

Department of Pediatrics  
University of Saskatchewan



Presents

2021 Child Health Research Trainee Day

Thursday April 15, 2021  
12:00 pm -3:00 pm



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# Child Health Research Trainee Day

Thursday, April 15, 2021

12:00 pm- 3:00 pm

- 12:00-12:05 pm** Welcome and Opening Remarks (**Dr. Darryl Adamko**)
- 12:05-12:45 pm** **Dr. Hugh O’Broovich** (Key Note Speaker) *Discovery, scholarship and innovation to improve the health of children.*
- 12:45-1:00 pm** Lightening Round (Undergraduate)  
**Colten Molnar** (Medicine)  
**Sarah Moroziuk** (Medicine)
- 1:00-1:25 pm** Lightening Round (Graduate)  
**Elyse Proulx-Cullen** (MSc - Health Science)  
**Matthew Chapelski** (MSc- Kinesiology)  
**Yekeen Abu-Shiraz** (MSc- Kinesiology)  
**Aliya Abbasi** (MSc- Nursing)  
**Valerie Caron** (PhD - Health Sciences)
- 1:25-1:30 pm** *Break (Trivia Questions)*
- 1:30-2:00 pm** Lightening Round (Residents)  
**Astrid Lang / Netusha Thevaranjan** (Pediatrics)  
**Janell Lautermilch** (Pediatrics)  
**Madison Peaker** (Pediatrics)  
**Olivier Legault** (Pediatrics)  
**Poonam Jariwala** (Pediatrics)  
**Ruchika Sharma** (Pediatrics)
- 2:00-2:05 pm** *Break (Trivia Questions)*
- 2:05-3:05 pm** Long Presentations  
**Carissa McGuin** (Undergraduate – Medicine)  
**Kylee Kosokowsky** (Undergraduate – Medicine)  
**Mahdi Rostami** (PhD – Kinesiology)  
**Yuwen Zheng** (PhD- Kinesiology)  
**Astrid Lang** (Resident – Pediatrics)  
**Poonam Jariwala** (Resident – Pediatrics)
- 3:05 pm** *Closing Remarks*

Dr. Hugh O'Brodovich

Presents

Discovery, scholarship and innovation to improve the health of children.



Hugh O'Brodovich, MD FRCP(C) is the Arline and Pete Harman Professor of Pediatrics (Emeritus) at the Stanford School of Medicine. He was the Chair of Pediatrics at Stanford University from 2008 through 2016 during which time he led the creation of Stanford University's Child Health Research Institute and served as its inaugural director. Previously, he was the Chair of Paediatrics at the University of Toronto and SickKids' Pediatrician-in-Chief. His laboratory investigated how the lung's airspaces become fluid filled (pulmonary edema) and how airspace fluid is cleared under physiologic (fetal lung liquid at birth) and pathophysiologic (pulmonary edema) conditions. Most recent research involved population-based studies to discover genetic factors that influence the development of bronchopulmonary dysplasia. He was elected as a Fellow of both the Canadian Academy of Health Sciences and the American Association for the Advancement of Science.

## Lightening Rounds - Undergraduate PRESENTATIONS

12:45 - 1:00 pm

### *Survey of Staff Satisfaction and Barriers to Use of Numbing Cream and Nitrous Oxide for Pediatric Inpatients in Tertiary Care*

Colten Molnar, Casey McMahon, and Krista Baerg

**Introduction/Aim:** When simple strategies including numbing cream (NC) are ineffective for pediatric procedural pain-management, nurse-administered nitrous oxide (NANO) is safe and effective. The Pediatric Inpatient Department (PIPD) at Jim Pattison Children's Hospital launched NANO for children over 1 year in September 2019. This study aims to identify barriers to use and determine satisfaction with NC and NANO for simple procedures.

**Methods:** In spring 2020, a 44-item anonymous survey was distributed to 398 health professionals caring for children admitted to PIPD. For inter-group variance analysis, responses were sorted by nurses, physicians, and others. We completed descriptive analysis for all items including coded open text responses regarding barriers.

**Results:** Seventy-one individuals out of 398 participated. For NC, 83.1% agreed NC is an essential pain-management option for needle pokes, 73.2% were confident to access/provide it, and 24% identified barriers (availability, time, distress). For NANO, 81.7% agreed NANO is an essential pain-management option for minor procedures, 50.7% were confident to access/provide it, and 32% identified barriers (education). Those involved in the care of a patient receiving NC or NANO in the past 6-months were satisfied with effectiveness, 83% and 85.7%, respectively.

**Discussion/Conclusions:** NC and NANO are essential procedural pain-management strategies in PIPD. A focus group with staff, patients and caregivers to 35 identify strategies to overcome barriers to implementation of NC may inform further improvements. To address staff needs for further education, we suggest additional opportunities for NANO education be provided through existing channels such as nursing education days and pediatric grand rounds.

### *Preliminary analysis of coping strategies utilized in pediatric patients with complex pain*

Sarah Moroziuk, Casey McMahon, Krista Baerg

**Background:** Chronic pain affects 25-35% of youth and negatively impacts physical, psychological and social functioning. This preliminary analysis aims to describe coping strategies utilized by patients and assess the relationship between coping strategies and functional disability, school attendance and pain interference. It is hypothesized that children utilizing more coping strategies will have lower functional disability, pain interference and school absence.

**Methods:** 44 participants were recruited from the local Interdisciplinary Pediatric Complex Pain Clinic. Participants consented to having their information as part of a registry database which involved completion of self-assessment measures. Demographic information, parental report on school attendance, and scores from the Functional Disability Inventory (FDI), PROMIS Pediatric Pain Interference, and PedsQL Pain Coping Inventory were exported for preliminary data analysis.

**Results:** The study population consisted of participants aged 9.4–18.3 years (mean=14.6, SD=2.3), 32 (72%) were female. The mean number of school days missed per month was 8.1 (SD=8.5, range of 1–25 days). PROMIS Pain Interference scores are strongly correlated with Total FDI scores ( $r=+0.8; p<0.001$ ). Total Pain Coping score is moderately correlated with PROMIS Pain Interference ( $r=+0.4; p<0.005$ ), weakly correlated with FDI score ( $r=+0.3; p<0.05$ ) and not correlated with number of school days missed ( $r=+0.04; p<0.8$ ).

