2020 CAS Annual Meeting

Perioperative

(Abstracts & Case Report/ Series)

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"Hydrate While You Wait": Application of a Pre-Procedural Oral Hydration Concept in the Ross Tilley Burn Centre

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Introduction: Although the literature strongly supports oral consumption of clear fluids up until 2 hours pre-operatively, surgical inpatients are routinely 'nil per os' (NPO) from midnight prior to their anticipated surgery and only fed again several hours after returning from the operating room[1]. This practice is not without significant consequences for patients with severe burn injuries, given their high nutritional requirements and the number of procedures (i.e., surgeries and dressing changes under sedation) that they undergo. Hydrate While You Wait is a pre-operative hydration pathway that has been successfully implemented on other units at Sunnybrook Health Sciences Centre. This study describes how this protocol was adapted for use at the Ross Tilley Burn Centre (RTBC), with the aim of reducing fasting times and patient discomfort (subjective hunger and thirst) in the pre-procedural period.

Methods: Ethics approval was waived by the local REB. Baseline data on fasting time (including fasting time before each procedure and cumulative fasting time during admission) was collected over a 7-week period from July to September 2019. Nursing staff were instructed to ask patients to rank their subjective hunger and thirst on a scale of 1 to 10 (1 being "not at all hungry/thirsty" and 10 being "extremely hungry/thirsty") 15 minutes prior to each procedure. Analysis of procedural scheduling and extensive consultation with stakeholders informed the development of hydration cut-off times for each type of surgical case (i.e., first, second, third, and emergency cases) and procedural sedation.

Results: Data was collected on 15 patients, who underwent a combined total of 36 procedures. At baseline, patients fasted for a median of 10.5 hours on each occasion, with a median cumulative fasting time of 18.1 hours over the course of their admission. Patient survey responses (n=18) revealed that baseline median subjective thirst was greater than median subjective hunger (7 vs 3), which is consistent with what has been reported in the literature[2,3]. Application of the proposed hydration cut-offs would have resulted in a 67% reduction in median cumulative fasting time.

Discussion/Conclusion: Adaptation and implementation of the Hydrate While You Wait initiative has strong potential to reduce fasting time, aligning practices in RTBC with best practice guidelines. Lessons learned in the implementation phase will provide insight into the feasibility of implementing a pre-procedural hydration pathway in burn units, while maintaining flexibility in procedural scheduling.

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A Quality Improvement Initiative to Identify Peri-Operative Hyperglycaemia – The Barriers and Challenges

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Introduction: The University Health Network (UHN) is an academic healthcare institution that participates in the American College of Surgeons-National Surgical Quality Improvement Program (ACS-NSQIP). Currently, the ACS-NSQIP rating for Surgical Site Infection (SSI) in the General Surgery Program at UHN has been found to "need improvement." The incidence of perioperative hyperglycemia, and its role in the development of SSI in the general surgery population at UHN is currently unknown. As a single hyperglycaemic episode (BG >11mmoL) increases risks of SSI,[1] we aimed to identify barriers to hourly glucose measurement and the incidence of BG>10mmoL in the preoperative care unit (POCU) /operating and rooms in patients undergoing general surgery procedures >2hr duration. The Canadian Diabetes Association recommends pre-prandial targets of 5-8mmoL in non-critical inpatients and <10mmoL for random measurements. [2] These guidelines highlight potential methods for sampling, role of benchmarking and system performance and developing data management systems, but lack information on implementation and development of such a program. Therefore, we help address important knowledge gaps by reporting our multisite, quality improvement (QI) process.

Method: As a QI initiative, ethical review was waived. A steering committee was formed; workflow and potential measurement points were mapped to understand current and possible performance/knowledge gaps. A protocol for monitoring and managing perioperative hyperglycemia (BG > 10mmoL) was developed. Fifty consecutive patients, undergoing eligible general surgery procedures were identified (Sept 2019 – Feb 2020). Hourly intraoperative glucose measurements were requested, barriers to measurement were documented by staff and follow-up focus groups/interviews conducted. Study data was collected pre, intra and post-operatively using the electronic medical record.

Results: Engagement of anesthesiologists, surgeons, endocrinologists, nurses and pharmacists allowed for interdisciplinary dialog and collaboration. Ad-hoc measurements of blood glucose in POCU and PACU revealed 6.7% at Toronto Western Hospital (TWH) and 5.8% at Toronto General Hospital (TGH) measured BG> 10mmoL. A practice change was introduced, POCU and PACU nurses were asked to perform BG checks on all patients. Identified barriers included education/training surrounding glucometer use, staff workload, insulin availability and treatment pathways. Hourly intraoperative monitoring revealed 11% (TWH) and 38%(TGH) of patients had a BG >10mmoL. Barriers in this phase included

staff prompts to monitor glucose, insufficient staffing to run samples, glucometer availability and patient inaccessibility due to surgical positioning.

Discussion: This QI initiative highlights the complex system required to develop an infrastructure that ultimately improves perioperative glycemic measurement. Engaging relevant stakeholders is vital to foster leadership and drive on-going QI cycles. Education and training require continual support given the turnover of residents and nurses. Documentation, collection and monitoring of data needs to be reliable and robust, use of an electronic system can improve data quality and frequency of reporting.[3] Other institutions wishing to improve perioperative glycemic control may benefit from our experience and QI roadmap. Future work will address the barriers identified to ensure glucose can be measured readily prior to implementing therapies.

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A Survey of the Anesthesia Assistant Profession in Canadian Teaching Hospitals: 12 Years Later

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Introduction: The role of the Anesthesia Assistant (AA) varies widely across Canada, both in level of education and clinical responsibility. As of January 2019, respiratory therapists must pass a national certification exam to achieve the "Certified Clinical Anesthesia Assistant" (CCAA) designation. The intent is to regulate AA education programs and standardize the skillset of AA graduates. A survey completed in 2007,[1] examined the role of AAs at academic hospitals across Canada, focusing on the most common technical and clinical responsibilities of the profession.

Objectives: This study aims to identify the educational background and clinical roles of AAs in Canadian University Departments of Anesthesia (ACUDA hospitals) and determine how they have changed over the last 12 years.

Methods: Ethics approval was obtained from the local REB. A non-interventional survey of ACUDA hospitals was completed between October 21st, 2019 and January 30th, 2020. Hospital managers were contacted and asked to complete a standardized, telephone-based survey. Data regarding AA education, clinical tasks, and scope of practice was collected, analyzed and compared to study findings of the same ACUDA hospitals from 2007. Analysis was completed using descriptive statistics.

Results: A total of 15/17 ACUDA hospitals were available for survey participation. On average, there were 33 operating rooms (ORs) per hospital, with 100% having some level of AA involvement. Only 5 hospitals (33%) had AAs with formal certification. There were approximately 22 AAs per hospital. AAs spent 25% of their time working in areas outside of the main ORs, and 47% of sites (7/15) had 24-hour, on-site AA coverage. The most common technical responsibilities of AAs included bronchoscopy assisting/cleaning (14/15), epidural/spinal anesthesia assists (14/15), and troubleshooting equipment (13/15). The most common clinical duties included monitoring for general anesthesia and OR anesthesiologist relief (15/15; 14/15), intravenous catheter insertion (15/15), and medication delivery (15/15). Compared to 2007, the largest increase in AA responsibilities was observed for monitoring general anesthetics (43.8%), OR anesthesiologist relief (43.3%) and administration of vasopressors (43.8%). Additionally, increases were observed for administration of induction agents (37.5%) and maintenance (37.5%), recovery room care (33.4%) and central line insertion (20%). A comparison of 2007 to 2019 responsibilities is represented in figure 1.

Conclusion: There remains considerable variability in educational background and certification of AAs across Canadian academic anesthesia departments. The majority (67%) of departments have assistants on staff that have not completed a formal AA certification program. Currently, AAs spend a quarter of their time out of OR; however, their most common responsibility is monitoring for general anesthesia. Compared to 2007, OR responsibilities have increased significantly, demonstrating a shift towards more clinically-based skills.

