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75867 - PRACTICE IMPROVEMENT BY TRACKING PEDIATRIC TONSILLECTOMY OUTCOMES

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Introduction: One method of improving anesthesia practice may be to provide outcome data to individual anesthesiologists and groups of anesthesiologists, causing them to reflect on their own practices, as well as systemic factors in the perioperative environment. We undertook to evaluate a group of pediatric patients undergoing tonsillectomy and perform a detailed analysis of their perioperative experience and outcomes with the purpose of providing feedback to anesthesiologists on their own practice and those of their peers. The expectation was that this would provide a stimulus for personal educational objectives, and changes in practice to improve perioperative and postoperative outcomes for children.

Methods: Local research ethics committee approval was obtained for the study. Over a six month period, willing parents or guardians of all children undergoing tonsillectomy at a free-standing children's hospital provided written informed consent to participate. Data collected included demographics, anesthetic techniques, in-hospital outcomes as well as outcomes for the first day postoperatively. The practice of all 19 consenting anesthesiologists in the group was included. Parents/guardians received a structured telephone questionnaire on the first postoperative day, which included quantitative and qualitative data. Confidential individual patient outcomes, as well as aggregate group data, were provided to anesthesiologists, both in written format and at a facilitated group discussion session.

Results: 89% (263/296) of eligible families consented to participate in the study. 243 families completed the study. 78% of parents were very satisfied and 2% were quite dissatisfied with the care they received. Individual anesthesiologists were able to reflect on their own practice, considering items such as premedication, parental presence at induction, the use of cuffed tubes, analgesic and antiemetic regimes, and fluid management. Individual comments from families were made available to the anesthesiologist who provided care to their child. Specific findings of note were a postoperative vomiting rate of 22% over 24 hours, and a mean "worst" pain score of 6.9/10, which was felt to be unacceptably high. Cuffed tubes were used in 61% of cases, parental presence in 44%, and deep extubation in 76%.

Discussion: Anesthesiologists found the ability to reflect on the outcome data of their

own patients, as well as their peers to be a powerful way to stimuate practice improvement. Individual comments from families were also valued highly by participating anesthesiologists. If such models of providing outcome data to anesthesiologists were more widely made part of everyday practice, this might well lead to an improvement in patient and family satisfaction. As an example, the unacceptably high pain scores encountered in the first 24 hours will need new strategies to manage. It is hoped that tracking of perioperative outcome data will become the standard for all children in the institution.

76374 - CROSS-OVER RANDOMIZED DOUBLE BLIND STUDY.

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Introduction: Pre-operative oral carbohydrate-rich drink (12.5% carbohydrate) , containing maltodextrins, has been shown to reduce post-operative insulin resistance, without delaying the gastric emptying. The present study was designed to measure gastric emptying following ingestion of a commercially available orange clear drink with or without whey protein.

Methods: The study was approved by the Ethics board and followed a randomized, double-blinded, cross-over design. Twelve (mean age 55.75) otherwise healthy subjects were enrolled in the study. Each subject underwent two 180 min testing sessions where blood samples were taken every 15 min for the easurement of acetaminophen: one following ingestion of orange drink (400 ml. 12.5% carbohydrate) and the other orange with 10 g of whey protein. The two drinks were ingested over the period of 10 min, together with acetaminophen 1.5 g for the determination of gastric emptying by analysis of plasma concentrations.

Results: Absorption of acetaminophen was reduced with whey in 9 and increased in 3, out 12 subjects. In total, absorption was numerically reduced with AUC (13680 umol/L*180 min following orange drink, and 11535 umol/L*180 min following orange drink with whey protein). The gastric emptying rate tended also to be slower with orange and whey (T50 80.2 ±3.8 min) compared with orange alone only (T74.3 ±5.6 min). (NS) At 120 min the retention was 21.0 ± 2.8% with orange drink only and 21.6 ±1.9% with orange + whey.(NS)

Discussion: No delayed gastric emptying was seen with either drinks, suggesting that a commercially available orange drink with or without whey protein may be safely administered 180 min before induction of anesthesia.

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76409 - KNOWLEDGE RETENTION BY ANESTHESIA RESIDENTS AFTER FOCUS TTE TRAINING

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Introduction: Focused transthoracic echocardiography (TTE) is a valuable diagnostic tool for anesthesiologists treating patients with hemodynamic instability. Previous studies have demonstrated that training residents to perform and interpret TTE is both feasible and effective (1,2). We recently introduced a 4 week focused TTE rotation in our anesthesiology residency training program, after which our residents are able to integrate this modality into their clinical practice. However, the ability to retain information and the degree of knowledge retention after their rotation has not been assessed. This is important, because while many educational interventions have shown immediate gains in knowledge or skills, these gains are often subject to subsequent decay over a period of non-use (3). Therefore, this study's aim was to assess knowledge retention at 6 months following the TTE rotation, and to assess any modifying any factors.

Methods: Approval was obtained from the local Research Ethics Board. Residents in their postgraduate years 3-5 who had successfully passed the TTE rotation were recruited to fill out a brief questionnaire and complete a written multiple-choice exam 6 months after the end of the rotation (EOR). Residents were asked about their current self-rated knowledge and comfort level, the number of times that they used TTE since the rotation, and barriers to the use in practice. The written exam assessed ultrasound fundamentals, anatomy and imaging windows, as well as interpretation of static images and video clips of both normal and abnormal findings. Results were compared to their EOR exam results.

Results: To date, 8 residents have completed both their rotation and 6-month follow-up assessments. The average EOR exam score was 43.8 (87.6%) versus the 6-month score of 43.7 (87.4%) (P=0.9). The EOR self-rated knowledge was 7.9 out of 10, compared to a 6-month self-rated knowledge score of 6.0 out of 10. At the EOR, all resident felt comfortable using TTE in their clinical practice. At 6 months 7 out of 8 residents still felt comfortable. At 6 months, all the residents had used TTE after their rotation in their practice, with an average frequency of 3.7 times. The most cited reason that residents did not use TTE more frequently was that there was no perceived clinical need.

Discussion: One goal of medical education is to promote long-term knowledge and skill

retention. Residents in this study were able to maintain their exam scores 6 months after the completion of a TTE rotation. Whereas infrequently used knowledge generally decays over time, this was not the finding in this study. This may be due to the fact that all resident have incorporated focused TTE in the clinical setting since their rotation. Dispersed learning and reinforcement in this manner has been shown to improve long-term knowledge retention (5). Another explanation may be the robustness of the initial training that included a dedicated 4 weeks of study and practice to learn the required knowledge and skills. Over-learning in the initial phases of knowledge acquisition has been associated with strong long-term memory (6). Further study is required to determine if long-term retention is in fact related to clinical proficiency with focused TTE.

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76474 - DO CHECKLISTS IMPROVE INTERPROFESSIONAL TEAM PERFORMANCE?

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Introduction: The past decade demonstrated a 300% increase in the number of surgical/diagnostic procedures performed in US ambulatory surgical centres. [1] While the incidence of major adverse events in ambulatory surgical centers appears to be low [2], the management of critical events can be complicated by the lack of resources that are usually available in a hospital. The purpose of this study was to determine the effectiveness of Critical Event Checklists (CECs) [3] in the management of 8 high-fidelity simulation scenarios designed for use in an ambulatory surgery setting.

Methods: After REB approval, 7 multidisciplinary teams (1 surgeon, 1 anesthetist and 3 RN/RPNs) from a single ambulatory facility consented to participate in a realistic high fidelity simulation in an after hour single OR setting. Each team was oriented to the study and simulation equipment. Using an ABAB design (A=no CEC, B=use of CEC), each team managed a total of 8 distinct simulation scenarios designed to include the common perioperative critical events described by Ziewacz et al.[3]. Teams completed 4 scenarios at session 1 and 4 different scenarios at session 2, 5-11 months later. Four independent raters evaluated non-technical performance using the Team Emergency Assessment Measure (TEAM) [4]. Adherence to key processes (how closely the team followed evidence based management guidelines) was evaluated live by a research team member. [3] Given the small sample size, we used a standardized approach of visual inspection of means and standard error values to evaluate the observed patterns in the two data sets.

Results: While the team's adherence to key processes did not appear to depend on the presence or absence of the CEC in session 1, a pattern emerged in session 2 (Figure

1), suggesting an improved adherence when the CEC was present. The intraclass correlation (ICC) for TEAM scores was 0.47, indicating only moderate agreement. TEAM scores did not appear to depend on either the presence of the CEC or the session timing.

Discussion: This study suggests that the use of Critical Event Checklists may lead to improved adherence to evidence-based management of critical events if teams are familiar with its use. Teamwork, as measured by the TEAM score, however did not demonstrate any difference with use of checklists. A larger study with more teams and a more diverse set of scenarios would allow more robust statistics and hence more substantive recommendations.

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76974 - TRAGIC OUTCOME OF A DELAYED PERIMORTEM CESAREAN DELIVERY

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Introduction: A systematic review of case reports describing the management of cardiac arrest during pregnancy significantly enhanced our understanding of cardiopulmonary resuscitation (CPR) in pregnant women[1]. Cardiopulmonary resuscitation during out-of-hospital cardiac arrest in pregnant women still remains a major challenge for emergency medical technicians (EMTs) responding to a call. Here we describe the circumstances leading to a tragic outcome despite the immediate availability of CPR to a full-term pregnant woman who suffered a witnessed out-of-hospital cardiac arrest.

Case description: A two member team of EMTs attended a full term pregnant women who suddenly collapsed and then suffered from cardiac arrest at her home. She received immediate CPR as she lost her pulse in front of the EMTs, who were present to attend her "collapse". She was transported to the operating room of a hospital in 20-minutes time with CPR in place. A multidisciplinary team took over her further management in the hospital. A perimortem caesarean delivery (PCD) was performed in 10-minutes time. A severely hypoxic but alive foetus was delivered who died few days later. The spontaneous circulation of the woman returned immediately after the delivery. The peripheral arterial oxygen saturation and end-tidal carbon dioxide monitoring indicated adequate cardiac output [Figure Below: Trace of patient's arterial oxygen saturation (SpO_2) and end tidal carbon dioxide (ET_{CO2}) after the return of spontaneous circulation]. Post-cardiac arrest care was instituted but she died 16-hours later.

Discussion: The applications of effective left lateral uterine displacement and incorporating the 4-minute rule to perform PCD during a CPR have saved the lives of many foetuses and mothers in hospital-settings[2]. Out-of-hospital cardiac arrest during advanced pregnancy poses special challenges to CPR because the "goldstandard" treatment of early PCD currently is not possible in an out-of-hospital setting and usually a late PCD after arriving a hospital is performed. Our recent insight from a series of out-of-hospital CPR cases revealed that the outcome could be improved by educating the family members and friends of cardiac arrest victims in the techniques of basic life support[3] but even this strategy will not be successful in pregnant women because here success depends upon an early PCD. Aortocaval compression severely restricts cardiac output in pregnant women during CPR[4]. Early intravenous fluid administration may be helpful to break this vicious cycle and restore spontaneous circulation. This report emphasis that some new direction is required to deal with the challenge of pre-hospital CPR in full-term pregnant women[5,6].

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77021 - ARTICULAR REHABILITATION UNDER REGIONAL ANESTHESIA: CASE SERIES

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Introduction: Joint fibrosis is a complication that generates disability in patients after orthopedic surgery. The literature reports this complication most frequently in shoulder and knee surgeries.1 2 A key component of the treatment of articular fibrosis is physical therapy. However, when mobility is forced in the presence of fibrosis, severe pain is triggered creating a vicious circle. Restricted mobility generates pain and the pain itself restricts mobility.3 Continous regional anesthesia guided by ultrasound is an alternative that allows painless physical rehabilitation for several days. The objective of this study is to determine the clinical efficacy and safety of joint rehabilitation under continuous regional anesthesia in patients with postoperative shoulder and knee fibrosis.

Methods: With prior approval from the institution's ethics committee, a prospective longitudinal descriptive study was conducted. 8 patients with postoperative articular fibrosis refractory to conventional management who consulted to our institute during July 2011 - July 2012 were included. Each patient signed a consent for publication. The patients underwent joint rehabilitation under regional anesthesia with the insertion of a peri-neural catheter guided by ultrasound at femoral level for patients with knee disease and inter scalene level for patients with shoulder disease. The patients went to 45-minute physical therapy sessions on an outpatient basis for 5 consecutive days. A total volume of 20mL of Lidocaine 1% with epinephrine was used during each session. Patients were followed for twelve weeks. The outcomes evaluated were pain intensity before and after physiotherapy, shoulder function, mobility of the knee and complications. The magnitude of pain was assessed using the Visual Analogue Scale (VAS). Shoulder function was assessed using the Shoulder Pain and Disability Index (SPADI scale).4 The mobility of the knee was assessed by goniometry.5

Results: We analyzed a total of eight patients; four with shoulder disease and four with knee disease. Patients in both groups started with severe pain (VAS 8-10). At 12 weeks all patients reported mild pain (VAS 1-4).The difference in median VAS scores before and after therapy was 8 points; this was a statistically significant difference ($p = 0.011$). Only one patient in the knee group reported mild pain during therapy. The difference in the degree of functionality of the shoulder joint (SPADI scale) before and after physiotherapy was 67.7 points, which represented a statistically significant improvement (95% CI 60.9, 74.5 p value < 0.0001).The mobility of the knee joint, evaluated by goniometry, improved 108 degrees on average. The recovery of range of motion of the

knee was statistically significant (95% CI -153, - 64, p = 0.004). Two patients required relocation due to displacement of the inter-scalene catheter.

Discussion: Even though this is a small series of patients, the findings of this study show that when physical therapy is not possible due to pain in the case of shoulder and knee fibrosis, joint rehabilitation with regional anesthesia provided by a perineural catheter is an available, effective and safe alternative for providing painless therapy.

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78656 - BISPECTRAL INDEX AS PREDICTOR OF ACCEPTABLE NON PARALITIC INTUBATION

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Background and Goal of Study: We evaluated if BIS values could predict acceptable conditions for laryngoscopy and tracheal intubation (TI) without muscle relaxants, with the use of remifentanil plus propofol.

Methods: Local ethics board approved the study. We reviewed charts of 2 groups of patients: patients anesthetized with 1,2 mcg/Kg remifentanil+ lidocaine 1,5 mg/Kg + propofol enough to produce BIS in the range of 40 – 55; and patients who received the same induction but remifentanil 2 mcg/Kg. TI conditions were evaluated by an arbitrary method in which: Grades 0 means excellent, grade 1 acceptable and grades 2 or 3 means unacceptable TI condition; besides these, hemodynamic data were also recorded. Difficult TI, nasotracheal and double lumem tubes were excluded

Results: Among 23 cases in 1,2 mcg/Kg group, BIS 40-55 failed to predict acceptable TI conditions 5 patients(21,7%). Acceptable conditions were found in 18 patients(78,2%), score zero 9 (39,1%) and score one 9 (39,1%). Systolic, diastolic pressure and heart rate dropped more than 25% from baseline in 43,4%; 39,1% and 17,3% of cases respectively.

Among 24 patients who received 2 mcg/Kg remifentanil, BIS 40-55 failed to predict acceptable intubating conditions in 3 (12,5%). Acceptable conditions were found in 21 (87,5%), score zero in 16(66,6%) and score one in 5 (20,8%). Systolic, diastolic pressure and heart rate dropped more than 25% from baseline in 58,3%; 41,6% and 4,1% of cases respectively, but in no case the drop reached 50% of baseline values.

With both doses, the attending anesthesiologist never deemed necessary resort to muscle relaxation to perform the TI, and there were no hemodynamic difference between the patients with acceptable and non acceptable intubating conditions. With both doses acceptable TI conditions were related to Cormack grade.

Discussion: We evaluated TI conditions by a crude criteria, instead of the Stockholm criteria, for the sake of feasibility of the study done in our regular work hours. With the caveat that what we understand as acceptable TI conditions, may not be deemed so by a stricter investigator. We tried to find if BIS in the therapeutic value could predict adequacy for TI without relaxants. We speculate if a lower BIS target and /or higher opiate dose could achieve higher TI excellent conditions, and at which hemodynamic cost. Due to the small number of patients we understand that the study might be

underpowered to draw definite conclusions.

Conclusion: When combined to lidocaine and propofol, increasing the dose of remifentanil from 1,2 to 2 mcg/Kg increases the reliability of BIS (87,5%) as a predictor for acceptable TI conditions, but also increases the incidence of drop in systolic and diastolic pressures beyond 25% of the baseline. No disclosures. No financial support.

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78685 - REMIFENTANIL AS A SOLE SEDATIVE FOR AWAKE FIBEROPTIC INTUBATION

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Background and Goal of Study: Awake Fiberoptic intubation (AFOI) generates more patient discomfort than general anesthesia, but when it comes to difficult ventilation and/or intubation, comfort shall be sacrificed in favor of safety. The combination of midazolam plus fentanil has been employed as sedative along with local anesthesia for AFOI for many years as a standard technique with good results, but the author deemed that results were improvable according to current literature.

Methods: Since no novel drugs or techniques were involved, the ethical board not only approved the study but also deemed not necessary specific written patient authorization. We compared data from 44 patients who underwent AFOI from June to November 2013, under standard sedation protocol (midazolam 100 mcg/Kg + fentanil 2 mcg/Kg) ("GROUP M") with data collected from 41 patients who underwent AFOI from January to November 2014, but sedated with remifentanil (1 mcg/kg in 3 minutes + 0,07 mcg/Kg/min) ("GROUP R"). All the intubations were done by the author, in two hospitals, and evaluation of the response to the airway instrumentation was recorded by the nurse, blinded to the sedative technique. In both groups the same local anesthetic technique and oxygen supplementation were employed.

Results and Discussion: Among 44 GROUP M patients, 34 (77,7%) had fair to good intubation conditions with minimal cough or reaction to the "spray-as-you-go" (SAYGO) lidocaine injections and intubation, 10 patients (22,7%) reacted with strong cough and/or movement to the SAYGO lidocaine injections to the larynx and trachea, 5 patients (11,3%) demanded more than 10 minutes to perform the intubation; in 5 patients (11,3%) saturation dropped to 85% and 3 patients (6,8%) needed immediate general anesthesia after the intubation.
Only one patient in GROUP R reacted to the SAYGO injections with a weak cough, none reacted to intubation. All remained calm and comfortable after the intubation, none developed saturation below 93%, no patient demanded more than 5 minutes to complete the intubation. No GROUP R patient developed muscle rigidity. Hemodynamic values were equally stable in both groups. Nine extra patients who underwent nasal AFOI under remifentanil were not included, in spite of excellent results, because the author deemed that they could not be compared to orally intubated GROUP M patients. Respiratory rate was not recorded because respiratory drive was under anesthesiologist verbal command. Amnesia or memory of the procedure was not investigated.

Conclusion: Due to the discrepancy the of the results between the two groups, the “old

standard" was replaced by remifentanil as the "new standard" technique for AFOI. No conflict of interest, no financial support.

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78734 - SPACE, TIME ET AL.: WHY MORNING INTERPROFESSIONAL ROUNDS FAIL

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Introduction: Patient rounds are a cornerstone of both the education and care functions of teaching hospitals. Beyond this, there is little consensus about rounds in theory or in practice. In intensive care units (ICUs), debates continue about who should participate and what those participants should contribute. Multiple studies have identified rounds as the sites of interprofessional conflict,[1-4] yet explanations for why this is the case and how the functions of rounds might be optimized have been elusive. Our research sought to address this gap in understanding. Through a close study of ICUs, we tracked the form and functions of interprofessional rounds in 4 teaching hospitals, and sought to understand how and why morning interprofessional rounds are contentious, we sought to identify their functions and associated sources of conflict.

Methods: Our data were collected in a yearlong observational study of team interactions in 4 ICUs at 4 academic hospitals. Ethics approval was obtained at all sites. The 4 ICUs were purposively recruited to match on medical specialty, beds, and staff rosters. All 4 deployed high intensity ICU physician staffing in which dedicated specialists managed or comanaged ICU patients. Our research followed best practices in healthcare qualitative research,[5-6] and included 576 hours of observation, 56 interviews, and 47 shadowing sessions conducted by 2 ethnographers. In the analysis for this paper, all rounds-associated field notes and interviews were extracted and coded iteratively by the first two authors using the constant comparative method.

Results: Rounding practices varied widely according to the preferences of attending physicians. Attending physicians considered education for medical trainees to be a critical function of rounds – a function that was compromised by the involvement of other professionals, especially in light of important time constraints. Meanwhile, interprofessional collaboration during rounds was constrained by space and by the unsystematic participation of nurses and other healthcare professionals.

Discussion: The sub-optimal nature of rounds may be attributed to the misalignment of their form and functions: there are too many things to do, too little time, and too little space. Those engaged in rounds may be trying, ineffectively, to serve two masters: care and education. In an era of increasing interprofessionalism and commitment to patient-centered care, new and empirically tested structural models for rounds are urgently

needed.

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78796 - REDUCING BARRIERS TO CAPNOGRAPHY MONITORING DURING CARDIAC ARRESTS

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Introduction: Current Advanced Cardiovascular Life Support (ACLS) Guidelines highlight the importance of quality cardiopulmonary resuscitation (CPR) using physiologic monitors such as capnography monitoring (CM) during cardiac arrests. Little is known about adherence to the guidelines, and barriers, if any, to using CM during CPR. The purpose of this study was to assess the current use of CM at our institution, and potential barriers to its use

Methods: REB approval was obtained. A retrospective chart review and defibrillator data review of all cardiac arrests from September 2013-February 2014 was performed; capturing the frequency of CM, length of time to implement CM, and any documentation for not using CM. Duration of arrests using CM were compared to all arrests using an independent samples t-test. A survey using a 5-point likert scale was administered to all respiratory therapists (RTs) at our institution (n=70) to further explore potential barriers to implementing CM during arrests. Results were summarized using descriptive statistics. The survey included a comments section that was qualitatively analyzed for themes.

Results: Data was available for 51 cardiac arrests between September 2013-February 2014 at our institution, with CM used 29% (15/51) of the time. The average time to implementing CM was 10.71 ± 4.1minutes. The most frequent reasons for not using CM were 1) arrest resolved prior to use (48%), 2) forgot (18%), and 3) CM equipment not available (15%). The average duration of arrests using CM were comparedwith all arrests (16.8 ± 7.1 minutes vs. 18.9 ± 11.1), which was not significantly different (p=0.467). For the survey portion of the study, the response rate was 67% (n=47). Results were combined into 3 categories: “agreement”, “disagreement” or "undecided". Survey questions with the most agreement included: 1) refresher courses on using CM would be helpful (76.6%), 2) switching out the defibrillator to the arrest cart with CM took too much time (74.5%), 3) there was not enough space to accommodate both defibrillators in the room (63.8%), and 4) reminders on the arrest carts would be useful (53.8%). The most common theme in the comments was that switching out the defibrillator took too long.

Discussion: The use of CM during arrests at our institution is suboptimal. Currently, only ICU defibrillators have CM and need to be switched with floor defibrillators for every arrest outside of the ICU. RTs are responsible for connecting the CM and when surveyed, agreed that switching out the defbrillator took too long (74.5%) and there was

not enough space in the patient room to accommodate both defibrillators (63.8%). A process map was created to show how CM is currently used during arrests at our institution (Fig 1). Based on the results of the survey, and as depicted by the process map, increasing CM availability will improve space in the room and eliminate the need to switch out defibrillators. This should increase CM use at the time of an arrest. Given that 76.6% of respondents agreed a refresher course would be helpful, an audit and feedback educational session will be provided to the RTs. The effectiveness of these interventions will be monitored in real time using defibrillator data to assess CM use.

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79873 - AWAKE CRANIOTOMY USING SPEECH ASSESSMENT FOR OPTIMAL TUMOR RESECTION

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Introduction: Since its early development by Dr. Penfield, the goal of awake craniotomy is to achieve optimal tumor excision while preserving eloquent brain regions. The evolution of our understanding of speech mechanisms has allowed for the application of increasingly sophisticated methods of assessing high-level speech function intra-operatively. We utilized an anesthetic approach needless of any airway manipulation[1], thereby optimizing brain mapping conditions and real-time continuous speech assessment during brain tumor resection. We present three cases of repeat craniotomies with an awake approach and we compare this experience with their prior asleep craniotomy, assessing the value of continuous intraoperative speech assessment.

After REB approval and obtaining informed consent, case-reviews were performed for three patients who had undergone awake redo-craniotomy. The standardized anesthetic protocol was based on scalp block and dexmedetomidine infusion as the primary anesthetic agent. [1]

A multidisciplinary team included anesthesia, surgery, medical imaging, nursing and Speech and Language Pathologist (SLP). The SLP completed a preoperative assessment and performed ongoing assessment during tumor resection. Post-operatively, a telephone interview was conducted with the patients following their awake craniotomy. The Wessex Neurological Questionnaire (WNQ) was used and modified to allow for comparison between the procedure performed under general anaesthetic and that performed awake.[2]

Results: All three patients had successful excision of the tumor. In each case, SLP provided a systematic evaluation of speech and language function and the surgical team identified that real-time speech assessment directed the surgical plan promoting an optimal tumor excision and preservation of eloquent areas. All patients felt both anesthetic experiences were positive. Results from the WNQ are presented in Table 1.

Discussion: Patient's assessment, preparation and an integrated team-expertise are crucial to the success of an awake craniotomy. The support of SLP allows minimizing postoperative neurological sequelae providing an ongoing assessment during surgery. The preoperative evaluation is the opportunity for the SLP to connect with the patient, engaging in topics that can be used for conversation during surgery.

Interestingly, in these cases the patients were kept awake during tumor resection and the SLP continued conversation with them. One patient had speech arrest during resection of what was mapped to be a safe area and one patient had a seizure. These deficits may not have been detected if the patients had been sedated after brain mapping or if utilizing an anesthetic technique with instrumented airway (e.g. asleep-awake-asleep).

It's also important for the healthcare team to understand the patients' complex and subjective experience to improve delivery of care. There is limited literature published relating to the comparative anesthetic experience of patients who underwent asleep vs. awake craniotomy. [3] Our findings show patients had a positive experience for both types of surgery. However the awake procedure had a shorter length of stay.

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80310 - RIGHT ATRIAL HERNIATION FOLLOWING RIGHT EXTRAPLEURAL PNEUMONECTOMY

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Purpose: To describe a case of right atrial herniation occurring after right extrapleural pneumonectomy.

Clinical Features: Patient consent was obtained in accordance to local institutional guidelines prior to the submission of this case report.

A 63-year-old male with malignant mesothelioma presented for right extrapleural pneumonectomy. He reported productive cough with white sputum, nagging right chest pain, low-grade fever and shortness of breath on minimal exertion. Medical history included chronic obstructive lung disease, gastro-esophageal reflux, and history of deep venous thrombosis. Chest radiograph showed right pleural effusion. He had undergone staging evaluation with bronchoscopy, mediastinoscopy, and thoracoscopy with pleural biopsy.

Right extrapleural pneumonectomy with pericardiectomy and reconstruction of the diaphragm was uneventful. The pericardial defect was repaired with a prosthetic mesh patch. He was extubated and transferred to the intensive care unit (ICU) in stable condition. On postoperative day #1, tachycardia and hypotension were noted. The hypotension showed no sustained response to intravenous fluid and vasopressor administration. A portable chest radiograph revealed a mass in the right hemithorax with marked mediastinal shift consistent with cardiac herniation (Figure 1). The patient was emergently brought to the operating room and the thoracotomy incision was reopened. The right atrium had herniated superiorly through a large opening due to dehiscence of the pericardial patch closure. After the heart was returned to its anatomic position in the pericardial cavity, the patient's hemodynamics dramatically improved. Additional mesh was used to reconstruct and reinforce the pericardial defect. The patient tolerated the procedure well and was transferred back to the ICU.

Conclusion: Cardiac herniation after pneumonectomy is a rare but life-threatening complication.[1] Predisposing factors include an inadequately closed pericardial defect and an empty right hemithorax after pneumonectomy. Precipitating factors include changes in gravity from positioning the patient in the lateral decubitus with operated side down, increased pressure gradient between left and right hemithoraces from coughing, straining, positive pressure ventilation, PEEP, suction on chest drains, and

increased abdominal pressure.[2] The clinical presentation of cardiac herniation ranges from no symptoms to sudden cardiorespiratory arrest. Hypotension, tachycardia, and hypoxemia due to cardiac herniation may be mistaken for hypovolemia, postoperative hemorrhage, congestive heart failure, acute myocardial ischemia, and pulmonary embolism. Heightened awareness and high index of suspicion are needed to establish an early diagnosis. Management of cardiac herniation consists of aggressive hemodynamic support and turning the patient to lateral position with the operated side up.[3] Definitive treatment requires early surgical re-intervention with repositioning of the heart and closure of the pericardial defect. Awareness and prevention of the precipitating factors for cardiac herniation following pulmonary resection is crucial. Once it occurs, a timely diagnosis and prompt surgical intervention is essential to ensure a favorable outcome.

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80406 - ANALGESIA FOR PRIMARY TOTAL KNEE ARTHROPLASTY

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Introduction: Total Knee Arthroplasty (TKA) is associated with moderate to severe pain. Multimodal analgesia is commonly used perioperatively along with a Periarticular Injection (PI) or Femoral Nerve Block (FNB) [1-4]. FNB is not without risk [5] and opinion is still divided as to which of the two is better [6]. This study is a prospective double blinded randomized controlled trial comparing PI with combined Continuous Femoral Nerve Block and Posterior Capsular Injection (NB+PCI) with postoperative follow-up for 1 year.

Methods: Appropriate ethics approval was obtained. Both groups had preoperative oral analgesia with Controlled Release Hydromorphone (CRHM), Celecoxib & Acetaminophen; NB placed by ultrasound or nerve stimulator guidance or both; standardized spinal anesthesia and sedation; Intravenous Patient Controlled Analgesia (IVPCA) with HM on postoperative day 0 (POD-0) ; Oral analgesia with CRHM, Immediate Release HM, Celecoxib and Acetaminophen from POD-1 onwards. These treatments were the same for all patients in the study.

Patients were randomized and had either 20 ml of 0.2% Ropivacaine through the FNB catheter or saline as a loading dose in the OR in the NB+PCI & PI groups, respectively. The FNB catheter was infused with either 0.2% Ropivacaine or saline at 15 ml per hour until POD-1 morning, followed by 10 ml per hour until POD-2 morning. Either 20 ml of 1% Ropivacaine or periarticular solution was injected in the posterior capsule of the knee and a sham PI with saline or a solution containing Ropivacaine, preservative free Morphine, Ketorolac and Epinephrine was infiltrated around the joint and skin in the NB+PCI & PI groups, respectively. Physicians, patients and assessors were blinded to the group assignment.

Pain was assessed at rest and during movement twice daily on POD-1 & 2 by a Numerical Rating Scale (NRS). The worst pain experienced between the two time points, number of patients reporting mild, moderate & severe pain in each group, knee range of motion (ROM), quadriceps strength, walking distance, narcotic usage & side

effects, hospital length of stay (LOS) and patient satisfaction were also assessed. Pain score, patient satisfaction, Oxford Knee Score (OKS) and ROM were assessed again at 1 year post TKA. The study was powered to detect a 2 point difference in NRS at rest and with motion between groups (p=0.05, beta=0.2).

Results: 72 ASA 1-3 patients under the age of 70 years were recruited. 39 were randomized in a concealed manner to the NB+PCI group and 33 to the PI group. Baseline differences between groups were not significant. A statistically but not clinically significant trend towards reduced pain on POD-2 for PI versus NB+PCI was seen. There were small differences in IVPCA HM usage on POD-0, (2.9+/- 2.4 mg in PI group vs 4.4+/-3.2 mg in NB+PCI group, p= .03), and knee flexion at 1 year (119.9+/-10.9° in NB+PCI group vs 109.9+/- 22.4° in PI group, p=.03). There were no significant differences in other outcome measures.

Discussion and Conclusion: There was no demonstrated improvement in pain control with the use of NB+PCI versus PI when both groups had a background of multimodal oral analgesia. The chosen technique should have the least potential for serious complications and least impact on work flow.

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80770 - HEMODYNAMIC PROFILE OF BIS GUIDED NON PARALITIC TRACHEAL INTUBATION

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Introduction: Studies have shown that remifentanil in combination with propofol provides adequate conditions for laryngoscopy and tracheal intubation (TI) without muscle relaxants. We evaluated the hemodynamic response to a BIS guided, non paralytic technique with two doses of the opiate.

Methods: Local Research Ethics Board (REB) approved the study. We reviewed charts of 2 groups of patients: patients anesthetized with 1,2 mcg/Kg remifentanil+ lidocaine 1,5 mg/Kg + propofol enough to produce BIS between 40 and 55; and patients with the same induction but 2 mcg/Kg remifentanil. TI conditions and hemodynamic data were recorded.

Results: Among 23 cases in 1,2 mcg/Kg group, and 24 patients who received 2 mcg/Kg remifentanil, BIS 40-55 predicted acceptable TI conditions 18 patients (78,2%) and in 21 (87,5%) respectively. Incidence of drops in hemodynamic variables is depicted in Table1.
With both doses: In no case the drop reached 50% of baseline values, the attending anesthesiologist never deemed necessary resort to muscle relaxation to perform the TI, and there were no hemodynamic difference between the patients with acceptable and non acceptable TI conditions. TI conditions were related to Cormack grade.

Conclusion: Increasing the dose of remifentanil from 1,2 to 2 mcg/Kg increases the reliability of BIS (up to 87,5%) as a predictor for acceptable IOT conditions without relaxants, but also increases the incidence of drops, especially systolic pressure, beyond 25% of the baseline. We speculate if it would be useful to add some vasopressor preemptively to this technique, for the sake of stability. NO disclosures. No financial support.

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81361 - TRANSITIONING TO A REDUCED CALL MODEL AMONGST ANESTHESIA RESIDENTS

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Introduction: Considerable controversy exists regarding the optimal work hours of physicians and surgeons in training. The current concerns in residency training committees is determining appropriate resident duty hours. How many hours should residents be working and how will this impact the residents, delivery of quality healthcare, and patient safety. A recent meta-analysis reported that reduced call hours showed little improvement on healthcare and even a negative effect in most aspects including patient safety, and resident wellness, burnout and education (1,2).

Extensive research has recently examined the issues associated with making changes, but none have specifically looked at the field of anesthesia. The primary objective of this study was to assess anesthesia residents' opinions and perceptions on wellness/burnout, fatigue, education, and patient safety after the initiation of a reduced call model (16 hour call).

Methods: After appropriate ethics approval was obtained, a prospective cohort study was conducted at three time points in the 2013-2014 academic year.
A web-based questionnaire consisting of 23 questions (an adaptation of the already validated survey produced by Drolet et al. in the NEJM) was electronically distributed to all anesthesia residents from postgraduate years 1 to 5 who were part of the active call roster (n=84) (3).
Descriptive summaries were calculated, counts and percentages were used for categorical variables, and answers to open text questions were reviewed for themes.

Results: A response rate of 67% was obtained for this study.
The majority of anesthesia residents (65%) approved a 16-hour call schedule, and felt that their overall quality of life of a junior (PGY2 and below) or senior resident (PGY3 and above) had improved (55% and 73% respectively), They reported overall feeling less fatigued.

Most respondants indicated that the quality of education remained unchanged (47%), or had improved (31%) (Figure 1).

Most felt better prepared for the royal college exam (52%).

Most thought patient safety had improved or was unchanged (48%).

The strengths of our study are that it is the first in Canada to present anesthesia residents' perceptions at multiple time periods throughout the year immediately following implementation of a 16-hour call model.

Conclusion: Our study demonstrated that 16-hour call improved resident wellness, reduced burnout and fostered an environment where residents are less fatigued and more satisfied with their educational experience and promoted an environment of patient safety. Overall, the anesthesia residency group demonstrated that a 16-hour call model is not only preferred but beneficial. The study has several implications: it can inform the active policy debate, guide ongoing implementation of the current duty hour requirements, and direct future policy. Limiting duty hours represents a necessary paradigm shift in the medical environment, and change will take time. As the pendulum on duty hour swings, it is important to continue to teach clinical medicine, but foster an environment where residents thrive, and patients are safe.

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81676 - A SURGICAL WASTE AUDIT OF LAPAROSCOPIC CHOLECYSTECTOMIES

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Background: Over the past three decades, health care waste has increased significantly owing to the fear of spreading blood-borne illnesses. Although operating rooms occupy a small area within a hospital, they produce an estimated 20-30% of a hospital's total waste. The impact of medical waste remains a largely unrecognized source of environmentally damaging material that threatens the sustainability of both our health care system, and the planet. This study's objective was to quantify the amount of potentially recyclable waste associated with laparoscopic cholecystectomies at a tertiary care hospital through a surgical waste audit.

Methods: The Local Ethics Committee determined that ethics approval was not required for the completion of this research project. Twenty laparoscopic cholecystectomies were audited between March and May 2014. All surgical waste was categorized into six streams: recyclable waste, biohazard waste, sharps, blue sterile wrap, linens and normal solid waste (consisting of items that did not meet the definition of the previous 5 categories). The volume and weight of each stream was quantified. The province's Health Information Centre provided data on the number of laparoscopic cholecystectomies performed in the province during one fiscal year. Using this information, we estimated the annual weight and volume of waste produced by all laparoscopic cholecystectomies in the province.

Results: The average total waste (excluding linens) per laparoscopic cholecystectomy was 6.56 ± 0.30 kg, of which 4.23 ± 0.16 kg (64.5%) was normal solid waste, 0.97 ± 0.23 kg (14.8%) was biohazard waste, 0.55 ± 0.05 kg (8.3%) was blue sterile wrap, 0.51 ± 0.14 kg (7.7%) was recyclable waste and 0.31 ± 0.08 kg (4.7%) was sharps. By extrapolation, we estimated that the 1511 laparoscopic cholecystectomies performed in the province in 2012-2013 contributed 7993 kg by weight, roughly the weight of an adult male orca whale, and 317 m^3 by volume, roughly the volume of 3.5 adult blue whales, to landfills. Anesthesia waste accounted for approximately 16% of the total surgical waste. Recyclable anesthesia waste accounted for 2.8% of the total anesthesia waste, which represented only 0.5% of the total surgical waste.

Conclusion: While laparoscopic cholecystectomies produce considerable amounts of waste, they are not the leading waste generating surgeries. The preliminary data obtained from this waste audit indicate that better waste management strategies in the operating room could reduce the amount of waste ending up in landfills. Future

directions include investigations into the cost effectiveness and environmental impact of a waste reduction and recycling program in the operating room.

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82053 - DEXMEDETOMIDINE VS REMIFENTANIL FOR EBUS-TBNA

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Introduction: Dexmedetomidine hydrochloride (Precedex, Hospira®), is a α_2-adrenoreceptor agonist that produces sedation and analgesia with minimal respiratory depression. It exhibits a unique profile compared to commonly used hypnotics as its action is not mediated by the γ-aminobutyric acid (GABA) pathway. Dexmedetomidine has been used in patients requiring monitored anesthesia care (MAC) for awake intubation and surgical or diagnostic procedures. We hypothesize that, compared to remifentanil, the use of dexmedetomidine for MAC during endobronchial ultrasound-guided transbronchial needle aspiration (EBUS-TBNA) in spontaneously breathing non intubated patients would result in a lower incidence of major respiratory and hemodynamic adverse events while providing equally satisfying operative conditions

Methods:
After obtaining patient consent in accordance with local institutional guidelines, sixty (ASA I-III) patients scheduled to undergo EBUS-TBNA under MAC without intubation were randomized to receive either remifentanil : 0.5 µg/kg IV bolus in 2 minutes, followed by 0.05-0.2 µg/kg/min, or dexmedetomidine : 0.4 µg/kg IV bolus in 10 minutes, followed by 1.0 µg/kg/h. Primary outcome was number of major adverse events (Bradypnea, Apnea, Hypoxia, Hypotension, Hypertension, Bradycardia, Tachycardia) while secondary outcomes included differences in operative conditions, observer's Assessment of Alertness/Sedation Scale (OAA/S) scores, pain, recall, discharge criteria (Aldrete score), total dose of endotracheal lidocaine administered and nausea and vomiting incidence. Unpaired t test with Sodak-Bonferroni correction for multiple comparaison and Mann Whitney test were used.

Results:
The median number of apnea (0[0-0] vs 0[0-0.5] p=0.010) and desaturation episodes was higher in the remifentanil group (0[0-0.5] vs 1[0-4] p=0.01). Remifentanil was associated with a decrease in mean respiratory rate (Figure). Otherwise, dexmedetomidine use resulted in longer post EBUS-TBNA discharge time (24.80±28.78min vs 4.50±3.10min $p < 0.0001$) and greater need for intra-tracheal lidocaine during the procedure (201.50±7.53mg vs 175±5.97mg p=0.0091). Dexmedetomidine was also associated with more hypotensive events (0[0-0] vs 0[0-0.5] p=0.0015). Sedation depth (OAA / S), operative conditions and other secondary

outcomes (operator satisfaction, patient satisfaction, pain, cough, vocal cord mobility and recall) were similar in both groups.

Conclusion:
Although dexmedetomidine resulted in a safer respiratory profile compared to remifentanil for MAC during EBUS-TBNA, its use was associated with more hypotension, delayed postoperative discharge and need for more local anesthetics during the procedure.

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82175 - PERFORMANCE ASSESSMENT IN ANESTHESIA: A POST-IMPLEMENTATION SURVEY

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Introduction: The use of electronic medical records in the perioperative setting has provided a wealth of clinical data, however the optimal method of packaging such data into formal performance feedback is ill-defined (1). In 2013, our centre provided its anesthesiologists with a table of individualized performance data extracted from the local electronic medical record system. Performance measures reported were a convenience sample of data mined for research purposes. A post-implementation survey was administered to determine user-acceptability of current measures and to highlight areas of potential improvement for future assessments.

Methods:
Following Research Ethics Board approval an electronic survey was administered to all recipients of a performance assessment. Research participants were identified by departmental email contact list. Questionnaire items were generated by investigator review of quality indicators in anesthesiology and data elements in the electronic medical record. Respondents graded their replies on a five-point Likert scale with higher scores indicating increased acceptability or interest. The survey was pilot tested by five clinical anesthesia fellow volunteers using the Burns Clinical Sensibility tool (2). Eligible participants were sent an email describing the purpose of the study. A copy of the participant's individual performance assessment followed in one week with a link to the electronic survey. Three email reminders and a paper version were offered to increase response.

Results:
Fifty-eight of 76 (76%) eligible participants responded with 53 complete questionnaires for a completed response rate of 70%. Responses are summarized in Figure 1. Respondents indicated a reasonable level of user acceptability, with the majority agreeing that this type of feedback is respectful of physician autonomy and influential to practice and professional development. Variables which the user group most consistently felt should be included in future assessments trended towards practice outcome measures such as patient temperature on arrival to PACU, frequency of

resident case involvement, and frequency of adverse events such as unplanned re-intubation, cardiovascular events, etc. Areas for improvement trended towards exclusion of specific practice and process of care descriptors - such as patient age and gender data and frequency of ketorolac and ketamine use, however 70% of respondents felt that all existing data should remain in future assessments.

Discussion:
The high survey completion rate suggests that physician performance assessment is an area of significant interest to anesthesiologists at our centre. Preliminary review of the survey results indicates reasonable user-acceptability of the current performance assessment tool and has identified several areas for future improvement. Through annual repetition of this process we aim to establish of a sensitive, specific, and clinically relevant performance assessment that can support professional revalidation and self-reflection for anesthesiologists at our centre.

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82201 - THE IMPACT OF TRANSVERSUS ABDOMINIS PLANE BLOCKS ON LENGTH OF STAY

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Introduction: Several systematic reviews exist which support the role of transversus abdominis plane (TAP) blocks in improving postoperative pain scores, and decreasing opioid consumption, nausea, and vomiting (1,2,3). However, the impact of TAP blocks on postoperative functional recovery and resource utilization, such as length of stay (LOS), is not often reported and has not been reviewed. The purpose of this systematic review and meta-analysis is to determine whether TAP blocks lead to a reduction in LOS following elective abdominal surgery. The results of this study may help to identify the impact of TAP blocks on LOS or highlight the need for further research on resource-related outcomes.

Methods: A literature search was performed in the following databases: MEDLINE, PUBMED, CINAHL, EMBASE, Web of Science, CENTRAL, PROSPERO, US Clinical Trials Database, and WHO ICTRP. A systematic review protocol was developed and registered with PROSPERO. Given the nature of the study, ethical approval was deemed unnecessary. From our literature search, two investigators will independently identify all RCT and cohort studies that report LOS and meet our inclusion criteria (Table 1). These investigators will independently and sequentially review all identified titles, then abstracts, and finally identify full text reports (including data extraction). Disagreement will be settled through a tie-break by a third investigator. Using a data collection form specifically developed and piloted for this review, data will be extracted from tables or text of the identified full text reports. Risk of bias will be assessed using the Cochrane risk of bias tool for quality assessment of RCTs and the ACORBAT-NSRI and Newcastle-Ottawa Scale for cohort studies. Quality of evidence for each study will be documented using the GRADE approach.

Results: Literature search yielded 3,712 articles and 384 registered systematic reviews and clinical control trials. Identification of studies which meet the study inclusion criteria is currently underway. A random effects model will be used to meta-analyze data extracted from included studies. As LOS data are typically right-skewed, data will be log transformed and meta-analysis performed using the geometric mean and associated standard deviations to allow meaningful comparisons of standardized mean differences. Primary outcomes data (PACU LOS and hospital LOS) will be analyzed separately. Planned sub-group analyses include inpatient vs. outpatient surgery, laparoscopic vs.

open and upper vs. lower abdominal procedures, single-shot vs. continuous infusion of local anesthetic, and pre- vs. post-operative block placement.

Discussion: The TAP block has established efficacy for improving pain outcomes following lower abdominal surgery. An understanding of the effect of TAP block on resource utilization such as LOS is needed. Knowledge of the effect of TAP block on discharge time may highlight the need for further research on resource-related outcomes and may be beneficial in understanding the role of this intervention in Enhanced Recovery Programmes.

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82224 - ISOLATION OF LUNG WITH DOUBLE LUMEN TUBE IN A CASE OF DIFFICULT AIRWAY

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Isolation of lung with double lumen tube(DLT) is sometimes (even with endoscopic help) a demanding task, especially in a case of difficult airway. The combination of the both features in the same patient makes this case rare and challenging.

Case Report:Male 66 year old. Comorbidities:tipe 2 diabetes, dyslipidemia, carotid atheromatosis, obesity (BMI 35,9 Kg/m2) and hypertension. Previous anesthesias 1 - (for colon cancer March 2013): failure of intubation (with McCoy laryngoscope and Fastrach ILMA), he was awakened and fiberoptic intubation was done with difficulty. 2 - (hepatectomy, August 2013), awake fiberoptic intubation with great difficult due to the relative size of his tongue to his mouth. Now he was scheduled for lung lobectomy for metastasis.
He has borderline thyromental distance, despite good mouth opening he was graded Mallampati IV. He is cooperative and understood the risk related to his airway management. We employed up to 3,57 mg/Kg of lidocaine for airway anesthesia (90 mg in non-needle block with 10% spray +160 mg trans endoscopic), and sedation with 1,2 mcg/Kg remifentanil (injected in 2 minutes) + 0,08 mcg/Kg/min. Oxygen 7 L/min via nasal prong. Insertion of a Valentin Madrid (VAMA) canula (that allowed our vison of the larynx), proved the adequacy of glossopharyngeal block. We believe that we could not see the larynx without the VAMA canula.

It was difficult to maneuver the endoscope passed through the bronchial lumen of a DLT especially because the VAMA canula had to be replaced for a bite block (after getting larynx view) due to the bulk of the DLT. In the first attempt, with the carina in view, we were not able to rail a (39 left) DLT into the trachea, despite several rotations. We repeated the procedure with a smaller tube (37 left) and after several 90 degree rotations we succeed to thread the DLT into the trachea. At this point we navigate the tip of the endoscope to the left main bronchi and could identify its ramification. Then we railroaded bronchial tip of the DLT into the left main bronchi.

Patient remained conscious and complied to the repeatedly anesthesiologist’s command to breath, his saturation was never below 97%. Despite full memory of the procedure the patient did not grade it as a particular bad experience. After surgery DLT removal was done over an exchange catheter in the trachea.

Discussion: We followed ASA guideline for difficult airway [1] and tried to do the best

for lung isolation[2], as described in literature[3]. Our alternate plan was to intubate with single lumen tube and try to use a tube changer as a rail to the bronchial lumen of the DLT, and then endoscopically locate the DLT. Other alternative would be to use a bronchial blocker via a single lumen tube.

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82398 - PEDIATRIC DIFFICULT AIRWAY MANAGEMENT IN A TERTIARY CARE CENTER

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Introduction: This study identifies the incidence, common features and clinical management of difficult intubation in children treated at a pediatric tertiary care center over a two-year period.

Methods: With REB approval the anesthetic records of patients aged 0 to 17 years undergoing general anesthesia between December 2009 and December 2011 were reviewed. Cases with documented difficult airway (C-L grade 3 or more) were identified and analyzed for incidence, demographics, airway history, physical assessment, airway management details, and complications. Descriptive statistics were used to analyze the data.

Results: The total number of anesthetics was 22766. Ninety-four patients with difficult airway underwent 125 anesthetics, for an incidence of 5 in 1000 anesthetics. The highest proportion of children with difficult airway was in adolescents greater than 13 years of age (49%), with infants less than one year representing 21% of cases.

A difficult intubation was anticipated in 80.6% of cases. Seventy (74.4%) of the difficult airway patients had previous anesthetics. Figure 1 outlines the history and physical findings in those patients.

In 76 (60.8%) of patients spontaneous respirations were maintained for intubation. Sevoflurane and propofol were used as induction agents with similar frequency and rocuronium and remifentanil were administered in 31.2 and 22.4% of patients, respectively. Muscle relaxation had been administered to all but 4 of the 25 unanticipated difficult airways.

Ninety one percent of the patients with difficult airways were managed with tracheal intubation, 5.6% with an LMA, 1.6% with nasal prongs and 1.6% with face mask. Of those patients with an anticipated difficult airway, DL was the first intubation method of choice in 53 patients (42.4%). Four emergency tracheotomies and 2 rigid bronchoscope intubations were performed, each after at least one failed intubation attempt. Of the 38 anesthetics in patients aged 14-17 years, six intubations were

performed awake after airway topicalization.

Postoperatively 34 (27.2%) of patients were admitted to the pediatric intensive care unit, 2 (1.6%) of which were unplanned admissions.

Discussion: The almost 20% incidence of unanticipated difficult intubation in this series is in contrast to the adage that difficult airways are almost always predictable in children. Over half the patients with a difficult airway had at least one prior anesthetic in which intubation difficulty was not an issue, suggesting that reliance upon prior anesthetic history alone is insufficient and careful physical assessment is essential. In most of the patients with a known or suspected difficult airway direct laryngoscopy was still chosen as the first choice despite the increasing number of fiberoptic and videolaryngoscopic intubating devices available on the market.

Conclusion: Even in a tertiary care pediatric center the rate of unanticipated difficult intubation remains considerable.

References:

82474 - SURVEY OF PROGRAM DIRECTORS ON RESIDENT TRAINING IN SMOKING CESSATION

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Background: Smoking is a modifiable risk factor for perioperative complications.[1,2] Residents of various medical and surgical specialties have the opportunity to interact with the patients in the perioperative period and have an opportunity of a “teachable moment”.[3] However, there is limited knowledge about the training for smoking cessation received by the Canadian residents in the different specialties of anaesthesiology, family medicine, internal medicine and surgery.This survey of Canadian Program directors aims to identify the format of the current and future curriculum of smoking cessation training for residents in the different specialties.

Methods: A national survey of Canadian program directors of anesthesia, family medicine, internal medicine and surgical specialties was conducted with an online survey tool after appropriate approval by Research Ethics Committee. The survey consisted of eight questions pertaining to the demographics, current and future curriculum.

Results: One hundred and twenty-nine Canadian postgraduate programs directors were invited by emails to participate in the online survey. Overall, the Program director response rate was 60% (76/126). Responders were from family medicine 36.5% (46/126), anaesthesiology 13%(17/126), internal medicine 9.5%(12/126) and surgical specialties 17% (21/126).

From the program directors responses regarding current resident curriculum, 62% (49/79) agreed that the curriculum trained residents in asking patients about tobacco use, 29% (23/79) in assessing the role of tobacco in causing perioperative complications and only 18% (14/79) responded that the curriculum provided training to assist patients to quit smoking in perioperative period.

