SASK KIDS PEDIATRICS
UNIVERSITY OF SASKATCHEWAN

Department of Pediatrics Research Report

MAY 2017

spring
SASKATCHEWAN PEDIATRIC RESEARCH AND INNOVATION GROUP

Dr. Krista Baerg, Principle Investigator, Chronic Pain Network, and Casey McMahon, local CPN research coordinator.

Inside This Issue

Online viewing

Chronic Pain Network

Dr. Krista Baerg and Casey McMahon

The Chronic Pain Network (CPN) is one of five chronic disease networks funded by the Canadian Institutes of Health (CIHR) Strategy for Patient-Oriented Research (SPOR). The CPN is a collaboration of patients, researchers, healthcare professionals, educators, industry, and government policy advisors.

The Clinical Research Network (CRN) is a national network of pain centres within the CPN. With more than half of the research coordinators now in place, activity at the 12 (4 pediatric) CRN sites is ramping up. The CRN has received interest in utilizing CRN sites for both Chronic Pain Network projects, as well as several external projects. In the next few months, the remainder of the coordinator positions will be filled and the CRN sites will be seeking opportunities to further make use of this resource. Saskatoon Heath Region's Interdisciplinary Pediatric Complex Pain Clinic is one of the 4 pediatric clinical research units and Dr. Krista Baerg is the local principal investigator. Casey McMahon recently joined the Saskatchewan CPN team as our local CPN research coordinator.

Our local site will be launching a Canadian Surveillance Study of Complex Regional Pain in Children and Youth using the established methodology of the Canadian Paediatric Surveillance Program. Co-principal investigators along with Dr. Baerg include Dr. Susan Tupper (Strategy Consultant, Pain Quality Improvement and Research) and Dr. Allen Finley from the IWK Health Centre. In addition, our site along with the 3 other pediatric sites have recently received CIHR funding for a national Patient Engagement registry to guide research in pediatric chronic pain. The 4 pediatric CRN sites will be working with patients as partners to identify priorities to improve health outcomes, identify new treatments, and deliver more effective healthcare for pediatric patients with chronic pain.

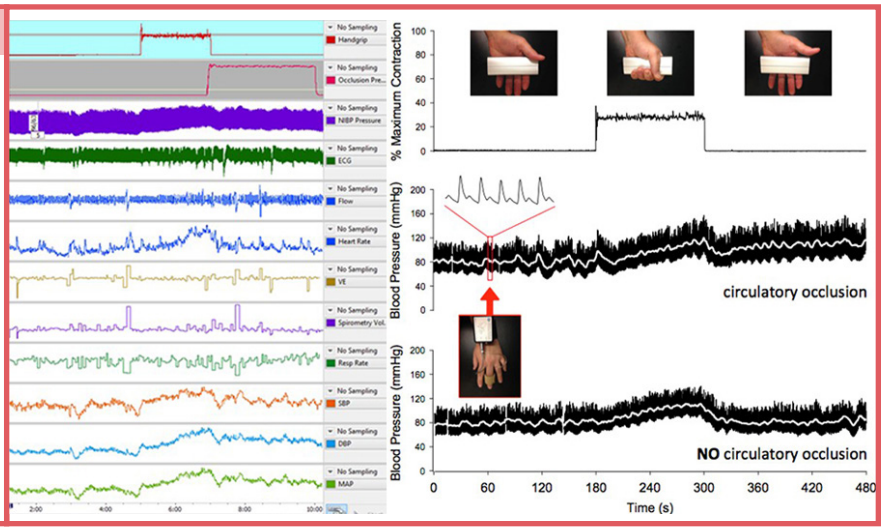
Chronic pain is common in children and adults. Approximately 20% of Canadian children and adults have chronic pain, and 5% of children and youth experience pain that interferes with schoolwork, social development, and physical activity. Headaches, stomach aches, muscle pain, joint pain, and back pain are most common. Chronic pain affects both girls and boys, but

continued on P3...

Image of Interest

Demonstration of the multiple physiological signal acquisition approach used in the Tomczak Integrative Cardiovascular Physiology Lab (Kinesiology). The right panel illustrates a post-processed diagram generated from raw continuous blood pressure signals obtained by finger photoplethysmography (left panel; channel 3). Data was obtained on a child with hypoplastic left heart syndrome during isometric handgrip exercise (left panel; channel 1) followed by circulatory occlusion (left panel; channel 2). Heart rate by ECG (left panel; channel 4) and ventilation (left panel; channel 5) were also recorded. This data was collected as part of an experiment for MSc student Stephanie Fusnik (Kinesiology) in collaboration with Pediatric Cardiology. The purpose of the experiment was to study the role of autonomic function on vascular regulation in children with hypoplastic left heart syndrome during physiologic stress.

Submitted by Dr. Corey Tomczak, College of Kinesiology, and the the Children's Healthy-Heart and Activity Monitoring Program of Saskatchewan (CHAMPS) investigators. Research support from the Children's Hospital Foundation of Saskatchewan.



This issue of The Pediatric Research Report is sponsored by The Saskatoon Hub City Optimist Club

Visual Abstracts

Erin Prosser-Loose

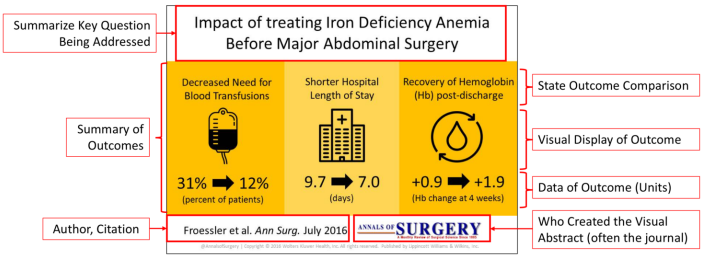
Visual abstracts are a relatively new tool for use in dissemination of research manuscripts, typically online among social media. They are a simple, visual representation of the main findings of a research publication, reflecting what is normally seen in the written abstract. Visual abstracts are not a replacement for written abstracts, but rather are meant to be an eye-catching, quick summary of a paper's findings, that can be easily perused by potential interested readers. The visual component not only is attractive and attention-grabbing, but also allows for better dissemination among social media, as there is evidence that in general, posts with graphics are clicked on and shared, significantly more than non-visual, text-only posts.

Dr. Andrew Ibrahim, MD, MSc, is a Clinical Lecturer in Surgery at the University of Michigan and a Robert Wood Johnson Clinical Scholar at the Institute for Healthcare Policy & Innovation, and is the creator of the visual abstract concept. Dr. Ibrahim is the Creative Director of the journal *Annals of Surgery*, which recently adopted the use of visual abstracts for dissemination among the journal's social media channels. Currently, 15 journals are using visual abstracts for this purpose, with *Stroke* requiring the submission of a visual abstract for basic science manuscripts.

Dr. Ibrahim performed a prospective, case-control, crossover study to determine whether dissemination of visual abstracts through the *Annals of Surgery* Twitter account, had an impact vs. non-visual dissemination. Overall, they found a 7.7 fold increase in impressions ("likes"), an 8.4 fold increase in retweets, and a 2.7 fold increase in article visits when visual abstracts were dissminated, vs. title of the manuscript alone. The group also collected feedback which indicated that for busy clinicians and researchers, visual abstracts provide a quick preview, allowing them to find relevant content quicker. (Ref: *AM Ibrahim et al. Visual Abstracts to Disseminate Research on Social Media: A Prospective, Case-control Crossover Study. Annals of Surgery, May 5 2017*).

Find more information and a primer on creating visual abstracts at Dr. Ibrahim's website, https://www.surgeryredesign.com/resources/. Below are the components of an effective visual abstract, taken from Dr. Ibrahim's primer.

COMPONENTS OF AN EFFECTIVE VISUAL ABSTRACT



See page 4 for visual abstracts developed for Department of Pediatrics members, by Erin Prosser-Loose, Pediatric Research Coordinator.

Featured Child Health Researcher

Dr. Corey Tomczak


Photo credit: SHRF

Dr. Corey Tomczak is an Assistant Professor in the College of Kinesiology. He completed his PhD and postdoctoral fellowship training at the University of Alberta through the Faculty of Rehabilitation Medicine and the Mazankowski Alberta Heart Institute. His PhD research employed an integrative physiology approach to examine reverse cardiac remodeling mechanisms associated with cardiac resynchronization therapy and exercise interventions in heart failure. To study the role of respiratory muscle fatigue in exercise limitation, his postdoctoral research examined the neural respiratory control of chest wall mechanics in healthy adults. These studies were published in the prestigious American Physiological Society journals (Journal of Applied Physiology, American Journal of Physiology Heart & Circulatory Physiology, and Journal of Neurophysiology).

Upon arriving at the University of Saskatchewan in January 2014, Dr. Tomczak established the Integrative Cardiovascular Research Lab where he continues to study exercise limitation mechanisms in heart failure and cardiovascular disease. He is currently investigating the pathophysiology of exercise intolerance in heart failure with preserved ejection fraction – work that is being led by graduate student Natasha Boyes in close collaboration with Drs. Calvin Wells, Darcy Marciniuk, Janine Eckstein and Stephen Pylypchuk. To further understand the role of autonomic dysfunction on cardiac control in heart failure, Dr. Tomczak is running a series of experiments that alter the sympathovagal balance of the autonomic nervous system while using non-linear modeling to quantify the kinetics of heart rate adaptation during exercise.

