UNIVERSITY OF SASKATCHEWAN
College of Medicine
OFFICE OF THE VICE-DEAN RESEARCH
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UNDERGRADUATE SUMMER RESEARCH SHOWCASE

# Abstracts

# 2021

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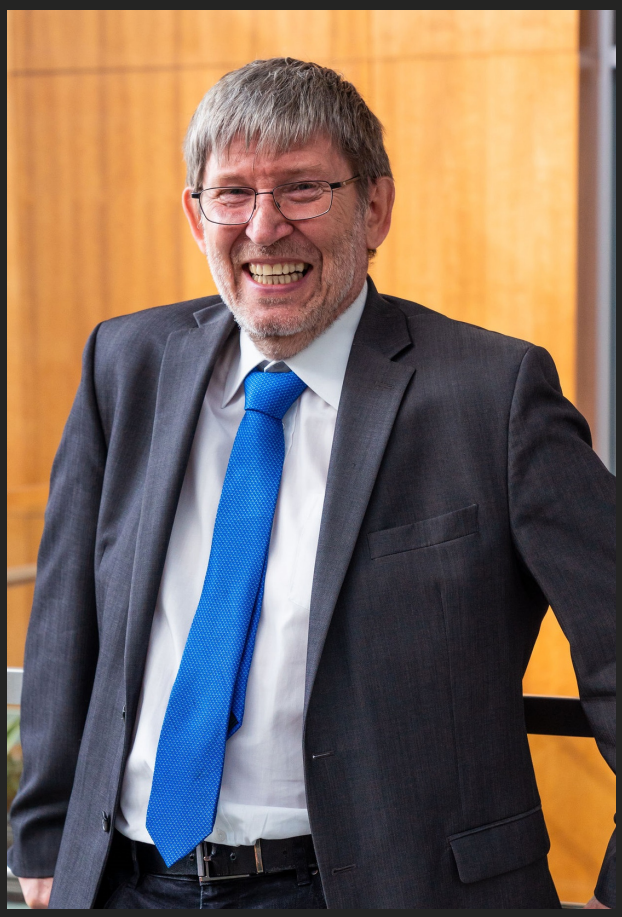
# A Message From The Vice-Dean

Dear Colleagues,

Welcome to the 2021 Virtual Undergraduate Summer Research Showcase.



This is the eighteenth iteration of our undergraduate summer student research programming, which has grown to be a very important event in the University of Saskatchewan College of Medicine research calendar.

This year we have poster submissions from 11 different biomedical and clinical research categories.

I am delighted to acknowledge an exceptional dedication and work of students, mentors, adjudicators and all who facilitated undergraduate student research programs. Even in these unprecidented times, our staff worked incredibly hard to ensure all students gained the research experience they desired.

I wish all of us in our college yet another unforgettable research experience!

With kind regards,

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## Timothy Onofrychuk (Drs. Robert Laprairie and John Howland)

*Preclinical Evaluation of Cannabinoid Receptor Positive Allosteric Modulators*

Cannabis-based therapeutics show potential in treating diseases affecting the body and brain; however, deleterious side effects such as tolerance and withdrawal limit clinical utility. Cannabinoid receptor (CBR) positive allosteric modulators (PAM) are a novel drug class which enhance CBR activity while minimizing undesirable side effects. Here, we describe an iterative drug development pipeline of CBR PAMs which utilizes in-silico, in-vitro, and in-vivo testing. Informed by computational modelling of drug-receptor interactions, the effects of candidate PAMs on various cellular responses associated with therapeutic potential and intoxication are presented. Additionally, we present the in-vivo cognitive effects of a CBR PAM, GAT211, on a rat model of acute psychosis. Results show that structurally related candidate PAMs (GAT843, GAT860, GAT861) have differential agonist and PAM action on cAMP and beta-arrestin2 signaling at the CB1R. Additionally, GAT211 was unable to rescue performance deficits as measured through the 5CSRTT in rats. However, GAT211 and its derivatives were identified as potential compounds for ongoing evaluation and improvement.

1

## Maya Berscheid (Dr. Brian Eames)

*Investigating the Participation of ARSI in Cartilage Maturation*

Endochondral ossification is the process of bone formation from a cartilaginous model. Mature chondrocytes, located in the center of the developing bone, secrete molecules that induce the differentiation of adjacent cells into osteoblasts which form bone in the overlying perichondrium. Sulfated proteoglycans (PG) in the cartilage extracellular matrix have been shown to regulate the timing of endochondral ossification. PG sulfation levels, controlled by sulfotransferases and sulfatases, may influence binding affinities and signaling activities of growth factors that rely on PGs to promote bone formation. Decreased sulfation levels previously observed in mature cartilage suggest that the removal of sulfur allows for signaling of bone formation in the perichondrium. Previous results from our lab show that Arylsulfatase family member I (ARSI) acts on cartilage PG in vitro and is differentially expressed in mature cartilage regions. This leads us to our hypothesis that ARSI promotes the maturation of cartilage during endochondral ossification. To test our hypothesis, transgenic zebrafish overexpressing ARSI and mutant zebrafish knockout for ARSI were generated, and cartilage maturation was analyzed by skeletal prep. Preliminary data suggest that transgenic zebrafish have accelerated cartilage maturation and subsequent bone formation compared to wild-type siblings while mutant zebrafish cartilage matures slower.

1

## Justin Hall (Dr. Anand Krishnan)

*Contribution of Parasympathetic Innervation and Cholinergic Signaling in Prostate Cancer Progression*

Prostate cancer is the leading cancer diagnosed in men worldwide. It often follows a predictable progression, transitioning from hormone-sensitive adenocarcinoma to hormone-insensitive castration-resistant prostate cancer (CRPC), and ultimately undergoing neuroendocrine differentiation to become neuroendocrine prostate cancer (NEPC). NEPC is treatment-resistant, and the average survival time of NEPC patients is 12-16 months. Recent studies showed that parasympathetic (cholinergic) nerves promote prostate cancer growth and progression. However, little is known about the impact of cholinergic innervation on neuroendocrine differentiation of prostate cancer. In this study, we found that in vitro treatment of DU-145 prostate cancer cells with acetylcholine reverses norepinephrine-induced neuroendocrine differentiation, indicating that cholinergic signaling may suppress NEPC development. Additionally, our analysis of prostate tumor clinical specimens revealed a reduction in cholinergic innervation in tumor areas compared to the normal adjacent areas. This is accompanied by reduced cholinergic M1 receptor expression in the tumor site compared to the normal site, indicating that cholinergic signaling may be suppressed during tumor progression. Interestingly, some patients that showed tumor-specific reduction in cholinergic innervations also developed metastasis and CRPC. This is a pilot study, and although inconclusive, it suggests that cholinergic signaling may suppress prostate cancer progression, especially its advancement to CRPC and NEPC.

1

## Sameer Rathnayaka Koralage (Dr. Valerie Verge)

*What about the guys? - Can a novel non-invasive therapy improve repair in a male mouse model of MS?*

Multiple Sclerosis (MS) is an inflammatory disease of the central nervous system (CNS) characterized by immune-mediated segmental demyelination and varying degrees of axonal/neuronal degeneration, that disproportionately affects females (3:1). Males and females differ significantly in their physiology and immune responses, and consequently how they may respond to therapies. Current MS therapies primarily target the immune response that leads to demyelination/lesion generation. While these conventional therapies help alleviate symptoms, development of novel therapies that also promote effective remyelination and prevent axon degeneration are needed. It is also desirable that these therapies be beneficial in both sexes. In previous studies, we showed that Acute Intermittent Hypoxia (AIH), a novel non-invasive therapy that exposes subjects to 10 5-minute alternating episodes of moderately low oxygen (11%) with normal oxygen (21%), augments intrinsic repair mechanisms in the female MOG35-55 EAE mouse model of MS. This project now explores the therapeutic potential of AIH in the male MOG35-55 EAE mouse model of MS, with data supporting that AIH is also beneficial for mitigating disease progression, levels of inflammation, and myelin loss in males.

**Todd Stang (Dr. Michael Levin)**

## *Occurrence of Nuclear Pore Complex Perturbations in a Model of Nervous System Disease*

Multiple sclerosis (MS) is an autoimmune demyelinating disease in which neurodegeneration, the damage and loss of neurons and axons, underlies permanent disability. Dysfunction of an RNA binding protein (RBP) called heterogeneous nuclear ribonucleoprotein A1 (A1) contributes to neurodegeneration in MS. A characteristic of A1 dysfunction is mislocalization from its homeostatic nuclear location to the cytoplasm resulting in loss of A1 function within the nucleus. Recent data suggests that RBP dysfunction is linked to defects in the nuclear pore complex (NPC), a critical structure for nucleocytoplasmic transport. Therefore, we hypothesized that loss of A1 function would alter the NPC structure and negatively impact cellular health. To test this, we used siRNA-mediated knockdown of A1 (siA1) in neuronal cells to model loss of A1 function and assessed the NPC structure using immunocytochemistry. Cells treated with siA1 showed significantly greater abnormal staining patterns of NPC components compared to cells treated with non-targeting control siRNA. NPC images were then assessed using 3D rendering demonstrating that the abnormal staining patterns observed in siA1 treated cells could be quantitatively and objectively assessed. Alterations in the NPC structure due to loss of A1 function could lead to changes in nucleocytoplasmic transport resulting in neuron damage and neurodegeneration.

**Brynne Stebbings (Dr. Scott Widenmaier)**

## *Role of Stress-Regulated Transcription Factors on HDL Function and Composition*

It is well known that high density lipoprotein (HDL) particles play a role in cholesterol homeostasis, especially through the process of reverse cholesterol transport. Along with lipid transport, HDL has many other roles including endothelial protection, antioxidation, and antiinflammation. The proteomic composition of HDL creates this functional diversity and provides an opportunity to study the functional effects of altered HDL composition. HDL is synthesized in the liver, and as such can be modified and controlled in response to metabolic stress. Nuclear factor erythroid 2 related factor-1 (Nrf1) and nuclear factor erythroid 2 related factor-2 (Nrf2) are stress-regulated transcription factors that could provide insight into metabolic stress especially relevant to obesity-linked disease. Using liver-specific knockout mice, as well as control mice, plasma was collected and then separated into fractions using fast protein liquid chromatography (FPLC). In the Nrf1 and Nrf2 double knockout mice, a significant change in cholesterol percentages between fractions, as well as changes in western blot results, indicate a change in HDL composition. Ultimately, this provides insight regarding the effects of altered proteomic composition on HDL function, and offers an opportunity for further research on the role of Nrf1 and Nrf2 related to the topic.

**Adam Lanigan (Dr. Eric Sy)**

*Outcomes and Treatments of Critically Ill Patients with Candida spp. Colonization of the Lower Respiratory Tract in Regina, Saskatchewan*

Critically ill patients receiving mechanical ventilation are at increased risk of nosocomial infection with ventilator-associated pneumonia. While Candida spp. are commonly detected in the lower respiratory tract (LRT), they are generally considered colonizers rather than a pathogenic cause of infection. Empiric antifungal treatment is generally not recommended, except in cases of shock, multi-organ failure, and more than one site isolate. This retrospective analysis of medical and surgical ICU patients in Regina, SK with positive Candida spp. on LRT isolates evaluated the use of antifungal treatment and clinical outcomes. Of the 200 enrolled patients, 160 (80%) died in hospital. Antifungal therapy was given to 51.5% of patients and more likely for those with shock or who received parenteral nutrition. We found high mortality among patients with positive Candida spp. LRT cultures regardless of treatment. Multivariable logistic regression, after adjusting for age, sex, CCI, and SOFA score, showed antifungal treatment was associated with a 39% lower odds of death (95% CI 0.17-0.87), compared to no treatment (p=0.02). This study reports higher mortality rates than previous literature. The results of this study require further investigation into the need for antifungal therapy across critically ill patients to improve patient survival.

2

## Kirk Haan (Dr. Thomas Fisher)

*Osmotically induced ΔN-TRPV1 translocation*

Magnocellular neurosecretory cells (MNCs) of the hypothalamus release vasopressin (VP) to maintain body fluid homeostasis. MNCs are osmosensitive due to ΔN-TRPV1 channels, which activate in response to cell shrinkage, which occurs when the external osmolality increases. Prolonged increases in osmolality cause extensive changes in MNCs, including marked somatic hypertrophy, but the mechanisms underlying sustained VP release are poorly understood. We showed previously that exposing rat MNCs to hyperosmolality activates phospholipase C (PLC) and that this is required to activate hypertrophy. We also showed that transgenic mice lacking the PLCδ1 isoform (PLCδ1 knockout [KO] mice) display defective osmoregulation and diminished ΔN-TRPV1 currents. We show here that rat and mice MNCs exposed to hyperosmolality causes translocation of N-TRPV1 to the plasma membrane, that this depends on PLC activation, protein kinase C, and SNARE-dependent exocytotic fusion, and that this process is reversible through dynamin-dependent endocytosis. Furthermore, we show that MNC hypertrophy and ΔN-TRPV1 translocation are both absent in MNCs isolated from PLCδ1 KO mice. These data suggest that osmotically induced ΔN-TRPV1 translocation is important for maintaining VP release during sustained increases in osmolality and is therefore important for osmoregulation, and that PLCδ1 is essential for activating osmotically induced MNC ΔN-TRPV1 translocation and hypertrophy.

**Sanskriti Shrestha (Dr. Anand Krishnan)**

*Sympathetic Signaling Contributes to Prostate Cancer Progression*

Prostate cancer (PC) is the second leading cancer diagnosed and the fifth frequent cancer-related death in men worldwide. Most PC-related deaths occur due to the transdifferentiation of adenocarcinoma cells into neuroendocrine cells, resulting in neuroendocrine PC (NEPC). There is no effective treatment available for NEPC, and the survival rate of NEPC patients is less than 16 months. Recent studies suggested that sympathetic (adrenergic) signaling may have a critical influence on PC progression. Our analysis of nerve fibers in human prostate tumors and corresponding normal adjacent tissues showed higher sympathetic innervation in the tumors. Several patients who demonstrated tumor-specific higher sympathetic innervations later developed metastasis and castration-resistant PC (CRPC), a stage prior to developing NEPC, indicating that sympathetic signaling advances PC progression into treatment-resistant stages. We also found that the expression of both adrenergic 2 and 3 are upregulated in PC. Our cell culture experiments further demonstrated that the presence of sympathetic signaling during sudden withdrawal of androgen from the culture - a simulation of standard androgen deprivation therapy used for PC treatment - facilitated transdifferentiation of PC cells into neuroendocrine cells. Taken together, our results indicate that sympathetic signaling may contribute to NED and NEPC. Future studies using a large set of clinical samples and detailed cell culture studies are warranted in this direction.

2

## Lauren Duncan (Dr. Lane Bekar)

*The Role of K+ in Regulating Adaption in Distinct Cortical Layers*

High extracellular potassium concentration is known to induce adaptation in neurons. We wanted to investigate whether the potassium concentration affects the adaptation differently when stimulating in layer 3 versus layer 6 of the somatosensory cortex. Adaptation is seen in neurons in the cortex when continuously stimulated. The resulting EPSPs begin with a large amplitude then continually decrease in size. Stimulation in layer 6 seemed to create a pattern of adaptation with a faster onset of inhibition than stimulation in layer 3. We found that potassium concentration plays a larger role in modulating the adaptation during layer 3 stimulation than layer 6 stimulation. It is hypothesized that the inhibition caused by the GABA-releasing interneurons in layer 4 overshadow the role of potassium in adaptation when stimulating in layer 6.

**Khrystia MacKinnon (Dr. Ryan Lett)**

## *Defining Anemia in Iron Replete Pregnancy*

Background: Anemia in pregnancy was defined as a Hb < 110g/L in 1968 by the World Health Organization (WHO) without iron studies. Given the negative outcomes for both fetal and maternal health associated with iron deficiency and anemia (including peri-natal loss, postpartum hemorrhage, maternal mortality, and pre-eclampsia), we sought to define hemoglobin (Hb) levels in iron replete pregnancies.

Methods: Hemoglobin, ferritin, and iron studies were collected from pregnant patients in the 2nd trimester at Queen City Obstetrics & Gynecology in Regina, Saskatchewan over the last 3 years. Chart review was completed and data from 1239 charts was included in the final analysis.

Results: Only 137 / 1239 (11.06%) of patients were iron replete. The mean Hb of all patients was 120.98g/L (s = 8.17) (range: 92g/L – 150g/L) and the mean Hb of iron replete patients was 123.58g/L (s = 7.46) (range: 100g/L – 147g/L). Excluding the lowest 2.24% showed a lower limit of normal of 107g/L.

Conclusions: Given its prevalence, routine oral iron supplementation is recommended to treat iron deficiency in pregnancy. The current threshold for anemia in pregnancy set by the WHO is the lower limit of normal - further studies with more patients are needed. Hemoglobin does not reflect iron status.

**Abdul Salama (Drs. Ellen Wasan & Ahmed Shoker)**

## *Optimization and In-Vitro Characterization of Chitosan-Coated Polymeric Nanoparticles for Sustained Oral Release of the Immunosuppressant Drug 'Mycophenolate Mofetil'*

Introduction: Nonadherence to immunosuppression therapy remains a challenge in the transplant world resulting in complications, i.e., transplant rejection. Mycophenolate Mofetil an antiproliferative drug utilized in the maintenance phase of immunosuppressant therapy is dosed twice a day. Utilizing the science behind nanoparticle formulation, chitosan coated PLGA/PLA nanoparticles allow for GI retention, protection of the stomach, enhances drug loading and modulates drug release allowing for once daily dosing.

Methods: Utilizing microfluidics allows for control and manipulation of fluids at the scale of micro-liters. Various lines containing solvents interact via diffusion inside of a micro-channel chip. Through manipulation of fluid flow rates as well as concentration ratios, droplets containing polymeric nanoparticles (PNPs) are formed. Three pumps are involved in the process; pump one which contains our aqueous solvent interacts with pump two containing our drug and polymer Poly(D,L-lactide-co-glycolide) [PLGA] to form the PNP. Formed PNPs interact with Chitosan in pump three producing the final formulation.

Results: Preliminary results show that microfluidics is a practical method of producing Chitosan-PNPs. Sizes between 100-400 nm in diameter; poly-dispersity index (PDI) less than 0.4; zeta-potential greater than 30mV have been consistently produced. These results show our formulation can be tested for encapsulation efficiency and in-vitro release characteristics.

**Jaclyn Bossaer (Dr. Michelle Collins)**

*To the Beat of the Zebrafish Heart: Mechanisms of Cardiac Rhythm Control in the pitx2c Model*

Cardiac arrhythmias are defined by abnormalities in heart rate and heart rhythm. Although the zebrafish heart contains only a single atrium and ventricle, it remains a key model for research on cardiovascular defects including cardiomyopathy and arrhythmia. This is due to similarities in its heart rate and general cardiac action potential morphology compared with those of humans. PITX2 is a transcription factor which is a key transcriptional regulator of human cardiac development. Pitx2c, the zebrafish ortholog to PITX2, is hypothesized to play a similar role in zebrafish cardiac development. A pitx2c loss-of-function zebrafish model has previously been developed which displayed cardiac phenotypes like those seen in patients diagnosed with atrial fibrillation, the most common arrhythmia. Further analysis of cardiac transcriptomics datasets revealed that the expression of many genes are dysregulated in pitx2c mutants. Some of these dysregulated genes are known to play integral roles in ensuring proper heart structure and function. The goal of this project is to describe the defective mechanisms of cardiac rhythm control in this genetic model. These findings can then be applied in finding more specific, curated treatments for human arrhythmias.