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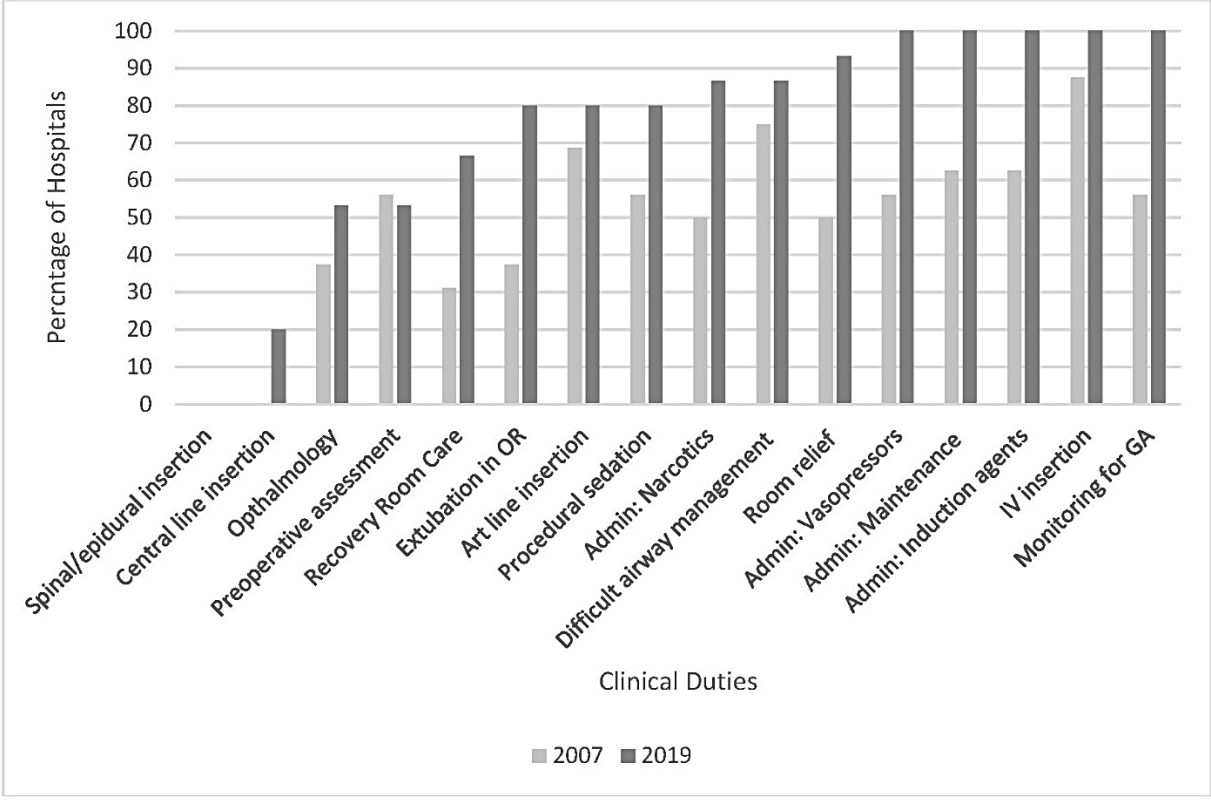
Figure 1. Type and percentage of AA clinical duties performed in Canadian teaching hospitals in 2007 and 2019



Anesthesia for Total Joint Arthroplasty in a Smaller Community Hospital – An Observational Quality Improvement Study

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Introduction: As part of a larger Quality Improvement project aiming to reduce LOS for Total Hip Arthroplasty (THA) and Total Knee Arthroplasty (TKA) patients, this retrospective observational study aimed to examine anesthesia related factors that might influence patients' perioperative experience and be considered for future intervention.

Methods: Ethics approval was received from the local REB. Charts were reviewed for 143 consecutive patients who underwent single Total Hip or Knee Arthroplasty at a smaller community hospital (Collingwood General & Marine – 78 total beds, 3 Orthopedic Surgeons, 6 Family Practice Anesthetists). Type of anesthetic given (Spinal vs GA) and resulting pain scores and narcotic usage, use of intrathecal epimorphine and its correlation to catheter rates, nausea rates and pain scores/narcotic use in the first 24 hours, and the effect of femoral nerve blocks on pain scores and narcotic use in the first 24 hours for TKA patients were analyzed.

Results: Overall, 92% of THA and 90% of TKA patients received a spinal anesthetic. Patients who had spinal anesthesia had significantly lower maximum pain scores, total narcotic use in the first 24 hours and a significantly longer time to first narcotic use than patients who had general anesthetic. For patients receiving spinal anesthesia, the catheter rate postoperatively for inability to void was 22% with a significant correlation with epimorphine dose (R squared 0.956, p=0.004). Nausea rate overall was 29.2% which was not significantly associated with the use of PONV prophylaxis or epimorphine dose. Trends were observed for both THA and TKA patients between epimorphine dose and maximum pain scores, time to first narcotic and total narcotic requirements in the first 24 hours postop however these were not significant. The use of femoral nerve blocks for TKA patients significantly reduced narcotic requirements in the first 24 hours postop with non-significant trends towards lower maximum pain scores and longer times to first narcotic dose.

Conclusions: Our data suggests that for THA and TKA patients in our institution, spinal anesthesia is preferred, epimorphine use should not be routine and for TKA patients, femoral nerve blocks should be encouraged. During the study period, 75% of THA and 72% of TKA patients were discharged on postop day 1 which will serve as a baseline for future comparison.

Case Report: Using Dexmedetomidine Infusion for Sedation in Spontaneously Breathing Patient with Myotonic Dystrophy

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Introduction: Myotonic dystrophy type I (DM) is the most common muscular dystrophy in adults. It affects numerous body systems including the musculoskeletal, respiratory, cardiovascular, gastrointestinal, and central nervous systems which complicates their anesthetic management. Patients are prone to myotonia, a prolonged muscle contraction, which is triggered by succinylcholine, neostigmine, hypothermia, shivering, and surgical stimulation. Dystrophic organization of skeletal muscles result in weakness, often involving the facial, laryngeal, and respiratory muscles. Thus, patients have increased risks of post-operative complications including respiratory depression and pneumonia. DM patients also have low central ventilatory drives, increasing their sensitivity to respiratory depressants, including opioids. They are prone to arrhythmias and both systolic and diastolic dysfunction because of fibrosis of cardiac myocytes. Volatile agents may exacerbate these preexisting cardiac comorbidities. Smooth muscle involvement slows peristalsis in the gastrointestinal tract, increasing the risk of aspiration and prolonged post-operative ileus time.

Case Presentation: Patient consent was obtained for publication of this case. A 42 year old male with DM diagnosed in early adulthood presented for septoplasty and bilateral inferior turbinate reductions due to a deviated septum. His disease involvement included: 1) severe upper and lower extremity myotonia and weakness; 2) pulmonary impairment with non-obstructive patterns; 3) first-degree atrioventricular block and reduced ejection fraction. He uses bilevel positive airway pressure, a cough assist device, and is paced 3% of the time with a single chamber pacemaker.

To reduce potential complications associated with opioid use and a general anesthetic, an opioid-free anesthetic was planned using local infiltration and dexmedetomidine infusion for sedation. 0.25% bupivacaine with epinephrine was injected into septum, bilateral inferior turbinates, nasal mucosa, and posterior septum. Twenty-three micrograms of dexmedetomidine was given as bolus doses over the first 6 minutes. Then, an infusion was started at 0.4mcg/kg/hr for 20 minutes, increased to 0.5mcg/kg/hr for the next five minutes, and again to 0.7mcg/kg/hr for ten minutes. It was decreased to 0.5mcg/kg/hr for the remaining 25 minutes of the case. Oxygen was applied via facemask at eight liters per minute and the patient was kept spontaneously breathing. The patient remained hemodynamically stable and was kept overnight for monitoring. The post-operative course was uneventful.

Conclusion: Dexmedetomidine is a highly selective α2-adrenergic receptor agonist that has the ability to provide sedation, analgesia, and anxiolysis with a stable hemodynamic profile. Avoiding both opioids and a general anesthetic in patients with DM decreases their risk of respiratory and cardiovascular complications. Communication with the surgical team was imperative to the success of using sedation for this procedure. This is the first case report of using dexmedetomidine infusion for sedation in a spontaneously breathing patient with DM and

advocates for its efficacy and safety in these patients with multiple comorbidities.

