32nd Annual Pediatric Research Education and Scholarship Symposium

Friday, April 13, 2018
ACKNOWLEDGEMENTS:

Oral Presentation Judges

Craig Bierle, PhD
Assistant Professor of Pediatrics
Division of Pediatric Infectious Diseases and Immunology

Elissa Downs, MD
Assistant Professor of Pediatrics
Division of Pediatric Gastroenterology Hepatology and Nutrition

Annie-Laurie McRee, DrPH
Assistant Professor of Pediatrics
Division of General Pediatrics and Adolescent Health

Abstract Reviewers

Melena Bellin, MD
Associate Professor of Pediatrics
Division of Endocrinology

Sarah Cusick, PhD
Assistant Professor of Pediatrics
Division of Global Pediatrics

Timothy Hallstrom, PhD
Assistant Professor of Pediatrics
Division of Blood and Marrow Transplantation

And thank you to the many poster judges!

The PRESS 2018 Committee would like to thank everyone for their assistance with making this event possible.

Gwenyth Fischer, MD
Aaron Kelly, PhD
Angela Panoskaltsis-Mortari, PhD
Thea Hall, Administrative Associate
32nd ANNUAL PEDIATRIC RESEARCH, EDUCATION AND SCHOLARSHIP SYMPOSIUM (PRESS)

April 13, 2018
1:00–5:30 p.m.
University of Minnesota Masonic Children’s Hospital
Wilf Family Center, 2nd Floor/Lobby Level of the Riverside East Building

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**FORMAL ORAL PRESENTATIONS**
Wilf Family Center
1:00-3:00 p.m.
See Full Abstracts 1-8 in Oral Presentation section

1:00pm  Liz Butler, Undergraduate Student – Pediatric Hospital Medicine
“QUANTITIVE ANTIBODY SCREEN FOR TIMELY DIAGNOSIS of SYMPTOMATIC LYME DISEASE”
➢ Research Sponsor: Bazak Sharon

1:15pm  Katie Tastad, Undergraduate Student – Pediatric Infectious Disease
“ALTHOUGH BASELINE AWARENESS IS LOW, INTEREST IN CONGENITAL CYTOMEGALOVIRUS SCREENING IS HIGH: RESULTS FROM A MINNESOTA STATE FAIR STUDY”
➢ Research Sponsor: Mark Schleiss

1:30pm  Li Ou, Postdoctoral Fellow – Pediatric Experimental and Clinical Pharmacology
“LIVER- TARGETING GENE EDITING CORRECTS SYSTEMIC AND NEUROLOGICAL DISEASE OF MUCOPOLYSACCHALDOSIS TYPE I”
➢ Research Sponsor: Chester Whitley

1:45pm  Thomas Bastian, Postdoctoral Fellow – Pediatric Neonatology
“IRON DEFICIENCY ALTER THYROID HORMONE ACTION IN DEVELOPIng HIPPOCAMPAL NEURONS”
➢ Research Sponsor: Michael Georgieff

2:00pm  Rachel Cafferty, Pediatric Chief Resident – Division of Pediatric Emergency Medicine
“DO PRIMARY CARE PHYSICIANS DISCUSS SEXUAL ACTIVITY AND OFFER STI SCREENING TO LGBT ADOLESCENTS?”
2:15pm  Heidi Moline, Pediatric Resident – Minnesota Department of Health Epidemiology
“RESPIRATORY PATHOGEN DETECTION AND ILLNESS SEVERITY AMONG PREVIOUSLY HEALTH AND ASTHMATIC CHILDREN HOSITALIZED WITH ACUTE RESPIRATORY ILLNESS, MINNESOTA 2013-2016”
Research Sponsor: Ruth Lynfield

2:30pm  Alyssa Halper, Fellow – Pediatric Endocrinology
“EFFECT OF ANASTROZOLE ON BONE MINERAL DENSITY AND BODY COMPOSITION IN CHILDREN WITH CONGENITAL ADRENAL HYPERPLASIA”
Research Sponsors: Kyriakie Sarafoglou

2:45pm  Ellen Ingolfsland, Fellow – Pediatric Neonatology
“ALTERATION OF RETINAL GENE EXPRESSION PATHWAYS IN ANEMIC RODENT PUPS”
Research Sponsor: Michael Georgieff
Abstract #

[9] Gretchen Colbenson & Ryan Cullen, Medical Student – Pediatric Emergency Medicine
“EVALUATING PSEUDOHYPERKALMEMIA IN THE EMERGENCY DEPARTMENT”
➢ Research Sponsor: Rahul Kaila, Jeff Louie

[11] Priya George, Undergraduate Student – Pediatric Global Medical Education and Research and Pediatric Center for Neurobehavioral Development
“STUDYING THE GLOBAL TRENDS OF POLIO TITERS IN INTERNATIONALLY ADOPTED CHILDREN”
➢ Research Sponsor: Cynthia Howard & Judith Eckerle

[13] Caleb Murphy, Medical Student – General Internal Medicine
“SELF-PERCEPTION OF SERVANT LEADERSHIP AND LEADERSHIP SELF-EFFICACY AMONG FIRST SEMESTER HEALTH STUDENT?”
➢ Research Sponsor: Brian Sick

[15] Dira Lesher, Undergraduate Student – Pediatric Infectious Disease
“CHARACTERIZING GUINEA PIG CYTOMEGALOVIRUS PATHOGENESIS IN AMNION”
➢ Research Sponsor: Craig Bierle

[17] Sarah Swenson, Medical Student – Pediatric Emergency Medicine
“BEYOND CONSTIPATION: A 4-YEAR OLD FEMALE PRESENTING TO AN EMERGENCY DEPARTMENT WITH LOCALIZED ABDOMINAL PAIN”
➢ Research Sponsor: Jeff Louie

[19] Faith Myers, Medical Student – Pediatric Emergency Medicine
“FREQUENCY OF CHES RADIOGRAPHS DURING A SINGLE BRONCHIOLITIS SEASON AT A LOCAL GENERAL EMERGENCY DEPARTMENT”
➢ Research Sponsor: Jeff Louie

[21] Ashley Borgschatz, Undergraduate Student – Pediatric Emergency Medicine
“INCIDENCE OF RESPIRATORY SYNCYTIAL VIRUS TESTING DURING BRONCHIOLITIS”
➢ Research Sponsor: Jeff Louie

[23] Octavía Ruelas, Medical Student – Pediatric Critical Care Medicine
“STANDARIZED OF CENTRAL VENOUR CATHETERIZATION IN PEDIATRICS PATIENTS IN THE ICU AT UNIVERSITY OF MINNESOTA MASONIC CHILDREN’S HOSPITAL”

➢ Research Sponsor: Arif Somani

[25] Shelby Graf, Medical Student – Pediatric Hematology and Oncology
“SILENT TRANSIENT ABNORMAL MELOPOIESIS AS PRECURSOR TO PEDIATRIC ACUTE MYELOID LEUKEMIA”

➢ Research Sponsor: Nathan Gossai

[27] Rachel Bilski, Medical Student – Pediatric Blood, Marrow, and Transplantation
“FUNCTIONAL OUTCOMES IN ENGAFTED SURVORS OF HCT FOR ADVANCES cALD; A COMPARISON OF PATIENTS UNDERGOING FULL- INTENSITY VERSUS REDUCED- INTENSITY CONDITIONING PRIOR TO TRANSPLANTATION”

➢ Research Sponsor: Paul Orchard

[29] Andrea Tinsay & Nicholas Pricco, Medical Student – Pediatric Emergency Medicine
“SEDATION AND ANALGESIA USE IN LUMBAR PUNCTURES AT A PEDIATRIC TERTIARY CARE CENTER”

➢ Research Sponsor: Vishal Naik & Manu Madhok

[31] Simon Noel Ndely, Medical Student – Pediatric Infectious Diseases and Microbiology Translational Research
“FORGOTTEN, BUT NOT GONE! PEDIATRIC BACTERMIA AND MENINGITIS AS AN ILLUSTRATIVE CASE DEMONSTRATING THE EMERGENCE OF INVASIVE HEMOPHILUS INFLUENZAE TYPE A DISEASE IN MINNESOTA CHILDREN”

➢ Research Sponsor: Mark Schleiss

[33] Madeline Smith, Graduate Student – Pediatric Infectious Diseases and Microbiology Translational Research
“cCMV HEARING LOSS PROGRESSION WITH ANTIVIRAL THERAPY”

➢ Research Sponsor: Mark Schleiss

[35] Michael Joyce, Graduate Student – Pediatric Blood, Marrow, and Transplantation
“GUIDED VASCULARIZATION OF 3D-BIOPRINTING CONSTRUCTS”

➢ Research Sponsor: Angela Panoskaltsis Mortari

[37] Katherine Schleiss, Undergraduate Student – Pediatric Infectious Diseases and Microbiology Translational Research
“INVASIVE HEMOPHILUS INFLUENZA AND HEMOPHILUS INFLUENZA SEROTYPE A CASES IN MINNESOTA 2006-2017”

➢ Research Sponsor: Mark Schleiss

[39] Zachary Galliger, Graduate Student – Pediatric Blood, Marrow, and Transplantation
“TRACHEAL CARTILAGE-DERIVED EXTRACELLULAR MATRIX MEHACRYLAMIDE FOR 3D BIOPRINTING”
Stephen Knier, Pediatric Resident – Pediatric Emergency Medicine
“LOOKING BOY WAYS: A NEONATE WITH A STIFF NECK AND NECK MASS”
➢ Research Sponsors: Jeff Louie, Michael Murati, and Rahul Kaila

Erin Balay, Pediatric Resident – Pediatric Emergency Medicine
“BARIERS AND PERCEPTIONS OF INADEQUATE PAIN CONTROL FOR ED INFANT LUMBAR PUNCTURES”
➢ Research Sponsor: Jeff Louie & Marissa Hendrickson

Erin Balay, Pediatric Resident – Pediatric Emergency Medicine
“FEBRILE NEUTROPENIA IN THE EMERGENCY DEPARTMENT: IMPROVING TIMELY ANTIBIOTIC ADMINISTRATION IN PATIENTS WITH INDWELLING CENTRAL LINES: A QI INITIATIVE”
➢ Research Sponsor: Jeff Louie

Ashley Phimister, Catherine Koozer, and Heidi Moline, Pediatric Resident – Pediatric Neonatology and Pediatric Infectious Diseases and Microbiology Translational Research
“CLINICAL SEQUELAE IN PATIENTS RECEIVING VALGANCICLOVIR AND/OR GANCICLOVIR THERAPY FOR CONGENTIAL CYTOMEGALOVIRUS (cCMV)”
➢ Research Sponsor: Erin Osterholm & Mark Schleiss

Karl Eckberg, Pediatric Resident – Pediatric General Pediatrics and Adolescent Health
“NEEDS ASSESSMENT AND EARLY EXPERIENCE WITH OUTPATIENT COMPLEX CARE ELECTIVE”
➢ Research Sponsor: Emily Borman-Shoap

Karl Eckberg, Pediatric Resident – Pediatric General Pediatrics and Adolescent Health
“It’s “SNOT” THE BLOOD, OR IS IT?: AN UNUSUAL CASE OF ABDOMINAL PAIN IN A 4-YEAR-OLD CHILD WITH CHRONIC KIDNEY DISEASE”
➢ Research Sponsor: Jonathan Strutt

Emma Schempf, Pediatric Resident – Pediatric Emergency Medicine
“The Admissions Conference Call: A Novel Approach to Optimizing Emergency Department to Admitting Floor Communications”
➢ Research Sponsor: Marissa Hendrickson

Margot Zarin-Pass, Pediatric Resident – Pediatric Hospital Medicine
“EXPLICIT REFERENCES TO “13 REASONS WHY” DOCUMENTED IN THE ELECTRONIC HEALTH RECORD OF PEDIATRIC PATIENTS IN A LARGE HEALTHCARE SYSTEM”
➢ Research Sponsor: Michael Pitt

Lauren Buckley, Pediatric Resident – Pediatric Hospital Medicine
“EPIDEMIOLOGY AND CLINICAL PRESENTATION OF NEONATAL HSV INFECTION IN FULL TERM, PREVIOUSLY HEALTHY INFANTS-CASE SERIES”
- Research Sponsor: Bazak Sharon

[59] Taylor Argo, Pediatric Resident – Pediatrics Developmental and Behavioral Pediatric Physician
“DEPRESSION IN A SCHOOL BASED ON POPULATION IN PORT-AU-PRINCE, HAITI: A DESCRIPTIVE STUDY”
- Research Sponsor: Andrew Barnes

[61] Catherine Koozer, Pediatric Resident – Pediatric Cardiology
“IDENTIFICATION OF MISSED CHD FORM CARDIAC INTERVENTION DATA AND DEATH RECORDS DURING THE CCHD SCREENING PILOT STUDY IN MINNESOTA”
- Research Sponsor: Jamie Lohr & Melissa Engel

[65] Dorothy Curran, Pediatric Resident – Pediatric Emergency Medicine
“14 YEAR OLD FEMALE WITH NECK PAIN”
- Research Sponsor: Jeff Louie

[67] Joy Norman, Medical Student – Pediatric Gastroenterology
“DIFFICULT TO SWALLOW: EPIDERMOLYSIS BULLOSUS, ESOPHAGEAL STRicture, AND BOUNDARIES OF FORGOING MEDICAL NUTRITION AND HYDRATION?”
- Research Sponsor: Nneka Sederstrom

[69] Ashley Phimister, Pediatric Resident – Pediatric Cardiology
“THE EFFORT OF STATEWIDE ELECTRONIC REPORTING ON THE OUTCOMES OF CCHD SCREENING IN MINNESOTA”
- Research Sponsor: Jamie Lohr & Melissa Engel

[71] Meghan Fanta, Pediatric Resident – Pediatric Neonatology and Laboratory Medicine and Pathology
“EARLY ONSET NEONATAL SEPSIS DUE TO VERTICAL TRANSMISSION OF PASTEURELLA MULTOCIDA”
- Research Sponsors: Johanna Scheurer & Patricia Ferreri

[73] Khaled Mohammed & Maher Aainawi – Pediatric Hospital Medicine
“ACUTE DISSEMINATED ENCEPHALOMYELITIS (ADEM) IN UNITED STATES – ANALYSIS OF THE HCUP-KID’S INPATIENT DATABASE (KID) 2012”
- Research Sponsors: Mike Pitt

[75] Agnes Barclay, Medical Student – Pediatric Cardiology
“MOTHER KNOWS BEST: WHEN PARENTS ACT BEFORE WE ARE READY?”
- Research Sponsor: Nneka Sederstrom

[77] Dustin Hansen, Pediatric Resident – Pediatrics Critical Care Medicine
“UNIVERSITY OF MINNESOTA PEDIATRIC RESIDENT QUALITY AND PATIENT SAFETY ELECTIVE: A PILOT STUDY”
- Research Sponsor: Sam Gupta
Abstract #

“BREAKING THE CYCLE: SEXUAL HEALTH AMONG STUDENTS IN JUVENILE JUSTICE SYSTEM”
➢ Research Sponsor: Rebecca Shlafer

[12] Laurel Davis, Postdoc Fellow – General Pediatrics and Adolescent Health
“ADVERSE CHILDHOOD EXPERIENCES AND WEIGHTS STATUS AMONG ADOLESCENTS”
➢ Research Sponsors: Rebecca Shlafer

[14] Fanben Meng, Postdoc Fellow – Pediatric Blood, Marrow, and Transplantation
“4D ENGINEERED IN VITRO METASTATIC MODELS VIA GUIDED CANCER CELL MIGRATION”
➢ Research Sponsor: Angela Pansokalsis- Mortari & Michael C. McAlpine

[16] Michael Parks, Postdoc Fellow – General Pediatrics and Adolescent Health
“HOUSEHOLD IMPLEMENTATION OF SMOKE-FREE RULES IN HOMES AND CARS: A FOCUS ON ADOLESCENT SMOKING BEHAVIOR AND SECONDHAND SMOKE”
➢ Research Sponsor: Iris Borowsky & Barbara McMorris

[18] Chimei Lee, Postdoc Fellow – Clinical Behavioral Neuroscience
“AUTISTIC CHARACTERISTICS AND DEVELOPMENTAL TRAJECTORIES AMONG INDIVIDUALS WITH GRAGILE X SYNDROME AND NO-SYNDROMIC AUTISM SPECTRUM DISORDER”
➢ Research Sponsor: Amy Esler & Rebekah Hudock

[20] Mary Ebadi, Postdoc Fellow – Pediatric Hematology/Oncology
“THE MENINGES INCREASE ACUTE LYMPHOBlastic LEUKEMIA CHEMORESISTANCE IN THE CENTRAL NERVOUS SYSTEM”
➢ Research Sponsor: Peter M. Gordon

[22] April Wilhelm, Postdoc Fellow – General Pediatrics and Adolescent Health
“What Drives An Intervention’s Success? Contextual Barriers and Facilitators to Youth and Parent Participatory Action Research Projects In Schools”
➢ Research Sponsor: Iris Borowsky

[24] Carly Jo Alexander, Postdoc Fellow – Clinical Behavioral Neuroscience
“NEUROPSYCHOLOGICAL PROFILE OF 14-YEAR OLD MALE WITH AN UNSPECIFIED AUTOIMMUNE MOVEMENT DISORDER, ADHD, AND COMPLEX NEUROPSYCHIATRIC PRESENTATION”
- Research Sponsor: Margaret Semrud-Clikeman

[26] Damir S. Utržan, Postdoc Fellow – Nursing
“BULLYING AND CARING RELATIONSHIPS AMONG ADOLESCENTS FORM IMMIGRANT BACKGROUNDS: ASSOCIATIONS WITH INTERNALIZING PROBLEMS”
- Research Sponsor: Barbara J. McMorris

[28] Mary Christoph, Postdoc Fellow – General Pediatrics and Adolescent Health
“LONGITUDINAL TRAJECTORIES IN DIETARY INTAKE DURING THE TRANSITION FROM ADOLESCENCE TO YOUNG ADULTHOOD”
- Research Sponsor: Iris Borowsky

[30] Nikki Anderson, Postdoc Fellow – Pediatric Neurobehavioral Development
“CHARACTERIZATION OF NEUROCOGNITIVE DECLINE IN FUCOSIDOSIS”
- Research Sponsor: Julie Eisengart

[32] Christopher J. Mehus, Pediatric Fellow – General Pediatrics and Adolescent Health
“PARENT INTEREST IN RESOURCES TO ADDRESS THEIR CHILD’S BEHAVIORAL HEALTH THROUGH PRIMARY CARE”
- Research Sponsor: Iris Borowsky

[34] Beth Thielen, Pediatric Fellow – Pediatric Neonatology
“HIGH-THROUGHPUT SEQUENCING OF DIVERSE RHINOVIRUSES AND RESPIRATORY ENTEROVIRUSES FROM CLINICAL SPECIMENS”
- Research Sponsor: Iris Borowsky

[36] Steven Skolasinksi, Pulmonary Fellow – Pediatric Blood, Marrow, and Transplantation
“DEVELOP A DEVISE CAPABLE OF DELIVERING LIVING VELLs INTO PULMONARY AIRWAYS BOTH EX-VIVO AND IN-VIVO”
- Research Sponsor: Cathy Bendel

[38] Catherine Heith, Pediatric Critical Care Fellow – Pediatric Critical Care
“EFFECTS OF AM EX VIVO PEDIATRIC EXTRACORPOREAL MEMBRANE OXYGENATION CIRCUIT ON SEQUESTRATION OF MYCOPHENOLATE MOFETIL, TACROLIMUS, HYDROMORPHONE HYDROCHLORIDE, AND FENTANYL CITRATE”
- Research Sponsor: Gwenyth Fischer

[40] Ashish Gupta, Pediatric BMT Fellow – Pediatric Blood, Marrow, and Transplantation
“HEMATOPOIETIC STEM CELL TRANSPLANT OUTCOMES WITH SECOND OR HIGHER TRANSPLANTS IN CHILDREN WITH INHERITED METABOLIC DISORDERS”
- Research Sponsor: NA
[42] Calla Brown, Academic General Pediatric Fellow – General Pediatrics and Adolescent Health
"ARE YOUTH IN JUVENILE CORRECTIONAL FACILITIES IN MINNESOTA RECEIVING RECOMMENDED WELL CARE? A SECONDARY DATA ANALYSIS USING THE 2016 MINNESOTA STUDENT SURVEY"
➢ Research Sponsor: Rebecca Shlafer

[43] Erin Plummer, Neonatal-Perinatal Medicine Fellow – Pediatric Neurobehavioral Development
"BODY COMPOSITION AND COGNITION IN PRESCHOOL-AEG CHILDREN WITH CONGENITAL GASTROINTESTINAL ANOMALIES"
➢ Research Sponsor: Sara Ramel

[44] Jamie Cheever, Pediatric & Adolescents (LEAH) Fellow – General Pediatrics and Adolescent Health
"THE RELATIONSHIP BETWEEN ADOLESCENT SPORT PARTICIPATION AND SEXUAL AGRESSION- EXAMINING PERPETRATION AND VICTIMIZATION"
➢ Research Sponsor: Marla Eisenberg

[45] Brinda Desai, Internal Medicine Pediatric Fellow – Pediatric Emergency Medicine
"LET’S TALK ABOUT SEX: DO ADOLESCENTS’ PARENTS AND PRIMARY CARE PHYSICIANS TALK TO THEM ABOUT SEX?"
➢ Research Sponsor: Kari Schneider

"CONVERSATION, CONDOMS & CONTRACEPTION: HOW DOES COMMUNICATION WITH SEXUAL PARTNERS AFFECT SAFER SEXUAL BEHAVIORS AMONG AMERICAN INDIAN YOUTH"
➢ Research Sponsors: Annie- Laurie McRee

[47] Satia Issaranggon Na Ayuthaya, Pediatric Infectious Disease Fellow
"MICROBIOLOGICAL SPECTRUM AND ANTIBIOTIC SUSCEPTIBILITY PATTERN OF BACTERIAL SKIN ISOLATES FROM PATIENTS WITH EPIDERMOLYSIS BULLOSA AND ITS CHANGING TREND AFTER OF BONE MARROW TRANSPLANTATION"
➢ Research Sponsor: Bazak Sharon

[48] Raiza Beltran, Pediatric & Adolescents (LEAH) Fellow – General Pediatrics and Adolescent Health
"EXPLORING SOCIETAL AND CULTURAL NORMS SURROUNDING YOUNG FILIPINO WOMEN’S CONTRACEPTIVE PERCEPTIONS AND EXPERIENCES: A QUALITATIVE APPROACH"
➢ Research Sponsor: Sonya Brady, Barb McMorris, Annie- Laurie McRee

[49] Jessica Knight- Perry, Pediatric BMT Fellow – Pediatric Blood, Marrow, and Transplantation
“PERIPHERAL BLOOS LYMPHOID AND MYELOID CHIMERISM AFTER HEMATOPOIETIC STEM CELL TRANSPLANT FOR NON-MALIGNANT DISORDERS”
➢ Research Sponsors: Angela R. Smith

[58] Shannon Andrews, Adult & Pediatric Fellow – Infectious Diseases
“EPIDEMIOLOGY AND CLINICAL FEATURES OF SEPTIC ARTHRITIS IN CHILDREN”
➢ Research Sponsor: Bazak Sharon

