



UNDERGRADUATE SUMMER  
RESEARCH SHOWCASE

**ABSTRACTS**

**2020**



UNIVERSITY OF SASKATCHEWAN  
**College of Medicine**

OFFICE OF THE VICE-DEAN RESEARCH  
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# A MESSAGE FROM THE VICE-DEAN

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Dear Colleagues,

Welcome to the 2020 Virtual Undergraduate Summer Research Showcase.

This is the seventeenth 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.

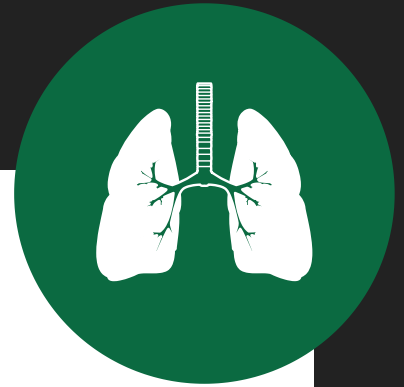
I am delighted to acknowledge an exceptional dedication and work of students, mentors, adjudicators and all who facilitated undergraduate student research programs. Even in these unprecedented times, our staff worked incredibly hard to ensure all students gained the research experience they desired.

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

With kind regards,

*Mark Rostomil*





## Brian Pinno (Dr. Michael Levin)

### *Mice with Experimental Autoimmune Encephalomyelitis Demonstrate a Dysregulated Relationship Between mRNA and Protein Abundance for Components of CME*

Multiple sclerosis (MS) is an autoimmune disease of the central nervous system characterized by inflammation and neurodegeneration. MS patients develop autoantibodies to heterogeneous nuclear ribonucleoprotein A1 (A1), an RNA binding protein involved in mRNA transport and importantly, RNA homeostasis. A1 dysfunction is a hallmark of neurodegeneration in mice with experimental autoimmune encephalomyelitis (EAE), a mouse model of MS, and administration of anti-A1 antibodies (A1-Ab) exacerbates disease. A1-Ab were also found to enter neurons and exacerbate A1 dysfunction, which has been linked to neurodegeneration, and in vitro experiments suggest that A1-Ab entered neuronal cells through clathrin-mediated endocytosis (CME). Here, we indirectly measured CME in EAE mice treated with PBS, control IgG, or A1-Ab, or naïve mice, by determining RNA and protein abundance of clathrin and calcyon, a CME protein highly expressed in neurons. We found that all EAE groups had higher clathrin and calcyon mRNA abundance versus the naïve group, but naïve animals demonstrated a higher clathrin protein abundance; there were no differences among EAE groups. We propose that dysfunctional A1 in EAE mice affects translation of CME-related mRNAs. In the future we will modulate CME in tissue culture with siRNA to clarify the role of CME in A1-Ab uptake in neurons.

## **Iris Geldenhuys (Dr. George Katselis)**

### *Cellular Proteomics Platform to Characterize Insecticide Resistance*

Manifestation of Chagas disease occurs as a result of the parasite, *Trypanosoma cruzi*, transmitted from the feces of the *Rhodnius prolixus* insect into the host through the skin. The disease affects more than 16 million people in the Americas and is associated with potentially fatal digestive and cardiac complications. Due to the lack of curative interventions the World Health Organization has declared vector-control strategies to be most promising for the containment of Chagas disease. However, routine application of insecticides and errors in this process has led to the development of resistance in the vectors of this disease. Our objective was to investigate which proteins were responsible for the emergence of this resistance. Through examination of relevant literature on insecticide and multidrug resistance, we were able to compile a database consisting of proteins suspected to contribute to the development of insecticide resistance. This database will be used to investigate our proteomics data which will be obtained from analyzing insect Malpighian tubules and brain-blood barrier and will be valuable in the potential development of insecticides with novel mechanisms of action to combat the spread of Chagas disease, as well as other vector borne diseases.

## **Jordan Bairos (Dr. Scott Widenmaier)**

### *Molecular Genetics of Cellular Cholesterol Homeostasis: An In Silico Analysis*

The ability of cells to monitor and regulate the abundance of cholesterol within their membranes is crucial to sustaining cellular homeostasis. Dysregulation of this process contributes to a multitude of cardiometabolic and neurological disorders. The aim of this project is to systematically identify molecules that control the de novo synthesis, distribution, and import/export of cholesterol within the cell. Using proteomics on biochemically isolated membrane fractions from the human liver cell-line Hep3B, we identified all detectable plasma membrane-localized and ER membrane-localized proteins whose abundance is dynamically regulated by cholesterol excess and/or cholesterol depletion. In silico analyses of these candidates were carried out and we identified multiple molecules that appear to regulate cholesterol homeostasis. We observed the upregulation of major cholesterol biosynthesis genes (FDFT1 and SQLE) in the ER-membrane when exposed to cholesterol depletion, and the downregulation of a cholesterol-rich lipoprotein import gene (LDLR) in the plasma membrane during excess cholesterol conditions. With regard to the identification of novel candidates, our future work is aimed toward investigating the function of molecules that have not previously been known to regulate cholesterol metabolism. To hone our search, we are cross-referencing our candidates with genes identified in human genetic polymorphisms linked to cardiovascular disease mutations that have been associated with abnormal lipid traits (i.e. total cholesterol, low-density lipoprotein cholesterol, triglycerides) and confer risk for cardiovascular disease. These insights may further our understanding of the molecules that control cellular cholesterol homeostasis, and open a new path toward the treatment of diseases driven by abnormalities in cholesterol metabolism.

## **Madison Macnab (Dr. Lane Bekar)**

### *Neuromodulator Mediated Calcium Signaling in Astrocytes*

This summer I wrote a review paper on the effects of neuromodulators on calcium signaling in astrocytes. Calcium signaling in astrocytes is a highly researched area. It has been noted to have clinical significance. Neuromodulators usually act through G-protein coupled channels to regulate astrocytes. The subtypes of G-protein coupled receptors include *G $\alpha$* , *G $\beta$*  and *G $\gamma$* . The neuromodulators can also interact with voltage-gated channels and mitochondrial channels. Ca<sup>2+</sup> is stored in the endoplasmic reticulum and mitochondria in astrocytes. There are mitochondrial channels to allow for release from the mitochondria and release from the endoplasmic reticulum is coupled to G protein coupled cascades. The neuromodulators I researched were histamine, acetylcholine, dopamine, norepinephrine, and serotonin. Each produces a different pattern of Ca<sup>2+</sup> release. I also researched the effects of multiple of these neuromodulators acting on one astrocyte at the same time to produce unique calcium dynamics. I also researched how the neuromodulators interacted with GABA and glutamate acting on astrocytes.

## **Meet Patel (Dr. Terra Arnason)**

### *Anaphase Promoting Complex and Genomic Stability*

The Anaphase Promoting Complex (APC) is an E3 ubiquitin ligase belonging to the Really Interesting New Gene (RING) class of E3 enzymes. The APC targets specific proteins for degradation by the Proteasome at distinct times in the cell cycle and ensures proper cell cycle progression. Cdh1 and Cdc20 are two prominent co-factors that activate the APC. Cdc20 activates the APC to promote the onset of anaphase. Cdh1 mediated APC activation allows for proper mitotic exit and maintenance of genomic integrity in G1 of the cell cycle. Mutations to the many subunits of the APC has been shown to lead to increased DNA damage and overall genomic instability, however, the mechanisms that are disrupted through APC dysfunction that cause increased DNA damage are not known yet. This review aims to summarize DNA repair pathways, important DNA repair proteins in budding yeast, and the influence of APC on DNA repair. These DNA proteins can act as markers for the respective DNA repair pathway and they can be used to study alteration in the type of DNA repair and their frequencies between wild-type and mutant APC yeast strains. The review also describes the role of the APC in influencing repair choice of dsDNA breaks in mammals between Homologous Recombination and Non-homologous End Rejoining pathways.

## **Melissa Herdzik (Dr. John Howland)**

### *Advances in Establishing a Reliable Preclinical Model for Evaluation of Prenatal Cannabis Smoke Exposure*

Prenatal cannabis smoke exposure is an insult to the fetus in utero that may alter neurological and cognitive development, ultimately impacting the long-term behaviour of the offspring. Currently, there are few experiments that have studied the effects of combusted cannabis plant buds on the offspring of rat dams who are exposed during pregnancy. Employing smoke delivery in preclinical studies is important as humans most commonly ingest cannabis by smoking it. Therefore, the aim of this project was to evaluate the long-term behavioural effects of prenatal cannabis smoke exposure. We initially exposed 22 pregnant Sprague Dawley rats to either a high THC strain of cannabis smoke (200mg combusted) or a room air control daily from gestational day (GD) 6 to 20 using a smoke inhalation apparatus. Body weight, food intake, and temperature were taken every 3 days during exposure. Initially, we wanted to test the offspring in late adolescence in a battery of behavioural tasks including elevated plus maze, sociability, locomotion, and novel object recognition; however, due to COVID, certain modifications had to be made. Thus, we proceeded to test the offspring in adulthood in the elevated-plus maze, open field test, and social interaction. Cannabis exposed offspring showed evidence of an anxiety-like phenotype in the open field test but there were no significant differences between groups in either of the other two tasks. This project is still ongoing, as our lab is working on assessing different aspects of cognition, such as discrimination learning, behavioural flexibility, memory, and attention, in the offspring.

## **Mimi Girard (Dr. Lane Bekar)**

### *Does Lithium Mediate Modulation of Brain Serotonin*

This summer for the Biomedical Summer Research, I wrote a summary review paper discussing the role of lithium in modulating neuromodulator release primarily by upregulating BDNF. The poster briefly discusses the mechanism of lithium modulated release of serotonin. Lithium is a metal that is commonly used to treat Bipolar patients. Lithium is an inhibitor of the enzyme GSK3 $\beta$ . GSK3 $\beta$  is known to downregulate levels of BDNF (Brain derived neurotrophic factor), a neurotrophic factor that promotes neuronal growth, and serotonin release. GSK3 $\beta$  downregulates levels of BDNF by inhibiting CREB (cyclic AMP response element binding protein), a transcription factor for BDNF. BDNF is able to upregulate release of serotonin by promoting the depolarization of the cell membrane for serotonergic neurons, and Tryptophan Hydroxylase (rate limiting enzyme for serotonin synthesis). Therefore, lithium administration promotes the release of BDNF and serotonin. Bipolar patients have been recorded to have lower levels of BDNF in the blood serum, and hippocampus, as well serotonin during the depressive state. Further research needs to be conducted to understand the effects of lithium on neuromodulator release and its related consequential alleviation of symptoms.

## Navona Muo (Dr. Valerie Verge)

### *Timing of When to Use Novel Therapy to Induce Repair in MS*

Multiple sclerosis is a demyelinating disease of the central nervous system distinguished by myelin loss, inflammation, and a variable extent of axonal and neuronal degeneration. The Verge lab has been working with a non-invasive therapy known as acute intermittent hypoxia (AIH) with the hopes of improving the intrinsic repair response of the focally demyelinated nervous system. AIH involves breathing reduced oxygen (11% O<sub>2</sub>) for brief periods alternating with normal air to stimulate repair. Using the experimental autoimmune encephalomyelitis mouse model (EAE), we have been exploring how AIH may help to improve behavioural & pathological outcomes. EAE serves as a preclinical model of MS where scoring based on behavioural symptoms & analysis of various markers of MS pathology are analyzed. We investigated the impact of timing of the delivery of 7d AIH versus normoxic controls in EAE mice at the onset of disease (clinical score 1.0) followed by 7d with no treatment. Lumbar spinal cord sections of tissue were harvested, cryosectioned, and processed for immunofluorescence with a number of EAE pathological markers. Preliminary results suggest that EAE mice subjected to AIH experience less inflammation and myelin degradation than normoxic control EAE mice, providing support for a beneficial impact on disease progression.

## Niteesh Jain (Dr. Brian Eames)

### *Chondroitin Sulfate Proteoglycans Affects the Skeletal Formation by Negatively Regulating the BMP Signaling Pathway*

The role of extracellular matrix in the intracellular signaling pathways is still to be determined which can be related to many human diseases in the timings of cellular differentiation. Chondrocytes (cartilage producing cells) secrete proteoglycans such as chondroitin sulfate in the extracellular matrix during the endochondral ossification. Further in development, the perichondral cells differentiate to osteoblast cells. Recent studies have illustrated that fam20b, a xylose kinase involved in the synthesis of proteoglycans, mutant produces lower levels of chondroitin sulfate compare to the wild types and initiated perichondral bone formation earlier. Recent studies also suggest that the cellular growth factor are connected with extracellular matrix and involved in cell differentiation. One example of such growth factor is Bone morphogenetic protein (BMP). The aim of this project is to examine the effect of disruptive chondroitin sulfate PG which can link to increase in the Bone morphogenetic signaling protein bone-mediated pathway. Fam20b mutant, Tg(hsp70l:dnBmpr1a-GFP) zebrafish and DMH1 (a selective inhibitor of BMP1 receptor) treatment were used to understand the intracellular activation of BMP pathway. Fam 20b mutants expresses high amount of p-Smad 1/5/8 when compared to the wild-types. Transgenic and DMH1 embryos show downregulation of BMP signaling with statistical significance. . The DMH1 treated embryos also showed morphological defects and decreased endochondral ossification. These results help better understand the effects of proteoglycans on BMP signaling and the timing of endochondral ossification.

## **Olivia Woo (Dr. Valerie Verge)**

### *Impact of Injury and Electrical Nerve Stimulation on Expression of Luman/CREB3-Regulated Unfolded Protein Response/ER STRESS Targets IN Motor Neurons Ipsilateral and Contralateral to injury*

Lesions in peripheral nerves are a common injury, which consequently leads to decreased functionality in both sensory and motor control. Axonal injury signals include transcription factors transported back to the nucleus to help transition neuronal gene expression from homeostasis to regeneration. Previous studies discovered that the transcription factor Luman (aka CREB3) is a retrogradely transported injury signal, playing a critical role in sensory axon regeneration through its regulation of the UPR and cholesterol biosynthesis. It has been shown that brief electrical stimulation (ES) following axotomy has elevated the response of Luman in both sensory and motor neurons. Downstream targets of the UPR (GRP78 and CHOP) and cholesterol biosynthesis (SREBP1) are regulated by Luman activation and translocation in sensory neurons. However, in motor neurons, this response is unknown. In this study, we investigated the temporal expression of Luman-regulated UPR markers (GRP78, CHOP and SREBP1) in lumbar spinal cord motor neurons and surrounding neuropil following unilateral sciatic nerve injury. Results show that ES elevated the UPR response bilaterally and may be accelerating its response, similar to Luman, supporting a direct and systemic injury response in motor neurons.

## **Stephanie Bigsby (Dr. Veronica Campanucci)**

### *A Review On Voltage-Gated Sodium Channels and Their Implications in Diabetic Neuropathy*

Diabetic sensory neuropathy (DSN) is a debilitating consequence of diabetes that may be present in as many as one in two patients with diabetes. DSN presents with a constellation of sensory abnormalities, including numbness, tingling sensations, exacerbated responses to painful and non-painful stimuli, and a paradoxical loss of pain sensation. Despite the substantial burden that DSN afflicts on patients, they are often left with insufficient treatment as the pathophysiology remains poorly understood. Particular interest has been concentrated on voltage-gated sodium (Nav) channels and their roles in painful forms of neuropathies in longterm diabetes. In the current review article, we evaluated literature on the structure, function, and modulation of Nav channels focusing on Nav channels in dorsal root ganglion (DRG) neurons and their implications in DSN. This review aims at identifying potential novel therapeutics targeting Nav channels for the management of DSN.

## Todd Stang (Dr. Michael Levin)

### *Relationship Between T-cells and Stress Granules in Experimental Autoimmune Encephalomyelitis, an Animal Model of Multiple Sclerosis*

Background: Previous research has shown that neuronal stress granules (SGs) are present in experimental autoimmune encephalomyelitis (EAE). Interferon gamma (IFN $\gamma$ ), a pro-inflammatory cytokine released by T-cells, has been shown to induce SGs in neurons in vitro. Objectives: This project aimed to determine if there was a relationship between T-cells present in the spinal cord of EAE mice and the formation of neuronal SGs.

Methods: EAE spinal cord sections from different time points across the EAE disease course were cut at 10  $\mu$ m and immunohistochemistry was performed for T-cells (CD3), SGs (TIA1), and neurons (NeuN). The total number of T-cell infiltrates and SG+ neurons were calculated in each section.

Results: Similar to previous publications, T-cell infiltrates peaked at symptom onset, and then decreased for the duration of disease. The percentage of SG+ neurons peaked at the three time points that were sampled following symptom onset. No significant correlation was found between T-cell infiltrates and SG+ neurons in EAE spinal cord.

Conclusion: Although no significant correlation was found, the presence of SG+ neurons may better correlate with cytokines secreted by T-cells, or by other infiltrating immune cells, which should be examined in future studies.



## Alexandria Flaman (Dr. Troy Harkness)

### *Progeria: Exploring Genes Involved in APC Function*

Hutchinson-Gilford progeria syndrome (HGPS) is a rare disease that causes accelerated aging in children. This disease is caused by a mutation in the lamin A gene that produces a truncated protein called progerin. Preliminary research suggests that anaphase promoting complex (APC) activity may be required to degrade progerin in human cells. The APC is a conserved multi-subunit ubiquitin ligase that targets protein substrates that block cell cycle progression for degradation. Transcriptome datasets from progeria patients were used to look for changes in APC subunit and APC substrate gene expression. Gene set enrichment analysis revealed the decreased expression of APC mediated degradation of substrate proteins in HGPS patients. Transcriptome comparison of HGPS patients to non-diseased age matched individuals revealed slight, but significant alterations in APC subunit and substrate expression. Biological validation including qPCR and western blots should be performed to verify results, as protein levels may not be reflected at the genomic level.

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

### *DEAD-box Helicases in the Homeostasis of Stress Granules and P-bodies*

DEAD-box helicases are best known for their roles in RNA metabolic processes; however, very little is known about their roles in the homeostasis of RNA granules: stress granules and P-bodies. Several DEAD-box helicases have been identified in stress granules and P-bodies, including DDX6, DDX1, DDX3, eIF4A (DDX4), DDX17 and RIG-I (DDX58). Although their exact functions are largely unknown, evidence suggest that they might serve as scaffold proteins bridging the interaction between protein and mRNA. Using their instinctive ATP hydrolysis activity, they might unwind dsRNA into ssRNA, which in turn disrupt RNA: RNA helices, or protein-RNA association. Our recent work on DDX41 revealed that DDX41 might utilize its ATP-independent strand annealing activity to form dsRNA, which in turn assemble stress granules and P-bodies structures. Given their critical roles in RNA granules formation that are linked to various cancers and diseases, DEAD-box helicases serve as potential therapeutic targets. Nevertheless, we are still in the early stage of exploration for the roles of DEAD-box proteins in stress granules and P-bodies; much study is required.

## **Braylin Fan (Dr. Kerry Lavender)**

### *Effects of IFN $\alpha$ Subtypes on the Function of CD8 $^{+}$ T Cells During HIV-1 Infection*

HIV infects CD4 $^{+}$  lymphocytes and integrates itself into host DNA as HIV provirus. Proviral DNA hides in CD4 $^{+}$  lymphocytes and continues producing new HIV virions indefinitely. HIV can be controlled, but not cured. Chronic HIV infection in most patients leads to disturbed T cell homeostasis; however, a small subset of HIV patients known as elite controllers can sustain undetectable viral loads. And virus specific CD8 $^{+}$  T cells appear to have an important role in this control. Interferons play a role in priming and maintaining T cell responses. Humans have 12 IFN $\alpha$  subtypes that induce expression of antiviral proteins and moderators of the immune response and have been shown to have distinct effects during viral infection. IFN $\alpha$ 2 is commonly used in research because it has been clinically approved to treat hepatitis. However, IFN $\alpha$ 2 appears relatively ineffective against HIV, whereas IFN $\alpha$ 14 has shown promising results in its ability to control HIV infection and reduce T cell dysfunction. My initial project was to assess the differential effects of IFN $\alpha$ 2 and 14 on CD8 $^{+}$  T cell proliferation. However, due to the Covid-19 shutdown we instead developed two additional experimental objectives assessing the effects of IFN $\alpha$  subtypes on CD8 $^{+}$  T cell function during HIV infection.

## **Chantelle Wong (Dr. Kerry Lavender)**

### *Modulation of anti-HIV-1 Effector Functions of NK Cells by IFN- $\alpha$ 2 and IFN- $\alpha$ 14 In Vitro*

Natural killer (NK) cells are of considerable interest as innate immune effectors that may facilitate the control of Human Immunodeficiency Virus-1 (HIV-1) infection, due in part to their MHC-independent cytotoxic qualities. Our previous studies have demonstrated that IFN- $\alpha$ 14 exhibits more potent effects on the anti-HIV-1 activity of NK cells in humanized mice than IFN- $\alpha$ 2. Here, we outline experimental procedures that aim to determine the differential effects of IFN- $\alpha$ 2 and IFN- $\alpha$ 14 on NK cell-mediated lysis of HIV-1 infected CD4+ T cells and to determine which NK cell receptors (NKR) are responsible, by comparing NKR expression with and without IFN- $\alpha$ 2/14 modulation. The first objective will be met by assessing endogenously infected CD4+ T cells from HIV-1-positive donors as well as uninfected CD4+ T cells from healthy donors, using an NK cytotoxicity assays and CD107a degranulation assay. The second objective will be achieved by genetically screening donors for specific NKR suspected to be involved in the lysis of HIV-1-infected targets and performing an antibody-mediated blocking assay to confirm the role of specific NKR in the differential cytotoxicity observed between IFN- $\alpha$ 2 and IFN- $\alpha$ 14 treated NK cells. This project will contribute to work that leads to the development of NK cell immunotherapies as part of a cure for HIV-1 infection.

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

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

Epilepsy is characterized by structural and functional changes at the cellular level that permit an overactive brain state. However, the mechanism and mediators that carry out these changes are vastly undescribed. Adenosine signaling is known to regulate excitability in the brain and has been implicated in the onset and maintenance of epilepsy. We propose that adenosine receptors exert their neuromodulatory effects through hyperpolarization-activated cyclic nucleotide-gated (HCN) channels. Adenosine receptors, especially the A1 receptor subtype (A1R), trigger a signaling cascade that recruits various proteins and mediators to modulate the cellular distribution and function of HCN channels. We have identified postsynaptic density protein 95 (PSD-95), adducin, and endophilin A1 as downstream targets of adenosine signaling that likely interact with HCN channels and regulate their activity. These interactions represent a novel way for adenosine to control excitability in the brain. Thus, we explored the process through which adenosine receptors regulate HCN channel function and excitability in the brain, as well as the consequences of these interactions in epilepsy. We hope that further investigation into this area provides a better understanding of potential targets and mechanisms for the development of epilepsy drugs.

## **Judy Kim (Dr. Jeffrey Chen)**

### *The Study of EspK Protein Expression By pET28a-espK In E. coli LOBSTR*

Mycobacterium tuberculosis (M. tb) utilizes ESX-1 Type 7 protein secretion system to secrete virulence effectors in order to facilitate infection. EspK was recently discovered to be an important component of the ESX-1 system that enhances the secretion of other ESX-1 virulence effector. Since little is known about the biochemical or binding properties of EspK, an improved method for expression and production of EspK would be useful for elucidating EspK function and production of anti-EspK antibodies. The espK gene was then cloned from M. tb genomic DNA by PCR and ligated into pET28a, a commercial expression plasmid for recombinant protein production in E. coli, to yield pET28a-espK. Several resulting clones were verified to contain the espK gene and subsequently transformed into an E. coli strain (LOBSTR) that is routinely used for producing recombinant proteins. E. coli LOBSTR + pET28a-espK was then induced by IPTG for protein expression. We were able to see induction of high-level expression of EspK from two clones of E. coli LOBSTR + pET28a-espK. However, further optimization of EspK induction could be done to obtain future insight.

## **Maa Quartey (Dr. Darrell Mousseau)**

### *The Alzheimer Disease-Related $\beta$ -Amyloid Peptide Interacts Directly with Monoamine Oxidase*

Depression is considered a prodrome to dementia suggesting a period prior to symptom onset. This suggests molecular events common to both diseases. To effectively intervene and potentially prevent, or repair the damage that ultimately results in dementia, these molecular events need to be identified. The depression-related enzyme monoamine oxidase (MAO), which regulates the availability of neurotransmitters such as dopamine, serotonin and noradrenaline, is altered in the brain of Alzheimer disease (AD) patients. MAO has been detected in the vicinity of the amyloid plaque, which is composed primarily of the amyloid beta (A $\beta$ ) peptide. This provides an exciting focus of investigation into the association between depression and AD/dementia. We used surface plasmon resonance (SPR) and enzyme kinetic assays to investigate the possibility that MAO and the A $\beta$  peptides might physically interact. Our results indicate that A $\beta$  peptides can interact with, and regulate the function of MAO. This interaction could reflect an early event in the amyloidosis associated with the AD brain. We will investigate how this interaction might alter cell models of AD.