Eighty two percent (63/77) of the program directors agreed that the future curriculum should include training residents to assist patients to quit smoking. Currently only 20% (15/74) of program directors said that they have a program at their institution to provide tobacco interventions to surgical patients.

Discussion: The survey highlights the gap in the current perioperative tobacco control curriculum in Canadian residency programs. At the same time, the attitudes of program directors were generally positive towards incorporating education about tobacco cessation in the perioperative period and tobacco control interventions in residency curriculum Addressing the gap in education about this important public health problem will allow residents to be better equipped to be able to help patients quit smoking, which ultimately may have a significant effect on both short-term surgical outcomes and the long-term health of patients. This initiative had already been taken in paediatric speciality with positive results.[4]

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82667 - PERIOPERATIVE MANAGEMENT OF RENIN ANGIOTENSIN SYSTEM ANTAGONISTS

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Introduction: Blockade of the renin angiotensin system (RAS) with ACE inhibitors (ACEi) or Angiotensin II receptor blockers (ARBs) is common in patients being treating for hypertension and cardiovascular disease [1]. Evidence is limited to guide anesthesiologists in the management of these drugs in the preoperative period [2]. Practice ranges from stopping or continuing these drugs on every patient, to decisions made on a case by case basis [3,4,5]. This study sought to identify the current practice of anesthesiologists and internal medicine specialists in the management of RAS blockers in the preoperative period to assist with the development of guidelines at our institution.

Methods: Application of our institution's ethics tool indicated a full ethics review was not required. 102 email invitations to complete the online 15 question survey were sent to anesthesiologists (ANES) and pre-op clinic internists (IM) in our region.

Results: 77.5% of ANES and 21.5% of IM completed the survey. Regarding management of ACEi pre-operatively 16.5%, 16.5%, and 67% of ANES would always stop, would never stop, and would decide according to patient and procedure conditions, respectively, compared to 13.6%, 0%, and 86.4% of IM.

71.3% of respondents approach ACEi and ARBs similarly. Of those who manage them differently, 44% would always stop ARBs.

Rationale driving management included evidence from the literature (60.4%), and personal experience with difficult perioperative blood pressure control (64.9%). Significantly ($p < 0.05$) greater proportions of ANES cited simplicity of patient instruction as a factor (25.3% ANES vs 6.8% IM), but a greater proportion of IM noted that their rationale was driven by institutional expectation (29.5%IM vs 7% ANES).

Patient and procedure factors associated with the decision to hold RAS blockers were use of neuraxial block, with or without GA (71.6%), carotid surgery (62.5%), anticipated blood loss (77.8%), and perioperative fluid restriction (64%). The decision to give RAS blockers was most likely when sedation only was planned (67%). Ambulatory surgery had no influence as a factor.

75% and 82% of ANES and IM respectively would support development of a policy on preoperative management of RAS blockers. Of these, 78% of ANES vs 53% of IM ($p < 0.05$) would continue to support the policy if it were nurse administered without physician input for each patient. 55% of the respondents supporting the nurse administered policy make their decision regarding preoperative management based on patient and procedural factors themselves.

Discussion: There exists a broad range of practice in the preoperative management of RAS blockers. The majority of anesthesiologists and internists use patient and procedure factors to guide their decisions. While there is support for institutional guidelines for management, support decreases if these guidelines are being applied without direct physician input, perhaps reflecting that most physicians manage these drugs on a case by case basis.

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82726 - PERCEPTIONS AND PRACTICE OF INTRAOPERATIVE HANDOVERS: A SURVEY

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Introduction: Intraoperative anesthesia handovers can be unstructured and of variable quality (1). Verbal, ad hoc handovers are prone to communication failure, information loss, and inaccuracy, all of which can compromise patient safety (2). The purpose of this study was to provide data regarding current intraoperative handover practices at a tertiary-care academic institution, as well as the perceptions of their quality, from anesthesia providers. Presently, there is no intraoperative handover protocol at this institution. The data gathered will inform a future study which will endeavour to develop a standardized institutional protocol for use among anesthesia providers who transfer the care of patients intraoperatively, with an aim to improve the quality of handovers.

Methods: With local REB approval, an online survey was created and distributed using Survey Monkey (Palo Alto, CA). An invitation to participate in the survey was e-mailed to 75 OR anesthesia consultants and 45 anesthesia residents on December 1, 2014. After two weeks, weekly reminder e-mails were sent to non-respondents until a 75% response rate was achieved. There were ten multiple-choice questions and one free text question. Only two questions, which collected demographic information, were mandatory. Responses could not be linked to individual respondents.

Results: 59 consultants and 34 residents responded, yielding a response rate of 77.5%. Responses to selected questions are depicted in stacked diverging bar charts (Fig 1). 67.7% (63/93) of respondents do not have a standardized way of handing over a patient to an anesthesia colleague in the OR, and 81.7% (76/93) do not have a standardized way of receiving such a handover (Fig 1a). When asked to rate the quality of handovers given and received in the last three months, most respondents rated them as “good” or “acceptable” (Fig 1b). Most providers state that they “rarely” experience major or minor intraoperative complications due to poor quality handovers. 9.7% (9/91) of respondents “frequently” feel “uncertain” after receiving a handover and the original provider has left and 46.2% (43/91) “sometimes” do (Fig 1c). There was no association between having a standardized method of either giving or receiving a handover and the frequency of perceived intraoperative complications or feeling uncertain.

Discussion: Standardized communication tools and transition of care practices improve information transfer and reduce errors (3,4). At this institution, most anesthesia providers do not have a standardized way of giving or receiving intraoperative handovers. While intraoperative complications are only rarely attributed to poor quality

handovers, almost 56% of providers routinely feel uncertain about the information received during handovers. The lack of association between reporting a standardized handover practice and perceived complications due to poor handovers or feelings of uncertainty may indicate that individual standardization practices are not effective. The results of this survey suggest that this institution may benefit from a structured handover protocol. This study will be used to begin creating that protocol.

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82734 - HEMODYNAMIC EFFECTS OF LOW DOSE SPINAL ANESTHESIA IN CESAREAN SECTION

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Introduction: Spinal anesthesia is the most commonly used technique for Cesarean section. The conventional local anesthetic used is hyperbaric bupivacaine (0.75% solution) with or without opioids [1-3]. The conventional dose of local anesthetic has been decreasing over time to between 8 and 12.5mg [4]. Recent published reports have demonstrated adequate anesthesia with even lower doses of bupivacaine (4.5-7mg) [5,6]. These lower doses may be associated with less hypotension, improved cardiac output, lower incidence of nausea and vomiting, and faster recovery from motor and sensory blockade. We hypothesized that low dose spinal anesthesia (4.5 mg) would result in improved maternal cardiac index when compared with conventional dose (9mg) intrathecal bupivacaine while maintaining adequate surgical anesthesia.

Methods: This Randomized Controlled Trial was approved by the local Biomedical Research Ethics Board. Written informed consent was obtained from healthy parturients undergoing elective cesarean section. In addition to standard CAS monitors, an arterial line was placed for continuous monitoring of blood pressure and cardiac index using a minimally invasive cardiac output monitor. Our primary outcome was the difference in cardiac index (CI) between groups from the start of the case to 25-minutes after spinal anesthesia was initiated. Secondary outcomes included mean arterial pressure response, time to discharge from recovery room, fluid administration, vasopressor usage, maternal satisfaction, adequacy of surgical blockade and recovery time from motor and sensory blockade.

Results: Cardiac index decreased significantly in both groups from the start of the case to the 25-minute time period ($p < 0.0001$, two way repeated measures ANOVA). The decrease in CI however was not significantly different between groups ($p=0.36$, group vs. time interaction). With respect to mean arterial pressure, there was a positive group vs. time effect with patients in the high dose spinal group having higher mean arterial pressures than the patients in the low dose spinal group ($p < 0.001$, group vs. time effect). Vasopressor use was similar between groups. The low dose spinal group demonstrated equivalent surgical anesthesia and block onset times compared to the

conventional spinal group. In addition, the low dose group had significantly faster sensory and motor recovery times with a shorter recovery room stay compared to the conventional dose group (70 ± 11 minutes vs. 92 ± 21 minutes, $p < 0.01$).

Discussion: Low dose spinal anesthesia for cesarean section does not result in improved maternal CI when compared with conventional dose. This lack of difference in CI may be related to persistent IVC compression in both groups. Alternatively the venodilating effect of both doses of bupivacaine on the splanchnic vasculature reduces venous return, and therefore CI, to a similar extent. In appropriately selected patients, low dose spinal anesthesia demonstrates equivalent surgical conditions and hemodynamics to conventional spinal anesthesia with the benefit of faster recovery from sensory and motor blockade.

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82753 - PROBABILITY OF MODERATE-SEVERE OSA BY THE STOP-BANG QUESTIONNAIRE

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Introduction Diagnosing the patients with moderate-to-severe (AHI >15) and severe (AHI >30) obstructive sleep apnea (OSA) is important because of the increased risk of perioperative complications. Polysomnography (PSG) - the gold standard for the diagnosis of OSA - is time consuming and costly. The STOP-Bang questionnaire is a validated screening tool for obstructive sleep apnea[1]. We conducted this meta-analysis to determine the predictive probability of moderate-to-severe (AHI >15) and severe (AHI >30) OSA by the STOP-Bang questionnaire.

Methods: A search of the literature databases MEDLINE (from 2008 to April 2014), Embase (from 2008 to May 2014), Cochrane Databases of Systematic Reviews (from 2008 to march 2014) and PubMed (from 2008 to August 2014) was carried out. The search yielded 340 citations. Irrelevant papers were excluded by title, abstract and full-text review, leaving 5 manuscripts for analysis. Inclusion criteria were: 1) Studies that used STOP-Bang questionnaire as a screening tool for moderate-to-severe and severe OSA in adult subjects (>18 year); 2) The accuracy of the STOP-Bang questionnaire was validated by polysomnography - a gold standard for diagnosing OSA; 3) Availability of data on AHI or respiratory disturbance index (RDI) ≥15; 4) and probability of moderate-to-severe and severe OSA at the different STOP-Bang scores 5) Publications in the English language. Validity criteria assessing the internal and external validity were explicitly described and coded according to the Cochrane methods group on screening and diagnostic tests. The data about the probability of moderate-to-severe and severe OSA and the different STOP-Bang scores were pooled and presented as a bar graph.

Results: The meta-analysis was carried out in 5 prospective studies including a total of 2,792 patients (3 studies in the sleep clinic patients,[2-4] n=1835 and 2 studies in the surgical patients,[5,6] n=957). The data on the predictive probabilities for the different severities of OSA with the corresponding STOP-Bang scores were shown in Figure.

In the sleep clinic population, the probability of moderate-to-severe OSA for a score of 3 is 52%. With a stepwise increase of the STOP-Bang score to 4, 5, 6 and 7/8, the probability rises proportionally to 62%, 72%, 82% and 92% respectively (Fig 1A). Similarly, the same pattern exists for severe OSA. With a stepwise increase of the STOP-Bang score of 4, 5, 6 and 7/8, the probability of severe OSA climbs to 35%, 45%, 55% and 75% respectively (Fig 1B).

In the surgical population, the probability of moderate-to-severe OSA for a score of 3 is 40%. With a stepwise increase of the STOP-Bang score to 4, 5, 6 and 7/8, the probability soars proportionally to 48%, 60%, 68% and 80% respectively (Fig 1C). With a stepwise increase of the STOP-Bang score of 4, 5, 6 and 7/8, the probability of severe OSA escalates to 25%, 35%, 45% and 65% respectively (Fig 1D). A higher STOP-Bang score reflects a higher cumulative score of the known risk factors and the greater the probability of moderate-to-severe and severe sleep apnea.

Conclusion: In the sleep clinic and the surgical patients, the higher the STOP-Bang score, the greater the probability of patients suffering from moderate-to-severe and severe sleep apnea.

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82771 - COMPOUND RYR1 HETEROZYGOSITY AND MALIGNANT HYPERTHERMIA

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Malignant hyperthermia (MH) is a potentially fatal pharmacogenetic myopathy triggered by exposure to volatile anesthetics and/or depolarizing muscle relaxants. Susceptibility to MH is primarily associated with dominant mutations in the ryanodine receptor type 1 gene (RYR1).[1] Recent genetic studies showed that RYR1 variants are the most common cause of dominant and recessive congenital myopathies - central core and multi-minicore disease, congenital fiber type disproportion, and centronuclear myopathy.[2-4] However, the MH status of many patients, especially with recessive RYR1-related myopathies, remains uncertain. We report the occurrence of a triplet of RYR1 variants, c.4711A>G (p.Ile1571Val), c.10097G>A (p.Arg3366His), c.11798A>G (p.Tyr3933Cys), found in cis in four unrelated families. Phenotype-genotype correlation analysis indicates that the presence of the triplet allele alone confers susceptibility to MH, and that the presence of this allele in a compound heterozygous state with the MH-associated RYR1 variant c.14545G>A (p.Val4849Ile) results in the MHS phenotype and a congenital myopathy with cores and rods. Our study underlines the notion that assigning pathogenicity to individual RYR1 variants or combination of variants, and counseling in RYR1-related myopathies may require integration of clinical, histopathological, in vitro contracture testing, MRI and genetic findings.

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82777 - MECHANICAL STRENGTH AND STIFFNESS OF SINGLE USE LARYNGOSCOPE BLADES

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Introduction: Disposable laryngoscope blades have been introduced for concerns over infectious risks and convenience, vis-a-vis lack of cleaning requirements. Various clinical, cadaver and manikin studies have reported forces ranging from 20 to 39 newtons[1-3] during direct laryngoscopy. The most recent ISO standard specifies that the laryngoscope blade tip must deflect less than 10 mm with an applied load of 65 N and blades must be structurally intact after an applied load of 150 N[4]. There are no studies evaluating adult disposable laryngoscope blades in comparison to the ISO standard. The purpose of this study was to assess the mechanical properties of metal and plastic adult single-use laryngoscope blades in comparison to the ISO standard.

Methods: Nine different models of single-use Macintosh laryngoscope blades were tested (5 metal and 4 plastic). Each blade was attached to a "green standard" metal laryngoscope handle (Heine) which was rigidly clamped to an engineering materials testing machine. Five samples were tested for each type of blade. The testing machine deflected the tip of the laryngocope blade at a constant rate of 25 mm/min and the resultant force (N) and displacement data (mm) were recorded using a data acquisition computer. Each blade was loaded until structural failure or to a maximum load of 200 N. Custom written LabVIEW software was used to analyze the raw data for deflection at prescribed loads, slope of the load-displacement curves and ultimate failure load. The primary outcome measures were blade deflection at 65 N and ultimate failure load. Secondary outcomes were blade stiffness (N/mm) and mode/location of blade failure. Deflection and load data were expressed as mean ± 1 standard deviation, and analyzed using ANOVA with Holm-Sidak multiple pairwise comparisons.

Results: The blade deflections at a load of 65 N ranged from 5.3 ± 0.3 to 9.5 ± 1.6 mm for metal constructs versus 15.1 ± 0.4 to 19.9 ± 0.8 mm for the plastic designs ($p < 0.001$ for all metal vs. plastic blades). The ultimate failure loads ranged from 146.1 ± 4.8 to 200 N for the metal blades and 116.8 ± 0.5 to 163.6 ± 0.7 N for the plastic blades ($p < 0.005$ for all metal vs. plastic blades). A common mode of blade failure was gross deformation or fracture at the handle-blade connection.

Discussion: All of the metal blades and none of the plastic blades met the deflection

criteria (< 10 mm) set by the ISO. All but one of the metal blades withstood the ISO recommended failure load of 150 N, whereas only one of the plastic blades withstood this level of loading. The metal blades were significantly stiffer and stronger than the plastic designs, which may be important in the selection of disposable devices for clinical use.

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82906 - IMPROVING AD HOC TEAM PERFORMANCE WITH A UNIQUE COMMUNICATION TOOL

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Introduction: Anesthesiology residents are key members of various emergency teams outside the operating room. Such scenarios can be challenging and stressful for many reasons; lack of familiar supports (e.g. personnel and resource availability), leadership is unclear, patient condition is critical and not well defined, and the medical team gathered, “for this specific purpose” (i.e. AD HOC), are unknown to each other – it is unlikely that they have worked together before and they will probably not work together again.[1]

A standardized communication framework called “I START-END” (described in the attachment) was created to assist anesthesia residents to perform more effectively on AD HOC teams.

The I START-END communication tool is based on Crisis Resource Management principles[2] and operationalizes the key concepts of leadership, closed loop communication, shared mental models, situational awareness and adaptive behavior.[3] The tool guides a “process” and is not content specific. It sets the **expectation** that teams need to talk and encourages this dialog by standardizing the interaction and getting everyone “on the same page”.

Methods: A pilot study was designed and approved by the local Research Ethics Board.
17 anesthesia residents participated in this study from July to October 2014.

Residents filled out a PRE-tool questionnaire about their experience in AD HOC settings.

Each resident, served as their own control, and participated in two simulated AD HOC scenarios;one PRE-tool training and one POST-tool training.

The I START-END tool was taught in a small group session at the end of the PRE-tool simulator session and a memory aid provided.

A POST-tool training questionnaire was administered.

Results: PRE questionnaires: 85% of residents stated the AD HOC setting "feels" chaotic & out of control, that working with people they don't know is challenging, and that it is difficult "to be heard" in this setting.

POST questionnaires: 90% of residents stated the I START-END tool was OFTEN or ALWAYS helpful in the AD HOC setting. It facilitated communication and speaking up, and made them more aware of what else was happening with the patient and to anticipate additional resources needed.

Discussion: I START-END encourages a communication PROCESS that actualizes the principles of Crisis Resource Management.

Training individual residents in I START-END improved their subjective ability to effectively perform on AD HOC teams.

The I START-END intervention moves a team from performing not ONLY as a group of **competent individuals** but also as a **collectively competent team**.[4]

I START-END is a process not bound by content so it may be transferrable to other teams and healthcare settings.

As the complexity of medicine increases, it is the norm that a single patient will require the expertise of many healthcare workers who have
no prior/future relationship with each other (AD HOC encounter).[5]

To prevent fragmentation of care, resilient communication strategies, such as I START END, are essential for successful inter-professional practice of the future.[6]

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82927 - RCT OF CESAMET® (NABILONE) FOR PREVENTION OF PONV IN ELECTIVE SURGERY

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Introduction: : Postoperative nausea, vomiting, or both (PONV) continues to be an important clinical problem. Untreated, one third of patients undergoing general anesthesia will have PONV[1]. PONV frequently delays discharge, and is the leading cause of unexpected hospital admission after planned ambulatory surgery[2]. Nabilone is a synthetic cannabinoid and a potent CB1 agonist[3] which has been shown to be effective in preventing nausea and vomiting in patients receiving chemotherapy[4]. Given the past success translating treatments for chemotherapy-induced nausea and vomiting (ie. 5-HT receptor agonists) for use in the perioperative environment, we hypothesized that preoperative administration of nabilone would reduce the rate of PONV in the PACU.

Methods: With prior REB and Health Canada approval, informed patient consent and trial registration, we conducted a double-blind, randomized, placebo-controlled, single center, trial of Cesamet® (nabilone) for the prevention of PONV. A priori sample size calculation indicated the need to treat a total of 330 patients to detect a 25% reduction in PONV when selecting patients with a high pre-operative risk of developing PONV (based on the presence of at least 3 of 4 Apfel risk factors[1]) scheduled for elective surgery under general anesthesia. Patients were randomized to receive either nabilone (0.5 mg) or placebo by mouth 1 to 3 hours pre-operation and were followed until discharge from the PACU. The primary outcome is nausea or vomiting in PACU and secondary outcomes include the total number and dose of rescue medications, nausea scores, rates of medication side effects, time to discharge from PACU, rates of admission due to PONV, pain scores and adverse events.

Results: Target enrollment (n=330) was completed just prior to abstract submission deadline so datalock and unblinding have not yet occurred. Preliminary demographic data showed mean age of 50 (range;18-84 SD;15) and all female subjects. The categories of surgery are: Intra- or retro-peritoneal 16%; Head-and-neck surgery – 14%; Urologic or gynecologic – 41%; Orthopedic – 14%; Breast – 16%. Overall, 31% of patients reported PONV and/or were given antiemetic therapy prior to discharge from the PACU. After unblinding and primary and secondary outcome analysis, we will

perform a multivariate analysis to stratify outcomes based on preoperative risk of PONV, type of surgery and the number and types of antiemetics given prophylactically at the anesthesiologist's discretion. Categorical data will be analyzed using a chi-square test, continuous data using a student's t-test or ANOVA, and survival analysis will be performed using Cox regression, with a level of significance set as $P < 0.05$.

Discussion: This is the largest trial of nabilone for PONV to date. This study was designed to be pragmatic and generalizable, including patients for a wide range of surgeries and simple single dosing regimen taken just prior to surgery. If this trial shows nabilone to be efficacious for this application it could provide a new option with no known prolongation of QT interval to prevent PONV in patients at high risk for this adverse outcome.

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82973 - OPTIMUM BRIGHTNESS OF A NEW LED LIGHTWAND DEVICE IN A CADAVERIC MODEL

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Introduction: Lightwands still play an important role in the difficult airway situation[1]. However, the recent withdrawal of the Trachlight (Laerdal) from the airway market has left many anesthesia providers without a suitable replacement for this well validated airway device[2]. While the Trachlight was popular, it had limitations including: appreciable degradation in light output with repeated use and cleaning[3], the potential risk for thermal burns from the incandescent bulb, and fixed light output (new wands brightness 2300 lux[3]) which could not be adjusted for different neck thicknesses[4]. A new LED lightwand prototype with adjustable light intensity has recently been developed. The purpose of this pilot study was to assess the optimum range of light intensity and LED bulb color (white vs red) for transtracheal illumination with this new device.

Methods: After obtaining the approval of the REB, two freshly prepared clinical grade cadavers (1 male and 1 female cadaver with neck circumferences of 40.4 and 38.3 cm respectively) were obtained for this pilot study. A Trachlight device handle was equipped with a custom built power system and adjustable dimmer dial which powered a modified lightwand with either a red LED (brightness range 0-4500 lux) or white LED bulb (brightness range 0-8000 lux). Thirteen staff anesthesiologists familiar with lightwand intubations were recruited and consented to participate in the study. The device light output was calibrated using a validated light meter testing system[3]. The room was darkened to an ambient light level of < 3 lux and the order of testing scenario (cadaver/bulb color) was block randomized. The lightwands were placed at the glottic opening by the primary investigator with placement confirmed by direct laryngoscopy. Testing was done on both cadavers using both the red and white LED bulbs. For each bulb color, the staff were asked to adjust the brightness dial to the optimum transtracheal illumination from the off position up to the optimum and then from the maximum brightness down to the optimum. After completing the study, participants were asked which bulb color they preferred. Optimum brightness levels were analyzed using three way ANOVA with Holm-Sidak multiple comparisons.

Results: The optimum light intensity (mean ± sd) selected by the 13 staff for the different testing scenarios is shown in figure. There was a significant difference in the optimum light intensity for cadaver 1 versus cadaver 2 ($p < 0.001$) and red versus white LED bulb brightness ($p < 0.001$), however there was no significant difference in optimum brightness selection by direction of dial adjustment (i.e up/down, $p=0.162$). There was no observable pattern of preference in bulb color.

Discussion: Our pilot data suggest that the optimum brightness required for transtracheal illumination was dependant on the anatomy of the cadaver tested, with a wide range of lux required for both LED bulb colors. The optimum brightness often exceeded the brightness of the old Trachlight device. The red LED appeared to require less light intensity for transtracheal illumination. These data support the design of an adjustable light intensity feature in the new lightwand device.

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82991 - NOVEL METHOD TO MEASURE CEREBROVASCULAR REACTIVITY USING MRI AND CO2.

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Introduction: Cerebrovascular reactivity (CVR), defined as a change in cerebral blood flow in response to a vasoactive stimulus, reflects the vasodilatory reserve capacity of cerebral vessels. CVR impairment has shown to be an important prognostic marker of several diseases including stroke.[1] Several techniques have used to measure CVR but the lack of appropriate reproducible stimuli and noninvasive CBF measurement methods limit the routine use of CVR measurement in clinical practice.[2] We have developed a non-invasive method of mapping CVR using a precise targeting of CO2 and BOLD-MRI. Aim of our study was to investigate the feasibility of measurement of CVR using sequential breathing circuit for precise targeting of CO2 in mechanically ventilated patients.

Methods: After IRB approval, patients with known cerebrovascular disease needing general anesthesia for BOLD MRI were included in the study. All patients had standardized general anesthesia care. BOLD-MR imaging was performed in 3.0 Tesla magnet while precise targeting of CO2 was achieved using a custom made sequential breathing circuit and a computer controlled gas blender. Three different P_{ET}Co2 targets (normocapnia (baseline resting Co2), Hypercapnia (baseline +10mmHg), and Hypocapnia (baseline -5mmHg) were achieved. MRI and P_{ET}Co2 data were imported into custom software (Labview, TX) for creating CVR maps. The BOLD-MRI signal from each voxel was then correlated to the PCo2 and the correlations (positive and negative) were color coded to generate a CVR color maps.(Fig 1). In addition, we also measured the changes in CBF under both propofol and sevoflurane anesthesia using ASL –MRI sequence.

Results: We recruited four patients (1 male and 3 female) with mean age of 20 years. All patients had Moyamoya disease with history of previous strokes and cerebral revascularization procedures (EC-IC bypass). All patients had both step and ramp changes in P_{ET}Co2and targets were achieved within 2 breaths in all patients. BOLD signal changes correlated with the changes in P_{ET}Co2. Impaired CVR with evidence of steal physiology was seen in 3 patients (Fig 1). Under propofol anesthesia, CBF values (ml/100gm of brain tissue) were lower when compared to sevoflurane (38.4 vs 56.6 in Grey matter and 31.6 vs 42.5 in white matter). In addition, even with hypercapnia, CBF values under propofol anesthesia were lower than the sevoflurane anesthesia under normocapnia.

Discussion: Our pilot study showed that using precise targeting of Co2 and BOLD-MRI, measurement of CVR is feasible in mechanically ventilated patients. This combined technique may be complementary in identifying vulnerable brain regions and thus constitute a " Brain Stress test " Non-invasive measurement of CBF is possible using ASL-MRI technique. Cerebral blood flow values (both normocapnia and hypercapnia) were lower under propofol anesthesia compared to sevoflurane.

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82997 - FUNCTIONAL CONNECTIVITY IS PRESERVED UNDER SEVOFLURANE ANESTHESIA.

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Background: Anesthetic agents dependably and reversibly abolish conscious perception, an event for which the ultimate mechanism remains elusive. Advances in brain imaging technology have allowed us a peek into this enigma. Defined regions of the brain are interconnected into networks that allow for complex processing of stimuli. These functional connectivity maps can be seen as fluctuations in blood-oxygen level, correlated to changing levels of brain activity, on MRI scans (BOLD-fMRI). Functional connectivity studies have shown that there are number of resting state networks that are reproducible at the individual level. The objective of this study is to look at the changes in resting state functional connectivity under 1 MAC sevoflurane anesthesia in mechanically ventilated patients.

Methods: **After** REB approval and informed consent, adults scheduled for MRI of the brain under general anesthesia were recruited for the study. Routine standard preparation of the patient for general anesthesia for MRI was carried out in all patients. Resting state fMRI scans were acquired in all patients on a 3 Tesla scanner at 1 MAC of sevoflurane concentration. During the study period, $ETCO_2$ and the blood pressure were maintained at baseline value. Spontaneous BOLD fluctuations are measured, and a seed-voxel analysis done to identify the resting state networks. Five networks were investigated, the default mode network (DMN), executive control network (ECN) as well as the auditory, visual and sensorimotor networks. For each seed taken separately, Pearson's correlation r-values were calculated between the seed time-course and the time-courses at each grey matter voxel. The r-values were transformed into Fisher z values.

Results: Total of 21 patients were recruited for the study and data from 13 patients were included in the final analysis (7 men and 6 women, mean age 39 years). Under 1 MAC sevoflurane anesthesia, resting state functional connectivity is preserved in all the five networks.(figure1) For the DMN we identified connectivity in the posterior cingulate cortex/ precuneus (z=9.5), medial prefrontal cortex, middle temporal and parahippocampal gyrus. For the ECN, dorsolateral prefrontal cortex showed highest connectivity (z=8.6). For the auditory, visual and motor networks, insula (z=8.8), cuneous (z=8.2) and pre-central gyrus (z=8.5) showed increased connectivity respectively.

Discussion: To our knowledge this is the first study to show the persistence of resting state networks under surgical anesthesia (1 MAC Sevoflurane). Our results suggest that there is a continued activity within the DMN under 1 MAC sevoflurane anesthesia. DMN plays a role in conscious self-awareness, a property of brain activity thought to be abolished by general anesthesia. This study suggests that some components of consciousness may be preserved even under clinically significant doses of anesthetics. Further studies are needed to confirm these early findings.

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83021 - PERIOPERATIVE INTRAVENOUS FLUID VOLUME PROLONGS SURGICAL RECOVERY

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Introduction:

In major abdominal surgery, it is common practice to administer intravenous fluids perioperatively to adjust for acute changes in fluid hemodynamics and hypotension. However, emerging evidence suggests that the volume of intravenous fluids administered is an important risk factor for postoperative complications and prolonged length of hospital stay (Corcoran et al. 2012). Our objective was to determine if perioperative intravenous fluid volume is associated with length of hospital stay (LOS) and complications after colorectal surgery.

Methods:

After obtaining the appropriate Research Ethics Board approval, d
ata were retrospectively collected on adult patients who underwent inpatient colorectal surgery from 2008-2013. The primary outcome was prolonged LOS, defined as a LOS above the median (8.2 days). Secondary outcomes investigated included post-operative complications (pulmonary edema, acute renal failure and myocardial infarction) and postoperative death. The impact of fluid volume on LOS was examined using multivariable logistic regression. Surgical, anesthetic and patient variables were included in the model. Intravenous fluids included normal saline, balanced salts, hydroxyethyl starch and albumin (5%).

Results:

During the study period, 1,615 patients underwent colorectal surgery and complete perioperative data was available for 1,242 patients. The majority of these cases were elective (57.4%) oncology cases with Charlson Comorbidity Index (CCI) ≥ 3 in 9.3%. The volume (L) of intravenous perioperative fluids administered was independently

associated with an increased probability of prolonged length of hospital stay, with an odds ratio of 1.31 (95% CI, 1.19-1.45, $p < 0.01$). In addition to fluid volume, four other risk factors were found to be associated with prolonged LOS: age > 65, CCI ≥ 3, estimated blood loss > 200mL, and emergent surgical cases. Goodness of fit was assessed using a receiver operating characteristic (ROC) curve with a C statistic of 0.78 and Hosmer-Lemshow statistic of 0.67. Postoperative morbidity was associated with prolonged LOS, but the number of adverse events was not sufficient in order to investigate the association of these secondary outcomes with perioperative intravenous fluid therapy, independent of the effect of perioperative intravenous fluids on LOS.

Discussion:

Larger volumes of intravenous fluids administered perioperatively are independently associated with increased LOS after colorectal surgery. While additional studies are required to demonstrate a causal relationship, the volume of intravenous fluid administered in the perioperative period is an important, modifiable potential risk factor for prolonged LOS that deserves further investigation. Further studies may also shed light on possible associations between perioperative intravenous fluid therapy and postoperative adverse events (morbidity), independent of their possible effect on morbidity indirectly through increased LOS.

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83100 - INTRAOPERATIVE ANAPHYLACTOID REACTION TO MIDAZOLAM: A CASE REPORT

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Introduction: Anaphylaxis is a Type I immunoglobulin (Ig)E-mediated hypersensitivity reaction involving mast cells and basophils.
The
incidence during the perioperative period is estimated to range from 1 in 3,500 to 1 in 13,000 cases.1 Though rare, hypersensitivity reactions occurring during anesthesia can rapidly evolve into life-threatening anaphylaxis. The most common agents known to cause hypersensitivity reactions are muscle relaxants, latex, and antibiotics.2 Although benzodiazepines are considered safe from hypersensitivity reactions, a review of the literature has described rare case reports outside North America.
345
Here, I report a case of midazolam hypersensitivity, and discuss the important role of perioperative follow-up to avoid re-exposure.

Case Presentation: A 51-year-old caucasian male; 98Kg and 175cm, was scheduled to undergo surgery for a left Femur biopsy, and the placement of an intra-medullary stabilizing rod secondary to impending pathologic fracture. Five minutes following induction of general anesthesia and surgical draping, the patient was found to have severe refractory hypotension. There were no cutaneous or bronchial signs of a hyperreactivity reaction. Intra-operative and subsequent work-up failed to determine any cardio-respiratory or equipment related causes for this presentation. The hypotension responded immediately to the titration of intravenous epinephrine. Anaphylaxis was the diagnosis of exclusion owing to the profoundness of his hypotension. His case was cancelled with the knowledge that a repeat OR was required. Post-operative work-up of anaphylaxis and a referral to an allergist was sought. Intradermal Skin Testing (IDT) at 4 weeks showed that Midazolam was the sole reagent that tested positively in-vivo for an allergic reaction.

Conclusion: The perioperative period is a unique environment wherein a myriad of exposures and parenteral drugs are encountered that may lead to an adverse reaction. Anesthetists are more likely to encounter and manage immediate hypersensitivity reactions than other physicians. Given the rapidity with which a life-threatening situation can occur, the mechanisms, therapy, and investigations of allergic responses should be familiar to every anesthetist. The perioperative management should focus on developing an approach to reduce its incidence by identifying potential allergens prior to subsequent anesthetics. Prevention is paramount to decrease the occurrence of anaphylaxis. Close collaboration and consultation between the allergist and anesthesiologist is a key goal when investigating an allergy. A validated protocol should be used. Recent guidelines have been published in an effort to standardize the

investigation of presumed anaphylaxis.6 Documentation of events leading to anaphylaxis, immediate laboratory investigations, referral to an allergist, as well as appropriate labeling of the patient are essential to prevent future episodes. Failure of the above measures may lead to unnecessary fatal re- exposure.

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83115 - SUMATRIPTAN IMPROVES QUALITY OF RECOVERY AFTER CRANIOTOMY

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Background: Microvascular decompression (MVD) is a surgical treatment for trigeminal neuralgia and hemifacial spasms[1]. Current surgical approach is via a small craniotomy which often results in minimal surgical site pain, easily managed with conventional analgesics. However, these patients often experience post craniotomy headache which is a more complex type of pain reminiscent of a migraine headache and is associated with other unpleasant symptoms such as photophobia, nausea and vomiting. This headache may affect the quality of recovery and has the potential for development of chronic pain[2,3]. Sumatriptan is used to treat migraine-like headaches in various settings[4]. We conducted a randomized controlled study to investigate the effects of subcutaneous sumatriptan administration on post-operative headache and on the overall quality of recovery after MVD surgery

Methods: This was a single centre, prospective, randomized double blind clinical trialAfter REB approval and patient consent,fifty patients who complained of postoperative headache after MVD were randomised to receive a subcutaneous injection of sumatriptan (6 mg) or saline in the post-operative period. The primary outcome was quality of recovery as measured by the QoR-40 score at 24 hours. The QoR-40 is a validated tool to measure quality of recovery and has been used successfully following neurosurgery[5,6]. The other outcome measures were pain and headache scores, total opioid consumption and hospital discharge times. Statistical analysis were using unpaired t-test, Mann-Whitney test, chi square test or Fischer's exact test where appropriate. P value < 0.05 was considered significant.

Results: Fifty patients were randomised to the sumatriptan group (n=25) and placebo group (n=25).. There were no statistically significant differences in demographics between the two groups . The QoR-40 scores were significantly higher in the sumatriptan group (median 184; interquartile range 169 – 196) than the placebo group (133; 119 – 155, $p < 0.01$), suggesting higher quality of recovery (table 1). The median scores for the individual aspects of the QoR-40 (physical comfort, emotional state, physical independence, patient support and pain) were all higher in the Sumatriptan group as compared with the placebo group. The sumatriptan group also had significantly lower headache scores at 4, 6 and 24 hours postoperatively. There were

no significant differences in other secondary outcomes. The median duration of stay was 2 days (range 1 to 3 days) in both groups with no statistical differences (p = 0.7). There were no adverse events related to the use of sumatriptan in the study.

Conclusions:. Our study showed that the use of Sumatriptan improves the quality of recovery as measured by the QoR-40 at 24 hours post-operatively. This may present as a useful alternative treatment for post-craniotomy headache. The precise mechanism remains unknown but may be related to reduction in headache, or mood modulation mediated by a serotonin effect.

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83138 - REGRESSION OF QRS WIDENING INDUCED BY BUPIVACAINE AFTER INTRALIPID

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Background and Goal of Study: The principal mechanism of cardiac toxicity of bupivacaine relates to the blockade of myocardial sodium channels, which leads to an increase in the QRS duration. Recently, experimental studies suggest that lipid emulsion is effective in reversing bupivacaine cardiac toxicity. We aimed to evaluate the temporal evolution of the QRS widening induced by bupivacaine with the Intralipid administration.

Material and methods: Six pigs were premedicated with ketamine and anesthetized with intravenous sodium thiopental 5mg-kg. The anesthetic maintenance was performed with sevoflurane 1 CAM (2.6%). Femoral artery and vein were canalized for invasive monitoring, analytical blood gas samples and bupivacaine levels determinations. After instrumentation and motorization, a bupivacaine bolus of 4 $mg.kg^{-1}$ was administered in order to induce a 150% increase in QRS duration (defined as the toxic point). The Electrocardiographic parameters were recorded and blood samples were taken after bupivacaine and 1, 5 and 10 minutes after Intralipid administration (1.5 mL/kg over 1 minute followed by an infusion of 0,25 mL/kg/min) Three additional animals served as a control group, saline infusion was administered instead of Intralipid. Statistical analysis: Mann-Whitney test.

Results: The baseline QRS was 63 ± 7.4 ms in IL group, and 50 ms in control group. Bupivacaine induced similar electrocardiographic changes in both groups, the maximum QRS widening was183 ± 39 ms and 180 ± 35 ms in IL and control group respectively. After IL administration the QRS enlargement was reversed as shown in Figure 1, ($p < 0,05$). At 10 min of the IL administration, the QRS interval was 84% of baseline value.

Discussion: Intralipid reversed the lengthening of QRS interval induced by the injection of bupivacaine. Time to normalization of electrocardiographic parameters can last more than 10 min. While the phenomena of cardiac toxicity persist, resuscitation measures and adequate monitoring should be continued until adequate heart conduction parameters were restored.

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83149 - PREDICTION OF BLOOD PRESSURE RESPONSE IN SURGICAL PATIENTS

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Introduction Pulse pressure variation (PPV) and stroke volume variation (SVV) are excellent predictors of cardiac output response to intravenous fluid bolus administration (1-3). Dynamic arterial elastance (EaDyn), the ratio of PPV/SVV, has been shown to predict mean arterial blood pressure (MAP) increase to intravenous fluid bolus administration in patients with sepsis (4). This study aims to generalize this result to patients undergoing major elective vascular surgery, in order to guide fluid therapy to maximize therapeutic effect and patient safety.

Methods: Ethics approval was obtained from the local research ethics review board. A post hoc analysis was conducted of forty patients undergoing combined general and thoracic epidural anesthesia for open repair of infrarenal abdominal aortic aneurysm in a tertiary care center. Continuous hemodynamic monitoring with a minimally invasive cardiac output monitor was employed for all patients. A 15% increase in MAP with fluid boluses was considered a priori as being clinically significant. Five-minute averages of hemodynamic variable were compared pre and post fluid bolus administration. Receiver operating characteristic curves were then generated to show the sensitivity and specificity of EaDyn for the prediction of mean arterial pressure increase to fluid bolus administration.

Results: Patients with a 15% increase in MAP with fluid bolus demonstrated a significant decrease in pre vs. post EaDyn from 1.0 ± 0.3 pre fluid bolus to 0.63 ± 0.29 post fluid bolus (P=0.0021). In those patients who did not have a 15% increase in MAP with fluid administration, EaDyn remained unchanged (0.75 ±0.35 vs. 0.73 ± 0.31 pre vs. post fluid, p=NS). There was no change in central venous pressure in MAP responders [9.5 ± 5.1 vs. 11.2 ± 6.2 mmHg, P=0.3713] or MAP non-responders [9.6 ± 3.3 vs. 10.1 ± 3.2 mmHg, P=0.4765] with fluid bolus. Stroke volume index did not differ significantly pre and post IV fluid bolus between MAP responders [40.7 ± 5.4 vs. 45.5 ± 9.6 ml/M^2, P=0.0342] or non-responders [40.4 ± 8.7 vs. 40.0 ± 8.2 ml/M^2, P=0.7824]. An EaDyn cutoff value of < 1.1 gives a sensitivity of 87.5% and specificity of 48% for predicting a 15% increase in MAP. Figure 1 shows the receiver operating characteristic curve for EaDyn, arterial stiffness (Pulse Pressure/ Stroke Volume) and systemic vascular resistance.

Discussion: EaDyn successfully predicts MAP response to IV fluid bolus administration in adult patients undergoing open AAA repair. PPV, as shown previously,

predicts cardiac output response to IV fluid bolus administration, and may predict MAP response in some patients. Traditional predictors of fluid responsiveness such as CVP are ineffective. Dynamic arterial elastance is a promising new tool for predicting which surgical patients will benefit from IV fluid bolus, potentially avoiding excessive volume administration and complications.

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83197 - IMPACT OF NAME TAGS ON ANESTHESIA RESIDENTS' AWARENESS IN SIMULATION.

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Introduction: Obtaining and maintaining the commitment of participants in a high fidelity (Hi-Fi) simulation is essential for a better learning experience. We investigated whether wearing name tags and place identification during Hi-Fi simulation leads to better residents' commitment and situational awareness.

Methods: Six simulation sessions were scheduled with 25 anesthesia residents unaware of the exact topic of the study. Each session ran for 4 hours during which 2 Hi-Fi simulation scenarios (a massive amniotic fluid embolism case and a postoperative malignant hyperthermia) took place with the same participants. A randomization table was used to prospectively designate in what order the scenarios would be conducted. In the first scenario run (control scenario), participants wore no name tag and there was no indication as to the location where the scenario was supposed to take place" . For the second scenario (intervention scenario) run during the session, trainees had to wear name tags stating their actual roles and a sign identifying the physical location in which the scenario was to take place was posted at the entrance of the simulator. At the end of each scenario, each participant completed a 6-question survey using a 7-point Likert scale in order to evaluate their role and location awareness at the beginning and during the case as well as their overall emotional engagement and commitment level (local 0-10 scale). Later, a specially trained auditor unaware of the scenarios' sequence listened to the soundtrack (without the visual) of the videos in search of specific indicators related to participants poor situational awareness.

Results: The subjects' assessment of their own awareness regarding their roles or location at the beginning and during the case was not influenced by the intervention (name tags and formal indentification of scenarios' location). The emotional implication and the subjects' perceived realism leading to learning engagement was not modified by the intervention either. The intervention had no effect on the residents' learning engagement (Wilcoxon matched-pairs signed rank test, figure). Number of indicators suggesting poor situation awareness was not statistically different between groups (Chi-square test).

Conclusion: Our study suggests that wearing name tags during Hi-Fi simulation scenarios does not improve trainees' perception of their own situational awareness or commitment. Nevertheless, the usefulness of name tags or formal participants identification should be discussed in terms of learners and scenarios characteristics as well as educational objectives.

Registered clinical trial: Clinicaltrials.gov reference number NCT02105883

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83350 - THE POPULATION-LEVEL IMPACT OF FRAILTY ON POSTOPERATIVE OUTCOMES

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Introduction: Frailty is a phenomenon that describes a multidimensional loss of reserve and is differentiated from related concepts, such as multi-morbidity, by focussing not on a count of medical conditions, but on factors that denote physiologic vulnerability to stressors. In the general population frailty is strongly correlated with early mortality and vulnerability to adverse health outcomes. Recent single center studies demonstrate that frailty independently predicts postoperative mortality, morbidity, increased length of stay (LOS), and institutional discharge; the impact of perioperative frailty on population-level mortality and health resource use has not been documented, but is of significant importance to clinicians, patients and health system planners.

Methods: This study was conducted under institutional review board oversight specific to the use of anonymized health administrative data. All community-dwelling Ontarians aged
> 65 years at the time of elective, major noncardiac surgery were identified from 2002-2012. Frailty status for each patient was established using the Johns Hopkins ACG® frailty indicator. Our primary objective was not to calculate the independent impact of frailty on resource use, but to estimate the percent of postoperative mortality and resource use attributable to frail patients in general; therefore, our primary analyses were adjusted only for procedure. We compared hospital LOS, institutional discharge, ICU admission, 30-day hospital readmission, 30-day total physician billing, and 30-day ED visits between frail and non-frail patients using appropriate statistical tests. We then calculated the attributable percent of mortality and resource use by frail patients for each outcome (prevalence x ([risk ratio-1]/risk ratio)), and the number of frail patients who would need to have surgery to contribute once excess adverse event (number needed to treat to harm). As a secondary analysis we used multivariable regression to calculate the independent impact of frailty on mortality and resource use.

Results: We identified 202 811 patients, of whom 6 289 (3.1%) were frail. Frail patients were older, more likely to be female, and carried a higher comorbidity burden than non-frail patients. Mortality and all measures of resource utilization were significantly higher in frail patients (Table 1). Adjusting for multi-morbidity and patient demographics, frailty remained an independent predictor of LOS, ICU admission, MD billing, and institutional discharge.

Discussion: Although the prevalence of frailty is relatively low in community-dwelling elderly elective surgical patients, frail individuals experience a much higher absolute and relative increase in their risk of adverse postoperative events. Frail patients represent an important target for quality improvement efforts aimed at enhancing the value, efficiency and outcomes of perioperative care.

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83393 - HEMODYNAMIC STABILITY IN PHEOCHROMOCYTOMA RESECTION

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Introduction: Ideal perioperative management of pheochromocytomas / paragangliomas (pheo) is a subject of debate and can be highly variable. (1-4) The purpose of this study was to identify potential predictive factors of hemodynamic instability during pheo resection.

Methods: A retrospective review of pheo resections from 1992 to 2013 was done after obtaining ethical approval. Intraoperative hemodynamics, patient demographics, tumor characteristics, and perioperative management were examined. Post-operative intensive care admission, myocardial infarction, stroke and 30-day mortality were reviewed. Linear regression was used to analyze factors influencing intraoperative hemodynamics.

Results: During the 20-year study period, 100 patients underwent pheo resection. Postoperative morbidity and mortality was significantly reduced ($p = 0.003$) in the last ten years of practice. There was a trend towards greater morbidity and mortality with intraoperative hemodynamic instability ($p = 0.06$). The preoperative dose of phenoxybenzamine and number of laparoscopic procedures increased in the last decade (59 mg (95% CI 32, 108) to 106 mg (95% CI 91, 124) $p = 0.008$ and 27 vs 54%, $p=0.05$, respectively). Increased preoperative phenoxybenzamine dose was a significant predictor of improved intraoperative hemodynamic stability ($p=0.01$). Lack of intraoperative magnesium use resulted in greater hemodynamic instability as preoperative SBP increased ($p=0.002$).

Discussion: Post-operative outcomes following pheo resection have improved over the last two decades. Preoperative alpha-blockade plays a significant role in improving intraoperative hemodynamics and post-op outcomes. Increased doses of phenyoxybenzamine and utilization of laparoscopic approaches have likely contributed to improved outcomes in the last decade. Intraoperative magnesium use may provide protection against hemodynamic instability and warrants further study.

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83559 - UNIVERSAL TXA PROTOCOL REDUCES TRANSFUSION IN HIP & KNEE ARTHROPLASTY

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Introduction: Randomized clinical trials and observational studies have demonstrated that tranexamic acid (TXA) reduces blood loss and allogeneic red blood cell (RBC) transfusion in cardiac and non-cardiac procedures (1,2). Despite this data, our institutional use of TXA for total hip and knee arthroplasty was relatively low (46%). To address this translational gap in TXA utilization, we implemented a quality of care policy to initiate a universal protocol for treating all eligible patients with TXA perioperatively. We hypothesized that successful implementation of the universal TXA policy would increase TXA utilization and reduce allogeneic RBC transfusion. Additional outcomes included postoperative hemoglobin (Hb), length of stay (LOS) and adverse events.

Methods: After institutional ethics committee approval was obtained, we implemented a quality of care policy to provide universal administration of intravenous TXA (20 mg/kg perioperatively) to all eligible patients undergoing total hip and knee arthroplasty between October 21, 2013 and April 30, 2014. We compared data from an equal number of patients before and after protocol implementation (n=422 per group). The primary outcome was RBC transfusion. Secondary outcomes included postoperative Hb and LOS. Adverse events including death, myocardial infarction, stroke, acute kidney injury, venous thromboembolism, and seizure were identified from the electronic patient records. Data were analyzed by adjusted logistic and linear regression analysis and Chi-square test with significance assessed at $p < 0.05$.

Results: We observed an increase in TXA utilization [45.8% vs. 95.3%, change of 49.5 (44.1-54.5) %] which resulted in a reduction in RBC transfusion rate [8.8% vs. 5.2%;

change of 3.6 (0.1 -7.0) %, p=0.043]; and an increase in postoperative day 3 Hb from 97.1 (95.6 – 98.5) to 100.8 (99.5 – 102.2) g/L ($p < 0.001$). An analysis of the impact of anemia was performed by stratifying patients with preoperative Hb < 120 g/L (anemic patients) vs. those with a preoperative Hb ≥ 120 g/L (nonanemic patients). This analysis demonstrated a high incidence of RBC transfusion in anemic patients not treated with TXA (53.2%) which was reduced to 18.9% in anemic patients who received TXA therapy ($p < 0.001$). The RBC transfusion rate in nonanemic patients who did not receive TXA was lower than that observed in anemic patients (9.9%). TXA treatment resulted in a further reduction on RBC transfusion in these non-anemic patients (4.0%). No change in LOS was observed and there was no increase in incidence of adverse events.

Conclusion: In this observational quality improvement study we demonstrated that the implementation of a universal TXA policy for total hip and knee arthroplasty resulted in an increase in TXA utilization and a reduction in RBC transfusion. We also observed an increase in postoperative Hb suggesting that the reduction in transfusion rate did not result in worsened post-operative anemia. No increase in adverse events was observed suggesting that this protocol was safe. Broader application of TXA therapy for major joint arthroplasty may improve patient outcome.

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83581 - STANDARDIZATION OF ANALGESIC ORDERS FOR JOINT REPLACEMENT SURGERY

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Introduction: A common care pathway for total joint procedures has been widely adopted within our region that includes standardized postoperative orders. However, orders are subject to individual interpretation, potentially contributing to omissions of certain aspects of multimodal analgesia. Additionally, responses from postoperative visits suggest that not all patients have received postoperative analgesia to their satisfaction. This study sought to evaluate and improve postoperative pain management of total hip and knee joint replacement (THR/TKR) and to develop and incorporate an analgesic pathway into the postoperative care plan following THR/TKR that will facilitate best care of each patient that is tailored to their needs and expectations.

Methods: Categorization of quality assurance provided ethics review exemption. Sixty patients undergoing THR (n = 22) or TKR (n = 38) were consecutively recruited. Baseline pain assessments and quality of recovery (QoR) scores were acquired preoperatively. American Pain Society patient outcome questionnaires and visual analog scale (VAS) pain scores were completed and acquired daily during inpatient stay. QoR scores were acquired on postoperative (POD) day 1 and day of discharge. Additional pain assessments were completed on post-discharge days (PDD) 1, 3 and 5 and a final QoR score acquired on PDD 5. Statistical analysis was completed using SPSS 19.0 (IBM, Armonk, NY, USA).

Results: Median (IQR) THR and TKR length of stay (LOS) was 3.08 (0.22) and 3.21 (1.71) days, respectively. Median THR and TKR VAS pain scores on POD 1, 2 and 3 were 1, 2, 2 and 2, 3, 3, respectively. 45.5% and 54.3% of THR and TKR patients presented with high nausea scores (≥ 5 on a 0-10 scale) on POD 1. Significant differences ($p < 0.05$) were found between POD 1 QoR and all other QoR scores for both THR and TKR patients. Specifically, mean THR QoR scores were 124.2 ± 13.4 (preoperative), 97.6 ± 20.6 (POD 1), 119.7 ± 17.5 (day of discharge) and 125.7 ± 13.5 (PDD 5). Mean QoR scores for TKR were 126.7 ± 14.9 (preoperative), 97.3 ± 23.2 (POD 1), 122.1 ± 19.8 (day of discharge) and 121.9 ± 23.3 (PDD 5). 86.7% and 90.3% of THR and TKR patients were satisfied with their level of pain control on PDD 1, rising to 100% and 91.7%, respectively, on PDD 5. 18% of TKR and 36% of THR patients were ordered NSAIDs as part of their analgesic protocol. 50% of patients had simultaneous orders of Tylenol#3, acetaminophen and Percocet for breakthrough pain

control.