**Michael Durr (Dr. Payam Dehghani)**

## *The Systemic Right Ventricle: Risks and outcomes of congestive heart failure*

Background: The right ventricle (RV) is a key determinant of clinical status. For patients with a systemic RV due to transposition of the great arteries (TGA), ventricular systolic function is expected to gradually decline and lead to congestive heart failure (CHF). Wide discrepancies between ventricular and clinical function exist, raising questions about their relationship. Standard CHF pharmacotherapies have shown little to no desired effects in systemic RV, even when systolic function is very poor. This project contributes to the largest systemic RV database to stratify patient risks for clinical practice.

Methods: Retrospective cohort study of patients with Dextro-TGA or Levo-TGA seen since 1/1/2002, age >18 at time of first assessment. Patients were excluded for single ventricle anatomy.

Results: In Saskatchewan, 7 patients met inclusion criteria, with 1850 more in the international database. Target predictor variables include patient's demographics, cardiac anatomy, biomedical markers, electrocardiogram, echocardiogram, cardiac catheterization, hospitalisations, mortality.

Future directions: From the database, multivariate analysis will be performed to determine risk factors for death, CHF, and transplant success. As there are likely difference between Dextro-TGA and Levo-TGA, univariate analysis will also be performed. The results will be used to create clinical guidelines for patients with systemic RV.

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## Stephanie Bigsby (Dr. Veronica Campanucci)

*Assessment of time-dependent sensory parameters in a mouse model of diabetes*

Neuropathy is the most common diabetic complication, affecting approximately 50% of patients. Neuropathy of sensory nerves may lead to exacerbated responses to pain (hyperalgesia), pain responses to non-painful stimuli (allodynia), or paradoxical loss of pain perception (hypoalgesia). Diabetic rodents show a consistent development of pain-related abnormalities which start approximately 6-8 weeks after the induction of diabetes. However, our lab's biochemical and electrophysiological studies in sensory neurons from diabetic mice at only 3 weeks after the induction of diabetes revealed a reduction in expression and function of voltage-gated sodium channels (Nav channels), which are essential and responsible for exacerbated pain responses. To further investigate sensory neuron abnormalities, we conducted behavioral studies on young adult C57BL/6J male mice to monitor for the onset of parameters of mechanical allodynia and thermal hyperalgesia over a period of 10 weeks. We used Von Frey and Hargreave's testing on control and STZ-induced diabetic mice. We observed a significant reductions in mechanical withdrawal threshold among the diabetic mice by week 7 respect to control. In contrast, no significant trends were observed in thermal hyperalgesia with the diabetic mice. These results are consistent with our hypothesis that in diabetic mice sensory neuron abnormalities weeks before the exacerbated pain phenotype typical of sensory neuropathy starts. These findings point to a possible earlier and new windows of opportunity for therapeutic intervention.

## Adam Wandzura (Dr. Julia Boughner)

*The Significant Conservation of p63's DNA-Binding Domain in Primates*

Earlier this year, we showed via phylogenetic tree comparison that p63's DNA binding (DNAB) domain was well conserved among primates, relative to p63's other domains. Here, we continue that line of exploration by bioinformatically probing for p63 binding sites in genes thought to be regulated by p63. That is, exploring p63's gene regulatory network (GRN). This in silico work is supplemented by immunohistochemistry experiments on fetal primate tissue sections. Using antibodies raised against our genes of interest, we probe for specific expression of genes such as Fermt1, Krt15, and Prss8.

## Joyce Lee (Dr. Michelle Collins)

*Elucidating the function of Pitx2c in early cardiac morphogenesis*

Heart development is a very complex process that involves many different pathways and factors. Pitx2c is a major transcription factor in zebrafish heart development that defines the left side of the heart and is associated with atrial fibrillation, which is the most common type of cardiac arrhythmia in humans. Pitx2c mutant larval hearts display arrhythmia and disorganized sarcomere structures. Therefore, we want to examine early heart morphogenesis to determine what are the earliest phenotypes in the developing heart that may be contributing to the development of cardiac arrhythmia. We hypothesize that pitx2c plays a role in cardiac looping angles between the atrium and ventricle, cell shape changes that occur throughout heart development, and sarcomere assembly. By comparing the transcriptomes from WT, pitx2c-/-, and pitx2cOE hearts, several genes associated with cardiac morphology and muscle were differentially expressed. Using in situ hybridization to visualize the heart, cardiac looping angles in WT zebrafish embryos at 48, 58, and 72 hpf were measured and analyzed. These data indicate a wide variation in cardiac looping angles at each of the stages in WT embryos. Future experiments will assess cardiac looping angles in pitx2c mutant hearts and validate structural genes identified from the transcriptomics analyses.

**Spencer Orvold (Dr. John Howland)**

*Development of spontaneous tests of olfaction, object memory, and social behaviour in male golden hamsters: use in rodent models of SARS-CoV-2 infection?*

While the SARS-CoV-2 virus is well known for its impact on the respiratory system, neurological symptoms such as headache, anosmia, and cognitive impairments have been observed. Most strikingly, anosmia is reported in around 50% of COVID-19 cases. Male golden hamsters are used to study the consequences of SARS-CoV-2 infection and therefore may also be used to model the neurological and behavioural effects of infection. To this end, we have developed a behavioural battery to assess behavioral changes in hamsters following SARS-CoV-2 infection. All tasks rely on rodents' innate preference for novelty and are conducted without extensive training or rule learning. Briefly, hamsters are exposed to two copies of a stimulus (odour or object) in a training trial. Following a brief delay, the hamsters are re-exposed to a third copy of the now familiar stimulus, and a novel stimulus. Results indicate that hamsters show a preference for novel odours; however, they are unable to perform the object-based task. In a sociability task, male hamsters were shown to preferentially explore a novel hamster more than either an object or familiar hamster. Future experiments will assess behavioral and neurological deficits in peripherally anosmic hamsters, as well as SARS-CoV-2 infected hamsters using our battery.

3

## Jordan Bairos (Dr. Scott Widenmaier)

*Investigating the Role of mTOR Signaling in Cellular Cholesterol Homeostasis*

Introduction: The ability of cells to monitor and regulate cholesterol abundance within their membranes is crucial for cellular homeostasis, and dysregulation contributes to cardiometabolic and neurological disorders. Using a genome-wide short-hairpin RNA (shRNA) screen, we identified the nutrient-sensing serine/threonine kinase, mTOR, as a potentially key adaptive regulator in response to cholesterol deficiency. The aim of this project is to explore how downstream mTOR signaling coordinates cholesterol metabolism through lipogenic and potentially other metabolic pathways.

Methods: A human liver cell line (Hep3B) was subjected to in-vitro studies to probe mTOR signaling. Cells were treated with pharmacological inhibitors of mTOR in cholesterol-depleted and control conditions. Downstream targets of mTOR signaling were analyzed at the protein and RNA level via western blot and RT-qPCR, respectively.

Results: We observed reduced phosphorylation of mTOR target S6K in low cholesterol conditions and during mTOR inhibitor treatment. mTOR inhibitors also decreased fatty acid synthesis genes but surprisingly had less of an effect on cholesterol synthesis genes, which will be investigated further.

Conclusion: These insights will further our understanding of how cholesterol dysregulation in the context of mTOR signaling contributes to disease and may provide potential treatment options for at-risk Canadian populations.

# Biochemistry, Microbiology & Immunology

1

**Kyle Luo (Dr. Jenny-Lee Thomassin)**

*Identification of Novel Type II Secretion System Exoproteins from Klebsiella pneumoniae*

Klebsiella pneumoniae is a Gram-negative bacterium that causes many hospital-acquired infections. K. pneumoniae strains encode a conserved type II secretion system (T2SS). T2SSs are used to secrete folded proteins (exoproteins) from the intermembrane space called the periplasm into the external environment. While T2SSs in most bacteria secrete 7-25 exoproteins, K. pneumoniae is only known to secrete 1 exoprotein, a starch debranching enzyme called pullulanase. We hypothesize that K. pneumoniae secretes more than one exoprotein. Quantitative mass spectrometry analysis comparing proteins secreted by K. pneumoniae with and without a functional T2SS identified over 80 putative exoproteins. The purpose of this study was to validate the mass spectrometry results by cloning select individual putative exoproteins, expressing them in the presence or absence of a functional T2SS and monitoring culture supernatants for exoprotein secretion. I successfully cloned 5 putative exoproteins in addition to a soluble form of the known exoprotein pullulanase. Analysis of total cellular proteins revealed that pullulanase was overproduced by the low copy plasmid, and as a result was partially released non-specifically into the culture supernatant. While there was evidence for secretion of additional exoproteins, these results will have to be repeated under conditions where the pullulanase secretion is exclusively T2SS-dependent.

**Ananna Bhadra Arna (Dr. Yuliang Wu)**

*Localization of DDX41 helicase in processing bodies (P-bodies)*

Mutations in DDX41 lead to myelodysplastic syndromes (MDS) and acute myeloid leukemia (AML). DDX41 point mutation R525H is the most frequently identified patient mutation. However, the underlying molecular mechanism remains unknown. Processing (P) bodies are dynamic membraneless ribonucleoprotein granules found in the cytoplasm of eukaryotic cells. They are involved in the degradation and translational arrest of mRNA. The aberrant assembly or disassembly of P-bodies has pathological implications in cancer initiation and progression, including MDS and AML. Recently, we found reduced P-bodies formation in DDX41 knockout cells, indicating that DDX41 is required for P-bodies assembly. The objective of this study was to discover any underlying roles of DDX41 in P-bodies assembly and subsequently, to understand the effects of P-bodies dysregulation on MDS/AML onset. Immunofluorescence studies showed that DDX41 does not co-localize with P-bodies marker EDC4 under stress. Yet, the EDC4 expression was compromised in DDX41 knockout cells and overexpression of R525H mutant in DDX41 deficient cells failed to rescue P-bodies assembly. Therefore, DDX41 is required for P-bodies assembly and any dysregulation in this assembly pathway will lead to MDS/AML onset. This study elucidates not only the fundamental role of DDX41 in P-bodies assembly, but also the molecular pathogenesis of MDS/AML.

**Muaaz Asghar (Dr. Brian Eames)**

*Effect of Confinement on Cell Embedded Hydrogels under in vitro Conditions*

Cell-embedded hydrogels is one of the leading solutions to osteoarthritis. Current research is focused on maximizing COL II deposition and decreasing COL I deposition to regenerate hyaline cartilage. One method of testing these new forms of constructs is through in vitro research. However, current in vitro research does not replicate the effect that the surrounding tissue can have on the constructs. These tissues confine the constructs which leads to greater mechanical forces. This can affect the collagen deposition of the constructs and will impact the validity of current in vitro research. To test this factor, constructs were 3D printed using ATDC5 (mouse chondrogenic cell line) and alginate as the hydrogel. These constructs underwent an in vitro 5-day loading protocol under confined and unconfined conditions as well as differing displacement strains. After cryosectioning, the slides underwent an immunostaining and histological analysis for collagen and ECM deposition, respectively. Due to time constraints and production issues, only the one loading strain could be imaged and COL I could not be analyzed. Also, a small number of slides were imaged. This led to large error in the experiment and a lack of stastically significant results. However, COL II deposition was increased for confined conditions.

**Thomas Lowe (Dr. Francisco Cayabyab)**

## *Adenosine Signaling Regulates HCN Channels and Neuronal Excitability in the Brain*

Adenosine is an important signaling molecule that is significantly elevated in epilepsy and suppresses seizures (decreases neuronal activity). However, the neuroprotective mechanisms of adenosine signaling in the brain are poorly described. Hyperpolarization-activated cyclic nucleotide-gated (HCN) channels are ion channels that likely mediate the inhibitory effects of adenosine because of their ability to suppress the generation of action potentials (neuronal communication signals). We hypothesized that activation of the adenosine A1 receptor subtype (A1R) triggers a downstream signaling cascade that stimulates the activity of a scaffolding protein known as postsynaptic density protein 95 (PSD-95), increasing its ability to bind HCN1 and HCN 2 channels. This interaction increases the expression of HCN1 and HCN2 channels in rat hippocampus, which consequently allows these ion channels to more effectively inhibit action potential generation and neuronal activity. Hippocampal brain slices were collected to quantify the expression levels and co-localization (spatial overlap) of HCN1 channels, HCN2 channels, and PSD-95. We concluded that A1R stimulation activates downstream signaling cascades that ultimately increase the ability for PSD-95 to bind HCN1 and HCN2 channels and stabilize their expression at the cell surface in rat hippocampus. This highlights a novel mechanism for adenosine to suppress neuronal activity and alleviate seizures.

**Lyubov Pastushenko (Dr. Jo-Anne Dillon)**

*Exploring Protein-protein Interactions of Cell Division and Elongation Proteins in N. gonorrhoeae and E. faecalis, respectively, using Glutathione S-Transferase Pull-down Assays*

A number of proteins are implicated in cell division and cell elongation in bacteria. Biochemical methods, like bacterial two hybrid (B2H) assays, are used to screen for proteins which may interact. Glutathione S-Transferase (GST) pull-down assays are commonly used as a confirmatory method. Using GST pull-down assays, I ascertained the interactions of proteins implicated in Neisseria gonorrhoeae (Ng) cell division and Enterococcus faecalis (Ef) cell elongation. Our laboratory had previously shown, using B2H assays, that in Ng, cell division protein FtsE putatively interacted with FtsQ. GST pull down assays showed no interaction of the Ng proteins. The protein interactions of Ef elongation protein EF1025 with MreC and GpsB were also investigated by GST pull-down, with both tests showing no interactions. These results indicate that EF1025 may have functions other than being part of an elongasome complex in Ef. Further, the non-interaction of FtsE with FtsQ in Ng could mean GST pull-down assay conditions were not yet optimized for that interaction due to time constraints. The variance of the B2H and GST pull-down assays highlights the importance of using confirmatory methods for protein interactions and encourages further study of these proteins by other confirmatory methods.

**Aashana Patel (Dr. Kiven Erique Lukong)**

## *Identifying the localization of FRK in HeLa cells using fluorescence microscopy*

Fyn-related kinase (FRK) is 54kDa protein which belongs to the Protein Tyrosine Kinase 6 (PTK6) family. This family consists of FRK, BRK and SRMS. FRK consists of three domains: Src homology 3 (SH3), Src homology 2 (SH2), and a kinase. The C-terminal end of FRK consists of regulatory tyrosine (Y497). BRK and FRK have conserved functional domains and modes of regulation, however, BRK functions as an oncogene while FRK displays tumour suppressor functions. What dictates this functional difference is unknown. We hypothesize that the functional difference depends on their subcellular localization and therefore their accessibility to different cellular targets. FRK contains nuclear localization signals in its SH2 domain, however, predominantly localizes in the cytoplasm in Hek 293 cells. The localization of FRK in cancer cells are unknown. The HeLa cell line was isolated from aggressive glandular cervical cancer from Henrietta Lacks more than 50 years ago. We have chosen the HeLa cell line as a model to examine the localization of ectopically expression of GFP-tagged FRK wildtype, and the constitutively active variant Y497F. The cells were transfected using the polyethylenimine (PEI)-mediated transient transfection method and localization examine and imaged on Evos Imaging fluorescence microscope.

**Alina Sami (Dr. Linda Chelico)**

*The Role of APOBEC3C Deoxycytidine Deaminases in Somatic Mutagenesis*

APOBEC3 (A3) enzymes are host restriction factors that suppress retroviruses like HIV by inducing mutation of viral DNA through deamination of cytosines to uracils. Evidence shows that A3 enzymes can also have off-target effects in human genomes, which can develop into mutations due to erroneous repair of the uracil. These mutations may cause cellular transformation and cancer. One type of APOBEC3, called APOBEC3C (A3C), is catalytically active but has poor antiviral activity. Interestingly, a variant found in 10% of African populations, called A3C S188I, has high anti-HIV activity. We hypothesized that the more active A3C variant is kept at a low level in the population because it may have greater off-target effects than the common A3C. To test this hypothesis, in this project, we directly assessed the wildtype and variant A3C enzymes for their ability to cause cellular DNA damage. Using the DNA damage marker γH2AX and immunofluorescence microscopy, we report for the first time that the A3C S188I variant induces seven-fold more cellular DNA damage than the common A3C. Future studies will investigate the mechanism of how A3s contribute to somatic mutations by characterizing how they access transiently available single-stranded DNA at replication forks and transcription bubbles.

**Jessica Sparrow (Dr. Aaron White)**

*Salmonella oral transmission via water: potential role for biofilm formation*

Gastroenteritis causing Salmonella cause an estimated 155,000 deaths each year and are ranked #1 in disease impact among the 22 most common foodborne pathogens [1,2]. The White lab has been studying 'biofilms', a specialized and resistant multi-cellular form of Salmonella. We speculate that biofilm contributes to transmission success [3,4,5], but the exact process has yet to be discovered. During my summer research, we conducted a Salmonella survival assay in water, followed by an animal trial to investigate if biofilm formation gives Salmonella a competitive advantage for transmission. Biofilm-positive and biofilm-negative Salmonella strains were inoculated into water at equal amounts. I measured the number of colony forming units (CFU) to compare the survival of two strains over time. Surprisingly, biofilm-positive and -negative strains survived equally well in water over a period of 6 weeks. When the long-term strain mixtures were used to infect mice, we found that neither strain had a virulence advantage. We expected that the biofilm-positive strain would outcompete the biofilm-negative strain. We will likely repeat this experiment to see if we obtain consistent results. I learned all the steps to take to design and implement a real-world approach to simulate different aspects of the Salmonella transmission cycle.

**Michelle Gerber (Dr. Aaron White)**

## *Building a Salmonella Reporter Strain to Examine Host-pathogen Interactions*

Gastroenteritis causing (GE) Salmonella were recently ranked as the #1 foodborne pathogen in global disease impact (1). These bacteria transmit by cycling between hosts and the environment (2, 3). When exiting an infected host, GE-Salmonella split their cellular population into two types: persisting biofilm cells and virulent single cells (4). This is called bet-hedging. We hypothesize that bet-hedging is a critical step in the GE-Salmonella transmission cycle that occurs before exiting the host. Virulent single cells can infect an immediate host, while biofilm cells can survive until a new host appears. To study bet-hedging I used Golden Gate Assembly cloning (5) to build a dual reporter plasmid construct that can track biofilm and virulent cells at the same time. Assembly was confirmed by restriction digestion and gel electrophoresis. Biofilm and virulent cells will be quantified through fluorescence microscopy. The reporter will be integrated into the Salmonella Typhimurium genome using an established Tn7 technique in our laboratory (6). After characterization of the Salmonella dual reporter strain in vitro we will infect mice to follow bet-hedging in the host intestine. From these experiments we can identify when bet-hedging occurs and host factors that may influence the bet-hedging program. This may ultimately lead to greater understanding about transmission of enteric bacteria.