**Conclusion:** Preliminary analysis shows that total Pain Coping score is moderately related to level of pain interference and weakly correlated with FDI score but not the number of school days missed. Further exploration is needed to identify the specific coping strategies associated with decreased pain interference, functional disability and school absenteeism.

## Lightening Rounds – Graduate PRESENTATIONS

1:00 - 1:25 pm

### *The voices of mothers of twice-exceptional children: a narrative inquiry.*

Elyse Proulx-Cullen

**Background:** Twice-exceptional (2e) children manifest both giftedness and disabilities and are defined as high-potential, talented individuals with neurological disorders (ADHD, learning disabilities, social impairments). As a result of the lack of adapted and biometric diagnostic tools, the paucity of expert resources and societal stigmas related to the condition, 2e children are often diagnosed too late, misdiagnosed or even undiagnosed. As research has shown, this results in potentially devastating consequences to their well-being from increased risk of mental illness and education failure to self-medication and addiction. In our society, mothers typically experience the atypical behaviours and warning signs of their 2e child first-hand. However, little is known about how mothers become aware of their child's exceptionalities, an experience mostly dismissed and marginalized in the traditional health care system.

**Purpose:** Considering the mounting evidence about the importance of early screening in contributing to a successful life journey for 2e children, this qualitative health research project aims to elicit the lived experiences of mothers of 2e children and to listen to these critical steps in their journey.

**Methods:** This study will be realized through a narrative inquiry design. The patient-parent expert will be at the core of this inquiry. Using snowball and later purposive sampling, mothers of 2e children will be recruited and invited to share their story. Interviews will be audio recorded and transcribed. Field notes will also be kept. Critical feminist and intersectionality theories will provide a lens through which to conduct the inductive analysis.

The significance of the project is to uncover the acquired knowledge of the mothers in raising their 2e children and to inform the delivery of services and resources mothers will need to access. This narrative inquiry project will also act as the building block of a subsequent research project about providers and related systems designed to support these children and their families. Furthermore, this study aims to build on seven of the 17 Sustainable Development Goals (#3-4-5-8-9-10-17) by developing a model of sustainable engagement whereby the dyad child-mother would become a key partner and decision-maker as well as a bridge between the education sector and the health care system.

### *Sex Differences in Motor Competence of Children in Kindergarten and Grade 1*

Matthew Chapelski, Louise Humbert, Amanda Froelich Chow, Adam Baxter-Jones, Marta C. Erlandson.

**Introduction:** Engaging in physical activity is beneficial for the health and wellness of children. However, there are concerns that the majority of Canadian children, 5 to 17 years of age, are not meeting the recommended physical activity guidelines. Motor competence focuses on children's proficiency to perform motor skills and is linked with physical activity participation. Children with higher motor competence engage in more physical activity. In pre-school aged children males have been found to have greater object control motor competence whilst females have greater locomotor and balance motor competence. However, less is known if these sex difference persist in the early school years when children are provided the same motor competence development opportunities during physical education classes.

**Purpose:** The purpose of our study was to assess sex differences in the motor competence of children in Kindergarten and Grade 1.

**Methods:** 186 Kindergarten and Grade 1 students (77 females), 4-7 years of age had their motor competence evaluated using an adapted version of the PLAYfun tool. This tool tests 10 different fundamental motor skills in the movement domains of: run (run a square and run there and back), locomotor (skip, gallop, hop, and jump), object control (throw, catch, and kick) and balance (stationary balance). Independent sample t-tests tested mean differences between males and females for each skill and domain, and alpha was set at 0.05.

**Results:** Males had significantly higher motor competencies in the run domain ( $p=0.020$ ), specifically for the skills run a square ( $p=.027$ ) and run there and back ( $p=.026$ ).

Males also had greater motor competencies for the object control domain ( $p=.001$ ) specifically for throw ( $p<.000$ ) and kick ( $p=.045$ ) but not for catch ( $p>0.05$ ). In contrast, females had greater motor competence for the locomotor domain ( $p<.000$ ) specifically for the skills skip ( $p<.000$ ) and gallop ( $p=.002$ ) but not hop and jump ( $p>0.05$ ). No significant differences were found between the sexes ( $p>0.05$ ) for balance and total motor competency.

Conclusion: Similar to the research performed in pre-school aged children, it was found that males in Kindergarten and Grade 1 had greater running and object control skills, while females had greater motor competence for locomotor skills. This study provides insight into where inequalities exist in motor competence development between males and females and suggests that early intervention may be needed to address these differences in skill development between the sexes.

### **Body Appreciation of Children with Congenital Heart Disease Compared to Healthy Peers**

**Yekeen Abu-Shiraz, M. Adam, M. Chapelski, C. Tomczak, K. Wright, C. Pockett, T. Bradley, M.C. Erlandson**

Introduction: Despite significant advances and rising survival rates, children with congenital heart disease (CHD) face many physical, emotional, and behavioral challenges. As a result, these challenges can have an impact on how a child feels about themselves and how others perceive them. Although this challenge has often been assumed, there are a limited number of studies examining body image and body appreciation in children with CHD. Body appreciation refers to an individual's acceptance of, positive feelings toward, and respect for their bodies. Therefore, understanding the body appreciation of children with congenital heart diseases will help us better understand aspects of their well-being.

Purpose: This study evaluated the body appreciation of children with CHD compared to age and sex matched healthy peers.

Methods: Twelve children with CHD (age =  $13.6 \pm 2.1$ ,  $n= 3$  females) and nine healthy children (age =  $12.6 \pm 2.7$ ,  $n= 4$  females) completed the Body Appreciation Scale - 2 (BAS-2). This scale consists of 10 fundamental questions that can be given a score of 1 (Never) to 5 (Always) that best characterizes the child's attitude or behavior. A higher score on the BAS-2 represents a higher degree of positive feelings towards one's body. Body appreciation scores, age, height, weight and physical activity levels between CHD and control groups were assessed using independent t-tests.