[59] Ketzel Marsh, Adult & Pediatric Fellow – Infectious Diseases
“ADDRESSING SOCIAL SUPPORT AND SOCIAL ISOLATION IN ONLINE INTERVENTIONS FOR YOUNG BLACK MSM: EXAMINING THE ROLE OF PEER-TO-PEER SHARING”
➢ Research Sponsors: Cathy Bendel

[60] Patrick Basile, Pediatric Fellow – Pediatric Hematology/Oncology
“REACTIVE OXYGEN SPECIES AS A MECHANISM OF LEUKEMIA CELL DEATH IN CEREBROSPINAL FLUID”
➢ Research Sponsor: Peter Gordon

[61] Marie Hickey, Neonatal-Perinatal Medicine Fellow – Pediatric Endocrinology
“CHARACTERIZING PREMATURE, LOW BIRTH WEIGHT INFANTS WITH POSITIVE NEWBORN SCREENS FOR CONGENITAL HYPOGLYCEMIA”
➢ Research Sponsor: Brandon Nathan

[62] Kieran Leong, Pediatric Fellow – Pediatric Cardiology
“OUTCOMES WITH SPECIFIC APPROACH IN CHILDREN AFTER UNDERGOING PERICARDIOCENTESIS”
➢ Research Sponsor: Guru Hiremath

[63] Lerraughn Morgan, Pediatric Fellow – Pediatric Cardiology and Critical Care Medicine
“REDUCING VARIATION IN PEDIATRIC BLOOD PRESSURE MEASUREMENTS IN A PEDIATRIC INPATIENT UNIT”
➢ Research Sponsor: Elizabeth Braunlin & Sameer Gupta

[64] Sacha Kumar, Pediatric Critical Care Fellow – Pediatric Critical Care Medicine
“INSTITUTION OF A NIGHT-TIME HUDDLE SYSTEM AND ITS IMPACT ON UNSCHEDULED PICU TRANSFERS”
➢ Research Sponsor: NA

[65] Elizabeth Zorn, Pediatric Neonatology Fellow – Pediatric Neonatology
“HIPPOCAMPAL VOLUMES CORRELATE WITH MEMORY FUNCTION AT 5 YEARS FOLLOW-UP IN CHILDREN WITH HIE”
➢ Research Sponsor: Katie Pfister & Michael Georgie

[66] Annie Simones, Pediatric Neonatal Fellow – Pediatric Neonatology
“INTRA-TRACHEAL N-ACETYLCYSTEINE IN A NEWBORN PIG MODEL OF MECONIUM ASPIRATION SYNDROME”
➢ Research Sponsor: Kari Roberts
### APPETIZERS
- Tyro dip with vegetables
- Melitzana (Eggplant) with pita crisps
- Spinach-feta boughatsa
- Mezethes Skewers

### SALADS/ENTREES
- Tomato/Cucumber Salad
- Gyros (with lettuce, tomato, onion)
- Grilled Schultz Chicken Skewers
- Tzatziki, mustard yogurt sauce, pita

### DESSERT BUFFET
- Handmade baklava, lemon cream boughatsa, gioconda truffles

### BEVERAGES
- Coffee, peppermint tea, Souroti sparkling water, home-made lemonade (100% honey sweetened)
FORMAL
ORAL
PRESENTATIONS
(Abstracts)
Quantitative Antibody Screen for Timely Diagnosis of Symptomatic Lyme disease

Elizabeth P. Butler, Megan P. Reinhard, Bazak Sharon

Background
Lyme disease is the most common tick-borne infection in the United States. Ixodes scapularis transmits Borrelia burgdorferi to human hosts. Infection produces local inflammatory response and may also disseminate resulting in nonspecific illness. Diagnosis guidelines suggest two-tiered algorithm (antibody screen followed by confirmatory immunoblot). Results may take several days, delaying diagnosis. For patients with joint swelling, when septic arthritis is on the differential diagnosis such a delay often results in more aggressive management. Timely recognition may prevent such unnecessary interventions.

Objectives
To assess the reliability of quantitative chemiluminescent immunoassay (CLIA), in the timely diagnosis of Lyme disease, particularly Lyme arthritis (LA).

Methods
After obtaining IRB approval, we retrieved all Lyme screens ordered for children (1-18yo) between 1/2015 – 1/2017, throughout the Fairview health system. We reviewed the charts of children with highly positive results (>8.0) in order to identify and characterize their presentation and diagnosis.

Results
During the study period, 2245 children had CLIA screens done. Results were negative for 92% of children (2069). Of the 176 children with positive screen, 88 had results above 8.0 units (Figure 1a). The vast majority of patients with highly positive results had obvious clinical evidence of Lyme disease at the time of presentation, arthritis being the most common (>50%) (Figure 1b). Joint swelling was more common in the 43 patients (2% of the entire cohort), whose levels were >12.4, with over 75% of them diagnosed with LA.

Conclusions
Highly positive Lyme CLIA results suggest symptomatic disease. More than 85% of patients with result >8.0 units presented with clinical signs of inflammation attributed to Lyme infection, most commonly arthritis. Quantitative Lyme CLIA screen can be used to confirm the clinical suspicion of LA within hours, thus preventing unnecessary aggressive and invasive procedures.
Although baseline awareness is low, interest in congenital cytomegalovirus screening is high: results from a Minnesota State Fair study

Katie J Tastad, Nicole E Basta, Mark R Schleiss

Background: When women are infected with cytomegalovirus during pregnancy their infants can be born with congenital cytomegalovirus (cCMV). In the US approximately 1% of infants are born with cCMV infections - up to 20% of which will result in permanent disabilities. This is the most common cause of birth defects, yet studies suggest awareness is limited. We aimed to assess awareness of cCMV; attitudes towards screening; and behaviors that could increase risk of prenatal infection.

Design/Methods: We conducted a survey at the 2017 Minnesota State Fair. Female Minnesota residents aged 18-44 years who were fluent in English were eligible if they either 1) had never been pregnant or 2) had been pregnant within the past 10 years. We compared responses between never pregnant and recently pregnant women using logistic regression analysis.

Results: Of 726 respondents, only 145 (20%) had heard of cCMV – the least well-known of 11 health conditions listed. Overall, 13% identified cCMV as the most common cause of birth defects and 15% identified hearing loss as its most commonly associated problem. After adjusting for age, education, and history of having worked in healthcare, there was no significant difference in awareness by pregnancy history. After we provided information about cCMV, 96% believed prenatal or newborn screening should be offered. Women who had children participated in child-related cCMV risk factors more than women without children anticipated doing, such as cleaning a pacifier with their mouth (59%, 40% respectively p<0.05).

Conclusion(s): Although baseline awareness was low, women were supportive of screening after learning about the risk of cCMV. Proposed legislation in Minnesota aims to increase cCMV awareness among women and healthcare providers. Our findings suggest that even recently pregnant woman have limited awareness of the risk of cCMV infection. Efforts to provide education and identify ways to reduce risk are needed.
*Statistically significant differences between groups using chi-square test with alpha less than or equal to 0.05.
† Fictional virus used for validation purposes.
Liver-targeting gene editing corrects systemic and neurological diseases of mucopolysaccharidosis type I


Abstract: Mucopolysaccharidosis type I (MPS I) is characterized by progressive neurodegeneration, and premature death. Caused by α-L-iduronidase (IDUA) deficiency and subsequent accumulation of glycosaminoglycans (GAG), current therapies include stem cell transplant (with significant risk of morbidity and mortality), and enzyme replacement therapy (requiring costly and frequent long therapeutic infusion sessions).

In contrast, we are proposing a one-time, single infusion of three AAV vectors to accomplish in vivo gene editing. This method employs insertion of the normal IDUA cDNA by means of dual zinc finger nuclease (ZFN)-mediated cutting and insertion into intron 1 of the albumin locus. A small number of hepatocytes are thereby edited in vivo to create a stable long-term source of corrective IDUA enzyme. MPS I mice (n=8 per gender, 4-9 weeks old) were injected with a single dose of AAV2/8 encoding albumin-targeted ZFN and a donor encoding a partial IDUA cDNA. MiSeq analysis showed that treated mice displayed significant levels of indels (56%) at the target locus, demonstrating efficient cutting by ZFN. IDUA levels in these animals increased significantly in liver (up to 14 fold), heart, lung, muscle and spleen. Tissue GAG levels were significantly reduced in liver (by 91%), heart (85%), lung (86%), muscle (68%) and spleen (84%). Barnes maze tests at the end of the study showed that ZFN+IDUA donor treated MPS I mice achieved significant neurological benefits compared with untreated MPS I mice. This study serves as a proof-of-concept for this platform-based approach that should be broadly applicable to the treatment of a wide array of monogenic diseases.

Further, IND (BB-16821) based on these results was approved in 2016 by the US FDA for the initiation of a Phase I study of in vivo genome editing. This protocol was recently opened as an “actively recruiting” clinical trial (clinicaltrials.gov ID: NCT02702115).
Iron Deficiency Alters Thyroid Hormone Action in Developing Hippocampal Neurons

Thomas W. Bastian, Sierra E. Burr, Lorene M. Lanier, and Michael K. Georgieff

Background: Early-life iron deficiency (ID) blunts hippocampal neuron development and reduces dendritic arborization, causing learning and memory impairments that persist into adolescence and adulthood despite iron repletion. Aberrant mitochondrial energy metabolism is likely one of the cellular mechanisms driving these neurodevelopmental deficits and is a potential target for alternative therapies beyond iron. Both iron and thyroid hormone (TH) are important regulators of cellular energy homeostasis and their deficiencies impair mitochondrial energy production in the developing brain. Early-life nutritional ID anemia impairs TH levels and TH-responsive gene expression in the neonatal brain. These ID-induced TH deficits could be maladaptive and contribute to impaired neurodevelopment or they could be a coordinated adaptive response to low levels of another critical energy substrate (ie, iron).

Objective: To determine whether neuron-specific ID causes a homeostatic reduction in thyroid hormone-regulated gene expression in developing hippocampal neurons.

Methods: Primary hippocampal neuron cultures from embryonic day 16 mice were treated with 10 μM deferoxamine (DFO, an iron chelator) beginning at 3 days in vitro (DIV). Physiological levels of triiodothyronine (T3) in the growth media are maintained throughout the experiment. At 11DIV (at the beginning of rapid dendrite outgrowth) and 18DIV (during peak dendrite maturation), quantitative real-time PCR was used to quantify changes in mRNA levels for iron- and TH-regulated genes (ie, Tfr1, Dio2, Hr, Klf9, Ngrn, and Pvalb).

Results: Tfr1 mRNA expression, an indicator of cellular iron status, was ~2-fold higher in 11DIV and 18DIV DFO-treated cultures (p<0.05). Neuronal ID decreased mRNA levels for Ngrn (37% lower, p<0.05), Pvalb (30% lower, p<0.05), and Klf9 (23% lower, p<0.05) at 11DIV. At 18DIV, Dio2 mRNA levels were 63% higher in iron-deficient neurons (p<0.05), indicating reduced cellular TH status. There was a trend toward higher Hr and lower Pvalb and Klf9 in 18DIV iron-deficient neurons (0.05<p<0.1).

Conclusions: Our results demonstrate, for the first time, that cellular TH action is altered in developing neurons with insufficient iron availability. We propose that, at least initially, this is a homeostatic adaptive response in order to coordinate energy metabolism signaling for two important metabolic regulators (ie, iron and TH). These findings may have implications for the efficacy of potential alternative therapies targeting neuronal energy metabolism following early-life ID.
Do Primary Care Physicians Discuss Sexual Activity and Offer STI Screening to LGBT Adolescents?

BACKGROUND: Pride festivals celebrate lesbian, gay, bisexual, transgender (LGBT) culture. Adolescents attending these events have never been characterized. Given that adolescents with non-biologic gender identity or non-heterosexual orientation represent an at-risk population for health inequities, consistent primary care and STI screening are especially important.

OBJECTIVE: Characterize gender identity and sexual orientation of adolescent Minnesota PRIDE Festival attendees and determine whether Primary Care Physicians (PCPs) are discussing sexual history and offering screening for STIs in this population.

DESIGN/METHODS: Adolescents, aged 13-17, attending the 2017 Minnesota PRIDE Festival completed an 18-question survey. Participants were queried regarding PCP visits in the preceding year and whether they were asked about sexual activity and/or offered STI screening. Basic frequencies, Chi-square analyses and logistic regression were used to evaluate the variables.

RESULTS: 490 surveys were evaluated. Thirty-two percent of adolescents identified as heterosexual, 34% bisexual, 16% gay/lesbian, and 18% other – primarily pansexual (55%) or asexual (10%). 12% of adolescents identified as transgender. The majority (90%) of adolescents had been seen in the past year by a PCP. Of these, 68% had been asked a sexual history and 29% were offered STI testing. Older adolescents were more likely to be asked about sex (OR 9.6, CI 4.0-23.2; p<0.0001) and offered STI testing by a physician (OR 3.7, CI 1.2-11.1; p=0.018). Sexual orientation was not associated with rate of sexual history taken (OR 1.0, CI 0.6-1.7; p=0.88) or STI screening offered (OR 1.3, CI 0.8-2.2, p=0.29).

CONCLUSIONS: Although sexual minority adolescents sought primary care at a greater rate than anticipated, over 30% were not asked about their sexual activity and over 70% were not offered STI testing by their PCPs. Sexual orientation was not associated with risk for omission of either practice.
Respiratory pathogen detection and illness severity among previously healthy and asthmatic children hospitalized with acute respiratory illness, Minnesota 2013-2016.

Background:
Respiratory illness is the leading cause of hospitalization among children less than 9 years of age in the United States. In 2013, the Minnesota Department of Health began conducting hospital-based surveillance to characterize and monitor severe acute respiratory illness (SARI) in children across the Minneapolis-St. Paul metro area.

Methods:
From September 2013 through September 2016, respiratory specimens collected from routine diagnostic testing of hospitalized children were analyzed for 22 viral and bacterial pathogens by real-time PCR. Medical records were reviewed and an illness severity index was developed.

Results:
During the surveillance period, 4,850 children met the SARI case definition. Of these cases, 2,487 (51.3%) children were previously healthy, of which 144 (5.7%) required mechanical ventilation during their hospitalization. The most common pathogens of previously healthy children requiring intubation were RSV (25.7%), rhinovirus (25.0%), adenovirus (11.8%), coronavirus (9.0%), and parainfluenza (9.0%). Six of these children died, with ages ranging from 6 weeks to 9 years. Additionally, of the 4,850 cases, 522 (10.7%) children had a prior diagnosis of asthma. The most common pathogens among asthmatic children were rhinovirus (36.9%), RSV (23.4%), adenovirus (10.0%), parainfluenza (9.0%), and human metapneumovirus (8.4%). Children with asthma had a shorter length of stay (mean=4.0 days) than previously healthy children (mean=5.3 days), and demonstrated a positive correlation with enterovirus-d68 (EV-D68) infection (OR=3.9, p<0.001, CI 2.2-6.8).

Conclusions:
Acute respiratory infections are responsible for significant morbidity among both healthy and asthmatic children. No specific viral pathogens were found to be statistically significant with the need for mechanical ventilation among healthy children, and only EV-D68 was found to be significant among asthmatic children.
Effect of anastrozole on bone mineral density and body composition in children with congenital adrenal hyperplasia.

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BACKGROUND: Aromatase inhibitors have been used off-label in the pediatric population to improve predicted final height outcomes, but there is limited information about anastrozole use in children with congenital adrenal hyperplasia (CAH) and its effect on bone mineral density (BMD) and body composition.

OBJECTIVE: To evaluate the effect of anastrozole, an aromatase inhibitor, on BMD and body composition in children with CAH.

METHODS: In a cross-sectional fashion, 25 CAH patients treated with anastrozole (mean age 11.3±3.0 years, 56% males) were compared to 31 untreated CAH patients (mean age 13.5±4.6 years, 29% males). Participants had height and weight measurements, a pubertal exam, and a dual X-ray absorptiometry (DXA) scan. Total BMD and L2-L4 BMD Z-scores were adjusted for height-for-age Z-scores (TBMDHAZ and L2-L4HAZ). Hydrocortisone doses (mg/m2/day) for each patient were averaged over the past year.

RESULTS: After adjustment for pubertal status, type of CAH, years on hydrocortisone, years on anastrozole, BMI Z-score, and bone age Z-score, CAH patients treated with anastrozole did not differ from untreated patients for any BMD measures (p=0.86 for total BMD, p=0.47 for total BMD HAZ, p=0.72 for L2-L4, and p=0.41 for L2-L4 HAZ Z-scores). Visceral adipose tissue (VAT) did not differ between anastrozole-treated and untreated patients after adjusting for pubertal status, type of CAH, years on hydrocortisone, years on anastrozole, BMI Z-score, and bone age Z-score (p=0.13).

CONCLUSIONS: Anastrozole use in children with CAH does not appear to significantly impact BMD or VAT. This provides preliminary data supporting the use of anastrozole as an adjunct therapy to delay bone age advancement and improve final adult height in children with CAH, as there does not appear to be harmful effects on BMD and VAT. More long-term data examining anastrozole’s effect on BMD and VAT should remain a focus of study in children with CAH.
Alteration of retinal gene expression pathways in anemic rodent pups

Ellen C. Ingolfsland, Phu V. Tran, Linda K. McLoon, Michael K. Georgieff

**Background:** Retinopathy of prematurity (ROP) remains as prevalent today as it was 30 years ago due to an incomplete understanding of its pathogenesis. It is unknown how phlebotomy-induced anemia (PIA), a common comorbidity experienced by preterm infants, impacts the development of neovascularization. We hypothesized that PIA would exacerbate changes in expression of retinal genes within the hypoxia-sensitive mechanisms central to vascular development.

**Objective:** Determine the impact of anemia on retinal gene expression at postnatal day (P) 20 in a rodent model.

**Methods:** Sprague Dawley rat pups were phlebotomized from P3 to P20 to reach a goal hematocrit (hct) of <20%. Control pups were not phlebotomized. Retinas were collected at P20, and RNA was isolated and underwent next generation sequencing (NGS). NGS data were analyzed by EdgeR package to identify differentially expressed genes (DEGs). DEGs were analyzed by Ingenuity Pathway Analysis (IPA) to uncover altered functional gene networks.

**Results:** Phlebotomized pups reached their goal hct on P15, with a mean hct of 18.6 g/dL, and maintained their hematocrits within goal until euthanasia. Non-phlebotomized controls had a mean hct of 39.5 g/dL on P14 and 34 g/dL on P20. Analysis of NGS data identified 43 DEGs between the anemic and control groups (Fig. 1) which mapped onto signaling pathways that included angiogenesis, vasculogenesis, inflammation, and cell movement. Four candidate genes were independently validated with qPCR (P<0.05 for all).

**Conclusions:** P20 anemic rodent pup retinas showed increased expression of genes within networks of blood vessel development, inflammation, and cell movement. Compared to previous findings in a rodent model of oxygen induced retinopathy (OIR) at P20, both groups showed increased expression of Wnt16 and Apln, molecules important in cell signaling and vasculogenesis respectively. These common molecular changes induced by PIA and OIR provide evidence supporting our hypothesis that PIA likely exacerbates ROP pathogenesis.

**Figure 1.** Heatmap of 43 DEGs between anemic rat pups and control pups at P20, filtered at 1.5 fold change, false discovery rate <0.05, P≤ 0.05, obtained from edgeR.
POSTER SESSION
UNDERGRADUATE / GRADUATE / MEDICAL STUDENTS

Abstracts
Evaluating Pseudohyperkalemia in the Emergency Department

Authors: Ryan Cullen, Jeff Louie, Rahul Kaila, Gretchen Colbenson

Background
Obtaining serum samples for electrolytes is common in busy emergency departments. Despite best efforts, hemolyzed samples causing hyperkalemia, termed “pseudohyperkalemia” occurs in approximately 3% of blood draws. Redrawing samples increases length of stay, places the child for a secondary painful procedure, and is likely a cause for patients and families to become dissatisfied.

Objective
Determine if pseudohyperkalemia occurring among healthy children should be repeated.

Methods
We performed a 5-year retrospective chart review of all patients with hyperkalemia secondary to hemolysis. We compared children without medical or surgical conditions to subjects with heart, kidney, genetic, metabolic, and chronic problems.

Results
A total of 236 children were captured with any degree of hemolysis. Age ranged from 3 days to 17.9 years. Mean age was 3.7 years of age with an initial mean hemolyzed potassium level of 6.5 ranging from 5.4-12.6 mmol/L. One hundred and fifty subjects were healthy (150/236, 63.6%) and 92 (92/150, 61.3%) had a repeat potassium. Two children (2/92, 2.1%) had true hyperkalemia and both had abnormal BUN and creatinine. Eighty-six subjects had either kidney, heart or other conditions (86/236, 36.4%) and (78/86, 90.7%) had repeat potassium. Four children (4/78, 5.1%) had true hyperkalemia. The true hyperkalemia patients had the following diagnoses: focal segmental Glomerulonephritis, chronic renal failure, DKA, and carnitine deficiency. With the exception of the child with carnitine deficiency, each patient had elevated BUN and creatinine.

Conclusion
In our small sample, it appeared that children without underlying conditions and children with medical conditions who have hyperkalemia from hemolysis do not require a repeat sample unless there is associated abnormal BUN and Cr. More than 60% of healthy patients and 90% with underlying medical conditions had hemolyzed sample repeated, which can be avoided. Performing less sampling on pseudohyperkalemia would decrease length of stay and increase family satisfaction.
Figure 1

Pseudohyperkalemia

236

Healthy

150/236 (63.6%)

Sample repeated
92/150 (61.3%)

Normal K
81/150 (54%)

Not repeated
58/150 (38.6%)

Abnormal K
11/150 (7.3%)

Sample repeated
9/11

Normal K
9/9

(Not repeated)
2/11

Abnormal K
0

Kidney, cardiac and other underline medical conditions

86/236 (36.4%)

Sample repeated
78/86 (90.7%)

Normal K
58/86

Not repeated
8/86 (9.3%)

Abnormal K
20/86

Sample repeated
20/20 (100%)

(Not repeated)
0

Normal K
16/20

(Not repeated)
0

Abnormal K
4/20

(True Hyperkalemia)
4/78 (5.1%)
Studying the global trends of polio titers in internationally adopted children

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Background: Polio is an infectious disease that affects the nerve cells and can lead to paralysis. We analyzed trends of polio neutralizing antibody levels in internationally adopted children, stratified by region to see if socioeconomic status affected vaccination response. We hypothesized that countries of lower socioeconomic status will have children with a lower likelihood of polio immunity.

Methodology: We included international adoptees that completed their adoption screening at the Adoption Medicine Clinic, University of Minnesota. 215 participants were screened between January 2000 and December 2016. Socio-economic factors from the Human Development Reports database were used to analyze adoptees by gross national income, multidimensional poverty index, life expectancy, under 5 year old mortality, and inequality in income.

Results: Children from Latin America/Caribbean had 0.215 times the odds ratio of immunity to Polio 1 compared to children from Asia in the adjusted odds ratio. There were no significant relationships with any of the socioeconomic indicators; all had a p value greater than 0.5.

