CAS 2026

Patient Safety Abstracts

Contents

Assessment of electronic cognitive aids for perioperative emergencies used at a major tertiary care hospital: a quality improvement initiative using the theoretical domains and plan-do-study-act framework

Submission ID

219

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INTRODUCTION

Cognitive aids (CAs) are tools, such as checklists and algorithms, designed to reduce human error and improve performance in high-risk environments [1,2]. Widely adopted across safety-critical industries, CAs in healthcare have demonstrated benefits including improved teamwork, increased adherence to critical management steps, and reduced perioperative complications [1-4]. Accordingly, Canadian anesthesia practice guidelines recommend the use of CAs during perioperative emergencies [4,5]. Traditional paper-based anesthesia CAs are being replaced by electronic CAs (eCAs) as part of modern digital integration efforts. Despite improved accessibility, effective eCA use remains dependent on clinician engagement and compliance [2]. This quality improvement study aims to assess patterns of eCA use within the Department of Anesthesiology at a tertiary care hospital**.** The Theoretical Domains Framework (TDF) will be applied to identify behavioural barriers and facilitators to eCA utilization; with findings used to inform iterative Plan–Do–Study–Act (PDSA) cycles to optimize eCA engagement in peri-operative clinical practice.

METHODS

Research ethics board approval was waived as our study and questionnaire were classified as a Quality Improvement (QI) initiative. An initial retrospective audit was performed to determine the usage of eCAs using the Epic™ electronic medical record (EMR) system and the SlicerDicer™ data information modeler since the start of EMR in 2022 to 2024 at a tertiary care hospital. Audited components included eCA records, case characteristics, basic patient demographics, and clinical context. Subsequently, a department-wide online survey was distributed over a six-week period to assess clinicians' beliefs, attitudes, and experiences related to eCAs. The survey included demographic items, general eCA usage items, and a TDF–informed component with Likert-scale responses. Statistical analysis was

conducted using SPSS version 24 and qualitative information was coded based on the Handbook of Emergent Methods qualitative methodology.

Survey findings informed sequential PDSA cycles with incrimental interventions aiming to improve knowledge and utilization of eCAs. Cycle 1 focused on departmental education through recurring communications detailing eCA location, content, and documentation over six months. Concurrently, Cycle 2 involved updating EMR-embedded eCAs to reflect current evidence and best practices. Following Cycle 1, a repeat TDF-based survey and EMR audit will evaluate changes in attitudes and eCA utilization.

RESULTS

Baseline audit of 48,382 anesthetic records 2022-2024 demonstrated minimal eCA use (Table 1). A total of 37 surveys were completed, responders included 28 attending anesthesiologists, 5 residents, 2 fellows, and 2 anesthesia assistants. 16% of the participants used eCA's for perioperative emergencies, emergency drills, preparation for complex cases, debriefing clinical events, and educational review. Nearly half, 49%, of respondents had never used eCAs due to unawareness, difficulty locating them, or lack of training.

Thematic analysis identified facilitators, including perceived alignment with anesthesiologist roles and belief that eCAs improve patient safety and teamwork. Furthermore, most of the respondents believed they possessed the requisite knowledge and skills to use CA's, notably in rare perioperative emergencies. Key identified barriers included difficulty accessing eCAs in current EMR, reliance on alternative CAs resources, lack of resources to support eCA used during peri-operative emergencies, and perceived cultural stigma associating eCA use with clinical inadequacy.

DISCUSSION

At this tertiary hospital, eCAs are infrequently used and are primarily accessed for educational or non-emergent purposes. Low utilization appears to be driven by knowledge gaps, lack of formal training, and perceived negative cultural attitudes toward eCA use during perioperative emergencies. Based on these findings, subsequent PDSA cycles will prioritize education and awareness through a comprehensive e-module detailing eCA location within the EMR, application during emergencies, documentation and supporting evidence. Ongoing PDSA cycles are intended to progressively improve eCA utilization, with a goal of achieving at least 90% clinician awareness and proficiency of eCA use at this institution.

