recipient of the UTHSC James Hunt Distinguished Visiting Professorship Award, will deliver the keynote lecture, “To Think What No One Has Thought Before”. The other Invited Speakers and Short Talk presentations, as well as the Poster presentations, will highlight the breadth and depth of the ongoing GI, Hepatology and Nutrition and other research activities here at Le Bonheur, St. Jude and the University of Tennessee Health Science Center. A record number of abstracts were submitted this year, reflecting the continued growth of our research programs.

We are excited by the advances in pediatric research at Le Bonheur Children’s Hospital and think you will be, too. Again, welcome and enjoy!

Dennis D. Black, MD
J. D. Buckman Professor of Pediatrics
Professor of Physiology, UTHSC
Vice Chair for Research, Department of Pediatrics
Director, Children’s Foundation Research Institute of Memphis
Vice President for Research, Le Bonheur Children’s Hospital

Welcome to the 11th Annual Research Day Co-Sponsored by the Department of Pediatrics at UTHSC, Le Bonheur Children’s Research Hospital, and the Children’s Foundation Research Institute. This year's theme is Gastroenterology, chosen to highlight our expertise and commitment to clinical care and research in this field.

I would like to thank the faculty for volunteering to judge abstracts and posters, administrative staff at UTHSC and Le Bonheur Marketing, and members from my laboratory for helping to organize this event; this day would not be possible without your help. Thank you to all our invited speakers, poster presenters, and guests for participating in today’s event by sharing your discoveries and knowledge. A special thank you to Dr. Jon McCullers (Department of Pediatrics), the Children’s Foundation, BioLegend, and the College of Medicine for financial sponsorship that enabled us to host this event and give awards of excellence. I also would like to thank Drs. Ajay Talati and Vicki Park for chairing the Judges Panels. Please refer to the back of the book for acknowledgements.

Please don’t hesitate to ask if you should have any questions. I hope you enjoy the day as much as I enjoyed planning it!

Amali E. Samarasinghe, Ph.D.
Associate Professor
Division of Pulmonology, Allergy-Immunology and Sleep, Department of Pediatrics
University of Tennessee Health Science Center
Scientific Program

Pediatric Research Day 2019
Wednesday, September 18th 7:45 a.m. - 4:00 p.m.
Chesney Auditorium, Children’s Foundation Research Institute

7:45 - 8:00 am Breakfast

8:00 - 8:10 am Opening Remarks
- Jonathan McCullers, M.D.
  Dunavant Professor and Chair, Department of Pediatrics, UTHSC;
Pediatrician-in-Chief, Le Bonheur Children’s Hospital;
Senior Executive Associate Dean of Clinical Affairs
- Michael Wiggins
  President and CEO, Le Bonheur Children's Hospital
- Amali Samarasinghe, Ph.D.
  Associate Professor, Pulmonology, Allergy-Immunology, and sleep
  Research Day Organizer

8:10 – 9:10 am Keynote Address: James C. Hunt Visiting Distinguished Professorship
To Think What No One Has Thought Before
Richard Weinberg, M.D.
Professor
Internal Medicine | Physiology & Pharmacology
Clinical Translational Science Institute, Wake Forest School of Medicine

8:10 – 9:10 am Coffee served in the atrium of the Faculty Office Building

Session One:

Auditorium, Faculty Office Building

Session Chairs: Patricia Dubin, MD [Division Chief, Pulmonology, Allergy-Immunology and Sleep]
Mark Corkins, MD [Division Chief, Gastroenterology]

9:30 – 9:40 am Introduction by Session Chairs

9:40 – 10:10 am Apolipoprotein A-IV: The Ultimate Multifunctional Protein
Dennis Black, M.D.
Professor, Department of Pediatrics, UTHSC
Scientific Director, Children’s Foundation Research Institute

10:10 – 10:20 am Intestinal commensals promote resistance to lung injury in experimental bronchopulmonary dysplasia
Kent Willis, M.D.
Outstanding Abstract Award: Junior Faculty
10:20 – 10:30 am  *Known predictors of IVIG resistance in patients with Kawasaki disease: are they applicable to the Le Bonheur population?*
Ellen Soufleris, M.D.
Outstanding Abstract Award: Clinical Resident

10:30 – 10:45 am  Coffee Break

10:45 – 11:15 am  *The Lil’ Gut Microbiome that Could*
Ellie Margolis, M.D, Ph.D.
Assistant Member, Department of Infectious Diseases, SJCRH

11:15 – 11:25 am  *Eosinophils undergo temporally regulated phenotypic and physiologic changes during influenza A virus infection*
Meenakshi Tiwary, Ph.D.
Outstanding Abstract Award: Postdoctoral Fellow

11:30 – 1:20 pm  **POSTER SESSION** and Lunch
CFRI Ground and Lobby Levels
Presenters must be available at posters from 12:00 - 1:00 pm

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**Session Two:**

Session Chairs:  Joan Han, MD [Director, Pediatric Obesity Program]
Weiqiang Zhang, PhD [Assistant Professor, Division of Infectious Diseases]

1:20 – 1:30 pm  Introduction by Session Chairs

1:30 – 2:00 pm  **Astrovirus: More than Just Diarrhea**
Stacey-Schultz-Cherry, Ph.D.
Member, Department of Infectious Diseases, SJCRH

2:00 – 2:10 pm  **Copeptin: A novel biomarker in pediatric heart failure**
Karan Karki, M.D.
Outstanding Abstract Award: Clinical Fellow

2:10 – 2:20 pm  **Safety and efficacy of oral RV521 in a human respiratory syncytial virus (RSV) phase 2a challenge study**
Elizabeth Meals
Outstanding Abstract Award: Research Staff

2:20 – 2:30 pm  **Greetings and Thanks from BioLegend**
John Rutigliano, Ph.D. | Technical Application Scientist II
Team Leader, BioLegend, Inc.

2:30 – 2:45 pm  Coffee Break (Kindly Sponsored by BioLegend, Inc.)
Scientific Program

2:45 – 3:15 pm  
*Hirschsprung Disease 2019: Addressing Morbidity & Mortality through Translational Science*

Ankush Gosain, M.D., Ph.D.
Associate Professor of Surgery and Pediatrics | Director Surgical Research | Program Director, Pediatric Surgery Fellowship | Associate Program Director, General Surgery Residency

3:15 – 3:25 pm

*Lateralizing focal seizure origin using source space rs-MEG connectivity analysis in the theta band*

Haataf Purmotabbed
BioLegend – Graduate Student Research Award

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Session Three:

3:25 – 4:00 pm

*Award Ceremony and Closing Remarks*

Dennis Black, M.D. Scientific Director, CFRI
Ajay Talati, M.D. Division Chief, Neonatology

- Outstanding Abstract Awards from the Department of Pediatrics:
  - Junior Faculty: Kent Willis, M.D.
  - Clinical Fellow: Karan Karki, M.D.
  - Postdoctoral Fellow: Meenakshi Tiwary, Ph.D.
  - Clinical Resident: Ellen Sourfleris, M.D.
  - Research Staff: Elizabeth Meals

- BioLegend, Graduate Student Research Award: Haataf Pourmatabbed

- Outstanding Poster Awards from the Department of Pediatrics:
  - Faculty
  - Clinical Fellow
  - Postdoctoral Fellow
  - Clinical Resident
  - Research Staff
  - Graduate Student

- Outstanding Poster Awards from the College of Medicine:
  - Three Medical Students

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SAVE THE DATE

*12th Pediatric Research Day: 17th March, 2021*
Le Bonheur Children’s Hospital

Le Bonheur Children’s Hospital is recognized as a top children’s hospital by *U.S. News and World Report* and the Leapfrog Group. The hospital is Magnet certified and has the only ACS Level 1 Pediatric Trauma Program in the region. Le Bonheur is a comprehensive, not-for-profit hospital that serves more than 250,000 children in the hospital, clinics and through outreach programs each year. While primarily serving the MidSouth, children come from all 50 states for treatment at Le Bonheur. Families that travel long-distances for care can stay free of charge at the FedEx Family House. Le Bonheur serves as the primary pediatric teaching hospital for the University of Tennessee Health Sciences Center.

**The Children’s Foundation Research Institute at Le Bonheur Children’s Hospital**

Founded in 1995, the Children’s Foundation Research Institute (CFRI) represents the culmination of a unique partnership between the Children’s Foundation of Memphis, the University of Tennessee Health Science Center (UTHSC) and Le Bonheur Children’s Hospital to support the expansion of pediatric research. The CFRI provides comprehensive basic and clinical research infrastructure to support all research activities at Le Bonheur, including clinical trial support, provision of lab space, safety assistance, grant submission, budgeting services, scientific editing, and statistical assistance. This centralized and coordinated support accelerates discovery and innovation and forges collaboration, allowing our physicians and scientists to concentrate on what they do best: cutting edge research aimed at improving the health of children.

**The Children’s Foundation of Memphis**

The Children’s Foundation of Memphis is a private foundation established in 1982 with the sale of The Crippled Children’s Hospital. The organization’s mission is to serve the health and well-being of children in the Memphis area. The Foundation has given more than $17 million to support pediatric medical research at the Children’s Foundation Research Institute (CFRI). This sustained and significant support makes the CFRI’s groundbreaking research possible and is vital to improving the health of children in Memphis.
The goals of the Department have been to establish a strong partnership with Le Bonheur Children's Hospital, to recruit outstanding faculty and housestaff, and to promote excellence in pediatric clinical care, research, education, and service to our community. Resources have been acquired from a number of sites, including Le Bonheur, St. Jude Children's Research Hospital, the Regional Medical Center, the Boling Center, the Children's Foundation of Memphis, and national funding agencies to fulfill these goals. We are particularly proud of our outstanding pediatric and medicine-pediatric residency training programs. Dr. Jon McCullers is Chair of the Department and Pediatrician-in-Chief of Le Bonheur.

The Department has strong clinical and research programs in Allergy-Immunology & Pulmonology, Cardiology, Critical Care, Developmental Pediatrics, Endocrinology, Gastroenterology, General Pediatrics, Genetics, Infectious Diseases, Neonatology, Nephrology, Neurology, and Rheumatology. Two outstanding integrated clinical and translational programs are housed in the Heart Institute and the Neuroscience Institute. The Department also has strong ties in both clinical and research areas to the Department of Surgery and Maternal Fetal Medicine in OB-GYN.

The Departmental Philosophy is to develop new models of care for the most pressing problems in our community including broad, cross-disciplinary challenges such as pediatric obesity, asthma, and developmental disabilities. We strive to meet changing environments head-on; our facilities, leaders, and faculty focus on innovative methods in patient care and target research to meet new demands.

The UTHSC Department of Pediatrics continues to play a very important role at Le Bonheur Children's Hospital, and its goal remains to fulfill its education, research, patient care, and advocacy missions.
Invited speaker

Biography: Richard B. Weinberg, M.D.

Richard B. Weinberg, M.D. is Professor of Internal Medicine and Physiology & Pharmacology at Wake Forest School of Medicine in Winston-Salem, NC, where he also serves as Executive Chair of the Wake Forest Health Sciences Institutional Review Board. Dr. Weinberg received his A.B. degree in chemistry from Harvard College and his M.D. degree from the Johns Hopkins University School of Medicine. He completed his internal medicine residency and fellowship in gastroenterology and human nutrition at the University of Chicago. For over three decades Dr. Weinberg has investigated the impact of genetics on lipid metabolism in studies funded by the National Institutes of Health. His clinical focus has been the treatment of diarrheal diseases and nutritional disorders. Dr. Weinberg has received numerous honors and teaching awards, most recently the Wake Forest School of Medicine Class of 2021 Basic Science Teaching Award. He is a Fellow of the American Gastroenterology Association and the American Heart Association. Dr. Weinberg has authored over 100 peer-reviewed articles, book chapters, editorials, and essays, and has written extensively on the central role of narrative in clinical medicine. Off hours, he enjoys cooking, fly fishing, and playing music with his old high school rock band.

To Think What No One Has Thought Before

Throughout the ages, luck and serendipity have often played a key role in spurring great scientific discoveries. We will tell the stories of three physicians whose vigilance, vision, and persistence turned such moments into new approaches to diagnosis, treatment, and disease prevention that have had a major impact on the health and wellbeing of very young children.

The James Hunt Visiting Professorship

The James C. Hunt Visiting Professorship in Pediatrics was established through a generous endowment from the Greater Memphis Community Foundation. The Professorship was established to honor Chancellor Emeritus of the University of Tennessee Health Science Center, Dr. James C. Hunt. Dr. Hunt was born in Lexington, N.C. He received his undergraduate degree from Catawba College in 1949. His M.D. degree was conferred from Bowman Gray School of Medicine. He completed his residency and fellowship at Mayo Clinic. He worked his way through the hierarchy at Mayo from instructor to professor, then nephrology Division Chief, then Chairman of the Department of Medicine, and finally Associate Dean of Clinical Programs. Dr. Hunt came to UTHSC in 1978 as Dean of the College of Medicine. He became Chancellor of UTHSC in 1981 and served until 1993. He then served as a Distinguished Professor and Director of the Clinical Scholars Program until 2001. He is currently Chancellor Emeritus and Vice President of Health Affairs. His list of awards and honors is long. He has served as President of the National Kidney Foundation and received the Gift of Life Award from that organization in 1991. He has been honored by both of his undergraduate and medical schools with distinguished alumnus awards. He has served on the Board of Directors for numerous organizations. Dr. Hunt served as a Trustee of Le Bonheur Children’s Medical Center from 1981 to 1993. His longstanding commitment to the health and well-being of children led to the establishment of a visiting professorship in his name in pediatrics.
Invited speakers

**Dennis Black, M.D.**

Dr. Dennis Black, a pediatric hepatologist, is the James Dustin Buckman Professor of Pediatrics and Professor of Physiology at the University of Tennessee Health Science Center, Memphis. Dr. Black serves as Scientific Director of the Children’s Foundation Research Center of Memphis, as well as Vice President for Research for Le Bonheur Children’s Medical Center. His research and clinical interests are neonatal lipid metabolism and pediatric liver disease. He has had continuous NIH, FDA and other federal research funding for the past 25 years. He has served on several grant review committees, including those for the NIH, American Liver Foundation, North American Society for Pediatric Gastroenterology, Hepatology and Nutrition (NASPGHAN), and the American Heart Association. He was Vice Chair and Chair of the American Gastroenterological Association (AGA) Council Section on Obesity, Metabolism and Nutrition from 2013 to 2018. His recent honors include the UTHSC Department of Pediatrics Excellence in Mentorship Award in 2017 and the NASPGHAN Gerard Odell Excellence in Pediatric Hepatology Research Award in 2018.

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**Apolipoprotein A-IV: The Ultimate Multifunctional Protein**

Apolipoprotein A-IV is one of the most abundant proteins in the enterocyte and is highly regulated by lipid absorption. Over the years, myriad extraintestinal functions for apo A-IV have been identified, including roles as a satiety factor, lipid anti-oxidant, atherosclerosis inhibitor, promoter of reverse cholesterol transport, incretin and insulin sensitizer, and anti-inflammatory factor. However, defining a role in intestinal fat absorption has been elusive. Our laboratory and collaborators have used neonatal porcine models to define a role for apo A-IV in augmenting absorption of a high-fat diet in the suckling period by promoting packaging of additional lipid into larger chylomicron particles. Studies of the overexpression of native swine and human apo A-IV, as well as mutant apo A-IV proteins, in a porcine neonatal enterocyte cell line (IPEC-1) have demonstrated secretion of larger chylomicron particles and increased triacylglycerol (TG) secretion with native human and porcine apo A-IV overexpression, and a 25-fold increase with a human apo A-IV mutant lacking the EQQQ-rich carboxy-terminus not present in swine apo A-IV, suggesting an inhibitory role for this sequence. Additional studies have shown that apo A-IV up-regulates microsomal triglyceride transfer protein (MTTP) in a manner to promote increased packaging of TG into the CM core, which may also be important in neonatal fat absorption. We have also defined the lipid-mediated regulation of apo A-IV by hepatocyte nuclear factor-4α (HNF-4α). Taken collectively, these studies suggest a coordinated role for apo A-IV in the absorption of a high enteral lipid load in the newborn enterocyte.
Invited speaker

Elisa Margolis, M.D., Ph.D.

Ellie Margolis is a physician scientist at St Jude Children's Research Hospital where she balances being an pediatric infectious disease physician treating immunocompromised hosts and running a laboratory dedicated to investigating how to keep kids healthy bacteria happy. Prior to receiving her MD and PhD in Population Biology, Evolution and Ecology from Emory University, she was a Fulbright Scholar in Bolivia studying how to prevent Chagas disease through housing improvements. She trained for both residency and fellowship at Seattle Children's Hospital.

The Lil’ Gut Microbiome that Could

When scientists investigate the human microbiome they often supply a list of all the bacteria (and sometimes fungus, viruses) present at a site. When the host perceives the microbial community living on it, they are reacting not to a list of names but to the exterior coats of those microbes and the metabolic products produced by those microbes. We have investigated how the dynamics of human gut microbial communities change over the course of childhood and how secondary microbial metabolites alter host responses and clinical outcomes. We have unexpected results that suggest pediatric patients with Clostridoides difficile differ remarkably from the microbiome signatures associated with this infection. In addition, microbial secondary metabolites (e.g. butyrate) play a distinct role in predicting infection risk in patients receiving a bone marrow transplant.

Pediatric Research Day • September 18 2019 • Chesney Auditorium, Children Foundation Research Center, Memphis, TN
Invited speaker

Stacey Schultz-Cherry, Ph.D.

Stacey Schultz-Cherry, PhD is a Full Member in the Department of Infectious Diseases at St Jude Children’s Research Hospital in Memphis, TN where she serves as the Deputy Director of the World Health Organization (WHO) Influenza Collaborating Center and Co-PI for the NIAID-funded Center for Excellence in Influenza Research and Surveillance. She received her Bachelor of Science degree in Cell Biology at the University of Wisconsin-Platteville and her Doctoral degree in Molecular and Cellular Pathology from the University of Alabama at Birmingham. She did her postdoctoral training in influenza virology at the University of Wisconsin and then spent five years as a lead scientist at the Southeast Poultry Research Laboratory, USDA-ARS. In 2002, she was recruited to the Department of Medical Microbiology and Immunology at the University of Wisconsin-Madison School of Medicine where she was promoted to an Associate Professor with tenure before joining the faculty at St Jude Children's Research Hospital in 2009. Her laboratory focuses on the pathogenesis of influenza and enteric viruses in high risk populations. Dr. Schultz-Cherry is the author and co-author of over 150 research articles, reviews and book chapters, an editor at the Journal of Virology and Journal of General Virology, past President of the American Society for Virology, and was recently invited to chair the Public and Scientific Affairs Board Committee for the American Society for Microbiology (ASM). Dr. Schultz-Cherry is recognized internationally for her studies on the pathogenicity of influenza viruses and astroviruses.

Astrovirus: More than Just Diarrhea

Astroviruses are a major cause of diarrhea in the very young, elderly and immunocompromised populations where the virus can cause systemic and even fatal infections. Indeed, we have shown that astrovirus infections are more prevalent than norovirus in our pediatric oncology population with many patients being long-term shedders. Due to the lack of cell culture systems and animal models for most astrovirus genogroups, little is known about pathogenesis. Our group demonstrated that the canonical human astroviruses (HAstV1-8) induced a loss of cell-cell junctions in differentiated Caco2 cells resulting in increased membrane permeability through a replication–independent mechanism. Only the viral capsid protein was required. To determine if this could be recapitulated in vivo, animal models were orally inoculated with species-specific astrovirus or astrovirus capsid and intestinal permeability and clinical disease was monitored. Like our in vitro findings, capsid protein alone caused a loss of membrane permeability, relocalization of sodium transporters and diarrhea. Ongoing studies are examining the cellular mechanisms leading to increased permeability and the region of the capsid involved.
Ankush Gosain, M.D., Ph.D.

Dr. Gosain directs the Pediatric Surgery Research Laboratory at the Children's Foundation Research Institute of the Le Bonheur Children's Hospital. His PhD training focused on neuro-immune modulation, specifically the role of the peripheral nervous system in modulating innate immune cell function in cutaneous wound healing. His clinical training in Pediatric Surgery led to his interest in understanding the mechanisms and developing therapies for congenital diseases of the gastrointestinal tract. His laboratory research focuses on the development of the Enteric Nervous System and Gastrointestinal Mucosal Immune System using the pathogenesis of Hirschsprung-associated enterocolitis as a model for enteric nervous system-mucosal immune system interaction. As a practicing Pediatric Surgeon-Scientist focused on congenital colorectal diseases, Dr. Gosain has a unique perspective to understand the mechanisms responsible for aberrant ENS development and how these manifest clinically in children. The long-term goal of his research is to gain an understanding of the interactions between the Enteric Nervous System and Gastrointestinal Immune System in both development and disease to permit the generation of novel neuro-immunomodulatory therapies that may potentially target a broad range of congenital and acquired pediatric gastrointestinal tract diseases (Hirschsprung's disease, Necrotizing Enterocolitis, Intestinal Atresia, Motility Disorders, Inflammatory Bowel Disease, etc.).

Hirschsprung Disease 2019: Addressing Morbidity & Mortality through Translational Science

Hirschsprung disease (HSCR), a common cause of intestinal obstruction in the newborn, is characterized by an absence of Enteric Nervous System ganglion cells in the distal hindgut, extending from the rectum to a variable distance proximally, and results from a failure of cranial-caudal neural crest cell migration. The resulting aganglionic segment exhibits tonic contraction, resulting in functional bowel obstruction. Untreated, this leads to progressive bowel distention, the development of Hirschsprung-Associated Enterocolitis (HAEC), and death. A surgical therapy for HSCR was described 70 years ago but, minus technical variations, is essentially unchanged today. While HSCR is traditionally treated with surgical resection of the aganglionic segment and “pull-through” of ganglionated bowel to the anus, recent studies indicate that ~5% of children die from HSCR and ~1/3 of children experience poor long-term outcomes. These poor outcomes, including abdominal pain, constipation, fecal incontinence, soiling, and need for re-operative surgeries result in repeated hospitalizations with increased healthcare utilization and decreased quality of life, strongly indicating the need to develop novel therapeutic approaches to HSCR. This talk will detail our translational science approaches aimed at eliminating the morbidity & mortality faced by HSCR patients.
Oral Presentations
Intestinal commensals promote resistance to lung injury in experimental bronchopulmonary dysplasia

Kent Willis¹, David Siefker², Michael Aziz¹, Catrina White¹, Naiha Mussarat¹, Charles Gomes³, Joseph Pierre, Stephanie Cormier¹, Ajay Talati¹

University of Tennessee Health Science Center¹; LSU Department of Biological Sciences Department²; University of Texas at Austin³

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During the newborn period, intestinal commensal bacteria influence pulmonary mucosal immunology via the gut-lung axis. Epidemiological studies have linked perinatal antibiotic exposure in human newborns to an increased risk to develop bronchopulmonary dysplasia, but the role of the gut-lung axis in is unknown. To explore antibiotic disruption of the newborn gut-lung axis, we studied how maternal antibiotic exposure (MAE) influenced lung injury in a hyperoxia-based mouse model of bronchopulmonary dysplasia. We randomized pregnant C57BL/6j mice on the tenth day of gestation to perinatal maternal antibiotic exposure (penicillin 500mg/L) or control. After birth, newborn offspring were randomized to hyperoxia (FiO2 0.85 or 0.60) or FiO2 0.21 for 14 days. In further experiments we studied the effects of only antenatal or postnatal MAE. Alveolarization was analyzed by histology and morphometry. Pulmonary fibrosis was characterized by immunohistochemistry. Inflammasome activation was quantified in whole lungs and cytokines were measured in bronchoalveolar lavage. We report that disruption of intestinal commensal colonization during the perinatal period promotes a more severe bronchopulmonary dysplasia phenotype characterized by increased mortality and pulmonary fibrosis. Mechanistically, metagenomic shifts were associated with decreased IL-22 expression in bronchoalveolar lavage and were independent of hyperoxia-induced inflammasome activation. Collectively, these results demonstrate a previously unrecognized influence of the gut-lung axis during the development of neonatal lung injury, which could be leveraged to ameliorate the most severe pulmonary complication of premature birth.

Funding/Grant Support: The Marshall Klaus Award - The American Academy of Pediatrics, The Excellence in Research Grant - The Neonatal Cardiopulmonary Biology Young Investigators Forum. The Fellow's Basic Research Award - The Society for Pediatric Research

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Known Predictors of IVIG Resistance in Patients with Kawasaki Disease: Are They Applicable to the Le Bonheur Population?

Ellen Soufleris¹, Amber Thacker¹, Sydney Elizer¹, Sandra Arnold¹

University of Tennessee Health Science Center¹

Email address: epigott@uthsc.edu

Background: Kawasaki Disease (KD) is treated with intravenous immune globulin (IVIG) and aspirin, although some patients do not respond to IVIG. Steroids with initial IVIG may reduce the risk of IVIG resistance (IVIGR). There are published risk scores using clinical and laboratory findings that are used in Asia to predict IVIGR. Our hypothesis was that patients with KD at Le Bonheur Children’s Hospital (LBCH) can be stratified for risk of IVIGR to determine who would benefit from early steroids.

Methods: We reviewed the charts of patients admitted to LBCH with a discharge diagnosis of KD for the years 2009 to 2017. We collected demographic, clinical, and laboratory data. Association of individual risk factors and four published risk stratification scores with IVIG resistance were assessed using chi-square test.

Results: 255 of 282 patients were treated on or before day 10 of illness; 50 (20%) had IVIGR, 203 had complete KD, and 52 with incomplete. There were 38 with coronary artery abnormalities (CAA). The only significant differences found between IVIGR patients and treatment successes were that patients with IVIGR were more likely to have lymphadenopathy (72% vs 55%, p=0.03) and ALT > 80 (32% vs 18%, p=0.03). Patient scores on four published risk stratification scores could not predict IVIGR in our population.

Conclusions: There are no significant demographic, clinical, or laboratory findings that can be used to differentiate patients with KD with IVIGR among LBCH patients. Published risk scores using clinical and laboratory findings that have been validated in Asia completely failed to risk stratify patients in Memphis. Alternative strategies are needed to determine how to identify patients at risk for IVIGR.
Eosinophils undergo temporally regulated phenotypic and physiologic changes during influenza A virus infection

Meenakshi Tiwary1, Kim LeMessurier1, Amali Samarasinghe1

Department of Pediatrics, Division of Pulmonology, Allergy-Immunology, and Sleep, UTHSC 1

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Eosinophils are traditionally known for their antiparasitic responses and as biomarkers of allergic diseases, including asthma. Using our model of asthma and influenza (AF) co-morbidity wherein disease outcomes varied by the presence of eosinophils in the airways, we determined that eosinophils played a dynamic antiviral role during influenza A virus (IAV) infections mainly by regulating CD8+ T cell immunity. We have also found that eosinophils in different niches including bone marrow, lymphoid organs, and lungs, undergo distinct immunophenotypic changes depending on the disease state in mice with asthma, influenza, or AF co-morbidity. Therefore, we hypothesized that eosinophil activation and migratory capacity are temporally regulated during IAV infection and that these changes are sensitive to the environment. Virus-exposure resulted in the upregulation of ICAM-1, CD69, and CD11b and downregulation of CD62L on eosinophils within 20 minutes. This expression pattern was temporally regulated suggestive of the ability sense IAV and alter functional responses such as migratory potential. Furthermore, mice infected with eosinophil pre-exposed IAV had a significantly reduced viral burden in the lungs. Eosinophils prevented IAV-induced cytopathology on lung epithelial cells when co-cultured directly or separated by transwell. In addition, eosinophil recipient IAV-infected mice showed no damage to the bronchial airway epithelium. Cumulatively, these data suggest a direct antiviral role for eosinophils through self-activation, reducing virus infectivity, and protecting the respiratory barrier from virus-induced damage further establishing an antiviral role for eosinophils in allergic airways.

Funding/Grant Support: NIH R01-AI125481 (AES)

Copeptin: A novel biomarker in pediatric heart failure

Karan Karki1, Jeffrey Towbin2, Ranjit Phillip2, Samir Shah2, Sachin Tadphale3, Camden Harrell4, Alina Nico West3, Arun Saini5

University of Tennessee Health Science Center1; Pediatric Cardiology, Le Bonheur Children's Hospital2; Pediatric Critical Care, Le Bonheur Children's Hospital3; CFRI4; Baylor College of Medicine5

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Introduction/Hypothesis: Biomarkers are often used to assess the severity of heart failure. B-type natriuretic peptide (BNP) is only prognostic biomarker available for these patients, which is imperfect. Copeptin is emerging as a useful marker for risk stratification, therapeutic implications and predicting all-cause mortality in adults with HF. No data is available in children with HF. The objective of this study is to determine the copeptin level in children with HF and to correlate the copeptin level with clinical heart failure grading, BNP level, and echocardiographic variables.

Methods: A prospective case-control study of children ages 1 month to 18 years with HF compared with age- and sex-matched control group of healthy children.

Results: A total of 46 children with heart failure were age and sex matched with 23 healthy controls. The median (IQR) age of the study group was 8.53(1.93-16.24) years. The median (IQR) copeptin level in the study group was 47pg/ml (13.4-317) compared to the control group 6.2pg/ml (5.8-6.8) (p<0.001). The copeptin had strong correlation with BNP level(r =0.96, p <0.001) and moderate correlation with heart failure grading(r =0.56, p <0.001). The copeptin level had moderate correlation with left atrial volume(r =0.62, p <0.001) and weak negative correlation with left ventricular ejection fraction(r =-0.23, p =0.134).

Conclusions: This is the first study to report copeptin levels in children with HF. Copeptin can be a useful prognostic and therapeutic marker in conjunction with other standard biomarkers. A larger multi-center study is needed to assess the role of copeptin as a prognostic and therapeutic marker in children with HF.

Funding/Grant Support: Le Bonheur Fellow's Research grant
Selected Short Talks for Oral Presentation

Safety and Efficacy of Oral RV521 in a human Respiratory Syncytial Virus (RSV) Phase 2a challenge study
Elizabeth Meals1,2, Lisa Harrison1,2, John DeVincenzo1,2,3, Derek Tait3, Elaine Thomas4, Neil Matthews4, Rachel Harland4, Stuart Cockerill4, Ken Powell4, Eddy Littler4
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Background: RSV is a major cause of lower respiratory tract infections. No effective antiviral treatment currently exists. RV521 is an oral small molecule RSV fusion inhibitor in development for the treatment of RSV infection in infants and adults.

METHODS: In a randomized, double-blind, phase 2a clinical trial in healthy adult volunteers inoculated with RSV-A (Memphis-37), participants received RV521 (200mg, 350mg, or placebo PO bid x 5d) starting 12 hours after a confirmed RSV infection.