Discussion: THR/TKR LOS were in close alignment with pathway goals. Patients displayed high satisfaction in postoperative analgesia, although 100% satisfaction was not achieved for TKR. Of concern were elevated levels of high nausea incidence and the percentage of suboptimal dosing of breakthrough analgesics, necessitating adjustment on POD 1. The absence of clear orders for breakthrough pain control leads to nursing-implemented analgesia administration. Despite providing some degree of autonomy, this can be confusing, especially for junior staff. We plan to implement an analgesic order set that incorporates equipotent doses of opioids, nonsteroidal analgesics and acetaminophen and complete a similar follow-up analysis.

83706 - PREVALENCE OF FATIGUE RELATED RISK AMONG LOCAL ANESTHESIA RESIDENTS

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Introduction: An anesthesiologist must be vigilant during his shift to provide good care. Despite this fact, anesthetists are working long hours without structured support programs which is negatively affecting their mood, cognitive function and alertness. Several measures were acknowledged by the Joint Commission to ensure alert and watchful anesthesiologist before putting patients to sleep.(1) Hospital administrations are recommended to enforce such measures to decrease fatigue related risk. This study is taking the first step for our local anesthesia residents, which is evaluating fatigue related risk

Objective: To estimate prevalence of fatigue related risk among anesthesia residents in our country.

Methods: After local ethical approval has been obtained, all anesthesia residents a were invited to voluntary participate. We have conducted a self-reporting survey that includes demographic data, Epworth sleepiness scale (ESS) and two scales to assess fatigue related risk. The first scale used is a Checklist for Individual Strength (CIS) that has been validated to assess fatigue in the working population. (2) The second is a predefined comprehensive fatigue risk assessment that was previously developed by the Australian Medical Association (AMA). (3)

Results: We received 102responses, with more than half of the sample were at elevated risk of fatigue according to CIS measures and 58.6% (n=92) of the participants are excessively sleepy on ESS. On AMA risk assessment of work patterns 35% of the participants (n=60) were at moderate risk of fatigue and quarter of them are at higher risk.

Discussion and Conclusion: Our sample can be labeled to be fatigued and sleepy. Also, our population had a higher score in being excessive sleepy than general health care workers (59.78% vs. 39.3% representative sample in 3 hospitals locally) (4). Concluding that, such difference could be owed to the different type of population. Statistical analysis demonstrated that although the residents are fatigued, more than half of the resident were feeling motivated (62.54%). Being motivated wasn't enough to alter the overall risk of fatigability in our population.

All three scales suggest presence of fatigue related risk. This could be multifactorial; explained by long shifts, cultural and lifestyle habits. In the conference, we will explain our recommendation to start a Residents Well-Being Program to decrease fatigue, and increase awareness of healthy sleeping habits. Therefore, ensuring residents remain physically and mentally healthy and subsequently safer healthcare for our patients.

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83715 - POSTOPERATIVE ANALGESIA AFTER LOWER LIMB DISTRACTION OSTEOGENESIS

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Introduction: Distraction osteogenesis is known to cause severe pain with patients, making postoperative analgesia crucial.[1] We report the transition process of the postoperative analgesia in children after lower limb distraction osteogenesis over a seven-year period. The objective of this study was to evaluate the effectiveness, complications, and side effects of six different methods.

Methods: The local Research Ethics Board reviewed this case report and gave permission to publish in accordance with all national regulations. As all patient data is collected anonymously and retrospectively, national regulations do not require written patient consent.
Sixty-two children underwent lower limb distraction osteogenesis between December 2007 and December 2014. In 2007, we performed epidural analgesia with ropivacaine (group E). A majority of patients reported severe pain, leading us in 2010 to use fentanyl with ropivacaine via epidural (group EF). In 2011, we began using peripheral nerve blocks and performed continuous sciatic nerve blocks with 0.2% ropivacaine. Some patients had only continuous sciatic nerve blocks (group S), while others had a combination of continuous sciatic nerve blocks and fentanyl infusions (group SF). In 2013, we began combining sciatic nerve blocks with continuous femoral blocks with 0.1% ropivacaine (group B). Some patients only received continuous fentanyl infusions (group F) because of contraindications to regional anesthesia, or due to patient or family request.
In groups E, S, and B, we calculated how many of the patients received intravenous fentanyl infusions as rescue analgesia because of a failure of initial pain management with regional anesthesia. In all groups, we calculated how many of the patients had severe pain (face scale score 4 or 5), postoperative nausea and vomiting (PONV), or whether they had had sensory or motor blockades.

Results: Results are shown in the table. Group B had the fewest pain management failures. Severe pain was lowest in group EF. Groups E, S, and B (without fentanyl) had lower rates of PONV. Intravenous fentanyl infusion combined with regional anesthesia decreased the rate of severe pain, but increased PONV. For peripheral nerve blocks, there were no sensory or motor blockades with the use of 0.1% ropivacaine.

Discussion: In group S, 75% of patients reported severe pain, indicating that only continuous sciatic nerve blocks were insufficient. Therefore, we later combined continuous femoral nerve blocks with sciatic nerve blocks. However, it is crucial to not exceed the maximum dose of local anesthetic, especially with lower weight children. Group B had the best analgesia in terms of effectiveness and having the fewest side

effects. Nevertheless, over 44% of all patients in this study had severe pain, indicating that none of the methods were yet sufficient. We concluded that we must have a backup plan in such cases. Limitations of this study included that the n-values were too low for each group (preventing a statistical analysis), we had no specific protocol for administration of acetaminophen or NSAIDs, and the technical skills of anesthesiologists were unstable during early uses of peripheral nerve blocks.

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83755 - QUALITY IMPROVEMENT OF AN EVIDENCE-BASED PREOPERATIVE CLINIC

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Introduction: DEFINE
As perioperative physicians, anesthesiologist should strive to provide high quality care that, in our current system of limited resources and increased demands, is managed responsibly. To help achieve this, a quality improvement (QI) initiative was undertaken to reorganize a high volume preoperative assessment clinic (PAC) at a community academic hospital. The goal is a PAC that efficiently optimizes patients for surgery using medically- and fiscally-responsible best-practice guidelines for care while minimizing day of surgery (DOS) cancellations. With increased health care system strain, supporting Government initiatives including Ontario's Quality-Based Procedures[1] and the Canadian Medical Association's Choosing Wisely Campaign[2] is a priority. An overarching principle is to foster a patient- and family-centred environment.

Methods: MEASURE
The project was REB approved. Stakeholder meetings involved anesthesiologist, surgeons, internists, nurses, allied health, management, QI specialists and patients. Using a Lean Six-Sigma QI approach, a preoperative process map was examined from initial surgical consultation until DOS. After streamlining improvement cycles, several key concerns included: the lack of completeness of charts, PAC booking barriers, PAC no-shows, long duration of PAC appointments and medically unnecessary investigations/consultations (perhaps ordered as 'operation cancellation insurance').

Results: ANALYSE
Current state metrics include number of patients seen, type of consult done (anesthesia, medicine, nursing), no-shows, incomplete charts, duration of appointment and type and cost of investigations.

IMPROVE
Using best-practice recommendations from current perioperative literature[3-6] and major societal practice guidelines[7,8], routine preoperative investigation orders (laboratory, chest X-ray and electrocardiogram) were updated. Guidelines, based on patient and surgical criteria, were created to help guide surgeons whether patients require preoperative consultation by anesthesiology and/or internal medicine, if at all. A perioperative package was updated to facilitate communication between hospital and

surgeon's offices to improve the completeness of charts and avoid delays. To help create a patient- and family-centred experience, patient pamphlets were updated with clear instructions and a reduction of unnecessary visits/investigations will ultimately result in shorter PAC appointments.

CONTROL
Pre and post-restructuring metrics will be compared as outcome measures. Control measures including DOS rates of: cancellation, unanticipated admission, medicine consultations and recovery room length of stay will be recorded to assess for negative patient outcomes. Cost analysis of investigations will assess for potential system resource savings. Finally, qualitative patient surveys will be conducted.

Discussion:The restructuring of a PAC is described. A QI approach is being used to create an efficient, patient- and family-centred environment that minimizes unnecessary investigations/consultations while maintaining a high standard of care that is consistent with current perioperative literature.

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83770 - AMBULATORY SURGERY DAY OF THE WEEK DOES NOT IMPACT READMISSION OR ED USE

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Introduction: Surgery is increasingly performed on an ambulatory basis, and has proven to be relatively safe. However, over 3% of patients may require unplanned acute postoperative medical care. The day of the week of surgery has been shown to impact postoperative mortailty following inpatient surgery; the impact after ambulatory surgery is unknown. We hypothesized that ambulatory surgery perfomred later in the work week may impact access to continuous care, and shift the burden of care to emergency departments (ED) or hospitals.

Methods: Following approval by the ethical review board, we conducted a historical cohort analysis of population-based health administrative data in Ontario, Canada. Individuals were selected if they underwent planned ambulatory knee or shoulder surgery, hernia repair, lumpectomy, transurethral resection, or laparoscopic cholecystectomy between 2002 and 2012. Multivariable regression was used to measure the association between day of the week of surgery and our primary outcome, a composite of ED visit or readmission within 30 days of successful discharge on the day of surgery; and unsuccessful discharge on the day of surgery, our secondary outcome. We also determined which day of the week ambulatory surgery patients were most likely to return to the ED, regardless of the day of surgery.

Results: Of 296 497 patients, 9 197 (3.1%) were not discharged on the day of surgery. 32 100 (10.5%) discharged patients returned to the ED or were readmitted within 30 days. Adjusting for socio-demographic factors, comorbidities, and preoperative health resource use, Friday surgery was significantly associated with ED visit or readmission (adjusted HR 1.07, 95%CI 1.03-1.11) compared to Monday. This association was notably stronger after transurethral and shoulder surgery. No association between day of the week and unsuccessful discharge was noted. Regardless of day of surgery, patients were most likely to visit the ED on Saturday or Sunday after ambulatory surgery.

Conclusion: On a population-level, day of the week of ambulatory surgery is not strongly associated with ED visits or readmission. Certain surgical types may be more susceptible to a day of the week effect, but more research is needed. With over 10% of successsfully discharged ambulatory surgery patients requiring acute medical attention within 30 days, and higher rates of ED visits over the weekend, we suggest future

efforts to address issues of continuity and transitions in care to improve patient safety and experience.

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83946 - ALKALINIZED LIDOCAINE INTRACUFF TO PREVENT EMERGENCE COUGHING

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Introduction: Cough upon emergence from general anesthesia (GA) is associated with adverse effects[1]. Evidence shows that alkalinized lidocaine (AL) in the endotracheal tube cuff (ETC) decreases cough, although these studies used nitrous oxide (N20)[2]. N2O diffuses into the ETC, which can lead to tracheal mucosal injury[3]. Therefore, we conducted a randomized controlled trial to evaluate AL's effect on cough incidence during emergence from GA without N2O. Furthermore, we sought to characterize AL's *in vitro* diffusion rate for various doses.

Methods: Following Local Ethics Committee approval, 80 patients requiring elective gynaecological or urological surgery (minimum 2 hours) consented to participate in the study. Patients were blindly randomized to the AL or normal saline (NS) group and followed a standardized anesthetic protocol. After intubation, the cuff (low pressure-high volume polyvinylchloride Mallinckrodt ETC) was filled with 4 ml of 4% lidocaine (AL group) or with 4 ml of NS (NS group). A volume of 8,4% bicarbonate solution or NS was added respectively for adequate seal at a 20 cm H2O pressure. Primary outcome was the presence of cough upon emergence. Secondary outcomes included nausea and vomiting, voice hoarseness, and sore throat. Sample size was determined for 80% power, based on a 50% relative outcome reduction and a cough incidence of 70% in the NS group. A chi-square test was used for dichotomous variables, while Student's t-test or Mann-Whitney test were used depending on continuous variables' distribution. A $p \leq 0.05$ was considered statistically significant.

For the *in vitro* study, diffusion of AL was compared to lidocaine with NS. Six endotracheal tubes (as above), 3 per group, were placed in separate physiologic mediums (37°C, pH 7.4). In each group, 4% lidocaine was injected in the ETC for doses of 40 mg, 80 mg, and 160 mg. A total volume of 12 ml was obtained in each ETC with 8,4% bicarbonate or NS. Lidocaine samples were measured hourly for 8 hours using high performance liquid chromatography.

Results: Five patients (2 AL and 3 NS) were excluded from analysis due to protocol breach. Group characteristics were similar. AL provided a statistically significant reduction in cough upon emergence by 55% (left figure). There were no differences for secondary outcomes. The *in vitro* study demonstrated that lidocaine diffusion increased more than 20 fold when alkalinized, proportionally to dose and time (right figure).

Discussion: We conclude that AL (160 mg) in the ETC decreased cough upon emergence from GA over 2 hours without N2O. The in vitro component illustrates that time is a factor in allowing sufficient amounts of AL to diffuse and block sensory cough receptors. These concepts have clinical applicability for surgery where cough can have detrimental consequences for the patient.

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84009 - MENTORSHIP IN CANADIAN ANESTHESIA RESIDENCY: A NEEDS ASSESSMENT

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Introduction: Mentorship in medical education is an important factor in deciding choice of specialty and direction of clinical practice (1) and can provide social and professional benefits for both mentor and mentee (2). Studies have described the importance of mentorship in medicine and its aspects including mentor selection, characteristics of the mentoring relationship and barriers to the success of the mentorship (3,4), but there is little anesthesia resident-specific mentorship literature.

The primary goal of this study was to determine which mentorship program characteristics are most important to mentees in Canadian English-language anesthesia residency programs.

The authors have no conflicts of interest to declare.

Methods: Local Research Ethics Board approval was obtained. Since no validated appropriate survey existed, input from focus groups and a literature review was used to develop a questionnaire. Applicable anesthesia program administrators were emailed a link to an electronic survey (www.fluidsurveys.com) and a description of the project to be forwarded to the program's residents. The survey included questions on demographics, initiation of mentorship and desirable characteristics of a mentor, and space for free text. Residents who completed the survey were eligible to win an iPod Nano or a Starbucks gift card.

Results: 134 residents (of a total of 531) from 14 different programs responded to the survey; 12 respondents completed only the demographic information and were excluded. Results were reported as a percentage of those who responded to the question. 66% felt that mentorship pairing should occur in the second year of residency, and 58% felt that mentorship pairings should be formally assigned. 88% felt that it was important or very important for a mentor to provide inspiration, and 92% felt that it was important or very important for a mentor to provide support during times of professional or personal stress. 98% felt that staff participation in mentorship should be voluntary, and 62% felt that anesthesia staff should be educated on how to mentor. Please see Table 1 (attached) for other results.

Discussion: This qualitative study is the first to investigate the characteristics desirable for a mentorship program in an anesthesia residency using a sample of Canadian

anesthesia residents. Our findings suggest that a small majority may favor formally assigned pairings which conflicts with suggestions in the current literature (5,6), and the results suggest that characteristics such as voluntary anesthesia staff participation, mentor education, and delay of mentorship initiation until second year may contribute to satisfaction with these relationships. This information will be used to improve the local mentorship program. Our findings have limitations including the use of an original questionnaire and a 23% response rate. Further studies are needed to delineate how to best assess the success and effectiveness of mentorship programs.

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84206 - HIGH SPINAL ANESTHESIA AND DELIRIUM INCIDENCE AFTER CARDIAC SURGERY

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Background: Delirium is a syndrome of acute brain dysfunction that commonly occurs in the postoperative patient. [1] The pathophysiology of delirium is poorly understood, however there is general agreement that it is multifactorial in its etiology. [1] Inflammation may play an important role in the pathogenesis of delirium, particularly in the setting of cardiac surgery, which is known to have an exaggerated inflammatory response. [1,2,3] Certain interventions, including high spinal anesthesia (HSA), may attenuate the inflammatory response to cardiac surgery. [4,5,6] The aim of this study was to determine the impact of HSA on the incidence of delirium after cardiac surgery.

Methods: Following Research Ethics Board approval, we conducted a retrospective analysis of all patients who received HSA for cardiac surgery at our institution from March 1st 2010 to March 30th 2014. Each HSA case was propensity matched to a non-HSA case from the same time period from a database which included 2300 cardiac surgery cases. Propensity matching was based on a number of pre-defined preoperative and intraoperative delirium risk factors. The primary outcome was the incidence of delirium, which was defined as any positive Confusion Assessment Method (CAM) or CAM-ICU score on postoperative days zero to seven (POD 0-7). Our secondary outcome was delirium severity, which was determined by the average number of days in hospital (POD 0-7) on which a positive CAM score was recorded.

Results: Delirium occurred in 11 (8%) of 137 patients in the HSA group, as compared to 23 (18%) of 130 in the control group (relative risk [RR] 0.45, 95% CI 0.23 to 0.89). Average (mean ± SD) number of days with delirium was not significantly different between groups (0.1 ± 0.6 vs. 0.3 ± 0.9 days in HSA vs. controls; $p = 0.87$)

Conclusions: Compared to a propensity-matched control group, HSA patients had a significant decrease in the incidence of post-cardiac surgical delirium. The reasons for this decrease are not known but might be related to a reduction in the inflammatory response or due to differences in anesthetic management inherent with the use of HSA.

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83706 - PREVALENCE OF FATIGUE RELATED RISK AMONG LOCAL ANESTHESIA RESIDENTS

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Introduction: An anesthesiologist must be vigilant during his shift to provide good care. Despite this fact, anesthetists are working long hours without structured support programs which is negatively affecting their mood, cognitive function and alertness. Several measures were acknowledged by the Joint Commission to ensure alert and watchful anesthesiologist before putting patients to sleep.(1) Hospital administrations are recommended to enforce such measures to decrease fatigue related risk. This study is taking the first step for our local anesthesia residents, which is evaluating fatigue related risk

Objective: To estimate prevalence of fatigue related risk among anesthesia residents in our country.

Methods: After local ethical approval has been obtained, all anesthesia residents a were invited to voluntary participate. We have conducted a self-reporting survey that includes demographic data, Epworth sleepiness scale (ESS) and two scales to assess fatigue related risk. The first scale used is a Checklist for Individual Strength (CIS) that has been validated to assess fatigue in the working population. (2) The second is a predefined comprehensive fatigue risk assessment that was previously developed by the Australian Medical Association (AMA). (3)

Results: We received 102responses, with more than half of the sample were at elevated risk of fatigue according to CIS measures and 58.6% (n=92) of the participants are excessively sleepy on ESS. On AMA risk assessment of work patterns 35% of the participants (n=60) were at moderate risk of fatigue and quarter of them are at higher risk.

Discussion and Conclusion: Our sample can be labeled to be fatigued and sleepy. Also, our population had a higher score in being excessive sleepy than general health care workers (59.78% vs. 39.3% representative sample in 3 hospitals locally) (4). Concluding that, such difference could be owed to the different type of population. Statistical analysis demonstrated that although the residents are fatigued, more than half of the resident were feeling motivated (62.54%). Being motivated wasn’t enough to alter the overall risk of fatigability in our population.

All three scales suggest presence of fatigue related risk. This could be multifactorial; explained by long shifts, cultural and lifestyle habits. In the conference, we will explain our recommendation to start a Residents Well-Being Program to decrease fatigue, and increase awareness of healthy sleeping habits. Therefore, ensuring residents remain physically and mentally healthy and subsequently safer healthcare for our patients.

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84215 – CAPS - CARDIAC ACUTE PAIN SERVICES € A NATIONWIDE SURVEY

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Introduction:
Acute Pain Services (APS) have been well established in Canada and their services improve the management of postoperative pain. The availability and use of APS in cardiac surgery units however is less widespread and even where present may be provided less consistently. We undertook the first nationwide survey from Canada to assess the current clinical practice of pain management after cardiac surgery.

Methods:
The Survey was approved by the IRB. The questionnaire was drafted by two anesthesiologists working in pain management and reviewed for content validity by a domain specialist. The twenty items that were retained covered structure, functioning and demographics of the pain services. A list of all the national centers performing adult cardiac surgery in Canada was drafted and their lead anesthesiologists identified by direct contact. The survey questionnaire was then sent electronically and results collected.

Results:
We received completed questionnaires from all 32 centers achieving a response rate of 100%. Nine centers (29.0%) stated that they had an organized Acute Pain Service (APS). Eight centers (25.8%) stated that they did not have an APS and 14 centers (45.1%) sited “other”. “Other” referred to the fact that the hospital had an APS service but that it covered only non-cardiac surgeries or that they consulted to a neighboring institute when required. For the 9 centers that had a cardiac APS service 3 (33%) had been running for more than 5 years, 2 (22%) for 2 to 5 years and 3 (33%) had been running less than 2 years. One center did not answer this question. For those centers with an organized Cardiac Acute Pain Service (CAPS) 4 had a physician only model and 5 had a combined physician and nurse CAPS, however in only 2 of 9 centers were greater than 50% of the patients receiving APS care after cardiac surgery. Each of the 9 centers had an anesthesiologist assigned to daily APS rounds. On-call coverage, nights and weekends, was the responsibility of the on-call anesthesiologist in 3/9 centers, of the in-house physician in 3/9 centers and of the dedicated APS physician in 3/9 centers.

Discussion:
Acute pain services in Canadian cardiac care centers are varied in both structure and functioning with nearly as many variations as there are sites. In general pain management is a protocol driven activity. Further identification of patients at risk, surgical procedures with severe acute neuropathic pain or chronic post-surgical pain and therapeutic modalities with proven benefit in the non- cardiac surgical population; may improve the care and outcomes of patients undergoing cardiac surgical

procedures.

The development and standardization of Cardiac Acute Pain Services will be important to achieve these and the findings of this Survey provide useful first steps in this direction.

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84224 - OBSTRUCTIVE SLEEP APNEA AND HYPOXEMIA IN POSTPARTUM WOMEN

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Introduction : The prevalence of sleep-disordered breathing (SDB) and obstructive sleep apnea (OSA) in pregnant women has been estimated to range from 12% to 26.7% (1,2,3). Previous studies have evaluated SDB and/or OSA during pregnancy, but no study has specifically examined the first postpartum day. The first-day postpartum is associated with significant changes to maternal physiology and sleep conditions. We have performed a prospective observational study among women during the first postpartum night to assess the prevalence of OSA and hypoxemia.

Methods : After approval from the local Ethics Committee, we monitored fifty-five women during the first postpartum night, to identify patients with OSA and hypoxemia (oxygen saturation < 90%). Consenting women were monitored with a Remmers sleep recorder. Oxygen saturation, heart rate, nasal airflow, snoring sound, and respiratory movements were recorded continuously. The data was uploaded to a computer and summarized with the Remmers Insight software (SagaTech Inc, Calgary). A respirologist with subspecialty sleep medicine training manually interpreted the generated reports according to American Academy of Sleep Medicine criteria. A diagnosis of OSA was based on 5 or more episodes of apnea or hypopnea per hour during sleep. Oximetry data and clinical information were recorded. Continuous variables were analyzed with analysis of variance. Fischer's Exact Probability Test was used for comparison of categorical variables. The results are presented as mean +SD. Results with a p-value less than 0.05 were considered statistically significant.

Results : Seven patients (12.7%) have OSA by polysomnography criteria. Six of the 7 OSA patients had hypoxemia overnight. Five patients had hypoxemia but did not meet the polysomnography OSA criteria. Eleven (20%) of the 55 women in this study, had severe hypoxemia (oxygen saturation < 90%) during the first postpartum night. Compared to the normal subjects, the OSA subjects and the hypoxemic subjects had significantly lower mean oxygen saturation overnight, lower minimum oxygen saturation levels , and greater weight as well as BMI (Table). There was no respiratory arrest and none of the patients required assisted ventilation or endotracheal intubation. There was no significant difference in the anesthetic techniques or the frequencies of intrathecal opioids received by the hypoxemic and non-hypoxemic patients.

Discussion : The 12.7% prevalence of OSA in the first postpartum night is consistent with the reported prevalence of OSA in the obstetric population during pregnancy (2,3). The 20% prevalence of hypoxemia (oxygen saturation < 90%) in the first postpartum night is greater than the prevalence of OSA in our patients. This indicates that OSA is not the only disorder associated with postpartum hypoxemia. OSA is more prevalent in pregnant women than non-pregnant women of similar age, and is associated with hypoxemia during sleep in the first postpartum night. Further studies are needed to identify the women at risk for hypoxemia, to assess the clinical courses of these women and to determine the clinical implications.

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84257 - RANDOMIZED COMPARISON OF ISOFLURANE & SEVOFLURANE IN CARDIAC SURGERY

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Introduction: Traditionally, much of anesthesia research has focused on testing new drugs, novel indications for older drugs, or new devices. For multiple reasons including differential benefits or harms, practical, and financial considerations, it is also important to know whether clinically important within-class differences exist for available drugs or devices. Unfortunately, within-class comparisons are rarely studied, and significant knowledge gaps exist. Comparative Effectiveness Research (CER) has emerged as a type of pragmatic research targeting 'real world' comparisons of the benefits and harms of commonly used interventions, including within-class comparisons.[1,2] Volatile anesthetics possess preconditioning cardioprotective properties,[3] but it is unknown if the cardioprotective effects extend equally to all members of the class. Using CER principles, we sought to determine if sevoflurane and isoflurane are comparable in their effects on clinically important outcomes in adults undergoing common cardiac surgeries. We hypothesized that sevoflurane would be non-inferior to isoflurane.

Methods: Written informed consent was obtained from all study participants and this study was approved by the local Research Ethics Board. 464 adults having cardiac surgery were randomly allocated to maintenance of anesthesia with sevoflurane (n=231) or isoflurane (n=233), administered at a dose of 0.5 to 2.0 minimum alveolar concentration (MAC) throughout the entire operation. The primary outcome was a composite of intensive care unit (ICU) length of stay ≥ 48 hours or death from any cause within 30 days of the operation. The non-inferiority margin was defined as less than 10%, based on an expected event rate of 25%. All care-givers except for the anesthesiologist and perfusionist were blinded.

Results: No losses to follow-up occurred. The primary outcome occurred in 25% of sevoflurane patients and 30% of isoflurane patients (absolute difference -5.4%, one-sided 95% CI 1.4%), thus non-inferiority was declared. Sevoflurane was not superior to isoflurane for the primary outcome or for any categorical secondary outcomes (prolonged ICU stay, 30-day all-cause mortality, inotrope or vasopressor usage, new-

onset hemodialysis or atrial fibrillation, stroke, or readmission to the ICU, see Table). Times to tracheal extubation, ICU discharge, and hospital discharge were not different between groups.

Discussion: There are no substantive differences on any clinically important outcomes between sevoflurane and isoflurane when used for maintenance of anesthesia for cardiac surgeries. Substantial cost savings could be realized by using isoflurane, rather than sevoflurane, for cardiac anesthesia. (This trial was registered at www.clinicaltrials.gov: NCT01477151.)

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84261 - PAIN FOLLOWING UNILATERAL TOTAL KNEE ARTHROPLASTY

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Introduction: Total knee arthroplasty (TKA) is a painful surgery but it requires early mobilization for successful joint function. Therefore, effective pain management is essential for rehabilitation. Multimodal analgesia including: spinal anesthetic, nerve blocks, periarticular infiltration, opioids, and co-analgesics have been shown to effectively manage post-operative pain. One of the criticisms of nerve block is the potential to impair quadriceps muscle strength which limits mobility.(1-3) Both adductor canal (AC) and peri-articular infiltration (PI) have been shown to manage pain without impairing motor function.(4-7) However, it is unclear which technique is most effective. The purpose of this 3 arm trial was to examine the effect of both AC+PI vs AC vs PI. The primary outcome was pain on walking at post-operative day (POD)1.

Methods: Following Ethics Board approval, patients undergoing unilateral TKA were approached to participate in this trial. Inclusion criteria included: 18 years or older, ASA I-III, able to speak and read English. Patients were excluded if they had a contraindication to regional anesthesia/local anesthetics, chronic pain not related to their knee, were using opioids for 3 months or longer, or had a peripheral neuropathy. The sample size was calculated based on the primary outcome, and with a α0.5 and 15% attrition rate, a sample of 159 participants was required. Eligible and consenting participants were randomized into 1 of the 3 groups. On the day of surgery, the participant was admitted to the 'block room' where they received either AC block with 30mL of 0.5% Ropivicaine or sham block. PI was performed intra-operatively with a 110mL solution of Ropivacaine 300mg, morphine 10mg, ketorolac 30mg, in normal saline. Those patients randomized to AC only received normal saline. Outcomes measured on POD1 and 2 were pain, analgesic consumption, distance walked and pain related interference.

Results: A total of 159 participants consented and 144 completed the trial. The mean age was 67 years, and 63% were female. On POD1 participants who received AC+PI reported statistically lower pain on walking (3.3) as compared to those who received AC (6.2) or PI (4.9). Participants who received AC reported statistically higher pain scores at rest and knee flexion as compared to those who received AC+PI or PI. On POD2 participants who received AC+PI reported statistically less pain on walking (3.3), as compared to those who received AC (6.2) or PI (4.9). On POD2 there was no difference between the groups for pain at rest, or flexion. Participants who received AC used more IV PCA on POD 0. There was no difference between the groups regarding distance walked.

Discussion: Participants who received both AC + PI reported statistically less pain on walking on POD1 and 2. There was no difference between the groups on distance walked, however, this was only reported 1 time per day and did not capture distance walked over a 24 hour period if the participant walked multiple times.

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84274 - A SYSTEMATIC REVIEW OF CASE REPORTS OF FACTOR XIII INHIBITOR

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Introduction: Factor XIII (FXIII) cross-links fibrin monomers to support clot stabilization and wound healing. Acquired FXIII deficiency is caused by autoantibodies that inhibit FXIII, and can result in bleeding despite normal routine coagulation tests. Given the rarity of this disease, large clinical studies to inform clinical practice are not feasible. We therefore performed a systematic review of case reports and case series of acquired FXIII inhibitor to answer the question “In hospitalized or perioperative patients what are the management and treatment strategies for acquired FXIII inhibitor?”

Methods: Ethics was not required, this is a review of published literature. A systematic search of MEDLINE, Embase, and Web of Science (to 07/2014) identified all reports of hospitalized/perioperative patients with acquired FXII deficiency. No restrictions were placed on language or publication type. Article screening and data extraction were performed independently by two reviewers. Completeness of reporting was evaluated according to elements from the CARE guidelines. PROSPERO registration: 42014006279

Results: 1082 citations were reviewed with 36 case reports and 3 case series meeting eligibility criteria (66 patients total). There were 18 patients in the perioperative setting and 48 in the hospitalized setting. The mean age was 61 [range 9-87] with equal gender representation. At presentation, 51 patients (77%) had intramuscular or subcutaneous bleeding, and 38 patients (58%) had external or surgical bleeding. Identified risk factors for FXIII acquired inhibitor included autoimmune disease in 12 patients (18%) and isoniazid treatment in 6 patients (9%). All cases were diagnosed by a two-step process, identification of the FXIII deficiency followed by identification of the inhibitor. Specific inhibitor type was reported for 26 patients (39%), with 20 of those patients having an IgG auto-antibody. Clinical improvement in bleeding was seen in patients receiving FXIII concentrate (11/17 patients), cryoprecipitate (4/8), plasma (2/6). Inhibitor reduction was seen in patients who received rituximab (5/5 patients), plasma exchange (1/1), exchange transfusion (1/1), IVIG (1/1), steroid (10/14), cyclophosphamide (8/12). Concurrent initiation of multiple therapies made direct independent association to

outcomes difficult to establish. Outcomes were reported for 56 patients (85%) with 41 patients (73%) having complete inhibitor eradication and 15 patients (27%) having partial resolution; 22 patients (39%) had a relapse and 14 patients (25%) died (7 from internal hemorrhage). Completeness of reporting varied for specific CARE items. Patient demographics, clinician assessed outcome and laboratory tests were reported in all case reports. Least reported items included informed consent and a title containing the words ‘case report’.

Discussion: This systematic review provides the most complete overview of FXIII acquired inhibitor to date. There is a paucity of data available on FXIII acquired inhibitor. Available data may be limited by variable reporting. Despite multimodal therapy, a significant proportion of patients with FXIII acquired inhibitor have a large burden of morbidity and mortality.

84282 - A SURVEY ON PREOPERATIVE FASTING PROTOCOLS AND PRACTICES

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Introduction: Seminal work by Maltby and others in the 1980s and 1990s demonstrated that clear fluids are cleared from the stomach within 2 – 3 hours, thus negating the need for long periods of fasting (1). Recent evidence suggests that starvation – "NPO from midnight" – for clear liquids is not only unnecessary to allow for gastric emptying, but could also have deleterious effects in the peri-operative period (2). The widespread adoption of these evidence-based fasting guidelines has been slow. We present data from a recent survey of anesthesiologists from Canada, Australia, and New Zealand (ANZ) to determine current practices and perceptions around fasting guidelines.

Methods: Local ethics committee approval was obtained. An anonymous electronic survey was created using a web-based survey company. Practicing anesthesiologists were solicited by email via provincial and national anesthesia societies.

Results: 834 anesthesiologists (659 Canada; 175 ANZ) agreed to participate in the survey. Fasting guidelines were determined by an anaesthesiologist in 89% of hospitals in all countries; however, they were generally provided to patients by the preoperative clinic nurse (86.8% Canadian, 76.6% ANZ), and 34% of patients were informed by their surgeon. The majority (85%) of respondents followed society fasting guidelines. Preoperative fluids were encouraged by 46% of Canadian anesthesiologists compared to 64% of ANZ anesthesiologists. Reasons cited included a variable OR schedule (30.2% Canadian; 25.1% ANZ), and fear that the practice could not be safely implemented (21.1% Canadian; 14.2% ANZ). 23% of Canadians allowed patients to have solid food 6 – 8 hours before surgery, but 83% of ANZ physicians allowed this practice. Less than 1% of respondents stated they had ever seen a peri-operative aspiration event, yet more than 5% had seen adverse events from dehydration, and hypoglycemia. The majority of anesthesiologists reported having patients comment on enforced fasting prior to surgery (28.4% frequently; 58.4% rarely).

Discussion: Modern fasting guidelines allow for intake of fluids prior to surgery, yet clinical practice lags behind current recommendations. Despite the majority of anaesthesiologists indicating that they follow current fasting guidelines, less than half of them encourage their patients to drink liquids prior to 3 hours to OR, citing variability of OR times, and perception around patient safety, as reasons. Interestingly, the majority of ANZ anesthesiologists are comfortable with a light breakfast the morning of surgery (compared to less than 10% of Canadian anesthesiologists); this is likely due to the fixed morning and afternoon operating room schedule. Given increasing ambulatory surgery, enhanced post-operative recovery programs (such as ERAS), and potential detrimental effects of fasting from midnight, we hope our survey will help reveal ways in which traditional fasting policies can be changed to follow more current guidelines. We are investigating by expanding the survey to Europe and other countries.

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84341 - SPREAD FOLLOWING INADVERTENT INTRATHECAL INJECTION IN SPINE MODELS

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Introduction: Rapid high spinal blockade (HSB) can result from bolus injection via inadvertent misplacement or migration of an epidural catheter into the intrathecal space. As spinal curvature may also influence such local anesthetic spread in the intrathecal space, it is important to predict how positioning affects cephalad spread in a clinical condition with altered spinal curvature, as with obstetric patients. Pregnancy is known to induce spine flattening in a supine position.[1] Since it would be challenging to study clinically, we attempted to investigate how anatomical changes of spine curvature in different postures would affect the spread time of local anesthetic in an *in vitro* setting.

Methods: We simulated unrecognized placement of a lumbar epidural catheter into the intrathecal space in a straight spine (i.e., laboring patient in supine position) and a spine with normal lordosis (control). A modified model[2] of the intrathecal space made from clear polyvinylchloride tubing filled with 115 mL 0.9% normal saline (Sp. gr 1.006) was constructed and maintained at 37°C to simulate cerebrospinal fluid (Sp. gr 1.0069).[3] Relative degrees of kyphosis and lordosis in both spines (supine) were replicated from previously published MRI data .[4] With spines in the supine, upright, and semi-seated (30° head-up incline) positions, a bolus of 4.9 cc of 0.25% isobaric bupivacaine with 0.1 cc of 1% methylene blue marker was injected at a constant rate of 8.5 mL/min through a length of 5 cm of 19G epidural catheter inserted into the normal saline column. Time for the bolus to reach T3-T4 (cardioaccelerator fibers) and C3-C4 (diaphragmatic innervation) was recorded. The experiment was repeated four times.

Results: The bolus did not spread to the thoracic or cervical space in either spine when supine. In the straight spine, mean time of cephalad spread to T3-T4 (97 s upright, 69 s incline; $p=0.11$) and C3-C4 (140 s upright, 124 s incline; $p=0.43$) was not significantly different with respect to position. In the normal lordosis spine, mean time for the dye to reach T3-T4 (86 s upright, 144 s incline; $p=0.009$) and C3-C4 (122 s upright, 255 s incline; $p=0.003$) was significantly different in the cephalad spread depending on position. As illustrated in Figure 1, it was only in the semi-seated position that we observed a delay in spread to T3-T4 and C3-C4 (both $p < 0.05$) with the normal lordosis spine.

Discussion: Our simplified model of the intrathecal space demonstrates that spinal curvature appears to affect spread of isobaric solution in a normal saline column. A clinical implication is that keeping the patient supine prevents cephalad spread. In addition, maintaining spinal lordosis is important when bolusing local anesthetic with the patient in a semi-seated position. This may delay the spread of large quantities of isobaric solution within the intrathecal space in the event of inadvertent intrathecal catheter tip placement. Since the onset of HSB following a local anesthetic bolus is multifactorial, further clinical study is needed to confirm results of the study.

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84365 - MAJOR SPINE SURGERY IN PATIENTS WHO REFUSE BLOOD PRODUCT TRANSFUSION

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Introduction: Patients undergoing major spinal surgery are at increased risk of intra-operative bleeding [1]. The management of patients who refuse allogeneic blood transfusion and undergo complex spine surgery is challenging yet little evidence exists to guide the peri-operative management of this population [2,3]. This study compared blood conservation strategies and outcomes between complex spinal surgery patients who declined (versus those who accepted) blood product transfusion.

Methods: With institutional REB approval and a waiver for informed consent, we used our institutional Blood Utilization Program database to identify patients who underwent major surgery for degenerative spine disease and who refused blood product transfusion between June 1, 2004 and May 31, 2014. Patients who refused blood transfusion were randomly matched to control patients (who accepted blood transfusion) based on age, sex, year of surgery, baseline hemoglobin and surgical location (cervical vs thoracolumbar). A detailed retrospective chart review was completed. Peri-operative blood conservation strategies and post-operative outcomes were compared between the two groups.

Results: Seven patients who refused blood transfusion underwent major spinal surgery for deformity or degenerative correction over the study period and were matched to 27 control patients. Patients who refused blood product transfusion received a greater number of blood conservation interventions than those who accepted transfusion (median (range) 5 (3-7) versus 3 (0-6), $p < 0.005$). The peri-operative hemoglobin nadir was similar between the two groups (mean (standard deviation) 101 (20) versus 94 (15) g/L, $p=0.27$ in the refusal and control groups, respectively). Hospital length of stay was also similar and there were no deaths identified in either group. No major adverse events were documented for any patient who refused blood product transfusion.

Conclusion: Our study results describe a cohort of patients who declined blood product transfusion yet successfully underwent major spinal surgery with similar outcomes compared to patients who accepted transfusion. Patients who refused blood transfusion received more aggressive peri-operative blood conservation measures to minimize the risk of severe anemia.

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84383 - KNOWING THE ANGLE OF RUL BRONCHUS BRINGS THE RESURGENCE OF THE R-DLT

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Background: The right-sided double lumen endobronchial tube (R-DLT) is seldom used since positioning its lateral orifice in front of the origin of the right upper lobe (RUL) can be difficult.[1-3] A few years ago, a publication[4] has suggested that the enlargement of the lateral orifice of R-DLT allowed a better positioning of the R-DLT. At that time, only the clinical intuition has guided the investigators to modify the R-DLT. Now, the angle between the RUL bronchus origin and the right main stem bronchus (RMSB) can be measured with high resolution CT-scan.

Hypothesis: In dorsal decubitus position, the ostium of the RUL bronchus varies from an anterior to a posterior position, from the horizontal plane, on the lateral aspect of the RMSB.

Methods: With local REB approbation, we retrospectively evaluated 200 consecutive thoracic CT-Scans. Inclusion criteria were patients aged from 35 to 85 years old. Patients with thoracic or intrathoracic pathologies were excluded. Two investigators, a PGY-4 radiology resident and a staff radiologist, collected the data. Measurement of the RUL bronchus antero-posterior angle from the RMSB was done on axial slices of 2 mm thickness from standard thoracic CT-scan examinations. The slice showing the widest opening of the right upper lobe (RUL) bronchus was the one used for measurement. A first line passing by the center of the RMSB lumen was drawn horizontally. A second line was drawn from the center of the RMSB through the middle of the RUL bronchus. The acute angle between those lines is the RUL angle (figure 1).

Results: 106 CT-scans were analysed. The mean RUL angle is 0.1 ± 9.5° with a 21.2° maximal variation in the anterior direction and a 28.6° maximal variation in the posterior direction determining a maximal range of 49.8°. The correlation coefficient between the two observers is 0.89. **Discussion**: The results of our investigation confirmed our hypothesis of a large range of the orientation of the RUL bronchus ostium (extending from 21° anterior to 29° posterior to the horizontal plan of the lateral aspect of the RMSB).

Conclusion: This study shows a large variation of the angle of the RUL bronchus. These results explain the utility of a modified R-DLT (with enlarge area of the orifice) discussed in the recent literature.[4]

Figure 1: Axial slice of thoracic CT-Scan

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84493 - CAESAREAN FOR HEREDITARY NEUROPATHY WITH LIABILITY TO PRESSURE PALSY

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Purpose: Hereditary Neuropathy with liability to Pressure Palsies (HNPP) is a rare (7-16/100 000) but likely underdiagnosed genetic predisposition to motor and sensory nerve injury from minimal pressure and stretch (1). There are limited reports in the literature discussing neuraxial anesthesia in obstetrical patients with HNPP (2-5). The purpose of this case report is to highlight the existence of this unusual disorder, to report the use of spinal anesthesia for elective Caesarean delivery in a patient with HNPP, and to discuss principles of management of HNPP perioperatively.

Clinical Features: Patient consent for this case report was obtained. A 31 year old G1P0 presented for elective Caesarean delivery at 38 weeks and 3 days. Pregnancy was unremarkable except for shingles in a thoracic distribution in 3rd trimester, which was treated with antiretrovirals and had resolved prior to delivery. Past medical history was significant for a clinical and electrophysiologic diagnosis of HNPP 6 years prior (presenting with numbness/weakness in the hands, and a foot drop). During pregnancy, the patient experienced numbness in the hips and thighs, but no other signs or symptoms of neuropathy. Despite no obstetrical indication for operative delivery, Caesarean was chosen after anesthetic consultation and discussion with the obstetrician, in an attempt to decrease the time that the patient might be immobile, and to avoid an assisted vaginal delivery. Information from the HNPP website (http://www.hnpp.org/letter.htm) was reviewed by the anesthesia provider.

A spinal anesthetic was performed at L3/4 using a 25G Whitacre needle, with a brief paresthesia to the labial area that resolved almost immediately. Bupivacaine 0.75% 1.5 cc, 10 micrograms of fentanyl and 150 micrograms of morphine were administered. Prior to incision, the block was at T4 (ice) and T6 (pinprick). Careful attention was paid to positioning, with foam pads at the knees and elbows, in the position of "maximal comfort" prior to block onset.

The Caesarean section proceeded uneventfully. The block to ice had receded to T6 2 hours after the spinal injection, and the patient was noted to be ambulating on the ward the evening of surgery. Telephone follow up with the patient several months later revealed that she had developed a unilateral foot drop which resolved slowly over the course of 2 months postpartum. The patient was seen at an urgent care clinic for these symptoms, but did not contact her neurologist or the anesthesia department. She felt strongly that her foot drop was related to pressure from the foam padding at the site of the common peroneal nerve during surgery. At the time of follow-up, the patient had no active neuropathy.

Conclusions: Despite best efforts to avoid pressure on peripheral nerves in patients with HNPP, there is still of risk of neuropathy in parturients, whether during labour or delivery. Although longer labour and use of forceps may be associated with a higher incidence of neuropathy (2), there is no evidence that elective Caesarean is indicated to avoid nerve damage, and a dense block may mask signs of pressure despite attempts at careful positioning. However, spinal anesthesia is a reasonable choice if Caesarean delivery is required in patients with HNPP.

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84513 - INTRAOPERATIVE HYPOTENSION AND KIDNEY INJURY AFTER CARDIAC SURGERY

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Introduction: Acute kidney injury (AKI) is a common and serious complication of cardiac surgery. Many AKI risk models have been proposed to date, but none has addressed the combined effect of intraoperative hypotension (IOH) pre-, during and post-cardiopulmonary bypass (CPB). We investigated whether varying periods of IOH, defined separately by mean arterial pressure (MAP) of < 65 mmHg pre-, during and post-CPB, were associated with postoperative AKI.

Methods: After institutional REB approval, we conducted a retrospective cohort study of 2314 consecutive patients undergoing major cardiac surgery requiring median sternotomy (November 2009 – July 2014). Exclusion criteria were preoperative MAP < 65, dialysis dependence, and lack of pre- or postoperative creatinine measurements. The primary outcome was AKI, as defined by the Acute Kidney Injury Network (AKIN) Stage I criteria (50% relative or 26 μmol/L absolute increase in creatinine over preoperative value) during the first 2 postoperative days. Secondary outcome was AKIN Stage II-III AKI (>100% relative or 44 μmol/L absolute creatinine increase). The primary exposures were the total durations of MAP < 65 pre-, during and post-CPB, in minutes. All intraoperative invasive BP measurements were recorded every minute in an electronic patient record, with any artifacts removed using an automated algorithm. The relationship between IOH and AKI was modeled using multivariable logistic regression with adjustment for *a priori* selected AKI risk factors. Where appropriate, covariates were tested for interactions. Measure of association was OR (95% CI). Statistical significance was defined by a 2-tailed $p < 0.05$. All analyses were conducted using SAS 9.1.

Results: AKIN Stage I AKI occurred in 400 patients (17.3%). Each 10 additional minutes of IOH with MAP < 65 during CPB was associated with a 6% increased odds of AKI (adjusted OR 1.06; 95% CI, 1.02-1.10), while each 10 additional minutes of MAP < 65 post-CPB was associated with a 11% increased odds of AKI (adjusted OR 1.11; 95% CI, 1.06-1.16). Pre-CPB IOH was not associated with AKI. Older age, male sex, history of hypertension, LVEF < 40%, preoperative renal insufficiency, anemia, aortic crossclamp > 120 min, intraoperative transfusion of ≥ 4 units of packed red cells and need to reopen postoperatively were also associated with AKI. There was no interaction between preoperative hypertension and intraoperative hypotension, or between preoperative anemia and intraoperative transfusion.

AKIN Stage II-III AKI occurred in 78 patients (3.4%) and was associated with post-CPB IOH (adjusted OR 1.18, for every 10 additional minutes of MAP < 65; 95% CI, 1.11-1.27) and low output syndrome.

Discussion: In this analysis, AKIN Stage I AKI is independently associated with MAP < 65 mmHg during and post-CPB while AKIN Stage II-III AKI is associated with MAP < 65 post-CPB, with evidence of a dose-response relationship with increasing total durations of hypotension. This study provides an impetus for clinical trials to determine if specific interventions that facilitate prompt treatment of IOH also help reduce the risk of AKI.

84571 - A CASE OF MALIGNANT HYPERTENSION DURING KASAI PORTOENTEROSTOMY

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Introduction: Biliary atresia is a progressive, obliterative cholangiopathy of the intra- and extra-hepatic biliary tree presenting in infancy. Left untreated, this condition is universally fatal. The Kasai procedure is the primary treatment for biliary atresia (1). This palliative operation involves hepatic portoenterosotomy, followed by Roux-en-Y jejunal loop formation and anastomosis to the hepatic hilum, re-establishing bile flow. We report a case of a 3-month-old infant male undergoing the Kasai procedure who experienced iatrogenic epinephrine overdose secondary to epinephrine soaked surgical packing. The subsequent malignant hypertension resulted in pulmonary edema, mesenteric ischemia and lactic acidosis which required aggressive treatment with multiple pharmacologic agents. This case highlights the importance of closed-loop communication in the operating room.

Methods: Using PubMed, a literature search was performed to identify any existing guidelines on the use of topical epinephrine in Kasai portoenterostomy. Parental consent was obtained for this case report.

Results (n/a)

Discussion: Currently, there are no guidelines or established protocols to aid surgeons and anesthesiologists in choosing an appropriate dose for topical epinephrine administration. Systematic reviews, case reports and randomized controlled trials in the otolaryngologic and burn literature have suggested that topical use of undiluted, 1:1000 epinephrine is safe in nasal surgery, tonsillectomy and burn surgery (2,3). Interpretation of results is made difficult by large variability in volume and concentration of epinephrine applied. Case reports cite adverse effects including tachyarrhythmias, myocardial ischemia and infarction, hypertensive crises, pulmonary edema, cardiogenic shock and death when topical epinephrine is used in endoscopic nasal and reconstructive burn surgery (2,3,4,5). Our review of the literature found no reports of regular use of topical epinephrine in Kasai portoenterostomy.

Surgical and anesthesiology teams should practice clear, closed-loop communication during the application of epinephrine. Preoperative briefings have been shown to

increase patient safety by improving team communication (6). Studies in patient safety have focused on operating room culture, suggesting that while teams operate in the same physical space, a strong hierarchical environment persists. In our case, the operating room nurses supplied 1:1000, undiluted epinephrine to the surgeon, who administered the drug via surgical packing to the liver bed, while the anesthetist remained unaware that the drug was being used in the surgical field. Malignant hypertension with pulmonary edema, mesenteric ischemia and lactic acidosis ensued. Many factors contributed to this communication breakdown, including a long, complex operation, fatigue, a large surgical team, and reluctance to challenge team members.

Our case highlights the importance of performing a comprehensive surgical safety checklist with all team members present and maintaining clear communication intraoperatively. Due to this adverse event, our department is looking into developing an institutional guideline regarding the use of topical vasoconstrictors

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84614 - OBSTETRIC MASSIVE TRANSFUSION PROTOCOL: QUALITY OF CARE TOOL

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Introduction: Postpartum hemorrhage (PPH) is the leading cause of maternal mortality globally implying a considerable disease burden for our society. Canadian PPH rates increased by 22% from 2003 to 2011 (from 5.1% to 6.2%). Antenatal risk factors screening is crucial to identify women at high risk of developing PPH. However, a large proportion of women who presents with PPH do not have any identifiable risk. When it occurs, timely diagnosis is critical to set off appropriate interventions. Peripartum hysterectomy can be a life-saving intervention performed in women with PPH who might otherwise exsanguinate. Frequently, women have hemorrhaged by the time they undergo the procedure and lose significantly more blood during the hysterectomy itself. Massive Transfusion Protocols (MTP) were originally developed for trauma emergencies to provide blood transfusion to unstable patients in an immediate and sustained manner. The MTP is an effort to coordinate surgical, anesthesia, laboratory and blood bank teams and to address and monitor hemorrhage emergencies. The aim of this study was to define a tool to outline the “ideal” care during a MTP activation in an obstetric environment.

Methods: A multidisciplinary team at Sunnybrook Hospital Health Science represented by a hematologist, obstetrician, anesthetist, trauma surgeon, intensivist, nurse and blood bank technician was assembled. The team was required to set up a tool that would indicate a paramount quality of care during a Massive Transfusion Protocol (MTP) activation. Parameters were selected and set for each phase: activation, initiation, maintenance, and deactivation. The performance of each item was assumed to be essential to deem that the protocol goals were achieved.

Results: Table 1.

Discussion: To our knowledge, the current level of evidence on clinical impact of MTPs in obstetric practice is low (level of evidence 4). There are only two descriptive studies published in this population: a series of 3 cases and a descriptive report on 31 consecutive cases of MTP activation in obstetric settings. Apparently, current development and implementation of MTP in obstetrics are relying on trauma literature.

Our tool was constructed comprising both face and content validity. Hopefully, the tool suggested by this study will assist institutions to: 1) implement efficient MTP in obstetrics; 2) evaluate the quality of care provided when MTP is activated in obstetrics; and 3) assess adherence to protocol.