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	Jan 1st to Dec 31st 2022	Jan 1st to Dec 31st 2023	Jan 1st to October 30th 2024
Handover checklist	28	3	2
Delayed emergence	0	0	0
Hemorrhage	0	1	0
High-spinal	0	1	0
Hyperglycemia	2	0	1
Hypertension	0	1	1
Hypotension	0	1	3
Malignant hyperthermia	2	1	0
Pneumothorax	0	1	0
Power failure	1	0	0
Right heart failure	0	2	1
Transfusion reacHon	1	0	0
ACLS	0	0	0
CRM protocol	0	0	0
Trauma	0	0	1
Code bleed	1	0	0
Anaphylaxis	0	0	1
Total	**35**	**11**	**10**

Table 1. Frequency of documented electronic cognitive aid use by aid type identified through retrospective audit of anesthesia records in the electronic medical record from January 2022 to October 2024.

Complete ventilation failure due to a defective heat and moisture exchange filter: a pediatric case report.

Submission ID

61

AUTHORS

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INTRODUCTION

Heat and moisture exchange (HME) filters are commonly used in anesthetic practice to provide passive humidification and protect anesthetic equipment. They are inexpensive, effective, and do not require an external power source. However, they are not without risk, including increased dead space, higher resistance, and potential obstruction from secretions, saturation, foreign bodies,[1,2] or manufacturing defects.[3,4] Complete airway obstruction caused by a manufacturing defect is exceptionally uncommon but may result in catastrophic consequences if not promptly recognized. Automated anesthesia machine checks do not reliably assess circuit patency, allowing such defects to reach the patient. Here we report a pediatric case of complete ventilation failure caused by a defective HME filter, initially confounded by plausible clinical explanations. This case highlights the importance of maintaining a high index of suspicion for equipment malfunction during unexpected difficulty in ventilation and reinforces the role of manual circuit patency testing as a critical patient safety measure.

CASE PRESENTATION

A three-year-old child, ASA 2 with a history of asthma, presented for elective cochlear implantation. Mild upper respiratory tract infection symptoms were present on the day of surgery. Collaborative discussion with the clinical teams and family prompted a decision to proceed.

During the intravenous induction, the patient became distressed, refused preoxygenation and began coughing. Following induction, effective face mask face mask ventilation was not possible and was initially attributed to laryngospasm. Tracheal intubation was performed without difficulty, with a grade 1 view of the vocal cords; however, ventilation remained impossible, with absent chest movement, no breath sounds, and no end-tidal carbon dioxide trace. Severe bronchospasm was suspected, treatment initiated, and additional

anesthesia assistance urgently requested. Re-intubation by a second anesthesiologist was again uncomplicated, but ventilation remained impossible.

In anticipation of cardiovascular deterioration, intravenous epinephrine and chest compressions were initiated prior to the development of bradycardia or cardiac arrest. The breathing circuit was completely replaced with a backup circuit connected to an auxiliary oxygen source, after which ventilation was immediately restored and the patient rapidly stabilized. Total time from induction to restoration of ventilation was less than four minutes. Examination of the anesthesia circuit revealed a complete obstruction within the HME filter caused by a solid internal plastic barrier consistent with a manufacturing defect (Figure 1).

The procedure was abandoned. The patient was extubated uneventfully, admitted for overnight observation, and discharged the following day without complications. The family described the event as profoundly distressing, despite the absence of long-term physical harm.

CONCLUSION

This case demonstrates that rare manufacturing defects in anesthetic equipment can result in ventilation failure and life-threatening events, even in routine pediatric practice. Plausible clinical explanations may contribute to fixation error and delay recognition of equipment malfunction[5]. Because automated anesthesia machine checks do not assess circuit patency, manual verification such as the two-bag test remains essential. The family's experience highlights the significant psychological impact of these events and reinforces the importance of human checks alongside automated systems. Maintaining vigilance for equipment failure, reinforcing standardized checks, and supporting crisis management training are critical strategies to enhance patient safety and prevent recurrence.