With an interdisciplinary team of investigators that includes Dr. Calvin Wells, Dr. Larry Brawley, and Dr. Ian Paterson (University of Alberta), Dr. Tomczak is leading a Saskatchewan Health Research Foundation Establishment Grant and a Heart & Stroke Grant-in-Aid funded interprovincial trial called EVADE (Early Versus Standard Access CarDiac Rehabilitation to Counter Ventricular RemodEling Post-MI). This work aims to establish the anti-cardiac remodeling benefits of commencing cardiac rehabilitation within 1-week of hospital discharge post-myocardial infarction compared to usual care (7 weeks post-hospital discharge).

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Our Partners: Children's Hospital Foundation of Saskatchewan

The Children's Hospital Foundation of Saskatchewan (CHFS) continues to provide strong and increasing support for child health research in Saskatchewan through its research granting program.

The CHFS has provided funding to support trainee research and the Child Health Research Trainee Day presentations which are highlighted in this issue of the Research Report.

Clinical Investigator Program (CIP) for Residents

The CIP at the University of Saskatchewan is available to residents enrolled in a Royal College accredited residency program who have interest and potential for a career as a clinician investigator or clinician scientist. CIP offers two streams: A Graduate stream for participants enrolled in a graduate (M.Sc. or Ph.D.) program, and a Postdoctoral Stream for residents who already hold a Ph.D. and are interested in undertaking a structured research program. For further information about CIP, please contact Dr. Alan Rosenberg, alan.rosenberg@usask.ca.

Chronic Pain

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is more common in girls and the peak age is 14 years. When pain continues beyond the time expected for healing, the term chronic pain is used. Because chronic pain is not fully explained by an underlying disease of the tissues where the pain is felt, treatment that targets the location of the pain alone is unlikely to be effective. Chronic pain results in more health utilization and lost productivity than cardiac disease and cancer combined.

The Saskatoon Health Region Interdisciplinary Pediatric Complex Pain Clinic serves Saskatchewan children age 6-18 with pain related disability referred by pediatric specialists. The pain clinic members provide an interdisciplinary assessment and in partnership with the child and family, develop a personalized care plan that incorporates a biopsychosocial approach. Pain clinic members include a general pediatrician, a physical therapist, a clinical health psychologist, and a nurse coordinator.

For more information on chronic pain in childhood, the Saskatoon Health Region Interdisciplinary Pediatric Complex Pain Clinic has resources for parents available at www.usask.ca/childpain/chronic/refs.html. In addition, information and tools for Canadians are available through the Canadian Pain Coalition (http://www.canadianpaincoalition.ca/) and the Pain Resource Center (http://prc.canadianpaincoalition.ca/en/index.html).

For more information about the Saskatchewan Clinical Research Network and the national Chronic Pain Network, contact Casey McMahon, cj.mcmahon@usask.ca or 306-844-1225.

Dr. Krista Baerg is an Associate Professor, Department of Pediatrics, U of S, and Principle Investigator of the CPN. Casey McMahon is the local CPN research coordinator.

Corey Tomczak

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Dr. Tomczak also began a strong collaborative relationship with Pediatric Cardiology soon after his arrival in Saskatoon. Along with community stakeholders, Drs. Tomczak, Marta Erlandson (Kinesiology), Kristi Wright (Psychology, University of Regina), Charissa Pockett, Scott Pharis and Ashok Kakadekar initiated a pilot health intervention study for children with congenital heart disease called CHAMPS (Children's Healthy-Heart and Activity Monitoring Program in Saskatchewan) that was funded by the Children's Hospital Foundation of Saskatchewan. CHAMPS was well received in the community and at academic conferences and has continued to flourish with its upcoming third summer camp, with the addition of Dr. Tim Bradley and further funding from the Children's Hospital Foundation (PI: Dr. Bradley). Related to the CHAMPS program, Stephanie Fusnik (Tomczak lab graduate student) recently completed an experiment in children with hypoplastic left heart syndrome post-Fontan operation to characterize the autonomic nervous system's regulation of vascular function during physiologic stress. Her findings revealed that the exercise pressor reflex is likely blunted in these children and may play a major role in exercise impairment. These recent findings have been submitted to the 2017 Canadian Cardiovascular Congress meeting for presentation.

In the coming years, Dr. Tomczak looks forward to continuing and expanding his collaborations with his Saskatoon Health Region/College of Medicine colleagues with the aims of better understanding the cardiovascular pathophysiology of exercise intolerance in heart failure and other cardiovascular diseases.

Dr. Corey Tomczak is an Assistant Professor in the College of Kinesiology, University of Saskatchewan.

Coming Events

JUN THU 1
Anesthesia and the Patient with Mucopolysaccharidosis
Dr. Cengiz Karsli
Pediatric Grand Rounds
11am-12pm
East Lecture Theatre RUH

JUN THU 8
Morbidity & Mortality
Dr. Vicki Cattell
Pediatric Grand Rounds
11am-12pm
East Lecture Theatre RUH

JUN THU 8
Mingling Minds Seminar Series
4:15-5:30pm
University Club
RSVP to erin.loose@usask.ca

JUN THU 15
TBA
TBA
Pediatric Grand Rounds
11am-12pm
East Lecture Theatre RUH

JUN THU 22
Pediatric Respirology
Johnathan Rayment
Pediatric Grand Rounds
11am-12pm
East Lecture Theatre RUH

JULY WED 19
Deadline:
College of Medicine Research Award (CoMRAD) Grant Applications

OCT TUE 17
Deadline:
SHRF Sprout Grant Applications
*See guidelines for earlier Relevancy Review Intake Deadlines

SEPT FRI 15
Deadline:
CIHR Project Grant Applications
*Registration Aug 15, 2017

Recent Publications & Presentations from U of S Child Health Researchers

· Barton M, Shen A, O'Brien K, Robinson JL, Davies HD, Simpson K, Asztalos E, Langley J, Le Saux N, Sauve R, Synnes A, **Tan B**, et al. Paediatric Investigators Collaborative Network on Infections in Canada (PICNIC). *Early-Onset Invasive Candidiasis in Extremely Low Birth Weight Infants: Perinatal Acquisition Predicts Poor Outcome.* Clin Infect Dis. 2017;64:921-927.

· **Bradley TJ,** Slorach C, Mahmud FH, Dunger DB, Deanfield J, Deda L, Elia Y, Har RL, Hui W, Moineddin R, Reich HN, Scholey JW, Mertens L, Sochett E, Cherney DZ. *Early changes in cardiovascular structure and function in adolescents with type 1 diabetes.* Cardiovasc Diabetol. 2016;15:31.

· **Hansen G,** Joffe AR. Confounding brainstem activity during pediatric brain death determination: two case reports. J Child Neurology. 2017;32:676-679.

· Nazemi SM, Amini M, **Kontulainen SA**, Milner JS, Holdsworth DW, Masri BA, Wilson DR, Johnston JD. *Optimizing finite element predictions of local subchondral bone structural stiffness using neural network-derived density-modulus relationships for proximal tibial subchondral cortical and trabecular bone.* Clin Biomech. 2017;41:1-8.

· Oen K, Guzman J, Dufault B, Tucker LB, Shiff NJ, Watanabe Duffy K, Lee JJY, Feldman BM, Berard RA, Dancey P, Huber AM, Scuccimarri R, Cabral DA, Morishita KA, Ramsey SE, **Rosenberg AM**, et al., Research in Arthritis in Canadian Children emphasizing Outcomes (ReACCh-Out) investigators. *Health-related quality of life in an inception cohort of children with Juvenile Idiopathic Arthritis: A longitudinal analysis.* Arthritis Care & Res. 2017; [Epub ahead of print].

· Palmero J, Dart AB, De Mello A, Devarajan P, Gottesman R, Guerra GG, **Hansen G,** Joffe AR,Manmen C, Majesic N, Morgan C, Skippen P, Pizzi M, Palijan A, Zappitelli M. *Biomarkers for early acute kidney injury diagnosis and severity prediction: A pilot multicenter Canadian study of children admitted to the ICU.* Pediatr Crit Care Med. 2017; [Epub ahead of print].

· **Rezaei E,** Hogan D, Trost B, Kusalik A, **Rosenberg AM,** for the BBOP Study Group. Biologically-based approach for classifying chronic childhood arthritis. ACR/ARHP Pediatric Rheumatology Symposium. Houston, Texas, May 17-20, 2017.

· **Wilson-Gerwing TD,** Panahifar A, Cooper DML**, Rosenberg AM.** Influence of age and sex on collagen-induced arthritis. ACR/ARHP Pediatric Rheumatology Symposium. Houston, Texas, May 17-20, 2017.

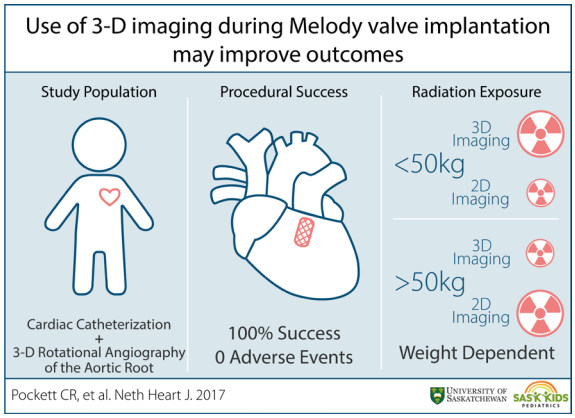
· **Wilson-Gerwing TD, Rosenberg AM.** Age-related differences in neuronal high mobility group box-1 and resolvin D1 receptors in collagen-induced arthritis. ACR/ARHP Pediatric Rheumatology Symposium. Houston, Texas, May 17-20, 2017.

