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

UNIVERSITY OF ALBERTA

12th ANNUAL GELFAN AND BELL ANESTHESIA CONTINUING EDUCATION AND RESEARCH SYMPOSIUM

Friday May 12, 2023

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 5.25 hours (credits are automatically calculated)

Abstracts

Oral Presentations

Symposium Learning Objectives:
At the conclusion of this program, the participants will be equipped to explain current anesthesiology related research and scholarly activities taking place in Edmonton over the past year, and will strengthen professional collaborative bonds with their colleagues in and around the city of Edmonton.

The Use of Immersive Video to Teach Cannot Intubate Cannot Oxygenate Scenarios

Presenter: Dr. Allyson Farran[1]
Additional Author(s): Dr. Laura Duggan[2], Dr. Sylvian Boet[2], Dr. Yuqi Gu[2]
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INTRODUCTION

The “cannot intubate cannot oxygenate” (CICO) scenario is one of the most feared emergencies in acute care and may result in an emergency cricothyrotomy. Maintaining skill competency in this life-saving technique can be challenging given the rarity of performance. Simulation has been the mainstay technique to teach this skill. Unfortunately, simulation can expensive, time-consuming, and resource intensive, which limits its use. The primary objective of this project was to validate a training package that utilizes virtual reality (VR) to teach CICO scenario management. We hypothesized that in a group of acute care physicians, a single exposure to our training package will lead to improved cricothyrotomy performance at 6 -and 12-months post-exposure.

MATERIALS AND METHODS

This was a single-blinded randomized control trial (RCT) with repeated measures based on time. 40 participants who were blinded to the purpose of the study underwent a simulated CICO scenario requiring cricothyroidotomy (pre-test). They then watched a 360-degree, 3D immersive video of a similar scenario through a pair of VR goggles. Participants then practiced their cricothyrotomy skills on a 3D printed trachea. Following these interventions, participants underwent an immediate post-test simulation session of another CICO scenario. They were then randomized to return at either 6- or 12-months, to undergo a final CICO simulation to assess skill retention. Videos were recorded of all simulations and assessed using a task-specific checklist (CL), procedure time, and time to initiate cricothyrotomy. Pre-, post- and retention-tests were compared to assess for improvement in these measure over time, and whether skills were retained out to 6- and 12-months.

RESULTS

This study is ongoing and currently in the retention phase of data collection. The projected date of completion is June 30, 2023.

CONCLUSIONS

Validation of our training package would result in an alternate method for teaching and maintaining skills in CICO scenario management. This new modality would be less labor- and resource-intensive, as well as more cost effective compared to traditional, simulation-based training.

Learning Objectives

At the conclusion of this session, participants will be able to demonstrate that after a single exposure to our CICO training package, participants will have improvement in cricothyrotomy skills that are retained out to 12-months.

TIVA vs Volatile Anesthetic for Pediatric Tonsillectomies and the Incidence of PRAE: A Cohort Study

Presenter: Dr. Katherine Impey[1]
Additional Author(s): Dr. Austin Pak To Ho[1], Dr. Wanhua Su[2], Dr. Mancho Ng[1]
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Purpose:
Tonsillectomies are high-risk surgeries for respiratory compromise and occur in populations with additional risk factors for perioperative respiratory adverse events (PRAE). Minimizing the risk for PRAE may reduce morbidity and mortality. Our study aimed to investigate whether IV induction and TIVA was more effective at reducing PRAE compared with inhalational anesthetic exposure in pediatric adenotonsillectomies.

Methods:
Our study was a prospective, observational cohort study of elective pediatric patients undergoing tonsillectomies at a tertiary-care pediatric hospital under general anesthetic with either TIVA-only or volatile-exposure anesthetics. All intraoperative and postoperative PRAE were recorded. Recruitment and data collection occurred between November 2019 and May 2021 with 143 patients in the TIVA-only group and 141 in the volatile-exposure group. Exclusion criteria included patients undergoing concurrent non-ENT surgeries, significant comorbidities, and premedication administration. Data collection sheets were completed by guardians, anesthesiologists and PACU nurses. Our primary outcome was the incidence of PRAE intraoperatively, postoperatively, and overall.

Results:
Fisher's exact test showed a statistically significant decrease of postoperative and overall PRAE in the TIVA-only group compared with the volatile-exposure group ($p = 0.03$ for both). There was no significant difference in intraoperative PRAE between the two groups ($p = 0.77$).

Conclusion:
Overall, 15% of patients in the TIVA-only group and 26% of patients in the volatile-exposure group experienced any PRAE ($p = 0.03$). A 42% reduction of overall PRAE using TIVA-only anesthetics was shown, thus possibly illustrating that anesthetic technique may be an important factor for reducing PRAE in pediatric patients undergoing tonsillectomies.

Learning Objectives
At the conclusion of this session, participants will be able to:
1. Recognize the common causes of increased PRAE in pediatric patients undergoing tonsillectomies.
2. Calculate how to alter an anesthetic to attempt to lower the risk of PRAE in pediatric patients undergoing tonsillectomies.

Intraoperative Temperature Monitoring and Management: A Quality Improvement Initiative

Presenter: Dr Lauchlan Jankola[1]
Supervisor(s): Dr Gerry van Rensburg[1], Dr Mancho Ng[1], Dr Wing Lam[1]
Additional Author(s): Candy Liu[2]
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Introduction:
Unintended perioperative hypothermia (UPH) is associated with numerous adverse perioperative outcomes. 2016 Canadian Anesthesia Society guidelines (CAS-G) recommend monitoring patient core temperature during cases of general and neuraxial anesthesia 30 minutes or longer, and active patient warming systems (APWS), ambient temperature control and other modalities to target 36 to 37 degrees Celsius central core temperature. UPH local incidence is 35-40%, with 75% of patients missing temperature monitoring data.