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

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

Salmonella strains that cause gastroenteritis were recently ranked as having the #1 worldwide impact amongst human foodborne pathogens. To cause disease and transmit between people efficiently, these bacteria cycle between hosts and the environment. Before leaving the host, Salmonella uses a bet-hedging program to differentiate into two cell types: 1) resistant biofilm cells and 2) virulent single cells. We think this population split increases the chances for Salmonella to transmit, providing a way to cause disease immediately (single cells) or to survive under harsh conditions and cause disease after long time periods (biofilm cells). For my research project, I built reporter constructs for Salmonella that will allow us to track both cell types (green fluorescent protein = biofilms; mCherry = single cells) and follow their interactions with host cells. I used a process called Golden Gate Assembly to build the reporters and confirmed the product and proper orientation by restriction digestion and gel electrophoresis. In future experiments, I will move the reporters into the chromosome of *S. Typhimurium* and screen for ones that give the best combination of stability and signal strength. The final reporter strain will be used in biofilm flask and in vivo animal experiments.

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

### *FtsE and FtsX, Two Non-Essential Cell Division Proteins in Neisseria gonorrhoeae, have Unique Divisome Interactions with Other Divisome Proteins*

Cell division is a fundamental process for all living organisms; improper cell division leads to cell death. In bacteria, cell division is accomplished by a protein complex known as the divisome which consists of both the essential and non-essential cell division proteins. FtsE and FtsX are two non-essential cell division proteins in *Neisseria gonorrhoeae* (*N. gonorrhoeae*). Using a Bacterial-Two-Hybrid (B2H) method, we investigated the ability of FtsE to self-interact and to interact with ZipA. We also tested the ability of FtsX to interact with FtsW and FtsL. Two plasmids (pCp22 and pCp434) and host strain *E. coli* R721 were used to study B2H interactions. An ONPG assay was performed and the average  $\beta$ -galactosidase activity for each sample was measured. The average activity of each sample was normalized to the baseline sample (i.e. *E. coli* R721 with 100% activity). We determined that FtsE exhibits self-interaction and does not interact with ZipA while FtsX interacts with both FtsW and FtsL. From our results, we can conclude that interactions of FtsE and FtsX with other divisome proteins are unique to *N. gonorrhoeae* because these interactions are not observed in the model organism *E. coli*.

## **Namrata Das (Dr. Yuliang Wu)**

### *The Emerging Role of DEAD-box Helicases in DNA Damage Repair*

Known to facilitate versatile RNA and RNA-protein rearrangements through ATP-dependent and independent mechanisms, DEAD-box RNA helicases impel virtually all aspects of RNA metabolism. However, the import of their catalytic functions and associations with other proteins to the DNA damage response (DDR) remains to be elucidated. Emerging evidence suggests that multiple DEAD-box proteins perform distinct roles in DNA replication, transcription, translation, telomere maintenance, checkpoint regulation, and DNA repair during DNA insult. To date, several DEAD-box helicases are known or anticipated to contribute to the DDR by repairing lesions, regulating co-transcriptional structures (R-loops, D-loops, and non-canonical G-quadruplexes), participating in the alternative splicing of relevant proteins, or activating and interacting with important repair and checkpoint proteins.

## **Svea Jouband (Dr. Troy Harkness)**

### *Characterizing the Roles of Multiple Ubiquitin Ligases in Stress Response*

Cells live in continuously changing environmental conditions, which can hold a variety of stress factors. Consequently, cells developed stress response pathways to cope with a wide variety of stress factors. Studying cellular stress response is important as cells that can properly resist stress and respond to damage can potentially live healthier and longer lives. Stress factors are countered by cellular stress response pathways that can be regulated and influenced by ubiquitin ligases in ubiquitin-mediated pathways. Previous work by the Harkness lab showed that the ubiquitin ligase Anaphase Promoting Complex (APC) is critical for yeast longevity and stress response. As the APC is evolutionarily conserved, it was hypothesized that increasing APC activity in aging cells may increase the lifespan of these cells – in both yeast and human cells. As not being able to be in the lab during most of the summer due to the COVID-19 pandemic, my project under the supervision of Dr. Troy Harkness turned into a literature review researching the roles of multiple evolutionarily conserved ubiquitin ligases (including the APC) in yeast and comparing their roles in humans, in order to confirm the benefit of yeast as a model organism for human cellular stress response research.

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

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

Epilepsy is characterized by structural and functional changes at the cellular level that permit an overactive brain state. However, the mechanism and mediators that carry out these changes are vastly undescribed. Adenosine signaling is known to regulate excitability in the brain and has been implicated in the onset and maintenance of epilepsy. We propose that adenosine receptors exert their neuromodulatory effects through hyperpolarization-activated cyclic nucleotide-gated (HCN) channels. Adenosine receptors, especially the A1 receptor subtype (A1R), trigger a signaling cascade that recruits various proteins and mediators to modulate the cellular distribution and function of HCN channels. We have identified postsynaptic density protein 95 (PSD-95), adducin, and endophilin A1 as downstream targets of adenosine signaling that likely interact with HCN channels and regulate their activity. These interactions represent a novel way for adenosine to control excitability in the brain. Thus, we explored the process through which adenosine receptors regulate HCN channel function and excitability in the brain, as well as the consequences of these interactions in epilepsy. We hope that further investigation into this area provides a better understanding of potential targets and mechanisms for the development of epilepsy drugs.



## **Annie Monteith (Dr. Alexandra King)**

### *Nurturing Families, Nurturing Communities: Determining the Efficacy of a Pilot Support Network Intervention at Sanctum 1.5 in Saskatoon*

Sanctum 1.5 is Canada's first HIV pre-and post-natal care home, located in Saskatoon, Saskatchewan. Many of the women residing at Sanctum 1.5 use substances, and in their journey to recovery, must abandon all unhealthy supports. Connecting mothers to stable and supportive families in the community can assist them in their journey to sobriety, successful parenting, and any other goals they set for themselves. To facilitate this, a pilot program with a non-profit (Hands at Work) was implemented at Sanctum 1.5 in 2019 to provide three volunteer families as support networks for the women. The main purpose of this study was to determine the efficacy of the 'network families' support for new mothers. One-on-one interviews were conducted using qualitative theory from 10 participants, focusing on (i) How women used the 'network of families' for support and (ii) The experience(s), perspective(s), strength(s) and improvement(s) the 'network of families' encountered. The interviews (two Sanctum 1.5 mothers who participated in the program, two Sanctum 1.5 mothers who did not participate in the program, three staff of the program, and three network families) were then transcribed and analyzed using grounded theory through application of a Two-eyed Seeing approach (which provides a balancing lens for application of Indigenous health perspectives while upholding mainstream perspectives). Codes and themes were generated and similar themes were moved to one single category which finally reflected an overarching theme. The most important themes that emerged from analysis included reliability and support experienced by the Sanctum 1.5 Mothers who participated in the pilot; the lack of support and Isolation from the Sanctum 1.5 Mothers who did not; communication and debriefing from staff; and relationship building and social support, from the network families. The results showed a largely positive impact on those involved in the 'network families' pilot project. The project provided at-risk Mothers with healthy supports for them and their children, where the network families made meaningful connections and found personal fulfillment. Recommendations for a continuation of the program include additional funding and growth for more Mothers to be involved, as well as ensuring open communication between all parties involved.

## **Craig Albert (Dr. Nazeem Muhajarine)**

### *Prevention and Control of COVID-19: A Comparative Case Study Analysis*

The purpose of conducting this study is to identify facilitators and barriers in promoting an effective response to a pandemic. The analysis evaluated 3 pairs of countries that had different outcomes in terms of COVID-19 mortality rates during the months of January to May of 2020. These dyads included Brazil and Argentina, France and Germany, and Sweden and Finland. The individual actions of the healthcare system and government were recorded through reviewing press releases and news articles during that time frame. Each action was categorized and placed into a timeline for comparison. A narrative approach compared the dyadic countries to determine facilitators and barriers in the pandemic response process for future recommendations. Following the analysis, four recommendations can be made for future pandemic response. First, increasing healthcare capacity and maintaining essential stockpiles of masks and essential protective equipment for being able to absorb additional caseload and protect healthcare workers. Second, the initial response should quickly implement protective measures, such as social distancing and limitations on public gatherings, to limit the initial spread while preparations for a longer-term strategy can be implemented. Third, a plan to protect at-risk populations, such as elderly care homes, needs to be implemented early, as mortality rates can be particularly high in these populations. Finally, the messaging from government and public health authorities must be coordinated throughout the pandemic, as inconsistent messaging can lead to confusion and a lack of adherence for restrictions on social life.

## **Damien Spilchen (Dr. Stuart Skinner)**

### *Effective HIV Care Delivery Models for Rural Indigenous Communities*

Canada's Indigenous population is disproportionately affected by HIV, especially in Saskatchewan, wherein 69-81% of all new HIV infections between 2008 and 2018 occurred in individuals who self-identified as Indigenous. Since the majority of Saskatchewan's Indigenous population reside in rural communities, this population experiences both Indigenous-specific risk factors, as well as rural risk factors. In order to search for evidence-based HIV care delivery models that are tailored towards a largely rural Indigenous population, a literature review was conducted. A Medline search yielded 19 relevant articles, which explored the efficacy of a series of HIV care delivery models, such as decentralized models, community-based models, care models combined with social services, telecare models, and mobile care models. The efficacy of decentralized models, community-based models, and care models combined with social services was supported, whereas support for the efficacy of telecare and mobile care models was lacking. The applicability of these studies to Saskatchewan's Indigenous population is limited; most of the included articles were done on samples that resided in Africa, and only one article used a mainly Native American sample. In order to construct stronger recommendations for the delivery of HIV care in rural Canada, future studies on rural HIV care delivery models should use a largely Indigenous sample that resides in a developed country.

## **Eman Abdulhadi (Dr. James Barton)**

### *The Role of Practitioners in Indigenous Wellness – Participant Experience with Cultural Responsiveness Training*

Introduction: The impact of colonization has had a lasting impact on the Indigenous peoples of Canada. Within the healthcare system, Indigenous people experience racism and mistreatment, resulting in a variety of negative health effects. This educational program is delivered through stories of Indigenous Elders, Knowledge Keepers, community members, scholars and health providers. Participants are supported by facilitators within the course to engage in self-reflection and produce a culturally responsive communication strategy for their work with Indigenous people in Saskatchewan.

Objective: To determine whether engagement in an Indigenous cultural responsiveness training course allows health practitioners to grapple with, highlight and reveal their own perspective on strategies for culturally responsive care for Indigenous patients.

Methods: Participants took part in a 4-month course that included modules on history of intergenerational trauma and colonization, racism in healthcare and access to care. The course culminated in a communication strategy assignment that was the primary source of data for each participant. Iterative thematic analysis was used to examine qualitative data.

Results: A total of 64 participants took part in the course and 36 completed the final assignment. Five primary themes emerged: 1) Communication: A Cornerstone of Effective Care; 2) Reframing the Patient and Community as the Central Puzzle Piece; 3) Understanding Access to Community Resources; 4) Importance of Traditional Ways in Indigenous Wellness; and 5) Employing a Culturally Safe Approach in a Western System.

Discussion: Analysis revealed that following participation in The Role of Practitioners in Indigenous Wellness, participants identified: 1) knowledge about intergenerational trauma and racism in healthcare, and the impact on the experiences and health outcomes of Indigenous people; 2) the importance of availability of traditional methods in the care of Indigenous people; 3) the necessity of adapting practice to the unique needs of the patient; 4) the importance of culturally safe communication strategies in building relationships with patients.

## **Emre Islam (Dr. Senthil Damodharan)**

### *Evaluation of Brief 'Caring Telephone Contact'*

The study is designed to evaluate the mental health telephone follow-up provided by mental health community nurses during the high-risk transition period on its effectiveness as a post-discharge care for adolescents admitted to the ED or Adolescent Psychiatric Unit for suicidal ideations and/or behaviours. It is a retrospective electronic health record study collected from the ED and Adolescent Psychiatric Unit in Regina General Hospital for quality improvement purposes. Multiple studies have shown that the first few weeks to 3 month period after discharge from the emergency department (ED) is correlated with increased risk of suicide attempts and/or reattempts. As such, post-discharge treatment and follow up is encouraged, and have been shown to reduce risk of further suicidal behaviour, for both adults and youths. Post-discharge treatments can be varied in its approaches, and have been shown to save costs to healthcare centres as well. One of the methods includes telephone follow-up with the patient, such as the mental health telephone follow-up program in Regina. Our study aims to evaluate the mental health telephone follow-up program as a post-discharge follow-up for patients, and its impact on the readmission rates of the patients to ER and adolescent psychiatry unit, such as the number of readmissions and at which point post-discharge they were readmitted. We anticipate that with the results of the study, we could ensure quality improvement of the program and suggest any changes that are needed. The collection of the data is delayed due to COVID-19 and will be continued in following months.

## **Jessica Froelich (Dr. Malcolm King)**

### *Evaluation of the Recovery Lake Program: A Miyo-Pimâtisiwin Project*

Community engagement processes conducted with the Northern Village of Pinehouse, situated on Treaty 10 territory in northern Saskatchewan, determined a need for an evaluation of the Recovery Lake Program (RLP). The RLP uses land- and culture-based activities to promote healing in the context of mental health and substance use. It was developed based on the understanding that substance use interventions, within an Indigenous health determinants framework, require a wholistic community-led and community-driven approach to care as opposed to the individualistic framework typically emphasized in the Western approach. Despite the demonstrated need for land-based cultural practices, programs such as RLP face many challenges regarding funding and acceptance by policy makers. A Two-eyed Seeing approach to data collection and analysis was used and involved qualitative research methods incorporated with Indigenous research methodologies for coding, thematic analysis, and knowledge synthesis. Primary data collection included 9 telephone interviews with past and current clients of the program, family members, caregivers, program staff and community leadership. These were audio-recorded and transcribed verbatim. A modest cash honorarium was offered to honor participants' shared time and wisdom. Preliminary findings were presented to participants and community members for input and feedback to emphasize Two-eyed Seeing and Indigenous grounding of the data. The outcome is to highlight 'wise practices' in the development of land- and culture-based interventions in the context of mental health and substance use for Indigenous communities and make recommendations towards policy formulation and service delivery for the RLP.

## **Joel Scott (Dr. Brian Clapson)**

### *Saskatchewan Opioid Crisis: Location Based Prescribing Trends Within Our Province*

Canada has among the highest rates of opioid prescribing globally. The increase in opioid prescribing over recent decades has been accompanied with a significant increase in opioid related mortality. Much effort has gone into responding to the opioid crisis, and one facet of this has been the creation of prescription drug monitoring programs. In Saskatchewan, the Prescription Review Program (PRP) is a quality assurance and improvement program that monitors physician prescribing of high-risk drugs (including opioids) and aims to educate physicians on best prescribing practices. An identified need within the PRP was to generate a broader understanding of opioid prescribing within our province. Exploring community level prescribing was identified to provide insight into regional variation and factors associated with rates of opioid prescribing. Further, location-based variance in opioid prescriptions has been demonstrated in Ontario, demonstrating a strong link between high prescribing regions and increased opioid related mortality. This was a cross-sectional study involving the locations and opioid prescribing metrics of general practitioners in Saskatchewan. Individual physician opioid prescribing metrics used were the number of patients prescribed opioids, and the average OME/day prescribed, both over a 3-month time period. Descriptive statistics were generated for each community and graphed according to size of practice community. Our research found that variation exists in opioid prescribing of physicians throughout the province, with some communities standing out with relatively high prescribing rates. The hope is this can be useful baseline data to aid in understanding and mitigating Saskatchewan's opioid crisis.

## **Kennedy Flegel (Dr. Stuart Skinner)**

### *HIV Cascade of Care in Rural and Remote Communities*

The rate of HIV in Saskatchewan is twice the national average. Within Saskatchewan the First Nations communities have an HIV rate that is four times the national average. The Cascade of Care framework consists of 1. Diagnosis 2. Linkage to care 3. Receiving treatment; and 4. Achieving a suppressed or undetectable viral load. The World Health Organization proposed a goal of 90-90-90: 90% of all people living with HIV diagnosed; 90% of all people diagnosed with HIV infection receive sustained ART; and 90% of all people receiving ART have viral suppression. Charts of patients receiving care in rural areas and First Nation communities between 2015-2019 were reviewed retrospectively to explore the outcome of the cascade of care and 90-90-90 outcomes. The results indicated that out of 38 active patients; 37 (100%) were on treatment and 33 (89%) were virally suppressed and 35 (95%) was co-infected with Hepatitis C. In northern communities 37 (100%) clients linked to care started ART and 33 (89%) on ART achieved VL suppression. In southern communities 30 (100%) clients started ART and 18 (60%) clients on ART achieved VL suppression.

## **Mackenzie Jardine (Dr. Carrie Bourassa)**

### *Addiction Treatment Models: Sources of Resilience and Empowerment Among Indigenous Peoples*

The effects of intergenerational trauma, colonization and genocide are numerous and include higher rates of health disparities including substance use. The purpose of this research was to identify areas of resilience and empowerment in addiction recovery among Indigenous Peoples. Community approval was sought from the Community Research Advisory Committee and network sampling was used for co-researcher recruitment. Co-researchers included individuals in sustained recovery of 12 months or more (n=5), Elders and Knowledge Keepers (n=2), and physicians (n=1). Indigenous story-telling (4) was used during one-on-one interviews with co-researchers via phone call. Co-researchers were gifted with a tobacco tie as an acknowledgement of their participation. Elders and Knowledge Keepers were gifted tobacco and cloth as well as an honorarium as per local traditional protocol. Pseudonyms were assigned to all co-researchers and following transcription, interviews were coded for thematic analysis using Nvivo 12. Thematic analysis resulted in 12 themes identified from the interviews. These include trauma, systemic racism, gaps in care, role of physicians, health care needs, confidence, family support, peer support, spiritual care, resilience, culture and Elders, and words of advice. Co-researchers identified many areas of resilience and empowerment among Indigenous Peoples in addiction recovery including spirituality and prayer, and connection to culture, Elders, and traditional healing practices.

## **Muzzafar Haque (Dr. Senthil Damodharan)**

### *A Patient-Centered Approach to Engaging Patient Partners regarding Self-Harm Hospitalisations as Secondary Suicide Prevention in Saskatchewan*

Background: There are gaps in our healthcare system regarding the intervention and treatment of suicidal behaviours in children and youth. This exists to an even higher extent within First Nations communities in Saskatchewan where the rates of death by suicide is 4.3 times higher than non-First Nations people. First Nations and Metis patients are also at a higher risk of Intentional self-harm hospitalizations. It is critical to identify these shortcomings within our healthcare system delivery and to improve our level of care to improve suicide prevention outcomes.

Objectives: To identify gaps in suicide prevention and methods of intervention delivery improvement with a focus on communities with higher aboriginal populations.

Methods: Utilizing patient partners as equal members of data collection and analysis. Exploring current databases of patients up to the age of 25 years that were discharged in 2017 because of intentional injuries. This will aim to proportionally represent Aboriginal communities and evaluate the healthcare interventions prior to the self-harm incident and after self-harm hospitalization.

Results: Timeline of project delayed due to COVID-19. Finalization of project expected in August 2021.

## Richard Ngo (Dr. Peter Hedlin)

### *Wellness During COVID-19: An Anesthesiology Perspective*

**Background:** Physicians experience high levels of stress, emotional exhaustion, burnout, and depression. For residents, this can be exacerbated by fatigue, high financial debt loans, conflict between work and home life. In the context of COVID-19, anesthesiologists are at increased risk of infection during face-to-face interaction with patients and when performing aerosol generating procedures). Anesthesiologists have expressed fears of infecting close family members. Building on a well-established Anesthesiology Departmental Wellness Program, we sought to better understand the unique needs of Saskatchewan Anesthesiologists, residents, and Family Practice Anesthesia providers (FPAs) to determine what additional supports might be needed during the COVID-19 pandemic.

**Methods:** Following REB approval (May 2020), 209 Saskatchewan anesthesiologists, FPAs, and residents were invited to complete the Professional Fulfillment Index (PFI) of the Stanford Physician Wellness survey. Open ended questions were used to assess wellness concerns, supports, and needs, and respondents could volunteer for a follow up interview conducted by the primary author, audio recorded and transcribed, with field notes.

**Results:** Seventy-nine respondents (55 FRCPC anesthesiologists, 4 FPAs, and 20 residents) answered the survey (79/209, 38% response rate), and 1 key informant agreed to be interviewed. Respondents were primarily male (47/79, 59%), have been practicing medicine for more than 10 years (47/79, 59%), and serve an urban/suburban population (74/79, 11%). Of the 69 respondents who completed the Professional Fulfillment Index, 46/69 (67%) reported a low level of professional fulfillment and 36% expressed burnout. Compared to work before the COVID-19 pandemic, only 23/69 (33%) reported that they enjoy work just as much, and only 12/69 (17%) reported that morale was high where they work. Conversely, 42/69 (61%) somewhat agreed or strongly agreed that they were more stressed now. Residents expressed concerns over lack of clinical exposure and scheduling.

**Conclusions:** Many (67%) anesthesiologists, FPAs and residents reported low levels of professional fulfillment, and a sizeable number (36%) are experiencing burnout. Anesthesiologist staff had occupational wellness concerns with administrative protocols. Future directions should address channels of communication, provide exercise opportunities, and facilitate mental health support that target the needs of anesthesiology providers as the COVID-19 pandemic continues.

## Robert Henderson (Dr. Graham Taylor)

### *Modelling the Effects of Dynamic Physical Distancing Measures in the COVID-19 Pandemic: Application to Saskatchewan, Canada*

**Background:** The COVID-19 pandemic has resulted in widespread changes to daily life, and the impact on Canadian public health outcomes of gradually re-opening several economies is expected to be dramatic. We explore the effects of re-opening the Saskatchewan economy at various time points, and examine the potential outcomes on ICU and acute care case load. **Methods:** We propose a compartmental infectious disease model with application to the province of Saskatchewan. The model is fit to publicly available case data. We estimate effects of physical distancing and suggest approaches to minimise future outbreaks, using cumulative hospital and ICU admission counts per day to aid in fitting. This approach is helpful in cases of rare event data and serves as an example approach which could be adapted to other jurisdictions.

**Results:** Our base model predicts a total caseload of just over 1,000 individuals, approximately 68% of whom are detected. We find that relaxing physical distancing restrictions after one month results in a high number of deaths and hospitalizations. Returning to an interaction level of 25% of normal before 3 months results in a severe spike in cases (>10,000).

**Interpretation:** Long-term population-level health outcomes from a pandemic disease process are exquisitely sensitive to physical distancing practices. Strain on hospital capacity can be avoided by aggressive physical distancing over a sustained period. In our model for Saskatchewan, Canada, a reduction of physical interaction to below 20% of normal is required over a period of at least 6 months to significantly reduce disease spread.

## **Sarah White (Dr. Kali Gartner)**

### *Housing and Harm Reduction During the SARS-CoV-2 Pandemic: What Should Be Done?*

People experiencing homelessness and those who use criminalized substances are at higher risk of Severe Acute Respiratory Syndrome coronavirus-19 (SARS-CoV-19) exposure and severe infection, as well as substance use related harms. This literature search looked to find how the unique needs of people who use drugs (PWUD) and/or are homeless should be addressed. A scoping review of academic and grey literature was conducted using Medline, Proquest, and Google Scholar. Citations were saved to Zotero and duplicates removed. Rayyan online software was used to review titles, abstracts and full articles. A total of 153 articles were identified. Titles were screened by three reviewers resulting in 34 articles. An abstract and full-length article screen resulted in twenty articles. Inclusion criteria were: literature published 2000-2020, English language, included an intervention or prevention strategy, substance use/harm reduction OR homelessness and study conducted related to a pandemic or outbreak. Exclusion criteria were: HIV/AIDS or other non-respiratory transmitted pathogens, or vaccination campaigns. Of the included articles, 10 were related to people experiencing homelessness, 8 related to people who use drugs, and 2 related to both homelessness and substance use. Main themes included: 1. Public Health Guidance Needs to Be Adapted 2. Increased Risk of Overdose and Drug Related Harms During Pandemic 3. Medical Services Adapted to Meet the Needs of PWUD During Pandemic 4. Special Considerations for Children and Families. Public health guidance and services need to be adapted to address increased overdose rates and other harms for PWUD and people experiencing homelessness during a pandemic.

