College of Health Sciences
Faculty of Medicine & Dentistry
Anesthesiology & Pain Medicine

UNIVERSITY OF ALBERTA

13th ANNUAL GELFAN AND BELL

ANESTHESIOLOGY CONTINUING EDUCATION AND RESEARCH SYMPOSIUM

Friday May 10, 2024
Maple Leaf Room - Lister Centre

This event is an Accredited Group Learning Activity (Section 1) as defined by the Maintenance of Certification Program of the Royal College of Physicians and Surgeons of Canada, and approved by the University of Calgary Office of Continuing Medical Education and Professional Development.
You may claim a maximum of [4.5] hours (credits are automatically calculated)

Abstracts

Oral Presentations

Symposium Learning Objectives:
Research Day provides the opportunity for our grad students, residents, and fellows to demonstrate and measure their progress. Participants will strengthen professional collaborative bonds with their colleagues in and around the city of Edmonton. At the conclusion of this program, participants will be equipped to explain and apply knowledge using current anesthesiology related research and scholarly activities that have taken place in Edmonton over the past year.

Efficacy of surgically-inserted rectus sheath catheters, epidural and patient-controlled analgesia for major urologic surgeries

Presenter: Dr. Rebecca Entz[1]
Additional author(s): Dr. Vivian Ip[1], Rakesh Sondekoppam[2]
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Introduction (including objectives):
Enhanced Recovery After Surgery protocols recommend epidural analgesia in open procedures; however, they have associated risks and variable success rates. Rectus sheath (RS) catheters are gaining popularity as a pain adjunct with comparable efficacy and considerably less risk than epidurals. The utility of surgically-initiated RS (SI-RS) catheters is currently unknown.

We have examined the analgesic and non-analgesic benefits of SI-RS catheters compared to other modalities following open urologic procedures. Objectives of this presentation include a review of relevant literature, introduction to the technique of SI-RS catheters, discussion of methods, presentation of results, and consideration of limitations and future directions.

Design and Methods:
This is a retrospective audit of patients who underwent cystectomy/cystoprostatectomy from January 2010 to December 2016. Inclusion criteria were ≥ 17 years old, elective open cystectomy/ cystoprostatectomy, and ASA status I-III. Patients were grouped into PCA-only, SI-RS with PCA, and thoracic epidural analgesia (TEA) only.

The primary outcome was pain score at 24 hours with movement. Secondary outcomes included intraoperative and PACU opioid consumption, pain scores on movement at 12, 24, 48 and hours, length of PACU and hospital stay, ICU admission, and incidence of nausea/vomiting.

Results:
The probability of having a VAS score of < 5/10 at 24 hours post-op was significantly higher with either SI-RS or TEA compared no block, and similar results were noted at other time points. There was no significant difference between SI-RS and TEA groups. The groups showed no difference in ICU admissions, time to mobilization, time to oral diet, or length of hospital stay. TEA resulted in significantly longer PACU stays. There was one dislodgement and no leakage noted in any of the RS catheters.

Conclusions:
Pain scores on movement were lower with the use of SI-RS or TEA and were comparable. Use of TEA resulted in a longer length of stay in the PACU and was not associated with any significant benefits in terms of analgesia or non-analgesic outcomes. There was no leakage associated with the SI-RS technique.

Learning Objectives:
At the conclusion of this session, participants will be able to compare the efficacy of surgically-inserted rectus sheath catheters, epidural and patient-controlled analgesia for major urologic surgeries.

Enhanced Recovery After Cardiac Surgery (ERACS): A Comparative Study of Elective Cardiac Surgery Patients in the Pre-ERACS and Post-ERACS Era

Presenter: Dr. Sunny Fong[1]
Additional author(s): Dr. Wing Lam[1], Dr. Gerry Van Rensburg[1], Dr. Thomas Varughese[1], Dr. Roman Nepomuceno[1]
[1]Department of Anesthesiology & Pain Medicine, Faculty of Medicine & Dentistry, University of Alberta

Introduction:
Results of Enhanced Recovery After Cardiac Surgery (ERACS) protocols at various institutions are showing promising outcomes with regards to patient care, including decreased intensive care and hospital length of stay, post-operative complications, and opioid use.

In conjunction with CVICU, our local institution implemented an ERACS protocol in hopes to decrease variability in patient care, improve cost effectiveness, and improve quality of care for patients undergoing elective cardiac surgery.

Design and Methods:
The objective of this study is to assess the efficacy of the ERACS protocol, and audit patient outcomes to identify areas of strengths and weaknesses in the pathway for further refinements.

This is a pre-post study comparing elective cardiac surgery patients before and after ERACS protocol implementation. ERACS implementation occurred January 2024. The study is designed for quality assessment of the ERACS protocol, and therefore waiver of consent was obtained via the ethics board.

Outcome Measures:
The implementation protocol focused on intraoperative patient care bundles. This included adopting modern fasting guidelines, carbohydrate loading, multimodal analgesia, extensive post-operative nausea and vomiting prophylaxis, maintenance of normothermia, and minimizing post-operative sedation. Outcomes measured included time to extubation, post-operative pain scores and analgesic needs, post-operative nausea and vomiting, length of intensive care stay and hospital stay, and post-operative complications.

Results:
At the time of abstract submission, results of the post-ERACS patients were incomplete. In terms of pre-ERACS patients, a total of 189 chart reviews were conducted. The extubation time was typically 5.2 hours, and time to ICU discharge was 47 hours. Pain scores were an average of 5 throughout the first 24 hours, and over 99% of patients were treated with hydromorphone PO and IV. Post-operative nausea and vomiting was also high, as up to 60% of patients received anti-emetics within first 24 hours in the ICU. In general, complication rates were low, with acute kidney injury at 2.6%, delirium at 4.2%, cerebrovascular accident at 1%, re-intubations at 1.6% and re-sternotomy at 3.2%.

Learning Objectives:
At the conclusion of this session, participants will be able to describe the enhanced recovery pathway and identify the important outcomes measured in this study.

Analgesic consumption in chronic cannabis users following orthopedic trauma surgery

Presenter: Dr. Jaasmit Khurana[1]
Additional author(s): Gaurav Sidhu[1], Dr. David Thiessen,[1] Dr. Vivian Ip[1]
[1]Department of Anesthesiology & Pain Medicine, Faculty of Medicine & Dentistry, University of Alberta

Introduction:
Marijuana, legalized in Canada since 2018, has seen increased use, with 15% of Canadians employing it for medical purposes. Advocates suggest its potential for managing pain, including in fibromyalgia and multiple sclerosis; however, a recent ASRA guideline highlights the lack of evidence on cannabis's impact on acute postoperative pain. Our prospective study assesses opioid consumption and pain among chronic marijuana users after orthopedic trauma surgery, addressing a research gap in this demographic.

Methods:
Following ethics approval and written informed consent, orthopedic trauma surgery patients were categorized into study group (chronic marijuana users), those using marijuana at least once weekly for three months prior to surgery, or control group (non-users), who abstained for at least 12 months. Exclusions applied to those lacking consent capacity, receiving regional anesthesia, or experiencing chronic pain. Primary outcomes included oral morphine-equivalent opioid consumption in the first 72 hours, and secondary outcomes involved numerical rating scale (NRS) assessments, nausea incidence, and adverse events. Data analysis utilized 2-sample t-tests for continuous variables and chi-squared tests for categorical variables.