RESULTS: 53 participants were PCR-confirmed as infected with RSV. The area under the curve (AUC) for RT-qPCR viral load for 350mg RV521 (n=16) and 200mg RV521 (n=18) groups were significantly lower than the placebo group (n=19) with reductions in group mean Log10 RT-qPCR viral AUCs of 63% and 55% respectively. The AUC for total symptom score, and the AUC for mucus weight were also significantly reduced in both groups receiving RV521 compared with the placebo group. RV521 demonstrated an excellent safety profile across both RV521 dose groups; there were no changes in laboratory determined safety parameters or vital signs with RV521 treatment.

CONCLUSIONS: Therapeutic administration of RV521, an oral RSV fusion inhibitor, safely and effectively reduces viral load and disease severity and is being further evaluated in RSV-infected adults and children.

Funding/Grant Support: ReViral Ltd.

Lateralizing focal seizure origin using source space rs-MEG connectivity analysis in the theta band
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Rationale: Resection of the epileptogenic zone (EZ) is a potential treatment for patients with drug-resistant epilepsy, however not all children are seizure-free after surgery. Improvement in EZ localization is needed to help increase the success rate of epilepsy surgery. Resting-state magnetoencephalography (rs-MEG) connectivity analysis has been investigated for EZ localization. This study investigated whether the source space rs-MEG network topology can be used to accurately lateralize epilepsy.

Methods: Rs-MEG data were collected from 16 patients with right-hemispheric epilepsy (RHE) and 25 patients with left-hemispheric epilepsy (LHE). Time series of the brain activities were reconstructed for 246 regions of interest (ROIs). The debiased weighted phase lag index between the ROIs in six frequency bands was used to construct adjacency matrices, whose second (right versus right (RvR)) quadrants were used to calculate three global graph measures (global efficiency (GE), characteristic path length (CPL), and transitivity (T)).

Results: The GE, CPL, and T in the theta band and the GE and T in delta band of the RvR quadrant were significantly different between RHE and LHE (false discovery rate (FDR)-adjusted P < 0.05). We used the GE, CPL, and T in theta band as input features of a Naïve Bayes classifier and achieved 78.0% accuracy and an area under the receiver operating characteristic curve of 0.87 for classifying RHE and LHE.

Conclusions: The results of this study revealed that the graph measures of the RvR quadrant may be able to distinguish LHE from RHE. Therefore, a source space rs-MEG network topology may be valuable for lateralizing epilepsy and for incorporation in pre-surgical evaluations.

Funding/Grant Support: This study was funded by the Children’s Foundation Research Institute & The Shainberg Neuroscience Fund.
Poster Presentations:
Faculty
F01  

Wandering spleen and association with absence of the left kidney - a case study and literature review  

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Wandering spleen, a rare cause of an acute surgical abdomen is associated with serious consequences secondary to vascular pedicle torsion resulting in splenic infarction. It arises from laxity of intraabdominal ligaments failing to fixate the spleen in its normal location. Due to nonspecific clinical symptoms and nondiagnostic laboratory workup, the diagnosis of wandering spleen is often delayed which leads to increased risk for complete splenic infarction necessitating splenectomy. This poster presents both a literature review and case study of two patients, one with OHVIRA syndrome and another who had undergone a left nephrectomy during infancy, both of whom developed a wandering spleen with acute splenic torsion in the setting of an absent left kidney. The clinical presentation, imaging findings and operative findings will be discussed as well as a review of literature highlighting embryology, medical imaging findings. While absence of the left kidney is commonly seen in pediatric patients, its association with wandering spleen is under recognized and not frequently considered in the differential for patients with acute abdominal pain. This poster aims to raise awareness of this association leading to an earlier diagnosis with increased potential for spleen preserving surgery.

F02  

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- ÂÔI I $ I ÈI À12, I ÎOÎ I, ÑAÔ, #AÔBurcham2; Rebecca Doran2; Kaylan Lowry2; Cody McMillan4  

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Background: Children who grow up in low income, urban areas often will experience unstable housing, unsafe neighborhoods, trauma, violence, and substandard education. These factors can lead to increased bullying, fighting, and disruptive behavior in the classroom setting as a result of poor self-regulation. The impact of the social determinants of health intensify negative behaviors.  

Purpose: The purpose of the small test of change was to establish appropriate behaviors for self-regulation of emotions in the classroom to decrease disruptive behaviors. A pilot study designed as a Small Test of Change, in small urban school in disadvantaged neighborhood at the invitation of the school principal, implemented a resiliency skill-building classroom activity that involved trauma and ACE informed teachers and staff taught by PNP faculty and students over a 4-week time period. IRB Exempt approval for this small test of change provides potential evidence to support how resiliency skills can impact daily activity and behavior in the classroom.  

Measurable Outcomes: Self Report anonymous Surveys by teachers in K-6th grade and student survey with emojis provided aggregate descriptive data. Aggregate child heart rates demonstrated a decrease.  

Evaluation: Education and “buy-in” by teachers is crucial to daily 10 minute practice time.  

Conclusions: ACE assessment of children in a clinical setting can lead to potential integration of resiliency skill building in the home, in the school and community environment. Building resiliency and self-regulation skills in all child environments may improve learning, mental and physical health. Further refinement and interprofessional research may lead to evidence based practice.
Maternal Graves’ Disease and Fetal Tetralogy of Fallot: A Case Series

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Context: Congenital heart defects have been reported with the use of antithyroid medication with ventricular septal defects being the most common. As per the current practice guidelines maternal Graves’ disease (GD) is not an indication for fetal echocardiogram.

Case Description: We described three neonates with tetralogy of Fallot (TOF) born to mothers with GD. Only one of the mothers was on antithyroid medication. Two of these neonates were diagnosed postnatally when they failed the pulse oximeter congenital cardiac screening and diagnosis was established by postnatal echocardiogram. Two of the mothers had radioactive iodine ablation and were on levothyroxine during pregnancy. The dose of levothyroxine was increased during pregnancy. There was no other complication during pregnancy. The third mother had hyperthyroidism and developed thyroid storm during pregnancy requiring inpatient admission and treatment with propylthiouracil (PTU), metoprolol and methimazole. All babies had normal thyroid function test postnatally and eventually had successful repair of TOF defect.

Conclusion: We report the largest known case series of children with TOF born to mothers with GD. Apart from the isolated reports of fetal TOF in mothers with GD, there is no clear association between fetal TOF and maternal GD and antithyroid medication. Based on the review of the literature and our case series, there may be an increased incidence of congenital heart defects in maternal GD irrespective of antithyroid medication use. This case series may add to the current knowledge base and support routine fetal echocardiogram screening for all mothers with GD.

An Experiential, Longitudinal, Collaborative, and Mentored Approach to Resident Evidence-Based Medicine Curriculum

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Background: The Accreditation Council for Graduate Medical Education requires Evidence-Based Medicine (EBM). One way this is accomplished is through Resident Journal Clubs. These are often removed from clinical practice, sparsely attended, and less than ideal. Residents report a lack of comfort with biostatistics and evidence-based medicine. Within a pediatrics residency, we aimed to improve resident-reported comfort, self-assessed competency, and testable knowledge of EBM over a two-year period.

Methods: A baseline survey was performed which identified three main areas of weakness within our existing EBM program: lack of mentorship, delay of presenting to the third year, and no guidance on transferring knowledge to clinical practice. With this in mind, we designed a curriculum that would solve these problems. A resident from each class participates with mentorship. Following a validated format, the presentation is divided with specific roles assigned to each resident. Annual surveys have gauged comfort, self-assessed competency, and knowledge of EBM.

Results: The proportion who reported low comfort in general with EBM decreased from 89% to 62% to 30% (p=0.006). The proportion who rated themselves as Advanced Beginner or higher on ability to "critically appraise an article" increased from 50% to 92% to 90% (p=0.002).

Conclusions: This overhauled curriculum has allowed for clinically-relevant, longitudinal, collaborative, and mentored experience with EBM. Residents report improved comfort with aspects of EBM and self-rate their milestones higher than with our prior curriculum. No change has been seen in their medical knowledge around EBM, however.

Funding/Grant Support: Funding support provided by Mallinckrodt Pharmaceutical
Clinical Evaluation of a Novel Fastening Device for a Scoliosis Brace
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Study Design: Clinical pilot study assessing effects of scoliosis brace fastening devices: Velcro straps versus controlled tension unit (CTU) fasteners, in different activities of daily living.

Objectives: The first objective studied the effects of the brace fasteners on perceived comfort levels and maintenance of tension during various activities. A second objective determined if patients could tolerate greater tension with CTU fasteners for equivalent levels of discomfort to Velcro fasteners.

Summary of Background Data: Conventional Velcro straps lose tension over time, decreasing brace stiffness and corrective force, and negating the benefit of the brace.

Methods: Fifteen patients performed eleven activities while wearing a standard Boston brace having three posterior Velcro straps. Velcro straps were replaced with CTU fasteners and the 11 activities were repeated. Measures of strap tension, brace gap, and discomfort were statistically compared (p < 0.05 and power > 0.8).

Results: A significant loss in strap tension occurred at each level following all 11 activities. Leg raises and lying on either side caused a significant loss in strap tension, while forward bending resulted in significant increase. Relative gap separation significantly decreased with the CTU fasteners except during inspiration and forward bend, where a significant increase occurred. Pain scores for the Velcro Brace were significantly greater during forward bending. At equivalent levels of discomfort, significantly greater tension was applied by the CTU fasteners at all three strap levels and gap separation decreased.

Conclusions: The CTU fasteners maintained strap tension during some daily movements and nighttime postures without compromising

Pilot Study of Sham Feeding in Post-surgical Neonates
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Background: Prolonged periods without oral feeding can lead to oral aversion, prolonged parenteral nutrition, and parental stress. Sham feeding may allow neonates with bowel dysfunction to develop oral skills and improve maternal-infant bonding, but it is unknown if sham feeding is feasible in post-operative neonates.

Hypothesis: We hypothesize sham feeding is feasible for post-operative neonates.

Methods: Post-operative neonates with bowel dysfunction were offered sham feeding up to three times daily until deemed ready for enteral nutrition. The sham procedure offered a specified volume by mouth with continuous gastric suction up to 3 times daily. The mother of each participating infant completed a survey to assess satisfaction with sham feeding.

Results: 12 neonates were enrolled. Median gestational age was 36 (IQR 35-37) weeks. 302 episodes of sham feeding were conducted. Each patient received a median of 25 (16-35) sham feeds. All patients tolerated sham feeding with rare minor complications: cough, tachypnea, and blood-tinged gastric output. 12 mothers returned the satisfaction survey. On a 1-5 scale, mothers rated the experience of not feeding the baby more stressful than sham feeding [mean (sd) 4 (1.3) vs. 1.6 (0.8), p<.001]. 11/12 mothers chose to sham feed the baby themselves, all report they were satisfied with sham feeding, 10/11 report sham feeding improved the relationship with the baby, and all would recommend sham feeding to others.

Conclusion: Sham feeding is feasible for post-operative neonates with bowel dysfunction and is highly rated by mothers. Further studies are warranted to assess the long-term safety and outcomes associated with sham feeding.
**Poster Presentation-Faculty**

**F07**

**Optimizing nutritional outcomes in VLBW infants: A QI Project**

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**Objective:** Decrease our postnatal growth failure rates at discharge by 25% by December 2018, as measured by change in Z-score (delta Z) from birth to discharge in VLBW (Very Low Birth Weight) infants.

**Methodology:** Process measures / PDSA cycles: 1. Start early Total Parenteral Nutrition (TPN) and improve adherence to our revised standardized feeding guidelines; 2. Early fortification of human milk feeds at 40mls/kg/day with new and revised feeding guidelines; 3. Stop checking feed residuals; 4. Audit and collect anthropometric data on regular basis; 5. Increase human milk use; 6. Weekly nutrition rounds.

**Measurements:** Performance measures included time to starting TPN, initiation of enteral feeds, days to achieve full target calorie of 120-130kcal/kg/day, protein target goals were aimed at 3.5gm/kg/day while on TPN and 4.5gm/kg/day while on full enteral feeds. Z-scores at birth and discharge were compared to see effects of our interventions. Growth and anthropometric measurements for our VLBW infants were collected from Jan 2016 – Dec. 2018 as performance measures

**Results:** We saw an improvement in our delta Z scores for weight from -1.46 in Jan. 2016 to -0.64 in Dec. 2018. Head circumference delta Z scores also improved from -1.04 to -0.18. Linear growth improved with early achievement of full enteral feeds and goal calories. Overall growth failure at 36 weeks is now 40%, compared to previous at 55%. Early fortification of human milk feeds was tolerated well and did not affect our overall Necrotizing enterocolitis (NEC) rates. Our growth velocity showed a modest improvement with a trend in the right direction.

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**F08**

**A quality improvement initiative to improve delayed cord clamping rates in preterm neonates.**

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**PURPOSE:** Delayed cord clamping (DCC) offers multiple benefits to the newborn and is now recommended as a standard practice for all neonates. However, it is challenging to safely implement this practice in vulnerable preterms (PT). In 2017, over a 3-month period, only 34% of PT infants received DCC at our institution. This led to the quality improvement initiative to improve the rates of DCC in our hospital with a goal to increase the rate of DCC in PT infants to 50% in 1 year and to evaluate clinical outcomes in infants who received DCC.

**METHODS:** With help of a multidisciplinary core team, specific guidelines to implement DCC in PT were formed. After 6 months of training and education of necessary personnel, monthly data was collected and compliance rate for DCC in PT infants assessed. Clinical outcomes in cohort with highest compliance of DCC and admitted to NICU (29-34 weeks GA) were reviewed and compared with infants without DCC.

**RESULTS:** Following the implementation of departmental guidelines, 67% of PT received DCC. Fig 1 shows monthly compliance for different GA. Better success with DCC was observed in larger babies. Comparison between infants with and without DCC born at 29-34 weeks GA (Table 1) showed that infants delivered by CS, needing PPV or lower Apgar score at 1 min were less likely to receive DCC. Table 2 shows comparisons of other clinical parameters.

**CONCLUSION:** With implementation of departmental guidelines, education and team work, the practice of DCC in PT infants improved significantly, though challenges remain for babies born below 29 weeks GA. Infants between 29-34 weeks GA who received DCC had higher Hct in the 1st week of life and improved hemodynamics and respiratory outcomes.
Measuring Insulin Pump Success Rates Among ULPS Diabetes Clinic Patients
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Background: While insulin pump therapy may improve glycemic control, mismanagement of the pump may place patients at risk of developing hypoglycemia or severe hyperglycemia and diabetic ketoacidosis (DKA). In March 2017, a screening process was implemented in our division to use a multi-disciplinary team approach. The team includes physicians, diabetes educators, dietitians and a social worker. Determination of patient and family preparedness and suitability for insulin pump therapy is made before the patient is transitioned from multiple daily injections. The purpose of this study was to evaluate the success rate of patients on insulin pump therapy with this intervention.

Methods: A retrospective chart review was performed to identify patients who transitioned to insulin pump between Mar 2016 and July 2018. Pump utilization data was collected for at least one year after pump therapy initiation for each patient.

Results: For the period from Mar 2016 to Feb 2017, forty-eight patients, age <18 years were on insulin pump therapy that was initiated at ULPS endocrine clinic. Of the forty-eight patients, nine (19%) were discontinued due to non-compliance or poor glycemic control. Twenty one patients started insulin pump therapy in one year after implementation of the multi-disciplinary team approach for pump screening (March 2017 to July 2018). Four of these patients were lost to follow up. Of the remaining seventeen patients, three (18%) have had their pump therapy discontinued. All three pump discontinuations were by patient/family choice (two of the patients remained in excellent diabetes control on pump and one patient had poor control before and on insulin pump).

Conclusion: We were able to reduce rates of insulin...
Impact of Body Composition on the Oral Microbiome and Mycobiome in Pediatric Populations

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Abstract Body: Obesity is a global epidemic associated with numerous chronic diseases, including cardiovascular disease, diabetes, and cancer. While the role of microbial communities in modulating host metabolism is now increasingly recognized, attention has been primarily on the lower gastrointestinal tract. Interestingly, the rich microbial diversity colonizing the oral cavity has been correlated with body mass index (BMI) in adult human studies, suggesting that oral microbial communities and metabolism may be interrelated. However, this interaction has not been reported in pediatric populations. We hypothesize that the oral microbiome from children with obesity will differ from children with normal weight. We prospectively collected dental plaque samples (left and right sides of mouth) from children with obesity (OB, n=13) and normal weight (NW, n=12) aged 8-18y to sequence the bacterial, archaeal, and fungal microorganisms. There were no differences in alpha diversity metrics at any level. Samples taken from the left and right size of the mouth were more similar within patients than between patients. At the phyla level, dental plaque from OB had significantly lower bacterial TM7 and GN02 and elevated fungal Basidiomycota. At the family level, Polyporales was elevated in OB and almost undetectable in NW. At the genus level, OB dental plaque also displayed higher bacteria Allobaculum, Parvimonas, and lower Peptococcus, TM73, and BD15. These studies address a gap in knowledge regarding the nexus of the oral microbiome, mycobiome, and host phenotype interactions in pediatric populations using novel approaches. These data provide the basis for subsequent studies examining these interkingdom interactions focused on childhood obesity.

Funding/Grant Support: 2017 CORNET award

Dysbiosis of Gut Fungal Populations Promotes High Fat Diet-Induced Obesity

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Abstract Body: Obesity is an important problem in westernized societies that is associated with numerous comorbidities. While obesity undoubtedly includes multifactorial triggers, the gut microbiome is now a recognized driver in addition to diet, genetics, and environmental factors. Bacteria are the most recognized gut community members; however, other organisms also co-inhabit the intestine and remain largely unexplored under non-infectious states. We recently observed that perturbations in - but not elimination of - gut fungal communities through low-dose antifungals elevated weight gain in diet induced obesity (DIO) mice. These findings led to the hypothesis that certain intestinal fungi stimulate host weight gain and obesity risk. Antifungals Fluconazole (Fluco) and 5-fluorocytosine induced the largest increase in body fat, compared to amphotericin and voriconazole. To determine if fungal communities mediate weight loss, we conducted gastric sleeve or sham surgery +/- Fluco in DIO mice. Gastric sleeve significantly reduced body weight lowered body fat versus sham. Surprisingly, Fluco prevented efficient surgical-mediated weight loss and led to regained adipose tissues. Sequencing the mycobiome showed Fluco enriched the mold/hyphae forming species, Cladosporium, Aspergillus, and Penicillium spps, but eliminated yeasts, including Candida. Since these fungi are characterized by high levels of “unmasked” cell wall beta-glucans, we gavaged purified beta-glucans in mice, which induced significantly greater body weight and adiposity than vehicle controls. These findings are the first demonstration of fungal influence upon adiposity and provide important insights into previously unrecognized roles for eukaryotes microorganisms in obesity.

Funding/Grant Support: Department of Pediatrics
Air Guns: A Contemporary Review of Injuries at Six Pediatric Level I Trauma Centers

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Methods: From 1/1/2007 to 12/31/2016, we examined AG injuries across six Level I Pediatric Trauma Centers. AG injuries were defined as injuries sustained by BB or pellet air powered guns. Paint ball and soft foam air guns were excluded. Following IRB approval, patients were identified by ICD code from the trauma registry. A retrospective review included demographic data, injury severity scores (ISS), length of stay (LOS), outcome at discharge, and overall cost of admission for patients <19 years. Descriptive statistics and parametric tests were employed.

Results: A total 499 patients sustained 565 injured body regions. Mean age was 9.5 (4.0) years; 81% of victims were male; all survived to hospital discharge. 30% (n=151) required operative intervention. Hospital LOS was 2.3 (2.2) days; with mean cost of $23,756 ($34,441). ISS mean of 3.7 (4.6) on admission. Over 40% of the injuries to the head/thorax were severe (AIS 3) and required operative intervention (p < 0.001).

Conclusion: AG injuries to the head or thorax seen at trauma centers were likely to require operative management. While no fatalities occurred, the cost of these injuries is substantial. This study demonstrates that pediatric injuries resulting from AG projectiles remains a significant health concern. ONT had 75% sensitivity and 67% specificity. In LSC, ONM identified more LSC in right hemisphere than VGM. Accuracy of ONT across LSCs was 73%, with high specificity and greater left hemisphere reliability. This study is the first to demonstrate good concordance of TMS and fMRI derived HD. However, that LSC showed only moderate concordance indicating a need for further TMS optimization.

Funding/Grant Support: The Michael J. Fox Foundation for Parkinson’s Research

Is There a Magic Number: Noon Conference Attendance and Standardized Testing Scores?

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Background: Many pediatric residency programs utilize noon conference (NC) didactic lectures to fulfill the educational requirements of residency training. However, little data exists as to the effectiveness of this type of lecture format in relation to knowledge acquisition and scores on subsequent standardized tests. Limited research in family practice and internal medicine show small increases in short term knowledge retention, but no improvement in test scores for those who attend a higher number of conferences.

Hypothesis: We hypothesized that NC attendance would not be predictive of performance on American Board of Pediatrics (ABP) Certifying Exam scores in our pediatric residency training program.

Methods/Results: Records of NC attendance and ABP Certifying Exam scores from 2016-2018 were obtained and analyzed. 56 residents were included in the final analysis and divided into two groups based on their three-year average NC attendance, either above or below 60%, which is the minimum yearly required attendance. Each group had 28 residents. An unpaired t-test was run to compare the board scores for each group. Residents attending less than 60% of NC had a mean ABP exam score of 195, while those attending greater than 60% of NC had a mean score of 202.5 (p value = 0.1326).

Conclusions: Our results confirm our hypothesis, demonstrating that greater conference attendance did not correlate with improved ABP board scores. NC is still an important platform to protect resident educational time and deliver knowledge, however additional curricula are needed to equip residents to score higher on boards. We have since implemented a board study curriculum to supplement NC and better prepare residents for ABP boards.
**F15** CFTR-NHERF2-LPA2 Complex in Intestinal Epithelium and Its Role in the Pathological Process of Cholera

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**BACKGROUND:** Cholera is an acute diarrheal infection caused by Vibrio cholerae. It is estimated that annually cholera causes 1.3 to 4.0 million cases and 21,000 to 143,000 deaths. The hyperactivation of CFTR in the GI tract plays a central role in the pathogenic process of cholera. The goals of this study were to investigate the roles of a protein complex, CFTR-NHERF2-LPA2, in the fluid homeostasis in the gut and to target this complex for possible therapeutic Interventions of cholera.

**METHOD:** (1) Models: Intestinal epithelial cells (human HT29-CL19A cells, mouse m-ICc12 cells); mouse intestinal epithelial tissues; open-loop and closed-loop mouse intestine fluid secretion models. (2) Techniques: Immunofluorescence imaging, Western blotting, Q-PCR, Ussing chamber, etc.

**RESULTS:** (1) CFTR-NHERF2-LPA2 complex exists at the apical plasma membrane of intestinal epithelial cells. (2) LPA inhibits CFTR Cl- channel function through an LPA2-mediated Gi pathway. (3) LPA substantially reduced the cholera toxin (CTX)-induced and CFTR-mediated intestinal fluid secretion in mice. (4) A specific LPA2 agonist, GRI977143, inhibited the FSK-induced and CFTR-mediated Isc in polarized HT29-CL19A cells and in mouse intestinal epithelial tissues. (5) GRI977143 significantly inhibited the CTX-induced and CFTR-dependent intestinal fluid secretion in mice. (6) CFTR-NHERF2-LPA2 complex regulates IL-8 secretion in HT29-CL19A cells and m-ICc12 cells.

**CONCLUSIONS:** CFTR-NHERF2-LPA2 complex plays a critical role in the pathological cascade of cholera. Specific and potent anti-secretory agents such as LPA2 agonists and small-molecule CFTR channel blockers can be useful additions to ORT for treatment of cholera.

**Funding/Grant Support:** R01 HL123535 St. Jude Pediatrics Research/Recruitment Support

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**F16** Examining the Anxiety Levels of Parents Pre and Post Participation in Parent Present Anesthesia Induction

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**Abstract Body:** On a yearly basis, millions of children undergo anesthesia for various surgical and nonsurgical purposes. Anesthesia induction has been noted as one of the most stressful and anxiety provoking procedures for both the parent and child. The level of anxiety peaks in a child at the time the anesthesia provider introduces the face mask for induction. Parental anxiety also impacts the level of anxiety in the child. Studies have revealed minimizing anxiety in the child and parent during anesthesia induction may reduce adverse psychological and physiological outcomes. Hospitals have utilized premedication and multiple distraction techniques to allay the anxiety levels of children. Through the collaboration of hospital administration and the Family Practice Council (FPC), parental presence during anesthesia induction was an intervention introduced to assist with decreasing anxiety at Le Bonheur Children’s Hospital (LBCH).
**F17**  
**Efficacy of Early Enzyme Replacement Therapy in Mucopolysaccharidosis type VI (MPS VI) Maroteaux Lamy Syndrome**  
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Le Bonheur  

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**Abstract Body:** Background: MPS VI is a progressive condition that untreated leads to macrocephaly, hydrocephalus, macroglossia, heart-valve abnormalities, hepatosplenomegaly, hernias, airway narrowing, corneal clouding, short stature, carpal tunnel syndrome, spinal stenosis, contractures, and reduced life expectancy. Heart disease and airway obstruction are major causes of death. Currently available enzyme replacement therapy (ERT) is Galsulfase (Naglazyme®). Most cases however are not recognized before 1 year of age. We present a case of a boy and older brother similarly affected by MPS IV that started on ERT at different ages.

**Hypothesis:** Early diagnosis and ERT initiation before 1-year of age improves quality of life and clinical outcome.

**Results:** Per recommended guidelines for older patients, including imaging and clinical features, there is an absence of most natural progression features. His older brother has several typical features despite a slowed progression and good therapy response.

**Discussion:** Our case of two brothers affected by MPS IV offers insight in the effects of starting ERT before appearance of major clinical manifestations. This first reported case at this young age suggests that starting therapy earlier has the potential to significantly improve patient quality of life. This conclusion is further supported by comparison to an affected older sibling who was started later on treatment. Both larger case studies and long-term outcomes are needed to support this conclusion.

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**F18**  
**Performance and Outcome of a Multi-Hospital Congenital Cytomegalovirus (cCMV) Universal Newborn Screening Program**  
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**Background:** Identification strategies for cCMV infected infants includes hearing screen and physical exam which are insensitive and miss affected infants. We established a universal, multi-hospital cCMV newborn screening program, evaluated its performance, and infant outcomes.

**Methods:** This report encompasses the cCMV screening program (newborns born at or transferred to nurseries within a 4-hospital system in Memphis, TN) between 4/1/2016-8/15/2018. Saliva was collected by swab before discharge and within 2 weeks of birth. Specimens were centrally processed using real-time CMV-PCR amplifying the UL83 gene. Newborns with positive screen tests were referred for evaluation including physical, retinal, and audiology exams, blood lab analyses, and cranial ultrasound.

**Results:** Of 13,736 newborns screened, 74(0.54%) were positive. 100% of screen-positive newborns were contacted, and 73(99%) were evaluated by a pediatric infectious disease specialist (at mean 17.7 days of corrected gestational age). Confirmatory urine was obtained on 71 before discharge and within 2 weeks of birth. Specimens were centrally processed using real-time CMV-PCR amplifying the UL83 gene. Newborns with positive screen tests were referred for evaluation including physical, retinal, and audiology exams, blood lab analyses, and cranial ultrasound. False-positive screening salivac PCR Ct values were higher than true-positives (lower viral load). Most of these false-positive newborns were breastfed. All confirmed cCMV-infected newborns were referred for early intervention programs and retinal, head-ultrasound, and hearing evaluations.

**Conclusions:** We show the feasibility of implementing a multi-hospital large-scale, saliva-based universal newborn cCMV screening program, greatly improving detection and management of affected newborns.
Miniature Urinary Carbon Dioxide Sensor
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Abstract Body:  Microcirculatory perfusion is the key indicator of patient prognosis in shock. Methods to monitor urinary carbon dioxide are clinically cumbersome and recommended against. Urinary carbon dioxide is a potential surrogate for microcirculation that is able to be more conveniently monitored. But a urinary carbon dioxide sensor with appropriate parameters, including low sample volume and high sampling frequency, remains unavailable. After researching the relationship between urinary carbon dioxide and global perfusion parameters using a commercial carbon dioxide sensor, we have developed a miniature urinary carbon dioxide sensor based on the novel application of a conductive polymer able to overcome its barriers.

Funding/Grant Support: National Institutes of Health Loan Repayment Program.

Insurance Coverage for Laparoscopic Sleeve Gastrectomy in Adolescents in the Mid-South
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Background: Bariatric surgery has been shown to be an effective treatment for adolescents with severe obesity, yet many providers express hesitance to refer adolescents for surgery due to concerns for insufficient insurance coverage based on age.

Methods: The Healthy Lifestyle Clinic, a pediatric weight management clinic, was established in 2014, and an adolescent bariatric surgery program was added in 2017. Patients ≥ 15 yrs who meet specific criteria are eligible for the bariatric surgery track. The purpose of this study was to describe insurance coverage for laparoscopic sleeve gastrectomy (SG) in the first 18 months of this program. A chart review was done to extract information about insurance approval.

Results: 16 of 17 patients (94%) for whom insurance coverage for SG was sought were approved. Of these, 10 (62.5%) had public insurance (encompassing 3 state’s Medicaid programs) and 6 (37.5%) had private insurance. 7 (44%) were < 18 yrs at the time of approval, and all 7 had public insurance. 7 (44%) patients were approved after the initial application, 5 (31%) required submission of additional information, and 4 (25%) required an appeal or peer to peer. Number of contacts with the insurance company ranged from 1 to 17 with 5 patients (31%) requiring >5. 1 patient was interested in SG but it was not an included benefit under the private insurance plan.

Conclusions: Age < 18 yrs and having public insurance have not been barriers to insurance coverage for SG in our clinic. Adolescent bariatric surgery programs should be prepared to have multiple correspondences with insurance companies. Providers should not delay referral for bariatric surgery for adolescents based on age or fear of insufficient insurance coverage.

Funding/Grant Support: This research was supported by funding from Le Bonheur Children’s Foundation Research Institute, Memphis Research Consortium, and Urban Child Institute.
Role of Non-invasive Mapping to Guide Placement of Intracranial Electrodes and Responsive Neurostimulation (RNS)

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RATIONALE: Responsive neurostimulation (RNS) has emerged as a promising alternative to resective surgery in patients with intractable epilepsy which carry a high risk of post-operative functional deficit(s). The efficacy of RNS therapy is reliant on optimal localization of the ictal onset zone, traditionally achieved utilizing intracranial recordings. Non-invasive localization of the seizure focus, as well as functional deficit zone, can limit both the need for widespread cortical mapping, and help direct decisions of surgical resection versus neurostimulation placement in patients with epileptogenic zones in or around areas of eloquent cortex.

METHODS: An 18-year-old female with focal onset epilepsy secondary to cortical dysplasia in the right leg motor cortex, was referred for epilepsy surgery evaluation and assessment of candidacy for RNS placement. Non-invasive localization of epileptiform discharges was performed through magnetoencephalography (MEG) and spatial extent of the primary leg motor cortex along the medial frontal gyrus was confirmed using transcranial magnetic stimulation (TMS). Consideration of risks and side effects of potential surgical complications indicated intracranial monitoring with the goal of RNS placement, as surgical resection had an excessively high risk of damage to the lower extremity motor cortex.