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Dynamic LVOT Obstruction with Severe Hemodynamic Instability after Spinal Anesthesia

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Introduction: Perioperative dynamic left ventricular outflow tract (LVOT) obstruction is not uncommon and its diagnosis might be a challenge. Perioperative dynamic LVOT obstruction may occur due to surge of catecholamine, hyperdynamic status or hypovolemia in patients with concentric left ventricular hypertrophy. Although rare, patients with sigmoid septum may exhibit dynamic LVOT obstruction. We present a case of dynamic LVOT obstruction in a patient with sigmoid septum, small and hypertrophic left ventricle (LV).

Case Report: A 76-yr-old female patient with isolated systolic hypertension (190-200 mmHg) and hypothyroidism presented for a left total knee arthroplasty. Preoperatively she denied any cardiac symptoms, and ECG was showing normal sinus rhythm. The transthoracic echocardiogram (TTE) revealed a concentric LV hypertrophy with small cavity and proximal septal thickening. Normal systolic function with myocardial perfusion imaging (MIBI) negative for myocardial ischemia.

At admission, her vitals showed a blood pressure (BP) of 230/80 mmHg and heart rate (HR) of 80 bpm. She was fasting for a period of 16 hours. After receiving a spinal anesthesia in the block room, she became hemodynamically unstable with systolic BP of 50 mmHg, treated with boluses of phenylephrine and fluid resuscitation with full recovery.

In the operating room, before the procedure starts, she became bradycardic (HR 30 bpm), complaining of lightheadness and nausea, treated with 0,2 mg of glycopirrolate, which increased her HR to 135 bpm. She remained hemodynamically stable but complaining of chest pain. After discussing the findings with the surgical team and a senior anesthesiologist, cardiology was consulted, and the decision was made to carry on with the surgery as planned. The patient was becoming asymptomatic as the HR decreased to 110 bpm. She remained asymptomatic throughout, an intraoperative point-of-care ultrasound cardiac exam was performed and showed a hyperdynamic LV with signs of dynamic LVOT obstruction as shown by Doppler late systolic peak velocity (Figure 1). Preoperative echocardiogram images were further reviewed and showed a normal LVOT Doppler pattern.

The patient remained asymptomatic post-operatively, with a normal ECG and no increase in troponins, being discharged from the hospital on POD3.

Discussion: It is currently assumed that LVOT obstruction is a dynamic phenomenon, the occurrence of which requires the coexistence of two elements: 1) predisposing anatomic factors and 2) a physiological condition that induces such a phenomenon. In our case, anatomic factors are a small hypertrophic LV cavity with a sigmoid septum, and the physiological conditions are

related to a catecholamine driven anxious patient, volume depleted due to prolonged fasting period and with decreased afterload due to the spinal anesthesia. Treatment is based on reducing heart contractility and rate (sedation and beta blockers), increasing the pre-load (with fluid resuscitation) and afterload (with vasopressors).

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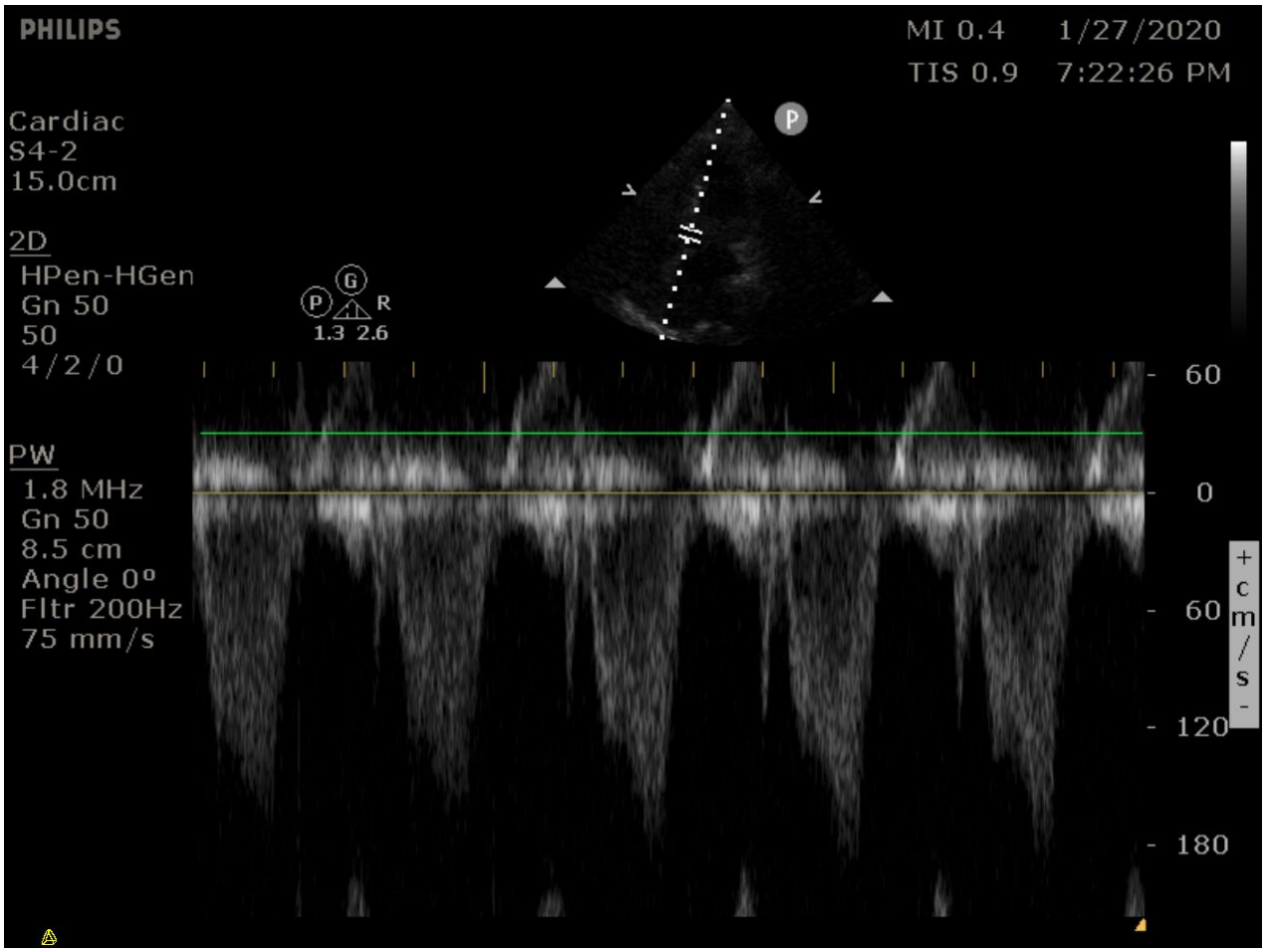

Figure 1 - Intraoperative point-of-care ultrasound cardiac exam

Effectiveness of Preoperative Patient Blood Management Strategies in Orthopedic Reconstructive Surgery

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Introduction: Both preoperative anemia and red blood cell transfusion are associated with increased risk of morbidity, prolonged hospitalization, and mortality1. Preoperative treatment of anemia may reduce transfusion in patients undergoing primary hip and knee reconstructive surgery – procedures with historical transfusion rates as high as 68%. We sought to characterize the relationship between preoperative Hgb and transfusion among patients undergoing primary hip and knee replacement at our centre2-4. Further, we compared the efficacy of interventions used at our centre to treat anemia preoperatively.

Methods: Ethics approval was obtained from the local REB. We conducted a retrospective cohort study of patients undergoing primary hip or knee replacement between January 2010 and May 2019. Patient-level data was collected from existing databases of orthopedic procedures performed at our centre, our Perioperative Blood Management Program (PBMP) clinic, and from our transfusion records. Patients in the PBMP were prescribed iron and/or erythropoietin at their anesthesiologist's discretion. We excluded patients undergoing revision or bilateral arthroplasty and patients with documented refusal of blood products, known bleeding diathesis, or hemoglobinopathy. Logistic regression modelled the relationship between preoperative Hgb and the probability of transfusion. Linear regression modelled the effect of iron and erythropoietin. All analyses were performed at the 95% level using R (R version 3.6.1).