Results: No significant difference between groups for age, height, weight and physical activity level were found ( $p > 0.05$ ). For each question on the BAS-2 scale, as well as the overall score, no differences ( $p > 0.05$ ) were found between the groups. When comparing males to females for the entire sample (CHD and controls combined), there was no significant difference between sexes. However, when analyzing sex differences in the CHD group alone, there was a significant difference in the feelings of respect that each group had towards their body, with females being less likely to always have respect for their bodies ( $p < 0.05$ ).

Conclusion: Our preliminary findings suggest that there is no difference in body appreciation of children with CHD and their healthy counterparts. Future studies should focus on increasing the sample size, as this might influence the significance between groups. Furthermore, focusing on sex differences within the CHD group could also have important implications.

### **Exploring the experiences of Indigenous family caregivers of children with life-limiting/life threatening illnesses when participating in symbol-based intervention**

**Aliya Abbasi, Jill Bally, Meredith Burles**  
Sustainable Development Goals:

3: Ensure healthy lives and promote well-being for all at all ages  
10: Reduce inequality within and among countries

16: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels

Largely influenced by Canada's long history of European colonization, a multitude of social and health disparities between the Indigenous and non-Indigenous populations exist (Wilmot, 2018). In Saskatchewan, Indigenous caregivers of children with life threatening and life-limiting illnesses (LTIs/LLIs) face many complex healthcare inequities and their experiences have not been fully explored.

In 2015, the Truth and Reconciliation Commission of Canada (TRC) developed "94 Calls to Action" to advance Canadian reconciliation. The 19th call to action (TRC, 2015), calls for the federal government to consult with Indigenous peoples and establish measurable goals to identify and close the gaps in health outcomes between Indigenous and non-Indigenous communities. Additionally, the Canadian Pediatric Society (2014) has issued a call to address systemic barriers that negatively impact Indigenous children and enhance cultural safety in health care and support. Addressing these calls to action is imperative for increasing integration of cultural knowledge and practices into pediatric healthcare.

In collaboration with family and cultural advisors, our research team aims to pursue collaborative, patient-orientated research. Together, our priority is to engage Indigenous families to identify priorities for health care and support that is inequity-responsive, culturally safe, and trauma-informed. As one part of a two-phase study, the purpose of this qualitative study is to explore the experiences of Indigenous family caregivers navigating healthcare for their child with LLIs/LTIs. The findings will, in part, inform the development and testing of a symbol-based support intervention. Indigenous culture utilizes symbol-based arts such as visual art, drumming, storytelling, and journaling, to promote healing in all realms of wellness (Wright et al., 2016). Therefore, this research aligns with Indigenous research principles and employs a trauma-informed approach to produce awareness of Indigenous families' experiences. The knowledge obtained will support development of a meaningful culturally-based support intervention to promote safe, holistic pediatric healthcare.

### **Go, Dog. Go! A rehabilitation dog for walking and balance training for children living with cerebral palsy.**

**Valerie Caron, Alison Oates, Colleen Dell, Joel Lanovaz, Sarah Oosman, Romany Pinto, Sarah Donkers.**

Cerebral palsy (CP), caused by a brain injury prior to, during, or shortly after birth, is the most common neurological condition to limit gross motor function in childhood. Only half of children living with CP can safely walk independently, directly impacting participation in peer-groups and independent community engagement. Current evidence, and advice from our patient and family advisors, prioritizes innovation to motivate and promote adherence for walking and balance interventions, thus enhancing the ability of children living with CP to participate with peers and their community. Animal-assisted interventions (AAs) are unique rehabilitation options for improved walking and balance, social functioning, and psychological wellbeing. Dog-specific AAs are not well documented and impacts from AAs combined with the use of highly-trained and certified service dogs, such as rehabilitation dogs, have not been investigated.

Aim: To pilot a balance and walking AAI using a rehabilitation dog with ambulatory children living with CP; to explore participants' experiences and perspectives relating to the AAI; and to describe the effects on motivation, confidence, quality of life, and participation in age-appropriate activities.

Methods: 30 participants (8-18 years, CP, gross motor function classification system II-III) will be recruited. A baseline assessment (Week 0) followed by a 2-month waiting period will allow each child to act as their own control and account for high intra- and inter- participant differences. The pre-intervention assessment (Week 8) will be followed by an 8-week individualised physiotherapy intervention using the rehabilitation dog. A post-intervention assessment (Week 16) and follow-up assessment (Week 24) will be completed. At each assessment, participants will walk 10m with their typical walking aid and with the rehabilitation dog. Using inertial-movement sensors, electromyography, and clinical outcome measures, walking performance, neuromuscular control, balance control, and participant-reported outcomes will be evaluated. Participants and their families will describe their experience using multimedia which will inform the post-intervention interviews. Semi-structured interviews will discuss perspectives and experiences to identify impactful characteristics and themes of the AAI.

This project aligns with two Sustainable Development Goals: 3. Good Health and Well-being and 10. Reducing Inequalities. This intervention aims to directly improve well-being, remove barriers to accessing rehabilitation, and create long-term changes in overall health.

The proposed AAI is an innovative, collaborative and individualized approach that may promote adherence and influence enjoyment. These are critical in increasing participation in age-appropriate activities and supporting engagement with community, which are meaningful outcomes that impact quality of life and reduce inequalities.

## **Lightening Rounds – Resident PRESENTATIONS**

**1:30 - 2:00 pm**

### ***Incidence of pediatric eating disorders during Covid-19 in Saskatchewan***

**Astrid Lang, Netusha Thevaranjan, Ayisha Kurji, Oluwafemi Oluwole**

**Background** The COVID-19 global pandemic has had marked effects on mental health, including in pediatric populations. However, there has been little research done on the incidence, severity, and triggers for eating disorders in a pediatric population. In our centre, and nationally, clinicians have noted a trend towards increased eating disorder referrals.

**Hypothesis** The incidence of eating disorders among adolescents has increased during the COVID-19 pandemic. We also hypothesized that patients presented at a younger age and were more likely to require hospitalization.

