2022 FACULTY RESEARCH DAY
DEPARTMENT OF SURGERY

University of Saskatchewan

Saskatchewan Health Authority

"Nothing in life is to be feared, it is only to be understood. Now is the time to understand more, so that we may fear less."

- Marie Curie

Marie Curie (1867 - 1934) was the first woman to be awarded a Nobel Prize in 1903.

Dr. Ivar Mendez

Fred H. Wigmore
Professor &
Provincial Head

Department of Surgery

University of
Saskatchewan &
Saskatchewan Health
Authority

Welcome to the 2022 Faculty Research Day!

After two years battling COVID-19, I am proud of the resilience of the Department members to maintain exemplary surgical care and keep research, educational, and quality improvement productivity under these strenuous pandemic circumstances. After the initial lockdown in March of 2020, research was reinitiated under strict COVID guidelines and formal educational activities were resumed using virtual technology platforms. We are now slowly transitioning to hybrid and in-person academic activities. This 2022 Faculty Research Day is a testimony of the dedication and commitment of the members of our department to research and our academic mission.

The Department is fully engaged in supporting and promoting research at all levels. The research committee, led by Dr. Daryl Fourney, has worked very hard in assisting faculty, residents, graduate, and undergraduate students in their research endeavors. Peer reviewed publications have reached an all-time high this past academic year and the number of faculty engaged in research continues to grow.

Our guest speaker this year is Dr. Trevor Schuler, Associate Professor of Urology from the University of Alberta. He will be speaking on health technology and surgical innovation.

Looking forward to an exciting day celebrating research in our Department.

As we continue to move forward from the COVID-19 pandemic, the greatest challenges for the health care system still await our surgical teams: dealing with a huge backlog of elective and semi-urgent procedures. Surgical waitlists are a key public health issue. Limited physical and human resource capacity will ensure that these wait lists continue to be a major problem for some time. There is a huge opportunity right now for surgeons to participate in research efforts to study the scope of the problem, its impact on patient outcomes, and future strategies to reduce waitlists. The latter requires innovation, and this is perhaps the greatest reason for optimism right now. New tools are needed to optimise surgical patient selection, improve perioperative quality care and shorten hospital stays to improve bed flow. Artificial intelligence is going to have a huge impact in analysing large amounts of clinical data to improve quality care. Minimally invasive technology/robotics continue to develop in an effort to reduce complications and shorten postoperative recovery time. But none of these tools are very useful without principled, skeptical, unbiased surgical scientific inquiry at the root of it all.

In short, the health care system is more invested into looking for ways to improve surgical outcomes/efficiency than ever before and surgeons need to play a key role in research and innovation to address these challenges.

As noted in the Annual Report, our Department's published research output continues to grow. I was very pleased to see so many high-quality abstracts submitted this year for Faculty Research Day. I am also very excited about our prospects for the future and many Divisions have been developing long-term funding plans for research coordinators and established research programs.

Today we have the great privilege of celebrating just a fraction of some of the surgical research that is being done in out Department. You will see a diverse group of researchers across multiple Divisions, spanning basic science and clinical-translational work. Please take this opportunity to learn more about research in the Department of Surgery and reach out to your colleagues to collaborate. I wish to thank all of the presenters, session chairs and judges. I would also like to thank the Department of Surgery Research Committee, who helped plan today's program and awards. I particularly want to thank our invited guest, Dr. Schuler. And finally, I would like to thank the support staff in the Department for facilitating such an excellent program.

Dr. Daryl Fourney

Professor &
Director of Research

Department of Surgery &
Division of
Neurosurgery

University of
Saskatchewan &
Saskatchewan Health
Authority

FACULTY RESEARCH
AWARDS

2021 Award Recipients

Surgery
Faculty Research Day

Platform Presentations:

1st Prize	Elisabet Jakova/Dr. Michael Zaki
2nd Prize	Dr. Michael Moser
3rd Prize	Dr. Jonathan Norton
Honourable Mention Presentation	Dr. Gary Groot

2019 Award Recipients

Surgery
Faculty Research Day

Platform Presentations:

1st Prize	Dr. Paul Mick
2nd Prize	Dr. Jeremy Reed
3rd Prize	Dr. Michael Zaki
Honourable Mention Presentation	Dr. Jake Pushie

2018 Award Recipients

Surgery
Faculty Research Day

Platform Presentations:

1st Prize	Hye Ji (Jay) Kim
2nd Prize	Dr. Michael Moser
3rd Prize	Dr. Daryl Fourney

2022

VIRTUAL FACULTY RESEARCH DAY
DEPARTMENT OF SURGERY

May 12, 2022

Contents

Introduction

Virtual Faculty Research Day
Department of Surgery

08:00 AM - 08:05 AM

WELCOME

Dr. Ivar Mendez

Fred H. Wigmore Professor & Provincial Head
Department of Surgery
University of Saskatchewan & Saskatchewan Health Authority