Results:
Out of 80 participants, three users and two non-users requiring rescue regional nerve blocks were excluded. Statistical analysis involved data from 38 non-users and 37 users, with users being notably younger. Demographic differences were minimal. No significant variations in mean opioid consumption were observed. Users reported higher NRS 24 hours postoperatively (rest), and pre-operatively and 48 hours postoperatively (dynamic). No other significant differences emerged in NRS, nausea, or complications. Due to substantial loss to follow-up at 2 weeks (27 participants), statistical significance for that comparison is not reported.

Discussion:
Our study showed opioid consumption was not significantly different between cannabis users and non-users, however, users reported significantly more pain at 24 hours (rest) and 48 hours (dynamic). Surprisingly, this heightened pain experience did not increase opioid consumption. These results highlight our limited understanding of cannabis' pain-modulating effects. Risk stratification for cannabis users is crucial, considering their potential for heightened pain, necessitating better analgesia. A larger study, perhaps including regional anesthesia, is warranted.

Learning Objective:
By the end of this session, participants will:
1. Acquire knowledge on local cannabis users' pain experiences
2. Reflect on the utility of multimodal analgesia in this patient population

Are we effectively controlling post-operative pain? A Quality Improvement Project on Post-operative Pain Scores in Level 3 OR at The University of Alberta.

Presenter: Dr. Zohreh Moazzeni[1]
[1]Department of Anesthesiology & Pain Medicine, Faculty of Medicine & Dentistry, University of Alberta

Introduction:
Postoperative pain, in addition to causing physical and emotional disturbances, possibly persistent postsurgical pain (PPP) and opioid misuse or use disorder is also a known factor for delaying discharge from PACU that can lead to delays and possible cancellations for subsequent operating room procedures.

Methods:
The anesthetic and PACU electronic records of 300 consecutive patients who had a surgical procedure in the main OR of the University of Alberta Hospital in January 2021 were reviewed retrospectively and the information about patient's demographics, procedure type and duration, intra-operative pain management modalities and the highest pain score in PACU using numerical or verbal rating scale collected. 48 patients were excluded as they did not have PACU admission. The pain scores classified as none to mild pain (0-3), moderate pain (4-6) and severe pain (7-10). The prevalence of each class of pain severity was observed in relation to patients' demographics, procedure type and duration, and the pain management that used intraoperatively before transfer to PACU.

Results:
The prevalence of moderate to severe pain in PACU was 36%. The highest prevalence of moderate to severe pain was reported by the patients in age group 18-39. The prevalence of moderate to severe pain was lowest in patients with urology and OHSN procedures. The prevalence of moderate to severe pain did not change significantly with adding NSAIDs and ketamine to intraoperative opioids. However, it was reduced significantly using pre-operative neuraxial or peripheral nerve block by the acute pain service team or intraoperative nerve blockade by the surgeon.

Conclusions:
The prevalence of moderate to severe pain in PACU in the University of Alberta Hospital was slightly lower than the reported prevalence in the literature (36% vs 41%). The addition of neuraxial or peripheral nerve blockade to the multimodal analgesia regimen made the most significant difference to the pain scores.

Learning Objectives:
At the conclusion of this session, participants will be able to recognize and visualize the pain prevalence in PACU and the reliable analgesic intervention in reducing postoperative pain as well as integrate improvements in pain scores at the University of Alberta Hospital.

Postoperative nausea and vomiting in the postanesthetic care unit not affected by guideline adherence or educational intervention

Presenter: Dr. Francesca Seal[1]
Additional author(s): Dr. Michael Vargo[1], Dr. Heather Ting[1]
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Introduction:
Post-operative nausea and vomiting (PONV) affects 30% of patients within 24 hours of surgery. Prevention of PONV reduces the duration of postanesthetic care unit (PACU) stay, costs, and increases patient satisfaction. The American Society of Enhanced Recovery and Society for Ambulatory Anesthesia published the fourth iteration of their consensus guidelines on management of PONV in August 2020 with the recommendation that the number of antiemetics administered for PONV prevention be determined by risk stratification.

Methods:
After obtaining approval from the University of Alberta Health Research Ethics Board, we performed a retrospective review of anesthetic records of adult patients undergoing elective procedures under general anesthesia at the University of Alberta Hospital. PONV prophylaxis was determined to be sufficient if the number of prophylactic measures for PONV met guideline recommendations. 500 charts were reviewed from January 1, 2021 to February 18, 2021 and 502 charts were reviewed from March 2, 2022 to April 4, 2022. After each chart review, anesthesiologists received individual and group data on PONV management.

Results:
Antiemetic administration met the guideline recommendations in 374/1,002 (37.3%) cases. 181/1,002 (18.1%) patients experienced PONV during the PACU period. There was no significant difference in the rate of PONV when the guideline was followed. There was no significant change in adherence to the guidelines or in the rate of PONV after providing anesthesiologists with the data from the initial chart review.

Conclusion:
While PONV was common, occurring in almost 1/5 of patients in our study, and the recent guideline recommendations for prophylaxis were not met in the majority of cases, our study did not find evidence to support the risk stratification strategy recommended in the guidelines in order to reduce PONV. Anesthesiologists at our institution were not influenced to change their clinical practice after being informed of their guideline adherence and of the rate of PONV among their patients.

Learning objectives:
By the end of this session, participants will be able to apply the “Fourth Consensus Guidelines for the Management of Postoperative Nausea and Vomiting” and evaluate the potential implications of the guideline for PONV management at our institution.

Polypharmacy: a flag for high-risk emergency surgery patients

Presenter: Dr. Melissa Shears[1]
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Purpose
Polypharmacy (≥5 medications) increases with age and is associated with adverse postoperative outcomes. This study aimed to 1) evaluate the association of polypharmacy with postoperative outcomes in older patients undergoing emergency general surgery (EGS) and 2) compare the predictive power of polypharmacy to the Comorbidity Polypharmacy Score (CPS).

Methods
This was a retrospective cohort study of patients ≥65 years presenting for EGS in 2 Canadian tertiary care hospitals from 2014-2017. Primary outcomes were 30-day and 6-month survival. Secondary outcomes included postoperative complications, length of stay (LOS), and readmission. Outcomes were estimated using multivariable modeling analyses. Discrimination between polypharmacy and CPS on survival was compared using concordance index analysis.

Results
Polypharmacy was present in 321/684 patients (46.9%). Mortality was higher in the polypharmacy group at 30-days and 6-months (6.9% vs 1.7% and 11.5% vs 4.4%, respectively, p<0.001). Adjusting for covariates, polypharmacy was associated with lower survival at 30-days and 6-months (HR 2.70, 95% CI 1.07-6.80; p=0.03, and HR 2.07, 95% CI 1.14-3.75; p=0.02). Polypharmacy was associated with postoperative delirium (OR 2.05, 95% CI 1.35-3.10; p<0.001), increased LOS (RR 1.20, 95% CI 1.05-1.36; p=0.01), and readmission (RR 1.20, 95% CI 1.05-1.36; p=0.05). There was no difference in survival at 30-days and 6-months between polypharmacy (c-index 0.85 and 0.81, respectively) and CPS (0.86, and 0.81).

Conclusions
Polypharmacy is common in older patients undergoing EGS and associated with adverse outcomes. Screening for polypharmacy is a simple and objective approach to identify high-risk patients. The more complex CPS may not add additional prognostic benefit.