Conclusions: Generally, children from Asia had a stronger immune response to all Polio vaccination types than those from Sub Saharan Africa and Latin America/Caribbean. The most important trend is the independent predictor of titers in children from Latin America/Caribbean vs Asia. Both the adjusted and unadjusted odds ratio find that children from Asia have better immunity to Polio 1 than those from Latin America/Caribbean. Surprisingly, there was no significant correlation to show that specific socioeconomic indicators affect Polio immunity. Further testing with larger data sets is necessary.
Self-perception of servant leadership and leadership self-efficacy among first-semester health students

Authors
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Background: Little is known about the leadership competencies of entering health professions students. The objective of this study was to evaluate the association of self-perceived servant leadership (SL) and leadership-self efficacy (LSE) ability with degree program and demographic difference of first-semester health professions students. We present the results of this study along with implications for interprofessional and leadership curricula.

Methods: A 35-item survey measuring SL and LSE was administered to 1,014 students from 15 academic programs enrolled in the first semester of the University of Minnesota’s interprofessional health curriculum. The survey utilized a condensed version of Page and Wong’s SL instrument and Paglis and Dwyer’s LSE instrument. Also captured were 15 demographic variables.

Results: 453 students (45%) responded to the survey. Post-hoc testing showed higher SL scores for Medicine vs. Pharmacy and Dentistry vs. Pharmacy (p = 0.02 for both). SL and LSE scores were correlated with additional previous leadership roles (p < 0.01 for both) and additional previous leadership trainings (p < 0.01 for both). SL scores were correlated with lower socioeconomic status (p = 0.03). No significant differences in leadership scores were found with respect to gender, race, or sexual orientation.

Conclusion: This cross-sectional evaluation of student leadership self-perception is notable for identifying higher SL scores in first-semester medical students compared to pharmacy students, as frequent collaboration between these two professions could presumably be influenced by differences in leadership approach. Also notable is a dose-dependent increase in SL and LSE scores with additional leadership experience.
Characterizing Guinea Pig Cytomegalovirus Pathogenesis in Amnion

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Human cytomegalovirus (CMV) is the most significant infectious cause of congenital disease and preventable sensorineural birth defects. Congenital CMV infection occurs in up to 2% of pregnancies in the United States, and an estimated 8,000 children are disabled by the virus each year. Recent studies have observed that persistent human CMV infection of the amnion is associated with premature birth, intrauterine growth restriction, and congenital CMV disease. As the innermost layer of the fetal membrane, the amnion is the final barrier separating the fetus from the outside world. A single layer of amniotic epithelial cells protects against viral and bacterial pathogens by secreting cytokines and other factors to modulate the innate and adaptive immune responses. How human CMV establishes infection in the amnion and how persistent viral infection impacts the membrane’s normal function are poorly understood. We sought to determine whether guinea pig CMV, a well-established animal model of in utero CMV transmission, also infects the amnion during natural infection. After a mid-gestation viral challenge, guinea pig CMV (GPCMV) was detected in the placenta and amnions of pups collected at 21 days post-infection. Guinea pig amniotic epithelial (CPAE) cells were isolated from late-term amnions and immortalized with HPV16 E6/E7. Both primary and immortalized guinea pig amniotic epithelial cells supported GPCMV replication. Compared to GPCMV infections in lung fibroblasts, replication in guinea pig amniotic epithelial cells is less lytic, sustained for a longer duration, and results in markedly less extracellular virus production. Additionally, experiments have revealed that guinea pig amniotic epithelial cells secrete trans-acting antiviral factors of unknown identity. Together, these results indicate that the guinea pig is an appropriate animal model for studying viral infection of the amnion in vivo and in vitro.
Beyond Constipation: A 4-year-old Female Presenting to an Emergency Department with Localized Abdominal Pain

Sarah Swenson, Faith Myers, Ashley Borgschatz, Shawn Mahmud, Rahul Kaila, Kari Schneider, Patricia Hobday, Jeff Louie

A 4-year-old female with history of constipation presented to an outside emergency department with abrupt onset, sharp right lower quadrant abdominal pain, which caused her to “double over”. She had a heart rate of 117/min, temperature 37.4 C, respiratory rate of 24/min, oxygen saturation 99%, weight 25.7 kg (99%). Her white blood cell count was 15.8 ($10^9$ per liter) with absolute neutrophil count of 11.4 ($10^9$ per liter). Her platelets were mildly elevated at 471 ($10^9$ per liter). The differential diagnosis for right lower quadrant abdominal pain included appendicitis, constipation, UTI, gastroenteritis, intussusception, hydronephrosis, pneumonia, strep throat, nephrolithiasis, Meckel's diverticulum, and tumor of the ovary. A limited ultrasound was concerning for a mass possibly involving the right ovary.

She was referred to the University of Minnesota Masonic Children’s Hospital Emergency Department for further care and management of her suspicious mass. Upon presentation, she was well-appearing and reported her pain as much improved without use of medications. Her physical exam was significant for mild right lower quadrant tenderness to deep palpation without rebound, guarding, or any palpable mass.

Her ultrasound was repeated with a Doppler study that revealed a large complex, cystic mass measuring 7.8 x 5.2 x 6.8 cm, felt to represent the right ovary (Figure 1). The uterus and left ovary were sonographically normal. The appendix was not visualized. Blood flow to the presumed right ovary, but not the mural nodule, was preserved.

Pediatric surgery was consulted and performed a laparotomy with right oophorectomy for presumed teratoma. Oncology was consulted and recommended additional labs: β-HCG, estradiol, AFP, and inhibin levels that were not elevated.

Pathology and cytology reports confirmed a diagnosis of mature cystic teratoma with negative peritoneal washing.
Figure 1. Cystic adnexal mass with multi-lobulated mural nodule
Frequency of Chest Radiographs During a Single Bronchiolitis Season at a Local General Emergency

Faith Myers, Sarah Swenson, Ashley Borgschatz, Dorothy Curran, Nick Jubert, Joseph Alfano, Kelly Dietz, Lorilee Peterson, Brian Harvey, Dan Nerheim, Rahul Kaila, Kari Schneider, Marissa Hendrickson, Patricia Hobday, Jeff Louie

Introduction: 2014 American Association of Pediatrics (AAP) guidelines on bronchiolitis discourage the use of routine imaging in diagnostic assessment of otherwise healthy children. Although there is evidence that pediatric emergency departments adhere to these guidelines, less is known about general emergency department (GED) practices. As the majority of bronchiolitis cases are seen in GEDs, it is useful to observe current practices to better understand opportunities to improve adherence to guidelines.

Methods: We abstracted 197 charts from a local GED based on ICD-10 codes for pneumonia, bronchiolitis, RSV, wheezing, respiratory distress, and respiratory failure. We included children 24 months of age and younger who were seen in the ED from October 2016 to May 2017 with clinical symptoms consistent with bronchiolitis. We excluded medically complex patients and repeat visits within 72 hours. Variables abstracted included age, gender, chest radiography, official reading by off-site radiologist (OSR), triage vitals, and physical exam findings. All radiographs were re-read by a pediatric radiologist (PR).

Results: 134 patients met clinical criteria for bronchiolitis. 98 patients (73.1%) received chest radiographs with a median age of 9.78 months (range: 0.36 months to 23.64 months). OSR read 29 chest radiographs as consistent with pneumonia, whereas PR read 0 as pneumonia. Of the 36 patients who did not receive chest radiographs, the median age was 10.11 months (range: 1.92 months to 22.56 months). Comparing OSR and PR readings revealed multiple discrepancies (Figure 1).

Conclusions: In our small cohort, 73% (98/134) of children who had clinical findings of bronchiolitis received a chest radiograph. Our findings suggest GED providers do not adhere to AAP Guidelines and further education strategies are needed to decrease unnecessary radiation exposure. An unexpected finding was the large discrepancy among OSR and PR and highlights fundamental differences in training.
Figure 1. Retrospective chart review flowchart.
Incidence of Respiratory Syncytial Virus Testing During Bronchiolitis Season at a Rural Emergency Department

Ashley Borgschatz, Sarah Swenson, Faith Myers, Dorothy Curran, Nick Jubert, Joseph Alfano, Lorilee Peterson, Brian Harvey, Dan Nerheim, Rahul Kaila, Kari Schneider, Marissa Hendrickson, Patricia Hobday, Jeff Louie

Introduction: The 2014 American Association of Pediatrics (AAP) guidelines on bronchiolitis discourage the use of routine viral testing. Bronchiolitis is one of the top ten emergency department diagnoses during the late fall and winter, and the majority of children are seen in a general emergency department (GED), rather than a pediatric hospital. Although there is evidence that pediatric academic hospitals adhere to AAP guidelines, less is known about GED practices for bronchiolitis. This study aims to quantify the use of respiratory syncytial virus (RSV) testing in children with symptoms consistent with bronchiolitis at a local GED.

Methods: We abstracted 197 charts based on ICD-10 codes for pneumonia, bronchiolitis, RSV, wheezing, respiratory distress, and respiratory failure. Children 24 months of age and younger seen at a local GED from October 2016 to May 2017 with clinical symptoms consistent with bronchiolitis were included. Medically complex children or repeat visits within 72 hours were excluded. Variables abstracted included age, gender, RSV testing, triage vitals, and physical exam findings.

Results: 134 children met bronchiolitis criteria. The mean age was 10.32 months (range 3.32 - 23.64 months), (95% CI, 9.24 - 11.40). There were 70 males (52.2%) and 64 females. Of the 134 children, 74 (57.5%) were tested for RSV: median age 6.96 months, (95% CI, 7.764 - 10.735). 44 children had positive rapid RSV testing: median age 7.74 months, (95% CI 7.16 - 10.92). 30 children had negative rapid RSV testing: median age 6.78 months (95% CI 7.00 - 12.10).

Conclusion: In our small cohort, 57% of children with clinical symptoms consistent with bronchiolitis were tested for RSV, yet recent AAP guidelines recommend against routine viral testing. Our findings demonstrate a need for ongoing education of GED providers regarding current guidelines to avoid unnecessary testing in children with bronchiolitis.
Figure 1. Retrospective chart review flowchart

197 charts reviewed

134 with Bronchiolitis
63 excluded (complex, bounce-back, clinically not bronchiolitis)

74 (55%) received rapid RSV testing
60 (45%) did not receive rapid RSV testing

44 (60%) RSV +
30 (40%) RSV -
Title: Standardization of Central Venous Catheterization in Pediatric Patients in the ICU at University of Minnesota Masonic Children’s Hospital

Introduction: Central venous catheterization (CVC) is a common procedure performed in critically ill patients for medication delivery and blood sampling. Unfortunately, central line placement is invasive and associated with risks of thrombophilic events, bloodstream infections and other potential safety complications. Practice variability across healthcare providers precludes evaluation of best practice, quality, and risk management. Our goal was to standardize central line placement focusing on: 1) controlling risk of bloodstream infections, 2) reducing frequency of associated clot burden events post procedure, 3) utilizing a dual confirmation technique to confirm ideal line placement, and 4) standardize documentation in the electronic health record for future QI metrics.

Methods: Interdepartmental meetings with Interventional Radiology, Anesthesiology, Intensive Care, Emergency Medicine, Vascular Access, Surgery and Informatics were held to discuss and facilitate integration of practice. Onboarding with data collection will allow for compliance review and streamlining of relevant practice. Multidisciplinary input allowed creation of a standard shared electronic template to optimize and document required parameters relevant to risk modulation as supported best practices defined in current literature and Solution for Patient Safety Cohort (SPS).

Results: Data collection will be used as a guideline to implement relevant and necessary components to CVC standardization. We anticipate other departments that routinely perform central line placement in pediatric patients will be onboarded. Adopted CVC standardization and documentation will improve patient safety and future quality assessments.

Discussion: We anticipate that this will create more logistical organization in the EHR and more consistent care to patients with improvement in post procedure outcomes. Follow up would include formal data analysis on the frequency and types of adverse events after standardization implementation.
silent transient abnormal myelopoiesis as precursor to pediatric acute myeloid leukemia

INTRODUCTION: Children with Trisomy 21 have significantly increased incidence of acute myelogenous leukemia (AML) and may also experience a phenomenon termed transient abnormal myelopoiesis (TAM) early in life. TAM manifests as leukocytosis with blast cells, as well as mutations in the hematopoietic transcription factor GATA1. TAM is customarily self-limited and does not require therapy, yet up to 30% of neonates with TAM will develop AML in the future, necessitating close monitoring for increasing blast counts. We report two patients with ‘silent’ TAM who were monitored closely after identification of TAM, but whose evaluation did not identify concerning trends other than cytopenias prior to their diagnosis of AML.

METHODS: A retrospective electronic medical record chart review was conducted. A waiver of consent was granted by the institutional review board at Children’s Minnesota.

RESULTS: Records of two patients with Trisomy 21 and TAM as neonates who subsequently developed AML indicated prolonged periods (>12 months) of laboratory evaluations without diagnostic findings of leukemia. Over that same period, laboratory evaluations demonstrated thrombocytopenia. The first patient died of recurrent/refractory AML and the second patient is now doing well following the completion of chemotherapy.

DISCUSSION: While most children with Trisomy 21 who develop AML respond favorably to chemotherapy, there is a subset of patients for whom current therapy options are insufficient or intolerable, and their AML is lethal. In these patients, earlier and more sophisticated identification and characterization of their AML through GATA-1 testing, peripheral morphology, or bone marrow evaluation may inform better therapeutic decisions and enable targeted therapies. While broad generalizations cannot be made from two patients regarding development of monitoring algorithms, their courses illuminate the need for further study about how to optimize monitoring, including the routine incorporation of genetic testing, and identify actionable changes in patients with ‘silent’ TAM.
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**FUNCTIONAL OUTCOMES IN ENGRAFTED SURVIVORS OF HCT FOR ADVANCED cALD: A COMPARISON OF PATIENTS UNDERGOING FULL-INTENSITY VERSUS REDUCED-INTENSITY CONDITIONING PRIOR TO TRANSPANTATION**

Rachel L Bilski: Troy C. Lund, MD, PhD: Kelly Miettunen, MHA: Paul J. Orchard, MD: Rene Pierpont, PhD, LP: Weston Miller, MD

**BACKGROUND:** While childhood-onset cerebral adrenoleukodystrophy is a universally fatal disease if left untreated, allogeneic hematopoietic cell transplantation (HCT) has been shown to drastically improve survival if completed prior to the onset of symptoms. Treatment efficacy is significantly worse among children who undergo HCT after neurological symptoms are present. There are reports of favorable outcomes for children receiving reduced intensity conditioning (RIC) prior to HCT, however no large-scale trial has been performed.

**OBJECTIVE:** To compare gross neurologic function in boys with advanced cALD treated with HCT after myeloablative vs reduced-intensity conditioning.

**METHODS:** A query of the University of Minnesota Blood and Marrow Transplantation Database was done. After excluding children who did not engraft or died of transplant-related causes, there were 23 patients in the myeloablative group and 13 in the RIC group. The pre-transplant parameters of neurologic function scale (NFS), Loes score, and CSF chitotriosidase activity were compared between the groups. Comparisons of mean change in NFS and Loes score after transplant were made. The groups were also compared for duration of follow-up.

**RESULTS:** The MA cohort trended toward lower mean pre-transplant NFS than the RIC cohort (1.39 vs 2.61, p=0.059). There was no statistically significant difference in the pre-transplant Loes score (12.78 vs 13.67, p=0.347) or chitotriosidase activity (6902 vs 11782, p=0.0876). The MA cohort had a significantly smaller change in NFS than the RIC cohort (6.56 vs 13.46, p=0.045). Time to follow up was not significantly different (1203 days vs 1041 days, p=0.59). There was no difference in the change in Loes scores one year after transplant (3.14 vs 2.60, p=0.61).

**CONCLUSIONS:** The children who underwent reduced-intensity conditioning had more dramatic loss of neurologic function than those who had myeloablative conditioning despite having similar pre-transplant characteristics suggesting that MA conditioning may be advantageous even in cases of advanced disease.
Sedation and analgesia use in lumbar punctures at a pediatric tertiary care center.

Background: Sedation and analgesia are frequently used when performing pediatric lumbar punctures (LP). However, there is significant variation in the use of these medications.

Objective: To assess whether different sedation and analgesia medications affect pediatric LP outcome.

Methods: A retrospective review was conducted on the records of patients that had LPs between 2012-2016. Data abstracted included age, race, procedure location, medications, and outcomes. Outcomes were defined as unsuccessful if the record had a subjective description of an unsuccessful attempt, a CSF RBC count of >400 cells/µL, or the need of a second LP within 24 hours. LPs performed in hematology/oncology clinic, therapeutic procedures, and records with missing information were excluded. Data was analyzed via chi-square analysis and logistic regression. Survey responses from attending physicians regarding LP medications used at Children’s Hospital were obtained.

Results: 8463 patients were reviewed and 4489 (53%) were included in the study. Sixty seven percent of patients were < 2 years old (YO), 23% were 2-12 YO, 9% were 12-21 YO, and 1% were > 21 YO. There were 1273 (29%) unsuccessful attempts. Of these patients, 15% received fentanyl, 15% midazolam, 11% morphine, 8% propofol, 7% nitrous, and 2% ketamine. In chi-square analysis, patients who received midazolam (RR 0.66, CI 0.60-0.74) and fentanyl (RR 0.80, CI 0.71-0.89) were less likely to have a successful LP. Ketamine (RR 3.50, CI 1.72-7.12), propofol (RR 2.54, CI 1.90-3.38) and nitrous (RR 1.76, CI 1.38-2.24) were associated with success. In the regression, fentanyl, nitrous, and ketamine were associated with increased success (Figure 1).

Conclusion: A significant variance exists in analgesia and sedation. Sedation use decreased the likelihood of an unsuccessful LP. Nitrous and ketamine were better sedation options. Of common analgesics, fentanyl was best associated with success. Among physicians surveyed, there was no consensus regarding medications. These data suggest the need for a standardized LP analgesia/sedation protocol.
Forgotten, But Not Gone! Pediatric Bacteremia and Meningitis as an Illustrative Case Demonstrating the Emergence of Invasive \textit{Haemophilus Influenzae} Type A Disease in Minnesota Children

Abstract:

The Hib vaccine has made a significant impact on the decline of meningitis caused by \textit{Haemophilus influenzae} serotype B (HIB). However, other typeable non-type B \textit{Haemophilus influenzae} serotypes, although uncommon, are still potential causes of invasive disease, even in HIB-immunized children. We report a case of an immunocompetent 6-month-old female that was found to have \textit{Haemophilus influenzae} type A (HIA) bacteremia and meningitis. The patient was admitted to the PICU for complex febrile seizures associated with a $T_{\text{max}}$ of 104.3°F. The patient met SIRS criteria with an elevated white count and fever. Blood cultures were positive for a \textit{Haemophilus} species, immunoreactive with a polyvalent antiserum containing antibodies to strains A-F, but it did not react to monovalent antiserum against type B. CSF obtained after the initiation of antibiotic therapy demonstrated a pleiocytosis (WBC count of 39, 84% neutrophils), and imaging studies demonstrated meningeal enhancement and concomitant mastoiditis. The blood culture isolate was sent to the Minneapolis Department of Health (MDH) where serotyping identified HIA. We researched in greater detail the MDH’s experience in identification of this organism, and noted an increase in HIA incidence over the last decade. HIA cases are more common in children under two years of age of American Indian background. Invasive disease has presented as meningitis or pneumonia. The emergence of HIA has prompted some authorities to promote vaccine development for this emerging pathogen. In the setting of invasive \textit{Haemophilus} disease, it is important to work with the clinical laboratory to serotype all isolates and report these findings to state health departments. \textit{Haemophilus influenzae} meningitis, once a commonplace occurrence in any children’s hospital, may be forgotten, due to the success of conjugate Hib vaccines, but it is not gone! It is important for pediatricians to remain informed about the presentation, manifestations, and management of this infection.
ABSTRACT: Objective: Cytomegalovirus (CMV) is a common viral infection that the majority of the population will acquire by age 40. If contracted during pregnancy, a fetus can acquire congenital CMV (cCMV). Infants who are cCMV positive can present either symptomatically or asymptptomatically. Signs and symptoms of cCMV include hepatosplenomegaly, microcephaly, seizures, and neurodevelopmental delay. Sensorineural hearing loss (SNHL) is particularly common. cCMV is the most prevalent cause of nongenetic hearing loss in children, accounting for 25% of pediatric SNHL. This study examined the longterm audiological outcomes of symptomatic cCMV in children who received antiviral therapy (ganciclovir or valganciclovir) in children evaluated in an otolaryngology clinic.

Methods: Study data were collected and managed using REDCap electronic data capture tools hosted at the UMN. Institutional review board approval was obtained through the UMN. Retrospective data were collected from infants and children evaluated at the Lions Children’s Hearing & ENT Clinic at the UMN Masonic Children’s Hospital. From a database of 370 participants, 16 children were identified as positive for either suspected or confirmed cCMV and received antiviral therapy. Hearing thresholds were analyzed longitudinally.

Results: Data from the subgroup of 32 cCMV ears positive for receiving antiviral therapy indicates that 7 of 32 ears presented with a progression in hearing loss. Cases of progression occurred unilaterally in 5/7 ears and bilaterally in 2/7 ears. Furthermore, 22 ears presented with stable hearing thresholds; 6 ears maintained a profound hearing loss. Finally, 3/32 ears displayed improvement in hearing thresholds.

Conclusions: Children with cCMV often present with severe and progressive SNHL and antiviral therapy may be of limited benefit when severe or progressive hearing loss is already established. Our findings may reflect a referral bias that identifies only the most severely affected cCMV infants. Additional data analysis is in progress; findings will be presented at PRESS.
Guided VASCULARIZATION OF 3D-BIOPRINTED CONSTRUCTS

Pediatric specialists encounter a wide variety of disorders that arise from abnormalities in development. If corrective actions are not taken early on, with methods that allow for growth as the patient grows, the patient may require a series of corrective surgeries or procedures throughout their lifespan. Recent advances in patient-specific medicine, and 3D bioprinting may offer the potential to correct many disorders seen by pediatricians with a single procedure.

Vascularization of tissue has been one of the major challenges preventing the creation of advanced biological tissues. Common bioprinters do not offer the resolution needed (8-20µm) to print capillary structures. Functioning capillaries are required for tissues greater than 200µm in thickness to circulate essential nutrients, and cytotoxic waste to and from metabolically active cells. We plan to overcome this challenge by strategically placing angiogenic growth factors in between 3D printed vascular networks in order to induce in situ angiogenesis leading to capillary formation. This would allow more complex vascularized tissue structures to be created de-novo.

Optimization of this approach requires identification of the cell types and materials required to create a biocompatible vascular network construct in three dimensions (3D) as well as the hardware that is capable of utilizing all materials required and is supportive of angiogenesis in response to VEGF (vascular endothelial growth factor). The 3D bioprinting process will be described, as well as how results are analyzed and interpreted.
Figure 1: Design of vascularized tissue construct as it is bioprinted (A), and once the alginate support structure has been removed by chelating Ca\textsuperscript{2+} with EDTA (B). After 14 days incubation in a bioreactor at physiological conditions, samples are sliced through cross-sectionally as shown in (C) to allow immunocytochemical (IHC) staining to be performed. Vascular tubules printed near the angiogenic gradient shown in blue in (C) produce capillary-like vesicles in a directional growth towards an increasing morphogen gradient. Where the control vascular tubule in yellow, has a stunted rate of angiogenesis with growth in a directionally random manner.
Invasive *Haemophilus influenzae* and *Haemophilus influenzae* Serotype A Cases in Minnesota 2006-2017

Katherine Schleiss MPH, Lori Triden, Kathryn Como-Sabetti MPH, Richard Danila PhD MPH, Kristy Connors, Paula Snippets, Mark R. Schleiss MD, Ruth Lynfield MD

**Keywords:** *Haemophilus influenzae*; serotype A

**Background:** Invasive *Haemophilus influenzae* (HI) and HI serotype A (HIA) can cause severe disease and disproportionately affect American Indian populations. An increase in invasive HI cases was evaluated and trends among specific serotypes were examined.