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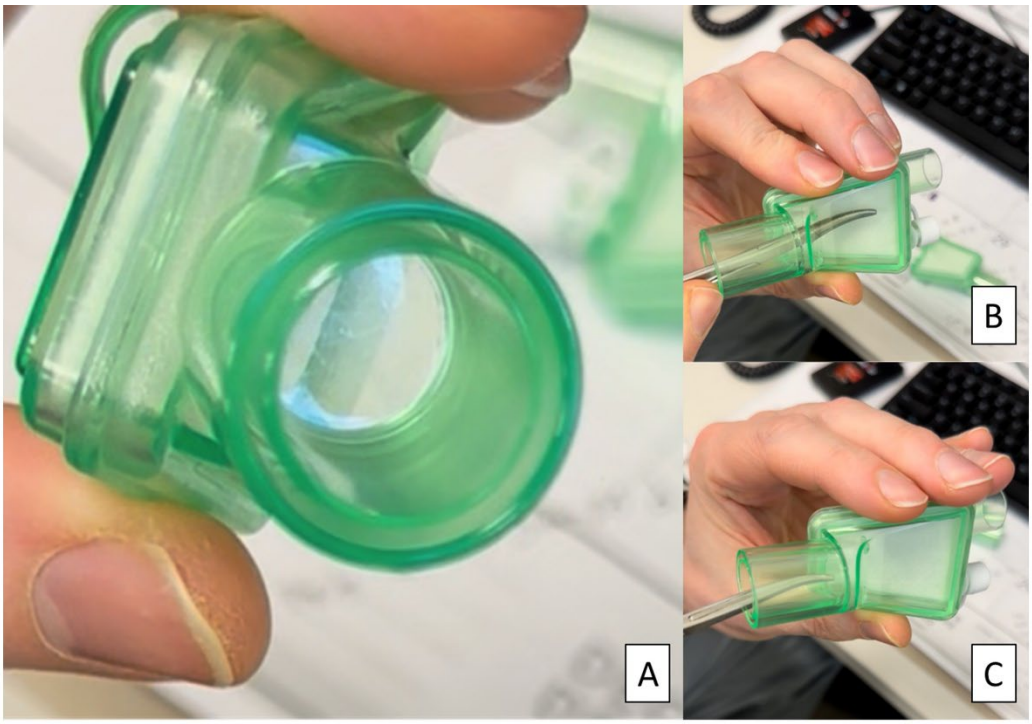

Figure 1. Images showing the complete solid plastic barrier in the heat and moisture exchange (HME) filter used in this case (A and B) compared to a normal filter (C).

Incidence of vascular and neurological complications associated with arterial catheter in anaesthesia and intensive care in the adult population : a systematic review

Submission ID

94

AUTHORS

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INTRODUCTION

Arterial catheter (AC) is an hemodynamic monitoring tool recommended in intensive care units (ICU) and operating rooms (OR) to manage moderate to high-risk patients. More than 8 million arterial catheters are inserted annually in the United States, and 49,5% of mechanically ventilated patients will require one[1,2]. While studies described a low rate of major complications (<1%), arterial cannulation is associated with a wide range of vascular and nerve complications (hematoma, bleeding, thrombosis, vasospasms, paresthesia, nerve injury, etc.)[1]. Considering the high frequency of insertion, these complications might still affect a substantial number of patients every year. Recent meta-analysis established that ultrasound-guided insertion can significantly increase first-attempt success and reduce complications rate[3,4,5]. We conducted a systematic literature and risk analysis to update previous data with modern insertion techniques.