## **Sunny Lu (Dr. Andrea Lavoie)**

### *Using the CardioSTAT® Ambulatory ECG Monitor to Detect Arrhythmias in High Risk Indigenous Individuals Living in Rural Saskatchewan*

A large gap exists in the delivery of timely and effective care to Indigenous people living on First Nation communities in Saskatchewan. Higher rates of diabetes and other risk factors means a higher risk of heart disease. This study will examine the effectiveness of a wearable continuous ECG monitor called the CardioSTAT® Recorder at screening heart rhythm disease in the setting of high-risk individuals in rural Saskatchewan's First Nation communities. This device may potentially reduce the barrier of access as it can be obtained and returned at local health centers. Its usability will be compared with the Holter monitor, and participant satisfaction will be gathered through survey. We will partner with an established community healthcare outreach team called the Wellness Wheel to recruit 100 participants, provide arrhythmia education, and provide treatment if appropriate to members of the Touchwood Agency Tribal Council. Data gathered from this project may help improve delivery of care for similar populations across the province.



## **Amira Muftah (Dr. Taofiq Olusegun Oyedokun)**

### *Exploring Communication Between Consultants and Referring Physicians – A Qualitative Study*

Effective communication between physicians is a core competency in medicine. However, requests from referring physicians for advice from consultants is often stressful, subject to misunderstanding, and has been identified as a source of professional incivility. While existing literature focuses on the role of referring physicians, little is known on how consultants can improve the structure and substance of providing expert advice. Until recently, phone conversations involving physicians from Saskatoon were mediated by trained telecommunicators and Emergency Medicine Dispatchers through the Acute Care Access Line (ACAL). These services are now provided by the provincial System Flow Coordination Center (SFCC). This study explores the experiences of ACAL operators to: (1) identify the effective and ineffective components of physician-to-physician communication; (2) recognize the factors which trigger and sustain the tensions that are anecdotally reported by referring physicians; (3) generate a series of concrete recommendations to aid consultant physicians in providing advice. ACAL operators were recruited to participate in individual semi-structured interviews. Preliminary thematic analysis of 10 interviews using a grounded theory approach are presented in this abstract. Linguistic, personal, and situational features of telephone consultations were identified as sources of tension. Communication breakdowns due to these tensions were implicated in delays in patient care, transport and care miscommunications, avoidance of consultants by referring physicians, and overwhelming other medical services. To mitigate these tensions, we propose a scheme to aid consultants in providing professional advice to referring physicians. Data from future interviews will be compared to our preliminary analysis to solidify a conceptual framework which may inform future process improvement efforts and educational interventions to reduce the perceived tension and increase the utility of consultations.

## **Aisha Moustapha (Dr. Lynsey Martin)**

### *Can ED Chest Pain Patients with Intermediate HEART Scores be Managed as Outpatients? A Retrospective Review of Two Rapid Access Chest Pain Clinics*

The HEART score is a validated risk stratification tool for patients presenting to the ED with chest pain that predicts the risk of a major adverse cardiac event (MACE) within 6 weeks. Patients are assigned 0-2 points for each category (History, ECG findings, Age, Risk factors, Troponin) and categorized as low, moderate or high risk depending on their overall score. The current recommendation for patients with a moderate HEART score is to admit to the ED for further observation and additional workup, a resource intensive approach that does not result in better outcomes for patients. While there is literature to support the outpatient management of low-risk patients via rapid access cardiology clinics, no studies have explored a similar strategy for moderate risk patients. Therefore, the focus of this study was to explore if outpatient management is a safe strategy for moderate risk patients through a retrospective review of patients (n = 1991) who were referred to the rapid access clinic in Regina or Saskatoon from the ED.

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

### *Exploring the Impact of COVID-19 Visitor Restrictions on Patient and Family Centered Care in the ICU*

On March 14, 2020, the Saskatchewan Health Authority responded to the COVID-19 pandemic by implementing visitor restrictions at all hospitals, clinics, and continuing care facilities. It has been hypothesized that restrictive hospital visitation policies are associated with negative effects on patient and family centered care. Many studies have characterized the impact of hospital visiting policies on patient outcomes, suggesting that flexible visiting policies lead to greater patient satisfaction, positive impacts on patients and families and that key stakeholders have clear preferences for open or flexible visitation policies (1). We aimed to characterize the impact of the COVID-19 visitor restrictions on patient and family centered care in the ICU by developing and distributing a survey then conducting qualitative interviews to further explore key themes and challenges. A review of literature identified that important principles of patient and family centered care in the ICU are frequency of communication, participation in care, participation in daily rounds, involvement in decision making, competence of ICU staff, perception of symptom management, emotional support and wellbeing, and ability to ask questions and get answers. Using these key themes as the basis for survey question development, Patient Family Advisors helped greatly with survey development to ensure survey questions were patient-centered and meaningful to patient families. Survey responses are still in the process of being collected and will be analyzed using descriptive statistics. Willing survey participants will be interviewed to further explore impacts and challenges. We intend to use this data to develop a framework of patient family perspectives for considering the impact of visitor restrictions on ICU care during pandemic conditions and communicate these findings to key stakeholders.

## Kiyana Ghavami (Dr. Phil Davis)

### *Exploring the Reasons for Patients Presenting to Saskatoon Emergency Departments with “Abnormal Lab Values”*

**Background:** Within Saskatoon, primary care physician referrals to the Emergency Department (ED) for a chief complaint of abnormal lab value (ALV) represent approximately 850 ED visits/year (~1% of ED visits, SHIPS data)<sup>1</sup>. Common reasons for ED referral for an ALV are: 1. abnormal CBC, 2. electrolyte abnormality, 3. abnormal internal normalized ratio (INR), 4. Elevated D-Dimer and 5. Elevated Troponin. While the first three abnormalities are often found during routine screening and follow-up, the latter two are often identified when considering a diagnosis of venous thromboembolism (VTE) or cardiac ischemia. Given that VTE and cardiac ischemia are potentially life-threatening diagnoses, getting results in a timely manner is paramount one wonders if work-up in an outpatient setting is appropriate.

**Objective:** Describe the magnitude of problem and reason for referral to the ED as well as to determine if an alternative care pathway should be established for diagnosing patients with elevated D-Dimer or Troponin.

**Methods/Methodology:** After obtaining REB approval (Bio ID-1807), we performed a retrospective cohort study of patients who presented to the ED with abnormal lab values from Jan 1, 2019- Dec. 31, 2019. Charts were reviewed electronically using Sunrise Clinical Manager). The following information was collected on each patient: age, gender, comorbidities, specific abnormal lab value they were referred for, length of time in the ED, and whether they were admitted to hospital. Furthermore, specifics about their ED stay will also be documented, including blood work drawn, imaging, management, complications, mortality within 30 days, and ED return within 30 days from complications due to work up. Data was analyzed using descriptive statistics.

**Results/Findings:** During the study period, we identified 866 patients presenting to Saskatoon's EDs with an Abnormal Lab Value. Of these patients, 343 (39.6%) presented with an electrolyte abnormality, 282 (32.6%) with an abnormal CBC, 79 (9.1%) with a positive blood culture, 43 (5.0%) with elevated D-Dimer, 38 (4.4%) with elevated troponin, 19 (2.2%) with an elevated INR and 62 (7.1%) patients with an other lab abnormality (i.e. elevated LFTs, etc.). 580 (67.0%) of these patients were initially seen by the emergency physician and 286 (33.0%) of the patients were direct for consultant. Of these patients, 437 (50.5%) were admitted to hospital, 407 (47.0%) were discharged from ED, 21 (2.4%) left against medical advice, and one (0.1%) patient died in the ED. Of the patients that presented with elevated D-dimer, only 5 (11.6%) were identified as having a VTE. Of the patients presenting with an elevated troponin, 18 (47.3%) had an acute coronary syndrome. Furthermore, the data showed 33 (3.8%) patients died within 30-day of their index visit. 186 (21.5%) patients represented to the emergency department within 30-days for the index visit. 36 (4.2%) complications related to the index visit were identified.

**Discussion & Conclusion:** Within Saskatoon, patient presentations for ALV make up approximately 1% of ED visits and many of these patients require admission for further work-up and management. With respect to the potentially time-sensitive diagnoses of VTE and ACS these were identified in very few patients suggesting that an alternate care pathway for testing would have minimal impact on system flow and patient outcomes.

## **Mckinley Smith (Dr. Brittany Ellis)**

### *Diagnostic Yield of Head Computed Tomography in Elderly Emergency Department Patients with Possible Delirium. A Retrospective Chart Review*

**Background:** Delirium has a broad differential diagnosis and often suggests grave pathology in the elderly; therefore, prompt determination of the underlying cause is essential for management. Computed tomography of the head (CT-Head) may have a role in determining the cause of delirium in certain circumstances, though inpatient studies have demonstrated that CT-head is an overused imaging tool in this population. However, there is a paucity of emergency department (ED) based research surrounding the use of CT-Head in delirium. Therefore, we hypothesized that trends seen in the inpatient setting would be mirrored in the ED and that CT-Head is likely overused in the context of delirium.

**Objective:** This study aims to describe the diagnostic utility of CT-Head and how its use changes medical management for elderly patients presenting to the ED with delirium.

**Methods:** Patients  $\geq 65$  years who visited the ED with suspicion of delirium were included. We compared charts of patients who received CT-Head and those who did not to examine for differences between groups. In this retrospective chart review, a total of 630 patient charts concerning delirium were evaluated. 138 patient charts were excluded as the patient either presented to the emergency department for direct care by a non-emergency physician or had reference to a delirium irrelevant to their current ED visit. 492 charts were included in statistical analysis.

**Results:** It was found that of those who received CT-Head ( $n = 279$ ) only 16 had acute findings. Of those with acute findings on CT-Head, indications for ordering CT-Head included a new focal neurological deficit ( $n = 2$ ), trauma ( $n = 3$ ), acute confusion ( $n = 7$ ), altered level of consciousness or obtundation ( $n = 2$ ), or other ( $n = 2$ ). Further, delirious patients who did not receive CT-Head were more likely to be discharged ( $p < 0.01$ ) and have an absence of new focal neurological deficits ( $p < 0.01$ ).

**Conclusion:** These results show CT-Head is frequently ordered for patients presenting to the ED with symptoms of delirium, though positive findings are rare and occur most commonly in patients with other findings. This suggests that CT-Head may be overused in this patient population in the ED.

## Ryan Donnelly (Dr. Eric Sy)

### *Direct from ICU Sent Home (DISH) - Evaluation of Safety Outcomes of Direct Discharge Home Patients from ICU's: An Updated Systematic Review and Meta-Analysis*

**Background:** Traditionally, patients discharged from intensive care units (ICUs) have been transferred to lower acuity wards before being sent home; however, more patients are now being discharged directly home from ICUs at an increasingly greater rate due to system pressures and overcapacity.

**Objective:** The purpose of this study was to assess the safety and efficacy of Direct from ICU Sent Home (DISH) by reviewing data for emergency department (ED) visits, readmissions, and mortality in the literature.

**Methods:** The study design is a systematic review and meta-analysis. A clinical librarian searched multiple databases (MEDLINE, CINAHL, etc.) to produce 8057 results with keywords related to DISH. There were 2620 duplicates were removed, with two independent reviewers screening 5410 studies by title and abstract for further review. Five studies met inclusion criteria for our systematic review, with data abstraction performed independently by 2 reviewers. The primary outcomes were re-admissions, ED visits and mortality at 30 and 90 days. Meta-analysis and heterogeneity assessment was completed using a random-effects model. Pooling of data was performed under the Mantel-Haenszel method. Outcomes were reported as odds ratios (OR). Meta-bias was assessed using Egger's/Begg's/arcsine tests and funnel symmetry plots to assess for publication bias. Certainty and quality of evidence was assessed using the Grading of Recommendations, Assessment, Development and Evaluations (GRADE) method.

**Results:** Two studies met the overall criteria for inclusion after critical appraisal for meta-analysis. For mortality, there was an OR of 0.50 (0.17, 1.48,  $p = 0.880$ ) with direct discharge compared to ward transfer at 30 days. For ER visits, there was an OR of 0.84 (0.74, 0.94,  $p = 0.487$ ) with direct discharge compared to ward transfer at 30 days. For readmissions, there was an OR of 0.65 (0.52, 0.83,  $p = 0.310$ ) with direct discharge compared to ward transfer at 30 days. The quality of evidence was deemed low for readmissions to very low for the outcomes of ER visits and mortality using GRADE. Overall, a weak recommendation could potentially be made that DISH may be appropriate with no difference in safety outcomes for certain patients.

**Conclusions:** Compared to ward transfer from ICU before discharge home, DISH appears to have no difference in readmission, ED visits, or mortality at 30 days. However, we found low to very low quality of evidence, mainly owing to a lack of randomized control trials and inconsistency in the literature. This reduces the ability for strong clinical recommendations and indicate that further high-quality clinical trials are needed.

## **Ryan Frehlick (Dr. Joanna Smith)**

### *Factors of Accidental Opioid Overdose Deaths Presenting to Saskatoon ED's*

Background and Purpose: Opioid-related deaths continue to rise in Canada. With opioid overdose deaths being largely accidental, it is beneficial to analyze the interactions between these patients and the health care system in the months leading up to their deaths. Opportunities exist for emergency departments to screen for patients with substance use disorder and initiate pharmacological and psychosocial treatments as well as link patients to ongoing care. Furthermore, the purpose of this project is to characterize risk factors for patients who present to Saskatoon emergency departments prior to accidental opioid overdose deaths, to create future risk measurement models for earlier intervention.

Methods: A retrospective chart review was conducted on accidental opioid overdose deaths in Saskatoon. Descriptive statistics for analysis included cohort demographics, type of visits, number of interactions with the healthcare system, toxicology reports, and number and type of prescriptions in order to be compared with general emergency department averages. These variables are currently being analyzed using Spearman rank correlation analysis, as well as, parametric and non-parametric methods.

Results: Results regarding the various data sets are still being interpreted. However, the preliminary data suggests, positive and negative relationships such as Glasgow coma scale on arrival and number of emergency department visits, depression and chronic pain among male and female characteristics, up until one year prior to accidental opioid overdose death.

Relevance of Findings: By identifying relevant risk factors in Saskatoon patients presenting to emergency departments for potential opioid overdoses, we will better be able to aid healthcare practitioners and patients. This will help create a risk measurement model to predict candidates for further assistance surrounding substance use, particularly opioids.

## **Sara Abolhassani (Dr. Taofiq Olusegun Oyedokun)**

### *Presence of Law Enforcement in the Emergency Department: A Scoping Review*

Law enforcement (LE) personnel (e.g. police officers) may be present in the emergency department (ED) for reasons such as provision of security, transport of patients, and completion of criminal investigations. Despite the need for LE personnel in the ED, LE personnel may have a negative impact on patients, including breach of patient confidentiality and privacy. The primary objective of this scoping review was to describe the interactions between LE and ED personnel, as well as the impact of LE presence on patient care. The secondary objective was to describe strategies that optimize LE and ED personnel interactions as well as patient care. Subject headings and keywords relating to the concepts of LE and the ED were searched. The forty-seven articles included in this review showed that ED personnel face ethical dilemmas of maintaining patient confidentiality/privacy versus potentially obstructing justice in LE investigations. LE personnel presence may inhibit patients from disclosing information to ED personnel but can make the ED feel safer for ED personnel to work in. Sub-optimal care is possible when ED personnel conduct incomplete examinations of some patients brought in by police. In the literature, the most common motives for LE presence in the ED were investigation / information gathering, as well as patient transport under a mental health act or in a trauma situation. Most commonly described strategies to optimize interactions and patient care were the use of locally created policies/procedures guiding ED and LE personnel. The findings of this scoping review may be used to guide discussions with relevant stakeholders including patients, ED personnel, and LE personnel to gain insight on the impact of LE presence in EDs in Saskatchewan

## Sehar Parvez (Dr. Eric Sy)

### *National Healthcare Provider Survey of Patients that are Discharged Directly from the ICU and Sent Home (PROVIDER-DISH)*

**Background:** The Canadian Institute for Health Information reported ICU admissions increased by 12% from 2007-2014 (1). Direct discharge home (DDH) from ICUs has been increasing because of this growth (2-3). Because the healthcare providers' (HCP) perceptions have been mixed in the literature (2-3), this study seeks to evaluate their perceptions into the practice of DDH from the ICU.

**Methods:** A 45-item cross-sectional survey was designed to assess the HCP's perspective. Surveys were sent to critical care providers (intensivists, pharmacists, nurses), community care professionals (family physicians, internists, respiratory therapist, social workers, physiotherapists, and occupational therapists). The survey was created with REDCap, an electronic database, and health care organizations were contacted for distribution.

**Results:** Distribution was to over 52,000 participants, with 169 responses between July 23 – August 27, 2020. 74.2% (125) of respondents never worked with patients DDH from the ICU. 48.5% (82) of respondents believe there was a growth in the number of patients DDH. For critical care providers, comorbidities (58.0%) was the biggest barrier to DDH from ICU, while non-critical care providers believed the biggest barrier was families' discomfort (49.4%,  $p < 0.0001$ ).

**Conclusion:** A third of healthcare providers are unaware of the increasing trend of DDH from ICU. Differences found between respondent perception, potentially reduces the organization and understanding in the management of DDH from ICU. Overall respondent participation was low, limiting the generalizability during this interim analysis period.



## Alice Kong (Dr. Lilian Thorpe)

### *Quality Improvement Project Using Existing Data: Exploring Unmet Needs Contributing to Requests for Medical Assistance in Dying (MAID)*

**Background:** The federal government passed Bill C-14 in June 2016 to allow Medical Assistance in Dying (MAID) in Canada. The number of Canadians contacting MAID program and receiving MAID has increased each year. However, concerns have also been raised that inadequate access to supportive services such as palliative care might be the precipitant for these requests. We undertook a quality improvement project to explore patient characteristics and potentially unmet needs underlying the request for MAID in patients assessed by Saskatoon-based clinicians.

**Methods:** We reviewed charts from 432 patients who contacted Saskatoon-based MAID assessors from September 2016 through July 2020. Demographics, health information, stated reasons for requesting MAID, as well as unmet needs at the time of their contact were extracted and entered into an Excel file. Descriptive analysis as well as multivariate Cox-regression statistical analysis was performed.

**Results:** We found that of 432 patients who made initial contact, 402 patients had a full assessment for MAID eligibility, 318 were deemed to be eligible for MAID and 192 patients received MAID. There was some seasonality to the pattern of MAID death. The largest proportion resided in large-urban population centres and also predominantly resided in higher income neighborhoods in the first year, which decreased in 2017 and 2018 but again increased from 2019 through 2020. Cancer was the underlying health condition most strongly predicting time to MAID, and this was more pronounced in women. The majority of the patients had access to palliative or disability care, and this access was not predictive of survival time or MAID outcome. Cox regression analysis suggested that the main underlying condition at the time of initial contact was overall the strongest predictor of progression to MAID while access to palliative care or other social/healthcare support was not statistically significant.

**Interpretation:** Many factors are associated with patients initiating discussion about MAID, some of which include socioeconomic factors as well as the expected underlying physical illnesses such as cancer. Access to palliative or other supportive care does not seem to be as significant as the underlying illness. Patients living in more populous regions and those from higher social economic strata are more likely to have the knowledge and supports to initiate discussion of this more recently available end-of-life choice.

**Future Study:** More detailed investigation of characteristics of patients applying for MAID, as well as the reasons and potentially unmet needs precipitating the request for MAID may be necessary to ensure equitable provision of services in Saskatchewan.

## **Elizabeth Hansen (Dr. Rae Petrucha)**

### *Goals of Care and Advanced Care Directives in the Long Term Care Setting - Patient Preference and Tools for Best Practice*

Advance care planning is an ongoing communication and decision-making process allowing patients to express and document their preferences for future care in an advance directive, in anticipation of a time when they may not be competent to make their own medical decisions. Advance care planning is especially important in the long-term care population, as members of this population are often elderly with multiple comorbidities, and they may also be suffering cognitive decline that will limit their decision-making capacity. In this rapid review, we attempt to synthesize the evidence and best practices for co-creating advance directives that are meaningful to individuals in long-term care facilities and their families. A shift over time from advance directives to advance care planning was identified. Little to no information on the necessary content of advance directive forms or what patients prefer in an advance directive form was found. This suggests that the literature has not yet matured to provide parameters that are recognized to effectively summarize in document form the broad approach that is essential to current ACP efforts. As a well conceived plan cannot be effective if it cannot be communicated to others when it is needed, it is necessary to have more research regarding the creation of easily translatable advance directives that patients and families are confident will express their wishes. We identified a paucity of advance care planning research involving the long-term care population. Further, many studies involving long-term care residents exclude patients who lack decision making capacity, despite the fact that this a significant population in long term care. The major finding of this review is the need for more research in the areas of advance care planning and advance directives at long term care facilities.

## **Kasey Berscheid (Dr. Robert Weiler)**

### *Canadian Credentialing of Medical Assistance in Dying*

Background: Medical Assistance in Dying (MAiD) has been legally available for eligible Canadians since June 2016. There has been consideration for expanding the eligibility for MAiD as an end of life option to include those without a foreseeable death. Each province had to develop its own solution to providing this end of life option. Since the passing of this legislation, Saskatchewan has created a provincial MAiD program.

Objective of this review: This study explores the regulations governing provincial MAiD. It allows comparison of different provincial regulations, programs and supports and the Saskatchewan providers views on the provincial program and the process of regulation of MAiD.

Methods: Three surveys were employed to explore regulators across Canada, the programs in each province and with Ethics approval a review of Saskatchewan assessors and providers.

Results: Our findings showed that many provinces do not have a provincial program. Additionally, Saskatchewan is one of the few provinces to have a provincial program to support providers and manage the case files. It is one of two that has independent oversight of its work. The surveys also identified need for further education. Saskatchewan providers reported having little knowledge about what constitutes the program's oversight. Further, 36% of Saskatchewan providers stated that their willingness to be a MAiD provider may change if the MAiD eligibility is no longer restricted to a foreseeable death. These findings highlight the need for further education and additional supports even though most Saskatchewan providers currently feel well supported in their roles as MAiD providers.

## **Lindsay Ironside (Dr. Rae Petrucha)**

### *What Strategies in the Literature Improve Team-Based Patient-Centered Care in Long Term Care Settings?*

**Background:** Recent reports from the Canadian Armed Forces in May 2020 highlight the unacceptable care being delivered in many long term care (LTC) facilities within Canada. The purpose of this rapid review was to synthesize current evidence for strategies that would improve care team functioning and thereby assist LTC administrative leaders and healthcare providers in improving patient-centered care.

**Methods:** The methods of this rapid review were guided by the Rapid Review Guidebook: Steps for Conducting a Rapid Review published by the National Collaborating Centre for Methods and Tools. A literature search was conducted using the PubMed database, resulting in 242 articles. One author (LI) reviewed the abstracts of the articles and eliminated any studies that were not focused on the research question or were not transferable to the Canadian LTC setting. Twenty studies met the inclusion criteria and were critically assessed using the CASP Checklist Appraisal Tool for Qualitative Studies. After removing articles with a weak quality score, 17 studies remained. Another author (RP) reviewed 10% of the studies and checklists to ensure consistency and reduce bias.

**Findings:** Four distinct themes emerged from the studies for improving team dynamics to optimize patient-centered care including strategies to improve effective communication, family involvement, change implementation, and leadership success. Furthermore, the use of electronic health records and nurse practitioners improved the communication within the facility. Utilization of a peer team member as a change champion for new protocols facilitated implementing change. Family involvement was considered successful when relatives contributed in a fashion that was viewed positively by the healthcare staff and when the family felt their concerns were addressed. Finally, LTC facilities were found to have effective leadership if they were organized in a structure of continuity of front-line care and if staff members found the leaders to appreciate their work and praise them.

**Conclusion:** This rapid review recognized four specific aspects of team functioning that contribute to their effectiveness. The results of this rapid review also revealed the deficiency in synthesized literature for team based strategies to improve patient-centered care within the LTC setting. Further research is necessary to ensure LTC administrative leaders are using the most effective evidence-based strategies to improve the quality of care being delivered to LTC residents in Canada.