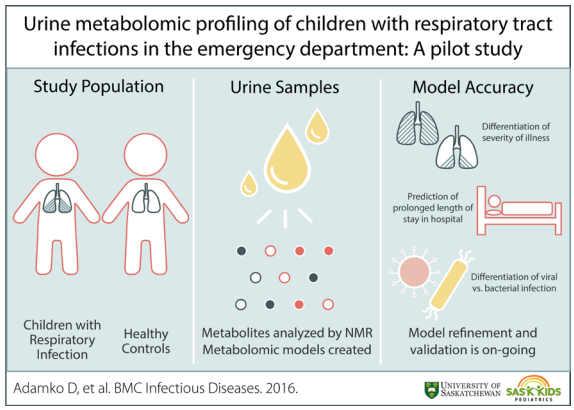
·**Yan Ng H, Rosenberg AM.** High mobility group box-1 protein in children with Kawasaki disease and systemic juvenile idiopathic arthritis. ACR/ARHP Pediatric Rheumatology Symposium. Houston, Texas, May 17-20, 2017.

Visual Abstracts

The following visual abstracts were developed by Erin Prosser-Loose, Pediatric Research Coordinator, for publications from Department of Pediatrics members, Dr. Charissa Pockett and Dr. Darryl Adamko.

We plan to feature a visual abstract in each upcoming edition of the Pediatric Research Report, so if you are interested in having a visual abstract developed for one of your publications, featured here, and shared on social media, please contact Erin at erin.loose@usask.ca.





Research Project Opportunities

"Relationship of ESR and CRP with inflammatory cytokine biomarkers"

Study format: Database analysis

Contact: Dr. Alan Rosenberg, alan.rosenberg@usask.ca

contact us

For more information about The Department of Pediatrics Research, SPRING, or to contribute content to The Department of Pediatrics Research Report, please contact:

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Next submission deadline is Sept15, 2017!

Online version of the newsletter:
www.medicine.usask.ca/pediatrics/research/newsletter

SPRINGSask

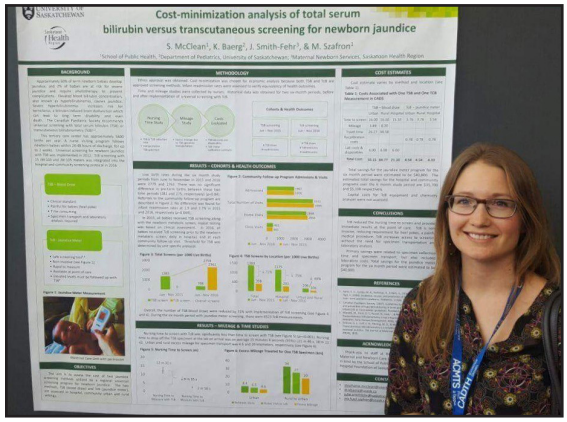
SPRINGSask

spring
SASKATCHEWAN PEDIATRIC RESEARCH AND INNOVATION GROUP

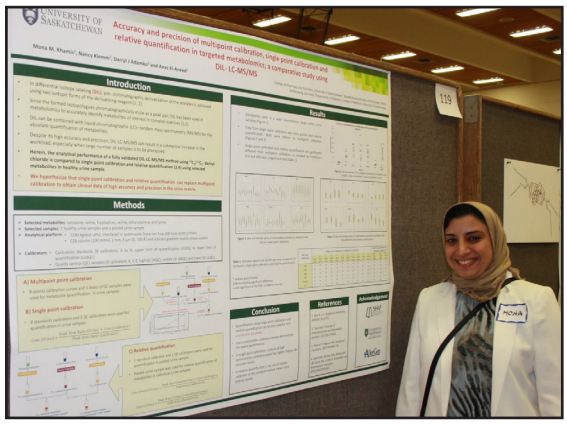
Congratulations!

Congratulations to the following students, whose projects involve Pediatric faculty, who won prizes for their poster presentations at the Life and Health Sciences Research Expo, held at the U of S, May 4-5th, 2017.

Stephanie McClean is a Master's student in the School of Public Health and is supervised by Dr. Michael Szafron (School of Public Health). The project was co-supervised by Dr. Krista Baerg (Pediatrics), and Julie Fehr-Smith (SHR Maternal Services). Stephanie won first place in the Community Health-General category, for her poster, "*Cost-minimization analysis of total serum bilirubin versus transcutaneous screening for newborn jaundice*".



Mona Hamada is a PhD student in the College of Pharmacy and Nutrition and is co-supervised by Dr. Darryl Adamko (Pediatrics) and Dr. Anas El-Aneed (Pharmacy). Mona won second place in the Novel Approaches category, for her poster, "*Accuracy and precision of multipoint calibration, single point calibration and relative quantification in targeted metabolomics; a comparative study using DIL-LC-MS/MS*".



YOUR OPINION PLEASE!

We would appreciate your opinion about the Department of Pediatrics Research Report and suggestions for future editions.

Please complete a brief survey at:
https://www.surveymonkey.com/s/NQVV6SB.
Thank you!

The Children's Health Research Trust Fund (**CHRTF**) was established in 1983 to help raise funds to support child health research at the University of Saskatchewan. As all donated funds are endowed, the CHRTF has continued to grow to become an important partner in helping advance research in the Department of Pediatrics. For further information about the CHRTF: **http://www.medicine.usask.ca/pediatrics/research/CHRTF.** To Donate to the CHRTF: **http://give.usask.ca/online/chrtf.php**

Children's Health Research TRUST FUND

Child Health Research Trainee Day Abstracts

The Department of Pediatrics held the annual Child Health Research Trainee Day on March 23rd, 2017. We had a total of 23 presentations this year, which was a record number. Pediatric residents, graduate students, post-doctoral fellows, and undergraduate students, from diverse fields such as Pediatrics, Kinesiology, Nutrition, Pharmacy, Nursing, Veterinary Medicine, and Community Health and Epidemiology, all presented their research, followed by questions and discussion from the audience of peers and faculty.

HON YAN NG, STEFAN SLOMP, TRACY WILSON-GERWING, JOAN DIETZ, ABID LODHI, TANYA HOLT, ALAN M. ROSENBERG

High mobility group box 1 protein in children with Kawasaki disease and systemic juvenile idiopathic arthritis

Background/Purpose: High Mobility Group Box 1 Protein (HMGB1) is a nuclear protein that stabilizes DNA and modulates gene expression. In sepsis and in certain other systemic inflammatory conditions HMGB1 is released extracellularly to mediate an array of cell signaling pathways that promote downstream release of pro-inflammatory cytokines. Elevated blood levels of HMGB1 are found in association with sepsis and a variety of conditions characterized by systemic inflammation. The purpose of this study was to determine if HMGB1 levels could serve as a discriminating biomarker in early Kawasaki Disease (KD) compared to new onset systemic juvenile idiopathic arthritis (sJIA).

Methods: Children (age ≤ 16 years) with KD and, for comparison, those with sepsis (systemic inflammatory response syndrome or bacteremia) and other non-infectious/non-inflammatory conditions were prospectively enrolled at the time of hospital admission. Prospectively collected data from new onset, treatment naive sJIA participants were derived from the BBOP Study (Biologically-based Outcome Predictors in JIA; www.bbop.ca). Blood was collected in P100 vacutainers (BD) and plasma stored at -80C until assayed. HMGB1 was measured in duplicate (1:100 dilution) by enzyme immunoassay (Biomatrix). Inter-group differences were compared by independent samples t tests and correlations by Pearson correlation coefficients.

Results: The study population comprised 70 participants (Table). HMGB1 levels were significantly higher in KD compared to sJIA (t= 4.19; p<.001; CI= 310-892) and to patients with other conditions (t=2.89; p=.009; CI=140-875) but were not different from HMGB1 levels in sepsis (t=.82; p=0.42; CI=-246-582). Participants with sJIA had significantly lower levels of HMGB1 compared to those with sepsis (t=2.42; p=.019; CI=73-792) and did not differ from those with other conditions. HMGB1 levels were significantly higher in younger children (r=.26); children 3 years of age or younger had higher HMGB1 levels than those older than age 3 (p=.028; CI=34-600). There was no correlation between HMGB1 levels and c-reactive protein in any of the groups. No sex differences in HMGB1 levels were observed.

Conclusion: Results of this study show that HMGB1 levels are significantly higher in children with KD than in sJIA and comparable to levels seen in children with sepsis. HMGB1 levels in sJIA are not different than in children with other non-infectious/non-inflammatory conditions. Further prospective studies in larger cohorts are required to determine if HMGB1 could serve as a biomarker to predict disease course and outcomes in KD and as an early biomarker useful for distinguishing KD from sJIA. Results suggest that HMGB1 has a role in mediating KD pathogenesis and that HMGB1, as a pro-inflammatory mediator, might be a potential target for biologically-based therapy in acute KD.

SHARMIN HARES, MARK INMAN, MUNIER NOUR

Pseudoacromegaly in the pediatric population: a case series

Introduction: Pseudoacromegaly is a rare presentation in the pediatric population. We present a case series of two patients displaying excessive growth consistent with pseudoacromegaly and acanthosis nigricans associated with marked hyperinsulinemia. While adult literature focuses primarily on the comorbid metabolic dysregulation, the impact of this condition on excessive growth leads to major psychosocial burden.