METHODS

We systematically searched Pubmed, Medline, Embase, CINAHL, Cochrane Central and Web of Science from inception to October 2024 for original studies without language restrictions. Search strategy included three core concepts: arterial catheterization, complications/patient safety, and ICU or OR environment. Article selection respected PRISMA methodology. We included prospective trials, including randomized control trials (RCT) and observational studies conducted on adult patients exposed to arterial catheterization in the OR or the ICU for hemodynamic monitoring or blood samples, and that reported vascular and/or neurological complications. We excluded studies of pulmonary artery catheterization, cardiac catheterization and ECMO cannula, and paediatric population. We extracted vascular

complications (hematoma, vasospasm, complete or partial artery occlusion, aneurysm, pseudoaneurysm, hemorrhage, posterior wall puncture, thrombosis and arterial dissection), and nerve complications (paresthesia, nerve injury, limb ischemia, limb weakness, pain), installation technique, arterial site, and catheter used. Quality of evidence was evaluated using the GRADE score. We conducted descriptive analysis for all complications, and segmented results by puncture site and use of ultrasound during installation.

RESULTS

Of 13 037 screened records, 234 met study criteria for full-text screen and 47 RCTs (n=7550 AC) and 30 prospective studies (n=8830 AC) were selected for extraction. A total of 7700 radial, 607 femoral, 476 posterior tibial 330 axillary, 304 dorsal radial, 160 dorsalis pedis, 146 brachial, 88 ulnar arteries were analyzed, and 6569 were extracted from trials with multiple installation sites without site-specific complications reporting. Vascular complications rate was the primary outcome in 17 studies and AC insertion was done in the OR in 56 studies. The overall incidence of vascular complications was 9,8% for hematoma, 4,6% for vasospasm, 6,1% for thrombosis, 15,1% for complete or partial arterial occlusion, 1,9% for pseudoaneurysm and 0,84% for limb ischemia. The incidence of paresthesia was 0,78%. Table 1 reports site- and technique-specific incidences. Four major complications were reported. Overall quality of evidence is moderate for RCT and very low for prospective studies.

DISCUSSION

We identified a similar incidence rate of hematoma and arterial occlusion than previously estimated[1]. US-guided placement of a radial artery catheter is associated with smaller incidence of vascular complications except for vasospasm. However, ultrasound might increase detection of vasospasm compared to the blind technique. The clinical impact of these complications can be debated considering the low incidence of major complications. Literature on AC-related nerve complications and on non-radial catheterization is poor. High quality evidence studies with early and late systematic assessment for AC insertion related adverse events would allow a more accurate estimation of arterial catheter detection.

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Table 1. Selected incidence of vascular complications according to the puncture site

Incidence	Overall incidence	US-guided insertion (RCT)*	Blind insertion (RCT)	Blind insertion (RCT + prospective)
Radial artery				
Hematoma	15,1% (1023/6773)	10,7% (323/3032)	13,7% (169/1230)	18,2% (700/3841)
Vasospasm	5,1% (93/1839)	5,5% (80/1462)	1,8% (5/272)	3,4% (13/377)
Thrombosis	12,7% (347/2729)	0,76% (13/1714)	20,1% (55/273)	35,4% (331/986)
Arterial occlusion	23,7% (655/2762)	0% (0/127)	21,1% (65/308)	24,9% (655/2635)
Limb ischemia	1% (33/3435)	0,5% (3/576)	0,9% (1/115)	1,2% (30/2548)
Femoral artery				
Hematoma	3% (15/493)	-	-	-
Arterial occlusion	4,76% (3/63)	-	-	-
Limb ischemia	0,7% (4/565)	1,8% (1/55)	-	0,6% (3/510)
Brachial artery				
Hematoma	3,1% (2/64)	-	-	-

*US-guided technique was used only in RCT studies

Managing anticoagulation in candidates for liver transplantation: a single-center experience with Dabigatran.

