

***29<sup>th</sup> Annual*** P  
***Pediatric Research*** R  
***Education and*** E  
***Scholarship*** S  
***Symposium*** S

**Friday, April 17, 2015**

**29<sup>TH</sup> ANNUAL PEDIATRIC RESEARCH, EDUCATION AND  
SCHOLARSHIP SYMPOSIUM (PRESS)**

**April 17, 2015**

**2:00–6:00 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**

**2:00-3:00 p.m.**

See Full Abstracts 1-4 in Oral Presentation section  
(pages 11-16)

- 2:00pm **Michelle Alexander, Postdoctoral Associate – Pediatric Neonatology**  
“REGIONAL EFFECTS OF IUGR ON THE NEUROCHEMICAL PROFILE OF THE  
DEVELOPING RAT BRAIN”  
➤ Research Sponsor: Anne Hall
- 2:15pm **Thomas Bastian, Postdoctoral Associate – Pediatric Neonatology**  
“IRON DEFICIENCY IMPAIRS NEURONAL DENDRITE COMPLEXITY AND  
SYNAPTIC PLASTICITY IN CULTURED PRIMARY HIPPOCAMPAL NEURONS”  
➤ Research Sponsor: Michael Georgieff
- 2:30pm **Gregory Forlenza, Fellow – Pediatric Endocrinology**  
“SUCCESSFUL IMPLEMENTATION OF FULLY AUTOMATED CLOSED LOOP  
THERAPY AFTER ISLET AUTO-TRANSPLANTATION”  
➤ Research Sponsor: Melena Bellin
- 2:45pm **Johannah Scheurer, Fellow – Pediatric Neonatology**  
“PRETERM INFANTS’ FAT-FREE MASS ACCRETION IMPACTS PRESCHOOL  
COGNITION”  
➤ Research Sponsor: Sara Ramel

**SPEED TALKS (3 MINUTES EACH, 3 SLIDES MAX)**

**Wilf Family Center**

**3:00-4:00 p.m.**

See Full Abstracts in Poster Session Section  
(pages 19-70)

- 3:00pm **Mayada Abu Shanap, Fellow – Pediatric BMT**  
“DEFINING PERFECT IMMUNE RECONSTITUTION AFTER ALLOGENEIC HEMATOPOIETIC STEM CELL TRANSPLANTATION (HSCT)” [Abstract #30]
- 3:03pm **Monica Agoston, Psychology Intern –Pediatrics/Psychiatry**  
“CORTISOL PHARMACOKINETICS AND EXECUTIVE FUNCTIONING IN CHILDREN WITH CONGENITAL ADRENAL HYPERPLASIA” [Abstract #5]
- 3:06pm **Tori Bahr, Med-Peds Intern – Pediatric GME**  
“INCIDENCE, CLINICAL AND RADIOGRAPHIC CHARACTERISTICS OF INTRACRANIAL HYPERTENSION IN CHILDREN WITH OSTEOPETROSIS UNDERGOING HEMATOPOIETIC STEM CELL TRANSPLANTATION” [Abstract #15]
- 3:09pm **Jessie Barnum, Fellow – Pediatric Hem-Onc & BMT**  
“Akt INHIBITION OF CHIMERIC ANTIGEN RECEPTOR MODIFIED T CELLS PROMOTES A STEM CELL MEMORY PHENOTYPE” [Abstract #32]
- 3:12pm **Jennifer Berger, Resident – Pediatric GME**  
“COMPLIANCE OF ADVERTISEMENTS FOR CHILDREN IN LEADING PARENTING MAGAZINES WITH AMERICAN ACADEMY OF PEDIATRICS RECOMMENDATIONS OVER FIVE YEARS” [Abstract #16]
- 3:15pm **Rachel Blue & Douglas Haase, Medical Students – Pediatric BMT**  
“RECELLULARIZATION OF INTACT ACELLULAR LUNG SCAFFOLDS” [Abstract #6]
- 3:18pm **Kyung-Dal Choi, Postdoctoral Associate – Pediatric Hem-Onc & BMT**  
“REPROGRAMMING OF SOMATIC CELLS INTO HEMATOPOIETIC PROGENITORS” [Abstract #24]
- 3:21pm **Ellen Christiansen, Resident – Pediatric GME**  
“SCHOOL READINESS STARTS EARLY: IMPROVED SCREENING AND REFERRAL RATES FOR DEVELOPMENTAL DELAY AT THE 18 MONTH WELL CHILD VISIT” [Abstract #17]
- 3:24pm **Steven Conlon, Medical Student – Pediatric Cardiology**  
“PREMATURE VENTRICULAR CONTRACTIONS: DOES THE ORIGIN OF THE ECTOPIC FOCUS RELATE TO PATHOLOGIC STATUS?” [Abstract #7]
- 3:27pm **Melissa Engel, Fellow – Pediatric Neonatology**  
“A QUALITATIVE STUDY ON STANDARDIZING INPATIENT TREATMENT FOR NEONATAL ABSTINENCE SYNDROME” [Abstract #34]

- 3:30pm **Melissa Engel, Fellow – Pediatric Neonatology**  
“RETROSPECTIVE ANALYSIS OF INFANTS INTERVENED FOR CRITICAL CONGENITAL HEART DISEASE USING ANATOMY TO VALIDATE UNIVERSAL PULSE OXIMETER SCREENING IN NEWBORNS” [Abstract #35]
- 3:33pm **Nathan Gossai, Fellow – Pediatric Hem-Onc & BMT**  
“BI-FUNCTIONAL DRUG-DNA CONJUGATED GOLD NANOPARTICLES FOR THE TREATMENT OF PEDIATRIC ACUTE MYELOID LEUKEMIA” [Abstract #36]
- 3:36pm **Pallavi Kamra, Resident – Pediatric GME**  
“AN UNUSUAL CASE OF SUSPECTED HEAD INJURY” [Abstract #18]
- 3:39pm **Heidi Kamrath, Fellow – Pediatric Neonatology**  
“THE IMPACT OF A PERINATAL PALLIATIVE CARE PROGRAM ON LENGTH OF STAY, ICU DAYS, AND INVASIVE PROCEDURES” [Abstract #38]
- 3:42pm **Katherine Klipfel, Psychology Intern – Pediatric GME**  
“MICROSTRUCTURAL, FUNCTIONAL-CONNECTIVITY, AND NEUROCOGNITIVE DISRUPTION IN PEDIATRIC TRAUMATIC BRAIN INJURY: A DTI AND RESTING-STATE fMRI STUDY” [Abstract #11]
- 3:45pm **Stacie Knutson, Fellow – Pediatric Cardiology**  
“IMPLEMENTATION OF DEVELOPMENTAL SCREENING GUIDELINES FOR CHILDREN WITH CONGENITAL HEART DISEASE” [Abstract #40]
- 3:48pm **Elizabeth Mann, Resident – Pediatric GME**  
“EDUCATING DIABETES CAMP COUNSELORS: IDENTIFYING THE GAP BETWEEN PERCEPTIONS AND KNOWLEDGE – A QUALITY IMPROVEMENT PROJECT” [Abstract #19]
- 3:51pm **Elizabeth Mann, Resident – Pediatric GME**  
“DISSEMINATED NEONATAL HSV FROM A BITE WOUND” [Abstract #20]
- 3:54pm **Justin Ryder, Postdoctoral Fellow – Epidemiology & Community Health**  
“IMPAIRED CARDIAC AUTONOMIC NERVOUS SYSTEM FUNCTION IS ASSOCIATED WITH HYPERTENSION AND HIGHER SYSTOLIC BLOOD PRESSURE INDEPENDENT OF ADIPOSITY IN CHILDREN AND ADOLESCENTS” [Abstract #28]
- 3:57pm **Emily Schaaf, Fellow – Pediatric Infectious Disease**  
“RELATIONSHIP OF BIOFILM FORMATION AND ALPHA-TOXIN PRODUCTION BY METHICILLIN-RESISTANT *STAPHYLOCOCCUS AUREUS* WOUND ISOLATES ON MUCOSAL EPITHELIUM” [Abstract #41]

**POSTER SESSION (INCLUDES SPEED TALK PRESENTERS)**  
**UMMCH 2<sup>nd</sup> Floor/Lobby Level**  
**4:00-6:00 p.m.**  
 See Full Abstracts in Poster Session Section  
 (pages 19-70)

Abstract #

- [30] **Mayada Abu Shanap, Fellow – Pediatric BMT**  
 “DEFINING PERFECT IMMUNE RECONSTITUTION AFTER ALLOGENEIC HEMATOPOIETIC STEM CELL TRANSPLANTATION (HSCT)”  
 ➤ Research Sponsor: Michael Verneris
- [31] **Kristen Aggerbeck Kessler, Fellow – Developmental Behavioral Pediatrics**  
 “PARENT CONNECTEDNESS PROMOTES RESILIENCE AMONG HOMELESS YOUTH”  
 ➤ Research Sponsor: Andrew Barnes
- [5] **Monica Agoston, Psychology Intern –Pediatrics/Psychiatry**  
 “CORTISOL PHARMACOKINETICS AND EXECUTIVE FUNCTIONING IN CHILDREN WITH CONGENITAL ADRENAL HYPERPLASIA”  
 ➤ Research Sponsors: Margaret Semrud-Clikeman and Kyriakie Sarafoglou
- [15] **Tori Bahr, Med-Ped Intern – Pediatric GME**  
 “INCIDENCE, CLINICAL AND RADIOGRAPHIC CHARACTERISTICS OF INTRACRANIAL HYPERTENSION IN CHILDREN WITH OSTEOPETROSIS UNDERGOING HEMATOPOIETIC STEM CELL TRANSPLANTATION”  
 ➤ Research Sponsors: Weston Miller and David Nascene
- [32] **Jessie Barnum, Fellow – Pediatric Hem-Onc and BMT**  
 “Akt INHIBITION OF CHIMERIC ANTIGEN RECEPTOR MODIFIED T CELLS PROMOTES A STEM CELL MEMORY PHENOTYPE”  
 ➤ Research Sponsor: Bruce Blazar
- [16] **Jennifer Berger, Pediatric Resident – Pediatric GME**  
 “COMPLIANCE OF ADVERTISEMENTS FOR CHILDREN IN LEADING PARENTING MAGAZINES WITH AMERICAN ACADEMY OF PEDIATRICS RECOMMENDATIONS OVER FIVE YEARS”  
 ➤ Research Sponsor: Michael Pitt
- [6] **Rachel Blue & Douglas Haase, Medical Students – Pediatric BMT**  
 “RECELLULARIZATION OF INTACT ACELLULAR LUNG SCAFFOLDS”  
 ➤ Research Sponsor: Angela Panoskaltsis-Mortari
- [23] **Debanjana Chatterjee, Postdoctoral Fellow – General Pediatrics and Adolescent Health**  
 “EXPERIENCE OF ABUSE, HOUSEHOLD DYSFUNCTION, AND EARLY USE OF ALCOHOL AND MARIJUANA AMONG MINNESOTA YOUTH: THE MODERATING ROLE OF INTERNAL ASSETS”  
 ➤ Research Sponsor: Iris Borowsky
- [24] **Kyung-Dal Choi, Postdoctoral Associate – Pediatric Hem-Onc and BMT**  
 “REPROGRAMMING OF SOMATIC CELLS INTO HEMATOPOIETIC PROGENITORS”  
 ➤ Research Sponsor: Michael Kyba

- [17] **Ellen Christiansen, Pediatric Resident – Pediatric GME**  
 “SCHOOL READINESS STARTS EARLY: IMPROVED SCREENING AND REFERRAL RATES FOR DEVELOPMENTAL DELAY AT THE 18 MONTH WELL CHILD VISIT”  
 ➤ Research Sponsor: Sonja Colianni
- [7] **Steven Conlon, Medical Student – Pediatric Cardiology**  
 “PREMATURE VENTRICULAR CONTRACTIONS: DOES THE ORIGIN OF THE ECTOPIC FOCUS RELATE TO PATHOLOGIC STATUS?”  
 ➤ Research Sponsor: Parvin Dorostkar
- [33] **Christen Ebens, Fellow – Pediatric BMT**  
 “KIDNEY TRANSPLANT AFTER HEMATOPOIETIC STEM CELL TRANSPLANT: INFECTIOUS COMPLICATIONS AND IMMUNOSUPPRESSIVE CONSIDERATIONS”  
 ➤ Research Sponsor: Angela Smith
- [34] **Melissa Engel, Fellow – Pediatric Neonatology**  
 “A QUALITATIVE STUDY ON STANDARDIZING INPATIENT TREATMENT FOR NEONATAL ABSTINENCE SYNDROME”  
 ➤ Research Sponsor: Andrea Lampland
- [35] **Melissa Engel, Fellow – Pediatric Neonatology**  
 “RETROSPECTIVE ANALYSIS OF INFANTS INTERVENED FOR CRITICAL CONGENITAL HEART DISEASE USING ANATOMY TO VALIDATE UNIVERSAL PULSE OXIMETER SCREENING IN NEWBORNS”  
 ➤ Research Sponsor: Lazaros Kochilas
- [8] **Windy Fredkove, Pre-doctoral LEAH Fellow – General Pediatrics & Adolescent Health**  
 “INTERNAL ASSETS, BULLYING AND EMOTIONAL DISTRESS AMONG YOUNG ADOLESCENTS”  
 ➤ Research Sponsors: Amy Gower and Renee Sieving
- [25] **Diego Garcia-Huidobro, Postdoctoral Fellow – General Pediatrics & Adolescent Health**  
 “WHAT MAKES PARENTING INTERVENTIONS EFFECTIVE AT REDUCING SUBSTANCE USE? A SYSTEMATIC REVIEW”  
 ➤ Research Sponsor: Iris Borowsky
- [9] **Michelle Gin, Pre-doctoral LEAH Fellow – General Pediatrics & Adolescent Health**  
 “WHY YOUTH AREN’T HAVING SEXUAL INTERCOURSE: DEMOGRAPHIC DIFFERENCES IN REASONS FOR ABSTINENCE AMONG MINNESOTA HIGH SCHOOL STUDENTS”  
 ➤ Research Sponsor: Iris Borowsky
- [26] **Kari Gloppen, Postdoctoral Fellow – General Pediatrics and Adolescent Health**  
 “SCHOOL AND INDIVIDUAL-LEVEL FACTORS RELATED TO BULLYING AND SUICIDALITY AMONG AMERICAN INDIAN YOUTH IN MINNESOTA”  
 ➤ Research Sponsor: Michael Resnick
- [36] **Nathan Gossai, Fellow – Pediatric Hem-Onc & BMT**  
 “BI-FUNCTIONAL DRUG-DNA CONJUGATED GOLD NANOPARTICLES FOR THE TREATMENT OF PEDIATRIC ACUTE MYELOID LEUKEMIA”  
 ➤ Research Sponsor: Peter Gordon

- [37] **Elwaseila Hamdoun, Fellow – Pediatric Endocrinology**  
 “THE SPECTER OF SEVERE UNTREATED CONGENITAL HYPOTHYROIDISM REMAINS IN IMMIGRANT FAMILIES IN THE UNITED STATES”  
 ➤ Research Sponsor: Anna Petryk
- [27] **Lyla Hampton, Postdoctoral Fellow – Pediatric Neuropsychology**  
 “HURLER SYNDROME TREATED EXCLUSIVELY WITH ENZYME REPLACEMENT THERAPY: A CASE REPORT OF SOMATIC AND NEUROLOGIC SEQUELAE”  
 ➤ Research Sponsor: Julie Eisengart
- [10] **Beth Jarrett, Medical Student – General Pediatrics and Adolescent Health**  
 “THE RELATIONSHIP BETWEEN ADOLESCENT SELF-PERCEPTION OF WEIGHT, MENTAL HEALTH, AND SOCIAL PROTECTIVE FACTORS”  
 ➤ Research Sponsor: Iris Borowsky
- [18] **Pallavi Kamra, Pediatric Resident – Pediatric GME**  
 “AN UNUSUAL CASE OF SUSPECTED HEAD INJURY”  
 ➤ Research Sponsors: Rahul Kaila and Jeff Louie
- [38] **Heidi Kamrath, Fellow – Pediatric Neonatology**  
 “THE IMPACT OF A PERINATAL PALLIATIVE CARE PROGRAM ON LENGTH OF STAY, ICU DAYS, AND INVASIVE PROCEDURES”  
 ➤ Research Sponsor: Jennifer Needle
- [39] **Sarah Kizilbash, Fellow – Pediatric Nephrology**  
 “THE IMPACT OF ACUTE KIDNEY INJURY (AKI) ON MORTALITY IN CHILDREN UNDERGOING HEMATOPOIETIC STEM CELL TRANSPLANTATION (HSCT)”  
 ➤ Research Sponsor: Clifford Kashtan
- [11] **Katherine Klipfel, Psychology Intern – Pediatric GME**  
 “MICROSTRUCTURAL, FUNCTIONAL-CONNECTIVITY, AND NEUROCOGNITIVE DISRUPTION IN PEDIATRIC TRAUMATIC BRAIN INJURY: A DTI AND RESTING-STATE fMRI STUDY”  
 ➤ Research Sponsor: Margaret Semrud-Clikeman
- [40] **Stacie Knutson, Fellow – Pediatric Cardiology**  
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- [19] **Elizabeth Mann, Pediatric Resident – Pediatric GME**  
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 ➤ Research Sponsors: Brad Miller and Brandon Nathan
- [20] **Elizabeth Mann, Pediatric Resident – Pediatric GME**  
 “DISSEMINATED NEONATAL HSV FROM A BITE WOUND”  
 ➤ Research Sponsors: Mike Pitt and Shane McAllister
- [21] **Nick Ryan, Pediatric Resident – Pediatric GME**  
 “GROUP A STREPTOCOCCAL PHARYNGITIS: UNCOMMON ADVERSE EFFECTS OF COMMON TREATMENTS”  
 ➤ Research Sponsor: Andrew Olson

- [28] **Justin Ryder, Postdoctoral Fellow – Epidemiology & Community Health**  
“IMPAIRED CARDIAC AUTONOMIC NERVOUS SYSTEM FUNCTION IS ASSOCIATED WITH HYPERTENSION AND HIGHER SYSTOLIC BLOOD PRESSURE INDEPENDENT OF ADIPOSITY IN CHILDREN AND ADOLESCENTS”  
➤ Research Sponsor: Aaron Kelly
- [41] **Emily Schaaf, Fellow – Pediatric Infectious Disease**  
“RELATIONSHIP OF BIOFILM FORMATION AND ALPHA-TOXIN PRODUCTION BY METHICILLIN-RESISTANT *STAPHYLOCOCCUS AUREUS* WOUND ISOLATES ON MUCOSAL EPITHELIUM”  
➤ Research Sponsors: Mark Schleiss and Marnie Peterson
- [29] **Nathan Schuldt, Postdoctoral Fellow – Pediatric Rheumatology**  
“THE ROLE OF DUAL TCR T CELLS IN IMMUNITY”  
➤ Research Sponsor: Bryce Binstadt
- [12] **Jarrod Tembreull, Medical Student – Pediatric Cardiology**  
“ONDANSETRON PROMOTES EXPRESSION OF SUDDEN CARDIAC ARREST IN A CHILD WITH LONG QT SYNDROME”  
➤ Research Sponsor: Parvin Dorostkar
- [13] **Caitlyn Wright, Pre-doctoral LEAH Fellow – General Pediatrics and Adolescent Health**  
“MENTAL HEALTH OUTCOMES AMONG DISCORDANT HIGH SCHOOL STUDENTS”  
➤ Research Sponsor: Marla Eisenberg
- [22] **Matthew Yocum, Med-Peds Resident – Pediatric GME**  
“TRANSSEPTAL PUNCTURE IN A PATIENT WITH L-TRANSPOSITION OF THE GREAT ARTERIES”  
➤ Research Sponsor: Parvin Dorostkar
- [14] **Rheanne Zimmerman, Medical Student – Pediatric Epidemiology & Clinical Research**  
“GENETIC SYNDROMES IN CHILDHOOD CANCER”  
➤ Research Sponsor: Logan Spector



**HAPPY HOUR (NON-ALCOHOLIC) AND AWARDS**

**(WILL BEGIN DURING THE POSTER SESSION)**

**UMMCH 2<sup>nd</sup> floor/Lobby level**

**4:30-6:00 p.m.**

**JUDGES**

Tim Hallstrom, Ph.D.  
Assistant Professor of Pediatrics  
Division of Blood and Marrow Transplantation

Helena Molero, M.D.  
Assistant Professor of Pediatrics  
Division of Pulmonary Medicine

Igor Nestrasil, M.D.  
Assistant Professor of Pediatrics  
Division of Clinical Behavioral Neuroscience

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FORMAL  
ORAL  
PRESENTATIONS

*(Abstracts 1-4)*

**PEDIATRIC RESEARCH, EDUCATION AND SCHOLARSHIP SYMPOSIUM (PRESS)**  
**April 17, 2015**

**ABSTRACT [1]**

Name: Michelle Alexander  
Status: Postdoctoral Associate

Division: Pediatric Neonatology  
Research Sponsor: Anne Hall

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**Regional Effects of IUGR on the Neurochemical Profile of the Developing Rat Brain**

M Alexander<sup>1</sup>, I Tkac<sup>2</sup>, K Ennis<sup>1</sup>, G Oz<sup>2</sup>, R Rao<sup>1</sup> and AM Maliszewski-Hall<sup>1</sup>

<sup>1</sup>Department of Pediatrics, Division of Neonatology, University of Minnesota-Minneapolis, MN, USA  
<sup>2</sup>Center for Magnetic Resonance Research, University of Minnesota-Minneapolis, MN, USA

**Background:** Intrauterine growth restriction (IUGR) infants are at increased risk for cognitive, motor and intellectual deficits as children and adults. The nature of these deficits suggests that specific brain regions (the hippocampus and cerebral cortex) may be particularly vulnerable, relative to other brain regions (e.g., the striatum). The mechanisms for the region-specific vulnerability/sparing are not known.