Objectives
At the conclusion of this session, participants will be able to:
1. Define polypharmacy and the Comorbidity Polypharmacy Score (CPS)
2. Demonstrate the utility of polypharmacy and the CPS scores as risk prediction tools for perioperative emergency surgery
3. Describe possible mechanism(s) for the association between polypharmacy and perioperative adverse events

Optimizing resuscitation of the donation after circulatory death heart by mitochondrial protection in a porcine model

Presented By: Fulin Wang[1]
Additional author(s): Dr. Phing-How Lou[1], Dr. Eliana Lucchinetti[2], Dr. Darren Freed[3], Dr. Michael Zaugg[1,2]
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Introduction:
We have previously shown that a multi-drug postconditioning treatment of Intralipid, sevoflurane and remifentanil improved the function and viability of porcine extended criteria donation after circulatory death (DCD) hearts undergoing prolonged ex situ heart perfusion (ESHP). However, changes in the cardiac transcriptome as a result of the prolonged ESHP and multi-drug postconditioning have not been investigated. Therefore, the aim of this study is to identify transcriptomic changes in the myocardium of porcine DCD hearts undergoing 6 h ESHP in the presence or absence of multi-drug postconditioning.

Design and methods:
Porcine DCD hearts were mounted on a custom ESHP apparatus and perfused with or without multi-drug postconditioning for 6 hours (n=5/group). The multi-drug postconditioning treatment consisted of 1% Intralipid, 2% (v/v) sevoflurane and 3 nM remifentanil given at the onset of ESHP. Hearts not subjected to the ESHP process served as an unperfused, native control (n=8). Left ventricular tissue was collected at the end of ESHP and processed for next generation messenger RNA (mRNA) sequencing. Data was analyzed using Gene Set Enrichment Analysis software and confirmed by real-time reverse transcription polymerase chain reaction. Transcriptomic changes were compared between groups to evaluate the “perfusion” effect and the “multi-drug postconditioning treatment” effect.

Results:
Of the 21,849 genes identified, 5,344 genes were differentially expressed between perfused and unperfused hearts. Acute inflammatory response (e.g. TNFα, IL-1, IL-17) as well as hypoxia and oxidative stress gene response pathways (HIF-1α) were enriched in the perfused group. The multi-drug postconditioning treatment resulted in a small, but significantly regulated group of 48 genes, including those involved in maintaining lipid homeostasis (SREBF1, SCD), DNA repair as well as cytokine (IL-2, IL-6) signaling pathways.

Conclusions:
Prolonged ESHP activated stress-induced genes and produced an inflammatory mRNA signature in the DCD heart. Multi-drug postconditioning differentially regulated genes controlling metabolism and cytokine signaling in the myocardium, likely contributing to its cardioprotective effects and improved organ function.

Learning Objectives:
At the conclusion of this session, participants will be able to 1) describe the major transcriptional changes that occur in DCD hearts undergoing prolonged ESHP, and 2) identify key regulatory gene sets affected by multi-drug postconditioning and its implications on organ viability.

The ER chaperone ER Oxidoreductin (ERO1) plays a critical role in determining nociceptive sensitivity

Presenter: Aislinn Maguire[1]
Additional author(s): Dr. Jayadeep Rao[2], Dr. Shawn Lamothe[2], Dr. Stephanie Shiers[4], Dr. Muhammad Yousuf[4], Dr. Gustavo Tenorio[1], Dr. Theodore Price[4], Dr. Harley Kurata[2], Dr. Anna Taylor[1,2], Dr. Bradley Kerr[1,2,3]
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Introduction:
There is a pressing need for new clinical pain therapies. By targeting the excitability of primary pain-sensing afferents of the peripheral nervous system (nociceptors), we may be able to develop treatments with fewer side effects than those targeting the central nervous system. Here, we focused on how nociceptor excitability can be affected by endoplasmic reticulum (ER) and mitochondrial calcium dynamics. Particularly, through calcium transfer from the ER to mitochondria at the mitochondrial associated membrane (MAM). The enzyme ER oxidoreduction 1 (ERO1) plays an important role in this process as it stabilizes ER IP3 receptors, allowing for efficient calcium release from the ER to mitochondria. We hypothesized that inhibiting ERO1 and thus reducing calcium transfer at the MAM would dampen calcium transfer and nociceptor excitability, thereby reducing pain.

Methods:
We used immunohistochemistry (IHC) to confirm that ERO1 is expressed in mouse nociceptors. Next, we used the formalin test to determine if ERO1 inhibition could affect acute pain. We also cultured primary sensory neurons isolated from mouse dorsal root ganglia (DRGs) to assess changes to neuronal excitability, mitochondrial reactive oxygen species (ROS) production, energy production, and membrane potential in response to ERO1 inhibition. Finally, our collaborators used IHC and RNA sequencing to confirm ERO1 expression in post-mortem human DRGs.

Results:
Inhibition of ERO1 with the drug EN460 abolishes acute pain in the formalin test in mice. Furthermore, in DRG cultures EN460 reduces neuronal excitability, mitochondrial ROS and energy production, as well as mitochondrial membrane potential. These results indicate that EN460 can indeed reduce calcium transfer from the ER to mitochondria in these neurons, resulting in dampened excitability and pain.

Conclusion:
Our findings suggest that ERO1 inhibition with EN460 can meaningfully impact calcium transfer at the MAM, sensory neuron excitability, and pain in mice. Based on these results we believe that with further testing ERO1 inhibition could be a viable pain therapy in humans.

Learning Objectives:
At the conclusion of this session, participants will be able to gain awareness of the potential clinical significance of peripherally targeted pain treatments, and to consider ERO1 as a future therapeutic target for acute pain.

Investigating the Role of Ferroptosis in Neonatal Sepsis-Induced Liver Injury

Presenter: Si Ning Liu[1]
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Background:
Late-onset-sepsis (LOS) is the dysregulated host response to an infection occurring after 72 hours of life. The Global Burden of Disease study estimates LOS affects 1.3 million neonates annually, with most cases occurring in low- and middle-income countries. Ferroptosis is an iron-dependent type of cell death that occurs following tissue iron sequestration, which is known to occur during inflammation. We hypothesized that LOS-induced inflammation would induce ferroptosis, leading to organ dysfunction.

Methods:
Three-day-old Sprague Dawley pups received an intraperitoneal injection of fecal slurry (FS, 1.0 mg/g body weight) or vehicle (5% dextrose). All pups received buprenorphine for pain control and antibiotics with fluids. Pups were euthanized at 8h and 24h for blood and tissue collection. Markers for liver stress (plasma ALT), lipid peroxidation (MDA), and Fe3+ levels were assessed using available kits; gene and protein expression profiles of mediators of ferroptosis were assessed by qPCR and Western blots, respectively.

Results:
FS caused 30% mortality in septic pups ($P<0.0001$). In surviving pups, IL- 1β and IL-6 levels were increased, as were liver Fe3+ levels (+60%; $P<0.0001$), and plasma ALT levels (+840%; $P<0.0001$) at 24h post-FS injection. Malondialdehyde, a marker of lipid peroxidation, was increased 8h post FS injection (+230%; $P=0.0005$). Transcript profiles of key regulators of ferroptosis, including glutathione peroxidase 4 (Gpx4) and ferroptosis suppressor protein (Fsp1), were downregulated (-42%, $P<0.0001$; -40%, $P=0.0003$; respectively) in septic pups at 24h post-FS.

Conclusion:
Our findings suggests hepatic ferroptosis is present in LOS, but whether it contributes to liver injury is still under investigation.

Learning Objectives:
At the conclusion of this session, participants will be able to list the key mechanistic pathways leading to ferroptosis and differentiate the septic response at various timepoints that could result in ferroptosis in the liver of septic neonates.