OPENING REMARKS

Dr. Daryl Fourney

Professor & Director of Research
Department of Surgery
University of Saskatchewan & Saskatchewan Health Authority

Session I

Virtual Faculty Research Day
Department of Surgery

MODERATOR: Dr. Gary Groot

08:05 AM - 09:50 AM

10 Minute Break 9:50 AM - 10:00 AM

Keynote Speaker

Department of Surgery
Virtual Faculty Research Day

MODERATOR: Dr. Kunal Jana

10:00 AM - 11:00 AM

Evidence Decision Support Program and PACOSI - Provincial Advisory Committee on Surgical Innovation

Dr. Trevor Schuler

Associate Professor, Division of Urology
Department of Surgery, Faculty of Medicine & Dentistry
University of Alberta

10 Minute Break 11:00 AM - 11:10 AM

Dr. Trevor Schuler

Associate Professor,
Divisional Director &
Zone Section Lead
(Edmonton Zone)

Department of Surgery &
Division of Urology

Faculty of Medicine &
Dentistry, University of
Alberta

Trevor Schuler is an attending Urologic Surgeon and Associate Professor of Surgery in the Division of Urology at the University of Alberta. He completed medical school at the University of Saskatchewan in 2001, Urology Residency in Edmonton in 2006 and a Society of Endourology Fellowship at St. Michael's Hospital in Toronto in 2008.

Dr. Schuler serves as Zone Section Lead for Urology in the Edmonton Zone with Alberta Health Services and Divisional Director for the Division of Urology at the University of Alberta.

His clinical interests are in urolithiasis, endourology, and minimally invasive urologic surgery. His research focuses on Health Technology Assessment, health outcomes, health services utilization and quality research.

Session II

Virtual Faculty Research Day
Department of Surgery

MODERATOR: Dr. Paul Mick

11:10 AM - 1:05 PM

Presentation of Awards & Closing Remarks

Department of Surgery
Virtual Faculty Research Day

1:05 PM - 1:30 PM

PRESENTATION OF AWARDS

Surgery Open Access Fees Award Winners
New Faculty Seed Funding Award Winners

Dr. Ivar Mendez
Fred H. Wigmore Professor and Provincial Head
Department of Surgery
University of Saskatchewan & Saskatchewan Health Authority

Dr. Daryl Fourney
Professor & Director of Research
Department of Surgery
University of Saskatchewan & Saskatchewan Health Authority

CLOSING REMARKS

Dr. Daryl Fourney
Professor & Director of Research
Department of Surgery
University of Saskatchewan & Saskatchewan Health Authority

1st, 2nd and 3rd Podium Presentations Award Winners will be announced via email later in the day

Acknowledgments

The Departments of Surgery would like to thank the following individuals for serving as judges and moderators for the 2022 Virtual Faculty Research Day.

Judges

Dr. Roland Auer
Professor, Department of Surgery
Division of Neurosurgery
College of Medicine, University of Saskatchewan

Dr. Suzanne Harriman
Assistant Professor, Department of Surgery
Division of General Surgery
College of Medicine, University of Saskatchewan

Dr. Paul Kulyk
Assistant Professor, Department of Surgery
Division of Orthopedic Surgery
College of Medicine, University of Saskatchewan

Dr. Ritesh Kumar
Assistant Professor, Department of Surgery
Division of Neurosurgery
College of Medicine, University of Saskatchewan

Dr. Trevor Schuler
Associate Professor, Department of Surgery
Division of Urology
Faculty of Medicine & Dentistry, University of Alberta

Session Chairs

Dr. Gary Groot
Professor, Department of Surgery
Division of General Surgery
College of Medicine, University of Saskatchewan

Dr. Kunal Jana
Assistant Professor, Department of Surgery
Division of Urology
College of Medicine, University of Saskatchewan

Dr. Paul Mick
Assistant Professor, Department of Surgery
Division of Otolaryngology
College of Medicine, University of Saskatchewan

2022
Department of Surgery
VIRTUAL FACULTY RESEARCH DAY ABSTRACTS

Preserving the Mind Through Personalized Brain Mapping

Platform Presenter: Dr. Layla Gould

Division of Neurosurgery, Department of Surgery
College of Medicine, University of Saskatchewan

Team Members/Affiliations:
Tasha Ellchuk (Department of Medical Imaging, University of Saskatchewan), Hamid Dabirzadeh (Department of Medical Imaging, University of Saskatchewan), Ron Borowsky (Department of Psychology, University of Saskatchewan), Josh Neudorf (Department of Psychology, University of Saskatchewan), Shaylyn Kress (Department of Psychology, University of Saskatchewan).