**Syed Ali Abbas (Dr. Oleg Dmitriev)**

*Search for selective inhibitors of high-MEMO1 cancer cell proliferation*

MEMO1 is a putative dioxygenase that may be involved in the synthesis or breakdown of a signal molecule that modulates breast cancer metastasis. The goal of this project is to identify compounds that selectively inhibit proliferation of breast cancer cells over-expressing MEMO1 through the analysis of genetic interactions. To analyze the interaction of MEMO1 with other genes, several databases of genome wide knockout and knockdown in cancer cells were screened for synthetic lethality (SL) and synthetic dosage lethality (SDL) effects with MEMO1. Proteins encoded by several genes showing strong SDL effects with MEMO1 were chosen as targets for selectively inhibiting viability of high-MEMO1 breast cancer cells since there are no known inhibitors of MEMO1. To test if the inhibitors of these proteins should suppress proliferation of high MEMO1 expressing cells. We measured viability of the parental cell line MDA-MB-231 (high-MEMO1) and is isogenic MEMO1 knockdown M67-9 (low MEMO1) in the presence of increasing concentrations of an inhibitor. Propylthiouracil, tiapride hydrochloride and methyl arachidonyl flurophosphonate showed no significant effect on cell viability. Bafilomycin and gallic acid showed stronger inhibition of high-MEMO1 cells as predicted by SDL screening. The search for more selective and potent inhibitors of high-MEMO1 cancer cell proliferation based of SDL data will continue.

**Kristine Plaza (Dr. Deborah Anderson)**

*Testing of promising anti-cancer drugs on breast cancer cell lines*

Breast cancer is the second most common cause of cancer-related death, affecting 1 in 8 women worldwide. The transcription factor CREB3L1 was previously identified to have a role in breast cancer as a metastasis suppressor. Decreased levels of CREB3L1 can be observed in roughly 30% of breast cancers, and it is especially evident in 90% of triple-negative breast cancers. To identify drugs that are effective in killing metastatic CREB3L1-deficient breast cancer cells, a drug screen was previously performed using CREB3L1-deficient HCC1806 ±HA-CREB3L1 cells. Four drugs were identified as effective, including palbociclib isethionate, cladribine, homoharringtonine, and lanatoside C. It was hypothesized that one or more of these drugs would be broadly effective across multiple breast cancer cell lines that lacked CREB3L1 expression. For the CREB3L1-negative breast cancer cells tested, homoharringtonine showed promising results, with similar EC50 values to the ones obtained from the initial drug screen with HCC1806 ±HA-CREB3L1.

**Monisha Chakder (Dr. Jo-Anne Dillon)**

*Three conserved residues in the cell division domain of FtsI from Neisseria gonorrhoeae are crucial for its interaction with FtsW and penicillin binding*

The protein FtsI of Neisseria gonorrhoeae (Ng), also known as penicillin-binding protein 2, is the primary target of β-lactam antibiotics. FtsINg consists of an N-terminal cytoplasmic tail, a transmembrane region, an N-terminal linker region and a C-terminal transpeptidase (TPase) domain. Mutations in the TPase domain confer resistance to β-lactam antibiotics by altering the structure of TPase active sites or by reducing the stability of FtsINg. Although it is known that N-terminal of FtsI is involved in cell division in model organism Escherichia coli (Ec), the function of this domain in FtsI in Ng has not been characterized. However, results from previous studies in our lab indicate that during cell division, FtsINg forms a complex with FtsWNg, a cell division protein. In the present study, we investigated whether mutations at three conserved residues (R75, R167, and E193) in the N- terminal linker region of FtsINg would affect the ability of the protein to interact with FtsWNg. We studied the interaction of FtsINg mutants (R75A, R167A, E193A, R75E, R167E) with wild-type FtsWNg using Bacterial-Two-Hybrid assay (B2H). After the analysis of the B2H results we have found that the FtsINg mutants did not interact with FtsWNg as compared to wild-type FtsINg and FtsWNg.

**Aimen Khan (Dr. Jenny-Lee Thomassin)**

## *Analysis of GspG binding affinity for Calcium and Manganese*

The type II secretion system (T2SS) is used by Gram negative bacteria to transport a wide range of seemingly unrelated proteins from the periplasm to the external environment. The T2SS assembles a central periplasmic fibre mainly composed of repeating subunits of a protein called GspG. Dynamic GspG fibre assembly is required for active protein transport, although the exact mechanism remains unclear. It was previously demonstrated that GspG monomer and assembled fibre stability is calcium dependent. A second cation, manganese, was also identified to promote GspG stability in vivo. In the absence of either cation, GspG is degraded in vivo. However, the relative binding affinity of each cation with GspG remained unknown. We hypothesize that the contribution of calcium and manganese to GspG stability differ. Intrinsic tryptophan fluorescence was used to determine the binding affinity of both manganese and calcium with GspG. Given the sensitivity of GspG to proteolysis in vivo, in silico modelling was combined with in vitro biochemical approaches to understand how calcium and manganese impact GspG folding and stability. We showed that GspG has higher affinity for calcium than manganese and putatively identified a second cation-coordination site in GspG.

1

## Adrian Teare (Dr. Malcolm King)

*A process for Indigenous community research through meaningful engagement with the community of Grandmother's Bay (GMB)*

Research partnerships between Indigenous communities and academic institutions have historically been exploitive and harmful for communities involved and must be improved moving forward. This project focuses on the research partnership between the community of Grandmother's Bay (GMB) and the University of Saskatchewan (USask) with the objective of providing new knowledge on how to initiate Indigenous community-led research and maintain this relationship in a good way. Following behavioural ethics approval from the USask Research Ethics Board (Beh-REB ID # 2717), seven participants were recruited for this study (two community participants; five academic staff from USask) and one-on-one interviews were conducted. These interviews were audio recorded with participants' consent and subsequently de-identified, transcribed, and analyzed using Etuaptmumk, a Two-eyed Seeing (Indigenous practices interwoven with Western practices) thematic analysis approach. From this analysis, codes and themes were generated, then grouped into categories until overarching themes were established. Based on themes which emerged, research partnerships must proceed through relationships of trust, be guided by community, and provide meaningful benefit to the community. Conducting research and knowledge translation in the community's language and involving traditional ceremonies in research was also significant. Going forward, more interviews with community members will be conducted to provide future recommendations.

1

## Sarah Smith (Dr. Alexandra King)

*"A Sacred Undertaking" towards Developing an etuaptmumk (Two-eyed Seeing)-framed Collaborative Research Project and Partnership: the Sanctum 1.5 Hope Through Strength Project*

Historically, research with community partners has prioritized Western academic approaches, however ethical engagement in Indigenous health research involves centring Indigenous perspectives and processes. The Hope Through Strength (HTS) Project is a CIHR-funded research project involving collaborations between Sanctum 1.5, a community-based organization in Saskatoon and researchers at University of Saskatchewan. Sanctum 1.5 is a 10-bed home supporting perinatal women living with or at risk of contracting HIV, and their infants. Approximately 80-90% of Sanctum 1.5's clientele identify as Indigenous, necessitating an Indigenous-centred approach. HTS aims to develop an evidence base for Sanctum 1.5's model of care through prioritization of Indigenous philosophies, including etuaptmumk (Two-eyed Seeing) and Ethical Space (ES) in the context of Indigenous methodologies. Through guided conversations with HTS team members from both Sanctum the University, we gathered diverse perspectives on the collaborative processes that informed the development of HTS. Results describe how the team was formed, and how etuaptmumk and ES frameworks were enacted through themes including collaboration, values, and capacity strengthening. We discuss a range of collaborative processes including etuaptmumk and ES, which have supported capacity bridging and strengthening Such approaches were found to strengthen relationships and research processes and potentiate impacts of the HTS project.

1

## Sharalynn Missiuna (Dr. Cordell Neudorf)

*Introducing the Social Environment Typology: A New Qualitative Measure of Social Environment*

Introduction: The Social Environment Typology (SET) was recently developed as a novel way to explore how the social environment influences the well-being of individuals and populations. The SET consists of clusters of dissemination areas grouped using a Hierarchical Cluster Analysis on 30 variables describing social and economic characteristics. This project serves to introduce the SET and demonstrate its utility as a new tool for area-based health analyses.

Methods: We used data sources including the Canadian Community Health Survey, Geographic Attribution File, the Canadian Census, the SET, the Canadian Index of Multiple Deprivation and the Material and Social Deprivation Index. We linked datasets using geographical coding and the Postal Code Conversion File and calculated both descriptive and regression statistics.

Results: Our results illustrated three main points: 1) SET clusters can be agglomerated across the nation to evaluate the health of less common social environments, 2) the SET can be used to describe the social composition of a city and 3) the SET is comparable to other established methods of classifying areas to quantify health.

Implications: The SET is a powerful tool that can be used by policymakers and public health officials.

1

**Lauren Ritchie (Dr. Brittany Ellis)**

*Understanding Barriers to Physician Response to Elder Abuse in Saskatchewan*

Background: Physician reporting requirements for suspected elder abuse vary throughout Canada. In Saskatchewan, there is no mandate for physicians to report elder abuse, nor is there a standardised way to address concerns. The objective of this study was to assess physician's perceived barriers to responding to elder abuse in Saskatchewan.

Methods: An online survey was developed and distributed via email to all practicing physicians in Saskatchewan (approximately 2,500). Physicians from all specialties that treat older people (≥65 years) were invited to participate.

Results: A total of 110 physicians completed this survey. Demographics showed a broad range of ages, specialties, and experience. Participants identified barriers to responding to suspected elder abuse, with most frequent barriers being lack of reporting structure (89%), patient safety concerns if reported (56%), and patient unwillingness (55%) or inability (52%) to consent to reporting. If a central intake for reporting abuse was available, 88% of participants stated they would utilise it.

Conclusion: These findings show that physicians in Saskatchewan are unsure how to respond to suspected elder abuse due to a lack of clear reporting expectations and structure and would support the use of a central intake for reporting concerns of abuse if one were available.

1

## Carly Hill (Dr. Cordell Neudorf)

*Diverse approaches to creating and using causal loop diagrams in public health research: Recommendations from a scoping review*

There is a trend in public health research for the application of complex systems thinking methods and tools. There is clear support for using qualitative system mapping and in particular, causal loop diagrams (CLDs) as analytical tools to embed complex systems thinking. To our knowledge there are no published literature reviews that synthesize public health research in terms of how CLDs are created and used. Through a scoping review we report on the following research questions:1) How are CLDs created and used in recent (>2018) public health research? 2) What recommendations emerge regarding how to create and use CLDs in public health research? We found diverse approaches in creating CLDs and in how CLDs were intended to be used. The most common method for data usage in CLD creation was the use of primary data. The most common process for CLD creation was researcher created only CLDs. The most popular intended uses for the created CLDs were finding or exploring ways to inform practice, inform policy, and identify leverage points for systems change. Based on these findings, we offer nine recommendations for future research to advance complex systems thinking and CLDs in public health research.

1

**Emily Harwood-Johnson (Dr. Mahli Brindamour)**

## *Community treatment of latent tuberculosis in children and adult refugee populations: Outcomes, successes, and challenges*

Background: Tuberculosis is a leading cause of death due to infectious disease worldwide. In Canada, the majority of latent tuberculosis infections (LTBI) are experienced by newcomers from endemic regions. The purpose of this study was to measure the screening test positivity for LTBI and compare treatment completion rates between a refugee clinic and a Tuberculosis Control centre in a mid-size prairie city in Canada using a retrospective chart review.

Methods: Charts were reviewed for all patients at the refugee clinic who received a positive IGRA test result from January 2017-June 2021 (N=125).

Results: Screening test positivity was 24.2% and 24.3% for Mantoux and IGRA tests, respectfully. Treatment initiation rate was significantly different between the refugee clinic, 67.1%, and the Tuberculosis Control centre, 88.9% ($p=0.007$). However, treatment completion rates were not significantly different between the two sites. Furthermore, treatment completion rates at each facility were not significantly different by age, gender, or region of origin. Treatment completion rates varied significantly depending on treatment regimen with those most likely to complete being prescribed rifampin ($p<0.0001$). Treatment completion rates at the refugee clinic appear to be higher than those from other refugee clinics in Canada.

2

## Jelyssa Luc (Dr. Alexandra King)

*Storying Saskatchewan's Response to HIV and HCV: a Knowledge Translation Project*

Saskatchewan has the highest rates of Human Immunodeficiency Virus (HIV) and Hepatitis C (HCV) in Canada. However, the factors that have shaped these distinct rates are not well understood. The primary goal of this project was to explore the history of these epidemics and the potential factors that have led to and continue to influence Saskatchewan's rates of HIV/HCV. We conducted semi-structured interviews with individuals who have been involved in the local, regional and/or provincial responses to HIV/HCV. Using these interviews, we produced a free online video resource to celebrate past efforts, educate, and support current and/or future actions involving HIV/HCV care. This project involved several elements of knowledge translation: community engagement and partnership activities (the exchange element), the integration of research findings and the interpretation of those findings within the larger body of knowledge (the synthesis element), and the production of a publicly accessible video resource (the application element).

2

## Nimra Tahir (Dr. Alexandra King)

*Exploring Innovations in Hepatitis C Virus and Harm Reduction Service Delivery in the Era of COIVD-19 Related Restrictions*

Harm reduction services are essential to those at risk or living with infections such as Hepatitis C virus. The public health response to the novel coronavirus (COVID-19) pandemic disproportionately affects individuals with the social determinants of health, especially Indigenous populations in Canada. We investigated the impact of these restrictions, including physical distancing, self-isolation, and closure of community services, on individuals living in Treaty 6 territory in Saskatoon. Nine virtual interviews were conducted on community-based organization or healthcare personnel for their shared knowledge and wisdom. These semi-structured interviews focused on the unintended impacts, challenges, innovative solutions, stories of resilience and future recommendations. Preliminary data was analyzed qualitatively using a Two-eyed Seeing approach and grounded theory for knowledge synthesis. The results showed an increased loss of culture, difficulty creating a connection with service users, increased mental health issues, and increased severity of medical conditions. However, there were also positive outcomes such as increased inter-agency collaborations, training and flexibility for staff. Moreover, service users demonstrated resilience by supporting themselves and their communities. Harm reduction research is crucial to highlight the inequities faced by marginalized individuals to expand our knowledge and provide more evidence to guide future policy decisions and government funding allocations.

2

## Tamryn Eglington (Dr. Karen Holfeld)

*The Role and Impact of Dermatology in Inpatient Care: a retrospective chart review regarding the epidemiology and outcomes of dermatology consultations in the inpatient setting*

Dermatologic conditions are frequently encountered in the inpatient setting, yet there is a paucity of data regarding the utilization of dermatology consults in the inpatient setting. Existing studies have indicated that consults result in a change in diagnosis for a majority of patients and that diagnostic accuracy by non-dermatologist physicians is poor.

A retrospective chart review was performed on 206 inpatient charts. The de-identified data were aggregated, and statistical analysis was performed to compare differences between groups who had or had not received dermatologic consultation.

Of the 206 charts reviewed, 122 received dermatologic consultation. The median length of stay was 10.5 days and 7.5 days for the consult and no consult groups respectively. In 82% of cases, dermatology consultation resulted in a change in management. Rash not yet diagnosed accounted for 31% of all provisional diagnoses. Among those who received consultation, 15% were diagnosed with drug eruption, 10% with other dermatitis and 10% with cutaneous infection. The most common change made to management was the addition of a topical steroid (23.6%).

Improved access to dermatology services in the inpatient setting and/or improved education of non-dermatologist physicians can improve the diagnostic accuracy and treatment of dermatologic patients in hospital.

**Tyrell Wees (Dr. David Kopriva)**

## *Socioeconomic Factors in Lower Extremity Amputation and Strategies for Prevention*

Amputations are prevalent, major procedures that contribute to significant disability, particularly among older patients with chronic conditions. Lower extremity amputations (LEA) are performed almost 100,000 times every year in the United States alone.1 Multiple sources have consistently documented both modifiable and non-modifiable risk factors for non-traumatic LEAs.2,3,4 While the modifiable risk factors can often be controlled with medications and lifestyle interventions, the upstream socioeconomic risk factors that contribute to these modifiable risk factors are rarely assessed. Social and economic factors are seldom considered in disease progression, but strategies to improve these factors can often have substantial impacts on disease outcomes. We conducted a literature review to examine the socioeconomic factors that predispose patients to require LEAs and what strategies have prevented LEA. Our literature review of 46 peer-reviewed articles demonstrated that socioeconomic factors such as lower education level, rural residence, health illiteracy, and food insecurity were associated with a higher risk of LEA.5,6,7,8,9,10 Additionally, preventative strategies including more intensive vascular care and multidisciplinary wound clinics have the potential to prevent up to 50% of amputations and save a significant cost to the healthcare system.11

2

## Shayan Shirazi (Dr. Mansfield Mela)

*Evaluation of Psychotropic Medication Algorithm for Fetal Alcohol Spectrum Disorder*

Introduction: In 2020, Dr. Mela and his team published a medication algorithm to guide prescribers through pharmacological management of Fetal Alcohol Spectrum Disorder. There was a need to evaluate prescriber perceptions of this algorithm with the goal of determining its overall efficacy and if any areas of improvement could be identified.

Methods: 136 prescribers were emailed a 25-question survey, which was to be completed in two parts. 10 prescribers completed the first part, and 3 prescribers returned and completed the second part. Additionally, 4 prescribers were not interested in using the algorithm, and were briefly interviewed via phone call. Data was analyzed using a thematic approach.

Results: Overall, algorithm feedback was positive, although several barriers to using the algorithm were identified – namely, prescribers identified unfamiliarity with the algorithm and uncertainty around how it was validated. Prescribers who used the medication algorithm observed that the medications were associated with minimal benefits (n=2) or having the risk outweigh clinical benefit (n=1).

Conclusion: Overall, the algorithm is appreciated by both prescribers and their patients, but there is insufficient data to make meaningful improvements at this time. Efforts should be made to promote knowledge and use of the algorithm in relevant prescribers.

**Vithusha Coomaran (Dr. Nazeem Muhajarine)**

*COVID-19: Effects of Social Factors on Mental Health Outcomes in Saskatchewan*

The COVID-19 pandemic has created obstacles for people to adjust their normal routine and navigate through extended periods of lockdowns. It has reshaped the ways in which individuals interact with each other. As a result, the isolating effect of COVID-19 has contributed to emerging mental health concerns1 among people in Saskatchewan and around the world. Specifically, this effect has been exacerbated among vulnerable populations such as recently immigrated, visible minority, and Indigenous groups due to pre-existing health inequities.2 This study aims to address the question: Which social factors are associated with anxiety and depression levels during the COVID-19 pandemic in Saskatchewan?

The latest national survey from Mental Health Research Canada (MHRC) assessing and depression levels among Canadians during this ongoing COVID-19 pandemic, was used to answer this research question. Statistical analysis examined the associations between factors such as employment/unemployment, age, ethnicity, education, baseline mental health status, mental health services usage, gender and anxiety and depression. Results suggest that the lack of mental health supports were associated with both anxiety and depression levels. Unemployment was also associated anxiety levels. Overall, the MHRC survey results demonstrate an association between key social factors and anxiety and/or depression since the onset of COVID-19.