Cases: Both patients, of First Nations descent, presented with excessive growth – patient one (male) at age 3 years 11 months (height 118cm, Z-score +3.75; BMI 28.3, Z-score +5.26) and patient two (female) at 9 years 0 months (height 168.5cm, Z-score 5.15; BMI 34.7, Z-score +2.75). Both patients had normal serial IGF-1 levels and appropriate GH suppression by OGTT with pre-pubertal growth velocities exceeding 9.5cm/year. Fasting insulin (>7000 pmol/L; normal 43-194) and C-peptide levels were markedly elevated. Patient one had a final adult height of 203cm; patient two's current height (at age 9y11mo; Tanner 2; bone age 12 years) is 175.8cm; both markedly exceed their mid-parental heights. Patient one's clinical course was complicated by type 2 diabetes (DM2), hidradenitis suppurativa with skin infections, and infective endocarditis of the aortic valve with post-surgical complications. Patient two has recently developed DM2. Both patients have suffered significant skin breakdown and infections in the thickness of their acanthosis. Furthermore, each patient desired treatments to blunt their growth.

Discussion: Pediatric patients with pseudoacromegaly achieve heights well above genetic prediction potentially leading to psychosocial difficulties. Unlike adults with acromegaly, whose linear growth has ceased, the implications in adolescence prompts consideration for therapies to reduce the growth rate. Additionally, the marked hyperinsulinemia/insulin resistance potentiates DM2 risk and other metabolic disturbances. Insulin receptor defects have been suggested as potential mechanisms, though an underlying genetic defect is rarely found. First Nations background appears to be a risk factor and this heavily applies to our Saskatchewan population. Aside from insulin sensitizing agents, no definitive treatments exist to correct the marked insulin resistance; treatments to reduce further linear growth, such as early pubertal induction or growth plate disruption, are burdensome with comorbidity. Given our population, we expect to see further cases that push us to identify therapeutic options.

SHARMIN HARES WON 2ND PLACE IN THE RESIDENT CATEGORY

SARAH FINCH, ELHAM REZAEI, ALAN M. ROSENBERG, HASSAN VATANPARAST, FOR THE BBOP STUDY GROUP

The association between vitamin D and inflammatory markers in children with juvenile idiopathic arthritis

Introduction: While the role of vitamin D in other autoimmune disorders has been established, less is known about its association with Juvenile Idiopathic Arthritis (JIA). Vitamin D might be immunosuppressive. Therefore, low vitamin D levels could be associated with inflammation. We aimed to determine associations between vitamin D and inflammatory markers in newly diagnosed JIA patients.

Methods: We used data from the Biologically-based Outcome Predictors (BBOP) in JIA prospective multi-centre study (n=186). Environmental and clinical data were collected and blood samples were obtained at baseline (treatment-naive) and 6 months (receiving treatment).

Results: There was a significant reduction in both Erythrocyte Sedimentation Rate (ESR) (29.4 ± 26.6 vs. 16.7 ± 18.8 p<0.001 mm/hr) and C-Reactive Protein (CRP) concentrations (18.3 ± 27.7 vs. 8.9 ± 18.9 mg/dL p<0.001) between baseline and 6 months. No difference was found in 25-hydroxy vitamin D (25(OH)D) levels between baseline and 6 months (84.5 ± 37.7 vs. 84.4 ± 43.7 nmol/L). An inverse association was found between ESR and daily milk intake and synthesizing season (p<0.05). Crossover-interaction effect was present with season; only in winter vitamin D supplementation was associated with lower ESR. There was a main effect of visit number with reduction in CRP at the second visit (p<0.01) and daily milk intake (p< 0.01). Crossover interaction effects predicted that drinking milk only in winter lowered CRP. Those with daily milk intake but not vitamin D supplement use had lower CRP compared to no milk drinkers but supplement users. Lower CRP was seen only in girls during summer.

Conclusion: While serum 25(OH)D levels were not associated with inflammatory marker status, factors that influence 25(OH)D status such as season and daily milk consumption were associated with lower inflammatory status.

LARISA C. LOTOSKI, NAZEEM MUHAJARINE, DANIEL FULLER, TARUN KATAPALLY, KEVIN STANLEY, DANIEL RAINHAM

EA 4-season longitudinal study examining the association between seasonality and sedentary behaviour in 9-15 year old Canadian children

Background: The average Canadian youth spends 8.6 waking hours of their day in a sedentary state, and consistently do not meet recommended leisure time sedentary limits of 2hrs per day. Greater than 2 hours of sedentary behaviour (SED) per day is associated with an increased risk of overweight, obesity, and cardiovascular disease.

Aim: This study seeks to establish how seasonal changes affect weekday school hour/leisure time, weekend and total SED in children and how the relationship between season and SED effects are moderated by children's and parent's view of SED and seasonality.

Method: Families (children aged 10-14 and their parents) were recruited from the city of Saskatoon, Saskatchewan (n=800). Location-specific SED was measured in children over three time frames using GPS equipped accelerometers. Questionnaires developed specifically for children and parents collected data on perceptions of seasonal changes, SED and demographic information. Using the random intercept model a multilevel modeling approach will be taken to understand seasonal changes in mean daily, weekday and weekend SED of children, the location of activities.

Results: After the final (third) round of data collection 631 participants remained (343 females (54.3%), 288 males (45.6%)). Almost one third of children were overweight or obese (31% of girls, 30% boys), and 12% of boys and 13% of and girls were considered obese. Children reported the greatest amount of mean daily sedentary time in winter months (January to April, 483 min) in comparison fall and spring seasons (September to December, 463 min; April to June, 435 min). The highest amount of inactive trips to and from school were reported in colder months, from September to December (31%) and January to April (32%) (vs 13% from April to June). Children living in grid pattern neighbourhoods accumulated the least amount of sedentary time, but living within the same neighbourhood as one's school did not improve sedentary outcomes. Results from multilevel multivariable models will be presented.

Conclusions: Forming a clearer understanding of SED in children is necessary for future successful intervention implementation. Disruptive positive interventions to physical activity in both boys and girls may provide the greatest benefit when done so in our youngest populations.

MCKENZIE RUSSELL, EWA MISKIEWICZ, DANIEL MACPHEE

HSPA1A is highly expressed in the myometrium during late pregnancy and labour

Introduction: The myometrium goes through phases of differentiation during pregnancy to become a powerful contractile tissue at term. Heat shock proteins are molecular chaperones that maintain proteostasis and cell signaling with the assistance of co-chaperones. The actions of HSPA1A are linked to inflammatory processes, which characterizes the events surrounding late term pregnancy and parturition. Thus, it was hypothesized that HSPA1A would be highly expressed in the myometrium during the contractile and labour phases of myometrial differentiation.

Methods: Rat uterine tissue samples (n=4 per timepoint) were collected from non-pregnant rats, from day (d) 6, d12, d15, d17, d19, d21, d22, d23 (labour) of pregnancy, as well as 1-day post-partum (PP). Samples of gravid and non-gravid horns were also collected from unilaterally pregnant rats on d19 and d23 (n=3 and n =4 at each timepoint, respectively). The spatio-temporal expression of HSPSA1A was then examined in these models using immunoblot and immunofluorescence analysis.

Results: HSPA1A expression in the myometrium of pregnant rats was significantly increased on d21, d22, d23, and PP ($p<0.05$, ANOVA). HSPA1A was detected in the cytoplasm of myometrial cells and in small extracellular vesicles during late pregnancy and labour. In unilaterally pregnant rats, HSPA1A protein expression was similar in both the non-gravid and gravid horns at d19, but significantly elevated in gravid uterine horns at (labour) compared to non-gravid horns (t-test, $p<0.05$).

Conclusion: HSPA1A is highly expressed in myometrium during late pregnancy and labour and expression appears to be regulated by both endocrine influences and uterine distension. HSPA1A may be mediating the inflammatory and signalling pathways needed for immune activation in the myometrium during labour.

MCKENZIE RUSSELL WON 2ND PLACE IN THE GRADUATE CATEGORY

STEPHANIE MCCLEAN, KRISTA BAERG, JULIE SMITH-FEHR, MICHAEL SZAFRON

Cost-minimization analysis of total serum bilirubin versus transcutaneous screening for newborn jaundice

Background: Jaundice affects approximately 60% of term newborns and approximately 2% of babies are at risk of severe hyperbilirubinemia and require phototherapy. Kernicterus is a preventable cause of death and long term disability; the Canadian Paediatric Society recommends universal screening with total serum bilirubin (TSB) or transcutaneous bilirubinometry (TcB). This study was undertaken in a tertiary care centre with approximately 5500 births per year and a community nursing follow-up program. In 2012 universal screening was implemented and subsequently non-invasive screening with jaundice meters was integrated into screening protocols.

Objective: To assess the cost for one TcB screen versus one TSB screen in hospital, urban and rural settings within the Saskatoon Health Region.

Methods: Time studies were completed to assess the mean time to collect TSB and TcB readings. Mileage data were collected for transporting TSB samples to the lab. Historical data was obtained for two six month periods, before and after TcB universal screening implementation (June to November in 2015 and 2016, respectively). Program fixed costs were also assessed.

Results: TSB costs were calculated based on nursing time, lab costs, travel time and mileage expenses versus nursing time to measure TcB. Urban and rural excess mileages due to transportation of TSB samples to the lab were 4.6 kms and 20.0 kms, respectively.

Conclusions: TcB reduced the nursing time to screen and costs associated with TSB blood draw, such as sample transportation and lab costs. In addition, TcB was available at point of care and minimized newborn exposure to painful procedures.

ANASTASIA ZELLO, ERIN PROSSER-LOOSE, ALAN M. ROSENBERG

Towards improved care for children with Kawasaki disease: A survey of Saskatchewan physicians

Objective: The objective of this survey was to collect Saskatchewan physicians' experiences with Kawasaki Disease (KD). The information gathered will be used to aid in developing resources to assist Saskatchewan physicians in diagnosing and caring for children with KD.