**Objective:** Evaluate the neurochemical profile consisting of metabolite markers of neuronal and glial integrity, energy reserves, neurotransmitters/amino acids and myelination in the cortex, hippocampus and striatum of IUGR and normally grown (NG) 7 day old rat pups using ultra-high field *in vivo* <sup>1</sup>H NMR spectroscopy (9.4T).

**Methods:** IUGR was induced using bilateral uterine artery ligation at gestational day 19 in timed-pregnant Sprague Dawley dams. NMR spectra were obtained from the cortex, hippocampus and striatum at P7 in 12 IUGR and 13 NG pups. The following neurochemicals were quantified: ascorbate, aspartate, creatine (Cr), phosphocreatine (PCr), GABA, glucose (Glc), glutamate, glutamine, glutathione (GSH), lactate, *myo*-inositol, *N*-acetylaspartate, *N*-acetylaspartylglutamate, phosphoethanolamine, Tau (Tau), the sum of glycerophosphocholine and phosphocholine (GPC+PC), total Cr+PCr, PCr/Cr and Glu/Gln. Differences in neurochemical concentrations among each region were compared between IUGR and NG.

**Results:** In the P7 cortex, IUGR resulted in lower concentrations of PCr, GSH, Tau, GPC+PC, Cr+PCr ( $P < 0.01$  for each) and Glu/Gln ( $P < 0.05$ ) while only resulting in lower concentrations of Tau in the hippocampus ( $P < 0.01$ ) and striatum ( $P < 0.05$ ).

**Conclusion:** IUGR differentially affects the neurochemical profile of the P7 rat brain regions with the cortex showing greater alterations than the hippocampus or striatum. The neurochemical changes in the cortex suggest disruptions in 1) energy reserves (PCr, Cr+PCr, Glu/Gln) 2) oxidative metabolism (Tau and GSH), 3) amino acids (Tau), 4) antioxidants (GSH) and 5) phospholipid synthesis (GPC+PC). Persistent neurochemical changes may lead to cortex-based long-term cognitive and motor deficits in human IUGR infants.

Supported by CHRCDA K12 HD068322 and Viking Children's Fund

**PEDIATRIC RESEARCH, EDUCATION AND SCHOLARSHIP SYMPOSIUM (PRESS)**  
**April 17, 2015**

**ABSTRACT [2]**

Name: Thomas Bastian  
Status: Postdoctoral Associate

Division: Pediatric Neonatology  
Research Sponsor: Michael Georgieff

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**Iron Deficiency Impairs Neuronal Dendrite Complexity and Synaptic Plasticity in Cultured Primary Hippocampal Neurons**

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

Background: Iron deficiency (ID), with and without anemia, affects an estimated 2 billion people worldwide. ID is particularly deleterious during fetal/neonatal brain development, leading to long-term neurological impairments, including deficits in hippocampal-mediated learning and memory. Fetal/neonatal ID anemia (IDA) and non-anemic hippocampal neuron-specific ID impair rodent hippocampal neuron maturation leading to shorter, thinner apical dendrites with disorganized branching patterns that persist into adulthood despite normalization of iron status. The molecular/cellular basis of these neuronal structural impairments is unknown.

Objective: To isolate the role of neuronal iron loss in mediating the effects of fetal/neonatal ID on hippocampal neuron dendritic maturation.

Methods: Embryonic hippocampal neuronal cultures were treated with 5-Fluoro-2'-deoxyuridine (an anti-mitotic drug that inhibits glia proliferation) and 10  $\mu$ M deferoxamine (DFO, an iron chelator), beginning at 3 days in vitro (DIV). Overall dendritic complexity was assessed using immunocytochemical staining for MAP2, a dendrite-specific microtubule-associated protein. Quantitative PCR was used to quantify changes in mRNA levels for genes indexing neuronal iron status and synaptic plasticity.

Results: At 11DIV, cell viability and neuronal density were not altered in 10  $\mu$ M DFO-treated cultures ( $p > 0.05$ ). Transferrin receptor 1 mRNA expression, an indicator of cellular iron status, was 2- to 3-fold higher in 11DIV and 18DIV 10  $\mu$ M DFO treated cultures ( $p < 0.0001$ ). DFO treatment from 7DIV to 14DIV decreased mRNA levels for Brain derived neurotrophic factor isoform VI (45% lower,  $p < 0.0001$ ), Calcium/calmodulin-dependent protein kinase II alpha (40% lower,  $p < 0.0001$ ), and Synaptobrevin I (42% lower,  $p < 0.0001$ ). Morphological assessment showed an 18% decrease in overall dendritic complexity in DFO-treated neurons at 11DIV ( $p < 0.05$ ).

Conclusions: Our findings suggest that neuronal iron loss is responsible for the effects of fetal/neonatal ID and IDA on hippocampal neuron dendritic structural maturation and synaptic plasticity. Impairments in these neurodevelopmental processes likely underlie the negative impact of early life ID and IDA on hippocampal-mediated learning and memory. This hippocampal culture model of neuronal ID offers the opportunity to elucidate the molecular and cellular mechanisms contributing to the effects of ID on neuronal structural development.

# PEDIATRIC RESEARCH, EDUCATION AND SCHOLARSHIP SYMPOSIUM (PRESS)

April 17, 2015

## ABSTRACT [3]

Name: Gregory Forlenza  
Status: Fellow

Division: Pediatric Endocrinology  
Research Sponsor: Melena Bellin

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### **Successful Implementation of Fully Automated Closed Loop Therapy After Islet Auto-Transplantation**

Gregory P. Forlenza, MD<sup>1</sup>, Brandon Nathan, MD<sup>1</sup>, Antoinette Moran, MD<sup>1</sup>, Ty B. Dunn, MD<sup>2</sup>, Gregory J. Beilman, MD<sup>2</sup>, Timothy L. Pruett, MD<sup>2</sup>, Melena D. Bellin, MD<sup>1</sup>

<sup>1</sup>Department of Pediatrics, University of Minnesota Medical Center, Minneapolis, MN, 55454

<sup>2</sup>Department of Surgery, University of Minnesota Medical Center, Minneapolis, MN, 55454

Total pancreatectomy with islet auto-transplantation (TPIAT) may be performed for patients with chronic pancreatitis to relieve pain while minimizing the risk of diabetes. Avoiding hyperglycemia is essential after TPIAT to minimize beta cell apoptosis during islet engraftment. Closed loop (CL) therapy has never previously been investigated in islet transplant recipients but CL devices may improve glycemic control within a narrow therapeutic target. Our objective is to determine the feasibility and efficacy of CL therapy to maintain glucose profiles close to normoglycemia following TPIAT.

Here we present an interim analysis for the first 11 patients (73% female; mean age 36.7±10.7 years-old). At the time of transition from IV to subcutaneous insulin (POD=5.8±1.4 days), subjects were block randomized to subcutaneous insulin via a CL pump (n=5) or multiple daily injections (n=4) for 72 hours.

Mean serum glucose values were maintained in the target range with a low degree of variability in the 5 patients on CL therapy (112±3.1 mg/dL), with rare hypoglycemia by CGM (1.3±1.6% of time <70 mg/dL). Hyperglycemia was also infrequent (10.9±4.5%); more than 80% of time was spent in target range of 70-140 mg/dL in all CL patients. The primary endpoint of average serum glucose was lower in the CL group (112.0 v. 129.0 mg/dL; p=0.008), with a trend towards less glycemic variability (glucose SD, 14.8 v. 23.6 mg/dL; p=0.083). CGM values have not demonstrated a significant difference between groups for average BG (114.8 v. 122.6 mg/dL; p=0.442) or glycemic variability (21.5 v. 23.0 mg/dL; p=0.765). Total insulin requirements (0.263 v. 0.577 U/kg/day; p=0.070) also appear to be lower in the CL group.

Preliminary data from this study suggest that the new CL technologies have the potential to produce tighter glycemic control without increased risk for hypoglycemia and are a promising tool to maintain strict euglycemic targets after TPIAT.

Table 1. Interim Serum BG and CGM BG Analysis

PtID	Serum BG		CGM BG		Hypoglycemia		Hyperglycemia		AM C-Peptide	Islet Eq	Insulin TDD (U/kg/day)
	Avg (mg/dL)	StDev (mg/dL)	Avg (mg/dL)	StDev (mg/dL)	AUC per Day (min*mg/dL)	% time (%)	AUC per Day (min*mg/dL)	% time (%)	Avg (ng/mL)	per kg (IEQ/kg)	
TPIAT01	112	15	114	17	11	0.5	576	5	0.8	3042	0.131
TPIAT03	115	12	116	21	95	1.1	2347	9.9	1.9	11940	0.181
TPIAT05	107	15	108	24	47	0.3	2685	8.3	2.2	9970	0.075
TPIAT06	110	17	120	21	60	1.1	3185	18.1	0.8	5413	0.513
TPIAT09	115	18	115	28	755	4.6	3206	13.8	0.7	2909	0.461
TPIAT11	113	12	116	18	53	0.5	1854	10.1	1.1	6382	0.220
<b>AVG</b>	<b>112.0</b>	<b>14.8</b>	<b>114.8</b>	<b>21.5</b>	<b>194</b>	<b>1.3</b>	<b>2400</b>	<b>10.9</b>	<b>1.2</b>	<b>6609</b>	<b>0.263</b>
<b>STDEV</b>	<b>3.1</b>	<b>2.5</b>	<b>3.9</b>	<b>4.0</b>	<b>315</b>	<b>1.6</b>	<b>1081</b>	<b>4.5</b>	<b>0.7</b>	<b>3677</b>	<b>0.181</b>
TPIAT02	122	38	90	39	11292	33.6	3027	10	0.4	3696	0.506
TPIAT04	118	11	118	10	0.0	0.0	15	0.5	1.4	8307	0.255
TPIAT07	126	16	123	16	0.0	0.0	1840	14.5	2.1	3928	0.579
TPIAT08	149	30	156	28	0.0	0.0	31793	65.1	0.4	1124	1.104
TPIAT10	130	23	126	22	13	0.2	5176	26.9	2.4	3635	0.440
<b>AVG</b>	<b>129.0</b>	<b>23.6</b>	<b>122.6</b>	<b>23.0</b>	<b>2261</b>	<b>6.8</b>	<b>8370</b>	<b>23.4</b>	<b>1.3</b>	<b>4138</b>	<b>0.577</b>
<b>STDEV</b>	<b>12.0</b>	<b>10.8</b>	<b>23.5</b>	<b>11.2</b>	<b>5048.5</b>	<b>15.0</b>	<b>13227</b>	<b>25.2</b>	<b>1.0</b>	<b>2596</b>	<b>0.318</b>
p-value	<b>0.008</b>	0.083	0.442	0.765	0.387	0.397	0.344	0.257	0.849	0.240	0.070

**PEDIATRIC RESEARCH, EDUCATION AND SCHOLARSHIP SYMPOSIUM (PRESS)**

**April 17, 2015**

**ABSTRACT [4]**

Name: Johannah Scheurer  
Status: Fellow

Division: Pediatric Neonatology  
Research Sponsor: Sara Ramel

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**Preterm Infants' Fat-Free Mass Accretion Impacts Preschool Cognition**

Johannah M Scheurer, MD<sup>1</sup>, Heather L Gray, MPH<sup>1</sup>, Solveig Hultgren, MA, LPCC<sup>1</sup>,  
Katherine Weir, BS<sup>1</sup>, Ellen W Demerath, PhD<sup>2</sup> and Sara E Ramel, MD<sup>1</sup>

<sup>1</sup>Pediatrics, University of Minnesota, Minneapolis, MN, United States and <sup>2</sup>Epidemiology & Community Health, University of Minnesota, Minneapolis, MN, United States.

**Background:** Premature infants are at risk for poor executive function due to slow brain processing speed. At term corrected age (CA) they have less fat-free mass (FFM) and more fat-mass (FM) than term controls, which is mediated by NICU nutrition and illness. At 4mos CA preterms with more FFM have faster neural speed of processing. Persistence of these relationships into preschool age is unknown.

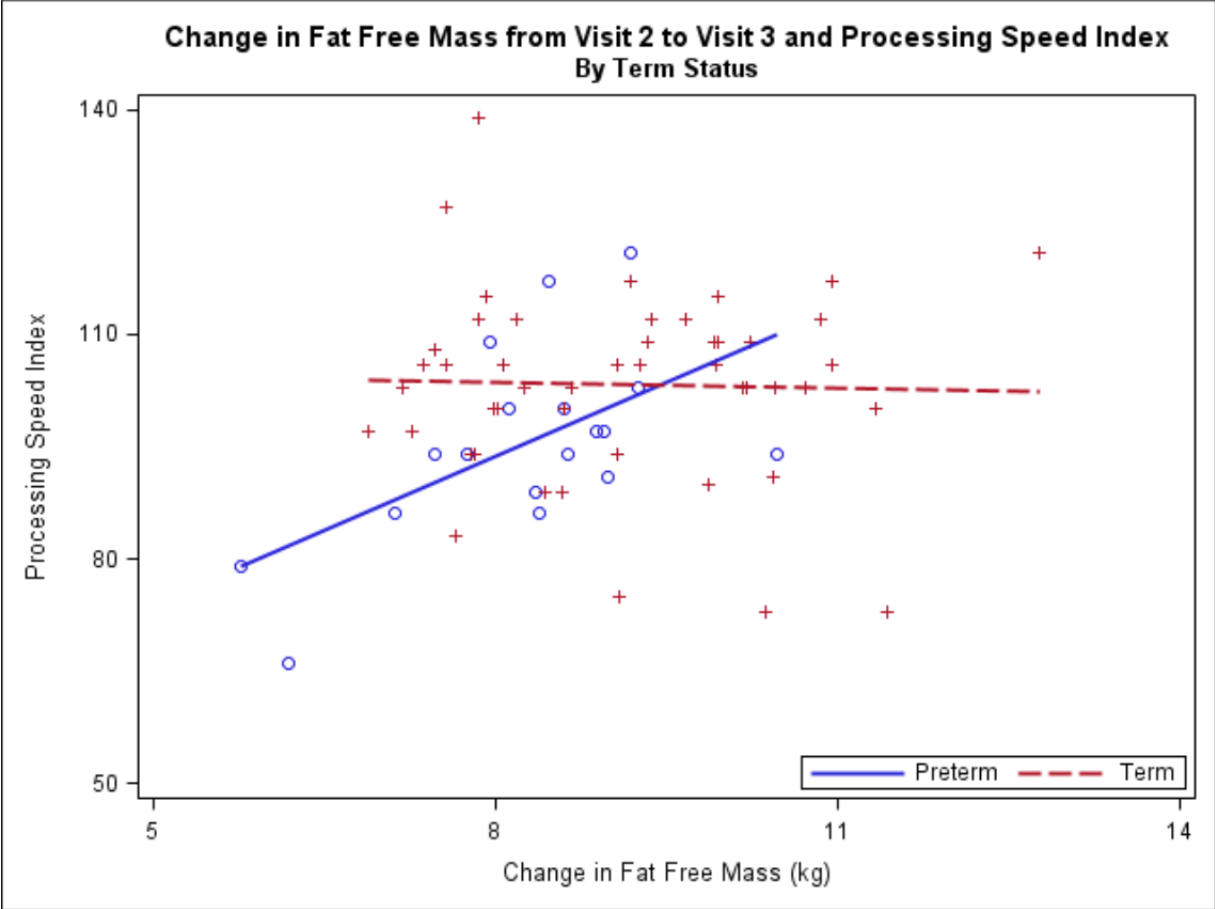
**Objective:** Investigate if lean mass accretion from infancy to preschool age impacts premature children's cognition.

**Methods:** A longitudinal cohort of appropriate for gestational age premature (n=18, mean gestational age 32.2wks) and term (n=48) infants were assessed at/near discharge (visit 1), 3-4mos (preterms' CAs) (visit 2), and 4yrs (visit 3). Body composition (FFM, FM, body-fat %) via air-displacement plethysmography and anthropometrics were measured at each visit. Intelligence quotient (IQ) was measured via WPPSI-IV at visit 3. The influence of individuals' changes in body composition from visit 2 to 3 on WPPSI-IV processing speed index (PSI) was tested using a mixed-effects linear regression model. Confounders were included if they improved the models (higher R<sup>2</sup>, lower AIC).