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84628 - IS SERUM LACTATE A POTENTIAL BIOMARKER OF NON-GLIAL BRAIN TUMORS?

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Introduction: Serum Lactate, an end product of anaerobic metabolism, is used as an indicator of poor tissue perfusion and a measure of severity of the illness.[1] Malignant tumors often switch to aerobic glycolysis for their energy needs producing lactate even in the presence of oxygen. This phenomenon is called Warburg effect. [2] We have shown that increased serum lactate can be used as a potential biomarker of high grade brain tumors (gliomas).[3] The aim of this study was to determine if serum lactate can be used as a biomarker for non-glial cell brain (NGC) tumors.

Materials and methods: After IRB approval and patient consent we conducted a prospective observational study in patients undergoing craniotomy for brain tumors. We collected intra-arterial blood samples after induction of anesthesia and measured serum lactate values. We excluded patients with heart failure, renal or liver dysfunction and those needing inotropic support. Lactate >2 mmol/L was considered as elevated. Statistical analysis was done to calculate the incidence of elevated serum lactate in NGC tumors and to determine the correlation between elevated lactate and tumors of different non glial cell origin.

Results: During the study period (September 2013 to August 2014), we collected data from 121 non-glial brain tumor patients (Meningioma (n=28), Pituitary (37), Metastasis (17) and others (39)). Mean age of study population was 48.7(±13), weight 76.7(±12), M: F 59:62. Overall incidence of elevated lactate in NGC tumors was 34% with varying incidence among the individual tumor groups (meningioma 21%, pituitary 32%, metastasis 70% and others 36%. Patients with metastatic brain tumors had significantly higher baseline serum lactate levels as compared to patients with meningioma and pituitary tumors (p= 0.001, p=0.009 respectively). There was a statistically significant association of metastatic brain tumors with elevated serum lactate (p=0.002, odds ratio=5.4, CI=1.76-16.61, sensitivity 54.5%, specificity 81.8% and PPV 12%.

Discussion: Our study showed that the incidence of elevated serum lactate in NGC tumors was 34%. This finding is similar to variable incidence of brain lactate peak observed on MR spectroscopy of meningioma, pituitary and brain metastatic tumors. Future studies comparing serum lactate and MR spectroscopic analysis in brain tumor patients are needed to correlate brain and serum lactate. As per our results there is no

association between individual brain cell types and baseline serum lactate levels. However brain metastatic tumors had significant association with high baseline serum lactate demonstrating notable Warburg phenomenon. Tracking Warburg effect helps to analyse response to treatment in patients with brain tumors. Hence serum lactate level in non-glial tumor patients may be considered a potential biomarker for quantification of Warburg phenomenon.

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84633 - PLATYPNEA-ORTHODEOXIA SYNDROME AFTER EXTRA-PLEURAL PNEUMONECTOMY

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Case Report: A 64 year-old male underwent extrapleural pneumonectomy for mesothelioma. Pre-operative echocardiogram showed normal LV and RV function, with no evidence of pulmonary hypertension (PHTN). There was no patent foramen ovale (PFO), but a bubble study was not performed.

Following an uneventful intraoperative course and confirmation of normal arterial blood gas (ABG) parameters, decision was made to extubate the patient. Almost immediately following extubation, the patient complained of shortness of breath. He was placed in a semi-fowler position to facilitate breathing efforts, which paradoxically worsened his oxygenation. Continuous positive airway pressure (CPAP) at 10 cm H2O did not improve his oxygenation. ABG showed a PO2 of 54 mmHg and oxygen saturation of 85% on 100% oxygen. The patient was re-intubated, and oxygenation improved following ventilation with 100% oxygen in the supine position.

Ventilatory support was weaned as oxygenation improved, but attempts at spontaneous ventilation in the sitting position again resulted in hypoxemia.

TEE showed no pulmonary embolus (PE) with normal RVSP and RV function, but revealed a large PFO with Doppler assessment showing a large R-to-L shunt. The patient was taken to the interventional cardiology suite for closure of the PFO, leading to resolution of hypoxemia.

Discussion: Dyspnea and hypoxemia immediately following pneumonectomy is commonly attributed to decreased alveolar volume, splinting, diaphragmatic dysfunction and atelectasis. Other causes include PE, and more rarely, platypnea-orthodeoxia syndrome.

The hypoxia observed in this syndrome is due to R-to-L shunting across the interatrial septum. One theory suggests that lung resection leads to decreased pulmonary vascular bed and subsequent increased pulmonary vascular resistance, causing a pressure gradient that drives the R-to-L shunt[3]. However, this syndrome has also been documented in patients without PHTN[3,4,5]. An alternate explanation describes a mechanical distortion following pneumonectomy that causes preferential flow from the

IVC through the PFO into the left atrium[6]. When upright, the weight of the heart pulls downward on the interatrial septum, causing the PFO to open or widen[3].

Diagnosis of this syndrome can include ABG (supine and upright), angiography and MRI. The utilization of bedside TEE in this patient provided a timely diagnosis, and subsequent treatment by transvenous closure of PFO. In patients with unexplained hypoxia following pneumonectomy, the possibility of R-to-L shunting should be considered despite the early time course, and the use of TEE for diagnosis should be considered.

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84641 - AWAKE CRANIOTOMY: PROPOFOL-REMIFENTANIL VS DEXMEDETOMIDINE

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Introduction: Awake craniotomy for brain tumors in close proximity to areas of eloquent brain function is performed to minimize neurological injury during resection. 1 The aim of conscious sedation is to have an awake and alert patient during brain mapping. 2 The purpose of this study was to compare the efficacy of propofol-remifentanil (PR) versus dexmedetomidine (Dex) based sedation during awake craniotomy for tumor resection. The primary endpoint was the assessment of ability to perform intraoperative brain mapping and secondary endpoints the incidence of complications and patient satisfaction and outcome.

Materials and Methods: After IRB approval and written informed consent, we conducted a prospective, double blind randomized study. Patients were randomized to the PR or the Dex group. After placement of standard monitors in operating room, each patient received fentanyl 50mcg IV. Group PR received infusions of remifentanil (0.01-0.1mcg/kg/min) and propofol (25-100mcg/kg/min) for 10min, and then titrated to effect. Group Dex received Dex bolus 1mcg/kg for 10min, followed by infusion at 0.2-1mcg/kg/hr and propofol. In both groups additional analgesia and/or sedation when required was with fentanyl 0.5-1.0mcg/kg and/or propofol bolus (20-40mg). Local anesthesia (0.25% bupivacaine and 2% lidocaine with 1:200,000 epinephrine) was injected by the surgeon for pin insertion and infiltration of incision ringblock. At 10min prior to brain mapping, propofol infusion was stopped. Minimal infusion rates of R and Dex were continued. Data collected included intra and postoperative (2hr) hemodynamic and respiratory variables, intraoperative sedation, pain, anxiety and mapping scores, and all complications. At 1hr and 24hr patients were assessed with mental status questionnaire and recall and satisfaction scores. Statistical analysis was performed.

Results: 50 patients (PR (25): Dex (25)) were studied. One patient (Dex) was excluded from analysis due to conversion to general anesthetic at the onset by surgeon's request. Demographics and results are in Table. There were no significant differences between the groups with respect to mapping, postoperative complications, and postoperative

patient recall and satisfaction scores. Intraoperative heart rate (HR) (80vs65,p =0.001)and mean blood pressure (MAP) (89vs82, p=0.047)were significantly lower in group Dex. Intraoperative respiratory complications (5vs0,p=0.021) were significantly more in the PR group.

Discussion: Both PR and Dex based sedation showed good efficacy for intraoperative brain mapping and postoperative patient satisfaction and outcome. Incidence of respiratory complications was more with group PR. In the Dex group overall MAP and HR were lower but did not require treatment. Most of the complications were quickly recognized and easily treated. Optimal dose regimen of sedatives and careful vigilance are the keys for successful conscious sedation for awake craniotomy.

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84646 - MULTIMODAL PREHABILITATION IN CANCER PATIENTS. WHO BENEFITS?

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Introduction: Recent publications on the impact of a multimodal prehabilitation program for patients undergoing surgical resection for colorectal cancer on functional walking capacity have shown a significant increase of this outcome during a 4-week program. However, not every patient improved to the same extent. The purpose of this subanalyis is to determine which patients would benefit from the multimodal prehabilitation.

Methods: This study involved a reanalysis of data arising from a pilot (1) and a randomized trial (2) with the addition of a new randomized controlled study. All three investigations received ethics approval. The primary outcome measure was functional walking capacity measured by the validated Six-Minute Walk Test (6MWT), which was assessed at baseline when patients were admitted to the study and after an average of 4 weeks of multimodal prehabilitation. The program included a 4-week, home-based unsupervised intervention of moderate aerobic and resistance exercises, nutritional counseling with whey protein supplementation (Immunocal), and relaxation exercises. The patients were divided in two groups: group A included those patients whose baseline 6MWT was below 60% of the predicted value, and group B included patients whose predicted value was above 60%. The change in 6MWT over the 4-week prehabilitation period was compared between the two groups.

Results: Data from 106 patients were analyzed. There were 40 patients in group A and 66 in group B. Gender distribution among the two groups and BMI were similar. The average age of group A was 72 ± 16 years compared to group B 66 ± 20 years ($p < 0.01$). There were more patients with ASA 3 and 4 in group A($p < 0.05$). The increase in 6 MWT during the prehabilitation period in group A was 46 ± 50 m while in group B was 22 ± 43 m ($p < 0.01$). The proportion of patients whose 6MWT improved over 20 m was significantly greater in group A (70%) compared with group B (43%) ($p < 0.05$).

Discussion: These preliminary data indicated that patients whose predicted 6MWT is below 60% at baseline, tend to be older and with ASA of 3 and 4. When these patients were enrolled in a multimodal prehabilitation program their functional walking capacity

increased by an average 45 m.

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84652 - PRESURGICAL MODIFICATION OF PHYSICAL FITNESS IN COLORECTAL CANCER

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Introduction: Poor physical function is associated with an increased risk of post-surgical complications. Not only are many patients sedentary with poor physical function at time of diagnosis but high complication rates following colorectal resection render many patients with poor post-surgical functional capacity and quality of life (1). Prehabilitation is the process of improving physical function prior to a physiological stressor, such as surgery. This study aims to assess if a prehabilitation program (exercise and nutritional supplementation), implemented in the 4 weeks from diagnosis to surgery, is sufficient to modify physical activity levels and functional capacity in elderly colorectal cancer patients.

Methods: Patients were assigned to either a prehabilitation (PREHAB; n=50; age 68.2±11.3 years) or a matched time control group (CON; n=49; age 67.2±9.5 years). Patients in PREHAB were prescribed an individualized 4 week home training program and received dietary supplementation with whey protein to ensure adequate protein intake. CON received the same program but only after surgery, as per present hospital protocols. In both PREHAB and CON, the Community Healthy Activities Model Program for Seniors (CHAMPS) questionnaire was used to measure physical activity levels, while the six-minute walk test (6MWT) was used for assessment of functional exercise capacity.

Results: Measurements were collected at the initial visit and on day prior to surgery. Change in total physical activity during the pre-operative period was significantly greater in PREHAB versus CON (+17.97 vs. -4.26 kcal/kg/week, $p=0.01$). The shift in levels of moderate and vigorous intensity exercise was significantly greater in PREHAB than CON (+17.52 vs. -3.09 kcal/kg/week, $p < 0.01$). Compared to CON, patients in PREHAB experienced a significantly greater change in 6MWT during the pre-operative period (+27.7 vs. -1.33 meters, $p < 0.01$), thus indicating improved functional capacity.

Discussion: These results show that a 4 week prehabilitation program is sufficient to improve both physical activity levels and functional capacity in elderly patients with colorectal cancer. These improvements are critical for post-surgical wellbeing, subsequent treatment strategies and overall quality of life in this surgical population.

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84665 - PRESSURE WAVEFORM TO CONFIRM PLACEMENT OF EPIDURAL NEEDLE IN LABOUR

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Introduction: Epidural analgesia is highly effective for labor pain relief and is widely chosen by pregnant patients. However, placement of the epidural needle can be challenging in pregnant patients due to lax tissue ligaments and edema so that the traditional loss of resistance method (LOR) used to find the space may be subtle leading to retries which may delay onset of analgesia as well as increase the risk of complications.[1] The ability to transduce a pulsatile pressure waveform from epidural needles placed in non-labouring patients correlates highly with successful placement of the epidural needle.[2,3] No studies have been done to date to identify a pulsatile pressure waveform in the obstetric patient population during labour. It is unknown how and if uterine contractions interfere with it. We wish to demonstrate the presence of a pulsatile pressure waveform transduced through the epidural needle in labouring women.

Methods: Instututional REB approval and written informed consent were obtained. All the three ASA II women requested epidural for analgesia during the first stage of labour, with a cervical dilation of 4 cm. Case 1: a 27-yr-old primigravida at 40 weeks gestational age, initial pain Numeric Rating Scale (NRS) of 5. Case 2: a 32-yr-old primigravida at 41 weeks gestational age, initial NRS of 8. Case 3: a 29-yr-old multipara at 40 weeks gestational age, initial NRS of 6. For each case, standard monitoring including a pulse oximeter were connected to the patient. An epidural anesthetic was then performed at the L3-4 level, using LOR to saline technique. The needle was filled with 2-3 mL NaCl 0.9% and a high-pressure tubing extension leveled at L3-4 was connected to the needle and the pressure was transduced. Epidural pressure waveform was recorded for all patients at both a “rest” state (in between uterine contractions) and at an “active” state (during a contraction). Epidural catheters were threaded and all patients receveid a loading dose of 8-10 mL of 2% lidocaine, and the catheters were connected to a PCEA pump. Thirty minutes later, block levels and patient satisfaction (NRS) were recorded.

Results: For cases 1 and 2, a clear epidural waveform and pressure readings were obtained during both the “rest” and “active” states. During the “active” phase, an elevation of the epidural pressure was noticed (4 mmHg for case1, 3 mmHg for case 2). At 30 minutes, both patients had a bilateral block (T10/T11 and NRS of 3 for case 1,

T9/T11 and NRS of 1 for case 2). For case 3, we were unable to obtain an epidural pressure waveform. At 30 min, she had an inadequate block (L1/L2, NRS remained at 6). After a bolus of lidocaine 2% 5mL, bilateral block (T10/T10 and NRS 1) was obtained.

Discussion: An epidural pressure waveform was identified in 2 of the 3 women, and correlated with an adequate bilateral block 30 min after epidural loading dose. The absence of a waveform on the 3rd case was associated with an inadequate block. The fact that case 3 had no waveform and an initial dysfunctional block could raise alert for a possible anatomic variation that prevented both epidural pressure reading and adequate local anesthetic spread.

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84701 - ADMA/DDAH PATHWAY IN REGRESSION CARDIAC REMODELING WITH ESMOLOL

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Introduction: Esmolol produces regression of left ventricular hypertrophy (LVH)(1). Increased asymmetric dimethylarginine (ADMA) may be an independent risk factor for development of LVH. We hypothesized that even a 48 hours of esmolol therapy could reduce ADMA in the left ventricle in a model of stable compensated left ventricular hypertrophy.

Methods: Adult male spontaneously hypertensive rats (SHRs) were randomly divided into esmolol therapy group (SHR-E, n= 4) and placebo group (SHR, n=6). Wistar Kyoto rats (WKY) were used as normotensive controls (n= 4). After 48 hours of intervention, left ventricle was removed to study ADMA, SDMA (symmetric dimethylarginine) and DDAH activity (dimethylarginine dimethylaminohydrolase). All the data were expressed as mean ± SEM. Comparisons between groups were made by Student´s t-test for independent samples. $P< 0.05$ was considered significant. Local Ethics Committee approval was obtained.

Results: SHR displayed a significant increase in ADMA concentration and a decreased DDAH activity compared to WKY. Moreover, ADMA significantly decreased and DDAH activity significantly increased in SHR-E compared to SHR. There were no significant differences in SDMA among SHR, WKY and SHR-E.

Discussion: Our study shows that 48 hours of esmolol therapy produces a reduction of ADMA levels by increasing its hydrolysis. In other words, esmolol is capable of normalizing ventricle's ADMA and DDAH activity. However, these effects need to be proven in future human clinical prospective studies.

Acknowledgements: This work was supported by a grant from FIS 13/01261.

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84713 - ANTRAL SONOGRAPHY IN PEDIATRIC PATIENTS WITH LARGE GASTRIC VOLUMES

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Introduction: Ultrasonography is a non-invasive tool to assess gastric fullness and aspiration risk at the bedside in adults and pediatric patients (1, 2). The aim of this study was to evaluate the performance of a 3-point grading system in the prediction of full stomach in the pediatric population by correlating antral grade with gastric volume assessed by suctioning under gastroscopic vision.

Methods: Local ethics board approval was obtained and legal guardians and/or patients scheduled to undergo elective upper gastroscopy provided written informed consent for the study. Following induction of anesthesia, gastric sonography was performed using a Phillips CX50 system (Philips Healthcare, Andover MA, USA) with a curvilinear (low frequency 2-5 MHz) or a linear (high frequency 7-12 MHz) transducer with the patient in both supine and right lateral decubitus (RLD). A video clip and three still images of the antrum between peristaltic contractions were recorded for each patient. Immediately following sonographic assessment, gastric contents were suctioned under gastroscopic guidance and the volume was measured. Qualitatively, the antrum was classified as empty (grade 0) if it appeared flat, with the anterior and posterior walls juxtaposed during a dynamic scan in both supine and RLD. The antrum was deemed to contain fluid if it appeared to have an endocavitary lumen with hypoechoic content and distended walls. In a grade 1 antrum, fluid was visualized only in the RLD position. In a grade 2 antrum, fluid was observed in both supine and RLD positions. A Mann-Whitney U test was completed using SPSS 19.0 (IBM, Armonk NY, USA).

Results: One hundred fasted pediatric patients (aged 11-216 months) presenting to a tertiary hospital for upper gastrointestinal endoscopy were included in the final analysis. A qualitative (content) and quantitative (volume) assessment of the gastric antrum was completed in the supine and RLD positions for each patient. 10% of patients presented with suctioned gastric volumes > 1.12 mL/kg, which is used as our full stomach cutoff volume (3). 0% (0/54), 10.8% (4/37) and 55.6% (5/9) of grade 0, grade 1 and grade 2 classified patients, respectively had suctioned volumes > 1.12 mL/kg. One patient with a full stomach was not graded as fluid was observed only in the supine position. Specifically, within the nine graded patients with a full stomach, a significant difference

($p < 0.05$) was noted in suctioned volumes between grade 1 ($x = 1.20 \pm 0.06$ mL/kg, 95% CI = 1.10-1.30) and grade 2 ($x = 2.05 \pm 0.87$ mL/kg, 95% CI = 0.97-3.13).

Discussion: These results suggest that a 3-point grading system (grades 0-1-2) based on qualitative gastric sonography may be a good predictor of gastric fullness and aspiration risk in pediatric patients. However, caution must be taken in the interpreation of significance in gastric volumes between grade 1 and grade 2 full stomach patients given the small size of this cohort. This suggests a larger study with appropriate statistical power is warranted to assess the utility of antral ultrasound in this population. Greater awareness and the ability for risk stratification could eventually influence a provider's choice of sedation, anesthetic, and airway management.

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84761 - A CANADIAN NATIONAL ANESTHESIOLOGY SIMULATION CURRICULUM (CANNASC)

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Introduction: The introduction of competency-based medical education will task educators with ensuring that trainees gain proficiency in managing a wide range of rare but critical clinical events. Despite widespread adoption of simulation, there is large variability in curriculum content and trainee assessment across training programs. The purpose of this project is to develop and implement a set of standardized high-fidelity simulation scenarios to be completed by every senior anesthesiology trainee during residency.

Methods: The local Research Ethics Board waived the need for ethics review for this project. In 2013, the Royal College Office of Health Systems Innovation and External Relations and Anesthesiology Specialty Committee assembled a task force of educators representing the 17 anesthesiology training programs in Canada. The CanNASC Task Force's goals were to design, implement and continually evaluate a national, standardized simulation-based curriculum comprising: 1) rare, but important clinical situations that may never be experienced in residency, and 2) clinical situations that are critical to competency as an anesthesiologist. Curriculum development followed the principles described by Kern[1] and were accomplished via monthly teleconferences and annual face-to-face meetings.

Results: The following has been achieved:
1) Needs assessment for curriculum content: Every Canadian resident, program director, simulation instructor, residency program committee member and education vice-chair was invited to participate in an online survey. 368 of 958 invitees responded (38.4%), resulting in 64 suggested scenario topics. Using a modified Delphi technique, the Task Force achieved consensus on important and technically feasible scenarios. These 7 scenarios are called CanNASC Simulation Milestones (Table 1).
2) Scenario development: All scenarios have learning objectives grounded in the National Curriculum for Canadian Anesthesiology Residency[2]. Standardized scenario templates were created and 1 scenario has been developed and piloted.
3) Assessment strategy: A published Global Rating Scale (GRS)[3] is the primary tool for assessment of competence; it will be informed by the use of scenario specific checklists (created via a modified Delphi technique) and the ANTS GRS[4].
4) Implementation strategy: Standardized scenario implementation guidelines, pre-brief / debrief documents and rater training videos, guide and commentary were generated. A national simulation resource survey was done to assess for implementation feasibility.

National implementation of a CanNASC Simulation Milestone scenario is currently underway.

Discussion: It is highly feasible to achieve consensus on the elements of a national simulation-based curriculum for anesthesiology trainees. Our process could be adapted by any specialty interested in implementing a simulation-based curriculum incorporating competency-based assessment on a national scale. Data collection on nationwide implementation of the CanNASC Simulation Milestones is underway with future plans for program evaluation and analyses of elements of standardization and performance across the country.

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84810 - DEPTH OF ANESTHESIA MONITORING IN PATIENTS WITH NEUROLOGICAL DISEASE

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Introduction: Use of Depth of Anesthesia (DOA) monitors has been shown to reduce the anesthetic use and to maintain perioperative hemodynamics.[1] Patients with neurological disorders such as Parkinson's disease are prone for perioperative hemodynamic instability due to preexisting autonomic dysfunction and hence benefit from the use of DOA monitors.[2] Commonly used DOA monitors like Bispectral index (BIS) and entropy are calibrated and validated in healthy subjets with normal cerebral function. The aim of this study was to determine how BIS and entropy perform in relation to the current clinical indices of DOA in patients with neurological conditions.

Materials and Methods: After IRB approval and patient consent we conducted a prospective non-randomized, observational study in patients with neurological disorders undergoing internalization of deep brain stimulators (DBS). All patients received standard general anesthetics with endotracheal intubation and sevoflurane maintenance. Age adjusted MAC (aaMAC) of inhalational anesthetic was maintained between 0.7-1.1 to ensure adequate depth of anesthesia. BIS and entropy sensors were applied on left forehead in all patients prior to induction. BIS, response entropy (RE), state entropy (SE), heart rate (HR) and mean arterial pressure (MAP) and aaMAC at various points from induction to post extubation were collected and analyzed and correlated. RE divergence of more than 10 points from SE is considered as inadequate patient analgesia.

Results: Thirty patients were recruited in this study (mean age was 58.4±11, Male: Female 18:12 and weight 79.2±17). Indication for DBS were Parkinson's disease (PD) (n=23), essential tremors(2), alzheimer's disease (2), Dystonia (2) and depression(1). We found that the trends in BIS, entropy, aaMAC and hemodynamic (HR and MAP) values followed closely during different intraoperative time points except during tunneling. There was a very strong positive correlation between BIS and RE (r=0.870) and BIS and SE (r=0.903), strong positive correlation between aaMAC vs BIS, RE, SE, r=0.476, 0.628, 0.544 respectively. There was no correlation between RE and HR r=

0.039, RE and MAP 0.167, SE and HR 0.042, SE and MAP 0.147, BIS and HR 0.036, BIS and MAP 0.147. RE divergence from SE were less than 10 throughout indicating optimal patient analgesia.

Discussion: Our study showed that BIS and entropy perform reliably in patients with Parkinson's disease and other neurological disorders. There was a good correlation between BIS and entropy devices. However, HR and MAP are not reliable indicators of depth of anesthesia in this subset of patients probably due to preexisting autonomic dysfunction. Hence BIS and entropy are dependable non-invasive tools to target the administration of anesthetics in these patients. Monitoring of divergence of RE from SE will enable careful titration of opioid analgesics. This helps in preventing chest rigidity, constipation, nausea and vomiting due to excessive opioids.

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84836 - ROLE OF INTRAOPERATIVE TEE IN PULMONARY EMBOLISM

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Pulmonary Embolism (PE) is a relatively common clinical problem that is associated with substantial morbidity and mortality. The incidence in the United States is 100-200 per 100 000 people per year(1) and is the most common cause of mortality that is not clinically diagnosed before death. The current European and American guidelines(2) offer a logical approach for limited context of patient that come to the emergency services. The perioperative environment demands different challenges for the diagnosis and treatment of this entity. Nowadays the Anesthesiologist has a pivotal role either the diagnoses but the treatment of the PE.
The Transesophageal echocardiography (TEE) is a relatively simple, minimally invasive and widely available imaging technique.

We present 2 cases where the (TEE) played a crucial role in the management of these patients, and we present the typical and not so typical echo findings associated with these cases that could be useful to cope patients with PE looking for successful perioperative outcomes.

A Women, 87 years old, with shortness of breath and known PE came to the OR awake but hemodynamically unstable for surgical embolectomy. The TEE demonstrated the typical findings associated with PE including Right Ventricular (RV) dilation (RVEED/LVEDD) and a disturbed RV ejection pattern. In addition the patient also had an element of dynamic outflow tract obstruction along with systolic anterior motion of the mitral valve leaflet.There are only few reports in the current literature about this complication.(3,4).

A Women, 23 years old, who presented with sudden dyspnea at home and subsequently had a out-hospital cardiac arrest and aspiration . She was resuscitated and later underwent surgical pulmonary embolectomy. The TEE showed clot in the right and left pulmonary arteries, RV dysfunction and McConnell's sign (depressed contractility on the RV free wall compared with RV apex) prior to the procedure as well as perioperative RV failure due to hypercapnia. The TEE was also an objective tool for assesment and following after the surgical embolectomy and successful Broncho-pulmonary Lavage.

Anesthesiologist are frequently being called to assess hemodynamically unstable patients with the use of either TEE or TTE. Pulmonary embolism is one differential diagnosis that should be considered. Unfortunately only half of patients have clot demonstrable on ultrasound perioperatively (5). For this reason other signs of PE qualitative and quantitative are frequently sought, and include RV systolic pressure (RVSP), RV end diastolic wall thickness, paradoxical interventricular septal motion, RV end-diastolic diemension (RVEDD) and the relation with the Left Ventricule (RVEDD/LVEED >0.7), Tricuspid annular plane systolic excursion TAPSE, Inferior Vena Cava Dimension and collapsibility and RV longitudinal strain and strain rate by speackle-tracking echo(6). Finally, the use of thoracic imaging to identify sub pleural infarcts is also suggestive of PE. The usefulness of this signs remains unclear.We describe and discuss the typical TEE findings in with PE in the operating room for diagnosis purposes, treatment and the potential prognosis implications.(6)

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84856 - EPIDURAL HEMATOMA ON SUBCUTANEOUS HEPARIN, ASPIRIN AND CELECOXIB

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Introduction: Spinal epidural hematoma (EH) is a rare but devastating complication associated with neuraxial techniques. A case of EH following atraumatic epidural insertion, in a patient without risk factor, a normal coagulation profile and appropriate anticoagulation medication respecting the current ASRA guidelines, is presented. (Patient consented.)

Case report: A 62 year-old lady (52.3kg, 155cm BMI22) with lung cancer presented for a right upper lobe and middle lobe resection, lymph node dissection and thoracotomy. She is a smoker with history of hypertension, dyslipidemia and hypothyroidism and smoking. A T5-T6 epidural catheter was atraumatically inserted pre-induction. Her intraoperative course was uneventful. Postoperatively, an epidural infusion (bupivacaine 1mg/ml and fentanyl 3µg/ml) was started. Subcutaneous unfractionated heparin (UFH) 5,000 units every 12 h (BID) was started 5h after surgery together along with aspirin 80mg (patient's prior medication). Celecoxib 200mg BID was initiated on post-operative day (POD) one. Patient coagulation profile remained within normal limits.

On POD 3, at 21h00, the patient had back pain and the nurse bolused 4ml as per epidural orders and increased the epidural infusion rate to 10 ml/h. At 4h45AM of POD 4, the patient woke up with urinary retention, hemiparesis, bilateral lower extremity weakness more prominent on the right and T4-T10 bilateral sensory block. The epidural site was clean, non- tender with negative aspiration for blood. Epidural was stopped and a stat magnetic resonance imaging (MRI) was performed.

The MRI showed a T3-T6 hematoma (1.1cm x 0.6 cm, AP * transverse) with mass effect. At 9h30 of POD 4 (12 h and 30 min since symptoms started and 4 h and 45 min after the patient woke up with neurologic deficits), a T4 - T6 laminectomy and decompression was performed successfully. Intra-operatively, a prominent venous plexus posteriorly was observed at the site of epidural hematoma occupying the majority of the posterior epidural space. The patient completely recovered her neurological function and was discharged home on POD7.

Discussion In this case, despite following ASRA and ESRA neuraxial guidelines for anticoagulation, a normal coagulation profile and atraumatic thoracic epidural insertion, the patient developed an EH. The risk of neuraxial technique with subcutaneous UFH alone is well documented (Table 1). There are no documented case reports of EH when aspirin or COX-2 inhibitor were administered alone with neuraxial technique. However, there are cases of spontaneous EH associated with aspirin use. Even with the guideline recommendations, the risk of EH when combining a COX-2 inhibitor to other anticoagulant and antiplatelet agents remains unknown. A cautionary approach should be used for evaluating the need on of concomitant use of these agents in patients receiving subcutaneous UFH and aspirin. Patient's prominent venous plexus might have contributed to develop the EH. The patient had complete neurological recovery after prompt laminectomy (within for 4h from the onset of neurological deficits). This reaffirms previous studies which show the importance to rapidly diagnose and decompress an epidural hematoma to avoid neurologic sequelae [3].

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84860 - CAUDAL BLOCK FOR POST OP ANALGESIA IN ANKYLOSING SPONDYLITIS PATIENTS

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Introduction: There is ossification in spinal ligaments thus caudal space can be used as an alternative site for insertion of epidural catheters in patients with ankylosing spondylitis as the sacrococcygeal membrane is usually not ossified.

Objective: To compare the efficacy of 0.125% bupivacaine alone or in combination with 50 mcg/kg of morphine.

Methods: Prospective, double blind, randomized controlled trial with 31 ASA I and II adults patients, aged 18-60 years, diagnosed with ankylosing spondylitis and scheduled to undergo total hip replacement surgery. Caudal epidural catheter was placed in lateral position after induction with GA. After establishing a negative test dose, 12ml of 0.25% bupivacaine was administered prior to skin incision. Patients in Group B (n=15) were administered epidural 0.125% bupivacaine and in group BM (n=15) 0.125 % bupivacaine with 50 mcg/kg morphine. After the completion of surgery of dye spread through the epidural catheter was ascertained.

Results: VAS scores were comparable between the two groups in postoperative period. Intraoperative and post operative fentanyl requirement was comparable between the 2 groups i.e. 126.92±33.80 mcg in group B as compared to the 136.67±29.87 mcg in group BM (p=0.887) and 413.00±105.48 mcg as compared to the group BM 426.67±89.87mcg . (p=0.82) respectively. The incidence of postoperative urinary retention was minimally higher in the group BM 7/15 (46%) as compared to group B 4/13 (30%). (p>0.005)

Conclusion : Caudal bupivacaine with or without morphine was found to provide adequate post operative analgesia in patients of AS for total hip replacement.

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84908 - DOES VIDEOLARYNGOSCOPY ACCELERATE LEARNING OF DIRECT LARYNGOSCOPY?

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Introduction: Medical students are required to perform direct laryngoscopy (DL). 50 attempts are needed to achieve a 90% success rate[1], volume that they are unlikely to approach during their Anesthesia rotation. Video laryngoscopes GlideScope Direct® (Verathon Medical, Bothell, MA) and C-MAC® (Karl Storz Endoskope, Tuttlingen, Germany), shaped and used like conventional Macintosh laryngoscope increase the success rate of students performing DL while the instructor views the progress on the monitor.[2,3] This allows real-time feedback with positive impact upon subsequent intubation of manikins[4] and patients.[2,5] The laryngoscopy can also be recorded for subsequent review. In this pilot study we are testing hypotheses that teaching DL on patients using Macintosh-style video laryngoscope (MacVL) enhances skill acquisition compared with conventional DL and that subsequent review of MacVL recordings accelerates this ever further.

Methods: Having obtained local ethics board approval, sixty consecutive 3rd year medical students are prospectively recruited prior to their two week Anesthesia rotation at two hospitals. After granting written consent they are randomized for the first TRAINING week into one of three groups to use either Macintosh laryngoscope (Control group), MacVL (either CMAC or GlideScope Direct) without (VL1 group) or with recordings (VL2 group). During the second week all students are TESTED using DL. The following outcome measures are noted: time to intubate during the TESTING week (primary outcome), number of intubating opportunities during each week, number of times each video-recording was viewed (VL2), overall success rate during TESTING week and complications. The statistical analysis is performed by Prism 5.0, GraphPad Software Inc, La Jolla, CA. ANOVA and Chi Square test is used to generate p values for intubating times and success rates, respectively, and $p < 0.05$ is considered statistically significant. Eligible students had no prior laryngoscopy experience with patients. During their two weeks the students were supervised by consenting staff anesthesiologists who determined patient suitability and provided non-standardized verbal feedback.

Results: Preliminary results from 30 students are available for analysis. Patients' age, BMI and gender were similar amongst groups. Average intubating attempt lasted 62.3+/-34.9 seconds in the Control group, 63.0+/-26.3 seconds in VL1 and 70.4+/-38.1 seconds in VL2 group, respectively, and differences were not statistically significant (p=0.54). Secondary outcomes are listed in Table 1. None of the observed differences between individual groups reached statistical significance. We recorded a 15% complication rate with no permanent harm.

Discussion: Preliminary results do not indicate significant differences between groups in any of the outcome measures. The primary outcome results are similar to those of other authors in the same subject population.[2] Other authors also found around 10 intubations with approximately 50% success rate in medical students during a two week rotation[4], similar to our findings. Full results after the completion of the study will inform the design of a larger trial potentially to be rolled out nation-wide.

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84932 - BIOMARKERS OF ANEMIA-INDUCED TISSUE HYPOXIA IN CARDIAC SURGERY

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Introduction: Anemia is associated with increased risk of organ injury and mortality (1-3). During cardiac surgery with cardiopulmonary bypass (CPB), hemodilutional anemia often occurs, putting patients at risk for adverse events(2). Assessing real-time biomarkers of tissue hypoxia during cardiac surgery may allow for early detection of tissue hypoxia and the development of patient specific treatments, including personalized transfusion thresholds. Translational animal models have demonstrated several early biomarkers of anemic-tissue hypoxia including nitric oxide (NO), methemoglobin (MetHb), erythropoietin (EPO, kidney) and hepcidin (liver) (4-5). We hypothesize that anemia causes activation of hypoxic signaling pathways thereby providing evidence of anemia-induced tissue hypoxia in patients undergoing cardiac surgery.

Methods: With institutional research ethics board approval, an observational prospective study was conducted on 36 cardiac surgery patients. After informed consent was obtained, 5 arterial blood samples were taken for each patient: baseline, 15 and 45 minutes after the start of CPB, within 15 minutes following removal from CPB, and within 1 hour of intensive care unit (ICU) admission. Standard hematology, arterial blood gas, MetHb, nitrate, nitrite and plasma EPO, hepcidin, were assessed. Brain oximetry was also assessed in 9 patients. Data [mean (STDEV)] was analyzed by repeated measures one-way ANOVA.

Results: Hemoglobin (Hb) levels decreased during the onset of CPB [125 (14.5) to 101 (15.1) g/L; $p < 0.05$]. No correlation with MetHb, or nitrite was observed; but plasma nitrate levels decreased during CPB [$p=0.002$]. Plasma EPO levels increased from baseline to ICU admission [9.2 (9.8) to 14.8 (14.0) mIU/mL; $p < 0.05$]. Changes in Hb correlated with changes in EPO [$R^2= 0.122$, $p < 0.05$]. Plasma hepcidin levels remained

stable at all time points and did not correlate with Hb levels. When EPO and hepcidin were analyzed as a ratio, there was an increasing trend with decreasing Hb [R^2=0.08, p=0.02]. Brain oxygen saturation decreased during the onset of CPB [71.4 (7.8) to 65.1 (7.1) %; $p < 0.05$].

Discussion: Our findings suggest that perioperative anemia lead to an early increase in EPO from the kidney, indicative of renal hypoxia. The stable hepcidin levels may provide indirect evidence of liver hypoxia, as hypoxia suppresses hepcidin expression and levels have been shown to be elevated by surgical inflammation(6). Combination of these two measures in an index may reflect combined liver and renal hypoxia. Decreases in plasma nitrate may also reflect altered NO / nitrite oxidation reactions with Hb. Characterization of patient-specific biomarkers of anemia-induced tissue hypoxia may help provide individual patient treatment thresholds and optimize care.

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84953 - CRYSTALLOID VS COLLOID RESUSCITATION ON O2 HOMEOSTASIS IN ANEMIC RATS

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Introduction: Anemia and hemodilution during surgery are associated with an increased risk of morbidity and mortality (1-3). Acute hemorrhage and fluid resuscitation occurs commonly during surgery. Common intravenous fluids used to restore blood volume during acute hypovolemia include colloids such as hydroxyethyl starch (HES), and crystalloids such as saline. There remains extensive debate over the optimal indication and volume of colloids and crystolloids clinically. In an experimental model, we aimed to compare the effects of acute normovolemic hemodilution with HES or saline on oxygen homeostasis by utilizing 1) novel approach (G4 Oxyphor) to directly assess brain and muscle tissue PO_2 and 2) traditional approach (blood lactate and oxygen extraction) to measure tissue hypoxia.

Methods: With institutional animal care committee approval, 21 anesthetized rats underwent 40% isovolemic hemodilution with either hydroxyethyl starch (HES) (n=10) or saline (n=7) to reach hemoglobin level of 70-80g/L. An additional 4 rats were placed in the sham control group. Brain and hind limb skeletal muscle tissue oxygen tension were measured using a microprobe containing phosphorescence (G4 Oxyphor). Mean arterial pressure (MAP), heart rate, temperature and standard hematological parameters were assessed at baseline, throughout the 10 minute hemodilution period, and for the following 60 minutes. Data were analyzed by repeated measures one-way ANOVA.

Results: Following HES hemodilution, MAP and muscle PO_2 remained stable while brain PO_2 decreased from 22.1 (5.6) to 17.5 (4.4) mmHg ($p < 0.05$). Arterial and venous oxygen saturation were not different from controls and systemic lactate did not increase. By contrast, fluid resuscitation with saline resulted in a drop in MAP from 77.3 (4.0) to 31.2 (12.8) mmHg ($p < 0.05$), and a significant reduction in both muscle PO2 [44.5 (11.0) to 19.9 (12.4) mmHg] and brain PO2 [23.2 (8.2) to 10.7 (3.6) mmHg, $p < 0.05$]. Blood gas analysis demonstrated a reduction in venous blood PO2 [47.9 (4.3) to 23.6 (5.1) mmHg, $p < 0.05$] and arterial lactate levels increased form 3.5 (1.3) to 10.9 (6.2)

mmol/L, $p < 0.001$). Heart rate and temperature remained constant in all groups at all time points.

Discussion: Our findings demonstrated that hemodilution with saline results in greater degree of tissue hypoxia relative to HES. This is primarily due to the inability of saline resuscitation (1:1) to maintain MAP. This resulted in severe tissue hypoxia in brain and hind limb, increased oxygen extraction, and elevated blood lactate. With stable MAP in HES hemodilution, tissue hypoxia was observed in the brain, likely due to its higher metabolic requirement. Resting muscle metabolism is relatively low, thus tissue hypoxia was not observed. The result of this study demonstrated that HES is superior than saline for 1:1 fluid replacement in extreme hemodilution in our animal model. Tissue hypoxia occurs in a heterogeneous manner that is partially dependent on specific tissue metabolism.

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84995 - TIMING OF DEXAMETHASONE FOR POSTOPERATIVE PAIN IN CESAREAN SECTIONS

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Introduction: Over the last decade the potential analgesic benefit of single dose dexamethasone has been demonstrated in several surgical populations including patients undergoing cesarean sections (1,2). Timing of dexamethasone administration remains controversial due to its delayed peak effect as explained by its intranuclear site of action (3). The purpose of our study was to evaluate the hypothesis that single dose intravenous dexamethasone given 60-90 minutes preoperatively reduces visual analog scale (VAS) pain scores and improves quality of recovery in patients undergoing elective cesarean section as compared to the same dose given intraoperatively.

Methods: Upon obtaining approval from the local Research Ethics Board we performed a double-blind, randomized, placebo controlled trial involving forty full-term pregnant patients (American Society of Anesthesiologists Class 1 or 2) undergoing elective cesarean section. Enrolled and consented patients were randomly allocated into two groups to receive dexamethasone 0.15mg/kg intravenously either 60-90 minutes prior to scheduled operation or immediately after surgical incision. Exclusion criteria included contraindication to spinal anesthesia, allergy to the study drug, diabetes, active infection, adrenal axis pathology, chronic pain syndromes and recent or active treatment with steroids. The primary outcome was postoperative VAS pain scores. Secondary outcomes included postoperative analgesic use, presence and degree of nausea and vomiting as well as overall satisfaction with postoperative recovery.

Results: Postoperative VAS scores, overall satisfaction with recovery as well as nausea and vomiting were not significantly different between the two groups although lower VAS score in the early versus intraoperative administration of dexamethasone trended toward significance at the 12-hour time point. Administration of dexamethasone 60-90 minutes before surgical incision resulted in a significantly decreased acetaminophen consumption at 12 hours postoperatively when compared to the control group.

Discussion: The results of our study demonstrated a small yet significant reduction in postoperative acetaminophen consumption in the group of cesarean section patients that were randomized to receive early preoperative dexamethasone, suggesting improved therapeutic benefit of preemptive rather than intraoperative administration of this analgesic and antiemetic adjunct. Despite major limitations of our study such as small sample size, and absence of a placebo-arm as well as an underpowered design

for the primary outcome, we believe that our findings are hypothesis generating and have important clinical implications further supporting the analgesic benefit of moderate dose dexamethasone in this surgical population. Furthermore, to the best of our knowledge our work comprises the first investigative report to compare the difference in the analgesic effect of early versus intraoperative administration of dexamethasone in patients undergoing elective cesarean section.

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85037 - BRAIN ANATOMICAL CHANGES AND TISSUE HYPOXIA IN SICKLE CELL ANEMIC MICE

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Introduction: Cerebral ischemia commonly occurs in children with sickle cell disease (SCD), and is a common cause of morbidity in these patients (1). Impaired learning and cognitive function are also observed in these young patients, suggesting that anemia causes impairment in neurological function (2,3). However, the mechanism of cerebral injury is poorly understood. We hypothesize that anemia-induced tissue hypoxia may be an important factor contributing to the changes in cerebral blood flow (CBF) and cerebrovascular reserve (CVR) in SCD. The purpose of this study is to utilize a transgenic mouse model of SCD to recapitulate the anatomical and functional changes observed in SCD patients, and to provide evidence of tissue hypoxia in sickle cell anemic mice.

Methods: With institutional animal ethics approval, female heterozygous Townes sickle cell mice and C57BL6/J control mice were used. At 6-7 weeks old, CBF and CVR were assessed with magnetic resonance imaging (MRI) using continuous arterial spin labeling by exposing mice to normocapnia (30% O_2 / 70% N_2) and hypercapnia (5% CO_2 / 30% O_2 / 65% N_2). At 13 weeks of age, blood flow and diameter of the left common carotid artery (LCCA) were measured using high-frequency ultrasound. The mouse brain was then perfusion fixed for ex vivo magnetic resonance imaging (MRI) and immunofluorescence staining for hypoxia-inducible factor (HIF).Brain Anatomical Changes and Tissue Hypoxia in Sickle Cell Anemic Mice
Brain Anatomical Changes and Tissue Hypoxia in Sickle Cell Anemic Mice**Results:** Basal CBF in sickle cell mice was significantly elevated relative to control mice (9.6 ± 0.7 vs 6.8 ± 0.8 ml/g/min; $p < 0.05$). Cerebrovascular reactivity to CO2 was reduced by 67% in the whole brain, 44% in the cerebral cortex and 85% in the hippocampus of sickle cell mice ($p < 0.05$ for all), relative to control mice. Ultrasound measurements demonstrated that sickle cell mice had significantly increased LCCA diameter (0.68 ± 0.06 vs 0.38 ± 0.05 mm; $p < 0.001$) and blood flow (2.19 ± 0.55 vs 0.68 ± 0.23 ml/min; $p < 0.001$). Ex vivo MRI analysis demonstrated significant volume differences in specific

regions in the grey and white matter of the brain. Increased HIF-1α staining was clearly evident in the perivascular regions of sickle cell mice relative to controls.Brain Anatomical Changes and Tissue Hypoxia in Sickle Cell Anemic Mice

Discussion: We demonstrated that the transgenic SCD mice exhibit evidence of tissue hypoxia (HIF staining), elevated basal CBF, impaired functional cerebrovascular reactivity to CO2, and morphological changes in the brain consistent with anemia-induced tissue hypoxia. An enlarged carotid artery may suggest vascular remodeling in chronic anemia, and the MRI analysis demonstrated atrophy of specific brain regions involved in learning and memory in SCD mice. Together, these findings suggest that disrupted oxygen homeostasis caused functional and structural adaptation in SCD mice. These changes in the brain function and structure may contribute to cerebral injury in children with SCD and may help define novel treatments to prevent stroke in children with sickle cell anemia.

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85092 - BED BRACKET FAILURES: AN ANALYSIS AND PATIENT SAFETY IMPROVEMENT.

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Introduction: In 2013, our perioperative patient safety committee identified a cluster of adverse event reports involving bed bracket failures. Bed brackets are devices that are clamped onto the operating room (OR) table to secure bed attachment equipment, such as lithotomy stirrups. Bracket failures are defined as the bracket (and the accompanying bed attachment equipment) falling off while in use, potentially causing serious patient injury.

Our initial goals were to investigate the frequency of bracket failures and identify contributing factors. The ultimate goal was to institute and monitor changes that would reduce bracket failures.

Methods: Local Ethics Committee approval was sought and waived. A multidisciplinary meeting was held to identify contributing factors. OR Nurses and OR Attendants at two sites of our hospital were also consulted at nursing rounds. Surveys were distributed and collected during these rounds, which resulted in equipment changes and new training protocols. Follow-up rounds and a repeat survey were conducted 3 months post intervention. Odds ratio and confidence interval (CI) were calculated using Microsoft Excel.

Results: Contributing factors identified included: 1) lack of sufficient training in bracket usage, 2) non user-friendly brackets, and 3) wide variety of bracket types (seven different types of brackets, each with distinct features).

The initial survey generated 91 responses (100% response rate). 29% of respondents had witnessed a bracket failure in the past 3 months. 13% of respondents reported receiving training in bracket usage. 35% felt the brackets were user-friendly, 78% felt there were too many types of brackets, and 33% felt comfortable using the brackets.

Our initial analysis led to the acquisition of new, user-friendly brackets, limited to two types. This initiative, implemented in September 2014, was followed by a widespread education campaign on proper bracket usage.

The follow-up survey generated 73 responses (92% response rate). 22% of respondents had witnessed a bracket failure in the past 3 months. 67% of respondents reported receiving training in bracket usage and 52% felt comfortable using the brackets

(Figure 1). Survey respondents were 2.2 times more likely (Odds ratio 2.2, 95% CI 1.17-4.16) to feel comfortable using the brackets after the training initiative.

Discussion: Our initial survey results suggests that bracket failures were more frequent than previously thought. The comfort level in equipment usage was lower than expected, possibly due to a high variability in bracket types and low training rates. The follow-up survey demonstrated an improvement in comfort level and reduction in bracket failures. The variability between sites in bracket training rates suggests a relationship between training, comfort level, and reported witnessed bracket failures.

The education campaign will continue until achieving a training rate of 100%. Another survey will be conducted 6 months post implementation of the new brackets.

85107 - CANADIAN ANESTHESIOLOGY DEPARTMENT PUBLICATION OUTPUT: 2000-2013

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Introduction: Academic output in anesthesiology has been quantified in the past, and concerns regarding a decline have arisen in multiple countries.[1-6] Our previous analysis of the academic output of anesthesiology departments across Canada between 2000 and 2004 identified a potentially concerning decline in the number of randomized clinical trials (RCTs).[6] Also concerning is a recent report by the Canadian Association of University Teachers[7] which revealed that the Canadian Institutes of Health Research budget fell 7.5% between 2007 and 2013. Here, we analyzed research from Canadian anesthesiology departments published between 2000-2013 to assess long-term productivity trends and effects of funding decreases on publication numbers.

Methods: Publications from 2000-2013 which listed Canadian anesthesiology departments as the primary corresponding source were identified using MEDLINE and categorized into methodological study designs following abstract review by two independent reviewers. Pearson correlation coefficient analysis was performed on the number of total publications, publications by study design, and publications by each university. Average annual percent change (AAPC) and annual percent change (APC)[8] were calculated using Joinpoint Regression[9] for the total annual number of anesthesiology publications as well as total annual number of RCTs.

Results: Between 2000 and 2013, we identified 2,940 published articles authored by a member of an anesthesiology department of a Canadian university or affiliated hospital. There was a trend towards increased publications by Canadian anesthesiology departments (r = +0.91) between 2000 and 2013. There was a slightly positive trend (r = +0.17) in number of RCTs published from 2005-2013; however, RCTs as a percentage of total publications showed a declining trend between 2000 and 2013 (Figure 1). APC analysis showed an average annual increase of 5.2% [95% CI 3.8-6.5] in total publications from 2000-2013 ($\alpha = 0.05$); however, no Joinpoints were found, indicating that no major year-to-year changes accounted for this increase.

Discussion: Our resultsreveal a steady increase in total publications and RCTs over the 14-year period analyzed. Our results also show a slight decline in the percentage of RCT publications among total publications. Nevertheless, these results are reassuring since they suggest that anesthesiology research productivity, at least in terms of publication numbers, increased even as federal funding for biomedical research

declined during the latter part of our period of analysis. However, it is difficult to assess whether the funding decline affected publication quality. A limitation of our study is that our methodology only allowed us to identify publications based on the corresponding author, which may overlook large, multi-centre studies involving Canadian anesthesiology departments.

Figure 1. Yearly numbers of total publications overall (white bars) and randomized controlled trials (RCTs) only (gray bars) for the period 2000-2013. Per-year percentage of total publications that were RCTs is represented by filled circles; the trendline shows the overall decrease in percentage of publications that were RCTs from 2000-2013.

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85112 - GLUTAMATE RECEPTOR CHANGES IN EXPERIMENTAL SUBARACHNOID HEMORRHAGE

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Introduction: Understanding the subcellular processes which contribute to cellular injury during stroke and traumatic brain injury may guide appropriate use of neuroprotective anesthetics during periods of neuron vulnerability. Glutamate is important in the pathogenesis of brain damage after cerebral ischemia, including subarachnoid hemorrhage (SAH). Notably, brain extracellular and cerebrospinal fluid (CSF) as well as blood glutamate concentrations increase after experimental and clinical SAH [1,2]. While neurons are one potential source of glutamate, platelets also release glutamate as part of their recruitment [3] and might mediate neuronal damage. This study investigates the hypothesis that platelet microthromboemboli release glutamate that mediates excitotoxic brain injury and neuron dysfunction after subarachnoid hemorrhage (SAH).

Methods: Ethics approval was received from the institutional committee on animal care. We used two models, primary neuronal cultures exposed to activated platelets, as well as a whole animal subarachnoid hemorrhage preparation. Propidium iodide was used to evaluate neuronal viability, and surface glutamate receptor staining was used to evaluate the phenotype of platelet exposed neurons.

Results: We demonstrate that thrombin-activated platelet-rich plasma releases glutamate, which exceeds concentrations of 300 micromolar. When applied to neuronal cultures, this activated plasma is neurotoxic, and attenuated in part by glutamate receptor antagonism. We also demonstrate that exposure to thrombin-activated platelets induces a marked downregulation of the surface glutamate receptor GluR2, a marker of excitotoxicity exposure and a possible mechanism of neuron dysfunction. Linear regression demonstrated that seven days following SAH in the animal there was a strong correlation between proximity to microthrombi and reduction of surface glutamate receptors.