**Methods** A retrospective chart review was performed comparing the first six months of the COVID-19 lockdown, March 15-September 15 2020 to the same period in 2019. Inclusion criteria included referrals to an eating disorder clinic and inpatient admissions to pediatrics or mental health services during the specified time. Data collected included age of symptom onset, triggers, comorbid mental conditions, and weight measures. Among hospitalized patients, orthostatic vital changes, need for NG feeds, length of medical stabilization and length of mental health hospitalization were included.

**Results** Overall, there were 11 patients from 2019 that met inclusion criteria compared to 25 in 2020. Of these, 2 required hospitalization in 2019 (18%) compared to 10 in 2020 (40%). Of patients seen in clinic, age of onset was 15.5 vs 13.8 ( $p=0.0528$ ). While the identified triggers varied and focused primarily on body image and peers, 5 patients in the 2020 cohort included COVID-19 as a contributor to the onset of their symptoms. Analysis of the data is ongoing.

**Discussion** Our preliminary results support national and international reports that eating disorder incidence has increased during COVID-19. Patients described loss of routine, worsened anxiety, and isolation as specific triggers related to the pandemic. Disruptions to daily life including school, sports, recreation, and relationships have had profound effects on the mental health of Canadian children. It is important for clinicians to screen for mental health conditions, including eating disorders at all available opportunities. Ongoing monitoring of this population is needed.

**Limitations** This is a single-centre study with a relatively low patient volume. Therefore, it is difficult to establish statistically significant trends. In addition, our methods did not include all patients who were seen during that period as many were referred outside of our specified dates. We also did not capture data on patients who may have been referred only to psychiatry.

### ***SARS-CoV-2 Infection in Pediatric Inpatients in Saskatoon, Saskatchewan.***

**Janell Lautermilch, Rupeena Purewal**

**Background:** The coronavirus disease 2019 (COVID-19) pandemic was declared March 11, 2020. Early literature reported mainly mild disease from the Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) in pediatrics. Infants are at an increased risk for severe disease compared to other age groups in pediatrics. Additionally, more severe disease is described with multi-system inflammatory syndrome (MIS-C) which occurs approximately 2 to 6 weeks following infection with SARS-CoV-2. A cohort study was completed to describe the characteristics of SARS-CoV-2 infection in pediatric inpatients.

**Methods:** This study includes descriptive statistics of a retrospective cohort of pediatric patients admitted to hospital in Saskatoon, Saskatchewan who were found to have SARS-CoV-2 infection. Cases were included if they had SARS-CoV-2 infection or MIS-C with molecular detection of SARS-CoV-2 or positive SARS-CoV-2 serology. Less than 20 patients were enrolled from March 11, 2020 to March 24, 2021.

**Results:** 50.0% of the cases enrolled were incidentally found to have SARS-CoV-2 infection and their admission occurred due to other medical reasons. 35.7% of the cases were due to acute infection with SARS-CoV-2. 40% of the patients with acute infection with SARS-CoV-2 required ICU admission and 60.0% required respiratory support. 60.0% of those admitted with SARS-CoV-2 were infants. There were two cases of probable MIS-C as per the World Health Organization (WHO) criteria. Both of these cases required treatment with IVIG, anakinra and aspirin.

**Conclusions:** Half of the children admitted to hospital with SARS-CoV-2 infection were admitted due to other diagnoses. Of those admitted due to acute infection with SARS-CoV-2, 60.0% were infants. Despite the limited sample size, the findings correlate with previous literature describing SARS-CoV-2 in pediatrics.

### ***Hypertension amongst pediatric patients with diabetes in Saskatchewan: improving detection and follow up***

**Madison Peaker, Mark Inman, Daphne Yau, Munier Nour**

**Introduction:** Diabetes mellitus (DM) is a chronic disease affecting many Canadian children and has long-term complications with marked morbidity and mortality. Up to 16% of adolescents with Type 1 DM and 11-33% of children and youth with Type 2 DM may present with or develop comorbid hypertension, which can amplify the risk of developing vascular complications in this population. The International Society for Pediatric and Adolescent Diabetes (ISPAD) recommends screening all children with diabetes yearly for hypertension to enable disease recognition and implement early management strategies. We conducted a retrospective quality improvement (QI) project to analyze whether pediatric patients with diabetes are being appropriately screened and managed for hypertension in our Saskatoon Pediatric Diabetes Clinic.

**Methods:** Data from clinic appointments between July 1, 2017 and June 30, 2019 were exported from the electronic medical record for analysis. The frequency of blood pressure (BP) measurements for patients with multiple encounters over the study period was assessed. BP results were analyzed using the 2017 AAP Hypertension Guidelines and categorized as normal, elevated, or stage 1 or 2 hypertension. Individual charts were reviewed for those patients with elevated and hypertension-range measurements, and the outcome of the screening was classified based on future measurements and follow-up plans.

**Results:** Data from 1558 diabetes clinic visits were collected from 563 patients between the ages of 1 and 18 years. 437 patients had multiple encounters over the study period and yearly screening was observed in 76% (330) of these patients. BP measurements were documented in 68% (1059) of patient visits. Elevated BP values were present in 21% (341) of visits, of which 47% (160) had no recorded improvement or planned further investigation, 44% (149) resolved with future assessment, 5% (17) had known hypertension at the time of the visit, and 4% (15) were referred for further evaluation or treatment. Preliminary assessments suggest younger patient age and diastolic hypertension may contribute to under-recognition of BP elevation.

**Conclusions:** We assessed the frequency and outcomes of screening for comorbid hypertension amongst patients in our Pediatric Diabetes Clinic in this QI project. Elevated blood pressure results were identified in a large number of clinic patients, with many lacking recorded normalization or clear follow-up plans. Based on this preliminary data, we will further assess characteristics of the visits where elevated blood pressure was not acknowledged, in order to target interventions on improving clinician recognition and follow up strategies to optimize patient outcomes.