**Results:** At 4yrs preterm children had lower PSI than term children (p=0.03). Both groups had similar full scale IQ, other IQ sub-scores, body composition, and anthropometrics. FFM gain from visit 2 to 3 was significantly associated with PSI for preterms ( $\beta=6.6$ , p=0.01) but not terms (p for interaction = 0.02). Adjusting for sex and 4mo CA nighttime sleep, the effect of FFM change was not altered, but the p-value increased ( $\beta=6.7$ , p=0.09). Body-fat % change was not associated with PSI.

**Conclusions:** Preterm infants' post-discharge gains in FFM, a marker of organ and brain accretion, are positively associated with preschool processing speed. Greater attention to improving preterms' pre- and post-discharge FFM gains may improve long-term cognitive development.

**Figure 1. Change in Fat-free mass from visit 2 to visit 3 and Processing Speed Index by term status (see below)**





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# POSTER SESSION

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GRADUATE /  
MEDICAL  
STUDENTS

*Abstracts (5-14)*

**PEDIATRIC RESEARCH, EDUCATION AND SCHOLARSHIP SYMPOSIUM (PRESS)**  
**April 17, 2015**

**ABSTRACT [5]**

Name: Monica Agoston  
 Status: Psychology Intern

Division: Pediatrics/Psychiatry  
 Research Sponsor: Margaret Semrud-Clikeman and  
 Kyriakie Sarafoglou

**Cortisol Pharmacokinetics and Executive Functioning in Children with  
 Congenital Adrenal Hyperplasia**

A. Monica Agoston, Maria Teresa Gonzalez, Margaret Semrud-Clikeman, Nancy Vanderburg,  
 Richard Brundage & Kyriakie Sarafoglou

Congenital adrenal hyperplasia (CAH) is a form of adrenal insufficiency characterized by impaired cortisol synthesis and excessive adrenal androgen production. Children with CAH receiving oral cortisol (hydrocortisone) therapy are repeatedly exposed to undesirable states of hypocortisolemia and hypercortisolemia. Studies have found mixed relations between cortisol and cognitive functions, including executive functioning (EF). Our study examined relations between EF, cortisol pharmacokinetics (PK) and cortisol dosing in children with CAH. Parents completed the Behavior Rating Scale of Executive Function (BRIEF), a measure assessing children’s everyday performance in multiple EF domains ( $n=22$ , males=10, females=12; mean age at questionnaire=11.34,  $SD=3.33$ , range: 6.83–18.80 years; salt wasting:  $n=14$ , simple virilizing:  $n=4$ , non-classical:  $n=4$ ). Morning and total daily doses ( $mg/m^2$ ) were recorded at the same visit.

Analyses were conducted using linear regression and adjusting for relative bone age, a proxy of disease control. The mean Global Executive Composite of CAH children was slightly lower but comparable to the sample of children on which norm-adjusted BRIEF scores were based, with lower scores indicating fewer deficits ( $t=46.77$  vs.  $t=50.00$ ). Higher cortisol dosages were associated with significantly greater deficits in monitoring, i.e., children’s ability to assess and/or keep track of their behavior on others or during tasks (morning:  $B=.52$ ,  $t=2.80$ ,  $p<.05$ ; total:  $B=.67$ ,  $t=2.59$ ,  $p<.05$ ). Relative bone age was not associated with monitoring ( $B=.36$ ,  $t=1.69$ ,  $ns$ ). We also investigated cortisol PK parameters (clearance and half-life) in a subsample of children with CAH ( $n=18$ ; salt wasting:  $n=11$ , simple virilizing:  $n=4$ , non-classical:  $n=3$ ). Cortisol half-life and clearance estimates were categorized as upper quartile, interquartile, and lower quartile and compared using  $t$ -tests. Children with longer cortisol half-life (upper quartile) had significantly fewer deficits in initiation, working memory, and organization of materials, better scores on the Metacognition Index, and marginally fewer monitoring deficits when compared to the intra quartile group.

*T-Tests Comparing Cortisol Half-Life and EF in Children with Congenital Adrenal Hyperplasia*

	Upper quartile half-life cortisol concentrations ( $n=6$ )		Interquartile half-life cortisol concentrations ( $n=8$ )		<i>t-test</i>	<i>p-value</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Initiation	43.33	3.39	52.88	9.52	2.33	<.05
Working Memory	44.67	4.13	52.13	7.32	2.23	<.05
Organization of Materials	41.67	7.09	51.88	6.31	2.84	<.05
Monitoring	38.80	4.09	47.63	9.32	1.98	<.10
Metacognition Index	41.67	2.58	51.13	8.48	2.62	<.05

**PEDIATRIC RESEARCH, EDUCATION AND SCHOLARSHIP SYMPOSIUM (PRESS)**  
**April 17, 2015**

**ABSTRACT [6]**

Name: Rachel Blue and Douglas Haase  
Status: Medical Students

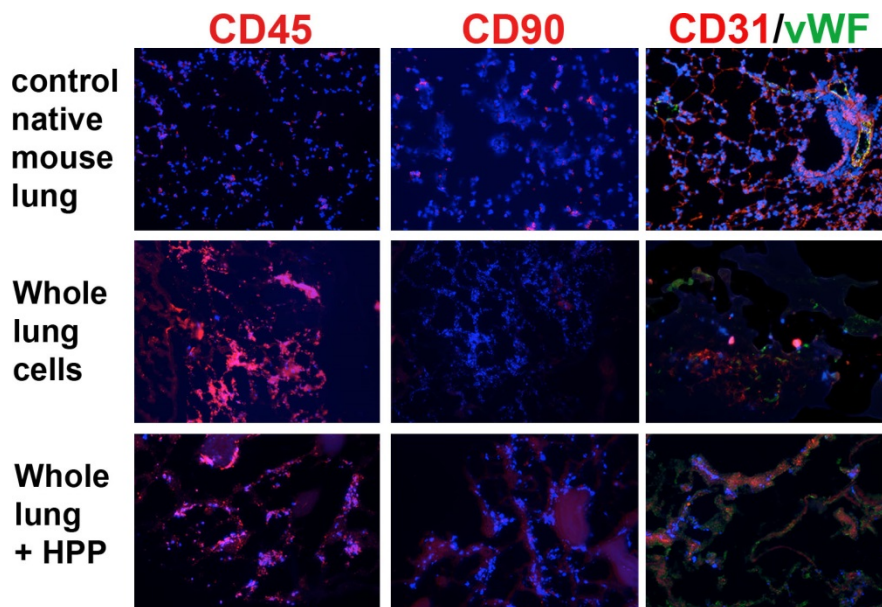
Division: Pediatric BMT  
Research Sponsor: Angela Panoskaltis Mortari

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**Recellularization of Intact Acellular Lung Scaffolds**

Rachel Blue, Douglas Haase, Angela Panoskaltis-Mortari

End stage lung disease causes significant morbidity and mortality with transplantation as the only curative option, for which donor lungs are in short supply. Protocols for lung decellularization provide a quality matrix but no protocol has proven successful for subsequent full lung recellularization. To further understand the dynamics of revascularization as part of the recellularization process, we injected three different cell type combinations into the vasculature of decellularized mouse lungs: 1. Rat pulmonary endothelial progenitor cells called High Proliferative Potential Endothelial Colony-Forming Cells (HPP-ECFC); 2. whole adult mouse lung cells (WAL); 3. a combination of HPP-ECFC cells followed by WAL cells. The lungs were cultured in a bioreactor under continual vascular flow with MEF media for one week. We then examined the lung construct cryosections using H&E and immunostaining to analyze cell distribution, proliferation and type. The lungs injected with only HPP-ECFC cells demonstrated minimal engraftment, both in small and large vessels. The lungs injected with WAL cells exhibited mild to moderate growth. The lungs injected with HPP-ECFC cells and WAL cells saw the most substantial growth. In cell type analysis, lungs injected with HPP-ECFC cells exclusively contained endothelial cells. Decellularized lung matrices infused with WAL cells contained predominantly CD45+ hematopoietic cells with smaller populations of CD90+ mesenchymal stem cells (MSC), CD31+ endothelial cells, and CD11b+ macrophages. Matrices infused with WAL and HPP-ECFC cells produced a more even distribution of cells throughout the matrix, an increased number of CD90+ and CD31+ cells and a broader distribution of CD11b+ cells compared to WAL cell only infused matrices (Figure 1). We found no smooth muscle actin staining in either condition, indicating no smooth muscle cell engraftment. This data indicates that orchestrated reseeded of acellular scaffolds will be required to provide the necessary intercellular crosstalk and permissive environment for successful recellularization-based bioengineering of lungs for transplantation.



**Figure 1: Immunostains of recellularized mouse lungs compared to native control. Magnification 200X.**

**PEDIATRIC RESEARCH, EDUCATION AND SCHOLARSHIP SYMPOSIUM (PRESS)**  
**April 17, 2015**

**ABSTRACT [7]**

Name: Steven Conlon  
Status: Medical Student

Division: Pediatric Cardiology  
Research Sponsor: Parvin Dorostkar

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**Premature Ventricular Contractions: Does the Origin of the Ectopic Focus  
Relate to Pathologic Status?**

Steven Conlon, MD, Parvin Dorostkar, MD

**Background:** Premature ventricular contractions (PVC) are common in pediatric patients occurring in up to 35% of children evaluated. Although, mostly a benign finding, they can be associated cardiomyopathy, and, rarely, PVC triggered sudden cardiac death.

The **Purpose** of this study was to evaluate whether the ectopic origin of PVCs is similar to that of idiopathic ventricular tachycardia, which tends to originate from the right and left ventricular outflow tracts (VOFT) and tends to be benign.

**Methods:** A retrospective study of 26 patients referred for PVC evaluation was performed. The 12 lead ECGs were used to determine the origin of PVC. Echocardiograms were used to assess for structural heart disease and serial Holter monitors were used to determine ectopic burden and its expression over time. Ten patients were found to have “pathologic” PVCs, defined as those that exhibited an increasing ectopic burden, need for intervention, or occurring in the setting of structural heart disease. 16 patients were asymptomatic, had no structural heart disease and demonstrated a decrease in ectopic burden over time. There was a statistically significant difference in the location of the PVCs in patients that were thought to have benign ventricular ectopy vs. those thought to have pathologic ectopy, using Fisher’s exact T test ( $p = 0.0256$ ).

<b>Origin</b>	<b>Pathologic</b>	<b>Benign</b>	<b>Total</b>	
VOFT	4	14	18	
Non VOLT	6	2	8	
<b>Total</b>	<b>10</b>	<b>16</b>	<b>26</b>	<b>p = 0.0256</b>

**Conclusions:** It appears that PVCs that are thought to be benign in nature originate from the VOLT area; this is comparable to the origin of idiopathic ventricular tachycardia. PVCs originating from outside of the VOLT are more likely, associated with a pathologic clinical course. PVC origin location, therefore, may serve as a marker for clinical compromise. Knowledge of algorithms that evaluate PVC focus / origin may prevent unnecessary evaluation and/or referral.

# **PEDIATRIC RESEARCH, EDUCATION AND SCHOLARSHIP SYMPOSIUM (PRESS)**

**April 17, 2015**

## **ABSTRACT [8]**

Name: Windy Fredkove

Division: General Pediatrics and Adolescent Health

Status: Pre-doctoral LEAH Fellow, PhD Student

Research Sponsor: Amy Gower and Renee Sieving

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### **Internal Assets, Bullying and Emotional Distress Among Young Adolescents**

Windy Fredkove

Adolescents are in a unique developmental stage, ideal for initiating healthy behaviors, enhancing well-being and benefiting from health promotion interventions. Despite an extensive literature exploring bullying in youth, little is known about how adolescents' internal assets are related to bullying and emotional distress. Internal assets are individual characteristics, such as social competencies and positive identity, which protect youth against risk and promote healthy development. Using a positive youth development framework, this study aims to assess whether internal assets are associated with bullying involvement and emotional distress and whether those associations vary by gender.

This study is a secondary analysis of data from the 2013 Minnesota Student Survey (MSS), a cross-sectional, population based survey of Minnesota youth. Participating 8th grade students (N=42,841) reported on emotional distress, physical, relational and cyberbullying involvement; and also responded to questions assessing internal assets (14-item scale; $\alpha=0.90$ ) (e.g., I feel good about my future).

Bullying involvement and emotional distress were common among 8th grade students, with 54.2% reporting some bullying involvement and 23.7% reporting elevated levels of emotional distress. Logistic regressions, stratified by gender and controlling for relevant sociodemographic characteristics, revealed that higher levels of internal assets were associated with lower levels of all forms of bullying victimization and perpetration. Higher levels of internal assets were also associated with less emotional distress. All associations were significant for both males and females, but appeared stronger for females.

These findings indicate that internal assets may buffer young teens from bullying involvement and from the emotional distress that may result from bullying victimization and/or bullying perpetration. Extending previous research on internal assets to domains of bullying and emotional health, this study suggests that approaches that bolster internal assets, such as social-emotional learning programs, may be beneficial in combating bullying and emotional distress during early adolescence.

**Table 1.** Odds Ratios for Internal Assets and Study Outcomes by Sex

	Relational Bullying Perpetration		Relational Bullying Victimization		Physical Bullying Perpetration		Physical Bullying Victimization		Cyberbullying Victimization		Emotional Distress	
	Males OR (99% CI)	Females OR (99% CI)	Males OR (99% CI)	Females OR (99% CI)	Males OR (99% CI)	Females OR (99% CI)	Males OR (99% CI)	Females OR (99% CI)	Males OR (99% CI)	Females OR (99% CI)	Males OR (99% CI)	Females OR (99% CI)
<b>Internal Assets</b>	.46* (.43-.49)	.42* (.39-.44)	.50* (.47-.53)	.35* (.33-.37)	.35* (.32-.37)	.23* (.21-.25)	.47* (.44-.50)	.35* (.33-.37)	.44* (.41-.48)	.31* (.29-.33)	.24* (.22-.26)	.13* (.12-.14)

**Note.** \* $p < .001$ . All regression models controlled for grade, race/ethnicity, poverty indicators (free/reduced-price lunch, insecure housing or insecure food), Individualized Education Program (IEP), and family structure.

**PEDIATRIC RESEARCH, EDUCATION AND SCHOLARSHIP SYMPOSIUM (PRESS)**  
**April 17, 2015**

**ABSTRACT [9]**

Name: Michelle Gin  
Status: Pre-doctoral LEAH Fellow

Division: Pediatric Adolescent Health  
Research Sponsor: Iris Borowsky

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**Why Youth Aren't Having Sexual Intercourse: Demographic Differences in Reasons for Abstinence Among Minnesota High School Students**

**Background:** Abstinence is the most effective way to prevent pregnancy and sexually transmitted infections (STI). Reasons to abstain from sexual intercourse vary; understanding why adolescents abstain is important for developing sexuality education materials.

**Methods:** This study included 69,886 9th and 11th graders who completed the 2013 Minnesota Student Survey (MSS). One question assessed reasons for abstaining: "If you don't have sexual intercourse, what factors influence your choice not to have sexual intercourse?" Youth were instructed to mark all that apply from a list of 14 options and were categorized into seven groups based on their reasons: (1) don't want to; (2) lack of opportunity; (3) fear of pregnancy or STIs; (4) personal values (e.g. religious reasons); (5) friend and family values/norms; (6) other reason(s) than assessed; and (7) mixed reasons. Nine demographic characteristics were assessed. Chi-square tests identified relationships between demographics and reasons for abstinence.

**Results:** Seventy-three percent reported never having had intercourse. Among abstainers, 0.7% abstained because of friend and family values/norms; 3.3% feared negative outcomes; 4.5% didn't want to have intercourse; 5.7% reported other reasons than assessed on the MSS; 7.5% lacked opportunity; 10.5% abstained due to personal values; and 67.8% had multiple reasons. The pattern of reasons differed significantly by gender and grade. For example, more males than females responded that the sole reason for abstinence was due to lack of opportunity ( $X^2= 3654.2$ ,  $p = .001$ ). For both males ( $X^2= 342.2$ ,  $p = .001$ ) and females ( $X^2= 247.2$ ,  $p = .001$ ), more 11th grade students feared pregnancy and STIs than 9th grade students.

**Conclusion:** Information about why youth abstain and whether reasons vary by demographic characteristics may be used to inform school-based sexuality education. Additional research is needed about how reasons for abstaining from intercourse are associated with sexual health behaviors and outcomes upon sexual initiation.



<b>Table 1. Percentage of youth who have abstained from sexual intercourse for various reasons. n (%)</b>								
	friends & family	fear of outcomes	didn't want to	other reasons than assessed	lacked opportunity	personal values	multiple reasons	
	n = 368 (0.7)	n = 1697 (3.3)	n = 2262 (4.5)	n = 2891 (5.7)	n = 3812 (7.5)	n = 5321 (10.5)	n = 34453 (67.8)	x2 (p)
<i>Gender</i>								3654.2 (<.001)
Male	249 (1.0)	786 (3.2)	1015 (4.2)	2039 (8.4)	3297 (13.6)	2799 (11.5)	14101 (58.1)	
Female	119 (0.5)	911 (3.4)	1247 (4.7)	852 (3.2)	515 (1.9)	2522 (9.5)	20352 (76.8)	
<i>Grade by gender</i>								
<i>Male</i>								342.2 (<.001)
9th	168 (1.2)	447 (3.1)	669 (4.6)	1067 (7.4)	1557 (10.8)	1839 (12.8)	8666 (60.13)	
11th	81 (0.8)	339 (3.4)	346 (3.5)	972 (9.9)	1740 (17.6)	960 (9.7)	5435 (55.1)	
<i>Female</i>								247.7 (<.001)
9th	67 (0.4)	423 (2.6)	771 (4.8)	400 (2.5)	223 (1.4)	1611 (9.9)	12706 (78.4)	
11th	52 (0.5)	488 (4.7)	476 (4.6)	452 (4.4)	292 (2.8)	911 (8.8)	7646 (74.11)	

**PEDIATRIC RESEARCH, EDUCATION AND SCHOLARSHIP SYMPOSIUM (PRESS)**  
**April 17, 2015**

**ABSTRACT [10]**

Name: Beth Jarrett  
Status: Medical Student

Division: General Pediatrics and Adolescent Health  
Research Sponsor: Iris Borowsky

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**The Relationship Between Adolescent Self-perception of Weight, Mental Health,  
and Social Protective Factors**

ES Jarrett, AL Gower, IW Borowsky

**Introduction:**

With increasing importance placed on weight and body shape in our culture, body image and weight worries may negatively shape the emotional well-being of adolescents. However, researchers disagree as to how weight status, weight perception, and mental health relate. The purpose of this study was to examine mental distress and social protective factors in youth of varying weight and weight perceptions.

**Methods:**

We used 2013 Minnesota Student Survey data from 122,180 8th, 9th, and 11th grade students. Using self-reported information, adolescents were classified based on weight perception (overweight, not overweight) and weight status (not overweight, overweight, obese). Weight status was based on BMI (kg/m<sup>2</sup>) percentiles from age-and-sex-specific CDC growth charts.

Internal mental distress was measured using a validated screener assessing somatic, depressive, and anxiety symptoms; traumatic distress; and homicidal or suicidal thought in the past year. Protective factors examined were parent, school, and friend connectedness; social competency; and positive identity.

**Results:**

Girls in all weight status groups were more likely than boys to perceive themselves as overweight. For each weight status, significantly more adolescents who perceived themselves as overweight reported high internal mental distress and lower mean levels of protective factors as compared to adolescents who did not perceive themselves as overweight.