Discussion: We conclude that platelet-mediated microthrombosis contributes to neuronal glutamate receptor dysfunction and might therefore influence clinical outcome following subarachnoid hemorrhage. Accordingly, we are hoping to begin a pilot trial on the use of ketamine for neuroprotection following SAH, which may confer neuroprotection through its anti-glutamatergic activities. This work was published in the

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85146 - COGNITIVE AIDS WITH ROLES DEFINED (CARD): CRISIS MANAGEMENT IN THE OR

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Introduction: Patient survival after intraoperative cardiac arrest highly depends upon rapid and coordinated delivery of life-saving actions, reliant upon a multi-disciplinary team. Uncoordinated teamwork due to overcrowding, lack of role definition and task overload[1-3] is the most important barrier to the efficient management of cardiac arrest.[1, 4] This study assesses the value of C.A.R.D. (Cognitive Aids with Roles Defined), which is a cognitive aid delineating roles and tasks designed to facilitate crisis resource management.

Methods: The local Hospital Research Ethics Board approved this study. Twelve multidisciplinary teams, each consisting of anesthesiologists, surgeons, nurses, a respiratory therapist, and operating room attendants, underwent three successive simulated intraoperative cardiac arrest scenarios each followed by a debriefing, and then a final focus group. The first scenario ran as per current practice without C.A.R.D.; the second scenario used C.A.R.D. without previous instruction; the third scenario used CARD after specific teaching. A retention test was performed six months later on eight teams (4 with and 4 without C.A.R.D.). The transcripts of the focus groups discussing C.A.R.D. for crisis management underwent a thematic analysis using an inductive methodology. Each scenario was videotaped and later rated by two blinded experts for technical and non-technical skills of teams (time to start CPR, hands-on time, global rating scale, and TEAM scale). The TEAM (Team Emergency Assessment Measure) scale is a validated and reliable teamwork assessment tool for emergency resuscitation team performance[5]. A repeated measures ANOVA was used to capture change in TEAM score rating across the three initial scenarios.

Results: Qualitative data revealed thematic dimensions including role definition in crisis management, logistical issues, and real-life applicability. C.A.R.D. clarified roles, enhanced efficacy, and improved team focus and coordination during crises. Participants felt more comfortable and confident on a personal level, and empowered to carry out their assigned tasks. Participants felt that C.A.R.D. requires initial training. Exploratory quantitative analysis did not show any change in team performance when

using C.A.R.D at the retention test (Table).

Discussion: The C.A.R.D. protocol was well received by participants. C.A.R.D. may facilitate crisis resource management for intraoperative cardiac arrest, but requires some teaching. C.A.R.D. is relevant and easily exportable to other types of crises. The concept of a well-organizing team with defined roles may be infinitely valuable for patient safety. Since this study, the C.A.R.D protocol has been implemented in ORs with positive feedback.

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85167 - SURGICAL EMPHYSEMA POST TRANSANAL MINIMALLY INVASIVE SURGERY

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Introduction: Transanal minimally invasive surgery (TAMIS) is a technique first developed in 2009 for local excision of appropriately selected low-grade rectal neoplasia [1]. Since its initial description, it has been used increasingly in the United States and internationally as an alternative to local excision and transanal endoscopic microsurgery for local excision of distal and mid rectum neoplasms.

We present a case of surgical emphysema, hypercarbia & pneumomediastinum that occurred during (TAMIS), which led to postoperative intensive care unit (ICU) admission. To the best of our knowledge, these complications have never been reported to occur during TAMIS.

Case Report: An 81-year-old woman was diagnosed with rectal adenocarcinoma. On MRI, the tumor was staged as a T2 N0 tumor. Although the surgeon recommended a low anterior resection as the standard care of T2 tumor, the patient elected to proceed with TAMIS given its decreased morbidity compared to major intra-abdominal procedure. Patient's informed consent was obtained.

In the operating room, standard monitoring was applied. Anesthesia was induced after adequate pre-oxygenation. The patient was positioned in the lithotomy position. TAMIS port was inserted. Pneumorectum was applied by insufflation of CO2 at a rate of 3 L/min with an insufflation pressure of 15 to 20 mmHg. The lesion included about 40% of the rectum circumference. As the rectum kept collapsing, the insufflation pressure needed to be increased by a few mmHg briefly. Eventually the tumor was excised. The defect was closed in running fashion.

Before the end of the surgery, the airway pressure and the end tidal CO2 began to increase. Chest auscultation revealed bilateral wheeze and ventolin was given through the ETT. The ventilation parameters were changed. 10 minutes later as the surgery concluded a significant amount of subcutaneous emphysema was noted on the face, neck and chest. End tidal CO2 continued to rise to 67 mmHg despite attempts to increase minute ventilation. The patient’s hemodynamics were stable. Arterial blood gases (ABGs) revealed a pH of 7.07 and a pCO2 of 112 mmHg. Given the amount of emphysema and the high pCO2, the patient remained sedated and intubated, and was transferred to the ICU.

In the ICU, Chest X-ray revealed diffuse subcutaneous emphysema and evidence of pneumomediastinum. There was no definite pneumothorax. After a few hours of ventilation, the emphysema began to resolve. Further laboratory investigations revealed a normalizing ABGs with a pH of 7.38 and a pCO2 of 50 mmHg. There were no signs of rectal perforation. The patient was extubated and then discharged from the ICU with no further complications.

Discussion: Postoperative complications following TAMIS are often mild, but serious complications may occur. Emphysema from extra-peritoneal insufflation of CO2 during TAMIS could be a result of raised insufflation pressures, in combination with full thickness excision, causing decreased tissue integrity [2,3].

Once insufflation has stopped the CO2 should theoretically reabsorb. However, delayed hypercarbia may occur after the procedure, and respiratory failure may develop[3]. As such, prolonged patient ventilation and monitoring in an appropriate setting should be considered.

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85250 - VISUAL ASSESSMENT OF MINIMUM LARYNGOSCOPE BRIGHTNESS

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Introduction: Repeated sterilization of laryngoscope blades progressively degrades light intensity[1] potentially affecting glottic visualization during intubation. A wide range of minimum or optimum laryngoscope light intensities has been reported in the literature ranging from 200 to 2000 lux [2-5]. The current ISO standard specifies a minimum illuminance of 500 lux for laryngoscopes[6]. However, it is not feasible for staff to check the light intensity of each blade with elaborate testing equipment on a case by case basis. Staff typically rely upon their own visual estimation of laryngoscope light adequacy prior to usage. No studies have compared anesthesiologists' visual assessment of light adequacy to that required at intubation or relative to the ISO standard. The purpose of this study was to quantify the minimum acceptable laryngoscope light intensity by visual inspection and manikin intubation in comparison to the ISO standard.

Methods: This bench top study was approved by the local REB. Ten discarded reusable adult fibreoptic Macintosh laryngoscope blades (Heine) with varying light intensities (range 140-2260 Lux) were acquired for use in this study. The light intensity delivered from each blade was measured using a validated light meter testing system[5].Thirty-five consenting anesthesia staff and residents participated in this study. Ambient room lighting level and participant experience level were recorded for each test. Each blade was tested using a fully charged laryngoscope handle. The adequacy of light intensity (acceptable/unacceptable) from the 10 blades was initially assessed by visual inspection alone as would be done prior to usage in the operating room. In the second portion of the study, the adequacy of lighting from the same ten blades was assessed during direct laryngoscopy on an airway manikin (Laerdal). The order of blade testing was randomized for each portion of the study and participants were blinded to the blade light intensity measurements. The light intensity delivered from each blade was checked with the light meter after each test. The minimum acceptable light levels for each assessment method were compared using ANOVA.

Results: The mean minimum acceptable light intensity for each individual subject was 362 +/- 203 during visual inspection and 419 +/- 211 lux during manikin laryngoscopy ($p=0.25$). However, the minimum light intensity that would be acceptable to all staff (100% acceptance) was 872 lux by visual inspection and 1060 lux for manikin laryngoscopy (figure).

Discussion: This study sought to compare the threshold for minimum brightness by two

different assessment methods, not the optimum level for intubation. Although not statistically significant, our data suggests that anesthesiologists prefer higher laryngoscope light levels during manikin intubation than determined by visual inspection alone. Blades found to have borderline brightness by visual inspection during the pre-operative check should be rejected as they may not be adequate for laryngoscopy, especially with real life conditions such as soiled airways or difficult laryngoscopy. The minimum light threshold required by our staff appeared to be consistent with the ISO standard of 500 lux.

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85299 - KNOWING THE LENGTH OF THE RIGHT MSB ALLOWS THE SAFE USE OF THE R-DLT

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Background: The right-sided double lumen endobronchial tube (R-DLT) is seldom used. The variable length of the right main stem bronchus (RMSB) is the principal cause of reticence for using the R-DLT. The right upper lobe (RUL) bronchus can originate directly into the trachea[1] or proximally into the RMSB.[2] There was no guideline to determine which level of insertion in the RUL bronchus is acceptable for the safe positioning of the R-DLT until Kim *et al.* described that a length of RMSB ≤ 23 mm should preclude the successful use of a R-DLT. This measurement done on CT-scan is complex.[3]

Objectives: To determine the distribution of RMSB's length and to measure the distance between the tracheal carina and the interlobar carina (method A) that corresponds to the Kim's measurement of 23 mm (method B).

Methods: With local REB approbation, we retrospectively evaluated 200 consecutive thoracic CT-scans. Patients with thoracic or intrathoracic pathologies were excluded. Two investigators, a PGY-4 resident and a staff radiologist, collected the data. Measurement of RMSB's length was done on the coronal plan with a resolution of 2 mm thickness in the axis of the RMSB according to the two methods: A-
proposed measure: distance between tracheal carina and interlobar carina (superior and middle bronchus) (fig 1A) and B-
reported measure: distance between tracheal carina and distal margin of the RUL bronchus (fig 1B).

Results: 106 CT-scans were analysed. The mean length of RMSB (method B) is 25.5 ± 4.7 mm (range 13.5 to 39.0 mm) and 36% are less than 23 mm. The ROC curve shows that 27.85 mm obtained with method A corresponds to the 23 mm described by Kim (method B), with a sensitivity of 80% and a specificity of 100%. The relation between the two methods is: «Reported measure (mm) = Proposed measure (mm) * 0.95 - 2.45». The intraclass correlation coefficient between the two observers for method A is 0.95 and for method B is 0.84 ($p < 0.0001$).

Discussion: The method A would be useful in clinical practice as it helps to determine when a R-DLT should not be used or used with caution when facing a proximal implantation of a RUL bronchus.

Conclusion: The proximal position of the (RUL) bronchus in the RMSB (< 23 mm) occurs in 36% of the cases. The method A showed that an interlobar length of < 28 mm corresponds to a length of RMSB < 23 mm and should alert the anesthesiologist to use a R-DLT with caution. Method A has a better correlation between observers, is more reproducible, and is easier to perform (only one measure) than method B (needs 3 lines, 2 angulations, and one measure).
Figure 1 : Methods of measurement

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85320 - NEW ANTIARRHYTHMIC IN HEART DISEASE. ECHOCARDIOGRAPHIC STUDY

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Introduction: Dronedarone is a new antiarrhythmic agent (1). Dronedarone has been shown to reduce ventricle rate, however no data on regression left ventricular hypertrophy are available. This study sought to ascertain if dronedarone reduce left ventricular mass in the SHR (spontaneously hypertensive rat) model of stable compensated ventricular hypertrophy.

Methods: We examined the effect of dronedarone on left ventricular hypertrophy and cardiac function in 11-month-old male SHR (n=5). Age-matched and sex-matched SHR (n=5) and Wistar Kyoto rats (WKY) (n=5) were use as controls. After 2 weeks of treatment, left ventricular morphology and function were assessed from M-mode echocardiograms [left ventricular mass (LVM), ejection fraction (%EF)] and transmitral Doppler [early-to-atrial filling velocity ratio (E/A), E-wave deceleration time (Edec time)]. Comparisons between groups were made by Student´s t-test for independent samples. $P< 0.05$ was considered significant. Local Ethics Committee approval was obtained.

Results: Dronedarone lowered heart rate in treated SHR with respect to untreated SHR ($P < 0.05$). LVM was increased in untreated SHR when compared with the age-matched WKY group ($P < 0.05$). LVM was attenuated in SHR treated with dronedarone with respect to untreated SHR ($P < 0.05$). %EF was higher in untreated SHR than in WKY ($P < 0.05$). Drondarone drecreased the %EF in treated SHR ($P < 0.05$) compared with untreated SHR, and was similar to WKY. There were no significant changes in E/A ratio nor in Edec time among the three groups.

Discussion: Dronedarone reduced early left ventricular mass and normalized systolic function in the SHR model of stable compensated ventricular hypertrophy. These are preliminary preclinical results to show the effect of dronedarone in the regression of left ventricular hypertrophy.

Acknowledgements: This work was supported by a grant from FIS 13/01261.

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85348 - POSTOPERATIVE SEROTONIN SYNDROME IN A PATIENT WITH HISTORY OF MH

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Introduction: Serotonin Syndrome is a rare reaction caused by excessive activation of both central and peripheral serotonin receptors. This can occur with therapeutic drug usage, over dosage, or by the interaction between serotoninergic drugs[1]. There are case reports of patients developing serotonin syndrome in the peri-operative settings, but this one is unique in its presentation in a patient with a history of MH. Written informed consent was obtained for publication.

Case Report: A 55 year-old male with hypertrophic cardiomyopathy presented for septal myectomy. His past history is significant for an MH reaction that was later confirmed on muscle biopsy, and depression for which he was on Paroxetine. Following a non-triggering anesthetic induction, the patient developed mild hyperthermia that was accompanied by increased ETCO2. This was followed by significant tachycardia, hypertension and diaphoresis during central cannulation. Those manifestations were corrected with the initiation of cardiopulmonary bypass. The rest of the surgery was completed uneventfully. In ICU, patient was hypotensive and increasingly febrile despite active cooling. Later on he developed metabolic acidosis for which cardiac etiology was ruled out and Propofol sedation was switched to Fentanyl infusion. On exam, there was muscle stiffness and inducible clonus. This was associated with significantly elevated CK levels. A diagnosis of Serotonin Syndrome was made and treatment with Cyproheptadine was initiated. Sedating agents were discontinued and patient was later extubated, becoming fully alert and oriented after 5 days of supportive care. Cyproheptadine was continued for 4 days and stopped on developing signs of anticholinergic syndrome. His fever continued for 6 days and was discharged from the ICU on day 7.

Discussion: Peri-operative Serotonin syndrome usually results from the interaction between SSRIs or MAO-I and the peri-operative administration of serotonergic agents[2,3]. Our patient was on paroxetine and was given fentanyl, remifentanil, and Ondansetron intra-operatively. He was also started on fentanyl infusion post-

operatively.Clinical symptoms of serotonin syndrome range from clonus, tremors and diarrhea in mild cases to delirium, hyperpyrexia and muscular rigidity in life-threatening cases. It can also be complicated by metabolic acidosis, elevated liver enzymes and renal failure[1]. The development of hyper metabolic manifestations made the diagnosis of serotonin syndrome difficult. With history of MH, our patient developed fever and hypercarbia following a trigger free anesthetic. There are rare case reports of patients developing MH without exposure to classic triggering agents[4]. However, our patient had only mild metabolic acidosis not the severe forms that would be expected with MH. The other distinguishing feature was the development of clonus, which is key in serotonin syndrome. Other metabolic syndromes that were on the differential diagnosis were neuroleptic malignant syndrome, which can occur with long-term use of dopamine antagonists or abrupt withdrawal of dopamine agonists[5]. Also, Propofol infusion syndrome, that is generally associated with higher doses and prolonged Propofol infusions and is extremely rare[6].

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85349 - PERIOPERATIVE FASCIA ILIACA BLOCKS FOR HIP FRACTURES

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Introduction: Over 12000 patients experience hip fracture in ontario each year. This will increase to over 88 000 by 2041 at a cost of $37 000. Indirect anesthetic costs include timing of surgery and the impact of anesthetic technique on recovery. The Ontario Hip Fracture Quality Based Procedure handbook recommends fascia iliaca blocks (FICBs) to improve analgesia, reduce opioids reduce incidence and severity of delirium and decrease length of stay. We describe the challenges of implementing perioperative FICBs in a community hospital.

Methods: REB approval was approved for this project. A group was created with orthopedic, anesthetic, pharmacy, nursing, administrative and a quality improvement specialist. Lean – Six Sigma methodologies were utilised to identify improvement opportunities.

Define
A standardized evidence base approach to managing perioperative pain management for patients suffering from hip fracture in order to reduce perioperative morbidity, delirium and pain.

Measure / Analyze
A ***process map*** was created. Contact with specialist consult teams including the acute pain service were identified. Operating room time is provided daily between 1pm and 6pm so the best time to perform FICB is between 1-4 pm. The on-call and trauma anesthesiologistare able to perfom the blocks with help from Anesthesia Assistants and registered nurses.

A ***chart review*** identified common risk factors. Many patients received opioids as their primary mode of analgesia and many were unsuitable for multimodal analgesic agents. Neuraxial anesthesia with spinal morphine use was typically used for intra/postoperative analgesia. Regional anesthesia to reduce opioid use was uncommon.

A scorecard was created to streamline ***data collection*** including; arrival time, time to

the surgery, length of stay and discharge destination.

Literature Review: FICB is a superficial peripheral nerve block using a large volume of dilute local anesthetic to block the femoral, lateral cutaneous and obturator nerves. Ultrasound guidance increases success.

Patient Safety: It was agreed FICBs could be performed in the emergency department or the ward. Monitoring and ultrasound will need to be available in both locations. Education on local anesthetic systemic toxicity (LAST) will be provided. Patients will require 20 minutes monitoring after the block. LAST therapy will be immediately available. 30-40ml of ropivicaine (0.25%) will be used. Exclusions include anticoagulation, patient refusal or neurological compromise.

Results: *Improve* We have now put in place the framework for implementation of a perioperative fascia iliaca block program led by the Department of Anesthesia. We believe the intervention will improve both preoperative and postoperative analgesia and the reliance on opiate medications for these patients.

Control
We will be using the following clinical markers of success:
-Pain scores (using the numerical rating scale).
-Incidence of delirium (using the Confusion Assessment Method).
-Length of stay.

Discussion: Although QBP handbooks provide best evidence, the implementation varies between institutions. Adoption of best practices provides anesthesiologists and excuse to escape from the operating room define our role as perioperative physicians.

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85562 - QUALITY OF RECOVERY IN PATIENTS UNDERGOING MAJOR SURGERIES

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Introduction: Post-operative quality of recovery is an important composite outcome tightly correlated with best care practices[1]. ERAS society and the Postoperative Quality Recovery Scale (PQRS) define recovery as a return to baseline scores in all the domains implicated in daily living: physical, social and psychological functions[2]. In order to advance our understanding of the areas that need improvements, we designed a descriptive study aiming to describe the characteristics and patterns of recovery in patients undergoing major abdominal, thoracic and orthopedic surgeries; as measurement tool we used the PQRS, a validated scale for assessing quality recovery[3].

Methods: After obtaining Institutional Ethics Committee approval, 130 patients, age 20 to 89, undergoing major surgeries were enrolled in our prospective longitudinal descriptive study. The PQRS questionnaire was administered pre-operatively, as a measurement for the patient's baseline, as well as 40 minutes, 1 day, 3 days and 1 month post-operatively. While in the hospital, the questionnaire was conducted face-to-face, whereas following discharge from the hospital it was obtained via telephone. Patients' baseline demographics and potentially confounding perioperative factors were collected. Data are presented as mean ± SD for continuous data and as percentage for categorical data. Recovery was obtained through the PQRS website calculation tool. Overall recovery, as well as recovery in each domain was obtained. A Pearson's chi-squared test was used to compare patients who recovered to whose who did not return to baseline characteristics after surgery. $p < 0.05$ was considered statistically significant.

Results: Our preliminary analysis finds that overall recovery at 1 month was the best in urological patients, although, even for those, only 50% of the assessed patients fully recovered. When looking at individual domains though, most of the patients recovered in the physiological, ADL and cognitive domains. The domains that skewed the overall recovery towards such a low percentage were the nociceptive and the emotional ones. Age, sex, type of anesthetics and length of surgery did not impact recovery. Patients enrolled in the enhanced recovery after surgery program were more likely to recover after surgery. Preoperative depression, pre-existing medical conditions with high ASA grade, poor postoperative pain control and postoperative complications were independent predictor factors for low quality of recovery after surgery.

Discussion: To our knowledge, this is the first study analyzing the quality of recovery in a large number of patients undergoing different major surgeries. The preliminary results of our study are consistent with the literature: the ERAS program and good postoperative pain control are already proven benefits in improving the quality of recovery after surgery[4,5]. The study confirmed the ability of PQRS to discriminate recovery in each domain and highlighted the need of finding specific strategies to improve the quality of recovery after each types of surgery, adapted to the particular patient's profile.

References:

85568 - ULTRASOUND IDENTIFICATION OF CRICOTHYROID MEMBRANE - LEARNING CURVE

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Introduction: Accurate identification of the cricothyroid membrane (CTM) is crucial for successful emergency cricothyrotomy. However, the conventional finger palpation of the CTM is frequently inaccurate. The CTM can be accurately identified using ultrasound (US). We aimed to determine the amount of training an anesthesiologist would need to achieve competence in the bedside US-assisted identification of the CTM.

Methods: Six anesthesia trainees (2 fellows and 4 residents) watched an educational video and atended a 30-min lecture followed by an interactive 30-min hands-on workshop and live demonstration performed by an expert sonographer. The participants were instructed on how to perform a neck US to identify the CTM. Individual learning curves were constructed using the cumulative sum method, and competence was defined as a 90% success rate in a series of ultrasound examinations.

Results: Each trainee performed 20 ultrasound examinations (a total of 120 assessments), and 5 of the six participants achieved competence. The median number of attempts required to achieve 90% success rates by CUSUM analysis was estimated to be 17 (range: 14-20). While the overall success rate for the entire group was 88.3% (106/120), the mean success rate among the five participants who achieved competence was 92.5% (range: 80 -100%). The participant who did not achieved competence by CUSUM obtained a success rate of 75%(15/20). The time to complete the task was achieved within a mean (SD) of 36.9 (9) seconds, and a minimum /maximum of 22.5/44.25 seconds.

Discussion: With appropriate training and supervision, it is estimated that anesthesia trainees with different levels of experience will achieve competence in ultrasound identification of the cricothyroid membrane after performing 17 examinations.The trainees are currently being submitted to a skill retention assessment 3 months after the teaching sessions.

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85573 - THE ROLE OF ASTROCYTES IN POSTANESTHETIC MEMORY LOSS

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Introduction: Many patients who undergo surgery with general anesthesia experience memory deficits that persist for days to months[1,2]. However, mechanisms underlying anesthesia-induced memory loss remain poorly understood. Animal models show that memory deficits following anesthesia are associated with a persistent increase in γ-aminobutyric acid type A ($GABA_A$) receptor activity[3]. The goal of this study was to use a cell culture model to elucidate the molecular mechanisms by which anesthetics increase $GABA_A$ receptor activity. We hypothesized that glial cells, such as astrocytes, may play a key role in triggering anesthetic-induced increase in $GABA_A$ receptor activity. Furthermore, since astrocytes express $GABA_A$ receptors[4], we postulated that anesthetics could exert their action by directly acting on astrocytes.

Methods: The study was approved by the local ethics committee. Cultures of hippocampal neurons, cortical astrocytes, and neuron-astrocyte co-cultures were prepared from embryonic mice. Cells were treated with the anesthetic etomidate (1 μM) or vehicle for 1 h and whole-cell currents were recorded from hippocampal neurons 24 h later. All data are expressed as mean ± SEM and were analyzed by Student's *t*-test or ANOVA ($p < 0.05$)

Results: Etomidate increased tonic current in neurons that were co-cultured with astrocytes by 75% (Control: 1.1±0.5 pA/pF; Etomidate: 1.9±0.9 pA/pF, $n = 11$, $p < 0.05$) but had no effect in cell cultures containing only neurons. In addition, application of supernatant collected from astrocyte cultures treated with etomidate unto neurons significantly increased tonic current (Control: 1.1±0.2 pA/pF; Etomidate: 1.5±0.2 pA/pF, $n = 6$, $p < 0.05$). This effect was abolished when bicuculline, a competitive $GABA_A$ receptor antagonist, was co-applied with etomidate in both co-cultures and supernatant paradigms.

Discussion: These findings suggest that astrocytes are necessary for the etomidate-mediated increase in tonic current. Furthermore, these results indicate that activation of $GABA_A$ receptors on astrocytes triggers the release of soluble factors that subsequently increase tonic current in neurons. Finally, our study provides a new model for understanding the interactions between astrocytes and neurons that are perturbed during general anesthesia.

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85581 - INTER-HEMISPHERIC EEG SYNCHRONIZATION WITH INTRA CAROTID ETOMIDATE

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Introduction: Wada test is a diagnostic test performed to determine the language and memory lateralization prior to temporal lobectomy in patients with epilepsy[1,2] The procedure involved intra carotid administration of etomidate to anesthetize one cerebral hemispheres and assessing the language and memory functions of awake contralateral hemispheres[3]. During the test, electroencephalogram (EEG) recordings are used to confirm the anesthetic effect. Currently we don't know how etomidate injection affects the EEG and neurophysiological functions. Unilateral etomidate injection has been shown to increase not only the slow activity but also the faster activity, in some case even bilaterally. [4] The aim of our study is to determine if the clinical effects of etomidate can be explained by a functional de-synchronization of EEG activity from the relevant targeted regions of the anesthetized hemisphere.

Methods: After IRB approval, we retrospectively analyzed the EEG data from 15 patients who underwent etomidate Wada test in our institution from August 2010 to December 2014. The EEG data from 3 time periods (before the etomidate injection, during the clinical effect and at least three minutes after the end of the clinical effect) were analyzed. Four electrodes (2 anterior (F3, F4) and 2 posterior (P3, P4)) out of 24 were analyzed. Samples were re-referenced to A1. We analyzed two frequency bands – alpha (7-13 Hz) for posterior electrodes (P3, P4), delta (1-4Hz) for anterior electrodes (F3, F4). After artifact rejection, we measured the anterior (delta) and posterior (alpha) inter-hemispheric connectivity before, during and after the drug effect using Matlab correlation function (http://www.mathworks.com/help/matlab/ref/corrcoef.html). The statistical analysis were done using paired t-test, where P value < 0.05 was considered statistically significant.

Results : Eleven out of 15 patients had left hemispheric injection of etomidate and the rest right-sided injection. EEG analysis showed increase in delta and alpha activity both in the injected side and the contra-lateral side (Figure 1-A). Connectivity analysis showed that 13/15 patients had significant de-synchronization between the hemispheres in the anterior delta frequency band. (Figure 1-B). Interestingly, de-synchronization of delta frequency recovered to higher synchronization level after

etomidate cessation, when comparing to the synchronization before the Wada test. Similar phenomenon was not consistently observed for the posterior alpha band (Figure 1C).

Discussion: Our study shows that intra-arterial etomidate injection results in anterior inter-hemispheric de-synchronization of frontal slow wave activity (delta). Frontal slow wave activity (delta) has been shown to be associated with attention/ working memory and these frontal process probably play a major role in memory tasks.[5,6] Hence the frontal de-synchronization of EEG activity probably affect the memory task and this could possibly explain the clinical effects during etomidate WADA test. Further studies are needed to validate this effect.

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85629 - CARBETOCIN AT ELECTIVE CESAREAN SECTION: 20 MCG VERSUS 100 MCG

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Introduction: Carbetocin is recommended by the Society of Obstetricians and Gynaecologists of Canada as the uterotonic of choice to prevent postpartum hemorrhage (PPH) post elective cesarean delivery (1). The recommended intravenous dose by the manufacturer is 100 mcg; however, 3 previous studies have shown that smaller doses may be as effective (2,3,4), and that the ED 90 could be as low as 14.8mcg (4). The purpose of this study was to compare the efficacy of 20mcg and 100mcg of carbetocin.

Methods: With institutional REB approval and informed consent of each participant, this study was conducted as a randomized double-blind, non- inferiority study. Women undergoing elective cesarean delivery under spinal anesthesia, who had no condition predisposing to PPH, were included in the study. They were randomized into two groups to receive either 20 mcg or 100 mcg of carbetocin intravenously upon delivery of the anterior shoulder of the baby. Uterine tone was assessed by the obstetrician at 2 and 5 minutes after carbetocin administration, according to a numerical verbal scale 0 to 10, where 0=atonic uterus and 10=firm uterus. If uterine tone was considered unsatisfactory by the obstetrician and additional uterotonic was deemed necessary, this was promptly administered according to usual practice at our hospital (oxytocin and/or ergot and/or carboprost). The primary outcome was the uterine tone (scale 0-10) at 2 minutes after carbetocin administration. Sample size was calculated at 102 subjects.

Results: Recruitment is underway and 28 cases have been completed until the preparation of this abstract. Overall, the uterine tone (mean±SD) was 7.8±1.6 and 8.2±1.0 at 2 and 5 minutes, respectively. Four women required the use of additional uterotonics within the first 24 hours. In these 4 cases additional uterotonic was administered intra-operatively; their uterine tone at 2 and 5 minutes was 6.5/6.5, 10/8, 7/8.5 and 8/6 and the time of request was 4, 11, 7 and 15 minutes after administration of carbetocin. The overall estimated blood loss (mean±SD) was 773±355 mL and the overall incidence of hypotension post carbetocin administration was 29%. At a recruitment rate of 24cases/month, we plan to recruit the last patient by April 2015.

Discussion: The overall uterine tone seems to be adequate in most patients, however, 21 and 7% of patients had uterine tone < 7 at 2 and 5 minutes, which in theory could prompt the request for additional uterotonics. It seems however, that the decision of requesting additional uterotonic is not based entirely on the assessment of tone, as only 2 of the 4 women receiving additional treatment exhibited tone < 7. Final discussion and conclusion will be presented at the meeting

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85720 - MENTORSHIP IN ANESTHESIOLOGY: BOTH SIDES OF THE RELATIONSHIP

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Introduction: Mentorship has been shown to improve career satisfaction, research productivity, and retention of academic physicians.[1] There are currently no studies that investigate factors that either promote or hinder effective mentoring relationships simultaneously through both the faculty and resident perspectives.[2] We planned to fill this gap by exploring mentoring relationships at one institution

Methods: Following local research ethics board approval, mentorship experiences were examined through semi-structured interviews. Data was analyzed with a grounded theory approach using open, axial, and the constant comparative method to identify common themes effecting positive or negative mentorship outcomes.

Results: A successful mentorship program was found to hinge on three key factors, as determined from both the mentor and mentee perspectives: the anticipated goals of a mentorship relationship; characteristics of the participants; and the structure the program. When themes were compared between mentors and mentees, differences in perception of the relationship goals and structure resulted in cases of participant disillusionment and negative mentorship outcomes. A perceived lack of explicitly stated expectations and responsibilities of mentorship led to confusion as to whether the relationship was fundamentally mentor or mentee driven. This differentiation was integral to the development of the relationship and fulfillment of outcomes.

Discussion: We were able to obtain multiple stakeholder perspectives through rich narratives including proposed solutions on designing a mentorship program for postgraduate training programs. The concept of a mentorship network, which has been well described in the business literature, emerged as a possible solution to meeting the evolving needs of mentees as they progress through training.

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85813 - SITTING POSITION MAY ALLEVIATE POSITIONAL OBSTRUCTIVE SLEEP APNEA

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Introduction: The severity of obstructive sleep apnea (OSA) has been shown to increase postoperatively.[1] Elevated head position has been used in the management of OSA in the general population,[2] but not postoperatively. In this pilot trial, we hypothesized that the use of a semi-upright position versus a non-elevated position will prevent postoperative worsening of OSA in patients undergoing non-cardiac surgeries.

Methods: Following research ethics board (REB) approval, adult patients (>18 years), ASA I to IV, undergoing elective inpatient surgery, were consented to undergo a home portable sleep study. Patients with OSA (AHI >5 events/h), were randomized into a treatment group, semi-sitting position (45 degrees incline, Group S), or a control group (no head-end elevation, Group C). The bed angle was measured by using either an in-built bed-angle monitor or a goniometer, at the beginning and end of night. All patients were monitored for three postoperative nights using oximetry and underwent a PSG on the postoperative night 2 (N2) or night 3 (N3). The primary outcome measurement was postoperative AHI. Subgroup analysis was performed to examine the effects in patients with positional or supine-related OSA, defined as preoperative overall AHI > 5 events/h, and, supine AHI more than two times of the non-supine AHI [3] ANCOVA analysis was used to compare change of AHI as a continuous variable from baseline between two groups.

Results: Eighty-three OSA patients undergoing mainly orthopedic and general surgeries were randomized (Group S: 41 and Group C: 42). There was no difference between the two groups in baseline demographics and comorbidities. Forty-six patients (Group S: 25 and Group C: 21) completed PSG on the postoperative N2/N3. The AHI increased postoperatively within the groups (Group S: pre-op AHI vs. postop AHI: 22.0±11 vs. 22.9±27 events/hr, p=0.001; Group C: Pre-op AHI vs postop AHI: 20.2±14 vs. 25.0±26 events/hr, p < 0.001), indicating worsening of the severity of OSA. Based on the intention-to-treat analysis, no significant difference was observed in AHI on postoperative N2 and N3 between the two groups (p >0.05). Subgroup analysis showed that patients classified as “supine-related OSA” (n=12) had a significantly lower AHI postoperatively in the semi-sitting position than those who were not (n=34) (p < 0.05), (Supine-related: pre-op AHI vs. postop AHI: 19.3±11 vs. 14.5±26 events/hr, p=0.01;

Group C: pre-op AHI vs. postop AHI: 21±13 vs. 25.8±30 events/hr, $p < 0.001$). (Figure)
Conclusion. This pilot trial demonstrated the feasibility of the use of semi-sitting position amongst OSA patients postoperatively. Patients with supine-related OSA benefitted from the semi-sitting position and had a significantly lower AHI postoperatively. Future trials with sufficient power are needed to establish this relationship further.

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85816 - NEW LABOR PAIN QUESTIONNAIRE: HIGH TEST-RETEST RELIABILTY

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Introduction: The Labor Pain Questionnaire (LPQ) is the first health-specific multidimensional psychometric instrument developed to measure women's childbirth pain experiences.Once validated, the LPQ will allow interdisciplinary research to resolve existing controversies related to childbirth pain relief and build the scientific foundation required for evidence-based labor analgesia. We hypothesized that the LPQ would provide reliable measurement (ICC>0.7) in women in early labor without pain relief who reported *minimal or no change* in their pain over the course of the study. We further hypothesized that the LPQ would demonstrate sensitivity to change in women who reported clinically important changes in their pain.

Methods: Following REB approval and written informed consent, healthy ASA 1-2 laboring women with healthy term fetuses were recruited in early labor. All women were fluent in English, >18 years of age,
< 6cm cervical dilatation, contracting
> 3 minutes apart without pain relief. Women were randomized to answer the LPQ in Mixed versus Standard questionnaire format in two test sessions (Test 1, Test 2) separated by a 20minute window. Versions of the LPQ differed only by the order of questions. Both test sessions were administered by the same trained interviewer. Additional questions included an 11 point numeric rating scale (NRS) for pain, verbal pain rating scale (VPRS) and Pain Mastery Scale (PMS) completed during each test session as part of validity testing. Changes in women's pain experiences over the course of the study were rated using the Patient Global Impression of Change Score (PGICS), permitting assessment of meaning of pain scores on the LPQ associated with each level of change in pain. Analyses: An *apriori* sample size estimation suggested 90 women were required to examine test-retest reliability. Intraclass correlation coefficients (ICC) were used to analyse the test-retest reliability of LPQ composite scores and subscale scores between first and second administrations of the LPQ. Raw scores were transformed to percentage scores to ensure even representation of

subscale scores in composite LPQ scores.

Results: 104 women completed the study. Ninety-two reported *no change* or *minimal change* in their pain over the study based on the PGICS. Test-retest reliability for the LPQ and subscales were high (ICC, 0.84 to 0.98, $p < 0.001$, Table 1). Data from the 12 women who reported a clinically important change in their pain were used to assess the LPQ's sensitivity to change. Analyses demonstrated an effect size (ES) of 0.57 (moderate) and a Standardized Response Mean (SRM) of 1.29 (small). Correlations between average percentage scores for the LPQ and the NRS were strong for Test 1 and Test 2 respectively ($r= 0.78$ and 0.78, $p< 0.001$) and moderate for the PMS (Test 1 $r= 0.58$, Test 2 $r= 0.661$, $p < 0.001$) and VPRS (test 1, 0.58, Test 2 $r=0.50$, $p < 0.001$).

Discussion: The LPQ and its subscales demonstrated high levels of reliability when used to assess women's experiences of childbirth pain during early labor without pain relief. Study findings also suggest that the instrument demonstrates sensitivity to change and convergent validity with commonly used pain tools in labor analgesia trials.

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85824 - POSTOPERATIVE HYPERGLYCEMIA IN NON-DIABETIC SURGICAL PATIENTS

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Introduction/Objectives: Postoperative hyperglycemia increases the risk of surgical site infections, length of hospital stay, and can increase mortality. Although recent studies have shown that elevated glycosylated hemoglobin (HbA1c > 6.0%) is common among hospitalized patients, it is not known if this is predictive of postoperative hyperglycemia. The objectives of this prospective observational study were to 1) determine the incidence of postoperative hyperglycemia (blood glucose > 10 mmol/L) in elective surgical patients with no previous history of diabetes 2) assess whether preoperative elevated HbA1c is associated with postoperative hyperglycemia and 3) identify other factors that may predict postoperative hyperglycemia. Thus, future interventional studies could target this group with strategies to prevent postoperative hyperglycemia and its associated adverse effects.

Methods: Following local ethics committee approval, 275 patients consented to participate in the study. Patients > 18 years of age having elective surgery requiring hospital admission postoperatively were eligible to participate. Patients with planned ICU admission and patients taking oral hypoglycemic agents or insulin were excluded. Preoperatively, participants had capillary blood glucose (CBG) and HbA1c measured and they completed the CANRISK diabetes-screening questionnaire. Standard demographic and perioperative data were collected. CBG was ordered on arrival to PACU, before meals and at 22:00h for 2 days or until discharge. Postoperatively, if CBG>10 mmol/L on two or more occasions, the surgical service was notified and they determined the most appropriate management. The incidence of postoperative hyperglycemia was calculated as the percent of participants with CBG>10 mmol/L on at least one occasion. The chi square test was used to assess for potential risk factors for postoperative hyperglycemia including elevated HbA1c, CANRISK score, and fasting blood glucose on the first morning postoperatively (FBG-POD1).

Results: Thirty-four participants were excluded because they were discharged home from PACU. Of participants admitted to hospital, 14.5% (35/241) had at least one episode of postoperative hyperglycemia. HbA1c was elevated in 18.4% (44/239) of all participants and 6.7% (16/239) had a value that was consistent with a provisional diagnosis of diabetes (HbA1c ≥ 6.5%). Postoperative hyperglycemia was common (68.8%) in participants with HbA1c ≥6.5%. However, 11% of participants with a normal HbA1c also had at least one episode of hyperglycemia. Those participants with the combination of an elevated HbA1c and FBG-POD1 had the highest incidence of postoperative hyperglycemia (91.7%, 11/12). (See table for details of potential risk factors).

Discussion/Conclusions: A significant number (14.5%) of elective surgical patients with no previous diabetic history experienced postoperative hyperglycemia. Approximately two thirds of those with postoperative hyperglycemia had a provisional diagnosis of diabetes based on their HbA1c value. The best predictor of postoperative hyperglycemia was the combination of elevated HbA1c and elevated fasting blood glucose on POD1.

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85831 - ACUTE PAIN MANAGEMENT IN MORBID OBESITY- AN EVIDENCE BASED UPDATE.

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Introduction: The management of acute pain in patients with morbid obesity (MO) is complicated by the perception of increased sensitivity to the respiratory depressant effects of opioids. The goal of this review was to present an evidence based clinical update on the management of acute pain in patients with MO.

Methods: We performed a search of peer reviewed literature for the relevant keywords (morbid obesity, postoperative pain, acute pain and bariatric anesthesia). We screened the abstracts for population (obese, morbidly obese), intervention (study drug for acute/ postoperative pain management), comparisons (placebo or standard of care) and outcomes (pain scores, analgesic consumption, side effects, LOS, Satisfaction and Recovery Scores). We did not apply any limitations to study design. The study findings were reviewed and a summary of level of evidence and grade of recommendations for each modality was prepared.

Results: Our initial search resulted in approximately 600 citations. After removing duplicate studies and lower levels of evidence, we prepared a narrative review summary based on 48 studies. Majority of the studies of pain management in obesity relate to bariatric anesthesia and weight loss surgery [1]. Evidence confirms the role of multimodal analgesia with the goal of reducing opioid analgesics [1, 2]. Patients with MO have an increased risk of postoperative sedation and respiratory depression, airway obstruction and hypoxemia. Regional anesthesia (central, neuraxial and plexus) techniques have been used successfully [3]. A step wise approach to systemic analgesia for acute pain improves patient safety and outcomes. Recognition of acute neuropathic pain and pronociception has led to the widespread use of “adjuvant” drugs- ketamine, lidocaine, dexmedetomidine and pregabalin [4, 5]. These anti- nociception medications are very effective in further reducing pain, analgesic requirements and improving enhanced recovery outcomes. Opioid use in morbidly obese patients is safe if used judiciously [6]. When parenteral opioid therapy is required in the postoperative period IVPCA’s (without continuous infusions) increase the safety of opioids in MO. We also list the risk factors for poorly controlled pain and emphasize importance of the accurate diagnosis (and appropriate management) of OSA and its relationship to opioid analgesic use in the perioperative period.

Conclusions: Acute Pain management in morbid obesity requires careful adherence to standardized protocols and care plans. Risk identification & appropriate pre-emptive multidisciplinary approach improves safety and outcomes related to pain management.

Opioid sparing and opioid free protocols can be used effectively in some patients undergoing certain procedures- systemic multimodal analgesia can provide high quality pain relief with both short and long term benefits. Evidence for individual modalities is lacking and role for novel regional anesthesia techniques is evolving.

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85847 - URINARY RETENTION FOLLOWING LOWER LIMB ARTHROPLASTY

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Introduction: Post-operative urinary retention (POUR) after lower limb total joint arthroplasty (TJA) is a common cause of morbidity. The incidence of POUR is highly variable, but is commonly reported as 30-50% (1,2). More recently, peri-operative care has been streamlined toward a multi-modal, fast-track approach, which may have affected the incidence. Our primary objective was to assess the incidence of POUR, as defined by need for a catheter, following lower limb TJA. Our secondary objectives were to identify risk factors associated with the onset of POUR, and describe the association between POUR and postoperative length of stay (LOS).

Methods: This prospective, observational study was conducted after institutional research ethics board approval and informed consent. All consecutive patients undergoing lower limb TJA from June to September 2014 were included. Pre-operatively, subjects completed an International Prostate Symptom Score (IPSS) questionnaire and a post-void residual (PVR) bladder scan was completed. Peri-operative management was consistent with the current standard of care. In our institution, patients are not routinely catheterized unless they are unable to void within 6-8 hours and a PVR is >500ml, at which time an intermittent catheterization (IC) is performed and consideration is given to an indwelling catheter if >1 IC is needed. Standard demographic and peri-operative data were collected in addition to bladder volume prior to discharge from the Post-Anesthetic Care Unit and LOS. Chi-square tests, t-tests and nonparametric (Mann-Whitney) tests were used to determine the association between postoperative urinary retention and baseline parameters. Regression analysis was performed to determine the contribution of individual factors to POUR.

Results: Of 128 patients, the incidence of POUR was 37.5%. For male participants, the incidence was 50.7% (38/75). In univariate analysis, factors associated with any need for catheterization included gender, age, IPSS and pre-operative PVR. Contrary to previous reports, POUR was not associated with type of anesthetic, use of intrathecal

opioids, postoperative opioid use, or ASA classification. In multivariate analysis, the only factors independently associated with POUR were age (OR:1.59, 95% CI: 1.05-2.40, p=0.028 for every 10 years of age) and male gender (4.78, 2.02-11.30, p < 0.001). While pre-operative IPSS fell just short of significance (1.06, 0.99-1.13, p=0.056) in the whole cohort, it was significant for male participants (1.08, 1.002-1.170, p=0.045). In multivariate analysis, POUR was independently associated with increased LOS (p=0.002), as was age (p < 0.001), blood loss (p=0.025), and opioid requirements on postoperative day #1 (p = 0.007). Indeed, presence of POUR appeared to increase LOS by almost one full day.

Discussion: A significant number of patients still suffer from POUR following TJA even with contemporary peri-operative management, and this complication is highly associated with increased LOS. Older men, particularly those with higher IPSS scores, are at highest risk of POUR. Further investigation and intervention should target this group.

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85870 - AGREEMENT OF RISK DISCLOSURE FROM 5 ANESTHESIOLOGY ASSOCIATIONS

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Introduction: 72% of people in the US searched online for health information in the past year (1). National anesthesiology associations are a source of credible online information regarding anesthesia, and they produce patient education materials (PEMs). The risks of general anesthesia (GA) and neuraxial blockade disclosed in PEMs should be similar in developed countries. This would ensure that the PEMs have the same potential to facilitate informed consent and that a consistent message is sent to patients seeking information from multiple associations. Yet, agreeability has not been investigated previously. Therefore, our primary aim was to quantify the overall agreement in risk disclosure between 5 national anesthesiology associations

Methodology: REB approval was not required as only public domain documents were used. Included associations were from English speaking countries with high UN human development index scores and similar WHO health system rankings: American Society of Anesthesiologists (ASA); Australian Society of Anaesthetists (ASA_{AU}); Association of Anaesthetists of Great Britain and Ireland (AAGBI); Canadian Anesthesiologists' Society (CAS); New Zealand Society of Anaesthetists (NZSA). Disclosed risks were extracted from online PEMs. Agreement network analysis was performed (2). Each network represented agreement regarding one risk and a sum composite network was calculated. Descriptive statistics included overall network density (agreement between all associations), and node degree (agreeability of a given association relative to the other four) (2-3). Agreement was examined at 2 levels: 1) disclosure of a risk and 2) specification of risk (GA, neuraxial blockade, both, undifferentiated). A permutation test determined if the level of agreement seen for disclosure was due to chance (4). Data was analyzed using Ucinet social network analysis software (version 6, MA), and Excel 2013.

Results: 59 unique risk were identified across all PEMs (range 11-42 for individual associations, **figure 1**). Overall agreement was: 1) 54.2% for disclosure, 2) 42.2% for specification. Agreement in risk disclosure was not greater than what would be seen by chance ($z=0.57$, $p=0.21$). Agreeability and the number of risks disclosed by the individual associations are shown in figure 1. Only 4/59 risks were disclosed by all five associations (death, awareness, respiratory complications, and allergic reaction). The five associations did not agree on specification of any risk.

Conclusions: There was poor agreement in anesthesia risk disclosures in PEMs between the 5 associations studied, and the number of risks disclosed varied widely. This may cause confusion in patients seeking risk information from online PEMs. It would be ideal if associations could collaborate in creating a standardized set of risks to disclose in their PEMs.

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85881 - LOCAL INFILTRATION ANALGESIA FOR KNEE REPLACEMENT: A META-ANALYSIS

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Introduction: Total knee arthroplasty (TKA) is a common surgical procedure that can result in severe postoperative pain.[1] Local infiltration analgesia (LIA) has recently gained popularity due to the lack of undesirable motor-related adverse events associated with peripheral nerve blocks. Despite these benefits, it remains unclear whether LIA provides pain relief comparable to femoral nerve block (FNB) or another regional anesthetic technique.

Materials and Methods: Electronic literature search of Medline, Embase, CENTRAL and Cochrane Database of Systematic Reviews databases for articles on LIA published before April 2014 was conducted. Clinical trial registries and international conference abstracts published over the last five years were also searched. Randomized controlled trials comparing LIA against no injection, placebo or regional anesthesia in adults (>18 years) undergoing elective unilateral primary TKA were included. Studies investigating unicompartmental TKA, using only intra-articular LIA or comparing two different LIA methods without a control group were excluded. Outcomes included pain scores at rest and with movement and cumulative morphine consumption at 8 and 24 (+/- 4) hours postoperatively; length of hospital stay; functional outcomes and complications. Data extraction and risk of bias assessment were performed by two independent reviewers. A random-effects meta-analysis of eligible studies was conducted.[2] The requirement for IRB approval was waived as this was a systematic review of already published studies and de-identified data was used for meta-analysis.

Results: 1670 studies were identified and screened in two stages. A total of 24 studies including 1617 patients undergoing unilateral TKA were included. Of these, 753 patients were randomized to the LIA group. Eight studies compared LIA to placebo, 10 studies compared LIA to FNB, and 6 studies compared LIA to a neuraxial technique. When compared to placebo/no injection, LIA was associated with reduced pain scores at rest at 8 hours (SMD −1.68; 95% CI −3.10, −0.27) and 24 hours after surgery (SMD −0.85; 95% CI −1.48, −0.22). Similarly, reduced pain scores with movement at 8 and 24 hours were noted. Compared to FNB, LIA was associated with decreased pain at 8 hours at rest (SMD -2.55 (95%CI -4.22,-0.89) and with movement (SMD -0.58 (95% CI -0.99, -

0.18). By 24 hours, pain scores were reduced in the FNB compared to LIA (SMD 0.44; 95%CI 0.23, 0.65). Cumulative oral morphine equivalent consumption was lower with LIA compared to placebo (SMD -49.03 mg; 95% CI -92.84, -5.23) and neuraxial techniques (SMD -1.07 (95% CI -1.68, -0.46) over 24 hours but not when compared to the FNB. Length of stay was similar between LIA versus placebo, FNB or neuraxial techniques. Functional outcomes were qualitatively better with LIA. Long-term outcomes were lacking.

Discussion: LIA reduces short-term pain compared to placebo and provides improved early postoperative pain relief compared to FNB but this is reversed by the first postoperative day. Future research should focus on uniform assessment and long-term follow-up of pain and function.

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85891 - ANESTHETIC MANAGEMENT OF INCIDENTAL VALLECULAR CYSTS

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Introduction: Vallecular cysts are largely asymptomatic in adults and typically described upon incidental discovery during laryngoscopy, where they may present a challenge in airway management.[1] Existing literature is currently limited to case reports despite potential for life-threatening complications.

Methods: We describe management of such a case (patient consent and REB approval obtained). A literature review is then followed by anesthetic management recommendations, in relation to Canadian Airway Focus Group (CAFG) guidelines.[2]

Results: A vallecular cyst was incidentally discovered in a healthy 64-year-old on induction for an elective laparoscopy. Unexpected difficult bag-mask ventilation was followed by three laryngoscopies (Macintosh 3 and Glidescope with grade 2b and 3 views, respectively) and one successful attempt of intubation. Intraoperative ENT consultation was requested and suspension laryngoscopy was performed with difficulty (fig 1A). Cyst incision under direct laryngoscopy combined with a fibreoptic bronchoscope yielded cyst rupture and airway edema (fig. 1B) necessitating ICU admission and delayed extubation on post-operative day 2.

Review of relevant reports (n=17) revealed that while 59% of attempts at ventilation were easy, 35% were difficult (as defined by CAFG) and in one, impossible. Description of supraglottic airway device (SGD) use with vallecular cysts is limited to two cases of SGD failure and one of successful rescue use. Review of laryngoscopy demonstrated an average of 2.8 laryngoscopy attempts per case; intubation under direct laryngoscopy was successful in 65% when attempted, and a further 18% with ENT assistance. Video laryngoscopy failure rate was 100% while fibreoptic bronchoscopy was 100% successful. One case necessitated a tracheostomy. Intraoperative ENT consultation was sought in 53% of cases (two on induction, six post-intubation); ENT cyst treatment rate was 100%. Postoperative extubation was uneventful in 86% of cases, two ICU admissions were noted.

Discussion: *Ventilation:* CAFG recommend SGD in persistent difficult mask ventilation. However, vallecular cysts may distort supraglottic anatomy. Thus, incidental vallecular

cysts may represent a limitation in the applicability of difficult airway algorithms in events of difficult ventilation.