Objectives:
We aimed to improve perioperative temperature monitoring to decrease the incidence of UPH at the University of Alberta Hospital (UAH) site. Secondary outcomes included postoperative infection, perioperative blood products, major adverse cardiac event and death within 30 days.

Methods:
A preliminary chart audit over 5 days at Stollery Hospital, UAH and MAHI sites provided a baseline for daily chart audit comparisons. Audits included: temperature recordings during perioperative phases (preoperative, intraoperative and postoperative), APWS usage, UPH and secondary outcome evidence. Root cause analysis was performed to develop PDSA-cycle strategies to improve temperature monitoring at a selected site (UAH). Interventions included rounds presentations, nursing education, accessibility to preoperative APWS and alternative temperature monitoring systems. PDSA-cycle trends were monitored by run plot.

Results:
At baseline, 93/405 OR cases (23%) had documented temperatures during all perioperative phases – with similar daily audit comparisons (20 to 29%). Perioperative measurements were recorded for cases preoperatively: 81%, intraoperatively: 22%, and postoperatively: 96%, with documented UPH and APWS use in 35% and 46% of cases, respectively. Initial interventions aimed at physician and nursing education showed initial improvement in perioperative temperature monitoring (preoperative 90%, intraoperative 50%, postoperative 97%), with increased use of APWS (86%) and less documented UPH (13%). This effect returned to baseline levels by 30 days after intervention. PDSA-cycles aimed at preoperative APWS access and alternative monitoring were underway at the time of abstract submission – results pending.

Conclusion:
Employed interventions showed improved temperature management with limited sustainability. Further PDSA cycles are needed to target culture, equipment aceess and barriers to the use of monitoring and management equipment.

Learning Objectives
At the conclusion of this session, participants will be familiar with PDSA cycles, processes to analyze quality improvement and the sustainability of specific interventions in maintaining target benchmarks.

An anesthesiology video curriculum: insights from video analytics and student feedback

Presenter: Dr. Reid McKibbon[1]
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Introduction:
The practicality and benefits of using videos in medical education has been well demonstrated. We sought to explore the use of a novel video curriculum designed for medical students, and evaluate satisfaction and engagement with this resource.

Objectives:
- Evaluate the engagement of the anesthesiology video curriculum designed for medical students, and provide insights about preferred content and viewing habits
- Conduct a qualitative review of rotation feedback, and the impact of providing additional video curriculum resources.

Design and Methods:
We created an anesthesiology video curriculum for medical students which covers 13 introductory topics, and is intended to supplement in-person teaching and standard suggested readings. Videos vary in length (mean = 9.18 minutes, SD = 4.45 minutes) as needed to explain individual topics. Videos were posted publicly to the YouTube channel VipulTalks, which has a catalogue of content designed for medical students and residents in anesthesiology training. A survey was distributed to medical students on anesthesiology electives and selective rotations at the University of Alberta.

Main Results:
A total of 81 unique videos were disseminated between August 1, 2021 and February 28, 2023. Videos were viewed a total of 15813 times during this period, for a total view time of 1219 hours. All survey responders (n=8) agreed that videos were helpful for promoting learning around anesthesia.
Please note - additional data (available via YouTube Analytics and Reporting API) will be analyzed for the impact of video length and topic category on audience retention. Data is omitted from this abstract due to ongoing collection. Additional student feedback will be analyzed subject to availability.

Conclusions:
Our anesthesiology video curriculum for medical students was well rated by survey responders on rotations at the University of Alberta. The videos likely have a broader appeal and have been used externally to our institution based on available analytics from YouTube. The impact of video length and topic on audience retention is subject to analysis.

Learning Objectives
At the conclusion of this session, participants will be:
1. Able to interpret the medical student video curriculum that we have released.
2. Able to formulate future endeavours to design or implement curriculum resources, and inform on learning interests of students.

A comparison of Intrathecal Morphine to Opioid Alternatives for Caesarean Section

Presenter: Dr. Lynn Squires[1]
Supervisor(s): Dr. Jalal Nanji[1], Dr. Mairi Chadwick[1]
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Introduction:
Caesarean sections account for one third of all deliveries. Poor pain control following this procedure is associated with impaired maternal-neonatal bonding, delayed functional recovery and an increased risk of chronic pain. Intrathecal morphine is the gold standard for pain control but is associated with side effects including pruritus.

Objectives:
We retrospectively compared local practices surrounding pain management for caesarean section patients.

Design and Methods:
This retrospective cohort study included patients who received a spinal anesthetic for their caesarean section over 4 months at the Royal Alexandra Hospital. Patients were divided into three groups: intrathecal (IT) opioids, alternative long-acting narcotics, and no long-acting narcotics. Opioid requirements were recorded for the first 24 hours following spinal placement as well as pruritus and need for antipruritic administration. The primary outcome was time to first opioid administration with total opioid use also compared. The three groups were analyzed using the Kruskal-Wallis H test.