Adolescents with the highest frequency of high internal mental distress were those who perceived themselves to be overweight but were not overweight (54.2% of girls, 33.7% of boys).

**Conclusion:**

Perceiving oneself as overweight in adolescence is a risk factor for internal mental distress and decreased social protective factors and thus has significant implications for adolescent health and well-being. Healthcare providers in primary care and weight counseling should assess both weight perception and weight status.

**PEDIATRIC RESEARCH, EDUCATION AND SCHOLARSHIP SYMPOSIUM (PRESS)**  
**April 17, 2015**

**ABSTRACT [11]**

Name: Katherine Klipfel  
Status: Psychology Intern

Division: Pediatric GME  
Research Sponsor: Margaret Semrud-Clikeman

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**Microstructural, Functional-Connectivity, and Neurocognitive Disruption in Pediatric Traumatic Brain Injury: A DTI and Resting-State fMRI Study**

Klipfel, K. M., Mueller, B.A., Krach, L.A., Lim, K.O., & Wozniak, J.R.

**Objective**

We investigated corpus callosum (CC) microstructure and inter-hemispheric connectivity, and associated neurocognitive deficits, in children with recent traumatic brain injury.

**Participants and Methods**

Fifteen children (ages 10-18) with mild, moderate, or severe TBI within 6-18 months were studied along with 15 non-injured controls. Participants completed a neurocognitive battery examining processing speed (WISC-IV/WAIS-IV PSI) and motor skills (grooved pegboard). MRI data included resting-state fMRI and DTI. White matter microstructure was evaluated by examining fractional anisotropy (FA) and mean diffusivity (MD) in the anterior and posterior CC. Inter-hemispheric functional connectivity was derived from a 6-minute resting-state fMRI. Analyses focused on participants falling beyond 1.5 standard deviations (SD) from the control mean on FA, MD, and inter-hemispheric connectivity.

**Results**

MANOVAs showed low FA in anterior (not posterior) CC in TBI as compared to controls (Cohen's  $d=.75$ ). High MD was seen in both CC regions in TBI (Cohen's  $d=.87$  &  $.89$ ). Inter-hemispheric connectivity was disrupted in cortical regions sub-served by anterior (not posterior) CC in TBI (Cohen's  $d=.78$ ). Pearson correlations ( $.40-.73$ ) showed association between white matter microstructural integrity and inter-hemispheric functional connectivity.

Among the TBI group, those with abnormalities  $>1.5$  SD on FA and MD showed motor deficits (not processing speed) relative to those with more normative FA and MD. Similarly, outliers on the functional connectivity measures also showed motor deficits.

**Conclusions**

Research MRI methods (DTI and resting-state functional connectivity) reveal subtle abnormalities in children with TBI, and these abnormalities are associated with practical neurocognitive deficits, especially in the motor domain.

**PEDIATRIC RESEARCH, EDUCATION AND SCHOLARSHIP SYMPOSIUM (PRESS)**  
**April 17, 2015**

**ABSTRACT [12]**

Name: Jarrod Tembreull  
Status: Medical Student

Division: Pediatric Cardiology  
Research Sponsor: Parvin Dorostkar

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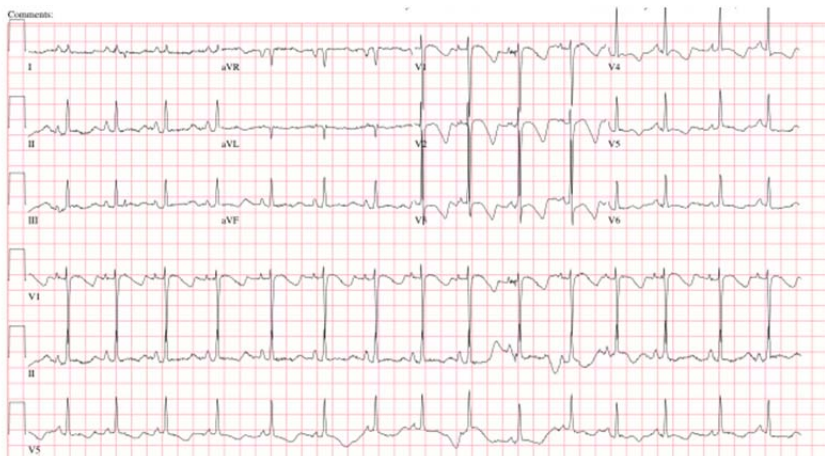
**Ondansetron Promotes Expression of Sudden Cardiac Arrest in a Child With Long QT Syndrome**

Tembreull, J. and Parvin Dorostkar  
Division of Pediatric Cardiology

**Introduction:** Ondansetron use for control of gastrointestinal symptoms in the pediatric population has drastically increased in the last decade (Ann Emerg Med. 2014). Prolongation of the QT interval is a well-known side effect of ondansetron therapy. Expression of Torsades de Pointes in association with ondansetron induced prolongation of the QTc has previously not been reported in a pediatric patients with the clinical LQT syndrome.

**Case Report:** An 8 year old boy had a history of neonatal intermittent complete atrioventricular block and underwent dual chamber epicardial pacemaker implantation for a clinical diagnosis of long QT syndrome in the neonatal period. He presented to the hospital after cardiac arrest with pulseless electrical alternans eight years later, while being treated with ondansetron for gastroenteritis associated vomiting. His most recent ECG prior to the arrest in April 2014 showed a QTc of 520 msec and abnormal T waves throughout the precordial leads while being atrially paced. Emergency Medical Services had arrived within five minutes of the witnessed cardiac arrest and he was resuscitated with continued CPR, intubation and multiple rounds of resuscitative medications and fluids, after which he was admitted to the ICU for further resuscitation with GCS of 3. A 12 lead ECG revealed ventricular pacing and capture at 90 beats/minute. Despite maximal resuscitative efforts, the patient was pronounced dead due to anoxic brain injury leading to brain death one day later.

**Discussion:** To the best of our knowledge this is the first case report of a cardiac arrest and death in a child with LQT syndrome in association with ondansetron therapy. We recommend that providers should maintain a high level of suspicion and respect for QTc prolonging medications, such as ondansetron, given the associated risk of Torsades de Pointes and sudden death.



**Figure 1.** Patient's EKG from April 2014

**PEDIATRIC RESEARCH, EDUCATION AND SCHOLARSHIP SYMPOSIUM (PRESS)**  
**April 17, 2015**

**ABSTRACT [13]**

Name: Caitlyn Wright

Division: General Pediatrics and Adolescent Health

Status: Pre-doctoral LEAH Fellow

Research Sponsor: Marla Eisenberg

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**Mental Health Outcomes Among Discordant High School Students**

Gay, lesbian, and bisexual adolescents are likely to experience poorer mental health outcomes than their straight counterparts. However, little research has been conducted regarding mental health outcomes between concordant and discordant adolescents. We used data from the Minnesota Student Survey to compare demographic characteristics and mental health outcomes among 7,812 sexually active high school youth whose sexual orientation and behaviors were concordant with those whose sexual orientation and behaviors were discordant. Chi-square tests of association were used to measure the distribution of discordance/concordance by sex, race/ethnicity, and grade level, and to determine the association between discordance and three mental health outcomes: self harm, suicidal ideation, and suicide attempt. Logistic regression was used to determine odds ratios between discordance/concordance and the three measures of mental health. Statistically significant differences were found in all demographic characteristics across concordant/discordant sexual orientation groups. African American, American Indian, and Hispanic youth identified as straight with same-sex behaviors (i.e. discordant heterosexuals) more frequently than White, multiracial, and Asian youth. Similarly, males, and 9th graders, identified as straight with same-sex behaviors more frequently than females, and 11th graders. Discordance is positively associated with self-harming behavior, suicidal ideation and suicide attempts for females, and with self-harm for males. These associations persist upon adjustment for race/ethnicity, but become non-significant when further adjusting for grade level, with the exception of suicide attempts among discordant females. Discordant females remained almost twice as likely to attempt suicide than concordant females.

	SELF HARM			SUICIDAL IDEATION			SUICIDE ATTEMPT		
	Model1	Model2	Model3	Model1	Model2	Model3	Model1	Model2	Model3
MALES									
Discordance	<b>1.28</b> <b>(1.06-1.55)</b>	<b>1.26</b> <b>(1.04-1.52)</b>	1.19 (.98-1.45)	.84 (.7-1)	.86 (.71-1.03)	.83 (.7-1)	1.18 (.93-1.51)	1.19 (.93-1.51)	1.16 (.91-1.49)
FEMALES									
Discordance	<b>1.36</b> <b>(1.05-1.76)</b>	<b>1.35</b> <b>(1.04-1.75)</b>	1.22 (.93-1.59)	<b>1.39</b> <b>(1.08-1.78)</b>	<b>1.34</b> <b>(1.04-1.72)</b>	1.24 (.96-1.6)	<b>2.02</b> <b>(1.53-2.67)</b>	<b>1.91</b> <b>(1.44-2.53)</b>	<b>1.78</b> <b>(1.34-2.37)</b>

**PEDIATRIC RESEARCH, EDUCATION AND SCHOLARSHIP SYMPOSIUM (PRESS)**  
**April 17, 2015**

**ABSTRACT [14]**

Name: Rheanne Zimmerman  
 Status: Medical Student

Division: Pediatric Epidemiology & Clinical Research  
 Research Sponsor: Logan Spector

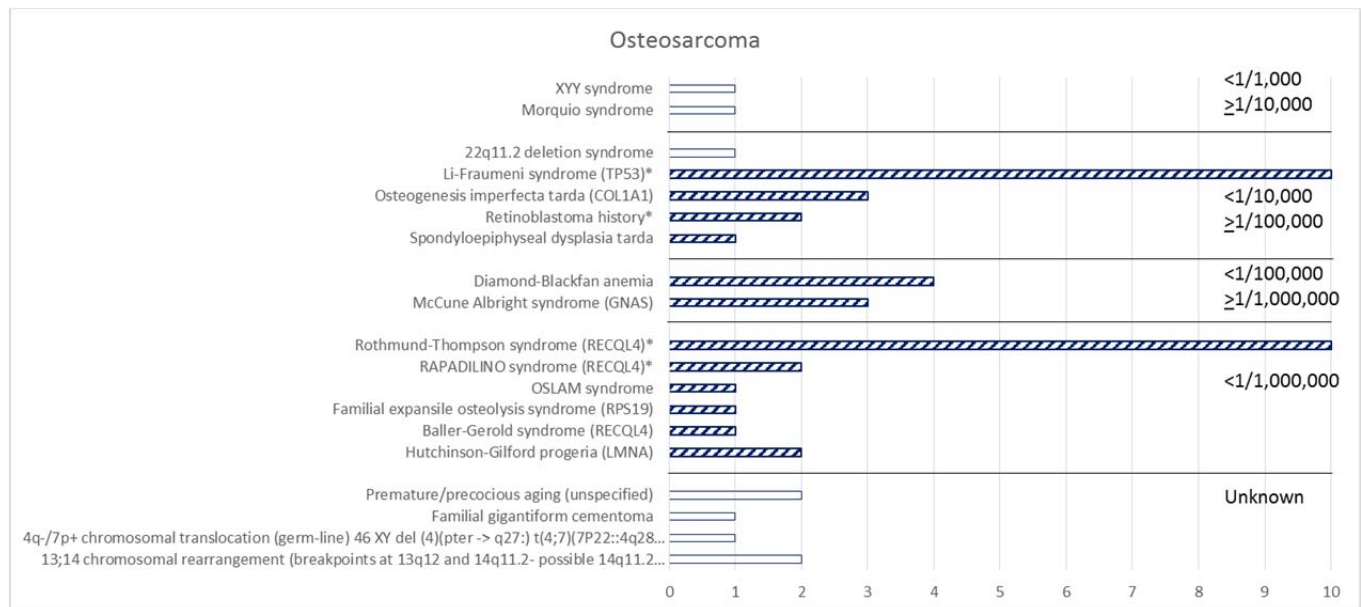
**Genetic Syndromes in Childhood Cancer**

**Background:** Genetic syndromes and pediatric cancers are each rare, so instances of co-occurrence raise the question of whether the two conditions may be etiologically linked. Clear examples of causal association can be found in the cancer pre-disposition syndromes, in which a known germline gene mutation causes a predisposition to certain types of tumors.

**Procedure:** This report contains the results of a systematic literature search using Ovid Medline for co-occurrence of genetic syndromes with 23 types of pediatric cancer.

**Results:** The results reflect known associations as well as many reports of co-occurrence that have been observed infrequently.

**Conclusion:** This compilation of reports of co-occurrence of genetic syndromes and childhood cancers may suggest previously overlooked patterns, and the information could be used to identify gene pathways critical in the development of childhood cancers.



**Key:** The bar graph shows the number of cases of co-occurrence reported for each syndrome. Count was stopped after ten, as this report aimed to identify less common instances. There is a separate graph for each of the 23 tumor types included in this study.

The numbers on the right indicate the population prevalence of the syndrome.

An asterisk\* indicates that the tumor and syndrome were reported to be associated by *Principles and Practice of Pediatric Oncology* by Pizzo and Poplack.

Dashed filling in the bar indicates that the syndrome is thought to be due to a single gene mutation. The most common gene responsible, if known, is in parentheses after the syndrome name.

Unfilled bars indicate that the syndrome is thought to be caused by larger chromosomal abnormalities.

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PEDIATRIC  
RESIDENTS

*(Abstracts 15-22)*



**PEDIATRIC RESEARCH, EDUCATION AND SCHOLARSHIP SYMPOSIUM (PRESS)**  
**April 17, 2015**

**ABSTRACT [15]**

Name: Tori Bahr  
Status: Med-Peds Intern

Division: Pediatric GME  
Research Sponsor: Weston Miller and David Nascene

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**Incidence, Clinical and Radiographic Characteristics of Intracranial Hypertension in Children with Osteopetrosis Undergoing Hematopoietic Stem Cell Transplantation**

**Purpose:**

Osteopetrosis (OP) is a rare, life-threatening disease caused by abnormal osteoclast function. Intracranial hypertension (IH) has been described in OP, but few case reports exist in the literature. We report the incidence, clinical and radiographic characteristics of IH in thirty-two OP patients treated with HSCT at our center from 1978-2013.

**Results:**

Ten patients (32%) developed IH at a median age of 11 months. Onset was post-transplant in 3 patients and pre-transplant in 7. Signs and symptoms included headache, irritability, somnolence, bulging fontanel, proptosis, and sudden vision changes.

For patients with IH, the median age of OP diagnosis was 3 months (range, 0-176 months). Six patients had evidence of IH at initial presentation and neurologic deficits including hearing loss (3), facial nerve palsy (1), nystagmus (6) and optic nerve atrophy (9).

Imaging prior to intervention for IH was available for 5 patients at a median age of 12 months. Four (80%) demonstrated subdural hemorrhage. Three (60%) demonstrated posterior globe concavity. Maximal venous engorgement was in the posterior superior sagittal sinus for three patients and in the transverse sinus for two.

Interventions for IH occurred in nine patients, including shunting (8), serial LP (2), optic nerve decompression (2), and acetazolamide (1).

Transplant occurred at a median age of 12 months. Eight patients experienced respiratory failure and three demonstrated pulmonary hypertension. Five patients died from transplant-related complications and two from disease progression. Three patients survive, an average of 5 years post-transplant.

**Conclusions:**

IH appears common in children with osteopetrosis who present for and undergo HSCT. Ongoing analysis aims to further identify clinico-radiographic features and outcomes following intervention for IH in OP. Ultimately, we hope such analysis will inform rational intervention for this patient population.

**PEDIATRIC RESEARCH, EDUCATION AND SCHOLARSHIP SYMPOSIUM (PRESS)**  
**April 17, 2015**

**ABSTRACT [16]**

Name: Jennifer Berger  
Status: Resident

Division: Pediatric GME  
Research Sponsor: Michael Pitt

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**Compliance of Advertisements for Children in Leading Parenting Magazines With American Academy of Pediatrics Recommendations Over Five Years**

Jennifer N. Berger DO, University of Minnesota, Minneapolis, Minnesota, Karen Sheehan MD, Ann & Robert H Lurie Children's Hospital of Chicago, Chicago, Illinois, Michael B. Pitt MD, University of Minnesota, Minneapolis, Minnesota

**BACKGROUND:** Frequent exposure to health-related messages in advertisements can impact an individual's health decisions. The American Academy of Pediatrics (AAP) issues consensus statements on many issues facing children, several of which speak against products or actions often advertised in the media (i.e. infant walkers, unsafe sleep practices).

**OBJECTIVE:** Determine the frequency of advertisements for children's products which violate AAP recommendations in the top two parenting magazines, and compare these offenses over 5 years.

**METHODS:** All advertisements from the top two parenting magazines based on circulation were reviewed for 2009 and 2014. Ads for products intended for use by children were included. Any ad with images or products which went against an AAP recommendation was deemed a violation, and was categorized according to the statement it violated. Violation totals and types for each year were compared using Fischer's exact tests.

**RESULTS:** 3,218 advertisements were reviewed (1,845 in 2009; 1,373 in 2014) of which 2,047 (63.6%) were for products for children. Of these, 337 (16.5%) contained one or more violations of AAP recommendations. Recommendation violation categories ranked by percent share of violations from most to least: non-FDA approved medical treatments, choking hazards, vitamins/supplements, cold medicine, infant formula, nutrition, oral care, screen time, sleep safety, fall risk, unsafe toys, and water safety. There was no significant difference in the total percentage of violations between 2009 and 2014 (215 [17.7%] vs. 122 [14.6%];  $p=0.069$ ), however several violation categories showed significant ( $P<0.05$ ) decreases over the five years including nutrition, oral care, screen time, and sleep safety.

**CONCLUSIONS:** Nearly 1 in 6 advertisements for children's products in the top two parenting magazines contain images or products which violate AAP recommendations. Despite a difference in the share of several violation types, there was no significant change in the total number of violations over the 5 years.

**PEDIATRIC RESEARCH, EDUCATION AND SCHOLARSHIP SYMPOSIUM (PRESS)**  
**April 17, 2015**

**ABSTRACT [17]**

Name: Ellen Christiansen, Dania Dia, Ruth Friedrichsdorf,  
Nathaniel Meuser-Herr, Pallavi Kamra, Ebony Richards  
Status: Resident

Division: Pediatric GME

Research Sponsor: Sonja Colianni

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**School Readiness Starts Early: Improved Screening and Referral Rates for Developmental Delay at the 18 Month Well Child Visit**

Ellen Christiansen, MD, Dania Dia, MD, Ruth Friedrichsdorf, MD, Nathaniel Meuser-Herr, MD, Pallavi Kamra, MD, and Ebony Richards, MD

**Background:** The American Academy of Pediatrics recommends early, routine developmental screening. The pediatric clinic at Hennepin County Medical Center did not have a standardized approach to developmental screening at well child checks (WCC); thus we suspected rates of screening and subsequent referral to early intervention services could be improved.

**Objective:** To increase the rate of screening for developmental delays and appropriate referral to early intervention services at the 18 month WCC through a quality improvement intervention which standardized the process for all clinic providers.