Rationale:
Functional magnetic resonance imaging (fMRI) is increasingly used for presurgical planning and intraoperative guidance for brain surgeries near eloquent cortex. Precise presurgical assessment of the individual functional anatomy surrounding a brain lesion is crucial for safe and effective neurosurgery. The operative feasibility, surgical approach, and risk of postoperative functional deficits are essential considerations when planning neurosurgical interventions. As each patient's brain anatomy is unique and the functional anatomy may present pathology-induced atypical organization or reorganization, brain mapping is not generalizable and must be done in a patient-specific manner. As interruption of white matter tracts can also lead to major neurological dysfunction, presurgical DTI tractography also provides information about the white matter surrounding lesions.

Methods:
Neurosurgical patients at RUH are preoperatively studied with fMRI and DTI for neurosurgical planning. fMRI paradigms for localizing eloquent cortex include various tasks for language and sensorimotor processing, and other cognitive processes such as audition, vision, and attention processing.

Results:
The presurgical fMRI and DTI results from RUH illustrate the utility of these techniques for presurgical counseling and planning. Integration of preoperative fMRI, DTI, and neuronavigation, allows the neurosurgeon to plan the safest route to and removal of the lesion.

Conclusion:
Preoperative fMRI is an effective for mapping brain tool for in neurosurgical cases in which lesions involve eloquent cortex. The combined use of multimodal neuronavigation (fMRI and tractography) and cortical stimulation under awake conditions provides the best option of minimizing the risk of neurological deficits and maximizing lesion excision.

Funding Sources:
None.

Multisensory Impairment in Older Canadian Adults

Platform Presenter: Dr. Paul Mick

Division of Otolaryngology - Head & Neck Surgery, Department of Surgery
College of Medicine, University of Saskatchewan

Team Members/Affiliations:
Razieh Safaripour (Department of Surgery, University of Saskatchewan), Rishi Thakkar (Department of Surgery, University of Saskatchewan), M. Kathleen Pichora-Fuller (Department of Psychology, University of Toronto), Walter Wittich (Ecole d'Optometrie, Universite de Montreal), Natalie Phillips (Department of Psychology, Concordia University).

Rationale:
Sensory health care is organized into silos based on individual sensory organs even though perceptions are integrated. We aimed to determine the degree to which four different sensory impairments (hearing, vision, smell and taste) were associated with each other to inform efforts to design more holistic approaches to sensory health care.

Methods:
An analysis of 30,000 participants in the Canadian Longitudinal Study on Aging (aged 45-85) was performed. The prevalence of multisensory impairment was calculated. Next, impairments in hearing, vision, smell and taste were determined using questionnaires. Age- and sex-standardized prevalence was calculated for each impairment according to each of the others. Multivariable regression was used to determine cross-sectional associations between sensory variables. Finally, we assessed longitudinal associations between audiometric hearing loss at baseline, and changes in visual acuity over a 3-year follow up, and vice versa (smell and taste items were only measured at one time point). Multivariable linear mixed models were used.

Results:
The prevalence of multisensory impairment increased exponentially with age. In cross-sectional models, loss of smell was independently associated with loss of taste (odds ratio 17.3, $p<0.001$), and hearing impairment was independently associated with impairments in vision (odds ratio 3.4, $p<0.001$) and smell (odds ratio 1.6, $p<0.001$). Worse audiometric hearing at baseline predicted faster declines in visual acuity, and vice versa, in longitudinal models.

Conclusion:
A generalized sensorineural impairment syndrome may exist in some older people. Individuals with a single sensory impairment should be screened for other impairments within an integrated health care model.

Funding Sources:
University of Saskatchewan College of Medicine (CoMRAD award).

A Comparison of Perineal Stapled Rectal Prolapse Resection and Altemeier's Procedure at two Academic Hospitals

Platform Presenter: Dr. Nathan Ginther

Division of General Surgery, Department of Surgery
College of Medicine, University of Saskatchewan

Team Members/Affiliations:
Zarrukh Baig (Department of Surgery, University of Saskatchewan), Haven Roy (Department of Surgery, University of Manitoba), Terry Phang (Department of Surgery, University of British Columbia), Ahmer Kharimuddin (Department of Surgery, University of British Columbia), Carl Brown (Department of Surgery, University of British Columbia), Dilip Gill (Department of Surgery, University of Saskatchewan).

Rationale:
Traditionally, the perineal repair of choice for full thickness rectal prolapse has been the Altemeier, a perineal proctosigmoidectomy with a handsewn anastomosis. A recently described variant of this procedure combines the resection and anastomosis into one step by means of linear and transverse stapling. There is little published data comparing characteristics and outcomes of these two approaches. This study aims to perform a perioperative, postoperative, and cost comparison between the perineal stapled prolapse resection and the Altemeier procedure.

Methods:
Observational case-control series in two western Canadian tertiary care teaching hospitals. All patients undergoing perineal stapled prolapse resection (25) and Altemeier (19) between 2015 and 2019 were included. The main outcome measures were operative time, prolapse recurrence, and operating room cost.