**Afsoun Amiraslany (Dr. James Stempien)**

## *Don't Ask, Don't Know: Are Saskatoon ED providers screening for human trafficking in high-risk patient presentations?*

Human trafficking (HT) is the recruiting, harboring, and transporting of a person with the intent of exploitation, most commonly through sexual exploitation and forced labour. 88% of HT victims visit a healthcare provider during their time in captivity. Due to the hidden nature of these cases, the Emergency Department (ED) typically serves as a first and only point of contact with the healthcare system, making the role of an ED physician crucial in identifying HT. A retrospective chart review was completed using data collected from Sunrise Clinical Manager from presenting to any ED in Saskatoon from June 1, 2019- May 31, 2021. Selection criteria included a discharge diagnosis of one or more: chlamydia, gonorrhea, syphilis, genital herpes, pelvic inflammatory disease, sexual assault, physical assault, pregnancy, and IPV. Data collected includes demographics, chief complaint, discharge diagnosis, and any reference to HT. Preliminary results show no mention of HT in any patient chart review. 26% of cases had no sexual history recorded during their visit. Common themes of patient histories included: sexual assault, IVDU, homelessness, purchasing of sex, physical abuse and IPV. Currently, ED physicians in Saskatoon are not screening for HT. Given the impact of detection and liberations, we suggest that emergency physicians should be instructed on this issue and specific screening for human trafficking should be implemented.

## Amira Muftah (Dr. Taofiq Oyedokun)

*Communication Between Consultants Providing Advice and Referring Physicians- A Scoping Review*

Communication during consultations between referring and consultant physicians is often cited as a source of professional incivility. While existing literature focuses on the role of referring physicians, little is known on how consultants can improve communication during the consultation-referral process. A scoping review using PRISMA-ScR guidelines was conducted to identify available recommendations to aid consultants in providing telephone or in-person advice to referring physicians. Medline, EMBASE, and PsycInfo databases were searched to identify English publications from inception to May 2021. Fourteen publications met inclusion criteria. Thematic analysis of available recommendations revealed three major competencies for consultant physicians in providing advice: organization, expertise, and interpersonal skills. Although all studies described recommendations to improve the structure of advice, only eight studies highlight interpersonal skills during consultations which are important in addressing the widespread professional incivility that is commonly reported during consultations. Existing recommendations to improve the advice provided by consultants are generally weak as they lack standardized interventions which acknowledge all three competencies identified in this review. This study synthesizes available recommendations to generate a comprehensive framework which emphasizes organization, expertise, and interpersonal skills as essential components of communication to improve the structure and substance of advice provided by consultant physicians.

## Manojkumar Balakrishnan (Dr. Jonathan Grynspan)

*Arterial Spin Labelling in the Setting of Acute Stroke: Implementation of an Optimal Imaging Protocol*

In 2015, the care of acute stroke was revolutionized by data supporting the use of new clot retrieval techniques. This required emergent imaging for accurate stroke diagnosis, however current imaging protocols still miss a significant number of cases (1,2). Recently, arterial Spin Labelling (ASL) magnetic resonance imaging (MRI) has gained interest as it can detect perfusion changes in stroke that were otherwise occult in conventional MRI (3,4). Here, we have developed initial imaging/processing pipelines to assess the clinical utility of ASL in stroke. Specifically, an automated script for extracting perfusion metrics and registering these metric maps to a standard space from raw ASL images was developed. Signal to noise (SNR) ratios was assessed for pseudo-continuous and pulsed ASL (pCASL and pASL) techniques. Registration quality of a 3D T1 and single shot T1 structural images were also analyzed. Initial analysis shows that increased label delays with pCASL imaging may accommodate delayed arterial transit times (pertinent in stroke) while maintaining adequate SNR. The use of a larger labelling slab may improve the SNR of pASL imaging improving clinical utility. Finally, registration of ASL maps via lower resolution single shot T1 images may be possible which could reduce scan times in clinical practice.

## Sehar Parvez (Dr. Eric Sy)

*Direct Discharge Home (DDH) from ICU and the impact of the novel coronavirus-2019*

Background: Directly discharging home (DDH) patients from ICUs is growing(2)(3) while the coronavirus-2019 (COVID-19) pandemic has increased the critical care demands, interrupted continuity of care, and delayed patient follow-ups (4)(5)(6)(7). This study aims to evaluate risk factors for adverse outcomes after DDH from the ICU home, during the COVID-19 pandemic.

Method: Retrospective chart review with adults DDH from the ICU between February 1, 2020, to May 1, 2021. Patient characteristics, ICU interventions and outcomes were collected using REDCap.

Results: 120 patients were DDH from ICU where substance overdose (33%) was the most common diagnosis, and COPD (14%) was the most common comorbidity. Patients had a median Charlson comorbidity index (CCI) of 1 (0-3), median nine equivalents of nursing manpower use score (NEMS) on admission of 25 (18-36) and mean sequential organ failure assessment (SOFA) score of (4.1 ± 2.8). Multivariate logistic regression depicted females with (95% confidence interval [CI] odds ratio [OR], 0.29; 20.1-83.4) 69% less repeat ED visits (p = 0.01, Hosmer-Lemeshow goodness of fit = 15 (29%) repeat ED visits, 16 (37%) readmissions, 5 (42%) deaths) after DDH. Deceased patients had higher NEMS scores on admission (p=0.01) and higher SOFA scores (p=0.02) than alive patients using Pearson-chi square analysis.

Conclusion: Female sex was associated with less repeat ED visits, while higher NEMS and SOFA scores was associated with increased deaths in DDH from ICU. Further research warranted to understand high-mortality risk patients DDH from ICU.

**Trevor Oleniuk (Dr. Paul Olszynski)**

*Performance of an automated ultrasound device in identifying the heart in porcine cardiac arrest*

Background: While intra-arrest echocardiography can be used to monitor chest compression quality, it is not available for out-of-hospital cardiac arrest. In this porcine study, we sought to describe the performance of a bladder scanner in correctly identifying the heart and its borders in three distinct states: pre-arrest, arrest, and late arrest.

Methods: Localization of the heart was performed on 7 swine. The transducer was placed on the chest along the left parasternal border (4th - 8th intercostal spaces), with scan volumes and scanner-generated images recorded for each space. Then same spaces were scanned again at arrest, and again during late arrest. 150 images were randomly selected, and bladder scanner tracings were obscured to allow for a free trace by authors PA, PO and RW. Human reviewer tracings were compared to bladder scanner tracings; with concordance between these images determined via Sorenson-Dice (SD) score.

Results: Bladder scanner performance was best during the initial arrest state and worst in late arrest (SD of 0.9 & 0.5 respectively).

Conclusion: A simple ultrasound device (bladder scanner) can reliably trace porcine hearts during cardiac arrest. Further investigation into rapid sonographic localization of the heart to guide the area of compression in cardiac arrest is warranted.

## Melissa Herdzik (Dr. Eric Sy)

*Effect of restrictive versus liberal fluid management strategies on major adverse kidney events in critically ill adult patients: Protocol for systematic review and meta-analysis*

Intravenous fluid therapy is ubiquitous in intensive care units. With increasing recognition of the value of restrictive fluid management strategies, including improved survival and renal function, these have yet to be adopted universally. We conducted a systematic review and meta-analysis of randomized controlled trials (RCTs) with the objective of understanding the impact of restrictive versus liberal fluid therapy on major adverse kidney events (MAKE) in critically ill patients. A search strategy was executed on these databases (PROSPERO CRD42021261225): Ovid MEDLINE, PubMed, EMBASE, CINAHL, Web of Science, and The Cochrane Library. Four independent researchers selected studies and extracted data in duplicate, with 15 studies included in the final analysis. Risk of bias was assessed via the Cochrane Collaboration Risk of Bias assessment tool for RCTs. Primary outcome was detection of MAKE by 30 days. Secondary outcomes included incidence of MAKE at 60 and 90 days; mortality, new onset renal replacement therapy, and persistent renal dysfunction at 30, 60, and 90 days. We performed a meta-analysis using a DerSimonian and Laird random-effects model. Analysis subgroups included patient type, ICU type, and study quality. Data extraction and statistical analysis are ongoing, where the findings will be used to optimise ICU fluid management.

## Emre Islam (Dr. James Stempien)

*Evaluating the Use and Perceptions of Language Interpretive Services by Emergency Department Physicians and Residents*

Background: Barriers to communication between physicians and patients are a major source of healthcare inequity. Patients with limited English proficiency often face poorer health outcomes in emergency departments (EDs). Trained language interpretation services (TLIS) have proved to be effective in mitigating language barriers and improving patient outcomes.

Methodology: We administered a cross-sectional survey to emergency physicians, residents, and family physicians providing rural, regional, and urban ED coverage across Saskatchewan. The quantitative data were analyzed using SPSS and subgroup analyses were based on ED site population. Thematic analysis of qualitative data was done to identify common themes.

Results: Demographics of the survey were mostly physicians and some residents, with almost similar distribution of staff from urban, regional and rural ED sites. Results showed majority (90%) of respondents believing TLIS were underused. Respondents believed they would use TLIS significantly more frequent in most ideal patient interaction scenarios compared to use of TLIS currently.

Discussion: Reported barriers to more TLIS use include limited availability, lack of training on how to access TLIS, time constraints to using the service, and varying quality. We recommend more awareness of TLIS, and having more reliable options of TLIS in addition to our current service.

## Sara Abolhassani (Dr. Taofiq Oyedokun)

*Hepatitis B Immune Status of Healthcare Workers Presenting to the Emergency Department for Assessment after Blood or Body Fluid Exposure*

Background: Healthcare workers (HCWs) are at risk of hepatitis B (HB) infection if they are non-immune (HB surface antigen antibodies<10 IU/L) and have a blood or body fluid exposure (BBFE). The primary objectives of this study were to determine the proportion of HCWs with BBFEs who are HB non-immune, and compare the HB non-immune status rates between HCWs and non-HCWs with BBFEs. The secondary objective was to compare the HB non-immune status rates between Saskatchewan Health Authority (SHA) HCWs and non-SHA HCWs with BBFEs.

Methods: Following ethics approval, a retrospective chart review was conducted for patients presenting between January 1st, 2020 and December 31st, 2020 to Saskatoon's emergency departments (EDs) with chief complaints or discharge diagnoses related to BBFEs.

Results: Of the 1034 patient charts reviewed for eligibility, 345 were included. HB non-immune status rates were 34/256 (13.3%) among HCWs, and 20/89 (22.5%) among non-HCWs (p<0.001). HB non-immune status rates were 24/191 (12.6%) among SHA HCWs, and 10/65 (15.4%) among non-SHA HCWs (p=0.494).

Conclusions: In Saskatoon, over one in ten HCWs with BBFEs were HB non-immune, potentially at risk of HB infection. Significantly more non-HCWs were HB non-immune. Further research may demonstrate contributors to HB non-immune status in Saskatoon.

**Armaghan Wasim (Dr. Mansfield Mela)**

## *Understanding the Experiences of Individuals with FASD who visit the Emergency Department*

Background: Fetal Alcohol Spectrum Disorder (FASD) is a neurodevelopmental disorder which may occur after alcohol exposure in utero. Currently, it is the leading cause of neurodevelopmental disability in Canadian youth but is unfortunately underdiagnosed. Due to social and disease factors, these patients often seek primary care through the Emergency Room (ER). Preliminary study in Saskatoon finds patients with FASD as having a high rate of repeat/bounce-back visits.

Objectivers: Explore the reasons for high frequency of repeat or bounce-back visits for patients with FASD in Saskatoon hospitals.

Methods: Mixed methods approach was used. Quantitative data was collected through surveying patients with FASD and caregivers of those with FASD. Qualitative data was collected via focus groups, consisting of semi-structured interview questions. Participant recruitment was done through several community partners who disseminated our study, including Saskatchewan FASD Network, Saskatoon Crisis and SAI.

Preliminary Results: Vertical themes identified include stigma, lack of opportunity to disclose diagnosis, inefficient communication between providers and patients, and nature of FASD-related disability as factors contributing to bounce-back visits to ER. Further study and participant recruitment must be done to consolidate these findings.

## Gabriella Antaya (Dr. Angela Baerwald)

*Is the Pattern of Ovarian Follicle Wave Dynamics Repeatable Over Multiple Menstrual Cycles?*

Background: Women develop two or three waves of ovarian follicular development during the menstrual cycle. Waves are defined as the synchronous growth of a group of follicles. Minor and major patterns of follicular growth occur. It is unknown whether patterns of follicular wave dynamics are consistent across cycles.

Objective: To test the hypothesis that wave patterns of ovarian follicular development are repeatable over 2 cycles.

Materials and Methods: A prospective observational study was conducted. Transvaginal ultrasound examinations were performed every 1-3 days over one interovulatory interval (IOI) in 17 women (age 18-44). Growth profiles of follicles ≥6mm were quantified over 2 IOIs following retrospective review of ultrasound videos. Changes in AFC were quantified across 2 IOIs for the diameter categories; 2-5mm, 2-10mm, ≥4mm, ≥5mm and 4-6mm.

Results: 14/17(82%) women developed 2 follicle waves within each of the 2 cycles evaluated. The remaining 3 women developed 2 or 3 waves across the 2 cycles. In 10/17(59%) women, major and minor follicular wave patterns were repeatable.

Conclusions: Most women exhibited repeatable patterns of ovarian follicular wave dynamics across two cycles. These preliminary findings have implications for optimizing stimulation of follicle growth during fertility therapies and suppressing follicle growth with contraceptive therapies.

## Sahya Bhargava (Dr. Cathy MacLean)

*Kinesiologists In Family Practice Clinics- moving forwards*

Background: Physical inactivity has been identified to be a major public health concern, and demands continued attention and new strategies to combat this issue. The benefits of physical activity are well documented and is known to be appropriate therapy for the prevention and management of many chronic diseases. One strategy to help patients receive individualized evidence-based exercise counselling is to promote multi-disciplinary teams of kinesiologists and physicians within family practice (FP) clinics.

Purpose: Summarize the literature on the role of kinesiologists in FP settings and the importance of exercise as a therapeutic recommendation in this environment.

Method: A literature search was done using MEDLINE and Google Scholar, examining the role of Kinesiologists in healthcare settings. An environmental scan was completed to understand educational and political barriers that exist.

Results: The literature review and environmental scan were completed and supported further exploration of kinesiologists in FP clinics in Saskatchewan. To study this further, ethics proposal was submitted and approved.

Conclusions: This is a very complex political environment which is influencing what is occurring at the educational and healthcare settings. Further study is planned to specifically look at kinesiology students rotating in FP settings.

## Sarah Valentine (Dr. Cordell Neudorf)

*Barriers to accessing the HPV vaccine for adults across the Canadian prairies*

This study explores barriers to HPV vaccination for adults in Canada. Family physicians, obstetricians, gynecologists, and sexual health clinic staff across the Canadian prairies were surveyed and four public health recommendations were made to increase HPV vaccination for adults: 1) reframing the risks of HPV to include the risk of other cancers (anal, throat, etc.) as well other pathologies (genital warts, cervical dysplasia, etc.), 2) making the vaccine easily accessible at the family physician level, 3) reducing the cost of the vaccine for those who fall out of the provincial coverage criteria, and 4) ensuring consistent education of family physicians regarding practices and policies surrounding HPV vaccination in their region.

## Shannon Haughian (Dr. Cathy MacLean)

*After-Hours Care in Family Practices in Saskatoon*

Accessible care is one of the pillars of the Patient's Medical Home, where patients can access medical advice and information on accessing care 24/7. Existing clinics offering extended hours results in decreased ED utilization.

We phoned 51 family medicine clinics in Saskatoon and noted instructions/options for after-hours care. Results were mapped using QGIS mapping software. Accessibility of clinics and the populations of each network were compared using the 2020 Neighbourhood Profiles of Saskatoon document.

57% of family medicine clinics in Saskatoon provide access to some form of after-hours care (phone consultation or on-call physician). 57% of clinics said to call 911/go to ED in an emergency. 22% of clinics listed 811 as an option for 24/7 medical advice. 12% of clinics did not give any instructions. One clinic did not have an answering machine.

Saskatoon's Core has the best access to after-hours care. Saskatoon North and West have the lowest access to clinics and after-hours care per population. This study provides valuable insight into the accessibility of family medicine clinics and their distribution across the 5 health networks in Saskatoon. This information can help inform decisions regarding the location of future urgent care centres and walk-in/extended hours clinics.

## Gloria Yu (Dr. Kyle MacDonald)

*Does a Simple Bedside Clinical Frailty Score Predict CPR Survival?*

Background: Frailty, a syndrome of impaired physical function and reduced physiological reserve, has been recently associated with decreased survival to discharge following in-hospital cardiac arrest. Currently, there is limited research about the association between frailty and survival to discharge following in-hospital cardiac arrest in Canada.

Objective: The objective of this study is to determine the sensitivity and specificity of the Clinical Frailty Scale (CFS) score with respect to cardiopulmonary resuscitation (CPR) survival for hospitalized patients over age 60 in Regina, Saskatchewan.

Methods: A retrospective chart review of patients who underwent CPR was conducted with inclusion criteria of over age 60, hospitalized, and CPR performed in-hospital. Exclusion criteria consisted of alternative code blue diagnosis, and no documented physiotherapy assessment. CFS scores were determined from physiotherapy assessments by a multidisciplinary team. Sensitivity and specificity of CFS scores >4 as a predictor of CPR survivorship will be calculated and interrater reliability of the CFS will be evaluated.

Results: Study findings will assist clinicians in using the frailty score as a guide when making clinical decisions regarding whether CPR will be futile. Furthermore, the frailty score can be used to inform and guide patients about the realistic outcomes of resuscitation during end-of life care discussions.

## Margaret Sutherland (Dr. Yvonne Blonde)

*Evaluation of Equity-Oriented Care in a Primary Care Setting*

Background: Structural inequities embedded in the health system and organizations shape the environments in which providers work, limiting access to services for people living with intersecting levels of vulnerability.1 Equity-oriented Primary Care (EOPC) is an evidence-based, theoretically-informed framework intended to guide the delivery of equitable patient-centered, contextually-tailored care services.2

Methods: This was a qualitative descriptive study. Content analysis was performed on clinic documents and thematic analysis was performed on focus group discussion transcripts.

Results: The clinic documents referenced patient-centered care and flexibility frequently; access and performance-evaluation moderately; and power-differentials and inclusivity infrequently. Overall content pertaining to equity was higher in documents intended for learners. Themes from the focus group analysis included explicit commitment to equity, power differentials, and flexibility.

Conclusion: There were clear gaps in EOPC-related policies in the documents that were analyzed. The documents with the most references to EOPC were the broader provincial resident documents suggesting a focus on learner awareness rather than the site-specific clinic. Overall impressions varied depending on clinic roles, but strengths and areas to be prioritized were discussed in all groups.