RESULTS: Interictal discharges identified with MEG localized to the right primary leg motor cortex, abutting the cortical dysplasia, and overlapping with TMS locations which elicited a response in the left tibialis anterior muscle. Given the overlap between the ictal onset zone and leg motor cortex, confirmed by electrocorticography, a decision was made to alter placement of RNS.

Funding/Grant Support: Shainberg Foundation.

Seizure onset zone identification using graph theory and convolutional neural networks

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INTRODUCTION: Brain connectivity analysis and graph theory have a great potential in identifying seizure onset zone (SOZ) in patients with epilepsy. In this study, we, for the first time, investigated identification of the SOZ using a convolutional neural network (CNN) machine learning approach in which the graph measures were used as input features and these measures were calculated based on a dynamical brain network analysis using ictal electrocorticographic (ECoG) recordings.

METHODS and RESULT: We analyzed ictal ECoG data of 19 seizures in 6 patients (4 males; aged 19-40 years) who underwent implantation of subdural electrodes before surgery, and were seizure-free at least 6 months after surgery. We calculated dynamical connectivity between subdural electrodes using Granger causality. Then outflow and inflow graph measures were extracted from the dynamical connectivity analysis. Next, a 3-dimensional feature matrix was constructed by considering outflow and inflow and their dot product. After that, we used the Alex-net CNN for feature extraction. Finally, the extracted feature vector was used in a support vector machine (SVM) to classify the electrodes into two groups: 1) visually detected electrodes as SOZ by epileptologists; and 2) non-resected electrodes, presumably electrodes outside of the SOZ. We trained, cross-validated, and tested the SVM for binary classification of electrodes, and found that the accuracy, sensitivity, and specificity of the classifier were 81.0%, 87.5%, and 79.1%, respectively.

CONCLUSIONS: We utilized a novel method to analyze ECoG recordings and our proposed method enhanced the identification of SOZ electrodes, potentially resulting in an increase in successful epilepsy surgeries.

Funding/Grant Support: This study was funded by the Children’s Foundation Research Institute & The Shainberg Neuroscience Fund.
Vaccine-like Monoclonal Antibody Single Injection Prevents RSV Disease in Healthy Preterm Infants Throughout the RSV season

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Background: RSV is the principal cause of lower respiratory tract infection (LRTI), and the second most common cause of death in infants world-wide. RSV protection using vaccines in infancy has failed. An anti-RSV human monoclonal antibody (mAb) (MEDI8897) was engineered with higher potency than palivizumab, and with extended plasma half-life. We assessed efficacy, safety, and pharmacokinetics in preterm infants 29-35 wks gestation.

Methods: 1453 Infants were randomized 2:1 to a single 50 mg IM dose of MEDI8897 (n=969) or placebo (n=484) and followed for 360 days. Injections occurred just prior to the 2016 & 17 RSV seasons in 23 northern and southern hemisphere countries. Medically-attended (MA) LRTI (outpatient or inpatient) encounters were assessed for 150 days (an entire RSV season) with nasal swabs obtained for RSV-PCR.

Results: 1417 (97.5%) subjects completed the 150-day efficacy period and 1367 (94.1%) completed the study. In MEDI8897 recipients, a 70.1% (95% CI: 52.3%, 81.2%; p<0.0001) reduction in medically attended RSV LRTI and a 78.4% (95% CI: 51.9%, 90.3%; p=0.0002) reduction in RSV LRTI hospitalization occurred. Efficacy was consistent across hemisphere, RSV subtype, and subject demographics. Adverse events (86.8% placebo; 86.2% MEDI8897) and serious adverse events (16.9% placebo; 11.2% MEDI8897) were balanced. There were no significant hypersensitivity reactions with similar proportions reported for both groups (0.6% placebo; 0.5% MEDI8897).

Conclusions: A single injection of vaccine-like mAb (MEDI8897) safely prevents RSV MA-LRTI and hospitalization in healthy preterm infants, and will now be assessed in healthy term infants.

Funding/Grant Support: MedImmune

Rapalog resistance in TSC-deficient cells is associated with EMT and aberrant Wnt/beta-catenin signaling

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Mutations in TSC1 or TSC2, which lead to the hyperactivation of mTORC1, cause Tuberous Sclerosis Complex (TSC) and Lymphangioleiomyomatosis (LAM). The mTORC1 inhibitors rapamycin and its analogues, collectively rapalogs, are approved for the renal and lung lesions in TSC and LAM. Because rapalogs do not induce apoptosis tumors shrink but do not disappear. If treatment is stopped tumors regrow. Therefore, life-long rapalog administration is required which raises a concern for the development of acquired drug resistance. Additionally, 5-10% of kidney and 20-25% of lung lesions do not respond to treatment. In conclusion, new treatment strategies are needed in order to eradicate TSC and LAM lesions.

We developed the first TSC2 (nontumorigenic in mice, metastatic to the lungs, and refractory to rapamycin. Compared to parental cells, ELT3 exhibited anchorage-independent cell survival which is resistant to rapamycin, and resistance to anoikis. Gene expression profiling identified two pathways/processes that were differentially regulated in ELT3 cells: epithelial-to-mesenchymal transition (EMT) and Wnt/beta-catenin signaling. At the protein level, ELT3 cells have loss of tight and adherens junctions proteins, and increased (and rapamycin-insensitive) Snai, nuclear beta-catenin, and MMP-2 activity. Currently, we are characterizing additional TSC2-deficient RR cell lines, and the effect of Wnt/beta-catenin inhibitors on the induction of apoptosis in TSC2-deficient cells.

Funding/Grant Support: University of Pennsylvania Orphan Disease Center (MBDR-15-103-LAM).
An antimicrobial stewardship program (ASP) can decrease antibiotic use and cost without compromising patient care
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Background: Up to 50% of antibiotics prescribed in hospitals in the United States are inappropriate or unnecessary. Antibiotic misuse can lead to adverse events and contributes to the growing antibiotic resistance public health threat.

Methods: Our ASP started in June 2011 with development of empiric antibiotic use guidelines for our critical care units. A feedback loop was utilized to engage physicians, share compliance and evaluate trends. From 2013-2014 we began prospective review of antibiotic use in individual patients and positive sterile-site cultures with recommendations for regimen changes to prescribers. Our program has also implemented a 48-hour antibiotic time-out, guidelines for community-acquired pneumonia, cystic fibrosis, and linezolid use, and led practice changes for urinary tract infections, perforated appendicitis and short bowel syndrome associated central venous line infections.

Results: Since starting our ASP, antibiotic days per 1000 patient days (DOT) has decreased from 800 to 568 (29%), 403 DOT to 216 DOT (46%), and 85 DOT to 34 DOT (60%) for all antibiotics, all monitored antibiotics, and broad-spectrum antibiotics, respectively. Yearly antibiotic purchase costs decreased from $902,996 to $345,316 (62%). Non-cystic fibrosis Pseudomonas aeruginosa isolate susceptibility to meropenem increased from 89% to 98% (p<0.001). During this time sepsis mortality decreased from a high of 11.7% to 4.9%.

Conclusion: Since initiation of our ASP, antibiotic use and costs have continually decreased. Antibiotic susceptibility patterns have improved and sepsis mortality has not increased. We conclude an ASP can decrease antibiotic use and cost without compromising patient care.

Narrowing empiric antibiotics in febrile short bowel syndrome (SBS) patients: an antimicrobial stewardship (ASP) intervention
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Background: Meropenem and vancomycin has been the traditional empiric therapy for febrile parenteral nutrition (PN)-dependent SBS patients with suspicion of CVL-related infection as it provides coverage for Staphylococcus and gut-derived, multi-drug resistant (MDR) Gram negative bacteria (GNB). Routine ASP surveillance identified that MDR CVL infections were likely rare in this population at our hospital.

Purpose: To study the frequency of blood cultures positive for MDR GNB in SBS patients with suspected CVL infection and determine the necessity of empiric meropenem.

Methods: Febrile SBS patients admitted with suspected CVL infection from March 2013 through February 2018 were identified. Blood cultures obtained within the first 2 days of admission were reviewed. Isolates of all GNB including Enterobacteriaceae known to harbor Inducible AmpC β-lactamase were assessed for susceptibility to third-generation cephalosporins.

Results: 27 patients had 134 admissions (range: 1 – 21 admissions per patient) for possible CVL infection. 5 (19%) patients never had growth on blood culture. 34 cultures contained GNB, all of which were susceptible to ceftazidime. Any AmpC-inducible GNB in previous year increased the risk of isolating on blood culture.

Conclusions: All initial blood cultures containing GNB were ceftazidime-susceptible. The empiric antibiotic regimen for SBS patients with suspected CVL infection has been revised from meropenem and vancomycin to ceftazidime and vancomycin. We continue to recommend empiric meropenem in patients with a history of AmpC-inducible Enterobacteriaceae isolated from blood culture in the previous year. ASP team will continue to monitor this patient population for infections with MDR organisms.
**F27** Extracellular vesicles spread disease phenotype to intact cells in tuberous sclerosis complex

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**Introduction:** Patients with tuberous sclerosis complex (TSC) have sporadic mutations in either of TSC1 or TSC2 genes causing increased cellular mTORC1 activity. Analysis of renal cysts lining from patients show majority of cells are genetically intact in TSC1 or TSC2 locus.

**Aim:** study if extracellular vesicles (EVs) are involved in phenotype spreading from TSC2-deleted renal cells to recipient cells.

**Method:** Media from kidney intact and Tsc2-null mIMCD3-cells (principle cells) were used to isolate and characterize EVs. EVs and the RNA/protein cargo were used to test the effect on mTORC1 activity in recipient renal cells.

**Results:** EVs isolated from principle cells and also patient’s cysts fluid had mean diameter of 300-400nm. EVs form Tsc2-null cells had pH buffering effect. Tsc2 deletion in cells showed increased mTORC1 activity and increased EVs synthesis and release. Recipient cells had higher mTORC1 activity when treated with EVs or EVs-protein/RNA from Tsc2-null cells. These data suggest that disease phenotype is conveyed via EVs from mutant cells to normal cells. Mice with Tsc2 deletion in principal cells (Aqp2CreTsc2 mice) develop renal cyst with age and urine EVs characteristics are similar to above. Aged Aqp2CreTsc2 mice develop renal cell carcinoma which implicates chronic phenotype spreading via EVs maybe involved in cellular re-programming.

**Conclusions:** Extracellular vesicles provide novel mechanism of developing renal cysts in TSC and may mediate cellular programming into renal cell carcinoma.

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**F28** Functional Disorders Present an Excessive Burden to Healthcare Resources

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To assess healthcare burden created by patients with functional neurologic disorders (FND). Single center, retrospective chart review of 103 patients, ages 8-18 years, who presented with functional symptoms, filed under the ICD-9 Code R300.1 and the ICD-10 Code F44.5, between the years of 2015-2017. The length of a patient’s stay was used as a measure of minimal resource use during hospital stay.

Out of 103 patients (75 females, 28 males, mean age: 14.6 years, and mean length of hospital stay: 31.7 hours) patients presented most commonly with seizure-like episodes (n=63), syncopal-like episodes (n=14), or limb weakness/paralysis (n=9). Length of stay was likely to be shortest in patients that presented with seizure-like episodes (n=63, standard deviation of 1.20), syncopal-like episodes (n=14, standard deviation of 1.17), and least in patients that presented with limb weakness/paralysis (n=9, standard deviation of 1.17). Most children who presented with functional symptoms were females (72.8%) and presented with seizure-like symptoms. The length of hospital stays had a wide standard deviation due to the hospital area in which the patients were evaluated, i.e., epilepsy monitoring unit versus the emergency department. The majority of patients (73.5%) returned to the hospital due to the lack of adequate follow up care.

Our study indicates that patients with FND pose a significant healthcare burden primarily due to lack of adequate follow up care. This study reveals a need for development of a standardized protocol to be used in the evaluation, management, and follow-up of patients with functional symptoms. Further investigation in this area is needed in order to facilitate development of such protocols and to address the need for adequate follow up care.
Perinatal fungal and bacterial superkingdom microbial community composition has long-term metabolic consequences

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Abstract Body: During early life, commensal intestinal bacterial community composition has long-term metabolic impact, but the role of fungi has not been explored in this context. We tested if maternal perinatal antimicrobial exposure altered fungal community composition produced short or long-term metabolic consequences. We randomized pregnant C57Bl/6J mice to either an antibiotic (penicillin, cefoperazone - PCN or CPZ 500 mg/L), an antifungal (fluconazole – FLZ 250 mg/L), or a combination of either antibiotic and FLZ from E15 until 2 wk postpartum. The resulting offspring were matured until 4 or 8 weeks (early adolescence or maturity). EchoMRI was employed to quantify body composition. We collected metabolically active tissues for analysis. Colonic and ileal contents were analyzed by Illumina MiSeq. In male and female offspring, fat body mass increased after PCN or CPZ, compared to controls. After PCN, bacterial order Bacilli was reduced, leading to an expansion of Clostridia, and fungal order Eurotiales was reduced leading to an expansion of Dothideales. After CPZ, bacterial order Alphaproteobacteria was nearly eliminated, and Bacteroidia was reduced, leading to a more extensive expansion of Clostridia. The administration of FLZ with or without antibiotics also led to increased weight gain but the hallmark was specific increases in epididymal white adipose tissues. Concurrently, FLZ led to an expansion of Penicillium and eliminated Aureobasidium, a metabolically protective fungi previously used as a dietary supplement. We conclude that early life dysbiosis of commensal fungal and bacterial communities lead to altered body weight and body fat distribution with long-term metabolic outcomes.

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Poster Presentations:

Clinical Fellows
Small Bowel Bacterial Overgrowth: When Should We Obtain Cultures

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An increase in number of bacteria in the small bowel is referred to as small bowel bacterial overgrowth (SBBO). Normally the small bowel is protected by the acidity of gastric acid, enzymatic digestion, and the ileocecal valve amongst other factors. However, children with intestinal failure (IF) are at risk for SBBO due to deficiency or absence of some or all of the above factors. Symptoms of SBBO include nonspecific intestinal symptoms such as increased stool output, feeding intolerance, bloating, steatorrhea, diarrhea, and abdominal pain. Other symptoms include anemia as a result of malabsorption and various vitamin deficiencies, most commonly Vitamin B12.

Diagnosis begins with high clinical suspicion in the at-risk patient. While the gold standard is to obtain aspiration and cultures of duodenal-jejunal fluid, it is an invasive procedure and many laboratories do not routinely perform aerobic and anaerobic cultures and therefore not routinely performed. Treatment of suspected SBBO involves antibiotics that control and suppress overgrowing both aerobic and anaerobic bacteria. Most commonly used antibiotics include amoxicillin-clavulanate, metronidazole, rifaximin, and trimethoprim-sulfamethoxazole. There are no set guidelines about which antibiotics, duration, or cycle of use. Antibiotics may be used the first 5 days of each month with increasing frequency if patients become symptomatics or they may be on multiple antibiotics on various rotation schedules.

We present the case of a 20 month old female born at 36 weeks gestation with short bowel syndrome secondary to gastroschisis with 70 cm small bowel and 20 cm colon after jejunocolic anastomosis and serial transverse enteroplasty (STEP) procedure. Patient is gast.
Amplitude Integrated Electroencephalogram (aEEG) and Umbilical Cord Drug Screening in THC Exposed Neonates

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Background: Marijuana (THC) is the most common illicit substance used during pregnancy and its prevalence is increasing with its legalization and uses for medical purposes. It is not clear whether marijuana causes withdrawal in neonates. However, studies show that prenatal exposure to THC causes impaired cognition, decreased attention span, and behavioral problems in children. Additionally, in adults THC does alter stage 3 sleep, but this has not been evaluated in newborns. aEEG is a validated diagnostic test used to detect background pattern, sleep/wake cycles, and seizures in infants. aEEG has been used extensively as a predictive modality for neurodevelopmental outcome in infants with HIE.

Objective: To assess if intra-uterine exposure to THC results in abnormal sleep/wake cycles and correlate aEEG results with umbilical cord drug levels.

Methods: Infants 35-42 wks GA were recruited from 07/2018-12/2018 with prenatal exposure to THC identified by maternal history and/or urine toxicology. UCS was ordered, a two channel bedside continuous aEEG was placed within 72hr of birth for 3-5 hrs.

Results: A total of 15 mother/infant dyads were enrolled. Mean GA and BW was 38wks and 2909 gm. Maternal UDS was positive in 93% (14/15), infant UDS was positive in 60% (6/10), and UCDS was positive in 73% (11/15). An abnormal SWC was observed in 47% (7/15), 3/8 infants with normal SWC had an undetectable UCDS. The other 64% (5/8) with normal SWC had a THC level of 204 (89,875 pg/g), a significantly lower concentration than infants with absent SWC, 135 (529, 4769 pg/g, p=0.003

Conclusion: Absent SWC in aEEG is significantly associated with high THC umbilical cord levels and warrants neurocognitive follow up.

Exploring the Role of Physiomarkers and Bioinformatic Algorithms for Earlier Diagnosis of Severe Sepsis in a Piglet Model

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Prevention of increased morbidity and mortality due to pediatric severe sepsis is highly dependent on prompt recognition and treatment, yet there are challenges in its early recognition. One area of innovation in severe sepsis recognition to be explored is the use of machine-learning. We have previously demonstrated that physiomarkers derived from machine-learning algorithms can predict pediatric severe sepsis earlier than existing clinical decision support systems. However, there is a paucity of literature on the feasibility of prospective severe sepsis prediction with the use of machine learning in humans, suggesting the need of an animal model. Adult porcine sepsis models have similar physiologic responses to humans, and although no infantile sepsis model exists, we highly suspect the responses of such a model to also be similar. Thus, we hypothesize that an infantile porcine severe sepsis model will provide high-fidelity physiomarkers that will inform predictive modeling of severe sepsis. In our study, healthy newborn piglets will be placed on continuous physiologic monitoring to establish baseline values and assess data accuracy and reliability. Sepsis-like physiologic responses will be induced via E. coli lipopolysaccharide (LPS) stimulation and continuously monitored for 48 hours. Detection of severe sepsis onset using physiomarker data generated from continuous monitoring and compared to gold standard clinical diagnosis will be analyzed by bioinformatic algorithms. From our infantile severe sepsis porcine model, we will be able to demonstrate machine-learning capabilities in the early detection of severe sepsis. We intend to use this model to inform human studies using this highly innovative technology.
Efficacy of a multidisciplinary approach for the management of pediatric obesity

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Pediatric obesity is an ongoing public health problem leading to serious medical comorbidities and psychosocial consequences. Behavior interventions encompassing dietary and physical activity modification are the cornerstones of management. We investigated the effects of 6-18 months enrollment in the Le Bonheur Healthy Lifestyle Clinic (HLC), a multidisciplinary pediatric outpatient weight management clinic. We studied 165 children with overweight/obesity enrolled in HLC for at least 18 months who also had prior BMI data available. BMI trajectory was calculated as annualized percentage of BMI at initial HLC based on the 6-18 months period to initial visit and during the 6-18 months-period after start of intervention. Gaining BMI was defined as ≥ 5%/year increase, decreasing BMI was defined as ≥ 5%/year decrease, and stable as <5%/year change.

Characteristics of the cohort: age 12.7±3.5 years, BMI 151±31% of 95th percentile, 61% female, 69% African American). At initial HLC visit, 56% were gaining, 37% were stable, and 7% were decreasing during the 6-18 month period prior to intervention. During 6-18 months of intervention, 45% were gaining, 44% were stable, and 11% were decreasing. Of the initial gainers, 51% stabilized and 9% decreased. Of the initially stable patients, 32% remained stable and 15% decreased. Of the initially decreasing patients, 8% continued to decrease and 42% stabilized. Multidisciplinary approach for weight management achieved BMI stabilization or reduction in 60% of children who had an increasing BMI trajectory at initial clinic visit. Further analyses regarding factors that predict response to intervention are underway, including genotype, nutrition and exercise habits, and demographics.

Funding/Grant Support: Le Bonheur Children's Foundation Research Institute, Memphis Research Consortium, and Urban Child Institute.

Development and implementation of a severe sepsis screening algorithm for children ages 1-5 years

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Introduction: Severe sepsis remains an under recognized problem. In efforts to improve this in the pediatric patients we have developed a screening tool for patients 6-18 years. The 1-5 year olds are a challenge, due to their ability to compensate for illness, falsely normal physical exams, and significant variation in age specific vital signs and lab results. Contributing to the delay in diagnosis and treatment of pediatric sepsis. We hypothesize that using an age-specific multi-variable approach we can modify our existing screening tool to identify severe sepsis in children ages 1-5 years with high levels of accuracy.

Methods: With IRB approval, we adjusted our code logic variables for age and reviewed age specific laboratory findings indicating acute organ dysfunction and defined respiratory dysfunction as requiring >8L/50% FiO2 excluding home respiratory support. The EMR-based algorithm generated alerts were evaluated in real-time by a critical care nurse and a physician and reviewed by a critical care physician. All patients admitted ages 1-5 year were reviewed by critical care trained nurses to evaluate for any false negatives.

Results: Of the 2063 patients screened, 238 alerted as possible severe sepsis of those 158 were true positives. For this analysis multiple alerts were possible for a single admission. We had a false negative rate of 1.2%, resulting in an 85.2% sensitivity, 95.6% specificity, a 65.5% positive predictive value and a 98.5% negative predictive value.

Conclusions: Severe sepsis can be identified with a reasonable high sensitivity in the 1-5yr age range by using an EMR-based algorithm. More prospective studies are needed to evaluate the impact of such a tool on clinical decisions and outcomes.

Funding/Grant Support: Le Bonheur Children’s Hospital Foundation Fellows Research Grant 2018-2019
Evaluating efficacy of a standardized protocol for diagnosis and management of diabetes insipidus in neurosurgical patients

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Central diabetes insipidus (CDI) is a known complication following surgical resection of an intracranial mass, specifically in the suprasellar region. Post-surgical CDI can be seen in many cases and can contribute to significant morbidity and mortality if not recognized and managed in a timely and appropriate manner. There is limited literature on the effectiveness of utilizing a treatment protocol for the management of postoperative CDI in the pediatric population.

At Le Bonheur Children’s Hospital, a protocol for prompt identification and treatment of post-surgical CDI was implemented in December 2016. We performed a retrospective cohort study to determine if having a standardized approach improved the timeliness of diagnosis and treatment and thereby decreasing the fluctuation in serum sodium values. Patients with known history of DI and those that had repeat surgeries were also reviewed in a sub-analysis. We excluded patients that required the use of vasopressin for shock.

Hypothesis: Implementation of the postoperative CDI protocol will lead to reduce serum sodium variability in the first five days post-op. Results: The pre-operative sodium range was 130-150 mmol/L. The sodium range within the first 48 hours post-op was 125-165 mmol/L and between 48 hours to 120 hours post-op was 126-169 mmol/L. Sodium levels <135 mmol/L occurred in 19% patients in first 48 hours and 26% in the period of 48 hours to 120 hours post-op. No patient had severe hyponatremia (<125 mmol/L). Sodium levels >150 mmol/L occurred in 38% patients in first 48 hours and 40% in 48h-120h.

Host Immune Response in the Pediatric Acute Respiratory Distress Syndrome

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Rationale: The Pediatric Acute Respiratory Distress Syndrome (pARDS) results, in part, a dysregulated response to a variety of lung insults. To comprehensively understand pARDS immunopathology, this study examines cell composition, single cell gene expression, and microbiologic diversity in tracheal aspirates from infants and children with and without pARDS.

Methods: Patients are enrolled if they meet consensus criteria for pARDS, are 0-12 years of age, are receiving invasive mechanical ventilation, and if the cause is a LRTI. Tracheal aspirates are collected on day one, four, and seven of mechanical ventilation from pARDS patients. Control samples from patients with and without pARDS are also being collected. Cellular samples are processed for 3' single cell gene expression, flow cytometry, and microbiome sequencing.

Results: 6 pARDS patients (age range 2 to 14 months) and 6 control patients (age range 2 months to 6 years) have been enrolled. 3' single cell RNA sequencing has been performed on 44,000 cells from these 23 samples. Immune cells predominate. Using dimensionality reduction methods, gene expression varies longitudinally over time during an individual patient’s illness course and also differs as a result of the inciting pathogen type. Subsetting on individual immune cell types reveals important immune cell phenotypes emerging with time.

Conclusions: Gene expression in tracheal aspirates from patients with pARDS due to LRTI varies as a result of day of illness and inciting pathogen. Neutrophil and monocyte/macrophage subtypes with distinct gene expression profiles are found during the first week of a patient’s illness.

Funding/Grant Support: Children’s Infection Defense Center Grant (St. Jude)
**CF09**

**Troponin Levels in Pediatric Cardiac Catheterization: A Pilot Prospective Study of a Transplant Population**  
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**Abstract Body:** Cardiac troponin levels have traditionally been thought of as a marker of myocardial ischemia and necrosis however, the etiology of myocardial damage may not be so evident. This uncertainty can lead to an extensive and costly cardiac evaluation. There is little data regarding troponin leak after cardiac catheterization in the pediatric transplant population. Understanding the troponin trend after cardiac catheterization will help prevent unnecessary interventions and provide predictive factors for elevated biomarkers post-transplant. This pilot prospective single-center study purposes to evaluate troponin levels in pediatric patients undergoing cardiac catheterization. We will compare troponin I levels of patients who have undergone orthotopic heart transplant to those who have not. We hypothesize that transplant patients undergoing cardiac catheterization and endomyocardial biopsies will have an elevated troponin level after the biopsies compared to non-transplant patients. One hundred patients between the ages of 0 and 21 years who undergo either a diagnostic or interventional cardiac catheterization will be screened and consented to partake in this study. Blood samples for analysis will be obtained at the time vascular access is obtained and prior to removal of vascular access at the end of the procedure. The troponin I assay will be run on the VITROS Integrated chemistry system and results will be considered significant if greater than 0.034 ng/mL. Data will be analyzed using multivariate analysis utilizing SPSS with the assistance of a biostatistician. A reported P value of <0.05 will be considered significant.  

**Funding/Grant Support:** LeBonheur Fellow Grant

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**CF10**

**Familial Cases of Ichthyosis and Neurodegenerative Disease with FLG and NDUFAF3 variants**  
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**Background:** Pathogenic variants in NDUFAF3 leading to mitochondrial complex I deficiency are associated with a variety of phenotypes often leading to mortality at an early age. Ichthyosis vulgaris is caused by FLG gene loss-of-function variant. Ichthyosis vulgaris renders increased risk of environmental toxin/irritant exposures causing secondary disease due to impaired functional barrier.  

**Case Series Description:** A 6-yr old boy presented with severe sensorineural hearing loss after otitis media, corneal erosions, ichthyosis, and abnormal gait. It was thought patient inherited a familial condition as three paternal family members (father, uncle, grandmother) had all experienced ichthyosis and neurodegenerative disease. Uncle and grandmother died from their condition. The patient initially stabilized on Prednisone (max 100 mg daily) but rebound symptoms and progressive peripheral neuropathy leading to generalized weakness occurred 6 months after discontinuation. Whole exome sequence analysis revealed a pathogenic variant in FLG, pR501X (heterozygous, autosomal semi-dominant), as well as a likely pathogenic variant NDUFAF3, p.C150VfxX13 (heterozygous, autosomal recessive), both paternal origin. Right cochlear implantation has improved quality of life. He is maintained on prednisone 10mg daily, CeraVe, and sunscreen SPF 70 for skin care.  

**Conclusion/Speculation:** We report familial cases of neurodegenerative disease and ichthyosis associated with two unrelated gene variants affecting barrier function and mitochondrial complex 1. It is plausible that defective barrier function exacerbates the detrimental environmental effects due to impaired function of mitochondrial complex 1 leading to neurodegenerative disease.  

**Funding/Grant Support:** This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.
Exploring the Biophysical Properties of Respiratory Secretions in Human Disease

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Respiratory secretions are complex biological fluid that play a large role in maintaining the integrity of the airway mucociliary escalator through its antimicrobial and anti-inflammatory properties. Changes in the composition and biophysical properties of respiratory secretion have been shown to have a negative impact on airway clearance in certain populations. In patients who require endotracheal intubation, these secretions have been subjectively noted to exhibit changes in viscosity over a course of illness. While this phenomenon has been anecdotally noted, to our knowledge, there have been no studies that have defined these changes in those requiring endotracheal intubation, a population that is intrinsically susceptible to poor mucociliary function. The aim is to characterize the changes in the biophysical properties of respiratory secretions over the course of mechanical ventilation in patient requiring endotracheal intubation for respiratory illness. Our study is an exploratory single-center prospective study. Study subjects are those patients who are hospitalized in the pediatric intensive care unit at Le Bonheur Children’s Hospital and require endotracheal intubation and mechanical ventilation due to primary respiratory failure. Enrolled subjects will have tracheal aspirates collected throughout their course of mechanical ventilation. Viscosity of these samples will be obtained using a commercially available viscometer and these results will be used to objectively characterize the changes in the viscoelastic properties of respiratory secretions over the course of mechanical ventilation.

Dysphagia Is For The Birds

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A 13-year-old female presented with two months of dysphagia and regurgitation of all solids and some liquids following a pneumonia. Symptoms included a 30-pound weight loss, epigastric abdominal pain, chest pain, and odynophagia. She denied diarrhea, hematochezia, melena, and constipation. Family history included lupus, thyroid disease, and type 1 diabetes. Normal vitals included a weight of 50.3 kg (63rd percentile). Oropharyngeal exam was unremarkable. She had epigastric and left lower quadrant tenderness. No distention, hepatosplenomegaly, rebound, guarding, or masses were noted. The rest of her exam was unremarkable. Other than hypernatremia to 148, CMP, CBC, LDH, uric acid, lipase, ESR, CRP, TSH, free T4, chest x-ray, and abdominal x-ray were unremarkable. The differential diagnosis included esophagitis, foreign body, gastritis, achalasia, tumor, vascular ring, cyclic vomiting, or rumination syndrome. An esophagram demonstrated a “bird’s beak” appearance and stasis of barium indicative of achalasia. This differential diagnosis included malignancy, esophagitis, scleroderma, and Sjogren’s syndrome. Gastroenterology completed an esophagogastroduodenoscopy (EGD) with dilation and biopsies. Manometry could not be obtained. Rheumatologic workup was negative. General surgery completed a Heller myotomy and Dor fundoplication. Achalasia is characterized by aperistalsis, failed lower esophageal sphincter (LES) relaxation, and high LES resting pressures due to a neurotransmitter imbalance. Evaluation with an esophagram is followed by EGD or manometry. Treatments include dilation, Botulinum toxin injection, or myotomy. This case demonstrated the importance of obtaining a full diet history and developing a broad differential.
Efficacy and Safety of the Amplatzer Vascular Plug II for Closure of Patent Ductus Arteriosus in Extremely Small Children

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Objectives: This study aims to describe the early clinical experience of using the Express LD® stent to treat pediatric patients with congenital heart disease.