Results: During the study period 13113 patients underwent hip or knee arthroplasty, of which 2532 (19.3%) were anemic preoperatively and 288 (2.2%) received transfusion. The odds of transfusion are 1.9 [1.4-2.5] times higher in hip arthroplasty compared to knee replacement, adjusting for preoperative Hgb ($p<0.001$). The adjusted odds of transfusion are 2.5 [2.3-2.7] times higher for each 10g/L decrease in preoperative Hgb, and 8.8 [6.7-11.8] times higher for anemic patients compared to non-anemic patients ($p<0.001$) (Figure 1a). Adjusting for procedure and compared to no preoperative treatment of anemia, oral iron increased Hgb 5.1 [1.9-8.2] g/L ($p=0.0015$) and decreased the odds of transfusion (OR 0.28 [0.16-0.51],$p<0.0001$); IV iron increased Hgb 8.5 [5.0-12.0] g/L ($p<0.0001$) and decreased the odds of transfusion (OR 0.14 [0.07-0.28], $p<0.0001$); erythropoietin increased Hgb 8.5 [4.5-12.5] g/L ($p<0.0001$) but had no significant impact on transfusion (OR 0.68 [0.33-1.41], $p=0.303$); combination therapy increased Hgb 9.9 [6.0-13.8] g/L ($p<0.0001$) and decreased the odds of transfusion (OR 0.41 [0.20-0.83], $p=0.013$) (Figure 1b).

Conclusions: Preoperative Hgb and anemia are strongly associated with transfusion in primary hip and knee arthroplasty. Iron and erythropoietin significantly increase Hgb preoperatively whereas only iron was found to decrease transfusion. These findings suggest that iron supplementation, with or without erythropoietin, before reconstructive orthopedic surgery can decrease transfusion and may therefore improve outcomes.

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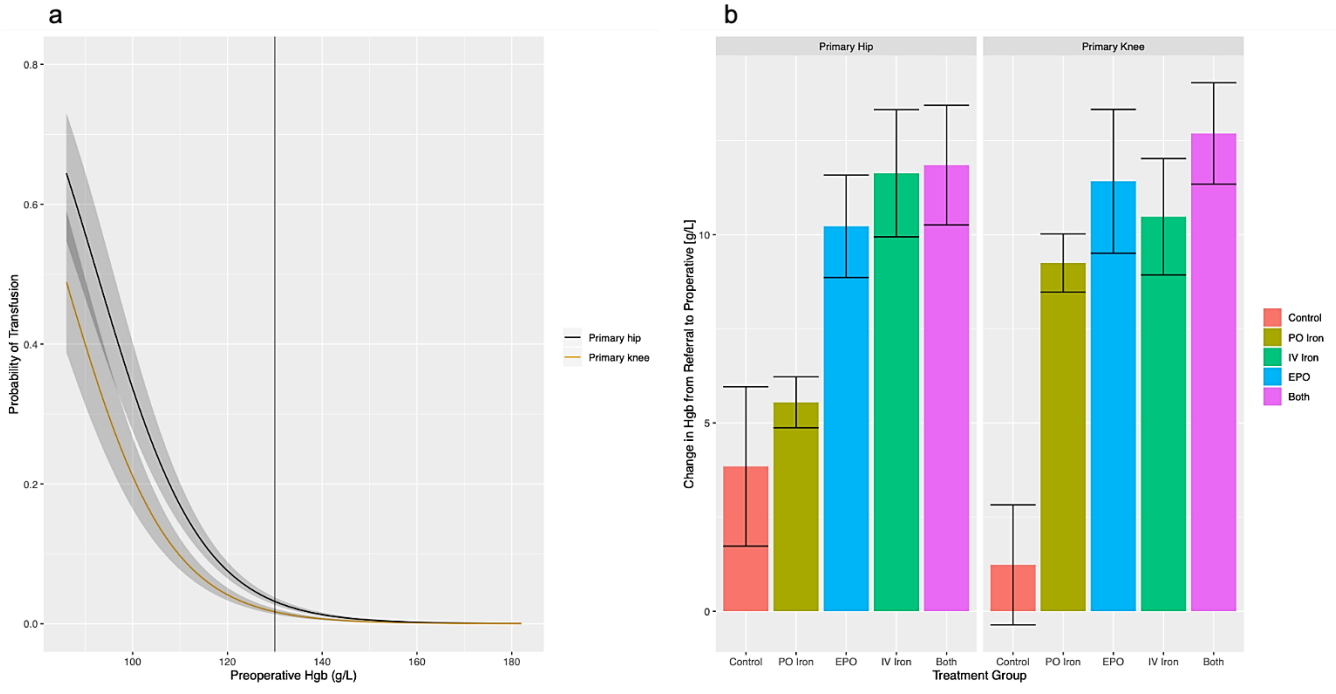

Health Resource Utilization Associated with The Implementation of The Canadian Cardiovascular Society Perioperative Guidelines for Patients Undergoing Non-Cardiac Surgery at an Academic Hospital

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Background: The Canadian Cardiovascular Society (CCS) guidelines for patients undergoing non-cardiac surgery address the lack of standardized approaches to the management of patients at risk of perioperative cardiovascular complications through preoperative brain natriuretic peptide testing or troponin (TnI) testing with electrocardiograms.[1] The implementation of these guidelines has not been systematically evaluated, and we lack data on adherence and impacts on healthcare resource utilization. We recently employed a multidisciplinary team-based approach to implement CCS guidelines at an academic hospital, including a quasi-experimental evaluation of changes in adherence, costs, length of stay, and complications.

Methods: Ethics approval was obtained from the local REB. We used an interrupted time series (ITS) design to study the effects of the CCS guidelines (August 2018 – February 2019), using routinely collected data. We included elective, non-cardiac surgery patients with: i) expected length of stay ≥1 day, and ii) age ≥ 65 or age 45-64 with a revised cardiac risk index of ≥1 or severe cardiopulmonary disease (peripheral artery disease, pulmonary hypertension, and obstructive cardiac pathology). Our primary outcome was guideline adherence (postoperative TnI monitoring). Our secondary outcome was appropriate follow-up care (consult for TnI positive patients). Tertiary outcomes included additional testing (electrocardiograms, perfusion scans, etc.), costs, length of stay and complications. The effect of guideline implementation was estimated using an ITS analysis based on Box-Jenkins methods for autoregressive integrated moving average models; we estimated the association of implementation with changes in the log-transformed rate of outcomes in each time period, adjusting for the underlying trend and post-implementation trend.

Results: We included 1,421 patients over the course of the study (706 pre-implementation and 715 post-implementation). Baseline demographic variables were balanced pre versus post. Table 1 provides outcomes rates pre vs post. Adherence to TnI testing following the implementation increased 21.79-fold (95% CI 10.59-44.79), without an increase in length of stay (RoM 1.05; 95% CI 0.69-1.60) or hospitalization costs (RoM 1.10; 95% CI 0.76-1.60). We also found no strong evidence of change in complications rates (RoM 0.99; 95% CI 0.62-1.59). In patients who had elevated TnI following guideline implementation (n=64, 8.9%), the majority (84.4%) received appropriate follow-up care in the form of a general medicine or cardiology consult, all (100%) received at least one electrocardiogram, and half (51.6%) received at least

one coronary diagnostic test (CT angiogram, cardiac perfusion scan, or a percutaneous intervention).

Conclusions: Systematic, multidisciplinary implementation of CCS postoperative monitoring guidelines led to a substantial increase in postoperative troponin screening in at risk-patients, including a high rate of appropriate follow up in screen-positive patients. These improvements in guideline-based care were not accompanied by increases in healthcare resource use. Large-scale multicenter evaluations of CCS guideline implementation are needed to evaluate the impact of guidelines on patient outcomes.

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Period	Pre-implementation	Post-implementation
No. of patients (n)	706	715
TnI Testing Adherence (n, %)	40 (5.7%)	496 (69.4%)
Elevated Troponin (n, %)	19 (2.7%)	64 (9.0%)
Length of stay (mean, sd)	4.3 (6.7)	4.0 (5.9)
In-hospital cost (mean, sd)	$12,833.32 ($15,378.31)	$11,317.01 ($7,313.29)
Any complication (n, %)	81 (11.5%)	78 (10.9%)
Received Appropriate Follow-up Care (of elevated TnI patients)		54 (84.4%)
Received at least one echo (of elevated TnI patients only)		19 (29.7%)
Received at least one ECG (of elevated TnI patients only)		64 (100%)
ECGs per patient (mean, SD)		3.84 (2.77)
At least one cardiac test (CT angio, perfusion scan, perc. Interventions)		33 (51.6%)

Table 1 displays the difference in outcomes rates pre- and post-implementation of the CCS guidelines.