Submission ID

203

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INTRODUCTION

End-stage liver disease (ESLD) results in complex alterations in coagulation, resulting in a propensity for both bleeding and thrombotic events. Orthotopic liver transplant (OLT) candidates may present simultaneously with indications for anticoagulation including cardiovascular comorbidities, portal vein thrombosis or venous thromboembolism (1). The use of direct oral anticoagulants (DOACs) offers potential advantages with avoidance of routine coagulation monitoring and fixed oral dose administration (1). Despite the increasing use of DOACs in patients with ESLD, safety data is limited (1,2). This issue is compounded by the need for effective reversal of anticoagulation in the setting of liver transplantation. At our institution, OLT candidates requiring anticoagulation are routinely switched to dabigatran once listed for transplantation due to a more reliable renal clearance profile and the ability to reverse with Idarucizumab. In this single-arm cohort study, we aim to report our institutional outcomes for patients treated with a DOAC while awaiting OLT.

METHODS

Institutional research ethics board approval was obtained.

Patients listed for liver transplantation at a single centre and receiving a DOAC between January 2023 and December 2025 were retrospectively identified from our transplant database. Collected variables included patient demographics, transplant and anticoagulation indications, liver disease severity at DOAC initiation (e.g., Na-MELD and Child-Pugh score), DOAC agent and duration, and pre-existing renal dysfunction. Renal dysfunction was defined as chronic kidney disease stage ≥3 per KDIGO criteria. The primary outcome was safety, defined as bleeding and thrombotic complications while awaiting transplantation and, among those transplanted, during the perioperative period (intraoperative through postoperative day 7). Bleeding events were classified as major or clinically relevant non-major using the International Society on Thrombosis and Haemostasis criteria. For transplanted patients, perioperative data was obtained including

timing of last DOAC dose, use of reversal agents, and transfusion requirements. Patient outcome data included assessment of post-operative graft function and patient survival (30 day and 1-year). Early allograft dysfunction was defined as the presence of either: (i) ALT/AST > 2000 IU/l within first 7 PODs, (ii) bilirubin ≥ 10 mg/dl on POD 7 or (iii) INR ≥ 1.6 on POD 7.
Outcomes are reported as counts (percentages) for categorical variables or median (IQR) for continuous variables.

RESULTS

Twelve patients received dabigatran while awaiting liver transplantation. The most common indication for anticoagulation was portal vein thrombosis (n=11, 92%). Median NaMELD at anticoagulation initiation was 14 (IQR 7–17). Six patients were classified as Child-Pugh B, 3 patients Child-Pugh C. Pre-existing renal dysfunction was observed in one-third. Median dabigatran treatment duration was 4 months (IQR 3–7.5). Two bleeding events were reported (1 clinically relevant non-major, 1 major). Dabigatran was restarted in both patients without recurrence.

Ten patients proceeded to liver transplant. Eight patients remained on dabigatran at the time of surgery (1 stopped due to thrombus resolution, 1 due worsening liver function). Median time from last dose to surgery was 22 hours (IQR 16–33). All 8 received idarucizumab preoperatively. One major thrombotic event occurred intraoperatively (intracardiac thrombus). No postoperative thrombotic events were reported.
There were no DOAC-related deaths, and all transplanted patients were alive at 1 year.

DISCUSSION

Anticoagulation is increasingly used in patients with advanced liver disease when clinically indicated, but bleeding risk remains a major concern. Despite limited evidence in advanced liver disease, DOAC use has expanded, particularly apixaban (3). However, challenges related to anticoagulation reversal with Andexanet alfa include substantial cost and associated thrombotic risk. Idarucizumab offers a cost-effective reversal, though safety data are limited to case reports (4). In this small retrospective cohort, our preliminary data suggest that dabigatran use in Child–Pugh B and C patients awaiting transplantation and its reversal in emergent perioperative settings, was associated with acceptable bleeding and thrombotic outcomes.