Main Results:
Of the 545 patients that met the inclusion criteria for our study 85.1% received IT opioids, 7.2% received alternative long-acting opioids and 5.7% received no long-acting opioids. The average time to first opioid administration was 17 hours in the IT group compared to 13.4 hours and 11.7 hours ($p=0.003$). Opioid requirements in the first 24 hour were less in the IT morphine group, averaging 8.4 mg of oral morphine compared to 17.9 mg and 19.0 mg ($p<0.001$). Furthermore, a smaller percentage of patients required opioids in the IT group (41% compared to 61.5% and 64.5%, $p=0.003$). After excluding antipruritic administrations with a clearly documented alternative indication, the risk of significant pruritus in patients administered IT opioids was 11%.

Conclusion: Consistent with prior studies, our study trends towards superior pain control with intrathecal opioid administration compared to alternative treatments although definitive conclusions are limited by the small sample size of our non intrathecal groups. Future quality improvement projects are required to better identify and treat pruritus associated with this treatment as our study reports a lower incidence than prior studies.

Learning Objectives
At the conclusion of this session, participants will be able to discuss the risks and benefits of different opioid regimes with their patients presenting for caesarean section.

Pre-admission Clinic Review: How do Patient and Procedure Factors Influence PAC Utility and End-outcomes?

Presenter: Dr. Drayton Trumble[1]
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BACKGROUND
Evidence based resources exist to help decide who should go to pre admission clinics (PAC). While helpful, they do not guarantee worthwhile, high-yield, or otherwise effective consultations. Similarly, the patient experience in PAC is variable.

METHODS
A retrospective chart review with in-person questionnaires for both patients and anesthesiologists was conducted at the Royal Alexandra Hospital in February 2021. Patients seen in PAC were offered a questionnaire immediately prior to the OR. The corresponding anesthesiologist was approached with a questionnaire after completing their chart review.

RESULTS
Eighty patients were enrolled, 41 female and 39 male. Thirteen (16%) anesthesiologists did not review the consult prior to the case and 9 (11%) indicated “no investigations” for patients with investigations ordered. There was no correlation between surgical discipline and opinion of consult helpfulness or likelihood of reviewing lab investigations. Surgical discipline did correlate with likelihood of a consult being reviewed ($p=0.047$). Odds a consult was reviewed increased 9.1% for every one-year increase in age and opinion that a consult better prepared the patient increased 4.3% with every one-year increase in age. There was no correlation between time spent in hospital and patient satisfaction score. Increasing age weakly correlated with increasing satisfaction score ($p=0.058$). Younger patients who spent less total time in PAC correlated with a reduction in self-reported pre-and-post PAC anxiety scores ($p=0.041$). Finally, there was no correlation between anesthesiologist opinion of patient preparation and patient satisfaction score.

CONCLUSIONS:
Patient age and surgical discipline may influence review rate and perceived utility of PAC consults. Anesthesiologists’ opinion of a PAC visit does not appear to correlate with patient satisfaction. Patient selection should continue to be evidence based via patient and procedure factors, with more focus on who can foreseeably be better prepared by PAC. Going forward, patients considered unlikely to be better prepared by PAC do not appear to be at risk for lower patient satisfaction.

Learning Objectives
At the conclusion of this session, participants will be able to:
1. Discuss utility of PAC consults, investigations, and interventions.
2. Qualify patient satisfaction, perception, and understanding of their PAC visit.
3. Identify areas for improved PAC functionality based on patient and provider feedback.

Combined femoral and ilioinguinal/iliohypogastric nerve blockade vs local infiltration for Transfemoral Transcatheter Aortic Valve Implantation (TAVI) procedures

Presenter: Dr. Elliott Pittman[1]
Supervisor(s): Dr Derek Dillane[2], Dr Angela Neufeld[2], Dr Ben Tyrell[3]
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Introduction:
Transcatheter aortic valve implantation (TAVI) is a minimally invasive technique for aortic valve replacement reserved for elderly patients with multiple comorbidities. While there is no consensus on optical anesthetic management, common techniques include general anesthesia (GA) and local infiltration anesthesia (LIA), with or without conscious sedation. Results with LIA can be inconsistent, and patients frequently require additional sedation. Perioperative cognitive decline associated with the administration of sedation or anesthesia is a frequent concern. Ultrasound-guided regional anesthesia (UGRA) of the femoral nerve and the ilioinguinal / iliohypogastric nerves provides a targeted surgical anesthesia of the dermatomes and myotomes of the lower abdomen and upper thigh.

Objectives:
The primary objective is to compare the quality of recovery, as measured using QoR15, between patients who have a combined ultrasound-guided femoral and ilioinguinal/iliohypogastric nerve blockade for TAVI versus those who have the procedure performed with local infiltration. Secondary objectives include intraoperative sedation, post-procedure cognitive function, perioperative opioid requirements, and postoperative pain scores.

Design and Methods:
A prospective, double blind, randomized controlled trial of ultrasound-guided femoral and ilioinguinal/iliohypogastric nerve blockade versus LIA. Adult patients undergoing TAVI at the Mazankowski Heart Institute and deemed eligible for a regional nerve block by the attending anesthesiologist are included. Exclusion criteria include contraindication to local anesthetic, inability to provide informed consent, patients requiring intra-operative conversion to general anesthesia, and patients where the surgical approach was changed after placement of the regional nerve block.

Results:
Data acquisition is ongoing. Preliminary results will be presented.

Conclusions:
Regional anesthesia consisting of an ilioinguinal/iliohypogastric and femoral nerve block is a feasible approach to the provision of anesthesia for a TAVI procedure. This targeted approach has the potential to reduce the requirement for intraoperative sedation and/or anesthesia, improve peri-operative cognitive function, reduce post-operative pain and improve the overall post-operative health of patients.