In-Home, Computerized Assessment for Investigating Perioperative Neurocognitive Deficit in Elderly Surgical Populations

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Introduction: 200 million people worldwide receive general anesthesia (GA) each year.[1] Unfortunately, significant post-operative changes in patient cognition may occur after surgery with the greatest deficits in elderly patients[2]. Despite the potential long-lasting complications of perioperative neurocognitive deficits (PND)[3], there is currently no consistent and easy method to identify a patient's risk of developing PND and monitor its long-term outcomes.

The Dalhousie Computerized Attention Battery (DalCAB) is a patient-friendly tool available online that assesses fundamental aspects of cognition that could bridge this gap[4]. A 2016 pilot study demonstrated the feasibility of pre-operative administration in the clinic in adults over age 55[5]. The DalCAB showed a PND incidence of 14%, aligning with quantitative reports using extended test batteries[6].

This ongoing project aims to establish a peri-operative DalCAB that can be administered at home before and after surgery in order to investigate risk factors for PND, as well as monitor the time course of PND and impact on everyday outcomes, by generating a dataset of control and surgical participants 65 years and older. DalCAB results, along with other extensive pre- and intra-operative data will be analyzed using machine-learning methods to establish potential predictive determiners of PND in relation to post-surgical cognitive outcomes.

Methods: Ethics approval was obtained from the local REB. We report data from 86 participants recruited at the QEII Health Sciences Centre surgery pre-admission clinic (Halifax, NS, Canada). 41 surgical participants completed cognitive testing at two time points: first pre-operatively, then 45-90 days post-surgery. 45 control (non-surgical) participants completed a similar testing administration schedule. These tests included the DalCAB, the Hospital Anxiety and Depression Scale (HADS), a modified Telephone Interview for Cognitive Status (mTICS), and pain ratings on a visual analogue scale.

Results: Initial analyses examined the prevalence of impaired cognitive function (z score >1.96) post-operatively in surgical participants in relation to pre-operative testing. Overall, 11/41 (26.8%) surgical participants had an impairment in at least two cognitive domains, with 4 (7.3%) showing impairment in 3 domains, including working memory and executive function. Cognitive impairment was not reliably associated with changes in mood or pain.

Discussion/Conclusion: The at-home, online DalCAB is able to detect post-operative cognitive deficits in surgical patients over the age of 65. Upcoming predictive modelling will identify a patient's predisposition to PND using DalCAB test results, demographics, and health information. In the long run, these factors will be accessible to physicians with an easy-to-use interpretation scale to enhance decision-making and outcomes related to anesthesia delivery methods in this vulnerable population. Empowerment through informed decision-making will ultimately improve patient outcomes.

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Inter-Individual Variability in Postoperative Worsening of Sleep Disordered Breathing: A Pilot Cohort Study

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Introduction: Increased risk of postoperative complications in obstructive sleep apnea patients is thought to result from the combined negative effects of surgery, anesthetic agents, and opioid analgesics exacerbating upper airway dysfunction.[1] However, little attention has been directed to inter-individual variation in this effect[2], even though patients who experience significant postoperative worsening of sleep disordered breathing (SDB) are likely at highest risk of complications. This single centre, pilot cohort study established protocol adherence, described the variability in postoperative changes in SDB among a homogeneous surgical population receiving standardized perioperative care, and explored potential predictors of worsened postoperative SDB.

Methods: Ethics approval was obtained from the local research ethics board. Consented patients having laparoscopic bariatric surgery between May 2017 and September 2018 recorded preoperative and postoperative overnight oximetry studies, using an approved monitor.[3] A trained analyst calculated the oxygen desaturation index (ODI) and severity of nocturnal hypoxemia (cumulative percent of study time with SpO2<90%, CT90) for each study. For each patient, the worst postoperative night was compared to the preoperative baseline for both parameters with changes of >10 events/h in ODI and >5% in CT90 considered clinically significant. Caregivers were blind to oximetry study results. All other care was as per local routine with hospital discharge on the first post-operative morning. Analysis was descriptive except as noted.

Results: Thirty-five of 96 (36%) of patients had complete oximetry data for analysis (studies in the preoperative period and each of the first three post operative nights). Baseline parameters were not significantly different between patients with and without analyzable data. 15/35 (43%) had evidence of pre-existing SDB (preoperative ODI>5). Postoperative night 2 was most frequently the worst for both ODI (21/35, 60%) and CT90 (16/35, 46%). Group median ODI and CT90 changed modestly from preoperative baseline to worst postoperative night (-0.3 events/h and +4.9%, respectively), despite marked interindividual variation (Figure). ODI and CT90 respectively worsened by a clinically significant amount in 4 (11%) and 14 (40%) patients but showed net improvement in 20 (57%) and 8 (23%). Univariate linear regression modelling found body mass index, baseline ODI, early postoperative hypoxemia and opioid analgesic use on post-operative day 1 predicted ($p<0.05$) worsening CT90 while a history of positive airway pressure device use was protective. Only pre-operative CT90 and male sex predicted worsened post-operative ODI.

Conclusions: Protocol adherence was comparable to similar studies[2] but might be improved by simplification of study procedures. Despite similar surgery and perioperative care, we observed considerable inter-individual variability in magnitude and direction of change in postoperative ODI and CT90 that was incompletely explained by pre-existing SDB and other clinical variables. This variability requires further study but may relate to OSA phenotype[4], susceptibility to opioid induced respiratory depression and other patient related factors.

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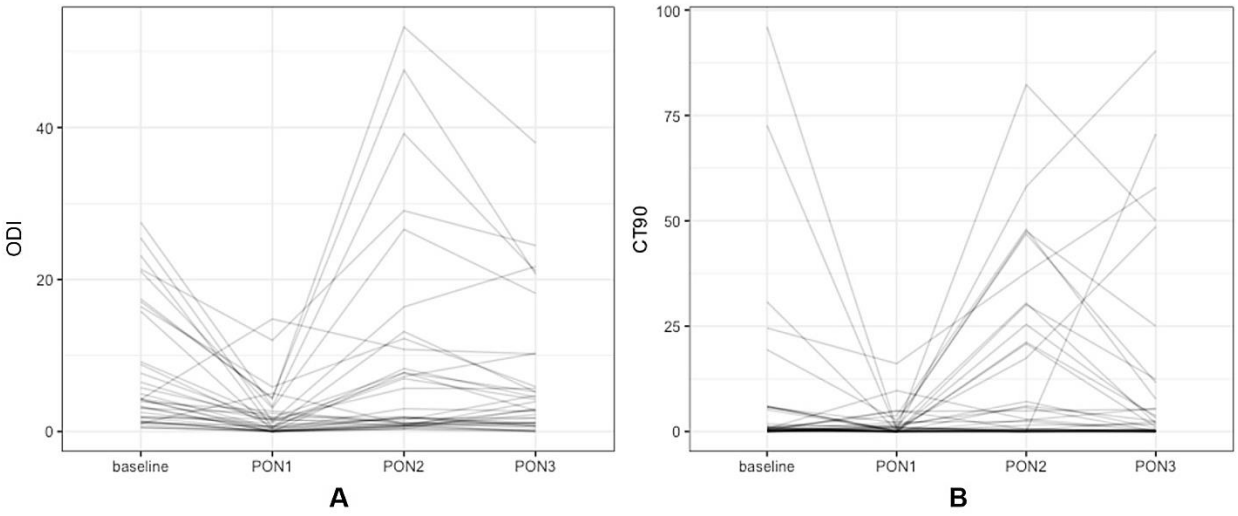

Figure. Spaghetti plots of individual patient's pre- and post-operative (**A**) oxygen desaturation index (ODI, events/h) and (**B**) cumulative time spent with SpO2 of <90% (CT90) expressed as a percentage of total recording time. Baseline is the weighted average of up to three pre-operative oximetry studies. PON1, 2, and 3 are postoperative night 1, 2 and 3 oximetry studies, respectively.

Interventions that Increase Unused Postoperative Opioid Disposal Rates: A Systematic Review

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Introduction: Opioid prescription and misuse is considered an epidemic. Unused post-operative opioids contribute meaningfully to iatrogenic supply of opioids available for misuse, accidental ingestion or diversion. Efforts at curbing the epidemic have been challenging and safe disposal rates of unused opioids has been poorly evaluated while remaining low (Hartford et al., 2019).