**Design/Methods:** At the 18 month visit, we incorporated online versions of the PEDS: Developmental Milestones (PEDS: DM) and The Modified Checklist for Autism in Toddlers (M-CHAT) screening tools within our electronic medical record visit template. We also simplified the computerized referral process to early intervention. We trained clinic providers in these changes. We reviewed consecutive charts from before and after the interventions and performed a provider satisfaction survey.

**Results:** Charts of 99 toddlers pre-intervention and 100 post-intervention were reviewed. There were significant increases in screening with the PEDS:DM from 2% to 39% (z-score -6.33, p-value <0.05) and the MCHAT from 4% to 57% (z-score -7.93, p-value <0.05). Also, early intervention referrals increased from 1% to 9% (z-score -2.42, p-value <0.05). 65% of providers reported self-rated improvement in screening and referral and satisfaction with the intervention.

**Conclusions:** After our quality improvement intervention at the 18 month WCC, there were significant increases in screening and referral rates for developmental delay at our urban primary care clinic. Early detection and referral are crucial to improve long-term outcomes such as school-readiness.

**PEDIATRIC RESEARCH, EDUCATION AND SCHOLARSHIP SYMPOSIUM (PRESS)**  
**April 17, 2015**

**ABSTRACT [18]**

Name: Pallavi Kamra  
Status: Resident

Division: Pediatric GME  
Research Sponsor: Rahul Kaila and Jeff Louie

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**An Unusual Case of Suspected Head Injury**

Pallavi Kamra, MBBS. Rahul Kaila, MD. Jeff Louie, MD

A previously healthy 2 year old female presented to the Emergency Department with lethargy and recurrent episodes of non bilious non projectile emesis after sustaining a fall while playing at the recreation center.

On exam, she was drowsy though easily arousable with GCS of 15. Her abdominal exam revealed a left quadrant mass. Initial labs were remarkable for a low hemoglobin. In the setting of trauma, given the low hemoglobin and abdominal mass there was a concern for splenic injury and hemorrhage. A CT of the abdomen and pelvis revealed a large mass arising from the left kidney suggestive of Wilms tumor.

Wilms tumor is the most common primary renal malignancy in children and constitutes about 5% of all Pediatric cancers. It is typically described as an asymptomatic abdominal mass noted by a caregiver, however may have vague and atypical presentations. Pediatric ER physicians are often the first point of medical contact for children with malignancy and play an important role in early diagnosis of pediatric cancers.

**PEDIATRIC RESEARCH, EDUCATION AND SCHOLARSHIP SYMPOSIUM (PRESS)**  
**April 17, 2015**

**ABSTRACT [19]**

Name: Elizabeth Mann  
Status: Resident

Division: Pediatric GME  
Research Sponsor: Brad Miller and Brandon Nathan

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**Educating Diabetes Camp Counselors: Identifying the Gap Between Perceptions and Knowledge – A Quality Improvement Project**

Elizabeth A Mann, MD<sup>1</sup>, Gregory P Forlenza, MD<sup>2</sup>, Anne Kogler, RN, CDA<sup>2</sup>,  
Bradley S Miller, MD, PhD<sup>2</sup> and Brandon Nathan, MD<sup>2</sup>

<sup>1</sup>Department of Pediatrics, University of Minnesota, Minneapolis, Minnesota, United States and

<sup>2</sup>Division of Pediatric Endocrinology, University of Minnesota, Minneapolis, Minnesota, United States.

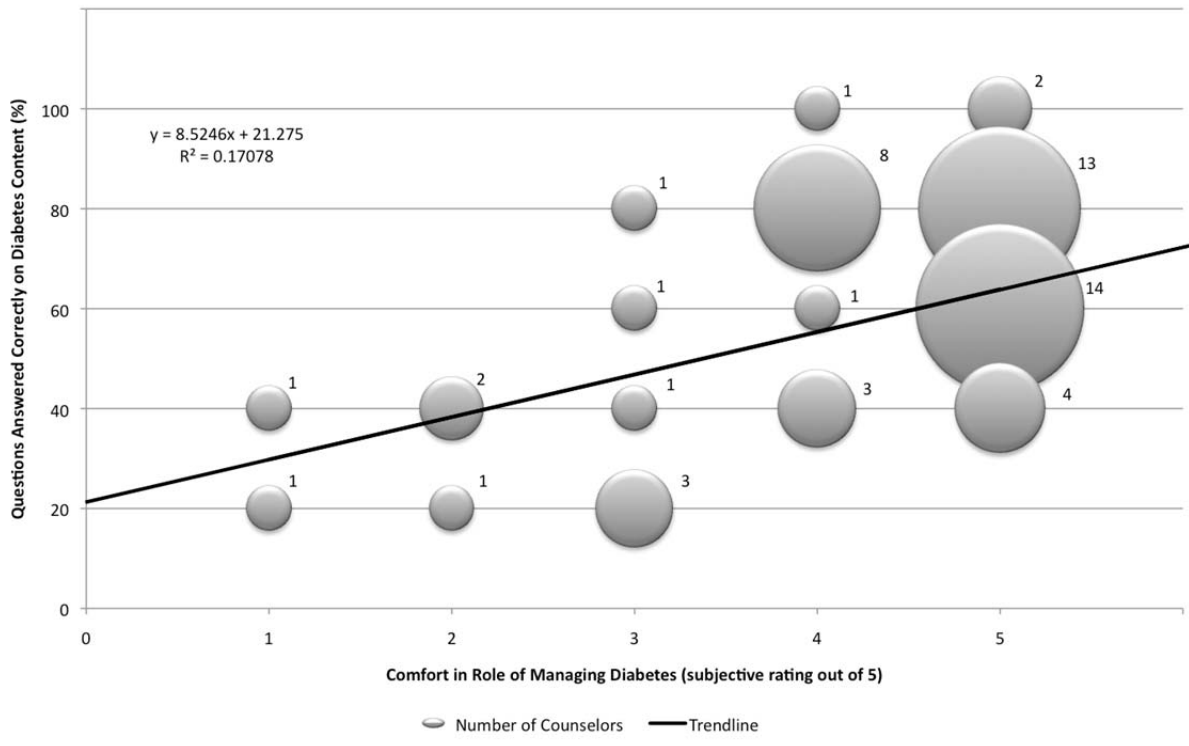
**Background:** Diabetes camps provide children with diabetes the opportunity to attend summer camp while learning to manage and take responsibility for their disease. Counselors serve as primary camper role models, teaching diabetes self-management while ensuring camper safety. We sought to delineate counselor knowledge about diabetes management before and after education and compare this with subjective comfort level in their role managing diabetes.

**Methods:** Through a written module and an interactive presentation, counselors from the American Diabetes Association (ADA) Camp Needlepoint were educated in topics recommended by the ADA that suited their level of management responsibility at camp. Evaluations before and after education assessed: 1) diabetes management knowledge and 2) comfort level managing camp care diabetes. The evaluation covered hypo- and hyperglycemia, recognizing symptoms of diabetic ketoacidosis, insulin dose calculation, insulin pump dysfunction, and addressing accidental insulin overdose.

**Results:** Pre-education evaluations were completed by 57 counselors (mean score=63%). Only three (5%) answered every question correctly. 33 counselors (58%) reported pre-education comfort managing diabetes 5 out of 5. Of these, two (6%) answered every question correctly. 5 counselors (9%) ranked their comfort less than 3 (mean score=32%). 51 counselors completed post-education evaluations (mean score=76%), with a small but statistically significant increase in score based on t-test analysis ( $p<0.001$ ). Of these, 31 counselors (61%) reported 5 out of 5 comfort and of these, 9 (29%) answered every question correctly. Average counselor-reported comfort level managing diabetes increased 6% from 4.2 to 4.5 out of 5 ( $p=0.827$ ). When asked how useful the orientation was in helping counselors feel more comfortable in their role managing diabetes, the average score was 4.24 out of 5.

**Conclusions:** There exists a significant gap between how comfortable counselors feel managing diabetes and their diabetes management knowledge. This highlights the importance of effective counselor education prior to each camp session.

**Figure 1. Counselor Knowledge vs. Comfort Pre-Test Analysis**



**PEDIATRIC RESEARCH, EDUCATION AND SCHOLARSHIP SYMPOSIUM (PRESS)**  
**April 17, 2015**

**ABSTRACT [20]**

Name: Elizabeth Mann  
Status: Resident

Division: Pediatric GME  
Research Sponsor: Michael Pitt and Shane McAllister

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**Disseminated Neonatal HSV from a Bite Wound**

Elizabeth Mann, MD<sup>1</sup>, Michael Pitt, MD<sup>2</sup>, & Shane McAllister, MD, PhD<sup>3\*</sup>

<sup>1</sup> University of Minnesota Medical School, Pediatrics Residency Program

<sup>2</sup> University of Minnesota Medical School, Division of Pediatric Hospitalist Medicine

<sup>3</sup> University of Minnesota Medical School, Division of Pediatric Infectious Diseases and Immunology

**Case:** A three week-old male infant was admitted to the hospital for evaluation and management of an infected human bite wound on his forehead concerning for herpes simplex virus (HSV) infection. He initially presented to his pediatrician four days prior to admission for evaluation of a right forehead wound sustained three days before from a bite by his 18 month-old cousin. Over the subsequent days, the wound progressed to partially coalesced vesicles with surrounding erythema (Figure 1a) despite appropriate antibacterial management for cellulitis. Concern was raised for primary HSV infection when the caregiver reported that the infant's cousin had similar lesions on his mouth at the time of the bite. The infant appeared well other than the concerning skin lesions, but was admitted to the hospital for evaluation and management of possible HSV infection. The infant was started on intravenous acyclovir while confirmatory testing was pending. Laboratory evaluation ultimately revealed disseminated HSV-1 infection without CNS involvement. The lesions became fully encrusted (Figure 1b) after three days of acyclovir. Transaminases trended upward, reaching peak values on hospital day four and resolving by hospital day six with normal synthetic liver function throughout. He was treated with intravenous acyclovir for a total of three weeks followed by oral valacyclovir to complete 6 months of total therapy. He was seen 2 weeks after completing therapy and had no apparent sequelae but was subsequently lost to follow up.

**Discussion:** Disseminated neonatal HSV can have devastating consequences, with mortality rates as high as 30% and neurological sequelae in 20% of survivors. Neonatal HSV is most often transmitted directly, from mother to infant, via infected vaginal secretions during childbirth. Only 10% of cases are transmitted postpartum. To our knowledge, this is the first report of primary disseminated HSV infection in a neonate resulting from a human bite.

A



B



**PEDIATRIC RESEARCH, EDUCATION AND SCHOLARSHIP SYMPOSIUM (PRESS)**

**April 17, 2015**

**ABSTRACT [21]**

Name: Nick Ryan

Status: Resident

Division: Pediatric GME

Research Sponsor: Andrew Olson

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**Group A Streptococcal Pharyngitis: Uncommon Adverse Effects of Common Treatments**

Streptococcal pharyngitis is a common illness in pediatric patients and represents up to 15-30% of all cases of pediatric pharyngitis (Choba, 2009). In the setting of a positive rapid antigen test, treatment is simple with multiple well validated options. However, even common and seemingly innocuous treatments can have significant consequences.

We describe an 8 year old female who presented with two weeks of left thigh pain and 3-4 days of left knee pain following penicillin G injection into her left quadriceps muscle for treatment of rapid antigen confirmed group A streptococcal pharyngitis. On examination she had marked tenderness to her left medial thigh and a left knee effusion with limited range of motion. Laboratory evaluation revealed normal CRP and WBC count, and moderately elevated ESR and CK. MRI of the leg showed diffuse inflammatory-like signal of the distal quadriceps muscles and two peripherally enhancing collections concerning for myonecrosis. In addition, the knee capsule showed a moderate effusion and synovial enhancement with possible communication with myonecrosis pocket, concerning for septic joint. Arthrocentesis revealed hemarthrosis with no bacterial growth on culture. The patient recovered with splinting and physical therapy. This case represents a rare but serious complication of a relatively treatment of a common pediatric illness.



**PEDIATRIC RESEARCH, EDUCATION AND SCHOLARSHIP SYMPOSIUM (PRESS)**  
**April 17, 2015**

**ABSTRACT [22]**

Name: Matthew Yocum  
Status: Resident

Division: Pediatric GME  
Research Sponsor: Parvin Dorostkar

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**Transseptal Puncture in a Patient with L-Transposition of the Great Arteries**

Matthew Yocum MD, Henri Roukoz, MD, Parvin Dorostkar MD

**Background:** L-Transposition of the great arteries (L-TGA) is a rare form of congenital heart disease that is associated with Ebstein's anomaly of the left sided atrioventricular valve, pulmonary stenosis, ventricular septal defect and atrioventricular conduction abnormalities. Improved surgical outcomes support expression of late postoperative atrial tachyarrhythmias. Such arrhythmias are amenable to electrophysiology studies with ablation of the substrate, but are hampered by the unique atrial anatomy associated with L-TGA.

The **purpose** of this work is to describe unique features of the atrial septum in L-TGA and discuss how these may impact the transseptal procedure in patients with L-TGA.

**Methods:** A 33 year old female with L-TGA underwent electrophysiology study for postoperative atrial tachycardias associated with L-TGA. Pre-procedural studies included documentation of the tachycardia, an echocardiogram, CXR, and a CT angiogram. Position and rotation of the anatomy of the atrial septum in this patient were defined and the results of the CT angiogram were used to adjust camera position to maximize visualization of the atrial septum and the location of the fossa ovalis. The transseptal puncture was safely performed using landmarks identified by CT angiography in combination with fluoroscopy in the electrophysiology laboratory.

**Conclusions:** L-TGA is associated with unique atrial septal anatomy. A solid understanding of anatomy and supportive diagnostic studies can facilitate a safe transseptal puncture in patients with L-TGA.

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PEDIATRIC  
POST-DOCTORAL  
FELLOWS

*(Abstracts 23-29)*

**PEDIATRIC RESEARCH, EDUCATION AND SCHOLARSHIP SYMPOSIUM (PRESS)**  
**April 17, 2015**

**ABSTRACT [23]**

Name: Debanjana Chatterjee  
Status: Postdoctoral Fellow

Division: General Pediatrics and Adolescent Health  
Research Sponsor: Iris Borowsky

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**Experience of Abuse, Household Dysfunction, and Early Use of Alcohol and Marijuana  
Among Minnesota Youth: The Moderating Role of Internal Assets**

Debanjana Chatterjee, PhD, Amy Gower, PhD, Barbara McMorris, PhD, and  
Marla Eisenberg, PhD

**Background:** Adverse experiences early in the lifecourse are important risk factors for onset of alcohol and marijuana use among adolescents. This study identifies whether internal assets, a crucial developmental component among adolescents, moderates the association between experiences of abuse or household dysfunction and early use of alcohol and marijuana.

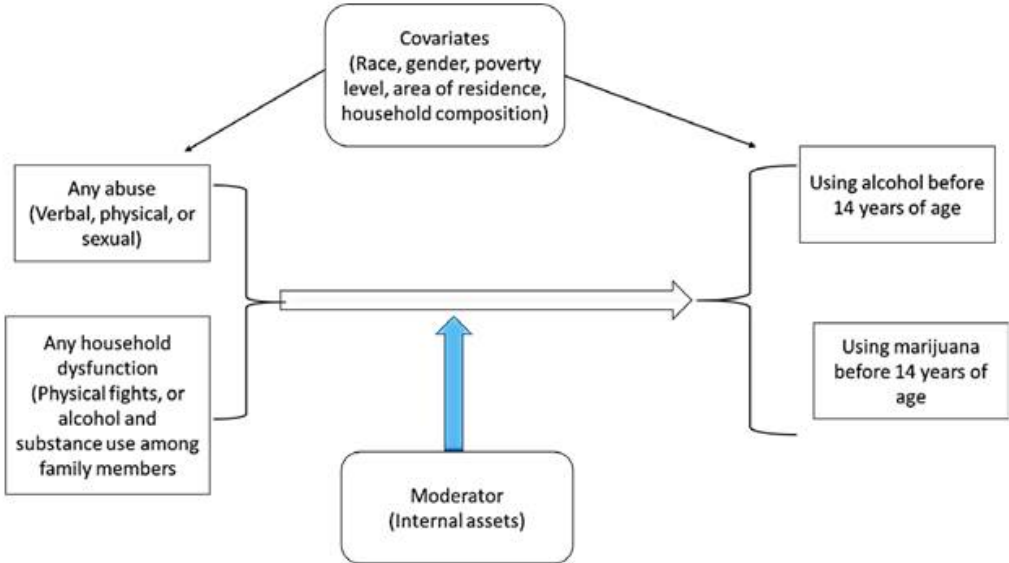
**Methods:** We used data from 9th and 11th graders who completed the 2013 Minnesota Student Survey (N=79,339). Multivariable logistic regression was used to investigate whether abuse including physical, verbal, and sexual; and household dysfunction including witnessing violence among adults, and alcohol and drug use among family members; were independently associated with early use of alcohol and marijuana (before 14 years). Additionally, we investigated whether internal assets, a composite score constructed from student response to fourteen developmental items, moderated these associations.

**Results:** Approximately 22% and 18% of the students reported experiencing any abuse or household dysfunction, respectively. Odds of early use of alcohol were 69% (AOR=1.69, CI=1.59, 1.79) and 61% (AOR=1.61, CI=1.52, 1.69) greater among those who had experienced abuse and household dysfunction, respectively, compared to those who did not. Similarly, odds of early use of marijuana were 47% (AOR=1.47, CI=1.23, 1.58) and 72% (AOR=1.72, CI=1.58, 1.86) greater with respective experience of abuse and household dysfunction than without similar experiences. Internal assets strongly modified the association between early marijuana use and household dysfunction (interaction P-value= <0.001) but not abuse. Specifically, household dysfunction was less likely to affect early use of marijuana among students with higher levels of internal assets compared to those with lower levels of internal assets.

**Conclusion:** Promoting developmental assets among adolescents may be protective against adversities like household dysfunction, but may not be against verbal, physical, and sexual abuse. Interventions need to be targeted at multiple levels including individual, home, and communities to promote adolescent health and development.

**Figure 1**

**Conceptual model**



**PEDIATRIC RESEARCH, EDUCATION AND SCHOLARSHIP SYMPOSIUM (PRESS)**  
**April 17, 2015**

**ABSTRACT [24]**

Name: Kyung-Dal Choi  
Status: Postdoctoral Associate

Division: Pediatric Hem-Onc and BMT  
Research Sponsor: Michael Kyba

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**Reprogramming of Somatic Cells Into Hematopoietic Progenitors**

<sup>1</sup>Kyung-Dal Choi, and <sup>1,2</sup> Michael Kyba

<sup>1</sup> Pediatric Hematology-Oncology and Blood and Marrow Transplantation Program, Dept. of Pediatrics, Medical School, <sup>2</sup>Lillehei Heart Institute, University of Minnesota

Direct reprogramming of somatic tissues has significant potential for de novo generation of isogenic hematopoietic stem cells (HSCs). In this study, we have discovered a method of reprogramming somatic cells directly to the blood lineage through the overexpression of hematopoietic stem cell-specific three transcription factors. We have generated a mouse with conditional (doxycycline-induced) coexpression of these 3 factors, and found that MEFs can be directly converted into hematopoietic colony-forming cells. In the presence of doxycycline, induced MEF (iMEF) generated erythroid-, myeloid-, and mixed-CFCs in hematopoietic cytokine containing methylcellulose media. Primary colonies can be replated, giving rise to secondary colonies, supporting the multipotent and clonogenic potential of iMEF-derived hematopoietic progenitors. In particular, hematopoietic colonies from reprogrammed iMEFs contain Lin-Sca-1<sup>+</sup>c-Kit<sup>+</sup>(LSK) and SLAMF<sup>+</sup>(CD150<sup>+</sup>CD48<sup>-</sup>) cells. These cells were enriched after additional culture on mouse OP9 stroma with cytokines. Surprisingly, when we transplanted iMEF-derived CD41<sup>bright</sup> cells directly to NSG-CD45.1 mice, we could observe engraftment with low efficiency and short-term in BM and spleen of the recipients. Although similar in surface phenotype and limited engraftment potentials, these cells are unlikely to be fully competent HSCs. Current work is focusing on testing additional transcription factors required to acquire long term (LT) in vivo repopulating properties of iSLG-MEFs.