Background: The Express LD® stent (Boston Scientific, Marlborough, MA) is a large diameter (6-10 mm), pre-mounted, bare metal, stainless steel stent with an open cell design that is FDA approved to treat atherosclerotic lesions in iliac arteries. This stent can be dilated up to 16-20 mm; beyond which it easily unzips as shown by previous in vitro and animal experiments.

Methods: A retrospective review of patients less than 18 years of age who have had attempted stent implantation with an Express LD® stent to help treat or manage congenital heart disease at Le Bonheur Children’s hospital since 2014 was performed. Success rate described as successful implantation of the stent in the desired location, re-intervention rates (either surgical or catheter based), and procedure related serious adverse events were documented.

Results: A total of 30 Express LD® stents were implanted in 19 patients (age 1 month – 16 yrs; median 3.5 yrs). Two patients had 3 stents, six had 2 stents and the rest had a single stent implanted. At most recent follow up (median = 19 months), ten patients (with 15 stents) have had 18 subsequent catheterization procedures. Seven stents have so far required re-dilations for recurrent stenosis. There have been no procedure related serious adverse events or during the early follow-up period.

Conclusions: It is feasible to use the Express LD® stent to treat stenotic vessels in children with CHD with no adverse events on short term follow-up. The Express® LD stent could therefore add to the existing repertoire of stents currently used in children.

A SWINE MODEL FOR THE PREMATURE INFANT PATENT DUCTUS ARTERIOSUS

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Background: The management of the Patent Ductus Arteriosus (PDA) in the premature infant is the subject of much research and controversy. An animal model would serve as an important tool in the development of new management techniques and in understanding the natural history of interventions. We predict that the anatomical measurements of the PDA of premature piglets closely resemble that of their human infant counterparts.

Methods: Eleven premature piglets born by C-section to Sows at 100 day-gestation, which correspond to 23-27 week-gestation for a human neonate, had an echocardiogram performed within the first 6-12 hours of life. Using the parasternal short axis view, each piglet’s PDA was measured for its length and diameter at the aortic and pulmonary end. These were compared to the corresponding measurements of 50 premature infants born between 23 and 27 week-gestation using an unpaired t-test.

Results: The median diameter of PDA at the aortic end was slightly higher for human infants compared to the piglets {4.4mm (IQR 3.3 to 4.9) versus 3.2mm (IQR 3.0-4.0), P=0.018 respectively}. The median diameter at the pulmonary arterial end of the infants was similar to that of piglets {3.1mm, (IQR 2.2-4.4) versus 2.8 mm (IQR 2.3-3.5), P: 0.64}. The median PDA length was similar between human infants (8.4 mm, IQR: 6 to 11.6) and piglets (7.6 mm, IQR: 7.3 to 9.6) with P=0.89.

Conclusion: By echocardiogram, piglets born at 100-days gestation have a PDA that is tubular and similar in morphology to that of human premature neonates born at 23-27 week-gestation. While this study is limited by population size, similarity of sizes between the two groups shows a premature swine PDA is a viable model for a premature infant PDA.
Machine-learning applied to continuous physiologic data may predict intracranial hypertension in critically ill children

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Rising intracranial pressure, when severe and progressive, can compromise cerebral perfusion, cause herniation, and result in death. Currently, recognition of intracranial hypertension (ICH, an ICP > 20 cm H2O) relies upon either characteristic hemodynamic or neurologic changes which occur very late, or invasive ICP monitoring which is sometimes deferred due to associated risks. Other work has shown that higher-order processing of streaming physiologic data can uncover hidden signatures that are predictive of clinical events. In this study, we hypothesize that machine-/deep-learning analyses of continuous heart rate and invasive blood pressure monitoring can predict downstream ICH events. All patients > 2 years old who have undergone ICP monitoring while having an arterial line and routine ICU monitoring will be eligible for our phase I analysis. A subset of patient data will be used to train machine-/deep-learning models to predict ICH events within 30-60 min, and the performance of the predictive models generated will be determined on a different test subset of patients. Results will provide a proof-of-concept and/or an understanding of the shortcomings and data processing steps necessary to stage a more refined, prospective study. We are uniquely suited to perform these studies because few centers have the necessary continuous physiologic data collection and transfer pipelines as well as experts in machine-learning methodologies. Theoretically, early, non-invasive prediction of ICH could allow for preemptive management of ICH as well as guide decision-making for invasive ICP monitoring.
Poster Presentations:
Residents
**R01** Making Headway for Discussions About Concussions: Experiences of Former High School and Collegiate Student-Athletes

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**Purpose:** This study is to identify information influencing athletes’ attitudes towards reporting their concussions and the perceived trajectory of their recovery both athletically and academically.

**Methods and Study Design:** Structured, qualitative individual interviews were conducted with 25 former high school and collegiate athletes who experienced sports-related concussions. Main outcome measures included influencers in perceptions of concussions, the reporting of concussions, properly recovering from concussions, and implications of increased awareness of concussions.

**Results:** Eight major themes were identified regarding the participants’ experiences with sport-related concussion: optimism bias, invisibility of the injury, diagnostic barriers, desire to play, external support and pressures, uncertainty of long term prognosis, generational factors, and protection of future athletes.

**Conclusions:** Our findings support that underreporting of concussions among those players interviewed is related to misperceived risk, lack of education, and a struggle between internal and external pressures to play through injury. However, those who did seek medical and academic support, often did receive the necessary aid.

**Significance:** The themes discovered through this research aid in understanding the underreporting of concussions and help lay a foundation for addressing these items in protecting future athletes, as we show athletes’ perceptions of concussions are changing.

**Funding/Grant Support:** This work was supported by the University of Tennessee Health Science Center College of Nursing Dean’s Research Fellowship Award (PI: Stanfill).

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**R02** Infantile Cortical Hyperostosis: Case report of an uncommon mimic of common pediatric disorders

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Infantile cortical hyperostosis or Caffey disease is a rare disorder of infancy characterized by fever, acute periosteal inflammation, cortical thickening and soft tissue swelling. Involvement of the mandible, scapula, clavicle, skull, ileum and long bones is frequently observed. We present a case of a previously healthy 4-week-old term male infant who presented with a two-day history of fever, fussiness and left clavicle swelling. There was initial concern for nonaccidental trauma as well as multifocal osteomyelitis for which he received treatment. His osseous survey revealed pronounced periosteal reaction about the clavicle. Biopsy of the lesion was sent to rule out oncologic and infectious etiologies however in conjunction with radiologic findings was felt to be most consistent with Caffey disease. Lab indices were significant for elevated inflammatory markers and leukocytosis. Specific genetic testing was also sent to rule out osteogenesis imperfecta and was negative. He was discharged after clinical improvement but was readmitted 1 month later due to limited motion of his right leg. A repeat osseous survey revealed callous formation at the site of the previous left clavicle lesion and periosteal reaction/hyperostosis of bilateral scapulae, bilateral ribs, right tibia and mandible. He was treated with acetaminophen, improved clinically and was discharged. The diagnosis of Caffey disease may be delayed as it can mimic disorders including non-accidental trauma, osteomyelitis, hypervitaminosis A, bony tumors and scurvy. A high index of suspicion is warranted with young infants presenting with fever, fussiness and bony lesions as there is no specific lab test that can be used to rule out this disease entitiy.
Efficacy of Once Weekly Folic Acid Supplementation in Pediatric Inflammatory Bowel Disease

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Background: Methotrexate is a folate analogue used in treatment of pediatric inflammatory bowel disease. The current recommendation is daily folic acid supplementation to prevent folate deficiency and reduce side effects, such as nausea, stomatitis, and hepatotoxicity. The goal of this prospective study was to evaluate the efficacy of once weekly folic acid supplementation with the goal of improving compliance and health-related quality of life.

Methods: We included patients ages 2-18 (at diagnosis) with inflammatory bowel disease on standard methotrexate dose of 15 mg/m² weekly and folic acid 800 mcg daily. Baseline folate level, routine labs, and symptom questionnaire were completed. Once enrolled, patients were switched to weekly folic acid to be taken in conjunction with methotrexate. Monthly phone calls with standardized questionnaire assessed compliance and new or increased unexplained symptoms. Follow-up labs were obtained 6 months after enrollment.

Results: 31 patients age 7 to 21 years old were enrolled. 5 patients were withdrawn due to poor compliance, missing clinic appointments, or transition to adult gastroenterology. Of the remaining 26 patients, 21 had Crohn’s disease (17 with ileal involvement), 5 had ulcerative colitis; 12 patients were on methotrexate as combination therapy with a biologic. At 6 month follow up visit, all patients had stable folic acid levels (> 5.38 µg/L) without evidence of macrocytic anemia. Monthly questionnaires showed controlled symptoms without adverse events.

Conclusion: Once weekly folic acid supplementation is sufficient to maintain normal folate levels without development of adverse side effects in pediatric inflammatory bowel disease patients on methotrexate.

Funding/Grant Support: LeBonheur Clinical Fellows Grant

Eating Disorder Screening in an Urban Pediatric Clinic

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Background: Eating disorders are a heterogeneous group of psychiatric illnesses that occur in 1-7% of adolescents. They are associated with many medical comorbidities and have the highest likelihood of death among all psychiatric disorders. Despite these risks, they are under-diagnosed in adolescents both at the national level and in our local clinic setting. The purpose of this study is to establish the feasibility of screening in our clinic, estimate our population’s prevalence, and identify high-risk groups for further studies.

Methods: Patients ages 10-21 years presenting to our general pediatric or gastroenterology clinics were screened for eating disorders using the SCOFF questionnaire, a validated 5-question survey that targets food-related behaviors and body image. After identifying patients with positive screens, we performed a retrospective review of secondary characteristics, such as weight percentile, BMI change, gender, age, and chief complaint. Each patient with a positive screen was notified and referred to adolescent clinic.

Results: The SCOFF questionnaire was successfully implemented into both clinics, and the percentage of positive screens surpassed the national average of eating disorders. Of 146 surveys completed to date, 17 were positive. Preliminary findings indicate that children ages 11-16 years old are at higher risk; less predictably, a third of positive screens were from males and half were from obese patients.

Conclusion: The SCOFF questionnaire is a feasible screening tool in our clinics that increased identification of patients who are at risk for eating disorders. Further, it serves to help providers recognize that these patients may not have a low BMI or be female.
Lipshutz ulcers: Case report of an adolescent female with recurrent genital ulcers

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Idiopathic vulvar aphthosis (Lipshutz ulcers) also known as acute genital ulcers is a rare, self-limited condition characterized by the rapid onset of painful, necrotic ulcerations of the vulva or lower vagina. It is most commonly seen in sexually inactive adolescent girls or young women and may be preceded by influenza-like or mononucleosis-like symptoms. We present the case of a previously healthy 14-year-old female who presented with a 3-day history of fever and labial pain/ulceration. She had been seen by her primary gynecologist prior to admission who sent screening labs for herpes simplex virus (HSV), HIV, syphilis, gonorrhea and chlamydia, all of which returned negative. During admission due to concern for labial cellulitis/possible infected Bartholin cyst she was started on antibiotics. Her lab indices were significant for elevated inflammatory markers and urinalysis positive for leukocyte esterase. She was admitted two years prior for similar symptoms and concurrent pneumonia. At that time, she was screened for sexually transmitted infections with the aforementioned labs, all of which were negative. During both admissions she vehemently denied any sexual activity/abuse and lesion swabs and serology were negative for HSV. A biopsy of the lesion was most suggestive of idiopathic vulvar aphthosis. Dermatology and Gynecology were consulted and agreed on this diagnosis. She clinically improved on antibiotics and was discharged home. Idiopathic vulvar aphthosis is a diagnosis of exclusion as it is important to rule out HSV. Many cases have been linked to Epstein Barr virus, Mycoplasma pneumoniae and Influenza. Treatment is mainly supportive with emphasis placed on pain management and disease recurrences are common.

Surgeon- & Anesthesiologist-Perceived Barriers to Initiating Enhanced Recovery After Surgery in Pediatric Colorectal Patients

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Background: Enhanced recovery after surgery (ERAS) protocols have been shown to improve length of stay and complications in adults. Recently these pathways have been proposed in pediatric populations.

Objective: The aim of this study was to determine surgeon and anesthesia perceptions and identify potential barriers to implementation of ERAS in pediatric colorectal patients aged 5-17 years old.

Methods: Following IRB approval, attending anesthesiologists and surgeons at a free-standing children’s hospital were surveyed and maintained in RedCap database. Where applicable, survey responses were “never” (0%), “rarely” (10-24% of patients), “occasionally” (25-49% of patients), “frequently” (50-74% of patients), and “almost always” (75-100% of patients).

Results: The response rate was 100% (n=7) for surgeons and 60% (n=9) for anesthesiologists. Among anesthesiologists, 44.4% never and 55.6% rarely participate in pre-op multidisciplinary counseling with patients. Time constraints and lack of materials to provide counseling were universally cited as barriers to multidisciplinary pre-op counseling. Non-opioid analgesics are never (11.1%), rarely (77.8%), or occasionally (11.1%) administered pre-op. Most common barriers to pre-op non-narcotic use is efficient drug availability (50%), surgeon preference (37.5%), and pre-op analgesics are thought to be not helpful (12.5%). No surgeon uses a dedicated wound closure instrument tray. Post-op, patients are allowed to drink clear liquids on POD#0.

Conclusions: Survey results indicate significant variability in current treatment of pediatric patients undergoing colorectal surgery. Barriers to implementation of ERAS protocols will be the focus of education.
**R07**

**Clinical Outcome Comparison of Total Body Irradiation Before and After Chemotherapy in Preparative Regimens in Allogeneic STE**

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**Introduction:** Hematologic malignancies may require, at one point during their treatment, allogeneic bone marrow transplantation. Preparative regimens prior to transplantation are administered to provide sufficient immunoablation to prevent graft rejection, reduce the tumor burden and empty the host bone marrow for donor marrow cells. Chemotherapy combined with total body irradiation is a common preparative regimen, however evidence of the optimal order remains limited.

**Method:** A retrospective chart review was performed with information already available in the medical record. Patients were analyzed based on if the patient received chemotherapy followed by total body irradiation (Chemo/TBI), if the patient received TBI before chemotherapy, or if no TBI was administered. Additionally, timing of antithyocyte globulin administration (early, late, or no ATG) was analyzed as this could represent a significant variable in our results.

**Results:** The TBI/Chemo group had a 78.9% survival rate, chemo/TBI group had a 55.3% survival rate, and no radiation group had a 65.0% survival rate. Demographics, donor type, status before transplant, diagnosis, decade of transplant and Graft versus Host Disease were roughly the same between the groups. The No ATG group had a 41.3% survival rate, Early ATG group had a 66.7% survival rate, and late ATG group had a 72.0% survival rate. The No ATG group was almost entirely comprised of sibling donors and occurred in the 1990s to early 2000s, while the early and late ATG groups were almost entirely matched unrelated donors and occurred in the early 2000s to present. The relapse rate for the TBI chemo group was much lower than Chemo/TBI and no radiation groups (7.9% versus 31.8% and 30.0%, respectively).

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**R08**

**ERCP vs MRCP in Children with Choledocholithiasis**

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**Intro:** Endoscopic retrograde cholangiopancreatography (ERCP) can be difficult in children. Some centers utilize magnetic resonance cholangiopancreatography (MRCP) to determine necessity of invasive procedures for suspected choledocholithiasis (CD). We hypothesized MRCP would be less accurate for diagnosing CD when compared to both ultrasound and the gold standard, ERCP.

**Method:** Records of children at three pediatric hospitals undergoing both ERCP and cholecystectomy from 2006-2016 were reviewed. Trauma and complicated pancreatitis were excluded. Data obtained from ERCP, ultrasound and MRCP including common bile duct (CBD) size, presence of stone or sludge, intervention, length of stay (LOS) and pertinent lab values were compared using correlation and multiple linear regression.

**Result:** Thirty-four of 164 patients, age 9-18, underwent both perioperative MRCP and ERCP in addition to cholecystectomy; 155 had ultrasounds. The sensitivity and specificity of MRCP for identifying CBD stone was 96% and 30% with overall accuracy of 76%. The positive likelihood ratio (PLR) was 1.4 and negative (NLR) 0.1. Eight inaccurate-MRCP patients had an elevated bilirubin (1.4-7.8, mean 3.8) and dilated CBD. These patients had an intraoperative cholangiogram but required post-operative ERCP for treatment regardless of the negative MRCP. Mean LOS was 1.42 days longer in patients undergoing MRCP.

**Conclusion:** Though accurate when positive, negative MRCPs do not exclude CD. MRCP increases length of stay and cost, and may be unnecessary when ultrasounds have similar accuracy. Pediatric centers without direct access to ERCP should consider performing intraoperative cholangiogram at cholecystectomy rather than ordering a MRCP to decrease LOS and costs.
**Poster Presentation - Residents**

**R09**  
Retrospective review of high-risk adolescents eligible for Pre-Exposure Prophylaxis (PrEP) therapy for HIV  

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**Background:** In 2014 in the US, adolescents aged 13-24 made up 22% of all new HIV infections. In 2012, the FDA approved Truvada as pre-exposure prophylaxis (PrEP) to reduce the risk of sexually acquired HIV in high-risk patients. The Adolescent Trials Network has completed 2 pilot studies to assess feasibility of PrEP to adolescents, the most recent resulting in the expanded indication of Truvada for individuals aged 15-17. The primary goal of this study was to identify adolescent patients at the ULPS General Pediatrics Clinic that would meet clinical criteria for PrEP therapy.

**Methods:** A retrospective chart review included all patients ages 11-19 that presented to the ULPS General Pediatrics Clinic from March 2018-2019. The CDC 2017 Clinical Practice Guidelines were used to identify patients based on reported sexual activity, contraceptive use, and confirmed history of bacterial sexually transmitted infection.

**Results:** We reviewed the charts of 1038 adolescent patients seen in the General Pediatrics clinic between March 2018-2019. 27 patients met clinical criteria for PrEP therapy (0.026%). Of those, 19 were male and 8 were female. 2 additional patients were identified as high-risk patients that may benefit from PrEP without meeting criteria, one patient who engaged in isolated oral MSM and another with a high number of sexual partners.

**Discussion:** Using the CDC criteria, a small percentage of adolescent patients in our clinic would be candidates for PrEP therapy, potentially preventing new HIV infections in this patient population. Resident and provider education would be beneficial in increasing recognition and referrals for treatment.

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**R10**  
A Fruit-free But Not Fruitless Dietary History: a case report of scurvy in a pediatric patient  

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Scurvy is caused by a deficiency of vitamin C and is rarely seen in industrialized countries, however, children with restrictive diets due to psychiatric or developmental problems are still at risk. A 5-year-old male with a history of autism presented to the ED with bilateral upper and lower extremity pain for 11 days, decreased PO intake, weight loss, and recurrent gingival swelling and bleeding. Outpatient work up and imaging were negative. In the ED, he was afebrile, but exam was notable for gingival hyperplasia, an upper incisor hematoma, and gait favoring the right leg with tenderness of distal right femur. Lab work up showed ESR of 27 but normal CMP, uric acid, LDH, CBC, CK, and UA. X-rays showed subtle right proximal to mid femoral medullary sclerosis with questionable thin periosteal reaction. He was admitted for IV antibiotics and further workup. Inpatient MRI showed increased signal intensity in the distal femoral and proximal tibial metaphyses, and a focus of increased signal in the midshaft of the right femur, concerning for multifocal bone marrow neoplasia. Follow up abdominal US and CXR were normal. Additional history revealed a “very picky diet” restricted to only 3 foods. Due to the constellation of hemorrhagic gingival disease, bone pain, and pseudoparalysis in an autistic patient with severely restricted diet, a nutritional work up showed critically low Vit C. Empiric treatment with ascorbic acid was started. Within 48 hours, the patient had improved pain, resolved limp, and resolving gingival disease.

This case illustrates the importance of a detailed dietary history and consideration of potential chronic malnutrition, as early vitamin supplementation represents a cheap and practical intervention.
Resident comfort level with adverse childhood experiences (ACEs) and social determinants of health (SDOH)

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**Background:** While the impact of ACEs and SDOH on child health is well documented, knowing how to effectively screen in the primary care clinic is a new area of exploration. We hypothesized that residents had little knowledge about addressing ACEs/SDOH and that this would vary by level of training.

**Methods:** A 30 question survey was sent by email to residents from the UTHSC pediatrics and med-peds programs. The survey questioned post-graduate year (PGY) status, comfort level screening for and knowledge of ACEs/SDOH, and factors influencing these. We performed descriptive statistics and compared proportions using Chi-square and Fisher's Exact tests.

**Results:** Of 121 residents, 44 surveys were completed (36%). There was no association between PGY and percent of well child checks where ACEs are assessed (63% vs 63% vs 56% vs 33%, p=0.9). There was no association between PGY level and comfort level discussing ACEs (38% vs 38% vs 33% vs 0%, p=0.8). Most (75%) reported their level of knowledge on ACEs as “some” and 84% reported they “sometimes know” how to address ACEs. The most cited reasons for not assessing ACEs were lack of time (91%), not knowing what to do (54%) and feeling uncomfortable (40%).

**Conclusion:** PGY is not associated with comfort level or decision to screen for ACEs in the clinic setting. Most residents have only “some” knowledge of ACEs and how to assess for them. The most significant barriers to screening and addressing ACEs are lack of time and not knowing how to treat or refer for a particular ACE.

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Improving Sexually Transmitted Infection Screening Rate in Inpatient Pediatric Patients

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**Background:** Sexually transmitted infections (STIs) are a group of infectious diseases that can cause acute illness and life-long health effects. Nearly half of all diagnosed cases occur in adolescents and young adults, ages 15-24. The American Academy of Pediatrics and Centers for Disease Control provide guidelines for routine STI screening for all sexually active adolescents. Despite these recommendations, screening rates in adolescents admitted to our hospital are low. The purpose of this study is to use quality improvement methodology to improve screening for HIV, gonorrhea, chlamydia, and syphilis in adolescent patients in an inpatient setting.

**Methods:** Eligible patients included all adolescents ages 14-18 admitted to our hospital over 6 months. Following baseline data collection, we introduced three interventions; rates of sexual history documentation and STI screening were recorded after each one. Interventions included providing resident education on the importance of STI screening, introducing prompts for sexual history taking in the History and Physical form, and providing residents with a “badge buddy” as a sexual history taking template.

**Results:** Prior to the intervention, 50% of patients ages 14-18 were asked questions regarding their sexual histories; 30% of patients were tested for STIs. After three interventions, sexual history taking improved to 70%, and STI screening rate improved to 53%. This represents an improvement in the rate of STI screening by 23%.

**Conclusions:** Simple interventions targeted at improving sexual history taking and knowledge of STI testing recommendations led to a significant increase in STI screening in an inpatient adolescent population.
**R13**

**Resident Led Initiatives to Improve Adolescent Idiopathic Scoliosis (AIS) Screening**

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**Background/Purpose:** Scoliosis is a common problem in adolescence, affecting 2-3% of the population, with the age of onset 10-15 years old. The American Academy of Pediatrics (AAP) recommends screening for AIS beginning at 13 years old for males and at 10 years old for females. The US Preventive Services Task Force (USPSTF) 2018 guidelines do not recommend routine screening.

**Hypothesis:** We hypothesized that the conflicting recommendations led to a low rate of routine AIS screening in our resident run clinic (RCC). Objectives were 1) to determine baseline data of AIS screenings performed at adolescent well child checks (WCC) and 2) to improve the rate of screening by 25% through a resident run quality improvement (QI) project.

**Methods:** Baseline data from Jan-July 2017 WCC for patients ages 10-15 were reviewed to assess the rates of AIS screening. PDSA (Plan Do Study Act) cycles with targeted interventions were done starting Sept 2018 including education on the forward bend test, sociometer use, documentation, and referral guidelines. Two scoliometers were obtained and Electronic Health Record (EHR) modifications done to allow for designated space to document the spinal measurement and exam. Post intervention data was collected over 9 months.

**Results:** Baseline preintervention data in adolescents presenting for all WCC ages 10-15 years data revealed a low AIS screening rate of 4.5%. Post-intervention data showed an increase in AIS screening to 12.6%.

**Conclusions:** Our study revealed a low rate of baseline AIS screening in our RCC likely due to confusion among trainees due to conflicting recommendations from AAP and USPSTF. Our efforts to improve the AIS screening did alter the rate but was less than intended.

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**R14**

**Furthering resident education as a means to reduce diabetic ketoacidosis admissions**

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**Introduction:** Type 1 Diabetes (T1D) is an autoimmune condition that results in loss of pancreatic beta cells, insulinopenia and, without adequate insulin administration, can lead to life-threatening diabetic ketoacidosis (DKA). Responding to high blood sugars and ketones appropriately (Referred to as sick day rules) is important to avoid DKA and hospitalization. Addressing home management is an important part of inpatient DKA management and may help with prevention. Our current aim is to improve resident understanding of sick day rules so that we can provide cohesive care for our families.

**Methods:** All patients admitted to Le Bonheur Children's Hospital for DKA in a six-month period were evaluated via retrospective chart review. Documentation of abdominal pain, nausea, and vomiting, and if patients had been following sick day rules was analyzed.

**Results:** Ninety-four patients admitted to Le Bonheur with a diagnosis of DKA were studied. Patients with new onset diabetes were excluded. A total of 66 patients with previously diagnosed diabetes who were admitted to the hospital for DKA. Upon admission to the floor, the admitting physician only asked about checking for ketones at home 24% of the time and use of sick day rules 18% of the time.

**Conclusion:** There is room for significant improvement of resident and education regarding management of DKA at home and in the hospital. We hope to indirectly improve DKA admission rates and outcomes at the same time we improve resident understanding.
Purpose: Urinary tract infections (UTI) are common in children and frequently over-diagnosed and overtreated. UTI visit data were utilized to create a care pathway to guide diagnosis and management of UTI in both settings.

Methods: Children 0-18 years of age, treated in the emergency department (ED) and inpatient (IP) settings at Le Bonheur Children’s Hospital (LBCH) from 2013-2015 for uncomplicated UTI were included. We collected demographic, clinical and laboratory data via chart review. UTI was defined as >10,000 colony forming units/mL of a pathogen in urine culture. We determined urinalysis (UA) results predictive of UTI. Culture and susceptibility results were used to assess risk factors for resistant bacteria.

Results: Presence of UTI was predicted by any of the following on UA: ≥1+ leukocyte esterase (odds ratio [OR] 3.1, 95% CI 1.8-5.4), nitrates (OR 18.2, 95% CI 8.9-37.5), >10 white blood cells (OR 3.3 95% CI 2.1-5.4). Limiting empiric therapy to patients with one or more of the above criteria would reduce unnecessary antibiotic prescriptions by 11% and miss only 2.5% of UTIs. E. coli and K. pneumoniae accounted for 85% of UTIs. 92% of UTIs were 1st generation cephalosporin susceptible; thus, cephalaxin or cefazolin would be optimal for empiric treatment. We are now using these data to create a UTI care pathway for ED and IP visits for LBCH which will be presented and implemented hospital wide.

Conclusion: Overdiagnosis and overtreatment of UTI leads to unnecessary antibiotic use and contributes to antibiotic resistance. Implementation of the UTI care pathway should reduce antibiotic use and promote use of narrow spectrum antibiotics at LBCH.
Poster Presentations:
Postdoctoral Fellows
**Poster Presentations-Postdoctoral Fellows**

**PDF01**

Siglec-1 negatively regulates TLR4-mediated inflammatory response by uniquely controlling Src phosphorylation at Ser17

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**Introduction:** Sepsis are mainly caused by Gram-negative bacteria, and Toll-like receptor 4 (TLR4) sensing of LPS plays pivotal roles in the pathogenesis of sepsis. Identifying key regulators that govern LPS-induced TLR4 activation of inflammatory pathway will facilitate the understanding of the regulatory mechanisms of inflammation and provide potential targets for sepsis therapy.

**Results:** LPS induced robust Ser17-phosphorylation (dispensable for kinase activity) of Src kinase in RAW 264.7 and THP1 cells. Silencing of Siglec-1, a membrane-bound lectin, dramatically abrogated Src phosphorylation at Ser17 induced by LPS in RAW 264.7 cells, whereas did not affect Src phosphorylation at Tyr416 and Tyr527, two critical sites that determine Src kinase activity. Furthermore, the phosphorylated levels of P38, NF-kB, JNK, ERK, Syk and PKC triggered by LPS remained comparable between scramble shRNA-transduced and Siglec-1 shRNA-transduced Raw 264.7 cells. Strikingly, LPS failed to induce Ser17-phosphorylation of Src kinase in Siglec-1-/-BMDMs compared with WT BMDMs; no defects on Tyr416 and Tyr527 sites were observed. RAW 264.7 cells with Src depletion showed enhanced cytokine production by LPS treatment. Reconstitution of WT Src and Src-S17D mutant, but not Src-S17A mutant, rescued the elevated inflammatory cytokines in Src knockdown cells with LPS challenge. Co-IP identified a novel interaction between Siglec-1 and Src, and over-expression of DAP12 enhanced the interaction in 293T cells.

**Conclusion:** Siglec-1 negatively regulates TLR4-mediated inflammatory response by uniquely controlling Src phosphorylation at Ser17. Pharmacological targeting Ser17 in Src may provide promising strategies to fend off sepsis.

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**PDF02**

F508del CFTR mutation affected ciliary structure in CF airway epithelial cells which contribute to the mucus accumulation

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**Background:** Cystic fibrosis (CF) is a life-threatening genetic disorder caused by loss-of-function in the cystic fibrosis transmembrane conductance regulator (CFTR) protein. The symptom of CF is induced by the increased mucus layer in the airway surface, which usually blocks the airways and promotes chronic bacterial infections and inflammatory lung damage. Previous study believe the accumulation of mucus was caused by the dehydration and lack of liquid. There is limited research to study the function of CFTR in regulating the clearance of mucus (mucociliary clearance (MCC)). Our study displayed other evidences to show that the CFTR mutation affected the morphology of cilia, which may affect the ciliary mucus clearance function and therefore contribute to the accumulation of mucus.

**Method:** We analyze the mucus accumulation, morphological changes in tight junction and motile cilia structure in the human airway epithelial cells through immunofluorescence, western blot and QPCR. We also analyzed the MAPK and Hedgehog signaling pathway change in the CF airway epithelial cells, which have been shown to be related with morphology and function of motile cilia.

**Result:** The mucus is accumulated in the CF trachea and bronchus, while the mucus expression is not changed. The tight junction structure and the apical localized acylated tubulin is affected in CF airway epithelial cells. CFTR mutation leads to the hyper activation of MAPK pathway, attenuated Hedgehog pathway and increased expression of LPA receptors.

**Conclusion:** The CFTR mutation affected the ciliary structure of the airway epithelial cells, and the defected ciliary structure in CF airway epithelial cells contribute to the mucus accumulation.