Results:
The perineal stapled prolapse resection group was significantly older than the Altemeier group (81 [95% CI; 70-92] vs 74 years [95% CI; 63-85]; $p = 0.047$), with a lower Body Mass Index (21.4 [95% CI; 17.7-25.1] vs 24.4 [95% CI; 18.5-30.3]; $p = 0.042$) and equivalent American Society of Anesthesia score (2.84 [95% CI; 2.09-3.59] vs 2.68 [95% CI; 1.93-3.43]; $p = 0.49$). The operative time for perineal stapled prolapse resection was significantly less (30.3 [95% CI; 16.3-44.3] vs 67 mins [95% CI; 43-91]; $p = <0.0001$), as were the operative costs. Recurrence (28% vs. 37%; $p = 0.53$) and complication rates were equivalent.

Conclusion:
Perineal stapled prolapse resection is a safe, efficient, and effective approach to perineal proctosigmoidectomy, with outcomes comparable to the Altemeier procedure.

Funding Sources:
Department of Surgery Publication Fund.

Comparing Superficial vs. Deep Local Anesthetic Infiltration to Improve Patient Experience During Carpal Tunnel Release

Platform Presenter: Dr. David Sauder

Division of Orthopedic Surgery, Department of Surgery
College of Medicine, University of Saskatchewan

Team Members/Affiliations:
Kristi Billard (Department of Surgery, University of Saskatchewan), Laura Sims (Department of Surgery, University of Saskatchewan), Yanzhao (Alex) Cheng (Department of Surgery, University of Saskatchewan), Anne Sperling (Clinical Trial Support Unit, University of Saskatchewan).

Rationale:
Carpal tunnel release (CTR) is generally performed with the patient wide-awake using local anesthetic (LA). We compared two LA infiltration techniques to determine which is best to provide the least amount of pain or discomfort during a CTR. The two methods are subcutaneous infiltration alone (superficial) and subcutaneous infiltration with infiltration into the carpal tunnel (deep).

Methods:
On the morning of their procedure, 74 participants (n=80 cases) were recruited and randomized to either deep or superficial LA infiltration. There were 38 in the deep group and 42 in the superficial group. The primary outcomes were presence and severity of pain during the LA infiltration and the procedure.

Results:
Average age of participants was 63.04 ± 12.92 (n=40 females and n=34 males). In the deep group, 21% experienced pain during freezing compared to 9.5% in the superficial group (p=0.149), while 13.2% of the deep group and 11.0% of the superficial group experienced pain during the procedure (p=0.866).

Conclusion:
In this randomized clinical trial comparing deep vs. superficial LA infiltration techniques for CTR, we found that there was no statistically significant difference in the pain experienced during the administration of the LA or during the procedure. Given these findings, we recommend using superficial infiltration for CTR as it is technically easier and reduces the risk of potential median nerve injury.

Funding Sources:
Department of Surgery Resident Research Award.

Case in Kinase 2 Regulates Adenosine Transport and Adenosine A1 Receptor Trafficking in Hypoxia

Platform Presenter: Dr. Francisco Cayabyab

Neuroscience Research Cluster, Department of Surgery
College of Medicine, University of Saskatchewan

Team Members/Affiliations:
Zhicheng Chen (Shenzhen Bay Laboratory, China), Jocelyn Stockwell (Department of Surgery, University of Saskatchewan), Zhi Ming (Department of Surgery, University of Saskatchewan), Nicole L. Longmuir (Department of Surgery, University of Saskatchewan).

Rationale:
The adenosine transporters called equilibrative nucleoside transporters (ENT1/ENT2) and adenosine A1 receptors (A1Rs) are widely expressed in the hippocampus, acting to regulate extracellular adenosine levels and induce synaptic depression, respectively, during cerebral ischemia. We recently showed that casein kinase 2 (CK2) inhibition exacerbated the downregulation of A1R surface expression during hypoxia. Since ENT1 contains a consensus site for CK2 phosphorylation, we hypothesized that inhibition of CK2 function during hypoxia increases A1R-dependent downregulation of ENT1 surface localization.

Methods:
In rat primary cultures of hippocampal neurons and hippocampal brain slices, we determined using biochemical analyses and confocal imaging whether ENTs interacted with A1Rs and whether CK2 inhibitors reduced ENT phosphorylation in normoxia and hypoxia.

Results:
Using hippocampal brain tissue homogenates or primary cultured neuron lysates, ENT1/ENT2 co-immunoprecipitated or colocalized with A1Rs, and ENT1 showed constitutive phosphorylation at Serine254-ENT1 (pSer254-ENT1, a known CK2 target). The CK2 inhibitors (TBB, DMAT, and DRB) reduced, while the CK2 activator spermine increased, pSer254-ENT1 levels in rat hippocampal tissue. Moreover, CK2 inhibition significantly downregulated ENT surface expression in rat hippocampal tissue and primary hippocampal neurons. In contrast, direct ENT1 inhibition with NBTI did not alter pSer254-ENT1 levels but did cause a significant A1R-dependent downregulation of ENT1 surface expression. Furthermore, both CK2 and ENT inhibitors enhanced hypoxia-mediated downregulation of ENTs and A1Rs. Finally, CK2 inhibition reduced hypoxia-induced neuronal damage.