# Medical Education

1

**Alanna Wong (Dr. Brian Le)**

*MRI Shoulder at 3T versus MRI Shoulder Arthrography for Detecting Labral and Rotator Cuff Tears*

Introduction: The main purpose of this study was to determine whether there is a difference in diagnostic accuracy using MRI versus MR arthrography to detect rotator cuff and labral tears.

Methods: A retrospective review of shoulder MRI and MRA reports on rotator cuff and labral tears performed on 3T MRI machines in the Saskatchewan Health Authority, Regina. Labral and rotator cuff tears were identified on PACS. The reports from MRI or MRA imaging were then compared to operative reports found on SCM to either confirm or refute the findings identified on imaging.

Results: A total of 173 labral tear cases (MRI = 131, MRA = 42) and 307 rotator cuff tear cases (MRI = 294, MRA = 13) were evaluated. MRI has significantly ($p<0.05$) higher sensitivity and specificity than MRA sensitivity and specificity for labral tears of the shoulder. However, no significant ($p>0.05$) difference was observed between MRI sensitivity and specificity than MRA sensitivity and specificity for rotator tears of the shoulder.

Conclusion: Study results have concluded that MRI is considerably more sensitive and specific than MRA for labral tears of the shoulder. Future direction for prospective projects/studies includes larger sample sizes for each category warranted.


1

**Caitlyn Kitts (Dr. Sabira Valiani)**

## *Connect-ICU: using technology to facilitate patient and family-centered care, enhance communication, and build relationships between patients, their loved ones, and the healthcare team*

Introduction: Care in the ICU presents unique challenges due to the complexity of care, nature and pace of decision-making and the emotional toll of having a loved one in critical condition.1 While ineffective communication has been known to influence satisfaction with ICU care, the COVID-19 pandemic and resulting visitor restrictions implemented have amplified communication challenges in the ICU and incited the need for solutions.1,2 Technology including video calls and virtual rounds have been vital to improve communication with patient's loved ones.3

Methods: This project utilizes design thinking methodology is a human-centered approach to innovation centered around understanding experiences and characterizing need to generate meaningful solutions.4 Specifically, the journey mapping process will allow us to see the ICU journey from the perspectives of patients, loved ones and healthcare providers. Up to 20 interviews will be conducted, centered around key moments and milestones identified through focus groups with diverse patient partners, healthcare providers and Indigenous elders. Journey mapping personas will be developed using the concepts and themes identified through these interviews. These personas will help capture the ICU experience through the lens of multiple diverse identities and intersections of identities (for example, a patient whose first language is not English) and inform evidence-based solutions to enhance communication using technology in the ICU.

Conclusion: The design thinking process will provide a foundational understanding of previously existing technologies to envision future solutions in the ICU where technology supports trust, relationships, and communication.

MEDICAL EDUCATION

1

## Hifsa Noor (Dr. Rabia Shahid)

*Uptake of the Early Warning System*

Background: The Early Warning System (EWS) is a numerical scoring system that includes blood pressure, temperature, oxygen delivery, oxygen saturation, heart rate, level of consciousness, and respiratory rate. EWS scores can be used by clinical providers in the hospital to detect patients' early deterioration to escalate care, increase frequency of monitoring, or the rapid response team's initiation to prevent cardiac arrest, increased length of stay, and even death. However, the effectiveness of the EWS depends on the accuracy of its usage, timelines of measuring EWS scores, and the completeness of EWS scores.

Methods: Patients with medical illnesses who were admitted to the CTU at RUH from Feb 2020-June 2020 with EWS charts were included, and uptake of EWS was assessed.

Results: 172 patients were included in the study; 26 patients had vital signs assigned correctly in the score sheet, 139 had missing vital signs, and only 12 had EWS calculated and of those who had EWS calculated.

Conclusion: Our results showed gaps in accuracy and completeness of EWS; this study is limited due to the confounder of the COVID 19 pandemic. Future directions shall aim at strategies to improve the uptake of EWS.


1

## Gabrielle Cousyn (Dr. Lexy Regush)

*Factors Contributing to Trial of Labor after Caesarean (TOLAC) Success Rates in Saskatoon*

The term trial of labour after caesarean (TOLAC) includes all attempts at vaginal delivery following a previous caesarean, regardless of outcome delivery type. A TOLAC can be a valuable alternative to ERCD in suitable candidates and success rates reported in various studies range from 60–80%. (1) Successful TOLACs have reduced perinatal complications including bleeding, thrombosis, and infection. (2) TOLAC has a minimal risk of uterine rupture between 0.2-0.8%. (3) Maternal obesity has been cited as an increasingly common obstacle to TOLAC success. (4) We have no local data to support these findings. Our project had two objectives: to determine the effect of BMI on TOLAC success in Saskatoon, and to create a regression model using local data for TOLAC success based on multiple relevant factors. We collected data from all Saskatoon TOLAC charts over a 5-year period (May 2016 – May 2021). Our final data set contained data points from 508 charts for 18 relevant variables, including neonatal weight, maternal BMI, and previous VBAC. Results are pending.


1

## Kelsey Hammond (Dr. Olivia Reis)

*Evaluating the effectiveness of teaching rounds in an academic teaching setting*

Objective: This study analyzed Family Medicine Unit (FMU) residents' perceptions of current morning rounds in regard to the process of safe patient handover, learning aspects of rounds, and the culture of rounds.

Methods: A mixed-methods research design was used to evaluate morning rounds at the FMU. A cross-sectional survey was distributed by email to all residents who attend the FMU's rounds during the current (2020-2021) academic year. The survey included a demographic section, questions on residents' knowledge regarding patient safety and residents' perceptions of rounds. Semi-structured interviews were done with residents attending rounds.

Results: The survey had a response rate of 44% (n=11) and 3 residents participated in interviews. Residents agree that having a structure for morning rounds would make rounds more efficient and improve their learning experience. Analysis of survey results and interview responses indicated that morning rounds are not currently meeting all training needs for learners, and residents feel that morning rounds are an unsafe environment, for both patient and learner safety.

Conclusions: The survey and interview results indicate that the learning aspect of morning rounds needs improvement and structure, and a change in culture is necessary for improving the learner experience at the FMU.


1

## Mohamed Omar (Dr. Regina Taylor-Gjevre)

*Curriculum Renewal: Equity, Diversity, and Inclusion curriculum review, goalsetting and evaluation*

Objective: There is an increasing recognition of the responsibility of undergraduate medical curricula in supporting student education towards equity, diversity, and inclusion (EDI). This recognition stems from the need to produce physicians who are better equipped with the necessary skills to serve our diverse patient population.

Methods: To explore areas of improvement with respect to EDI in our undergraduate medical curriculum, a comprehensive review of all learning objectives relating to EDI was undertaken, a literature review on the current literature on the topic was conducted, and a survey was distributed to all the students to identify areas for improvement. The learning objectives inventory, the literature review, and the survey were results were subsequently summarized to produce a number of recommendations to aid curricular innovations with respect to EDI.

Results/Conclusion: To develop a curriculum which promotes EDI and ultimately produces physicians who are well equipped with the necessary skills to serve our diverse patient population is not an easy task. However, consistent effort in producing curricular innovations that aid in said goal and then assessing those innovations for their success will put us on the right trajectory. This study has ultimately produced a number of recommendations to aid in such efforts.


1

## Alice Kong (Dr. Cordell Neudorf)

*How to be a High Functioning Medical Health Officer (MHO) in Canada and Improve Health Equity*

Background: Medical Health Officers (MHO) are leaders in public health to promote public health and disease prevention. Despite the significant responsibilities and expectations, there is lack of teaching resource available to assist better understanding of how to be a high-functioning medical leader. This project explores which qualifications are necessary for high-functioning MHO to improve health equity and how their skills be fully cultivated during training.

Method: The researcher interviewed former MHOs to understand the MHO role and its expectations and address concerns about health inequity. Interviews were conducted by a researcher and focused on understanding the role and experience of MHOs and gathering any ideas or advice they had. Interviews were recorded and transcribed for further data analysis and use.

Conclusions: Gaining medical knowledge and developing clinical and leadership skills are most crucial to becoming a high-functioning MHO.

Future study: There is a lack of appropriate literature and studies to assist MHO in becoming high-functioning and more competent leaders despite MHO's influence on public health outcomes and their broad scope of practice. Therefore, more studies and books must be published to assist future and current MHOs to better equipped to improve public health and health equity in Canada.


1

**Rishi Thakkar (Dr. Regina Taylor-Gjevre)**

## *Learning through application: exploring case and experience-based learning as an alternative to lectures*

Background: Medical students no longer desire to learn exclusively through didactic lectures, preferring active learning, requiring them to be both physically and mentally engaged. This study focuses on the proportions and nature of curriculum delivery methodologies at the University of Saskatchewan, College of Medicine, as well as student perceptions on effectiveness of various teaching methods.

Method: An internal curriculum delivery review was conducted to inventory educational format within curriculum. Additionally, student perspectives on teaching formats/methods were sought through both emailed survey and focus group.

Results: Of 488.097 hours dedicated to organ system-based teaching in the preclerkship years of the program, 408.27 hours (83.6%) are didactic lectures. Student survey results indicated preference for learning about disease presentation and management in clinical settings over didactic lectures and focus group findings highlighted need to incorporate more case-based-learning opportunities and formative workbooks focused on disease presentation and management into the curriculum.

Conclusion: Current curriculum delivery methodological proportions in the preclerkship component of the program are heavily weighted towards lecture formats. Student perspectives identified preferences for more active learning strategies. Intentional diversification of curriculum delivery strategies within courses/modules may be a feasible transition approach for addressing this imbalance.

MEDICAL EDUCATION 1

## Gina Choi (Dr. Peter Hedlin)

*Subarachnoid Failures: Reasons for Insufficiency*

Spinal anesthesia is a common procedure used to aid in Caesarean Sections. Bupivacaine is often used to induce a subarachnoid block (SAB). SAB failure is defined as the inability to create a significant enough sensory blockade to allow surgery to be completed without causing significant pain. Failed SABs in Caesarean sections can have detrimental effects to the parturient and the neonate. Current literature suggests that SAB failure can occur between a range of 0.46-17%. The etiology of failure can be classified into three mechanisms: 1) Procedural complications; 2) Patient factors; 3) Lability of bupivacaine. The wide range of reported failure rates prompted our group to study SAB failure at our institution, and help guide future studies of provider, product, and patient related factors associated with failure. It is very likely that all three mechanisms of provider error, patient factors and bupivacaine liability will contribute to the SAB failures we are able to capture. However, we have recently discovered that a lot of bupivacaine at JPCH has been impacted in several failed SABs. We have collected several vials from this lot for analysis and will likely be the greatest contributor to the recorded failed SABs.

MEDICAL EDUCATION

2

**Bryan Johnston (Dr. Paul Olszynski)**

## *Enhanced acquisition of POCUS skills after additional instruction from simulated patients*

Background: Point of Care Ultrasound (POCUS) training in Canadian undergraduate medical programs is steadily increasing. To date, the simulated patients (SPs) in our program have been passive partners in the training process, only providing feedback on comfort and professionalism. Involving the SPs as teachers (SP-teachers) of POCUS skills provides an additional opportunity for instruction to students.

Aims: We explored the impact of having SP-teachers actively instruct medical trainees while they learned PoCUS. Outcomes of interest included the level of proficiency achieved after a single session and trainee satisfaction with the learning experience.

Methods: First year medical students (N=19) were randomized into a traditional or SP-teacher learning experience. Both groups received the same instructions, teaching and basic SP feedback (comfort and professionalism) but the SP-teaching group received additional instruction (landmarks, transducer technique, and troubleshooting). Students were assessed in a mock OSCE.

Results: Students that received SP-teaching scored significantly higher in both image acquisition ($p=0.029$, $d=1.26$) and overall entrustment ($p=0.002$, $d=1.75$). Both groups gave equally high scores on the post-workshop evaluations.

Conclusions: Students that received SP-teaching were observed to better acquire images and were more confident in their PoCUS abilities. SP-teachers had a positive effect on the acquisition of PoCUS skills.

**Sunam Jassar (Dr. Rabia Shahid)**

*Are there more code blues after hours?*

Background: There is a lack of data on medical patients considering outcomes of a code blue (cardiac arrest) in relation to time of day or day of week. This retrospective cohort study aims to compare the difference in number and outcome of code blue events before and after hours.

Methods: A retrospective cohort study was conducted in medical patients who had a code blue event at two tertiary care hospitals in Saskatoon from 2014 - 2020. Data was analyzed using SPSS 25.

Results: 160 eligible patients were included. 111 (69.4%) code blue events occurred afterhours. Overall 79 (71.2 %) patients were deceased when the code blue event occurred between 1700-0800 hrs, as compared to 32 (28.8%) during the day time (p=0.46). Code blue events were dispersed throughout the days of the week, with Monday being more common (n = 31, 19.4%) followed by Tuesday (n=17.5%). Odd ratios for death were 1.3 (p=0.45) and 1.3 (p=0.54) when code blue event occurred after hours and on weekends respectively, however they were not statistically significant.

Conclusion: In patients admitted to general internal medicine, most code blue events occurred afterhours and following the weekend. We did not find difference in death if code blue events occurred afterhours or weekends.


2

## Veronica Rally (Dr. Rob Woods)

*Using Natural Language Processing and Machine Learning to rate narrative assessment comments in CBME*

In competency-based medical education, programs of assessment rely heavily on direct observation assessments. The Quality Assessment for Learning (QuAL) score has evidence for rating the utility of short narrative comments in this context. However, given the volume of direct observation assessments within a training program, manually rating comments with the QuAL score is a labor-intensive process. Natural Language Processing (NLP), a sub-field of Machine Learning, offers a promising means of automating this process. To be reliable, NLP algorithms must be trained on large, labelled datasets. We compiled 2500 narrative comments from two Emergency Medicine training programs. The comments were de-identified and placed into 25 surveys of 100 comments each. We recruited emergency medicine faculty and residents across Canada to rate these comments using the QuAL score. Each comment received a score from one resident and one faculty member, and these scored comments formed our 'truth' database. We will use these data to train an NLP algorithm to assign narrative comments a QuAL score. This highly efficient system will aid faculty development by quickly producing personalized assessor "report cards", and could potentially be integrated into the evaluation system itself to offer suggestions to strengthen assessments even prior to their submission.


2

**Alexa McEwen (Dr. Carla Holinaty)**

*Review of 2SLGBTQ+ content in the University of Saskatchewan Undergraduate Medical Curriculum*

Background: Two-spirit, lesbian, gay, bisexual, trans, and queer (2SLGBTQ+) individuals experience multiple levels of oppression, including inadequate healthcare professional training, that contribute to worse health outcomes. How well 2SLGBTQ+ content is included in the University of Saskatchewan undergraduate medical curriculum is currently unknown.

Aim: To outline the 2SLGBTQ+ content currently in the U of S undergraduate medical curriculum, determine when it occurs, and to identify opportunities for improvement.

Methods: Written course materials for the 2020/2021 academic year were reviewed for 2SLGBTQ+ content, and course personnel were contacted for further information. Data were analyzed for the degree to which topics were discussed and the amount of focused curricular time was calculated.

Results: Approximately 10.75 hours are devoted to explicit coverage of 2SLGTBQ+ topics. Most of this is large group lectures during the first two years, but there is also time for practicing communication with 2SLGBTQ+-simulated patient cases. There are very few instances where 2SLGBTQ+ content is discussed as part of a larger topic, such as in a specific disease process.

Conclusion: The University of Saskatchewan undergraduate medical curriculum has as good foundation of curricular time already devoted to covering 2SLGBTQ+ topics that can be harnessed to improve the training students receive.


2

## Erinna McMurtry (Dr. Robert Weiler)

*Needs assessment for education on medical assistance in dying: Knowledge of MAiD among Saskatchewan health care providers*

On March 2021, Bill C-7 was passed by the Canadian government, resulting in several important amendments to the Criminal Code regarding medical assistance in dying (MAiD). There remains some uncertainty about the implementation of these new criteria among healthcare providers, especially about the removal of the previous requirement of a "reasonably foreseeable death." This study aimed to examine the desire and need for education about MAiD among Saskatchewan healthcare providers. A total of 41 participants (8 nurse practitioners and 33 physicians) responded to an online survey distributed to nurse practitioners and family physicians in Saskatchewan by email. This survey was informed by consultation with other provincial MAiD programs across Canada. Study participants reported uncertainty about the implications of changes in MAiD enacted by Bill C-7, and decreased comfort in managing the cases of patients requesting MAiD without a reasonably foreseeable death. Respondents also indicated that they would like to receive more information about MAiD and recommended methods to increase the level of knowledge about MAiD among healthcare providers including: online webinars, online training modules, and emailed updates.


2

## Devynn McIntyre (Dr. Cathy MacLean)

*A Coach Certification Program Proposal for Faculty Development*

Coaching is being adopted widely across medicine; however, medical education lacks a standard coach training process to prepare faculty to fill this distinct role. The goal of this project was to develop a draft proposal of a coach certification program to be used by Faculty Development offices to train faculty as coaches. Methods included a review of the medical education literature to identify key coaching skills and elements of successful coach training programs to inform the proposal and an environmental scan of faculty development programs at medical schools across Canada to gain an understanding of what is already being offered in terms of coach training. The environmental scan confirmed that there is a wide variety of programming on coach training across the country, and the literature review reinforced the need for dedicated training in order for coaching to be effective. The results were used to create a proposal for a certification program consisting of 3 levels to provide evidence-based longitudinal training for faculty acting as coaches, which we hope will one day improve the quality and value of coaching in medicine.

MEDICAL EDUCATION

2

**Georgia Bailey (Dr. Deepti Ravi)**

## *Utility of Intra-Departmental Pathology Rounds in a Multidisciplinary Academic Centre*

Background: Intra-departmental pathology rounds are utilized in many academic centers across the North America to encourage discussion about complex cases while enhancing collaboration between pathologists. The goal of these rounds is to allow pathologists to provide an efficient and effective service to decrease turnaround times, allowing the clinical team to initiate treatments for patients sooner. Thus, it is hypothesized that implementation of these rounds in Saskatoon SK, will enhance learning, improve collaboration, decrease turnaround time, and decrease the need for external consultations; all of which may increase job satisfaction of pathologists.

Methods: These parameters were assessed using a short survey which consisted of a mix of multiple choice, select all that apply, sliding scale, and short answer questions. Majority of participants believed rounds enhance learning and collaboration, however turnaround time and the need for external consults were not affected by the implementation of these rounds. Barriers preventing attendance to rounds was also examined and demonstrated that the current virtual format of rounds took away most barriers from attending.

Results: These results provide insight on how to enhance intra-departmental pathology rounds to optimize individuals time and increase job satisfaction for pathologists, thus allowing for a more streamlined and rewarding pathology service.


2

**Kirti Garg (Dr. Stephanie Madill)**

*Literature Review of Current Best Practices for Inclusion of Sexual and Gender Minority Content in Healthcare Education*

Despite people who are sexual and gender minorities (SGMs) being a significant portion of society, many trainees report inadequate exposure to SGM content in medical school. The objective of this review was to summarise the literature describing current best practices for inclusion of SGM content in medical training.