**Funding/Grant Support:** NIH grant (R01 HL123535 to W.Z.)
PDF03

**Systems genetics analysis defines novel gut-heart axis in TMEM43/LUMA induced arrhythmogenic cardiomyopathy**

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**Background:** The pathogenic variant in transmembrane protein 43 (TMEM43/LUMA), p.S358L, causes arrhythmogenic cardiomyopathy (ACM), however etiopathological mechanisms remain controversial. This study investigated S358L-TMEM43-associated gene-pathophysiology interactions using systems genetics approach.

**Methods:** Mutant knock-in Tmem43S358L mice were generated for phenotype and transcriptome assessment. The BXD family of inbred mice were used as murine genetic reference population (GRP) for genotype-phenotype correlation, genetic enrichment, eQTL and co-expression network analyses. Human myocardial tissues were analyzed by histology and immunohistochemistry.

**Results:** Tmem43S358L mutants displayed right and left ventricular (RV and LV) chamber dilation, systolic dysfunction, arrhythmias, and myocardial fibro-fatty infiltrations consistent with human ACM. In BXDs, expression of cardiac Tmem43 negatively correlated with heart mass and heart rate, but positively associated with plasma HDL and LDL levels. The expression of Tmem43 also correlates with that of Ppargc1a (Pgc1a) in cardiac and intestinal tissues. In Tmem43S358L heart, S358L downregulates Tmem43 and Pgc1a and diminishes PPAR\(^\alpha\) activity. Conversely in Tmem43S358L intestine, PPAR\(^\alpha\)-regulated genes responsible for cholesterol, bile acid, and lipid transport are elevated leading to hyperlipidemia. Altered localization of TMEM43 was confirmed in myocardial tissues collected from ACM patients.

**Conclusion:** TMEM43 is important in heart and intestinal function and homeostasis. The S358L-Tmem43 variant downregulates cardiac Tmem43 and Pgc1a and PPAR\(^\alpha\) signaling leading to ACM in vivo. In the gut, S358L-Tmem43 elevates PPAR-signaling, potentially triggering ACM pathophysiology.

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**Surgically induced weight loss corrects obesity driven tumor progression**

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Obesity in pediatric patients is associated with increased cancer incidence in adulthood, setting the pace for escalating cancer rates. We study changes to the tumor microenvironment in Triple Negative Breast Cancer (TNBC), an aggressive subtype associated with obesity. Research suggests that weight loss prior to cancer onset is protective, but mechanisms remain unknown. Indeed, retrospectively, bariatric surgery-induced weight loss reduced the risk of BC, with the greatest benefit detected in pre-menopausal patients with tumors like TNBC. We aim to test various weight loss approaches in obese mice to reduce TNBC with the goal of developing a therapeutic that mimics weight loss or surgery-associated metabolites. We hypothesize surgically-induced weight loss will diminish obesity-associated tumor progression. Female C57BL/6J mice placed on a high fat diet (HFD) at weaning became obese while mice fed a low fat diet (LFD) remained lean. Obese mice underwent Vertical Sleeve Gastrectomy (VSG) bariatric surgery, which reduced body weight and adiposity compared to obese mice receiving a sham surgery. Upon weight stabilization two weeks post-surgery, TNBC cells were transplanted into the mammary fat pad. As expected, tumor growth was increased in obese mice versus lean. Importantly, both dietary and surgical weight loss rescued obesity-driven tumor progression. We identified changes in infiltration of leukocytes into the tumor that could be responsible for the beneficial effects of weight loss on tumor progression. In conclusion obesity promotes a pro-tumor microenvironment, that can be corrected through surgically induced weight loss potentially through reprogramming the immune microenvironment.

**Funding/Grant Support:** TREC R25CA203650
**PDF05**

**MicroRNA Modulation of Human Astrovirus Infection and Epithelial-Mesenchymal Transition**

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Astroviruses are a leading cause of infectious diarrhea in the young, immunocompromised, and the elderly. Notably, astrovirus infection causes diarrhea by a poorly understood mechanism that is distinct from other viruses and enteric pathogens. Despite not killing infected cells in vitro or in vivo, astroviruses cause disruption of the epithelium and increased barrier permeability during infection. We have recently demonstrated that astrovirus impacts barrier permeability by inducing epithelial cells to undergo epithelial-to-mesenchymal transition (EMT), a process by which epithelial cells lose specific markers including ZO-1, occludin, and E-cadherin, while acquiring mesenchymal markers like vimentin. Regulation of EMT is complex, but in the intestines, microRNAs (miRNAs) are known to play a critical role. Therefore, we hypothesized that astrovirus-induced EMT is mediated by miRNA. To test this hypothesis, we first performed a screen of miRNA levels during infection. Significant differences were seen in both up- and down-regulated miRNAs. To complement this strategy, we identified three human microRNAs that had high homology to the human astrovirus-1 genome. Using miRNA mimics and inhibitors we showed that one of these miRNAs, hsa-miR-487a, contributes to astrovirus-induced EMT and positively influences influenza virus infection. Furthermore, an astrovirus clinical isolate lacking the miR-487a sequence causes a slower decrease in barrier integrity following infection compared to strains with the miR-487a sequence. Together these data demonstrate that astroviruses utilize miRNA to promote infection and induce cells to undergo EMT.

**Funding/Grant Support:** ALSAC

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**PDF06**

**Gut Microbial Metabolites Influence Lipogenesis in a Reductionist Microbiota Model of Obesity**

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Emerging data continue to portray a complex and dynamic relationship between host and microbes which are now recognized as important factors in multifactorial diseases such as obesity. Defined microbial communities such as Altered Schaedler Flora (ASF) allow focused investigation of specific host-microbial interactions in a reductionist system. Our previous data revealed colonization of germ-free mice with 4 of the 8 defined ASF species significantly accelerated weight gain compared to germ-free controls. Increased weight was characterized by significantly larger adipose tissue deposits but no changes in bile acid pools. Insulin was higher in high fat fed ASF animals indicating insulin resistance in these animals. These observations suggested that ASF induces higher fat mass gain and concomitant insulin resistance. We hypothesized production of a small bacterial molecule derived under high fat was sufficient to drive adiposity. To elucidate the potential microbial mechanism driving adiposity, we cultured each species in high-fat (hf) or low-fat (lf) simulated intestinal media (SIM), providing many nutrients found in the gut in vivo. Spent media was added to 3T3-L1 cells for 72 hours for histology and lipolytic and lipogenic genes assessment. Results: In 3T3-L1 cells, genes related to lipogenesis (e.g. FASN, ACACA) showed increased expression whereas genes related to lipolysis (e.g. ATGL) showed decreased expression in ASF360 hsSIM relative to ASF360 lfSIM. Currently, we are focusing to confirm our hypothesis through fractionation of the ASF360 hsSIM media. Adipocyte assays will be performed using fractionated media and metabolites screened to identify metabolic signature in fractions resulting in increased lipogenesis.

**Funding/Grant Support:** Le Bonheur Children’s Hospital Research Grant
PDF07  Evaluating the therapeutic use of mitochondrial transfer to protect against diet-induced obesity

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Abstract Body: Mitochondrial dysfunction in major metabolic tissues is one of the mechanisms contributing to obesity and its co-morbidities. Mitochondrial transfer (mitotherapy) may improve adipocyte function and result in better systemic metabolic outcomes. We hypothesize that injection of healthy mitochondria into obese mice may recover normal adipocyte bioenergetics. We treated 3T3-L1 preadipocytes and mature adipocytes with 10mg of mitochondria for 72hrs and analyzed ATP levels, mitochondrial function using seahorse and expression of energy expenditure and lipid metabolism genes. Mice maintained on either chow or high fat diet were injected intravenously with vehicle or mitochondria (1mg/g body weight) every three days for a total of three doses. Histology and molecular analyses of serum, brown and white adipose tissues collected from these mice is ongoing. Treatment of 3T3-L1 cells with mitochondria led to increased ATP levels and a higher basal oxygen consumption rate. Our preliminary study in 3T3-L1 cells suggests that treatment with healthy mitochondria may recover adipocyte bioenergetics. Further studies are ongoing using in vitro and in vivo methods to further examine the therapeutic effects of mitochondrial transfer on ATP production, lipid accumulation and to identify other molecules that may be involved in these processes within the adipocytes. Mitochondrial transplant could potentially serve as an alternative therapy in the remodeling of adipose tissue for the treatment of obesity.

Funding/Grant Support: PI: Chester W. Brown, M.D. Ph.D. R073223654 St. Jude Peds Research Recruitment Subcontract Brown

PDF08  Comparative analysis of electrocardiograms in mouse models of arrhythmogenic cardiomyopathy and dilated cardiomyopathy

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Background: Arrhythmogenic cardiomyopathy (ACM) and dilated cardiomyopathy (DCM) are distinct forms of heart muscle diseases associated with mechanical and/or electrical dysfunction resulting in heart failure. In this study, we studied the different performance of electrocardiograms (ECGs) in ACM and DCM mouse models.

Methods: Two wild-type (WT) and four mutant strains of knock-in mice carrying human ACM (TMEM43-S358L) or DCM (CSRP3-K69R) associated mutations, were studied at 6 months of age (N>10). A single lead ECG were recorded in anesthetized mice by BIOPAC system and then analyzed using AcqKnowledge 3.9.2 and LabChart 7 software. Rhythm disturbances were counted as number of arrhythmias per thousand heart beats (%).

Results: No differences in RR, PR and QRS duration were noted in all groups. The QT duration was significantly higher in Tmem43 mutant mice (50±7 ms in Tmem43WT/S358L and 45±4 ms in Tmem43S358L) than that of in Tmem43WT or CSRP3 group. The frequency of arrhythmia events was significantly higher in Tmem43S358L (1.80‰) vs Tmem43WT (0.57‰) and Tmem43WT/S358L (0.96‰) or CSRP3WT (0.36‰), CSRP3WT/K69R (0.77‰) and CSRP3K69R (0.67‰) groups. Highest J amplitude was found in Tmem43WT/S358L (0.22±0.08 mv) mice, which was significantly higher compared to CSRP3WT/K69R (0.07±0.14 mv) or Tmem43WT (0.08±0.09 mv) groups. Premature atrial contractions were commonly recorded in all 6 groups, but more frequently in the Tmem43S358L group. Moreover, atrioventricular block II, premature ventricular contractions and ventricular tachycardia were recorded in Tmem43 mutants.

Conclusions: ECG tracing in anesthetized mice obtained repeatable and stable results. TMEM43 mutant mice display arrhythmias recapitulating ACM in humans.
**PDF09**

Whole Exome Sequencing Reveals Novel Pathogenic Variants with Di-/polygenic Inheritance in Left Ventricular Noncompaction

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**Background:** Left ventricular noncompaction (LVNC), a subtype of cardiomyopathy, is a genetically and phenotypically heterogeneous cardiac muscle disorder. Much progress has been made, but the genetic basis remains incomplete. This study aimed to further identify the genetic landscape of LVNC using whole exome sequencing (WES).

**Methods:** The study included 42 patients with LVNC and 18 unaffected family members from 33 families. WES was followed by read mapping, variant calling, annotation, and bioinformatics filtering. Candidate variants selected according to MAF<0.01 (1000G, ExAC, ESP6500, or gnomAD), variant class, and functional impact were further validated by Sanger sequencing and family-based phenotype-genotype analysis.

**Results:** Seventy-one pathogenic or likely pathogenic variants were identified in 49 genes. Variants in TTN (8 in 7 families), MYH7 (6 in 6 families), OBSCN (5 in 4 families) and MYBPC3 (3 in 2 families) were the most common. Two pathogenic variants were found in CPT2, DSC2, SYNE2, and PLEC. One pathogenic variant was identified in 41 genes, including the sarcomeric genes MYH6, ANKRD1, and MYPN. Sarcomeric variants were compound digenic with metabolic/OXPHOS variants in 10 patients, suggesting an association between LVNC and ATP depletion. Tri- or polygenic variants were identified in 10 patients. For example, a 22-year-old female carried variants in TTN, ACADVL, CPT2, DSP, and AARS2. Trigenic MYH7, ANKR1D, and NRG1 variants co-segregated in a family with two family members affected with dilated cardiomyopathy (DCM) and LVNC.

**Conclusions:** Our results expand the genetic spectrum of LVNC. The diverse di, tri, and polygenic profile of inheritance may be associated with heterogeneous LVNC phenotypes.

**PDF10**

Isolation of extracellular vesicles from renal cyst fluid: challenges and solutions

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**Introduction:** Tuberous Sclerosis Complex (TSC) is a genetic disorder leading to tumor formation in various organs, including in heart, brain, skin, lungs and kidney. In the kidney, patients also develop progressive renal cysts. Our interest is focused on the function of extracellular vesicle in the pathogenesis of renal TSC disease. Here, we aim to describe challenges and solution in isolation of extracellular vesicles (EVs) from renal cystic fluid using size exclusion chromatography (SEC).

**Method:** Patients with renal cysts underwent laparoscopic cyst reduction including fluid removal. Cystic fluid was centrifuged at 4000 rpm to remove cellular debris and then was concentrated via centrifuge concentrating device to 0.5ml. The fluid concentrate then subjected to SEC to collect fractions containing EVs. EVs were characterized for size distribution and charge using the qNANO instrument.

**Result:** Renal cystic fluid from TSC patients was acidic in nature with pH of 6.0. We observed extraordinary viscosity when the cyst fluid was concentrated prior SEC. This observation is also common with urine because renal cells are known to secrete a glycoprotein called Tamm-Horsfall protein (uromodulin). Uromodulin is a monomeric protein but aggregates in acidic media and forms complexes with size exceeding million Daltons. To solve this issue, uromodulin complex was inhibited by adding the reducing agent dithiothreitol (DTT) or the zwitterionic detergent 3-[(3-cholamidopropyl)dimethylammonio]-1-propanesulfonate (CHAPS). These additions helped in recovery of EVs from renal cystic fluid similar to urine.

**Conclusion:** We recommend the addition of reducing agent in isolation of of EVs from renal cystic fluid.

**Funding/Grant Support:** DoD W81XWH-14-1-0343
INCREASED EXPRESSION OF HOST VIRAL RESPONSE GENES IN INSULITIC ISLETS

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Background: Type 1 diabetes (T1D) is an autoimmune condition hypothesized to be enhanced or triggered by viral infections. Islet pathology in T1D is characterized by destruction and loss of insulin producing pancreatic beta cells. In this study we evaluated physiological pathways associated with the T1D pathogenesis by examining differential expression of host genes within islets, with special emphasis on identifying evidence suggestive of responses to a viral infection.

Methods: Pancreatic tissue samples were obtained from non-diabetic donors, autoantibody positive donors, and donors with T1D through the Network for Pancreatic Organ donors with Diabetes (nPOD) program. Laser microdissection was used to isolate individual islets based on immunohistochemical documentation of presence or absence of insulin (INS+) and T-lymphocytes (CD3+). RNA was isolated and microarray used to assess transcriptomes.

Results: Increased expression in insulitic islets was seen in a variety of genes involved in viral response pathways including TLR3 (p=7.35E-10), STAT1 (1.64E-7), and IRAK4 (6.41E-6). Two genes with known specifically for viral responses, DDX58 (p=6.4E-10) and IFIH1 (p=2.7E-9), were found to have increased expression in insulitic islets.

Conclusions: These studies noted an increased expression of multiple host genes associated with antiviral responses. The demonstration of specific protein involvement in host responses to infections are up-regulated in T1D islets with signs of immune activation and residual insulin positivity (INS+CD3+), supports the potential involvement of host viral response pathways in the development of T1D.

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PDF12

Predication of the early stage of Alzheimer’s disease

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Background: Approximately 15% of adults older than 65 years old suffer from mild cognitive impairment (MCI) and from these more than half progress to Alzheimer’s disease (AD) within five years. The goal of this study was to utilize predictors for diagnosis conversion to AD based on integrating the brain connectivity analysis using resting-state functional MRI (rs-fMRI) and the brain atrophy using structural MRI (sMRI).

Methods: We included 177 subjects in this study and aimed at identifying patients with MCI who progress to AD, MCI converter (MCI-C), patients with MCI who do not progress to AD, MCI non-converter (MCI-NC), patients with AD, and healthy controls (HC). The graph theory was used to characterize different aspects of the rs-fMRI brain network. The cortical and subcortical measurements were extracted from sMRI data to characterize the brain atrophy. The rs-fMRI graph measures were combined with the sMRI measures to construct input features of a support vector machine (SVM) and classify four groups of subjects. Novel algorithms were proposed for feature reduction and also selecting a subset of optimal features.

Results: We obtained an accuracy of 67% and 56% for three-group (“AD, MCI-C, and MCI-NC” or “MCI-C, MCI-NC, and HC”) and four-group (“AD, MCI-C, MCI-NC, and HC”) classification, respectively. Our results revealed that the top 4 features with the most discriminant information in identifying the early stage of AD were associated with 4 hub brain regions (i.e. insular cortex, occipital cortex, cerebellum, and precentral gyrus).

Conclusions: Results of this study demonstrate potential of biomarkers based on the functional and structural MRI for early identification of AD.
PDF13
Which came first? Children with severe asthma in Memphis suffer from low levels of vitamin A, IgG1, IgG2 and IgA
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Rationale: Asthma is a syndrome that affects over 8% of the pediatric population in the United States, and Memphis, TN has been nicknamed the “asthma capital.” Le Bonheur Children’s Hospital cares for over 4,000 asthmatic children annually. Previously, we found that (i) low levels of vitamin A are common in Memphis, and (ii) in a mouse model, vitamin A is required for the establishment of normal immunoglobulin isotype levels and patterns. We therefore tested vitamin A and immunoglobulin isotypes in asthmatic children.

Methods: Plasma samples were analyzed from 95 children with severe asthma and 47 age-matched, hospitalized non-asthmatics. Immunoglobulins were tested using bead-based assays. Retinol binding protein (RBP, tested by ELISA) was measured as a surrogate for vitamin A.

Results: Children with severe asthma had lower levels of IgG1, IgG2, and IgA, and higher levels of IgE, compared to hospitalized children without asthma. Approximately half of the asthmatic children exhibited IgG1 levels that were below age-specific norms. Frequencies of steroid treatments and certain immunoglobulin isotype levels were inversely correlated. Vitamin A levels were insufficient or deficient in most children, and correlated positively with IgG1 among severe asthmatics.

Conclusions: A simple explanation for our data is that disease and immunosuppressive drugs reduce vitamin A and immunoglobulin levels. As an alternative explanation, we propose that poor nutrition results in poor immunoglobulin levels, rendering children vulnerable to respiratory infections and consequent asthma. We further propose that improvements in diet may reduce the frequencies of asthma and other inflammatory diseases among Memphian children.

Funding/Grant Support: This work was funded in part by ALSAC.

PDF14
Dysbiotic EdnrBNCC-/ - Microbiome is inadequate to cause Hirschsprung-Associated Enterocolitis (HAEC) in Pseudo Germ-Free Mice
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Objective: HAEC is a life-threatening complication of Hirschsprung disease, a condition in which the enteric nervous system of the distal bowel fails to form. We have previously shown that EdnrBNCC-/ - mouse model of HSCR exhibit colonic dysbiosis prior to developing HAEC. We also observed tight junctions (TJ) downregulation prior to HAEC. We hypothesized that the dysbiotic EdnrBNCC-/ - microbiota would trigger downregulation of TJ and promote HAEC.

Methods: WT Pseudo Germ-Free (PGF) pups were generated by treating pregnant dams with broad spectrum antibiotics/antifungals in drinking water. WT PGF received fecal microbiota transplant (FMT) by oral gavage of EdnrBNCC-/ - microbiota or sterile PBS as control at post-natal day (P)21. Mice were separately housed and followed for 1 week (P28).

Results: 16S pyrosequencing and copy numbers confirmed PGF status and engraftment of FMT. Neither FMT nor controls showed clinical HAEC based on established clinical severity scoring. FMT increased expression of TJ proteins occludin (Ocln) and zona occludens-1 (ZO-1) in the ileum and colon. No differences in claudin-3 (Cldn3) or E-cadherin (adherens junction protein) were seen.

Conclusions: We conclude that the dysbiotic EdnrBNCC-/ - microbiota are insufficient to induce HAEC in WT PGF mice. Increased expression of TJ proteins following FMT is consistent with our prior, in vivo, observations in EdnrBNCC-/ - mice (initial increase in TJ, followed by decrease) and suggests that dysbiosis along with dysmotility and/or impaired immune defense are required for HAEC. Specific components of the EdnrBNCC-/ - microbiota contributing to TJ maturation/failure and mechanistic pathways for potential therapeutic targeting are under active investigation.

Funding/Grant Support: NIH/NIDDK; American College of Surgeons; Children’s Foundation Research Institute
**PDF15** Metabolism and immune modulation by Respiratory Syncytial Virus Infection

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**Abstract Body:** Respiratory syncytial virus (RSV) causes severe respiratory disease and infects virtually most children by 2 years of age. It is the leading cause of hospitalization of infants worldwide and reemerges later in life to be a serious lower respiratory tract illness in the elderly. Recently, significant emphasis focused on changes in host cellular metabolism in response to viral infection. We performed a retrospective study of pediatric patients infected with respiratory viruses and found these infectious correlated with increased glucose uptake in the lungs. We characterized epithelial and immune cells from naturally infected non-ventilated pediatric patients' nasopharyngeal aspirates (NPA) and quantified their bioenergetics. Next, we will determine the kinetics of RSV induced changes in primary human epithelial cells (NHBE). We will characterize the infect co-cultures of NHBE and dendritic cell (DC) with RSV to determine if their crosstalk can help regulate aberrant NHBE metabolism. Moreover, the function of RSV infected DC will be assessed. We found a dramatic increase in glycolysis and mitochondria respiration in cells freshly isolated from patients' nasal pharyngeal aspirates. RSV infection increases basal respiration, ATP production, and proton leak while reducing mitochondrial oxygen consumption and respiratory capacity in pediatric patients' nasopharyngeal aspirate cells. Significant increases in metabolism in the infected patient's upper respiratory cells ex vivo support our in situ findings in RSV infected patients lungs. Understanding and defining the metabolic changes in the host during RSV infection may lead to novel therapeutic approaches through targeted inhibition of specific cellular metabolic pathways.

**Enteric virus regulation of gut homeostasis via goblet cells**

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Astroviruses are a common cause of pediatric gastroenteritis, but they are understudied, and little is known about their pathogenesis. Unlike other enteric viruses, astroviruses do not cause cell death or histopathology and we have observed delayed proinflammatory cytokine production in our newly characterized murine model. We hypothesized that the limited pathogenesis caused by astroviruses is mediated by its cellular tropism, which has not been clearly defined. Using in situ hybridization, we discovered that murine astrovirus selectively infects goblet cells, which are the main producers of the mucus barrier. Because goblet cells constitute a minority population of gut epithelial cells and only a subset of these cells become infected with astrovirus, we performed single-cell transcriptional profiling of gut epithelial cells from infected and uninfected animals. Compared to uninfected goblet cells in both uninfected and infected animals, astrovirus-infected goblet cells expressed significantly higher levels of the secretory components of mucus, indicating that the virus preferentially infects actively secreting cells and coopts the secretory pathway of goblet cells to promote its replication. We also found that the virus induces high expression of indoleamine 2,3-dioxygenase 1 (ido1), a suppressor of inflammation. In ido1-deficient animals, virus replication was attenuated and clears more rapidly than in wildtype mice, indicating that the virus uses this enzyme to establish infection and evade immune detection. These studies provide insight into a novel pathway by which enteric viruses manipulate host responses within the gut to promote viral replication and significantly alter mucosal immunity.

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Surgical weight loss reduces grip strength and disrupts skeletal muscle proteostasis in mice

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Abstract Body: Bariatric surgery results in ~15-fold greater loss of skeletal muscle than the loss expected during the typical aging process. Given the importance of muscle mass and strength for healthy aging, accelerated muscle loss following bariatric surgery may have serious clinical consequences that outweigh the immediate metabolic benefits of rapid weight loss. We have used a mouse model of bariatric surgery to test the hypothesis that bariatric surgery disrupts skeletal muscle proteostasis and reduces physical strength. Sixteen wk-old male C57BL/6J mice with diet-induced obesity underwent vertical sleeve gastrectomy (VSG) or sham surgery (laparotomy; DIO). Body composition was determined weekly, whereas ambulatory activity and grip strength were measured at 4- and 6-wk post-surgery, respectively. Changes in myofiber morphology and proteostasis were determined in quadriceps femoris muscles 6-wk post-surgery. Compared to DIO, surgery induced rapid weight loss in VSG (-22%, p<0.01), with loss of both fat (-51%, p<0.01) and lean mass (-13%, p=0.01). Ambulatory activity was similar for VSG and DIO, yet grip strength was reduced in VSG (-10%, p=0.04). VSG had a marked increase in the number of myofibers with central nuclei, indicative of muscle damage, and increased expression of atrophy-related transcripts Gadd45a, Hdac4 and Ctsl (+30%, +80%, and +41%, all p<0.05). VSG also had increased mTORC1 activity compared to DIO (p70S6K phosphorylation (T389) was +205%, p=0.01). These findings demonstrate that bariatric surgery induces molecular adaptations in skeletal muscle that result in muscle atrophy and reduce physical strength. Future studies will identify whether pre-surgery interventions can mitigate post-bariatric surgery muscle loss.

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Plasticity in the developing brain: neurophysiological basis for motor reorganization in a clinical pediatric cohort

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Introduction: Plasticity of the developing brain may be observed following motor cortex injury (MCI). Factors such as timing of injury, size, etiology, and location influence normal hemisphere acquisition of motor representation – interhemispheric reorganization (IEHR), or motor representation maintenance in the lesioned hemisphere – intrahemispheric reorganization (IAHR). IEHR is most likely to occur following injury before 2 years of age, however injury etiology’s role is understudied. We hypothesized that IEHR would be more likely to occur following traumatic injuries, as opposed to developmental disorders, and that corticomotor representation would be shared following IEHR.

Methods: We retrospectively examined 55 patients with reorganized motor maps found through the use of transcranial magnetic stimulation (TMS). Hand motor cortex center of gravity (COG) was calculated, and the distance between normal and reorganized COGs was measured.

Results: COG distances in patients with IEHR were significantly shorter (p<0.001) than those with IAHR. A significant effect of injury etiology on motor reorganization (p<0.001), independent of timing and age of injury, was found – traumatic injuries were more likely to cause IEHR.

Conclusion: The results indicate shared cortical representation in the case of IEHR, which implies that IEHR proliferates existing ipsilateral pathways through axonal sprouting. The nature of developmental disorders to resist IHER is also implied. Novel information obtained with TMS regarding developmental motor plasticity is demonstrated. These data aid in understanding basic reorganization principles, facilitating better and more useful therapeutic techniques to improve functional recovery following

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Reduction in Sarcomere Contractility Triggers Right Ventricular Dysfunction in a Mouse Model of Arrhythmogenic Cardiomyopathy

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Background: Arrhythmogenic cardiomyopathy (ACM) is a progressive genetic disorder due to expression of pathogenic variants of desmosomal genes, with plakophilin-2 (PKP2) as the most affected gene. ACM is defined by a right ventricular (RV) dysfunction in part due to replacement of myocytes by fibrosis and adipocytes. To uncover the mechanisms of ACM progression, we developed a new PKP2 knock-in mouse model (L404fsX5) based on a mutation we identified in clinic. Aging heterozygous mice (PKP2+/-) revealed that development of ACM correlates with a progressive reduction in RV myocytes contractility, while intracellular Ca2+ signals that trigger sarcomere contraction remain normal. Hypothesis: RV dysfunction is due to a progressive loss in sarcomere contractility rather than ventricular remodeling.

Results: Picrosirius red and oil red O staining revealed absence of remodeling, fibrosis and lipid infiltration in both the LV and RV of 6-month-old (developing ACM) PKP2+/- mice. Immunostaining of isolated PKP2+/- RV myocytes by desmin suggested a 10% increase in sarcomere length compared to WT. Real time PCR reported minor changes in sarcomere gene expression, confirmed by normal protein densities. Yet, PKP2+/- RV homogenates revealed a 30% and 60% increase, respectively, in phosphorylation of both MYBPC3 and Troponin-I – two major regulators that improve sarcomere contractility and relaxation. Conclusions: Altogether, these data show that gradual loss in RV myocyte contractility is a marker of ACM prior to ventricular remodeling; and that the reduction in sarcomere function is in part compensated by post-translational modifications (e.g., phosphorylation) of sarcomere proteins to improve myocyte function.

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**RS03**

The Impact of Resistin-like Molecules on Host Immune Response to Influenza Virus Infection

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**Background:** RELMs are small secreted proteins found in the gut, lung and adipose tissue. While RELMα plays an inhibitory role by downregulating inflammation, RELMβ promotes inflammation. Based on our observation that RELMs were significantly elevated in the lungs of mice with acute asthma and influenza, which were safeguarded from severe influenza, we hypothesized that RELMα and RELMβ enhance antiviral defenses.

**Methods:** Mice deficient in Retnla and Retnlb were subjected to the acute asthma model and infected with influenza A/CA/04/2009 virus along with C57BL/6 wild-type control mice. Animals were sacrificed on days 1, 3, 5, 7, and 9 following viral infection for sample acquisition (airway hyperresponsiveness, airway cell infiltrates, cytokine and RNA analyses, etc.) and weight loss was monitored until sacrifice.

**Results:** Virus infected non-allergic mice lost weight as expected. Interestingly, allergic Retnla¹⁻/⁻ and Retnlb¹⁻/⁻ mice were protected from influenza similar to the wild-type control mice marked by no change in weight. However, both knockout strains had increased airway inflammation, particularly a significant increase was apparent in CD8⁺ T cells, macrophages and eosinophils at late timepoints compared to their respective wildtype controls. A significant reduction in viral burden occurred in the lungs of Retnla¹⁻/⁻ allergic mice infected with flu at day 7 as compared to the non-allergic flu only controls.

**Conclusion:** The host immune response was evidently impacted by the absence of Retnla and Retnlb proteins in mice. Further studies are required to elucidate how the RELM proteins mediate protection against influenza.

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**RS04**

Mapping language cortices in school-age children: A comparison of success rates for TMS and fMRI

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**Abstract Body:** Noninvasive functional brain mapping is critical in children with epilepsy, brain tumors, and other neurological conditions that may require surgical intervention. Procedures such as functional MRI (fMRI) and transcranial magnetic stimulation (TMS) can localize crucial language cortices of the brain and assist in neurosurgical planning. Anesthesia, though necessary in many children, can impede successful language mapping in fMRI. We hypothesized TMS could be used to map language cortices in children, particularly those aged 5 to 13 years. We retrospectively reviewed our database and found 138 patients who underwent both TMS and fMRI language mapping to assess success rates, sedation effects, and the viability of TMS. Success was defined as clear, statistically significant determination of hemispheric language dominance for each procedure.