Methods: A 16-item survey was distributed via Survey Monkey to 519 Saskatchewan family physicians from a list provided by the Department of Academic Family Medicine, and to 76 general and sub-specialty pediatricians. The introduction to the questionnaire provided an explanation for the purpose of the questionnaire and the KD diagnostic criteria.

Results: Of the 595 surveys distributed 139 (23.4%) were returned. Of surveys completed, 78 (56.2%) were completed by family physicians and 36 (25.9%) by general pediatricians or pediatric subspecialists. 24 respondents indicated their specialist was "other" and of these 21 (87.5%) identified as Emergency physicians (all of whom were on the Family Medicine Registry).

Of all respondents, 37 (26.2%) were very confident in applying KD criteria, 56 (40.3%) somewhat comfident, and 31 (22.3%) not very confident. 78 (56.5%) respondents were aware that KD is most common in the 0-4 year age group while 49 (42.7%) considered the 5-10 year age group as being the most common. Pediatricians were more likely to correctly recognize that KD is more common in the 0-4 age group ($\chi2=11.1$, $p=.004$). Among all respondents, when a diagnosis was made or suspected, referrals were most often to general pediatrics either alone (77; 55.8%) or to general pediatrics and a sub-specialty (17: 10.4%).

70 of 137 respondents (51.1%) would be comfortable initiating therapy (IVIgG and aspirin) in their local centres, 55 (40.2%) would not be comfortable and 12 (8.8%) were uncertain if they would be comfortable or not in initiating therapy. 130 respondents (94.2%) were aware that coronary artery aneurysms can be associated with KD. 100 (72.4%) were unaware of the characteristics of macrophage activation syndrome.

Conclusion: Pediatricians were significantly more likely to be very confident than family physicians in applying the KD diagnostic criteria. Most often referrals are made first to general pediatricians. There was strong awareness of coronary artery complications in KD and no difference in awareness between family physicians and pediatricians. Family physicians and some pediatricians are unaware of the characteristics of macrophage activation syndrome. Results of this survey will help design resources to aid Saskatchewan physicians in diagnosing and caring for children with KD.

ANASTASIA ZELLO TIED FOR 2ND PLACE IN THE UNDERGRADUATE CATEGORY

ANASTASIA ZELLO, TANYA HOLT, JACLYN SKOYE, RHONDA BRYCE

Utilization of PRISM scores to assess severity of illness during pediatric inter-facility transport

Background: Pediatric transport medicine continues to advance as a specialized field. Pediatric Risk of Mortality (PRISM) score is the severity of illness score commonly used in the Pediatric Intensive Care Unit (PICU) and during pediatric transport. We hypothesized that the timing of scoring PRISM during the transport process had an impact on predicting hospital disposition and length of stay (LOS).

Methods: We retrospectively evaluated 373 pediatric transports in a 12 month period. PRISM was scored at two seperate times by the transport team. Time 0 (T0) was time of the initial call and Time 1 (T1) was when the team arrived to the patient. We compared T0 and T1 to determine if the score changed and how the two times related to hospital disposition and LOS.

Results: There were 169 patients (45.3%) with a score of 0 at the time of initial call. Among these, 160 (94.7%) had no change in PRISM between T0 and T1; however, even with these stable, low-risk scores, 59.4% were subsequently admitted to PICU, step-down, or observation units. Of the 204 subjects with scores exceeding zero at T0, 123 patients (60.3%) improved by the T1 assessment, 63 of these (51.2%) to a zero score; one-third (36.8%) were unchanged; and only 6 subjects (3.0%) worsened. Median length of stay was longer for those whose PRISM scores were greater than 0 versus those that were zero, regardless of the time point ($p<0.01$ for both); the difference between these calues was slightly larger when scores were assigned at T1 (T0: 3 days versus 4 days; T1: 3 days versus 5 days). Subjects receiving a score of zero were also less likely to require more advanced care compared to those with higher scores regardless of the time point assessed, although only the T0 difference reached statistical significance on Chi-Square testing (T0: 58.6% versus 75.0%, $p=0.01$); T1: 63.7% versus 73.3%, $p=0.05$).

Conclusion: Preliminary analysis suggests that timing of scoring PRISM during transport may be important in predicting LOS and disposition of pediatric patients. Subjects initially assessed as low risk appear to remain stable in their scoring although its accuracy is questionable. Prospective validation of PRISM in the pediatric transport setting is necessary.

KATE NEUFELD, ELHAM REZAI, ALAN M. ROSENBERG, FOR THE BBOP STUDY GROUP

Relationships between stressful life events in juvenile idiopathic arthritis and clinical, social, biomarker, functional, and quality-of-life outcomes

Background: Psychosocial stress has been implicated as a possible factor influencing juvenile idiopathic arthritis (JIA) occurrence, course, functional ability, and quality-of-life.

Objective: Determine relationships between stressful life events scores at enrolment and clinical, sociodemographic, biomarker, physical function, and quality-of-life at 6,12, 18 and 24 months post-enrolment.

Methods: 186 new-onset, treatment naïve JIA patients from a Canadian inception cohort (BBOP – Biologically-based Outcome Predictors in JIA) were studied. At enrollment and at 12- and 24- months post-enrollment stress was assessed using a Stressful Life Events Questionnaire (StLEQ) completed by participants and parents and a Hassles Questionnaire, a measure of daily irritants, administered to participants and parents. Enrolment StLE and Hassles scores were analyzed for associations with clinical, biomarker, and social factors, physical function (Children's Health Assessment Questionnaire [CHAQ]), and quality-of-life characteristics (Juvenile Arthritis Quality-of-Life Questionnaire [JAQQ]).

Results: Enrolment child StLE scores (N=80) correlated positively with divorced parents ($p< 0.001$), number of homes lived in ($p=0.05$), and negatively with household income ($p=0.002$). Positive correlation between child StLE scores and JAQQ scores ($p=0.005$), and all 4 follow-ups($p<0.01$) was found. Child StLE scores correlated positively with 12- and 18-month CHAQ scores a ($p=0.044$ and $p= 0.014$ respectively). Child StLE scores did not correlate with maternal or paternal age, adoption status, number of children in the home, pain score, health status score, number of active joints, ESR, CRP, or biomarkers.

Enrolment adolescent StLE scores correlated positively with ESR at 12 months ($p=0.035$) and pain score at 24 months ($p<0.01$). Adolescent StLE scores did not correlate with CHAQ, JAQQ, or other clinical factors.

Enrolment parents' StLE scores correlated positively with divorce at enrollment ($p<0.01$), JAQQ at all visits ($p<0.01$), CHAQ at 6 ($p=0.033$), 12 ($p=0.016$) and 18 month visits ($p=0.008$), pain score at 12 months ($p=0.03$), and health status (CHAQ) at 24 months ($p=0.03$). Parents' StLE scores correlated negatively with household income at enrollment ($p=0.008$). Parents' StLE scores did not correlate with other sociodemographic, biomarker or outcome variables.

Enrolment Hassles scores correlated negatively with enrollment ESR ($p=0.05$), and biomarkers Interleukin (IL) 1b ($p=0.04$), IL-8 ($p=0.04$), MIP-1a ($p=0.02$), MIP-1b ($p=0.04$); MMP1 ($p=0.03$) and Il-10 ($p=0.03$) at 6 months; and Il-8 ($p=0.04$), MIP-1a ($p=0.02$), MIP-1b ($p=0.04$) at 12 months.

Conclusions: Identifying and addressing stressful life factors at first presentation of JIA is important. A multidisciplinary team, including social worker, psychologist, or spiritual support, may help address these needs at onset as they likely impact future disease course.

MARK EPP, BLAKE KNITTIG, MARYAM MEHTAR

A survey of physician attitudes on the health care of foster children in Saskatchewan

Children in foster care represent a vulnerable patient population within our province. They have higher health care needs; commonly suffering from mental illness, developmental delay, poor academic performance, poor dentition, and chronic medical illness. In Saskatchewan, there are over 5000 children in care and little is known about the care being provided to these children.

We carried out a survey, that was sent to 999 family physicians and pediatricians. These practitioners represented most of the health regions in the province. Questions assessed physicians practice demographics, level of involvement with children in foster care, knowledge of common comorbities found in children in care, knowledge of the current Canadian Pediatric Society position statement on caring for children in foster care, and difficulties associated with caring for children in care.

17% of physicians responded, 53% had been in practice for greater then 16 years. 13% of physicians reported children comprising greater than 50% of their patient population, with only one physician reporting children in foster care making up greater than 50% of their practice. There was large variation in what physicians would screen for during an initial visit. Only 50% of physicians reported screening for mental health concerns, and 57% reported screening for developmental concerns. 67% of physicians reported rarely or only some of the time having access to the medical records of children in foster care when they were being seen for the first time. Children in care are most often seen with their foster parent (57%) or a social worker (29%) who may not know any pregnancy, birth, or past medical history.

In conclusion, we conducted the first assessment of physician engagement and knowledge of children in foster care in Saskatchewan. Few physicians are focusing on this high needs population, thus making a targeted education campaign difficult. This study does provide data that can be provided to the Government of Saskatchewan to create a dialogue and work towards improving the care being provided to children in foster care. Children in foster care are a vulnerable patient populations in our society, that require a well-informed health care professional to meet their complex needs.