## Olivia LaFrance (Dr. Rae Petrucha)

### *What Are the Strengths and Opportunities for Change Related to Care of Individuals in Long Term Care Settings and Their Families?*

Background: Canada's population is rapidly aging, and the baby-boomer generation will soon require a greater amount of healthcare and living assistance. Long-term care facilities (LTCFs) provide a variety of medical and personal services to people who require assistance in daily activities and managing their health. The purpose of this rapid review is to identify the strengths and opportunities for change related to care of individuals in LTCFs.

Methods: A PubMed literature search was conducted. O.L and R.P. reviewed the abstracts and excluded articles not relevant to the research question. The Critical Appraisal Skills Programme checklists were used to assess the quality of the articles. O.L evaluated 100% of the articles and R.B. evaluated 10% to ensure consistency. Articles were excluded if they were not relevant to the research question, low-quality, published outside of the last 10 years, or conducted outside of Canada and the United States. In total, 21 studies were included in this review.

Findings: Six recommendations evolved from the studies for how to improve quality of care in LTCFs. Respecting the resident's autonomy and tailoring their care to their values and beliefs is strongly recommended. Developing personal relationships between the staff and residents was found to be a way to effectively deliver person-centered care and was also comforting for the residents. The physical environment should utilize home-like décor, provide access to the outdoors and offer orientation cues for dementia patients. The dining environment should encourage family-style dining as well as optimize sensory stimulation for dementia patients. Social engagement with friends, family, and other residents was found to improve quality of life. Finally, an appropriate amount of privacy is greatly appreciated by the residents.

Conclusion: This rapid review identified six opportunities for improvement of care in LTCFs. To implement these recommendations, changes at the facility level or an increase in funding and education are required. Further research is necessary to explore how to improve the experience of family members of loved ones in LTCFs. By implementing these changes, the care and quality of life of residents in LTCFs can be considerably improved.

## Shivani Tauh (Dr. Lillian Thorpe)

### *The Impact on Patients with Acute Spinal Cord Injury of Extending the Eligibility for MAID to those Without Reasonably Foreseeable Death*

**Background:** Since June 2016, physicians and nurse practitioners in Canada have been legally able to provide Medical Assistance in Dying (MAID) under Bill C-14. A specific requirement under this bill for MAID eligibility requires that a, “[patient’s] death has become reasonably foreseeable...without a prognosis necessarily having been made as to the specific length of time that they have remaining<sup>1</sup>.” Although this definition has allowed flexibility in assessing eligibility, it still requires a person to be in the later stages of the dying process. As a result, there have been recent challenges to this requirement, which means that reasonably foreseeable natural death will no longer be required for MAID eligibility. This may result in many young adults with traumatic spinal cord injuries (SCIs), who have a high suicide mortality following injury<sup>3</sup>, becoming eligible for MAID. This research examines the attitudes and subsequent recommendations of a group of persons with chronic SCI (over 5 years since injury) regarding the potential impacts of these expanded criteria. This is a continuation project from last year, at which time we interviewed a multidisciplinary group of care providers of patients with traumatic spinal cord injury.

**Methods:** We conducted an interpretive description qualitative study. Semi-structured online interviews were conducted with 10 individuals with a chronic (at least 5 years past injury) traumatic SCI, based out of either Saskatoon or Regina. Interviews were recorded and transcribed, and thematic analysis conducted.

**Results:** Four preliminary themes were identified through the ongoing analysis process: Accessibility of MAID, Timing of Access to MAID, Hope and Care. Participants expressed support for SCI patients having access to MAID, specifically in the context of preserving autonomy and respecting equity when compared with able-bodied individuals. However, some expressed concern about the implications of access to MAID solely based on a spinal cord injury. In regards to a specific timeline, participants emphasized the variability in initial individual responses to injury, and stated this variability informs the difficulty in regulating a particular timeline of MAID eligibility. Along this line, participants expressed concern for any immediate availability of MAID, as they explained the significance and necessity of what can often be a lengthy adjustment and acceptance process. Participants also discussed the importance of hope in the physical and psychological recovery process as well as in the process of regaining a sense of self. In addition, participants stressed the role healthcare providers have in either cultivating hope, or taking it away, simply based on their attitudes, conduct and ability to connect with individuals in the in-patient or out-patient setting. Furthermore, participants highlighted the integral and irreplaceable value of peer support and community in shaping hope throughout the rehabilitation and reintegration process. Finally, participants expressed the need for compassionate, comprehensive, affordable and continuous care – either in the rehab setting acutely following injury, or within the community, to facilitate reintegration and support independence. **Conclusion:** Expanding the criteria for MAID may provide a greater range of choices for individuals with tSCI but could also increase premature deaths. Recommendations for best clinical practice include increased involvement of eligibility assessors with expertise in spinal cord injury, and possibly including persons with a chronic traumatic SCI in the assessment process, as well as a longer mandatory waiting period, especially in young, vulnerable persons with an acute tSCI.

## **Tatiana Orlowski (Dr. Lilian Thorpe)**

### *Barriers and Facilitators in Accessing Care for People with Intellectual Disability and Advanced Life Limiting Disease*

Introduction & Objectives: Approximately 1-3% of the population have intellectual disabilities (IDs). People with IDs can have comorbidities including sensory impairments and health problems. Historically, life expectancy for people with IDs was lower than that of the general population. Life expectancies for this population have been increasing rapidly in recent years, leading to increased aging-related needs in a system designed to support young people. Few health care providers have expertise in both aging and IDs, and diagnosis of aging-related disorders can be more challenging in this group. This qualitative study identified and explored barriers and facilitators in accessing care for people with IDs and advanced life-limiting disease. Suggestions for improving care were also obtained.

Study Design & Methods: This project was designed through community input to determine project focus and develop the interview questionnaire. Recruitment of participants was via email with snowball enrollment. Semi-structured interviews were conducted via Webex. Interview transcripts were de-identified then analyzed using thematic analysis with Nvivo 12 software.

Results: 7 individuals were recruited and interviewed in total – 2 family members and 5 care providers. All participants were from urban centres. Facilitators identified included strong communication of wishes by the individual, family involvement for support/advocacy, and availability of nursing staff in larger facilities. Barriers identified included aging parents, limited education/understanding by care providers around working with people with IDs, and jurisdictional funding disagreements.

Conclusion: Although some participants described mostly positive experiences, many experienced challenges. Care providers and family members often felt they had to advocate to obtain care and resources, suggesting significant room for improvement in care provision. Participants provided numerous suggestions for improvement – such as health sciences curriculum changes and policies to ensure funding is provided when it is needed. Further research is needed to determine the feasibility of these suggestions.



## **Annie Dinh (Dr. Angela Baerwald)**

### *Virtual Primary Health Care Delivery During the COVID-19 Pandemic*

**Introduction:** In response to the COVID-19 pandemic, virtual care has been utilized to protect the public from unnecessary exposure to the novel coronavirus. Virtual care is defined as “any interaction between patients and/or members of their circle of care, occurring remotely, using any forms of communication or information technologies, with the aim of facilitating or maximizing the quality and effectiveness of patient care”. Virtual care can provide benefits to both clinicians and patients, such as increased accessibility and better time management. Research is needed to allow for the safe implementation of virtual care in the primary setting. Data collected during this study aims to evaluate the utility, practicality, and safety of virtual primary care. Evidence generated can be used to guide patients, health care providers, and policy makers on the use of virtual primary care.

**Methods:** Data was obtained from all physicians, family medicine residents, nurses, and nurse practitioners providing virtual primary care through electronic medical record (EMR) virtual visits (telephone and video) from Mar-Aug 2020. Appointments included general non-urgent primary care including, but not limited to, prenatal, newborn, and geriatric visits. Four quality improvement (QI) questions were asked at the completion of each virtual visit to evaluate indications, appropriateness, consent, time allocated, confidentiality processes and breeches, and need for follow-up. Data was collected bimonthly and analyzed weekly and monthly to assess for potential effect of provider learner as a potential confounder.

**Results:** The number of patients partaking in virtual visits increased and peaked in April and showed a decline from May – August. Across the four QI questions, 10353 responses have been recorded, with approximately 2600 responses per question.

**Conclusions:** The majority of virtual visits are done through phone call, and approximately 60% of patient concerns were adequately addressed by virtual visits. At the beginning of data collection, most in-person visits were avoided by having a virtual visit. More recently, a 10% increase occurred for in-person visits following a virtual visit. Virtual visit length became shorter as the study went on, this is suggestive of increased efficiency from health care professionals for providing virtual care.

## **Brandon Spink (Dr. Yanbo Zhang)**

### *Remote Consultation using Telemedicine with Psychiatrists and Adult Patients: A Scoping Review*

This scoping review examines the benefits and problems of telemedicine, with a focus on the field of psychiatry with an adult population. Telemedicine has a long history in psychiatry but will likely assume greater importance in the wake of the COVID19 pandemic. The results of the scoping review revealed that telepsychiatry has a number of important benefits including limiting viral transmission, providing protection to patients and providers who may be immunocompromised, eliminating face mask problem, improving access to care for patients who do not have the ability to leave home and those living in rural areas, and reducing productivity loss and costs for patients due to commuting. While telepsychiatry has these benefits, this technology also has some problems. These were identified as the possible increase of effort needed to establish rapport, the challenges for patients with auditory and visual impairments as well as those with migraines, the elimination of the possibility of physical examination for certain conditions, the loss of sensory input (e.g., body odour from not showering), the possible loss of intimacy and privacy provided by a closed-door office space, and issues with technology. Results revealed that there were no significant differences in the problems identified for telemedicine and face-to-face consultations. Yet, telemedicine did have some unique advantages over face-to-face consultations (e.g., no travel issues). The results also revealed that there is a need for studies examining ways to resolve the current issues posed by telemedicine.

## **Christianne Blais (Dr. Donald Cockcroft)**

### *Direct and Indirect Bronchoprovocation Tests in Dose-Response Studies of Inhaled Corticosteroids: Past, Present and Future Directions*

Inhaled corticosteroids (ICS) are a mainstay of treatment in eosinophilic asthma. Many studies have explored the dose-response effect of different formulations of ICS through direct or indirect bronchoprovocation testing. Such studies are important for investigating efficacy and identifying the relative potency between formulations. However, results have been highly variable with respect to the presence or absence of a dose-dependent effect. Furthermore, a lack of consistency in methods and designs hinders the comparability of study findings. This review discusses current knowledge of the dose-response, or lack thereof, of different formulations of ICS through direct and indirect bronchoprovocation. The strengths and weaknesses of past studies inform recommendations for future methodological considerations in this field and include the following: utilize a randomized double-blind crossover design, enroll participants likely to respond to ICS therapy by confirming significant airway eosinophilia at rest, carefully select treatment durations and washout periods to monitor for any progressing benefit while reducing the likelihood of a carryover effect, and report data in the form of dose-shifts or maximum percent fall in forced expiratory volume in one second post-exercise or post-allergen.

*(Please note that this review and abstract have been submitted for publication in a peer-reviewed journal)*

## **Gabby Antaya (Dr. Angela Baerwald)**

### *Repeatability of Ovarian Follicular Waves during the Human Menstrual Cycle*

Background: Multiple waves of ovarian follicles develop throughout the menstrual cycle. It is not known whether the number of follicular waves is consistent across cycles.

Objective: We tested the hypothesis that the number of follicular waves is repeatable among women.

Materials and Methods: A prospective, observational study was conducted in 12 women of reproductive age. Transvaginal ultrasonography was conducted every 1-3 days over 2 interovulatory intervals in each participant. The numbers and diameters of each ovarian follicle  $\geq 2\text{mm}$  were quantified at each visit through retrospective review of ultrasound cine-loops. Growth profiles of all follicles that reached  $\geq 6\text{mm}$  were graphed for each woman. Changes in the number of antral follicles (i.e., antral follicle count, AFC) were further quantified for the following size categories; 2-5mm, 2-10mm,  $\geq 4\text{mm}$ ,  $\geq 5\text{mm}$  and 4-6mm.

Results: Preliminary results revealed that 9/12 (75%) women exhibited repeatability in the numbers of follicle waves (2 vs 3) across cycles, while 3/12 (25%) women did not exhibit consistency across cycles.

Conclusions: The number of ovarian follicular waves appears repeatable in 75% of women. Research is ongoing to confirm preliminary findings. Knowledge about the repeatability of follicular wave patterns in women has clinical applications for optimizing fertility and contraceptive therapies.

## **Kayla Lett (Dr. Wilna Wildenboer)**

### *Psychosocial Interventions in Conjunction with Opioid Agonist Therapy: A Systematic Review*

Introduction: In Canada, the incidence of opioid use disorder (OUD) and related deaths have increased exponentially, highlighting the need for effective treatment regimens. Medication-assisted treatment (e.g., buprenorphine, methadone, naltrexone) and psychosocial supports are used in the treatment of OUD. However, there is a lack of consensus surrounding the type, intensity, and efficacy of psychosocial interventions. We aimed to provide an update on the use of psychosocial interventions for OUD delivered in conjunction with medication-assisted treatment.

Methods: Using a search strategy adapted from a recent systematic review, randomized controlled trials published between January 1, 2014 and July 3, 2020 were identified through PubMed and PsycINFO databases. Results were limited to human, English language studies with full-text entries available for review.

Results: A total of 20 studies were included, the majority of which involved methadone as the primary medication modality. Contingency management and cognitive-behavioural therapy were studied the most, indicating a modest, yet positive impact on abstinence rates. Technology-based therapies including mobile phone apps and computer programs also showed promise as user-friendly interventions.

Discussion: Several gaps in the literature were identified including the lack of studies examining the use of buprenorphine as the primary medication modality, despite its status as the first-line medication in treating OUD. Furthermore, traditional Indigenous healing practices have not been studied extensively, indicating the need for dedicated research in this area.

## **Mars (Yixing) Zhao (Dr. Jonathan Gamble)**

### *Patient and Provider Perspectives and Satisfaction of Virtual Care in the COVID-19 Pandemic*

The impact of the COVID-19 pandemic on health care systems is widespread and dramatic. Virtual Care has been employed as a solution for accessing healthcare while maintaining social distancing. Virtual Care is defined as “any interaction between patients and/or members of their circle of care, occurring remotely, using any forms of communication or information technologies, with the aim of facilitating or maximizing the quality and effectiveness of patient care.” Previous research suggests that virtual care leads to good patient outcomes; however, patient and provider satisfaction is not well detailed. We proposed a mixed methods project of health care during the COVID-19 pandemic to assess and identify patient and provider engagement, satisfaction, perceptions, and attitudes to virtual care in Saskatchewan, in addition to exploring solutions, and informing methods to improve Virtual Care. A survey (modified from Pflugeisen and McGrail) was distributed to patients accessing health care via Virtual Care in urban and rural areas within the Saskatchewan Health Authority area. Participants also had an opportunity to participate in a 30-minute semi-structured interview. Surveys are analyzed using descriptive statistics and interviews are analyzed using thematic analysis. Research is still ongoing, however, current results suggest patients and providers both find virtual care appealing and are willing to utilize it post-COVID-19, in many instances over traditional in-person care. We are currently exploring specific advantages and disadvantages and identify improvements to help with its current and potential post-COVID19 implementation and employment.

## **Oluwabukunmi Adesina (Dr. Meredith McKague)**

### *Supporting Early Literacy in a Primary Care Setting – Caregiver experiences*

Sharing books with children can help develop important neural networks and has been linked to emergent literacy abilities. However, significant discrepancies exist in children’s literacy exposure which can impact future educational engagement and achievement. Children have periodically scheduled primary care visits where they are assessed, and their caregivers counselled on health promotion strategies. These visits are ideal for providers to promote early literacy before formal education begins. A new program was initiated at West Winds Primary Health Centre earlier this year, wherein physicians promote literacy and give children an age-appropriate book. The program is for children aged 6 months to 5 years and is modelled after the American Reach Out and Read program. The goal of this project was to assess caregivers’ perspectives on early literacy, identify the program’s strengths and weaknesses, and establish its relevance. All program participants were invited to attend online small group discussions via Cisco WebEx. Interviews with two participants were conducted, transcribed, and analyzed. Generally, feedback for the program was positive. There were, however, variations in the program’s implementation. Parents accessed community resources to support literacy and expressed the need to have access to varied, affordable, and age-appropriate books. Time was a barrier to sharing books with children. Parents suggested initiating a book exchange at the clinic. These findings reinforce the importance of this new literacy program at West Winds. A limitation is the small sample size due to COVID-19 interruptions to the clinic. Future recommendation is to conduct additional small group discussions until theoretical saturation.

## Navdeep Hansra (Dr. Gary Groot)

### *AI-Derived Information on Indeterminate Lung Nodule: How do Patients Want Information Presented to Engage in Shared Decision-Making?*

Background: Lung nodules, while commonly benign, are often indeterminate on imaging. Because lung nodules are associated with lung cancer, these require further investigations such as biopsy leading to increased cost and anxiety. An emerging solution to assist radiologist in diagnosing these indeterminate nodules is Artificial Intelligence. AI is a tool that can greatly assist the radiologist in determining the malignant nature of an indeterminate nodule. As health-care shifts towards shared decision making (SDM), new technologies such as AI should be implemented with a focus on preserving the SDM model. Many patient factors may influence their attitude towards AI, understanding these factors will allow for better implementation of technologies in the current SDM model of health care.

Objectives:

- Comfort of patients with use of Artificial Intelligence in determining likelihood of malignancy on their indeterminate lung nodule.
- How best to convey AI lung nodule diagnostic data to patients, with the overall goal of increasing the ability for a patient to engage within SDM and be empowered in their decision-making process.
- How do patient's beliefs, values, and preferences influence their decisions in managing their indeterminate lung nodule.
- At what threshold are patients willing to undergo further investigation, more so invasive procedures to determine significance of their indeterminate lung nodule.

Methods: This is a patient-oriented, mixed qualitative and quantitative interview-based study. Sampling size will be based on convenience sampling. Patients who are residents of Saskatchewan with newly diagnosed indeterminate lung nodule between the months of May 2020 to December 2020 will be recruited for the study. One-on-one semi-structured interviews will be conducted using an interview guide co-developed together with Patient/family advisors. Interviews will be recorded and transcribed.

Results (Work in progress): Line-by-line analysis & coding of interview transcripts will be performed to identify patterns and commonalities using thematic analysis. Analyses will be conducted to explore potential differences (or lack thereof) in responses based on demographic variables including age, sex, worldview/cultural lens, and language. Interviews will be conducted until data saturation is achieved.

Conclusion (Work in progress): Factors such as education and age are believed to have a large impact on the perception of AI due to a dual effect of understanding the technology and cultural norms regarding technology. Younger patients and those from higher SES/educational backgrounds may have a more positive attitude towards AI. We believe that results of this study will help inform future implementation of AI in diagnosing indeterminate lung nodules.

## **Talha Gondal (Dr. Ginger Ruddy)**

### *Establishing a Patient and Family Advisory Committee in an Academic Family Medicine Unit: Opportunities, Challenges, and Applications*

Patient engagement in primary care is an important part of establishing patient-centered care. Providing opportunities for patient input to guide the development and functioning of primary practice is one of the visions of the Patient's Medical Home which is a model for family practice in Canada. The objective of this study was to learn the opportunities and challenges associated with creation and application of a Patient and Family Advisory Council (PFAC) at West Winds Primary Health Center (WWPHC); a primary care clinic and academic family medicine unit. Secondary purposes of this study include learning more about physicians' knowledge, attitudes and experience working with PFACs, assessing the value of a PFAC in an academic family medicine unit, and understanding the impact this may have on faculty and residents. We surveyed and interviewed staff at WWPHC regarding their research and quality improvement projects, invited recommended patients to participate, and finally interviewed and recruited patient partners to serve on the PFAC. This study found that most (84%) staff members had been familiar with a PFAC and saw the value of engaging patients in many of their projects yet there was little involvement of patients in most of the projects at the clinic. A PFAC was found to be applicable in this clinic's setting but establishing diversity that represented the wider community in the council was a significant challenge. Lastly, the study identified the following areas that required improvement for the clinic from patient partner feedback: patient follow-up, cultural competence, waiting times, and patient-physician communication.

## Warda Shamim (Dr. Dakshina Murthy)

### *Patients with Atrial Fibrillation and Concomitant Advanced Chronic Kidney Disease in Saskatchewan*

**Background:** Atrial fibrillation (AF) and Chronic Kidney Disease (CKD) often co-exist and share common risk factors such as Coronary artery disease, Diabetes mellitus and Hypertension. CKD is an independent risk factor for atrial fibrillation and patients with CKD are at high risk of bleeding as renal function declines with concomitant increase in the risk of ischemic stroke. The purpose of this study was to explore the prevalence of new-onset atrial fibrillation among advanced chronic kidney disease patients and to assess the association between atrial fibrillation and events such as all-cause mortality, major bleeding event and cerebrovascular event after initiation of dialysis.

**Methods:** This is a retrospective cross-sectional study in which patient's charts who are actively undergoing dialysis (Hemodialysis and Peritoneal dialysis) in Saskatchewan for assessment of atrial fibrillation prevalence were reviewed. Charts of 100 patients at Cardiology Unit, Regina General Hospital are reviewed using convenience sampling technique. Patients with a diagnosis of AF preceding dialysis initiation are excluded from the study. Patients age  $\geq 18$  years with initiation of dialysis therapy during the study period (Jan 2010-Dec 2019) are included in this study. Data on demographics, co-morbidities, medication history, ejection fraction and patient's outcomes are obtained and analyzed is performed using SPSS Statistics software.

**Results:** In a sample of 100 patients, the total prevalence of new on-set atrial fibrillation is 15%. Among patients with onset of new AF, 33.3% were deceased ( $p=0.57$ ), 14.3% experienced major bleeding event ( $p=0.33$ ), 26.7% had Angina/MI ( $p=0.73$ ), and 13.3% had CVA related bleeding ( $p=0.29$ ). Patients with new onset AF had significantly higher rates of GI bleeding (46.7,  $p=0.02$ ). The mean age of the patients is  $61.15 \pm 14.57$  years ranged between 21 to 93 years. The majority (64.3%) of the patient population is men. More than two third (83%) were receiving haemodialysis and 17% on peritoneal dialysis.

**Conclusion:** This study is one of the first study shows these data points among CKD patient with new onset of AF in Saskatchewan. However, further research with a larger sample size and involving a multicenter setting is warranted.



## **Afsoun Amiraslany (Dr. Katherine Knox)**

### *An Evidence-Based Review of Rehabilitative Management for Neurogenic Bowel Dysfunction in Multiple Sclerosis*

Multiple Sclerosis (MS) is a degenerative autoimmune disease that can cause fecal incontinence and constipation through demyelination of the frontal lobe and spinal cord. Up to 73% of MS patients suffer from neurogenic bowel dysfunction (NBD) interfering with quality of life, yet current treatments for NBD are derived from other patient populations (i.e. spinal cord injuries) and have not been validated in the MS population. The Multiple Sclerosis Best Evidence-Based Strategies and Treatment/Therapies for Rehabilitation (MSBEST) website has been developed by a group of researchers and clinicians across North America to address gaps in knowledge by providing online MS specific evidence-based reviews for symptomatic and rehabilitation care. To provide an overview of the evidence for pharmacological and non-pharmacological interventions for neurogenic bowel rehabilitation in persons with multiple sclerosis, a comprehensive literature search was performed. The search made use of online databases (PubMed, MEDLINE, CINAHL, Scopus, EMBASE) and appropriate studies were chosen following a specific selection criteria. No MS specific studies focused on commonly used interventions in the management of NBD such as dietary interventions, pharmacological interventions, and suppositories; thus, these were not included in the module. Abdominal massage and standing frames were found to have the highest levels of evidence (1a and 1b, respectively) supporting their use as a treatment for NBD in MS. Further research is needed in MS NBD, particularly for understanding the effectiveness of interventions used in other patient populations, and making treatments, which may be effective, more feasible to access for those likely to benefit.

## Kyra Ives (Dr. Sarah Donkers)

### *Exploring Barriers and Facilitators to Physical Activity in Persons with MS: A Photo-Elicitation Study*

**Background:** Multiple sclerosis (MS) is a chronic autoimmune disease of the central nervous system affecting over 2 million people worldwide. Saskatchewan has one of the highest rates of MS in the world. MS presents with various neurological symptoms which can negatively impact affected individuals' quality of life. MS currently has no cure, but there is substantial evidence that physical activity (PA) may be effective for managing symptoms and preserving function and quality of life. Understanding the factors that limit and facilitate PA participation in persons with MS is imperative. Previous qualitative studies have used interview methods to identify several common barriers and facilitators to PA in persons with MS; however, the understanding of this topic remains superficial and it has not yet been translated into an effective strategy to keep persons physically active as part of routine management of MS. One method that has potential to elicit a deeper understanding of PA participation in persons with MS is photo-elicitation. Photo-elicitation is a novel method in qualitative research that involves using photos to guide interviews and generate discussion. To our knowledge, photographic methods have never been used to explore PA participation in persons with MS.