**PEDIATRIC RESEARCH, EDUCATION AND SCHOLARSHIP SYMPOSIUM (PRESS)**  
**April 17, 2015**

**ABSTRACT [25]**

Name: Diego Garcia-Huidobro  
Status: Postdoctoral Fellow

Division: General Pediatrics and Adolescent Health  
Research Sponsor: Iris Borowsky

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**What Makes Parenting Interventions Effective at Reducing Substance Use?  
A Systematic Review**

Diego Garcia-Huidobro, Michele Allen, Dorothy Curran, Roma Patel, Iris Borowsky

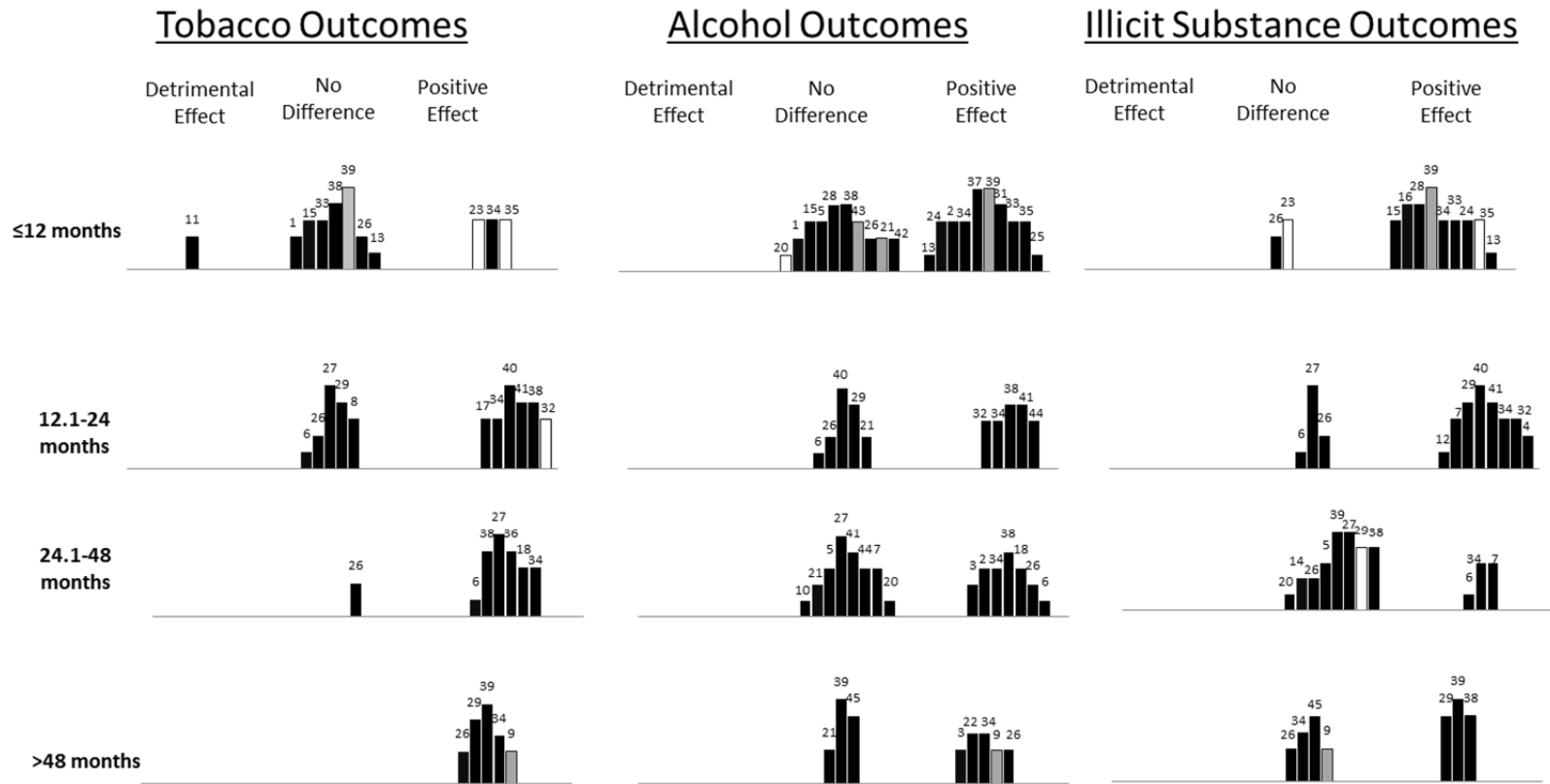
**BACKGROUND:** Interventions that strengthen parenting skills and parent-youth relations may prevent adolescent substance use. Parenting interventions vary in dosage, delivery settings, delivery methods, and targeted participants; thus, it is important to identify not only if parenting interventions work, but also the characteristics of effective interventions.

**OBJECTIVE:** To determine the effectiveness of parenting interventions at reducing adolescent smoking, alcohol, and illicit substance use and to identify the intervention dosages, settings, delivery format, and targeted participants associated with better results.

**METHODS:** PubMed, PsycINFO, ERIC, and CINAHL databases were searched by two independent reviewers to identify randomized controlled trials (RCTs) evaluating the effects of parenting interventions on adolescent substance use outcomes. Data was extracted by a single reviewer. Extraction accuracy was confirmed in 40% of the studies. Risk of bias was assessed using the Cochrane Risk of Bias Assessment Tool. Harvest plots were used to synthesize findings across outcomes.

**RESULTS:** 1,721 articles were screened, and 45 studies included. Most studies had high risk of bias. Figure 1 shows one series of harvest plots representing intervention effectiveness across outcomes by time of follow-up. Parenting interventions were most effective at reducing youth tobacco use. Effects on alcohol and illicit substance use were inconsistent. Across outcomes, most studies demonstrating intervention effectiveness evaluated interventions of 12 or fewer hours that were delivered in a group format and included both parents and youth. Effective interventions to prevent smoking were mostly conducted at schools, while effective interventions to reduce alcohol and illicit substance use were mostly delivered at participants' homes.

**CONCLUSIONS:** RCTs evaluating parenting interventions on youth outcomes must improve their reporting quality for stronger conclusions. Parenting interventions were most effective long-term at reducing youth smoking. Intervention characteristics associated with lower substance use are having a low dosage, group format, and involving parents and youth.



**Figure 1: Tobacco, alcohol and illicit substance use, initiation and intention outcomes according to length of participant follow-up**  
Column color: outcome reported; Black: substance use, Grey: substance use initiation, White: substance use intention  
Column height: risk of bias; taller columns represent studies with lower risk of bias  
Number: study ID

**PEDIATRIC RESEARCH, EDUCATION AND SCHOLARSHIP SYMPOSIUM (PRESS)**  
**April 17, 2015**

**ABSTRACT [26]**

Name: Kari Gloppen  
Status: Postdoctoral Fellow

Division: General Pediatrics and Adolescent Health  
Research Sponsor: Michael Resnick

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**School and Individual-Level Factors Related to Bullying and Suicidality Among  
American Indian Youth in Minnesota**

Kari Gloppen, Barb McMorris, Amy Gower, Marla Eisenberg

**Background:** Being involved in bullying as a victim or perpetrator is associated with depression and seriously considering or attempting suicide, and American Indian (AI) youth experience a disproportionately high rate of these mental health issues. The purpose of this study is to assess whether AI young people involved in bullying are more likely to experience negative mental health outcomes than those who were not involved in bullying, and how individual and school-level risk and protective factors potentially enhance or attenuate this relationship.

**Method:** Data for this study come from 5th, 8th, 9th, and 11th grade AI students who completed the 2013 Minnesota Student Survey (N= 2,443), a self-report measure of health, risk, and protection. Logistic regression was used to estimate associations between different forms of bullying involvement and mental health outcomes (depression and seriously considering or attempting suicide in the past year). Next, hierarchical linear modeling assessed how individual and school-level factors might protect bullying-involved youth from emotional distress.

**Results:** Logistic regressions indicated that involvement in bullying as a perpetrator, victim, or victim-perpetrator was associated with increased risk for mental health outcomes. Individual-level protective factors such as empowerment and positive identity reduced the likelihood of bullying involvement, and were also associated with less emotional distress. School-level factors such as overall perceptions of school being unsafe and rates of delinquency were positively associated with bullying involvement and with increased likelihood of depression and suicidal thoughts and behavior. Factors such as positive identity and positive relationships with teachers significantly reduced the likelihood of mental health outcomes among bullying-involved youth.

**Conclusions:** Findings suggest that promoting a positive school environment and social/emotional skills among American Indian students could help reduce bullying in schools and the mental health outcomes that can result from bullying.



**PEDIATRIC RESEARCH, EDUCATION AND SCHOLARSHIP SYMPOSIUM (PRESS)**  
**April 17, 2015**

**ABSTRACT [27]**

Name: Lyla Hampton  
Status: Postdoctoral Fellow

Division: Pediatric Neuropsychology  
Research Sponsor: Julie Eisengart

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**Hurler Syndrome Treated Exclusively with Enzyme Replacement Therapy: A Case Report of Somatic and Neurologic Sequelae**

Hampton, L.E.<sup>1</sup>, Shapiro, E.<sup>1</sup>, Delaney, K.<sup>1</sup>, Nestrasil, I.<sup>1</sup>, Ahmed, A.<sup>1</sup>, Kovac, V.<sup>2</sup>, Whitley, C.B.<sup>1</sup>, and Eisengart, J.B.<sup>1</sup>

<sup>1</sup>*Department of Pediatrics, University of Minnesota Medical School,* <sup>2</sup>*Washington University School of Medicine in St Louis*

**Background:** Mucopolysaccharidosis type I (MPSI) is a rare lysosomal storage disorder associated with deficiency in enzyme alpha L-iduronidase, leading to accumulation of glycosaminoglycans in nearly all organ systems. Standard of care for the attenuated form of MPSI is enzyme replacement therapy (ERT). However, because ERT is not believed to cross the blood-brain barrier, hematopoietic cell transplantation (HCT) is standard treatment for the severe form (MPSIH, Hurler syndrome), whose natural history involves rapid cognitive decline and mortality within the first decade of life. We present the unusual case of a patient with MPSIH treated exclusively with ERT, and examine whether her clinical outcomes differ from the untreated natural history of MPSIH or HCT outcomes.

**Patient and Methods:** A 14-year-old female diagnosed with MPSIH at 23 months received weekly intravenous ERT from age 27 months (HCT was declined). Her medical history and research data, including annual neuropsychological evaluations, from an investigation of the natural history of MPS disorders (NIH U54NS065768) were reviewed longitudinally.

**Results:** Urine glycosaminoglycan levels were elevated 3-fold the upper limit of normal at age 12. Neurologic course was stable until the development of cervical compression at age 8, and hydrocephalus at age 11. Cognitive functioning was in the average range until age 12, when verbal and nonverbal IQ declined (<-1.0 SD and <-2.0 SD). Medical course is significant over her lifespan for short stature, bilateral hearing loss, corneal clouding, joint pain and limitations, first degree AV block, and restrictive lung disease.

**Discussion:** This case suggests alteration in disease course from the untreated natural history of MPSIH as demonstrated by extended survival. Neurologic and somatic disease manifestations that are typically controlled by HCT emerged over time. Somatic disease manifestations seen regardless of HCT were also present. Future studies should re-examine findings in a broader sample.

**PEDIATRIC RESEARCH, EDUCATION AND SCHOLARSHIP SYMPOSIUM (PRESS)**  
**April 17, 2015**

**ABSTRACT [28]**

Name: Justin Ryder  
Status: Postdoctoral Fellow

Division: Epidemiology & Community Health  
Research Sponsor: Aaron Kelly

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**Impaired Cardiac Autonomic Nervous System Function is Associated with Hypertension and Higher Systolic Blood Pressure Independent of Adiposity in Children and Adolescents**

Justin R. Ryder, Ph.D.<sup>1,2</sup>, Michael O'Connell<sup>3</sup>, Tyler A. Bosch, Ph.D.<sup>4</sup>, Lisa Chow, M.D.<sup>4</sup>,  
Kyle D. Rudser, Ph.D.<sup>3</sup>, Donald R. Dengel, Ph.D.<sup>1,5</sup>, Claudia K. Fox, M.D., M.P.H.,<sup>1</sup>  
Julia Steinberger, M.D., M.S.,<sup>1</sup> Aaron S. Kelly, Ph.D.<sup>1,4</sup>

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**Abstract**

Impaired cardiac autonomic nervous system function and obesity are associated with higher systolic blood pressure (SBP) in adults and children. Whether sympathetic nervous system activity influences SBP independent of adiposity in youth has yet to be evaluated. We examined the association of heart rate variability (HRV) with hypertension status and SBP among children and adolescents (n = 188; 103 female; 6-18 years old) ranging from normal weight to severe obesity. Seated blood pressure was measured in triplicate using an automated cuff system. Pre-hypertension (SBP percentile  $\geq 90^{\text{th}}$  -  $< 95^{\text{th}}$ ) and hypertension (SBP percentile  $\geq 95^{\text{th}}$ ) were defined by age-, sex-, and height norms. HRV was measured using the SphygmoCor™ MM3 system and analyzed with different time- and frequency-domains which reflect various aspects of autonomic nervous system activity. Total body fat was measured via dual-energy X-ray absorptiometry. Logistic regression models demonstrated that lower values in all of the time-domain HRV measures and larger LF:HF ratio were significantly associated with higher odds of being pre-hypertensive / hypertensive independent of total body fat ( $p < 0.05$ ). In linear regression analysis, lower time-domain, but not frequency-domain, HRV measures were significantly associated with higher SBP independent of total body fat ( $p < 0.05$ ). These data suggest that impaired cardiac autonomic nervous system function, at rest, is associated with higher odds of being pre-hypertensive / hypertensive and higher SBP independent of adiposity in children and adolescents. Whether reductions in sympathetic modulation of cardiac function reduce blood pressure in obese youth independent of weight loss requires further investigation.

Table: Odds ratios for pre-hypertensive / hypertensive versus normotensive per unit difference in each HRV measure adjusted for tanner, race and total body fat.

	<b>Odds Ratio (95% CI)</b>	<b>P-value</b>
<b>Lower Mean R-R (per 50 ms)</b>	1.33 (1.13, 1.57)	<0.001
<b>Lower SDRR (per 10 ms)</b>	1.11 (1.00, 1.22)	0.045
<b>Lower Corrected SDRR (per 10ms)</b>	1.41 (1.11, 1.78)	0.004
<b>Lower RMSSD (per 10 ms)</b>	1.11 (1.02, 1.20)	0.011
<b>Lower NN50 (per 10 units)</b>	1.04 (0.98, 1.10)	0.160
<b>Lower pNN50 (per 10 units)</b>	1.21 (1.02, 1.44)	0.026
<b>Higher LF normalized (per 10 units)</b>	1.20 (0.99, 1.47)	0.070
<b>Higher HF normalized (per 10 units)</b>	0.83 (0.68, 1.01)	0.070
<b>Higher LF:HF ratio</b>	1.47 (1.09, 1.98)	0.011

Data were analyzed using logistic regression models with pre-hypertension / hypertension as the outcome, with adjustment made for tanner, race and total body fat. These models were not adjusted for age, sex, or height since systolic blood pressure percentiles are already adjusted for these variables.

**PEDIATRIC RESEARCH, EDUCATION AND SCHOLARSHIP SYMPOSIUM (PRESS)**  
**April 17, 2015**

**ABSTRACT [29]**

Name: Nathan Schuldt  
Status: Postdoctoral Fellow

Division: Pediatric Rheumatology  
Research Sponsor: Bryce Binstadt

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**The Role of Dual TCR T Cells in Immunity**

Dual TCR T cells arise due to incomplete allelic exclusion during TCR recombination. These cells have been hypothesized to expand the TCR repertoire by allowing typically unselected TCRs into the periphery, potentially including weakly reactive, alloreactive, or autoreactive TCRs. While efforts have been made to understand how dual TCR $\alpha$  T cells impact the TCR repertoire, little is known about dual TCR $\beta$  T cells. However, we recently demonstrated that dual TCR $\beta$  expression accelerated disease in a TCR transgenic model of autoimmune arthritis. To extend these studies we generated mice hemizygous for TCR $\alpha$ ,  $\beta$ , or both loci on the C57BL/6 background to test how dual TCR expression alters the T cell repertoire and impacts autoimmunity. We found that lack of secondary TCR $\alpha$  and/or TCR $\beta$  recombination reduced the efficiency of thymic selection. Bi-allelic TCR $\beta$  recombination was also important for maintaining normal  $\alpha\beta/\gamma\delta$  T cell proportions, as the  $\gamma\delta$  population was over-represented in TCR $\beta$ +/- mice. Sequencing the TCR $\beta$  chains of peripheral T cells revealed that the TCR repertoires of TCR $\alpha$ +/- $\beta$ +/- mice and wildtype mice were broadly similar with the exception of reduced usage of rare V $\beta$  genes in TCR $\alpha$ +/- $\beta$ +/- mice. Furthermore, for several foreign and self antigens, we observed no differences in the numbers of naive and expanded antigen-specific T cells between TCR $\alpha$ +/- $\beta$ +/- and wildtype mice. Finally, the absence of dual TCR T cells did not impact experimental autoimmune encephalomyelitis pathogenesis. We conclude that dual TCR expression increases the efficiency of thymic selection but is dispensable for immune responses to foreign and self antigens.

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PEDIATRIC  
FELLOWS

*(Abstracts 30-41)*

**PEDIATRIC RESEARCH, EDUCATION AND SCHOLARSHIP SYMPOSIUM (PRESS)**  
**April 17, 2015**

**ABSTRACT [30]**

Name: Mayada Abu Shanap  
Status: Fellow

Division: Pediatric BMT  
Research Sponsor: Michael Verneris

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**Defining Perfect Immune Reconstitution After Allogeneic Hematopoietic  
Stem Cell Transplantation (HSCT)**

**Introduction:**

HSCT is curative for patients with malignant and non-malignant conditions. However, GVHD, CMV reactivation and relapse cause considerable morbidity and mortality due to post-transplant immunodeficiency. We hypothesized that “perfect” immune reconstitution (IR) would occur in patients who lacked GVHD, CMV reactivation or relapse.