Conclusion:
Our results indicate that ENTs are physically coupled with A1Rs and that CK2-mediated changes in A1R-linked ENT trafficking represent an important regulatory mechanism of hypoxic/ischemic hippocampal brain damage.

Funding Sources:
Natural Science and Engineering Research Council of Canada (NSERC), Saskatchewan Health Research Foundation (SHRF) Collaborative Innovation and Development Grant, Heart and Stroke Foundation of Canada, and Canada Foundation for Innovation to FS Cayabyab.

Long-Term Patient-Reported Functional Outcomes Following Fragility Fractures of the Distal Radius – Do Outcomes Continue to Change Beyond a Year?

Platform Presenter: Dr. Laura Sims

Division of Orthopedic Surgery, Department of Surgery
College of Medicine, University of Saskatchewan

Team Members/Affiliations:
Sam Ibrahim (Department of Surgery, University of Saskatchewan), Yanzhao (Alex) Cheng (Department of Surgery, University of Saskatchewan), Samuel Stewart (Faculty of Medicine, Dalhousie University), Geoffrey Johnston (Rebalance MD, Victoria, BC).

Rationale:
To evaluate functional outcomes following fragility fractures of the distal radius at greater than five years and to compare these to one-year outcomes.

Methods:
Women 50-years of age and older and at least five years from a distal radius fracture (DRF) were invited to complete a repeat Patient Reported Wrist Evaluation (PRWE). Seventy participants were included, and changes in total PRWE scores and subscales from one-year to final follow-up were assessed. Secondary analysis was performed to assess those managed non-operatively compared to operatively, as well as to identify risk factors correlated with those who experienced worsening from one-year to final follow-up.

Results:
Mean time from injury to final follow-up was 5.8 years. Total PRWE scores from one year (12.4; 16.8) to final follow-up (9.5; 16.1) and change in total PRWE scores were not significantly different. In this time period, 26% reported worsening, 57% improvement, and 17% no change. No significant differences were present based on initial treatment, presence of a non-union, nor age. A subgroup analysis of those who worsened at final follow-up identified no significant correlations with age, limb dominance, initial treatment, radiographic outcomes, nor clinical outcomes.

Conclusion:
While no statistically significant differences were identified from one-year to final follow-up, some patients experience clinically significant improvement while some declined. This may be useful when counselling individuals on expected long-term outcomes. A ceiling effect limited assessment, and future long-term outcome studies for distal radius fractures should focus on functional outcome assessment tools that overcome this.

Funding Sources:
None.

Telerobotic Sonography for Remote and Rural Populations

Platform Presenter: Dr. Ivar Mendez

Division of Neurosurgery, Department of Surgery
College of Medicine, University of Saskatchewan

Team Members/Affiliations:
Scott Adams (Department of Medical Imaging, University of Saskatchewan), Rachel Johnson (Department of Surgery, University of Saskatchewan), Paul Babyn (Department of Medical Imaging, University of Saskatchewan).

Rationale:
Ultrasound imaging is a core diagnostic technology. However, rural, and remote communities in Canada and around the world have limited or no access to this diagnostic modality that is necessary to manage a wide variety of diseases across multiple organ systems. We have explored the use of a novel robotic ultrasound technology to address this gap in ultrasound diagnostic services in Saskatchewan.

Methods:
We deployed novel robotic sonography systems in 3 rural communities in Northern Saskatchewan. No sonography expertise was needed in the rural locations and expert sonographers operated the systems remotely from Saskatoon. Head-to-head clinical comparisons to standard sonography were conducted. Satisfaction of patients and clinicians using the system was determined and cost effectiveness of the systems was evaluated.

Results:
Robotic sonography was comparable to conventional sonography in both abdominal and obstetrical imaging, the only two modalities tested. There was a high degree of satisfaction of both clinicians and patients using this technology. Telerobotic sonography was found to be cost efficient in communities with population >2075 people and a distance >350 km from the nearest ultrasound facility.

Conclusion:
Telerobotic ultrasound is a feasible solution to perform diagnostic ultrasound exams and improve access to ultrasound imaging for remote and rural populations.

Funding Sources:
Canadian Institute of Health Research (CIHR), Saskatchewan Health Research Foundation (SHRF).