**Objective:** We aim to use photo-elicitation to build upon our understanding of barriers and facilitators to PA in persons with MS. This information may provide clinicians with insight as to how they can better support persons with MS to be physically active and improve overall care for persons with MS.

**Methods:** Participants captured photographs of situations, places, or things that they perceived to increase, decrease, or challenge their ability to be physically active. Semi-structured photo-elicitation interviews were conducted to discuss the content of the photographs and explore perceptions of managing their MS. Inductive thematic analysis was used to analyze data.

**Results:** Researchers identified three main themes, each containing several sub-themes, that described the barriers and facilitators to PA among participants: (1) Psychosocial: social support, attitudes and attributes; (2) Environmental: adaptive and assistive equipment, adapted and individualized PA; and (3) Logistical: MS symptoms and overall health, the natural environment, accessibility and cost, and information regarding PA programs. Messaging from healthcare providers was found to be a central factor that impacted all three themes.

**Discussion:** Barriers and facilitators to PA among persons with MS are complex and may be dependent on individual personality, mindset, experiences, relationships, context, and environment. Healthcare providers must realize the pivotal role that their messaging and advocacy plays in facilitating PA in persons with MS. Photo-elicitation may be an effective tool for gaining a deeper understanding of PA experiences of persons with MS and future studies should consider using this method.

## Malshi Karunatilake (Dr. Brian Le)

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

**Background:** Shoulder pain can originate from rotator cuff and labral tears, thus early accurate diagnosis is important to determine treatment options. Previous studies have shown Magnetic Resonance Arthrography (MRA) to be a superior imaging modality than Magnetic Resonance Imaging (MRI) for detecting shoulder pathologies, yet the comparisons were often made with low resolution 1.5T MRI images. Our study aims to compare MRA with high resolution 3T MRI images to better determine the superior imaging modality in detecting labral and rotator cuff tears.

**Methods:** We conducted a retrospective review of shoulder MRI and MRA performed on 3T MRI machines in Regina based Saskatchewan Health Authority. Radiological findings were confirmed or refuted using operative reports from Sunrise Clinical Manager.

**Results:** A total of 200 and 278 as well as 129 and 10 MRI and MRA labral and rotator cuffs were examined, respectively. Differences in true positive and negative tear detection was determined using MRI and MRA for lateral and rotator cuff tears ( $p < 0.0001$ ). For labral tears, MRA was found to have higher sensitivity than MRI (81% (CI: 0.81-0.81) versus 62% (CI: 0.61-0.63), whereas MRI showed higher specificity than MRA for detecting labral tears (88% (CI: 0.88-0.88) versus 85% (CI: 0.85-0.86)). For rotator cuff tears, MR showed higher sensitivity (31% (CI: 0.30-0.32) versus 29% (CI: 0.16-0.41)) and specificity (80% (CI: 0.80-0.81) versus 33% (CI: 0.19-0.48)).

**Conclusions:** We conclude that MRA has more diagnostic value in detecting labral tears and MRI is preferred for rotator cuff tears, though our study findings are limited by the small sizes in rotator cuff tears.

## Rachel Cey (Dr. Scotty Butcher)

### *The Impact of Mindfulness on Resilience in Strength and/or Power Trained Older Adults: A Remote Mixed Methods Study*

**Objectives:** 1) To explore the relationship between physical activity, mindfulness, resilience, and self-efficacy in older adults who have participated in strength and/or power training programs. 2) To describe the experiences of participants and express aspects that contributed to mindfulness, resilience, and self-efficacy.

**Methods:** This mixed methods study was comprised of an online survey of standardized questionnaires for quantitative analysis and an opt-in semi-structured interview that explored perceived benefits and experiences of participants with strength and/or power training. The online survey was comprised of the Five-Facet Mindfulness Questionnaire (FFMQ), the Connor-Davidson Resilience Scale (CD-RISC), the 36-Item Short Form Survey (SF-36), and the Self-Efficacy for Exercise (SEE) Scale. 131 participants (Sex: M=32.82% F=77.18%, Age:  $\mu=61$   $\sigma=8$ ) recruited using social media advertisements distributed over Facebook and Instagram completed the initial survey and 12 of these participants completed follow-up interviews.

**Results:** In strength and/or power trained adults over 50 years of age, resilience was predicted primarily by mindfulness, and secondarily by emotional wellness, physical function, and general health. Social function and pain had a negative contribution to the prediction. Contrary to our expectations, self-efficacy for exercise did not predict nor was significantly correlated with resilience.



## **Amani Khan (Dr. Ibraheem Othman)**

### *Literature Review: Hematologic Toxicities with Immunotherapy in Cancer*

#### *Patients*

Background: Checkpoint inhibitors, anti-programmed cell death 1 (PD-1) and cytotoxic T lymphocyte-associated antigen 4 (CTLA-4) have been shown to be effective in the treatment of various malignancies. Though rare, the novelty of immunotherapy necessitates further investigations of its potentially serious and even morbid consequent toxicities. To better understand the clinical evidence of hematologic toxicities, we conducted a literature review to help clinicians identify the risks burdening patients undergoing immunotherapy.

Methods: We searched the PubMed database for clinical research studies published between 2015 and 2020. Journal articles were included if they were in English, consisted of clinical trials and were focused on hematologic toxicities post checkpoint inhibitor immunotherapy in adults. A total of 115 publications for potential inclusion were identified.

Results: A total of 32 clinical studies met the inclusion/exclusion criteria. Findings from the extracted studies were critically examined according to checkpoint inhibitor type (75% Anti-PD-1/L1, 25% Anti-CTLA-4), drug name, study type, malignancy, participant description and incidence of hematologic toxicity. Varying levels of toxicity were dependent on the type of checkpoint inhibitor and drug combination used. A total of 11 articles (34%), 4 articles (12.5%), 2 articles (6%) and 15 articles (47%) included non-small cell lung cancer, renal cell carcinoma, melanoma and other, respectively.

Conclusion: It is recommended that future studies emphasize clarity in labeling toxicities while highlighting best management techniques used. Increasing use of evidence-based findings in oncology clinical practice is inevitable, and therefore, integrative clinical trial studies can play a greater role in developing clinical guidelines.

## Armaghan Wasim (Dr. Shaina Lee)

### *Hormone Replacement Therapy Use in Young Cervical Cancer Patients in Southern Saskatchewan*

Background/Objectives: Cervical cancer predominantly affects premenopausal women, with incidence amongst Canadian women being roughly 1000 in 2019. Treatment for cervical cancer, both surgery and chemoradiation may result in cessation of ovarian function for young patients. Premature menopause is associated with fertility loss, increased risk of cardiovascular disease, osteoporosis, sexual dysfunction, and early mortality. Physician counseling habits on premature menopause and hormonal replacement therapy (HRT) for young cervical cancer patients are not well known. Primary objective assessed physician patterns of HRT counseling in young cervical cancer patients. Secondary objective assessed for clinical or demographic factors associated with HRT use.

Methods: A retrospective chart review was conducted on all adult women < 50 years old with cervical cancer who received treatment at Allan Blair Cancer Center from 2007 to 2017. Patient and disease characteristics, disease outcome and record of HRT and bone health counseling were collected from the Cancer Agency electronic charts. Descriptive statistics were performed for baseline patient characteristics for data analysis.

Results: Overall, 70 out of 116 premenopausal women with cervical cancer had loss of ovarian function from their cancer treatment, making them candidates for HRT counseling. 37/70 (53%) received HRT counseling. Only 6 (8.5%) received counseling on bone health. 25/70 (36%) were using HRT at the time of their last review. Younger women (37.3 +/-6.6) were more likely to receive HRT counseling from their oncologists than older women (42.4 +/-6.0) ( $p = 0.001$ ). Cancer stage, BMI and smoking status were not associated with HRT counseling or usage. Geographical differences were noted in stage distribution throughout Southern Saskatchewan.

Conclusion: Only half of eligible cervical cancer patients received counseling on premature menopause and HRT. Further study is needed to explore reasoning behind this trend. Moreover, oncologists should consider including HRT counseling when caring for young cancer patients.

## Jaskaran Singh (Dr. Derek Liu)

### *Evaluation of Deep Learning-Based Needle Detection in High-Dose-Rate Prostate Brachytherapy*

Background: Deep learning (DL) represents a new paradigm in computer vision with the potential to detect and localize implanted flexible catheters on ultrasound images. Real-time treatment planning in high-dose-rate prostate brachytherapy involves identifying the spatial location of the inserted needles on ultrasound images, thus DL could greatly decrease the length of the procedure.

Objectives: Identification of correlations between user rankings of catheters and deep learning software prediction probability. Secondary objective involved outlier analysis and its implications on potential improvements that can be made on the software.

Method: Over 33,000 transverse US images from 256 retrospective prostate brachytherapy patients were available from a single institution. Associated with each image is a catheter binary label image generated from manual catheter localization during treatment planning. Each case had 12-18 catheters. Each catheter was given a visibility ranking and a confounder ranking by a person. Each catheter was given a deep learning predication for mean confidence and accuracy fraction. Two plots were made: Mean confidence vs. visibility ranking, and accuracy fraction vs. confounder ranking. A waterfall plot was also made for the true positive rate.

Results: Mean confidence vs. Visibility Ranking plot has correlation coefficient of -0.36 with p-value < 0.001. Accuracy Fraction vs. Confounder Ranking plot has a correlation coefficient of -0.42 with p-value < 0.001.

Conclusion: The software performs similarly to a human when it comes to identifying catheters on an ultrasound image. Some improvements to the software can be made when it comes to the interpretation of wide signals and bright signals.

## **Joel Tehse (Dr. Kyle Moulton)**

### *Artificial Intelligence for the Detection of Meningioma Growth: Implementation and Validation of a Locally-Derived Segmentation Algorithm*

Meningioma is the most common benign intracranial tumor. It may also occur in the spine. In addition to grade 1 meningiomas, which constitute approximately 95% of all such lesions, the WHO also grades these tumors as 2 and 3, based on histopathologic features. Grade 1 meningiomas generally exhibit slow growth. Asymptomatic lesions are often observed. Surgical resection may be considered for lesions that become symptomatic, or exhibit growth on surveillance imaging. Stereotactic radiosurgery is also included in the management algorithm for select cases. The current standard of practice in Neuroradiology to monitor tumor growth is through biaxial diameter measurements. This task is time consuming and has been demonstrated to result in significant interobserver variation and have somewhat limited sensitivity. With the goal to improve the process of identifying meningioma growth on serial imaging, this preliminary study's objective was to develop and validate an artificial intelligence (AI) segmentation algorithm on its performance of volumetric growth analysis of low-grade meningiomas. The deep-learning based AI algorithm was trained on an anonymized, retrospective dataset of 100 radiographically suspected meningiomas from 2008-2019. We included 23 randomized scans with 41 radiographically suspected meningiomas for the validation dataset. The results were compared to expert ground truth segmentations performed by radiology trainees and a radiation oncologist using Dice scores, 95% Hausdorff distance (DT 95%), volumetric and serial scan analysis. The automated segmentations strongly correlated with the expert segmentations, producing a mean Dice score of  $0.909 \pm 0.043$  and mean DT 95% of  $2.34 \pm 1.33$  mm. On average, the AI segmentations are within  $9.19 \pm 7.57$  % of the expert contour volumes. The mean serial scan difference between the expert and AI segmentations is  $1.27 \pm 1.66$  mL, while the proportional mean difference is  $267 \pm 474$  %. The AI algorithm produced accurate segmentations and volumetric analysis, yet inconclusive serial scan analysis, suggesting a promising foundation for improved meningioma volumetric analysis and early detection of tumor growth.

## **Maddy Owens (Dr. Ron Geyer)**

### *The Development of Antibody-Conjugated Immune Cells for Cancer Therapy*

The modification of immune cell surfaces to target cancer cells is an emerging field of immunotherapy. Metabolic labelling provides a rapid method for attaching biomolecules to the surface of cells. Recently, we developed a quick and simple method to display antibodies against tumour-associated antigens (TAAs) on the surface of immune cells, enabling them to specifically target and destroy tumour cells through effector cell responses. Metabolic labelling was utilized to introduce a modified monosaccharide onto immune cell surfaces. We non-specifically labelled an anti-TAA antibody with a reagent complimentary to the modified monosaccharide. The two moieties react specifically under physiological conditions to form a covalent bond, resulting in antibody-conjugated (AC) immune cells. Here, we examined how long the antibody remains on the surface of AC immune cells. Additionally, we show the enhanced activation of AC immune cells when they interact with target-positive tumour cells. This enhanced activation was determined by the detection of two immune cell activation markers through flow cytometry after co-culturing with a target-positive cancer cell line. These results are promising in that AC immune cells show potential for the specific targeting of tumour cells.

## **Rishi Thakkar (Dr. Kiat Tan)**

### *Does PET-CT Response to DEBIRI Chemoembolization Influence Lesion Progression Free Survival?*

Chemoembolization with irinotecan drug eluting beads (DEBIRI) is used to treat selected patients with hepatic metastases from colorectal cancer. However, the role of PET-CT in the post procedural assessment of these patients is uncertain. In addition, the authors have noticed that there is heterogeneity in the PET-CT response in these patients, whereby tumours that demonstrate a response on PET-CT may coexist with lesions that demonstrate progression or no response. The authors, therefore, hypothesize that lesions which demonstrate a response on PET-CT demonstrate slower progression than those that do not. This retrospective study involved 10 subjects (7 males and 3 females) with a total of 40 marker lesions. Of the 22 lesions that demonstrated an LPFS <3 months (55%), 0 showed a complete response (0.00%), 1 demonstrated a partial response (12.50%), and 21 demonstrated progression of the disease (91.30%). Of the 18 lesions that demonstrated a LPFS > 3 months (45%), 9 demonstrated complete response (100.00%), 7 demonstrated partial response (87.50%), and 2 demonstrated progression (8.70%). Lesion classification was significantly associated with LPFS ( $P < 0.0001$ ). Lesions that demonstrated a complete response to treatment on PET-CT are associated with an increased LPFS. Previous research has shown that the heterogeneity of PET-CT response after chemoembolization may be due to incomplete treatment of certain lesions. Therefore, the result from our current study suggests that follow-up PET-CT can be done to identify residual tumor 'hot spots' that may require additional treatment, through subselective chemoembolization of these lesions.

## **Sarah Valentine (Dr. Terra Arnason)**

### *Molecular Mechanisms of Anaphase Promoting Complex Dysfunction in Cancer*

Cell cycle checkpoint proteins are a common contributor to mutagenesis among cancers, because of their critical role in the regulation of cell health. The Anaphase Promoting Complex (APC) is an example of this phenomenon, as it is commonly found to be dysfunctional in cancer cells, especially those with multiple drug resistance (MDR) to chemotherapies. With roles not only in cell cycle regulation but apoptotic pathways and genomic stability as well, it comes as no surprise that a dysfunctional APC has detrimental effects on a cell. The fidelity of known mechanisms of APC activation were explored in this study to discover if they become dysfunctional in MDR breast cancer. Western blot analysis revealed post-translational phosphorylation of the APC1 subunit is reduced in cells exhibiting MDR (MCF7-Resistant) compared to their sensitive counterparts. Co-immunoprecipitation was used to study the levels of protein-protein interaction between the APC and its activator Cdc20. These experiments showed that the activating association between Cdc20 and APC are reduced in MCF7-Resistant cells. These results indicate that several mechanisms of APC activation have reduced efficacy specifically in MDR cancerous cells. These findings may contribute to the development of a novel method of treatment for drug-resistant cancers.

## Samitha Andrahennadi (Dr. Shahid Ahmed)

### *Efficacy of Fulvestrant in Hormone Refractory Metastatic Breast Cancer (mBC): A Canadian Province Experience*

**Introduction:** Fulvestrant is an estrogen receptor down-regulator that has demonstrated efficacy in women with hormone receptor positive (HR+) mBC both in first- or second-line settings. In clinical practice, however, fulvestrant is commonly used as a later-line therapy following progression on aromatase inhibitor or tamoxifen. Our study aims to assess the efficacy of fulvestrant in women with hormone refractory mBC in early versus later line therapy.

**Methods:** In this retrospective population-based cohort study individual medical records of women with HR+mBC who received fulvestrant thorough an access program during 2003-2019 in Saskatchewan were assessed. A multivariate Cox proportional survival analysis was performed.

**Results:** A total 186 eligible women with median age of 63.5 year (IQR: 54-74) were identified. 81% had history of early-stage breast cancer, 77% had bone metastases, and 57.5% had visceral disease. 102 (55%) women received up to 2-lines of therapy prior to fulvestrant (group I), and 84 (45%) received >2-line therapy before fulvestrant (group II). 43% received chemotherapy before fulvestrant and 17% received fulvestrant + targeted drug. 178 (95%) had hormone resistant mBC: 22% primary resistance, 82% secondary resistance. The median progression-free survival (PFS) of entire cohort was 8 months (95% CI:5.5-10.4); 12 months (9.4-14.5) in group I vs 6 months (5.1-6.9) in group II,  $p=0.015$ . Overall survival (OS) of all women following commencement of fulvestrant was 21 months (16-26), 26 months (16-36) in group I vs. 16 months (10.5-21.5) in group II,  $p=0.06$ . On multivariate analysis, absence of visceral metastasis was significantly correlated with better PFS, HR, 0.70 (95% CI:0.49-0.99) whereas <3 lines of therapy prior to fulvestrant, HR, 0.16 (0.05-0.46), targeted therapy, HR, 0.12 (0.03-0.51), and ECOG performance status of <2, HR 0.09 (0.02-0.33) were correlated with better survival.

**Conclusions:** Fulvestrant has demonstrated efficacy as both early and later line therapy in hormone resistant mBC. However, women who received <3 lines therapy prior to fulvestrant had better survival. Women with visceral disease at commencement of fulvestrant regardless of previous line of treatment had a shorter duration of disease control.

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

### *Cross-database analysis of the genetic and protein interactions of the metastasis modulator MEMO1*

MEMO1 is a dioxygenase involved in the synthesis or breakdown of a signal molecule that modulates breast cancer metastasis. The goal of this project is to determine the primary function of MEMO1 through the analysis of its genetic and physical interactions with other proteins. To analyze the interaction of MEMO1 with other genes, several databases of genome wide gene knockout and knockdowns in cancer cells were screened for synthetic lethality (SL) and synthetic dosage lethality (SDL) effects with MEMO1. CERES, Marcotte, Achilles Project, and RSA databases were searched for the differences in gene essentiality scores between the cell lines with high and low MEMO1 expression, with the aid of pattern search scripts written in gawk. The data from each database was cross-referenced with the other databases to identify the most robust interactions. Protein-protein interactions were analyzed using Human Reference Interactome database. Among the notable proteins interacting with MEMO1 are dioxygenases PLOD1 and OGDH, also involved in cancer proliferation. The selected interactions will be validated experimentally using CRISPR/Cas9 gene knockouts. Protein interaction maps generated in this work will be used in the continuing search for MEMO1 molecular function and its substrate molecule.

## **Vivian Murungi (Dr. Julie Stakiw)**

### *Oncology Care Pathway Modelling: Medical Lung Oncologists' Perceptions of Workload Intensity*

Background: As health policymakers and educators plan for future increases in oncology case volumes, more analysis of current workloads and alternative models of care are needed (1). Given that cancer has become more of a condition of chronicity, the workload for medical oncologists is expected to become exponential as new treatment options emerge requiring more complex pathways of patient care (2). Due to the increasing intensity in cancer care, concerns about high clinical volumes highlights the need for work force planning and new models of providing care.

Objectives: The objectives of this study are to quantify perceptions of four medical oncologists' (MO) workload intensity specifically across four lung cancer sub-types.

Methods/Data Collection: Interviews were conducted with participating MO physicians virtually (N=4). For each of the four lung cancer sub-types, an assessment scale evaluated perceived workload intensity looking at direct and in-direct patient care such as: insurance forms, multi-disciplinary case conferences, review of investigations ordered. Each MO was asked to rate their overall perception of workload intensity for each of the 4-lung cancer sub-types on a scale of 1-10.

Results/Data Analysis: Non-Small Cell (non-curative) lung cancer pathway was perceived to have the lowest workload intensity while the Small Cell (non-curative) lung cancer pathway was generally perceived to have the highest workload intensity. The generalizability of this data is limited by only having the perceptions of four MO physicians. Next steps include expanding the study to include more lung cancer MO physicians.



## **Anna Pham (Dr. Susan Petryk)**

### *Post Diagnostic Management of Autism Spectrum Disorders (ASD): Utility of the Canadian Pediatric Society Checklist for Physicians and Clinicians*

**Objective:** Children living with ASD require a comprehensive set of assessments and ongoing medical, developmental and psychosocial supports. In 2019 the Canadian Pediatric Society (CPS) created a checklist of best practises to guide physicians for the post-diagnostic management of ASD. This study explores how closely children with ASD in Regina, Saskatchewan receive best practise medical care and how practical the CPS guidelines are for clinicians to use. Where we identify gaps in care, clinicians and administrators may want to address these limitations. If the checklist is very impractical in certain areas, the feedback may be of interest to the CPS.

**Research Design and Methods:** Three specific online surveys were sent to 1) pediatricians and family physicians, 2) Autism Centre clinicians, and 3) parents/caregivers who had a child enrolled at the Autism Centre, Regina. We excluded physicians who did not provide care for anyone with ASD. The physicians' and clinicians' surveys collected information on their experiences using the post-diagnostic management of the ASD medical checklist, the nature of their diagnostic practises, and the diagnostic outcomes of their patients. The survey with the parents collected information regarding their child's ASD assessments and management. All participants were encouraged to share their opinions on their concerns, experiences, and suggestions regarding care for ASD patients. The de-identified data were aggregated, and statistical analysis was performed using SPSS (IBM SPSS Statistics 22.0), producing initial descriptive statistics. Continuous variables were summarized in means and standard deviations, and categorical variables were summarized in counts and percentages. Comments/text data were coded, grouped into common categories, and summarized.

**Results:** Physician response rate was low. 31% of responding physicians did not feel comfortable doing the entire recommended medical workup. Physicians and clinicians reported a lack of knowledge about complementary and alternative medicine approaches, yet 23% of children are using them including 11% using cannabis with only half of these families telling their physician. Autism support clinicians feel skilled and experienced enough to cover the recommended non-medical tasks as described on the checklist. Only 44% of responding parents reported ever seeing a pediatrician (which is significant since family physicians in Regina cannot order microarrays). A substantial minority of children missed getting the recommended vision, hearing or dental assessments and a majority missed adequate advice for sleep or nutrition concerns. Parents' top priority was not medical-related, but rather on receiving ASD specific therapies and behavioural management.

**Conclusions:** Although every child had access to a physician, medical workups were moderately incomplete, which could be remedied through pediatrician consultation. Autism support clinicians rather than physicians, who might not have the time or scope in their practise, are capable of managing non-medical recommendations (behavioural and family support needs).

## **Carissa McGuin (Dr. Tim Bradley)**

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

**Background:** The indications for fetal echocardiogram (ECHO) screening for congenital heart disease (CHD) in Saskatchewan were changed in 2017. An intermediate level was introduced with fetal ECHO indicated only if initial screening by obstetric ultrasound was abnormal. The aim of this study was to assess the clinical impact of these changes on the prenatal diagnostic rates of CHD in Saskatchewan.

**Methods:** All women undergoing fetal ECHO screening for CHD in Saskatchewan for 3-years before (1Jan2014-31Dec2016) and after (1Jan2017-31Dec2019) these changes were introduced, were identified from a pre-existing fetal ECHO database. Data was collated from a retrospective chart review including fetal ECHO date and location, maternal age and location of residence, gestational age, indication for fetal ECHO and fetal cardiac and extra-cardiac diagnoses.

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

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

## **Colten Molnar (Dr. Krista Baerg)**

### *Nitrous Oxide and Numbing Cream in the Pediatric In-Patient Department: A Survey of Staff Satisfaction and Barriers to Use*

**Introduction:** Painful procedures are a necessity in the investigation, diagnosis and treatment of hospitalized pediatric patients. When simple pain-management strategies such as numbing cream (NC) are not effective, nurse-administered nitrous oxide (NANO) is a safe, effective option. The Pediatric Inpatient Department (PIPD) at Jim Pattison Children's Hospital launched a nurse administered 50:50 nitrous oxide program for children over 1 year of age in September 2019. This study aims to identify barriers to and determine satisfaction with the use of NC and NANO by health professionals for simple procedures.