A randomized trial of nerve block versus local infiltration for transcatheter aortic valve implantation – Preliminary results

Presenter: Dr. Charles Gélinas[1]
Additional author(s): Dr. Elliot Pittman[1], Dr. Francesca Seal[1], Fadi Hammal[1], Dr. Benjamin Tyrell[2], Dr. Angela Neufeld[1], Dr. Derek Dillane[1]
[1]Department of Anesthesiology & Pain Medicine, Faculty of Medicine & Dentistry, University of Alberta
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Introduction:
Transcatheter aortic valve implantation (TAVI) is a minimally invasive treatment of aortic stenosis, usually performed in patients who are not surgical candidates due to frailty. The use of local infiltration analgesia (LI) alone has been demonstrated to be feasible in the majority of patients undergoing a TAVI, though a significant proportion may require supplemental intravenous sedation due to pain or anxiety. We hypothesized that use of a targeted ultrasound-guided regional nerve block in place of the traditional approach of LI performed by the interventional cardiologist would decrease periprocedural pain and improve perioperative outcomes.

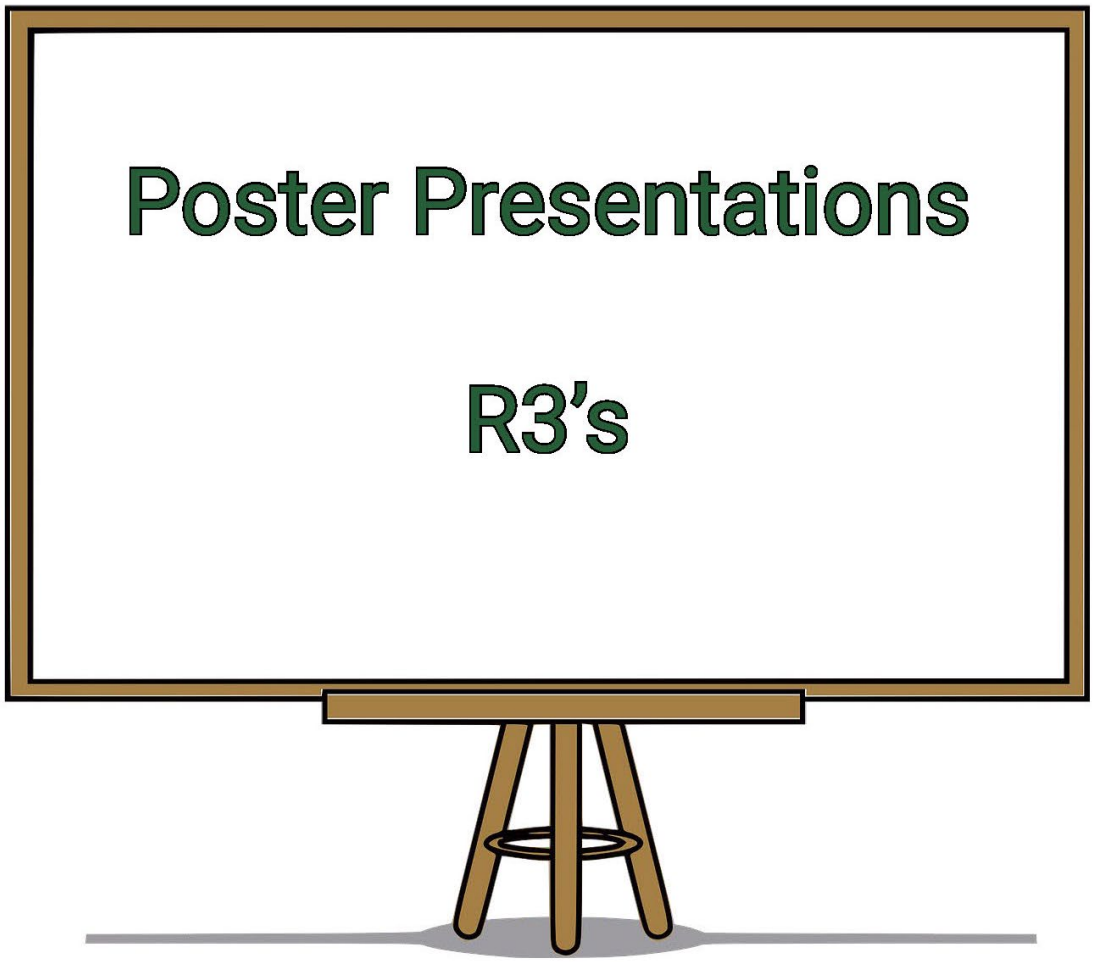
Design and Methods:
In this single center, randomized, double-blind trial, we will compare interventionalist-administered LI versus ultrasound-guided ilioinguinal/iliohypogastric, genitofemoral and femoral nerve blockade (NB) in 90 adult patients undergoing a TAVI at the Mazankowski Heart Institute (Edmonton, Canada). The primary outcome is the global quality of recovery-15 score (Qo-R15), measured 24 hours postoperatively. Secondary outcomes include total intra-operative sedation doses, perioperative analgesic requirements, pain scores, and postoperative delirium (3D-CAM).

Results:
Preliminary data analyzed on 20 patients. Median age was 80 (IQR 75-82) with 55% male patients. 9 patients were randomized to NB and 11 patients were randomized to LI. Mean Qo-R15 score in the NB group was 118 (SD 14), while it was 130 (SD 11) in the LI group. This was not statistically significant ($p=0.40$). Mean pain score was 2.9 (SD 4.1) in the NB group and 2.1 (SD 3.2) in the LI group. This was not statistically significant ($p=0.22$). The majority of patients did not require any opioids 24h post-procedure. Intra-operative sedation was minimal in both groups, and no patient was positive for delirium 24h post-procedure.

Conclusion:
Based on preliminary data, NB is feasible for TAVI but there is no difference in post-operative outcomes, when compared to LI. With both interventions, patients can undergo a TAVI with minimal sedation and postoperative pain. These results are underpowered and recruitment of all 90 patient is necessary to confirm these results.

Learning Objective:
At the conclusion of this session, participants will be able to discuss the role of regional anesthesia in patients undergoing a TAVI.

Abstracts



Two Pokes Too Many: Training and Implementation of Nursing Performed Ultrasound Guided Intravenous Access at The University of Alberta

Presenter: Dr. Ryan Brenneis[1]
Additional author(s): Dr. James Green[1], Ellen Reil[2]
[1]Department of Anesthesiology & Pain Medicine, Faculty of Medicine & Dentistry, University of Alberta
[2]Department of Critical Care, Faculty of Medicine & Dentistry, University of Alberta

Introduction:
Intravenous (IV) access is important for patient care and placement in hospital falls under the scope of nursing practice. Caring for patients with difficult IV access (DIVA) is more challenging. Ultrasound guided IV access (USGIV) has been shown to be an effective way to establish IV access in DIVA patients, reduce attempts, improve catheter dwell time, and reduce central venous access devices utilization. The objectives of this QI project are to establish a program at the University of Alberta (UAH) to train Medical Emergency Team (MET) nurses in USGIV, evaluate whether USGIV was successful in reducing IV attempts, and implement a workflow to minimize IV attempts without US guidance in DIVA patients.

Design and Methods:
A quality improvement initiative to train MET nurses at the UAH on USGIV access over a span of 1 month in the winter of 2023. A QI team was formed to design and implement a DIVA workflow incorporating MET nurse involvement to publish throughout the UAH hospital.