### ***Autism spectrum disorders in Saskatchewan. Referral pattern and diagnostic rate from 2016 to 2018***

**Olivier Legault & Ruth Neufeld**

Autism spectrum disorder is a neurodevelopmental disorder with increasing prevalence in North America. According to recent information from the Public Health Agency of Canada, the 2015 prevalence rate for ASD in Canada is 1 in 66 based on information from six provinces. (Public Health Agency of Canada, 2018) No information is available on the prevalence rates in Saskatchewan.

The time-consuming and resource sensitive diagnostic process of ASD include a referral from an allied health professional and a full multidisciplinary team assessment. Almost half of the referral for ASD will not conclude to an ASD diagnosis. (Baio, Wiggins, & Christensen, 2018) Few researches have assessed the pattern of referrals in relation to a diagnosis of ASD. (Ip, Weikum, & Lanphear, 2018) This study aims to identify the profile of referrals associated with a diagnosis of ASD by conducting a retrospective chart review including all Saskatchewan children referred to and assessed for ASD from 2016 to 2018 through the Alvin Buckwold Child Development Program (ABCDP). A better understanding of this will help predict likelihood of a diagnosis of ASD based on the referral source. This could have an impact on prioritization of referrals which would lead to a decreased in wait times to obtain a diagnosis. A negative association will help deliver education about ASD.

### ***HMGB1 protein as a predictor of clinical course and treatment in children with multisystem inflammatory syndromes***

**Poonam Jariwala, Mehul P. Jariwala, Rupesh U. Chawla, Tanya Holt, George Katselis, Kate M. Neufeld, Trent Kehrig, & Alan M. Rosenberg**

**Background:** Elevated high mobility group box 1 protein (HMGB1) levels in blood induce downstream pro-inflammatory mediators leading to systemic inflammatory syndromes. Elevated HMGB1 levels occur in infections, including coronavirus infections. Children with Kawasaki disease (KD) have higher HMGB1 levels than those with sepsis or systemic Juvenile Idiopathic Arthritis (sJIA). HMGB1 single nucleotide gene polymorphisms (SNPs) are associated with worse KD outcomes and resistance to therapy, and HMGB1, and certain of its isoforms, are elevated in macrophage activation syndrome (MAS). Our ongoing studies suggest higher HMGB1 levels in SARS-CoV-2-exposed animals.

**Objective and Hypothesis:** This study's objective is to demonstrate that HMGB1 can serve as a biomarker for predicting, diagnosing, and monitoring disease course and treatment response in children with multisystem inflammatory syndromes. Further, this study will determine if presence of specific HMGB1 isoforms and SNPs is associated with disease severity. The study aims to determine, in children with KD, sJIA, MAS, and COVID-related multisystem inflammation (MIS-C), if: 1) HMGB1 levels are elevated 2) Having high levels of HMGB1 and certain HMGB1 isoforms predict a severe disease course 3) Certain SNPs of the HMGB1 coding gene are associated with a greater likelihood of KD, MAS, sJIA, or MIS-C and 4) Having specific HMGB1 isoforms and HMGB1 SNPs predict treatment responses.

We hypothesize that pediatric patients with multisystem inflammation and elevated levels of HMGB1, SNPs that promote HMGB1 production, and those expressing specific HMGB1 isoforms will have more severe multisystem inflammation.

**Participants and Methods:** This is a group comparison study that will include children (<18 years old) with multisystem inflammation. Hospitalized children from Saskatoon and Vancouver with multisystem inflammation will be studied. Twelve study participants in each of the following five cohorts (60 participants total) will comprise the study population 1) KD 2) sJIA 3) MAS 4) MIS-C, and 5) Sepsis, all diagnosed according to established criteria. HMGB1 and targeted HMGB1 SNP analysis will be detected by immunoblotting and enzyme immunoassays, and by TaqMan SNP genotyping, respectively. Tandem Mass Spectrometry will identify HMGB1 isoforms.

**Progress:** Six participants have been enrolled to date. Data generated from this present study will be augmented by HMGB1 data from KD, sJIA, and sepsis pediatric patients collected during an earlier, proof-of-concept iteration of this research.

**Significance:** Ascertaining HMGB1 levels in pediatric multisystem inflammatory syndromes is expected to help diagnose and predict disease progression and treatment responses, and support the rationale for developing biologically-based therapies that target HMGB1.

### ***Fatal disseminated varicella and measles vaccine strain infection in a one year-old child with unsuspected IL-7R severe combined immunodeficiency (SCID)***

**Ruchika Sharma, Kayla Parker, Ben Tan, Anna Donovan, Matthew Bradshaw, Luis Marguia Favela, Candace Rypien, Sneha Suresh**

Severe Combined Immunodeficiency (SCID) is a life-threatening condition which predisposes patients to severe viral, bacterial, fungal opportunistic infections. We present a previously asymptomatic, unsuspected case of SCID who presented with disseminated varicella due to the vaccine virus strain infection during the second year-of-life.

A previously healthy boy presented in Regina with new lesions on his face, trunk and arms. He was found to have a varicella infection and he was treated with five days of oral Acyclovir. Despite this, his infection progressed to bilateral pneumonia in addition to his skin lesions with ongoing IV Acyclovir and antibacterial coverage.

Upon review of his immunization records, it was noted he received his first measles-mumps-rubella-varicella (MMRV) and meningococcal conjugate C (Men-CC) vaccines at 14 mos-of-age (26 days prior to onset of this illness). Because his rash developed within 42 days of the MMRV dose, his positive NPS/swabs were sent to the National Microbiology Lab where it was confirmed the infection was due to the Oka vaccine strain, and not circulating wild-type strain. He was also incidentally found to have infection of the vaccine strain of measles (genotype A).

He was subsequently admitted to Saskatoon where his infection worsened and he was found to have CSF infection with varicella and PJP pneumonia, requiring admission to the PICU. Despite ongoing treatment, his infection was difficult to control ultimately leading to respiratory failure and he was transferred to the Alberta Children's Hospital for consideration of bone marrow transplant. There, it was decided he would receive a BMT from his Father (6/10 match). Unfortunately, despite this, two weeks post-transplant he developed disseminated pneumonia and respiratory failure requiring ECMO for which he was transferred to the Stollery in Edmonton. He developed multiorgan failure and eventually succumbed to his infection.