Of the 138 cases, TMS failed to determine language dominance in 20 (14.5%). Of the 91 nonsedate fMRIs, 18 failed (19.8%), while of the 47 sedate fMRIs, 35 failed (74.5%). The age of sedated patients ranged from 5.1 to 18.4 years, with the majority under 10 (n=24) or 10 to 13 years (n=14). Furthermore, of the 35 failed sedate fMRIs, 30 were successfully mapped using TMS. These data illustrate the efficacy of TMS as an alternative to sedate fMRI for language mapping in children, particularly those aged 5 to 13 years. While nonsedate fMRI has a similar rate of failure to TMS (19.8% vs. 14.5%), the difficulty of successfully mapping language cortices in fMRI increases greatly with sedation. TMS is not precluded by patient movement; therefore, it can be used effectively without sedation and should be considered as an alternative to sedate fMRI for language localization in children.
RS05 Associations of FTO and BDNF Genotypes with Dietary Intake in Children with Obesity
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Background: Recent studies reveal a connection between genetics and food preference. We investigated the association of previously described obesity-associated SNPs with body mass index (BMI) and dietary intake in children enrolled in a weight management clinic.

Methods: We studied 573 youth with overweight/obesity enrolled in the Le Bonheur Healthy Lifestyle Clinic. Appetite was assessed using the Hyperphagia Questionnaire (Dykens). Habitual dietary intake was estimated using the Block Food Frequency Questionnaire (NutritionQuest). Patients were genotyped using TaqMan SNP assays (Thermo Fisher) for fat mass and obesity associated gene (FTO) intronic rs9939609, BDNF intronic rs12291063, and BDNF Val66Met rs6265. Skewed data were normalized by log transformation. Differences in dietary intake by genotype were assessed by ANCOVAs adjusting for age, sex, race/ethnicity, and BMI.

Results: Cohort characteristics: age 12.3±3.5y, BMI-Z 2.54±0.43, 60% female, 60% African American, 25% Caucasian, and 7% Hispanic. FTO rs9939609 minor A allele was associated with increased BMI only in females (p=.03). BDNF rs6265 minor T allele was associated with increased hyperphagia (p=.04). BDNF rs6265 T allele was significantly associated with higher BMI only in African Americans (p=.01). Carriers of BDNF rs6265 T allele (p<.05) and FTO rs9939609 A allele (p=.03) reported higher cheese intake. Carriers of minor BDNF intronic rs12291063 C allele reported higher fried chicken intake (p=.002).

Conclusion: Genetic factors may predispose children with obesity to greater appetite and increased consumption of higher fat foods, and therefore may be beneficial to consider for individualized weight management.

Funding/Grant Support: This research was supported by funding from Le Bonheur Children’s Foundation Research Institute, Memphis Research Consortium, and Urban Child Institute.

RS06 Infectious norovirus is chronically shed by immunocompromised hosts
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Abstract Body: Noroviruses are a leading cause of gastroenteritis and while infections in healthy individuals are self-resolving, individuals with a weakened immune system are at risk for chronic disease and severe complications. Chronic norovirus infection in immunocompromised hosts is often characterized by persistent virus shedding, but it is unclear whether this virus remains infectious. To better understand these infections, we described the prevalence, genetic heterogeneity, and temporal aspects of norovirus infections identified from 1,140 patients treated during a 6-year period at a children’s research hospital. Additionally, we identified 20 patients with chronic infections (range: 37 to > 418 days). Using a newly developed human norovirus in vitro propagation assay, we confirmed continuous shedding of infectious virus for the first time. We also observed longer shedding duration in males and patients with diarrheal symptoms. These data indicate that chronic norovirus infections in immunocompromised hosts can result in prolonged shedding of infectious virus, which could increase the likelihood for transmission and dissemination. Such infections could significantly influence the epidemiology and evolution of the virus on the population level.

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RS07  Phantom Limb Experience After Brachial Plexus Anesthesia
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Phantom limb sensations (PLS) are experienced by 80% of amputees; as such, it is critical that the unknown etiology is explored, as theories are contentiously debated. We explored the possibility of cortical remapping as a mechanism for PLS by assessing the timing of onset of PLS in patients receiving brachial plexus anesthesia (BPA), a nerve block reported to cause PLS. We hypothesized that PLS would arise after administration of BPA, prior to upper extremity surgery, and that patients would experience hand-to-face remapping (H2FR), demonstrating cortical remapping.

The presence of PLS and H2FR were assessed at 4 timepoints (T1-T4) by testing the patient’s perception of their arm and fingertip location, and referred sensation in the hand by touching the face. PLS occurred in 21 of 25 patients; timing of PLS onset and return to normal varied by patient and timepoint. Not all patients were available for testing at all timepoints (N=NWithPLS/Ntested). T1: There were no reports of PLS at baseline. T2: Within 40 min of BPA administration, 50% (N=12/24) of patients reported PLS onset. T3: 72% (N=18/25) reported PLS 1.5-4 hours after BPA at post-surgery testing. T4: Patients were called 1 day post-surgery; 40% (N=10/25) reported PLS. H2FR was not reported at any time point by any patient.

BPA leads to PLS onset in an average of 1.6 hours, affecting a patient’s proprioceptive abilities, as illustrated by incorrect reports of perceived arm and finger location, their arm levitating, being across the room, gone, or frozen in position. These effects are rapid and transient in nature, with complete resolution occurring on average 27.3 hours after BPA. The complete lack of H2FR reported by T4 suggests it is a late effect of amputation.

RS08  Pervasive Inflammatory activation in Mice with Very Long Chain Acyl-CoA dehydrogenase Deficiency (VLCADD)
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Background: VLCADD is a life-threatening condition that prevents the body from converting long-chain fats to energy, particularly during fasting, illness, and exercise. Patients can present with hypoglycemia, lethargy, muscle weakness, rhabdomyolysis and cardiomyopathy. Although newborn screening with early intervention provides the best opportunity to prevent morbidity and mortality, VLCADD remains difficult to treat. We previously showed that our mouse model had yet unrecognized elevations in gene expression and serum cytokine levels associated with inflammation. Understanding of this inflammatory pattern and its effects has the potential to elucidate the pathophysiology of poorly understood VLCADD cardiac and muscle manifestations.

Hypothesis: Pervasive chronic systemic inflammation is a physiologic dimension of VLCADD.

Results: Multicolor-flow-cytometry experiments in isolated-mouse-leukocytes correlate with previously observed increases of Tumor Necrosis Factor (TNF)® and interferon (IFN)® in VLCADD mice when compared to wild type (WT) mice. Cytokine studies from 3 to 6 months of age with and without fasting stress showed reproducible elevations in inflammatory marker TNF®.

Discussion/Conclusion: Together with our previous findings, our results endorse that systemic inflammation occurs in VLCADD mice which distinguishes them from their WT background. Further this agrees with collaborative studies showing similar changes in VLCADD patients. Together these findings support our hypothesis of that pervasive chronic systemic inflammation is a physiologic dimension of VLCADD both in humans and mouse model.

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Dysbiosis of Gut Fungal Populations Promotes High Fat Diet-Induced Obesity
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Obesity is an important problem in westernized societies that is associated with numerous comorbidities. While obesity undoubtedly includes multifactorial triggers, the gut microbiome is now a recognized driver in addition to diet, genetics, and environmental factors. Bacteria are the most recognized gut community members; however, other organisms also co-inhabit the intestine and remain largely unexplored under non-infectious states. We recently observed that perturbations in - but not elimination of - gut fungal communities through low-dose antifungals elevated weight gain in diet induced obesity (DIO) mice. These findings led to the hypothesis that certain intestinal fungi stimulate host weight gain and obesity risk.

Antifungals Fluconazole (Fluco) and 5-flurouracil induced the largest increase in body fat, compared to amphotericin and voriconazole. To determine if fungal communities mediate weight loss, we conducted gastric sleeve or sham surgery +/- Fluco in DIO mice. Gastric sleeve significantly reduced body weight and lowered body fat versus sham. Surprisingly, Fluco prevented efficient surgical-mediated weight loss and led to regained adipose tissues. Sequencing the mycobiome showed Fluco enriched the mold/hyphae forming species, Cladosporium, Aspergillus, and Penicillium spp., but eliminated yeasts, including Candida. Since these fungi are characterized by high levels of “unmasked” cell wall beta-glucans, we gavaged purified beta-glucans in mice, which induced significantly greater body weight and adiposity than vehicle controls. These findings are the first demonstration of fungal influence upon adiposity and provide important insights into previously unrecognized roles for eukaryotes microorganisms in obesity.

Funding/Grant support: Department of Pediatrics

Metabolic changes in dendritic cell response to influenza virus infection
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Influenza A virus (IAV) infections are a major cause of morbidity and mortality worldwide and pose increased risks to children. Despite considerable efforts, consistently effective vaccines remain elusive. The current therapeutic paradigm relies on early detection and treatment with viral targeting drugs resulting in variable efficacy. One way to circumvent some of these issues is to target the host response to infection. Despite growing evidence, from our lab and others, to support a role for targeting metabolism in respiratory viral pathogenesis little is known about it. Several brief clinical reports alerted radiologists that following Flu vaccination patients receiving PET/CT scans are prone to positive hypermetabolic lesions in draining lymph nodes near the injection site. This high metabolic activity was attributed to immune cells in the lymph nodes, while little was known of specific responses in the respiratory tract. We performed a retrospective study of PET scans from immune compromised pediatric patients undergoing chemotherapy and found the patients with respiratory viral infections had hypermetabolic regions in their lungs. We found metabolic pathways significantly changed 9 days after intranasal infection of mice with IAV. We then confirmed these findings in vitro using IAV infected murine dendritic cells (DC). These cell types had significant increases in glycolysis and mitochondrial respiration concomitant to changes in bioenergetics. Given we previously demonstrated oral treatment with metabolic targeting drugs has therapeutic potential for treating viral respiratory infections, these studies indicate cell specific responses to this line of therapy that need further delineation.
RS11  High Fat Carbohydrate Restricted Diet-Induced Altered gut-brain metabolism  
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The goal of this study is to identify potential mechanisms explaining why diet-induced altered composition of bile acids (such as microbial deconjugation of primary bile acids) or changes in gut microbiome (GMB) diversity/composition, relate to poorer host health and recovery from oxidative injury. Over the past decade we have consistently reported neuroprotection in carbohydrate restricted high fat ketogenic (HFCR) diet fed adult mice and rats, but have not completely delineated the metabolic mechanisms. Potential mechanisms include altered energetics that favor protection and reduced inflammatory/cytokine responses, but now we consider gut microbiome (GMB) health and metabolic status. Recent findings suggest the gut–brain axis plays fundamental roles in global energy homeostasis. This complex bidirectional communication system can be influenced by the gut microbiota which can contribute to poorer host health. One mechanism of communication is microbial interaction with bile acid (BA) pools and whole body energy balance, occurring through gut and peripheral FXR signaling. In this study, bile acids from liver were analyzed in HFCR fed rats compared to chow fed rats. We observed lower amounts of conjugated bile acids as compared to unconjugated bile acids in the liver of HFCR fed rats indicating altered gut microbiota. One important change observed was the blunting of aMCA and TaMCA/TbMCA in HFCR diet fed mice. Reduction in TaMCA/TbMCA would potentially inhibit FXR thereby modulating fatty liver and obesity associated metabolic parameters. Future studies are aimed at studying these changes from the perspective of HFCR diet induced gut microbial changes and their role in impacting the gut-brain axis.  
Funding/Grant Support: Tennessee Governor's Start-up Funds

RS12  Standardized education for improved detection and nurse intervention during seizures in a pediatric epilepsy monitoring unit  
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Abstract Body: It is necessary for providers to understand all of a patient’s presentations during seizures in order to effectively diagnose and treat the patient. Video-electroencephalogram (V-EEG) monitoring has given providers the ability to simultaneously evaluate clinical and electrographic recordings of seizures. However, V-EEGs have limitations. Mispositioned cameras, low video resolution, and obstructing objects may prevent clinical features of seizures from being correlated in the V-EEG. In addition to these visual limitations, V-EEGs cannot elicit a seizing patient’s status of awareness, memory, voluntary motor function, and language function, so these important pieces of information require proper nursing interaction. We hypothesize that obtaining this information will further improve the diagnosis and treatment of these children. To obtain this information for providers, nurses and EEG technicians in Le Bonheur Children's Hospital’s Epilepsy Monitoring Unit (EMU) were trained to fill in the gaps created by V-EEG. The education program included protocols for optimizing video recording, directing ictal assessments of patients, and narrating physical movements, vitals, and ictal assessment results. Periods before, during, and after the education period were evaluated for nurse and technician performance, rate of diagnosis changes, and rates of treatment alterations after the EMU. The rates of nurse presence at the bedside during a seizure and their use of the toolbox increased over a period of 9 months. The current study shows that the implementation of this education program increases nursing performance at the bedside and provides beneficial information to providers who diagnose and treat patients within EMUs.  
Funding/Grant Support: Neuroscience Institute, Le Bonheur Children’s Hospital, Memphis, Tennessee
**Poster Presentations-Research Staff**

**RS13** Bioenergetics profile of activin deficiency signifying an early stage of browning in the differentiated MEFs

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**Background:** TGF-β family members activin A induces proliferation and inhibits differentiation of adipocyte precursors, and activin B functions in mature adipocytes by suppressing lipolysis, suggesting important roles for activins in adipogenesis and mature adipocyte function.

**Methods:** Seahorse mitochondrial stress testing was conducted using a Seahorse Bioscience XF96 Extracellular Flux Analyzer. Oxygen consumption rates (OCRs) were determined for adipocytes differentiated from mouse embryonic fibroblasts (MEFs), obtained from mice homozygous for a conditional knockout allele of activin A, ap2-Cre+, and null allele for activin B; knockout of activin B alone (Cre-) or WT, with and without isoproterenol.

**Results:** Mitochondrial stress tests were used to determine potential changes in oxidative metabolism driven by cell autonomous activin deficiency by comparing WT, activin B knockout and activin B/activin A double knockout (dKO). Among the three groups, the differentiated, dKO MEFs exhibited significantly higher OCRs. Successful deletion of the activin A conditional allele was confirmed by Southern blot analysis. The isoproterenol treatment did not alter the OCR level significantly. The differences in basal, proton leak, ATP production, spare respiratory capacity and non-mitochondrial oxygen consumption are discussed.

**Conclusions:** The complete loss of activin B and reduction of activin A in adipocytes differentiated from MEFs leads to significantly higher OCR levels, suggesting emergence of browning effects in cells that typically assume the characteristics of white adipocytes. These results are consistent with our earlier findings in vivo and suggest cell autonomous roles for activins in adipocyte fate decisions.

**Funding/Grant Support:** NIDDK RO1 DK073572


**RS14** Clarifying the Effects of Growth Differentiation Factor 3 on Adipogenesis and the Signaling of Other TGF-β Family Members

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**Abstract Body:** The TGF-beta family member, GDF3, plays significant roles in white adipose tissues (WAT). It is upregulated in WAT of mice with diet-induced obesity (DIO) and can inhibit BMP7 and BMP4 activity, other family members that influence adipose differentiation and growth. Gdf3-/- mice are protected from DIO. Our preliminary data in undifferentiated C3H10 and 3T3L1 (mesenchymal and pre-adipocyte cell lines, respectively) showed increases in PPAR-γ-induced luciferase activity with addition of GDF3, BMP4 or BMP7 alone. Addition of GDF3+BMP4 showed further enhancement in C3H10T1/2, while causing inhibition in 3T3L1. In contrast, GDF3 partially inhibited BMP7-induced PPAR-g activity in both cell lines. This contradicted our hypothesis that increasing GDF3 concentration would cause consistent increases in PPAR-γ activity. To understand these relationships during adipocyte differentiation, exogenous GDF3, BMP4 and BMP7 were administered in a variety of combinations and concentrations, then induced to differentiate. RNA and protein have been collected at days 0, 3 and 8 of differentiation. PPAR-γ is being analyzed by western blot. PPAR-γ, and other markers of adipocyte differentiation are being assessed by qPCR. The goal of this research is to better understand the complex interrelationships among TGF-beta family members during adipogenesis, specifically early effects of GDF3 alone and indirect effects of GDF3 on BMP signaling.

**Funding/Grant Support:** NIDDK R01 DK073572
RS15  Epilepsy Surgery in Children with Tuberous Sclerosis Complex: Seizure Frequency, Developmental Outcomes, and Quality of Life
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Nearly 75% of Tuberous Sclerosis Complex (TSC) patients present with neurologic manifestations. Children with TSC under 3 years with epilepsy perform worse on developmental testing than those without seizures. Up to 85% of TSC patients who undergo epilepsy surgery (ES) experience a 50% seizure reduction. ES may also increase quality of life (QOL), often correlated with seizure frequency. Parental assessment of QOL in children after surgery can help quantify function and well-being.

We hypothesized that patients with TSC and DRE (Drug Resistant Epilepsy) who undergo ES during early childhood will have a reduction in seizure frequency as indicated by International League Against Epilepsy (ILAE) classification and stabilization of developmental scores after epilepsy surgery. A retrospective review compared seizure frequency and neuropsychological profiles of children (<7 years) with TSC before and after ES. We also predicted that improved seizure outcomes would correlate with stable or improved QOL, as assessed by a five-question survey answered by subjects’ guardians.

Improved seizure frequency was demonstrated in 7 of 8 patients (88%), with these subjects experiencing a 50-100% seizure reduction and a median ILAE score of 2. While individual developmental results varied, general trends suggest stable or improved results. The average parent survey score was 4.17 on a 1-5 scale, indicating an overall positive parental view of the impact of ES on their child’s life. No significant predictors were found between ILAE score and survey answers.

Seizure frequency and parental perceived QOL improvement are promising support of the benefits of ES in children with TSC despite lack of measurable developmental improvement.

RS16  Frequency and severity of cranial ultrasound abnormalities in a cohort of newborns molecularly screened for cCMV infection
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Infants congenitally infected with cytomegalovirus (cCMV) may develop permanent neurological sequelae, but most are asymptomatic at birth. Cranial ultrasound (cUS) can determine gross brain abnormalities in newborns that may indicate silent cCMV damage. To describe cUS abnormalities in infant cCMV, a retrospective analysis was performed on cUS obtained from 60 known cCMV-infected infants detected by our multi-hospital universal newborn cCMV screening program. For blinding, we randomly added 27 controls. A single radiologist, blinded to cCMV diagnosis and previous cUS reading, evaluated the cUS, and systematically categorized any hyperechogenic areas in the basal ganglia and/or thalamus of subject’s first cUS using a grading scale (0-3) of lenticulostriate vasculopathy (LSV) (Sisman et al, J Perinatol 2018). Quantity and dimensions of basal ganglia hyperechogenic linearities, branches, or dots were recorded. The presence of classic LSV defined by the radiologist was noted. Fisher’s exact tests and kappa statistics evaluated LSV diagnoses and inter-rater reliability (IRR), respectively. 91.7% (55/60) of cCMV infants had any LSV (15/55 grade 1, 23/55 grade 2, 17/55 grade 3, [8/55 classic]). 90% (27/30) of asymptomatic cCMV infants had LSV. No significant difference was found between presence of classic LSV and cCMV diagnosis (p=0.263). 12/30 (40%) infants with symptoms of cCMV had LSV grade 3 vs. 5/30 (16.7%) of those with asymptomatic cCMV (p =0.084). The kappa value for IRR between our reader and the original report was 0.425, a moderate agreement. A high percentage of asymptomatic and symptomatic cCMV infants have cUS-detected LSV. Adopting a grading system for LSV may improve accuracy of cUS in cCMV infected newborns.
RS17  Gastrointestinal interkingdom microorganisms and growth response to diets vary by commercial vendors

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The source of commercially available animals can lead to discrepant findings in biomedical research settings, despite identical genotypes and experimental conditions. Metabolism is intricately intertwined with diet, genetics, environment, and microbial inhabitants that function via interactions between these factors. Since microbes vary by vendor source, here we explored the effect of four vendors on baseline microbiome (bacteria) and mycobiome (fungi) and the influence of in-house diets upon host phenotype. We hypothesized that correlations would be found between baseline microbiota and propensity to gain weight under high fat diets. Animals were purchased from Charles River (CR), Envigo (Env), Taconic (Tac), and Jax. Animals were sacrificed at baseline for microbiome assessment or randomized to 6 weeks of purified high-fat, low-fat, or standard chow diet with biweekly MRI, food-intake, and GTT. Globally, regardless of diet, mice from Env gained the most weight while CR and Jax gained the least. Under high-fat diet, Env and Tac gained the most weight, while Jax and CR gained the least. Body fat % gain was also greatest in Envigo and lowest in Jax following HFD. Feeding purified low-fat or chow also caused the greatest body weight increase in Env mice, while Jax and CR grew more slowly. Tac animals were the most resistant to body fat % increases on low fat or chow but gained the greatest percentage of lean mass. Changes in total BW, lean mass, and fat mass in response to in house diet varies by vendor source and is currently the focus on differences in baseline and endpoint gastrointestinal microbiome community structure and function.

Funding/Grant Support: Department of Pediatrics

RS18  Predicting Vagus Nerve Stimulation (VNS) Seizure Outcome in Children with Epilepsy

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Vagus nerve stimulation (VNS) is an effective treatment option for patients with drug resistant epilepsy. However, pediatric epilepsy patients show substantial heterogeneity in VNS outcomes. The aims of this study were to explore whether: 1) demographic or clinical data can predict outcome of VNS in children with epilepsy; and 2) 6 months after VNS implantation is enough to decide the effectiveness of VNS. We enrolled 17 patients (8 males, 10±5 years of age) in this study who had VNS implantation at our center. Seizure reduction from baseline (i.e. before VNS implantation) to 12-month follow-up (M12) allowed us to categorize the patients into two groups: responders (RS) with seizure reduction > 50% and non-responders (nRS) with seizure reduction < 50%. Out of 17 patients, 6 were RS and 11 were nRS. We found that none of the 9 demographic (e.g. gender) or clinical (e.g. age at seizure onset) covariates was significantly different in the two groups (P>0.08). The seizure outcome (SO) at M12 in nRS was significantly smaller than that in RS (P<0.02). The SO at M12 is defined as SO = (SZ@M0 – SZ@M12) / SZ@M0 where 'SZ@M0' and 'SZ@M12' represent number of seizures per one month at M0 and M12, respectively. We also found that the SO at 6-month follow-up (M6) in nRS was smaller than that in RS, although the difference was not significant (P>0.06). Our results revealed a significant correlation between the SO at M6 and M12 in nRS (R=0.89, P<0.001); however, this correlation in RS was not significant (R=0.58, P>0.2). These results suggest that the demographic and clinical covariates do not predict VNS outcome in children. In addition, 6 months after VNS implantation is not enough time to evaluate the effectiveness of VNS therapy.

Funding/Grant Support: This study was funded by LivaNova, Inc., Houston, TX
Poster Presentations:
Graduate Students
Genomic Instability and The Development of High-Grade Gliomas

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Genomic stability is particularly important in neural cells in early mammalian brain development, with defects resulting in detrimental effects, including neurodegenerative diseases and cancer. DNA double strand breaks are the most harmful form of DNA damage to neural cells, however, can be repaired through homologous recombination (HR) or nonhomologous end-joining (NHEJ). A primary objective of this study is defining the key factors for genome stability that prevent tumorigenesis during cortical neurodevelopment. We compared the differential inactivation effects of HR and NHEJ towards tumorigenesis by directing their deletion to early cortical progenitors in mouse models. We found coincident loss of either repair pathway resulted in high-grade glioma formation. Furthermore, modelling the histone H3 K27M mutation found in pediatric high-grade gliomas, we discovered that gliomagenesis was accelerated after defective HR or NHEJ, although resultant cancers showed differences in penetrance and diffusion throughout the cortex. Gene expression analysis is being used to identify causative events that drive these individual tumor identities. Embryonic analysis has further shown inhibition of these repair pathways in combination with the H3 K27M mutation results in distinct spatiotemporal DNA damage, global changes in H3K27 posttranslational modifications, and significant loss of G2/M checkpoint activation in apical cortical progenitors. Our discoveries support cortical progenitor cell susceptibility to genomic damage is not only influenced by a critical period of early development but also the suppression of specific tumorigenic mutations involving DNA damage repair pathways and histone modifications during neurogenesis.

Funding/Grant Support: National Institute of Health Research Project Grant ALSAC and St. Jude Children’s Research Hospital Institutional Support

Application of deep learning in age estimation of normal infants based on brain MRI

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Human brain development is rapid during infancy and early childhood. Many disease processes impair this development. Brain age estimation (BAE) is, therefore, an essential component of all diseases impacting cognitive development. Brain magnetic resonance imaging (MRI) of infants demonstrates brain growth and morphologic patterns during childhood. Therefore, age can be estimated from brain images. MRI analysis is time-consuming because each scan contains millions of data points (voxels). We hypothesized that artificial intelligence using deep learning algorithms may predict chronological age based on MRIs automatically.

Methods: We investigated three-dimensional convolutional neural networks (3D-CNN), a deep learning algorithm, to estimate age. MRIs from 106 normal newborns were obtained from NIH MRI Study of Normal Brain Development (NIHPD). Age categories were: newborn (age 3 wks +/- y, 1 yr +/- 2 wks, and 3yrs +/- 4 wks.)

Results: An age estimation method using 3D-CNN from brain T1, T2, and Proton Density images from these MRI scans, and compared against the known age, the deep-learning-predicted age correlated with known age (Sens 0.84, specificity 0.87). Deep learning correctly classified all infants. Incorrect age classifications occasionally occurred in the 1 and 3 year age groups. The deep learning prediction for each child’s MRI took <1min.

Conclusion: Deep learning can predict neurodevelopmental age of infants and young children. This is one of the first experiences of using the 3D-CNN algorithm with MRI images for this age group. We will apply similar techniques evaluating brain MRI images to refine diagnostics and predict outcomes of other infant conditions potentially affecting neurodevelopment.
GS03

Evaluating a Collaborative Program to Improve Adolescent Health Literacy and Strengthen Dialogue Skills Between Teen Patients

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Background: Improving health literacy is an opportunity for enhancing patient care in medicine, and the period of adolescence offers a unique opportunity to address health literacy. During adolescence, teens are learning skills to interact with physicians as they transition from pediatric to adult medical care. Physicians caring for adolescents have significant deficits in discussing sensitive issues with their patients, and few programs exist to provide such training.

Design/Methods: Pediatric residents and faculty collaborated with adolescents from a hospital affiliated teen pregnancy prevention program to develop a three-hour health literacy workshop. The workshop included a presentation defining health literacy concepts, interactive scenarios, and an assessment tool. Each resident physician was placed in a group of 4-8 students from a local teen leadership program.

Results: Six residents and 21 students were involved in the health workshop; each completed pre- and post-surveys to assess health literacy as measured by their ability to attain accurate health information and discuss sensitive topics. Paired t-tests were used to identify areas of significant improvement. Residents gained skills to help students discuss health issues with parents (p=0.002). Adolescents were more comfortable asking a medical provider about sexual health issues (p = 0.003).

Conclusions: This program provides an innovative and effective approach to improving adolescent health literacy and resident communication with adolescents. Adolescents gained improved knowledge of health care resources and were empowered to engage with providers. Concurrently, residents became more comfortable initiating conversations about sexual health.

Funding/Grant Support: Children’s Foundation Research Institute & Alzheimer’s disease neuroimaging initiative (ADNI)

GS04

Activin signaling regulate adipocyte differentiation via SMAD2/3 pathway

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Activin A and B are members of the TGF- family which signals through Smad2 and Smad3 and other non-Smad mediated pathways, which in turn can enhance proliferation and inhibit differentiation of adipocyte progenitor cells. We have observed that the loss of activins A and B in adipose tissues alters the phenotypic characteristics of white adipose tissue (WAT) depots in vivo, including smaller adipocyte and WAT sizes and histologic and molecular features typically associated with brown adipose. Most in vivo studies have used the Inhbb (gene that encodes activin B) global knockout mouse, since a conditional allele has only very recently become available. Although we have demonstrated the significance of activins in energy homeostasis, the precise mechanisms that contribute to the observed phenotype upon activin deficiency are less understood. Therefore, in this study we seek to investigate the direct effect of downstream mediators of activin signaling on adipose tissue function, specifically Smad2 and Smad3. We will utilize mice with adipose-specific double knockout of Smad2/3 to examine the effects on adipocyte differentiation and function in vivo and in vitro. These studies will enhance our understanding of molecular pathways that regulate metabolism in response to activin signaling, which may be relevant in developing new and effective therapies for obesity and its co-morbidities.

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**GS05**

**Associations between physical activity level and metabolic dysfunction in youth with severe obesity.**

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Obesity is a serious epidemic caused by a host of factors; one of which being physical inactivity. Physical inactivity is associated with a variety of adverse health outcomes, including obesity complications including cardiovascular disease and hypertension. The purpose of this project is to evaluate self-reported physical activity levels and the associations with obesity co-morbidities. 708 youth (69% African American, 62% female, 12.3±3.6 yrs, BMI z-score 2.54±0.44, 147.1±28.0% of 95th%ile, and 47.5±6.5% body fat) were evaluated from the Healthy Lifestyle Clinic (HLC) at Le Bonheur Children’s Hospital. Physical activity (PA) was assessed by survey of the caregivers and categorized by activity level (26.7% complete 60 mins PA >5 day/wk, 42.8% complete 60 mins PA ≤4 and ≥2 day/wk, and 30.5% complete 60 mins PA <2 day/wk). Medical provider’s evaluations were abstracted from medical records and obesity-related diagnoses were recorded. In chi-square analyses, PA levels were not significantly associated with severity obesity (p=0.84), hypertension (p=0.7), low HDL levels (p=0.6), insulin resistance (p=0.3), abnormal liver function (p=0.5), impaired glucose tolerance (p=0.5), or elevated triglycerides (p=0.07). However, low PA levels were significantly associated with diagnosis of elevated LDL levels (p=0.02). In our cohort of youth with severe obesity, self-reported physical activity levels were not significantly associated with obesity-related metabolic complications except for elevated LDL levels. Our results are counter to previous published relationships between PA and chronic health conditions. The severe levels of obesity in our cohort likely overwhelms the contribution of PA alone and deserves further investigation.

**Funding/Grant Support:** 2019 Public Health Community Scholar Program, School of Public Health, University of Memphis; Memphis Research Consortium; Le Bonheur Children’s Foundation Research Institute.

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**GS06**

**Development of a quantitative CMV assay for saliva in congenitally infected infants**

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Cytomegalovirus (cCMV) is the most common congenital infection. Because traditional diagnostic measures for cCMV are insensitive, we previously developed a saliva-based universal institutional cCMV screening program to better identify infants at risk for long-term neurodevelopmental sequelae of cCMV. Viral quantification may be useful for antiviral monitoring and to predict such sequelae. A World Health Organization (WHO) CMV quantitative standard exists and is used for blood. We hypothesized that quantification of CMV from saliva could be accomplished on infant saliva. To establish a standard curve, WHO CMV quantitative standards and dilutions of cultured CMV were analyzed multiple times using the CMV PCR screening assay amplifying the UL83 gene. Stored Ct values from screen-positive infants were then extrapolated to this standard curve to generate quantitative viral load in saliva (IU/mL).