Endotracheal Intubation: Vallecular cysts may pose a challenge to laryngoscopy and endotracheal intubation. CAFG recommends alternative approaches in the event of difficult laryngoscopy. However, our review suggested failure of video laryngoscopy and ILMA, while highlighting the success of fibreoptic intubation, potentially representing another limitation of existing guidelines in reference to vallecular cysts.

ENT Consultation: Immediate ENT consultation is recommended where appropriate, e.g. difficulty maintaining oxygenation and multiple failed attempts at laryngoscopy or intubation. Furthermore, intraoperative consultation for cyst treatment should be sought for all cases, allowing for a secured airway and monitored recovery.

Extubation: Evaluation of the airway under direct visualization and/or a leak test prior to extubation may be considered to rule out airway edema, bleeding, or cyst rupture.

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85896 - MAGNETIC RESONANCE BRAIN STRESS TESTING IN ADOLESCENT CONCUSSION

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Introduction*:* A quantitative test to diagnose concussion remains elusive. Here we summarize the feasibility and results of a repeatable CO_2 brain stress test employing blood oxygenation level-dependent (BOLD) MRI. This test may potentially aid in management of post-concussion syndrome (PCS).

Methods*:* Local Ethics Committee approval was obtained. Fourteen adolescent PCS patients and 14 healthy control subjects underwent anatomical MRI and MRI brain stress testing using controlled CO_2 challenge and BOLD MRI. A sequential hypercapnic challenge was delivered using a respiratory gas blender, individualized for each subject using a model-based end-tidal targeting system.[1] Post-hoc processing was by statistical parametric mapping to determine voxel-by-voxel responsiveness of the brain to the CO_2 stimulus (increase in BOLD signal) or the inverse (decrease in BOLD signal). [2]

Results*:* All subjects received an equivalent CO_2 stimulus, and all studies were well tolerated without any serious adverse events. Anatomical MRI was normal in all subjects. Between group comparisons at the p=0.005 level revealed a mean voxel count of 1745±1208 (PCS group) vs 103±281 (control group) for individual response greater than the control atlas (p=0.042) and a mean voxel count of 219±299 (PCS group) versus 3±6 (control group) for individual response less than the control atlas (p=0.017). Individual analysis confirmed changes in BOLD response for every patient, but with a pattern of abnormalities unique to each individual.

Discussion*:* The results reported here provide empirical evidence that post-concussion syndrome in adolescents is associated with abnormal cerebrovascular responsiveness. In addition, the resolution of this investigation method revealed that each patient had a unique pattern of abnormal BOLD signal with important regional differences, sometimes showing simultaneous excessive and diminished responses in different areas of the brain, compared to the control atlas. These abnormalities in cerebrovascular

responsiveness can be safely and reliably detected in adolescent PCS patients with the novel MRI brain stress test protocol described here.

The attached figure is a representative example of the second level analysis of a PCS patient to the atlas of normal controls, examined at the p=0.005 level. Voxels with a BOLD response greater than or less than that seen in the control atlas are displayed as hot and cold scale, respectively. PCSS: post concussion symptom score.

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85907 - BLOOD PRODUCT TRANSFUSION AND RISK OF POSTOPERATIVE DELIRIUM.

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Introduction: The development of postoperative delirium (POD) may be related to an exaggerated inflammatory reaction caused by an aberrant stress response during surgical trauma (1). The use of intraoperative blood product transfusion can compound this inflammatory response (2), resulting in increased morbidity and mortality. The purpose of this study was to identify an association between different blood product transfusion and the risk of POD after non-cardiac surgery.

Methods: After Research Ethics Board approval, a retrospective review was conducted of all patients who underwent non-cardiac surgery at a large tertiary care hospital from 2003-2013. Delirium codes from the ICD10 were matched with all inpatients undergoing non-cardiac surgery during the same time period. Patients were excluded if they had a history of delirium, dementia, or underwent transplant surgery or neurosurgery. Unadjusted odds ratios (OR), 95% confidence intervals (CI), and p-values were calculated for selected risk factors. P value < 0.05 was considered statistically significant.

Results: The dataset consisted of 100,437 patients. There were 945 (0.94%) patients with ICD10 codes that were consistent with POD. The univariate risk factors for POD included age ≥ 70, male gender, ASA class 3 or 4, emergent/urgent surgery, preoperative anemia, 3 or more Charlson co-morbidities, and transfusion ≥ 1 unit of packed red cells, ≥ 5 units of platelets, and ≥ 1 unit of fresh frozen plasma. (Table)

Discussion: The results from this study have identified several significant risk factors associated with POD, including intraoperative blood transfusion. The multivariate analysis will identify whether blood product transfusion is an independent risk factor associated with POD after non-cardiac surgery. This data will be presented at the conference venue.

References:

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85913 - SUDDEN ASYSTOLE IN ADOLESCENT IDIOPATHIC SCOLIOSIS SURGERY.

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A 13-year-old 44 kg girl with adolescent idiopathic scoliosis was scheduled for posterior fusion of the thoracic spine from level T6 to T12. Her curvature was 48 degrees. As per standard institutional and investigational review board policy, permission was received from the patient and her family to publish this report. Past medical history was significant for migraine and trigeminal autonomic cephalagia, for which she took carbamazepine. She had no other past surgical history, and her physical exam and laboratory results were otherwise unremarkable.

After midazolam premedication, standard monitoring and administration of oxygen, she underwent induction and intubation with fentanyl, propofol, and rocuronium. Due to somatosensory evoked potential and motor evoked potential monitoring, anesthesia was maintained with 0.5MAC of isoflurane and infusions of propofol and fentanyl. She also received tranexamic acid. The patient was turned prone and supported on rolls placed longitudinally on a standard Jackson table frame. At incision, her arterial blood pressure was 99/60, heart rate 72, oxygen saturation 100%, and esophageal temperature 35.7.

Approximately 1.5 hours after surgical incision, there was a sudden loss pulse oximetry, of arterial line pressure, a flat EKG trace and decrease in end-tidal CO_2 from 36 to 18. There was no pulse palpated, and within seconds the neurophysiologist reported loss of EEG trace. Asystole was diagnosed. The causes included hypovolemia from compression of the inferior vena cava and cardiac tamponade-like pathophysiology from compression of the heart. The surgeons were immediately asked to stop all surgical manipulation, and they indicated that they had been applying downward pressure on the spine when placing spinal instrumentation. With cessation of surgical pressure on the thorax, there was spontaneous return of arterial blood pressure, pulses, EKG and pulse oximetry trace, and the neurophysiologic monitoring returned to baseline. ABG and blood tests were within normal limits. Surgery recommenced, and the patient was stable throughout the remainder of procedure except for a brief episode of bradycardia and hypotension with surgical pressure that immediately resolved once the surgical team was asked to apply less mechanical force. The total estimated blood loss during the procedure was 595 mL.

After tracheal extubation, the patient was following commands and her motor function

was intact. Postoperative EKG was unremarkable. Cardiology consult confirmed a normal cardiovascular exam. The postoperative course was uneventful. She was discharged on hospital day 10 with postoperative radiographs showing significant improvement of scoliosis.

Discussion: To our knowledge, this is the first report since the 1970 paper by Dykes, *Sudden Cessation of Cardiac Output during Spinal Fusion,* where similar phenomena of hypotensive episodes were associated with surgical pressure on the upper thoracic vertebrae. Anesthesiologists and surgeons should be aware of the potential for mechanical compression of the thorax causing sudden decrease in cardiac output during this procedure.

References:

REFERENCE: Dykes et al. Anesth Analg. 1970;49(4):596-9.

85917 - COMPLEX TESSIER FACIAL CLEFTS PRESENTING FOR CRANIOFACIAL SURGERY.

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Introduction: Complex Tessier Facial Clefts are rare craniofacial anomalies, which encompass a wide array of facial and cranial vault defects ranging from palatal and midface clefts to large skull defects requiring extensive reconstructive surgery. A multidisciplinary team approach (with anesthesia, plastic surgery, neurosurgery and other medical specialties) is crucial for preoperative planning. Surgery consists of osteotomies, cranial bone remodeling with grafting and fixation. Anesthesia challenges include airway issues such as difficult mask ventilation, difficult intubation and a shared airway. Prolonged operative time in infants < 10kg is usual. Utilizing multimodal blood conservation strategies is important, as massive blood loss is an issue. We present 2 such challenging cases. As per standard institutional and investigational review board policy, permission was received from the patient's families to publish this report.

Patient A: 19 month old 9 kg female, with a large midline Tessier facial cleft involving nose, palate and forehead, with developmental delay, and hypothyroidism. Surgical plan included facial bipartition, orbital and frontal bone reconstruction, and palatal repair. Preoperative Hct was 33 with normal coagulation profile and fibrinogen 286. Inhaled induction was challenging as the defect caused a poor mask fit. The patient's airway was secured with a video-assisted scope and the endotracheal tube was wired to the mandible. Surgical duration was 11 hours. EBL was 375 mL. Total fluids administered were crystalloid 540mL, 5% albumin 375mL and PRBC 293mL. Dopamine infusion and tranexamic acid were utilized. She was extubated with nasal trumpet placed by surgery. Postoperative Hct was 27, coagulation test borderline normal and Fibrinogen 124. ICU course was significant for mild upper airway obstruction.

Patient B: 5 month old 6 kg male, with large midline Tessier facial cleft and frontonasal encephalocele. Surgical plan included craniectomy for removal of encephalocele, bilateral orbital osteotomies, cleft lip and palate repair, and reconstruction of anterior cranial fossa. Preoperative Hct was 30, coagulation tests normal and fibrinogen 180. A

slow inhalation induction maintaining spontaneous ventilation was performed with two-hand technique of mask ventilation using an upside-down mask to give room for encephalocele. Direct laryngoscopy and intubation were successful. Surgical duration was 10 hours. EBL was 250 mL. Total fluids administered were crystalloid 725mL, 5% albumin 250mL and PRBC 306mL. Tranexamic acid was utilized. Postoperative Hct was 36, coagulation tests mildly elevated and fibrinogen 150. He was successfully extubated. ICU course was complicated by Diabetes Insipidus.

Discussion: Perioperative management of Tessier facial clefts involves a complex multidisciplinary approach. Issues include challenges with airway management including difficult mask fit, intubation and ventilation. Careful hemostasis, fluid and blood management techniques should be utilized to avoid hemodilution, metabolic acidosis and facilitate early and successful extubation.

85931 - AUDIT OF PAIN MANAGEMENT WITH THE IMPLEMENTATION OF AN ERAS PROGRAM

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Optimization of pain management using multimodal therapy is a key component of an Enhanced Recovery After Surgery Program (ERAS). Multimodal analgesia has been defined as the use of more than one modality of pain control to achieve effective analgesia while reducing opioids-related side effects[1]. We defined the use of multimodal analgesia therapy, as the use of peri-operatative acetaminophen and administering either a thoracic epidural, an Intraoperative Lidocaine infusion, or Transverse abdominal block, in elective colorectal surgery cases.

Method: After obtaining local ethics approval, the charts of 174 elective colorectal procedures performed between November 2013 and August 2014 were reviewed. The type of analgesia methods, analgesics requirements intraoperatively, in PACU, and postoperatively were determined. Morphine was converted to hydromorphone equivalents when used. Postoperative complications and length of stay were assessed. We compared our complication rates with our pre-existing American College of Surgeons National Surgical Quality Improvement Program NSQIP database prior to implementation of our ERAS program (July 2011-June 2013), and following implementation (November 2013-August 2014). Complication rates were compared using chi-square, Fisher's Exact and student t-tests as appropriate.

Results: Multi-modal analgesia was used in 76.2% of all procedures (81.4% of open cases versus 64.5% of MIS cases). 18.4% of cases received three different pain management modalities and 5.2% had
> 4 modalities and this varied by type of procedure (Table 1).

Opioid-Sparing Technique Utilized	Open Procedure N=56 cases	MIS Procedures N=108 case	MIS converted to Open Procedures N=10	Total N=174

Thoracic epidural	70%	31%	30%	43%
Lidocaine infusions	13%	32%	50%	27%
TAP block	0%	1%	0%	0.6%
Ketamine	21%	27%	20%	25%
Ketorolac	13%	15%	10%	14%
Acetaminophen	98%	100%	100%	99%

The use of an intraoperative lidocaine infusion was associated with a significant decrease in rescue analgesia requirements in the recovery room. The average requirements of fentanyl and hydromorphone in the lidocaine group were significantly lower; Fentanyl mean (standard deviation (SD)) 24.2 (59) versus 81.4 (78) ug ($P < 0.05$), and hydromorphone mean (SD) 0.76(1.3) versus 1.46 (1.4) mg ($p < 0.05$). Lidocaine infusions were also associated with a reduced incidence of excessive pain in PACU, 4.25% vs. 18.4% ($p < 0.05$).

Following implementation of our ERAS program, morbidity incidence fell from 31% to 21%.. Median length of stay was reduced from 9 to 7 days.

Conclusion: Although the majority of our patients are receiving multimodal analgesia,

as part of our ERAS program, pain management could be further improved. Lidocaine infusions are effective in reducing opioid requirements as previously shown[2], and appear to be under utilized in those patients not receiving thoracic epidurals. Implementation of our local ERAS program has resulted in a reductions in complication rates and hospital length of stay.

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85940 - PROPHYLAXIS OF POSTOPERATIVE VOMITING IN CHILDREN WITH DEXTROSE.

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Postoperative vomiting in children: Is dextrose an effective prophylactic anti-emetic? A non-inferiority, randomized control trial.

Background: Post-operative vomiting (POV) in children is a frequent (8.9-42%) and common indication for unexpected hospital admission [1-3]. Intravenous (IV) fluids containing dextrose are commonly used in children. Studies using these IV fluids in the perioperative period have shown improvement of POV in adults [4, 5]. Similar studies have not been done in paediatric patients.

Objective: To investigate the efficacy of intraoperative IV dextrose for antiemetic prophylaxis in children undergoing ambulatory surgery.

Methods: Local Research Ethics Board approved this double-blinded randomized control trial on 290 healthy children (3-9 years old) with low risk of POV undergoing ambulatory dental surgery. Patients were randomized into two groups based on antiemetic prophylaxis. The control group received dexamethasone (0.15 mg/kg IV) and ondansetron (0.05 mg/kg IV); the intervention group received dexamethasone (0.15 mg/kg IV) and intravenous 5% Dextrose in 0.9% normal saline (D5NS) maintenance fluid [6].

The primary outcome, emesis in the post anaesthetic care unit (PACU), was compared using Chi-Square. The secondary outcomes were analysed by T-test and non-parametric analysis where appropriate. Non-inferiority analysis of intraoperative IV dextrose relative to ondansetron was conducted with $\delta = 10$ % as the non-inferiority limit.

Results: Data from 289 patients were analyzed (intervention group 144, control group 145). Demographics and intraoperative anaesthetic management were similar. Results are displayed in Figure 1. Emesis in PACU was not different between groups ($p = 0.11$) The 95% CI upper limit of the POV proportion was below the non-inferiority margin (7 vs 21.7), demonstrating that intraoperative IV dextrose was non-inferior compared to

ondansetron. Patients who vomited in the PACU were 6.2 times more likely to vomit at 24 hours (p=0.015). POV within 24 hours of surgery occurred in 36 participants (12.4%).

Conclusion: This study demonstrates that IV dextrose is not less effective than ondansetron in preventing POV. The effectiveness, different mechanism of action, and safety profile of IV dextrose may lead clinicians to consider this as an alternative, or additional therapy for POV prophylaxis.

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85943 - RESCUE OF A FAILED ETT PILOT BALLOON IN A DIFFICULT AIRWAY: CASE REPORT

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Introduction:
Within the general surgical population, the incidence of anticipated difficult airways increases approximately 10-fold in the laboring parturient. Though the exact incidence is likely unknown, the management of these difficult airways is further complicated in obese parturients with pre-ecclampsia. While regional anesthesia is still preferred, urgent delivery may require a general anesthetic, tracheal intubation and controlled ventilation. We report an unusual failure of airway equipment that required immediate management.
The patient has provided written consent for the reporting and publication of this case report which includes appropriately masked photographs.

Case description:
Labor was being induced in a 37 year-old at 33+1 weeks gestational age for severe preeclampsia. Shortly thereafter, an emergency cesarean section was called for due to intermittent fetal bradycardia. The patient had features suggestive of a difficult airway: morbid obesity with a BMI of 44kg/m
2
, generalized edema, short stature, Airway Class 4 and a thick neck. Initially a spinal anesthetic was attempted, but was unsuccessful. Worsening fetal decompensation developed and the decision to proceed with a general anesthetic was made. The anesthetic was induced with a rapid sequence technique. A Grade 2 laryngoscopy view was obtained and a pre-packaged endotracheal tube with stylet was successfully inserted into the trachea. Once tracheal position was confirmed, the surgeons were instructed to proceed. When the attempt to inflate the cuff was made, it was discovered that the pilot balloon had been severed from the inflation tubing. Pharyngeal packing was inserted to tamponade the airway leak and the surgery and anesthetic continued without complication.

Discussion:
We review this case and discuss the causes of the damage of the tracheal tube inflation cuff. Firstly, there may have been a manufacturing defect in the initial production of the ETT or during the secondary preparation process in which a stylet was inserted and both were sterilized and repackaged. Standard inspection of the ETT prior to insertion may have overlooked this damage or the inspection neglected entirely in the urgency of the situation. As well, accidental trauma could have severed the inflation tubing, which

has commonly been described during ETT manipulation [1,2,3,4]. Though we were able to proceed without replacing the endotracheal tube, various options for this scenario include (1) repairing the pilot balloon, (2) tamponading the airway and/or (3) exchanging the endotracheal tube. For each option, there are a variety of possibilities. Also, if one method fails, another could be attempted if clinically appropriate. Previously published algorithms address this decision-making process, but neglect to incorporate the variables of an urgent situation with a difficult airway as we experienced in this case [1]. Therefore, we have developed an alternative algorithm for management of an airway leak (Figure 1).

References:

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85945 - UNANTICIPATED POST PARTUM RIGHT VENTRICULAR HEART FAILURE

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Introduction: The parturient undergoes significant cardiovascular and physiologic stress in the peripartum period, however the vast majority tolerate labor well. We present a rare diagnostic conundrum in obstetric anesthesia,; a patient with no known cardiac history develops acute and florid right ventricular heart failure post spontaneous vaginal delivery with epidural analgesia.

Discussion: Appropriate consent was obtained directly from the patient to publish this case report. We describe the case of a 32 year old female, G6P4 presenting in active labor at term. She had four previous uneventful spontaneous vaginal deliveries, all with intermittent intravenous analgesia. The patient did not describe any prior history of cardiac issues. She requested an epidural for analgesia, which was placed by the Obstetrical anesthesia fellow after appropriate consent was obtained. Starting immediately post partum she had progressive bilateral leg swelling and periorbital edema. A chest X ray was obtained which showed an unusually enlarged and globular shaped heart. She was noted to have the clinical signs of florid right heart failure and borderline hypoxic with room air sats of 91% and a P02 of 66. The obstetrical anesthesiology fellow performed a bed side echocardiogram without Doppler color images which revealed a moderately dilated right ventricular with no other obvious pathology. Cardiology was consulted for stat formal echo, and a CT to rule out PE was ordered. Pending consultations and tests, the decision was made to start IV heparin anticoagulation for the high index of suspicion that a large post partum pulmonary embolus was causing right ventricular failure. The CT chest eventually showed no evidence of pulmonary embolus, and the formal echo confirmed a moderately dilated right ventricle with normal valves and left sided function. It was noted however the patient had a 11-19mm atrial septal defect with significant left to right shunt, enough to explain the right ventricular failure. Her heparin was discontinued, she was diuresed with lasix, and arrangements were made to have a percutaneous closure of her atrial septal defect once she was clinically stable.

Results and Discussion: Although common complications such as pulmonary embolus should continue to remain high on the differential for pregnant patients, Anesthesiologists and Obstetricians should keep a broad differential that includes rare cardiovascular conditions when managing the peripartum complications of labor and delivery. This also serves to highlight the diagnostic role of bed side echocardiography in obstetric anesthesia

85952 - SOFA VS INDIVIDUAL ORGAN DYSFUNCTION AS A PREDICTOR IN ICU

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Introduction: The Sequential Organ Failure Assessment (SOFA) is a well established tool to predict mortality in critically ill patients[1,2,3].However the importance of its individual components is not known.The present study was done to determine the same.

Methods: After approval from institute ethics committee,in a prospective study, 41 consecutive patients admitted to ICU over an 8 week period were studied. Based on clinical examination and relevant laboratory investigations, SOFA scores were calculated 24 hours post admission and subsequently every 48 hours for the first 10 days. Patients were followed till discharge/death/transfer from ICU. The outcome measures studied were mortality and duration of stay in ICU. SOFA scores and individual organ dysfunction scores were correlated with the outcome measures using Mann Whitney test. Multivariate analysis of factors predicting the mortality was done with regression analysis (SPSS package).

Results: Of the 41 subjects 25 were males & 16 were females (age range 15- 80 years; mean age 40 ± 16 years). Sixteen subjects (39%) died. Indications of admission to ICU were due to 30 (73%) surgical, 10 (24%) medical and 1 (3%) obstetrical reasons. Total SOFA scores of day 1, 3 and 5 correlated significantly with survival but those of day 7 and 9 did not. Poor cardiovascular score on day 1 and day 3, coagulation profile on day 3 and respiratory score on day 7 correlated significantly with mortality.The rest of the individual system scores did not predict survival. The mean SOFA score and maximum SOFA score for each subject correlated significantly with mortality and survival. The duration of stay in ICU did not have a significant correlation with the outcome.

Discussion: Evaluation of the SOFA score can prove to be a useful protocol in ICU setting.The total SOFA score represents the cumulative organ dysfunction of the patient. This study shows that though the different system scores form an important component of SOFA calculation yet individually they may not be good predictors. Mean and maximum SOFA score help determine the severity of illness and can act as a guide for the intensity of therapy required for each patient.Hence SOFA should be considered in its composite form as a predictive model. and should be considered in its composite form as a predictive model.

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85956 - EFFECT OF CALCIUM ON OXYTOCIN DESENSITIZED HUMAN MYOMETRIUM IN-VITRO

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Introduction: A significant risk factor for uterine atony is prolonged exposure to oxytocin during augmentation of labor, which results in the *'desensitization'* phenomenon, a decrease in the response of the myometrium to further oxytocin.[1] The importance of extracellular calcium is well-established in myometrial contractility,[2] however, in the context of desensitized myometrium, its significance is unknown. We aimed to investigate the effect of low, normal and high extracellular calcium concentration on oxytocin-induced contractility, in desensitized human myometrium in-vitro.

Methods: After REB approval, and written informed consent from patients undergoing elective cesarean deliveries, this in-vitro experimental study was undertaken using myometrial tissue dissected into six strips. Each strip was mounted in a single organ bath with physiological salt solution (PSS) under homeostatic conditions and then pretreated for 2-hours with 10^{-5}M oxytocin (a model shown to achieve myometrial desensitization [3]), or a control with 2-hours PSS pretreatment. Following pretreatment, the tissue was washed with PSS, and the calcium concentration was altered to reflect either low (1.25mM), normal (2.5mM) or high (3.75mM) levels, thereby providing 6 study groups. After equilibration in the desired calcium concentration, a dose-response to oxytocin 10^{-10}M to 10^{-5}M was performed. Contractile parameters were measured and compared among groups. The primary outcome was motility index (frequency x amplitude), and secondary outcomes included frequency, amplitude and area under the curve. A sample size of 32 strips per group was used (32 patients; 6 strips/experiments per patient), to detect a difference of 0.7-1.4 (0.25-0.35) g*contractions/10 min (sq root) in motility index (SE) between groups, with a 5% significance level and a power of 80%. Primary analysis will be undertaken with linear regression models adjusted for repeated measures through compound symmetry covariance structure.

Results: Results from 49 experiments (of a total of 192) have been analyzed. The control experiments show an increase in motility index of oxytocin-induced contractions from baseline when analyzed as a cumulative dose-response average, in the presence of 2.5mM calcium (538%), versus the 1.25mM (465%) and 3.75mM (341%) groups. Similarly, the oxytocin desensitized groups showed higher motility index in the presence of 2.5mM calcium (462%), versus the 1.25mM (460%) and 3.75mM (173%) groups (Fig.

1). We plan to complete the study by April 2015 following further recruitment of 24 patients (providing 143 experiments, at a rate of 18 experiments per week).

Discussion: The results so far show that in both desensitized and non-desensitized myometrium, maintaining calcium levels at physiological levels (2.5mM), provides superior contractility. Hypercalcemia, in the setting of both non-desensitized and desensitized myometrium markedly attenuates contractility. Thus, after prolonged exposure to continuous oxytocin in labor augmentation, uterine atony and PPH could be attenuated by ensuring normocalcemia and preventing hypo- or hypercalcemia. Final analysis and discussion will be presented at the CAS meeting.

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1) Am J Obstet Gynecol **2003**;188:497-502;
2) Biol Reprod **1989;** 40: 942-948;
3) Anesthesiology **2013**; 119: 552-561

85958 - EFFECT OF PULSATILE OXYTOCIN ON THE DESENSITIZATION OF MYOMETRIUM

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Introduction: Postpartum hemorrhage (PPH) secondary to uterine atony is a leading cause of maternal morbidity. The use of prolonged continuous oxytocin in labor can result in several adverse effects, including the *'desensitization'* phenomenon,[1] which attenuates the response of the myometrium to further oxytocin and can result in uterine atony. One human clinical trial has shown the effectiveness of pulsatile oxytocin when compared to continuous oxytocin for labor augmentation;[2] however, PPH as a primary outcome has not been investigated. We aimed to investigate the effect of pulsatile oxytocin exposure, versus continuous oxytocin exposure, on the extent of myometrial desensitization.

Methods: After REB approval, and written informed consent from patients, this in-vitro experimental study was undertaken using myometrial tissue obtained during elective cesarean deliveries dissected into 6 strips (providing 2 strips/experiments per group). Each strip was mounted in a single organ bath with physiological salt solution (PSS) under homeostatic conditions and then subjected to either 1) oxytocin 10^{-5}M pretreatment for 2h (to induce myometrial desensitization, as shown by our previous model [3]); 2) PSS pre-treatment for 2h (control); or 3) alternating pretreatment of 15-minute exposures of oxytocin 10^{-5}M and PSS (pulsatile); thereby providing 3 study groups. Following pretreatment, a dose-response to oxytocin 10^{-10}M to 10^{-5}M was performed. Contractile parameters were measured and compared across various groups. The primary outcome was motility index (frequency x amplitude), and secondary outcomes included frequency, amplitude and area under the curve. A sample size of 32 strips per group will be used (16 patients; 6 strips/experiments per patient), to detect a difference of 0.7-1.4 (0.25-0.35) g*contractions/10 min (sq root) in motility index (SE) between groups, with a 5% significance level and a power of 80%. Primary analysis will be undertaken with linear regression models adjusted for repeated measures through compound symmetry covariance structure.

Results: This study is currently underway with no results for analysis as of yet. We had, however, done pilot experiments to assess the feasibility of the model and to determine the study design. The completed analysis will be presented in the Annual CAS meeting, following recruitment of 16 patients (providing 96 experiments, at a rate of 18

experiments per week), and completion of the study by February 2015.

Discussion: Labor augmentation with continuous oxytocin is a significant risk factor for uterine atony. The delivery of pulsatile oxytocin, compared to continuous oxytocin, for labor augmentation is likely to result in less total administration of oxytocin, less oxytocin receptor desensitization, less attenuation of oxytocin-induced myometrial contractility and a lower incidence of PPH. The final discussion and conclusion will be presented at the Annual Meeting.

References:

1) Am J Obstet Gynecol **2003**;188:497-502;
2) Clin Exp Obstet Gynecol **2000**; 27: 21-23;
3) Anesthesiology **2013**; 119: 552-561

85975 - PEDIATRIC MODIFIED MAGILL FORCEPS AFFECT ON NASAL INTUBATION TIME

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Introduction: Magill Forceps (MF) are commonly used as an adjunct in nasal tracheal intubation (NTI). (1) No literature has investigated whether the design of the forceps can be altered to account for differences in adult versus pediatric airway anatomy. Knowing that the pediatric larynx and trachea are angled posteriorly, we hypothesized that a +45^{o} change to the MF tip would ease manipulation of the nasal RAE tube, preventing it from getting caught on the anterior trachea and thus, reduce time to intubation TTI. (2)

Methods: Following local research ethics board approval, an open label study enrolling 100 consenting patients was conducted. Subjects were randomized to NTI via an aMF or conventional MF. Randomization was conducted using a computer generated randomization list. Group assignment was blinded using sealed opaque envelopes. Inclusion criteria comprised patients aged 0-15yrs and ASA≤ 2. Exclusion criteria included patients with upper airway abnormalities, risk factors for aspiration or known difficult airway. All intubations were performed by staff anesthesiologists and TTI was recorded via a stopwatch with a sole operator.

Results: Data from 52 patients in the aMF group and 48 patients in the MF group were analyzed using non parametric tests. Using intent to treat analysis, the median TTI and interquartile ranges for the MF and aMF were 8.89s (6.52s - 12.51s) and 10.48s (7.07s - 14.29s), respectively (p=0.23). A subset analysis of the data excluding all subjects in whom the corkscrew technique was used to facilitate passage of the nasal RAE tube showed the median TTI for the aMF to be slightly less than the MF, although not statistically significant.

Discussion: NTI of pediatric dental surgery patients using an aMF compared to a traditional MF did not result in a significant reduction in TTI. Several pediatric anesthesiologists, however, felt the aMF to be a handy alternative in certain patients. Having mastered using the conventional MF from years of experience, most anesthesiologists in the study felt there was a slight learning curve to using the aMF. This may have contributed to the difficulty in trying to detect a reduction in TTI, if one exists. Nonetheless, equivalence with minimal training was seen. Further studies comparing the aMF with the conventional MF in novice laryngoscopists may be warranted.

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2) Pediatr Anesth. 2011 21:417-21

85977 - ANALYSIS OF A CALL DISTRIBUTION SYSTEM IN A SHARED PRACTICE MODEL

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Introduction: The distribution of call in a shared practice model poses a significant challenge in terms of logistics and human resource planning. A shared practice setting typically uncouples remuneration provided for a call shift from the amount billed on that shift. Given that switching call is a real and necessary component of any call schedule, this leads to an underlying barter economy, with formal or informal systems of valuing call creating a currency of expected hours worked on a given shift [1, 2]. This study retrospectively reviewed the accuracy of an internal call value system in order to analyze its efficacy at equalizing, and appropriately distributing, workload.

Methods: Local research ethics board approval was obtained. Additionally, all staff members of the department of anesthesia whose billing and cases would be reviewed expressly consented to the study. A complete list of all billings by the department of anesthesia for the fiscal years of 2012-13 and 2013-14 was obtained. This was supplemented by a record of direct billings for patients not covered by a provincial plan. These lists were crosschecked against OR bookings in order to ensure an appropriate capture rate (>95% concordance) [3]. The following data was collected from each case, with all additional information being discarded: attending staff, time in/out, patient age, day and date, service code(s) billed and amount billed. The primary outcome was a measure of total hours worked compared against the maximum possible time worked on that shift. A secondary measure was the number of ‘spill-overs’; cases that started during the day and continued into call shifts. Total amount billed, in-house work and home call work and institutional status of the staff (i.e. academic appointment, full/part-time status) were also evaluated.

Results: When compared with an optimal system of assigning call – i.e. 1 hour assigned carries a consistent expected amount of work associated – the current system was very inefficient, with significant opportunities for improvement. Expected work varied significantly (46% +/- 15%) between shifts assigned during the week and on the weekend. A review of secondary measures revealed a high number of spillover cases (n= 2934) accounting for 48% of total work done during call hours. Using strategies from similar size centers, [4,5] a predictive model of call system distribution with time horizon = 1 year, showed a potential 14% increase in efficiency and a 17% decrease in time on call spent not providing patient care, with no decrease in available call coverage. The model also showed a marked (59% +/- 7.5%) reduction in handover of daytime cases

carrying into on-call hours, with no commensurate increase in individual staff workload.

Conclusion: A fair valuation of call shifts is necessary for institutional efficiency and staff morale. Perceived inequalities in the distribution of call can be efficiently evaluated and addressed using retrospective analysis and effectively addressed with dynamic business processes [6]. Solutions from similar industries with complete coverage (i.e. shipping, software support, public utilities) can also be effective at addressing staffing issues in healthcare.

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85981 - COMPETENCY BASED EDUCATION IN ULTRASOUND GUIDED PAIN INTERVENTIONS

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Introduction*:* The use of ultrasound (US) guided interventional pain procedures has become increasingly popular. Transition to a competency based education model to teach this skill set requires sufficient exposure to procedures for US image acquisition as well as visualization of needle insertion and injection. Published recommendations for US-guided training in pain medicine do not provide estimates on the number of training images and procedures to perform. (1) Our goal is to propose these estimates based on existing pain medicine literature to begin the design of a competency framework at our institution. Furthermore, in our review of the literature, we hope to incorporate complimentary methods of education in US guided procedures into our competency based framework.

Methods: Our objective was to search the existing literature on the teaching of US-guided pain interventions, including peripheral and axial structures as well as musculoskeletal applications. This included articles from radiology, rheumatology, physiatry, and chronic pain literature.

Results: One feasibility study provided a learning curve for US-guided intra-articular injections to the sacroiliac joint. Success increased from 60% to 93.5% when the number performed increased from 30 to 60 blocks in the hands of experienced radiologists. (2)

Discussion: There is a paucity of literature that informs the number of image acquisition scans and procedures required to construct a competency based educational program. The only article available studied learning curves in a feasibility study with experienced radiologists, which is not representative of the novice learner or an educational program. Estimates for training will have to be initially obtained from evidence for teaching US-guided regional anesthesia, which ultimately depends on the quality of didactic sessions, learner variability, and quality of evaluation and feedback. (3) Block performance skill acquisition based on available regional anesthesia literature could be estimated to require 30 procedures. (4,5).

As indicated in the literature, we feel there are several methods that can be used to assess and evaluate learners on a continual basis. Ultimately, these can be used to aid in the determination of competence. Most importantly, learners should be encouraged to keep a detailed log of patient encounters and procedures. For procedures that are

performed infrequently, novel methods of evaluation will be required. One such approach may be to videotape a procedure, and have that video evaluated from an external source, thereby assuring an unbiased evaluation.

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85989 - SCOPES VS. BLADES: WHAT ARE ANESTHESIOLOGISTS USING?

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Background: Video laryngoscopy is an established intubation technique in the field of anesthesia not only as an airway rescue device but a preferred intubation technique for many in routine anesthetic practice. What remains unknown is the utilization rate of video laryngoscopy versus standard laryngoscopy in elective surgery. Anesthetic records routinely indicate the type of intubation technique utilized however it is not possible to retrospectively review the reason for the use of video laryngoscopy nor whether a videoscope was brought into the room to be available in case of difficult laryngoscopy.

Methods: Following REB approval, we performed a prospective single-center observational study of all elective intubations in the operating room during a one month time period. When a videoscope was requested, information recorded by research personnel included: patient characteristics, method of intubation including whether the videoscope was used as the primary intubating device, after a direct intubation attempt, after an awake direct laryngoscopy, or remained in the OR unused. In addition the reason for use, and any delay in obtaining a videoscope including whether it was necessary to obtain a videoscope not designated for that particular operating room.

Results: The videoscope was requested for 72 (20.1%) of the 358 intubations during the study period. 67 of the 72 total cases were recorded. In 30(44.8%) recorded cases it was used as a primary intubation device, after unsuccessful direct laryngoscopy in 7 (10.4%) cases on 1 (1.5%) occasion for awake visualization prior to direct laryngoscopy and ill defined reasons in 3(4.5%). It was not used in 26 (38.8%) cases in which it was requested (Figure 1). The most frequent reasons cited for requesting the videoscope be present in the OR were: predicted difficult airway (65.2%), known difficult airway (13.6%), concern for dental damage (7.6%), teaching (6.1%), cervical spine immobility (4.5%) and preferred primary method of intubation (1.5%).

Anesthesiologists reported delays obtaining a videoscope in 9 of the 67 (13.4%) cases. On 10 (14.9%) occasions anesthesiologists used scopes not designated to that section of the Operating Suite.

Discussion: Anesthesiologists in our study requested a videoscope in approximately one in five surgical cases. In 10.8% of cases in which the videoscope was requested it was utilized after direct laryngoscopy, thereby underlining the importance of availability of this intubation method for patient safety. Delay in obtaining a videoscope as well as

utilizing videoscopes not designated for that area of the operating suite raise concerns surrounding equipment availability necessary for patient safety. Results from this study, though limited to one institution over a short study period, may assist anesthesiologists in hospital resource acquisition and allocation decisions. Further research should elucidate the role of the videoscope in other areas of the hospital, as well as in other centers.

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85993 - REDUCTION IN CODE BLUE ACTIVATIONS IN THE POST ANESTHESIA CARE UNIT

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Introduction: The purpose of this study is to determine if a code blue system that records only time and date of activations can be used to provide useful information for retrospective data collection that can then be used for quality improvement.

Methods: This study adheres to local Research Board Ethics regulations. The code blue management system (CBMS) was interrogated for the dates of January 1, 2007 to June 30th, 2014 in the Post Anesthetic Care Unit (PACU) at a children's hospital. The time, date, location and length of activation were reported for each activation. This list was cross-referenced with an electronic report of all patients admitted to the PACU during the same time frame. If a patient was present at the time of activation, the patient's health record was reviewed to confirm the event. If a code activation occurred when there were no patients present in PACU, the activation was deemed to be a test, which is consistent with weekly testing of the code blue system.

Results: The CBMS printed a report showing that the code blue button was pressed 939 times. 697 code activations were concluded to be tests. There were 201 code blue activations that were attributed to patients. 200 separate patients were found, with one patient having two separate events, 24 minutes apart. 18 activations were for simultaneous different button presses for the same event. There were 23 code blue activations where there was at least one patient in the PACU at the time of activation, but after all available charts were reviewed, no documented patient event could be found.
A control chart was created plotting the number of code activations per month versus month (figure 1). An upper control limit at 3 standard deviations from the mean is drawn at 6.72. The control chart indicates that there was between 0 and 7 code blue activations per month, with an average of 2.23 and a standard deviation of 1.48. There is one month (November 2013) above the upper control limit with 7 code blue activations.

Discussion: Looking at the control chart, the number of code blue activations per month is generally in control, with most of the variation due to common cause variation.

There is one month above the upper control limit, where special cause variation may be responsible.
This study is the first step of an overall quality improvement project with the goal to decrease code blue activations in the PACU. Now that it is known that we can determine which patients are having events in the PACU using the CBMS and successfully use retrospective data collection, each event can be further scrutinized to shed more light onto the common causes and special cause variation.

85998 - INTRALIPID AND DISPERSION OF REPOLARIZATION INDUCED BY BUPIVACAINE

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Background and Goal of Study: Bupivacaine, may induce lethal arrhythmias due to inadvertent intravascular injection. Intralipid is an effective antidote to treat bupivacaine toxicity. An increase of ventricular transmural dispersion of repolarization, a major arrhythmogenic marker, is reflected by the Tpeak-to-Tend in the ECG. The main goal is to determine the effect of bupivacaine on dispersion repolarization parameters such as QT and Tpeak-to-Tend intervals and to explore the impact of intralipid on these parameters.

Material and methods: 14 mini-pig were studied. After instrumentation a 4 mg.kg-bolus of bupivacaine was administrated followed by an infusion of 100 $\mu g.kg^{-1}.min^{-1}$). Heart rate: **HR**, **PR**, **QRS**, **QTc**: corrected by HR and **Tpeak-to-Tend** were determined in a sequential fashion: after bupivacaine (at 1 min, 5 min and 10 min) and after intralipid (1.5 $ml.kg^{-1}$ over 1 minute followed by an infusion of 0.25 $ml.kg^{-1}.min^{-1}$). A t-student test was used.

Results and discussions: Bupivacaine prolonged **PR**, **QRS** and **QTc** intervals (at 1, 5 and 10 min), and increases dispersion of repolarization (**Tpeak-to-Tend**). Intralipid significantly decreased **PR**, **QRS**, **QTc** and **Tpeak-to-Tend**. Table. Dispersion of repolarization was related to lethal arrhythmias (3 events, including asystole, sustained ventricular tachycardia) and repeated non-sustained ventricular arrhythmias (NSVA) (4/14, 28%). A Brugada-like ECG pattern was visualized at V1-4 leads in 5/14 pigs (35%). Intralipid significantly decreased the alterations induced by bupivacaine, with the termination of VA within 10 minutes. Intralipid administration and resuscitation maneuvers allowed for the recovery from cardiac arrest in 2 specimens.

Conclusions: Bupivacaine toxicity in this porcine model is associated with an increase of transmural dispersion of repolarization (Tpeak-to-Tend in the ECG), the occurrence of Brugada-like pattern and malignant ventricular arrhythmias. Intralipid reverses changes in dispersion of repolarization favoring the disappearance of Brugada-like pattern and ventricular arrhythmias.

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86003 - REDUCTION IN POST OPERATIVE COMPLICATIONS WITH ACTIVE PRE-WARMING.

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Introduction: It has been shown that perioperative hypothermia can cause adverse outcomes in surgical patients [1,2,3,4]. Recent research has shown that pre-warming patients can reduce peri-operative complications [5,6]. Our primary objective was to determine if active pre-warming reduced the incidence of intra- and postoperative hypothermia in non-cardiac surgery. Our secondary objectives were to determine if active pre-warming reduced the incidence of PACU complications and rates of transfusion and surgical site infection.

Methods: After ethics approval from our local ethics committee we carried out a retrospective cohort study. We included patients undergoing non-cardiac surgery scheduled for greater than 90 minutes duration from the American College of Surgeons National Surgical Quality Improvement Program (NSQIP) database. We compared patients from our baseline cohort (October 2011 to May 2012 (N=323) to a similar cohort after we introduced an active pre-warming program (May to Aug 2013 (N=191)). Patients were warmed with Bair Paws forced air gowns. Temperature was recorded pre-operatively, intra-operatively and on arrival to the recovery room. We compared the rates of hypothermia and PACU complications in each group as well as transfusion and surgical site infection rates. All statistical analysis was performed with Graphpad Prism 5.0, using t-tests or Fisher's exact tests where appropriate.

Results: The average period of pre-warming was 60
+ 40 minutes (SD). Active pre-warming resulted in a significant decrease in the incidence of patients arriving in PACU hypothermic, 33% pre intervention versus 5.4% pre-warmed, $p < 0.01$. The percentage of time intraoperatively below 36^{o} decreased from 27.3% to 21%, $p=0.03$. PACU complications including desaturation and excessive pain were significantly decreased in the pre-warmed group, 13.6% vs 3.2%, $p < 0.01$ and 27.6% vs 12.7%, $p < 0.01$ respectively. We were unable to demonstrate a statistical difference in transfusion or SSI rates between the groups.

Discussion: Implementation of an active pre-operative warming program was associated significant reductions in intraoperative hypothermia, hypothermia on arrival to PACU, desaturation and excessive pain in PACU. We hypothesize that reductions in pain and desaturations were secondary to reduced hypothermia following pre-warming, since shivering can contribute to thermal pain and increase oxygen requirements. A limitation of this study is that there was more use of thoracic epidurals in the pre-warmed population, which may have contributed to a reduction in PACU pain scores. In addition, the study was underpowered to detect any reduction in transfusion and surgical site infection rates for specific procedures.

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86004 - POST-OPERATIVE OPIOID USE AFTER CARDIAC AND THORACIC SURGERY

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Introduction: Opioid use in Canada is of considerable concern to the public and to prescribers. The use of opioids has increased dramatically in the past 20 years in North America (1). Chronic pain after surgery has been recognized as a significant problem over the same period of time (2). Reviews of perioperative data (3) have demonstrated that the overall use of opioids at 6 months after surgery is very low. Factors predicting long term opioid use after surgery are not yet clear. Our study examines this question in 2 surgical groups with minimal opioid use prior to surgery.

Methods: REB approval was obtained. The COAP dataset was created from the merger of the Anesthesia Information System and the prescription monitoring program database. Data from 2006 to 2010 was matched. Patients with a single surgery during admission were included. Four tolerance groups based on preoperative opioid prescribing for 3 months before surgery– naïve, acute, intermittent, chronic were identified. Data was reviewed at one month intervals for 3 months prior to and 6 months after surgery. Logistic regression analysis was used to determine whether demographic and perioperative factors were independently associated with post-operative opioid at 6 months.

Results: 1028 thoracic cases and 1333 cardiac cases were reviewed. More than 90% of patients did not use opioids or used them only intermittently. Table 1 shows the logistic regression analysis results. Age and gender were not predictive of postoperative opioid use at 6 months after cardiac or thoracic surgery. Use of opioids at one month after surgery was a predictor of opioid use at 6 months after cardiac and thoracic surgery. Chronic and acute preoperative use and was predictive of use at 6 months after thoracic but not cardiac surgery. No opioid use and use of opioids for less than 3 months was reduced the log odds of being on opioids at 6 months after cardiac and thoracic surgery.

Discussion: Most patients undergoing cardiac and thoracic surgery do not regularly use opioids for the 3 month period prior to surgery. They are at considerable risk of developing chronic pain syndromes after surgery (4). Preoperative opioid use is not an independent predictor of opioid use at 6 months after cardiac and thoracic surgery. Use of opioids at one month is the only independent predictor of use at 6 months. Use of opioids for more than one month after surgery should prompt consideration of a

chronic pain states and exclusion of other causes of pain.

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86005 - POHM: POSTOP HOME MONITORING AFTER ARTHROPLASTY EARLY DISCHARGE

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With surgical and pain management advances, early discharge (EDc) after hip or knee replacement (HA or KA) is now possible. However, after HA or KA, 3.1% experience DVT, or other complications.[1] Postop myocardial infarctions (45.8%) often occur after post-operative day (POD) 2.[2] With EDc, therefore, complications may occur as out-patients. Also, more medication errors occur at transition points; i.e. hospital discharge.[3] We hypothesize that home monitoring allows better transition of care and earlier intervention of post-operative complications at home. This is a preliminary report on home monitoring with wireless connectivity on pain scores and VS (non-invasive blood pressure, heart rate, and pulse oximetry).

Primary Outcome: ≥ 90% of patients with successful transmission of pain assessments and VS, once on evening of surgery (DOSx) and four times a day for 4 days of home monitoring

Method: After REB approval of this prospective observational study, patient consent was obtained prior to surgery. Inclusion Criteria were (a) Patients undergoing elective HA or KA; (b) expected LOS ≤ 1 day; (c) Age 18 – 80 years; (d) Revised Cardiac Risk Index (RCRI) ≤ Class 2; (e) available and able care-takers at home to assist the patient upon discharge during the early postoperative recovery phase. Exclusion Criteria: (a) ASA IV; (b) COPD with FEV_1 ≤ 1; (c) OSA; (d) patient or family reluctance to participate in early discharge; (e) new undiagnosed or unstable medical condition at the time of discharge; (f) previous participation in the study. Management protocols for pain and VS were created for these patients. Sample size was 54.

Results: To-date, 55 patients were eligible, 33 enrolled, and 1 withdrawal. Twenty-

seven of the 32 patients completed the 30-day follow-up (Table 1): 4 total hips; 2 unipolar hips; 13 total knees; 8 hemi-knees; 23 under spinal anesthesia and 4 under GA. All were discharged on the DOSx. Transmission rates were 100%, 96%, 96%, 85%, 85% on DOSx, POD1, 2, 3, 4 respectively. Overall, 74% (95% CI 57.5 to 90.6%) completed every transmission. On average, 1.34 phone calls were made per patient over 4 days. Twenty-three patients strongly agree or agree to recommend this. At 30-day follow-up, all were at home; no mortality; 1 visited the ED on POD 15 for pain and no re-admissions.

Discussion: Although the "all completed" transmission rate was 74%, pain scores and VS were received for all patients every day until POD4 when 2 patients felt the monitoring no longer necessary. Data interaction with all patients every day supports the feasibility of postop home monitoring. Completion of 54 patients is expected by May 2014.

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86006 - POSTOPERATIVE VISION LOSS MAY COMMONLY OCCUR POST HOSPITAL DISCHARGE

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Introduction: Postoperative visual loss (POVL) is usually a rare, devastating and immediate complication of nonocular surgery[1]. However, less severe cases may not be immediately recognized and some POVL subtypes become symptomatic only several days after surgery[2]. Previous POVL epidemiology studies have been restricted to clinical case series or analyses of hospital discharge abstracts databases (HDA)[1]; they may have unintentionally excluded late and less dramatic presentations. We employed a relatively unique longitudinal, provincial administrative database repository to determine the frequency with which POVL may present after hospital discharge.

Methods: With local ethics committee approval, surgeries considered to be high-risk for POVL[1,3,4] were identified in HDA between 1987 and 2013. These included cardiac, vascular, lung, lower extremity joint replacement, spine, head and neck, major pelvic, shoulder and trauma surgery. In addition, low-risk surgeries performed on similar populations but not associated with POVL (percutaneous coronary intervention and ambulatory orthopedic, gynecologic and general surgeries) were identified to provide a comparison estimate of the baseline incidence of acute vision loss. We only included surgeries where the patient had been continuously registered in the repository for at least 5 years prior to the date of surgery, in order to have sufficient data to identify exclusion criteria (see below). Cases of POVL were identified by the occurrence of relevant International classification of diseases version 9 (ICD-9) diagnoses in the HDA, and within 14 days of discharge in the medical service (MS) databases, which includes physician and optometry visits. We excluded patients with pre-existing diagnoses consistent with vision loss and, as the MS database is only coded to 3 digits, we also excluded patients with comorbidities that could confound the outcome of POVL (i.e. diabetics were excluded because ICD-9 code 362 includes both diabetic retinopathy and retinal vascular occlusion). Chi-squared and Fisher Exact tests were used for this preliminary analysis, with cell sizes of < 6 suppressed as a privacy requirement

Results: Of 242 POVL cases in 184,263 high-risk surgeries and 236 cases in 402,509 low-risk surgeries, 35.6% were diagnosed after discharge. The incidence of POVL

overall and after hospital discharge varied substantially by surgical subtype (Table 1). Some high-risk surgeries had rates comparable to low-risk surgeries. The risk of POVL was lower after 2008 compared to before in high-risk ($p = 0.05$), but not low-risk surgery ($p=0.68$). The proportion of post discharge diagnoses increased significantly ($p = 0.01$) after 2008 compared to before.

Discussion: Previous studies likely missed a significant number of cases of POVL that presented after hospital discharge, particularly in cardiac surgery patients. The number of these late presentations is increasing, even as overall rates of POVL decrease. More detailed analyses and ultimately clinical studies, will be required to better characterize these outpatient presentations.

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86013 - INCIDENCE OF PONV FOLLOWING ENDOSCOPIC ENDONASAL SKULL BASE SURGERY

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Introduction: Endoscopic surgery is quickly being adopted for multiple surgical interventions, including endoscopic endonasal surgery as an approach to a variety of tumors including functional and nonfunctional pituitary tumors and meningiomas. There are multiple factors known to contribute to postoperative nausea and vomiting (PONV), one of which includes surgical type (1). Endoscopic sinus surgery has been reported to have high rates of PONV, ranging from 40-68%(2), and intracranial procedures reaching rates greater than 40% (3), but PONV in endoscopic skull base surgeries (which combines endoscopic sinus surgery and intracranial surgery) has not been established, nor if any particular antiemetic prophylaxis or therapy is more effective in this specific patient population.

Methods: Following REB approval, a retrospective chart review was completed encompassing all cases of endoscopic endonasal skull base surgery performed at our centre since the procedure's inception through August 31, 2013. Data obtained included demographics, PONV risk factors, indication for surgery, CSF leak, NPO duration, duration of anesthesia, anesthetic technique, neostigmine use, intraoperative chemoprophylaxis, intraoperative and postoperative opioid doses, presence of PONV and time to discharge from PACU. Data was then analyzed with unpaired Student *t*-tests, Fisher's Exact Testing and Binomial Logistic Regression.

Results: A total of 202 cases were reviewed, with 40.1% of patients having PONV. There was no increase of PONV incidence with age ($p=0.83$), BMI ($p=0.36$), ASA > 2 ($p=0.75$), smoking history ($p=0.11$), NPO duration ($p=0.91$) or anesthetic duration ($p=0.44$). Time in the post anesthetic care unit (PACU) was increased from 1.98±0.23 hours to 3.54±0.85 hours ($p=0.001$) when PONV occurred. With binomial logistic regression analysis (Table 1), further significant variables included non-urgent ASA status ($p=0.014$), antiemetic prophylaxis ($p=0.024$) and dose of opioid received in PACU ($p=0.02$). For PONV chemoprophylaxis, steroids were found to be beneficial ($p=0.034$) with indication that ondansetron may be helpful ($p=0.09$), though it did not reach statistical significance.