**Methods:** Minnesota Department of Health (MDH) conducts active, statewide surveillance for invasive HI infections as part of CDC Active Bacterial Core Surveillance. Isolates are submitted to MDH for serotyping. Trends in HI and HIA case incidence from 2006-2017 were calculated using Kendall Tau-b correlation. HIA cases were compared to non-serotype A HI (non-HIA) cases.

**Results:** 1,139 HI cases were reported from 2006-2017; 93% had an isolate submitted. The HI incidence rate increased from 1.9/100,000 population in 2006 to 2.3/100,000 in 2017 ($r=0.485$, p<0.05). Notably, no changes in the proportion of HI serotypes (with n>2) or non-typeables were observed over this time. HIA cases were more likely to be American Indian (14% vs 2.2%, OR=7.42, p<0.01), <2 years old (36% vs 11%, OR=4.55, p<0.01), 2 to 5 years of age (6.5% vs 1.7%, OR=4.15, p<0.01), or reside in greater Minnesota (outside 7-county Minneapolis-St. Paul area) (66% vs 54%, OR=1.68, p<0.05) compared to non-HIA cases. HIA cases were more likely to have meningitis (21% vs 6.7%, OR=3.62, p<0.01). Among children ≤5 years, HIA cases were less likely to develop pneumonia than non-HIA cases (13% vs 56%, OR=0.111, p<0.01). A case of HIA meningitis recently seen at Masonic Children’s Hospital is the subject of a related PRESS abstract.

**Conclusions:** We observed an increase in HI incidence and proportion of serotype A among HI cases in Minnesota from 2006-2017. HIA cases were more likely to be American Indian, young children (≤5 years), residents of greater Minnesota, and present with meningitis. Continued surveillance is necessary to monitor HIA trends and is needed to inform future prevention strategies including vaccine development.
Tracheal Cartilage-Derived Extracellular Matrix Methacrylamide for 3D Bioprinting

Kemal Kirchmeier, Claudia Fernández-Alarcón, Nelmary Hernandez-Alvarado, Mark R. Schleiss (UMN Medical School), Chandy C. John, Dibyadyuti Datta (Indiana University Medical School)

3D bioprinting allows the rapid production of tissue-engineered constructs. This technology may lead to biologically derived patient specific grafts, ideal for pediatric applications where the graft can continue to grow with the patient. The continued growth and versatility of bioprinted constructs depend on the development of novel printable hydrogels that provide mechanical support, cell adhesion sites, and promote the function of the printed tissue. Gelatin methacrylamide (GelMA) has become a popular material for bioprinting, produced by adding methacrylamide to free amine groups in the gelatin to create photo-crosslinkable hydrogels with tunable mechanical and physical properties. However, GelMA alone does not fully recapitulate the complexity of native extracellular matrix (ECM). To bridge this gap, this work focuses on modifying decellularized extracellular matrix (dECM) from tracheal cartilage to produce extracellular matrix methacrylamide (EMA), specifically for the development of tracheal grafts. Using this EMA, we hope to develop bio-ink suitable for printing tracheal grafts to treat tracheal atresia, tracheomalacia, and critical length defects in pediatric patients. We hypothesize the addition of this tissue specific EMA to GelMA hydrogels seeded with human mesenchymal stromal cells (hMSCs) will improve the compressive modulus, cell viability, and the maturation of hMSCs to cartilage producing chondrocytes native to the trachea compared to GelMA alone. Preliminary results show no significant differences in compressive moduli or cell viability between hydrogels containing EMA or dECM. There was a slight increase in compressive moduli with greater amounts of EMA and dECM added but these were not significant. Counter to our expectations, collagen II expression was significantly higher in GelMA hydrogels at both 1 day and 7 days in culture compared to hydrogels containing EMA or dECM, EMA at 7 days is shown in figure 1. While initial study has shown minimal benefit of tracheal cartilage dECM or EMA, it is of scientific interest to continue longer term experiments examining the full maturation of hMSCs to chondrocytes and their ability to remodel the engineered matrix surrounding them.

Figure 1: Collagen II mRNA expression in cell laden GelMA hydrogels with varying levels of EMA, expression normalized to GAPDH. Mean ±StDev plotted, N=2. *P<0.01 **P<0.05 Compared to 0%
Difficult to Swallow: Epidermolysis Bullosa, Esophageal Stricture, and the Boundaries of Forgoing Medical Nutrition and Hydration

Joy Norman (MS3), Nneka Sederstrom (PhD, MPH, MA, FCCP, FCCM)

Case: A 4-year-old girl with recessive dystrophic epidermolysis bullosa, esophageal strictures despite multiple dilations and stenting, and gastrostomy-dependence experienced severe, recurrent anxiety and pain related to managing her saliva. Her parents requested an ethics consult to discuss withdrawing her medical feeding and allowing natural death. Ethics agreed with palliative care’s plan to discontinue scheduled gastrostomy feeding and allow oral or gastrostomy feeding for comfort. The girl died after 5 weeks of slowly declining intake but relative comfort in hospice care.

Discussion: Current position statements do not clearly address forgoing medical nutrition and hydration in developmentally typical children who are not actively dying or experiencing total intestinal failure. However, like all therapies, at some point, the burdens may outweigh the benefits. Compared with the poor prognosis of further esophageal procedures and the low quality of life of surgical salivary diversion in the context of a painfully disabling and progressive disease, the parents made a reasonable request to withdraw scheduled nutrition. Specific concerns about the need for the child's assent, euthanasia, and starvation are also addressed.
Mother Knows Best: When Parents Act Before We Are Ready

Agnes Barclay (MS3), Nneka Sederstrom (PhD, MPH, MA, FCCP, FCCM)

Case: A 4-year-old boy with a complex medical history most notable for L1CAM-related X-linked hydrocephalus, severe global delay, refractory epilepsy, and Hirschsprung disease with progressive intestinal failure resulting in total parenteral nutrition (TPN)-dependence presented to a palliative care clinic. His mother was concerned that he was experiencing worsening nausea and abdominal discomfort due to his TPN despite no clear mechanism for these symptoms and requested to withdraw nutrition and hydration to allow natural death. Some clinicians expressed concerns that the mother was exaggerating or misinterpreting the symptoms, were uncomfortable with her request, and consulted ethics who agreed with the mother. Surprisingly, the patient required much fewer opioids and benzodiazepines after discontinuing the TPN and died comfortably in his home.

Discussion: Medical nutrition and hydration can be withheld or withdrawn in certain circumstances, similarly to other life-sustaining therapies. Total intestinal failure requiring indefinite TPN or small bowel transplant is one circumstance when medical nutrition and hydration can be withheld or withdrawn. Although no mechanism accounted for how TPN would directly cause the boy’s discomfort without entering the intestinal lumen, the mother made a reasonable request even if the TPN did not directly cause the symptoms. In the absence of any clinicians suggesting the mother should be reported for medical neglect, ethics found no reason to refuse her request.
PEDIATRIC POSTDOCTORAL FELLOWS

Abstracts
Adverse Childhood Experiences and Weight Status among Adolescents

Authors: Laurel Davis, PhD, Andrew Barnes, MD, MPH, Amy C. Gross, PhD, Justin R. Ryder, PhD, Rebecca J. Shlafer, PhD, MPH

Abstract:

Objective: Adverse childhood experiences (ACEs) are known to be associated with weight status in adulthood, but this relationship has not been documented during adolescence. We investigate the relationship between ACEs and overweight and obesity in adolescents.

Methods: Data were drawn from the Minnesota Student Survey, a large (N = 111,334), statewide, anonymous survey of public school students in 8th, 9th, and 11th grades. Self-reported height and weight were used to calculate body mass index. Multinomial logistic regression was used to examine associations between self-reported ACEs and weight status, controlling for key sociodemographic characteristics.

Results: ACEs were positively associated with weight status, such that adolescents with more ACEs were more likely to be overweight, obese, and severely obese than adolescents with no ACEs (see Figure 1), with important differences by race and ethnicity.

Conclusions: Results suggest that pediatricians should understand the relationship between ACEs and obesity in adolescence, and that screening for ACEs and referring youth and their families to appropriate resources might be an important aspect of clinical weight management.
Figure 1.
Likelihood† of Being Underweight, Overweight, Obese, or Severely Obese by Number of ACEs.

† Odds Ratios have been adjusted for: age, sex, poverty status, rural status, and race/ethnicity
Note: Asterisks represent statistically significant differences (reference group is youth with zero ACEs). Example: Youth with one ACE are about 1.2 times as likely to be overweight as youth with no ACEs, while youth with six ACEs are about 1.5 times as likely to be overweight as youth with no ACEs.
4D Engineered In Vitro Metastatic Models via Guided Cancer Cell Migration

Fanben Meng, Carolyn Meyer, Michael C. McAlpine, Angela Panoskaltsis-Mortari, Department of Mechanical Engineering, and Department of Pediatrics, University of Minnesota, Minneapolis, MN 55455, United States.

Migration in the surrounding microenvironment is the most essential step in the physical translocation of cancer cells from primary tumors to local and distant organs. Although cancer cells can move both randomly and directionally, most of the processes involved in the metastasis are more efficient when cellular movement is directed. Engineered tumor tissues with the capability to guide cancer cell migration could provide feasible in vitro platforms to advance studies of pediatric cancers.

Chemotaxis is the most common mode of directed cell migration involved in each crucial step of tumor dissemination. We first created chemical gradients surrounding 3D cultured tumor tissues and programmed migration pathways of cancer cells. This was achieved by sequential 3D printing of cancer cell-laden natural hydrogels and multiplexed arrays of stimuli-responsive capsules. The former is constructed as tumor tissue, while the latter programmably releases chemotactic agents (i.e. growth factors and chemokines) to guide cancer cell migration. These printed structures allow us to spatiotemporally generate extracellular chemical cues, providing a tool for post-printed modulation of cellular activities. Most critically, a fourth dimension added to 3D engineered tumor tissues provides temporal control.

By taking advantage of the manufacturing capabilities of 3D bioprinting, we also integrated vasculature within bioprinted architectures, as a tumor needs a dedicated nutrient supply and a hematogenous path for metastasis. Aiming to represent crucial steps of tumor dissemination, multiple cell types, including cancer cells, stromal cells, and endothelial cells, were incorporated. These 4D engineered models both physically and chemically reconstruct microenvironments of living tumors, which provide a tool to: 1) further understand the mechanism of metastasis, 2) build personalized research platforms targeted to individual pediatric cancer patients, 3) test customized strategies of diagnosis and treatment, and 4) screen novel anti-cancer drugs.
Fig 1 Schematic of 4D engineered metastatic models (left) and an example of 3D printed invasion and intravasation model (right) on Day 12 after sequentially rupturing a pair of EGF and VEGF capsules every other day from Day 0. (inset: the model on Day 2)
Household Implementation of Smoke-free Rules in Homes and Cars: A Focus on Adolescent Smoking Behavior and Secondhand Smoke

Abstract: Smoking initiation in adolescence increases risks of experiencing tobacco-related mortality and morbidity regardless of smoking status in adulthood. Large proportions of the population are still exposed to secondhand smoke (SHS), including 43% of children. Household implementation of voluntary smoke-free rules in the home and car could reduce youth tobacco use and SHS exposure. Yet there is a dearth of research on how household smoke-free rules influence youth smoking and SHS exposure. Using data from the 2014 Minnesota Youth Tobacco Survey (MYTS), we examined how household implementation of comprehensive smoking restrictions (i.e., smoke-free home and car) relates to youth tobacco use and SHS exposure.

The analytic sample was limited to youth who lived with a smoker (N=1,327). Smoke-free rules were based on household smoking restrictions (1) inside the home and (2) in the vehicles that the respondent or family members own or lease: (a) none, (b) partial (home or car), and (c) comprehensive (home and car). Outcome measures included lifetime and past 30-day use of cigarettes only; and lifetime and past 30-day use of other tobacco products. SHS exposure assessed days in the past week respondents were exposed to smoke in (1) their home and (2) a vehicle within which they rode (range= 0 to 7).

We used multivariate logistic, zero-inflated Poisson, and zero-inflated negative binomial regressions.

Compared to comprehensive smoking restrictions, youth living with partial or no restrictions were more likely to have tried and currently smoke cigarettes, as well as other tobacco products (Table 1). The expected number of days exposed to smoke in the home and car increased substantially for youth whose households implemented partial or no restrictions compared to comprehensive restrictions.

Voluntary smoke-free rules within the home and car can help protect youth from tobacco use and SHS exposure. Public health practitioners should promote comprehensive smoking restrictions.
Table 1. Multivariate Logistic Regression Results for Smoking Behavior among Minnesota Youth who Live with a Smoker across Smoke-free Rule Categories

<table>
<thead>
<tr>
<th>Variables</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ever tried cigarettes in lifetime</td>
<td>Cigarette past 30-day use</td>
<td>Cigarettes plus other tobacco 30-day use^a</td>
</tr>
<tr>
<td><strong>Smoke-free rules</strong></td>
<td>OR^b (95% CI)</td>
<td>OR (95% CI)</td>
<td>OR (95% CI)</td>
</tr>
<tr>
<td>Partial rules</td>
<td>1.80 ** (1.24, 2.61)</td>
<td>2.20 ** (1.21, 4.02)</td>
<td>1.56 (0.86, 2.86)</td>
</tr>
<tr>
<td>No rules</td>
<td>2.87 *** (1.93, 4.25)</td>
<td>2.45 ** (1.34, 4.50)</td>
<td>2.14 * (1.13, 4.06)</td>
</tr>
<tr>
<td>Comprehensive rules (reference)</td>
<td>~</td>
<td>~</td>
<td>~</td>
</tr>
<tr>
<td><strong>Background characteristics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>1.35 *** (1.24, 1.47)</td>
<td>1.42 *** (1.26, 1.61)</td>
<td>1.25 *** (1.10, 1.43)</td>
</tr>
<tr>
<td>Race/ethnicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>0.66 * (0.46, 0.97)</td>
<td>1.17 (0.59, 2.29)</td>
<td>1.59 (0.75, 3.37)</td>
</tr>
<tr>
<td>Male</td>
<td>0.69 * (0.51, 0.94)</td>
<td>1.27 (0.78, 2.06)</td>
<td>1.11 (0.67, 1.84)</td>
</tr>
<tr>
<td>Metro vs non-metro</td>
<td>0.79 (0.56, 1.10)</td>
<td>0.90 (0.54, 1.49)</td>
<td>0.98 (0.58, 1.66)</td>
</tr>
<tr>
<td>Close friends who smoke (0-4)</td>
<td>2.56 *** (2.10, 3.12)</td>
<td>2.60 *** (2.16, 3.13)</td>
<td>2.72 *** (2.25, 3.30)</td>
</tr>
</tbody>
</table>

Notes. All estimates are derived using survey weights; 95% confidence intervals are in parentheses. ^aMeasure of cigarettes use plus other tobacco products (0=other, 1=cigarettes plus other tobacco products); ^bodds ratio. +p<.10; *p<=.05; **p<=.01; ***p<=.001.

Figure. Classes of bullying and sexual harassment victimization and perpetration
Autistic characteristics and developmental trajectories among individuals with fragile X syndrome and non-syndromic autism spectrum disorder

Objective: Fragile X syndrome (FXS) is the most common genetic cause of autism spectrum disorder (ASD). The high prevalence of autistic features among people with FXS raises the hypothesis that FXS and ASD may share similar underlying neurobiological causes. However, recent studies suggested that males with FXS exhibit distinct ASD symptoms compared to those with non-syndromic ASD. The purpose of this study is to examine the differences of ASD symptoms and developmental trajectories among children with comorbid FXS and ASD and those with non-syndromic ASD.

Participants and Methods: Eighteen children with full-mutation FXS and 18 children with ASD matched on age, gender, and cognitive level completed comprehensive diagnostic evaluations in an ASD specialty clinic. Eight of the children received follow-up evaluations one year after their first visits. The Fisher Exact Test was used to test the group differences of ASD symptomology using items of the Social Communication Questionnaire (SCQ). The changes of ASD symptoms, cognitive abilities, and adaptive functioning across two visits were also examined.

Results: Children with comorbid FXS and ASD exhibited less social impairments (sharing interests, joint attention, and facial expression) but poorer adaptability and motor skills compared to children with non-syndromic ASD. Among children with FXS, those with comorbid FXS and ASD displayed more repetitive motor movements than those without ASD. At follow-up, children with non-syndromic ASD demonstrated improvement in ASD symptoms, language, social skills, and daily living skills, whereas children with FXS displayed decline in expressive language, communication, social skills, daily living skills, and motor skills.

Conclusions: Children with comorbid FXS and ASD displayed different presentation compared to those with non-syndromic ASD. The differences in ASD symptoms and developmental trajectories may be critical to understanding the causes of ASD and in developing appropriate treatments.

Figure 1. Comparison of ASD symptomology, language abilities, and adaptive functioning between individuals with fragile X syndrome (FXS) and autism spectrum disorder (ASD) across two clinical visits.
The Meninges Increase Acute Lymphoblastic Leukemia Chemoresistance in the Central Nervous System

Maryam Ebadi, MD, Leslie M. Jonart, MS, Jordan Naumann, MS, Patrick M. Basile, MD and Peter M. Gordon MD/PhD

Central nervous system (CNS) relapse is a principal cause of treatment failure in acute lymphoblastic leukemia (ALL). Furthermore, available CNS-directed therapies are associated with short and long-term morbidities. However, how the CNS regulates leukemia survival and chemoresistance is unknown and thus limits our ability to develop novel CNS-directed leukemia therapies.

To investigate leukemia cell homing within the CNS, we transplanted multiple human leukemia cell lines into immunocompromised mice and identified the meninges as the predominant site that harbor leukemia cells both before and after treatment with systemic cytarabine. Leukemia cells adhered to meningeal cells in a co-culture system and were significantly more resistant to cytarabine- and methotrexate-induced apoptosis than when grown in suspension or adherent to either fibronectin-treated plates or a neural precursor cell line. In addition, leukemia cells cultured in meningeal-conditioned media exhibited moderate chemoresistance. Hence, both direct cell-cell contact and a soluble factor secreted by meningeal cells likely contribute to meningeal-mediated leukemia chemoresistance.

Next, we examined the effect of co-culture on the apoptosis pathway in leukemia cells. An apoptosis antibody array showed changes in the expression of multiple apoptosis family proteins in leukemia cells co-cultured with meningeal cells relative to those in suspension. Subsequently, we utilized a functional apoptosis assay, BH3 profiling, to show that leukemia cells adherent to meningeal cells are significantly less primed to undergo apoptosis than leukemia cells in suspension. Finally, we have identified pathways in both leukemia and meningeal cells that drive leukemia chemoresistance and are testing the therapeutic efficacy of targeting these pathways in co-culture and in vivo.

In summary, the meninges provide a unique leukemia niche that regulates the apoptotic balance in leukemia cells to enhance chemoresistance. This work also suggests that CNS leukemia persistence and relapse is not solely due to poor penetration of chemotherapy agents across blood-brain barrier.
What drives an intervention’s success? Contextual barriers and facilitators to youth and parent participatory action research projects in schools

Purpose: Participatory action research is increasingly used to engage youth and parents in addressing inequities in the social determinants of health, such as high-quality instruction and school connectedness, yet little work has examined this approach in the context of intervention refinement and implementation within a formal trial. This study aimed to evaluate the contextual barriers and facilitators to implementation of a youth and parent participatory action research (YPAR and PPAR)-driven intervention focused on enhancing the school environment within five middle and high schools participating in a NIH-funded trial.

Methods: We collected data from the community-academic research team coordinating the action research activities using a structured impact log, periodic semi-structured interviews, and observation of weekly team meetings for the first six months of 2017. Team members completed impact logs after meetings with school administrators/staff and action research teams. Logs collected information about meeting objectives, results, challenges, successes, and overall reflections. Interview and observational notes collected similar data. Data were analyzed using a thematic analysis approach with deductive and inductive coding to identify the most salient barriers and facilitators to the project’s implementation.

Results: Multiple contextual factors influenced early implementation of YPAR and PPAR activities including: school-level operational factors (e.g., intervention alignment with existing resources), partnership-level factors between the schools and the research team (e.g., school administrator buy-in and accessibility), and core research team-level factors (e.g., role dynamics).

Conclusions: Our findings highlight several contextual facilitators that the research team can continue to leverage in the next phases of the project, and key contextual barriers within the partnership, core research team, and larger school operations levels that should be addressed to improve the uptake of the YPAR and PPAR-designed intervention. This form of ongoing, qualitative, and rigorous implementation evaluation helps collaborative teams identify areas for improvement within complex, multi-year interventions with evolving membership.
Neuropsychological profile of 14-year-old male with an unspecified autoimmune movement disorder, ADHD, and complex neuropsychiatric presentation

**Objective:** Case study presents data from the neuropsychological evaluation of a male with an unspecified autoimmune movement disorder, along with other psychiatric symptoms, with a goal of disseminating information on this unique presentation.

**Participants and Methods:** 14 year, 5-month-old male with an autoimmune movement disorder, with response to immunotherapy/steroid treatment. Symptoms began at 6 years old and have re-occurred at various levels of severity. MRI indicated vasculitis & an arachnoid cyst in the posterior fossa. Abnormal T2 hyperintensity predominately in the basal ganglia, bilateral internal capsules, midbrain, and dorsal pons. CSF studies positive for oligoclonal bands. Mitochondrial genetic testing noted heterozygosity for the P308Q variant in the TIMM44 gene and for a D279N variant of unknown significant in the COQ9 gene.

His behavior profile involves inappropriate verbalizations, suicidal gestures, inappropriate boundary violations, and impulsive behaviors. Various medications have been attempted without success. History of three psychiatric hospitalizations. Diagnostic history of ADHD.

**Results:** In the context of average IQ and below average performance on memory tasks, severe deficits related to inattention, hyperactivity, and impulsivity were noted. Parents and teachers reported concerns in the areas of inhibition, self-monitoring, initiation, working memory. Daily adaptive functioning was in the impaired range. Fine motor speed and dexterity was in the impaired range. Visual-motor integration skills were below average range.

**Conclusions:** The patient’s most recent MRI noted improvement, yet he continues to have profound neuropsychiatric issues which reflect persistence of his basal ganglia and midbrain diseases. He is unable to maintain safety in his home, school, or community, requiring intensive services in all settings. Given this patient has a rare disorder, disseminating results can contribute to the limited research in this area.
Bullying and Caring Relationships among Adolescents from Immigrant Backgrounds: Associations with Internalizing Problems

Abstract

Introduction:
Research shows that bullying victimization is related to concurrent and future internalizing problems and that parental connections may buffer its effects. However, limited research exists for adolescents from immigrant backgrounds.

Methods: This study is a secondary data analysis from an ongoing socio-emotional learning and professional development intervention in three Twin Cities middle schools.