Methods: A systematic review of literature was conducted to explore evidence-based strategies to improve disposal of unused post-operative opioids. Ethics approval was not applicable because the study did not involve human or animal research. PUBMED (MEDLINE), EMBASE and COCHRANE from inception to Sept 2018 were searched. Papers were screened independently by two reviewers using pre-defined criteria. Of those full articles, those meeting our inclusion and exclusion criteria were included in the systematic review. Meta-analysis of data was not possible due to significant heterogeneity in study methodology and quality.

Results: Literature search yielded 883 unique sources. After abstract review, 153 were retained for full article review. 119 did not meet inclusion criteria and 34 articles were included in the review. Interventions researched include patient education, drug take-back days, drug kiosks, drug mail back programs and pharmacy return. Few interventions were evaluated as controlled trials and these involved primarily patient education. Patient education consistently increases patients' awareness, but behavioural interventions have not reached clinical significance. State-wide drug take back days or kiosks have been widely implemented in the US demonstrating bulk returns of large volume unused medications (including opioids), however it is uncertain what proportion of total unused opioids are collected. Only a single, small study evaluated drug mail back programs. Pharmacy return is a program widely available in Ontario, however the usage rates are not well evaluated prospectively, and remain largely underutilized. No study evaluated monetary or non-monetary incentive based strategies.

Conclusion: While patient education increases patients' awareness of concerns and drug take-back programs have yielded high absolute returns, there is a paucity of evidence-based interventions to improve unused postoperative opioid disposal. There is a clear opportunity and need to increase opioid disposal rates by exploring novel strategies to complement effective efforts in reducing excess prescribing.

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Optimizing Anesthetic Technique and Postoperative Analgesia in Candidates Undergoing Hip and Knee Arthroplasty

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Introduction: There are very different approaches across Canada and around the world to the perioperative care of patients undergoing hip or knee arthroplasty. As clinicians, it is difficult to establish “best practice” strategies as we often feel we are operating in the dark and lack data and tools to get feedback on how our management options actually impact outcomes.

Objectives: In order to obtain locally relevant data to inform decisions relating to a best practice approach, we decided to create our own quality improvement toolkit by making use of some innovative modern technology. The idea was to measure a wide range of data about our current practice, analyze it and show results to clinicians, staff and management. That would give us the feedback to identify deficiencies more objectively, adapt our practice and then measure the impact through a continuing process of quality control.

Methods: Ethics approval was obtained from the local REB. To learn as much about our arthroplasty candidates and their perioperative progress as possible, we used five main sources of data: (1) Subjective patient reported outcome and experience measures reported via a tablet-based communication platform with REDCap. (2) Objective mobility data from wrist worn mobility monitors (recording information about movement, sleep, temperature and ambient light). (3) Anesthesiologists completed a simple tablet based electronic REDCap tickform about anesthetic drugs and techniques. (4) A study nurse recorded chart reviews of in-hospital analgesic and anti-emetic use. (5) Physiotherapy performed a preoperative Timed Up and Go (TUG) test. We analyzed all this data relating patient experience over time to patterns of practice over time. We were specifically interested in how pain, nausea, sleep, mobility and their pharmacological treatment interacted to affect patient recovery. We also looked at the ability of measured preoperative mobility to predict post-operative recovery.

Results: The mobility sensors showed fascinating information about changes in mobility and sleep patterns after surgery. The main targets for improvement we identified were pain control, disrupted sleep patterns, an incidence of postoperative nausea of 40%, poor maximization of opioid sparing strategies (under-administration and under-dosing acetaminophen and NSAIDS), a surprisingly high incidence of thigh pain (tourniquet pain) and generally slow recovery of mobility that hardly reaches pre-operative baseline by two weeks. Patients were very poor at estimating their own mobility.

Conclusion: A simple perioperative learning health system using innovative modern technologies gave us fascinating insights into what is actually happening to our arthroplasty patients and clear targets for improvement and tools to measure the impact of interventions. Hopefully these tools will be built into future health systems (like EPIC). Mobility should be seen as a fifth vital sign and objectively monitored. This mobility phenotyping is a huge field for future research.

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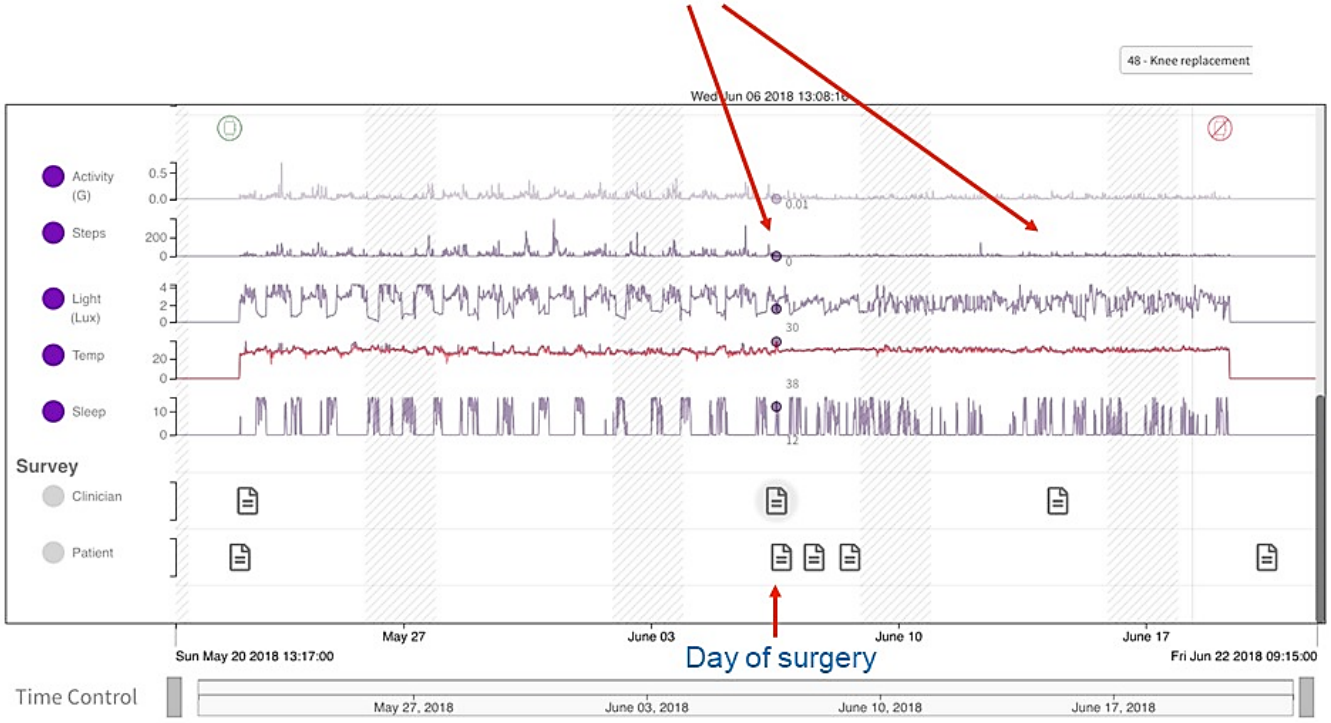
Mobility phenotype of a patient with poor recovery.



Low activity after surgery, not progressively walking more.
Sleep is very disturbed after surgery and does not seem to be returning to baseline after two weeks.

Perioperative Outcomes Following Preoperative Epidural Analgesia in Hip Fracture Patients Undergoing Surgical Repair: A Systematic Review and Meta-Analysis

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Introduction: With an aging population, it is projected that the number of annual hip fractures will increase to 6.26 million by 2050 (1). In the first 3 months after a hip fracture, mortality and healthcare expenditures are high (2-3). The elderly have reduced physiological reserves, increasing their susceptibility to inflammatory cytokines released by trauma, potentially leading to cardiovascular and multi-system complications (4). Through its anti-inflammatory mechanisms, epidurally administered anesthesia may improve perioperative outcomes in hip fracture patients (5). Previous systematic reviews have compared general vs. neuraxial anesthesia for the operative management of hip fractures, but to our knowledge the use of epidural analgesia in the presurgical period has not yet been reviewed (6,7). This systematic review aims to examine the effects of preoperative epidural analgesia on hip fracture patients undergoing surgical repair.