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Patient self-reported and surgeon-reported nerve injuries after peripheral nerve blocks: a retrospective quality improvement study in a regional anesthesia service

Submission ID

43

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INTRODUCTION

Peripheral nerve blocks (PNB) are an essential component of perioperative analgesia, providing superior pain control and enhancing recovery after anesthesia (1). A recent narrative review reported a pooled incidence of early postoperative post-block neurologic symptoms (PBNS) of 1% within the first two weeks, and a much lower incidence of 0.03% at one year (2). Incidence differed by block type and approach, with interscalene blocks having the highest incidence (2). Long-term nerve injury following PNBs is rare, with reported rates of 2-4 per 10,000 blocks (3).

Although most postoperative neurologic symptoms are transient, persistent deficits have significant implications for disability, patient satisfaction, and medico-legal risk (3,4). International guidelines emphasize structured post-block follow-up to ensure early detection and management (5). This quality improvement project aimed to quantify the incidence of patient- and surgeon-reported PBNS at our institution to guide the development of standardized follow-up processes.

METHODS

We conducted a retrospective chart review of PBNS events reported to regional anesthesia service as part of quality improvement audit over the period from January 2023 to October 2025 at a tertiary medical centre, The included subjects consisted of cases of patient-initiated complaints of PBNS during postoperative contact and surgeon-reported or referral-based cases.

Current workflow involves PNB performance by anesthesia provider, routine surgical follow-up by surgeons, and non-uniform post-block communication, where neurologic concerns

reach the anesthesia service only through passive channels (patient reporting or surgeon referrals). This quality improvement audit mapped the existing reports to guide the future standardized follow-up protocols.

The key metric is the overall local incidence of PBNS (per 10,000 blocks), and proportion of cases with full clinical resolution. Secondary outcome was to identify the distribution of block type, and factors related to the PBNS. The rate of PBNS per block type has not been elaborated due to the data's retrospective nature. Information was extracted from regional anesthesia procedure logs from electronic health records (EHR). Descriptive statistical analysis was applied, where data was presented as number (percent) for categorical variables and median [interquartile range] for numeric variables.

RESULTS

Of 19595 regional anesthesia procedures, twenty-five PBNS were identified in 23 patients, marking a PBNS rate of 12.8 per 10,000. Of these 25 blocks, 19 (76%) were lower limb blocks. The most commonly prevalent block among PBNS cases was a popliteal sciatic block (n= 13; 52%), followed by adductor canal block (n= 6; 24%). All blocks were done under ultrasound guidance; 23 (92%) did not have early procedural complications. The laterality was on the right side in 17 (68%) patients. Eleven (44%) patients had their symptoms for >48 hours to 1 week, while it was >1 week to 6 weeks in 9 (36%), and >6 weeks in 3 (12%). These findings supported the implementation of standardized post-procedure follow-up as a standard of care, in order to ensure early detection and management, decrease the under-reporting, and be able to identify patients at increased risk for developing PBNS.

DISCUSSION

The observed incidence of 12.8 nerve injuries per 10,000 blocks exceeds published long-term benchmarks of 2-4 per 10,000 (3), suggesting under-recognized or delayed reporting in passive surveillance. Several factors can contribute to higher incidence, including tourniquet use, patient position, and surgical factors. Without standardized follow-up, institutions lack accurate incidences, limiting their ability to identify modifiable risk factors. These findings support implementation of standardized post-block follow-up pathway utilizing telemedicine, followed by in-person assessment when indicated, to improve case capture, enable earlier intervention, and enhance patient safety. Moreover, prospective observational studies exploring the incidence and risk factors per block type are recommended.