**Methods:**

We prospectively analyzed the (IR) of 417 patients with hematologic malignancies treated at UMN from (2005-2013). Patients were assigned to the “perfect” category if they lacked GVHD, CMV, or relapse (n=116). All other patients were considered “not-perfect” (n=301). Quantitative recovery of lymphocytes subsets were evaluated using flow cytometry at different time points post-HSCT.

**Results:**

At early time points (D30, 60 and 100), IR did not differ between the groups for most lymphocyte subsets. However, at later time points the “perfect” group showed higher mean absolute counts of B cells (6 months [p=0.001] and one year [p=0.025]), helper T cells (one year p=0.058), T regulatory (6 months [p=0.0023], and one year [p=0.054]). In contrast, the “non-perfect” group had higher numbers of: cytotoxic T cells (6 months [p=0.002] and one year [p=0.025]) and NK cells (6 months, p=0.024). The “perfect” group was then divided into two groups based on prior CMV exposure in the recipient. The IR in the “perfect CMV+” and “perfect CMV-“ groups were compared. Strikingly, the “perfect CMV+” patients showed robust recovery of B cells (day +60, p=0.05), cytotoxic T cells at day+60 [p=0.0073], 3 months [ p<0.0001], 6 months [p<0.0001], and one year [p<0.0001]), helper T cells (+60 p=0.03), and a unique NK cell subset staining for NKG2C+CD57+ (one year p=0.038).

**Conclusions:**

Difference in IR post-HSCT between “perfect” and “non-perfect groups” was present at later time points. Among the perfect group, prior CMV exposure had a profound impact on immune recovery.

**PEDIATRIC RESEARCH, EDUCATION AND SCHOLARSHIP SYMPOSIUM (PRESS)**  
**April 17, 2015**

**ABSTRACT [31]**

Name: Kristen Aggerbeck Kessler  
Status: Fellow

Division: Developmental-Behavioral Pediatrics  
Research Sponsor: Andrew Barnes

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**Parent Connectedness Promotes Resilience Among Homeless Youth**

**Introduction**

One in every 30 children in the U.S. experienced homelessness in 2013. Homelessness is associated with worse health and achievement outcomes. Internal assets, including social competency and positive self-identity, promote healthy development. This study aimed to examine the association between homelessness and internal assets and the moderating effect parent relationships have in promoting healthy development among homeless youth.

**Methods**

Data on 79,339 students in grades 9 and 11 were obtained from the 2013 Minnesota Student Survey. Multiple linear regression was used to investigate whether living in a shelter in the past 12 months affected internal assets, a composite score of developmental items, and whether levels of parent connectedness moderated this association.

**Results**

Among the respondents, 4 percent (N=3,627) reported living in a shelter in the last 12 months. Approximately 42 percent of these students reported high levels of parent connectedness. The internal assets score for the overall sample ranged from 1 to 4 (mean=3.0, S.D. =0.58). The mean score of internal assets was significantly lower among those who lived in a shelter (mean=2.64, S.D.=0.66) compared to those who did not (mean=2.99, S.D.=0.57). After adjusting for race, gender, grade, school location, free lunch and family structure, being in a shelter was associated with a reduction in internal assets by 0.28 units. This association was strongly modified by levels of parent connectedness (interaction P-value <0.001). For students with high parent connectedness, being in a shelter was associated with a 0.13 unit decline in internal assets compared to a decline of 0.24 units among students with low parent connectedness.

**Conclusions**

Living in a shelter can have a negative effect on healthy youth development. However, strong connection with a parent can reduce the risk by almost half. Parents play an influential role in promoting healthy development in youth who have experienced homelessness.

**PEDIATRIC RESEARCH, EDUCATION AND SCHOLARSHIP SYMPOSIUM (PRESS)**  
**April 17, 2015**

**ABSTRACT [32]**

Name: Jessie Barnum  
Status: Fellow

Division: Pediatric Hem-Onc and BMT  
Research Sponsor: Bruce Blazar

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**Akt Inhibition of Chimeric Antigen Receptor Modified T Cells Promotes  
a Stem Cell Memory Phenotype**

Jessie L. Barnum and Bruce R. Blazar

**Background:** Genetically engineered T cell therapies have evolved and improved over time, now achieving successful remission induction in patients with refractory hematologic malignancies. A 90% remission rate was recently reported in patients with refractory acute lymphoblastic leukemia who received autologous T cells transduced with a CD19-directed chimeric antigen receptor (CAR). The event free survival unfortunately waned to 67% at 6 months, which correlated with a decreased persistence of the CD19+ CAR T cells in the peripheral blood.

Recent research has explored methods to improve the efficacy of T cell therapies by manipulating T cell subsets. Akt is a serine/threonine protein kinase that is a key protein involved in the PI3K-Akt-mTOR pathway. Constitutive activity of Akt has been shown to induce terminal differentiation of T cells into effector T cells.

**Hypothesis:** Pharmacologic inhibition of the Akt pathway can inhibit the differentiation of retrovirally transduced T cells, leading to increased expression of stem cell memory ( $T_{scm}$ ) markers CCR7 and CD62L.

**Methods:** CD4+ and CD8+ T lymphocytes were isolated and purified from WT C57BL/6 mouse splenocytes. The purified T cells were activated with CD3/CD28 beads and stimulated with exogenous IL-2. Samples were then supplemented with exogenous IL2, IL7, IL15, and varying amounts of Akt inhibitor following transduction with a GFP containing retrovirus, or a mock transduction procedure.

**Results:**

Figure 1a: Expression of CCR7 and CD62L on day+12 of culture

Figure 1b and 1c: Transduction of GFP containing retrovirus on day +9 of culture

**Conclusion:** Here, we show that pharmacologic inhibition of Akt promotes a  $T_{scm}$  phenotype. Unexpectedly, the AKT inhibitor also improved the transduction efficiency in a dose-dependent manner. This may translate to enhanced persistence of engineered T lymphocytes following adoptive transfer. Future studies will aim to further elucidate the metabolic and functional properties of these cells.



Figure 1a

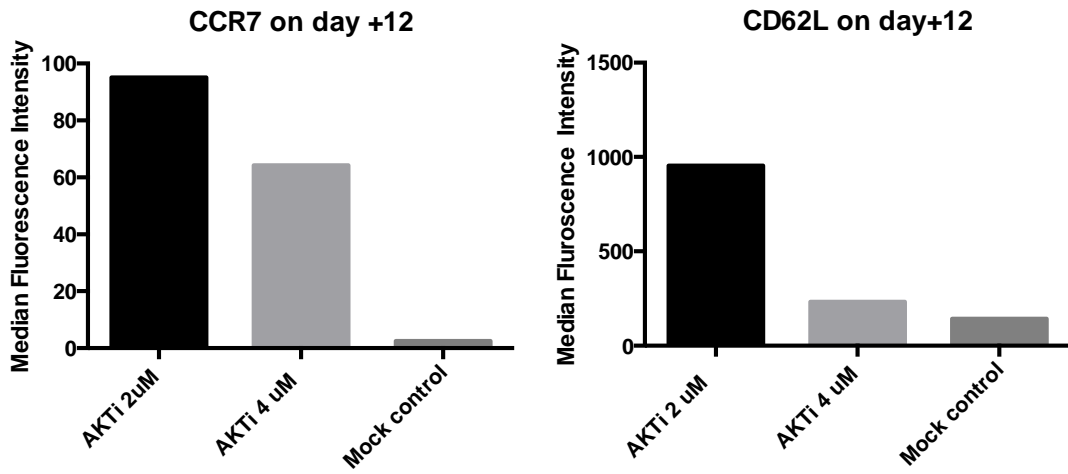


Figure 1b: GFP alone

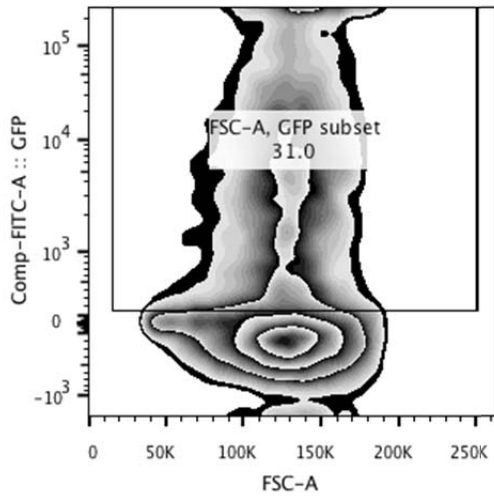


Figure 1c: GFP with 4 uM Akt inhibitor

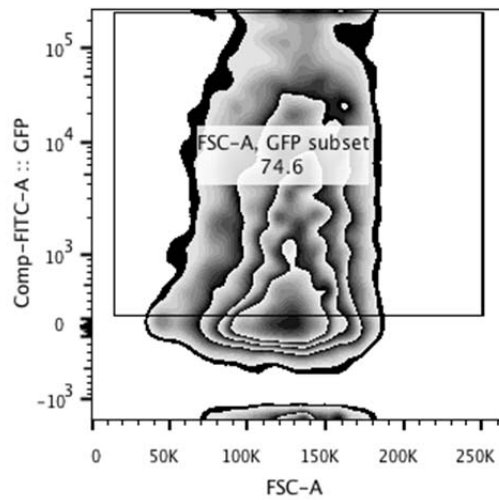
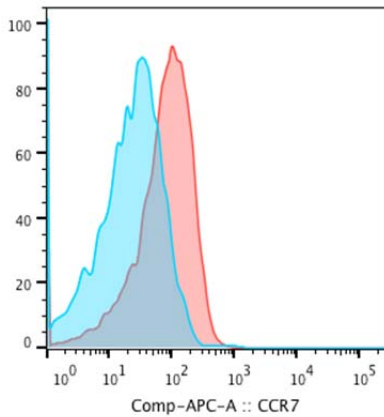


Figure 1c: merged GFP alone (blue), and GFP with 4 uM Akt inhibitor (pink)



Sample Name	Subset Name	Count
AKTi d+9_control + GFP.fcs	FSC-A, viability subset	25047
AKTi d+9_d0 AKTi 4 uM + GFP.fcs	FSC-A, viability subset	9512

**PEDIATRIC RESEARCH, EDUCATION AND SCHOLARSHIP SYMPOSIUM (PRESS)**  
**April 17, 2015**

**ABSTRACT [33]**

Name: Christen Ebens  
Status: Fellow

Division: Pediatric BMT  
Research Sponsor: Angela Smith

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**Kidney Transplant After Hematopoietic Stem Cell Transplant: Infectious Complications and Immunosuppressive Considerations**

Christen L. Ebens, Angela R. Smith, Priya S. Verghese  
Department of Pediatrics, University of Minnesota, Minneapolis, MN

**Background:** Renal toxicity is common following pediatric hematopoietic stem cell transplantation (HSCT). While rare, cases of end-stage renal disease (ESRD) requiring kidney transplant after HSCT have been reported. With decreased treatment-related mortality and morbidity making HSCT available to more children, the numbers proceeding to renal transplant will likely increase. Post-HSCT kidney transplant recipients have uniquely weakened immune systems placing them at higher risk of infectious complications with standard post-kidney transplant immunosuppressive regimens.

**Objective:** Review the immunosuppressive regimens and infectious complications in pediatric patients at a single institution receiving kidney transplant following HSCT.

**Methods:** Databases of prospectively recorded data for patients undergoing HSCT and, separately, kidney transplant were used to identify pediatric patients at the University of Minnesota who received kidney transplants following HSCT.

**Results:** Four pediatric patients received kidney transplants after HSCT between 2009 and 2014. The average time for immune reconstitution between HSCT and kidney transplant was 3.2 years. Each kidney recipient received standard anti-rejection immunosuppression with thymoglobulin for induction followed by a combination of a calcineurin inhibitor and mycophenolate mofetil for maintenance. All patients received anti-viral prophylaxis with valacyclovir (or valganciclovir with a history of CMV reactivation). All 4 patients demonstrated EBV reactivation (though no post-transplant lymphoproliferative disorder), three had BK viremia, one had CMV viremia, and one had adenoviremia. One patient had a recalcitrant BK viremia leading to BK nephropathy and kidney rejection within one year of transplant, dying of presumed BK encephalopathy (CSF positive). The remaining 3 patients are alive at 0.5, 5.6, and 6.2 years after kidney transplant.

**Conclusions:** Viral reactivation following kidney transplant for post-HSCT ESRD is common despite anti-viral prophylaxis and can be lethal. Post-HSCT patients are uniquely immunosuppressed at the time of kidney transplant and may have less viral complications, yet maintain their kidney graft, with a less aggressive anti-rejection regimen.

**PEDIATRIC RESEARCH, EDUCATION AND SCHOLARSHIP SYMPOSIUM (PRESS)**  
**April 17, 2015**

**ABSTRACT [34]**

Name: Melissa Engel  
Status: Fellow

Division: Pediatric Neonatology  
Research Sponsor: Andrea Lampland

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**A Qualitative Study on Standardizing Inpatient Treatment for Neonatal Abstinence Syndrome**

Melissa Engel<sup>1</sup>, MD; Andrea Lampland<sup>2</sup>, MD; Barb Symalla<sup>3</sup> RN, CNS;  
Andrea Postier<sup>4</sup>, MPH, CCRC

**Objective:**

Neonatal Abstinence Syndrome (NAS) is an increasing primary diagnosis for otherwise healthy neonates in neonatal intensive care units. Currently there is not a standardized protocol for treatment of NAS. These infants accrue significant medical cost due to their length of stay in a NICU or level II nursery.

Our specific aims:

- Assess if a standardized NAS treatment algorithm for in-utero opioid exposed term and late-preterm infants who require methadone for NAS will decrease inpatient length of stay by 10%
- Not increase re-hospitalization rates by 5%
- Not change the length of outpatient management for weaning of methadone by 0%.

**Methods:**

Development included a systematic review of the published literature, which led to an evidence-based protocol weaning of methadone for NAS. PDSA cycles were used to assure taper was appropriate to prevent withdrawal. Education was given to the nursing, pharmacy and medical staff about NAS, withdrawal scoring via modified Finnegan score and symptoms of withdrawal in neonates. Retrospective chart review was completed on infants who were treated with methadone for NAS from January 1<sup>st</sup>, 2012 through December 31<sup>st</sup>, 2013. Infants included were managed with methadone as an inpatient by our staff neonatologists, ≥35 weeks gestational age, and followed as an outpatient by Children's Hospitals and Clinics of Minnesota Pain/Palliative care team. The analysis included 16 infants pre-protocol and 18 infants post-protocol initiation.

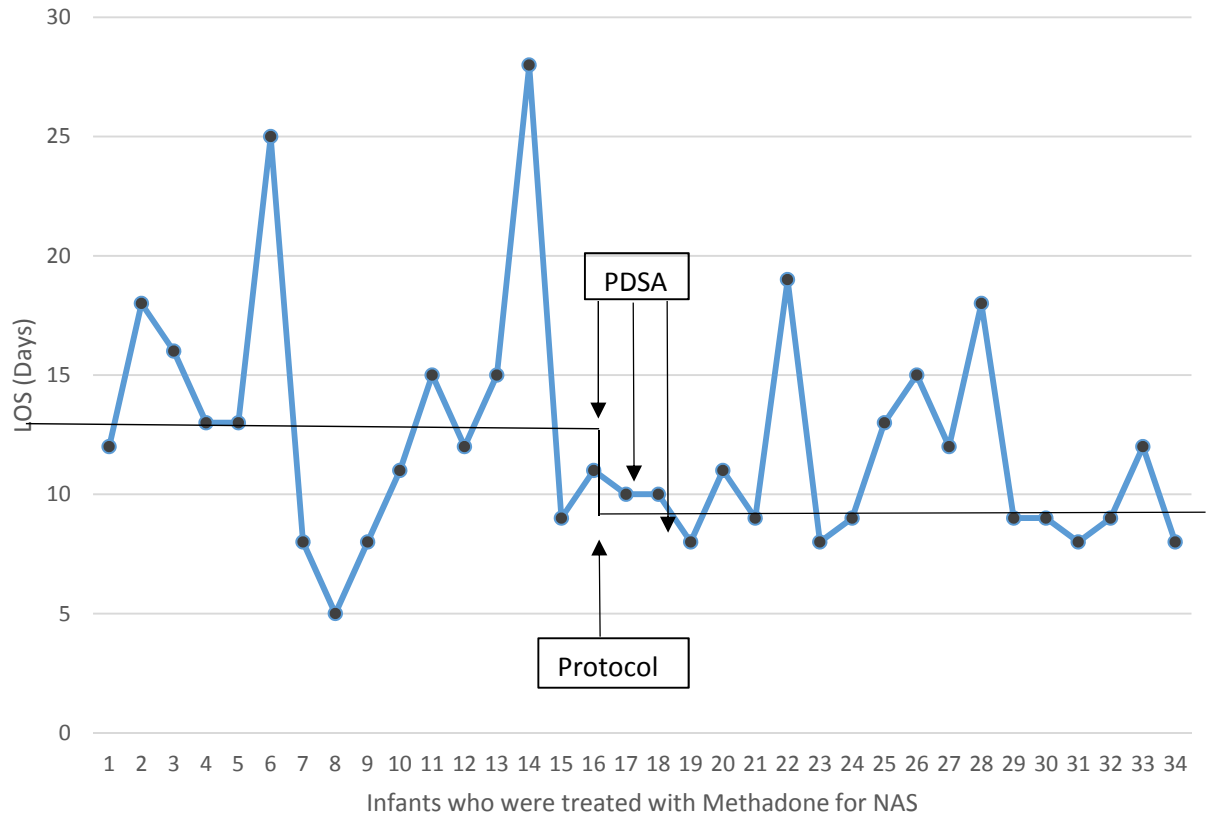
**Results:**

Average length of stay decreased from 13.7 days to 10.9 days post-protocol initiation. The run chart depicts a trend in the median length of stay from 13 to 9.5 days. There was no difference in readmission rates between the two groups.

**Conclusion:**

Our implementation of a standardized inpatient treatment guideline has facilitated quicker discharge without increasing re-hospitalization rates. With an average NICU stay costing \$4000/day, we were able to decrease cost of admission by \$11,200.