Methods: Ethics approval was not applicable because the study did not involve human or animal research. The study protocol was registered with the PROSPERO systematic reviews register: CRD42019140396. The following databases were searched: MEDLINE. EMBASE, and Cochrane Controlled Register of Trials. Grey literature was hand-searched. Title and abstract screening, full-text review, risk of bias assessment, and data extraction were performed independently by two reviewers. Disagreement was resolved through consultation with a third reviewer. The heterogeneity of the included studies was assessed using the I^2 statistic and a random-effects meta-analysis was conducted once sufficient homogeneity was shown ($I^2 <$ 75%). An assessment for publication bias was performed. Due to the small number of included studies, funnel plots and Egger's weighted regression method were not used.

Results: 2243 records were identified in the literature search conducted in June 2019. After 473 duplicates were removed, 1770 records were screened by title and abstract. 28 records were assessed for eligibility by full-text and 4 studies (8-11) met all inclusion criteria, which included a total of 221 patients randomized to preoperative epidural analgesia or alternative forms of analgesia. Preoperative epidural analgesia resulted in reduced cardiac events, which was a reported outcome in two included studies. The relative risk of suffering a cardiac event was 0.36 (95% CI 0.18 to 0.82; $I^2 = 0\%$) favouring those that received preoperative epidural analgesia. For the outcome of postoperative mortality, three studies were included for meta-analysis (the fourth did not report mortality as an outcome). There was no significant reduction in mortality in the group that received preoperative epidural analgesia (RR = 0.44; 95% CI 0.07 to 2.63; $I^2 =$ 55%).

Conclusion: Preoperative epidural analgesia for hip fracture likely reduces perioperative cardiac events. Reduced mortality was not demonstrated, but the number of included studies

was low. More research should be done to determine the benefit of early epidural analgesia for hip fractured patients.

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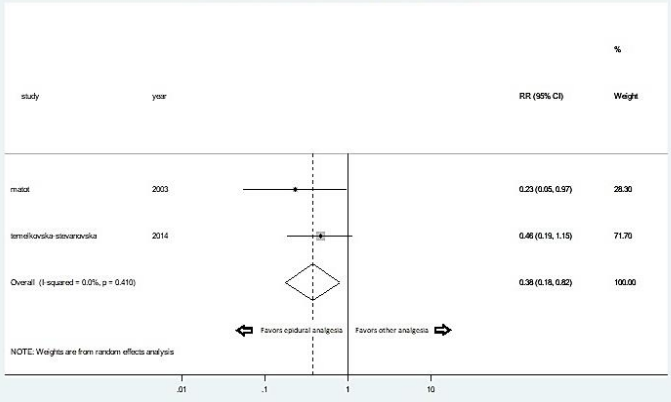
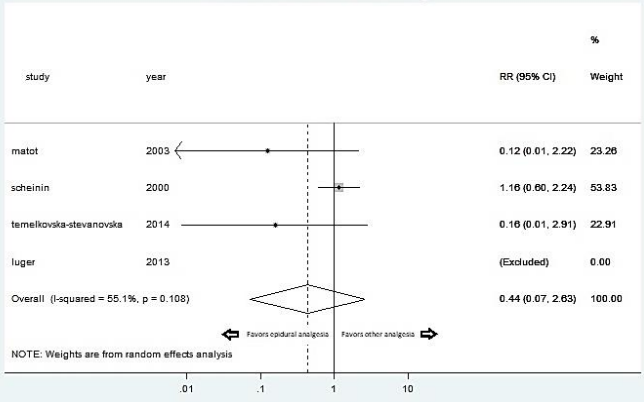
Pooled risk of cardiac events



Pooled risk of Mortality



Potentially Low-Value Preoperative Anesthesiology Consult Utilization in Ontario

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Introduction: Physician consultations are a limited resource within the healthcare system. Anesthesiologists in particular have multiple clinical roles, including providing anesthesia during surgery and other procedures, preoperative clinic appointments to prepare patients for surgery, and providing postoperative care to patients. Time spent in one of these roles is time they are not available for the other roles. This study sought to evaluate current consultation usage patterns, with an objective to determine opportunities for more efficient utilization.

Methods: Ethics approval was obtained from the local REB. A retrospective comprehensive population-based cohort study was performed, evaluating all hospitals in the Canadian province of Ontario from 2002-2018. The main outcome measures were American Society of Anesthesiologists (ASA) classification of the patients, and whether the patients underwent surgery within 3 months following the anesthesia consultation.

Results: A cohort of 2,023,499 patients, and a total of 2,920,100 preoperative anesthesia consultations was obtained. The number of consults per year doubled between 2003 (112,983/year) and 2017 (246,427/year). Each year, an average of 19.32% of the consults (range: 17.69-20.49%) were for patients that did not progress to having surgery. Of those that did have surgery following the anesthesia consult, 37.23% were ASA Classification I or II. The most common surgical procedures (percent of total) following anesthesia consult were: Knee implantation of internal device (9.46%), hip implantation of internal device (5.84%), cataract excision (4.09%), repair of muscle of chest/abdomen (3.31%), uterus excision (2.76%), and gallbladder excision (2.67%).

Interpretation: This study reveals important data relating to the utilization and trends over time of preoperative anesthesia consultations. Opportunities for optimization were found, including patients who did not proceed to surgery, and those healthier patients that may not require this consultation.

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Pre-Surgery Glucose and Metabolic Prehabilitation (Sugar-I Follow-Up Study)

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Background: Our Sugar-I study indicated that patients' compliance to preoperative fasting guidelines, particularly to clear fluids, was poor [1]. Since then, local fasting protocols have been revised, focusing on patient and staff education on current clear fluids fasting guidelines. This follow-up study aims to determine whether such education improved patients' adherence to fasting guidelines.

Methods: Patient education was provided via revised written fasting instructions which were sent to all elective surgical patients. The instructions clearly defined specific fasting times for clear fluids and solid foods and, included examples of acceptable and unacceptable clear fluids. Staff education was provided through Inservice meetings, consisting of content similar to the revised written instructions.

After institutional ethics approval, medical records for elective surgical patients during a 3-month period were then reviewed, and fasting times for fluids and solids were extracted. Fasting categories were defined as per the initial study [1].

Results: Data from 1852 patients were examined and analysed.

The results indicated that still too many patients fasted for too long, 48% for clear fluids and 55% for solid foods.

When compared to the initial study [1], a significant improvement was seen in the acceptable fasting category for clear fluid, 49% versus 6%. However, the rate of acceptable fasting for solid foods only slightly increased to 43% from 39%.

Of concern, while non-fasted patients from solid foods remained similar (2%), non-fasting from clear fluids increased by 3% in the current study. The significance of such increases in our perioperative practice and the implications on the way we educate our patients and staff requires further exploration.

Conclusions: Our initial measure of revising local fasting protocols to educate patients and staff proved effective, having improved patients' compliance to the current fasting guidelines significantly. However, there was an increase in patients who did not fast from clear fluids properly after receiving education. Thus, further revisions, incorporating solid foods and alternate methods of fasting instruction delivery are needed to address these identified issues.

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Prehabilitation to Improve the Perioperative Functional Trajectory in Major Cancer Surgery

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Background: Functional capacity has a strong role in peri-operative medicine, from the moment of decision to operate until full recovery.[1] Patient-centered outcomes, such as time to return to physical functioning, can impact not only on quality of life, but also on access and continuity of cancer care.[2] By targeting malnutrition, poor physical capacity and mental distress as key modifiable risk factors, prehabilitation is a preoperative intervention that aims to make patients fitter for surgery, and accelerate their recovery.

Despite mounting evidence of its efficacy, current investigations are deemed to lack of large cohort validation.

Methods/Results: Ethics approval was obtained from the local REB. Pooled data from research trials on prehabilitation in patients undergoing elective non-metastatic colorectal cancer surgery from 2009 to 2016 were analyzed. Patients were grouped into PREHAB or standard of care (CONTROL). All groups received enhanced recovery program. The primary outcome was the change in perioperative physical capacity compared with baseline measurement, evaluated with repeated 6-minute walk tests (6MWT) over a 3-month period.