Medline, Cinahl, Eric and Embase were searched. Included articles discussed the inclusion of SGM content in healthcare professional education and were published since 2015. 457 articles were identified and 37 were included in the review. Thematic analysis was conducted, and results interpreted with a representative from OUTSaskatoon.

Four themes were identified: 1. Instructional methods need to be tied to learning objectives; 2. Sufficient teaching time must be allotted to allow students to develop skills and confidence; 3. SGM content should include knowledge, attitudes and skills, should be distributed throughout the curriculum, and be integrated with other content to normalize SGM identities, and 4. Gender diverse persons' health should be covered separately from sexual minorities'. It is not sufficient to solely provide information about gender diversity; transphobia must be addressed as well.

These results will be used to inform recommendations for systematically integrating SGM content into the USask medical curriculum.


## Baljit Pandher (Dr. Robert Weiler)

*Exploration of Various Faith Based Communities' Knowledge and Attitudes Towards Medical Assistance in Dying*

Medical Assistance in Dying (MAiD) is an end of life health care option that allows adults suffering from serious and incurable disease, illness, or disability the opportunity to voluntarily request medicines to end their lives.1,2 Religious and spiritual beliefs can effect end of life health care choices,4 thus the purpose of this research is to increase understanding of the beliefs of different faith communities as they pertain to making the decision to access MAiD. To gain insight on the beliefs of different faith groups, a literature review was completed. The knowledge gained from this literature review was then used to help conduct semi-structured qualitative interviews with 22 local faith leaders across Saskatchewan. Each interview was 30 minutes in length, and involved the administration of a standardized questionnaire, followed by brief discussion. The results of the research indicate that a substantial percentage of faith leaders are accepting of MAiD as a conscientious end of life decision, and that a vast majority of faith leaders would continue to provide spiritual support to end of life patients, regardless of that patient's decision to access MAiD. Additionally, the research indicates that there is a desire for further education about MAiD among many faith leaders.

## Chelsea Healey (Dr. Laura Hopkins)

*Enhancing Recovery from Surgery in Gynecologic Oncology*

Objectives: The goal of this project was to establish baseline perioperative morbidity data in gynecologic oncology surgical patients prior to implementation of an enhanced recovery after surgery (ERAS) protocol at RUH.

Methods: Gynecologic oncology major open laparotomy perioperative morbidity data was collected from June 1, 2017 to May 31, 2018 using Sunrise Clinical Manager (SCM). Statistical Package for the Social Sciences (SPSS) was used to analyze the data.

Results: Data was collected for 52 women undergoing surgery. Four women (8%) developed surgical site infections (SSI); n=3 were obese and had co-morbid diabetes and n=3 underwent extended procedures. Only 6 women (11.5%) commenced early feeding post-operatively and 10 women (19.2%) developed post-operative ileus.

Conclusions: Implementation of ERAS is expected to decrease development of post-operative SSI and ileus. Additional ERAS measures will be assessed prospectively and are expected to improve patient experience, enhance recovery, and decrease hospital length of stay (LOS). In this pandemic, reducing complications from surgery and decreasing hospital LOS have never been more critical.

## Filip Davidovic (Dr. Pouneh Dokouhaki)

*Utilization of Celiac Testing: Have we crossed the (guide)line?*

Aim: Several diagnostic tests including serology, biopsy, and HLA genotyping exist to aid in the diagnosis of Celiac Disease. Incorrect use of these tests can lead to harmful downstream effects for the patient, and unnecessary strain on the healthcare system. We aim to determine if the increasing rates of celiac tests are due to clinically inappropriate utilization.

Methods: Utilization data for Celiac Tests from 2015-2020 in the Saskatoon region was retrieved. We then focused on patients who had received Anti-TTG serology, and/or HLA testing, and/or biopsy for celiac disease in 2019. Next we compared the patterns of use against several clinical guidelines for celiac disease diagnosis.

Results: From 2015 to 2019 there was a 34% increase in Anti-TTG serology tests. Of the 9136 tests in 2019, 10 physicians accounted for 26.8% of the orders. Repeat serology testing also rose 71% from 2015-2019. Of the 10 patients who had serology, HLA, and biopsy testing done, only 4 followed a pattern possibly compatible with guideline recommendations.

Conclusion: Our findings suggest a significant portion of celiac testing is being done inappropriately and Saskatchewan would benefit from further physician education, laboratory safeguards, and new serology algorithm.

## James Macaskill (Dr. Andries Muller)

*Assessing Outcomes of Saskatchewan's Practice Enhancement Program*

Introduction: This research synthesizes outcomes of Saskatchewan's Practice Enhancement Program (PEP) over the last 24 years. PEP is designed to provide physicians with patient and peer feedback on their clinical practice. In doing so, the program serves as an important means of promoting reflection and continued medical education. While PEP has been delivering this service since 1994, a comprehensive program evaluation has never been done.

Methods: The research team analyzed the outcomes of 825 practice assessment reports and over 4241 individual recommendations found therein, from 1997 to 2020. Data from these assessments were collected, organized, and analyzed to determine: (i) What are the areas in need of improvement? (ii) Is there any other information that results from the data?

Results: Several themes were identified as common reasons for recommendations. The top recommendation was around documentation. Other recommendations that made the top ten list were: chronic disease management, cumulative patient profiles, medications, emergency preparedness, lab investigations, objective measure of lung function, patient privacy, patient safety and mental healthcare.

## Kienna Mills (Dr. Christine Lett)

*Determining the validity of non-invasive hemoglobin testing to detect anemia in postpartum women stratified by pre-existing risk factors*

Iron deficiency, hemoglobin <100g/L, is common in pregnant and postpartum women. The major causes of postpartum anemia are antepartum iron deficiency, iron deficiency anemia and blood losses at delivery. Currently at Regina General Hospital, postpartum anemia detection requires a blood sample and CBC analysis. Noninvasive hemoglobin analyzers are currently available and can measure total hemoglobin.

A convenience sample of postpartum women at the Regina General Hospital Mother Baby Unit who met the inclusion criteria of being postpartum day one, greater than 18 years of age, and who delivered a singleton pregnancy were recruited. Masimo Pronto Pulse CO-Oximeter and Masimo Rad-67 CO-Oximeter hemoglobin non-invasive sampling were performed and compared to the postpartum CBC hemoglobin. Historical risk factors were also evaluated.

A majority of this cohort had postpartum anemia by phlebotomy hemoglobin measurement. Intraclass analysis of consistency of the device measurements with the CBC results were low. Bland –Altman plots determined an overestimation of 20-25g/L by the device compared to CBC. Both devices had low sensitivity but high specificity. High BMI, antepartum anemia, and postpartum hemorrhage were significant predictors of anemia, while age, and bleeding disorders were not.

In this high-risk population, CO-Oximeter devices were unable to reliably predict postpartum anemia. However, with refinement, the screening questionnaire may show promise.

## McKenzie Van Eaton (Dr. Polya Ninova)

*Physician Health and Wellness- A Peer Support Program at the Pediatric Department Of Regina General Hospital*

Physicians experience high rates of burnout due to the job related demands and emotional stressors. As a result, physician health and wellness initiatives have been sought out to mitigate burn out, and work towards advocating for physician well-being. Peer support programs have been used, and found to be effective, in alleviating burn out by utilizing the innate tendency to respond and empathized with shared difficulty. Our study evaluated the effectiveness of peer support and the recommendations needed to implement such a program on a larger scale. 14 physicians from the Regina General Hospital Pediatric department were paired to have informal virtual meetings (during COVID-19) every two weeks for three months. Following the program, physicians were individually interviewed and participated in a short cross sectional survey to understand the experience and perception of the program. Results showed a perceived benefit and value towards the program with an interest in continuing in a more formal fashion. The small department and the inability to meet naturally in person (due to COVID-19) provided limitations. Future indications of the program include continuation, expansion, and advocacy for the program. While providing a more formal structure with administrative support for schedule integration.

## Robert Downey (Dr. Jeremy Reed)

*Semi-Recumbent Patient Positioning on Hospital Wards: A Prospective Look*

Poor respiratory function and low oxygen saturation are often cited reasons for both prolonged hospital stays and delays in the initiation or progression of treatment. It has been anecdotally noted by the senior author, as well as other researchers, that patients are often "slumped" in their beds, with their pelvis distal to the crook of the mechanized bed, leaving them flexed across the abdomen, in a kyphotic posture. This slumped position limits lung volumes, increases the work of breathing, and compromises overall respiratory status. A visual assessment tool was created to classify position as good, fair, or poor. Data collection occurred in Saskatoon, on 12 different wards across 3 hospitals. Patient's position was evaluated from an anterior and lateral vantage point. Data collection occurred 3x/week at 3 different time periods throughout the day. Time blocks included morning (8:30-11:30am), afternoon (1:30-4:30pm), and evening (6:30-9:30pm), and were randomized between hospitals and weekdays. Poor patient positioning was relatively uncommon (9.4%), but positioning could be optimized for some patients. Further research should evaluate the impact of positioning on patient outcomes and the feasibility of improving patient positioning when considering the heavy workload of ward staff.

## Shravan Murthy (Dr. Fang Wu)

*Thyroid Function Testing: Choosing Unwisely in Saskatchewan*

Introduction: Thyroid dysfunction is quite prevalent and diagnosed through the thyroid function tests (TFTs): thyroid-stimulating hormone (TSH), thyroxine (T4), and triiodothyronine (T3). Guidelines recommend TSH alone as a screening test. Unnecessary testing can lead to patient harm and economic burden. This study aims to evaluate our institution's TFT ordering practices and identify strategies to reduce inappropriate use of TFTs.

Methods: Our group analyzed and visualized data from TFTs referred to Saskatoon biochemistry laboratories from January 1, 2016 to December 31, 2019.

Results: During this period, 1,186,369 TFTs were ordered with an approximate cost of $5.9 million. 37.2% of orders had TSH and free T4, and 16% had all 3 TFTs ordered simultaneously. Out of a total of 224,423 repeat TSH tests, 78.5% had normal initial results and 90.1% of those remained normal when repeated. On average, 51.7% of repeat TSH tests were performed within 3 months of initial testing.

Conclusions: Excessive thyroid testing and questionable ordering patterns indicate a need for standard practice protocols with clinical departmental involvement. From the data and existing guidelines, a TFT flowchart was created. Improving the appropriateness of TFT ordering will lead to more cost-effectiveness and enhance the sustainability of the healthcare system.

## Laura Wu (Dr. Stephen Lee)

*Appropriateness of urine cultures and correlated antimicrobial use in acute care*

Unnecessary urine culture (UC) ordering drives healthcare spending and antimicrobial overuse, which increases adverse drug reactions and antimicrobial resistance. The objective of this study was to assemble a comprehensive overview of the current state of appropriateness of UC ordering and correlated antimicrobial use at Regina General Hospital. An understanding of when and why UCs and UTI antimicrobials are ordered will direct further investigation and future interventions for resource stewardship in Saskatchewan. A retrospective chart review of 174 health records was conducted at Regina General Hospital. The revised McGeer Criteria for UTI were used to determine UC appropriateness through whether patients had a presumed UTI based on symptomatic criteria. Overall, 78% of UCs and 80% of UTI-directed antimicrobials were deemed unnecessary. Nearly twice as many asymptomatic patients with a positive UC were treated compared to those with symptoms but a negative UC, suggesting that UC results may have a greater impact on prescriber behaviour than symptomatology. Of those patients who received UTI-directed antimicrobials, 59% received treatment after the UC was sent but before results were received. Future interventions for UTI antimicrobial stewardship should focus on steps occurring prior to UC ordering, such as healthcare provider education and audit-and-feedback programs.

## Chiamaka Okonkwo (Dr. Jay Kalra)

*A Best Practice Model for Medical Error Disclosure*

Medical error remains a topic of concern in the healthcare system, as it contributes to significant morbidity and mortality. The healthcare system is deviating towards a culture of safety, which strives to not place the blame solely on an individual, but rather adopts a multi-disciplinary approach to disclosing medical errors. Health regions of most Provinces and Territories in Canada have instituted some form of policy regarding the disclosure of medical errors. However, no uniform policy for the disclosure of medical errors exists in Canada. We speculated that the best model for medical error disclosure would include the ten parameters of: an apology or expression of regret, avoidance of blame, avoidance of speculation, immediate disclosure following adverse event, support for the patient, support for providers, training of providers, a team-based approach, accessibility of policy through health region website and documentation of disclosure. Our study indicates that the most common criterion within disclosure policies across Canada include an apology or expression of regret, patient support and documentation of the disclosure. By adopting the parameters of the best model for medical error disclosure, the healthcare system can succeed in its efforts to create quality and safe patient care.

1

**Abdullah Masood (Dr. Andrea Lavoie)**

## *A Descriptive Quantitation of Cardiac Amyloidosis Related Hospitalizations in Saskatchewan*

Introduction: Cardiac amyloidosis is a condition in which there is systemic production and deposition of the amyloidogenic protein fibrils in the cardiac muscle and surrounding tissues. This infiltrative process makes it difficult for the cardiac tissue to contract effectively and pump blood to the human body.

Methods: A retrospective cohort study of cardiac amyloidosis related hospitalizations from 2010 to 2020 was performed in Regina and Saskatoon, Saskatchewan.

Results: Two thirds of the patients were male while at least 70% had an overweight BMI. In terms of comorbidities, 80% had a history of hypertension, a little less had dyslipidemia (69%), and almost half of the study population had coronary artery disease (46%). Patient presentations at time of admission were nonspecific. ECG findings were significant for A-fib and conduction abnormalities. Echocardiography consistently demonstrated LVH (73%) and a LVEF of 41.7%. 51% of the patients died within the first year after discharge.

Conclusion: Cardiac amyloidosis often presents with nonspecific symptoms as demonstrated in this study. Therefore, considering it is a less common condition, the possibility of under-diagnosis is high. As the mortality rate is elevated, an effective care pathway needs to be established for patients suspected to have cardiac amyloidosis.

ONCOLOGY

1

## Amelia Perrotta (Dr. Jennifer Brown-Broderick)

*Venous Thromoembolism in Gynecologic Oncology*

Patients with cancer account for about 20% of those diagnosed with venous thromboembolism (VTE), with a 4.1-fold greater risk than the average population (1). This risk is further increased in patients with gynecological malignancies, thought to be partially contributed to by the location of the mass and surgical interventions which can lead to vessel wall injury, hematomas, and venous stasis (2). The rate of VTE in gynecological cancer varies in the literature, from 3-30% based on method of diagnosis (2). VTE risk is highest in the ovarian cancer population and for those actively undergoing chemotherapy (3, 1). The rate of VTE in gynecological cancers and timing of diagnosis (relative to cancer diagnosis, chemo, surgery, etc.) has never been studied in the Saskatchewan population. The current retrospective study looks at the rate of VTE in patients with gynecological malignancies at the Saskatoon Cancer Center. The goal of this research is to better understand the risk of VTE in Saskatchewan patients with gynecological cancers to contribute to a prophylactic framework for those undergoing surgery. Preliminary findings show that VTE most commonly occurs in the chemotherapy period and is rare post-operatively, so universal extended prophylaxis may not be warranted.

**Apurv Patel (Dr. Moftah Younis)**

*The Volume of Disease in Head and Neck Cancer predicting the necessity of PEG tube insertion during the treatment with Curative Radiation Therapy*

Radiation therapy has played a major role in the treatment of head and neck cancers. While some of these patients are already malnourished, radiation therapy can exacerbate symptoms.1 Nutritional interventions such as a percutaneous endoscopic gastrostomy (PEG) tube have been shown to reduce malnourishment in patients undergoing radiation therapy.2 Reactive PEG tube placement and prophylactic PEG tube placement have both been shown to potential have problems such as malnourishment, PEG tube dependency, and recurrent infections.3,4 In this study, we aimed to determine objective predictors for PEG tube placement to improve better patient management and outcomes for patients who did not initially qualify for a prophylactic PEG tube. This study looked at 115 patients where the populations without prophylactic PEG tube placement were compared to the gross tumor volume (GTV) and calculated tumor volume (CTV). Preliminary results indicate a GTV cutoff at above 13.84 cm3 will reduce unnecessary PEG tube insertions by 27.70% in populations that did not require a PEG tube while including 90% of the population that did require a PEG tube. Setting the cutoff at above 62.65 cm3 will reduce unnecessary PEG tube insertions by 38.20% while including 75% of the population that did require a PEG tube.

ONCOLOGY

1

**Carissa McGuin (Dr. Mary Kinloch)**

## *Tumour Diameter as a Novel Prognostic Indicator in Vulvar Melanoma*

Background: Vulvar melanoma is a rare form of cutaneous melanoma. As a subtype of malignant melanoma, it is currently unclear if the pathogenesis of vulvar melanomas aligns with that of other types of non-genital cutaneous melanomas. Recent literature suggests the diameter of melanoma invasion is a contributor to prognosis, but no vulvar melanomas were included in past studies.

Hypothesis: Two groups of melanomas were retrospectively examined; genital cutaneous melanomas (vulva), and non-genital cutaneous melanomas. The tumor diameter was compared to other clinico-pathologic features in a multi-variate analysis. It is hypothesized that the diameter of genital cutaneous melanomas will also be a predictor of patient outcome like other non-genital cutaneous melanomas.

Methodology: A retrospective case-control study comparing genital cutaneous melanomas and non-genital cutaneous melanomas was performed. Clinical, pathologic, staging and outcome data traditional to patient risk stratification was compared between the vulvar and control group melanomas. T-test was used to compare median age, tumour thickness, and tumour diameter.

Conclusion: Genital cutaneous melanoma is similar to non-genital cutaneous melanoma in terms of age at diagnosis, Breslow depth, and diameter of tumour invasion. The two groups are also similar in mean recurrence-free survival and overall survival. This makes it likely that diameter of melanoma invasion can also be used as a prognostic indicator in vulvar melanoma.

ONCOLOGY

1

**Emma Yanko (Dr. Shahid Ahmed)**

## *Outcomes of Patients with Small Intestine Adenocarcinoma in Saskatchewan. A Retrospective Population Based Cohort Study*

Background: SIA is a rare cancer. Little is known about clinico-pathological factors that correlate with its outcomes. We aimed to determine outcomes of patients with SIA in Saskatchewan.

Methods: In this retrospective population-based cohort study, patients with biopsy-proven SIA diagnosed during 2008-2017 in Saskatchewan were assessed. A Cox Proportional multivariate regression analysis was performed to determine correlation between survival and exploratory factors.

Results: 112 eligible patients with median age of 73 years and Men:Women of 53: 59 were identified. 75% had a comorbid illness, 47% had duodenal cancer and 45% had WHO performance status <2. Of 112 patients, 51 (46%) had early-stage disease and 61 (54%) had advanced-stage disease. The median overall survival in relation to disease-stage was stage 1, 59 months, stage 2, 30 months, stage 3, 20 months and stage 4, 3 months (P<0.001). On multivariate analysis advanced-stage disease, hazard ratio (HR): 3.20 (95%CI:1.84-5.40), WHO performance status >1, HR: 2.22 (95%CI:1.42-3.45), no surgery, HR: 2.10 (95%CI:1.25-3.50), and neutrophil:lymphocyte of >4.5, HR: 1.72 (95%CI:1.10-2.71) were significantly correlated with inferior survival.