**Methods:** This quality improvement study was exempt from REB approval. Operational approval was obtained. A 44-item anonymous survey was administered using SurveyMonkey and was distributed to 398 health professionals and staff administrators involved in the care of children admitted to the PIPD. The survey was available to staff from May 25 to June 14, 2020. Responses were divided into three subgroups: nurses, physicians, other to allow for analysis of variance between groups. Descriptive analysis was completed and Chi-square tests were used to investigate associations between selected variables. Open text responses regarding barriers were coded by the researcher.

**Results:** 71 individuals participated. 73.1% agreed that accessing NC is an essential pain-management option for needle pokes; 73.2% were confident to access/provide it and 24% identified barriers. 81.7% agreed that accessing NANO is an essential pain-management option for minor procedures; 50.7% were confident to access/provide it and 32% identified barriers. For NC, availability, ease of access, distress from application, and inadequate time were most commonly cited barriers and for NANO, need for further education. Most participants involved in the care of a patient receiving NC or NANO in the past 6-months were satisfied with effectiveness, 83% (39/47) and 85.7% (30/35), respectively.

**Conclusions:** Access to NC and NANO are essential to support procedural pain management in a tertiary pediatric inpatient unit is essential but confidence to implement these strategies is low. Many participants mentioned modifiable barriers in their responses. Participants identified challenges at the direct care level for NC and the need for more education on the NANO program. A prospective study of staff barriers to implementation may provide more information on potential opportunities to improve implementation at the direct care and organizational levels. Surveying of patients and caregiver's perspectives may provide additional information on opportunities for institutional improvement.

## **Cuylar Conly (Dr. Darryl Adamko)**

### *Seasonal Variation of Urine Metabolomics in Pediatric Asthma*

Asthma is the most common chronic disease in all children typified by paroxysmal cough and wheeze brought on by an airway obstructing inflammatory response. Exacerbations are often the result of allergic inflammation and many patients experience significant seasonal variability in their symptoms and disease control. Often asthma exacerbations are the only signal that medical management should be modified, especially in children. Predicting and preventing these exacerbations is the preferred goal for both doctors and patients. Asthma induces changes in cellular composition and behavior which results in a unique profile of small molecule metabolites excreted in the urine. Urinalysis with mass spectroscopy has been shown to differentiate healthy patients from those with asthma, and those with COPD. A simple non-invasive urine test has been under development to characterize lung disease based on these metabolomic “fingerprints”. Our hypothesis is that the seasonal effects in asthma will also be identifiable in the urine metabolome. Theoretically, metabolic changes will precede symptomatology, exacerbation, and loss of disease control. My objective was to collect monthly clinical data from Summer through Fall when asthma exacerbations tend to occur. We will correlate these data with the urine metabolome. Thus far, we collected three months of data on 15 subjects. The study will be completed in November with metabolomic analysis to follow. We expect that a routine, objective, and non-invasive method of predicting disease trajectory may become possible in a primary care setting.

## **Emily Harwood-Johnson (Dr. Athena McConnell)**

### *Retrospective Analysis of the Initial Investigations in Pediatric Patients*

### *Admitted with Community Acquired Pneumonia in Saskatoon, 2015-2019*

Pneumonia is an acute infection of the lower respiratory tract and is one of the leading causes of hospitalization in Pediatrics. Previous studies suggest that many children with community acquired pneumonia [CAP] undergo unnecessary tests. This audit of the use of investigations in pediatric inpatients with CAP furthers the provision of evidence based clinical care and increases awareness about diagnostic stewardship. It is hypothesized that as the severity of the initial clinical findings increase, so does the appropriateness of the investigations. Royal University Hospital medical charts of patients < 17 years of age with an admitting or discharge diagnosis of CAP from July 1, 2015 to June 30, 2019 were reviewed. Clinical, laboratory, and radiological information were abstracted using a standard case report form. Patients were categorized as severe or not severe based on IDSA criteria. Descriptive statistics were used to examine the appropriateness of the investigations as a function of severity of illness as based on published algorithms. Four hundred and sixty-four patients were identified. Thirty participants were excluded for a primary diagnosis other than CAP or incomplete charts. Of participants included, ages ranged from 1 to 15 years old with a median age of 5 years and 53.4% (n= 241) were male. 44.2% (n= 205) of CAP cases were due to viral etiology and 1.7% (n= 8) were bacterial in nature. 0.6% (n= 3) of patients had viral and bacterial co-infection. Based on revised IDSA criteria, 42.4% (n= 184) cases were classified as severe. Data analysis is ongoing.

## **Kate Kopeck (Dr. Susan Petryk)**

### *Examining Menstrual Management and Menstrual Cup Receptivity Among Young People Who Menstruate in Regina*

Menstruation affects virtually half of the world's population, yet people who menstruate often find themselves having difficulties managing their periods for reasons such as cost, access to menstrual products, and lack of education. We hope to better understand how people who menstruate in Canada - particularly Saskatchewan - experience their periods, how they finance their periods, and whether they are satisfied with their current sanitary products or would like to switch to an alternative. Additionally, we aim to explore menstrual cups as a potential solution to these struggles. An anonymous online survey was distributed to 18-25 year old people in Regina, Saskatchewan with the help of local non-profit organizations. We explored period habits, product accessibility and affordability, knowledge about menstrual cups, and receptivity towards trying a menstrual cup. Survey included multiple choice, Likert scale, and open-ended type questions. Statistical analysis was performed using SPSS version 22.0 (IBM corporation). Descriptive statistics were reported for all variables. Continuous variables were summarized in means and standard deviations and categorical variables were summarized in counts and percentages. Comments/text data were coded, grouped into common categories, and summarized. A total of 116 responses were obtained. Results of the study showed that only 24 (20.7%) participants were using menstrual cups to manage their periods. Regarding affordability, 16.6% of menstrual cup users showed concerns in comparison with 43% of tampon users. Approximately 33% of all participants reported recently needing to take an absence due menstruation, with physical discomfort and fear of leaking of primary concern. Difficulty with use, initial cost, and lack of knowledge are some reported reasons that discourage the use of menstrual cups. However, proven ease of use and provision of free samples may influence more people to try one, as 80.2% of survey respondents reported wanting to try a free menstrual cup. To date, research surrounding menstruation and more specifically menstrual cups is lacking in Canada. This study has implications for people who menstruate in Canada and elsewhere. Menstruation related absenteeism and period poverty are both commonly experienced and debilitating, yet discussion surrounding menstrual health and equity are not of paramount concern in the eyes of public health. Though only 1 in 5 people are using menstrual cups to manage their periods, menstrual cups are a cheaper monthly alternative than tampons. Interest in trying a menstrual cup is substantial if initial cost is mitigated. Several participants that regularly use a menstrual cup report great satisfaction with the product. Of those who do not regularly use one, concerns regarding ease of use and knowledge are of primary concern. These concerns can be easily addressed. Through researching and analyzing these issues, we hope to ignite discussion around the difficulties facing people who menstruate, and the impacts these difficulties have on one's relationship with their period. As well, we hope to highlight existing gaps in menstrual health education, access, and affordability in Canada.

## **Kylee Kosokowsky (Dr. Tim Bradley)**

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

Background: Children with congenital heart disease (CHD) are at an increased of early onset obesity, hypertension and coronary artery disease. While the mechanism for these diseases is unknown, children with CHD exhibit higher than average rates of risk factors such as altered growth patterns, sedentary lifestyle, and high caloric diets. An initial focus on maximized caloric intake and catch up growth in response to failure to thrive in infancy of certain CHD subtypes may pre-set dietary habits and predict early onset childhood obesity and increased cardiovascular risk. Inappropriate exercise restrictions imposed by physicians, parents, or the children themselves may further contribute to these problems.

Methods: This retrospective chart review was designed to study the growth curves of height, weight and body mass index (BMI) for children in infancy and early childhood (birth to 6 years) and middle childhood (age 7 to 12 years) in children with different subtypes of CHD.

Discussion: For this component of the study, further data was collated and the data for children in middle childhood from age 7 to 12 years with different subtypes of CHD is presented. We expect that growth trajectories of height, weight, and BMI for children with different CHD subtypes will differ significantly from those of healthy children, and between CHD subtypes, according to the severity of the CHD and the timing of surgical repairs.

## **Michael Durr (Dr. Susan Petryk)**

### *Utilization of Psychotropic Medication in Children with Fetal Alcohol Spectrum Disorder*

Background: Fetal Alcohol Spectrum Disorder (FASD) is a neurodevelopmental condition resulting from pre-natal alcohol use. In Canada, roughly nine babies in every 1,000 are born with FASD. Despite the neurologic complications associated with FASD, no specific treatment guidelines exist. Recently, Mela et al. described four symptom clusters representing FASD and proposed specific pharmacologic treatment for each cluster. Objective: Measuring the accuracy of the proposed treatment algorithm in correctly prescribing for children with FASD. Secondary objective involved refining the description of symptoms that represent an FASD cluster.

Methods/Analysis: The complete history of patient visits from a Regina pediatrician were reviewed and 354 FASD patients were identified from 2005 to 2020. Using presenting symptoms, the patients' FASD clusters were derived and the predicted medications from the algorithm were compared to the historical data. A positive case was defined as all predicted medications matching the historical data; a negative case had one or more medications failing to match.

Results/Conclusions: Of the 354 patients, 36 were removed for insufficient information. Of the remaining 318 cases, 172 (54.1%) were positive compared to 146 (45.9%) negatives. The prescription algorithm is promising but requires further flexibility to accommodate the range of presentations in children. With respect to unclassified symptoms, we propose the following: sleep onset difficulty as hyperarousal; gender dysphoria, and obsessive compulsive disorder as cognitive inflexibility; grief as emotional regulation; and autism spectrum disorder as hyperactive/neurocognitive.

## **Melissa Ackerman (Dr. Kali Gartner)**

### *An Environmental Scan of Interventions to Support Women with Methamphetamine Use in Pregnancy and their Children: A Developmental Origin of Health and Disease Lens*

Prenatal methamphetamine exposure (PME) is a rising concern as the number of users, specifically those of childbearing years, continues to rise. The aim of our study was to identify literature between 2010-2020 which contributes knowledge towards satisfying the following objectives: 1) What are the effects of methamphetamine (MA) use in pregnancy, specifically in women who are living with or at risk of becoming HIV positive, on mother and baby and 2) What interventions can be useful to minimize or mitigate these effects. The search was restricted to this ten-year period to represent recent patterns in legal and health interventions for women who use substances and to reflect current drug composition as a potential confounding variable. To exclude literature potentially affected by the COVID-19 epidemic, no literature was included with a publication date after January 1, 2020. Ovid Medline, Embase, and CINAHL databases were utilized to identify academic literature; ProQuest-Public health also added academic results as well as contributing grey literature. A Google search was used to identify grey literature. Citations were exported into Rayyan. Articles were excluded based on initial review of their title, abstract, and contextual use of keywords. Data extracted from 80 articles identified 481 outcomes and six programs. The final articles were annotated by the first reviewer and catalogued into respective spreadsheets according to the results they provided. The results were presented as changes pertaining to one/or more of the following seven categories: maternal, neonatal/infant, cognitive, behavioural, visual, and neurological. Literature relating to programs and recommendations specific to the second objective, were labelled as interventions. Mothers were suggested to have an increased risk for a variety of diagnoses from hypertensive diseases, which were the most prevalent in the literature, to psychiatric disorders. The maternal outcomes displayed less contradicting literature than those related to the child. However, one notable contradiction was found in the literature specific to eclampsia where only two-thirds (n=2, 67%) of the literature claimed this was a true association. The most prevalent outcomes in children with PME pertained to the category of neonatal/infant outcomes. Majority of the literature (n=13, 72%) proposed an association between PME and low birth weight, but five articles (28%) negated the relationship. Similarly, majority of articles (n=9, 75%) claimed PME was linked to a decrease in head circumference, yet another three articles (25%) denied this association. One study reported nation-dependent changes in anthropometric measures which they attributed stemmed from differences in government policies and support. For instance, unlike NZ, the US enforces a legal mandate which requires all health professionals to report drug use during pregnancy. Policies like this one may further contribute to inadequate prenatal care, an issue which continues to persist in pregnant women who use MA. The research articulates recommendations for acceptance of MA use disorder as a disease that requires multidisciplinary interventions. Some approaches were proposed which included suggestions for family-orientated and gender-specific support, ideally provided as in-resident treatment. Our results will guide future research, support organizations acquiring government assistance, and enhance clinician knowledge which we hope will lead to closer monitoring and earlier diagnosis and treatment of PME related outcomes. A greater knowledge of these outcomes may also contribute to more specific interventions for PME children and their mothers.

## **Sarah Moroziuk (Dr. Krista Baerg)**

### *Preliminary Analysis of Coping Strategies Utilized in Pediatric Patients with Complex Pain*

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

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

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

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

## Tayyaba Bhatti (Dr. Roona Sinha)

### *Hemolysis in Pediatric Ventricular Septal Defects (VSD)*

Background: The pediatric hematology team in Saskatoon recently had a patient present with hemolysis and after multiple investigations the etiology was suspected to be a small perimembranous ventricular septal defect. This raised the question about the prevalence of patients with VSDs who have hemolysis (excluding post-operative patients with VSD patch leaks). Hemolytic anemia has been described rarely in case studies as a presentation of congenital heart disease including a case study about a child similar to the one who presented to us published by Daubeney et al. in January 1996. Previously, it has been well described related to insertion of prosthetic valves and patches at cardiac surgery. However, the epidemiology of how commonly it occurs in patients with an unrepaired congenital heart defect like a ventricular septal defect is unclear. Our objective with this survey is to determine the prevalence of this phenomenon in Canada.

Methods: There are two parts to this study, one with a provincial focus and another with a broader, national reach. For the provincial component, a retrospective cohort study was conducted. All patients < 18 years diagnosed with VSDs in Saskatchewan in the last 5 years were assessed. Individual medical records of patients who met these criteria were reviewed to identify any cases of hemolysis in the setting of VSDs. Further information, including age at diagnosis of VSD, type and velocity of VSD, and severity of hemolysis was collected. To gather national data, a survey was sent to all practicing pediatric cardiologists in Canada. The survey asked the cardiologists to indicate whether any of their pediatric patients (< 18 years old) with VSDs presented with hemolysis.

Results: Data collection and analysis is still underway. Thus far, 59 eligible patients in Saskatchewan were identified. Our preliminary results show a prevalence of anemia of 18.64% (n=11). 11% had hemolytic anemia (n=1), 44% (n=4) had other causes of anemia, and 44% (n=4) had no identified cause. Hemolysis was not ruled out in the last group.

Conclusion: Based on our findings so far, we conclude that hemolysis in pediatric patients with VSDs has a rare prevalence but can have very significant complications. Therefore, CBCs for all newborns with VSDs should be ordered to identify any hemolysis.



## Belma Kamencic (Dr. Laura Hopkins)

### *Evaluating the use of Media on Perceptions and Behavior During the COVID-19 Pandemic*

**Background:** Preliminary evidence suggests that anxiety, depression, and stress are common reactions to the COVID-19 pandemic. Understanding the relationships between anxiety, media use, and protective behavior during this pandemic has important implications for the mental health and safety of our population.

**Objective:** The aim of this study is to investigate how residents of Saskatchewan, Canada, use media during the COVID-19 pandemic and its effects on feelings of anxiety and engagement in recommended health practices.

**Methods:** An online questionnaire was distributed to University of Saskatchewan students and members of the general public in Saskatchewan, recruited via social media and email platforms, among others. A total of 696 individuals participated in the study. Statistical analysis examined the predictors of perceived COVID-19-related anxiety, predictors of protective behavior, and the associations between these factors.

**Results:** Seventy-three percent of participants reported using more media than before the COVID-19 pandemic, with the primary platforms for information being: online news networks (33%), television news networks (19%), and social media (15%). Facebook (7%) and Twitter (6%) were the most common social media platforms used. Over 70% of respondents reported feeling moderate anxiety or higher, with higher levels of anxiety significantly associated with the following: use of social media as the primary media platform ( $P=0.04$ ), higher perceived thoroughness of media coverage ( $P=0.01$ ), greater perceived COVID-19 risk ( $P=0.01$ ), and being female ( $P<0.01$ ). Furthermore, engagement in a higher number of protective actions was significantly associated with higher levels of anxiety and higher numbers of media platforms used, although the relationships were very weak ( $P<0.01$ ,  $R=0.142$ ;  $P<0.01$ ,  $R=0.135$ ).

**Conclusions:** Use of social media as the primary platform for COVID-19 information was associated with greater anxiety. There is evidence that increased anxiety and increased media platform use are associated with engagement in a higher number of protective actions.

## Avery Ironside (Dr. Trustin Domes)

### *The Natural History of U of S College of Medicine Graduates: Are Demographics at the Time of Admissions Predictive of Future Graduate Practice Location?*

**Introduction:** Decisions regarding admissions policies and standards within the College of Medicine should be based upon the best available evidence and informed by outcome data. Currently, the University of Saskatchewan's College of Medicine admissions processes are designed to 1) identify students that will be successful in medical school and 2) contribute to the care of the people of Saskatchewan following the completion of their training. Unfortunately, the admissions committee has little information regarding what pre-application factors contribute to ultimately practicing in Saskatchewan, making it challenging to determine whether current admissions policies are supporting the objective of meeting Saskatchewan's physician workforce needs.

**Objective:** The primary objective of this study is determining which demographic factors at the time of admission predict the practice location of graduates of the College of Medicine at the University of Saskatchewan.

**Methods:** A retrospective analysis of 14 cohorts (2000-2013) of graduates from the College of Medicine at the University of Saskatchewan (1019 graduates) was conducted to identify factors available at or before the time of admission that are predictive of Saskatchewan and rural based clinical practice. Practice location of graduates was obtained using provincial/state physician registries. The resulting database of graduates and their practice locations was cross-referenced with data from our admissions database including age at admissions, gender, place of birth, location where applicant graduated high school, previous post-secondary education location and time, and if they have lived in Saskatchewan their whole lives. Admissions factors were evaluated as predictive of graduate practice location using independent t-tests, chi-square tests, and logistic stepwise regression.

**Results:** A total of 1001 students who were admitted into the College of Medicine were able to be included in this study as 7 students did not complete their medical degrees, 4 did not complete a residency program, 2 are now deceased, 1 has since retired, and we were unable to locate the practice location of 4 graduates. Admission factors predictive of graduates practicing in Saskatchewan include graduating from a Saskatchewan high school ( $p < 0.001$ ,  $OR = 2.142$ ), graduating from a rural high school ( $p < 0.001$ ,  $OR = 1.733$ ), applicants who lived in Saskatchewan their whole lives prior to medical school ( $p < 0.001$ ), applicants who were admitted from a Saskatchewan university ( $p < 0.001$ ,  $OR = 2.833$ ), and applicants that were classified as an in-province applicant at time of admission ( $p < 0.001$ ) were more likely to practice medicine in Saskatchewan in the future. Age at admission, gender, total years of attending university prior to medical school, graduating from a northern high school and being born in Saskatchewan were not predictive of graduates future practice location in Saskatchewan. Admission factors predictive of future rural practice in Saskatchewan or elsewhere include older at age of admission ( $p = 0.027$ ), graduates that went to a rural high school ( $p < 0.001$ ,  $OR = 3.721$ ), and living in Saskatchewan their whole lives ( $p = X$ ,  $OR = 2.078$ ), however total years of attending university prior to medical school, gender, being born in Saskatchewan, graduating from a northern high school, graduating from a Saskatchewan high school, attending a Saskatchewan university, or with being an in-province applicant were not predictive of future rural practice.

**Conclusion:** Demographic factors of applicants that involve lived prior experiences in Saskatchewan were predictive of future practice in the province and older at age of admission and graduates that went to a rural high school and living in Saskatchewan for whole life were predictive of future practice in a rural community in Saskatchewan or elsewhere. These findings and specific predictive factors will be presented to the University of Saskatchewan College of Medicine Admission Committee, stakeholders, and collaborators of this project, this information and will be used to inform future decisions regarding admissions.

## **Chiamaka Okonkwo (Dr. Jay Kalra)**

### *A Best Practice Model for Medical Error Disclosure*

Healthcare is a high risk system, incomparable to many others due to the complex interaction of illnesses, practitioners, dynamic work environments, organizational policies, and procedures. An adverse event is defined as harm caused to a patient through medical management, and not their underlying illness. The disclosure of medical error is a facet of honest communication and honors the trust between a patient and their physician. Additionally, it is a process which is vital in assuring patient safety and delivering quality care to patients. Across Western Canada, the provincial health authorities have adopted some form of policy regarding medical error disclosure. However, these policies are not uniform because error disclosure is not mandatory or guided by legislature in all provinces. The standard for a disclosure process should include an apology or expression of regret, avoidance of blame, avoidance of speculation, immediate disclosure following adverse event, support for the patient, support for staff, training of staff, a team based approach, accessibility of policy through health authority website and documentation of disclosure. We believe that the disclosure policies can provide framework and guidelines for appropriate disclosure which can lead to more transparent practices. We suggest that disclosure practice can be improved by creating a uniform policy, centered on addressing errors in a non-punitive manner and respecting the patient's right to an honest disclosure.

## **Eva Karki (Dr. Laura Hopkins)**

### *Laboratory Test Utilization: Are We Using Thyroid Function Tests Appropriately?*

Introduction: Although advances in laboratory medicine have benefited the diagnostic process, over-testing could lead to risks of overdiagnosis and a financial burden to our healthcare system. Thyroid function tests (TFT) are among the most commonly ordered lab tests in clinical practice. The TFT bundle includes thyroid stimulating hormone (TSH), free triiodothyronine (FRT3) and free thyroxine (FRT4). Current practice guidelines, including Choosing Wisely Canada, recommend a stepwise algorithmic approach to thyroid testing and against simultaneous bundle testing. We analyzed the TFT ordering pattern in Saskatchewan Health Authority- Saskatoon region laboratories to develop an appropriate ordering algorithm.

Methods: Our group analyzed TFT data retrieved from the Saskatoon Laboratory Information System which were referred to Saskatoon biochemistry laboratories from January 1, 2016 to March 7, 2018. The descriptive data were analyzed and visualized by using R statistical program.

Results: 561,246 TFT were ordered during this period, with an estimated total laboratory cost of \$2.8 million. There were 163,212 instances of bundle testing with simultaneous ordering of all 3 tests, with most considered inappropriate by current guidelines as up to 62% had normal TSH levels. Additionally, 48,954 TFT, on average, are ordered as repeat testing annually, of which at least 75% have normal TSH values. According to these trends, over-testing in this region may be attributed to inappropriate repeat, follow-up and bundle testing.

Conclusions: To address these issues, regional ordering guidelines should be implemented to aid primary care physicians in Saskatchewan with clinical decision-making regarding TFT ordering while mitigating risks of overdiagnosis and costs to our healthcare system.

## Gina Choi (Dr. Jay Kalra)

### *Impact of the COVID-19 Pandemic on Anesthesia Residency Education*

**Background:** On March 11, 2020, the World Health Organization declared a global pandemic in response to the rapid spread of SARS-CoV-2, the first global pandemic declared since the H1N1 influenza in 2009. At the beginning of the pandemic, residents expressed concerns over their safety, education, clinical rotations, lifestyle, and mental well-being. Amidst changing policies, potential shortage of personal protective equipment (PPE), and concern for safety, the role of anesthesia residents as essential personnel within the hospital became difficult to determine. The aim of this study was to identify strategies taken by anesthesia programs, resident attitudes and experiences with these strategies, and the extent of exposure to COVID-19 in hopes to better understand strategies in managing trainees and medical education for unanticipated health crises in the future.

**Methods:** Following REB approval (June 2020), anesthesia residents across Canada were sent a survey consisting of 31 questions revolving around topics of personal safety, patient care, education, communication, and leadership.

**Results:** Thirty-three residents from 9 Canadian anesthesia residency programs responded to the survey. Respondents were primarily female (22/33, 67%) and in their first year of residency (14/32, 44%) in March 2020. Prior to the COVID-19 pandemic, 80% (20/24) residents reported working >40 hours/week at the hospital, compared to only 21% of residents working >40 hours/week from March-May 2020. Respondents felt that their clinical responsibilities and hours were influenced by concerns over PPE shortage. Forty-six percent (11/24) of residents experienced cancellation or postponement of core rotations, with one respondent commenting “On my five months of anesthesiology, three of them were cancelled.” Residents generally felt supported by their program directors and felt safe as they carried out their duties. Half of the respondents (12/24) reported exposure to COVID-19 patients during training, but none reported testing positive for COVID-19. Residents felt that helping during the pandemic was a part of their professional duty but expressed frustration over poor communication, disruption in core anesthesia rotations, and limited participation in patient cases.