Learning Objectives
At the conclusion of this session, participants will be able to review the derivation and evaluation of a regional anesthetic for TAVI and highlight preliminary results.

Comparison of Different Vasopressors on Spinal Cord Blood Flow

Presenter: Dr. Jaeun Yang[1]
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Introduction:
Initial management of acute spinal cord injuries remains critical in limiting secondary injuries and improving outcomes. The current guidelines recommend increasing spinal cord perfusion pressure (SCPP) in acute SCI as measured by elevated MAP, but not yet clear whether MAP is a good surrogate for SCP. Therefore, this study investigated the direct effects of commonly used vasopressors on spinal cord perfusion as it relates to MAP in a rodent animal model.

Design and Methods:
Under isoflurane anesthesia, nine male Sprague-Dawley rats were instrumented with arterial and intravenous lines for blood pressure measurement and intravenous delivery of phenylephrine (PE), vasopressin (VP), norepinephrine (NE) and epinephrine (EP), Given the size limitations of the artery of Adamkiewicz in this rodent model, a transonic flow probe, which detects changes in blood flow through artery over time, was situated around a directly adjacent lumbar spinal artery.

Intervention and Outcome Measured:
Rats were subjected to the vasopressors for 30 minutes each and spinal cord blood flow analyzed as a percentage of the baseline blood flow prior to the start of vasopressor infusion. Data are presented as mean±SEM, with statistical significance denoted at $p<0.05$.

Results:
Data were analyzed via one-way ANOVA. The baseline MAP was 108.4±9.3 mmHg, and with treatment changed to 121.1±10.9 mmHg (PE), 125.1±8.3 mmHg (VP), 132.7±10.6 mmHg (NE) and 108.4±8.1 mmHg (EPI). The heart rates were 295.4±12.3 (baseline), 297.0±12.4 (PE), 295.1±12.2 (VP), 313.8±13.3 (NE), and 321.9±10.6 (EPI). The percentage of spinal cord blood flow change from baseline was 102.1± 9.6% (PE), 87.34±12.8% (VP), 100.1±18.9% (NE), and 279.4±51.7% (EPI) (overall $p<0.0001$; post-hoc $p<0.0001$ for EPI). The change in spinal cord blood flow normalized to the change in MAP were as follows: 0.92±0.08 (PE), 0.79±0.13 (VP), 0.90±0.22 (NE), and 3.1±0.69 (EPI) (overall $p<0.0001$; post hoc $p=0.0003$ for EPI).

Conclusion:
To our knowledge, this is the first study to directly measure SCP in response to infusion of various vasopressors. Results of this study challenges the dogma that increase in MAP directly corresponds to increase in SCP and suggests epinephrine may be the best vasopressor to maintain SCP. Future studies to determine if this correlates to improved blood flow in SCI and improved outcomes following SCI are warranted.

Learning Objectives
At the conclusion of this session, participants will be able to:
1. Determine whether augmentation of mean arterial pressure directly correlates to increased spinal cord blood flow and perfusion.
2. Determine the best vasoactive agent in improving spinal cord blood flow and perfusion.

Development of a formalized handover process for pediatric patients after surgical tracheostomy: A quality improvement initiative

Presenter: Dr. Oliver Hatheway[1]
Additional Author(s): Dr. Paula Holinski[1]
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Introduction (including objectives):
Owing to the patient population at the Stollery Children's Hospital, there is a proportionally higher number of patients who undergo surgical tracheostomy. Such patients are at increased risk for life-threatening post-operative airway complications. Knowledge of the patient's underlying airway anatomy is often obtained at the time of surgery, then verbally conveyed during ICU handover, and documented in operative notes/anesthetic records. However this information is sometimes not immediately available to all practitioners at the patient's bedside.

Design and Methods:
Quality Improvement initiative. A multidisciplinary team involving Pediatric ENT, Anesthesia and ICU/OR nursing leadership were surveyed to better understand information gaps between OR and ICU care for pediatric patients with new tracheostomies.

Intervention(s) and Outcome Measures:
A formalized ICU handover protocol for pediatric patients undergoing tracheostomy was created. This included a bedside care bundle involving documentation of the patient's date and indication for tracheostomy, underlying airway anatomy, and algorithms for the management of tracheostomy related emergencies.

To further develop this initiative, a feedback survey involving the above multidisciplinary team will be undertaken after a sufficient number of patients have been handed over using this new process.

Results:
Not yet available. There has however already been significant interest in this new handover process amongst OR/ICU leadership.

Conclusions:
Our hope is that follow-up surveys will demonstrate improved knowledge translation between the OR and ICU for pediatric patients with new tracheostomies.

Learning Objectives
At the conclusion of this session, participants will be able to:
1. Rate the challenges that accompany pediatric patients after tracheostomy surgery.
2. Outline a process to better understand areas for OR to ICU handover improvement for such patients.
3. Summarize a QI initiative involving a novel OR to ICU handover process for pediatric patients with new tracheostomies.

A Retrospective Cohort Study of the Analgesic Benefit of Femoral Nerve Blockade for Hip Fracture Surgery

Presenter: Dr. Michael Ma[1]
Supervisors(s): Dr. Derek Dillane[1]
Additional Author(s): Calah Myhre[2], Natalie Vankka[2], Maha Alsaif[1], Dr. Matthew Menon[3]
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Introduction:
Approximately 500 hip fracture (HF) surgeries are performed annually at the University of Alberta Hospital (UAH). Opioid sparing techniques such as femoral nerve blocks (FNB) have been incorporated into the HF management pathway. The aim of this retrospective cohort study was to assess whether FNB significantly reduce pain scores and opioid use in the perioperative period for hip fracture patients.