The Association of Matrix Metalloproteinases With Acute Kidney Injury Following CPB-Supported Cardiac Surgery

Platform Presenter: Dr. Erick McNair

Division of Cardiac Surgery, Department of Surgery
College of Medicine, University of Saskatchewan

Team Members/Affiliations:
Michael Moser (Department of Surgery, University of Saskatchewan), Prosanta Mondal (Department of Community Health and Epidemiology, University of Saskatchewan), Greg Sawicki (Department of Pharmacology, University of Saskatchewan), David Reid (Department of Medicine, University of Saskatchewan), Abbas Khani-Hanjani (Department of Surgery, University of Saskatchewan), Josie Conacher (Department of Surgery, University of Saskatchewan).

Rationale:
Cardiac surgery–associated acute kidney injury (AKI) is an adverse outcome that increases morbidity and mortality in our patient population. Use of serum creatinine levels as an indicator of AKI has limitations because of its slow rise and poor predictive accuracy for AKI. We hypothesize that serum and urine levels of matrix metalloproteinases (MMPs)-2 and -9 are associated with and may provide earlier detection of AKI as compared with serum creatinine in our surgical patients.

Methods:
There were 150 cardiopulmonary bypass-supported (CPB) cardiac surgeries, 21 of which developed AKI according to the Kidney Disease Improving Global Outcomes criteria. We then selected 21 propensity matched cases from those without AKI. Primary outcomes were the measurement via gel zymography of the serum and urine activity of MMPs-2 and -9 drawn at specific time intervals.

Results:
At the 10-minute and 4-hour post-CPB time points, the serum MMP-2 and MMP-9 activity of AKI patients were significantly higher ($P < .001$ and $P = .004$; $P = .001$ and $P = .014$) as compared with non-AKI patients, respectively. At the same timepoints, urine MMP-2 and MMP-9 activity of AKI patients were significantly higher as compared with non-AKI patients ($P < .001$ and $P < .001$; $P < .001$ and $P < .001$), respectively.

Conclusion:
The study demonstrated that serum and urine levels of activity of MMP-2 and MMP-9 are associated with the clinical endpoint of AKI and appear to have earlier rising levels as compared with those of serum creatinine.

Funding Sources:
The RUH Foundation, College of Medicine Research Award, Department of Surgery.

Colorectal Liver Metastases with Higher Arterial Enhancement are More Likely to Respond to Drug-Eluting Bead Transarterial Chemoembolization (deb-TACE)

Platform Presenter: Dr. Mike Moser

Division of General Surgery, Department of Surgery
College of Medicine, University of Saskatchewan

Team Members/Affiliations:
Afsoun Amiraslany (College of Medicine, University of Saskatchewan), Chris Wall (Department of Radiology and Diagnostic Imaging, University of Saskatchewan), Shahid Ahmed (Saskatchewan Cancer Agency).

Rationale:
Drug-eluting bead transarterial chemoembolization (deb-TACE) involves the injection of microbeads containing chemotherapy via the arterial supply to a tumour. We hypothesize that colorectal liver metastases (CRLM) with a higher arterial blood supply have a better treatment response to TACE.

Methods:
We performed a chart review of all patients undergoing deb-TACE for CRLM in Saskatoon between 2013 and 2020 (n=97 procedures). We included only those studies in patients with at least one tumour >2 cm, who had not previously undergone deb-TACE, and who had a prior triple-phase CT scan. The two largest tumours in each patient were measured for Hounsfield Units (HU) on the non-contrast, arterial, and venous phases (n=62 tumours in 36 patients), and five validated perfusion indices were calculated for each tumour. Treatment effect was assessed on the follow-up scan using the modified RECIST 1.1 CT-based criteria.

Results:
Univariate analysis of response to deb-TACE treatment was performed, followed by multivariate analysis for variables with $p<0.2$. Arterial phase enhancement (AE = tumour HU in arterial phase–tumour HU in non-contrast phase) had the strongest association with treatment response ($p<0.001$) in a model including age and controlling for bevacizumab use (a monoclonal antibody targeting vascular endothelium). ROC analysis revealed an optimal cut-off for AE of 5.5, which yielded a corrected odds of treatment response of 11.5.

Conclusion:
CRLM with higher AE appear to respond better to TACE. AE is easily measured on a triple-phase CT scan, and this information may help guide treatment decisions.

Funding Sources:
No funding was necessary.

Developing Three-Dimensional Myocardium as an Alternative to Heart Transplant

Platform Presenter: Farinaz Ketabat

Division of Neurosurgery, Department of Surgery
College of Medicine, University of Saskatchewan

Team Members/Affiliations:
Titouan Maris (Division of Biomedical Engineering, University of Saskatchewan), Zahra Yazdanpanah (Division of Biomedical Engineering, University of Saskatchewan), Nicole Sylvain (Clinical Trials Support Unit, University of Saskatchewan), Huishu Hou (Department of Surgery, University of Saskatchewan), Ildiko Badea (College of Pharmacy and Nutrition, University of Saskatchewan), Xiongbiao Chen (Division of Biomedical Engineering/Department of Mechanical Engineering, University of Saskatchewan), Michael Kelly (Department of Surgery, University of Saskatchewan).