Conclusions: Most patients with SIA were diagnosed with advanced-stage. Patients with advanced-stage disease, poor performance status, high baseline neutrophil to lymphocyte ratio, and those who did not have surgery had inferior survival.

ONCOLOGY

2

## Jared Price (Dr. Franco Vizeacoumar)

*Identifying Synthetic Lethal Interactions Within DNA-Damage Pathways*

Cancer is a leading cause of death in Canada and despite intensive research efforts, it remains a major challenge. The concept of synthetic lethality has emerged as one of the leading strategies to selectively eliminate cancer cells. If one of the synthetic lethal genes is cancer specific, then it provides a tumour-specific context in which the second gene becomes a targetable vulnerability to eliminate cancer cells. Applications of synthetic lethality have been very successful in the field of DNA-damage and repair pathways. Our genomes are constantly under threat and any mistakes in DNA replication or repair can lead to genome instability. DNA damage must first be recognized before it can be repaired, a job assigned to genes within the DNA damage response family. Preliminary analyses done by Vizeacoumar and Freywald laboratories have found that about 24 of the DNA damage response genes are found to be lost or inactivated in cancers. To exploit the LOF of these 24 genes, we plan to apply the concept of synthetic lethality through this screen and validate any SLIs encountered. From this application, we have validated four SLIs which will be researched further.

**Lorena Stringer (Dr. Gary Groot)**

## *Surveying Indigenous Cancer Support Needs: Survey Design and Development*

Objectives: Cancer care supports have been found to improve cancer survival rates; yet little is known about whether cancer support services meet the needs of Indigenous peoples in Saskatchewan. The goal of this study was to create a survey to inform health planning surrounding Indigenous supports. To outline Indigenous cancer support needs, we developed a novel online survey instrument for distribution to Indigenous communities in Saskatchewan.

Methods: Survey questions were created in reference to a literature review and two current surveys regarding cancer care supports. The survey was validated based on face and content validity; using feedback from patient partners, health care professionals, and researchers to improve survey accuracy.

Results: The finished survey includes ten questions. Ten responses from Indigenous community contacts suggest lack of adequate knowledge provision on cancer care supports and a need for Indigenous translators, navigators, cultural competency training, and inclusion of traditional health care services.

Conclusion: This survey was designed to gather quantifiable information that could inform health policy. This study offers a validated survey tool and a methodological blueprint for developing surveys with Indigenous patient partners. These findings could inform further studies to explore the needs and prioritization of cancer care supports for Indigenous communities.

ONCOLOGY

2

**Mariah Katsiris (Dr. Dorie-Anna Dueck)**

## *Outcomes of Patients with Metastatic Melanoma Receiving Immunotherapy in Saskatchewan: A Retrospective Cohort Study*

Background: Metastatic melanoma was previously treated with chemotherapy with poor survival and overall response rate. This study aims to determine the outcomes of patients with stage 4 melanoma in Saskatchewan who were treated with immunotherapy.

Methods: This is a retrospective population-based cohort study. Survival was calculated by using the Kaplan-Meier method with a confidence interval of 95%. Cox proportional univariate analysis was performed to determine correlation between response to immunotherapy and patient/disease factors.

Results: 44 eligible patient charts were identified with a median age of 59 years and M:F 17:27. The median overall survival for the entire group was 70 weeks. 36% died from disease progression with a median of 3 doses received. The probability of surviving at 6 months was 86.4% (95% CI: 76.2-96.6) and at 12 months was 63.2% (48.9-77.5). Of those patients alive, 45% achieved stable disease and 55% achieved complete response. Time on treatment was significantly associated with survival (95% CI 0.914-0.966).

Conclusions: This research contributes to the body of data on correlations between patient and disease factors on survival outcomes with metastatic melanoma. Future research directions could examine the association between treatment interruptions on overall survival and the prognostic value of LDH in metastatic melanoma.

**Justina Machnee (Dr. Ibraheem Othman)**

*Venous Thromboembolism in Multiple Myeloma*

Venous thromboembolism (VTE) is a common complication of multiple myeloma (MM). There are several factors that contribute to a patient's risk of VTE from their demographics including age, BMI, previous clots, to cancer treatments including immunomodulators and steroids. Commonly used treatments include thalidomide, lenalidomide, pomalidomide, bortezomib, and cyclophosphamide. We conducted a literature review and identified 18 studies whereby the majority were retrospective chart reviews. Using inclusion/exclusion criteria, we found that there are several different anticoagulation guidelines, but the rate at which they are followed is low. The average occurrence of VTE across the studies was 8.2% ±0.05. Aspirin was the most used anticoagulant at 42.3% ± 0.28, then followed by no anticoagulation, low molecular weight heparin (LMWH), and warfarin at 38.7% ± 0.29, 14.9% ± 0.19, and 9% ± 0.09, respectively. Highest amount of VTE reported was among patients receiving aspirin at 4.1% ± 0.06 indicating there might be a discrepancy between anticoagulation prophylaxis guidelines and routine clinical practice. Overall, more research is recommended into the rate of VTE between different immunomodulators, steroid doses, and investigation of general risk factors to make a definitive anticoagulation guideline for MM patients.

ONCOLOGY

2

**Warda Shamim (Dr. Dilip Panjwani)**

*A retrospective chart review of limited stage small cell lung cancer patients treated with concurrent chemoradiotherapy*

Background: For patients with limited-stage-small-cell-lung cancer (SCLC), the optimal dose and timing of chemoradiotherapy for best prognosis remains unresolved, though randomized studies favor concurrent, accelerated radiotherapy.

Methods: A retrospective observational cohort study involving 159 participants undergoing different treatments at Allan Blair Cancer Centre from 2010 to 2019 was conducted to measure the overall survival.

Results: Radiotherapy initiation concurrently or sequentially relative to chemotherapy lacks statistical significance with overall survival. Concurrent chemoradiotherapy results in 1.04 (95% CI: 0.53-1.44) times higher likelihood overall survival (p =0.84), whereas the radiotherapy treatment greater than 5 weeks from diagnosis had 66% (95% CI: 24%-71%) lower survival chance (p <0.001*). Miscellaneous radiotherapy dosages were 7.94 (95% CI: 4.69-10.80) more likely to result in longer survival compared to 6000/30 fractions over 6 weeks (p <0.001*). No evidence was detected showing that radiotherapy dose fractionation impacts the overall survival in this study.

Conclusion: This study did not find statistically significant relationships between radiotherapy administration time or optimal radiotherapy regimen towards improved overall survival. While the two- and five-year survival rate was lower in this study compared to randomized clinical trials, it might resemble real-world outcomes. Further research is recommended to study the accelerated radiotherapy using larger patient population.


1

**Aishwarya Gannamani (Dr. Krista Baerg)**

## *Supporting Youth in School with Chronic Pain: A Scoping Review*

Chronic pain in adults is recognized as a public health concern; approximately 15-20% of children and adolescents have chronic pain. While some research about chronic pain in youth exists, there is little that directly addresses how to support youth functioning in the school. Youth with chronic pain face challenges in school resulting in higher rates of arriving late to, leaving early from, or entirely missing school. Strategies that support staying in school can include classroom accommodations that change the presentation, timing, or setting of information taught in school to support the youth's needs. The objective of this scoping review is to identify classroom accommodations that support attendance participation in school amongst youth with chronic pain. This includes school-based accommodations, training for educators, and models of course delivery. The full protocol is available at: www.osf.io/hnq4u. The five-step framework for scoping reviews was used to identify and select relevant studies: 4629 studies were screened by title and abstract. Of 54 full-text studies assessed for eligibility, 17 meet criteria for inclusion and 99 remain to be screened. Next steps in this project include data extraction and collation, identification of gaps in the literature, and the creation of a final report summarizing the results.

**Dinesh Kumar (Dr. Polya Ninova)**

## *Neurobehavioral and physiological outcomes of neonates born to mothers with SSRI use during pregnancy at the RGH Mother-Baby Unit*

Background: During pregnancy, adequate treatment of depression is crucial for fetal, maternal, and neonates' well-being. The most commonly prescribed medication for depressions during pregnancy is Selective serotonin reuptake inhibitors (SSRIs). The aim of this research is to examine the effects of SSRI to the neonates born to mothers who used this medication during pregnancy than the neonates not exposed to SSRIs prenatally.

Methods: The study is a quantitative comparative study involving a retrospective chart review (200 charts). The de-identified data were aggregated, and statistical analysis was performed using R version 4.0.2, producing initial descriptive statistics. A comparison of SSRI exposed and not exposed neonates were performed using the two-sided Student's t-test, chi-square test or Fisher's exact test (where appropriate).

Results: Neonates exposed to SSRI prenatally demonstrated significant differences in their neurobehavioral outcome (e.g. tremor, muscle tone, abnormal cry, sleep and irritability) compared to the neonates who were not exposed. Differences in the physiological outcomes were not statistically significant.

Conclusion: This research provides more data to understand the effect of SSRI use during pregnancy on neonatal neurobehavioral and physiological outcomes. SSRI exposed neonates require more support and care during the early postnatal period to mediate the SSRI neonatal behaviour syndrome.

**Fady Sulaiman (Dr. Nazeem Muhajarine)**

## *How has the COVID-19 pandemic impacted the mental health of children 5 to 18 years old? A Rapid Review*

Background: There is concern that the changes brought about by the COVID-19 pandemic put the mental health of school-aged children and youth at risk. We conducted a Rapid Review to understand how the pandemic has impacted the mental health outcomes of those aged 5-18 years old.

Research Question: How has COVID-19 and the public health response to the pandemic impacted mental health outcomes of children and youth 5 to 18 years old?

Methods: We performed two literature searches, on February 9th, 2021 and on May 20th, 2021. We screened abstracts in duplicate. Our final Rapid Review contained 63 articles, including 2 articles of Grey Literature, 2 systematic reviews, 9 cohort studies and 49 cross-sectional studies.

Results and Limitations: Cohort studies report worsening measures of depression, anxiety, and sleep quality, as well as an increase in frequency of substance use. Females and older children were at greater risk; exercise had a protective effect. Many studies were cross-sectional in nature, making it difficult to draw causal relationships. Results from some countries may not be generalizable internationally.

Conclusions: The mental health of children and youth is at risk following the COVID-19 pandemic; longitudinal studies from local populations would further elucidate this issue.

**Lindsay Ironside (Dr. Andrei Harabor)**

## *Outcomes of fetal recreational substance exposure in Southern Saskatchewan*

Background: Fetal recreational substance exposure is a significant issue in the neonatal population as the prevalence of recreational substance use antenatally increases among women in Canada. Few studies focus on the burden fetal substance exposure causes for the healthcare system or the developmental impacts it has on neonates.

Methods: Infants were identified through Health Information systems and developmental records were obtained from the Regina Neonatal Follow-Up Program.

Results: Fetal substance exposure was associated with an increase in preterm births and length of hospital stay for neonates in Southern Saskatchewan. There was a lack of AIMS and Gesell scores in the upper quartile (>75th percentile) at 2 years of age for infants with fetal recreational substance exposure, especially in cognitive and expressive language domains.

Conclusion: The increase in healthcare costs to care for infants with fetal recreational substance exposure at birth, due to increased preterm birth rates and length of hospital stay, demonstrates the need for prevention. Further follow-up of exposed infants is needed to understand the significance of the developmental findings on later development and to explore possible early interventions to decrease such impact.


**Marley Wacker (Dr. Tim Bradley)**

## *A Retrospective Review of Coronary Complications in Children with Kawasaki Disease in Saskatchewan*

Background: Kawasaki Disease (KD) is an acute medium-sized vasculitis of childhood and associated with the development of coronary artery aneurysms (CAA). Timely treatment with immunoglobulin (IVIG) has lowered the rates of CAA in KD from 25% to about 4%. The aim of this study was to determine in children presenting with KD in Saskatchewan, if there are delays in IVIG treatment and increased rates of CAA, compared with other centres.

Methods: We conducted a retrospective chart review of all children with KD presenting in Saskatchewan over the last 10 years. We abstracted data including diagnostic criteria for KD, duration from KD onset to IVIG treatment and evidence of CAA (maximum coronary artery z-scores >5). We compared our results with data from other centres.

Results: Of 124 children with KD included (aged 4.1±3.0 years, 88 males) compared with other centres, 110 had prompt IVIG treatment ≤10 days (89% vs. 83%; CAA 4% vs. 4%), 8 had delayed treatment >10 days (6% vs. 10.5%; CAA 12% vs. 16%) and 6 had no treatment (5% vs. 6.5%; CAA 0% vs. 8%).

Conclusions: Children presenting with KD in Saskatchewan receive IVIG treatment more promptly and develop less CAA, compared with other centres.


2

**Morgan Schatz (Dr. Krista Baerg)**

## *Impact of shift to virtual care during the COVID-19 pandemic: Retrospective review of clinic metrics in a clinic providing general pediatric and team based virtual services*

Introduction: The COVID-19 pandemic necessitated a large-scale implementation of virtual care services at many outpatient clinics.

Objectives: To evaluate the impact that virtual care had on various clinic metrics (visit volumes, duration, no-show rates, wait-times, and patient travel time) at two clinics located at Jim Pattison Children's Hospital: the General Pediatric Clinic (GPC) and the team-based Interdisciplinary Pediatric Complex Pain Clinic (IPCPC).

Methods: A retrospective cohort study was used. Two 1-year cohorts were selected: the pre-pandemic cohort (March 2019-February 2020) during which traditional care was used, and the post-pandemic cohort (May 2020-April 2021) during which virtual care was implemented. The Electronic Medical Record was accessed to collect visit data and complete chart review. This data was entered into an excel spreadsheet and descriptive analysis was performed using SPSSX.

Results: The GPC appointment durations were significantly longer ($p<0.001$) by approximately 7 minutes in the post-pandemic cohort, phone visits had the highest no-show rate at the GPC (8.3%), and video visits had the highest no-show rate at the IPCPC (8.7%). 35,000 kilometers traveled in the post-pandemic cohort were virtual.

Conclusion: Findings indicate that there may be assumptions regarding virtual care that may not be universally true in all clinic contexts.

**Riley Plett (Dr. Roona Sinha)**

*Empowering sickle cell patients and families through innovative education methods*

Sickle Cell Anemia (SCA) is a group of inherited blood disorders caused by a mutation in the beta subunit of hemoglobin (HbS). There are approximately 5000 Canadians living with SCA including children. Pediatric SCA patient education can: improve knowledge, decrease hospitalization, improve medication possession ratio, lead to better SCA related functioning, and lower pain impact. An innovative educational cartoon video targeted towards adolescents with SCA was developed to improve knowledge and self-efficacy regarding illness management of patients and parents/guardians. Patients (aged 10 – 18) with SCA and parents/guardians of patients (aged 0 – 18) were recruited online via flyers emailed to patients and posted to patient organization sites. Participants completed pre and post-tests that assessed knowledge, self-efficacy and satisfaction. The educational video improved knowledge scores in participants ($p = 0.04$). The educational video did not statistically significantly improve self-efficacy scores in participants ($p = 0.22$). 100% of participants were "Very Satisfied" with the educational video. Recruitment is ongoing in-person at JPCH hematology clinic. A focus group is planned to gather additional feedback.


2

## Teagan Holt (Dr. Susan Tupper)

*Creating a problem based pediatric chronic pain pathway*

Approximately 20% of children and youth live with chronic pain.1 It is reported that 15% of pediatric patients or their caregivers present to primary care settings for chronic pain.2 Primary care providers demonstrate low scores in all areas of pain management including: initial assessment, treatment goals and expectations, development of a treatment plan, reassessment and management.3 In 2020, SHA department of Clinical Excellence developed an adult chronic pain pathway document for primary care practitioners. Stakeholder feedback suggested that a separate pediatric chronic pain pathway document would be beneficial. Development of the pathway involves 3 phases, with Phase 1 consisting of a comprehensive literature search for pediatric chronic pain clinical practice guidelines, and creation of a rough draft of the pathway. Phase 2 involved iterative changes to the pathway based on consultation with experts in the field of pediatric chronic pain in Saskatchewan and Canada. Phase 3 work will consist of consultations with primary care end users including family doctors and nurse practitioners, patients and families. Phase 2 is complete, with phase 3 to be completed by Summer of 2022. Future directions include, graphic design, end user feedback, creation of pathway education materials, and pathway roll out and implementation outcome evaluation.

**Brooke Webster (Drs. Allison Cammer and Joshua Lawson)**

*Association of dietary factors and mental health conditions among children along an urban-rural gradient*

Objectives: The objective of our study was to examine the relationship between diet and mental health conditions while considering location of residence along an urban-rural gradient.

Methods: Cross-sectional survey data of children aged 5-12 years (n=3,032) were collected along an urban-rural gradient in Regina (Large-Urban), Prince Albert (Small-Urban), and communities surrounding Prince Albert (Rural). Multivariate analyses were used to assess associations between mental health, diet, and confounding factors among children in the sample.

Results: Overall the prevalence of mental health conditions was 4.9%. There were no statistically significant associations between dietary factors and mental health conditions of children. Factors such as age, sex, rural residence, father's education, income security, children born to smoking mothers, and children with a food allergy were significant contributors to the presence of a mental health condition in children.

Conclusion: The present study did not find a significant association between diet and mental health among children in this sample. Further investigation involving more thorough dietary and mental health assessments is required to determine a more accurate understanding of the relationship between diet and mental health in Children in Saskatchewan.

**Brigitte Moser (Dr. Brian Le)**

## *Magnetic Resonance Imaging versus Ultrasound for Detecting Distal Biceps Tendon Tears*

High grade and complete tears of the distal biceps tendon require urgent intervention when surgery is desired. Therefore, ideal evaluation of distal biceps tendon tears is both prompt and accurate. Magnetic resonance imaging (MRI) and ultrasound (US) are the primary imaging modalities to evaluate such an injury. Currently, MRI is the gold standard. We hypothesize that US would have similar sensitivity and specificity as MRI in patients with distal biceps tendon tears. Data was gathered for radiology reports from December 2011 to May 2021 for evaluation of potential bicep tendon pathology using MRI and/or US. Operative reports were collected assess imaging findings. Sensitivity, specificity, and positive and negative predictive values were calculated along with 95% confidence intervals. US (n=204 reports) identification of distal biceps tendon tears resulted in 96.67% sensitivity, 99.43% specificity, 96.67% positive predictive value, and a 99.43% negative predictive value. MRI (n=271 reports) had 100% sensitivity, 99.58% specificity, 96.97% positive predictive value, and 100% negative predictive value. We concluded that the receipt of injury appropriate care is comparable between imaging modalities, and US should be considered as first-line imaging for suspected distal biceps tendon tears.

**Mackenzie Bone (Dr. Gary Linassi)**

## *Experiences of social isolation and loneliness amongst persons with chronic mobility-limiting conditions during the COVID-19 pandemic*

Background: Social isolation and loneliness (SIL) are major health concerns associated with poor cardiovascular outcomes1,2, mortality3-5, and mental health5, 14-28. Social isolation refers to having objectively few relationships/social interactions. Loneliness is the subjective experience of insufficient quantity/quality of relationships. People with disabilities may be particularly vulnerable to SIL, especially in epidemic conditions33.