Design and Methods:
UAH Patients requiring HF surgeries from November 2019 to September 2020 were reviewed. Data was collected from the EPIC Connect Care database. We excluded patients with chronic pain, severe dementia, and those with incomplete sets of documented pain scores throughout the perioperative period. Numerical Rating Scale (NRS) and opioid consumption (intravenous morphine equivalents), were recorded from 24 hours preoperatively to 48 hours postoperatively. Block patients were compared to patients who did not receive a block. Statistical analyses were performed using SPSS version 28 for Windows (IBM Corp.). A P value < 0.05 was considered statistically significant. All values were reported as means and SDs. A Mann–Whitney U test was used to compare the means between the 2 groups.

Results:
415 patients were identified as having hip fracture surgery during the period of interest. After exclusion of 140 patients without a complete data set, a total of 275 patients were included in the final analysis. 213 patients received a FNB; 135 patients received a single shot block and 78 received a continuous catheter technique. Sixty-two patients did not receive a block. Demographic variables were comparable between groups. No significant difference was found between groups for opioid use or NRS pain scores throughout the entire perioperative period.

Conclusions:
This retrospective cohort study of FNB versus no block for patients undergoing HF surgery did not find an analgesic benefit for FNB. This is a relatively small study and its interpretation is subject to the usual limitations of retrospective cohort studies; availability of data and lack of control for potential confounding factors. Further analysis is required to determine if there was any benefit to a continuous versus a single shot technique.

Learning Objectives:
At the conclusion of this session, participants will be familiar with the current role APS plays in acute hip fracture management in UAH.

The perioperative performance of general anesthesia versus paravertebral block and monitored anesthesia care for total mastectomies. A quality improvement initiative

Presenter: Dr. Stephen Van Heyst[1]
Supervisor(s): Dr. Timur Ozelsel[1]
Additional Author(s): Dr. Rakesh Sondekoppam[1], Dr. Vivian Ip[1]
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Introduction:
Paravertebral blocks (PVB) are used to improve perioperative analgesia for patients undergoing general anesthesia for mastectomies. They can provide surgical level analgesia as well. At the Cross Cancer Institute, practice was changed from general anesthesia (GA) to PVB with monitored anesthesia care (MAC).

Objectives:
Whether changing from GA to MAC and PVB affects postoperative quality of recovery for a total mastectomy, is currently unknown. We designed this quasi-experimental study to evaluate a quality improvement initiative.

Design and Methods:
A prospective controlled design was chosen, where patients underwent a mastectomy under MAC and PVB in one hospital and mastectomy under GA at another hospital (control). A total of over 100 patients undergoing surgery between July 2022 and March 2023 were enrolled. The only exclusion criteria was age under 18. All other patients were included. The primary outcome was the change in Quality of Recovery Score (QoR-15) from pre- to postoperatively. Secondary outcomes included intra- and postoperative time profiles, perioperative analgesic and antiemetic usage and length of hospital stay.

Results:
The study is near complete; patient recruiting will end March 10, 2023. There are approximately 50 patients in both groups of the study. Once data collection is completed, statistical analysis will occur. There have been no safety issues, or patient or surgeon dissatisfaction brought forward.

Conclusions:
The results of the study will be required to determine patient quality of recovery and the other predetermined outcome measures.

Learning Objectives
At the conclusion of this session, participants will be able to promote the potential patient and system benefits of PVB with MAC for patients undergoing a total mastectomy.

Enhanced recovery after surgery in pediatric cardiac surgery: A single-centre retrospective study

Presenter: Dr. Mancho Ng[1]
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Background:
Enhanced recovery after surgery (ERAS) are evidence-based programs designed to promote patients' recovery throughout the peri-operative period. These initiatives identify key elements in the pre-operative, intra-operative, and post-operative phases that have been shown to reduce complications, and improve clinical outcomes.[1] ERAS guidelines have been implemented across multiple specialities, including cardiac procedures. However, there are limited number of studies evaluating the effectiveness of ERAS elements for congenital cardiac surgical cases.[2] This study aims to review current peri-operative management strategies at a local institution, identifying specific patient populations that could benefit from commonly accepted ERAS components. These results may provide a basis for the establishment of a local ERAS protocol for congenital cardiac procedures.

Methods:
This is a single-centre, retrospective cohort study that includes all pediatric patients (below age of 18) who underwent elective congenital cardiac surgery requiring cardiopulmonary bypass from 2020 to 2022 at the Mazankowski Alberta Heart Institute (MAHI) in Edmonton, Alberta. Patients' clinical characteristics, surgical characteristics, ERAS parameters and overall outcomes will be collected from an electronic (ConnectCare) chart review.

Results/Data Analysis:
A total of 1195 patients are eligible for further chart review. Interim analysis will be performed for 400 patient charts. Student's t-test, two tailed Mann Whitney test, and either two-sided Fisher's exact test or chi-square test will be used for parametric continuous, non-parametric continuous, and categorical data respectively. Multivariate logistic regression analysis will be used to identify predictive factors of key ERAS metrics. All statistical analysis will be completed by the EPICORE Data Management Group at the University of Alberta.

Potential Significance:
This study may provide evidence supporting the efficacy of ERAS elements in improving outcomes for congenital cardiac patients in a Canadian tertiary centre. The goal is to provide a basis for the implementation of a clinical trial evaluating the effectiveness of a specific congenital cardiac ERAS protocol at the MAHI.