Intervention(s) and Outcome Measures:
Train MET nursing staff on USGIV as the primary method for IV insertion in patients with DIVA with the goal of 50% of the MET pool trained and utilizing US in 6 months.
Incorporate USGIV access within a DIVA workflow to become standard protocol for obtaining IV access at the University of Alberta.

Results:
At 6 months post intervention 41% of the MET nurse pool were trained and utilizing USGIV as the intervention of choice on DIVA calls. The success rate for those utilizing USGIV versus landmark based IV access for DIVA patients was 79% versus 60%.

Conclusions:
MET nurses are able to effectively learn and perform USGIV. A workflow was published with the ideal number of intravenous attempts prior to USGIV utilization being two.

Learning Objectives:
At the end of this session, participants will be able to:
1. Recognize the major benefits of utilizing ultrasound to facilitate intravenous catheter placement.
2. State the generalized steps in performing a quality improvement initiative.

Pharmacokinetic profile of ropivacaine given as a universal dose infusion via transversus abdominis plane and rectus sheath block catheters for postoperative surgical pain control

Presenter: Dr. Alan Chan[1]
Additional author(s): Dr. James Green[1], Dr. Dion Brooks[2], Al Nebaihi[2]
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[2]Faculty of Pharmacy and Pharmaceutical Science, University of Alberta

Introduction:
Ropivacaine infusions have emerged as a promising opioid-sparing analgesic option, specifically in the setting of post-operative multimodal analgesia. Despite its' benefits as a local anesthetic, ropivacaine also carries a risk of adverse effects such as cardiac and central nervous toxicity. The risk of adverse effects is correlated to the plasma concentration, however there is little data supporting the optimal therapeutic range, or a discrete level at which adverse effects appear. The aim of this study is to examine the effect of obesity on serum plasma ropivacaine concentrations.

Design and Methods
This is an observational study. Patients will be stratified by BMI in 3 groups: normal weight (18.8-24.9), pre-obese (25.0-29.9) and obese (>30).

Intervention(s) and Outcome:
Patients who have undergone a laparotomy-type incision will have a transversus abdominis or rectus sheath perineural catheter placed, and will receive a 0.25% Ropivacaine bolus at weight-based dosing per local anesthetic toxicity guidelines. In the post-anesthetic care unit, they will be attached to a ropivacaine infusion pump, which will be initiated at a rate of 1mL/hr, with scheduled intermittent boluses of 15 mL every 240 minutes. The primary outcome will be the mapping of serum plasma concentration of ropivacaine.

Results:
Data collection to begin in the immediate future. We expect to collect a total of 45 samples.

Conclusions:
Despite its widespread use, there is limited data available to guide clinicians on dosing to achieve optimized effects of perineural ropivacaine infusions, as a therapeutic plasma concentration target range has not yet been established. Body mass index seems negatively correlated with ropivacaine clearance from plasma. Despite a significant portion of the population being consider overweight or obese, there remains a deficiency in our understanding of how it impacts pharmacokinetics in this patient population, limiting our ability to provide safe and effective analgesia.

Learning Objectives:
At the conclusion of this session, participants will be able to recognize the impact of obesity on serum plasma ropivacaine concentrations.

Pain management for hospitalized patients with rib fractures: A systematic review of randomized clinical trials

Presenter: Dr. Christine Chiu[1]
Additional author(s): Fadi Hammal[1], Janice Y. Kung[2], Dr. Nori Bradley[3], Dr. Derek Dillane[1]
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Introduction:
Rib fractures are common injuries. Multiple analgesia strategies are available for treatment of pain associated with rib fractures. However, the optimal multimodal technique for pain management is not known. The primary aim of this review was to evaluate the status of evidence derived from randomized clinical trials on the effectiveness of pain management modalities for rib fracture pain.

Design and Methods:
Searches were conducted in MEDLINE, Embase, Scopus, and Cochrane Library. The screening process involved two phases, two researchers independently screened the title and abstract and subsequently screened full text. RCT data were extracted independently by two research team members. Consensus was achieved by comparison and discussion when needed. Risk of bias assessment was performed using the Cochrane Risk of Bias 2 tool.

Intervention(s) and Outcome Measures:
A variety of pain interventions for rib fractures were identified through this review including oral and IV analgesics, neuraxial techniques, peripheral nerve blocks and more. Studies that followed our criteria were further analysed primarily for pain outcomes. Secondary outcomes included ICU length of stay, hospital length of stay, mortality, and complications. Included studies were also evaluated for risk of bias.

Results:
A total of 1344 citations were identified. Title and abstract screening excluded 1128 citations, and full text review excluded 177 articles. A total of 32 RCTs were included in the full review. Multiple analgesia techniques and medications were identified and their effect on pain score and need for rescue opioid analgesia. None of the included studies were judged to have a high risk of bias, while only 10 studies were assessed as having a low risk of bias.

Conclusions:
This systematic review found that studies are of low quality with diverse methodologies and outcomes. A reduction in pain scores was found for epidural analgesia when compared with other modalities. However, the low quality of the evidence necessitates cautious interpretation of this finding.

Learning Objectives:
By the end of this session, participants will be able to:
- Describe and compare existing rib fracture analgesia methods
- Reflect on the limitations of the current literature.

Correlation of intraoperative lactate levels during prolonged OHNS reconstructive flap surgery with peri and postoperative morbidity and mortality measures and the effectiveness of fluid resuscitation in mitigating these measures

Presenter: Dr. Joshua Hahn[1]
Additional author(s): Dr. James Green[1], Dr. Maha Alsaif[1], Dr. Michael Jacka[1], Dr. Haidi Seiky[2], Dr. Derek Dillane[1]
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Introduction (including objectives):
Carefully selected patients with advanced head and neck cancers are amenable to resection and reconstruction under the care of Otolaryngology/Head and Neck surgeons (OHNS). These cases often proceed for upwards of 18 hours. The physiological stresses of both surgery and anesthetic can result in pathological changes to metabolism, resulting in accumulation of lactate which has been observed to rise to levels normally associated with severe, often life-threatening injury.

1. Determine commonly observed lactate levels in OHNS flap patients (Nov 2019 - Nov 2023) intraoperatively and days 1, 2 postoperatively.
2. Determine if there is any association between intraoperative lactate and postoperative outcomes e.g., mortality, morbidity, icu admission, length of icu stay, length of hospital stay etc.
3. Determine if there is any association between preoperative morbidity and patient characteristics, intraoperative management, and lactate levels.

Design and Methods:
Retrospective case study (Connect Care chart review) of patients that have undergone reconstructive flap surgery with the OHNS service between November 2019 and November 2023. Controls will be matched by sex, age and surgery type.

Intervention(s) and Outcome Measures:
No interventions. Outcome measure: increased intraoperative lactate levels. A variety of patient specific and perioperative variables will be assessed for effect on lactate.

Results:
Results pending review of charts.

Conclusions:
This in-progress research seeks to identify which preoperative patient characteristics and morbidities are associated with a higher intraoperative lactate level in OHNS flap surgeries, and how the fluid management strategies and lactate levels might affect outcomes. If a relationship is discovered between these variables, it facilitates alterations to preoperative assessment recommendations and intraoperative management paradigms. This will allow for a measurable benefit to our patients undergoing major surgery, with the addition that improved patient outcomes provide benefits in terms of healthcare costs.

Learning Objectives:
At the conclusion of this session, participants will be able to interpret intraoperative lactate levels in flap patients as well as to interpret possible causes of any elevation. This will allow practitioners to more appropriately treat this condition.