This case clearly points to the importance of having newborn screening, as the patient's newborn blood blot would have identified SCID before the routine one year-old live vaccination. Further, diagnosis at an earlier age can prevent irreversible organ damage from recurrent infections, and more successful outcome from stem cell transplantation. The widely available newborn screen for SCID looks for presence of TREC which is a marker of naive T-cell receptor rearrangement which identifies many but not all variants of SCID. If newborn screening had been available for this case, it would have prevented this severe varicella vaccine infection, prolonged stay in the PICU, and possibly his subsequent death.

## **Long PRESENTATIONS**

**2:05-2:15 pm**

### ***Assessing the Clinical Impact of Changing the Indications for Fetal Echo Screening for Congenital Heart Disease in Saskatchewan***

**Carissa McGuin, Jennifer Wong, Erin Barbour-Tuck, Glennie Lane, Jocelyne Martel, Kristine Mytopher, Lara Wesson, Adewumi Adenlawo, George Carson, Ashok Kakadekar, Gitanjali Mansukhani, Tim Bradley**

**BACKGROUND:** Congenital heart disease (CHD) is the leading cause of infant mortality due to birth defects. Prenatal diagnosis of CHD using fetal echocardiography (ECHO) has many benefits including assessment of the optimal site for delivery and reduced costs to the healthcare system regarding treatment and transportation. The indications for fetal ECHO screening for CHD in Saskatchewan were changed in 2017 to include an additional intermediate level with fetal ECHO indicated only if initial screening by obstetric ultrasound was abnormal. The aim of this study was to assess the effect of these changes on the prenatal diagnostic rates of CHD in Saskatchewan.

**METHODS:** All fetal ECHOs performed in Saskatchewan for 3-years before (1Jan2014-31Dec2016) and after (1Jan2017-31Dec2019) these changes in Fetal ECHO indications were introduced, were identified from our existing ECHO databases and electronic medical records. Data was collated on: indication for fetal ECHO; maternal age, place of residence and postal code; other maternal factors such as gravidity and parity, obstetrical history, medical history and medications, cigarette, alcohol and drug use during pregnancy; gestation at the time of fetal ECHO; fetal ECHO diagnosis; and the fetal management plan and recommendations after delivery.

**RESULTS:** Women undergoing fetal ECHO screening before (N=567) compared with after (N=597) these changes were introduced were of similar age (30.3±7.4 vs. 30.2±6.4 years, p=0.858) and at similar gestation (28.2±8.6 vs. 28.2±7.4 weeks, p=0.988). Maternal and fetal factors also appeared similar, other than maternal diabetes as the indication for fetal ECHO (14% vs. 10%). This is likely due to maternal pre-existing diabetes with good control (HbA1c <7% at conception) being changed to an intermediate risk indication. The percentage of cardiac abnormalities / CHD detected at fetal ECHO remained similar (50% vs. 49%).

**CONCLUSIONS:** Introduction of an intermediate level of indications for fetal ECHO does not appear to have significantly affected prenatal diagnosis of CHD in Saskatchewan. This has important resource implications for the limited provincial availability of fetal ECHO.

**FUTURE DIRECTIONS:** To determine the clinical impact on the actual prenatal diagnosis rates of CHD, cases detected by fetal ECHO vs. postnatal ECHO still need to be matched from a previous retrospective review of all children born with CHD in Saskatchewan over this study period. This data is being used to inform healthcare resource planning in the development of a provincial Fetal ECHO Program to ensure all women in Saskatchewan receive optimum care independent of geographical location or socioeconomic demographics.

**2:15-2:25pm**

### ***Effects of Congenital Heart Disease Lesion Subtypes on Growth Trajectory in Middle Childhood***

**Kylee Kosokowsky, Megan Gallagher, Erin Barbour-Tuck, Gitanjali Mansukhani, Scott Pharis, Charissa Pockett, Tim Bradley.**

Sustainable Development Goals

3. Good health and well-being

16. Peace, justice, and strong institutions

**BACKGROUND:** Growth trajectories of children with congenital heart disease (CHD) have been shown to differ from those of healthy children. Children with CHD tend to be shorter, and weigh less than their healthy peers, but after surgical correction experience a rapid period of catch up growth. This rapid growth, in addition to other common risk factors such as sedentary lifestyle, high caloric diet, and obesity may predispose children with CHD to cardiovascular disease. The aim of this study was to compare the growth trajectories for height, weight and body mass index (BMI) for different CHD subtypes through middle childhood (7-12 years).

**METHODS:** Data were abstracted on sex, birth weight, birth height, CHD diagnoses, dates and types of cardiac surgeries and interventions, all available serial weights and heights; and BMI were calculated. Exclusion criteria were prematurity < 32 weeks, or any genetic, chromosomal syndromes or other multisystem disease known to affect growth trajectory.

**RESULTS:** The 7 CHD subtype groups included 17 coarctation of the aorta (median age at repair 2.5 [range 0.11 to 72.4] months), 15 transposition of the great arteries (median age at repair 0.4 [range 0.2 to 2.4] months); 19 tetralogy of Fallot (median age at repair 6.3 [range 1.3 to 21.5] months), 9 complex CHD with biventricular repair (median age at repair 3.8 [range 0.4 to 62.4] months), 17 complex CHD with single ventricular palliation (median age at Fontan completion 34.3 [range 29.9 to 49.9] months), 12 ventricular septal defects repaired (median age at repair 32.2 [range 3.5 to 136.2] months) and 13 ventricular septal defects not repaired. The mean number of visits was 4±4 with a mean duration of follow-up for all 102 CHD subtypes of 3.1±1.9 years.

The mean growth trajectory of all CHD subtypes for weight was 3.9±2.0 kg per year, for height was 5.9±1.2 cm per year, and for BMI was 0.5±1.0 kg/m<sup>2</sup> per year. The growth trajectories for weight, height, and BMI over the duration of follow-up were similar for each of the other CHD subtypes compared with ventricular septal defects not repaired.