Learning Objectives - At the conclusion of this session, participants will be able to:
1. Interpret the principles of ERAS and the potential nuances with pediatric cardiac surgery.
2. Explain the goals of an ERAS program and how it may similar or contrast with clinical outcomes.

Works Cited
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Left Atrial Resection and Pneumonectomy in a Patient with Recurrent Primary Cardiac Intimal Sarcoma

Presenter: Dr. Andy Liu[1]
Additional Author(s): Dr. Surita Sidhu[1]
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Abstract
Importance: While most cardiac tumors are benign, malignant tumors account for 25% of diagnoses, with cardiac sarcoma representing the most common type[1]. Within cardiac sarcomas, a variety of histology exists, the least common being intimal sarcoma, a type of mesenchymal tumor found in arterial vessels which are aggressive and associated with poor survival[1].

Clinical background:
A previously healthy 33-year-old female with respiratory failure and mixed shock was diagnosed on echocardiography with a left atrial mass resulting in severe mitral stenosis. She underwent surgical resection with left atrial (LA) reconstruction. Pathology revealed intimal sarcoma. Eighteen months later, surveillance echo demonstrated a new mass in the LA with partial occlusion of right upper pulmonary vein and complete occlusion of middle lobe vein, moderate mitral stenosis, and mildly reduced left and moderately reduced right ventricular (RV) function. She underwent en-bloc tumor resection with right pneumonectomy and LA reconstruction. Final pathology revealed recurrent intimal sarcoma.

Discussion:
We describe a challenging case of a young patient with a highly aggressive tumor for redo cardiac surgery with significant physiologic derangements. Specific concerns included risk of hemorrhage with redo sternotomy and concerns regarding ventilation management given the obstruction of the right-sided pulmonary veins. Anesthetic management included bilateral large bore IVs, placement of a Multilumen-Access Catheter (Teleflex, Morrisville NC) in the right internal jugular, and availability of six units of blood prior to skin incision. Physiologic goals for mitral stenosis included maintenance of a low-normal heart rate, sinus rhythm, maintained preload, and normal contractility. Weaning from bypass with moderately reduced RV function was facilitated with inhaled milrinone, norepinephrine, and careful echo-guided volume resuscitation. Anesthetic goals for pneumectomy included judicious fluid administration, lung protective ventilation strategies, and chest tubes placed to gravity rather than suction. Aggressive surgery may offer increased life expectancy if there is complete tumor resection[1].

Learning Objectives
At the conclusion of this session, participants will be able to:
1. Describe clinical presentation of a rare malignant cardiac tumor.
2. Describe anesthetic management for complex cardiac surgical procedure in a patient with significant physiologic derangement.

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Abstracts

Poster Presentations

Determining the Macrophage Contribution to Peripheral Neuropathic Pain

Presenter: Dr. Madelene Faye S. Ho[1,2]
Supervisor(s): Dr. Bradley J. Kerr [1,4,5,*], Dr. Jason R. Plemel [1,2,3,*]
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Introduction: Neuropathic pain (NeP), an incurable chronic pain condition typically rated as "the worst pain possible" by patients, can present after injuries like amputations as phantom-limb pain or systemic pain from autoimmune diseases like multiple sclerosis. NeP's well-characterized phenotype of prolonged hypersensitivity is initiated by the nervous system's macrophages: tissue-resident macrophages (TRMs) including the central nervous system TRM called microglia, and infiltrating macrophages derived from circulating blood monocytes (monocyte-derived macrophages, MDMs). Relative contributions of these macrophages are still unknown, but important to understand because therapies that target the spinal cord need to cross a blood brain barrier. The contribution of peripheral nervous system (PNS) macrophages remains poorly understood because approaches used to date fail to distinguish whether the PNS macrophage response is mediated by TRMs or MDMs, despite the PNS having critical contributions to the establishment of long-term chronic centralized pain.

Objectives: I aimed to characterize the dynamics of each macrophage population (TRMs versus MDMs) through the timecourse of acute-to-chronic NeP injury in the dorsal root ganglia (DRG, cluster of sensory neurons of the PNS) in a mouse model of NeP.

Design and Methods: Using novel transgenic mouse lines to fluorescently tag either TRMs or MDMs, we better define the localization and dynamics of macrophages in the spared nerve injury (SNI) model of NeP.

Main Results: TRMs are present in the DRG at 7-30 days post-injury (DPI), yet significantly decline in density by 120DPI. Simultaneously, MDM density increases at 7DPI versus non-injured controls, while non-resident macrophage density rises by 120DPI. Moreover, we observe that MDMs adopt specific satellite morphology post-injury that we refer to as "spooning" macrophages. Spooning macrophages are found adjacent to neuronal cell bodies in the DRG, suggesting MDMs adopt direct interactive roles alongside peripheral somatosensory neurons.

Conclusions: Using mouse lines and injury models as tools to categorically study the roles of TRMs versus MDMs provides context for future targets for immune-based NeP therapies.

Learning Objectives
At the conclusion of this session, participants will be able to describe that various macrophage populations adopt heterogeneous roles during NeP and the characterization of their contributions allows us to map the dynamic nature of the immune response during neuropathic pain.

Short-term sustained-release opioid for acute pain management following open abdominal urologic surgeries: a randomized, controlled trial

Presenter: Dylan Hollman,[1] CR2
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Introduction: In recent years, there has been a move away from the use of sustained-release (SR) opioid for acute pain as it may lead to long-term use risking addiction. However, there is paucity of evidence on short-term, low-dose SR opioid use in a monitored setting.