Towards a Guide for Pre-operative Type & Screen Testing – a Quality Improvement Study

Presenter: Dr. Jamie Hilland[1]
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Introduction:

Pre-operative type & screen (T&S) testing is commonly completed in preparation for surgery, however there is minimal local guidance in regard to which surgical procedures are high risk for requiring intra-operative blood transfusions. Transfusion requirements are unique to procedure, patient, and institution, which has prompted development of maximum surgical blood ordering schedules (MSBOS)1. This provides a guide to which procedures should receive pre-operative T&S testing based on local practices1,2. The objective of this quality improvement study is to create a local MSBOS in order to optimise timing of T&S testing to the required phase of care, generating cost saving measures via eliminating unnecessary blood sampling and increasing resource management of the blood bank/laboratories.

Design & Methods:

A retrospective chart review was performed with data collected from the University of Alberta (UofA) Hospital from November 2019-2023. Surgical specialities assessed included: General Surgery, Neurosurgery, Urology, Plastic Surgery, ENT, and Orthopedics. Inclusion criteria included elective surgery & pre-operative hemoglobin >120. Procedures were grouped based on surgical bookings, and phase of care during which patients received blood transfusions during admission was identified (intra-operative vs post-operative). Procedure specific transfusion rates were generated using data for intra-operative blood transfusion.

Results:

13 789 patients met inclusion criteria; from these patients 121 patients were transfused intra-operatively, with 3834 undergoing pre-operative T&S testing (3.2%).
Procedures with transfusion rates ≥ 5%, meeting criteria for pre-operative T&S testing, included:

- General surgery: exploratory laparotomy (8%), hepaticojejunostomy (8%), pancreatectomy (6%), pancreaticoduodenectomy (9%)
- Neurosurgery: posterior fossa craniotomy (7%)
- Plastic surgery: free flap closure (6%)
- ENT: Skull reconstruction (35%), facial reconstruction with neck dissection (16%), parotidectomy with neck dissection (8%), laryngectomy (11%)
- Urology: adrenalectomy (25%), cystectomy (6%), cystoprostectectomy (5%), radical nephrectomy (5%)

Conclusion:

Based on local transfusion rates for elective surgical procedures at the UofA Hospital, an MSBOS could be used to optimally guide timing of pre-operating T&S testing, optimizing hospital resources.

Learning Objectives:

By the end of this session, participants will be able to:

1. Indicate the benefits of having a local MSBOS
2. Describe local rates of peri-operative transfusion based on surgical procedure
3. Recognize the importance of implementing a targeted approach to pre-operative type & screen testing

Anki Flashcards for Anesthesiology Residents' Retention of Knowledge: A Randomized Control Trial

Presenter: Dr. Kristina Jeon[1]
Additional author(s): Dr. Austin Ho[1], Dr. Michael Zeeman[1], Dr. Nirupan Vipulananthan[2]
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Introduction:
Knowledge gained by a learner is easily and quickly forgotten, commonly described by Ebbinghaus' 'forgetting curve'.1, 2 This phenomenon is effectively countered by the 'spacing effect'; subsequent re-learning can lead to slower forgetting rates over time.3,4 Technology like quiz banks and digital flashcards provide a streamlined approach to optimize knowledge acquisition; however, often asynchronous to the learners' unique curriculum.5 The primary aim of this study is to evaluate whether using curated educational tools with the Anki flash card platform in-synchrony with curriculum would improve knowledge retention amongst learners.

Design and Methods:
Participants were voluntarily recruited from the PGY-1 and PGY-2 Anesthesiology and Pain Medicine and Family Practice Anesthesiology resident physician cohorts at the University of Alberta. Anki flashcard decks in various key topics were formulated by staff anesthesiologists and synchronized with the academic lecture curriculum.

Intervention and Outcome Measures:
Residents' identities were blinded and randomly divided into Group A and B; each received access to a different set of card topics (Topics A and B). Outcomes were obtained through comparing scores from a pre-test, post-test, as well as subjective pre- and post-study surveys.

Results:
There is a non-significant trend for higher mean delta scores amongst Group A learners (A 18.57%, B 1.43%, p=0.283), partly correlating to a higher proportion of Group A participants utilizing the flashcards. Pooled data demonstrates a statistically significant increase in delta scores between quizzes for Group-Topic matched questions (Q1 53.57% +/- 18.65%, Q2 68.57% +/- 17.03, p=0.043). The pre-study survey did not identify demographic differences between groups, although the post-study survey revealed more anesthesia rotations completed in Group A (A 12.20 +/- 5.40, B 3.25 +/- 0.50, p=0.014).

Conclusion:
Participants perceived Anki flashcards tailored to the curriculum effective, and a majority anticipated future use. Limitations include sample size and compliance. Future research should aim to improve motivation and utilization of synchronized spaced-repetition tools by learners.

Learning Objectives:
At the conclusion of this session, participants will be able to:
1. Describe the effect of spaced repetition in retention of knowledge.
2. Recognize the benefits of a synchronous spaced-repetition learning system.
3. Identify the real-life limitations and methods to support continued use of spaced-repetition tools by learners.

Equity and Diversity in Canadian Anesthesiology Residency Programs

Presenter: Dr. Valji, Yasmin[1]
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Introduction:
Increased diversity in the healthcare workforce has been shown to lead to higher quality patient care and enhance team performance. The overarching trend in medicine is underrepresentation of women and minority groups in most specialties, including anesthesiology. Currently, there is no data regarding the demographic features of anesthesiology residents in Canada. It is important to obtain this information as well as resident perceptions of equity and diversity, to guide future equity and diversity initiatives.

Design and Methods:
After obtaining approval from our local ethics board, an anonymous online survey was distributed to anesthesiology resident physicians in the 17 Canadian residency programs. The survey consisted of optional multiple choice questions that addressed the following topics: gender and ethnic identity, perceptions of diversity, and knowledge of initiatives in residency programs to foster equity and inclusion.

Results:
123 responses from 15 of 17 Canadian anesthesiology residency programs were received. 49% identified as male, 48% as female, and 1% as non-binary. 84% identified as heterosexual, 7% identified as lesbian/gay, and 8% as bisexual. 68% identified as White, 13% as East Asian, 8% as South Asian, 4% as Black, and 1% as Indigenous. 87% felt that equity and inclusion are important in residency training. 52% were unaware of existing initiatives in their programs about equity and diversity. 43% of residents reported receiving no training in anti-racism, sexual harassment, or gender inclusivity.

Conclusions:
This study reveals a similar proportion of male and female trainees. Compared to Canadian demographic data, there is similar representation of most ethnicities, as well as LGBTQ individuals. Indigenous individuals were underrepresented. Most residents believe equity and inclusivity are important in training, however, the majority were not aware of any existing initiatives within their programs. Important areas of growth include implementation of equity and diversity initiatives to ensure trainees reflect the diverse communities they serve and to educate trainees to care for minority groups.

Learning Objectives:
At the end of this presentation, participants will be able to:
1. Reflect on the current state of equity and diversity within Canadian anesthesiology residency programs.
2. Describe areas of future growth for equity and diversity initiatives.

Perioperative Management of Breastfeeding Patients Undergoing Day Surgery

Presenter: Dr. Valji, Yasmin[1]
Additional author(s): Dr. Jaime Sim[1]
[1]Department of Anesthesiology & Pain Medicine, Faculty of Medicine & Dentistry, University of Alberta

Introduction:
The perioperative period poses unique challenges to patients who are breastfeeding and undergoing day surgery. These may include separation from baby, breast engorgement and mastitis from delayed emptying, and pain control management. Additionally, healthcare providers may provide conflicting information regarding the management of breastfeeding in the perioperative setting. These issues can be potentially addressed by providing standardized information to patients preoperatively and adopting policies designed to improve the breastfeeding experience of patients in the perioperative setting.