Participants: Data used a baseline survey of 248 sixth graders (56% males) who lived in homes where a language other than English was spoken (Spanish, Hmong, Somali, Vietnamese, etc.). Students reported internalizing problems (4-items, \( \alpha = .80 \)), four types of bullying victimization (physical, appearance-based, relational, and cyber), caring relationships at home (3-items, \( \alpha = .73 \)), and sociodemographics.

Data Analysis: Descriptive and multiple linear regression analyses were conducted to examine associations and test for moderating effects.

Results: Victimization rates ranged from 15% (cyberbullying) to 40% (relational bullying). Internalizing problems were negatively associated with caring relationships at home (\( r = -.18, p \leq .01 \)) but positively associated with bullying victimization (e.g., \( r = .37, p \leq .01 \) for physical). In regression models, caring relationships at home continued to be a significant protective factor but they did not buffer effects of bullying victimization frequency on internalizing problems. A trend level exception was the moderating effect of caring home relationships on the association between physical bullying victimization and internalizing problems (\( b = -.19, \beta = -.47, p = .10 \); see Table 1).

Implications: Associations between bullying victimization and subsequent internalizing problems was not conditional on caring relationships at home among youth from immigrant backgrounds. But caring relationships at home were protective against internalizing problems, even after controlling for levels of bullying victimization and sociodemographics. Findings can inform programming that promotes inclusion of youth from immigrant backgrounds with their school peers while facilitating supportive and caring relationships at home.
<table>
<thead>
<tr>
<th>Predictor</th>
<th>b</th>
<th>SE</th>
<th>β</th>
<th>t</th>
<th>p</th>
<th>R²</th>
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<td>.38</td>
<td>.</td>
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<td>.16</td>
<td>-.00</td>
<td>-.06</td>
<td>.96</td>
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<tr>
<td>Second School</td>
<td>.08</td>
<td>.12</td>
<td>.05</td>
<td>.67</td>
<td>.51</td>
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<tr>
<td>Males</td>
<td>-.31**</td>
<td>.11</td>
<td>-.18</td>
<td>-2.91</td>
<td>.00</td>
<td>.18</td>
</tr>
<tr>
<td>Lives with Two Biological Parents</td>
<td>.09</td>
<td>.11</td>
<td>.05</td>
<td>.78</td>
<td>.44</td>
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<tr>
<td>Caring Relationships at Home</td>
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<td>.08</td>
<td>-.09</td>
<td>-1.30</td>
<td>.19</td>
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<tr>
<td>Relational Bullying</td>
<td>.45***</td>
<td>.09</td>
<td>.33</td>
<td>5.12</td>
<td>.00</td>
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</tr>
</tbody>
</table>

| Model 1                                        |       |     |      |       |       |     |
| (Constant)                                    | 2.01  | .68 | .     | 2.97  | .003  |     |
| First School                                  | -.11  | .17 | -.05 | -.63  | .53   |     |
| Second School                                 | .07   | .13 | .04  | .58   | .56   |     |
| Males                                         | -.40**| .11 | -.23 | -3.47 | .001  |     |
| Lives with Two Biological Parents            | .07   | .12 | .04  | .60   | .56   | .11 |
| Caring Relationships at Home                  | .12   | .19 | .11  | .63   | .53   |     |
| Physical Bullying                             | .87*  | .37 | .66  | 2.39  | .02   |     |
| Caring Relationships at Home × Physical Bullying | -.19  | .12 | -.47 | -1.64 | .10   |     |

* p ≤ .05, ** p ≤ .01, *** p ≤ .001
ABSTRACT

Longitudinal trajectories in dietary intake during the transition from adolescence to young adulthood

Authors: Mary Christoph, Nicole Larson, Megan Winkler, Melanie Wall, Dianne Neumark-Sztainer

ABSTRACT

Background: The transition from adolescence to young adulthood is linked to declines in dietary quality. However, the timing and extent of dietary changes is unknown. The aim of this study was to describe how dietary intake changed over time in young adulthood, and how diet as an adolescent predicted intake as a young adult.

Methods: This longitudinal secondary data analysis included three waves of survey data from Project EAT (Eating and Activity in Teens and Young Adults) participants (N=1664, 58% women, ages 25-36 in 2015-2016) who were initially recruited in 1998-1999 as adolescents in Minneapolis-St. Paul, Minnesota public schools. Follow-up surveys were given during 2008-2009 and 2015-2016. Dietary intake was measured via a semi-quantitative food frequency questionnaire. Paired t-tests were used to compare mean dietary intake across time. Least squares means were calculated to compare dietary intake for participants based on adolescent dietary quartiles, adjusting for age, adolescent sociodemographic characteristics and body mass index (BMI).

Results: Among young adult women, fruit intake increased by 0.20 servings ($p = 0.028$) and vegetables by 0.57 servings ($p < 0.001$) from 2008-2009 to 2015-2016. For men, vegetable intake increased by 0.34 ($p < 0.001$) during the same time period, whereas fruit intake did not change. Whole grain intake remained similar across time for both men and women, while dairy intake decreased by 0.30 servings among women ($p < 0.001$) and almost half a serving among men ($0.42, p < 0.001$). Participants in the lowest quartiles for intake of fruit, vegetables, whole grains, and dairy as adolescents continued to have the lowest mean intake for each marker in adulthood.

Conclusions: Dietary quality generally improved over a 6-year period in young adulthood; however, adolescents with poor dietary intake continued to have poorer markers of dietary quality as young adults.
Characterization of neurocognitive decline in fucosidosis

Anderson, N.A., Lund, T., Orchard, P.J., King, K., Shapiro, E.G., & Eisengart, J.B.

Department of Pediatrics, University of Minnesota Medical School
Shapiro Neuropsychology Consulting LLC

Fucosidosis is a rare lysosomal storage disorder associated with deficient alpha-L-fucosidase activity resulting in coarse facies, growth restriction, dysostosis multiplex, pulmonary compromise, progressive deterioration of the central nervous system, and delayed neurocognitive development that is presumed to decline over time, all leading to death in childhood. Hematopoietic cell transplantation (HCT) is the only current treatment option, with case reports and canine models indicating stabilization of disease progression. While reports have described neurocognitive and motor delay or intellectual disability, the course of neurocognitive decline has not been clearly characterized. This study’s objective was to quantify neurocognitive functioning in fucosidosis and investigate whether there may be a relationship with age to suggest decline. We hypothesized that there is decline across neurodevelopmental domains (i.e., cognitive, language, motor) associated with age. We measured the neurodevelopmental functioning of four girls with fucosidosis, three of whom proceeded to HCT. As some of these patients were seen more than once, there are a total of 7 observations, 6 prior to HCT and one 5 months post-HCT, although she eventually lost her graft. All neurocognitive functioning was quantified with the Bayley Scales of Infant and Toddler Development, 3rd Ed. A developmental quotient (DQ) was calculated for each observation and plotted with age to reveal declines across cognitive, language, and motor domains. For cognitive functioning, DQs declined from 90.4 at age 8.84 months to 20.2 at age 78.8 months (slope = -0.97). Overall, slopes of DQ decline ranged from -1.05 (expressive language) to -0.71 (fine motor). This case series provides quantitative evidence to support previous clinical descriptions of impairments in cognitive, communication, and motor functioning among individuals with fucosidosis. While the small sample size limits analytic approach, findings strongly suggest regressions in multiple neurocognitive domains associated with age.
Abstracts
Looking Both Ways: A Neonate With a Stiff Neck and Neck Mass

We describe a 5-week-old previously healthy post-term infant male who was brought to the Emergency Department for evaluation of a right-sided neck mass. This mass was noted by parents on the day of presentation while they were giving him a bath. One week prior to presentation he began developing restricted range of motion of the neck, which progressively worsened until he was unable to turn his head to the left. He had no associated fevers, and he was breastfeeding without difficulty at home despite this restricted range of motion. His past medical history: delivered via spontaneous vaginal delivery, birth weight 8 pounds, no perinatal infections, and prenatal ultrasound were normal. On physical exam, this well-appearing infant had a firm mass in the right neck which was approximately 3x2 cm and not tender to palpation without fluctuance, induration, or warmth. There were no skin changes overlying the neck mass and no adjacent lymphadenopathy. The patient held his head in a fixed position sidebent and rotated to the right, with significantly restricted range of motion of the neck with rotation to the left. At this time the differential diagnosis included: neck abscess, cervical lymphadenitis, branchial cleft cyst, torticollis, cystic hygroma, rhabdomyosarcoma, teratoma, cervical spine trauma (NAT), and fibromatosis colli. Given his nontoxic appearance and lack of fevers, laboratory testing was deferred. Ultrasound of the neck was performed which showed a bulky, hypoechoic, heterogeneous mass confluent with the right sternocleidomastoid with evidence of internal muscular fibers consistent with fibromatosis colli (Figure 1). Given his well-appearance, lack of fevers, age of onset of symptoms, physical exam, and ultrasound findings, we made the diagnosis of an uncommonly diagnosed medical problem: fibromatosis colli. He was discharged to home with reassurance to parents given these findings, and his primary care pediatrician was contacted to initiate physical therapy.

Figure 1. Ultrasound images of left sternocleidomastoid (Left image) and right sternocleidomastoid with fibromatosis colli (Right image)
Preventing pain: Barriers and Perceptions of Inadequate Pain Control for ED Infant Lumbar Punctures

Background
Evidence suggests that infants perceive and respond to painful stimuli and may be more sensitive to noxious stimuli than older children, however pain control during infant procedures remains limited. Lumbar puncture (LP) is an important diagnostic tool in evaluating febrile infants, with several available methods to manage pain. In our ED we initiated a QI project to assess patterns of and barriers to the use of multiple analgesics, and to increase pain management in this population.

Methods
We administered an online survey to all ED providers and nurses to determine current perspectives on infant LP analgesia, barriers to use, and opportunities for improvement. A Key Driver Diagram was developed to outline our approach.

Results
92% (12) of providers and 54% (12) of nurses responded. Providers felt at least 1 method was used 88% of the time, and 2 methods were used 71% of the time. The most popular methods included LMX, sucrose solution, and lidocaine injections. Nursing staff reported that 1 or more analgesics were used 86% of the time, most commonly sucrose solution and LMX. Barriers reported by providers included time constraints (33%) and the belief that LMX alone was sufficient (16%); nursing staff noted time constraints (50%) and lack of provider interest (25%). 50% of respondents reported no barriers to effective pain management.

Conclusion
Our survey found that among the respondents who reported barriers to adequate pain control in infant LP, time constraints and provider choice were the most common concerns. This indicates an opportunity to increase analgesic use through nursing and provider collaboration. Our interventions include:
1. Infographic in work spaces to encourage use of multiple analgesics
2. All staff acknowledgement of goal to use 2 forms of analgesics
3. Weekly reminder emails regarding pain management
4. Modification of procedure dotphrase to include analgesic choice
**STUDY AIM**

100% compliance for use of one or more pain control methods during lumbar puncture procedures performed at the Masonic Children's Emergency Department

**GLOBAL AIM**

Improve compliance for use of procedural pain control in the non-verbal infant population

**KEY DRIVERS**

- Time constraints to care process
- Provider specific choice of analgesic
- Staff collaboration and participation in increasing analgesic use

**INTERVENTIONS**

- Triage nurse to apply LMX during intake for febrile infants who meet LP criteria
- Infographic poster in work spaces detailing LP criteria, timeline, and encouraging multiple analgesics
- All staff acknowledgement of ED goal to use 2 forms of analgesics in all LPs
- Weekly nursing reminder emails regarding infant procedural pain management
- Modification of EMR procedure dot-phrases to include a choice of analgesics

*Figure 1: Key driver diagram for increased analgesic use in infant LPs*
Febrile Neutropenia in the Emergency Department: Improving Timely Antibiotic Administration in Patients with Indwelling Central Lines: A QI Initiative

Background
A central line (CL) is a central vein catheter which is commonly placed in children with cancer undergoing chemotherapy. These children often present to the ED with fevers and neutropenia. Time-to-antibiotic administration is a quality-of-care measure for pediatric oncology patients with febrile neutropenia.1 It has been proven that antibiotic administration in <60 minutes reduces mortality in patients with septic shock.2 In our ED, we initiated a QI project to improve time to antibiotics in this population.

Methods
Through chart review, patients with a port who presented to the ED febrile and neutropenic were included in the study. Historical data was collected from 2014-2016. Interventions were initiated on 1/1/2017 and post-intervention data was collected through 12/31/2017. I-charts were constructed from pre- and post-intervention data.

Results
222 encounters were reviewed. 215 patients were included in the final analysis, 161 pre-intervention and 54 post-intervention. Seven outliers were determined by time to antibiotics >3SD from the average. Average time to antibiotics was reduced significantly by 15 minutes from 67 to 52 minutes (P=0.0003). The median time to antibiotics was reduced by 10 minutes from 59 to 49 minutes. Encounters with time to treatment <60 minutes increased from 60.8% to 70.4%. Application of pre-arrival LMX increased by 2.7% to 80.7%. Finally, provider related delay in treatment decreased by 10.5% to 3.5%.

Conclusion
Through staff surveys we determined the barriers to timely treatment included: parental knowledge of port information, lack of pre-arrival LMX, and EMR port information access. Interventions included: port information entered in the EMR Snapshot tool and LMX reminder using parental education. Additionally, ED provider staff was notified of the QI study goal of improving time to antibiotics. Through these interventions, we found a statistically significant decrease in average treatment time to within the quality-of-care measure and an increase in percentage of patients who received antibiotics in <60 minutes.
Figure 1: Individual chart; patient time to antibiotics pre-and-post intervention
Abstract: Karl Eckberg, MD1 and Emily Borman-Shoap, MD2
1. Pediatric Resident
2. University of Minnesota Department of Pediatrics

Needs Assessment and Early Experience with an Outpatient Complex Care Elective

Background: Caring for children with complex healthcare needs is an important skill for general pediatric practice, but there is variability in education and comfort level among pediatricians. The American Board of Pediatrics highlighted this skill by including an Entrustable Professional Activity on caring for these children (EPA 6). Based on this EPA, we created a needs assessment survey to identify gaps in resident knowledge and skills. Our results informed the creation of an elective experience for residents, which uses community resources, clinical experiences in complex care clinics, and independent learning with the AAP modules on medical home.

Methods: In 2017, we created and delivered a needs assessment survey to all of our pediatric and medicine-pediatric residents. We then crafted goals, objectives, and a curriculum for an elective based on EPA 6 and knowledge gaps identified by residents.

Results: 61 residents (55% of all residents) completed the survey. 33% of respondents plan on a career in primary care. Residents reported having less adequate experience and decreased comfort level in caring for children with complex health care needs in the outpatient setting compared to inpatient settings (Figure 1). Residents identified managing medical devices, coordinating care in the outpatient setting, and providing health maintenance for children with complex healthcare needs as their top three desired areas to learn more about. Early feedback about the elective indicates that hands-on experience with medical devices and time spent working in complex care clinics were valued components of the experience.

Discussion: Our needs assessment suggests a need for enhanced training in care of children with complex healthcare needs in the outpatient setting. We present an EPA-informed, community-connected approach to designing and implementing an outpatient complex care elective.
It's “snot” the blood, or is it?: An unusual case of abdominal pain in a 4-year-old child with chronic kidney disease

CASE REPORT ABSTRACT A 4-year-old male with a history of chronic kidney disease presented to the emergency department with acute abdominal pain of four hours duration. Initial blood draw was described by the nurse to be "thick as snot," leading to additional testing. His lab work was significant for hypercalcemia and markedly elevated lipase, and abdominal ultrasonography revealed portal vein thrombosis. Although a rare etiology, hypercalcemia as an etiology for pancreatitis in the pediatric population should be considered, especially in chronic kidney disease. Additionally, pancreatitis can lead to thrombosis in splanchnic vasculature and should be considered in the diagnostic workup of pediatric pancreatitis.
The Admission Conference Call: A Novel Approach to Optimizing Emergency Department to Admitting Floor Communication

Schempf E, Furnival RA, Marmet J, Lunos SA, Jacob AK, Hendrickson MA.

**Background:** Optimizing information sharing at the time of transfer of care from one team to another is an important target for the improvement of patient safety. Poor communication is a leading cause of adverse safety events, and effective communication has been identified as an important driver of safety. Traditional handoffs between the emergency department (ED) and the inpatient floor often require multiple phone calls and do not allow for the development of a shared mental model between attending physicians, residents, and nurses.

**Objective:** To describe and evaluate the acceptance of a novel process for simplifying and coordinating physician and nursing handoff calls for patients being admitted to an inpatient floor from a children’s hospital ED.

**Methods:** Our Admission Conference Call (ACC) process was implemented in 2011. It consists of a single conference call coordinated by patient placement and including the ED attending, resident, and nurse and the inpatient attending, resident, and nurse. The ACC is used for the majority of admissions to the pediatric hospitalist services in our institution. We performed an online survey of physicians and nurses to assess their satisfaction with the process and their perception of effects on patient care.

**Results:** 43 nurses and 89 physicians completed the survey. 92% reported that the process supports safe patient care, 8% were neutral. None said they felt it increased risk. 75% agreed it improved interdisciplinary alignment, 20% were neutral, and 5% disagreed. 74% felt it had a neutral or positive effect on overall throughput time, although 50% reported it increased the time they spent on the handoff. There were logistical concerns expressed, but overall mean satisfaction was 6.8/10 (SD 2.1), and only 8% felt the benefits did not outweigh any inconveniences. Free text comments varied widely, from pride to frustration, and provide targets for improvement in the process.

**Conclusion:** The Admission Conference Call is a feasible and well-accepted alternative to a traditional multiple call process. Most participants feel it supports safe patient care and improves throughput, and it is well accepted in our institution. Further research would be necessary to confirm measurable effects on patient outcomes, but this project should provide encouragement to institutions considering innovative approaches.
Explicit References to "13 Reasons Why" Documented in the Electronic Health Record of Pediatric Patients in a Large Healthcare System

AUTHORS/INSTITUTIONS: M. Zarin-Pass, P. Plager, M.B. Pitt, Pediatrics, University of Minnesota, Minneapolis, Minnesota, UNITED STATES|

Background: The Netflix show 13 Reasons Why tells the story of a teenager who commits suicide. Professional organizations worried that the show would lead to a spike in suicidality among its viewers.

Objective: We wished to determine if 13 Reasons Why was referenced among pediatric patients in the period surrounding the show’s debut, and if so, understand the context for these references.

Design/Methods: We searched all clinical documentation for patients under 18 for the search terms “13 Reasons” or “Thirteen Reasons” between October 1, 2015 and September 9, 2017 in our electronic health record. We recorded demographics, location, and clinical context for each presentation. We used grounded theory approach to identify themes to the context of the reference.

Results: 13 Reasons Why was mentioned in 63 separate clinical notes of 31 unique pediatric patients across our healthcare system. Most references were documented in a hospital setting (59%; 37), and all but one took place during an encounter related primarily to the patient’s mental health treatment. Most patients made these references during an encounter related to suicide (71%; 22). The most common context of the reference (32%; 10) was the patient self-reporting that 13 Reasons Why was contributing to their worsening mental health symptoms with nearly all (90%; 9) of these patients presenting with suicidal thoughts or attempts.

Conclusion(s): Thirty-one pediatric patients in our healthcare system had documented references to 13 Reasons Why in their chart in the period surrounding the show’s debut, with nearly three-quarters in the context of a presentation for suicidal ideations or attempt. While this association does not indicate causality of the show contributing to these presentations, the most common context was the patient explicitly stating that viewing had made their mental health symptoms worse.
Epidemiology and Clinical Presentation of Neonatal HSV Infection in Full Term, Previously Healthy Infants – Case Series

Lauren A Buckley MD, Ellen C Ingolfsland MD, Catherine M Bendel MD, Bazak Sharon MD

University of Minnesota Medical School, Department of Pediatrics; Minneapolis, MN

BACKGROUND: Neonatal herpes simplex virus (HSV) infection is a rare and potentially devastating disease. Prompt recognition and timely initiation of antiviral therapy can be lifesaving. Unfortunately, nonspecific initial disease manifestation may lead to delay in diagnosis.

OBJECTIVE: Describe the clinical presentation of HSV infection in previously healthy full term and late preterm neonates.

METHODS: Case series of previously healthy infants who were managed for neonatal HSV infection in a large academic health center from January 2011 – July 2017. Eligible infants included those born after 34 weeks gestational age (GA) who were asymptomatic when discharged from the nursery and had laboratory proven HSV before 90 days of life.

RESULTS: Seven infants met inclusion criteria. Average age at presentation was 10.4 days, with 6 infants presenting at less than 14 days. Three neonates had clinically suspicious vesicles. Four neonates presented with nonspecific symptoms. Two patients had recent household exposure to HSV. In two other cases a member of the family had a distant history of HSV infection. Three patients had no known exposure. Two infants died, both of which were born at or before 37 weeks GA.

CONCLUSION: Our findings reaffirm neonatal HSV as a rare and potentially devastating disease. Although at times infection is clinically suggested by suspicious vesicles or known HSV exposure, often presentation is nonspecific and patients do not have a clear exposure history. Neonatal HSV tends to present in younger neonates (< 2 weeks of life), and death was associated with late pre-term or early-term birth. When previously healthy infants present with fever or other nonspecific signs of illness, clinicians must maintain a high index of suspicion for neonatal HSV, especially in neonates younger than 14 days of life. Empiric antiviral therapy should be considered, even in the absence of known exposure or obvious vesicles.
<table>
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<th>Case</th>
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<th>Gestational Age (weeks)</th>
<th>Age at presentation (days)</th>
<th>Presenting Symptoms</th>
<th>Known HSV Exposure</th>
<th>Disease Type (* = death)</th>
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<tbody>
<tr>
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<td>39 6/7</td>
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<td>3</td>
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<td>37 0/7</td>
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<td>Mother with active HSV skin infection on neck</td>
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<tr>
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Depression Screening in a School Based Population in Port-Au-Prince, Haiti: A Descriptive Study

Taylor Argo, MD, Evan Kourtjian, BS, Jeri Kessenich, MD
Helen DeVos Children’s Hospital
Michigan State College of Human Medicine

Purpose:

The country of Haiti is just 700 miles south of Miami, yet is the poorest country in the Western Hemisphere.\(^1\) Over 80% of its population lives in poverty, 60% are unemployed and the incidence of HIV/AIDS is one of the highest in the world.\(^2\) Further, 50% of the population is under the age of 20, leaving adolescents to bear the majority of this burden.\(^2\) While the poor health of Haiti’s population is well documented, there is limited data on the prevalence of mental health disorders, especially in children and adolescents. With the country’s widespread violence, gang activity, rape and death, it is fair to assume mental illnesses, such as depression, are prevalent. However a 2003 WHO report noted that there are only 10 psychiatrists working in the public sector, demonstrating Haiti’s severe lack of resources.\(^2\)

In 2010, the non-profit organization Power of Education (PEF) School was founded in Port-au-Prince, Haiti serving 300 students in K-9th grade. Semiannually, medical teams from Helen DeVos Children’s Hospital travel to PEF and provide care to the students. Over the years, clinicians have suspected a high prevalence of mental health disorders among the students. In response to this concern, the PHQ-9 depression questionnaire was distributed to all 6th-9th grade students in April 2017. With this information, we hope to determine the prevalence of depression and implement strategies to better care for this population in a culturally sensitive manner.