SE'ERA ANSTRUTHER, HASSAN VATANPARAST, ANNE LEIS, AMANDA FROELICH-CHOW, LOUISE HUMBERT, MATHIEU BÉLANGER, NAZEEM MUHAJARINE, RACHEL ENGLER-STRINGER, STEPHANIE WARD

The influence of socioeconomic factors and cultural diversity on food consumption patterns in 3-5 year old children

Childhood obesity remains a great public health concern in developed countries including Canada. In a recent sample of Canadian preschoolers, 5.7% were classified as overweight or obese. In response to these threatening trends, after an initial pilot study, the Healthy Start-Départ Santé (HSDS) health promotion initiative was launched in Saskatchewan and New Brunswick to address and help prevent some of the primary causes of obesity in 3-5 year old children. The project encourages families and educators to incorporate healthy eating and physical activity opportunities in the daily lives of preschoolers. Intervention sites received nutrition and physical activity training alongside several validated resources. This included LEAP-BC evidence-based handbooks, HOP and Food Flair. An Active Kids Toolkit filled with supplies necessary to perform some of the activities in HOP was also provided. For the outcome evaluation, 61 pre-kindergarten and childcare centres were targeted and randomly assigned to either receive the HSDS intervention, spanning 6-8 months, or serve as a control, and data was collected before and after the intervention period.

In general, people with a low socio-economic status are at a higher risk of being overweight/obese. So to further evaluate the Healthy Start Initiative, social and cultural determinants of health will be examined. Thus, the purpose

of this study is to examine food consumption patterns of 3-5 year old children attending childcare centres across Saskatchewan and New Brunswick and how these patterns are influenced by geographic location (urban versus rural), parental socioeconomic status, and cultural context in terms of language. The main outcome variable is the change in food consumption patterns in preschoolers, before and after the intervention. Geocoding software will be used to assess geographic location. Centre-level measures, such as postal codes, and further coding based on the median after-tax household income of that area provided by the 2011 National Household Survey census profiles will be used to measure socioeconomic status. Lastly, the dominant language at centres will be used to help examine culture. This research is important to Canadian society as a whole because it may lead to customized obesity intervention programs that are more effective in addressing childhood obesity, especially in the Prairie and Maritime provinces where prevalence of obesity is the highest.

CHUN CHE, KEVIN DURR, MONA HAMADA, DARRYL ADAMKO

Urine metabolomic profiling in asthmatic children

Metabolomics is the study of small molecules created by cellular metabolic activity. A proof of concept metabolome of children with stable asthma and those undergoing an asthma exacerbation measured by proton nuclear magnetic resonance spectroscopy (1H-NMR) has previously been described. This study aims to continue the work to determine the metabolome of the various severities of asthma with the ultimate goal of being able to predict those who are at high risk for an asthma exacerbation in the near future.

85 children were enrolled into the study. Some (n= 67) were seen only when stable in clinic on one or 2 visits (non-seasonal group). 18 of these children agreed to be followed monthly (a seasonal group). Pulmonary function tests were performed on all children 6 years of age or older at each visit. Urine samples were collected from all children during their appointments. The samples were promptly placed in a container of ice and subsequently placed into a freezer (minus 80) within 4 hours. Those in the non-seasonal group were seen during their follow up appointments in the pediatric respirology clinic. Each the child or a parent helped fill out an Asthma Control Questionnaire (ACQ) and Mini Pediatric Asthma Quality of Life Questionnaire (Mini PAQLQ) during each visit. Those in the seasonal group were seen on a monthly basis for 7 months. During each visit, they filled out an ACQ, Mini PAQLQ and Asthma Control Test (ACT). Each child was also given a calendar and instructed to place predetermined colored stickers on their calendar based on their asthma symptoms.

In the Seasonal cohort, there were 21 instances where patient's asthma control worsened and 30 instances where their asthma control improved. In the Non-Seasonal cohort, there were 6 instances where patient's asthma control worsened and 8 instances where their asthma control improved. The urine samples are currently awaiting to be analyzed by mass spectrometry (MS). We will then compare the clinical impression and the urine metabolomic data to see if there is a metabolome for impending asthma worsening.

LILA ABOBAKAR, HASSAN VATANPARAST, ANNE LEIS, AMANDA FROELICH-CHOW, LOUISE HUMBERT, MATHIEU BÉLANGER, NAZEEM MUHAJARINE, RACHEL ENGLER-STRINGER, STEPHANIE WARD

Evaluation of menus planned in Saskatchewan child-care centres participating in Healthy Start/Depart Santé Program

In recent decades, childhood obesity has been increasing steadily in Canada, which raises the risk of chronic diseases among young children. Over 52% of Canadian children are attending childcare settings regularly. These settings play a major role in shaping the healthy eating habits for almost half of Canadian children. Thus, many health promotion initiatives and organizations are targeting these settings to improve children's health. Healthy Start/Départ Santé (HS/DS) is one of these initiatives focusing on improving healthy eating habits and physical activity among Francophone and Anglophone preschoolers (3-5 years old). Between 2013 and 2016, the HS/DS intervention was designed and implemented in over 180 prekindergarten and childcare centres in Saskatchewan. In addition to the healthy nutrition and physical activity resources, HS/DS provides the participating centres with tools and guidelines that help in planning healthy food menus. Overall, 39 childcare centres were selected through a cluster randomized control trial to evaluate the intervention impact. This study was conducted to assess the extent to which the planned menus in participating centres adhere to the Saskatchewan childcare nutrition guidelines. Participating centres food menus were compared with the provincial childcare nutrition guideline recommendations. The comparison was done for both the intervention group and the usual practice group at the baseline and the endpoint in order to track the impact of the intervention. Out of 39 centres, 34 centres (16 intervention centres and 18 usual practice centres) had completed cycle menus information. The food items that were listed on the menus were categorized based on Canada's Food Guide and provincial food group categories. The results indicated that there were improvements in the adherence to the breakfast (from 71.4% to 100%), lunch (from 9.5% to 16.6%), and processed food limitation guidelines (from 42.8% to 50%) among intervention received centres. Conversely, there were no improvements in the adherence for centres on usual practice except on processed food guidelines (from 22.7% to 44.4%). In conclusion, the intervention had a positive impact on improving the percentages of adherences to the guidelines among intervention received groups. However, special attention should be given to the lunch and snacks menus to meet the guidelines.

ALI MARKLAND, BEN TAN, DARRYL ADAMKO, A. ESSALAH, SHELDON WIEBE, TANIA DENIER

Case presentation of atypical mycobacterium avian complex infection isolated from outdoor hot tub

A 3 year-old boy from Saskatchewan presented with a six-month history of lung symptoms (moderate, non-productive cough) and fatigue, but without fever, chills or weight loss. He also developed progressive bilateral lymphadenitis involving retroauricular, submandibular, supraclavicular, then axillary lymph nodes. Radiological investigation later confirmed the presence of underlying bilateral pneumonitis, associated with apical hilar lymphadenopathy. Biopsy of the nodes showed necrotizing granulomas. Bronchoalveolar lavage sample was positive for a non-tuberculous mycobacterial species. The family reports having an outdoor hot tub, from which Mycobacterium avium complex (MAC) was isolated, making it the most likely source for his infection. His chest x-ray has showed interval improvement on antibiotic treatment for the MAC. Literature review reveals outdoor hot tub to be an uncommon source of pulmonary and lymph node infection in children.

ALI MARKLAND WON 1ST PLACE IN THE RESIDENT CATEGORY

MONA M. KHAMIS, HANAN AWAD, KEVIN ALLEN, ANAS EL-ANEED, DARRYL J. ADAMKO

The significance of LC-MS/MS methods in identifying urinary metabolites differentially expressed in asthma and COPD

Urine is rich in metabolites and is an ideal biofluid for biomarker discovery. Obstructive airways diseases like asthma or COPD sometimes show overlapping symptoms that hinder their early and correct diagnosis. Current clinical tests are not available in a typical doctor's office or cannot be used in young children. Therefore, doctors need a better test. Metabolomics is the study of small molecules created by cellular metabolism. Our hypothesis has been that diseases like asthma will create a different metabolic profile compared to healthy people or those with other diseases like COPD. 1H-NMR based metabolomic analysis proposed 53 metabolites as potential diagnostic biomarkers among asthma and COPD patients. My objective has been to develop liquid chromatography-tandem mass spectrometric (LC-MS/MS) methods for targeted analysis of urine biomarkers to better diagnose respiratory diseases like asthma and COPD.

Metabolites were divided into 3 groups based on chemical structure. For groups 1 and 2 (1=amines and phenols 2=acids), we developed two LC-MS/MS methods using differential isotope labeling with dansyl chloride and dimethylaminophenacylbromide reagents. An internal standard for every metabolite is created using C13-labeled reagent. The use of C13-labeled derivatives allows for the correction of any matrix effects as well as the unambiguous confirmation of the identity of each metabolite. The LC-MS/MS methods were validated as per the FDA guidelines. In total, 36 metabolites were measured in patients' urine with asthma (n=30) or COPD (n=15). The values for each metabolite were analyzed using partial least square-discriminant analysis (PLS-DA, SIMCA) to determine important metabolites that differed between asthma and COPD subjects. A PLS-DA model for the separation of asthma and COPD subjects was created based on 11 metabolites. This model was also used against a blinded test set. We found excellent accuracy for diagnosis. Currently, I am developing additional methods for the quantification of new metabolites. My work shows promise for the development of diagnostic and prognostic biomarkers of asthma and COPD.

NATASHA BOYES, CHARISSA POCKETT, MARTA ERLANDSON, STEPHANIE FUSNIK, MARK J. HAYKOWSKY, SHONAH RUNALLS, SCOTT PHARIS, ASHOK KAKADEKAR, TIMOTHY BRADLEY, COREY R. TOMCZAK

Physical activity modulates arterial stiffness in children with congenital heart disease

BACKGROUND & HYPOTHESIS: Children with congenital heart disease (CHD) are often less physically active compared to healthy children. Children with CHD are also at risk for developing greater arterial stiffness and physical inactivity can potentiate this risk. We tested the hypothesis that less physically active children with CHD would have greater arterial stiffness compared to more physically children with CHD.