A standard curve with a linear regression equation of \( y = 8E+14e-0.64x \) (R² = 0.98204) was established to calculate viral loads. Inter-experimental quantification of identical aliquots of cultured CMV yielded quantitatively reproducible results (R² = 0.99795). Of 13,736 screens (Apr 2016 – Aug 2018), 60 infants considered truly infected (Screen PCR+ and confirmed via urine CMV PCR) had Ct values analyzed using the standard curve. Viral loads in infected infants ranged from 65,096.94 - 8,468,615,251 IU/mL. Infant viral load was also analyzed for correlation to disease severity markers.

Salivary CMV quantification can be reliably and reproducibly obtained from infants with cCMV infection. This viral quantification tool will be evaluated for prediction of neonatal outcomes and response to antiviral therapy.
Influenza A Virus Alters Bacterial Uptake by Airway Epithelial Cells
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Influenza is an infectious disease caused by influenza viruses and estimated to result in greater than 20 million cases each year. Virus strains that arise in some seasons are more pathogenic and can result in severe disease and death. A novel triple-assortant virus arose during the 2009 Swine Flu pandemic that, like the 1918 Spanish Flu strain, increased susceptibility to respiratory bacterial infections. While it is accepted that influenza A virus (IAV) decreases host antibacterial defenses thereby increasing susceptibility to opportunistic bacterial infections, mechanisms by which this occurs are still unclear. We hypothesized that bacterial adhesion and uptake by airway epithelial cells may be increased after virus exposure. We exposed A549 airway epithelial cells to IAV strain A/PR/08/1934 and subsequently to cell tracker orange (CTO) labeled (or unlabeled) Streptococcus pneumoniae. Bacterial uptake was measured by flow cytometry. We found that cell viability was decreased after co-infection and that bacterial uptake was enhanced in cells that were exposed to IAV. Future studies are aimed at investigating the impact of bacterial uptake on the expression of antiviral, antibacterial, and immunomodulatory genes on epithelial cells.

Clinical and Behavioral Correlates of TMS Cortical Excitability Measure in Focal Motor Epilepsy and Tumor Patients
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Background: We investigated whether Transcranial Magnetic Stimulation (TMS) derived resting motor threshold (TMS intensity eliciting a response in 50% of trials; MT), a composite measure of cortical excitability, can index altered cortical excitability in patients with epilepsy and serve as a marker for the epileptogenic hemisphere (EH). In this clinical cohort, we expected to demonstrate decreasing MT with age, previously observed in healthy controls, and significantly differing MTs in the EH, when compared to the non-lesional hemisphere (NH).

Methods: In a chart review, we identified 125 patients with focal motor seizures due to epilepsy or brain tumor who had undergone MT determination as part of clinical TMS motor mapping and correlated their behavioral, clinical, and drug serum levels with MT for EH and NH.

Results: MT in the two hemispheres correlated with each other significantly (r=0.75). Age (EH: r=0.42, NH: r=0.40) and IQ (EH: r=0.37; NH: r=0.34) were significantly (p<0.05) negatively correlated with MT. Similar to healthy controls, age and MT correlation in the patient cohort indicates that a better-myelinated adult motor network requires a lower TMS intensity to elicit a motor response. The increased MT with lower IQ levels in epilepsy patients likely reflects a pervasive developmental delay within this cohort. Serum drug levels did not correlate to MT.

Conclusion: These findings are novel as this is the first study in a large pediatric cohort to prove an association between MT and age and IQ. Through this study, we demonstrated that MT is a good measure of global brain developmental patterns. However, future studies should be aimed at identifying TMS parameters that can serve as markers of disease-specific abnormalities in cortical excitability.

Funding/Grant Support: UTHSC neuroscience institute scholarship award
Impact of MYCN Status on Response of High-risk Neuroblastoma to Neoadjuvant Chemotherapy

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Purpose: MYCN-amplification in neuroblastoma is associated with an aggressive phenotype. However, its impact on initial tumor response to neoadjuvant chemotherapy is unknown. We evaluated this impact to assist in pre-operative planning for patients with high-risk neuroblastoma.

Methods: In this retrospective study, primary tumor response, as assessed by percentage volume change on CT scan, and degree of tumor resection, as assessed by the operating surgeon (≥ or <90%), were compared in 84 high-risk neuroblastoma patients, thirty-four (40%) MYCN-amplified and fifty (60%) non-amplified, treated at St. Jude Children’s Research Hospital from 1999-2016. In addition, the response of metastatic disease was assessed on MIBG scan by the change in Curie score, the maximum score being 28 (one point for primary tumor being avid, 1-3 points for avidity in any of nine body segments). Fisher’s exact test or Wilcoxon rank sum test were used to compare these variables between patients with and without MYCN-amplification.

Results: MYCN-amplification, as compared to MYCN non-amplification, was associated with a greater mean percentage reduction in primary tumor volume after neoadjuvant chemotherapy (72.27% versus 46.83% respectively, p=0.001) as well as the absolute average decrease of tumor volume (576.91±89.35cm3 and 355.11±67.92cm3, respectively, p=0.022). The percentage of patients with a Curie score ≥2 at diagnosis who then had a score ≤2 after neoadjuvant chemotherapy was not significantly different (8 [61.5%] and 8 [34.8%] respectively, p=0.37). 72 patients (85.7%) were able to have ≥90% of their primary tumor/locoregional disease resected. Twenty eight (85.7%) patients with MYCN-amplification compared to forty five (91.84%) patients with non-amplified tumors (p=0.303).

Conclusions: In our experience, MYCN-amplification in high-risk neuroblastoma was associated with a better response of the primary tumor, but not metastatic sites, to neoadjuvant chemotherapy than non-amplified tumors, with a significantly greater decrease in tumor volume. However, this did not significantly impact the ability to resect ≥90% of the primary tumor/locoregional disease.

Funding/Grant Support: American Syrian Lebanese Associated Charities (ALSAC/St. Jude Children’s Research Hospital)

Are Antibiotics Always Required in Children with Tracheostomies and Acute Lower Respiratory Tract Infections?

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Children with tracheostomies (TR) have airway colonization with potentially pathogenic bacteria and often receive antibiotics for acute respiratory tract infections (ARTI). However, viral infections are the likely trigger of many of these infections. This project aims to characterize clinical features of children with TR who did and did not receive antibiotic therapy during admission for ARTI, to determine characteristics of patients with TR in whom antibiotics could be withheld.

This is a retrospective chart review of inpatient visits with discharge codes for chronic TR, acute tracheitis, and infection of TR at a single children’s hospital between 2009 and 2017. Patients were included if they did not have TR, were on home mechanical ventilation, or were admitted for non-ARTI illness. Groups were compared using chi-square for categorical variables and non-parametric tests for continuous variables.

There were 370 admissions included in this analysis: 306 patient received 5 or more days of antibiotics (AB group) and 64 patients received no antibiotics or ≤ 48 hours of antibiotics (no antibiotic group, NAB). There were differences between AB and NAB for the proportions with a history of nasal congestion (16% vs 27%, p=0.04), TR samples with moderate to many white blood cells (68% vs 48%, p=0.02) and normal flora only on culture (19% vs 30%, p=0.05). Median days of admission were fewer for AB (3, IQR 2-4) than for NAB (4, IQR 2-8, p=0.0). There are few distinguishing features between the AB and NAB groups. This may indicate that a greater proportion of patients with TR and ARTI could be safely observed without antibiotics. Prospective studies in this population are needed to further define this subset of patients.
**MS03**  
**Discovery of Spectinomycin Analogs with the Potential to Treat Mycobacterium abscessus Infections**  
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Mycobacterium abscessus is an emerging pathogen that is increasingly infecting immunocompromised patients, especially among the cystic fibrosis community. M. abscessus is notable for its high rate of intrinsic resistance to most commonly prescribed antibiotics and anti-tubercular drugs. Worryingly, the therapy recommended by the American Thoracic Society, clarithromycin-amikacin combination therapy, fails in over 50% of cases. In many cases, therapy fails due to acute liver and kidney drug toxicities; there is a clear need for new therapeutic options. To approach this challenge, we explored the potential of spectinomycin (SPC) analogues to treat M. abscessus infections. Profiling experiments against a large library of semi-synthetic SPC analogs identified a subclass of aminomethyl spectinomycins (AmSPC) with enhanced antimicrobial activity against M. abscessus. AmSPC retain whole cell antimicrobial activity against recent M. abscessus clinical isolates from St. Jude and multidrug resistant isolates from the University of Zürich, including amikacin resistant strains. The AmSPC leads share the desirable pharmacological properties of other SPC analogs but display heightened whole cell antimicrobial activity over SPC. When tested in M. abscessus mouse infection models, AmSPC leads demonstrate promising efficacy equivalent to or improved upon an amikacin positive control by significantly reducing bacterial burden in the liver, kidneys, and lungs. Our preclinical evaluation suggests that AmSPC analogues have the potential to be further developed as effective, safer anti-M. abscessus therapeutics.  
**Funding/Grant Support:** NIH R01 ALSAC/St Jude

**MS04**  
**An Institutional Review of Intestinal Malrotation and Midgut Volvulus over Last 7 Years**  
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**PURPOSE:** Midgut volvulus is a surgical emergency for a newborn. However, symptoms could be subtle and progression rapid, leading to high morbidity if diagnosis is delayed. We aimed to review cases of malrotation with or without volvulus at our institution and identify differentiating characteristics of infant with midgut volvulus.  

**RESULTS:** There were 51 infants diagnosed with malrotation in this time. Of these 51 babies 23 (45%) had midgut volvulus at the time of surgery. Higher proportion of males had volvulus (82% vs 46%, p=0.01). The primary presenting symptom of the volvulus cases was bilious emesis with 16 of 23 (69%) compared to only 2/28 (7%) in the malrotation group (p=0.0001). There were no cases of volvulus in any infant less than 31 weeks gestation at birth and only 3 (10%) cases of malrotation in this age group. The mean time from symptom onset to surgery for the volvulus group was 0.81 days with a range 0-2 days. The majority of the malrotation group had no gastrointestinal symptoms at presentation and were only found incidentally on screenings or at time of surgery for other reasons, 23 of 28 (82%, p=0.0001). Also, 22/ 28 (79%) patients in the malrotation group had other clinical associations or anomalies compared to only 4/23 (17%) volvulus patients (p=0.0001).  

**Conclusions:** As expected, bilious emesis was the most common presenting symptom of volvulus in neonates. In the volvulus group, the time from symptoms onset to surgery varied and was not related to bowel loss or death. Isolated malrotations are usually associated with other anomalies and are incidental findings. In our cohort, volvulus was more likely in males, closer to term gestation and as an isolated anomaly.
**Evaluation of Early-Onset Sepsis Risk Calculator in Neonates at a Level 3 NICU**

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**Purpose of Study:** Early-onset sepsis (EOS) incidence has declined over the last 2 decades. However, the incidence has been variable based on population. A web-based EOS calculator (CAL) has recently been used to evaluate the risk in newborns ≥ 34 weeks. Our purpose was to validate the CAL in a setting with an EOS incidence of 2/1000 live births. Our hypothesis was

**Methods Used:** Retrospective review of all newborns born ≥ 34 weeks admitted to NICU from Jan 1, 2016 to Dec 31, 2017. The CAL was applied to all neonates using an incidence of 0.6/1000 and 2/1000. Data were divided into four cohorts of 6-month periods for comparison. The rate of abx use was compared between local protocol and the CAL.

**Summary of Results:** Of the 1367 newborns, 679 received abx. Over 2 years, abx use has declined significantly from 64% to 40%. The CAL would have recommended abx for 468 patients (31% decline) for an incidence of 0.6/1000, but when local rate of EOS was applied (when available in July 2018) the CAL recommended abx for 673 patients (1% decline) overall.

**Conclusions:** The EOS CAL could be helpful in reducing abx, but local incidence of EOS should be known and applied when using the CAL. Our local protocol seemed to be comparable to the CAL, especially for the last 6 months of the study period.

**Funding/Grant Support:** None; stipend provided to medical student through the NIH Medical Student Research Program.

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**Opioid Prescribing and Use for Pediatric Umbilical Hernia Repair**

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**Background:** Opioid overuse is an increasing concern in both the adult and pediatric population in the United States. Physician education may help improve appropriate opioid prescribing and patient instruction for use.

**Objective:** To evaluate the pattern for prescribing and use of opioid medication for pain control after pediatric umbilical hernia repair before and after physician education on opioid stewardship. Content of education included discussion on current opioid epidemic and strategies for opioid stewardship.

**Methods:** A retrospective study was performed at a free-standing children’s hospital evaluating all children who underwent umbilical hernia repair (UH) 6 months before and 6 months after an educational presentation on opioid use. Prescribing data, prescription fill data, patient use data and effectiveness of pain control were assessed. Frequency of adverse events, defined as return to ED, readmission and refill needed, were also captured.

**Results:** There were 78 UH subjects in the pre-education group and 99 subjects in the post-education group. There was a significant reduction (p<0.0001) in the number of opioid prescriptions written and filled following the educational presentation. Further, there was a significant increase (p=0.0001) in the number of non-opioid prescription. There was no significant difference (p=0.4763) in adverse outcomes. Although available data on opioid doses used and quality of pain control was limited, the post-education group showed good pain control for all patients when this data was captured.

**Conclusion:** Physician education on current opioid epidemic and strategies for appropriate opioid stewardship can help improve opioid prescribing and use.

**Funding/Grant Support:** Supported by the Division of Pediatric Surgery, University of Tennessee Health Science Center, Le Bonheur Children’s Hospital, TN.
**MS07**

**Do medical history and acuity of illness affect decision to participate in a genetics biorepository**

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**Background:** The Biorepository and Integrative Genomics (BIG) Initiative collects and stores DNA for future genetic research. To maximize enrollment, we investigated factors influencing the decision to consent to participate. We hypothesized that families of children with a greater illness burden or who have had stressful procedures would be less likely to consent.

**Methods:** Using chart review, we collected data on patients 0-18 years old approached for BIG consent in alternating months of 2017. Data collected included: chronic medical conditions, previous hospitalizations, severity of illness markers (length of hospital stay, ICU admission, use of supplemental oxygen, need for surgery), blood draws, intravenous (IV) insertions, invasive (e.g. lumbar puncture), and non-invasive (diagnostic imaging) procedures. Chi-square was used to analyze categorical risk factors; non-parametric tests were used to compare continuous variables.

**Results:** Preliminary analysis includes 310 patients, 200 consenters and 110 non-consenters. Consent was less likely if the child had chronic conditions (26% vs 36%, \(p=0.03\)). There were no differences between consenters and non-consenters for ICU admission, radiology studies, invasive procedures, blood draws, swabs, IVs, surgery, hospitalizations in the past year, and supplemental O2. Length of stay was not different between consenters and non-consenters (both 1 day (interquartile range 1-2 days, \(p=0.7\)).

**Conclusions:** The only difference found between consenters and non-consenters was the presence of any chronic medical condition. No other illness characteristics were associated with the rate of consent. Further research is needed to understand factors affecting consent for biorepositories.

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**MS08**

**Evaluation of Antibiotic Use For Late-Onset Sepsis In A Level 3 Neonatal Intensive Care Unit**

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**Introduction/Purpose:** Nonspecific clinical symptoms lead to frequent evaluation for late-onset sepsis (LOS) and subsequent antibiotic (abx) use in the NICU. Overuse of abx can lead to several problems. The purpose of this study was to evaluate abx use in a NICU for LOS and identify signs and symptoms that lead to antibiotic use.

**Methods:** Charts were reviewed for LOS after identification of babies by use of vancomycin. Data were collected regarding symptoms, abx duration, and lab values from January 1, 2015 to December 31, 2017. Data were divided into three cohorts based on year.

**Results:** 235 babies with 352 events were identified with characteristics shown in table 1. Table 2 shows abx use patterns. Abx initiation decreased overall, but 39% of babies with a negative culture were still receiving abx for greater than 48 hours. Symptoms like anemia, asymptomatic elevation in CRP, and hypoglycemia do not seem to be associated with true infection.

**Conclusion:** There was an overall decrease in the number of evaluations for LOS requiring abx. The number of babies with negative culture receiving abx greater than 48 hours decreased, but a significant number of babies are still receiving abx for longer than 48 hours in a culture negative setting. Non-specific signs and symptoms may not be associated with a true infection.

**Funding/Grant Support:** No funding or grants were used for this project.
MS09  Hunger Games: Impact of Fasting Guidelines for Procedural Sedation in the Pediatric Emergency Department

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Introduction: Fasting guidelines for procedural sedation in the pediatric emergency department (ED) has historically been a topic of contention. Recent literature states there is no difference in adverse events with regard to fasting status.

Objective: Examine the impact of following the American Society of Anesthesiologists (ASA) fasting guidelines versus not following fasting guidelines on the pediatric ED. We hypothesize that patients following ASA guidelines will have significantly longer wait times but there will be no difference in adverse effects between the groups.

Design: A retrospective chart review was performed looking at patients that presented to the pediatric ED and required procedural sedation for orthopedic injuries from February 2011-July 2018 (n=2674). These patients were categorized into 3 groups: 1) Already within ASA fasting guidelines upon presentation to the ED (n=671), 2) Underwent procedural sedation while not within the ASA guidelines (n=555), and 3) Underwent procedural sedation after fasting in the ED to meet ASA guidelines (n=1448).

Results: There was no significant difference in time intervals between patients in Group 1 and Group 2. There was a significant difference in the length of stay (~80 minutes longer) and the time from admission to discharge (~80 minutes longer) between the first 2 groups and Group 3 (patients for whom ASA guidelines were followed). There was no significant difference in adverse events among the groups.

Conclusions: Our study found no difference in adverse events whether or not ASA procedural sedation guidelines were followed, and found that following ASA procedural sedation guidelines led to significantly increased ED wait times.

Funding/Grant Support: LeBonheur Fellow's Research Grant

MS10  Timing is Everything: A Suspected Case of Trimethoprim-Sulfamethoxazole Induced Sepsis

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A previously healthy 11-year-old female from Mississippi presented from an outside hospital with hypotension, fever, and leukocytosis. She had a 2-week history of worsening flank pain that started in the area of a suspected insect bite. The day of admission she presented to her PCP for worsening erythema and pain, and was prescribed Trimethoprim-Sulfamethoxazole (TMP-SMX). 3 hours after taking her first dose, she developed vomiting and fever. At an outside hospital she was found to be hypotensive and febrile with leukocytosis, with an elevated lactate and CRP, and was transferred to our PICU. She remained hypotensive needing fluid resuscitation and pressors, and was intubated for hemodynamic instability. She improved clinically and was discharged 5 days later with a diagnosis of culture negative sepsis vs loxoscelism on doxycycline for tick-borne illness coverage and clindamycin for concern of superadded bacterial infection of the insect bite. Subsequently, the wound grew MRSA (sensitive to doxycycline) but resistant to clindamycin, and her PCP switched her to TMP-SMX. Shortly after the first dose of TMP-SMX (4 hours), she was found to be febrile and severely hypotensive and was readmitted to the PICU. The wound on her back initially thought to be the source of infection was non-tender and significantly decreased in size. Due to the temporal relationship of TMP-SMX with fever and drastic hypotension, we suspect that her clinical presentation was related to acute drug toxicity which may mimic culture negative sepsis. Although there have been 2 reported cases of TMP-SMX induced sepsis-like syndrome in adults, to our knowledge this is the first report of this clinical presentation in a child.
**Poster Presentations- Medical Students**

**MS11**  
**Role of Adenoidectomy in Provision of Secondary Tympanostomy Tube Placement**  
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**Objectives:** To explore the rate of recurrence for tympanostomy tube (TT) placement in children who underwent concurrent primary adenoidectomy vs. initial TT placement alone.

**Methods:** By recording data on each TT procedure performed at a single tertiary academic children's hospital over the course of 45 months (September 2015 - June 2019), we were able to determine the rate of recurrence among each subject group. Of the patients who underwent primary adenoidectomy, we further stratified these patients based on age (<4 years old vs. 4 years and older) to assess any differences in outcomes. The senior author primarily utilized coblation technology for adenoidectomy procedures.

**Results:** In this retrospective cohort of 1,640 subjects, we determined that 10.67% of patients who underwent initial TT placement with concurrent primary adenoidectomy required repeat TT placement, while 28.8% of patients receiving TT placement alone required repeat TT placement (P=<0.0001). Moreover, there was no significant difference in TT recurrence rate amongst patients who received primary adenoidectomy when controlling for age (P=<0.266).

**Conclusions:** Our findings support that concurrent primary adenoidectomy performed in pediatric patients at the time of initial tympanostomy tube placement results in a statistically significant reduction in the need for repeat TT placement. Given the substantial direct and indirect financial burdens of recurrent otitis media and TT placement in the United States, this data and future studies may be used to influence clinical practice guidelines in more readily considering provision of concurrent primary adenoidectomy with initial TT placement in pediatric patients.

**MS12**  
**Association between Community Crime and Physical Activity Levels in Youth with Obesity in the Mid-South**  
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Obesity is a serious health concern affecting nearly all communities. Studies have shown significant health disparity with lower socioeconomic areas impacted most. This study examined associations of self-reported physical activity levels (PA) with community crime and poverty levels in 708 youth (BMI z-score 2.54±0.44, 12.3±3.6 years, 62% female, 69% African American, 47.5±6.5% body fat) in the Healthy Lifestyle Clinic (HLC) at Le Bonheur Children's Hospital. Caregiver survey assessments of PA showed 26.7% complete 60 minutes of PA ≥5 days/week, 42.8% complete 60 minutes of PA ≤4 and ≥2 days/week and 30.5% complete 60 minutes of PA <2 days/week. Public government and FBI sources were used to evaluate crime (total, property, and violent) and poverty levels in HLC families’ communities. Median household income in these communities was $43,801±21,494 (range $17,000-$129,382). Violent crime index (0-100) was 68.9±27.2 (national average (US)=22.7; Memphis metro average (MSA)=57.6). Property crime index (0-100) was 69.8±23.4 (US=35.4; MSA=59.4). Most HLC patients live in communities with high crime (nearly double US average for property (57.9%) and violent (57.8%)) while fewer patients live in areas with lower than the US average property (13.1%) and violent (23.3%) crime. Population below poverty was 24.1±13.3% (US=12.3; MSA=19.0). PA levels were not associated with total crime index (p=0.32), violent crime index (p=0.82), property crime index (p=0.92), or percent population below poverty line (p=0.32) in our cohort of youth with obesity. Our findings suggest that in our largely urban cohort, crime and poverty are significant concerns but may not be the key limiting factors in patient physical activity completion.

**Funding/Grant Support:** Memphis Research Consortium; Le Bonheur Children’s Foundation Research Institute
Validating a Definition of Pediatric Chronic Critical Illness (PCCI)

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Background: As pediatric mortality declines, a new group of complex, technology dependent children is emerging. PCCI is a new term characterizing this population, and a definition has been proposed for clinical and research utilization.

Hypothesis: The definition of PCCI will have a sensitivity and specificity of > 80% for children determined by ICU attendings. These children will have a higher dependence on technology, and a higher need for home nursing.

Results: 201 patients were prospectively identified in LeBonheur ICUs over 3 months with 290 encounters. Attending physician opinion was solicited about qualifying for PCCI. Chart was reviewed for PCCI criteria and patient description. 31% of patients met criteria for PCCI at 1st encounter, 54% when still hospitalized at 1 month, and 68% at 2 months. The sensitivity and specificity of the definition were 70 CI(57.87-80.38) and 89.92 CI(83.38-94.52) respectively. Comparison between PCCI and non-PCCI were: oxygen dependence (87.1 vs 62.3%), tracheostomy dependence (12.9 vs 0.7%), ventilator dependence (56.4 vs 23.9%), feeding tube (72.5 vs 5.8%), and ventricular device (6.5 vs 5.8%).

Conclusion: The sensitivity according to the attending perception was less than expected. The decreased sensitivity likely reflects the diversity of patients and a lack of consensus among ICU staff. The definition struggles to capture patients who are transitioning to/from PCCI and who are hospitalized for non-medical reasons. Additional testing and education is needed to further validate and raise awareness about PCCI.

Joint Function Following Extremity RT in a Pediatric Population

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Background: Children with soft tissue or bone sarcomas often require radiotherapy for cure. Radiation therapy (RT) can have long term effects in these patients including atrophy, fibrosis, and limitation in range of motion (ROM) affecting QOL. The incidence and correlation of loss of ROM and RT factors including dose have not been well described.

Purpose: Investigate the incidence and relationship of loss of ROM and RT treatment variables in patients who receive RT for sarcomas near the elbow and knee.

Methods: 22 pediatric patients with extremity sarcomas were treated with limited margin conformal RT as a part of local therapy adjacent the elbow or knee on an IRB approved prospective clinical trial at St. Jude. Physical therapy assessments were performed at each follow up visit to assess ROM for flexion and were tracked over time.

Results: 5 of 22 patients ultimately lost 15% or more of their maximum ROM for flexion of the joint (mean 35 degrees, range 21-59 degrees). Including the period of recovery after initial diagnosis or surgery, 6 patients lost 15% or more of their ROM at some point in time (mean 39 degrees, range 21-59 degrees). 17 patients maintained 90% of their maximum ROM of the joint throughout follow-up.

Conclusions: The majority of patients maintained excellent ROM despite receiving RT near their joint. Despite these successes, almost a quarter suffered a deficit in flexion greater than 20 degrees, with one losing 59 degrees. Understanding how radiation dose, volume and clinical factors impact this outcome will be explored further, and may help guide future radiation planning approaches, potentially avoiding joint dysfunction altogether.

Funding/Grant Support: St. Jude Children's Research Hospital
**MS15**


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Vocal cord dysfunction (VCD) is a functional disorder characterized by inappropriate adduction of the vocal cords during inhalation and exhalation, leading to partial airway obstruction. VCD and paradoxical vocal fold motion (PVFM) are the two most frequently used terms. The etiology of VCD is unknown; associated triggers include anxiety, exercise, smoke, upper respiratory infections, and irritant exposure. Patients with VCD often report difficulty breathing, wheezing, throat tightness, voice changes, or choking sensations. We present a case of a 15-year-old Caucasian female admitted for medical work up & management of two-week history of chest pain, dyspnea, and syncope. Psychiatry was consulted for assessment to rule out psychogenic etiology of her symptoms. On psychiatric evaluation, the team identified several potential sources of anxiety for the teenager; however, the level of anxiety was insufficient to fully explain patient’s clinical presentation. As a result, the team recommended continued medical work up and consultation with pulmonology. Patient was evaluated by pulmonology and ENT. A comprehensive upper airway examination was notable for vibrating vocal cords upon voicing, but lacking a good abduction of either vocal cord despite attempts to yell, sniff, take deep breaths, or count to ten. All other laboratory investigations and medical work up was unremarkable, thus, supporting a diagnosis of VCD. Patient and family were educated about this condition and patient was subsequently discharged with the outpatient follow up with psychiatry, ENT, and speech pathology. In conclusion, VCD is a functional disorder that requires vigilance during clinical evaluation and multi-disciplinary treatment approach.

**MS16**

Breastfeeding Rates and Effects of Counseling in a Family Medicine Clinic

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**INTRODUCTION:** Breastfeeding is recognized as the optimal standard for infant feeding and nutrition. The American Academy of Pediatrics recommendations for breastfeeding are exclusive breastfeeding for 6 months followed by breastfeeding with the introduction of complementary foods until the infant is at least 1 year old. Because prenatal care as well as experiences within the first few hours following birth influence later breastfeeding outcomes, improved hospital policies and practices play an important role in increasing breastfeeding rates.

**OBJECTIVES:** The objective of this study was to provide a quality improvement analysis for the University of Tennessee Family Medicine Center in Jackson, TN (UTFMC-J) on their breastfeeding rates and factors that influence breastfeeding.

**RESULTS:** Data from 164 medical charts were included. The breastfeeding rate at UTFMC-J (53%) is considerably lower than the TN breastfeeding rate (75.7%) and the U.S. National rate (83.2%). Among patients who breastfed, breastfeeding rates decreased greatly over time from 53% initially to 19.4% at 3 months to 15.8% at 6 months. At UTFMC-J, mothers are significantly less likely to breastfeed if she is less than 21 years old (p=0.035), had a C-section or vacuum-assisted vaginal delivery (p=0.041), or had early breastfeeding issues (p=0.016). There is a significant negative correlation between counseling and breastfeeding, in which those in the non-counseled group were significantly more likely to breastfeed (p=0.042).

**CONCLUSION:** Breastfeeding rates at UTFMC-J are much lower than both state and national rates, and interventions should be targeted towards certain subpopulations whom are significantly less likely to breastfeed.

**Funding/Grant Support:** UTHSC Family Medicine Student Research Assistantship Program (SRP)
MS17

AP in Pediatric Thyroidectomies
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Thyroid surgeries are considered clean cases with a low frequency of surgical site infection (SSI), occurring at an estimated rate of less than 5%. Recent literature states that routine antibiotic prophylaxis (AP) is unnecessary and should only be considered in high risk cases or instances of wound contamination. Despite evidence suggesting that AP in clean surgeries is unnecessary and contributes to antibiotic resistance, AP remains common practice. Research in the pediatric population is particularly lacking, so AP in pediatric thyroid surgery remains a controversial topic. This project aims to analyze the frequency of AP in pediatric thyroid surgery and the incidence of SSI to determine if routine AP should be withheld.

This is a retrospective chart review of patients 0-18 years of age who underwent any thyroid surgery at Le Bonheur Children’s Hospital or St. Jude Children’s Hospital from January 2008 - December 2018. Patients older than 18 years of age who underwent thyroid surgery at either institution were excluded. Groups were compared using Chi-square analysis.

48 admissions over 7 years were included in this analysis. 66.6% of patients received AP while 33.3% of patients did not. Antibiotics used include cefazolin (28/48), cephalexin (1/48), and clindamycin (3/48). There was 1 incidence of SSI in all 48 admissions and the patient with the SSI received AP. There was no statistically significant relationship between AP and incidence of SSI ($\chi^2 = 5.62, p = 0.089$).

There are few distinguishing features between the patients who received antibiotics prophylactically and those who did not. The SSI infrequency, particularly in patients who didn't receive AP, may indicate routine AP shouldn't be recommended.

MS18

A Cross-Sectional Analysis of Carbohydrate Consumption’s Impact on Glycemic Variability in Adolescents with Type 1 Diabetes
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Management of type 1 diabetes is shifting towards routine use of rapid insulin analogs delivered by insulin pumps and continuous glucose monitors to lower the risk for microvascular complications. The resulting carbohydrate to insulin ratios and flexible eating regimens contribute to heightened variability in carbohydrate consumption for T1DM patients. Poor metabolic control in puberty, in combination with the psychosocial challenges of adolescence, result in difficulty with glycemic control. We hypothesized that there is a direct, linear relationship between the amount of carbohydrates consumed and glycemic variability, as measured by median glycemia, coefficient of variation of blood glucose, and time in range. To test this hypothesis, patients between the ages of 10 and 21 with type 1 diabetes (duration > 1 year) were recruited from the Vanderbilt Eskind Diabetes Clinic. Following a patient’s clinical visit, a 24-hour dietary nutrition recall was performed and insulin pump and continuous glucose monitor data from the preceding day and week were collected. Additionally, to adjust for external influences on glycemia, patients completed questionnaires on physical activity, stress levels and adherence to diabetes recommendations. In the current sample size of seven T1DM patients, there is not a direct link between nutritional parameters, in particular total carbohydrate intake, and glycemic variables.