Methods

Descriptive, cross-sectional study. After translation into Haitian Creole, the PHQ-9 questionnaire was distributed to students in 6th-9th grade with completion assistance by Haitian interpreters. The PHQ-9 scores were analyzed using the t-test, one-way ANOVA and the Pearson’s Correlation coefficient. Significance was assessed at p<0.05.

Results

A total of 83 PHQ-9 questionnaires were completed with an average score of 9.3±4.7 (mean±SD) and a range of 1-20. Individuals categorized as mild to moderate depression represented 67.5%, and those categorized as moderately severe to severe depression represented 15.7%. There was a statistically significant difference in PHQ-9 scores between grades: 5th (5.6±4.1), 7th (10.4±4.1) and 8th (12.1±4.3). On average, females (10.2±4.3) scored significantly higher than males (8.2±4.7). Over half of the students, 57.8% (48/83) felt down, depressed or hopeless and 54.1% (26/48) felt this way nearly every day. Twenty-four of 83 (28.9%) endorsed thoughts of suicide or self-harm and 45.8% (11/24) had these thoughts nearly every day.

Conclusions
The prevalence of depression is significant in this population as over half the students were
categorized with mild to severe depression, and 3 in 10 students had thoughts of self-harm and
suicide. Managing mental health is necessary in order to optimize educational success and the care
of acute and chronic illnesses. Our results underscore the need for more mental health resources and
the opportunity to implement programing that supports children and adolescents struggling with
depression.

Sources of Support

1. Girault, Christian, Robert Lawless, Murdo MacLeod, and James Ferguson. *Haiti*,
Clinical sequelae in patients receiving valganciclovir and/or ganciclovir therapy for congenital cytomegalovirus (cCMV)

Authors: Phimister, Ashley N.; Koozer, Catherine J.; Moline, Heidi; Schleiss, Mark R.; Osterholm, Erin A.

Objective: This study aims to identify the common side effects seen with use of valganciclovir and/or ganciclovir for the treatment of cCMV.

Design/Methods: The electronic medical record was queried to identify patients between the years of 2006-2016 with positive urine or serum CMV results admitted to the NICU. Chart review of these patients was performed to identify patients with cCMV.

Results: A total of 15 patients in the NICU were treated with valganciclovir for the cCMV. Five patients were born at term and ten patients were born preterm. The average gestational age at birth was 33 weeks with ages ranging from 24 weeks to 39 weeks. Of the total 15 patients, 80% experienced neutropenia after starting treatment, with neutropenia defined as an absolute neutrophil count less than 1500. Of those with neutropenia, 53% required G-CSF. 27 percent of all patients required a pause in treatment due to neutropenia and 13 % experienced a serious bacterial infection during treatment. Of the 10 preterm infants, 90% experienced neutropenia. Of those preterm infants with neutropenia, 78% required G-CSF. Of the preterm infants, 40% required a pause in therapy due to neutropenia and 20% experienced a serious bacterial infection during treatment.

Conclusions: While treatment with valganciclovir has improved audiological outcomes in several studies, it is important to be mindful of the side effects of long-term antiviral therapy for congenital CMV, particularly neutropenia. This consequence may be of particular significance in preterm infants with immature immune systems and high risk for life threatening secondary infections. Our long-term goal is to better understand the complex pharmacokinetics of these drugs when used for infants, a high-risk population, for which guidelines are still evolving.
Identification of Missed CHD from Cardiac Intervention Data and Death Records During the CCHD Screening Pilot Study in Minnesota

Background: Pulse oximetry screening for CCHD has been widely implemented in the US, however rates of missed CHD following appropriate screening are unclear. We retrospectively analyzed data from our pilot study performed from 8/7/2011 to 11/1/2012 to identify missed CHD in our pilot study cohort.

Objective: The goal of this study was to identify infants from surgical, catheterization and death records that passed CCHD screening, yet were later identified with CHD requiring intervention in the first year of life.

Methods: Data from the pilot study cohort were matched by indirect identifiers to cardiac catheterization and surgical records from the University of Minnesota Masonic Children’s Hospital (UMMCH), Children’s Hospital of Minnesota, Mayo Clinic and the death records from the Minnesota Department of Health. Infants were included if they were born in Minnesota during the pilot study, ≥35 weeks gestation, and reside in Minnesota.

Results: Of the 7,543 infants who passed CCHD screening in the pilot study, three infants (0.035%) required transcatheater intervention and three died (0.035%) within the first year of life. All three transcatheter interventions were performed at UMMCH for valvar pulmonary stenosis. The deaths were listed as sudden unexplained death of infancy (two) and positional asphyxia. No infants in the cath or surgery cohorts at Children’s Minnesota or Mayo Clinic could be identified as newborns that passed CCHD screening in the pilot cohort.

Conclusions: Pulse oximetry screening is used to detect hypoxemic CHD in the newborn. The infants who passed CCHD screening during the pilot study and required an intervention within the first year of life did not present with hypoxemia in the newborn period. Additional techniques, including clinical screening and provider education are required to improve early detection and improve outcomes of CHD in newborns. Ongoing analysis of electronic reporting of statewide CCHD screening will allow validation of these study findings in the statewide population and identify areas for improvement in detection of CHD in the screening process.
We describe a 14-year-old female presenting with one day of neck and throat pain. She has a past medical and surgical history of hypoplastic left heart with failed repair and was now six months post-operative orthotopic heart transplant. Her post-transplant course is complicated by EBV viremia, acute renal failure, chronic respiratory failure, and acute antibody-mediated rejection.

She stated her pain suddenly occurred 1 day prior to presentation. The pain was midline, right lateral neck area, and she complained that her, “throat is closing.” She denied fever, difficulty swallowing, drooling, cough, retractions, voice changes, or stridor. She just completed a course of antibiotics for otitis media. In the Emergency Department her vitals were stable and she was well appearing. Physical exam was remarkable for Cushingoid features. Her neck circumference was subjectively large, but was at baseline. The right side of her neck was slightly full and tender to palpation, but there were no swelling, adenopathy, or areas of erythema.

The differential diagnosis included: neck abscess, adenitis, peritonsillar or retropharyngeal abscess, and Post-transplant lymphoproliferative disorder. Neck radiographs were normal. A neck ultrasound was obtained and was significant for a large, heterogeneous thyroid, concerning for thyroiditis.

TSH was 0.01 mU/L, free T4 was elevated > 8.00 ng/dL, free T3 was elevated at 20.2 ng/dL, and thyroglobulin was negative. Monospot was negative. Serum EBV DNA showed viral 1040 copies, (elevated from previous). CBC and CMP were unchanged from previous. Rapid strep test and throat culture were negative.

Endocrinology was consulted and recommended starting methimazole for acute thyroiditis. Within one month, thyroid levels had normalized and methimazole was discontinued. Endocrinology and Cardiology felt she likely had a subacute viral-induced thyroiditis. Subacute thyroiditis is a self-limited disorder, most prevalent in females, characterized by sudden onset neck pain and thyrotoxicosis.
University of Minnesota Pediatric Resident Quality and Patient Safety Elective: A Pilot Study

Two areas in which pediatric residents have often lacked training are quality improvement and patient safety. Though efforts have been made in recent years to incorporate some of these skills into residency, pediatric trainees still lack a comprehensive quality and patient safety experience. In this pilot project we present a structured curriculum for residents to learn the basics of these fields through a combination of educational modules and a variety of practical experiences. First, residents complete basic quality and patient safety training through the Institute for Healthcare Improvement. By doing this they become familiar with concepts such as PDSA cycles and the model for improvement. Next, they are given the opportunity to engage in meaningful quality or patient safety work through a project with a faculty mentor. Finally, throughout the elective residents are connected with other mentors who can facilitate participation in system wide activities to improve quality and safety such as root cause analyses and serious safety event reviews. As this has not previously been offered in the department of pediatrics this is a summary and reflection of the first pilot experience. It also establishes an outline for an elective in which future trainees can participate.
The effect of statewide electronic reporting on the outcomes of CCHD screening in Minnesota – Year 1.

Authors:
Ashley Phimister, Timothy Rauschke, Amy Gaviglio, Logan Spector, Melissa Engel, and Jamie Lohr

Background:
Newborn pulse oximetry screening is an effective way to screen asymptomatic newborns for critical congenital heart disease (CCHD). By January 1, 2017, the Minnesota Department of Health (MDH) implemented a statewide electronic reporting system, known as MNScreen, for CCHD screening by pulse oximetry. MNScreen contains a computerized algorithm to interpret pulse oximetry readings, which minimizes human error and provides real-time feedback to the onsite care provider. To date, no other states have a comprehensive electronic statewide screening program in place.

Objective:
The primary objective was to determine the impact of MNScreen on the completeness, efficacy, and accuracy of CCHD screening in Minnesota.

Methods:
Retrospective analysis of the CCHD screening data of all infants born in 2017 in Minnesota after the implementation of MNScreen was performed. This includes the number of reported births compared to reported screens, failed screens, echocardiograms performed, and CCHD diagnoses by screen vs. clinical diagnosis.

Results:
Preliminary results included 67,823 infants reported to MNScreen in 2017. 395 infants either expired prior to screening or parents refused screening. Of the remaining eligible infants, 99.42% (65,018) were screened. Of those screened, 0.19% (124) had failed screenings and 0.44% (284) had their screening results incorrectly interpreted according to the algorithm.

Conclusion:
With the MDH’s implementation of MNScreen statewide in 2017, the percentage of eligible infants in Minnesota screened and correct algorithm interpretation has improved compared to our pilot study. Further analysis of the data will be performed to determine why screening is missed and identify new cases of CCHD diagnosed by screening and the geographic location. False positive screens will be reviewed for diagnosis and outcome. Lastly, long term follow-up will be undertaken to determine the number of infants with passed screens that were subsequently diagnosed with CCHD requiring intervention in the first year of life.
Early onset neonatal sepsis due to vertical transmission of Pasteurella multocida

Introduction: Sepsis is a major cause of neonatal morbidity and mortality. Early onset sepsis is typically due to vertical transmission of bacteria during the intrapartum period and symptoms present in the first seven days of life.

Patient presentation: An appropriate for gestational age full-term neonate was born to a 26 year old G1P1 following a routine pregnancy. Respiratory distress with grunting was noted 5 hours after birth, and the infant became lethargic. Blood and tracheal cultures grew Pasteurella multocida. Further history revealed multiple pets in the home including two cats and one dog; family members denied any bites or scratches. Maternal vaginal culture was positive for Pasteurella multocida. The infant’s illness resolved, and he completed an IV antibiotic course.

Microbiology: Pasteurella multocida from the patient’s blood, the tracheal aspirate, and the maternal vaginal sample were identified by MALDI-TOF mass spectrometry. Further characterization was by 16S rRNA gene sequencing, and their sequences were aligned to one another using the NCBI nucleotide BLAST function. This showed that the three separate sequences were a 100% match to each other for Pasteurella multocida, subspecies septica.

Discussion: This case describes a newborn infant who developed sepsis shortly after birth and had cultures positive for Pasteurella multocida, subspecies septica, which is known to be a particularly virulent subspecies. Pasteurella is a rare cause of sepsis in the neonate. Both early and late-onset neonatal infections due to Pasteurella have been reported including sepsis, bacteremia, meningitis, osteoarthritis, and conjunctivitis. Reported transmission routes include traumatic and atraumatic animal exposure, vertical, and horizontal. Few reports have confirmed the same organism linking exposure and neonatal infection. To our knowledge, ours is only the second report to confirm genetically vertical transmission from mother to infant and first to report via gene sequencing.
Acute Disseminated Encephalomyelitis (ADEM) in the United States – Analysis of the HCUP-Kid’s Inpatient Database (KID) 2012

INTRODUCTION: ADEM is an uncommon disease. There are no studies with national data to describe the epidemiology of ADEM in the United States. The purpose of this study is to examine the incidence and trends of ADEM in the United States using a large national database.

METHODS: Data from the Kid’s Inpatient Database (KID) developed by the Healthcare Cost and Utilization Project (HCUP) for the year of 2012 were analyzed. The study included all children younger than 20 years old who were admitted to the inpatient care and had a discharge diagnosis of ADEM by the International Classification of Diseases, 9th edition (ICD-9) codes. Weighted variables are available, which allowed for the calculation of national rates. Unweighted, HCUP-Kid’s contains data from approximately 3 million pediatric discharges per year. Weighted, it estimates roughly 7 million hospitalizations.

RESULTS: A total of 472 patients with ADEM were identified with a weighted frequency of 675, yielding an estimated incidence of ADEM in the United States of 0.7/100,000 children per year for the reference population under age 20 years. All but 2 cases were postinfectious and 2 occurred after vaccination. The weighted frequency for postvaccinal ADEM was 3. Fifty two percent of patients with ADEM were females and 48% were males. More than 60% of patients were 9 years or younger with an average age of 7.6 years. Most patients with ADEM (47%) were white. The average length of stay was 9.8 days. In-hospital case fatality rate was 1.2 %. Hospital admission with ADEM peaked in January through May.

CONCLUSIONS: ADEM remains rare in the United States (0.7/100,000 children per year), is nearly always post-infectious, and is rarely deadly. Most affected children were white and younger than 10 years old. A seasonal distribution was observed, with ADEM admissions peaking in the winter and spring.
PEDIATRIC FELLOWS

Abstracts
Breaking the Cycle: Sexual health among students in the juvenile justice system

Background: Sexual health behaviors are understudied in juvenile detention centers (JDCs). Teen pregnancy rates in the US are decreasing overall; however, they may not be decreasing across all learning environments at the same rate. Little is known about the sexual health of students in JDCs.

Objective: This study aims to (1) assess prevalence of sexual health indicators in JDCs, (2) examine protective factors that influence sexual health in this population and (3) identify areas for interventions by educators and health providers.

Methods: This study uses data from the Minnesota Student Survey which utilizes responses from all detained students. Preliminary analyses included descriptive statistics and chi-square analyses. Future analyses will use multivariable regression to test associations between protective factors and youths’ sexual health.

Results: Preliminary data suggest that a substantial number of students in JDCs reported having sex with 3 or more partners in the past 12 months. Data also shows most 22% of students in JDCs do not talk with every partner about protecting themselves against pregnancy. At last sexual intercourse, 45% of youth in JDCs reported that they did not use a condom. Approximately 18% of youth reported that they had been pregnant or gotten someone pregnant at least once, with 7% having been pregnant or gotten someone pregnant more than once. The most common forms of birth control are no method (20.3%) and condoms (20.3%). Subsequent analyses will explore protective factors (e.g., parent-child connectedness) for youths’ sexual health.

Implications: Results indicate that a majority of youth in JDCs are engaging in high-risk sexual behavior, suggested an increased need for sexual health education. Subsequent analysis will highlight further opportunities for interventions and education.
Parent Interest in Resources to Address Their Child’s Behavioral Health Through Primary Care

ABSTRACT

Background: Parents with behavioral health concerns often look for guidance from their child’s primary care provider. Despite high numbers (~20%) of children with behavioral issues, referrals are often not available and in-clinic resources are extremely limited. Studies show that if parents have support to effectively address early behavioral concerns, it can prevent substance misuse, academic failure, risky sex, and other negative outcomes in adolescence. Primary care is an under-utilized setting for the delivery of evidence-based behavioral support.

Objective: To investigate parents’ interest in additional primary care-based resources for their children’s behavioral health, including parenting support.

Methods: We surveyed 264 English- or Spanish-speaking parents of children (3-11 years) at an urban, pediatric clinic. Primary measures included the Pediatric Symptom Checklist (PSC-17) and interest in behavioral resources (e.g., parenting class, online videos). We used multiple regression in MPlus with full-information maximum likelihood to evaluate predictors of resource interest.

Results: Overall, 82% of parents reported interest in at least one resource; 28% reported interest in all resource items. Table 1 shows the interest level for each item. A higher PSC-17 score was positively related to resource interest. The final model (controlling for child age, household income, and language) explained 17% of the variance in resource interest ($R^2=.17$, $SE=.04$, $p<.001$). While only 20% of parents reported child behavioral symptoms high enough for a positive PSC-17 screen, most parents reported interest in resources. Over half reported they would attend multiple sessions if a class was available.

Conclusions: Parental report of child behavioral health issues was related to greater interest in resources but most of the interest came from parents reporting levels of concern that would yield a negative screen. Results provide critical guidance to ongoing local and national efforts to increase access to behavioral health and parenting resources through primary care for all parents.
<table>
<thead>
<tr>
<th>Item</th>
<th>n(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Child Sex</strong></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>107 (40.5)</td>
</tr>
<tr>
<td>Female</td>
<td>151 (57.2)</td>
</tr>
<tr>
<td>Other</td>
<td>1 (&gt;0.1)</td>
</tr>
<tr>
<td><strong>Household Income</strong></td>
<td></td>
</tr>
<tr>
<td>&lt; 15,000</td>
<td>94 (35.6)</td>
</tr>
<tr>
<td>15,000 - 29,999</td>
<td>74 (28.0)</td>
</tr>
<tr>
<td>30,000 - 44,999</td>
<td>39 (14.8)</td>
</tr>
<tr>
<td>45,000 - 59,999</td>
<td>6 (2.3)</td>
</tr>
<tr>
<td>60,000 - 74,999</td>
<td>6 (2.3)</td>
</tr>
<tr>
<td>75,000 - 89,999</td>
<td>3 (1.1)</td>
</tr>
<tr>
<td>&gt; 90,000</td>
<td>18 (6.8)</td>
</tr>
<tr>
<td><strong>Time with Pediatrician</strong></td>
<td></td>
</tr>
<tr>
<td>&lt; 1 year</td>
<td>92 (34.8)</td>
</tr>
<tr>
<td>1 – 2 years</td>
<td>25 (9.5)</td>
</tr>
<tr>
<td>2 – 3 years</td>
<td>20 (7.6)</td>
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<tr>
<td>3 – 4 years</td>
<td>28 (10.6)</td>
</tr>
<tr>
<td>&gt; 4 years</td>
<td>86 (32.6)</td>
</tr>
<tr>
<td><strong>Resource Interest (% with interest when dichotomized)</strong></td>
<td></td>
</tr>
<tr>
<td>I am interested in online videos and resources about my child’s behavior, emotions, or mood.</td>
<td>170 (64.4)</td>
</tr>
<tr>
<td>I would like to learn more ways to handle my child’s misbehavior.</td>
<td>168 (63.6)</td>
</tr>
<tr>
<td>I am interested in resources to deal with difficult children.</td>
<td>166 (62.9)</td>
</tr>
<tr>
<td>If this clinic offers a workshop on advanced parenting strategies, I want to attend.</td>
<td>160 (60.6)</td>
</tr>
<tr>
<td>If this clinic offers a parenting class, I want to attend.</td>
<td>150 (56.8)</td>
</tr>
<tr>
<td>I wish there was someone I could call when I have questions about my child’s behavior, emotion, or mood.</td>
<td>146 (55.3)</td>
</tr>
<tr>
<td>I would like it if a nurse came to my house to provide support or resources for my child’s behavior or emotion.</td>
<td>110 (41.7)</td>
</tr>
<tr>
<td><strong>Number of class or workshop sessions interested in</strong></td>
<td></td>
</tr>
<tr>
<td>I would not attend</td>
<td>51 (19.3)</td>
</tr>
<tr>
<td>Only 1</td>
<td>56 (21.2)</td>
</tr>
<tr>
<td>2-5</td>
<td>97 (36.7)</td>
</tr>
<tr>
<td>6-10</td>
<td>14 (5.3)</td>
</tr>
<tr>
<td>10-14</td>
<td>6 (2.3)</td>
</tr>
<tr>
<td>15 or more</td>
<td>21 (8.0)</td>
</tr>
</tbody>
</table>

1 Totals do not equal 100% due to missing data
High-throughput sequencing of diverse rhinoviruses and respiratory enteroviruses from clinical specimens

Authors: Beth K. Thielen, MD, PhD; Sean Wang, DVM, PhD; Sarah Bistodeau, BS; Jaime Christiansen; Jason T. Wotton; David Boxrud, MS; Anna K. Strain, PhD; Ruth Lynfield, MD

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Rhinoviruses and respiratory enteroviruses (RV/EV) are common and genetically heterogeneous pathogens associated with a spectrum of respiratory disease. Some lineages such as enterovirus D68 (EV-D68) have enhanced pathogenicity, and thus strategies to correlate genetic features with clinical outcome may provide insights into pathogenesis. Whole genome sequencing (WGS) is the most comprehensive approach to genetic characterization but is technically challenging due to the genetic diversity of these viruses. To overcome this limitation, we adapted a protocol for sequencing of enteric enteroviral genomes using respiratory specimens. Upper respiratory specimens from patients with laboratory-confirmed viral respiratory infections were obtained through established inpatient and outpatient surveillance networks for influenza-like illness and acute respiratory illness. We extracted nucleic acid from archived specimens, removed contaminating human and bacterial nucleic acid, and subjected extracts to random reverse transcription and nucleic acid amplification. Libraries were constructed using the Nextera XT DNA library preparation kit and high-throughput sequencing performed using the Illumina Miseq Platform. Sequence analysis was performed using CLC Genomics Workbench. We obtained complete or nearly complete genome sequences of 60 of 87 (69%) specimens from patients testing positive for rhinovirus or enterovirus by multiplex panel. This included 10 of 10 specimens that tested positive for EV-D68 by other methods. The protocol was also compatible with laboratory-cultured virus and allowed identification of 15 of 19 (79%) of RV/EV previously unidentifiable by other methods. The protocol was also used for WGS of other RNA respiratory viruses including influenza, parainfluenza, respiratory syncytial virus, coronaviruses and human metapneumovirus and may allow for detection of novel RNA viruses. In summary, this methodology allows for WGS of diverse RV/EV from both primary patient respiratory specimens and
viral culture. Incorporation of WGS into existing surveillance programs for respiratory disease provides new opportunities to correlate viral genetic determinants and clinical outcomes.
Lung Bioengineering and Direct Pulmonary Cell Therapy Using a Novel Airway Spray Device

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1 University of Minnesota, Minneapolis, MN 2 Abbevision Corporation, Minneapolis, MN

Purpose: Develop a device capable of delivering living cells into pulmonary airways both ex-vivo and in-vivo.

Background: Substantial research is being directed toward developing cell therapies for a wide variety of applications in pulmonary diseases. One example is the use of patient-specific, induced pluripotent stem cell (iPSC)-derived cells to repopulate decellularized lung scaffolds. This could generate immunologically identical transplantable organs by revitalizing unsuitable donor lungs or “humanizing” animal lungs with the potential to eliminate the organ shortage while simultaneously eliminating rejection and the need for antirejection medications. However, the collapsibility of pulmonary lumina complicates cell delivery. Additionally, pulmonary cells require exposure to an air liquid interface. Therefore, we developed a spray device capable of aerosolizing intact cells for delivery directly into the pediatric bronchial tree.

Methods: Multiple prototype sprayers were developed and assessed for spray velocity, fluid flow rate, and droplet size. An illuminated angulation sleeve was designed to allow navigation of the sprayer through the bronchial tree. Pulmonary cells were sprayed into wells of growth media and onto pieces of decellularized pulmonary tissue. Cell viability was assessed by trypan blue staining and live-dead fluorescence staining, and growth was assessed by microscopy.

Results: The sprayer delivers pulmonary cells with high viability (99 ± 1.2%) and the cells appear normal by microscopy and grow to confluence. Greatest cell survival is seen in devices producing larger droplets at lower velocity and low flow rate. The device could be navigated throughout the bronchial tree to facilitate broad cell delivery throughout the airways, or localized delivery to specific target sites. Viability measurements on solid tissue are ongoing.