Rationale:
Myocardial tissue engineering (MTE) is a new concept intending to cure or replace the infarcted area in the heart. MTE involving three-dimensional (3D) printing technologies could be a revolutionary solution that can mimic the architecture and microenvironment of the heart. Here, the 3D-printed scaffolds are designed in a way to mimic the fibre alignment of the heart with minimal endothelial-cardiomyocyte cell-to-cell distance to provide oxygen and nutrients to cardiomyocytes.

Methods:
In this study, two different polymeric materials have been chosen as the primary materials of the scaffolds. The viability of cardiomyocytes and endothelial cells was studied after seeding these cells onto different combinations of two polymers, alginate and gelatin. Two solutions with the highest cell viability (approximately 100%) were selected for fabricating the scaffolds. Following encapsulation of cardiomyocytes and endothelial cells inside polymeric solutions, they were 3D-printed layer-by-layer with endothelial cells outnumbering cardiomyocytes by ~1:3. The cells' viability and proliferation and the elastic modulus of the scaffolds were studied after printing.

Results:
The cell viability assays showed that the 3D-printing process does not affect the viability of the cells, and the scaffolds provided a suitable microenvironment for the cells to grow. The 3D-printed scaffolds also showed optimal mechanical strength comparable to the myocardium (10-15 kPa).

Conclusion:
In conclusion, the 3D-printed scaffolds provide ideal support for cardiomyocytes and endothelial cells to function. These scaffolds could be an ideal environment to induce vascularized myocardium tissue for in vitro and in vivo studies.

Funding Sources:
This project was supported by University Dean's Scholarship for the first and second year of Farinaz's PhD program and the BIOE Devolved Scholarship and the NSERC Research Funding (RGPIN 06396-2019) for the third and fourth year of the program. Michael Kelly is the Saskatchewan Research Chair in Clinical Stroke Research, and this project was partially supported by the Heart & Stroke Foundation, the Saskatchewan Health Research Foundation, and the University of Saskatchewan College of Medicine. The project was also partially supported by NSERC Discovery RG-PIN-2020-05315.

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

Platform Presenter: Dr. Jeremy Reed

Division of Orthopedic Surgery, Department of Surgery
College of Medicine, University of Saskatchewan

Team Members/Affiliations:
Robert Downey (College of Medicine, University of Saskatchewan), Dylan Turner (Faculty of Kinesiology & Health Studies, University of Regina), Pavlo Zerebecky (College of Medicine, University of Saskatchewan), Wyatt Tyndall (College of Medicine, University of Saskatchewan), Michelle McCarron (Department of Surgery, University of Saskatchewan).

Rationale:
Poor respiratory function and low oxygen saturation are often cited as reasons for prolonged hospital stays and delays in the initiation or progression of treatment. It has been anecdotally noted by the senior author that patients are often "slumped" in their beds, with their pelvis distal to the crook of the mechanized bed, leaving them flexed across the abdomen, in a kyphotic posture. This slumped position compromises overall respiratory status. The purpose of this study is to investigate the prevalence of poor semi-recumbent patient positioning on Saskatoon hospital wards.

Methods:
A visual assessment tool was created to classify position as good, fair, or poor. Data collection occurred in Saskatoon, on 12 different wards across three hospitals. Every patient's position was evaluated from anterior and lateral vantage points. Data collection occurred three times per week during three different time windows throughout the day.

Results:
2036 patients were observed. 1047 met inclusion criteria. In total, 98/1047 (9.4%) patients received a "poor" classification in one or both perspectives. Optimal positioning, which is defined as a "good" rating in both perspectives was seen in 540 (51.6%) patients. The only significant difference was lateral position by ward type where surgical wards had a lower prevalence of poor lateral positioning compared to medical wards.

Conclusion:
Patient positioning is consistent across hospitals and time of day. In Saskatoon hospitals, 9.4% of patients are poorly positioned. Ideally, poor positioning should be 0% and therefore we conclude that positioning could be improved on Saskatoon hospital wards.

Funding Sources:
University of Saskatchewan Dean's Research Fund

The Dimer Caffeine-Indan Promotes Neuroprotection in a Novel Model of Parkinson's Disease

Platform Presenter: Elisabet Jakova

Neuroscience Research Cluster, Department of Surgery
College of Medicine, University of Saskatchewan

Team Members/Affiliations:
Kevin Allen (College of Pharmacy and Nutrition, University of Saskatchewan), Ed Krol (Department of Chemistry/College of Pharmacy and Nutrition, University of Saskatchewan), Francisco S. Cayabyab (Department of Surgery, University of Saskatchewan).

Rationale:
Accumulating α-synuclein (α-Syn) aggregates in neurons and glial cells are the staples of many synucleinopathy disorders, such as Parkinson's disease (PD). Brain adenosine becomes greatly elevated in ageing brains and chronic adenosine A1 receptor (A1R) stimulation leads to increased α-Syn expression and neurodegeneration. To reduce the potential aggregation of α-Syn during chronic A1R stimulation, we tested the effects of caffeine/1-aminoindan (C-I) dimer which was previously shown to reduce α-Syn aggregation in a yeast model of synucleinopahty.