**Conclusions:** Our results may inform the Royal College of Physicians and Surgeons, program directors, and health officials in optimizing anesthesia residency training during future pandemic conditions.

## **Laura Wu (Dr. Joann Kawchuk)**

### *Airway Event Documentation: Quality Audit of Airway Events in the Saskatoon Area Intensive Care Units*

Reliability of documentation of intubation procedures in patients requiring critical care admission is unknown in Saskatoon despite evidence of the safety impact for patients [1,2,3]. This quality audit study investigated the effect of introducing an intubation procedure record on the rate and completeness of intubation documentation at one ICU. Expert stakeholder consensus informed the key documentation aspects incorporated into the form and served as the benchmark for chart documentation. A total of 120 patients in ICU were identified to have required urgent intubation during the period of 3 months before and after implementation of this intubation procedure form. Airway events during the pre-intervention period were charted by physicians at an average of 26.4% but increased to 50.4% in the post-intervention phase. Furthermore, intubations documented using the intubation procedure record had an average documentation rate of 91.7%. Overall, this quality audit highlighted that although the baseline state of airway documentation at RUH ICU was minimal, introduction of a dedicated intubation procedure record can yield significant and immediate improvement in intubation documentation rates. Further research is required to investigate sustainability of the intubation procedure record and complications of airway capture that can impact patient outcome.

## **Marcie Beaulac (Dr. Michelle Clunie)**

### *Point-of-Care-Ultrasound (POCUS) in Canadian Hospitals During the COVID-19 Pandemic: A Cross-Sectional Survey*

Background: Several studies have demonstrated the benefits of using point-of-care-ultrasound (POCUS) at the bedside in the evaluation of lung conditions including acute respiratory distress syndrome and pneumonia. While the finding of lung ultrasonography are non-specific, it provides diagnostic results comparable to computerized tomography (CT) of the chest, without the added burden of patient transport, radiation exposure, and additional cost.

Objectives: To identify how point-of-care ultrasonography was used in the management of COVID-19 patients in Canadian hospitals. To identify the influence of COVID-19 on POCUS education and application in Canadian hospitals.

Methods: Following ethics approval, we deployed a cross-sectional electronic practice survey to healthcare providers who participated in the management of COVID-19 in Canadian hospitals. The survey was developed according to established methodology.<sup>2</sup> Survey questions were developed using literature review, focused discussion, and pre-testing on three provincial POCUS leaders. An invitation will be distributed to Anesthesiologists, Intensivists, Emergency Physicians, and family physicians via professional mailing lists and social media accounts: Canadian Point of Care Ultrasound Society (CPoCUS), Canadian Anesthesiologists' Society (CAS), Canadian Critical Care Society (CCCS), SaskSonic Twitter, UsaskEM Twitter, and the Canadian Association of Emergency Physicians (CAEP) weekly newsletter. The survey format includes multiple choice and open-ended questions that allows for quantitative and qualitative data to be used for the analysis. Survey responses will be reported in aggregate using descriptive statistics. Test responses will be analyzed by thematic content analysis: deductively according to the pre-established constructs and inductively for common themes.

Preliminary Results: To date, the survey has been distributed through SaskSonic and USaskEM Twitter accounts. Data collection is ongoing, with survey distribution through the CAS, CCCS, CPoCUS, and the CAEP pending.

Conclusion: This research will describe the uses of point-of-care ultrasound during the COVID-19 pandemic, identify potential uses for POCUS in the management of COVID-19, and explore lessons learned from physicians using POCUS during COVID-19.

## Mitchell Canaday (Dr. Andries Muller)

### *Disclosure of Personal Information by Healthcare Professionals During a Consultation*

Background: Previous studies have reported mixed results about patient satisfaction with disclosure of personal information by their physicians. (1–5) Physicians often wonder how patients will react to disclosure of personal information and therefore it was decided that a study about this would be beneficial to our cultural context in North America.

Hypothesis/Research Questions: Is it acceptable for physicians to disclose personal information about themselves or their family members during a consultation? The hypothesis is that patients might benefit from hearing that physicians have had similar problems to themselves.

Methods/Methodology: Seventy-five consultations at the West Winds Primary Health Centre were selected for the study. Informed consent was gathered from the patients prior to the consultations taking place. Participants were told that the study revolved around physician communication skills and would be used to help teach future healthcare workers. The physicians were tasked with disclosing pre-planned pieces of personal information relating to health concerns that were discussed during the visit. It was decided to exclude sensitive topics such as mental and genitourinary issues as well as patients under the age of 18. The participants were given a questionnaire afterwards for their perspective on the disclosure of personal information by their physician. Following this, the participants were debriefed about the purpose and methodology of the study.

Results/Findings: The results of the study were overwhelmingly positive as none of the participants felt that the disclosure of personal information by their physician was inappropriate. Many of the participants did however believe that disclosure of personal information by their physician was appropriate only in certain situations and as long as the physician does not cross any boundaries. Some of the main themes that emerged from our study included increased feelings of comfortability and ease of the participants due to physician self-disclosure. Many participants also believed that disclosure of personal information by their physician brought a human element to their consultations and strengthened their relationship with one another. A third major theme was that participants generally felt better knowing that other people have shared similar experiences as themselves.

Discussion & Conclusion: The conclusion garnered from the study was that the disclosure of personal information by a physician to their patients has a positive effect in most situations. When disclosing personal information, it is important to abide by professional standards and boundaries. For the most part, disclosure of information by a physician leads to an increased sense of normalcy and a better connection with their patients, but at times may be seen as inappropriate. It was quite surprising how unanimously positive (zero negative comments) participants felt about the disclosure of personal information by their physicians.

Recommendations: The recommendation is that physicians disclose personal information to their patients in a professional way when they are comfortable doing so and when they believe it is appropriate to do so.

## **Nimra Tahir (Dr. Kotoo Meguro)**

### *Revaluating Traumatic Brain Injuries Management Strategies Using the Brain Injury Guideline (BIG) Criteria to Improve the Flow of Saskatchewan Patients*

Traumatic brain injuries (TBIs) occur at high rates within Canada, causing a heavy burden on the healthcare system. Conventionally, patients with intracranial bleeding are admitted to neurosurgical unit at Royal University Hospital. In 2014, researchers at the University of Arizona developed the brain injury grading system (BIG) and showed that patients with mild TBIs can be discharged following observation and without neurosurgical admission. In our research, we investigated if the BIG management strategy is applicable to our Saskatchewan population. We conducted a retrospective review of the patients who were admitted to neurosurgical unit in Royal University Hospital since 2015. Patients with moderate to severe injuries, surgical intervention, and duration of stay over 7 days were excluded. CT scans must be positive for intracranial hemorrhage. There were 40 patients identified meeting criteria. 23 patients had BIG1 injury, 17 had BIG2 injury. 17 patients were from Saskatoon. Of the remainder, 18 were from a center with no CT scanner and 3 patients were from sites with CT scanner. No patients with BIG1 or BIG2 injury had any imaging worsening or need for neurosurgical intervention. 8 patients were given antiepileptic drugs, and only one patient had ABI referral. BIG guidelines applied to our population, and no patient matched to BIG 1 or 2 classifications had any decline or required intervention. There is under-utilization of CT scanners outside of tertiary care at Saskatoon, and under-utilization of Acquired Brain Injury (ABI) services. Further study will help to guide geomapping for optimal referral pathways.

## **Rahul Parekh (Dr. Jay Kalra)**

### *Quality Management: Assessment Tools in Clinical Diagnostic Laboratories*

Since the reliance on laboratory medicine is increasing it is paramount that the results obtained are accurate. Proficiency testing (PT) measures the ability of a laboratory to use a given instrument or to apply a certain method accurately. In a proficiency test, each lab compares its test results to those of the most appropriate peer group based on similar instruments and methods. The standard used by the CAP survey's during proficiency testing to assess results was compared against a different means of assessment of determining discrepancies following Westgard based Levy-Jennings's rules over the course of three years of testing. On average then over the three years the discrepancy rates determined using CAP standards and Levy-Jennings standards were found to be 0.30% and 0.69% respectively. An appropriate, timely corrective action should be taken to resolve concerns related to unsatisfactory results. These results meet the performance criteria and requirements set up by provincial regulatory agencies. The quality in the clinical laboratory is maintained in a satisfactory manner. It is prudent to monitor, promote and enhance quality services for patients. These proficiency-testing programs should be an integral part of quality care to promote continuous quality improvement in healthcare. Overall, it appears that an implementation of the Levy Jennings protocol when practical, increase stringency and may provide insight into areas where preventative measures can be taken.

## Oluwakayode Adesina (Dr. Niels Koehncke)

### *Is Leaded Radiology Shielding a Potential Lead Exposure Hazard for Veterinary Workers?*

**Objective:** Lead poisoning, one of the most common diseases of environmental origin, can lead to severe adverse effects like abdominal pain, fatigue, anemia, nerve damage, and high blood pressure. Veterinary workers who use perform radiological imaging use leaded shielding daily to protect themselves from radiation. Our research goal was to evaluate if leaded shielding poses a potential hazard for veterinary workers and if commercially available solutions can decrease lead levels.

**Methods:** From the Western College of Veterinary Medicine, our team analyzed 54 pieces of leaded shielding. We examined 18 aprons, thyroid shields, and 18 single gloves from the Equine Field Service and by Small Animal Radiology. We used 1cc of acetic to moisten cotton balls and then wiped all our lead shielding devices' inner surfaces. For each apron, we sampled a 6 x 12-inch area on the upper left. The entire thyroid shield's inner surface was wiped, and the inside of each glove. Approximately 24 hours later, we cleaned each shielding utilizing a commercially available hydrogen peroxide solution (Prevail) and repeated sampling afterward. Additionally, we collected six control samples on each of the two days and environmental samples of the walls, floors, Equine Field Service vehicles. Using a 3 point grading scale, we assessed for stitching and fabric integrity; we measured lead cracks and defects on each item's radiographs.

**Results:** Control lead values ranged from 0 to 4.2  $\mu\text{g}/\text{ft}^2$  while environmental values ranged from 0.7 to 7.8  $\mu\text{g}/\text{ft}^2$  except one sample taken from the wall under the hanging lead aprons, which was 640.6  $\mu\text{g}/\text{ft}^2$ . One of 18 aprons sampled exceeded the lead dust level considered acceptable by the Occupational Safety and Health Administration for workplace surface areas (200  $\mu\text{g}/\text{ft}^2$ ) (Table 1). Ten of 18 thyroid shields exceeded 200  $\mu\text{g}/\text{ft}^2$ ; 2 thyroid shields exceeded 500  $\mu\text{g}/\text{ft}^2$ , and one thyroid shield exceeded 1000  $\mu\text{g}/\text{ft}^2$  (Table 2). Ten of 18 gloves exceeded 200  $\mu\text{g}/\text{ft}^2$ ; all 10 exceeded 1000  $\mu\text{g}/\text{ft}^2$  (Table 3). Additionally, some of the results reflected higher lead levels post-cleaning. We suspect this might have been due to increased mobilization before collection, or the additional moisture making sampling easier.

**Conclusion:** Lead dust levels on radiology shielding are a potential health hazard to workers. Workers should be aware of the potential for lead exposure when using leaded shielding, and procedures to reduce exposure should be reviewed. We recommend that all radiology workers use disposable gloves when using leaded shielding and wash hands after each use. The potential for contamination of clothing worn under shielding should also be considered. While no benefit to cleaning the lead shielding was demonstrated, possibly due to the cleaning method's mobilization, the workspace surfaces where lead shielding is used and stored should be cleaned regularly.

## **Shaylin Pillay (Dr. Roona Sinha)**

### *Undergraduate Medical Education Cyclical Course Review - How Can it be Improved?*

**Introduction:** The implementation of a cyclical course review process spearheaded by the Curriculum Quality Review Sub-Committee (CQRSC) was developed in the fall of 2015. Information regarding a formal evaluation process for cyclical course review is limited in literature.

**Methods:** mixed-method qualitative approach, where various stakeholders of the course review process were invited to participate in an anonymous survey and guided interviews to share their opinions of the course review process. Students, course leaders, Curriculum Committee (CC) and CQRSC members were contacted regarding their participation in the process. Using a thematic approach, interviews and survey data were analyzed into various categories.

**Results:** There were 20 survey respondents and 10 interview participants. CC members held positive views of the process (100%), as did Course leaders (91.67%). There were mixed responses from the CQRSC members about the final results of their work (62.5%). Student feedback and course reports were reported to be the most valuable resources for course review assessment. Thematic mapping identified areas during each step of the course review process that could be improved, such as a lack of clarity during orientation or a need for a more robust follow-up.

**Discussion:** Stakeholders found the review process to be valuable and important to curriculum development. The current cyclical course review process used by the University of Saskatchewan UGME has been effective. Key areas that were identified for improvement included: more robust orientation process, clearer timeline with deadlines, engaging faculty in developing priorities for further review, and clarity regarding follow up.

## **Zach Oleynik (Dr. David Sauder)**

### *MSK Medical Education Videos and PDF Content Creation for Medical Students*

**Objective:** Our intention with this project was to create a series of up to date videos consisting of high yield learning concepts for medical students in the field of MSK and orthopedics. With the increasing demand for accessible, efficient online resources – we think these supplementary videos will be a useful resource for medical students preparing for clinical rotations. Additionally, PDF handouts were created and formatted for phones, tablets, or computer access and will provide a condensed approach to the most common clinical exams and MSK presentations.

**Methods:** Working in conjunction with the Orthopedic surgeons at the University of Saskatchewan, we were able to identify the pertinent, high-yield examination techniques that should be reinforced in medical education. In some circumstances, we surveyed surgeons to better understand which examinations they use in their clinical practice. We then created demonstration videos for the knee, shoulder, hip, spine, and pediatric examinations. To support medical student learning we created supplementary 1-page PDF handouts that go with each video. Students rotating through MSK and orthopedic rotations can utilize these resources to improve clinical history and examination skills.

**Conclusions:** In an evolving educational world – medical schools must continue to invest resources in creating medical education resources that are available through online platforms for students to review. We hope these videos and handouts can help with the MSK rotations for University of Saskatchewan medical students.

## Sim Singh (Dr. Rob Woods)

### *The QuAL (Quality Assessment of Learning) Score: Establishing Validity Evidence for Narrative Comments in EPAs (Entrustable Professional Activities) for Three Different End User Groups*

Background: Entrustable Professional Activity (EPA) assessments are the backbone of Competence By Design (CBD). Measuring the quality of EPA narrative comments supports program evaluation and faculty development. The QuAL Score has validity evidence for rating narrative comments with workplace based assessments but has not been evaluated with CBD EPAs.

Methods: 52 de-identified narrative comments were selected from an emergency medicine (EM) EPA database using purposeful sampling. Six collaborators (two Residents, two Academic Advisors, and two Competence Committee Members) were recruited from each of four EM Residency Programs (Saskatchewan, McMaster, Ottawa, and Calgary). They rated narrative comments for Utility and applied the QuAL Score. They also provided feedback on what makes a useful comment that was analyzed thematically. Pearson's correlation coefficient was utilized for statistical analysis.

Results: All 24 invited collaborators completed the full study. The average QuAL score correlated highly with the average Utility score for each comment ( $r=0.85, p<0.001$ ). Within different rater groups, each individual's Utility score was highly correlated with their QuAL score ( $r=0.70, p<0.001$ ). Five key themes emerged for a useful comment: 1. description of context 2. description of performance 3. suggestion or feedback provided 4. comments aligned with the EPA 5. entrustment score justified by comment.

Conclusion: The perceived utility of narrative comments rated by Residents, Academic Advisors and Competence Committee correlated highly with the QuAL score. The QuAL score can serve as an outcome measure in program evaluation and for individualized faculty development in the era of CBD.



## Alanna Wong (Dr. Brian Le)

### *Incidence of Infection Following Prostate Biopsy*

**Background:** The transrectal ultrasound guided prostate needle biopsy (TRUS PNB) is essential in the diagnosis and staging of prostate cancer, the most common cancer among males in Canada. Infections following TRUS PNB can be, and can lead to, serious complications following biopsy, which have been increasing in the literature due to the increasing emergence of fluoroquinolone resistant bacteria. Recent quality improvement programs at hospitals in Regina found the incidence of infections post-biopsy has grown to 9% in 2016, which was previously 3% in 2012.

**Methods:** This study retrospectively analyzed 90 patients who had undergone TRUS PNB between April 17, 2020 - July 15, 2020 in the Saskatchewan Health Authority – Regina area. Imaging and pertinent patient data were reviewed in PACS and SCM. Patients who did not have information confirming infection in the SCM database (i.e. White blood cells, neutrophils, urine cultures, blood cultures, emergency visits) within 21 days post-biopsy were contacted to confirm whether or not they had infections.

**Results:** From our remaining 64 patients who could be contacted, 10.9% experienced an infection: 57.1% were identified through culture and 42.9% were treated empirically. Relationships between infection status and antibiotic prophylaxis, infection status and number of biopsy cores taken, and infection status and previous TRUS-PNB were evaluated for significance using chi-square analyses with  $\alpha = 0.05$ . All associations examined were not statistically significant, and thus, we conclude there is not enough evidence to suggest a relationship between demographic data, previous surgical data, or different antibiotic prophylaxes.

**Conclusions:** Future direction for prospective projects/studies should aim to have a larger sample size, perhaps over a longer amount of time as well, to be able to make conclusions from data collected.

## Belma Kamencic (Dr. Laura Hopkins)

### *The Impact of Caesarean Section Surgical Site Infections on Quality of Life*

Background: Caesarean section can be a life-saving intervention and is the most common surgery performed worldwide. Unfortunately, Caesarean section surgical site infections are not uncommon and can cause significant pain and distress for new mothers. Despite this, there have been very few studies that investigate how these infections impact quality of life for new mothers.

Objective: The aim of this study is to investigate the impact of Caesarean section surgical site infections on new mothers and identify barriers to care in order to create solutions that are meaningful and helpful in reducing the rate of infection and improving overall quality of life.

Methods: A retrospective chart review was performed to identify all patients with a Caesarean section performed in Saskatoon, Saskatchewan between April- December 2019 with a surgical site infection identified by Saskatoon Infection Prevention and Control. Semi-structured phone interviews were then conducted with these patients.

Results: There were 46 patients who had a Caesarean section surgical site infection, an approximate rate of 4.0%. The average age of patients was 28 years old and 78% of Caesarean sections were urgent or emergent. The majority of infections were superficial, but 9% required readmission to hospital and 7% needed wound packing. Sixty five percent of patients interviewed reported that their Caesarean section surgical site infection negatively impacted their quality of life. While there was a range of experiences, mental health and independence were the most negatively impacted domains. Only 39% believed they received adequate instructions with regards to the signs and symptoms of a wound infection. Patient recommendations for future care included: more teaching at discharge, take-home learning materials, using pictures, and access to wound materials.

Conclusion: The approximate rate of Caesarean section surgical site infections in Saskatoon in 2019 is higher than the National Health Safety Network goal rates. Caesarean section surgical site infections negatively impact quality of life across a number of domains. Reducing the rates of infection requires multidisciplinary action, including physicians, nurses, and patients.

## Claire DuVal (Dr. Michael Kelly)

### *Detecting Energy Metabolites in a Mouse Model of Ischemic Stroke Treated with Lactate using Fourier-Transform IR Imaging*

Stroke is a primary cause of death and disability in Canada. An ischemic stroke event results in many cellular alterations, including the disruption of energy metabolism. By supplementing neuronal metabolism, there is the potential to improve cellular function and reduce damage to the tissue. One proposed method of supplementation is treatment with lactate, an energy metabolite that can be used as a substrate for ATP production. Our group uses Fourier-transform infrared (FTIR) imaging that enables identification of statistically different regions of stroke-affected tissue and quantification of metabolic changes. The aim of this project was direct detection of energy metabolites, including lactate, NADH, and ADP + ATP, that will be useful in assessing the metabolic effects of post-stroke lactate treatment. The utility of identifying these metabolites was evaluated through comparison of FTIR maps from control versus lactate treated brain tissue generated using the photothrombotic mouse model of ischemic stroke. The FTIR maps demonstrated relative differences in levels of NADH and ADP + ATP between treatment groups. These peaks can now be applied to previous and future datasets to assess stroke interventions. Further, they can be applied to research in the wider field of metabolic disruption.

## Connor Holmes (Dr. Anil Sharma)

### *Idiopathic Sub-Glottic Stenosis in Saskatchewan Hutterite Population*

Background: Idiopathic subglottic stenosis (ISGS) is a rare condition, characterized by narrowing of the subglottic region. By studying the odds of developing ISGS, we seek to strengthen the hypothesis that an underlying genetic predisposition may exist in the isolated and genetically unique Hutterite population.

Methods: A retrospective chart review examined the medical records of all adult patients treated for subglottic stenosis (SGS) in Saskatchewan between the years of 2008-2018. Cases with known causes of SGS were excluded. Cases were segregated into Hutterite and non-Hutterite. To determine Hutterite status, we matched the address and postal code of each patient to the colonies listed in the Hutterite directory for Saskatchewan.

Results: A total of 36 patients with ISGS were identified, all of whom were female. Cumulative incidence of ISGS in the Hutterite population is 0.00064, and 0.000029 in the remainder of the Saskatchewan population. Despite accounting for only 0.57% of the Saskatchewan population, 4 out of 36 cases occurred among Hutterites. The odds of a Hutterite developing ISGS is 21.89 times higher than non-Hutterites (95% CI from 7.74 to 61.9). Positive family history was only observed in Hutterite population constituting 3 out of the 4 cases, which is also associated with earlier mean age of diagnosis.

Conclusion: We strengthen the hypothesis that genetics have a role in the etiology of ISGS, by demonstrating that the genetically and socially unique Hutterites are more likely to develop this disease. Further research into an exact genetic link for the development of ISGS is warranted.

## Connor Holmes (Dr. John Lee)

### *Readability and Quality Assessment of Internet-Based Patient Education Materials Related to Nasal Septoplasty*

**Background:** The health information on the internet remains highly variable in terms of quality, reliability, and readability. It has been recommended that patient education materials (PEMs) are written at a sixth-grade reading level.

**Objective:** Given that nasal septoplasty is a common procedure in otolaryngology – head and neck surgery, the aim of this study was to assess the quality and readability of online PEMs on septoplasty.

**Methods:** A Google search was performed using eight different search terms related to septoplasty. Readability was calculated using the Flesch-Kincaid Grade Level, Flesch-Reading Ease Score (FRE), Gunning-Fog Index, Simple Measure of Gobbledygook Index, Coleman-Liau Index, and Automated Readability Index. The DISCERN tool was used to assess the quality and reliability of the PEMs.

**Results:** Eighty-five online PEMs were included. The average FRE score for all PEMs was  $54.9 \pm 11.5$ , indicating they were fairly difficult to read. The average reading grade level was  $10.5 \pm 2.0$ . PEMs from academic institutions had significantly lower reading grade levels than those originating from private medical clinics. The mean DISCERN score was  $42.9 \pm 10.5$  and 42% (36/85) of articles had DISCERN scores less than 39, corresponding to poor or very poor quality. There was no significant correlation between DISCERN scores and readability scores.

**Conclusion:** The majority of online PEMs on septoplasty are written above the recommended reading levels and have significant deficiencies in terms of their quality and reliability. Clinicians and patients should be aware of the shortcomings of these resources and consider the impact they may have on patients' decision making.

## Corey Blushke (Dr. Kylie Kvinlaug)

### *Evolving Trends in Abdominal Aortic Aneurysm (AAA) Repair in Saskatoon*

**Background:** There are two methods of repairing abdominal aortic aneurysms (AAA), open repair and endovascular aneurysm repair (EVAR), with the latter being introduced in 1990 to improve patient health outcomes. The trend in repair of AAA has not been studied in Saskatchewan since the introduction of EVAR. We tested the hypotheses that EVAR will have increased over the past 6 years, that EVAR accounts for less than 50% of AAA repairs today, that patients living in a rural area are less likely to undergo EVAR, and that EVAR will be associated with patients with advanced age when compared to open repairs.