Conclusions: The sprayer provides a key piece of equipment to translate emerging bioengineering techniques into clinically relevant therapies. The device allows delivery of cells throughout the airways of lung scaffolds and intact lungs. Current studies are aimed at assessing cells sprayed onto intact decellularized bronchial trees. Other potential uses of this device include the in vivo administration of regenerative cells for lung injury and pulmonary diseases amenable to cell therapy.

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NIH R43-HL136050
Regenerative Medicine Minnesota Grant
ABSTRACT

Effects of an *ex vivo* pediatric extracorporeal membrane oxygenation circuit on the sequestration of mycophenolate mofetil, tacrolimus, hydromorphone hydrochloride, and fentanyl citrate

**Authors:** Catherine S. Heith, MD,1 Lizbeth A. Hansen, PharmD,2 Rhonda M. Bakken, RRT,2 Sharon L. Ritter, MS, RRT,2 Breeanna R. Long, RRT,2 Janet R. Hume, MD, PhD,1 Lei Zhang, ScM,3 Danielle B. Amundsen,4 Marie E. Steiner, MD, MS,1 and Gwenyth A. Fischer, MD1

**Institutional Affiliations:** 1. Department of Pediatrics, Division of Pediatric Critical Care, University of Minnesota, Minneapolis, USA, 2. University of Minnesota Health and Fairview Health Systems, 3. Clinical and Translational Science Institute, University of Minnesota, Minneapolis, MN, USA 4. University of Minnesota, Minneapolis, MN, USA

**ABSTRACT**

**Objectives:** With the expanding use of extracorporeal membrane oxygenation (ECMO), understanding drug pharmacokinetics has become increasingly important, particularly in pediatric patients. This *ex vivo* study examines the effect of a pediatric Quadrox-iD ECMO circuit on the sequestration and binding of mycophenolate mofetil (MMF), tacrolimus and hydromorphone hydrochloride which have not been extensively studied to date in pediatric ECMO circuits. Fentanyl, which has been well studied, was used as a control.

**Methods:** ECMO circuits were set up using Quadrox-iD pediatric oxygenators and centrifugal pumps. The circuit was primed with whole blood and a reservoir was attached to represent a five kilogram (kg) patient. Fourteen French (F) venous and 12F arterial ECMO cannulas were inserted into the sealed reservoir. Temperature, pH, partial pressure of oxygen (pO₂) and partial pressure of carbon dioxide (pCO₂) were monitored and corrected. MMF, tacrolimus, hydromorphone and fentanyl were injected.
into the ECMO circuit. Serial blood samples were taken from a post-oxygenator site at intervals over 12 hours and levels were measured. Fentanyl levels were used as a control.

**Results:** Hydromorphone hydrochloride was not significantly sequestered by the ex-vivo pediatric ECMO circuit. Both MMF and tacrolimus were stable in the circuit over 12 hours.

Conclusions: Hydromorphone may represent an ideal pain control medication for pediatric patients on ECMO due to its minimal sequestration. MMF and tacrolimus also did not show sequestration in the circuit, which was unexpected given their lipophilicity and protein-binding. Fentanyl was significantly sequestered as expected and as demonstrated in previous literature.
Hematopoietic Stem Cell Transplant Outcomes with Second or Higher Transplants in Children with Inherited Metabolic Disorders

**Background:** Inherited metabolic disorders (IMD) are group of single gene disorders associated with significant morbidity and mortality. Early diagnosis can lead to preferable treatment with enzyme replacement therapy (ERT), hematopoietic stem cell transplant (HSCT) and gene therapy, where applicable. Early intervention results in restriction of disease progression and hence improve outcomes. Though outcomes with HSCT have improved, graft failure rate is high and patients often undergo second or more transplants. There has been limited information about outcomes and risk factors for poor survival post second or higher transplants. Analysis of these factors will help design strategies for better HSCT outcomes in this patient population.

**Methods:** We retrospectively investigated University of Minnesota’s pediatric transplant database for all patients diagnosed with an inherited metabolic disorder, who underwent at least two HSCTs between 1983 to 2017. Patient demographics and transplant related data were extracted. Univariate and multivariate regression analysis was used to identify the predictors of survival and identify risk factors associated with poor outcomes.

**Results:** Total of 119 transplants were performed in 56 patients who underwent more than one HSCT for IMD. Demographic characteristics are presented in table 1. Most common reason for second transplant was graft failure. Median age at first transplant in this patient cohort was about 1.8 years while for second transplant it was 2.9 years. Myeloablative conditioning was preferred for first transplant (80%) while non-myeloablative conditioning was slightly more preferred with second transplant (53%). Matched cord blood was preferred donor source for first transplant while matched unrelated bone marrow was preferred for second transplant. Overall survival after second transplant was noted to be about 50%, while 64% of patients survived who received their second transplant after the year 2000.

**Conclusion:** Outcomes of second transplant for IMDs have improved in recent years. As newborn screening has been increasingly implemented across the US for transplantable IMDs, more effective treatment strategies need to be developed for better outcomes.
Early increased gains in fat mass is associated with higher blood pressure at 4 years in VLBW preterm infants

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INSTITUTIONS:
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2. Epidemiology and Community Health, University of Minnesota School of Public Health, Minneapolis, MN, United States.
3. Clinical and Translational Science Institute, University of Minnesota, Minneapolis, MN, United States.

Background: Infants born preterm have increased adiposity and increased risk for hypertension compared to their term born peers. Increased gains in fat free mass (FFM), but not fat mass (FM), prior to 4 months corrected gestational age (CGA) are associated with improved neurodevelopment, however the relationship between early body composition and later hypertension risk is unknown. Objective: To determine if body composition at term corrected gestational age (CGA), 4 months CGA, or 4 years CGA, or changes between these time points are associated with higher systolic or diastolic blood pressure at 4 years CGA.

Design/Methods: Prospective data was collected on 29 appropriate for gestational age infants born <32 weeks CGA. Body composition (FM, FFM, and % FM) was measured with air displacement plethysmography at term, 4 months CGA and 4 years, and changes in these measurements were calculated. Systolic (SBP) and diastolic blood pressures (DBP) were measured at 4 years. Linear regression analysis was performed, adjusting for sex, gestational age, and 4-year length.

Results: Faster gains in FM and %FM between term CGA and 4 months CGA were associated with increased SBP at 4 years of age (p≤0.01 for both). Absolute 4 month FM was associated with increased SBP and DBP at 4 years of age (p≤0.04 for both). Neither growth nor body composition changes prior to term were associated with SBP or DBP at 4 years of age.

Conclusion: Greater gains in adiposity and FM from term to 4 months CGA are associated with higher BP at 4 years of age in very preterm infants. Changes in body composition prior to term did not confer the same risk. Monitoring quality of weight gain and targeting gains in lean mass, especially after hospital discharge, may allow a balance to be struck between optimizing neurodevelopment and minimizing later hypertension.
**Are youth in juvenile correctional facilities in Minnesota receiving recommended well care?: A secondary data analysis using the 2016 Minnesota Student Survey**

**Authors:** Calla Brown, MD; Laurel Davis, PhD; Rebecca Shafler, PhD, MPH

**Acknowledgements:** Minnesota Center for Health Statistics; Minnesota Department of Health

**Abstract:**
Compared to the general population, justice-involved youth have increased rates of several health conditions. However, many of the epidemiologic studies on this topic were conducted in the 1970s and 1990s, and little is known about the current generation of youth exposed to the juvenile justice system. Using the 2016 Minnesota Student Survey, this study evaluates whether youth residing in juvenile correctional facilities (N = 217) reported their health care needs as being met. The Minnesota Student Survey is a large, voluntary, anonymous survey administered to 5th, 8th, 9th, and 11th graders in educational settings (public schools, alternative learning centers, and juvenile correctional facilities) every three years in Minnesota. In our sample, 14.8% of youth rated their health as fair or poor. 30.2% of the youths reported no well-child care in the past year. Additionally, 34.1% of the sample reported no dental care within the past year. Youth who were experiencing depression symptoms, suicidal ideation, and those who had attempted suicide were more likely than those without these mental health issues to have received mental health treatment in the past year. However, many of these youth with serious mental health concerns had not received treatment in the past year. Based on these results, this study demonstrates unmet health care needs of the sample of youths in juvenile correctional facilities.
BODY COMPOSITION AND COGNITION IN PRESCHOOL-AGE CHILDREN WITH CONGENITAL GASTROINTESTINAL ANOMALIES

University of Minnesota, Minneapolis, MN, USA

BACKGROUND: Children born with gastrointestinal (GI) anomalies experience multiple stressors while hospitalized in neonatal intensive care units during an essential time of growth and development. Early stress and inadequate nutrition has been linked to altered growth patterns and later neurodevelopmental delays. Improved fat free mass accretion has been associated with improved cognitive outcomes.

OBJECTIVE: To determine if body composition is associated with cognitive function in preschool-age children with congenital GI anomalies.

METHODS: An observational study examined body composition and cognition in 31 preschool-age children with congenital GI anomalies (i.e. gastroschisis, Hirschsprung’s disease, esophageal and bowel atresia, omphalocele, and congenital diaphragmatic hernia). Children with known chromosomal anomalies were excluded. Anthropometric measurements and body composition testing via air displacement plethysmography were obtained. Measurements were compared with a control group enrolled in a previous study (Minnesota Infant Nutrition, Neurodevelopment, and Obesity Study). Neurocognitive testing included the NIH Toolbox Early Childhood Cognition Battery. Linear regression was used to test the association of body composition with cognitive function at preschool-age.

RESULTS: Compared to the control group, children with congenital GI anomalies had lower gestational age (38.2 vs 39.8 weeks, p<0.001), lower birth weight (3.2 vs 3.5 kg, p=0.04), and were older at the time of their preschool visit (4.7 vs 4.4 years, p=0.002). Anthropometric measurements (weight, height, and BMI z-scores) and body composition were similar between the groups. In children with congenital GI anomalies, increased fat free mass at preschool-age was associated with higher receptive vocabulary scores, higher cognitive flexibility scores, and higher composite cognitive functioning scores. Increased percent body fat was associated with lower receptive vocabulary scores (Table 1).

CONCLUSIONS: In this heterogeneous group of children with congenital GI anomalies, growth and body composition at preschool-age were similar to controls. Those with higher fat free mass had improved cognitive scores. Higher fat free mass may reflect improved organogenesis and brain growth, which may be neurally protective against early nutritional or inflammatory insults.
Table 1. Cognitive factors as associated with body composition in children with congenital GI anomalies

<table>
<thead>
<tr>
<th>Variable</th>
<th>NIH Toolbox Test</th>
<th>Fat Free Mass</th>
<th>Fat Mass</th>
<th>Percent Body Fat</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>r</td>
<td>p-value</td>
<td>r</td>
</tr>
<tr>
<td>Receptive Vocabulary</td>
<td>Picture Vocabulary Test (n=30)</td>
<td>0.497</td>
<td>0.005</td>
<td>-0.196</td>
</tr>
<tr>
<td>Inhibitory Control and Attention</td>
<td>Flanker Inhibitory Control and Attention Test (n=25)</td>
<td>0.221</td>
<td>0.288</td>
<td>-0.307</td>
</tr>
<tr>
<td>Cognitive Flexibility</td>
<td>Dimensional Change Card Sort Test (n=28)</td>
<td>0.480</td>
<td>0.009</td>
<td>0.039</td>
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<tr>
<td>Episodic Memory</td>
<td>Picture Sequence Memory Test (n=25)</td>
<td>0.325</td>
<td>0.113</td>
<td>0.122</td>
</tr>
<tr>
<td>Processing Speed</td>
<td>Pattern Comparison Processing Speed Test (n=23)</td>
<td>-0.012</td>
<td>0.957</td>
<td>0.307</td>
</tr>
<tr>
<td>General Cognitive Functioning</td>
<td>Cognition Early Childhood Composite Score (n=20)</td>
<td>0.525</td>
<td>0.017</td>
<td>0.327</td>
</tr>
</tbody>
</table>

*NIH Toolbox scores are normed for age, gender, race, ethnicity, and parent’s education
r = Pearson correlation coefficient
The Relationship between Adolescent Sport Participation and Sexual Aggression – Examining Perpetration and Victimization between Male and Females

The goal of this study is to examine how team athletic involvement is related to sexual aggression victimization and perpetration among male and female high school students.

A secondary analysis was conducted with 2016 Minnesota Student Survey data gathered from 122,501 Minnesota 8th, 9th, and 11th grade students. Sports participation was classified into three groups: 0 days of sports a week, 1-4 days of sports a week, and 5+ days of sports a week. Sexual aggression perpetration was characterized by committing sexual harassment and/or sexual coercion of a partner. Sexual aggression victimization was categorized by experiencing sexual harassment and/or being sexually coerced by a partner. Logistic regressions were stratified by sex and adjusted for multiple confounders (e.g., alcohol attitudes, positive development characteristics, childhood sexual abuse, and demographic characteristics).

Odds ratios indicate that sports participation was a protective factor for sexual aggression in most unadjusted models (Model A in table), but became a risk factor after adjusting for confounders (Model C). For example, sports are a significant risk factor for moderately involved females (1-4 days) for being a victim and a perpetrator of sexual harassment (OR=1.12, 95% CI 1.05-1.20 victim; OR=1.13, 95% CI 1.02-1.26 perpetrator). Highly involved males are significantly more likely to coerce a partner into sex (OR=1.14, 95% CI 1.01-1.67 5+days) and be coerced by a partner into sex (OR=1.22, 95% CI 1.05-1.42) than non-sport peers.

Results suggest athletic programs could be an important site to implement comprehensive sexual violence prevention programs targeted at individual actions, as well as harmful cultural norms and systematic inequities. Although female athlete perpetration of sexual aggression is low compared to male athletes, we need further research to explore the association between sexual aggression and moderately involved females.
Table: ORs for sexual harassment/sexual coercion involvement (reference group = no sports)

<table>
<thead>
<tr>
<th></th>
<th>Harassment - victim</th>
<th>Harassment - perp</th>
<th>Coercion – victim</th>
<th>Coercion - perp</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>A</td>
</tr>
<tr>
<td>Males</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-4 days sports</td>
<td>0.95</td>
<td>1.11</td>
<td>1.08</td>
<td>1.03</td>
</tr>
<tr>
<td>5+ days sports</td>
<td>0.90</td>
<td>1.15</td>
<td>1.11</td>
<td>1.07</td>
</tr>
<tr>
<td>Females</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-4 days sports</td>
<td>0.95</td>
<td>1.17</td>
<td>1.12</td>
<td>0.90</td>
</tr>
<tr>
<td>5+ days sports</td>
<td>0.84</td>
<td>1.13</td>
<td>1.06</td>
<td>0.82</td>
</tr>
</tbody>
</table>

Model A: Unadjusted

Model B: Adjusted for Alcohol Attitudes, Positive Development, Teacher Relationships, Sexual Orientation and Childhood Sexual Abuse

Model C: Adjusted for Alcohol Attitudes, Positive Development, Teacher Relationships, Childhood Sexual Abuse, Sexual Orientation, Race, Free and Reduced Lunch, and Grade

**Bold Font** = statistically significant
Let's Talk About Sex: Do Adolescents’ Parents and Primary Care Physicians Talk to Them About Sex?

**Background:** Teens/young adults account for more sexually transmitted infections (STIs) than all other ages combined. Primary care provider (PCP) visits are opportunities to provide health care services to treat and prevent STIs. Similarly, parent-adolescent communication has been shown to protect against teen sexual risk-taking behavior.

**Objective:** Assess the rate at which adolescents discuss sex with their parents and PCPs and frequency at which they receive screening for sexually transmitted infections.

**Design/Methods:** Adolescents, aged 13-17, and parents of adolescents attending the 2017 Minnesota State Fair were invited to complete an 18-question survey. Adolescents were queried whether they had seen a PCP in the past year, if they were asked about sexual activity and/or offered STI screening, and whether they discuss sex with parents. Parents were queried about their knowledge of discussions had by their child’s PCP as well as discussions they personally have had with their adolescent about sex. Frequencies, Chi-square analyses, and logistic regression were used to evaluate the variables.

**Results:** 582 adolescents and 516 parents were surveyed. The majority (90%) of adolescents had been seen in the past year by PCP - 55% of these were asked about sex and 13% were offered STI testing. Increased age was associated with greater likelihood of being asked about sex (OR 6.8, p<0.0001) or offered STI testing (OR 9.8, p=0.008). Females were also more likely to be asked about sex (OR 6.8, p=0.003). White adolescents were less likely than other ethnicities to be offered testing (OR 4.0, p=0.036).

Regarding PCP/adolescent discussion of sexual activity, 49% of parents indicated awareness that such discussions occurred while 24% did not know. Twenty-five percent of parents felt that PCPs should not discuss sex. 90% of parents reported that they discuss sex with their adolescent while only 39% of adolescents reported the same. A female parent was more likely to discuss sex (OR 2.8, p=0.002). Parents were less likely to report discussing sex if the teen was younger (OR 0.3, p=0.035) or if parent’s ethnicity was anything other than white (OR 0.33, p=0.014).

**Conclusion(s):** Nearly half of adolescents reported that they were not routinely asked about sex by their PCPs and few were offered STI screening. Parents report discussing sex with their teens but this is not supported by adolescent report. Further work is needed to increase the frequency of sexual history taking by PCPs and educating parents on the importance of these discussions.
Conversation, condoms & contraception: How does communication with sexual partners affect safer-sexual behaviors among American Indian youth?

**Background:** American Indian (AI) youth experience a disproportionate burden of sexually transmitted infections (STIs) and teen births compared to white youth. Communication with sexual partners about safer sex may be protective, but little is known about partner communication among AI youth. We examined AI adolescents’ communication with sexual partners about STI prevention and associations with safer-sexual behaviors.

**Methods:** Data are from a statewide, school-based sample of Minnesota youth in 9th and 11th grades during 2013 and 2016. The sample for this study was restricted to the 39% of AI youth who reported ever having had sex (n=773). Multivariable logistic regression models, stratified by sex, assessed associations between partner communication and three dichotomous measures of safer-sexual behavior (condom use; highly effective contraceptive use; and dual method use) controlling for demographic and other salient factors.

**Results:** Half (50%) of sexually-experienced AI youth reported discussing STI prevention at least once with every partner. Approximately half (56%) reported using a condom at last sex, with fewer reporting using a highly effective contraceptive method (21%) or dual method (8%). In multivariable models, females and males who communicated about STI prevention with every partner had greater odds of using a condom at last sex compared to those who did not talk with all partners (females: 56% vs. 45%; OR=2.7; 95% CI: 1.4-5.5; p<.05).

**Conclusions:** Findings suggest that communicating about STI prevention with every partner can promote safer-sexual behavior among AI youth, but that many youth do not do so. When counseling adolescent patients, healthcare providers may want to stress the importance of talking with all sexual partners about safer sex and STI prevention.
MICROBIOLOGICAL SPECTRUM AND ANTIBIOTIC SUSCEPTIBILITY PATTERN OF BACTERIAL SKIN ISOLATES FROM PATIENTS WITH EPIDERMOLYSIS BULLOSA AND ITS CHANGING TREND AFTER OF BONE MARROW TRANSPLANTATION

Satja Issaranggoon Na Ayuthaya, Bazak Sharon
Division of Pediatric Infectious Diseases, Department of Pediatrics
University of Minnesota Masonic Children’s Hospital

Background: Epidermolysis bullosa (EB) is a group of rare inheritable skin fragility disorders leading to be colonized and eventually infected by various bacterial organisms. Bone marrow transplantation (BMT) has become the novel effective treatment for EB in the past ten years. Little data are known in these EB patients, especially the changing patterns of skin isolates after receiving BMT.

Objectives: To determine the microbiological spectrum and antibiotic susceptibility pattern of bacterial skin isolates from patients with EB and to compare these patterns of before and after BMT in patients with EB who received BMT.

Method: We performed a retrospective study by collecting data from bacterial skin isolates including susceptibility pattern in patients age 0-22 years old diagnosed with EB at Masonic Children’s Hospital, University of Minnesota from 2007 to 2017.

Results: Three hundred and forty-two bacterial skin isolates were collected from 68 patients with EB. Forty-five (66.2%) patients received BMT. Thirty-three bacterial species were isolated, with most commonly Staphylococcus aureus (26%), Pseudomonas aeruginosa (14.3%), and coagulase negative staphylococci (12.8%). Compared to pre BMT antibiotic susceptibility, EB patients who received BMT tended to have decreased percentage of all antibiotic susceptibilities for both methicillin-susceptible S. aureus (MSSA) and methicillin-resistant S. aureus (MRSA), especially to clindamycin (decrease 29% in MSSA and 50% in MRSA), and fluoroquinolone (decrease 37% in MSSA and 27% in MRSA) after transplantation. P. aeruginosa in EB patients also had decreased percentages of all antibiotic susceptibilities especially to ciprofloxacin (decrease 49%), ceftazidime (decrease 45%), cefepime (decrease 33%), piperacillin/tazobactam (decrease 26%), and meropenem (decrease 26%) after transplantation too.

Conclusions: In patients with EB, various bacteria including antibiotic resistant bacteria were isolated from skin culture. After transplantation, a decrease in antibiotic susceptibility of bacterial skin isolates, both common gram positive and gram negative bacteria, was observed at our center.

Table 1 Culture Results from Skin of Patients with Epidermolysis Bullosa (EB)
<table>
<thead>
<tr>
<th>Bacteria</th>
<th>Patients with positive cultures (n = 68), n(%)</th>
<th>Positive cultures (n = 342), n(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Staphylococcus aureus</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Methicillin-susceptible <em>S. aureus</em></td>
<td>51 (75%)</td>
<td>63 (18%)</td>
</tr>
<tr>
<td>• Methicillin-resistant <em>S. aureus</em></td>
<td>21 (31%)</td>
<td>26 (8%)</td>
</tr>
<tr>
<td><em>Pseudomonas aeruginosa</em></td>
<td>38 (56%)</td>
<td>49 (14%)</td>
</tr>
<tr>
<td>Coagulase-negative staphylococci</td>
<td>37 (54%)</td>
<td>44 (13%)</td>
</tr>
<tr>
<td><em>Enterococcus</em> spp.</td>
<td>22 (32%)</td>
<td>22 (6.4%)</td>
</tr>
<tr>
<td><em>Streptococcus</em> Group A</td>
<td>19 (28%)</td>
<td>19 (5.5%)</td>
</tr>
<tr>
<td><em>Streptococcus</em> Group B</td>
<td>9 (13%)</td>
<td>9 (2.6%)</td>
</tr>
<tr>
<td><em>Streptococcus</em> non group A/B/D</td>
<td>2 (3%)</td>
<td>3 (0.9%)</td>
</tr>
<tr>
<td><em>Streptococcus pneumoniae</em></td>
<td>1 (1.5%)</td>
<td>1 (0.3%)</td>
</tr>
<tr>
<td><em>Klebsiella</em> spp.</td>
<td>9 (13%)</td>
<td>9 (2.6%)</td>
</tr>
<tr>
<td><em>Escherichia coli</em></td>
<td>7 (10%)</td>
<td>7 (2%)</td>
</tr>
<tr>
<td>Anaerobes</td>
<td>7 (10%)</td>
<td>9 (2.6%)</td>
</tr>
<tr>
<td><em>Acinetobacter baumannii</em></td>
<td>5 (7%)</td>
<td>5 (1.5%)</td>
</tr>
<tr>
<td><em>Stenotrophomonas maltophilia</em></td>
<td>4 (6%)</td>
<td>6 (1.8%)</td>
</tr>
<tr>
<td>Other gram positive bacilli/cocci</td>
<td>29 (43%)</td>
<td>37 (11%)</td>
</tr>
<tr>
<td>Other gram negative rods/coccobacilli</td>
<td>23 (34%)</td>
<td>33 (10%)</td>
</tr>
</tbody>
</table>
Exploring societal and cultural norms surrounding young Filipino women’s contraceptive perceptions and experiences: A qualitative approach

**Purpose:** The Philippines is experiencing rising unintended pregnancy and sexually transmitted infection rates with over three-quarters (78%) of sexually active unmarried Filipinos ages 15-24 reporting non-contraceptive use. As the Philippine government passed its first comprehensive reproductive health law in 2012, the political tension between religious and women’s rights factions exposed the influential role religion and gender ideology may play into young Filipino women’s (YFW) decision to contracept. The goal of this exploratory qualitative study is to examine how societal and cultural norms, religious and gender ideology in particular, influence YFW’s contraceptive behavior.