The aim of our study is to compare the effectiveness of using 2-days SR opioid combined with immediate-release (IR) opioid when required (SR+IR), versus IR opioid as required only, in the postoperative period following open abdominal urologic surgeries.

Design and Methods: Following ethics approval and patient consent, patients were randomized into two groups: SR+IR or IR only group All patients received local anesthetic via rectus sheath catheter and acetaminophen. The primary outcome was time to achieve adequate pain relief to ambulate 3 steps following surgery.

Main Results: A total of 34 patients were included and no difference was found in the time from the end of surgery until achieving adequate pain control to ambulate 3 steps . The total opioid consumption 72 hours postoperatively was higher in the SR+IR opioid group than the IR opioid only group although not statistically significant . Pain score both at rest and on deep breathing/movement were also lower in patients in the IR opioid only group compared to the SR+IR opioid group. No other adverse effects were observed.

Conclusions: With the limitations of our interim analysis in mind, patients in the IR opioid only group appear to have lower pain score and opioid consumption without jeopardizing the time to achieving adequate pain control for short-distance ambulation after open abdominal urologic surgeries compared to the SR+IR opioid group.

Learning Objectives
At the conclusion of this session, participants will be able to better assess whether there is additional benefit with short-term sustained-release opioid use as part of the pain management following open abdominal urologic surgeries.

Sex differences in the inflammatory response of the mouse DRG: implications for pain in Multiple Sclerosis

Presenter: Dr. Aislinn D Maguire[1]
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BACKGROUND: Multiple Sclerosis (MS) is an autoimmune disease with notable sex differences. Women are not only more likely to get MS but are also more likely than men to experience neuropathic pain in the disease. Neuropathic pain in MS may originate in the peripheral nervous system at the level of the dorsal root ganglia (DRG), which houses primary pain sensing neurons (nociceptors). These nociceptors become hyperexcitable in response to inflammation, leading to peripheral pain sensitization and eventually central sensitization, which maintains pain long-term. Our **AIM** was to characterize sex differences in the mouse DRG response to inflammation as they relate to neuropathic pain in MS.

METHODS: Using the mouse model experimental autoimmune encephalomyelitis (EAE) as well as primary mouse DRG neuron cultures in vitro, we sought to characterize the peripheral sex differences which may underlie the disparities in MS pain. We first investigated sex differences in inflammation in EAE DRGs using immunohistochemistry. Next, we treated cultured DRG neurons with the inflammatory cytokine tumour necrosis factor a (TNFa), as it is upregulated in MS and EAE, and is linked to various neuropathic pain disorders. We assessed the neuronal response to TNFa via western blotting, immunocytochemistry, and ELISA.

RESULTS: We found sex differences in the inflammatory profile of the DRG, and in the signaling pathways activated by TNFa in nociceptors. Given that TNFa signaling has been shown to impact on mitochondrial function, this led us to investigate sex differences in mitochondria. Our results demonstrate that male sensory neurons are more sensitive to mitochondrial stress in response to TNFa, making them prone to neuronal injury. In contrast, female sensory neurons appear to be more resistant to mitochondrial stress and exhibit an inflammatory and pro-regenerative phenotype that may underlie greater nociceptor plasticity, hyperexcitability and pain.

CONCLUSIONS: Our animal studies reveal fundamental sex differences in the inflammatory response of male and female peripheral pain pathways. Understanding these sex differences is an important first step in our long-term goal of developing sex-specific treatments to halt pain development in the periphery before central sensitization is established.

Learning Objectives
At the conclusion of this session, participants will begin to interpret the intracellular mechanisms in peripheral nociceptors that may underlie the generation of neuropathic pain in inflammatory conditions, and moreover to acknowledge the importance of studying sex differences at every level.

Waste generated by different types of anesthesia: a randomized controlled trial

Presenter: Gaurav Sidhu[1]
Supervisor(s): Dr Vivian Ip[1]
Additional Author(s): Dylan Hollman[1], Dr. Timur Özelsel[1]
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Introduction: To date many scientific assessments have shown the hazards climate change poses to human health[1]. Close to 5% of the worlds greenhouse gas emissions are attributable to the healthcare industry[2]. Within the healthcare system, anesthesia had greater carbon dioxide equivalent emissions than all surgical equipment /procurement[3].

Objectives: To evaluate the amount of waste different types of anesthesia (general, regional and a combination of general/regional) produce, which will help guide doctors and patients to choose the most environmentally friendly anesthetic, where possible.

Design and Methods: In this prospective, randomized controlled trial, adult patients >18years old undergoing open reduction and internal fixation (wrist) surgery were randomized into having general anesthetic (GA), regional anesthetic (RA) or both (GA+RA). In the GA group, patients were intubated with either laryngeal mask airway or endotracheal tube. After induction with propofol, sevoflurane was used as maintenance with air/oxygen (no nitrous oxide). In the RA group, patients were given a brachial plexus block and given the option of none or light sedation during surgery. In the GA+RA group, guidelines previously aforementioned pertaining to GA and RA were followed. Groups were compared using one-way anova analysis. In all groups the primary outcome was the total amount of waste generated in grams, with secondary outcomes of anesthetic gas use, oxygen use, and quantity of gloves, syringes, drugs being noted.

Main Results: There were 8 patients in the GA group, 5 in the RA group, 2 in the GA+RA group for a total of 15 patients. The amount of recyclable waste generated was highest in the RA only group and by each group was (44.0grams vs 68.8grams vs 59.5grams, p=0.51 for GA, RA and GA+RA respectively). The least non-recyclable waste generated was in the RA only group and by each group was (236.0grams vs 220.0grams vs 296.5grams, p=0.42, for GA, RA and GA+RA respectively).