Findings indicate that glycemic variability is a complex variable, independently influenced by diet, insulin dose and time of injection. Future studies will include additional participants to allow for multivariable regression analysis of carbohydrates consumed versus glycemic variability, adjusted for confounding factors.

Funding/Grant Support: NIH/NIDDK as part of Student Research Training Program (SRTP) at Vanderbilt University Medical Center
Maternal Breast Milk vs. Donor Breast Milk as first feed on Outcomes in Extremely Low Birth Weight Infants
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Introduction: Maternal breast milk (MBM) is the preferred first feed for ELBW infants (birth weight <1000g) who are at risk for increased morbidity and mortality. Often mothers who deliver prematurely are unable to provide their own milk. Instead of waiting several days, these infants are given donor milk (DBM) to initiate enteral feeds.

Aim: To compare the outcomes of ELBW infants who receive MBM vs. DBM as their first feed.

Methods: Medical records of 317 ELBW infants born at Regional Medical Center, ROH January 2013-December 2018 were reviewed. The following data was collected: maternal race, mode of delivery (MOD), administration of antenatal corticosteroids (ANS), gestational age (GA), birth weight, Apgar score, day of first enteral feed, time to achieve full enteral feeds (110 Kcal/kg), growth velocity (GV), and length of hospital stay (LOS). Additionally, we collected data on the following outcomes: retinopathy of prematurity (ROP), bronchopulmonary dysplasia (BPD), necrotizing enterocolitis (NEC), and healthcare associated infection (HAI). Data are presented as mean±SD, median(IQR), percentage(n), and analyzed by t-test, Mann-Whitney U test and Chi square test.

Results: 184 and 133 infants received MBM and DBM respectively. GA, ANS, racial distribution, MOD and Apgar scores were similar between groups. There was no significant difference in day of first enteral feed, GV and LOS. Days to full enteral feeds were 23±10 for DBM and 27±11 for MBM (p<0.001). There was no significant difference in the incidence of HAI, ROP, BPD, NEC and mortality.

Conclusion: DBM may be safely substituted for MBM as the first feed in instances where MBM is not available to avoid delay in timely initiation of enteral feeds.

Funding/Grant Support: Department of Pediatrics, UTHSC, and Le Bonheur Children's Hospital, Memphis

The Characteristics of Coombs Positive Infants with Hyperbilirubinemia
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Purpose of Study: The objective of this study was to evaluate the characteristics and outcomes of pre-term and full-term infants with positive DAT due to ABO incompatibility and to identify the factors that may help predict the severity of hyperbilirubinemia in these infants.

Methods: Neonatal data of DAT positive infants was collected through chart review. Statistical analysis was done to calculate mean, standard deviation, median, and range. Various variables were compared via chi square test and t-test. Mean bilirubin levels of infants who received phototherapy were compared to those who didn't.

Results: Sample size was 369. Of total infants, 31.2% required phototherapy. There was a statistically significant difference in requirement of phototherapy between the preterm and term infant groups (p value = 0.0022). There was also a statistically significant difference in highest reticulocyte count and lowest hematocrit count (p value = 0.0001) between those who did and didn't receive phototherapy. Infants with blood type B were more likely to receive phototherapy compared to blood type A infants (p value = 0.0001). Mean bilirubin levels of infants who received phototherapy at 12 hours were higher (7.4) compared to those who did not (4.2).

Conclusion: DAT positive infants with B/O incompatibility, high reticulocyte counts, low hematocrit counts, high bilirubin level at 12 hours, and prematurity are more likely to require phototherapy. Now, using certain variables and looking at specific factors, clinicians can better inform parents on what to expect regarding their child's hospital care.

Funding/Grant Support: Department of Pediatrics, UTHSC, and Le Bonheur Children's Hospital
**ABSTRACT:** Left ventricular noncompaction (LVNC) is characterized by abnormal trabeculations frequently seen towards the left ventricular apex. This heterogeneous cardiomyopathy may present with a wide spectrum of other clinical features. One of the most common subtypes includes the presence of a dilated ventricle with decreased function, overlapping with dilated cardiomyopathy. The genetic basis of LVNC has been linked to multiple gene variants. This report presents evidence of two first-degree family members (mother and daughter) who harbor a novel MYH7 gene variant associated with a LVNC dilated phenotype. Both patients developed end-stage heart failure requiring transplantation. Isolated/benign phenotype may be the most common presentation, yet when LVNC is associated with a dilated phenotype, progressive heart failure may result. Here, we provide evidence of a novel MYH7 variant (p.Glu1914Lys) linked to the LVNC dilated phenotype. To our knowledge, this variant has not been previously reported in LVNC with biventricular involvement and requiring transplantation. Based on our case, we encourage clinicians to utilize genetic testing in patients with LVNC for accurate diagnosis, management, and genetic counseling. Furthermore, if a pathogenic variant is found in the proband, a complete cardiovascular examination along with genetic testing should be extended to first-degree relatives for risk-prediction and preemptive care.

**Predisposing Factors for Technically Difficult Lumbar Puncture Requiring Imaging Guidance in Pediatric Oncology Patients**

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**Background:** Success rates of lumbar punctures (LP) in children have been reported as low as 50%, yet few studies have analyzed risk factors for difficulty in performing LP procedures.

**Aims:** Our study aims to identify intrinsic factors associated with technically difficult LPs in the pediatric oncology population with the goal of creating a systematic method of pre-procedural identification of at-risk patients.

**Methods:** This study was approved by the institutional review board as a retrospective review of patients who required diagnostic imaging support for identification of the subarachnoid space for an LP procedure at a single pediatric oncology institution between September 2008 and November 2018. These patients were referred for image-guided LPs following a technically difficult LP that was unsuccessful using anatomical landmarks.

**Results:** We evaluated 64 LPs performed in 33 patients requiring diagnostic imaging support for identification of the subarachnoid space following a failed LP. The following predisposing factors for LPs requiring imaging guidance were found: BMI>25 for 45 (70.3%) LPs in 26 (78.8%) patients; anatomical spinal abnormalities for 39 (60.9%) LPs in 16 (48.5%) patients; history of at least 5 previous LPs for 35 (54.7%) LPs in 11 (33.3%) patients; age younger than 12 months for 4 (6.25%) LPs in 3 (9.1%) patients; and history of back surgery for 3 (4.7%) LPs in 3 (9.1%) patients.

**Conclusions:** Elevated BMI, spinal abnormalities, and a history of >5 previous LPs were most strongly correlated with difficult LP procedures that subsequently required diagnostic imaging support. Age <12 months and a history of back surgery were also affiliated with difficult LPs, at a lower frequency.
Efficacy of Care Coordination for Patients with Hypertension and Type II Diabetes in a Family Medicine Clinic

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Integrated care coordination teams are a model of chronic disease management to combat the rising prevalence and complications associated with treating patients with multiple chronic conditions. The objective of this study was to investigate the efficacy of the Care Coordination program as it currently exists at the St. Francis Family Medicine Clinic.

Chart review was conducted on patients who were offered enrollment in the Care Coordination program at the clinic. Patients who had comorbid type II diabetes and hypertension were included. SPSS software was used to track changes in patients’ HbA1c and blood pressure and to analyze whether there was a difference in HbA1c and blood pressure reduction between enrollees in Care Coordination and those who declined to participate. An ANOVA statistical analysis was performed.

554 patient charts were included. No statistically significant difference was found between the Enrolled and Declined groups in terms of systolic blood pressure or HbA1c. The Enrolled group had statistically significantly higher diastolic blood pressure values relative to the Declined Group at the 1st, 2nd and 4th visits analyzed (p = <0.001, 0.002 & 0.049 respectively). There was a trend towards reduced HbA1c in the Enrolled group relative to the Declined group over time, but this finding was not statistically significant.

We propose possible reasons for the lack of equivalence between groups and future directions.

Funding/Grant Support: UTHSC Department of Family Medicine Summer Research Program

A patient with Adams Oliver Syndrome: one of the differential diagnoses for cutis aplasia

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Adams-Oliver syndrome (AOS) is a very rare developmental disorder characterized by the presence of aplasia cutis congenita (ACC) of the scalp and transverse terminal limb defects. Genetic heterogenicity is evident; four different gene account for only 10% of all AOS cases. Prognosis is dependent on the size and severity of the ACC lesion and limb defects. Larger scalp lesions are more likely to involve the skull and possibly the dura which may require neurosurgical reconstruction. Complications of large scalp lesions include infection, hemorrhage, thrombosis, and brain herniation, and can result in death. Limb defects are the most common feature, and mostly consist of terminal reduction defects of the fingers and toes. Transverse terminal limb defects (amputations, syndactyly, brachydactyly, and oligodactyly) are the most noted signature abnormality. These patients may also have variable involvement of central nervous, retinal, cardiopulmonary, gastrointestinal, and genitourinary systems.

We present a case of a female born at 32-weeks-gestation with a large scalp defect and limb anomalies as well as cutis marmorata with normal underlying skull. The combination of scalp and terminal limb defects suggests the diagnosis of AOS. This patient has no family history of scalp and limb defects, so it is most likely a sporadic case. Although AOS is a multisystem disorder, no other major internal organ involvement was discovered in this patient.

This case demonstrates the importance of determining an accurate diagnosis to initiate management as early as possible and surveillance for cardiovascular, neurologic, and/or ocular manifestations.
**Apple’s EpiWatch: Automatic Seizure Detection for Pediatric Generalized Tonic Clonic Seizures**

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Caregivers worry about missing seizures in a child with epilepsy, especially nocturnal events. Although there is technology on the market to automatically detect seizures, accuracy is still problematic. Johns Hopkins (JHH) developed EpiWatch, an app for the Apple Watch programmed to detect convulsive seizures, alert caregivers, and log seizure activity. EpiWatch requires the user to wear an Apple Watch, which tracks heart rate, motion, and electrodermal activity. By monitoring patterns in changes of these parameters, the watch can detect generalized tonic clonic seizures (GTCS). JHH has evaluated the diagnostic accuracy of the app in adults. We hypothesized the app and watch could detect convulsive seizures in children five years and older.

Participants undergoing video-EEG monitoring in Le Bonheur Children’s Hospital Epilepsy Monitoring Unit wore an Apple Watch with the EpiWatch app. Their seizures were captured and classified by epileptologists reviewing their video EEG recording. The watch’s accuracy in detecting the GTCS was compared to the simultaneous video-EEG.

EpiWatch performed with a sensitivity of 75% (detecting three out of four GTCS). However, despite the app's design to minimize false detections (e.g., movements from brushing teeth), testing in a pediatric population has presented new false positive movements not as common in the adult population (dribbling a ball, etc.). We recorded five false positives out of 1,260 hours of tracking (~ 1 every 10.5 days).

The Apple EpiWatch app appears to be very sensitive for detection of GTCS and has very few false positives, making this an attractive option for parents.

**Funding/Grant Support:** Johns Hopkins University

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**Evaluation of Outpatient Clinical Pharmacist Referral and HgbA1c Reduction in a Family Medicine Clinic**

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Early and aggressive intervention of Diabetes Mellitus (DM) is crucial in preventing diabetic complications, which can lead to poor outcomes and rising costs. For patients with “difficult to control” diabetes mellitus, a team based approach between a physician and a clinical pharmacist could increase control, via optimization of medication regimen, medication education, and in-depth dietary counseling. These collaborative benefits lead to a reduction in HgbA1c, which indicate better control of patients’ DM. The objective of this study was to determine if “difficult to control” DM patients were appropriately referred to the University of Tennessee Family Medicine Pharmacy Education and Management program (PEM), and to evaluate changes in HgbA1c after PEM visit. A retrospective chart review was performed for patients with diabetes mellitus (n=239). 93 patients were referred to PEM and 146 were not referred to PEM. 54 out of 239 (23%), were not referred to PEM and defined as "difficult to control." A convenience sample of 59 patients had HgbA1c values analyzed, HgbA1c after PEM visit was lower than before visit (mean 8.7% vs. 9.5%, p = 0.004); a statistically significant decrease of 0.78%. Our study found that patients with “difficult to control” DM were not always appropriately referred (54 out of 239, 23%). In addition, patients seen by PEM had lower HgbA1c values after visit to PEM compared to before visit in our sample. However, further studies are needed to determine the efficacy of the PEM program.
**MS27**

**Characteristics of Extremely Low Birth Weight Infants Requiring Vasopressors in 1st Week of Life**

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**Purpose of Study:** A significant variability exists for diagnosis and treatment of hypotension in ELBW infants. Benefits of use of vasopressors (VP) remain unclear. We wanted to identify the risk factors associated with use of VP in the 1st week of life and their impact on outcomes of ELBW infants.

**Methods Used:** Retrospective review of all newborns ≤ 28 weeks EGA and admitted in NICU from Oct 1, 2012 to Oct 31, 2015 was done. Data regarding antenatal and neonatal characteristics and outcomes were recorded. Study infants were divided into 2 cohorts and compared based on VP use. Chi-square, t-test and multiple logistic regression were performed as appropriate and significance set at p<.05.

**Summary of Results:** Of 213 ELBW infants, 90 (42.3%) received VP in 1st week of life. The mean blood pressure at admission in these infants was significantly lower than that of non-VP group. (27± 8 vs 30 ± 6 mm Hg, p <.05). VPs were initiated within 24h in 91% of babies. After controlling for other variables, use of VP was significantly higher in lower birthweight (OR 3.2, CI [1.6-8.3]), with 5-min Apgar score ≤ 5 (OR 1.8, [CI 1.2-3.12]) and admission hypothermia (OR 2.7[1.3- 4.9]). The use of VP was significantly associated with severe IVH, even after controlling for other significant variables ( OR 5.9 CI [1.6-9.3]).

**Conclusions:** Lower birth weight, low 5-min Apgar score and admission hypothermia are risk factors for early use of VPs in ELBW infants. Infants treated with VPs are at a higher risk of developing severe IVH.

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**MS28**

**Apple’s EpiWatch and the future of seizure monitoring software: moving beyond generalized tonic-clonic seizure detection**

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Epilepsy places a physical and emotional burden on patients and their caregivers. Efficacious seizure detection systems can help alleviate this by alerting the parents to a child’s seizures. However, the majority of wearable devices are aimed at detecting generalized tonic-clonic seizures (GTCS). This lack of available technology to detect other seizure types places a hardship on parents and physicians trying to manage other seizure types. Pediatric patients with uncontrolled seizures admitted to the Epilepsy Monitoring Unit in Le Bonheur Children’s Hospital were asked to wear an Apple Watch equipped with the EpiWatch app. We noted the seizure type classified by the epileptologist after reviewing video-EEG for the events and then reviewed the watch log to see if the events were detected.

Of the thirty-four focal, thirteen generalized clonic, fourteen generalized tonic, and more than twenty generalized myoclonic seizures observed during the study, none were detected by the EpiWatch app. However, extensive data was recorded from watches based on accelerometer and heart rate monitor information which will be further analyzed using frequency and amplitude patterns to see if we can develop a database to detect other seizure types.

The current app is not able to reliably detect non-convulsive seizures. However, the captured watch data from the non-GTC events observed in this study will help better characterize activity and create more accurate detection algorithms. Future detection strategies for non-GTC activity may need to rely more on data from the same patient over time in which the heart rate and accelerometer detectors are trained to create seizure thresholds personalized to the patient’s seizure activity.

**Funding/Grant Support:** Johns Hopkins University
MS29  

**Firearm Injury Research (FIRe) Study**  
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**STUDY OBJECTIVES:** In 2017, the child mortality rate in Tennessee was 65 per 100,000, which exceeds the national rate by almost 28%, and a majority of these mortalities are related to gun violence according to the TN Annual Child Fatality Review. A study examining firearm injuries at the adult trauma center identified an increasing trend in gun violence and morbidity in the last twenty years with larger caliber and higher velocity weapons used over time. A similar study in children has not been done and could help align prevention strategies with current trends in firearm injuries. We hypothesize the injuries would be equally distributed among accidental and intentional injuries in pediatric patients.

**MATERIALS & METHODS:** All firearm injuries over a 14-year period were evaluated at an urban freestanding Pediatric (PTC) Level 1-verified trauma center. Patients less than 19 years of age were included in the analysis. Exclusion criteria included patients admitted for complications related to a previous firearm injury and blast injuries that did not penetrate. Charts were reviewed to determine demographics, circumstance related to injury and patient outcomes.

**RESULTS:** Our cohort consisted of 482 patients seen at the PTC. The number of injuries per year has steadily increased with a peak in 2017 (figure). Most patients were male (80%), African-American (73%) and publicly insured (74%). The majority of injuries occurred in the extremities (54%), followed by the torso (32%) and the head/neck injuries (30%). Two hundred sixty patients had injuries involving more than one region of the body. Injuries to more than body region increased hospital LOS (5.8 vs 1.7 days), interventions (48 vs 27) and mortality (21 vs 12).

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MS30  

**Postpartum Depression Screening, Diagnosis, and Treatment at UT Family Medicine Center- Jackson TN**  
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**BACKGROUND:** Postpartum depression (PPD) is a subset of major depression with postpartum onset which affects many women in the United States. If left untreated, PPD puts mothers at higher risk for impaired infant bonding, suicide and infanticide. It is imperative for healthcare providers to properly screen and diagnose PPD to allow for appropriate subsequent treatment.

**PURPOSE:** The primary objective of this quality improvement study was to assess UT Family Medicine Center-Jackson’s (UTFMC-J) adherence to screening recommendations for PPD, as well as UTFMC-J’s diagnosis and treatment rates for PPD.

**RESULTS:** Out of 308 patients included in this study, we found that 275 (89.3%) had been screened. The rate of PPD at UTFMC-J was 7.19% - 14.24% (95% confidence interval), which is statistically similar to the national PPD rate. Out of the patients who screened positive for PPD, 61.2% received a new mental illness diagnosis during the postpartum period. Out of the patients who received a new mental illness diagnosis during the postpartum period, 97.6% were recommended or given treatment. Finally, we found that out of 805 total PPD screenings performed in 2018 at UTFMC-J, there were 61 (7.6%) miscalculations.

**CONCLUSIONS:** The rate of PPD at UTFMC-J was statistically similar to the national PPD rate in 2018. Recommendations for UTFMC-J following this study include: Consensus on proper diagnosis coding of PPD, improvements in diagnosing at higher rates within the population of patients who screened positive for PPD, and continued physician education on proper scoring of PPD screenings before recording them in patient charts.

**Funding/Grant Support:** This project was funded by the University of Tennessee Health Science Center.
MS31

The use of CT Versus Clinical Acumen in Diagnosing Appendicitis in Children: A Two-Institution International Study

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Appendicitis in children can be diagnosed utilizing clinical and laboratory findings, with the assistance of ultrasound (US) and/or computed tomography (CT). However, repeated exposure to ionizing radiation increases the lifetime risk of cancer and is therefore undesirable. We compared the work-up of suspected appendicitis between a children’s hospital in the United States (USA) and one in Spain to identify differences in imaging use and associated outcomes. A two-institution retrospective review was performed for surgical consultations for suspected appendicitis from 2015-2017. We compared imaging use, the utilization of overnight observation as a diagnostic modality, and diagnostic accuracy rates between the two centers. A total of 1,952 children were evaluated. Among 1,288 in the USA center, 754 (58.5%) underwent CT during their evaluation (78.1% of which were done at referral hospital). The most common imaging modality was US only (39.9%), then CT only (39.3%), CT+US (19.3%), and no imaging (1.6%). In Spain, only 19 (2.9%) of 664 children underwent CT compared to the USA (p<0.0001). No imaging was the most common modality employed (48.6%), followed by US only (48.5%), US+CT (2.4%), and CT only (0.5%). In the USA, 16.8% were observed overnight, 2.3% of whom received no imaging and 33.4% were observed overnight in Spain, 32.4% of whom had no imaging (p<0.0001). Use of clinical acumen and/or US have similar clinical outcomes and similar accuracy rates compared to heavy reliance on CT imaging for diagnosing appendicitis, resulting in decreased radiation exposure. The disparate diagnostic approach of the two centers may reflect that physical examination is a dying art in North America.

MS32

Association between Built Environment and Physical Activity Levels in Youth with Obesity in the Mid-South

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Abstract body: Future risks and complications of obesity pose a high burden on healthcare systems and patients. Recommended treatments and prevention of pediatric obesity include lifestyle intervention with physical activity. Research shows that the built environment (BE) affects physical activity levels (PA). This study examined the associations between BE and self-reported PA in 708 youth (BMI z-score 2.5±0.44, 12.3±3.6 years, 62% female, 69% African American, 47.5±6.5% body fat) in the Healthy Lifestyles Clinic (HLC) at Le Bonheur Children’s Hospital. Caregiver survey assessments of child’s PA showed 26.7% complete 60 minutes of PA ≥5 days/week, 42.8% complete 60 minutes of PA ≤4 and ≥2 days/week and 30.5% complete 60 minutes of PA <2 days/week. Public government sources were used to evaluate BE in HLC family’s communities. Median household income in these communities was $43,801±21,494 (range $17,000-$129,382). Percent vacant housing was 14.2±6.8% (national=7%; Memphis metro average (MSA) =12%). Walkability (18.1±12.5; MSA=4.0), bike lanes (0.96±0.93mi/mi2; MSA=0.14), greenways (0.2±0.2mi/mi2; MSA=0.03), and presence of sidewalks (41.9±15.5; MSA=33%) were collected. PA levels were not associated with vacant housing rates (p=0.61), housing density (p=0.74), number of transit stops (p=0.31), walkability (p=0.77), bike lanes (p=0.44), greenways (p=0.91), bicycle friendliness (p=0.70), distance to community center (p=0.99), distance to park (p=0.91) and sidewalks (p=0.77) in our cohort of youth with obesity. Our findings suggest that in our largely urban cohort the BE (exercise space) may not be the limiting factor in PA that HLC patients complete. More work is needed to evaluate the quality and functionality of the BE.

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**MS33**

**Role of Citrullination of Collagen in Autoimmune Arthritis**

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**Background:** Rheumatoid Arthritis (RA) is the most common form of chronic autoimmune arthritis, and patients with RA have increased anti-cyclic citrullinated protein (anti-CCP) antibodies. Citrullination is the process by which arginine residues are converted to citrulline via PAD (protein arginine deiminase). Since collagen is a ligand for the immusuppressive receptor LAIR-1, citrullination of collagen may affect its interaction with LAIR-1, leading to more severe autoimmune arthritis. Citrullinated type I was produced and administered to mice using the collagen-induced arthritis model to determine its effect on arthritis.

**Hypothesis:** Insufficient inhibition of the immune system can lead to damage to self or autoimmunity. Citrullinated collagen may bypass natural immunosuppressive receptors such as LAIR-1, leading to more severe arthritis.

**Results:** Type I collagen (mixture of α1(I) and α2(I)) either treated or untreated with PAD enzyme was administered intrasynovially (in hind paws) on days 6, 13, and 21 to groups of 10 DR1 mice which had been immunized with CII/CFA to induce arthritis. By day 44, the mice treated with citrullinated Type I collagen had a more severe arthritis than control mice. This was accompanied by an increased antibody response to both citrullinated and non-citrullinated type I collagen.

**Conclusions:** The injection of citrullinated type I collagen intrasynovially led to a more severe arthritis as compared to mice given untreated collagen. Citrullinated collagen may either bypass immunosuppressive receptors or become more immunogenic. A better understanding of the mechanisms by which citrullination of proteins affects autoimmunity could enhance our understanding of how to treat RA.

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**MS34**

**Cause of Death After Surgery in Infants and Children**

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**Introduction:** Pediatric surgery is currently safer than it has ever been in history. Our group has analyzed electronic health records of 47,842 patients who underwent surgery at Le Bonheur Children's Hospital. Among these patients there were 280 post-operative deaths. Propensity score analysis of this data revealed anemia as a statistically significant risk factor associated with post-operative death in this pediatric population. It is unknown why anemia is associated with this increased mortality. We hypothesize that children with anemia have a different set of causative factors associated with death than children without anemia.

**Methods:** Cause of death was determined by review of discharge/death summary in the EHR, or other records for those children not dying in hospital. These data were organized using the age based taxonomy of the National Vital Statistics System from the National Center for Health Statistics. Comparison of groups was done using Fisher’s exact test for non-parametric data.

**Results:** Cause of death could be determined for 219 (78.2%) of the 280 children. Of these, 47 were anemic before surgery and 172 were not anemic. Almost half of the deaths (49.3%) were observed in children less than 1 year of age. There were differences in cause of death between anemic and non-anemic children in the first year of life, but not later (p = .008). In children less than 1 year of age, anemia had the highest association with short gestation.

**Conclusions:**
1) Preoperative anemia is associated with different causes of post-operative death in the first year of life.
2) Mortality due to short gestation was associated with preoperative anemia in the first year of life.

**Funding/Grant Support:** No funding was required for this study.
**MS35**

**Intracystic catheter placement and transsphenoidal cyst fenestration for treatment of pediatric craniopharyngiomas**

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Craniopharyngiomas are rare embryonic malformations of the sellar and parasellar region. Aggressive surgical resection is associated with high morbidity, and there is currently no consensus for the best treatment regimen. Among patients with cystic or predominantly cystic tumors, less aggressive surgical approaches may be taken to drain the cyst prior to more definitive treatment via proton beam radiation. No study has ever evaluated the outcomes related to the three surgical techniques for cystic drainage in a pediatric case series. In this study, we reviewed 30 pediatric patients with no prior tumor resection who underwent one of these three techniques over the past 15 years: 1) frontal craniotomy for catheter placement into cyst under direct visualization, 2) stereotactic catheter placement into cyst via a burr hole, and 3) transsphenoidal fenestration of cyst. Our objective was to study the effect of these treatment options on postoperative outcomes, which included endocrine dysfunction, visual decline, and tumor progression. Clinical evaluation prior to treatment revealed visual deficit in 57% and endocrine dysfunction in 33% of patients. The incidence of endocrinopathy following surgery was high for both craniotomy and cyst fenestration (30% and 25%, respectively), whereas it was lower for tumors undergoing stereotactic placement (12.5%). Surprisingly, stereotactic placement was associated with the greatest risk of worsening visual outcomes (19%), recurrence rates (75%), and number of therapeutic interventions. Overall, transsphenoidal fenestration remained the lowest risk for long-term morbidity, suggesting that it may offer a better alternative for cystic and mixed pediatric craniopharyngiomas.

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**MS36**

**RISK FACTORS AND PREVALENCE OF CLOSTRIDIUM DIFFICILE COLONIZATION IN PEDIATRIC CYSTIC FIBROSIS PATIENTS**

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**Background:** *Clostridium difficile* has been identified in stools of 50% of asymptomatic adult patients with cystic fibrosis (Burke DG et al, J Cyst Fibros 2017, 16:291-8), but this association has not been studied in pediatric CF patients.

**Aim:** To determine the prevalence of *C. difficile* using molecular-based testing in asymptomatic pediatric CF patients and evaluate risk factors associated with its presence.

**Methods:** Asymptomatic children between 1-18yo with a diagnosis of cystic fibrosis who were not currently being tested or treated for *C. difficile* infection were enrolled in the study, and a stool sample was obtained for testing by nucleic acid amplification testing (NAAT; Illumigene *C. difficile* assay, ARUP laboratories). Asymptomatic children with positive NAAT (defined as colonization) and negative NAAT (no colonization) were compared based on medication and hospital exposures using Fisher exact statistical tests and paired t-tests. Multi-variable regression models are currently being analyzed to determine relative risk of each variable on colonization.

**Results:** Between May 2018 and May 2019, 89 asymptomatic CF patients were enrolled in the study. The median age was 9 years, 51% were male, and 98% were white. Of these patients, 27 (30.3%) tested positive for *C. difficile* by NAAT and were defined as colonized. Statistically significant risk factors for colonization included hospitalization within the last 90 days (p=0.01) and length of hospitalization (p=0.048). Variables that did not have a statistically significant effect on *C. difficile* colonization included comorbid asthma; comorbid GERD; history of previous *C. difficile* diagnosis; feeding tube insertion; use of probiotics, immunosuppressants or steroids, acid blockers, or antibiotics within the last 30 days; and length of antibiotic use (Table 1).

**Conclusion:** We identified high *C. difficile* colonization rates (30%) in asymptomatic pediatric patients with CF. Patients with recent hospitalization and longer hospital stays were more likely to be colonized. These data suggest that interpreting the results of a positive NAAT in patients with CF who develop diarrhea symptoms will be difficult.

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Pediatric mortality has decreased over the last decades, but survival with chronic illness and morbidity is increasing. ECMO survivors are some of the sickest patients and would have a significant burden of health care needs, technology dependence, and PCCI.

**Hypothesis:** ECMO survivors have a significant burden of technology dependence, hospital utilization, and PCCI. We aimed to describe the incidence of PCCI and technology dependence, and the frequency of ER visits, hospital and ICU admissions, and ventilator days over seven years after ECMO.

**Results:** This is a retrospective cohort study reviewing 7 years of ECMO survivors from 2011-2017. Thirty-five patients were identified, with 43% receiving VA ECMO and 57% receiving VV ECMO. 24% were cardiac etiology. Thirty-six percent met the criteria for PCCI and 43% depended upon technology at discharge, decreasing to 17% and 29% at one year, respectively. Median ER visits in the first year after ECMO were 1 visit (IQR 0-2), and at seven years median was one visit (IQR 0-1). Median hospital days in the first year after ECMO were 1 day (IQR 0-5), with the 90th and 95th percentiles having 27 and 45 days, respectively. This decreased after seven years to 0 days (IQR 0-0). Both median ICU and median ventilator days were 0 days at one year (IQR 0-1) and remained zero 7 years later.

**Conclusions:** The majority of ECMO survivors utilize limited hospital resources, but a few outliers utilize many resources. ECMO survivors have significant morbidity and frequency of pediatric chronic critical illness. PCCI and technology dependence is present for many ECMO survivors, but the medical burden appears to lessen over time, as evidenced by hospital utilization and technology dependence.
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Abstract Judges [These faculty members were blinded to the authors of assigned abstracts. Abstracts that received the highest mean score were selected for oral presentations.]

Sandy Arnold, MD  Shalini Narayana, PhD  Alina West, MD, PhD
Aristoteli Astreinidis, PhD  Jay Lieberman, MD  Sushita Surendran, MD
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Medical Student Poster Judges panel led by Vicki Park, Ph.D.

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Faculty, Fellow (Clinical and Postdoctoral), Resident, Staff, and Graduate Student Poster Judges panel led by Ajay Talati, M.D.

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