**Methods:** In August of 2017, we conducted a focus group with 10 YFW (ages 18-20) and individual interviews with five reproductive health providers in Puerto Princesa, Palawan, a small provincial island in the southwestern region of the Philippines. All sessions followed a semi-structured interview guide. Questions were developed in partnership with youth and qualitative sessions were recorded and transcribed. Analyses are ongoing using thematic analysis.

**Results:** Preliminary results suggest that deeply ingrained religious and gender ideologies are strongly linked and influenced how YFW perceive virginity, dignity and womanhood, as it relates to contraceptive behavior. Conflicting social expectations also play a role as YFW discussed being expected to portray innocence and docility in intimate romantic relationships while simultaneously being encouraged to achieve and lead in other areas of their lives.

**Implications:** Health professionals working in international settings as well as those working with minority, immigrant and refugee populations in the U.S. will find this topic relevant as findings from this study can be used to inform and develop culturally appropriate reproductive health programs and services to address the unique challenges and barriers YFW face in adopting positive contraceptive behavior.
Peripheral Blood Lymphoid and Myeloid Chimerism after Hematopoietic Stem Cell Transplant for Non-Malignant Disorders

Jessica Knight-Perry, Weston P. Miller, MD, Paul J. Orchard, Angela R. Smith

**Background:** Mixed chimerism after non-malignant transplant is a significant dilemma. Outcome is varied and difficult to predict. Given concern for graft failure, increasing mixed chimerism is often treated despite limited data. Full donor engraftment is not necessary for cure and stable mixed chimerism can occur. Better understanding of stable mixed chimerism may reveal more efficacious treatment.

**Methods:** Patients with non-malignant disease transplanted at UMN from January 2010-July 2017 were eligible. Lymphoid and myeloid chimerism was collected per protocol. Immune phenotype was collected for patients also enrolled on a concurrent immune reconstitution study. Chimerism outcome was defined as full donor (≥95%), stable mixed (2 consecutive measurements ±10%, off immunosuppression), mixed (10-95%) and failure (≤10% and/or disease recurrence). T-regulatory cells, B-cells, and transplant characteristics were compared across chimerism outcome by chi-square or rank-sum test.

**Results:** 274 patients were transplanted at a median age of 7yrs (0.1-67). Donor source was marrow (68%) and cord (32%). Conditioning regimen was myeloablative in 123 (44%), reduced toxicity in 47 (17%), and reduced intensity in 107 (39%). Secondary graft failure occurred in 20 (7%). Of the 174 ≥1yr post-transplant, 55% were fully engrafted in the lymphoid lineage and 86% in the myeloid. 20% had stable mixed chimerism in the lymphoid lineage and 9% in the myeloid. B-cells were higher in the stable mixed chimerism group at day +28 (p=0.02), +60 (p=0.02) and +100 (p=0.01). T-regulatory cells trended higher in the mixed chimerism group at all time points but only significant at +28 (p=0.01). Disease (p<0.01) and regimen intensity (p<0.01) were also associated with outcome.

**Conclusions:** Graft failure was low despite a high incidence of mixed lymphoid and myeloid chimerism. There was a higher percentage of stable mixed chimerism in the lymphoid lineage. Immune phenotype, including B-cells and early T-regulatory cells, and regimen intensity may help predict outcome.
Epidemiology and Clinical Features of Septic Arthritis in Children

**Title:** Epidemiology and Clinical Features of Septic Arthritis in Children

**Background:** Children with acute arthritis are commonly admitted to the hospital in part due to concern for septic arthritis (SA) and its complications. Many non-infectious, non-urgent conditions are more common than SA and present similarly. The epidemiology and clinical presentation of SA influences management of patients with acute arthritis.

**Methods:** Utilizing the electronic medical record, we reviewed the charts of children (1-18 years old) with joint complaints who presented to the hospitals and clinics of one large academic health organization in the Upper Midwest from Jan 2011 to July 2016. Query criteria included the presenting symptom (“arthritis”, “joint swelling”, or “joint pain”), diagnosis (“arthritis”, “septic arthritis”, or “Lyme arthritis”), and/or positive synovial fluid culture or PCR. SA was confirmed when synovial bacterial culture or PCR were positive. SA was suspected in cases with a positive blood culture or when the patient was treated empirically with 4 weeks of antibiotic with no alternate diagnosis. All other children were excluded from the study cohort.

**Results:** Of the 705 children whose charts were reviewed, 609 were excluded with a non-infectious diagnosis and 72 with Lyme arthritis. We identified 14 children with confirmed SA and 10 children with suspected SA (total of 24 children with SA). Of these, only 3 children with suspected SA were immunosuppressed. SA was more common in boys. Among children with SA, 11 were diagnosed with acute, isolated, monoarticular arthritis. The most common pathogen isolated was *Staphylococcus aureus* (12). The knee (7) and hip (6) accounted for the majority of confirmed SA.

**Conclusion:** SA is a rare cause of acute arthritis in children. In healthy children, SA may present with contiguous MSK infection or in an isolated joint. SA is more likely in boys and in the knee or hip joint. *S. aureus* is the most common cause of SA. Clear understanding of the epidemiology and clinical history of SA should shape clinical decision making in children with acute arthritis.
Addressing Social Support and Social Isolation in Online Interventions for Young Black MSM: Examining the Role of Peer-to-Peer Sharing

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²Division of Pediatric Infectious Diseases and Immunology, University of Minnesota
³Duke Global Health Institute, Duke University
⁴Clinical and Translational Science Institute, University of Minnesota
⁵Division of Epidemiology and Community Health, University of Minnesota
⁶Institute of Global Health and Infectious Diseases, University of North Carolina at Chapel Hill

Background: Young black men who have sex with men (YBMSM) are disproportionately burdened by HIV. Poor social support and social isolation are associated with decreased viral suppression and risky sexual behaviors, particularly for persons of color. Technology-based interventions that facilitate peer interaction may improve social support and reduce isolation.

Methods: HealthMpowerment (HMP) was a randomized controlled trial of a mobile-optimized online intervention designed to reduce sexual risk behaviors through interactive features. 474 YBMSM aged 18-30 (HIV-negative [n=275] and HIV-positive [n=199]) enrolled and completed surveys at baseline, 3, 6, and 12 months. Items included the Medical Outcomes Study Social Support Survey (MOS-SSS) and the Lubben Social Network Scale (for social isolation). Linear mixed models and generalized linear mixed models explored differences in change over time by intervention group, general HMP site use, number of forum posts, and HIV status.

Results: Mean age was 24.3 (SD 3.2). Baseline mean score for all participants of perceived total social support was low at 72.0 (SD 27.3) of 100, and 30% were socially isolated (score <12). At each time-point, there were no differences in social support or social isolation by intervention group, by overall HMP usage, or by use of the peer interaction features. HIV-positive participants had lower mean social support scores at baseline than HIV-negative participants (total social support p=0.02, emotional p=0.03, tangible p=0.05, interaction p=0.002) and reported more isolation (40% vs 23%, p<.001). Social support scores declined over time, for both HIV-negative and HIV-positive groups.

Conclusions: Perceived social support was low and social isolation was high in this sample of YBMSM, especially among those living with HIV. Neither factor improved over time regardless of intervention group, intervention dosage, or use of HMP features that facilitated peer discussion. Future technology-based interventions that aim to impact these factors should consider how to optimize virtual spaces to foster peer-to-peer interactions.
Reactive Oxygen Species as a Mechanism of Leukemia Cell Death in Cerebrospinal Fluid

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\textsuperscript{1}Division of Pediatric Hematology and Oncology, Department of Pediatrics, University of Minnesota, Minneapolis, MN, USA.
\textsuperscript{2}Masonic Cancer Center, University of Minnesota, Minneapolis, MN, USA.

Acute lymphoblastic leukemia is the most common pediatric cancer in the United States. While significant progress has been made in the therapy of leukemia in the last 40 years, several obstacles still hinder cure. One of these difficulties is the development or presence of CNS leukemia. Given the challenges in treating CNS leukemia, we have focused on identifying unique characteristics of the CNS microenvironment that create a sanctuary site for leukemia cells and potentially make cure harder to obtain. One significant difference between the CNS leukemia microenvironment and other leukemia microenvironments in the body, such as the bone marrow, is the presence of cerebrospinal fluid (CSF) as opposed to serum. CSF has a different composition and concentration of many substrates compared to serum. We have found that leukemia cells in CSF, when compared to regular growth media (RPMI), have a limited survival even when CSF is exchanged on a daily basis. Given significant differences in the levels of redox proteins in CSF and serum, we hypothesized that this decrease in leukemia cell viability may be secondary to elevated reactive oxygen species (ROS) in leukemia cells in the CSF. Accordingly, we found leukemia cells in CSF showed a higher level of ROS as well as a decrease in viability compared to the same leukemia cells in regular media. Current experiments are testing the ability of ROS scavengers to diminish ROS in leukemia cells and restore viability. Our work identifies a potential mechanism of leukemia cell death in the CSF when compared to typical growth conditions. Moreover, avoidance or increased ability to scavenge ROS is a possible mechanism for leukemia persistence or relapse in the CNS.
Characterizing Premature, Low Birth Weight Infants with Positive Newborn Screens for Congenital Hypothyroidism

Authors: Marie Hickey MD (Neonatal-Perinatal Medicine Fellow), Sandy Liu MD (Pediatrics Resident), Brandon Nathan MD (Associate Professor, Division of Pediatric Endocrinology)

Background: In premature and low birth weight (LBW) infants, congenital hypothyroidism (CH) is often diagnosed following a normal initial newborn screen. Thus, serial screenings at 24-48 hours, 14 days, and 28 days of life are now recommended in this population.

Objective: To identify the incidence, timing, and outcomes of positive CH newborn screening tests in preterm, LBW infants (<2000 grams) in the Fairview/University of Minnesota metro area neonatal intensive care units (NICUs).

Design/methods: Newborn screening results in all infants with LBW admitted to the NICU were ascertained through the Minnesota Department of Health from 8/2014 through 6/2017. In infants with positive primary (24-48 hours of life) or secondary (14 or 30 days of life) screens (per MDH cut-offs), a retrospective chart review was performed.

Results: Thirty-seven (5%) of 407 infants had a positive CH screen with 84% categorized as secondary positive screens. Infants with primary (n=6) positive screens differed only in age (older) as compared to those with secondary positive (n=31) screens. No difference in rates of levothyroxine treatment was noted between primary and secondary positive screen groups. Characteristics of treated vs. non-treated infants are listed in Table. Treated infants had higher rates of treatment for sepsis, hypotension, or shock (p=0.02), and trended towards lower confirmatory free T4 measurements (p=0.057). Five treated infants discontinued levothyroxine at a mean age of 13.5 months (range 3-24 months) and two infants expired while on treatment. Six patients are receiving ongoing levothyroxine (range 7-36 months).

Conclusions: Positive CH screens in premature LBW infants occurred most frequently on secondary testing. A transient hypothalamic-pituitary-thyroid axis alteration without requirement for ongoing levothyroxine treatment was apparent in most infants. Treatment thresholds and outcomes remain important areas for additional study.
**Table.** Characteristics of Levothyroxine Treated vs. Non-Treated Groups

<table>
<thead>
<tr>
<th></th>
<th>Treated (n = 14)</th>
<th>Non-Treated (n = 23)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean gestational age at birth</td>
<td>28.1 weeks</td>
<td>29.6 weeks</td>
</tr>
<tr>
<td>Gender (M/F)</td>
<td>6/8</td>
<td>11/12</td>
</tr>
<tr>
<td>Mean birthweight</td>
<td>1.12 kg</td>
<td>1.10 kg</td>
</tr>
<tr>
<td>No. born by Cesarean</td>
<td>9/14 (64%)</td>
<td>20/23 (87%)</td>
</tr>
<tr>
<td>No. multiple gestation</td>
<td>4/14 (29%)</td>
<td>6/23 (26%)</td>
</tr>
<tr>
<td>Average positive newborn screen test number</td>
<td>1.93</td>
<td>2.09</td>
</tr>
<tr>
<td>Corrected gestational age at abnormal screen</td>
<td>30.1</td>
<td>31.8</td>
</tr>
<tr>
<td>Median newborn screen TSH</td>
<td>17.8</td>
<td>13.6</td>
</tr>
<tr>
<td>Median confirmatory TSH</td>
<td>7.93</td>
<td>6.3</td>
</tr>
<tr>
<td>Median confirmatory FT4</td>
<td>0.77</td>
<td>1.4</td>
</tr>
<tr>
<td>% received glucocorticoids or vasopressors</td>
<td>8/14 (57%)</td>
<td>7/23 (30%)*</td>
</tr>
<tr>
<td>% with history of sepsis, hypotension or shock</td>
<td>8/14 (57%)</td>
<td>7/23 (30%)*</td>
</tr>
</tbody>
</table>

*p=0.02
Outcomes with Specific Approach in Children after Undergoing Pericardiocentesis

F Myers*, K Leong*, J Bass*, G Hiremath*
*University of Minnesota, Minneapolis, MN

BACKGROUND: Pericardiocentesis is a safe therapeutic procedure with a major complication rate of 1%. Echocardiographic guidance during pericardiocentesis has allowed for less traditional approaches to drainage of pericardial fluid. Furthermore, pericardiocentesis without subsequent drain placement has been associated with an increased risk of recurrence.

OBJECTIVES: To assess whether the anatomical approach during pericardiocentesis influences rates of complication. We also assessed if the underlying diagnosis and subsequent pericardial drain placement affects rates of complication.

METHODS: All patients undergoing pericardiocentesis from August 2008 to June 2016 at the University of Minnesota Masonic Children’s Hospital were included. Procedure-related complications, the approach of procedure, the location of effusion, history of hematopoietic cell transplantation, the presence of echocardiographic or clinical tamponade, and the use of pericardial drain were analyzed.

RESULTS: A total of 60 patients underwent pericardiocentesis. Post-hematopoietic stem cell transplant was the most common diagnosis (n=31, 51.7%). A pericardial drain was left in place in 40 patients (66.7%). The most commonly used approaches were the left axillary approach (36.7%) and sub-xiphoid approach (28.3%). The fifth intercostal space was the most commonly used intercostal space (n=16, 26.7%). There were 3 minor complications (5%) and 2 major complications (3.3%). The presence of hematopoietic cell transplantation, approach, or intercostal space did not increase the risk of complications; The complication rate was higher in those patients who did not receive a pericardial drain (p<.006).

CONCLUSIONS: The use of non-traditional, non-sub-xiphoid approach did not significantly affect the rate of complications nor did an underlying diagnosis of hematopoietic cell transplantation. The rate of any complication was higher among those who did not receive a pericardial drain.
Reducing Variation in Pediatric Blood Pressure Measurements in a Pediatric Inpatient Unit

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Aim of project
The aim of this ongoing project is to reduce variation in blood pressure (BP) measurement and accurately identify elevated BP among pediatric patients in the inpatient setting.

Design of study
This is a quality improvement project designed according to the IHI model. Process maps outlining the current BP measurement process are being utilized. Introduction of 2017 pediatric BP screening guidelines was provided through education of nursing staff and pediatric residents rotating on the inpatient cardiology service.

Setting/utilization framework
The project is being conducted on an inpatient pediatric cardiology floor. Standard QI models for healthcare are being utilized and the framework of the project is based on the Plan-Do-Study-Act (PDSA) model.

Steps and strategies
Baseline BP measurement information was obtained via nurse and resident surveys. BP measurement practices prior to utilization of the new pediatric BP guidelines were reviewed. Pre-intervention data was collected using EPIC EHR reports and areas for improvement identified.

Results, evaluation, and outcomes
Based on survey results, 90% of nurses would re-check elevated BP measurements and more than 50% would take a BP measurement on a different limb during a re-check. Following intervention, there was an increase in BP measurements performed using the right upper extremity from 11% to 63% (p=<0.001) and a 32% reduction in site variability per patient (p=0.031). Introduction of the 2017 pediatric BP guidelines offers an opportunity to educate nurses and residents on pediatric BP guidelines, reduce variation in BP measurement, and improve accuracy of identifying elevated BP in this ongoing study.
% of BP readings taken from upper right arm

- Pre-Intervention: 11% (n=327)
- Week 1: 41% (n=390)
- Week 2: 63% (n=252)

% BPs taken on right...
Institution of a night-time huddle system and its impact on unscheduled PICU transfers.

Introduction:
Compared to admissions from other venues, patients admitted to the PICU from the wards have been shown to have a higher odds of morbidity, mortality and longer lengths of hospital stay. The higher mortality rate has been attributed to delayed recognition of clinical deterioration. To improve early detection and intervention, and reduce the number of unscheduled transfers, we instituted a night-time huddle system wherein "at risk" ward patients are discussed each evening with the on-call intensive care attending and fellow. As a result a plan to intensify care and/or transfer to the PICU is created. The aim of this project is to demonstrate that with early identification of clinical deterioration, night-time ICU transfer rates, medical interventions at the time of transfer, and the calculated risk of mortality at time of PICU admission would decrease.

Methods:
Retrospective chart review of all unscheduled transfers from the Wards to the PICU between the hours of 2200 and 0830 hours. Data was collected from our institutional VPS database for the periods of April 2015 to March 2016 and April 2016 to March 2017. Variables of interest included PIM2, PRISM 3, number and type of interventions in the first hour after transfer. Statistical analysis done by Chi Squared for categorical variables and Mann-Whitney U for continuous variables.

Results:
Case mix index for non-ICU areas in the post-implementation was higher (1.91 vs. 1.76, p=0.05). Unplanned transfers overnight decreased from 3.82/1000 patient days to 2.62/1000 patient days (p = 0.029 ). Unplanned transfers PIM2 ROM scores decreased from a mean of 1.56 to 1.39 and PRISM 3 scores decreased from 3.39 to 3.27, neither difference was statistically significant. Number of critical care interventions required in the 1st hour after transfer decreased from 74 pre to 43 post (p= 0.002). There were significant decreases in need for respiratory escalation (p=0.04), need for vasoactive medications (p=0.04), and administration of fluid boluses (p=0.03) in the post-intervention period.

Conclusions:
Implementation of a house-wide evening huddle run by the PICU decreased the rate of unplanned transfers overnight and the number of critical care interventions needed in the first hour after transfer.
Hippocampal volumes correlate with memory function at 5 year follow-up in children with HIE

**Background:** While therapeutic hypothermia (TH) offers new hope for infants with hypoxic ischemic encephalopathy (HIE), HIE continues to be an important cause of mortality and morbidity. Studies conducted prior to TH showed reduced hippocampal volumes and impaired memory function in survivors of HIE. While TH is known to improve overall outcomes, the effect on subtler cognitive functions such as memory is unknown.

**Objective:** To determine whether survivors of HIE show impairments in memory function or reduced hippocampal size as compared to healthy controls.

**Methods:** This interim analysis included data from 17 children, 11 controls and 6 with moderate HIE. All participants with HIE were treated with TH. Children were assessed between 4.49 and 5.81 years of age. Participants underwent psychometric testing focused on general development (WPPSI) as well as memory and executive function (selected NEPSY subtests), and parents filled out a questionnaire about executive function (BRIEF-P). One child with HIE was unable to be tested due to developmental delay. Brain MRIs were used to assess regional volumes. MRI data was available for 5 controls and 4 children with HIE. Between-group differences in psychometric testing scores were assessed using t-tests, and correlations between MRI and behavioral data were assessed using Pearson correlation coefficients. Due to the small sample size, the Mann Whitney test was used to compare MRI volume data between groups.

**Results:** Both groups performed similarly on WPPSI and NEPSY, and BRIEF-P scores did not differ between groups. The HIE group had statistically significantly smaller mean right hippocampal volumes ($p = 0.032$), and a trend toward smaller left entorhinal cortex volumes ($p = .063$) There was a trend toward positive correlation between right parahippocampal and performance on two NEPSY memory subtests, narrative memory ($p = 0.067$) and sentence repetition ($p = 0.069$).

**Conclusion:** In this cohort, children with moderate HIE performed similarly to healthy controls on general IQ testing as well as on more specific tests of memory function. However, children with HIE did show structural brain changes. Right hippocampal volume was smaller in the HIE group and hippocampal size appears to correlate with performance on standardized memory assessments. This was an interim analysis and it will be interesting to see whether these findings remain as more children are assessed.
Intra-tracheal N-acetylcysteine in a newborn pig model of meconium aspiration syndrome

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Meconium aspiration syndrome (MAS) accounts for approximately 1,000 deaths in the United States annually. While treatment with exogenous surfactant has shown benefit in laboratory and clinical studies, mortality rates for neonates with MAS have remained unchanged. We hypothesized that intra-tracheal N-acetylcysteine (NAC), a drug with known mucolytic and anti-inflammatory properties, in addition to surfactant would improve oxygenation and ventilation and decrease markers of inflammation in a piglet model of MAS.

We induced MAS in thirty-six newborn piglets by intra-tracheal administration of 20% human meconium. Once MAS was achieved (P a O 2 < 100 torr on two serial blood gases 10 min apart) piglets were randomized into one of three groups: 1) Surfactant alone 2) Surfactant plus low-dose NAC (2 ml every 4 hours) and 3) Surfactant plus high-dose NAC (2 ml every 2 hours). Short-term respiratory physiology endpoints, ventilator settings, vital signs, and arterial blood gases were monitored and recorded every 30 minutes for the 8-hour study period. At study end, lungs were dissected for analysis of wet/dry ratio, histologic scoring, and analysis of cytokine levels in tissue homogenate.

Contrary to our hypothesis, piglets who received high-dose NAC had poorer oxygenation and ventilation compared with piglets that received low-dose NAC or surfactant alone (p < 0.01). Piglets receiving high dose NAC showed a trend toward higher airway pressures and higher wet/dry ratio compared to surfactant alone (p < 0.001). Piglets receiving NAC had clinical pulmonary hemorrhage in 80-100% of subjects compared to 10% in those receiving surfactant alone. We postulate that high osmotic load or surfactant inactivation by NAC led to these findings, however histologic and cytokine analysis is ongoing and will hopefully shed light on the mechanism of pulmonary injury caused by NAC.