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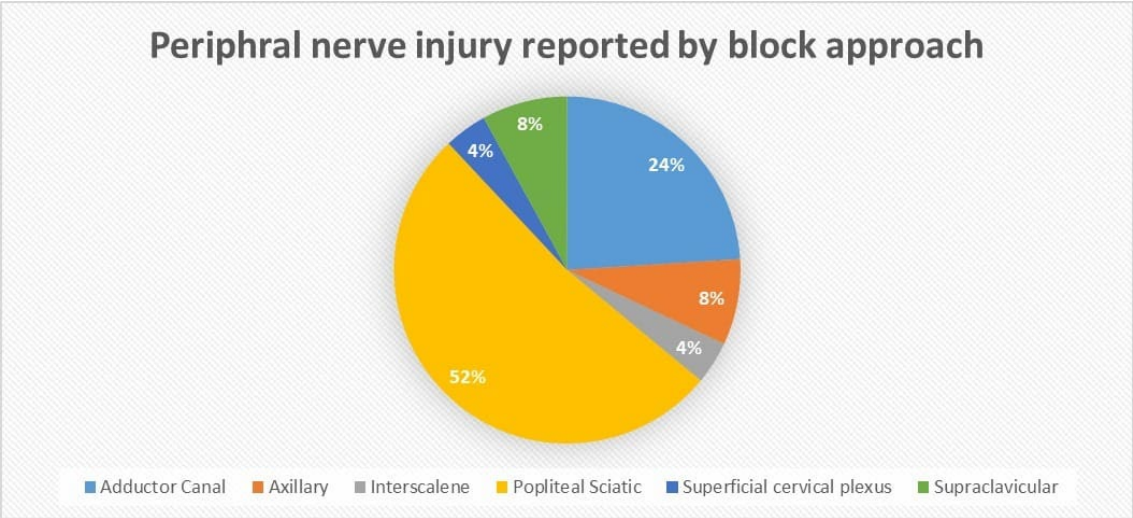

Figure 1

Review of RN led sedation with TCI remifentanil and propofol in complex endoscopy

Submission ID

72

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INTRODUCTION

A subset of endoscopy patients fail routine nurse administered, physician led sedation with midazolam and fentanyl[1]. These patients have needed anesthesiologist administered sedation or general anaesthesia. Anesthesia shortages mean that patients could be waiting up to two years for their intervention. Protocols for non-anesthesiologist directed sedation have been implemented successfully in multiple similar clinical settings[1-2]. This prompted development of a protocol in our institution using TCI propofol and remifentanil that could be delivered by trained endoscopy nurses. The rapid onset, offset, and titratability of propofol make it favorable in this clinical setting. Co-administration of remifentanil adds analgesic benefits, as well as reducing the amount and variability of propofol required[3]. Review of this service was undertaken to ensure safety and efficacy. Primary measures of interest were drug dosing, patient and clinician satisfaction, and time to discharge. Secondary outcomes were adverse sedation related events, and rates of failed sedation.

METHODS

This was a review of nurse delivered sedation for complex endoscopy with direct assistance of an anaesthetist available. 104 patients were referred between June 2024 and December 2025. Sedation was administered using plasma TCI remifentanil (Minto) and plasma TCI propofol (Marsh) following a protocol developed at our institution. Remifentanil started at target plasma concentration (Cp) 1.0ng.mL^{-1}and propofol at 1.5mcg.mL^{-1} when effect site concentration (Ce) of remifentanil had reached 0.7ng.mL^{-1}. Remifentanil 0.2ng.mL^{-1} and propofol titrations 0.2mcg.mL^{-1} were allowed every 2 min to allow for Cp and Ce equilibration. Larger propofol increments of 0.4mcg.mL^{-1} were allowed if patient was not sensitive to propofol (OAA/S 5 at Ce = 1.0mcg.ml^{-1}). Maximum doses were propofol

3.0mcg.mL^{-1} (3.5 if anesthesiologist approved) or remifentanil 2.0ng.mL^{-1}. Depth of sedation was monitored using the Observer's Assessment of Alertness and Sedation (OAA/S)[4] scale for adequacy (OAA/S = 3). Times from sedation start to scope passed, and discharge from recovery were recorded. Patient and proceduralist satisfaction were recorded using the Patient and Clinician Satisfaction with Sedation Instruments (PSSI/CSSI) respectfully[4]. Adverse events were documented per the Tracking and Reporting Outcomes off Procedural Sedation (TROOPS) instrument[5]. REB approval was granted for retrospective chart review to obtain patient demographics (comorbidities, BMI, sex, age).