A total of 397 patients were included, 259 in PREHAB an 138 in the CONTROL. Duration of prehabilitation was 35 days (SD 18). Groups characteristics were well-balanced, patients' mean age 69 years (SD 11.5), 29% stage II and 27% stage III cancer. Baseline 6MWT was 428.5 m (125) in PREHAB, and 417.6 (123.7) in CONTROL, P= 0.410. Functional trajectories are presented in figure 1. Compared with baseline 6MWT, patients in PREHAB gained 26.3 m (SD 59.0) preoperatively, while CONTROL dropped by 3.2 m (SD 63.2), P <0.001. At 4 weeks after surgery; PREHAB dropped by 1.9 m (SD 69.4), while CONTROL dropped by 50.9 m (SD 107.2), P <0.001. At 8 weeks after surgery, PREHAB gained 24.9 m (SD 50.4) while CONTROL dropped -1.9 (DSD 69.4), P <0.001.

Conclusion: Prehabilitation positively modulates for better perioperative functional trajectory of patients undergoing colorectal cancer surgery, and therefore could have a key role in peri-operative medicine.

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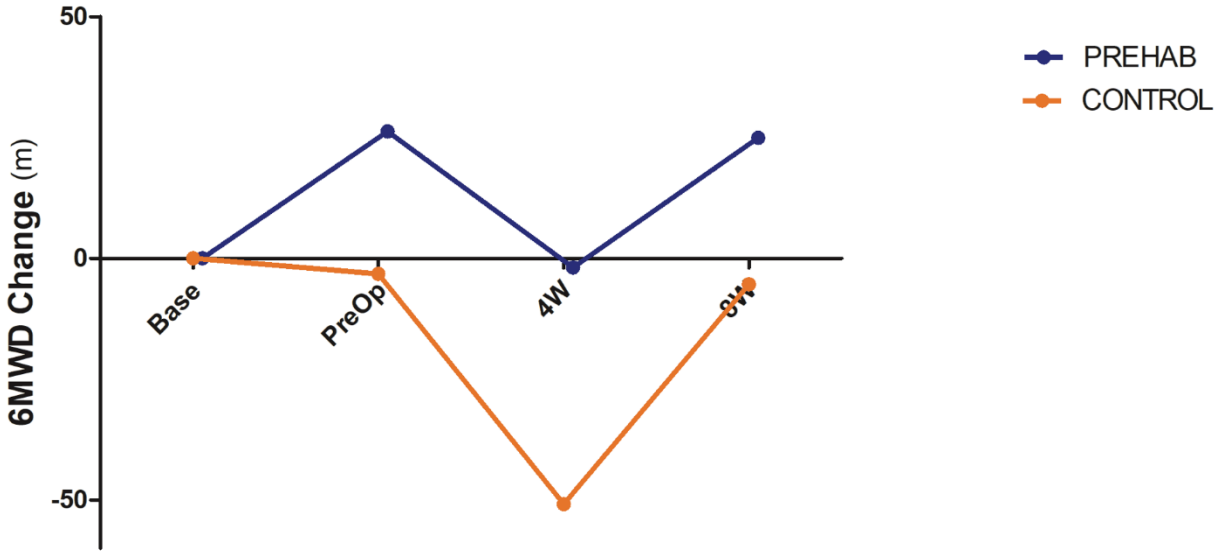
50
0
-50
6MWD Change (m)
Base
PreOp
4W
PREHAB
CONTROL

Survey on Preoperative Fasting: Patient Experience and Understanding (Sugar-II Follow-up Study)

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Background: The current guidelines for preoperative fasting recommend that patients should consume a sugary clear fluid up until 2 hours prior to anaesthetics. However, our Sugar-I study indicated that patients' compliance was poor [1]. The initial Sugar-II study [2] was subsequently conducted to investigate the reasons for poor compliance from the patient's perspective, and suggested some misunderstandings of the recommended fasting periods and what constituted a 'clear fluid' [2]. Based on these results, fasting instructions across local institute have been revised, focusing on patient education regarding clear fluids. This follow-up study aims to determine how effective patient education is on improving patients' adherence to the fasting guidelines, understanding of the instructions provided and their experience during the preoperative fasting period.

Methods: After local ethics approval, revised fasting instructions, using specific and straightforward language, were sent to all elective surgical patients.

During a two-month period, patients were randomly selected and followed up after their discharge from recovery room. When sufficiently alert, they were asked to consent and complete an anonymous questionnaire survey as used in the previous study.

Results: Data from 165 patients were examined and compared with the initial study [1].

The results for adherence to the fasting guidelines indicated an improvement for both clear fluids and solid foods, particularly clear fluids, where the acceptable rate was increased by 20% (from 39% to 59%).

There was a 10% drop in patients who experienced preoperative discomfort from fasting (from 84% to 74%). The incidence of thirst reduced from 60% to 44%, however, hunger slightly worsened by 2% up to 38%.

While there was minimal change in patients' understanding of recommended fasting periods for solid foods, prolonged or excessive fasting from clear fluids was significantly reduced, decreasing by over 50%.

Of note, recognition of 'clear fluids' as inclusive of clear sugary beverages improved dramatically from 3-15% to 36-62%, although identification of inappropriate beverages (e.g. white coffee or tea) as being 'clear fluids' also increased.

Compared to the initial study, the revised fasting instructions were reported to be much easier to follow; 10/10 ratings jumped from 26% to 56%. Similarly, many more patients were satisfied with their fasting experience, with an increase in 10/10 ratings from 8% to 44%.

Conclusions: Given the diversity of backgrounds, patient education remains notoriously challenging. However, patient comprehension of the fundamentals of the current fasting guidelines through lay language, such as in our study, could be a simple but effective approach to improve their compliance to the fasting instructions, as well as their experience and satisfaction with preoperative fasting.

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The Accuracy of Patient Self-Reported Frailty Using the Clinical Frailty Scale

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Introduction: Frailty is a syndrome related to accumulation of age- and disease-related deficits.1Frailty predicts a >2-fold increase in postoperative morbidity, mortality, and patient-reported adverse outcomes.[2]Identification of frailty can direct clinical care that may reduce rates of postoperative mortality.[3]Guidelines recommend routine preoperative frailty assessment in people >65 years,[4]however, adherence is minimal. Patients can self-report major comorbidities with strong to moderate agreement with a physician history,[5]however, the accuracy with which patients can evaluate their own frailty status before surgery is unknown. We hypothesized that patients could accurately report their own frailty status; this could empower patients to support an evidence-based approach to their own care.

Methods: Ethics approval was obtained from the local REB. This was an OHSN-REB (20150342) approved sub-study of a multicenter prospective cohort study of people >65 years having elective, major noncardiac surgery. During preoperative assessment, consecutive patients (blinded to clinically determined frailty score) self-rated their own frailty score on the Clinical Frailty Scale (CFS). Trained research assistants (blinded) performed formal CFS assessments that were reviewed by the primary investigator. Agreement between self- and clinically-applied CFS scores were assessed using weighted kappa statistics. Difference plots were constructed according to the methods of Bland and Altman. Pearson correlation coefficients were calculated. Explained variance was measured using linear regression. We evaluated whether self- or clinically-applied CFS scores were more accurate in predicting the occurrence of death or new disability 90-days after surgery.

Results: Five hundred and thirty-one participants had self- and clinically-applied CFS scores. Mean age was 73 (SD6) years, 261 (49.2%) were female, and 276 (52.0%) had orthopedic surgery. The median self-rated CFS score was 3 (IQR2-3), the median clinically-applied CFS score was 3 (IQR 2-4). Agreement between self- and clinically-applied CFS was moderate (weighted kappa=0.57 (95%CI 0.53-0.63). Bland-Altman plot is shown in Figure 1; 76% of measurements were within the limits of agreement. Correlation was high (ρ=0.76, P<0.0001) and the majority of the variance in the clinically-applied CFS was explained by the self-CFS (R2=0.58). When predicting death or new disability, the clinically-applied CFS had increased discrimination and was more strongly associated with the outcome than the self-applied CFS (AUC 0.69 vs 0.67, Type III Wald P-value 0.046 vs 0.121).

Conclusion: Patients can self-report their own frailty status using the CFS with good agreement and strong correlation to a clinically applied frailty assessment. Interestingly, this level of agreement is similar to that between different anesthesiologists assigning ASA scores to the same patient. However, in our data, clinically applied frailty scores were significantly associated with postoperative outcomes while self-reported scores were not.

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