Discussion: PONV contributes to multiple negative effects including electrolyte imbalance, dehydration, increased ICP, hypertension, surgical site compromise and potential airway compromise which can have major morbidity for patients with recent

intracranial surgery (4). Incidence of PONV was found to be 40.1%, within the range previously described for endoscopic sinus surgery. When PONV occurred, a clinical and statistical increase in time spent in the recovery area is noted, which may contribute to additional health care costs and patient discomfort. Analysis of current practices highlights a few elements that may be beneficial in minimizing PONV risk, including use of antiemetic chemoprophylaxis, especially steroids and potentially ondansetron, minimizing post operative opioids and avoidance of nitrous oxide. Improved understanding of the incidence and contributing factors, as well as current practice regarding prophylaxis and management will ultimately allow for improvement in care of this patient population.

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86014 - IMPACT OF SURGICAL SPECIAL CARE UNITS: A SYSTEMATIC REVIEW PROTOCOL

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Introduction: The overall incidence of post-operative complications is 10% and high-risk emergent surgery patients are associated with 30-day mortality rates of 9-18%. This may be in part due to difficulty in stratifying post-surgical patients appropriately within a two destination, ward vs. ICU, model of care. We hypothesize that the institution of an intermediate, third level of care (termed surgical special care unit, or SSCU) improves the surveillance of at-risk surgical patients and may lead to global improvements across surgical patient outcomes. Although a universal definition of SSCUs does not exist, they generally provide continuous monitoring, a high nurse:patient ratio, and intensive medical care in the absence of mechanical ventilation. Our systematic review is designed to answer the question, “In adult non-cardiac surgical patients does a three-level model of care delivery (i.e. ward, SSCU, ICU) compared to a two-level model of care (i.e. ward, ICU) affect post-operative mortality (in-hospital deaths or 30 day mortality)?”

Methods: Ethics approval was not required as this is a review of published literature. The protocol for this systematic review will be registered with PROSPERO. A systematic search of Medline, CINAHL, Embase, and the Cochrane library has been designed in collaboration with an information specialist, and a Peer Review of Electronic Search Strategy (PRESS) review of the strategy has been performed. The 2139 returned citations will be screened and data extracted in independently by two reviewers using piloted datasheets in DistillerSR. Disagreements between reviewers will be resolved through discussion with a senior team member. We will compare exposure to a two-level care model to exposure to a three level care model. All studies that include perioperative non-cardiac surgery patients will be included. Eligible studies will include randomized controlled trials and non-randomized comparator studies (e.g. controlled

before-after studies, interrupted time series and repeated measures studies). Outcomes reported in similar manners (hospital level, patient level) will be pooled. Meta-analysis using random effects modeling will be performed for the primary outcome of in-hospital or 30-day mortality, as well as selected secondary outcomes (e.g. serious adverse events, hospital resource utilization, measures of patient experience, and measures of processes of care). All data will be expressed with appropriate ratios and confidence intervals. Risk of bias will be assessed using either the Cochrane Risk of Bias Tool for randomized studies or A Cochrane Risk Of Bias Assessment Tool: for Non-Randomized Studies of Interventions, as appropriate. The results of this review will be reported according to PRISMA guidelines.

Discussion This will be the first systematic review of SSCUs. Results of this systematic review will help define the impact of SSCUs on the care of high-risk perioperative patients. In addition, it may help guide future studies investigating the role of SSCUs in perioperative care.

86016 - CONTINUOUS PARAVERTEBRAL BLOCK IN MINIMALLY INVASIVE MITRAL SURGERY

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Minimally invasive mitral valve surgery (MIMS) through a small thoracotomy is linked to faster recovery[1]. However, it is associated with pain in the immediate post-operative period that is more severe than a sternotomy[2]. We hypothesized that the addition of a continuous paravertebral bloc (CPVB) or a continuous intercostal bloc (CIB) would provide superior pain control and lower need for opioid after MIMS.

After institutional approval, charts of patients admitted for MIMS since 2012 were reviewed. We excluded patients with conversion to sternotomy, reoperation in the first 48 hours, chronic use of opioids and inability to evaluate pain.

Primary end points were numeric pain scores (NPS) at rest and upon mobilisation in the first 48 hours after surgery. Adequate pain control was defined as a NPS of 3 or less. NPS were obtained from the intensive care nursing charts on the day of the surgery and from postoperative pain service on subsequent days. Quantity of opioid received was calculated and converted to morphine equivalent. Adverse effects associated with opioid consumption and coanalgesic administration were also noted.

177 charts were reviewed. 141 were kept for analysis. Of those, 90 had CPVB, 28 CIB and 23 PO opioid only. Demographic and chirurgical characteristics were similar in all groups except that more women, atrial fibrillation and MAZE procedure were found in the CIB group.

Data analysis revealed that more patients in CPVB or CIB group had adequate pain control upon mobilisation on the first (CPVB 59.4% CIB 69.6%, opioid 30.0% p=0.0225) and second post-operative day (CPVB 78.9%, CIB 78.3%, opioid 50% p=0.0388). However, no statistical difference was found between groups for pain at rest during the first 48h after surgery. A tendency to less adequate pain control was seen in the opioid

group on the day of the surgery both at rest (CPVB 59.4%, CIB 61.1% opioid 25.0 %, p=0.1651) and upon mobilisation (CPVB 54.1%, CIB 57.1%, opioid 25.0% p=0.5207).

Opioid consumption was higher during the first 24 hours after surgery then on subsequent days in all groups (p=0.0001). Patients with CPVB had statistically lower need for opioid to achieve adequate pain control on both days (p=0.0071). Patients in the opioid group received ketamine more frequently to achieve adequate pain control (p=0.0137). No difference was found in duration of intubation and incidence of nausea. No Ramsey score ≥5 was recorded in any group. However, 2 patients required instrumentation for upper airway obstruction in the opioid group (p=0.0055).

In conclusion, after MIMS, patients with CPVB and CIB have better pain control upon mobilisation. Patients with CPVB need significantly less opioid to achieved adequate pain control at rest. However, a prospective randomised study is needed to confirm which pain control strategy is best suited for MIMS.

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86017 - NEUROPATHIC PAIN PATHWAYS IN THE HUMAN SPINAL CORD AND BRAINSTEM

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Introduction: Neuropathic pain is a subtype of chronic pain that affects 3-8% of the population, and presents a major clinical challenge because it is often refractory to conventional and unconventional treatments (1). Investigations of the neural signature of pain in humans have focused primarily on cortical regions, and studies that have included the spinal cord and brainstem have employed experimental models of pain (2, 3, 4). The objective of this study is to further this research by comparing the neural responses to noxious stimuli in healthy participants to those in a patient population diagnosed with peripheral neuropathic pain.

Methods: In this study, high-resolution functional magnetic resonance imaging (fMRI) was used to detect neural activity in the brainstem and cervical spinal cord of thirteen healthy participants and nine carpal tunnel syndrome (CTS) patients while noxious mechanical pressure was applied to the volar forearm overlying the median nerve. CTS results in peripheral neuropathic pain secondary to median nerve damage as it traverses the carpal tunnel. Participants in both groups indicated the pressure to produce a pain rating of 2, 4, and 6 out of 10 on an 11-point pain scale, and fMRI data were acquired with pain applied at each level during noxious stimulation. Standardized pain ratings were used (as opposed to standardized mechanical stimuli) because the pain response is subjective, and varies widely between individuals (5). This study was approved by the appropriate local research ethics board governing human studies.

Results: Revealing similarities and differences in fMRI signal change trends were observed between the groups. Both healthy participants and neuropathic pain patients exhibited a trend of overall positive signal change at a pain rating of 2 to negative signal change at a pain rating of 6 in the midbrain and rostral medulla of the brainstem. However, consistent differences were observed between the two groups in the ipsilateral dorsal horn of the spinal cord, rostral ventromedial medulla, periaqueductal gray matter, regions known to play an important role in nociceptive pain processing as well as the endogenous descending modulation of pain. Please see the attached figure for group results demonstrating regions of the brainstem and spinal cord that responded to stimulation of the right wrist in the area overlying the median nerve at all 3 pressures. The far right panel shows the contrast between neural activity in CTS patient and

control groups.

Discussion: This study is one of the first to identify variation in the neural activity associated with pain processing between control and neuropathic pain patient groups. The demonstration of the difference in signal activity between patient and control groups, in particular in regions critical to endogenous analgesia, is a key first step in elucidating the pathophysiology that underlies chronic neuropathic pain syndromes. This work could contribute to future studies investigating endogenous analgesia and pain processing in patient groups, which may facilitate the optimization of pain management and ultimately improve quality of life for patients suffering from chronic neuropathic pain.

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86018 - EFFECT OF DESFLURANE ON MEP MONITORING: HEMIFACIAL SPASM VS CONTROL

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Object: Hemifacial spasm (HFS) is a cranial nerve hyperactivity disorder characterized by unique neurophysiological features. Notably facial MEP from HFS patients show characteristics suggestive of elevated facial motor neuron excitability [1-4]. In this study we examine facial motor neuron excitability and compare the effects of desflurane on facial MEP from the spasm and non-spasm side of patients undergoing microvascular decompression (MVD) surgery for HFS.

Methods: 31 patients undergoing MVD for HFS consented to participate in this prospective study. MEP were elicited by transcranial electrical stimulation at C3 and C4 (referenced to Cz) and recorded from the o. oculi (spasm side only), o. oris and mentalis muscles prior to dural opening. Under total intravenous anesthesia (TIVA) and TIVA plus desflurane (0.5 and 1 MAC), MEP activation threshold voltage and mean amplitudes were determined from individual facial muscles as well as pooled data from all muscles on both sides. Mean arterial blood pressure and EEG were recorded at each anesthetic condition.

Results: During TIVA the mean activation threshold for spasm side facial MEP was 162.9 ± 10.1 V compared to 198.3 ± 10.1 V ($p = 0.01$) on the non-spasm side. Additionally, MEPs were elicited using single pulse transcranial electrical stimulation in 74% of HFS muscles versus 31% of non-spasm facial muscles ($p = 0.03$). Desflurane (1 MAC) significantly suppressed facial MEP from both the HFS and control sides [Figure 1]. However, the suppressive effects of desflurane were significantly greater on the non-spasm side (79%) versus the spasm side (58.8%). M waves recorded from the mentalis muscle (spasm side) were 1.76 ± 0.2 mV during TIVA and 1.82 ± 0.2 mV with 1 MAC desflurane ($p = 0.9$) indicating that desflurane was not effecting the neuromuscular junction [5]. Neither blood pressure nor EEG state were significantly different between the 2 anesthetic conditions.

Conclusion: The results of this study suggest that elevated motor neuron excitability is evident on the spasm side of the facial corticobulbar pathway in HFS patients and this

likely explains the differential effects of desflurane on spasm and non-spasm MEP.

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86022 - HYPERFIBRINOLYSIS IN LIVER TRANSPLANTATION

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Summary: Fibrinolysis is an integral part of hemostasis, which under normal conditions is carefully balanced by pro- and anti-fibrinolytic factors. However, this delicate balance is often disturbed in liver disease and during liver transplantation. Hyperfibrinolysis has been identified as one of the causes for microvascular bleeding during liver transplantation (LT). The incidence of hyperfibrinolysis in LT ranges from 9 – 75%. The objective of this study was to determine the incidence of excess hyperfibrinolysis as measured by rotational thromboelastometry (RotemÒ) during the 3 phase of liver transplantation: paleo-, an- and neohepatic phases.

Method: With research ethics board approval we retrospectively reviewed the data of 29 consecutive liver transplants conducted between Jan and Nov. 2014. Data reviewed included patient variables (etiology of liver failure, age, sex, height, weight, comorbidities), preoperative laboratory data (complete blood count, electrolytes, creatinine, internal normalized ratio (INR), fibrinogen concentration), RotemÒ data variables: EXTEM values CT (Clotting time), CFT (Clot Formation Time), MCF (Maximum Clot Firmness), time of onset of initial lysis, CLI (Clot Lysis Index), ML (Maximum Lysis), and surgical data (duration of surgery, cold ischemia time and warm ischemia time) . Hyperfibrinolysis was be defined as ML >15% on EXTEM associated with microvascular bleeding as reported by the surgical team. Tranexamic acid was not used unless there was the evidence of hyperfibrinolysis.

Results: Of the 29 patients, 25 (86.2%) has results for RotemÒ on blood drawn during the 3 phase of liver transplantation. Fibrinolysis occurred in 15 of 25 patients (60%) during surgery. None of the patients developed fibrinolysis in a preanhepatic phase. The incidence of hyperfibrinolysis varied between the 3 phase of liver transplantation. In an anhepatic phase fibrinolysis was observed in more than 50% patients. Significant number of patients with diagnosis of alcoholic liver cirrhosis 7 of 9 (77.7%) developed primary fibrinolysis.

Conclusion: Hyperfibrinolysis is a common phenomenon during liver transplantation as determined by rotational tromboelastometry occurring most often during anhepatic phase. RotemÒ may be guide to effectively manage the use of antifibrinolytics during liver transplantation.

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86023 - PERIARTICULAR KETOROLAC INJECTION AND ESTIMATED BLOOD LOSS

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Introduction: Total knee arthroplasty (TKA) is associated with significant blood loss. There is large variation in the reported blood loss and transfusion rates, and a number of factors are reported to influence it[1,2]. Periarticular multimodal injection, including Ketorolac, is a common mode of analgesia for patients undergoing TKA[3-5]. Ketorolac has a known anti-platelet effect and its intravenous use has been reported to be associated with increased blood loss[6-9]. The effect of periarticular Ketorolac on blood loss following TKA has not been studied.

The primary purpose of this study is to determine whether periarticular Ketorolac injection is associated with increased estimated blood loss following TKA. The secondary purposes are to determine if blood transfusion is more common and if postoperative analgesia is better following periarticular Ketorolac injection.

Methods: All patients in this study had provided consent to access their files, and ethical approval for this study was received from our institutional Research Ethics Board. This was a single centre retrospective cohort study of patients who have undergone a primary total knee arthroplasty under spinal anesthetic. The study group is patients who have received periarticular Ketorolac (n=57) and the control group is patients who did not receive Ketorolac (n=33). Patients with chronic diseases that would increase the risk of blood loss or transfusion, perioperative anticoagulant or NSAID use, or perioperative tranexamic acid use were excluded. The primary outcome is estimated blood loss following surgery, which was calculated using established formulas[10,11]; secondary outcome measures include postoperative blood transfusion requirements, pain scores and opioid consumption, hospital length of stay, and intraoperative and postoperative fluid administration and balance.

Results: There was no difference in estimated total blood loss between the two groups (1.24 ± 0.38 L in control vs. 1.41 ± 0.44 L in Ketorolac, p=0.07). One patient in each group required postoperative blood transfusion. There was less pain at rest on postoperative day 1 (POD1) in the Ketorolac group (3.6 ± 1.6 vs. 2.8 ± 1.7 numeric rating scale (NRS), p=0.02), but this difference was not seen on POD2, and there was no difference in opioid consumption between the two groups (p=0.18). There was no difference in hospital length of stay between the two groups.

Discussion: Periarticular Ketorolac does not seem to be associated with an increased

blood loss in patients who are at relatively low risk for blood loss undergoing primary TKA. The reduction in NRS pain score at rest on POD1 is not clinically significant and does not result in reduced opioid consumption, and is not seen past the first postoperative day. Given that patients at high risk for blood loss were excluded from this study, it is still unknown how these patients respond to a multimodal periarticular injection with Ketorolac. Going forward, periarticular Ketorolac for analgesia following arthroplasty should be assessed for increased blood loss in higher risk patients, and the benefits of its use should be carefully weighed against potential risks on a patient-by-patient basis.

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86026 - CARDIOVASCULAR PERTURBATIONS IN DBS SURGERY - A DETAILED ANALYSIS

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Hemodynamic perturbations can be anticipated in deep brain stimulation (DBS) surgery and may be attributed to multiple factors including patient, disease and procedural related characteristics [1-5]. In addition, the effects of other factors such as laterality of implants and same day of battery placement on hemodynamics are still not known. Acute changes in hemodynamics may produce severe complications such as intracranial bleeding, transient ischemic stroke and myocardium infarction [6]. Therefore, this study attempts to determine the incidence of total hemodynamic perturbances (rate) and related risk factors in patients undergoing deep brain stimulation surgery.

Material and Methods

After institutional approval, all patients undergoing DBS surgery for the past ten years were recruited for this study. Demographic characteristics including patient's characteristics, disease and risks factors characteristics, procedural characteristics and intraoperative hemodynamic changes were noted. Event rate (total hemodynamic perturbations in relation to total anesthesia time) was calculated and the effect of all the variables on hemodynamic perturbations (predefined - bradycardia, tachycardia, hypertension, hypotension and ECG changes) was analyzed by regression model. Standard anesthetic technique was used in all patients.

Results: Data from 79 procedures were included for the final analysis. Among various characteristics noted, male patients (64.6%), Parkinson disease (50.6%), history of smoking (25.3%), hypertension (33%), bilateral electrode placement (73.4%) and same day battery placement (58.2%) were found to be more common variables in their respective groups [Table 1]. Total hemodynamic adverse events during DBS surgery was 10.8 (0-42) and treated in 57 % of cases. Baseline blood pressure including systolic, diastolic and mean arterial pressure was found to have highly significant effect [14 %, 31 % and 19 % greater chance of adverse hemodynamic event per 10 mm Hg increase in value respectively] on intraoperative hemodynamic perturbations [Table 2]. DBP had the greatest impact among all the hemodynamic parameters. Other variables including type of disease, duration of symptoms, number of medications used, type of nuclei stimulated, laterality of DBS implants and battery placement on the same day had no significant effect on hemodynamic perturbations during DBS surgery (Table 3).

Conclusion: This study is the first detailed description of hemodynamic perturbations associated with DBS surgery in relation to all influencing preoperative and intraoperative possible factors. Among all the factors, baseline blood pressure does significantly affect the hemodynamic perturbations and DBP has highest impact on these events.

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86028 - CONTINUOUS SPINAL ANESTHESIA IN A PATIENT WITH AORTIC STENOSIS

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Purpose: General anesthesia is usually advocated in patients with moderate to severe aortic stenosis (AS) for its hemodynamically stable properties[1], however the patient's individual characteristics may require a different anesthetic management. In this case we successfully used a titratable continuous spinal anesthetic technique to manage a patient with chronic obstructive pulmonary disease (COPD), a potentially difficult airway, and moderate AS for a hip fracture repair.

Clinical features: Informed consent was obtained to release this information for publication. An 81 year-old male presented in the ER with a left-sided hip fracture for urgent surgical repair. His past medical history included moderate aortic stenosis with peak/mean gradient 55/32 mmHg and aortic valve area of 1.04 cm^2, COPD and signs of potential difficult airway. After reviewing risks and benefits, we elected to proceed with a titratable continuous spinal anesthesia. The patient remained clinically stable during the 90 minutes of surgery with a stable systolic blood pressure and required only one dose of vasopressor (5 mg of ephedrine) about 15 minutes after spinal was initiated. Patient had a fast and uncomplicated recovery post operatively.

Conclusion: Although the safety of neuraxial anesthesia in patients with moderate to severe AS continues under investigation, the use of a titratable continuous spinal anesthetic technique allowed us to successfully manage a patient undergoing hip fracture repair with multiple complicating factors. Further research regarding the anesthetic technique in patients with AS is warranted to enhance our ability to provide safe anesthetic management that is tailored to the individual patient.

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86029 - PATIENTS' AWARENESS AND KNOWLEDGE OF ANESTHESIOLOGY

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Background: Several international studies have demonstrated a lack of patient awareness regarding the roles and level of education of anesthesiologists both in and out of the operating room and limited understanding of anesthesiologists' roles in patient care [1-4] .The aim of this study is to examine patients' awareness about the medical specialty of anesthesiology. To that end, we have designed a questionnaire to determine patients' knowledge, awareness and opinions of anesthesiologists based on similar national surveys[1-2].

Methods: Following REB approval, we performed a prospective single-center observational study from September 2014 – January 2015. Consenting patients completed a multiple-choice questionnaire prior to elective surgery and before meeting the anesthesiologist. Total percentage scores were calculated and data were analyzed with Fisher's Exact Test. The questionnaire included patient demographics, prior anesthesia history and whether they had received a preoperative anesthesia assessment (PAA).

Results: 247 total patients were polled - 124 males (50.8%), 120 females (48.6%) and 3 (1.2%) unspecified. 149 (60.6%) of patients had a PAA prior to their proposed surgery, and 97 (39.4%) did not. 173 (71.5%) patients recognized anesthesiologists as medical doctors. 100 (44.1%) patients responded the primary role of the anesthesiologist was to assist the surgeon. 132 (58.4%) patients thought the surgeon was responsible for their medical well being during surgical emergencies. Post-operatively patients responded nursing staff is most responsible for: their safe recovery 142 (61.5%), treating nausea and vomiting 126 (55.5%) and pain management 115 (52.3%). Patients that had undergone PAA had a statistically significant improved understanding of addition roles of anesthesiologists outside the operating room.

210 (85.4%) patients had undergone prior surgical anesthesia. 146 (81.5%) patients

recalled meeting their anesthesiologist before surgery and 169(94.9%) were satisfied with their previous anesthesia. Only 90 (51.4%) patients thought their anesthesiologist prepared them for how they would feel post-operatively and 119 (69.2%) felt they had time to ask questions before going to the OR.

Discussion: This study demonstrates that the majority of patients undergoing elective surgery recognize anesthesiologists as medical doctors who have a similar level of training to surgeons. However, patients felt their safety was the responsibility of the surgeon and nurse in medical emergencies. This study demonstrates a need for improved communication in regards to roles of anesthesiologists in patient care.

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86032 - COMPARISON OF THREE METHODS TO PREPARE ZEUS ANESTHESIA MACHINE FOR MHS

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Introduction: To compare three methods of preparation Zeus Drager anesthesia workstation (ZDAnesWS) for malignant hyperthermia susceptible (MHS) patients and perform a cost-effectiveness analysis.

Methods: Ethics Board review was waived for this machine study. Three ZDAnesWSs were used to study the washout profile of the volatile anesthetics (VA) (sevoflurane, isoflurane and desflurane). Each ZDAnesWs was primed with 1.2 MAC for 2 h using fresh gas flow (FGF) of 2 Lpm, adult circuits and ventilatory parameters. VA concentration ([VA]) washout profiles were studied in three groups. G1: change disposables (breathing circuit, soda lime, CO_2 line and water traps) and washout with a FGF of 10 Lpmto reach a [VA] < 5 ppm for 20 min, then FGF was decreased to 3 Lpm for another 20 min to measure peak rebound [VA]. G2: Same as G1 plus replacing the breathing system (BS) with an autoclaved one.[1] G3: Same as G1 but adding two activated charcoal filters (ACF) on the breathing circuit.[2]

Outcomes: 1. Time to obtain [VA] < 5ppm in each group.[3] 2. Peak rebound [VA] after decreasing FGF to 3 Lpm. 3. In G3, peak rebound [VA] after removal of ACF after 90 min. 4. Cost Analyses: Institutional OR per minute and sterilization costs was estimated in U$ 22.00 and U$60.00 respectively.[4,5] Retailer prices for the ZD (U$100,000.00) and BS (U$7,500.00) were depreciated in 7 and 1 years respectively, assuming one MHS case per week. Estimated cost of preparation for one MHS was performed for each group.

Results: Time to [VA] < 5ppm was longest in G1 for all VA (>80 min), followed by G2 (>10 min) and the lowest was G3 (< 1 min) (ANOVA p=0.000) (Fig 1). Rebound effect after decreasing FGF to 3 Lpm with [VA] > 5ppm was found in G1 and G2 (p=0.000). Group 3 demonstrated rebound effect after removing the ACF with [VA] > 10 ppm (p=0.000). There were no significant differences for the time to [VA] < 5ppm or peak rebound [VA] between VA within each group. The cost analysis considered MHAUS recommended options.[6] Cost analysis estimate per group are: G1 U$ 3,148.00, spare ZDAnesWs U$ 1,003.00; G2 U$ 1,042.23 and G3 U$ 389.00.

Conclusions: ZDAnesWs preparation for MHS requires a prolonged washout time. Preparation time seem to be the most important factor in the preparation cost. Charcoal filters seem to be the most cost effective and safe alternative to prepare ZDAnesWs for MHS patients. In order to assure that > 95% of ZD are “VA free” the longest mean washout time per group plus 2 SD should be considered. Sterile BS may require up to 25 min washout time, and only changing disposables 130 min with FGF 10 Lpm washout and during the case.

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86033 - THE ROLE OF ANESTHESIA SIMULATION IN I-MRI GUIDED NEUROSURGERY

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Introduction: Simulation based practices represent a rapidly evolving field for the perioperative care of patients. [1] The role of simulation in neurosurgical anesthesia is still in its infancy and is mainly limited to management of raised intracranial pressure as well as intraoperative rupture of cerebral aneurysms.

We present 2 cases when pre-procedural simulation was used and highlight the practical value of such an approach when initiating a new i-MRI program. We utilized a simulation technique before commencing the real cases. These simulations assisted us in developing a thorough and clear plan of the perioperative management of the patients prior to starting the actual cases.

Cases: We did two simulation (Fig. 1) using a 3-Tesla 3 Tesla IMRISneuro i-MRI. Two of our nurses agreed [written and informed consent obtained] to volunteer. The first session was performed in supine position and the second session was conducted in prone.

Case 1. A right frontal craniotomy was simulated. In the pre-procedural area, a team of anesthetists, nurses, surgeon and an MRI technician checked the patient for presence of metallic implants or other restricted items. The infusion pumps were placed on the patient's right side, and the arterial and venous lines were taped to the participant's left arm to mimic a real case. An endotracheal tube was taped to the patient's cheek. hereafter, the surgeon imitated placement of the Mayfield frame (soft blocks), and the patient was properly padded and draped. and after final verification of the procedure checklist, the magnet was moved in and the simulation was uneventfully completed.

Case 2. A case of posterior cranial fossa tumor requiring prone positioning was imitated. While the magnet was in place and the patient in the prone position, we simulated an emergency situation with activation of a Code Blue to determine how much time would be required to remove the magnet, position the patient supine and initiate advanced cardiovascular life support (ACLS). It took 80 seconds to move the

magnet away from the patient's body so that CPR could be initiated while the patient was still prone. The time required to remove the magnet out of the suite, position the patient supine, attach the defibrillator and deliver the initial shock required almost 2 minutes and 45 seconds. "Restoration of pulse" concluded this unique simulation.

Discussion: In our opinion, simulation creates a real perception of the procedure with minute details that are really important for effective case management in the environment of a high magnetic field. We were able to precisely plan the anesthetic, surgical, and radiological strategies in both simulation cases [2-5].

We assessed the feasibility and implications of performing CPR in the i-MRI suite in the presence of a magnetic field. From the second simulation case, we have learnt that it is feasible to apply chest compression within short duration of time (within few seconds) till the magnet is being moved away up to the head of the patient.

Conclusion: These simulations assisted us to refine the procedural checklist, develop procedures for urgent situations and develop the skills required for effective management of patients undergoing MRI-guided neurosurgical interventions.

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86036 - PHARMACOKINETICS OF ROCURONIUM IN LIVER TRANSPLANTATION SURGERY

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Background: Despite tremendous advancements in the management of liver transplantation (LT), there is no precise method to assess the function of transplanted organ. Transplant organs come from either Deceased Donors (DD) or Living Donors (LD). The metabolic activity of the donor organ depends on the size of the donor organ and the amount of donor organ damage as a result of cold or warm ischemia. In the case of DD and LD, their influences on liver function are quite different. Our objective was to investigate whether pharmacokinetic (PK) of two anesthesia drugs routinely used during LT [i.e. Rocuronium (ROC) and Tranexamic acid (TXA)] could serve as a marker to evaluate the function of transplanted livers. ROC was considered because it is metabolized partially by the liver, and TXA was chosen since it is eliminated exclusively by the kidney.

Methods: Following REB approval and written informed consent, 22 consecutive patients scheduled for LT were recruited. Patients were divided into two groups: DD (n=13, assuming 1500 g liver) received cadaveric livers, and LD (n=9, 672±89 g liver) received living livers. Immediately prior to reperfusion of the transplant organ, all patients were given 0.6 $mg \cdot kg^{-1}$ of rocuronium (ROC). Tranexamic acid (TXA) was given as 1 g bolus at the beginning of LT followed by 10 $mg \cdot kg^{-1} \cdot h^{-1}$ for 2 h. Blood samples for PK analysis were collected at baseline and at 5, 30, 60, 180, 300, 420 and 540 min post TXA bolus, at 15, 120, 240, 360 min and 24 h after discontinuation of TXA infusion, and at 5, 30, 60, 90, 120, 180, 240, 300 and 450 min post ROC bolus. The plasma concentrations of TXA and ROC were measured by solid phase microextraction (SPME)-based extraction and liquid chromatography mass spectroscopic (LCMS) analysis as described previously[1,2]. PK analysis was conducted using a PKPD modeling software, ADAPT5® (BMSR version 5, USC).

Results: After bolus of ROC, biexponential decay profiles fit a two-compartmental model, revealed a significant difference in ROC clearance (CL). Patients from DD transplant group had a significantly lower CL (0.157±0.050 $mL \cdot min^{-1} \cdot g^{-1}$ liver) compared to those from LD transplant group (0.265 ± 0.148 $mL \cdot min^{-1} \cdot g^{-1}$ liver), values comparable to those (0.21-0.31 $mL \cdot min^{-1} \cdot g^{-1}$ liver) in healthy subjects[3]. By contrast, there was no difference in TXA CL (1.05±0.50 vs. 0.965±0.38 $mL \cdot min^{-1} \cdot kg^{-1}$; $P > .05$) or distribution volume (503±71 vs. 467±57 $mL \cdot kg^{-1}$; $P > .05$) between two groups. Baseline creatinine concentrations (81.8±46.7 vs. 89.6±19.7 μM) and creatinine clearance (103.6±34.7 vs. 83.2±20.0 $mL \cdot min^{-1}$) for LD and DD transplants were not significantly different ($P > .05$), suggesting normal renal function in both groups.

Conclusions: ROC CL was lower in DD than in LD transplant group which may indicate differences in the metabolic capacity of the donor organ immediately after reperfusion. In contrast, there was no difference in TXA metabolism which suggests there is no difference in renal function between the groups. Differences in the ROC metabolism may be used to assess immediate liver function.

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86039 - DIFFERENT STOP-BANG SCORES FOR OSA PATIENTS IN VARIOUS POPULATION.

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Introduction: The diagnosis of patients with suspected obstructive sleep apnea (OSA) is important because of the increased risk of perioperative complications. Polysomnography (PSG) - the gold standard for diagnosis of OSA - is time consuming and costly. The STOP-Bang questionnaire is a validated screening tool for obstructive sleep apnea.[1] We conducted this systematic review and meta-analysis to compare the effectiveness of different STOP-Bang scores to screen OSA patients in the sleep clinic and surgical population.

Methods: A search of the literature databases MEDLINE (from 2008 to April 2014), Medline-in-process & other non-indexed citations (up to May 2014), Embase (from 2008 to May 2014), Cochrane Central Register of Controlled trials (up to May 2014), Cochrane Databases of Systematic Reviews (from 2008 to march 2014), Google Scholar, Web of Sciences (from 2008 to August 2014), Scopus (2008to August 2014) and PubMed (from 2008 to August 2014) was carried out. The search yielded 340 citations. Irrelevant papers were excluded by title and abstract review, leaving 46 manuscripts. Inclusion criteria were: 1) Studies that used different STOP-Bang scores as a screening tool for OSA in adult subjects (>18year); 2) The accuracy of the STOP-Bang questionnaire was validated by polysomnography - a gold standard for diagnosing OSA; 3) OSA was clearly defined as apnea/hypopnea index (AHI), respiratory disturbance index (RDI) ≥ 5; 4) Publications in English language. Validity criteria assessing internal and external validity were explicitly described and coded according to Cochrane Methods group on screening and diagnostic tests. Statistical analysis was carried out using the Review Manager 5.3 software. The data about predictive parameters were pooled.

Results: Six studies (n=2807) qualified for the data collection to pool the predictive parameters of each STOP-Bang score cut-offs for the different AHI levels.[2-7] Out of which four studies (n=1980) were from the sleep clinic population[2-5] and two studies (n=827) from the surgical population.[6, 7]

In the sleep clinic population, as the STOP-Bang score increased from 1 to 8, the specificity and positive predictive value (PPV) increased continuously from 1% to 100% and 88.7% to 100% for all OSA (AHI ≥5); 1% to 100% and 67.5% to 95.1% for moderate-to-severe OSA (AHI ≥15); and 1% to 100% and 41.7% to 85.7% for severe

OSA (AHI ≥30) respectively (Table 1A). On the other hand in the surgical population, as the STOP-Bang score increased from 1 to ≥7/8, the specificity increased from 3% to 98% and the PPV increased from 68.6% to 81.6% for all OSA (AHI ≥5); 7% to 95% and 40% to 36% for moderate-to-severe OSA (AHI ≥15); and 2% to 97% and 18% to 32% for severe OSA (AHI ≥30) respectively (Table 1B).

Conclusion: The lower STOP-Bang score showed high sensitivity and NPV, while a higher STOP-Bang score showed higher specificity and PPV for all severities of OSA in the sleep clinic and surgical population.

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86044 - DIFFICULT NASAL INTUBATION DUE TO A PROMINENT ANTERIOR TUBERCLE OF C1

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Introduction: This is a case report of an unanticipated difficult nasal intubation due to a prominent anterior tubercle of C1 resulting an aspiration of blood and hypoxemia following intubation.

Methods: The information for this case report was obtained from the electronic health record as well as interviewing the parties involved.

Results: A healthy 17 year old female received a general anesthetic for an elective Lefort with bilateral saggital split osteotomy requiring a nasotracheal intubation. After an unremarkable induction of general anesthesia, an attempt was made to insert a nasotracheal tube (NTT). Several attempts to insert the NTT through both nostrils were unsuccessful and blood was observed in the pharynx. Nasotracheal intubation was eventually successful after several attempts.

Unfortunately, there was a decrease in air entry on the right chest and a decrease in oxygen saturation (low 90s) An intraoperative chest x-Ray showed right upper lobe atelectasis consistent with aspiration of blood. The operation was cancelled and the patient was awoken without difficulty and admitted to the hospital for observation. A review of the lateral x-ray of the head and neck of the patient showed a prominent anterior tubercle on C1. She returned for her operation 3 months later. To facilitate the advancement of the NTT over the prominent anterior tubercle on C1 under general anesthesia, the anesthesiologist placed the left index finger in the nasopharynx and lifted the tip of the NTT over the prominent anterior tubercle. The NTT was then advanced into the tracheal under indirect vision using a CMAC (Storz) without any difficulties or trauma. The surgical procedure was completed without any difficulties.

Discussion: Difficulty in advancing a NTT into nasopharynx during nasal intubation may be associated with a prominent anterior tubercle of C1. A number of methods may be used to circumvent this obstacle. These include: (1) The left index finger of the practitioner can reach into the nasopharynx in order to palpate the tip of the nNTT which can then be lifted anteriorly by finger or pushed to one side and gently advanced past the prominence; (2) Insertion of a pediatric tube exchanger or a cut nasogastric tube

through a nasal airway. This smaller caliber catheter may help to get around the prominent tubercle of C1 so that the NTT can then be easily advanced over the prominent anterior tubercle of C1; and (3) The use of the Endotrol tracheal tube which can provide directional control of the tube tip with the plastic ring on the Endotrol tube.

86061 - PHARMACOKINETICS AND PHARMACOGENOMICS OF ORAL OXYCODONE IN CHILDREN

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Introduction: Oxycodone is among the most commonly used opioid for postoperative pain control. Studies have demonstrated marked variation in the pharmacokinetics (PK) of oxycodone among pediatric population. The principal metabolic pathway of oxycodone is N-demethylation via enzyme Cytochrome P450 3A4 (CYP3A4) to generate inactive noroxycodone. However, 11% is O-demethylated by CYP2D6 to become oxymorphone, the active and potent metabolite that exhibits about 40 times the affinity and 8 times the potency on μ-opioid receptors compared to the mother substance. Frequencies of cytochrome P450 2D6 (CYP2D6) enzyme phenotypes for the Caucasian population are: poor metabolizers 5 – 10%, intermediate metabolizers 65–90%, and ultra-rapid metabolizers 5 – 10%. Ultra-rapid metabolizers may be at risk for serious side effects in the commonly prescribed dose. Understanding oral oxycodone pharmacokinetics and pharmacogenomics favors safe and effective use of this analgesic in a wide variety of pediatric surgical patients. There is little information of oral oxycodone pharmacogenomics and its metabolites in pediatrics. The aim of this study is to characterize the population PK of oxycodone and its metabolites (oxymorphone, noroxymorphone and noroxycodone) with specific respect to the pharmacogenomics.

Methods: This prospective cohort, single-center trial is approved by the hospital investigational review board. A total of 40 opioid-naive children, aged 0-6 years, scheduled for in-patient surgery, will be consented. Blood samples will be collected for the assay oxycodone and its main metabolites at specific time intervals and for CYP3A4 and CYP2D6 genotype. Oxycodone, oxymorphone, noroxymorphone and noroxycodonel levels at 10 time points will be assayed using LCMS (liquid chromatography- mass spectrometry) and single-dose Pharmacokinetics (PK) metric determined. CYP2D6 genotype will be determined to identify the ultra-rapid metabolizers.

Results: The preliminary analysis of 10 patients reveals an interpatient variability similar to that previously reported (1,2) (Figure 1). Some patients have a very short onset of

absorption with Cmax up to 10ng/mL, while others exhibit a lag time for absorption of at least 4h with peak concentrations under 4ng/mL. Although so far all these patients exhibit similar CYP3A4 expression, these differences in oxycodone plasma concentrations seem to agree with their CYP2D6 expression differences. Plasma concentrations using 250 mL of whole blood were analysed with state-of-the-art pharmacokinetics software.

Discussions: These preliminary results strongly suggest the paramount role of CYP metabolism in the systemic concentrations of oxycodone, and hence the need for its consideration in the dosing optimization of the drug.

Figure 1: Differences in onset of absorption and magnitude of oxycodone concentrations relative to CYPs 3A4 and 2D6 expression

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86063 - INTERNATIONAL WEB-SURVEY ON ARTERIAL LINE PLACEMENT IN PEDIATRICS

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Introduction: Arterial catheters are routinely used during major surgeries and in critically ill patients for continuous hemodynamic monitoring and blood samplings. Rare but serious complications can occur, with higher incidence in neonates and infants[1].

Specific recommendations for primary sites of insertion, alternative sites, insertion techniques and maintenance are lacking, as well as recommendations to manage failures/potential complications.

The aim of this survey was to describe the clinical and technical approach to arterial cannulation among pediatric anesthesiologists of Canada, United States, Great Britain and Italy.

Methods: After local ethics committee approval, a 26-items web questionnaire was designed according to guidelines previously published for websurvey[2]. Participants were asked to provide information regarding country of practice, academic position, years of experience, arterial cannulation preferences (preferred insertion sites, techniques, use of ultrasound), solutions used for maintenance and troubleshooting management. Three clinical neonatal scenarios were designed to adress certain technical and decisional aspects. Interviewer were contacted by theirs society of affiliation (CPAS, SPA, APAGBI and SARNePI). Descriptive statistic has been used for preliminary analysis.

Results: Most respondents are staff (93%), 52% full-time pediatric anesthesiologists, 56% work in a pediatric university hospital and 58% have > 10 years of experience. The radial artery represents the overall primary site in 88%. Clinical scenarios, answers regarding use of ultrasound and troubleshooting management are reported in Fig. 1.

In summary, 78% of the interviewers use intravenous catheters for radial artery cannulation. For femoral cannulation, 33% of providers use 3 F catheters or bigger. Most of respondents (75%) do not have guidelines for cannulation and do not assess

collateral perfusion prior radial/ulnar cannulation, and prefer landmarks/palpation to 2D ultrasound (20%).

Overall reported complications rate is 24%. The most common complications were temporary occlusion (42%), hematoma (33%) or thrombosis/embolism (12%).
In children < 10 kg, the keep Artery Opened (KAO) regimen was heparin 1Ui/ml in 42% and normal saline in 32% of the cases; 4% uses pressure bags.

Discussion: This preliminary analysis shows a relative uniformity of practice among experienced pediatric anesthesiologists, who declared having high success rate and low morbidity with traditional techniques. Radial is still the preferred site, despite axillary and brachial accesses have shown to carry similar risks[3].

2D ultrasound is mostly limited as a rescue technique, although data indicates high first attempt success rate and shorter cannulation time[4]. Few responders use pressure bags, which carry risk of serious complications[5].

On note, 33% of responders cannulate the femoral artery with big size catheters, which correlate to risk of thrombotic complications[6].

Conclusion: Further analysis between countries and regions, as well as group of responders (years of practice/experience and position) may give more insight into arterial line placement management but will require completed data and is not yet possible.

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86072 - COMPARISON OF USG VS LANDMARK TECHNIQUE FOR IL/IH BLOCK IN CHILDREN

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Introduction: Ultrasound guided IL/IH nerve block is gaining popularity for pediatric groin surgery with success rate more than 95 % in experience hand. However, despite the benefits , the absence of ultrasound machine should not hinder the provider from performing an IL/IH nerve block, considering that many institution are not able to afford an ultrasound machine. The main aim of this study was to assess the accuracy of needle tip in anatomical landmark technique and to compare the efficacy and success rate of IL/IH nerve block using ultrasound guidance and anatomical landmark technique.

Methods : Ethics committee approval was attained and 40 children (1-8 yrs) posted for inguinal hernia day care surgery were divided into 2 groups, group A (ultrasound) and group B (anatomical landmark). Following induction of general anesthesia, group A received IL/IH nerve block under ultrasound guidance. Group B received IL/IH nerve block using conventional landmark technique and ultrasound scan was done to assess the accuracy of needle tip before injecting the LA. The distance of needle tip from IL/IH nerve and plane of needle tip were recorded and LA were injected irrespective of the position of needle tip. 0.5% ropivacaine (0.25ml/kg) were used in both groups with maximum volume of 5 ml. Perioperative opiod requirement and duration of analgesia were recorded.

Results : IL/IH were visualized in all 40 Patients . The success rate was 90 % in group A and 60% in group B. Needle tip were seen between internal oblique and transverse abdominis in all 20 patients (100%) in group A and in 15 patients (75%) in group B. The duration of analgesia (p= 0.025) and intra-operative (p= 0.029) and post-operative (p= 0.019) opiod consumption were significantly lesser in the group A. In group B, needle tip was placed in internal oblique muscle in 2 patients, external oblique/internal oblique plane in 1 patient , transverse abdominis muscle in 1 patient and peritoneum in 1 patient.

Conclusion : Ultrasound guided IL IH nerve block is superior to anatomical landmark technique for IL/IH nerve block in terms of efficacy and success rate. However , in case of non availability and lack of experience in handling ultrasound machine, landmark-based technique can be used with lesser success rate for IL/IH nerve block for day care inguinal hernia repair.

86081 - BRIEF MIDAZOLAM EXPOSURE PERSISTENTLY INCREASES TONIC GABA CURRENT

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Introduction: Anesthetics and sedatives are administered to over 234 million patients each year to allow them to tolerate surgery[1]. Unfortunately, many patients experience memory deficits that persist long after the anesthetic has been metabolized[2]. It was previously shown that the GABAergic anesthetics isoflurane and etomidate cause long-term memory deficits in animal models[3]. However, it is unclear whether benzodiazepines and non-GABAergic anesthetics also cause persistent memory deficits. Anesthetic-induced memory deficits have been attributed to a persistent increase in tonic current mediated by γ-aminobutyric acid type A ($GABA_A$) receptors[3]. Specifically, brief exposure to etomidate was shown to increase tonic GABAergic current in neuronal culture and *ex vivo* brain slices as well as induce memory deficits in mice 24 h after treatment[4]. The goal of this study was to determine whether the benzodiazepine midazolam, the non-GABAergic anesthetic ketamine, and the endogenous agonist GABA also trigger a persistent increase in tonic current

Methods: This study was approved by the local ethics committee. Whole-cell voltage clamp techniques were used to record tonic currents from cultures of hippocampal neurons and neuron-astrocyte co-cultures. Cells were treated with midazolam (200 nM), ketamine (300 μM), GABA (0.5 μM) or vehicle for 1 h and currents were recorded from hippocampal neurons 24 h later. All data are expressed as mean ± SEM and were analyzed by Student's *t*-test or ANOVA when appropriate ($p < 0.05$).

Results: Midazolam increased tonic GABAergic current by 44% 24 h after treatment (Control: 0.9±0.3 pA/pF; Midazolam: 1.3±0.6 pA/pF). In contrast, ketamine and GABA alone had no effect on tonic current (Control: 1.3±0.5 pA/pF; Ketamine: 0.9±0.3 pA/pF GABA: 1.3±0.3 pA/pF).

Discussion: This is the first evidence that midazolam, but not ketamine, causes a persistent increase in tonic GABAergic current. Considering the widespread use of benzodiazepines, this finding could have significant clinical implications for long-term memory loss after sedation.

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86103 - PHARMACOKINETICS OF TRANEXAMIC ACID IN PEDIATRIC SCOLIOSIS SURGERY.

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Background: Tranexamic Acid (TXA)is a potent Antifibrinolytic, which is efficacious at decreasing blood loss and transfusion of blood products in pediatric cardiac, craniofacial and orthopedic surgery. To date conclusive evidence from a well-designed trail is lacking to support it's efficacy in Adolescent Idiopathic Surgery. The primary aim of this study is to determine if tranexamic acid is efficacious in this setting. Secondary aims are to determine the pharmacokinetic profile of Tranexamic acid in this specific group.

Methods: This prospective study randomized double blind study will enroll 120 children and adolescents ages undergoing scoliosis repair with the diagnosis of idiopathic scoliosis. This initial report will define the pharmacokinetic (PK) profile of TXA in children and adolescents will be determined and therefore the optimum dose will be predicted. These results are part of a larger efficacy and safety trial.

Results: With local institutional board approval and patient/parent consent; we have recruited 79/120 patients to date. We have completed an interim pharmacokinetic analysis of our plasma levels in 34 patients in the treatment group receiving tranexamic acid; 50 mg/kg loading dose and 10 mg/kg/h infusion for the duration of the surgery. The study investigators have remained blinded. Plasma samples were assayed for the drug with a validated LC/MS methodology. All plasma levels of TXA are above the recommended lowest therapeutic concentration to inhibit fibrinolysis. The highest concentrations reached at the end of the loading dose averaged 226 ug/mL (min=151; max=318). During the constant rate infusion till the end of the surgery, steady state concentrations were achieved, averaging 82 ug/mL (min=47; max=139). Post-infusion the concentrations decayed exponentially with a terminal half-life of 2.1 h (min=1.1; max=2.7). Interpatient variability is less that 20%, not yet factoring any demographic

covariates. Based on previous experience and published information, a population analysis upon full enrollment will certainly shrink this variability based on expected covariates, such as patient's body weight. The TXA plasma ccn vs time graph is presented in Figure 1. This raw data will be further analyzed to determine the population Pk parameters for TXA, devise a model to predict and recommend the lowest therapeutic dose of TXA for adolescents having AIS surgery; in a similar fashion to our previous report (1).

Discussion: This is the first report of the pharmacokinetic profile of tranexamic acid in children undergoing idiopathic scoliosis surgery. We will develop a model to predict the lowest optimum therapeutic dose for this patient population.

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86105 - PREDISPOSING FACTORS OF EMERGENCE AGITATION IN PEDIATRIC ANESTHESIA

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Introduction: Perioperative identification of children at risk of poor post-anesthetic outcome allows the anesthesia team to use appropriate intervention or prevention measure to reduce the incident of poor outcome, thereby enhancing the quality of the anesthetic experience. We defined one aspect of poor post-anesthetic outcome among pediatric anesthesia practice as the presence of emergence agitation. We conducted a prospective observational study to identify perioperative factors predictive of post-anesthesia agitation in children. In the last two years all patient encounter information for patients undergoing anesthesia in our institution has been placed in electronic format. Our research group has taken this information and added supplemental information on the preoperative temperament of children as well as their post-operative behavior, to create a comprehensive anesthesia outcomes analysis database for children undergoing selected surgeries.

Methods: After IRB approval and informed parental consent, we conducted a single-center prospective observational cohort study in 613 patients from age 2–21 years, undergoing a defined set of surgical procedures between August 2013 and May 2014. Preoperative factors included age, gender, weight, The American Society of Anesthesiologists physical status (ASA) classification, history of delayed development, baseline behavior and type of surgery. We also collected information about patient compliance during mask induction (using the Induction Compliance Check list (ICC)), anesthetic agent used and post-anesthetic parental satisfaction score. We defined poor pain control as high level pain (scores of 7 or more) in post-anesthetic care unit (PACU) and agitation as high Pediatric Anesthesia Emergence Delirium (PAED) scale score in PACU (score of 10 or more last longer than 10 minutes). A multivariable ordinal logistic regression model was generated and the performance of the multivariable model was evaluated by the *c* statistic.

Results: Among the 592 patients with pain data, 159 (26.9%) had high-level pain (scores of 7 or more for more than 10 minutes).[JU1] Among the 429 patients with agitation data, 170 (39.6%) had high agitation score (scores of 10 or more) (95% confidence interval: 35-44%). Testing all patients by multivariate logistic regression modeling revealed that only age between 2-6 years (adjusted odds ratio (OR): 2.8, 95%

CI: 1.7-4.4, P < 0.001) and tonsillectomy and adenoidectomy surgery (TNA) (adjusted OR: 3.2, 95% CI: 2.0-5.1, P < 0.001) were an independent predictor of agitation. When evaluating *first 410* patients by multivariate logistic regression modeling high PAED score was independently related to high-level pain (OR: 4.3, 95% CI: 1.6-11.5, P = 0.003). There was no correlation between emergence agitation and post-hospitalization behaviors or family satisfaction.

Discussion: Our observational results show a relationship between age, TNA surgery, high-level pain and emergence agitation. The use observational data has been associated with helpful outcome analysis and results have been shown to correlate with Randomized Controlled Trials.

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86106 - INTRATHECAL INFUSION FOR PAIN IN ELDERLY AND MALIGNANCY - CASE REPORTS

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Introduction, Achieving effective, durable, and safe pain relief, especially in the older adults and end stage malignancies, can be a clinical challenge[1]. We present an alternative method, based on time-limited intrathecal infusion of an analgesic mixture.

Method, Three old patients (64-94 y/o), admitted in hospital for intractable pain due to metastatic malignancy or fracture, became candidate. We obtained an**informed consent from the patients.** An intrathecal catheter 20G was placed by percutaneous approach while tunneled subcutaneously and fixed to skin. A preservative-free mixture of bupivacaine 1mg/ml, naloxone 0.02 ng/ml, ketamine 100 microg/ml, morphine 0.01 mg/ml and clonidine 0.75 microgram/ml was infused by an external pomp with a rate of 1-2 ml/h that was decreased during the following days due to patients' requirement. Mixture stability was assessed during five days.
Results, In all patients, pain was successfully controlled without any major complication such as lower limb muscles weakness, sphincter dysfunction, constipation and cognitive or mood dysfunction. In two patients, catheter was removed after four weeks before leaving hospital. (In one of them, catheter was infected on the fourth week following an urinary infection so it was removed. Infection was treated and cured completely. In the second patient, it was removed following complete pain control). In the third one with cancer, the catheter was kept in place up to five months out of the hospital under the supervision of a family physician. The patient then died of his cancer.

Discussion, The evidences show better result for intrathecal approach in comparison to epidural (2B+ and 2C+ respectively[2]). Morphine, clonidine and bupivacaine have been widely used by intrathecal way[3]. Naloxone in ultra low-dose helps controlling pain and prevents from hyperalgesia by multiple mechanisms[4,5]. Ketamine has an analgesic and anti-hyperalgesic effects via NDMA receptors. It could be used as intrathecal approach in end-stage cancer related pain. Our doses are much less than what have been already recommended[3] (Table-1). Regarding to very low concentration of drugs, absorption and systemic effect could not explain analgesic effect of the mixture. Synergic effect and different mechanisms of action by spreading in cerebrospinal fluid could explain sufficient analgesic effect of the mixture.