Objective: To explore experiences of SIL amongst persons with chronic mobility-limiting conditions and how these changed during the COVID-19 pandemic.

Methods: Nine participants were recruited via patient support and rehabilitation centers. Participants completed a semi-structured WebEx interview and REDCap questionnaire. Two researchers transcribed the interviews and conducted Thematic Analysis34 using Nvivo12.

Results: Of the six males and three females (Mage=54.1y), seven had a spinal cord injury. Median UCLA Loneliness score was 45 (IQR=13). Participants experienced SIL at times of major life changes, particularly onset of disability. Participants reported variable experiences of SIL during the pandemic including negative changes associated with pandemic restrictions and relationships growing apart, positive strengthening of relationships, or no changes. Some coping strategies included visiting outdoors, using technology, and moving to family/accessible places.

Conclusion: Further research should focus on post-isolation re-integration and means of reducing the negative effects of SIL in those particularly vulnerable.

## Barzany Ridha (Dr. Daryl Fourney)

*Does the Calgary Postoperative Pain After Spine Surgery (CAPPS) Score Predict Better Long Term Outcomes after Lumbar Spine Surgery?*

Acute postoperative pain is a common complication after many spinal surgeries, and many of these patients go on to develop chronic pain. The Calgary Postoperative Pain After Spine Surgery (CAPPS) score is a prediction scoring tool for identifying acute postoperative pain after spine surgery. This score assigns a probability that a patient may experience acute postoperative pain based on eight pre-existing patient characteristic variables. In this study, a retrospective database review was performed on 261 adults (>18 years of age) who underwent elective lumbar fusion surgery between 2011-2019. A modified eight-tier risk-based CAPPS score further simplified into the three-tier CAPPS score was determined for each patient. Baseline and follow-up outcome measures used to quantify pain and quality of life included the Oswestry Disability Index (ODI), EuroQol Group 5-Dimension Self-Report (EQ5D), and Visual analogue pain scores for back and leg. The CAPPS score was compared to these outcome measures at first follow 6-8 weeks after surgery, and final follow-up 12-18 months after surgery. In our linear regression model, the CAPPS score was significantly predictive of all quality-of-life outcome measures ($p < 0.05$) at the 12-18 month follow-up. Pre-emptively identifying patients at risk for acute post-operative pain could guide future treatment, for example in using aggressive pain control prophylaxis preoperatively.

## Michael Anderson (Dr. Sarah Donkers)

*Gait and balance interventions in multiple sclerosis: an evidence-based, comprehensive review from the MSBEST project*

Background and Purpose: MSBEST (Multiple Sclerosis Best Evidence-Based Strategies and Treatments for Rehabilitation) is a team of researchers and clinicians across North America who have expertise and special interest in MS rehabilitation. Gait and balance impairments are common in individuals living with MS, leading to falls and co-morbidity. Addressing balance and walking dysfunction is paramount in MS physical rehabilitation. We aim to report the latest evidence for interventions addressing gait and balance in MS as part of the MSBEST collaboration.

Methods: After an initial online database (PubMed, MEDLINE, CINAHL, Scopus, EMBASE) search, articles were uploaded to the Covidence review software. Articles underwent title and abstract screening (independently by 2 researchers), prior to full-text review. Studies will be summarized in data extraction tables and assessed for quality (PEDro tool). Level of evidence statements will be created using the Modified Sackett Scale with expert interpretation provided from MSBEST collaborators.

Results: The project is currently at the full article screening stage. Preliminary results of the review will be presented at the conference.

Discussion: MSBEST uniquely combines evidence-based reviews with expert input to aid in the interpretation and application of evidence-based rehabilitation interventions, with aim to accelerate best-practice recommendations and clinical practice guideline development.


1

## Claire DuVal (Dr. Michael Kelly)

*Validation of Two-Dimensional Stroke Lesion Volume Quantification in a Mouse Model of Ischemic Stroke*

Stroke is a leading cause of death and disability in Canada. Quantifying infarct volume is essential in the field of stroke research, as it is a measure of stroke severity and is correlated with post-stroke outcome. However, existing methods for small animal models, which estimate volume from many tissue slices, are time consuming and render the tissue unusable for metabolic imaging. Our lab proposes a method of lesion volume estimation for the photothrombotic mouse model of stroke using a single coronal slice through the centre of the lesion by assuming the shape of the lesion is comparable to a hemisphere. The aim of this project was to assess the accuracy of this approach at two post-stroke time points. Lesion volume was estimated using the traditional multi-slice approach and the single-slice approach, and the methods were compared both visually, using three-dimensional reconstructions of the lesion, and quantitatively. Analysis revealed that the hemispheric single-slice estimation method was not reasonable, but that alterations to the method, such as using a hemiellipsoid shape, could improve the single-slice estimation. Future work will be directed at refining the estimation method and investigating the contribution of the ischemic penumbra to the three-dimensional shape of the lesion.


1

**Jaskaran Singh (Dr. Yigang Luo)**

## *Abdominal Wall Dynamics*

Background: Hernia repair techniques fail to completely restore the natural physiological flexibility and contractility of the abdominal wall, which may contribute to hernia recurrence. This study attempts to quantify the forces experienced by the abdominal wall, so that refined technology may better restore flexibility and contractility of the abdominal wall.

Objectives: Find a method and record forces and abdominal size changes on the abdominal wall during different activities.

Method: Participants (8 male and 3 female) held their breath at the end of 5 measurement states (regular expiration, regular inspiration, maximal expiration, maximal inspiration, laying leg raise) while the probe of a dynamometer was pressed at a depth of 3cm roughly halfway between the xiphoid process and umbilicus. An abdominal circumference reading was taken simultaneously. Three trials were done at each measurement state and then averaged.

Results: 1-way ANOVA showed significant effect of different types of activity on force measurements at the $p<0.05$ level for the conditions [$F(4, 50) = 35.44341$, $p = 0.00001$] and not a significant effect of different types of activity on abdominal circumference at the $p<0.05$ level for the conditions [$F(4, 50) – 0.43162$, $p = 0.785108$].

Conclusion: There is a large variation within and between individuals for abdominal forces, but the forces are greatest during laying leg raise. Abdominal circumference varies greatly between individuals and little within individuals.


1

## Mars Zhao (Dr. Jonathan Gamble)

*A Virtual Airway Evaluation – As Good as the Real Thing?*

It is well documented that certain types of medical care can effectively be done virtually with both good quality and patient satisfaction. The intraoperative component of anesthesia care cannot be provided virtually, but a virtual preoperative assessment is plausible. This project aimed to assess the feasibility and reliability of performing a virtual preoperative airway evaluation compared to traditional in-person airway assessment when conducting a preoperative anesthesia assessment.

We utilized an observational self-controlled study to compare the comprehensive Virtual Airway Evaluations (VAE) of expert anesthesiologists and novice medical students to in-person airway evaluations in patients scheduled for surgery and preoperative anesthesia consult. All proposed airway exam components are previously described and validated. Evaluation scores were compared using likelihood ratio test and Pearson chi square test.

One hundred patients participated in the study. Novice VAE scores were strongly correlated ($r = 0.771$, $p < 0.001$) with In-Person evaluation scores while Expert VAE scores were weakly correlated ($r = 0.291$, $0 = 0.003$) with In-Person scores. Our findings suggests that technological familiarity with videoconferencing platforms may significantly influence the accuracy of VAEs; given adequate technological familiarity, VAEs may be used with reasonable accuracy to conduct the airway evaluation component of the preoperative anesthesia assessment.


1

## Michael Thatcher (Dr. David Sauder)

*Surgical outcomes of the open conjunctiva ab externo approach to XEN gel stent implantation in the management of glaucoma*

Background: Trapeziectomy with ligament reconstruction and tendon interposition (LRTI) with the flexor carpi radialis (FCR) tendon is one of the most common procedures for the treatment of thumb carpometacarpal (CMC) arthritis. An alternative method involves trapeziectomy alone (TA). The goal of this retrospective cohort study was to evaluate the clinical outcomes of trapeziectomy with or without LRTI at a minimum follow-up of 1 year.
Methods: A total of 43 patients who had underwent a total of 58 (TA=36, LRTI=22) surgical procedures for CMC arthritis participated in the study. The patients were evaluated subjectively (The Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire) and objectively (hand/thumb strength, pre/post-operative hand radiographs).
Results: Both the TA and LRTI procedures provided good pain relief, motion, strength, and stability without any severe complications. Radiography showed that compared to the preoperative status, the trapezial space decreased similarly between the two groups.
Conclusions: The TA procedure had similar outcomes to LRTI and has the advantages of shorter surgical time, less incision length, and lower surgical complexity. TA provided equivalent or better trapezial space after the operation. The significance of this increased joint space is still unknown with relation to hand function


1

## Mitchell Thatcher (Dr. Dominik Podbielski)

*Surgical outcomes of the open conjunctiva ab externo approach to XEN gel stent implantation in the management of glaucoma*

Purpose: The aim of this study is to determine the postoperative course of the open conjunctiva ab externo approach to XEN45 stent implantation.

Methods: Retrospective chart review of all patients between July 2018 and March 2020 who underwent XEN implantation.

Results: 44 eyes of 44 patients were included. Mean preoperative IOP was 26.2 ± 8.7 mmHg on 3.2 ± 0.7 IOP-lowering medications. At 12 months follow-up, mean IOP was 18.9 ± 9.1 mmHg (n=35, $P < 0.0001$; mean reduction of 27.9%) on 0.9 ± 1.4 (n=35, $P < 0.0001$) IOP-lowering medications. Postoperative needling was indicated in 5 cases (11.4%). Of the 35 cases with a postoperative visit at 12 months, complete success was achieved in 14 cases (40.0%) and qualified success in 3 cases (8.6%). 18 cases (51.4%) were recorded as failures at 12 months, comprised of 4 cases requiring additional surgery (2 repeat XEN, 1 trabeculectomy, and 1 Baerveldt valve), and 14 cases that did not meet the IOP-lowering criteria for success. 9 cases were lost to follow-up or did not attend an appointment at 12 months.

Conclusions: The open conjunctiva ab externo approach for XEN45 implantation is an effective method of reducing both IOP and number of medications in patients with glaucoma.


1

**Pavlo Zerebecky (Dr. Jeremy Reed)**

## *Surgical Outcomes for Long Head of the Biceps Surgery: An Updated Chart Review*

Purpose: To understand which surgical management option provides the lowest chance of re-operation and most favourable outcomes in patients with pathology of the long head of biceps tendon (LHBT).

Methods: 511 patients underwent one of four tenotomy or three tenodesis techniques: Arthroscopic tenotomy (n=8), Arthroscopic shortening and tenotomy (n=46), Arthroscopic tenotomy with mini-open shortening (n=16), Arthroscopic tenotomy with mini-open shortening and biceps groove debridement (n=97)), Arthroscopic tenotomy with mini-open tenodesis drawn in (n=21), Arthroscopic tenotomy with mini-open tenodesis pushed in (n=103), and Arthroscopic tenotomy with mini-open tenodesis pushed in and bicep groove debridement (n=34). A retrospective chart review determined if post-surgical intervention was required. Telephone interviews assessed patient satisfaction and subjective restriction in function following surgery.

Results: Tenodesis patients (12%) were significantly more likely to require subsequent intervention than tenotomy patients (4.2%), $\chi 21=6.687$, p=.010. Tenotomy patients were significantly more likely to to re-gain pre-injury shoulder function compared to tenodesis. Both tenotomy and tenodesis patients reported being glad that the surgery was performed (90.4% vs. 93%) and that they would have the surgery again (88.6% vs. 90.4%).

Conclusions: Overall, it appears that patients are satisfied with both procedures, but tenotomy leads to lower rates of re-operation and better functional outcomes.


2

## Richard Ngo (Dr. Paul Mick)

*To hear is to think: The association between cognition and speech understanding among cochlear implant candidates*

Sensorineural hearing loss is an epidemic that afflicts millions worldwide. Cochlear implants (CI) can treat this hearing loss by transmitting the electrical conduction to the acoustic nerve. Current assessment for CI candidates involves the Minimum Speech Test Battery (MSTB) which consists of the AzBio sentence tests and the Constant-Nucleus-Constant (CNC), both speech understanding tests. However, neurocognitive skills such as working memory capacity, information processing speed, and nonverbal reasoning skills may influence speech understanding. This study attempts to identify the relationship between cognition measures and speech understanding for adult undergoing CI assessment.

Cognition measurements included the BVMT, AFT, FAS, and Stroop test to assess executive and memory functions. Speech understanding tests involves the patient's ability to recognize words or sentences in noisy or noiseless environments. Potential confounders such as age, education, comorbidities, etc. were addressed in this study. 100 participants were initially sought but in this preliminary study only 12 inclusion criteria fitting candidates could partake.

Our results found that better cognition scores were associated with better speech understanding scores. This study highlights the need to change how patients undergo CI assessment with the results indicating that speech understanding scores along with cognition abilities should be accounted when assessing CI candidacy.


2

**Samantha Skebo (Dr. Bindu Nair)**

*Non-surgical treatment of osteoarthritis prior to hip and knee arthroplasty*

Objectives: Osteoarthritis is a chronic, irreversible joint disorder frequently affecting hip and knee joints. This study looks to identify the non-surgical treatments that individuals with osteoarthritis have explored prior to joint arthroplasty, and to highlight any care gaps that may exist in accessing treatment.

Methods: From the hip and knee arthroplasty waitlist, 215 people were invited to participate in a structured, telephone interview. Information on participant characteristics, pharmacologic management and non-pharmacologic therapies was collected. Participants were also asked about any difficulties in accessing healthcare services.

Results: 47 participants with hip or knee osteoarthritis completed the interviews. Commonly tried pharmacologic treatments included acetaminophen (83%) and, topical NSAIDs (83%). All participants reported trying at least one physical intervention such as exercise (100%) and weight loss (70.2%). Mind-body management approaches were tried by 36.2% of participants and fewer (4.2%) explored psychosocial approaches. Identified barriers to care included cost, unavailable services, decreased awareness of treatment options, and unrecognized disease severity.

Conclusion: Participants with hip or knee osteoarthritis reported varied use of both pharmacologic and non-pharmacologic treatments. Significant concerns for participants in accessing care included treatment affordability, availability of services, lack of knowledge about treatment options and underappreciation of the impact of osteoarthritis.


2

**Wyatt Tyndall (Dr. Jeremy Reed)**

*Calcific Tendonitis and the Surgical Approach to Calcium Deposit Removal*

Calcific Tendonitis, within the practice of the senior author, is frequent. It is documented that the first line treatment options for calcific tendonitis are typically non-surgical, however surgical treatment can be beneficial. This study aims to describe the outcomes of the surgical management for calcific tendonitis. More specifically, this study focuses on arthroscopic removal of calcium deposits for calcific tendonitis and its results on patient satisfaction. To test the hypothesis that this surgical approach is an appropriate and effective first-line treatment option for patients with painful calcific tendonitis, a retrospective chart review and telephone survey was conducted on 17 patients. Patients were asked a series of four questions: percentage of normal, if they were glad the procedure was done, if they would theoretically have the procedure done again, and as a scaled daily function assessment. The study demonstrated improved patient satisfaction following the arthroscopic removal of calcium deposits. Patients suffering from painful calcific tendonitis respond favorably to this procedure. This study, however, is not comparative therefor definitive conclusions cannot be drawn.


2

**Zakhar Kanyuka (Dr. Osama Souied)**

*Retrospective Analysis of Bladder Cancer Patient Outcomes when Neoadjuvant Chemotherapy is Delayed*

Canadian Urological Association guidelines recommend that muscle-invasive bladder cancer (MIBC) is treated with a course of cisplatin-based neoadjuvant chemotherapy (NAC) followed by radical local therapy. However, the optimal timing of NAC for MIBC is not well-studied. Therefore, we aimed to evaluate the impact of time to treatment initiation (TTI) on patient outcomes for MIBC patients receiving NAC followed by radical cystectomy. We conducted a retrospective cohort study reviewing the clinical and pathologic data of 2104 patients from the Saskatchewan Cancer Agency's electronic registry of adults diagnosed with bladder cancer from January 2000 to December 2018. We evaluated the impacts of chronological intervals during treatment on patients' outcomes using the Kaplan-Meier method and evaluated the significance of relationships using the log-rank test. After selecting the patients based on the inclusion and exclusion criteria, our data set had 43 patients. Our review showed that patients with treatment initiation delayed over 8 weeks had a 1.25 (95% Confidence Interval [CI]:1.09-1.35) times higher likelihood of decreased overall survival and 1.63 (95% CI: 1.03-1.77) times greater likelihood of lymph node involvement. Similar to the literature, we show the role of timely intervention in reducing pathological progression of disease. Our work demonstrated a significant impact of TTI on overall survival.


2

## Brooklyn Rawlyk (Dr. Peter Hedlin)

*Invasive Hemodynamic Monitoring during anesthesia; is there a better way?*

Background: Many Royal University Hospital (RUH) patients require continuous perioperative blood pressure (BP) monitoring. The current gold standard is the insertion of an arterial line which can be time consuming and painful for the patient. ClearSight, is a non-invasive finger cuff that is painless, has minimal risks, and measures continuous BP. The purpose of this prospective observational study was to assess the time to placement and accuracy of the ClearSight device in high-risk cardiac surgical patients compared to the arterial line.

Methods: 33 elective cardiac surgery patients were recruited at RUH. Time to placement for the ClearSight and arterial line as well as systolic, diastolic, and mean BP measurements were recorded throughout the surgery. The Wilcoxon matched-pairs signed rank test was used to compare time of placement.

Results: The median time to placement for the ClearSight was 96 seconds compared to that of the arterial line which was 243 seconds. The difference was statistically significant ($Z=-4.923$, $p<0.001$).

Conclusion: Pending analysis, if BP data is within the acceptable mean error of ≤5 mmHg ± 8 mmHg irrespective of comorbidity in the cardiac patient population, the ClearSight device will have implications for broader high-risk and complex surgical patient populations at RUH.


2

**Prapti Patel (Dr. Yigang Luo)**

*Physical Exam Replacement in HPB Surgery Consultations in the Era of Remote Health Care*

The role of physical examination(PE) in non-emergent HPB cases remains unknown with improvements in imaging and other technological advancements. We assessed the role of PE in determining diagnosis and treatment through a retrospective chart review comparing patients who had received virtual, followed by in-person consultations(n=22), only virtual consultations(n=30), and only in-person visitations prior to COVID-19(n=10). In sixty cases(97%), imaging was the primary modality used to determine the diagnosis. Of thirty-two patients who had in-person visits, zero experienced a change in their hepatobiliary diagnosis, but management plans were altered for ten patients. Changes in management were due to patient choice, progression of a condition, and success and failures of other treatments, rather than PE findings. Two patients became too unwell to undergo surgery, prompting changes in management, so moving forward, more specific, and thorough questioning, or video consultations may be employed to reduce miscalculations. A non-HPB PE finding altered the plan in one case reminding us that these findings may not be generalizable to other specialties. While this research could benefit from more data, currently, it seems that online consultations do not lead to errors in diagnosing and management and are a reliable method for initial consultation without compromising patient safety.

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