**CONCLUSIONS:** Growth trajectories for weight, height, and BMI over middle childhood for children with CHD were similar for complex compared with simple CHD subtypes. Generating growth curves for each CHD subtype using multi-level modelling and long-term follow-up, will be important to determine the effect of rapid catch-up growth for more complex CHD subtypes on future risk of obesity and cardiovascular disease.

**2:25-2:35 pm**

### ***Deficits in bone micro-architecture and lower bone strength in children and adolescents with type-1 diabetes: a systemic review and meta-analysis***

**Mahdi Rostami Haji Abadi, Yuwen Zheng, Zahra Ghafouri, Suelen Meira Goes, J.D. Johnston, Munier Nour, Saija Kontulainen**

**Introduction:** The elevated risk of fracture in children and adolescents with type 1 diabetes (DM1) might be related to a weaker bone structure. A previous systematic review reported lower bone mass in children with DM1; however, no systematic reviews or meta-analyses have synthesized the evidence of bone micro-architecture and strength differences between children with DM1 and typically developing children (TDC). We aimed to systematically review studies comparing bone micro-architecture and strength between children with DM1 and TDC using quantitative meta-analysis and qualitative synthesis. **Methods:** We searched articles published until July 2020 through a comprehensive search in MEDLINE, Embase, CINAHL, Web of Science, Scopus, Cochrane Library databases. We report standardized mean differences (SMD) from the meta-analyses comparing bone outcomes reported in ≥ 3 studies and assessed heterogeneity using I-square. We evaluated bone outcomes reported in 1-2 studies using qualitative synthesis. **Results:** We included 11 studies in the systematic review which assessed 675 children and adolescents with DM1. Nine studies were included in the meta-analysis. Children with DM1 had lower trabecular bone mineral density (SMD = -0.51; 95% CI, -0.81 to -0.21) and trabecular bone volume fraction (BV/TV) (-0.34; -0.58 to -0.11) at the distal radius as well as lower BV/TV (-0.39; -0.61 to -0.16) and trabecular thickness (-0.42; -0.68 to -0.15) at the distal tibia (p < 0.05). There was no evidence of heterogeneity between the studies (p > 0.05). Our qualitative synthesis suggested that children with DM1, when compared to TDC, had 8-17% lower bone strength (density-weighted polar section) at the radius and tibia shafts, 7-11% lower BV/TV and trabecular number with 13% greater trabecular separation at the proximal tibia. Cortical density was 3% lower at the lumbar spine when compared to TDC.

**Conclusion:** This meta-analysis indicated that children with DM1 have deficits in trabecular bone micro-architecture at the distal radius and tibia. Evidence (albeit limited) also suggested that children with DM1 have lower bone strength at the radius and tibia shafts as well as deficient trabecular micro-architecture at the proximal tibia. Importantly, bone micro-architecture and strength deficits may contribute to the elevated risk of fracture in children with DM1. Future studies with advanced imaging, are warranted to monitor bone development and develop evidence-based therapies for the prevention and treatment of bone fragility in children with DM1 as well as inform updates of clinical guidelines to optimize bone health in children with DM1.

**2:35-2:45 pm**

### ***Lower Bone Mineral Mass and Areal Bone Mineral Density in Children with Type 1 diabetes – A Systematic Review and Meta-analysis***

**Yuwen Zheng, Mahdi Rostami Haji Abadi, Zahra Ghafouri, Suelen Goes, Munier Nour, Saija Kontulainen**

**Introduction:** Higher fracture risk in children and adolescents with type 1 diabetes (DM1) may relate to deficits in bone mineral mass and density. There are no up-to-date meta-analyses comparing bone mineral mass (BMC) and areal bone mineral density (aBMD) between children with DM1 and typically developing children (TDC).



Therefore, our 1<sup>st</sup> objective was to perform a systematic review and meta-analysis comparing BMC and aBMD between children and adolescents with DM1 and TDC. Our 2<sup>nd</sup> objective was to assess if diabetes related factors (e.g., disease duration) would explain differences in bone outcomes. Methods: We identified and included studies in this systematic review and meta-analysis through a comprehensive search in MEDLINE, Embase, CINAHL, Web of Science, Scopus, Cochrane Library (inception to July 9, 2020) databases. Search terms included *children* OR *adolescents* AND *type 1 diabetes* AND *bone*. For the current analyses, we identified studies comparing dual energy x-ray absorptiometry (DXA)-derived BMC and aBMD outcomes between children with DM1 and typically developing controls. We report significant ( $p < .05$ ) standardized mean differences (SMD) from the meta-analysis (1<sup>st</sup> objective). We also report significant ( $p < 0.05$ )  $\beta$ -coefficients between diabetes related factors (disease duration and HbA1c level) and the pooled SMD between-group total body and lumbar spine aBMD from meta-regression analyses (2<sup>nd</sup> objective). Results: We included 27 studies with 1690 children and adolescents with DM1 and 1899 TDC. Children with DM1 had lower aBMD in total body, lumbar spine and femoral neck (SMD = -0.2 to -0.3,  $p < .05$ ), and lower BMC in total body and lumbar spine (SMD = -0.2,  $p < .05$ ). Longer disease duration was associated with a larger between group difference in total body aBMD ( $\beta = 0.3$ ,  $p < .05$ ). Conclusion and Relevance: This meta-analysis indicated deficits in BMC and aBMD in children and adolescents with DM1. Longer DM1 duration contributed to the larger deficit in total body aBMD in children with DM1. Bone deficits associated with DM1 may contribute to the increased risk of fracture and will require attention in both clinical research and guidelines to optimize bone development in children with DM1.

2:45-2:55pm

### ***Vibrio cholerae* infection related to Saskatchewan lake exposure**

**Astrid Lang**, Ben Tan, Maurice Hennick, Mohey Alawa, Joseph Blondeau, Amanda Lang, Jessica Minion, Kathy Malejczyk

Intro We present 2 cases of *Vibrio cholerae* infection in pediatric patients with non-gastrointestinal diseases after exposure to Saskatchewan lakes.