**Methods:** The Discharge Abstract Database (DAD) was searched to identify patients with that had been treated for AAA. Data such as type of procedure, patient demographics, details of the procedure and deaths were abstracted from both electronic and paper charts. Statistical analysis was performed using SPSS (IBM SPSS Statistics 20.0). Data were analysed using independent two-sample t-tests for continuous variables, Chi-square tests for categorical variables and univariable linear regression analysis for relationships. Significance was accepted at  $P < 0.05$ .

**Results:** EVAR was found to be slightly more frequent over time, and this relationship was found to be statistically significant ( $R = 0.34$  [ $R^2 = 0.11$ ];  $F < 0.005$ ). EVAR was found to account for more than 50% of aneurysm repairs over the past 6 years (EVAR: 69%; Open: 31%). The proportion of patients that underwent EVAR did not differ across patient geographic locations when compared to those that underwent open repairs (Saskatoon: EVAR 36.0%, Open 37.6%; 0-150km: EVAR 34.5%, Open 33.6%; 150-300km: EVAR 22.9%, Open 21.6%; >300km: EVAR 6.5%, Open 7.2%;  $P = 0.977$ ). Patients that underwent EVAR were found to be 4 years older than those that underwent open repair (EVAR:  $74.5 \pm 7.9$ ; Open:  $70.3 \pm 8.4$ ;  $P < 0.001$ ).

**Conclusion:** EVAR has been increasingly used in Saskatoon over the past 6 years; its practice has grown enough that it accounts for the majority of aneurysm repairs in Saskatoon. The type of repair undertaken did not differ between patients living in urban versus rural settings which means that patient residence is not a barrier to offering EVAR in Saskatoon. The significantly older patients undergoing EVAR demonstrate that AAA repair is being offered to older patients than would typically be offered a repair. Clinically this is significant because older patients that meet the criteria for repair can now undergo repair instead of waiting for a lethal AAA rupture. Many thanks to Muhammad Siddiqui for performing statistical testing.

## **Emmitt Hayes (Dr. Laura Sims)**

### *Scaphoidectomy and Four-Corner Arthrodesis with Differing Methods of Osteosynthesis: A Systematic Review and Meta-Analysis*

Purpose: To compare the union rate and clinical outcomes following four-corner arthrodesis with different methods of osteosynthesis.

Methods: We conducted a systematic review of studies published on OvidMedline, Embase, and Pubmed. Primary studies that reported clinical and radiographic results following four corner arthrodesis were eligible. Biomechanical or cadaveric studies, case reports, studies that did not define and report a radiographic union rate, reviews and technical articles, studies that did not report the method of osteosynthesis, and studies that used multiple methods of osteosynthesis but did not separate results for individual methods of osteosynthesis were excluded. A meta-analysis was performed for the radiographic union rate, range of motion (ROM), and grip strength.

Results: 57 studies were included. The radiographic union rate did not significantly differ between studies using K-wire, screw, staple, nonlocking plate, or locking plate osteosynthesis. Nonlocking and locking plate fixation was associated with significantly worse palmar flexion than K-wire fixation ( $p=0.036$ ,  $p=0.024$  respectively). Grip strength (% contralateral) was significantly lower in studies with dorsal locking plate fixation compared to K-wire fixation ( $P=0.002$ ). There were no other statistically significant differences between groups with respect to flexion, extension, radial deviation, ulnar deviation, and grip strength.

Conclusion: All methods of osteosynthesis result in similar union rates, with no significant differences between methods. The significant differences in ROM and grip strength are unlikely to be clinically relevant. This study is limited by the retrospective nature of included studies. Further randomized control trials are needed to directly compare methods of osteosynthesis.

## **Erica Ladham (Dr. Yigang Luo)**

### *Novel Fast Cold Flushing Cannulation for Transplant Organ Procurement*

The demand for organ donation has prompted many countries, including Canada to look into donation after circulatory death (DCD). DCD involves the retrieval of organs following death confirmed using circulatory cease criteria, which includes lack of organ perfusion for more than 5 minutes. As such, these organs are exposed to a longer duration of warm ischemia compared to organs from other types of donors. This ischemic injury increases the risk of delayed graft function (DGF) and primary non-function (PNF) in the recipient. We looked into a way to lessen this ischemic time to improve organ function. During organ procurement, the most critical step is fast cannulation of the distal aorta, exposure and cross-clamp of the upper abdominal aorta, and rapid cold flushing so that warm ischemic time is reduced. We designed a double balloon model cannulation tube (using an endotracheal tube), which allows us to block off the upper part of the abdominal aorta by inflating a balloon and as such, omit the exposure and clamping of the upper abdominal aorta. The study was divided into two trial groups, the experimental one using the balloon cannula and the control trial using standard cannulation techniques. The results of the experiment showed that the mean time to the start of flushing was significantly reduced in the experimental group as compared to the control. This study proved the concept of using a double-balloon cannula in organ procurement, particularly for DCD donors, can potentially lessen the warm ischemic time significantly. Further in vivo animal study will be warranted, with specifically designed double balloon cannula. Clinical use of this novel double balloon cannula in multi-organ procurement is foreseeable.

## **Haley Eckel (Dr. Marilyn Kinloch)**

### *Time Between Cervical Biopsy – Excision for High-Grade Squamous Precursor Lesions and the Effect of Diagnosis and Access to a Tertiary Care Centre*

**Background:** If a high-grade pre-cancerous lesion is present on cervical biopsy, a Loop Electrosurgical Excision Procedure (LEEP) is performed to remove the lesion and provide definitive diagnosis. LEEP is only available in tertiary centres. Although cervical cancer screening rates remain equal across geographic territories, women in rural communities face challenges in accessing follow-up care. The objective of this study was to evaluate the impact of distance to a tertiary care centre on the duration between preliminary biopsy and definitive management (turnaround time) for cervical pre-cancerous lesions.

**Design:** Women residing in Saskatchewan (n = 290) who underwent LEEP procedures between January 1, 2017 and December 31, 2018 were reviewed. Patients were categorized into six Home IDs based on distance to tertiary centre. Turnaround time was calculated using date of biopsy and LEEP procedure. The relationship of turnaround time to distance to a tertiary care centre and age were analyzed as independent variables using linear regression.

**Results:** The relationship between distance to a tertiary care centre and turnaround time was not statistically significant. However, the relationship between age and turnaround time was. Mean turnaround time of the reference group (age  $\leq 30$ ) was 58 days. Age groups and their respective turnaround times were as follows:  $30 \leq \text{age} < 40 = 38.41$  days ( $p = 0.018$ ),  $\text{age} > 40 = 26.53$  days ( $p = 0.001$ ). Turnaround time decreased by 1.36 days for each year of increasing age ( $p = 0.003$ ).

**Conclusion:** While age was significantly associated with turnaround time, distance to a tertiary care centre was not. Further study to determine why age is an independent factor in turnaround time is warranted. Surveys about attitudes towards pre-invasive lesions, or age specific barriers to follow up care are needed.

## **James Hill (Dr. Alan Beggs)**

### *Survival Analysis of Inter-Spinous Spacers In Regina*

Inter-spinous spacers are indicated in the treatment of neuropathic pain due to central or foraminal stenosis. There are many further “off label” indications for their operative use. As such, the use of interspinous spacers has evolved to become a niche procedure offered by surgeons with confidence in their use in the relative absence of data arguing in favor or against their use. Inter-spinous spacers represent a significant expense to the spine instrumentation budget and are known to represent a staging procedure prior to a more robust instrumented fusion. Limited resources in the Canadian healthcare system mandate that best practice be used by surgeons in the selection and evaluation of the viability of such surgical procedures where a large variety exists. This retrospective chart review analyzes the survival of inter-spinous spacers as an indicator of value. This preliminary study will serve as proof of concept to expand the study to either validate or invalidate future use of these implants from an economic perspective. A cohort of 215 inter-spinous implants spanning 5 calendar years were analyzed with regard to their initial indication, the implant type selected, failure or survival of the implant, and indication for revision if failure occurred. Our preliminary findings suggest that both implant choice and initial indication influence implant survival, and ultimately the economy of inter-spinous implants as a procedure in this health region. This pilot study supports a much more robust analysis of the use of inter-spinous spacers in the Regina Area of the SHA.

## Jasleen Saini (Dr. Luke Hnenny)

### *Does Methylation Status Affect the Recurrence Rates of Intracranial WHO Grade 2 and 3 Meningiomas*

**Introduction:** Meningiomas are neoplasms derived from arachnoid cap cells of the meninges of the central nervous system. Although most are benign, graded histopathologically by the World Health Organization (WHO) as I, some meningiomas are graded as WHO II (atypical) or III (anaplastic). Grade II and III lesions tend to behave more aggressively. Standard treatment of an intracranial meningioma, if deemed necessary, is surgical excision. If the meningioma is subsequently graded as WHO I, adjuvant radiation therapy is not typically prescribed. If the meningioma is graded WHO III, adjuvant radiation therapy is nearly universally prescribed. However, if the meningioma is WHO II, decision making, particularly regarding adjuvant radiation therapy, is less clear. Prognosticating the recurrence/progression of these lesions is difficult, as their behavior is unpredictable. Historically, the best predictors of meningioma recurrence/progression were extent of resection, as graded by the Simpson scale, and WHO grade (1). More recently, global DNA methylation profiling of these tumors has been proposed to better predict their behavior. A recent publication described and validated a nomogram to better predict the behavior of meningiomas to optimize clinical care (2). This nomogram includes the methylation profile. We hypothesize that WHO grade II and III meningiomas with higher DNA methylation profiles exhibit higher rates of recurrence/progression than those with lower DNA methylation profiles.

**Methods:** This study is a retrospective chart review, and methylome analysis of historical paraffin-embedded meningioma specimens. The chart review included all patients in Saskatoon and Regina who had resection of WHO II or III meningiomas between January 1, 2007 and December 31, 2017. Data collected included patient demographics, tumor location, Simpson grade for extent of resection, histologic subtype, whether or not adjuvant radiation therapy was given, and time to recurrence/progression. Methylation profiles of all specimens will be performed at the University of Toronto. Univariate analysis will be performed to determine if a higher methylation profile correlates with a higher rate of tumor recurrence/progression. Multivariate analysis will be performed to assess for other factors that influence rate of tumor recurrence/progression.

**Results:** After initial screening, 86 patients who underwent resection of WHO II & III meningiomas between January 1, 2007 and December 31, 2017 were eligible for evaluation. Thirty-nine patients (45%) were male, and 47 (55%) were female. The median patient age was 67 years (range 19–93 years). There were 77 (89.5%) WHO II and 9 (10.5%) WHO III meningiomas. Fifty-three (61.6%) meningiomas arose from the convexity. Twelve cases (13.9%) underwent Simpson grade 1 resection; 61 cases (70.9%) grade 2 resection; 8 cases (9.3%) grade 3 resection; 4 cases (4.7%) grade 4 resection; and 1 case (1.2%) grade 5 resection. Fifty-nine patients (68.6%) remained recurrence free during the follow-up period, and 27 patients (31.4%) experienced tumor recurrence.

**Conclusion:** The higher number of Simpson grade 1 and 2 resections in our cohort are consistent with the higher number of patients that remained recurrence free. DNA methylation profiling of our meningioma specimens will likely assist us in identifying patients that would benefit from adjuvant radiation therapy to further prolong their recurrence-free survival.

## **Nafisa Absher and Javeria Muhammadzai (Dr. Jay Shavadia)**

### *Contemporary Profile and Short-Term Outcomes of Patients Undergoing Coronary Artery Bypass Graft Surgery: A Single Center Experience*

**Background:** While coronary artery bypass graft (CABG) surgery has traditionally been the revascularization option for patients with complex and multi-vessel coronary artery disease (CAD), percutaneous coronary intervention (PCI) and novel secondary risk reduction pharmacotherapies have evolved the patient profile undergoing CABG. The aim of this study is to therefore describe contemporary risks and outcomes of patients treated with CABG at a single center in Saskatchewan.

**Methods:** A retrospective chart review examined patients treated with isolated CABG between July 2018-July 2019 at the Royal University Hospital, Saskatoon, Saskatchewan. Data collected included demographic variables, cardiovascular risk factors, pre- and post-operative medications, operative characteristics and investigations, in-hospital events, and 6-month outcomes.

**Results:** 198 patients underwent isolated CABG for the following indications: stable CAD 44%, non-ST elevation myocardial infarction/unstable angina 46%, and ST-elevation myocardial infarction 9%. Nearly one in two patients had diabetes, one in three had established CAD, 25.3% were smokers, 10% had chronic lung disease, 7% had cerebrovascular disease, 6% had history of heart failure, and 9.6% had severe left ventricular systolic dysfunction (<35%). Median number of grafts used was four, and the left internal mammary artery (LIMA) grafted onto left anterior descending (LAD) in 93%, non-LAD target in 6.1% and not used in 3.1%. The median in-hospital length of stays was 7 (5.00, 11.00) days. In-hospital complications occurred as follows: mortality 3.1%, new onset atrial fibrillation 19.7%, pleural effusion/pneumothorax 8.1%, acute kidney injury 1% and need for dialysis 1.5%. In survivors to hospital discharge, following outcomes were noted at six months: all-cause re-hospitalization 36.4%, unplanned revascularization 1%, and all-cause mortality 1%.

**Conclusion:** In patients selected for CABG within this single center in northern Saskatchewan, significant pre-operative comorbidity burden is evident. While the overall in-hospital and 6-month mortality remains low, nearly one in three patients is re-hospitalized within 6 months of surgery.

## **Michael Thatcher (Dr. Jeremy Reed)**

### *Does Tranexamic Acid Improve Visualization During Arthroscopic Rotator Cuff Repair A Double Blinded, Randomized Controlled Trial*

To determine whether intravenous administration of tranexamic acid (TXA) before shoulder arthroscopic rotator cuff repair surgery can improve arthroscopy visual clarity. Methods: This was a prospective, double-blind, parallel, 1:1, randomized, and placebo-controlled study. Patients requiring arthroscopic rotator cuff repair were enrolled and randomly assigned to either the TXA group (receiving 1g of TXA intravenously 10 minutes before surgery) or the placebo group (receiving the same volume of plain saline). The surgeon was blinded to the patient's group. Patients with massive rotator cuff tears, coagulopathy, or concurrent use of anticoagulation medications were excluded. Visual clarity was rated by the surgeon using a Numeric Rating Scale from grade 1 (poor) to grade 6 (clear) at the end of the procedure. The primary endpoint of the study was the surgeon's rating of the quality of visualization at the surgical site. Systolic blood pressure was maintained around 100mmHg but was increased or decreased at the discretion of the surgeon while not exceeding 150mmHg at any point or more than 120mmHg more than once during the procedure. A total of 50 patients will be recruited with 25 in each group. Approval for off-label use of TXA has been submitted to Health Canada. It is expected that data collection will be completed four months from the date of obtaining Health Canada approval. The authors expect to submit a manuscript for journal publication by May of 2021.

## **Miranda Messmer (Dr. Michael Kelly)**

### *Imaging Biomarkers of Hemorrhagic Transformation*

Spontaneous intracerebral bleeding, or hemorrhagic transformation (HT), affects 20-70% of acute ischemic stroke (AIS) victims. The therapeutic capacity of thrombolytic treatment for AIS is limited because it increases the risk of HT, resulting in adverse clinical outcomes. The sudden increase in blood pressure and oxygen following reperfusion contributes to vascular damage and vessel rupture. Blood components accumulate within the brain parenchyma and contribute to neurodegeneration by exacerbating edema, inflammation, and reactive oxygen species production. Here, we performed Fourier transform infrared (FTIR) spectromicroscopy and clustering analysis to identify HT within murine brain sections of the photothrombotic stroke model. We hypothesize that areas of the brain's stroke lesion (infarct) where HT has occurred will have blood-specific biochemical properties at an the sub-acute timepoint (48-72h post-stroke). These biomarkers include lactate, a high protein-to-lipid ratio (relative to the lipid rich brain tissue), methyl protein sidechains and  $\alpha$ -helical secondary structures (i.e. from albumin and hemoglobin). Early HT spectra are strongly correlated ( $r=0.98$ ) with erythrocytes and have significant increases in the absorption of these biomarkers. Secondary brain injury can persist for weeks as these blood products are metabolized within the parenchyma. Identifying HT with FTIR provides the means to analyze its biochemical contribution involved in neurodegeneration.

## **Mitch Thatcher (Dr. Jeremy Reed)**

### *Patient Productivity Losses for Surgical Clinic Appointments and Initial Experiences with Telemedicine as a Method of Follow-up Care*

**Introduction:** Telemedicine has been rapidly implemented in orthopedics during the COVID-19 pandemic. These changes prompted the researchers to investigate the productivity losses that patients face when attending in-person appointments as well as quantify patient experiences with telemedicine.

**Methods:** We developed a telephone survey for patients who have had elective orthopedic surgery and have also attended at least one in-person and one phone call appointment. The survey assessed productivity losses with in-person appointments, experience with telemedicine, and preferred type of appointment in the future.

**Results:** 41 subjects completed the survey. Median travel distance to the clinic was 108.0 km and time spent in the clinic was 60 minutes. Subjects responded “yes” to various forms of productivity losses associated with attending in-person appointments, including missed work (46.3%), recreational activities (26.8%), home or yard care (14.6%), socializing with friends or family (12.2%), school (2.4%), childcare (2.4%), and lost income (34.1%). Average ratings, from 0-10, of various aspects of their telemedicine appointment included convenience (8.4), ease of use (9.2), confidence in the doctor’s diagnostic ability (8.2), likelihood of using services in the future (6.4), and overall satisfaction (8.2). Finally, preferred type of appointment for future follow-up care included in-person (36.6%), first visit in-person and the rest over the phone (61.0%), and unsure (2.4%).

**Conclusion:** Our research supports that patients have a favourable view towards telemedicine and are supportive of a blended in-person and telemedicine approach for follow-up care.

## Muhammad Shoker (Dr. Haissam Haddad)

### *Actionable Arrhythmias in Low-Risk STEMI Patients: The Role of Continuous ECG Monitoring Beyond 48 Hours of Reperfusion*

**Background:** Following reperfusion in ST segment elevation myocardial infarction (STEMI), continuous ECG monitoring is strongly recommended for the first 24-48 hours, the highest at-risk period for an actionable arrhythmia (AA). Beyond this time-frame, the incident rate of an AA and the role of continued telemetry is unclear.

**Methods and Results:** Between Dec 2019 and Mar 2020 (interrupted by COVID-19), we aimed to prospectively quantify the risk of an AA in a consecutive low-risk STEMI cohort treated within a single network of care (Royal University Hospital, Saskatoon). Patients presenting with cardiogenic shock, cardiac arrest or acute decompensated heart failure were excluded; additionally, excluded were patients treated medically without reperfusion. The primary outcome included the occurrence of an AA following discharge from the coronary care unit (CCU); an AA was defined as any of the following: >3 seconds asystole; high grade block; ventricular fibrillation; >15 beats ventricular tachycardia; atrial fibrillation with rapid ventricular response; and >15 beats supraventricular tachycardia. Patients with a history of any of these arrhythmias was also excluded. Key secondary outcomes included 30-day all-cause mortality and re-hospitalization. Continuous variables are presented as mean ( $\pm$ SD), and categorical variables as proportions. Of the 85 patients meeting eligibility criteria, 82 provided informed consent and their baseline demographics are presented in Table 1. The mean ( $\pm$ sd) durations of CCU and cumulative in-hospital length of stays were 2 ( $\pm$ 0.81) days and 3.8 ( $\pm$ 1.4) days, respectively. Two-thirds (n=54) had been treated with primary percutaneous coronary intervention, the rest with a fibrinolytic pharmaco-invasive strategy. The infarct-related territory was distributed as: anterior 34% and inferior 49%; significant stenoses (>70% non left main or >50% left main) in the non-infarct related territory were identified in 45%. Only 1/82 (1.2%) had an AA following CCU discharge; new onset atrial fibrillation not identified within the first 48 hours of presentation. All 82 patients survived to hospital discharge, and the 30-day rates of all-cause mortality and re-hospitalization were 1% and 10%, respectively.

**Conclusion:** In this small, single-center, observational analysis of contemporarily treated low-risk STEMI patients, the risk of an AA beyond 48 hours appears to be very small. The practice of universally monitoring all low-risk STEMI patients until hospital discharge needs to be better defined.

## **Nathan Baron (Dr. Daryl Fourney)**

### *Does Prolonged Symptom Duration Influence Surgical Outcomes for Cervical Radiculopathy*

Background: The traditional approach to cervical radiculopathy is conservative management, with the consideration of surgical referral typically recommended after 12 weeks of treatment without improvement<sup>1</sup>. With additional wait times between referral, specialist appointment, and surgery, the time interval between symptom onset and surgical intervention can be significant. A 2015 study<sup>2</sup> showed that receiving surgery within 6 months of onset resulted in significantly better outcomes of pain reduction. However, this study was done in America where wait times are more variable, and with a relatively small sample size (n=58).

Objective: The goal of this study is to investigate whether time-to-surgery significantly impacts outcomes of pain, daily function, and quality of life. The hypothesis is that in patients appropriately selected for surgery, a shorter time from symptom onset to intervention will result in significantly improved outcomes.

Methodology: A retroactive chart review was performed for 133 patients of a single surgeon. Primary outcome measures included Visual Analogue Scores for Neck and Arm, Neck Disability Index, and Euro-Quality-of-Life scores (VASneck, VASarm, NDI, and EQ-5D respectively). These measures were collected at an initial visit, 6-8-week follow-up, and 2-year follow-up.

Analysis/Results: A Multivariate Regression Analysis was performed comparing pre- and post-surgery scores, dichotomized by time from onset to surgery. Results will be discussed at presentation.

## **Saria Jabbar (Dr. Huse Kamencic)**

### *Management of Severe Postpartum Hemorrhage: A Quality Improvement Study*

Postpartum hemorrhage (PPH) is a significant cause of maternal morbidity and mortality worldwide.<sup>1,2</sup> Severe PPH is defined by an estimated blood loss greater than or equal to 1500 mL or the need for blood transfusion.<sup>3</sup> The worldwide incident rate of PPH is 5% compared to 2.5% for severe PPH.<sup>1,2,3</sup> Current guidelines for the management of PPH exist in terms of first line treatment such as uterotonics, bimanual massage and treating hypovolemia.<sup>4</sup> However further interventions such as Bakri Balloon tamponade, B-Lynch suture, uterine artery embolization and hysterectomy are utilized based on physician preference and judgement in cases of severe PPH. This study has three objectives: to determine the effectiveness of Bakri Balloon tamponade in comparison to B-Lynch suture and uterine artery embolization in the management of severe PPH, determine if early use of a Bakri balloon tamponade in the management of severe PPH decreases the rate of postpartum hysterectomies and if the management of severe PPH is equally effective in Saskatoon and Regina. We conducted a retrospective chart review of patients with severe PPH who delivered at Regina General Hospital in 2018. We identified 60 charts that met the severe PPH criteria and obtained various data points about demographics, interventions and patient outcomes. The study is currently incomplete as similar data will need to be obtained from Royal University Hospital in Saskatoon. Statistical analysis will be performed once both data sets are available to assess the effectiveness of severe PPH management on patient outcomes in both cities. Preliminary findings indicate that severe PPH is most often managed with a combination of uterotonics and Bakri Balloon in Regina. Without further analysis it is difficult to currently make any other claims. Once completed, we hope that the findings of this study will inform management guidelines for severe PPH in Saskatchewan.

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

### *Evolving Trends in Abdominal Aortic Aneurysm (AAA) Repair in Regina*

This study was undertaken to examine the changing trends in abdominal aortic aneurysm (AAA) repair in Regina, Saskatchewan. Surgical repair of AAAs in North America has begun to shift preference towards endovascular repair (EVAR) over conventional open AAA repair due to the less invasive nature of the procedure through EVAR. A retrospective chart review was performed to determine the frequency of AAA repairs as well as factors that influence selection of open or EVAR procedures between October 2004 and July 2019 in Regina, SK. Over the 15-year study period, 911 patients met criteria for elective AAA repair. Of the 911 patients, 76.4% of patients underwent open AAA repair and 23.6% underwent EVAR. Patients who underwent EVAR were shown to have favourable anatomy and increased co-morbidities when examining their Charlson Co-morbidity Index. Kaplan-Meier curves demonstrated that open AAA repair is associated with, on average, a 10-month increase in survival when compared with EVAR. Additionally, while open surgery has a higher rate of perioperative mortality, after a short period, open surgery has better survival than EVAR because it represents a cohort of patients with fewer co-morbidities. There was no statistically significant difference in average distance to hospital for selection of open vs. EVAR.

## ADJUDICATORS

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*Thank!  
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