# Length of Stay for Inpatient treatment with Methadone for NAS



**PEDIATRIC RESEARCH, EDUCATION AND SCHOLARSHIP SYMPOSIUM (PRESS)**  
**April 17, 2015**

**ABSTRACT [35]**

Name: Melissa Engel  
Status: Fellow

Division: Pediatric Neonatology  
Research Sponsor: Lazaros Kochilas

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**Retrospective Analysis of Infants Intervened for Critical Congenital Heart Disease Using Anatomy to Validate Universal Pulse Oximeter Screening in Newborns**

Melissa Engel MD\*, Jeffrey M. Vinocur MD\*, Lazaros Kochilas MD

**Importance:** Newborn pulse oximetry screening has been shown to improve detection of congenital heart disease.

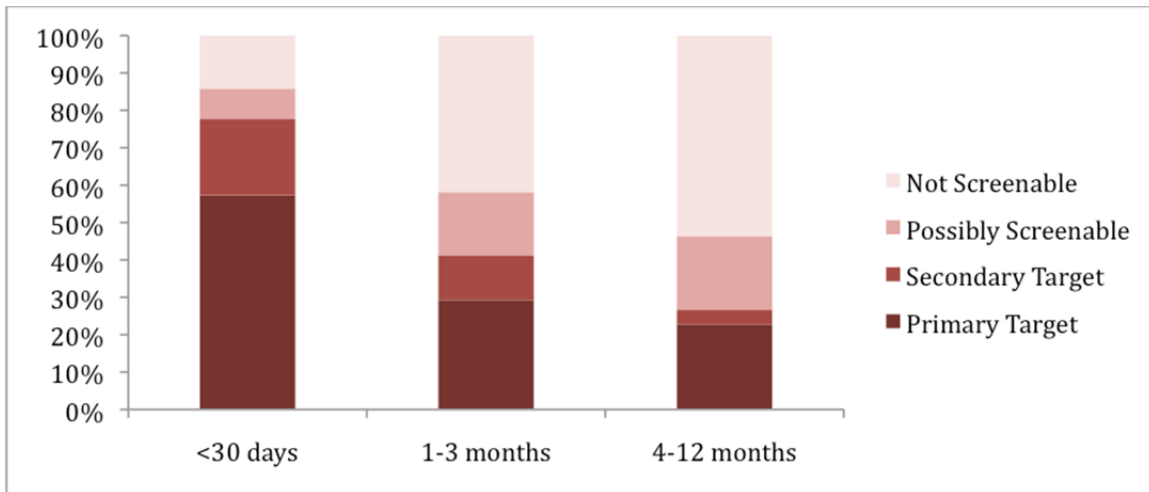
**Objective:** Assess the frequency of cardiac interventions during infancy for congenital heart disease (CHD) lesions within the first year of life that can be suspected by pulse oximetry.

**Design, Setting and Participants:** Population based retrospective study from the Pediatric Cardiac Care Consortium (PCCC) of 6,292 infants that underwent a surgical or catheter-based intervention within the first year of life for CHD. The cardiac defects were classified by anatomy and severity as determined by initial intervention. The patients were grouped into four categories: Primary Target, Secondary Target, Possibly Screenable, and Not Screenable lesions based on their cardiac anatomy and likelihood of a positive pulse oximetry screen due to hypoxemia in the newborn period.

**Main Outcomes Measures:** Proportion of patients predicted to have a positive pulse oximetry screen, grouped by timing of cardiac intervention.

**Results:** The distribution of CHD was similar across states and eras. Of infants requiring intervention in the neonatal period, 57% had Primary Target lesions, 20% had Secondary Target lesions, 8% had Possibly Screenable lesions, and 14% had Not Screenable lesions. The accumulated mortality after interventions for Primary and Secondary Target lesions accounts for 90% of the mortality observed among interventions for congenital heart disease in the first month of life.

**Conclusions and Relevance:** The Primary and Secondary Targets of newborn pulse oximetry screening account for 78% of the lesions undergoing intervention within the neonatal period. The pulse oximetry screen is a good tool to detect CHD severe enough to require invasive therapy in the newborn period. However, a significant number of lesions with considerable mortality still can escape this screening method. Further research on screening methods for impaired cardiovascular physiology is needed for improving neonatal outcomes for all CHD.



**PEDIATRIC RESEARCH, EDUCATION AND SCHOLARSHIP SYMPOSIUM (PRESS)**  
**April 17, 2015**

**ABSTRACT [36]**

Name: Nathan Gossai  
Status: Fellow

Division: Pediatric Hem-Onc and BMT  
Research Sponsor: Peter Gordon

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**Bi-functional Drug-DNA Conjugated Gold Nanoparticles for the Treatment of Pediatric Acute Myeloid Leukemia**

Nathan Gossai, MD<sup>1</sup>, Jordan Naumann, MS<sup>2</sup>, Peter M. Gordon, MD PhD<sup>1</sup>

<sup>1</sup>Division of Pediatric Hematology and Oncology, University of Minnesota

<sup>2</sup>University of Minnesota Masonic Cancer Center

Only ~60% of children with acute myeloid leukemia (AML) are cured despite intensive cytotoxic chemotherapy. As further intensification with conventional chemotherapy or myeloablative therapy with stem cell transplant has not substantially improved outcomes, novel therapies are needed. Gold nanoparticles (AuNP) have been used for a wide variety of biomedical applications, including both diagnostic and therapeutic uses. We have developed an AuNP that carries a customizable combination of traditional cytotoxic, molecularly targeted, or nucleic acid based drugs that are selectively activated within the targeted cancer cell. First, we have designed oligonucleotide conjugated AuNPs that selectively release a DNA oligonucleotide in the presence of mRNAs that are overexpressed or unique to AML, such as *survivin* or *AML/ETO*, which results from the t(8;21) translocation that occurs in ~15% of pediatric AMLs. Second, we have chemically linked the multi-tyrosine kinase inhibitor dasatinib to the oligonucleotide and have shown that this conjugation does not perturb the ability of dasatinib to inhibit target kinases. Finally, we have demonstrated that these AuNPs efficiently enter AML cells, selectively release the dasatinib conjugated oligonucleotide in the presence of survivin mRNA, and significantly inhibit proliferation of the AML cells. Ongoing work is aimed at fully characterizing the effect of these dasatinib-DNA conjugated AuNPs on AML cells and enhancing mRNA knockdown by incorporating a DNzyme, which cleaves targeted RNA sequences with multi-turnover kinetics, into the AuNP. This method of selectively activating molecularly targeted drugs in cancer cells will maximize drug efficacy while minimizing toxicity and thus represents a novel, therapeutic strategy for AML therapy and cancer in general. This approach of selectively activating a drug in a specific cell extends beyond oncology and could impact many areas of medicine including infectious diseases.

**PEDIATRIC RESEARCH, EDUCATION AND SCHOLARSHIP SYMPOSIUM (PRESS)**  
**April 17, 2015**

**ABSTRACT [37]**

Name: Elwaseila Hamdoun  
Status: Fellow

Division: Pediatric Endocrinology  
Research Sponsor: Anna Petryk

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**The Specter of Severe Untreated Congenital Hypothyroidism Remains in Immigrant Families in the United States**

Hamdoun E, Karachunski P, Nathan B, Fischer M, Torkelson J, Drilling A, Moran A, Petryk A

**Background**

Implementation of newborn screening programs for congenital hypothyroidism (CH) has dramatically reduced rates of untreated cases. However, many developing nations do not have adequate screening programs.

**Objective**

To raise awareness about undiagnosed CH in immigrant children

**Subjects**

We report three cases of CH in Somali immigrant relatives, undiagnosed until after their arrival in the US. Patient 1 is now a 21.5 years old male (bone age 14 years). He was 14.8 years old at diagnosis (bone age 1.3 years). His height was at -7.5 SD, and he was prepubertal (Table 1). Brain MRI showed empty sella. After 7 years of treatment, his height deficit remains dramatic (-6.1 SD). He has musculoskeletal deformities. Neuropsychological evaluations (NPE) revealed severe neurodevelopmental deficits including profound intellectual disability (ID), motor dysfunction (33 months-age equivalent) with spastic paraparesis, fine motor deficit (36 months), and receptive/ expressive language (28 months/2 months). Patient 2, now a 14.5 years old female, was diagnosed at age 7.7 years. At diagnosis, her height SDS was - 8.1. Following 7 years of treatment, her height deficiency was reduced to -2.9 SD. She has moderate ID. Patient 3, now 7.4 years old male, was diagnosed at age 6 months. At diagnosis, his height was -8.1 SD. His current height is -1.4 SD. Despite developmental gains over 7 years on treatment, he has global developmental delay.

**Conclusions**

Untreated CH remains an important consideration among immigrant children. The continuing rise in immigration and displacement increases the number of unrecognized CH cases. Worldwide screening programs should be implemented, as delayed diagnosis of CH has profound negative effects on growth and development.



1. Table: Results.

	Patient 1	Patient 2	Patient 3
Sex	Male	Female	Male
<b><i>At diagnosis</i></b>			
Age (years)	14.8	7.7	0.5
Height (SD)	-7.5	-8.1	-8.1
Weight (SD)	-11.3	-7.3	-3.7
Bone age (years)	1.3	0.7	N/A
Tanner stage (breasts)	N/A	1	N/A
Tanner stage (testes)	1	N/A	1
Tanner stage (pubic hair)	1	1	1
TSH (ng/dl)	150	>500	26
Free T4 (ng/dl)	Not available	0.36	0.89
<b><i>At most recent visit 7 years after the diagnosis and treatment of congenital hypothyroidism</i></b>			
Age (years)	21.5	14.5	7.4
Height (SD)	-6.1	-2.9	-1.4
Delta height SDS	1.4	5.2	6.6
Weight (SD)	-6.5	-2.9	-2.5
Bone age (years)	14.0	14.5	7.4
Tanner stage (breasts)	N/A	3	N/A
Tanner stage (testes)	2	N/A	1
Tanner stage pubic hair	3	1	1
Testicular volume (ml)	Right (4) Left (6)	N/A	2
TSH (ng/dl)	3.65	0.16	0.31
Free T4 (ng/dl)	1.02	1.47	1.64

**PEDIATRIC RESEARCH, EDUCATION AND SCHOLARSHIP SYMPOSIUM (PRESS)**  
**April 17, 2015**

**ABSTRACT [38]**

Name: Heidi Kamrath  
Status: Fellow

Division: Pediatric Neonatology  
Research Sponsor: Jennifer Needle

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**The Impact of a Perinatal Palliative Care Program on Length of Stay, ICU Days,  
and Invasive Procedures**

**BACKGROUND:**

The University of Minnesota (UMN) Perinatal Palliative Care Program (PPCP) founded in 2008, is a multidisciplinary program involving maternal-fetal medicine, neonatology, genetics and social work. This team coordinates palliative care services for families whose infants have prenatally diagnosed life-limiting conditions.

**OBJECTIVE:**

The aim of this study was to show the impact PPCP has for infants born with a life limiting condition. We hypothesized that perinatal palliative care planning can decrease length of stay (LOS), number of ICU days and number of invasive procedures for infants with life limiting conditions.

**DESIGN/METHODS:**

This was a retrospective chart review of infants with life limiting conditions treated at the UMN from 1/01/11-9/30/14. Infants were identified through PPCP records and NICU death records. Infants were divided into two cohorts - those identified through PPCP records and those identified through NICU death records who were not part of the PPCP (No PPCP). Differences between the two groups were analyzed with t-tests.

**RESULTS:**

Thirty-nine infants were identified, 18 in the PPCP cohort and 21 in the No PPCP cohort. Infants with an active PPCP at birth had decreased LOS, number of ICU days and number of invasive procedures. Also, infants with an active PPCP at birth were less likely to have CPR performed (6% vs. 48%,  $p=0.0017$ ) or receive code medications (6% vs. 32%,  $p=0.0017$ ).

	PPCP (n=18)	No PPCP (n=21)	
MEAN GA (wks)	33.67	34	$p= 0.7947$
MEAN BW (gram) <sup>†</sup>	2892	1920	
MEAN±SD LOS (days)	1.61±0.78	7.1±8.9	<b><math>p= 0.0130</math></b>
MEAN±SD ICU Days	0.78±1.81	7.1±8.9	<b><math>p= 0.0052</math></b>
Invasive Procedures* MEAN (range)	0.11 (0-2)	2.19 (0-8)	<b><math>p= 0.0003</math></b>

<sup>†</sup> Unable to calculate p-value due to missing data in the PPCP group. \*Includes: intubation, needle decompression, chest tube, PICC line placement, therapeutic hypothermia, pericardial tap, ECMO, EXIT procedure. Does not include PIV, NG/OG UAC or UCV.

## CONCLUSIONS:

Perinatal palliative care provides individualized and holistic support for families whose unborn child has a life-limiting condition. This study demonstrates that infants with life limiting conditions can have decreased LOS, number of ICU days and number of invasive procedures when there is an active PPCP at birth. These reductions can lead to a decreased cost of care for health care institutions and families as well as decreased stress burden for the care team, family and ultimately the infant.

**PEDIATRIC RESEARCH, EDUCATION AND SCHOLARSHIP SYMPOSIUM (PRESS)**  
**April 17, 2015**

**ABSTRACT [39]**

Name: Sarah Kizilbash  
Status: Fellow

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Research Sponsor: Clifford Kashtan

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**The Impact of Acute Kidney Injury (AKI) on Mortality in Children Undergoing Hematopoietic Stem Cell Transplantation (HSCT)**

**Background:** AKI is a well-documented complication of pediatric HSCT. Although dialysis after pediatric HSCT is a proven risk factor for mortality, the effects of less severe AKI on survival are unknown.

**Objective:** To examine the impact of all stages of AKI on survival at 1 year after HSCT using pRIFLE criteria

**Method:** This was a retrospective study of 122 consecutive patients  $\leq 21$  years, who underwent HSCT between 1/1/12 and 10/24/13 at our center. GFR was estimated by modified Schwartz method. AKI severity was classified according to the peak pRIFLE score (R=risk, I= injury, F= failure, L= loss of function, E= ESRD). Survival was estimated using Kaplan-Meier method and compared using log-rank tests. Predictors of mortality were analyzed by cox regression.

**Results:** In univariate analysis, 1-year survival significantly decreased with an increase in the severity of pRIFLE grading ( $p < 0.01$ ) (Table 1). Although there was a trend towards lower survival among patients with pRIFLE R/I compared to no AKI, the difference was not statistically significant (88% vs. 100%,  $p 0.11$ ). Other predictors of mortality on univariate analysis included aGVHD (stages 3, 4), VOD and donor type. Multivariate cox regression showed pRIFLE F/L/E to predict mortality independent of acute GVHD (Hazard ratio: 22.91, 95% CI 2.99-2941.76,  $p < 0.001$ ). VOD and donor type were highly correlated with AKI. Seven of 13 patients who received dialysis died (53.8%) while 5 of 10 patients with stage F who did not receive dialysis died (50%).

**Conclusion:** The risk of mortality after HSCT in children increases significantly with an increase in severity of AKI, as estimated by pRIFLE score. The results of this study suggest that prevention and minimization of AKI may improve survival after pediatric HSCT.

**Table 1: Survival at 1 year by pRIFLE classification**

Variable	Mortality (%)	Survival estimate (%) (95% confidence interval)	P value
No AKI	0/20 (0%)	100%	< 0.01
R	5/46 (11%)	89% (76- 95%)	
I	5/35 (14%)	86% (69- 94%)	
F/L/E	13/21 (62%)	38% (18- 58%)	

**PEDIATRIC RESEARCH, EDUCATION AND SCHOLARSHIP SYMPOSIUM (PRESS)**  
**April 17, 2015**

**ABSTRACT [40]**

Name: Stacie Knutson  
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Research Sponsor: Lazaros Kochilas

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**Implementation of Developmental Screening Guidelines for Children with  
Congenital Heart Disease**

**Background:** In order to address the neurodevelopmental morbidity associated with congenital heart disease (CHD), the American Heart Association (AHA) released guidelines for the evaluation and management of developmental problems in children with CHD in 2012. The degree of implementation of these guidelines and the barriers to their implementation remain unknown.

**Objectives:** To assess the awareness and implementation of developmental screening guidelines for children with CHD among pediatric primary care providers in Minnesota.

**Methods:** An online survey was administered to licensed pediatric primary care providers in Minnesota (Pediatricians = 530, Family physicians = 1469) to evaluate their awareness of the AHA guidelines, current screening practices, and barriers to the implementation of these guidelines.

**Results:** A total of 148 pediatricians (29%) responded to the survey and 126 (85%) reported providing care for children with CHD. Among pediatricians caring for children with CHD, 95% recognize as important the existence of specific neurodevelopmental screening guidelines for children with CHD and 98% perform regular developmental screening. The most commonly reported reasons for neurodevelopmental referral were abnormal screening results (91%), parental concerns (90%), and the presence of a genetic abnormality or syndrome (81%). Presence of specific risks for children with CHD, such as history of cyanotic heart disease or open heart surgery as an infant, accounted for only 25% and 22% of referrals respectively. Only 30% of providers were aware of the guidelines and only 5% have received guidance from a pediatric cardiologist regarding neurodevelopmental screening in children with congenital heart disease.

**Conclusions:** These findings highlight the need for further education of primary care providers on the developmental risks associated with CHD as well as the opportunity for increased involvement by the pediatric cardiology community to enhance the developmental outcomes of children with CHD.

**PEDIATRIC RESEARCH, EDUCATION AND SCHOLARSHIP SYMPOSIUM (PRESS)**  
**April 17, 2015**

**ABSTRACT [41]**

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**Relationship of Biofilm Formation and Alpha-Toxin Production by Methicillin-Resistant *Staphylococcus aureus* Wound Isolates on Mucosal Epithelium**

Emily M Schaaf, MD, Michele Anderson, PhD, Heidi Wang, BA and Marnie L Peterson, PhD, PharmD

**Background:** *Staphylococcus aureus* is a major cause of chronic wound infections, and biofilm formation may contribute to persistence. We and others have shown that biofilm formation data from *in vitro* models do not mimic host-pathogen interactions. Previously we observed that alpha-toxin (AT) was required for biofilm formation on mucosa but dispensable on plastic.

**Objective:** The aims of this study were to examine whether wound isolates of methicillin-resistant *S. aureus* (MRSA) formed biofilm when grown in an *ex vivo* porcine mucosal epithelial model or in vitro on polystyrene; and to determine whether biofilm formation is correlated between the two models, and whether AT produced by the MRSA isolates correlated with biofilm formation.

**Design/Methods:** Eighteen MRSA clinical wound isolates were obtained from the Minneapolis Veterans Affairs Medical Center and underwent PFGE typing (Minnesota Department of Health). *Ex vivo*: MRSA isolates infected explants of porcine vaginal mucosa for 72 h. A biofilm producing *S. aureus* (MSSA MNPE) was a positive control, and uninfected explants and a non-biofilm alpha-toxin mutant (MNPE *hla*KO) were negative controls. Explants were stained with FilmTracer™ LIVE/DEAD® and imaged by confocal microscopy. Biofilm was graded on a 1-4 scale, depending on confluence and surface area coverage. *In vitro*: 96-well polystyrene plates were inoculated with MRSA isolates and incubated on a rocking platform at 37°C for 72 h. Biofilm was quantified by staining and resolubilization of Crystal violet. AT concentration in mucosal explants 72 h post-infection was quantified by sandwich ELISA.

**Results:** The MRSA isolates' PFGE types were USA100 (53%), USA300 (35%) and 12% nontypable. All MRSA isolates formed biofilm. Sixteen of the 18 MRSA isolates (89%) formed extensive biofilm, 3+ or 4+. No correlation ( $r_s = -0.5$ ,  $p = 1.0$ ) was observed between polystyrene biofilm formation and mucosal biofilm formation. A correlation between amount of AT produced and amount of biofilm formed by MRSA isolates *ex vivo* was seen by Spearman's test, but did not reach statistical significance ( $p = 0.33$ ).

**Conclusions:** All MRSA wound isolates formed biofilm on epithelium. All MRSA isolates produced alpha toxin, with higher amounts in the isolates that formed extensive biofilm. *In vitro* polystyrene MRSA biofilm experiments are not predictive of degree of wound isolate biofilm formation and alpha toxin production.