Design and Methods:
After obtaining approval from our local ethics board, a brief survey was designed and distributed to breastfeeding patients undergoing day surgery in five local hospitals. The survey was completed by patients prior to their surgery. The survey consisted of optional multiple choice questions that addressed the following topics: patient demographics, breastfeeding challenges, and perception of the amount and quality of information received from health care providers regarding breastfeeding management.

Results:
Preliminary results suggest that patients did not feel that they received adequate information from their healthcare providers regarding management of breastfeeding in the perioperative period. Patients desired further information regarding post-operative pain management, pumping and dumping, and existing policies regarding bringing their baby to the hospital.

Conclusions:
Patients who are breastfeeding and undergoing day surgery would benefit from the provision of standardized information pre-operatively to guide the management of their breastfeeding. Additionally, future initiatives should focus on improving current practices in order to enhance the experience of patients who are breastfeeding in the perioperative setting.

Learning Objectives:
At the conclusion of this session, participants will be able to:
1. Identify the benefits of supporting breastfeeding patients during the perioperative period.
2. Appraise current local practices regarding the pre-operative and post-operative management of patients who are breastfeeding and undergoing day surgery.
3. Describe future steps to improve the perioperative management of patients who are breastfeeding and undergoing day surgery.

Abstracts

Neuroplasticity and pain: Examining the influence of exercise on nociception

Presenter: Dania Villarreal[1]
Additional author(s): Dr.Timo Friedman[1], Dr. Aislinn D Maguire[1], Dr. Gustavo Tenorio[2], Dr. Bradley Kerr[1,2]
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Introduction:
Exercise is praised for its extensive health benefits, but for people experiencing chronic pain, exerting oneself with movement seems counterintuitive and may be difficult to adhere to. The advantages of exercise for chronic pain states are severely understudied. Inflammatory conditions, specifically those that result in chronic pain, have been shown to increase neurite outgrowth in the sensory ganglia of mice and affect their electrophysiological properties. Whether this outgrowth exacerbates pain remains to be fully elucidated. Our data suggests that sensory neurons from adult mice show increased outgrowth in response to an aerobic exercise regimen. We now aim to study the transition between acute and chronic pain in mice and how it is affected by aerobic exercise.

Design and Methods:
We employed a model of 'hyperalgesic priming' to study the transition from acute to chronic pain. Mice are injected subcutaneously in the hindpaw with tumour necrosis factor-alpha (TNFα, 0.5 ng) to mimic an acute noxious stimulus. Once sensory thresholds resolve, they are treated with a second injection of inflammatory-mediator prostaglandin (PGE2 100 ng), which leads to a prolonged state of hypersensitivity. Before priming, naïve mice were given two weeks of voluntary wheel-running to analyze the effects of aerobic exercise. Control mice receive only PGE2 and no running treatment.

Results:
We hypothesized that active mice would exhibit increased neurite outgrowth, as observed in previous pilot studies. However, with the addition of a noxious stimulus, the mice may experience prolonged pain due to the simultaneous structural changes in the sensory neurons. Pain assessment revealed no difference between running and nonrunning mice. Our data indicate that aerobic activity alters the growth of sensory neurons, and the change in growth status is counteracted by a noxious stimulus.

Conclusions:
Our data indicate that aerobic activity alters the growth of sensory neurons, and the change in growth status is altered by a noxious stimulus. Sex differences in these responses are currently being explored.

Learning objectives:
At the conclusion of this session, participants will be able to identify how pain assessment in mice models is used to characterize sex differences in chronic pain and reflect on the growth-promoting activity of exercise.

Fate-mapping CX3CR1+ and CCR2+ cells to determine macrophage dynamics in the DRG in neuropathic pain

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*contributed equally.

Introduction:
Typically rated as "the worst pain imaginable" by patients, neuropathic pain (NeP) results from damage to the somatosensory nervous system. NeP presents in many chronic pain conditions including but not limited to peripheral nerve injury (PNI) neuropathies such as from phantom limb pain, trigeminal neuralgia, and post-chemotherapy pain in cancer patients. Peripheral neuropathies are common yet debilitating and very difficult to treat due to a poor understanding of the complex underlying mechanisms. NeP's well-characterised phenotype of prolonged mechanical hypersensitivity is partly mediated by tissue-resident macrophages (TRMs) and infiltrating macrophages derived from circulating blood monocytes (monocyte-derived macrophages, MDMs) in the nervous system. Vast recent evidence suggests that CNS microglia are critical players of NeP; however, the peripheral nervous system (PNS) macrophages remain poorly understood, despite the PNS having critical contributions to the establishment of long-term chronic pain to the CNS.

Design and Methods:
To address a cell-specific targeting approach, our study employs a fate-mapping strategy with transgenic mouse lines to better define the localization, morphology, and dynamics of the TRMs and MDMs in the spared nerve injury (SNI) model of PNI-NeP. Using CX3CR1CreER or CCR2CreER mice crossed with Ai9 mice (mice presenting the constitutive promoter line ROSA26tdTomato), we follow the TRMs or MDMs, respectively, over the acute-to-chronic timecourse.

Results:
MDMs increase in population density acutely at 7 days post injury (DPI) and then return to baseline density by 120DPI. Meanwhile, TRMs do not significantly increase in density compared to controls but overall decrease in density by 120DPI regardless of injury. Moreover, we observe that macrophages are morphologically diverse at 7DPI: MDM counts tend to increase in "spooning" and "branched" morphologies after injury while TRMs tend to have increased counts of "spooning" morphology after injury, which suggest macrophage-sensory neuron interactions. Finally, we also find that the "spooning" macrophages are not a subtype of satellite glia cells.

Conclusions:
Our findings provide evidence that TRMs and MDMs dynamically change throughout the timecourse of the SNI model of PNI-NeP.

Learning Objectives:
By the end of this session, participants will be able to distinguish how DRG macrophages change throughout NeP and its pathophysiology into chronicity providing context for future targets for immune-based neuropathic pain therapies.

Investigating elamipretide as a potential therapeutic for sepsis-induced cardiac dysfunction

Presented By: Jennie Vu[1]
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Introduction:
Sepsis is an often fatal condition characterized by a dysregulated host immune response to infection leading to organ dysfunction. Cardiovascular dysfunction precedes the development of multi-organ failure and mortality in sepsis. The septic heart is characterized by attenuated biventricular systolic and diastolic function resulting in a blunted ejection fraction and decreased ventricular compliance; this may be due to inflammation-induced cardiomyocyte injury, and metabolic aberrations involving mitochondrial dysfunction. Mitochondrial perturbations can cause cardiomyocyte damage and energetic failure, suppressing myocardial function. There are currently no targeted interventions to address sepsis-induced cardiac dysfunction. Elamipretide is a peptide that facilitates the assembly of electron transport chain supercomplexes, promoting efficient energy generation. We propose that elamipretide will improve cardiac mitochondrial energy metabolism and preserve cardiac performance, ultimately improving survival in sepsis.

Objective:
We aim to characterize myocardial depression and cardiac mitochondrial dysfunction in sepsis, and evaluate the therapeutic efficacy of elamipretide in improving cardiac function in sepsis-induced cardiomyopathy.