Conclusions: The amount of recyclable waste generated in the RA group was the highest, with the least amount of non-recyclable waste. Further study using life cycle analysis will better quantify and compare the amount of waste generated between groups.

Learning Objectives
At the conclusion of this session, participants will be able to better recognize the importance of waste generation by different anesthesia types and apply this where applicable, towards reducing waste generated by anesthesia.

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Neurite outgrowth from sensory neurons in the context of cellular stress

Presenter: Dr. Dania Villarreal[1]
Additional Author(s): Dr. Timo Friedman[2], Dr. Aislinn Maguire[2], Dr. Gustavo Tenorio[2], Dr. Bradley Kerr[1,2]
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Introduction: Chronic pain in diseases like multiple sclerosis (MS) arise from overactive immune cells which promote neuronal injury and hyperexcitability in sensory neurons. The purpose of these experiments is to study the role of the Inositol Requiring Enzyme 1 (IRE1) pathway of ER on the stress response on neurite outgrowth of sensory dorsal root ganglion (DRG) cells, to better understand the mechanisms that promote neurite outgrowth as a result of the inflammatory environment leading to chronic pain.

Methods: Running treatment: Mice are placed in cages with wheels and odometers for voluntary running 6hr/day for 2 weeks total.

DRG neuronal cultures: DRG neurons are dissected, triturated, filtered, and cleared of myelin debris before growing for 48hr in BMDM media.

Bone Marrow-Derived Macrophage (BMDM) conditioned media treatment: bone marrow from femeurs is isolated, rinsed, and filtered. Cells are differentiate with L929 media over two-weeks. Macrophages are stimulated with TNFa, LPS or IL-4, for 6hr, then media is collected.

ICC staining: DRG neuronal cultures are fixed and stained with βIII antibody for neurites detection.
IRE1 TRPV1 Knockout mice: IRE1 knockout in TRPV1+ pain sensing nociceptive neurons.

Results: IRE1 downstream effectors are thought to promote regeneration. Effects on outgrowth in the context of two different models are studied here. Running exercise promotes outgrowth robustly in female DRG cultures. Knockout of the IRE1 protein abolished outgrowth of DRG cultures in response to running exercise. Mean branches per 100μm depicts increased growth density in running IRE1-/- mice. DRG cultures show increased outgrowth with exposure to macrophage conditioned media compared to control media which is diminished in IRE1 knockout mice.

Learning Objectives
At the conclusion of this session, participants will be able to explain the mechanisms that promote neurite outgrowth as a result of the inflammatory environment leading to chronic pain.

Optimizing resuscitation of the donation after circulatory death (DCD) heart by pharmacological postconditioning in *ex vivo* perfused porcine hearts

Presenter: Dr. F. Wang[1]
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Introduction: Heart transplantation remains the gold standard therapy for many cardiovascular diseases, but it is limited by the availability of usable donor hearts. Donation after circulatory death (DCD) hearts are an attractive source of “extended criteria donor hearts”, but they suffer significant ischemia-reperfusion injury (IRI) due to the circulatory death process. Intralipid, sevoflurane and remifentanil are well-characterized postconditioning agents known to be cardioprotective and to reduce IRI.

Objectives: To evaluate the efficacy of combined pharmacological postconditioning using Intralipid, sevoflurane, and remifentanil during prolonged ex vivo heart perfusion (EVHP) of DCD porcine hearts.

Design and methods: In this randomized controlled study, porcine DCD hearts were mounted on a custom EVHP apparatus and perfused with or without postconditioning treatment for 6 hours (n=5-6 per group). Heart function was evaluated every hour at left atrial pressures (LAP) of 6, 8, 10, and 12 mmHg using an in-house custom-made data acquisition platform. Functional data was analyzed by 2-way repeated measures ANOVA (treatment, time).

Intervention(s) and Outcome Measures: Hearts subjected to pharmacological postconditioning (treated) were perfused with 1% Intralipid, 2% (v/v) sevoflurane and 3 nM remifentanil; control hearts were perfused with no postconditioning agents. Measures of heart function included cardiac index (CI), left ventricular stroke work (LVSW) and myocardial contractility.

Results: Treated hearts had higher CI compared to control hearts starting from 2 h when perfused at LAP 12 mmHg (16.52 mL⋅min-1⋅g heart weight-1 vs 12.77 mL⋅min-1⋅g heart weight-1, P=0.04). In addition, treated hearts had higher LVSW starting from 3 h at LAP 6 mmHg (1576 mmHg⋅mL-1 vs 790 mmHg⋅mL-1, P=0.010). Postconditioning improved heart contractility starting at 3 h when perfused at LAP 12 mmHg, enhancing inotropy (dP/dtmax) (1434 mmHg⋅s-1 vs 992 mmHg⋅s-1, P=0.037) and lusinotropy (dP/dtmin) (-830 mmHg⋅s-1 vs -502 mmHg⋅s-1, P=0.016). Improved heart function persisted in treated hearts until the end of 6 hours of EVHP.

Conclusions: The combination of postconditioning with Intralipid, sevoflurane and remifentanil markedly improved heart function in porcine DCD hearts undergoing 6 h EVHP.

Learning Objectives
At the conclusion of this session, participants will be able to assess the effects of combined postco nditioning on the DCD porcine heart undergoing prolonged EVHP.