Conclusion, Short-term intrathecal infusion could be considered as an alternative method in advanced-age and end-stage malignancy pain management. The advantages of this method are better pain control and because of lower prescribed

doses, less systemic side effects. Further studies are required in order to determine the type of mixture and related doses for the best pain-control conditions with the least side effects.

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86111 - ERYTHROPOIETIN IN REFRACTORY PAIN AFTER CERVICAL SPINAL CORD INJURY

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Introduction: Erythropoietin has shown some promise in preclinical laboratory animal models of spinal cord injury. Erythropoietin has anti-inflammatory, neuroprotective and neurogenesis effects. We report a case of postoperative spinal cord injury with refractory pain that responded well to Erythropoietin.

Case presentation: Informed patient consent was obtained. A 42-year-old female patient presented with gait instability and progressive weakness in her right leg over a 6-year period. She was diagnosed as myelomalacia, and was candidated for cervical discectomy. After surgery, she suffered from right hemiplegia due to spinal cord injury. On second postoperative day, she complained of severe neuropathic pain in her right extremities. She was treated with Pregabalin and opioid analgesia. Lidocaine 75 mg/h/IV-infusion, N-Acetyl-Cysteine 600 mg/PO-BID, Ketamine 5 mg/PO-BID, and Naloxone 1 mg/PO-BID were started by the Pain-Service the sixth postoperative day. The next day, the pain was as before, so Erythropoietin (Aranesp 100 mcg/day SC three days) was added. The patient recovered progressively after Erythropoietin therapy.

Discussion: Based on patient's history, her pain did not respond to routine medications. After adding Erythropoietin the pain resolved progressively. The authors suppose that, the Erythropoietin played an important role in improvement of patient's problems. Following spinal cord injury, vascular disruption and ischemia ensue with a pathological cascade; Swelling and edema secondary to released inflammatory substances jeopardize regional blood flow leading to apoptosis and necrosis (figure 1) EPO induces a broad range of cellular responses in the nervous system which could protect and accelerate the healing process (Table 1). EPO has neuroprotective effects in *in vitro* models of trauma, hypoxia and hypoglycemia[2]. It protects ischemic cells from oxidative damage, prevents neuronal apoptosis, and attenuates necrotic cell death[3,4]. EPO also prevented excitotoxicity in neuronal cultures. The other tissue-protective mechanisms of EPO are its abilities to stimulate vascular endothelial growth factor secretion, increase angiogenesis, and protect vascular integrity[5]

. Moreover, Erythropoietin stimulates vascular endothelial growth factor secretion, axonal regrowth, and dendritic sprouting[4]. In addition, EPO regulates neurotransmitter synthesis, release, and intracellular calcium[2]
. EPO reduces inflammation by decreasing inflammatory cytokines, by attenuating reactive astrocytosis[2,4]
. Recent studies suggest that erythropoietin should be given as single high dose to exert a rapid neuroprotective effect[5]. Although a high single dose of EPO does not show any hematopoietic side effects, other adverse consequences of Erythropoietin should be evaluated in clinical trials.

Results and Conclusion: This Case-Report draws the attention on the beneficial role of Erythropoietin in pain control, and neuron recovery. Future studies are required.

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86119 - IMPROVEMENT OF HEARING LOSS FOLLOWING EPIDURAL BLOOD PATCH

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Introduction: Hearing loss may complicate spinal anaesthesia with a reported incidence ranging between 0.4-40%. Hearing loss relates to the degree of CSF leak and varies with size and type of needle used [1]. The association of hearing loss and Post Dural Puncture Headache is less well described. The aim of this study is to investigate the incidence of hearing loss and the improvement after epidural blood patch.

Methods: Appropriate ethical approval was obtained for this study. One hundred and ten patients who had symptoms of severe post dural puncture headache following accidental dural puncture with a 16G Touhy needle were recruited for a prospective observational study. Patients were excluded who could not co-operate with audiometric testing. Patient characteristics and symptoms were recorded. Each patient was evaluated by an audiologist and tested on the same audiometric equipment. Audiometry was performed in the sitting position one hour before and 24 hours after epidural blood patch. Results were analysed by students T-test, and the hearing threshold was considered to have changed if the difference between the two tests was at least 10dB in the same direction at two or more frequencies.

Results : Thirty four patients spontaneously complained of hearing loss. On direct questioning 91 of the 110 patients felt that their hearing was impaired post dural puncture. Statistical analysis of the Audiometric data showed a significant improvement in Audiometry post epidural blood patch ($p < 0.0001$) in the low frequency range (< 1000Hz). 86 of the 110 patients had an improvement of ≥ 10dB at two points in the low frequency range post epidural blood patch. All patients who had complained of hearing loss felt it had returned to normal levels post epidural blood patch.

Discussion : The mechanism of hearing loss associated with dural puncture is thought to be transmission of reduced CSF pressure to the inner ear by the cochlear aqueduct, an anatomical connection between the subarachnoid space and inner ear present in most individuals. Alteration in inner ear pressures distorts the basilar and vestibular membranes and auditory hair cell function[2].

This study would suggest that hearing loss after accidental dural puncture may be more

common than appreciated, and that audiometric testing may have a future roll in diagnosis and management of this problem.

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86136 - BURST SUPPRESSION WITH PROPOFOL ANESTHESIA IS LESS COMMON IN CHILDREN

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Introduction: Burst suppression (BS) is a feature of the electroencephalogram (EEG), in which electrical bursts alternate with isoelectric periods. It can be identified with clinical monitors that use a processed EEG to measure depth of hypnosis. Deep anesthesia is a predictor of postoperative mortality [1], especially in combination with low blood pressure and low anesthetic concentrations [2]. BS is associated with deep anesthesia [3] and one recent report found that BS was a significant predictor of postoperative mortality when it was coincident with low blood pressure during anesthesia [4]. However, the incidence, mechanism, and consequences of BS are poorly understood [5]. One recognized predictor of BS in adults is advanced age [5], but its incidence in children requires further study. The aim of this analysis is to evaluate EEG data we have collected during two recent studies of closed-loop controlled anesthesia to identify BS in children and adults undergoing propofol anesthesia.

Methods: Two investigational trials were conducted with Health Canada authorization, ethical approval and written informed consent. The cohort of study 1 comprised 102 children aged 6-17 years, ASA I-II, undergoing gastrointestinal endoscopy. Study 2 involved 82 adults aged 22-82 years, ASA I-III, undergoing elective surgery. In both studies, induction and maintenance of anesthesia was closed-loop controlled with propofol administered according to a EEG feedback measure (WAV_{CNS}) obtained from the NeuroSENSE monitor (Neurowave, Cleveland, OH), which calculates a Burst Suppression Ratio (BSR) based on the proportion of EEG epochs with BS over the previous minute.

Results:Median [IQR] of the overall lowest WAV_{CNS} observed during anesthesia was 36.4 [32.5, 39.1] in study 1, and 21.8 [14.9, 32.2] in study 2 (Figure 1). Only 2/102 (2%) children had BSR>0 (maximum BSR 5% for ≤2.5% of case duration). Both were 15 year old, ASA I males. In contrast, 60/82 (73%) of adults had BSR shortly after induction of

anesthesia and 39/82 (48%) had BSR at some point during maintenance of anesthesia. In the adult sample, a positive correlation between age and percent of case with BSR>10 (r_s = 0.425, p < 001) was observed.

Discussion: Differences in protocols and procedure types prevent direct comparison of these datasets: in study1, stimulation began immediately after induction of anesthesia, which may decrease BSR [6]; in study 2, intubation was followed by a period of unstimulating surgical preparation. Nonetheless, very little BS was detected in our pediatric sample, despite low WAV_{CNS} values. Our adult sample was much more prone to BS, and our data agree with the observation that age is a significant risk factor for BS during anesthesia [5], suggesting that BS is not simply a byproduct of deep hypnosis. The large variability in individual BS levels suggest further studies are required to elucidate the causes and effects of BS during anesthesia.

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86139 - A MULTI-FACETED PERIOPERATIVE TOBACCO INTERVENTION VS. BRIEF ADVICE

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Introduction: Intensive perioperative smoking cessation interventions increase abstinence[1,2] and reduce complications.[3] However, the American Society of Anesthesiologists and the Canadian Anesthesiologists' Society suggest brief advice and referral to Smokers' Helpline. The efficacy of this approach on abstinence is unclear. The objective of this study was to determine the efficacy of a multi-faceted intervention vs. brief advice and self-referral to Smokers' Helpline on abstinence in patients undergoing elective surgery.

Methods: Approval was obtained from the REB of two participating institutions and informed consent was obtained from all participants for this multi-centred, randomized controlled trial. A total of 296 patients were randomized to receive either: 1) multi-faceted intervention (a standardized 10-15 min counseling session by anesthesiologists trained to provide smoking cessation interventions, varenicline for 3 months, and a fax referral to Smokers' Helpline); or 2) standardized brief advice (< 5 min) by anesthesiologists trained to provide smoking cessation interventions and provision of the Smokers' Helpline number for self-referral. The primary outcome was biochemically (urine cotinine) confirmed 7-day point prevalence abstinence at 12 months. Secondary outcomes included: 7-day point prevalence abstinence at 1, 3, 6 months. An intention-to-treat analysis was performed. Chi-square test or Fisher's exact test (for categorical variables) and unpaired Student *t* tests (for continuous variables) were used. Multivariable logistic regression was performed to identify independent variables related to abstinence. $P < 0.05$ was considered statistically significant.

Results: Demographic variables were similar between the two groups, except the nicotine dependence was higher in the multi-faceted intervention group vs. the brief advice group (Fagerstrom test-score 4.99±2 vs. 4.37±2, $p < 0.01$). The 7-day point prevalence abstinence at 12 months for the multi-faceted intervention vs. brief advice was 46.6% vs. 29.2% ($p < 0.01$). At 1, 3, and 6 months, the 7-day point prevalence

abstinence was 51.1% vs. 24.8% ($p < 0.01$), 53.3% vs. 28.2% ($p < 0.01$), 50.8% vs. 29% ($p < 0.01$), respectively (Figure). The rate of quitline contact was 78.8% vs. 8.3% ($p < 0.01$) in the multi-faceted intervention group vs. the brief advice group. The multi-faceted intervention was associated with higher abstinence at 1, 6, 12 months (OR 2.0; 95% CI 1.02-3.92, $p < 0.05$, OR 1.9; 95% CI 1.12-3.20, $p=0.02$, OR 2.1; 95% CI 1.22-3.54, $p < 0.01$), respectively. Smokers' Helpline utilization was associated with abstinence in both groups at 1, 3, 6 months (OR 2.1; 95% CI 1.06-4.26, $p=0.03$, OR 4.8; 95% CI 2.23-10.22, $p < 0.01$, OR 7.7; 95% CI 1.66-35.31, $p < 0.01$), respectively.

Conclusion: Our study confirms that multi-faceted perioperative smoking cessation interventions more effectively increase both long-term and short-term abstinence compared to brief advice. Nonetheless, the quit rate in the brief advice group was still higher (29.2%) than the spontaneous unassisted quit rate of 4-7% in the general population.[4]

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86143 - USE OF BED-SIDE ULTRASONOGRAPHY TO DIAGNOSE IATROGENIC PNEUMOTHORAX

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Introduction: Point of care ultrasound is becoming more common place in the critical care and peri-operative setting. Ultrasound can now be used for the rapid diagnoses of numerous evolving clinical phenomena like pneumothorax. Ultrasound is an attractive modality due to its relative portability, speed of acquisition, and real-time imaging. This report describes the utilization of ultrasound to diagnose an iatrogenic pneumothorax intraoperatively following the placement of a central venous catheter.

Clinical features: Following patient consent we report on a 52 year old female who presented for a choledochectomy and biliary reconstruction following a 3 month history of obstructive jaundice associated with significant weight loss. Following the induction of general anesthesia, a central venous catheter (CVC) was sited in her right internal jugular vein. Shortly following the placement of the CVC, there was a decrease in oxygen saturation, and diminished breath sounds over the right hemi-thorax. While waiting for an intraoperative chest x-ray (CXR), point of care ultrasound demonstrated an absence of lung sliding. From this information a diagnosis of pneumothorax was made. This was subsequently confirmed by the CXR. The surgical team inserted a chest tube and there was immediate improvement in oxygenation. Surgery was completed without any further respiratory events.

Conclusion: Current literature demonstrates that lung ultrasound is more accurate than CXR in ruling out pneumothorax. This report highlights the utility of perioperative point of care ultrasound in the rapid assessment and diagnosis of pneumothorax in a rapidly evolving clinical scenario.

86165 - PRE-OXYGENATION OF OBESE: EFFECT OF POSITION AND VENTILATION

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Introduction: Morbidly obese patients are at high risk of hypoxemia following induction of general anesthesia. Patient's position and ventilation strategy used during pre-oxygenation influence the safe non-hypoxic apnea length by their effect on functional residual capacity (FRC). Head-elevated positions including beach-chair position (ramp position) are currently recommended and used to provide a better laryngoscopic view during tracheal intubation. A positive pressure ventilation strategy during pre-oxygenation might benefit FRC, but is not used systematically. We hypothesized that FRC will be better after pre-oxygenation simulation in head-elevated positions (beach-chair and reverse Trendelenburg position) than supine position and after spontaneous ventilation with positive pressure versus spontaneous ventilation at zero inspiratory pressure.

Methods: Using a prospective crossover randomized trial design, we compared the FRC (helium dilution method in a physiology lab) following simulation of pre-oxygenation period according to different positions and ventilation strategies. After approbation of the local REB and written consent obtained, subjects underwent, in a randomized order, 6 simulations of pre-oxygenation strategy during 5 minutes. Pre-oxygenation strategies included a combination of one of three positions: supine (S), beach-chair (BC; 25° back inclination), reverse Trendelenburg (RT; 25° table inclination) and one of two ventilation strategies: spontaneous ventilation at zero inspiratory pressure (ZEEP-SV) or spontaneous ventilation with positive pressure provided by a mechanical ventilator (PP-SV) set to an inspiratory pressure of 8 cm H_2O, PEEP of 8 cm H_2O and FiO_2 of 0.21. A mouthpiece and a nose clip were used in PP-SV and for FRC measurement to minimize leak. Pre-oxygenation simulations were separated by 20-minutes intervals in sitting position to minimize a potential alveolar recruitment from the previous intervention.

Results: Seventeen obese patients (BMI = 50 ± 8 kg/m^2) were included. Mean FRC was significantly higher in RT compared to BC position (2483 ± 521 versus 2338 ± 469

mL, p=0,009), while there was no difference between S and BC (2359 ±519 mL versus 2338 ± 469 mL, p=0,894). Mean FRC in the three positions (S, BC, RT) was also significantly higher using PP-SV compared to ZEEP-SV (2571 ± 477 versus 2215±481 mL, p < 0,001). The pre-oxygenation strategy using PP-SV in RT position was associated with a 465 mL (21%) increase in FRC compared to ZEEP-SV in BC position (2684±473 versus 2219 ± 477 mL; p < 0,001).

Conclusion Compared to supine, the beach-chair position did not increase FRC. Significant increases in FRC are observed when the patient is moved from beach-chair to reverse Trendelenburg position. Significant increases in FRC are observed when the spontaneous ventilation at zero inspiratory pressure is switched to positive pressure spontaneous ventilation. Finally, the strategy using the reverse Trendelenburg position combined with spontaneous positive pressure ventilation is superior to beach-chair position associated with spontaneous ventilation at zero inspiratory pressure.

86174 - EHANDOVER: AN ELECTRONIC TOOL FOR SAFE HANDOVER OF CARE (PILOT)

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Handover of care can be a risk to patient safety, particularly when critical information is missed or misunderstood. Implementation of a handover improvement program has been shown to reduce medical errors and preventable adverse events in a large multicenter trial (1). At our center, a current state analysis showed no consistent approach to handover of patient care, and wide variability of practice among physicians and services. A study of our hospital's cardiac surgical patients found increased morbidity and mortality when anesthesia care was handed over intraoperatively (2).

We created the eHandover Working Group, a team of health care and information technology experts, to design a user-friendly electronic handover tool that would enhance face-to-face handover, while keeping patient information secure. After conducting a literature review, needs assessment, and current state analysis, we designed the Handover tool for our electronic medical record on the iPad mobile device. A collaborative design approach was used. Key features include the ability to flag acute patients, to share information within and across teams, and to identify problems and tasks.

Usability testing was conducted with residents across multiple disciplines, and an iterative design process was used for tool refinement. We began our pilot in December 2014 with physicians in anesthesiology and geriatrics. Our protocol was reviewed by the local ethics committee, and was deemed not to entail human subject research, with further review not required. Survey data is being used to collect feedback from participating resident and staff physicians. The pilot has successfully begun and further improvements to the Handover tool will be implemented based on data collected.

Our electronic Handover tool is an innovative new solution to facilitate safe and comprehensive handover of patient care. Close partnership between physician users and information technology experts has led to a user-friendly tool that will be used to improve patient safety as part of a multifaceted handover improvement program. Although designed as an integral part of our Clinical Mobile electronic health record, the key features and overall design of Handover are applicable to other physicians looking to develop and use an electronic handover tool.

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86191 - MASTERY LEARNING VERSUS TIME-BASED EDUCATION: BLS SKILL RETENTION

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Background: Teaching basic life support (BLS) to laypeople is integral to improving survival after out-of-hospital cardiac arrest. However, retention of these skills after BLS training is poor.[1] The mastery learning (ML) based educational approach is shown to be valuable in other healthcare domain.[2] We aimed to compare the effectiveness of two distinct learning strategies for the retention of BLS skills – a traditional time-based learning approach versus mastery learning.

Methods: This study is a single-blinded randomized controlled trial approved by our local hospital and university REB. Forty-nine laypeople without previous BLS training were recruited from the science faculty of our university and were randomized to either traditional time-based (TB) BLS course group or mastery learning-based (ML) group. Both groups received a six-station BLS training course including diagnosis of cardiac arrest, chest compression, ventilation, single-rescuer BLS, AED use and choking (adult CPR and AED only). In the ML group, subjects received feedback at each station and only passed on to the next station when they achieved a predetermined level of competence. In the TB group, the same six stations were taught in two hours, as is standard for BLS teaching. Subjects were assessed using a knowledge test and simulated scenario immediately after teaching (immediate post-test) and at four months (retention post-test). All scenarios were video recorded and assessed by two blinded, independent expert raters.

Results: 46 participants completed the study. **Results are presented in Table 1**. Videos are currently being rated by blinded, independent raters for assessment of skills at immediate post-test and retention post-test. Detailed study results will be available for the CAS conference.

Conclusion/discussion: The difference in course duration was not clinically relevant and the ML-based BLS course is not better than the traditional BLS course with regards to the knowledge retention in laypeople. However the results of the skill testing may lead to important changes in the way BLS training is designed and delivered internationally. Ultimately, the aim of such research should be to improve patient outcome, and it is likely that improved skill retention of BLS skills amongst laypeople will ultimately improve survival after out-of-hospital cardiac arrest.

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86197 - A MIXED COHORT STUDY COMPARING PERSISTENT PAIN POST THORACIC SURGERY

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Introduction: Persistent Post Thoracotomy Pain (PPTP) is a recognized complication following thoracic surgery, with an incidence between 44%-67% (1). Its etiology is considered to be multifactorial, with both surgical and patient factors involved (2). It is uncertain whether the pathophysiological process involved is predominantly inflammatory, neuropathic, or mixed(2) . The burden of PPTP after Video Assisted Thoracoscopic Surgery (VATS) is considered to be less, although previous studies have shown conflicting results (3). Since the use of Epidural Analgesia (EA) is less with VATS, it is unclear if this influences the chances of PPTP (4). Our primary objectives were: 1) assessing the incidence of PPTP at 6 months after surgery, as compared to Open Thoracic Surgery (OTS) and VATS; and 2) identifying the type of pain if present (neuropathic versus non-neuropathic). The secondary objectives were to: 1) analyze the effect of EA on PPTP between the 2 groups; and 2) analyze other predictive factors of PPTP development.

Methods: Approval from REB was obtained for a mixed cohort (retrospective and prospective) study of thoracic surgery patients aged 18 or greater, performed at our center. Patients were contacted by a mailed questionnaire regarding the presence or absence of pain, its type and other pertinent factors. Non-responders were reminded by a phone call. Demographical, surgical, and postoperative analgesia details were collected from health records, acute pain database, and the thoracic surgery database. The patients were divided into 2 groups (OTS or VATS). Sample size of 90/group, was calculated using the primary outcome of difference in proportions; P1: 25%, P2: 45%, (Alpha: 0.05 and Power: 80%). The data was analyzed using a multivariable logistic regression analysis, with adjusted odds ratio for primary and secondary outcomes.

Results: Out of 353 patients initially approached, 130 patients responded; 5 patients

were excluded due to selection criteria, and 18 responses could not be appropriately analyzed. Final analysis involved a total of 106 patients. A logistic regression model, with surgeons treated as clusters, indicated a significantly lower incidence of PPTP in the VATS group; adjusted OR: 0.33(0.13, 0.86). In the reduced model with important predictors included, diagnosis of cancer, and history of previous chronic pain were observed to be significantly predictive of PPTP development (table 1).

Conclusion: Our study indicates that persistent pain at 6 months has an incidence of 35% with VATS, compared to 54% with OTS. The persistent pain has a higher chance of being neuropathic with OTS, compared to VATS. The results support the finding that a diagnosis of cancer, and history of previous pain are highly predictive; however, the actual procedure, gender, and the use of epidural do not affect the development of PPTP. A prospective randomized study of appropriate sample size is necessary to confirm the above findings.

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86211 - PEER VERSUS INSTRUCTOR DEBRIEFING FOR SIMULATED CRISES.

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Background: In simulation-based education, debriefing has traditionally been led by an instructor, with the limitation of cost and availability. Research on peer-assisted learning suggests that involving students in peer-assessment could be effective and further develop their own competencies in learning. We hypothesized that peer-debriefing alone would improve the performance of non-technical skills (NTS) of medical students in a simulated crisis.

Methods: After institutional ethics approval, volunteer undergraduate medical students(n=61), were randomized to one of three groups: instructor debriefing (control), peer-debriefers, and peer-debriefees. All students individually managed a simulated crisis (pre-test). All subjects then underwent two successive simulation scenarios, each immediately followed by a debriefing. Subjects from the control group had an instructor debriefing while the peer debriefee group were debriefed by their peers (peer-debriefers). All subjects then managed a further simulated scenario (immediate post-test) and a retention post-test two months later. Two blinded and trained experts independently rated videos of all performances in a random order, using the Ottawa Global Rating Scale (OGRS).

Results: For the three groups, performance significantly improved from pre-test to both immediate and retention post-tests ($p < 0.038$). There was no significant difference between the immediate and retention post-test. There was no significant difference in performance between-subjects by group allocation ($p=0.147$).

Discussion/Conclusions: Peer-debriefing in simulated crisis situation effectively improved NTS performance in both the peer-debriefers and peer-debriefees, and the degree of improvement was not different from instructor debriefing. Learning with peers

through simulation debriefing was a valuable alternative to traditional instructor debriefing.

86222 - A NEW MOUSE MODEL OF CONCUSSION TO STUDY MEMORY AND SYNAPTIC PLASTICITY

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Background: Each year, approximately 1.7 million North Americans suffer from traumatic brain injury (TBI) (1). Deficits in memory and executive function are common after TBI, and are powerful predictors of poor long-term functional recovery (2). The mechanisms underlying these memory deficits remain elusive and there are no effective treatment strategies. A barrier to the development of therapies is the lack of animal models that accurately mimic the pathology of mild concussion in humans. Current models require surgery and prolonged anesthesia and are not easily adopted for studies of mice. Our goal is to develop a novel, high-throughput mouse model that can be used to study memory deficits and treatment strategies after mild TBI. We will use this model to study a variety of memory-related behaviors and synaptic plasticity in the hippocampus after TBI.

Methods: Local Ethics Committee approval was obtained for all experiments. A modification of the free weight drop method (3) was developed to cause mild TBI in mice. The new model: 1) was performed under a brief anesthesia (isoflurane 1.3% for 20 min); 2) did not require stereotaxic head restraint or scalp surgery; 3) allowed for rapid acceleration of the free-moving head and torso, an essential characteristic of concussive injury in humans; 4) allowed repetitive injuries. Memory performance was tested in TBI and sham (anesthesia only) mice using three behavioural assays: Novel Object Recognition (NOR), Object Place Recognition (OPR) and Fear Conditioning (FC). In addition, long-term potentiation (LTP) in the hippocampus, a cellular correlate of memory was recorded. Statistical analyses were conducted using Graphpad Prism 5.0. Student *t*-test or standard One-Way or Two-Way ANOVA was used when appropriate. All values are expressed as mean ± SEM, and $p < 0.05$ was considered statistically significant.

Results: Following a single concussive injury, mice spontaneously recovered their righting reflex and showed no evidence of seizures, skull fractures, paralysis or overt impaired behavior. One week after TBI mice had impaired performance in the OPR (Sham: 53% ± 3%; TBI: 32% ± 4%, $p < 0.01$) and cued fear memory assays (Sham:

34% ± 4%; TBI: 24% ± 3%, $p < 0.05$), but not the NOR or contextual fear memory assays. LTP in CA1 region of the hippocampus was reduced in slices from TBI compared to Sham animals (Sham: 146% ± 9%, TBI: 121% ± 3%, $p < 0.05$).

Conclusions: We developed a novel, high-throughput animal model that mimics human concussive injury and does not require surgery or prolonged general anesthesia. We show for the first time that this model leads to impaired memory performance and synaptic plasticity in the hippocampus. Importantly, not all forms of memory are impaired after TBI. This model will aid in the development of biomarkers and treatments for cognitive impairment following concussive brain injury.

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86224 - DEXMEDETOMIDINE REDUCES DELIRIUM AFTER HIGH RISK CARDIAC SURGERY

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Introduction: Approximately one in five elderly patients experience postoperative delirium (POD) after cardiac surgery.[1] POD is associated with higher mortality, longer hospital length of stay (LOS), and increased health care costs.[2-4] Dexmedetomidine (DEX) is an α2-adrenergic receptor agonist that possesses sedative and analgesic properties, whilst lacking clinically significant anticholinergic effects, and respiratory depression. The current studyis a prospective, randomized, controlled clinical trial comparing DEX and propofol (PROP) based postoperative sedation regimens after high-risk cardiac surgery. We hypothesized that DEX based approach would result in lower POD rates after surgery.

Methods: After Institutional Ethics Review Board approval, an informed consent was acquired in patients over 60 years of age undergoing elective complex cardiac surgery, and over 70 years of age undergoing either isolated coronary revascularization, or single valve repair/replacement surgery. Patients with a history of psychiatric disease, delirium, severe dementia, or undergoing emergency procedures were excluded. Anesthesia, monitoring, and surgical techniques were conducted according to routine institutional practice. Upon arrival to intensive care unit (ICU), patients received either DEX bolus of 0.4mg/kg followed by an infusion of 0.2-0.7mg/kg/h, or PROP infusion 25-50mg/kg/min. DEX infusion was continued for a maximum period of 24 hours. Assessment of delirium was performed with confusion assessment method (CAM) for ICU preoperatively (baseline) and postoperatively every 12 hours or as needed according to the patient's condition during the first 5 postoperative days. Patients were rendered either CAM-positive (delirium present) or CAM-negative (delirium absent). Given the prevalence of delirium of 20% in patients over 60 years of age,[1] to see a reduction to 6% (3% in low risk patients[5]), with a = 0.05 and 1-b = 0.8, the group of 90 patients in each arm of the study is required for a total of 180 patients. Delirium rate was calculated with the ^{2} test for differencesin probabilities of a 2x2 contingency table. All analyses were performed on an intention-to-treatbasis.

Results: POD was present in 16 of 91 (17.5%; 95% CI, 9.7 to 25.3), and 29 of 92 (31.5%; 95% CI, 22.0 to 41.0) patients in the DEX and PROP groups respectively, p = 0.028. Median duration of delirium was 2 [1 - 4] vs 3 [1 - 5] days in DEX and PROP groups, p = 0.04. Both groups were similar with respect to demographic data, preoperative medications, co-morbidities, and surgical characteristics. In patients who had delirium, the median difference in ICU- and hospital-LOS was 8.7hours and 2.5days favouring the DEX group.(Table)

Discussion: Postoperative administration of DEX based sedation regimen in elderly patients resulted in lower POD rates after high-risk cardiac surgery.

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86225 - RETROLAMINAR PARAVERTEBRAL VERSUS EPIDURAL INFILTRATION IN PAIN

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Introduction: By some estimates, the annual cost of treating back pain alone exceeds $100 billion with more than half due to lost productivity. Recently, the Food and Drug Administration (FDA) issued a letter warning that the injection of corticosteroids into the epidural space of the spine may result in rare, but serious adverse events, including “loss of vision, stroke, paralysis, and death”(1). In this retrospective study we compare retrolaminar paravertebral infiltration (PVI) of a non-steroid-mixture with conventional epidural steroid infiltration (EPI).

Method: All participating patients have signed an informed consent. We identified 31 patients registered in our data bank, suffering from chronic lumbar or cervical radicular pain referred to the pain clinic between 2009-2014. These patients received retrolaminar PVI with a mixture of morphine 1 mg, ketamine 10 mg, neostigmine 0.5 mg, naloxone 2 ng and bupivacaine 10 mg. The control group, matched for gender, age and DN4 sub-scale score at baseline, consisted of 31 patients with the same pathology, pain and period and was treated by epidural steroid infiltration. Principal pathologies in both groups were disc disorders and/or foraminal stenosis. All cases with malignancies, congenital anomalies, infection and past history of lumbar or cervical operation were excluded. All patients received only one infiltration during the six months following the initial visit. Pain intensity was assessed at the first visit and in six months follow-up using a Numeric Rating Scale (NRS-11). BPI, PCS and SF-12 were compared in both groups. Overall satisfaction in pain relief in six month was assessed with a scale of 1 (very unsatisfied) to 6 (very satisfied). (Statistical analysis software SAS version 9.3)

Results: Average NRS scores for last seven days preceding the first visit were 7.5 (SD=1.7) and 7.2 (SD=1.9) in the case and the control groups respectively. At the six month follow up visit, these scores were 6.9 (SD=1.9) and 6.2 (SD=2.4) respectively (Fig-1). No significant changes were noted in NRS scores at the 6 month visit between two groups. Overall satisfaction from pain relief in six months were 3.8 (SD=1.8) and 4.5 (SD=1.5) in the case and the control group respectively. There is no significant difference in satisfaction score between 2 groups.

Discussion/conclusion: Neither of the two methods was shown to be superior to the other in pain relief and overall treatment satisfaction after six months. Analgesic and/or anti-hyperalgesic effect of morphine, ketamine, neostigmine and ultra-low dose of naloxone have been already reviewed in the literature. Considering possible complications and side effects of EPI, PVI infiltration with non-steroid mixture could be

considered as an alternative method. Possibility, multiple PVI could further decrease pain. Well designed studies are needed to evaluate this hypothesis.

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86234 - ONSET OF LABOUR EPIDURAL ANALGESIA WITH VARYING DOSES OF FENTANYL

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Introduction Dilute concentrations of local anesthetic solutions combined with opioids are commonly used to provide epidural labour analgesia as they reduce motor block without compromising analgesia [1]. However, onset of analgesia can be delayed. The addition of a fentanyl bolus at initiation of labour epidural analgesia can speed onset [2]. A dose comparison study was conducted to investigate the onset of labour analgesia using 0.08% bupivacaine with varying doses of epidural fentanyl. We hypothesized that increasing doses of fentanyl (20, 50, or 100 mcg) would hasten the onset of labour analgesia.

Methods: Institutional REB approval was obtained. Written, informed consent was obtained from all patients participating in the study. A prospective, randomized, double-blinded, clinical trial of 105 women (ASA 1-2) at term gestation with singleton fetuses in early labour requesting epidural analgesia were enrolled in the trial. Each woman was randomly assigned to receive 20, 50, or 100 mcg epidural fentanyl with 10 mL of 0.08% bupivacaine. Maternal Numeric Rating Scale (NRS) pain scores were monitored for each contraction until pain scores were 3 or less, or for 30 minutes. The onset and duration of analgesia, maternal side effects, satisfaction, type of delivery, and fetal outcomes were also recorded.

Results: Data from 105 patients were analyzed. No losses to followup occurred. There was good balance between groups at baseline. The 50 and 100 mcg doses of fentanyl were associated with a faster development of NRS ≤ 3 compared to 20 mcg fentanyl (Table). Hazard Ratios [HR] for developing NRS ≤ 3 compared to the 20 mcg group: 2.1 [95% CI 1.2 to 3.5, P = 0.007] and 2.8 [95% CI 1.7 to 4.8, P < 0.001] for the 50 and 100 mcg groups respectively. The incidence of failure to reach NRS ≤ 3 within 30 minutes was higher in the 20 mcg group compared to both other groups. There were no differences in adverse events between groups, except for a higher incidence of fetal bradycardia in the 50 and 100 mcg groups. However, Apgar scores were not significantly different between groups.

Discussion: Labouring parturients wish to have a rapid decrease in pain after the institution of epidural analgesia. We found that increasing doses of epidural fentanyl hastened the onset of analgesia without increasing maternal adverse events.

References:

86242 - IMPACT OF TRANSESOPHAGEAL ECHO IN AORTIC ANEURYSM SURGERY.

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Introduction: Despite advances in surgical and anesthetic techniques, perioperative management of patients undergoing abdominal aortic aneurysm (AAA) open repair represents a major challenge.[1] Invasive and non-invasive monitoring may be required to achieve optimal hemodynamic management and minimize cardiovascular adverse events. [2] Transesophageal echocardiography (TEE) is a powerful diagnostic and monitoring tool in assessment of hemodynamics during major surgical procedures. The aim of this study is to evaluate the impact of TEE on the outcomes of patients undergoing elective AAA open repair.

Methods: After obtaining REB approval, a retrospective study was conducted. The study includes patients undergoing elective open AAA surgery from December 2009 to December 2014. Emergency and endovascular repair cases were excluded. Utilization of TEE in our institution for AAA surgeries is based on the availability of qualified echocardiographers.The study is aimed to divide the patients into two groups: control group (C) didn't have intraop TEE and echocardiography group (E) had hemodynamics managed based on TEE findings. The two groups were then compared for cardiovasculare adverse events (primary outcome). The primary outcome were defined as myocardial infarction (MI), pulmonary edema (PE), stroke, arrythmia (that required treatment) and in-hospital mortality. Secondary outcomes include: intensive care unit (ICU) lenght of stay (LOS), lenght of ventilation (LOV), intraoperative fluids balance and incidence of acute renal failure (RF). The charts of all eligible patients will be manually reviewed and descriptive statistics will be used to summarize the characterisitics of the two groups. Primary outcomes will be compared using chi-square statistics. Further logistic regression analysis will be conducted for secondary outcomes.

Results: A total of 226 patients were deemed to meet the inclusion criteria. So far 30 records have been reviewed. Chart reviews are expected to be completed in the coming weeks. Demographic data of the first 30 patients are presented in Table I. The reported cardiovascular events and secondary outcomes are presented as follows: Group E (n=12) had 1 PE and Group C (n=18) had 4 PE. Additionally 4 patients developed arrythmias in Group C vs none in Group E. ICU LVO was 0 minutes in 83% of Group E vs 72% in Group C. The incidence of renal failure was 8.3% in Group E vs 50% in Group C. The average ICU LOS was 74+-43hours and 92+-63 hours in Group E and Group C respectively.

Conclusion: The preliminary data of this study suggests that TEE may have significant impact in reducing perioperative cardiovascular adverse events in patients undergoing AAA open repair

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86246 - NSAID USE IN CARDIAC SURGERY

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Introduction: A 500 bed tertiary care centre has been performing cardiac surgery since 1991. In 1996, a multidisciplinary quality improvement team created an innovative and cost- effective rapid surgical recovery program (RSR), using philosophies similar to current Enhanced Recovery After Surgery (ERAS) programs. The RSR model emphasized early extubation and proactive treatment of pain, nausea, bowel dysfunction, and immobility helping to dramatically increase the case load (mid 200s to the mid 900s). Due to the opioid-sparing effect of non-opioids, the proactive pain management plan utilized maximal non-opioids including non-steroidal anti-inflammatory drugs (NSAIDs), unless contraindicated, which were supplemented with an opioid as needed. With this protocol >70% of patients received 3 or more indomethacin suppositories, the average postoperative length of stay was 5.9 days, 70% of patients were discharged on day 4 or 5 and delirium was less than 1%.In the 18 years since RSR was instituted the program has seen many changes in terms of new team members and case complexity and the use of NSAIDs has been called into question. We elected to review recent practice to assess this change.

Method: To assess this change in practice clinical ethics board approval was obtained to conduct a retrospective chart review of consecutive patients undergoing isolated coronary artery bypass surgery. A variety of demographic and clinical variables were extracted from 109 charts (2008) and 142 charts (2013).

Results: Patients from 2008 and 2013 were comparable in regards to age, sex, BMI, and a crude count of comorbidities (diabetes, kidney disease, etc). The surgical classification revealed significantly more urgent/emergent cases in 2013. NSAIDS were used in 78% of patients in 2008 versus 22% in 2013. No significant difference was found between the two groups for change in renal status (highest creatinine (Cr), Cr change, Cr at discharge, RIFLE criteria). Dialysis was instituted in 8 patients, all non-NSAID. Excluding long-stay outliers, delirium was recorded as 9% for NSAID patients versus 18% for non-NSAID patients. The average maximum pain score (0 to 10 verbal analogue scale) was 3.8 for NSAID patients versus 5.2 for non-NSAID patients.

Discussion: Clinical practice constantly evolves as circumstances and people change. Review of clinical practice helps assess whether such changes provide the anticipated benefits. As for other programs, our patient population has become more complex, and concern for the potential for complications has modified treatment programs.. The data available here, with all the drawbacks of a retrospective chart review, suggest that the use of NSAIDs has not been associated with increased complications but rather with-holding NSAIDs is associated with some specific poorer outcomes. Further insight would warrant a prospective study.

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86248 - MORPHINE WITH LOW DOSE NALOXONE ON RESPIRATORY FUNCTION AND ANALGESIA

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Introduction: Low back pain (LBP) is a major health issue affecting over 70% of people in industrialized countries. Neuraxial morphine is used as treatment. However, it is associated with side effects, among which respiratory depression being the most severe. The addition of low-dose of opioid antagonist, such as naloxone, has shown to enhance the analgesic effect and to decrease the side effects of neuraxial morphine. This study aims to evaluate the effect of epidural morphine combined with low-dose naloxone on respiratory function and analgesia among patients already treated with oral opioids or cutaneous opioid patch.

Method: Local Ethics Committee approval was obtained. Subjects who agreed to participate provided written informed consent. A randomized, double-blind, crossover controlled clinical trial was conducted. Each of the 28 patients received 2 treatments in a crossover manner: 1 mg morphine + 10 mg bupivacaine with or without 0.08 mg of naloxone. There was a 14-day washout period. For each treatment period, respiratory disturbance index (RDI), mean (SpO_2m) and minimal oxygen saturation (lowest SpO_2) were recorded to evaluate the respiratory function, and pain intensity was measured according to a visual analogue score (VAS).

Results: There was no statistically significant effect of morphine with or without naloxone on the respiratory parameters. Both treatment groups presented a significant difference in pain intensity for 14 days following the epidural treatment compared with baseline ($P < 0.001$), but neither treatment showed better analgesia.

Discussion/Conclusion: 1 mg of epidural morphine with or without 0.08 mg of naloxone is not associated with any significant effects on respiratory function. The analgesia of epidural morphine lasted more than 24 hours. The administered dose of naloxone (0.08 mg) is too low to antagonize the analgesic effect induced by morphine, but too high to potentiate it. Further studies are warranted to define the best morphine to naloxone ratio to enhance analgesic efficacy of morphine.

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86249 - STEM CELLS FOR PRECLINICAL PERIOPERATIVE MI: REVIEW PROTOCOL

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Background: The incidence of perioperative myocardial infarction (POMI) is 6% in at risk patients and is associated with a 30 day mortality of 10-11%. The burden of POMI will only increase in Canada given an aging population and a growing number of patients undergoing major surgery. There is preclinical evidence that mesenchymal stromal cells (MSCs, 'adult stem cells') represent a promising new therapy for POMI. These stem cells have potent anti-inflammatory and organ protective effects. Prior to considering a first-in-human clinical trial, a systematic review of preclinical evidence is needed to summarize the efficacy and safety of MSCs in animal models of POMI. Our systematic review will answer the question, "In preclinical models of POMI what effect do MSCs (in comparison to control therapy) have on cardiac function, infarct size, inflammation, and death?"

Methods/Design: No ethics approval was necessary as this is a review of published preclinical literature. This systematic review protocol will be registered with CAMARADES website (www.CAMARADES.info) prior to data analysis. Electronic searches of MEDLINE, Embase, BIOSIS, and Web of Science were constructed in consultation with an information specialist and reviewed by the Peer Review of Electronic Search Strategies (PRESS) process. Two independent reviewers will review studies and extract data into standardized, piloted forms. Discrepancies will be resolved through discussion with a third team member. Eligible studies include controlled comparative studies (randomized and non-randomized) of preclinical *in vivo* models of MI in which MSCs are administered within 7 days of disease induction. The primary outcome will be left ventricular ejection fraction. Secondary outcomes include death, infarct size, cellular infiltration, apoptosis and MSC retention and differentiation biochemical outcomes such as proinflammatory cytokines, anti-inflammatory cytokines, growth factors and chemokines. Results from outcomes with discrete data (e.g. death)

will be pooled and meta-analysis will be performed with inverse variance random effects modeling. Continuous endpoints (e.g. cytokine levels) will be pooled using the ratio of weighted means method with inverse variance random effects modeling. Data will be expressed as odds ratios and 95 percent confidence intervals. Risk of bias will be assessed using the SYRCLE risk of bias tool for animal studies, and individual study reporting will be assessed according to the Animal Research: Reporting of In Vivo Experiments (ARRIVE) guidelines. Results of this systematic review will reported in accordance with the PRISMA reporting guidelines. Knowledge users have been identified and have agreed to participate in dissemination of results. These include the Canadian Perioperative Anesthesia Clinical Trials Group, the Canadian Society for Atherosclerosis, Thrombosis, and Vascular Biology, and the Canadian Stem Cell Foundation. To date, ~25% of data has been extracted.

Discussion: This systematic review of preclinical evidence will summarize the efficacy and safety of MSCs in animal models of MI. The results will aid in determining whether sufficient evidence exists to conduct a clinical trial and guide future POMI research.

86252 - SONOGRAPHIC EVALUATION OF URINARY CATHETER PLACEMENT IN A NEWBORN

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Introduction: Urethral catheterization in pediatric patients is not without complications. Urethral injury can occur during difficult catheterization, for example, patients with pre-existing urethral stricture, prominent utricle or contracted external urinary sphincters [i]. Inflation of the balloon in the urethra can also cause urethral trauma, which happened to the newborn patient presented here. We report our intraoperative real-time ultrasonographic evaluation of the placement of the urinary catheter in his urethra (sonourethrography).

Case: A two-day old male patient with imperforated anus was brought to operating room for creation of colostomy. After induction of anesthesia and securing the airway, urinary catheterization was tried with a 6 French Foley's catheter, which turned out to be unsuccessful and there was some fresh blood at the urethral meatus. Bedside ultrasound imaging was sought to look for any possible urinary trauma.

The ultrasonographic examination of the penis was performed with the patient in the supine position with the penis supported with towels between the thighs. A SonoSite M-Turbo (SonoSite Inc., Bothell, Washington, USA) machine was used with a SLAx 13-6 MHz hockey-stick transducer in the longitudinal (Fig 1A) and transverse (Fig 1B) planes. A sufficient amount of sonographic acoustic gel was applied without excessive compression on the probe. The Foley's catheter balloon could easily be seen inflated in the anterior urethra and apparently not the in the bladder. It was lying ventral to the urethra and corpus cavernosum (Fig 1A). The catheter was then deflated and withdrawn gently. The patient was then scheduled for confirmatory imaging studies.

Discussion: Urethral trauma due to urinary catheter placement is a relatively uncommon condition with an incidence of up to 3.2 in 1000 in adult male patient[ii]. The incidence in pediatric male patients is not widely reported. This complication is preventable by appropriate training as well as by confirming the catheter placement in the bladder prior to inflation[iii].

Ultrasound techniques have been shown as a valuable asset at the point of care in diagnostic and therapeutic interventions. To the knowledge of authors, however, the ultrasound confirmation of placement of the urinary catheters in pediatric patients has not been reported.

Various imaging techniques are used to diagnose the type, location and extent of the penile injuries such as cavernosography and retrograde urethrogram. They are, however, invasive techniques mainly used to detect urethral traumas, not to confirm the placement of the urinary catheter. Magnetic resonance imaging with its excellent tissue contrast is not considered a routine part of the evaluation of penile trauma.

Conclusion: Sonourethrography is a point-of-care, minimally demanding imaging modality with a high quality to confirm placement of urinary catheters in the pediatric patients.

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86254 - POINT-OF-CARE SYRINGE LABELING PROCESS PREVENTS MEDICATION ERRORS

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Introduction: Anesthesia medication errors are rare but predictable events. The unintended ampoule swap and label swap type of errors are not recoverable and often lead to erroneous administration. An average anaesthesiologist administers approximately 10,000 drug doses a year. Error rates reported in literature range from 0.1% to 0.85%

The preprinted color-coded syringe labeling systems, consisting of multiple rolls of (up to 30) on anesthesia carts are common today in most of ORs. This approach may reduce syringe swap errors. However, a label swap error is more likely than ever as a result of this solution. Labels for rarely used medications are still hand written, or are omitted.

We have devised developed and introduced to clinical practice a barcode reader aided point-of-care labeling process, which prevents an unintentional label and ampoule swap, and forces a "second look" at the ampoule by the anesthesiologist during medication preparation. Some of the preliminary results were previously reported in an abstract form.

Methods After local REB approval, we have studied effectiveness of this process for preventing this type of error in a large scale prospective evaluation. In 19 operating rooms over a period of three years, we have introduced apoint-of-care process to scan barcodes on all anesthesia injectables and to produce corresponding syringe labels. The use of this process was voluntary and traditional label rolls were also present on anesthesia cart at all times. Once the ampoule was scanned the user had an option to print the label or cancel printing by choosing one of the 4 menu options: Near Miss(drug error)/ Error in Preparation/ Testing / Practice-Training. At the end of 5 months period we have conducted a retrospective, anonymous survey of anesthesia providers asking them if and how many times the use of the system potentially intercepted their drug error. At the end of 3 year period printer logs were analyzed again for incidence of drug errors intercepted by the barcode scanning.

Results: During the first 5 months 58,644 ampoules were scanned by

anesthesiologists in all ORs. 41 anesthesiologists (76%) participated in the retrospective survey indicated that "wrong drug" error has been intercepted on 29 occasions according to the participants (0.049%). At the end of three years 306,928 ampoules were scanned and 184 intercepted near-miss errors were prospectively logged (0.059%). Most common "near-miss" drugs were: cefazolin (15), midazolam (13), ephedrine (13), epinephrine (11), fentanyl (9), succinylcholine (7)

Conclusions: The barcode aided point-of-care syringe label generating process is effective in intercepting impending medication errors. Estimated lowest limit for the ampoule/label swap during drug preparation is 0.06%. This is lower than previously published data, possibly because the process itself requires a "second look" to position ampoules under the scanner.

86258 - EFFECT OF A REGIONAL GUIDELINE ON UNNECESSARY PREOPERATIVE LAB TESTS

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Introduction: Preoperative laboratory testing (PLT) is intended to assist in perioperative care. However, its value has been questioned for some time[1] and it is widely accepted that many preoperative tests are unnecessary health system expenses resulting in patient inconvenience, and perhaps even harm[2,3]. The development of a consensus between caregivers regarding expected testing and subsequent education strategies to raise awareness of new guidelines have resulted in short term success at reducing unnecessary PLT in the literature[4,5,6]. However, these single centre studies are not reflective of contemporary perioperative care where primary care providers, anesthesiologists and surgeons share responsibility for patients across a wide range of settings and locations.

In 2010, a multidisciplinary team created a consensus based provincial guideline for PLT to reduce unnecessary testing. The document received approval from local standards committees and senior health administration and was widely distributed through a dedicated implementation strategy. We report on this guideline's transient effect in reducing unnecessary testing in a large health region, 2 years after implementation.

Methods: Ethics approval was obtained to re-analyze 3 quality assurance audits. These retrospective chart review audits examined PLT prior to (November 2010), 6 months after (September 2011) and 2 years after (May 2013) guideline implementation. Each audit reviewed a random sample of adult patients having surgery across 8 facilities within the largest provincial health region during a typical 5 day week. Each sample was stratified by surgical specialty and facility, and included 150-250 patients, reflecting 15-20% of the total number of surgeries. The PLT ordered for the patient was noted with the specialty of the physician who ordered the test (primary care, surgery, anesthesia). Tests were considered unnecessary if they were ordered but were not recommended by the guideline, based on the patient's age, comorbidities, functional status, medications and the nature of the proposed surgery, as documented in the chart.

Results: Unnecessary tests were ordered 31.6% of the time at baseline, 27.0% of the time 6 months after implementation ($p < 0.005$), and 31.3% of the time 2 years after implementation ($p=0.86$). Overall and individual test results were consistent except there was a trend ($p=0.06$) to a sustained reduction in unnecessary chest xrays from 44.9% at baseline to 25.6% at two years post-implementation. Primary care providers and surgeons ordered over 95% of unnecessary tests.

Discussion: Implementation of a new PLT guideline did not result in important or

sustained reductions in unnecessary testing in a large health region. The short-term success documented in previous single centre studies may not translate to long-term results in multicentre, multidisciplinary models of care. More research is required to understand the determinants of unnecessary PLT in contemporary practice, and to develop knowledge translation strategies to improve guideline adoption by caregivers.

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86259 - GABAA RECEPTORS CONTRIBUTE TO DEPRESSIVE BEHAVIORS IN MICE

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Introduction: One of the most exciting recent advances in modern anesthesiology and psychiatry is the discovery that a single low dose of ketamine is effective in treating refractory depression. This discovery has opened the door to the development of newer, faster-acting, and more effective antidepressant drugs. Accumulating evidence suggests that reduced function of the inhibitory neurotransmitter g-aminobutyric acid (GABA) system contributes to the pathogenesis of depression. In particular, the a5subtype $GABA_A$ receptor has been implicated in both depression and anxiety-related disorders. Thus, repurposing anesthetics that target a5subtype $GABA_A$ receptors is a novel therapeutic target for treating mood disorders.The goal of this study was to determine whether reduced expression of α5$GABA_A$ receptors leads to a depressed and/or anxiogenic behavioral phenotype.

Methods: Approval from the local animal care committee was obtained for all experiments. Mice were randomly assigned to one of three experimental groups (n=10 per group): a5 wildtype ($a5^{+/+}$); a5 knockout ($a5^{-/-}$); a5 heterozygous ($a5^{+/-}$). The experiments were designed to assess whether genetic manipulation of the a5 receptor are associated with depression and anxiety states. In addition, animals were assessed on executive function memory tasks, which have been shown to be impaired in depressed patients. Animals were serially assessed in a battery of behavioral tests which included: (1) open field test (OFT); (2) light-dark maze; (3) puzzle box; (4) elevated plus maze (EPM); (5) forced swim test (FST), and; (6) tail suspension test (TST). The same cohort of animals was tested on each behavioral paradigm.

Results: There was a significant group effect in the OFT [$F_{(5,51)}=6.94$, $p < 0.001$]. Specifically, $a5^{-/-}$ mice displayed a higher rate of defecation in the OFT as compared to $a5^{+/+}$ animals, a variable which has been previously associated with high anxiogenic behavior in rodents. Preliminary results indicate that $a5^{-/-}$ animals are cognitively impaired compared to $a5^{+/+}$ animals in measures of executive functioning such as the puzzle box.

Discussion: A genetic knockdown of extrasynaptic α5$GABA_A$ receptors causes an axiogenic phenotype in mice. These results suggest that pharmacological manipulation of these receptors by positive allosteric modulators such as general anesthetics may alleviate depressive and axiogenic symptoms.

Clinical Relevance: Depression is a highly debilitating and pervasive illness which affects over 350 million people worldwide. The monetary costs of depression and related mood disorders that result from reduced productivity, job loss, hospitalization, and drug treatment exceeds well over 40 billion dollars annually. Repurposing anesthetic drugs that selectively act on extrasynaptic a5GABA$_A$ receptors may provide a novel alternative therapy for patients with depression. This strategy may enable the development of low-cost treatments that can be rapidly scaled up to address the global burden of depression