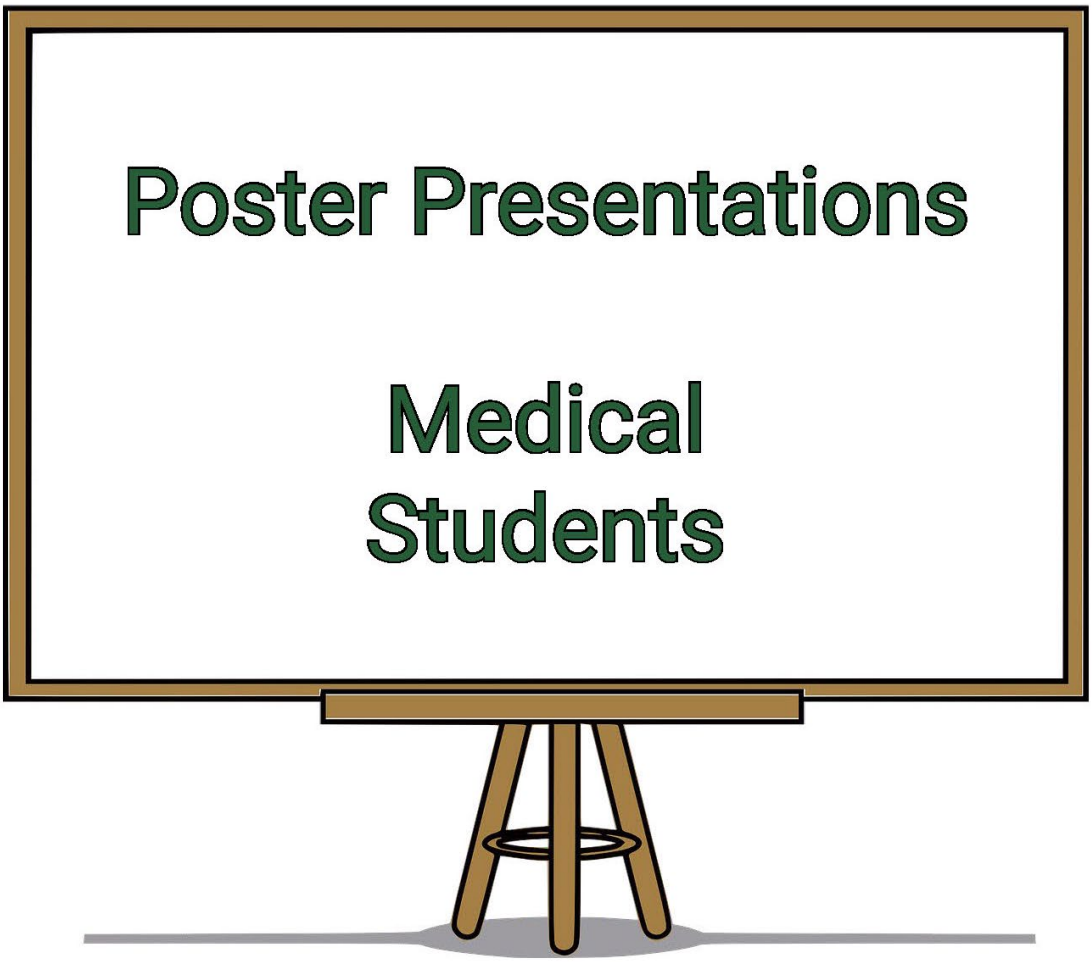
Methods:
A validated fecal slurry (FS) induced peritonitis (FIP) mouse model of sepsis was utilized whereby mice were injected intraperitoneally with fecal slurry (0.55 mg/kg) or dextrose vehicle. Additional intervention groups were included whereby elamipretide (10 mg/kg) or PBS vehicle were administered 1-hour after FS-injection. 12 hours post-inoculation, cardiac contractile capacity and ventricular filling ability were evaluated with speckle-tracking echocardiography. Left ventricular (LV) pressure-volume loop acquisition was used to elucidate load-independent cardiac and hemodynamic (mal)adaptations in sepsis. Biochemical assays were conducted to investigate inflammatory infiltration, markers of cardiac and kidney cell stress and injury, and activities of metabolic enzymes.

Results:
LV ejection fraction, cardiac output, and stroke volume were diminished in untreated septic mice, but elamipretide treatment significantly improved these parameters. Stroke work, cardiac inotropic capacity, cardiac efficiency, and ventriculo-arterial coupling indices were compromised in sepsis, and were significantly improved with elamipretide intervention.

Conclusions:
Elamipretide is a promising therapeutic candidate for the prevention of sepsis-induced cardiovascular decline by restoring cardiac contractility.

Learning Objectives:
At the conclusion of this session, participants will be able to characterize cardiovascular dysfunction in the FIP mouse model of sepsis, and summarize elamipretide-mediated improvements in cardiac performance.

Abstracts



Perioperative temperature monitoring and forced-air warming

Presenter: Lauren Coulombe [1]
Additional author(s): Dr. Michael Vargo[1]
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Introduction:
Maintaining normothermia improves emergence from anesthesia, intraoperative coagulation, and reduces rates of post-operative wound infections. Accordingly, current Canadian Anesthesiologists' Society (CAS) guidelines recommend continuous temperature monitoring for cases in which the duration of general anesthesia exceeds 30 minutes and warming systems be immediately available. Pre-warming before anesthesia may prevent heat redistribution. This study is a quality assurance study to determine rates of compliance with CAS perioperative temperature management guidelines and frequency of pre-warming at a local hospital.

Design and Methods:
This was an observational quality assurance study in which data was collected from 140 patients across three operative areas of the hospital – diagnostic treatment centre OR (DTCOR), ground OR (GOR), and women's OR (WOR). Temperature was measured pre-operatively and post-operatively upon arrival to the post-anesthesia care unit using the 3M SpotOn cutaneous zero heat flux thermometer system due to high concordance with pulmonary artery catheter temperature.

Intervention(s) and Outcome Measures:
Information regarding patient age, sex, surgical procedure and respective specialty, anesthetic type, usage of pre-operative and intra-operative forced-air warming (3M Bair Hugger System), and use of intra-operative temperature monitoring via invasive thermometers (nasopharyngeal, esophageal, or bladder) was collected.

Results:
35.1%, 50.0% and 29.4% of patients in DTCOR, GOR, and WOR, respectively, had post-operative temperatures below 36 degrees. Despite 82.1% of patients having a Bair Hugger gown on pre-operatively, only 7.9% of patients received forced-air warming pre-operatively. 32.8% of cases with a duration beyond 30 minutes had intra-operative temperature monitoring (34.0%, 0%, 57.1% in DTCOR, GOR, and WOR, respectively). Post-operative temperature was significantly lower in patients in otolaryngology and ophthalmology cases (GOR) (35.85±0.66, n = 20) compared to general surgery, thoracic, urology, orthopedic, and plastics cases (DTCOR) (36.22±0.61, n=97) ($p=0.03$, one-way ANOVA, Tukey's multiple comparisons test).

Conclusions:
Post-operative hypothermia rates ranged from 30-50% with intra-operative forced-air warming utilized more frequently than temperature monitoring. Pre-operative warming was rarely utilized despite access to equipment. Areas of improvement include increasing equipment accessibility and encouraging appropriate patient warming and temperature monitoring for cases exceeding 30 minutes.

Learning Objectives:
At the conclusion of this session, participants will be able to describe physiologic underpinnings of perioperative temperature management and identify possible barriers to following these guidelines.