MATERIALS & METHODS: Nineteen children with CHD (11±3 years; males=9) and 20 age- and sex-matched controls (11±3 years; males=11) were studied. Carotid-radial pulse-wave velocity (PWV) was assessed with applanation tonometry to determine arterial stiffness. A 6-minute walk test (6MWT) was performed to estimate aerobic fitness. Average daily step count was assessed by accelerometry over a 7-day period. The median step count score for each group was used to determine high-step (high physical activity) and low-step (low physical activity) groups. Data were analyzed with t-tests and significance accepted at $P < 0.05$.

RESULTS: 6MWT distance was lower in CHD (521±50 vs. 605±79 m; $P < 0.001$). PWV was similar between CHD (8.78±1.24 m/s) and controls (8.67±1.28 m/s; $P > 0.05$). However, when considering physical activity as a modulating factor for PWV (by comparing high-step and low-step groups), PWV was significantly lower in the high-step CHD group (7.89 ± 0.68 m/s) compared to the low-step CHD group (9.78 ± 0.91 m/s; $P < 0.001$), but not between the high-step (8.70 ± 1.35 m/s) and low-step control group (8.64 ± 1.28 m/s; $P > 0.05$).

CONCLUSION: Physically activity in children with CHD may be an especially important modulating factor for arterial stiffness.

NATASHA BOYES WON 1ST PLACE IN THE GRADUATE CATEGORY

MICHAEL PRODANUK, TANYA HOLT, NAZMI SARI, VERONICA MCKINNEY, RACHEL JOHNSON, MATTHEW BRADSHAW, ERIN PROSSER-LOOSE, ALAN M. ROSENBERG, LUIS BUSTAMANTE, IVAR MENDEZ

Remote presence robotic technology reduces need for pediatric inter-facility transportation from a northern First Nations community: A feasibility study

INTRODUCTION: Providing acutely ill children in rural/remote communities access to specialized inter-facility transportation is a substantial challenge. This study evaluated remote presence robotic technology (RPRT) for enhancing pediatric remote assessments, expediting initiation of treatment, refining triaging, and reducing the need for transport.

METHODS: We conducted a proof of concept prospective observational study at a primary/urgent care clinic in Pelican Narrows, Saskatchewan, a northern First Nations community. Participants were acutely ill children <17 years who were assessed, managed, and triaged by an off-site pediatric intensivist through a remote presence device. Controls from a preexisting transport database were generated using a propensity score matching technique. The primary outcome was the number of transports among participants versus controls. For transported participants, secondary outcomes included use of a regional hospital as disposition and hospital length of stay.

RESULTS: Of 38 acutely ill children, 24 were triaged to remain at the clinic while 14 were transported. 42.9% of matched participants required transport, whereas all controls were transported ($p<0.05$). 44.4% of matched transported participants were triaged to a nearby regional hospital, while no controls were regionalized ($p<0.05$). All participants who remained at the clinic stayed less than 24 hours, while corresponding controls stayed 4.9 days in tertiary care ($p<0.001$).

CONCLUSION: RPRT reduced the need for specialized pediatric inter-facility transportation from a northern First Nations community while enabling redistribution to a regional hospital when appropriate. This study has implications for broader implementation of RPRT to expand access to healthcare in rural/remote areas.

MICHAEL PRODANUK WON 1ST PLACE IN THE UNDERGRADUATE CATEGORY

NANCY THORP-FROSLIE, JEREMY YOUNG, MICHELLE KENT, TRACIE RISLING

On the path to the development of a mobile application to support Canadian youth with inflammatory bowel disease

There has been a significant increase in the diagnosis of inflammatory bowel disease (IBD) in Canadian children in the last decade. Statistics from Crohn's and Colitis Canada report a significant rise in the prevalence of IBD in children under ten years old, revealing an estimated 5,900 Canadian children living with IBD. With potentially one of the highest rates of childhood IBD in the world, it is essential that the country addresses this crisis. As more children and families navigate the healthcare system, there is an increasing need to examine healthcare transition (HCT) between pediatric and adult care. Thus, there is a growing demand for HCT assessment tools and research in order to identify key HCT needs for pediatric patients.

The purpose of this presentation is to give an overview of current grants our research team is working on in collaboration with Crohn's and Colitis Foundation of Canada, Royal Bank of Canada, Community Engaged Research, and Saskatchewan Health Research Foundation. With the support from each of these grant providers, the research team outputs will be: 1) a scoping review on IBD assessment tools, 2) a scoping review on HCT assessment tools for all diseases, 3) an IBD HCT assessment tool questionnaire from the perspective of adolescents and caregivers, 4) an IBD HCT assessment tool questionnaire from the perspective of gastroenterology nurses, and 5) a pilot IBD HCT mobile web-based application. The scoping reviews have allowed the researchers to evaluate previously developed assessment tools for both pediatric IBD and other illnesses that affect children such as diabetes, spina bifida, sickle cell disease, and cystic fibrosis. Using the scoping reviews, the team has created questionnaires from the perspectives of patients, caregivers, and nurses. These questionnaires will lead to the development of a mobile web-based intervention to address HCT assessment for children living with IBD within a Canadian context. After the development of the pilot mobile application, the researchers will test for improved outcomes and experiences with the mobile web-based intervention.

Ultimately, the goal of this research is to provide tools that will improve the health outcomes of children living with IBD and enhance their quality of life as they emerge into young adulthood.

AMY BUNYAMIN, CHANTAL KAWALILAK, JAMES JOHNSTON, SAIJA KONTULAINEN

Annual changes in clinically relevant cortical bone properties in children can be characterized using HR-PQCT, particularly at the distal tibia

Introduction: Cortical bone properties (e.g., thickness, porosity) at distal bone-ends are major determinants of bone strength and fracture-risk in children and older adults. High resolution CT (HR-pQCT) can be used to monitor cortical bone in adults; however, it is unknown if changes in cortical bone micro-architecture can be monitored in children. To determine if a real biological change has occurred, observed change can be compared to the respective least significant change (LSC) value. If the observed change exceeds the LSC, the change should be beyond measurement error. Our objective was to define precision errors and LSCs to assess the proportion of children with annual changes beyond their respective LSCs for cortical bone properties at the distal radius and tibia.

Methods: To determine measurement precision errors, 32 children (16 boys, 16 girls; mean age 11.3, SD 1.6 years) were scanned twice, one week apart. To assess annual change, another 20 children (6 boys, 14 girls; 10.9, 1.6 years) were scanned twice, one year apart. For both sample groups, we scanned the distal radius (7% of ulnar length) and distal tibia (8% site) using HR-pQCT. We assessed the following cortical properties: bone volume, density, area, thickness (apparent and fine-structured), porosity, pore diameter, and pore volume. LSCs were calculated from precision errors (root-mean-squared coefficients-of-variation, CV%RMS). We report significant changes (t-tests, $P<0.05$) in cortical bone properties and the proportion of children with annual changes exceeding LSCs.

Results: At the distal radius and tibia, cortical bone volume increased (10.1%; 8.2%, respectively), density increased (9.0%; 3.8%), and porosity decreased (-26.9%; -13.2%) ($P<0.05$). At the distal radius, fine-structured thickness increased (15.9%) ($P<0.001$). At the distal radius and tibia, the proportion of children with annual change beyond the LSC were: bone volume (radius:53%; tibia:50%), density (79%; 75%), area (58%; 40%), apparent thickness (21%; 55%), fine-structured thickness (58%; 35%), porosity (63%; 65%), pore diameter (26%; 40%), pore volume (53%; 75%).

Conclusion: Our findings indicate that cortical bone properties, particularly at the distal tibia, can be reliably captured with annual measurements in children; changes at the distal radius, however, may require longer time between measurements. These preliminary results highlight the potential of using HR-pQCT to monitor clinically relevant cortical bone properties in children and help alleviate the lack of information present in pediatric research.

AMY BUNYAMIN TIED FOR 2ND PLACE IN THE UNDERGRADUATE CATEGORY

KELSEY BJORKMAN, CHANTAL KAWALILAK, JD JOHNSTON, SAIJA KONTULAINEN

Monitoring bone development in children: A pilot study

Background: Reliable estimates of the time required to detect skeletal changes are necessary when designing pediatric bone studies able to capture bone development with limited radiation exposure. Monitoring Time Intervals (MTIs) provide an estimate of that time, and have been defined using high resolution peripheral quantitative computed tomography (HR-pQCT) in postmenopausal women 1,2, but not in children. The purpose of this study was to determine the MTIs for HR-pQCT derived trabecular and cortical bone outcomes, with a specific focus on bone micro-architectural measures in children.

Methods: Distal radius and tibia of 22 children (15F:7M, 10.8yrs, SD 1.6yrs) were measured using HR-pQCT at baseline and one year later. Images were analyzed using both the standard and the advanced cortical micro-architecture evaluation protocols. We calculated median annual percent change for each outcome of bone area, density, and microarchitecture. We divided previously defined least significant change (LSC) values (derived from precision error data in children, not yet reported) by the median percent change per year to estimate MTIs for each outcome.