Patient 1 is a 12 year old girl who presented in August with dysuria and hematuria. She received a course of nitrofurantoin with resolution of symptoms. Urine culture was positive for non-O1, non-O139 *Vibrio cholerae*. There was no history of recent travel outside of Canada. However, the patient had water-skied at a lake her family frequents in eastern Saskatchewan. Since ascending urethral spread may have occurred whilst in lake water, we requested that lake water samples be tested. Three samples were positive for four strains of *V. cholerae*. By whole genomic sequencing, these and the original UTI strain were not identical.

Patient 2 is an 8 year old boy who developed pustular lesions on his trunk and left calf in June. Truncal lesions cleared rapidly, but the left calf's persisted despite amoxicillin treatment. It became a deep-seated abscess four months later, in October. Pus was drained, and culture was positive for *V. cholerae*. This boy also had no travel outside Canada, but spent the whole summer at the lakeside family cabin in southeastern Saskatchewan. We similarly requested lake water samples be collected. Unfortunately, the cultures were negative; this was in late October when ambient and water temperatures had dropped.

Discussion *Vibrio* are Gram-negative bacteria commonly found in coastal sea water, but can survive in freshwater(1-3). It may contaminate water or food sources. Person-to-person spread is by fecal-oral route. While its toxin causes secretory diarrhea, non-toxin strains cause non-gastrointestinal infections such as UTI, necrotizing skin infections and sepsis(4,5).

Saskatchewan has 5-10 cases annually, mostly from food poisoning by *V. parahaemolyticus*; finding *V. cholerae* is unusual. Although it has been found in northern European lakes, *V. cholerae* has never been reported in Canadian lakes(6).

We confirmed it in one of two lakes, and the genomic divergence of the five strains suggests there has been in the lake long enough for mutations to occur. Alternately, different strains may have been spread by water fowl(7). *V. cholerae* is difficult to grow from cold water, so summertime studies will be needed to determine how common it is in Saskatchewan lakes. Conclusion A history of lake water exposure with possibility of *Vibrio cholerae* should now be in the differential of persons with non-gastrointestinal infections during the Saskatchewan summertime.

2:55-3:05pm

### ***Bone health in adolescents with type 2 diabetes***

**Poonam Jariwala**, Marta Erlandson, Munier Nour

Introduction: The prevalence of type 2 diabetes (T2D) has increased alongside the global obesity epidemic. While once considered a disease of adulthood T2D is being diagnosed at an increasing rate in children and adolescents. Adults with T2D have been found to have an increased fracture risk without reductions in bone density. As type 2 diabetes is a relatively new entity in adolescents, the effect on bone density and microarchitecture are currently unknown.

Objective: The primary objective of this study was to examine the bone microarchitectural properties of adolescents with T2D compared to a healthy reference population.

Methods: A prospective cross-sectional pilot study was conducted. Participants were recruited from the Pediatric Diabetes clinic in Saskatoon, Canada and compared with a previously published healthy pediatric reference sample (Gabel et al, 2018). Anthropometric measurements, medical record review, questionnaires, and HR-pQCT scans of the non-dominant radius and tibia were obtained for each T2D participant and compared to reference data. Microarchitecture variables in females with T2D were compared with sex specific healthy reference values using independent sample t-tests.

Results: 5 participants with T2D (4 female) were recruited with a mean age of  $14.5 \pm 2.3$  years (range 10.4-16.3), duration of diabetes  $19 \pm 15.7$  months (range 3 - 36), BMI  $32.7 \pm 7.3$  kg/m<sup>2</sup> (range 22.4-40.1), and A1C  $8.6 \pm 3.9$  % (range 5.4-13.1). At the distal tibia, females with T2D had a significantly greater *total area* but lower *trabecular bone volume fraction* and trabecular thickness compared to the health reference sample (+11%, -17%, and -15%, respectively;  $p < 0.05$ ). At the radius, trabecular bone volume fraction, trabecular thickness were lower but trabecular number was higher in the females with T2D compared to the reference population (-9%, -16% and 7%, respectively;  $p < 0.05$ ).

Conclusion: HR-pQCT was used in this pilot study to examine bone density and microarchitectural properties, in a small cohort of adolescents with T2D and compared with a healthy reference population. Statistically significant differences in bone microarchitectural properties in females with T2D were found, specifically in the trabecular compartment. These findings suggest that bone development may be impaired in female adolescents with T2D. Future studies with a larger cohort are required to confirm our findings and will help us understand the clinical relevance of the differences noted.

## Award for Best Research Photo

### *Atretic Encephalocele Mimicking Ectopic Lips*

Astrid Lang, Kaarthigeyan Kalaniti, Veronica Samedi, Julia Radic

A term baby was admitted to the NICU after an uneventful pregnancy and birth due to an unusual scalp lesion over occipital bone. On neuroimaging, a low-lying torcula was noted with communication through the bone. The scalp lesion was circular, skin-colored and hairless, over the occiput medially with a tuft of hair in the margins. (Figure) To the left of the lesion there was a small hole, raising concerns for a possible dermal sinus tract. A preop diagnosis of an atretic encephalocele (a rare type of neural tube anomaly) was made. Prior to 1-year of life, the patient underwent resection of the lesion and closure of dermal sinus tract both to minimize risk of meningitis and for cosmesis. Final surgical pathology did not find any evidence of a dermal sinus tract. The patient recovered fully with no existing neurologic concerns.



# Thank you

Our Presenters

Our Judges

The Department of Pediatrics, Research Office

The College of Medicine, University of Saskatchewan

The Jim Pattison Children's Hospital Foundation of Saskatchewan

SPRING (Saskatchewan Pediatric Research and Innovation Group)

For comments, suggestions, or more information on child health research at USask, please contact Tova Dybvig, Pediatric Research Facilitator, [tova.dybvig@usask.ca](mailto:tova.dybvig@usask.ca) or Oluwafemi Oluwole, Pediatric Resident Research Coordinator, at [oluwafemi.oluwole@usask.ca](mailto:oluwafemi.oluwole@usask.ca)