Methods:
We determined using a novel rat model of α-synucleinopathy whether a 7-day chronic injection of the A1R agonist CPA was sufficient to induce behavioural and morphological changes in brain regions. We also tested whether the dimer exhibits neuroprotective potential against chronic A1R stimulation using markers of neurodegeneration and confocal imaging. Therefore, four groups of male Sprague-Dawley rats were subjected to a 7-day sub-chronic injections as follows: (1) DMSO /Saline, (2) CPA, (3) C-I (3 mg/kg) + CPA, and (4) C-I (5 mg/kg) + CPA.

Results:
CPA treatments increased spatial memory deficits and anxiety in the Y-maze and Open Field Test, respectively. CPA treatments enhanced motor deficits (Forced Swim and Rotarod test). Also, immunohistochemical analyses of hippocampal and nigral slices showed increased neurodegeneration in the CPA treatments. These behavioural and morphological changes were reduced with co-administration of the C-I dimer.

Conclusion:
Our study demonstrates that A1R stimulation with CPA leads to A1R-dependent accumulation and aggregation of α-Syn. This rodent model of α-synucleinopathy will lead to further understanding of the molecular basis of PD pathophysiology and the development of neuroprotective PD drugs.

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Intraoperative Blood Flow Changes and Angiographic Outcomes After Direct Cerebral Revascularization for Moyamoya Disease

Platform Presenter: Dr. Uzair Ahmed

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Team Members/Affiliations:
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Rationale:
Moyamoya Disease (MMD) is a progressive steno-occlusive vasculopathy of the large intracranial vessels precipitating ischemic and hemorrhagic events. Cerebral revascularization is the mainstay of treatment in MMD. Intraoperative measurements of cerebral blood flow following direct intracranial bypass may be performed to quantitatively assess the anastomosis. We aim to correlate flow parameters to angiographic and clinical outcomes.

Methods:
Consecutive patients undergoing direct superficial temporal artery (STA) to middle cerebral artery (MCA) bypass were retrospectively analyzed. Preoperative and 6-month postoperative patient data was collected including presenting symptoms, MRI and angiographic findings, neurological complications, and functional outcome. Intraoperative cerebral blood flow was measured using a micro flow probe.

Results:
A total of 50 direct revascularization procedures in 39 patients were analyzed, of which 40 were in females (80%). The mean flow prior to anastomosis in the M4 MCA was +2.2 ± 6.1 ml/minute and +26.8 ± 19.0 ml/min in the STA. Post-anastomosis, the mean flow was -10.9 ± 14.8 ml/min (towards the Sylvian Fissure) in the proximal M4 and +7.9 ± 9.2 ml/min in the distal M4. At 6-month follow-up angiography, the graft was patent in all cases. Matsushima grade A, B, and C revascularization was obtained in 64%, 20%, and 16% of cases, respectively. Higher retrograde flow was observed in Matsushima grade A bypasses, compared to grades B and C. Postoperative stroke occurred in one patient, with Matsushima grade C.

Conclusion:
Greater intraoperative retrograde flow in the recipient MCA immediately following anastomosis was observed in patients achieving a higher Matsushima grade.

Funding Sources:
None.

Sâkipakâwin: Assessing First Nations and Métis Cancer Support Needs in Saskatchewan

Platform Presenter: Dr. Gary Groot

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Rationale:
Cancer is the leading cause of death in Canada. First Nations and Métis people historically experienced much lower rates of all cancer incidence and mortality compared to the general Canadian population. In recent decades however, First Nations and Métis are impacted disproportionally by high rates of diagnosis and lower cancer survival rates. Despite this increasing trend there is a limited understanding of the unique support needs for First Nations and Métis cancer patients.

Methods:
We used a mixed methods approach that included an environmental scan, key informant interviews, community gatherings, service provider focus group meetings and a survey of health directors to conduct this work.

Results:
We found that: a. Specific support for First Nation and Métis patients and their families are scarce in Saskatchewan, b. Kinship, spirituality and connection to culture were important informal supports that exist in community independent of the health care system, and c. Issues regarding coordination of care, access to services, culturally relevant care and educational supports such as navigation were most in need of being addressed.

Conclusion:
Our recommendations to the key stakeholders (SCA, SHA, MN-S, FSIN) are to establish an oversight committee to develop and implement an Indigenous Specific Cancer Strategy for Saskatchewan that would include but not be exclusive to: 1. Bridging the gaps between services provided by these organizations, 2. Address the need for Indigenous navigation of the healthcare system including cultural awareness/humility and language translation, and 3. Recognizing the complexity of Indigenous Sovereignty.

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Notes

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