Results: At the distal radius, all MTIs were between 1 and 10 years for area and density, and with the exception of trabecular area (>55 years), were between 1 and 11 years for micro-architecture. The shortest MTI pertained to cortical density (~1 year); the longest pertained to trabecular area (<55 years). At the distal tibia, all MTIs were between 1 and 8 years for area and density, and with the exception of cortical thickness (>56 years), were between 1 and 5 years for micro-architecture. The shortest MTI pertained to cortical density (~1 year); the longest pertained to cortical thickness (>56 years).

Conclusion: Estimated MTIs suggest that bone micro-architectural development, such as changes in trabecular thickness and number, as well as cortical area and porosity can be reliably monitored with follow-up measurements every 2 years at the distal radius, and every 3-4 years at the distal tibia, in children.

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ANTHONY KEHRIG, NAZEEM MUHAJARINE, SAIJA KONTULAINEN, KELSEY BJÖRKMAN, JAMES JOHNSTON

Benefits of moderate and vigorous physical activity are evident at the weight-bearing tibia but not at the non-weight bearing radius

The Canadian 24-Hour Movement Guidelines for Children and Youth recommend 60 minutes of moderate-to-vigorous physical activity (MVPA) per day but do not specify the recommended type or intensity of muscle and bone strengthening activities to be performed 3 times per week. We investigated if daily minutes of MVPA, vigorous physical activity (VPA), or average daily impact counts would independently predict bone strength at the distal and shaft sites of the radius and tibia in children. We recruited 46 children (mean age=11, SD1.7y) and used peripheral quantitative computed tomography (pQCT) to estimate the bone strength at distal and shaft sites at the radius and tibia. Physical activity was recorded for seven days using triaxial accelerometers (Actigraph). We used linear regression models to assess the independent role of average daily minutes of MVPA, VPA, and average daily impact counts ≥3.9g to predict variance in bone strength while controlling for sex, body mass, and cross-sectional muscle area. We report significant ($P<0.05$) β-coefficients and R2 of the models. MVPA (mean=51.6, SD=23.1 min/day), VPA (18.9±10.9 min/day), and impacts (70.3±57.0 counts/day) did not predict variance in bone strength at the radius. At the tibia, MVPA (β =0.25, R2=0.55; and β=0.22, R2=0.72), VPA (β =0.28, R2=0.56; and β=0.27, R2=0.78), and daily impact counts ≥3.9g (β =0.23, R2=0.54; and β=0.21, R2=0.72) predicted variance in bone strength at the distal and shaft sites, respectively. Results suggest that a 10-minute increase of daily MVPA or VPA could result in a 3% or 8% percent increase in tibia bone strength, respectively. An increase in 30 daily impact counts ≥3.9g could result in a 4% increase in tibia bone strength. Future studies are needed to identify specific physical activities that could target bone strength development in the forearm, a site prone to pediatric fractures, and test if short daily bouts of MVPA, VPA, or high impact counts optimize bone strength development at the tibia and other weight-bearing bone sites such as the hip or spine in children.<17 years who were assessed, managed, and triaged by an off-site pediatric intensivist through a remote presence device. Controls from a preexisting transport database were generated using a propensity score matching technique. The primary outcome was the number of transports among participants versus controls. For transported participants, secondary outcomes included use of a regional hospital as disposition and hospital length of stay.

RESULTS: Of 38 acutely ill children, 24 were triaged to remain at the clinic while 14 were transported. 42.9% of matched participants required transport, whereas all controls were transported ($p<0.05$). 44.4% of matched transported participants were triaged to a nearby regional hospital, while no controls were regionalized ($p<0.05$). All participants who remained at the clinic stayed less than 24 hours, while corresponding controls stayed 4.9 days in tertiary care ($p<0.001$).

CONCLUSION: RPRT reduced the need for specialized pediatric inter-facility transportation from a northern First Nations community while enabling redistribution to a regional hospital when appropriate. This study has implications for broader implementation of RPRT to expand access to healthcare in rural/remote areas.

RENEE RAMIKIE, HIWOT HAILESLASSIE, AMANDA FROELICH-CHOW, PHYLLIS SHAND, YELENA BIRD, RACHEL ENGLER-STRINGER, HASSAN VATANPARAST, DAN RAMDATH, CAROL HENRY

Acceptability and feasibility of a nutrition intervention to promote consumption of pulse based food products in childcare centres in Sask.

Background: Despite Canada being one of the largest producer of pulses worldwide and regardless of their nutritional benefits, pulses are not widely consumed by the Canadian population including the children population aged 3-5 years old. Establishing healthy eating habits in young children can improve consumption of beneficial foods, which can result in good eating habits, that continue into adulthood.

Objective: The study evaluated the acceptability and feasibility of a pulse based nutrition education curriculum entitled "Pulse Discovery Tool Kit" (PDTK). The kit is designed to promote healthy eating habits and promote consumption of pulse-based food products at an early age.

Method: The study was conducted in two childcare centres in Saskatoon over a 3-month period. The intervention included weekly lesson plans, a food service guide, taste testing sessions, pulse based recipes and parent's newsletter. Qualitative and quantitative data were captured regarding feasibility and acceptability of the PDTK through sensory evaluations, lesson plan evaluations, teachers' semi-structured interviews, cooks interviews, individual plate waste and parent's socio demographic questionnaires.

Results: The study involved 45 participants (n=36 children n=9 childcare staff) from both English and French speaking childcare centres. Sensory analysis revealed that majority of the children liked the pulse recipes, 44% liked the green split pea spread initially, which was increased to 56% during a repeated taste testing session. The lesson plans evaluation and the teachers' interviews indicated that most of the lesson plan activities could be implemented in the existing curriculum and had good nutrition concepts. Modification of a few lesson plan activities by breaking them into smaller components would overall increase it's acceptability. Cooks from both centres believed that it was feasible to include recipes from the PDTK into their regular cycle menus and expressed no barriers to cooking and serving pulses within their facilities. The parent's sociodemographic questionnaire (n=15) also revealed that at least 33.3 % of the children within the study population consumed pulses1-3 times per month. Measurements of the individual plate waste determined that the pulse based intervention recipes had lower amounts of saturated fat, calories and sodium in comparison to regular recipes.

Conclusion: The pilot testing of the Pulse Discovery Tool Kit showed that it was both acceptable and feasible to implement this model within child care centres to improve pulse consumption in the menu for children children 3-5 years old.

ELHAM REZAEI, DANIEL HOGAN, BRETT TROST, ANTHONY KUSALIK, ALAN M. ROSENBERG, FOR THE BBOP STUDY GROUP

Biologically-based approach for classifying chronic childhood arthritis

Background/Purpose: Juvenile Idiopathic Arthritis (JIA) comprises a heterogeneous group of conditions that share chronic arthritis as a common characteristic. International uniformity in classifying JIA, based predominantly on clinical characteristics at onset, has helped propel collaborative efforts to improve understanding of subset-specific pathophysiology, treatment responses,

and outcomes. The purpose of this study was to consider the added value of combining biomarker-based attributes with clinical characteristics to classify chronic childhood arthritis in a biologically-based context.

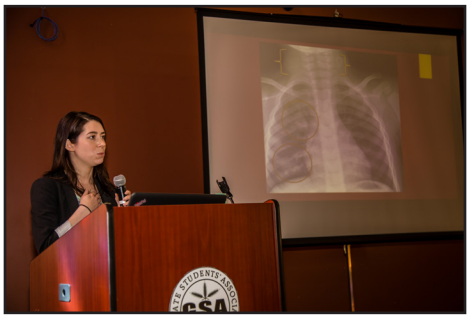
Methods: Data were derived from a prospective, nation-wide, longitudinal cohort study titled Biologically-Based Outcome Predictors in JIA (The BBOP Study). Newly diagnosed, treatment naïve children with JIA were evaluated at baseline and after six months. Data included clinical manifestations and plasma inflammation-related biomarkers. Probabilistic principal component analysis (PPCA) was used for dimensionality reduction purposes. To identify groups in the data, Gaussian mixture modeling (GMM) was applied. The results were compared with the JIA subgroups defined by International League of Associations for Rheumatology criteria.

Results: A total of 150 JIA patients were included. Data consisted of 191 variables. PCA reduced variables into 3 clinically relevant principal components (PCs). Using PCs, three clusters were identified at baseline and five clusters six months after. PCs recovered 35% and 40% of variance in the patient profiles in visit 1 and 2, respectively. Clustering validation indices showed that PPCA-GMM is a reliable clustering method. At first presentation, clusters revealed in this analysis exposed different and more homogenous subgroups compared to the seven JIA ILAR subgroups. A large subset of patients with oligoarthritis and rheumatoid factor negative polyarthritis grouped into one cluster.

Conclusion: Using data-driven, unsupervised machine learning algorithms these analyses recognized distinctive patterns that provide insight into the underlying biology of chronic childhood arthritis and enable categorization of disease based on a combination of clinical and biomarker profiling.

Congratulations to our winners!

Resident Category



ALI MARKLAND: 1ST PLACE

SHARMIN HARES: 2ND PLACE

Graduate Student Category

NATASHA BOYES: 1ST PLACE

MCKENZIE RUSSELL: 2ND PLACE

Undergraduate Student Category

MICHAEL PRODANUK: 1ST PLACE

AMY BUNYAMIN: 2ND PLACE (TIE)

ANASTASIA ZELLO: 2ND PLACE (TIE)

Thank you to

Our Presenters

Our Judges

Dr. Ben Tan (photographer)

The Department of Pediatrics, Research Office

SPRING (Saskatchewan Pediatric Research and Innovation Group)

The Children's Hospital Foundation of Saskatchewan

For comments more information on Child Health Research at the U of S, please contact Erin Prosser-Loose, Pediatric Research Coordinator, at erin.loose@usask.ca