RESULTS

Of 104 procedures, 2 patients (1.9%) had failed sedation at protocol limits requiring general anesthesia and were excluded from data analysis. Four patients (3.9%) had minor desaturation events resolved by reduction in sedation/increased supplemental oxygen, and/or manual airway maneuvers. Three patients (2.8%) had intermediate hypotension resolved with decreasing sedation and/or fluid bolus. There were no recorded sentinel airway, cardiovascular, or neurological events.
Average times (range): sedation start-scope in 12 (3-23) minutes. Recovery admission to discharge 41 (27-67) minutes. Average maximum Ce (range): Remifentanil 1.3 (1.0-2.4) ng·mL^{-1} and Propofol 2.4 (1.4-3.9) mcg.mL^{-1}. Five patients (4.9%) required additional propofol Ce >3 mcg.mL^{-1} under the guidance of an anesthesiologist. Satisfaction scoring was obtained for 85 of 102 patients (83%) and 96 clinicians (94%). Preliminary review showing 78% of clinicians and 92% of patients satisfied or very satisfied with sedation.

DISCUSSION

Use of a nurse-administered TCI propofol and remifentanil sedation protocol is a generally safe and effective method for complex endoscopy cases that would have otherwise required anesthesiologist care. Rates of desaturation were low and comparable with published literature[1-2]. Sedation failure was higher, perhaps reflecting that this cohort had already failed standard sedation unlike the largest published cohort[2]. Retrospective review of patient demographics comorbidities is ongoing, with the aim to identify features that may make patients higher risk of sedation failure or adverse events. Complete analysis of patient and clinician satisfaction is also in process.

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Semaglutide and gastric residual volumes: implications for perioperative risk and anesthesia planning

Submission ID

19

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INTRODUCTION

Semaglutide, a glucagon-like peptide-1 (GLP-1) receptor agonist, originally developed for glycemic control in type 2 diabetes mellitus (T2DM), has gained widespread use for weight management. In addition to improved cardiovascular outcomes and reduction in chronic kidney disease progression, its association with weight loss through appetite suppression has been a key driver in the momentum of increasing semaglutide use.[1,2] However, its mechanism of delayed gastric emptying has raised concerns among anesthesiologists regarding the potential for increased aspiration risk, even in patients adhering to standard preoperative fasting guidelines. Our primary study objective was to determine the incidence of a full stomach, defined as either >1.5 mL·kg^{-1} of clear fluid, having the presence of solid content represented by thick hyperechoic fluid or heterogeneous echogenicity[3], using preoperative gastric ultrasonography in fasted adult participants presenting for elective surgery taking semaglutide compared to non-users.

METHODS

Ethics approval was obtained from our local REB. This was a prospective, single-centre, observational cohort study of 94 adult elective surgical patients, evenly divided into non-users and semaglutide users. All participants followed fasting guidelines of 6 hours for solid content and 2 hours for clear fluids.[4] Participants had a preoperative gastric ultrasound using a 2-5 MHz curvilinear probe, completed by one of three anesthesiologists on the study who remained blinded to the participants. Qualitative assessment of the gastric antrum was completed using the 3-point Perlas Grading Scale.[3] The averaged antral cross-sectional area

(CSA) was calculated from three images captured in the right lateral decubitus (RLD) position. Gastric volume (mL/kg) was estimated using the formula: 27.0 + 14.6 × RLD CSA (cm^2) - 1.28 × age (y).[3] Our secondary objectives included comparing estimated gastric volume between groups, if changes to preoperative anesthetic management plans were required and whether surgical delays, cancellations, or aspiration events were associated with semaglutide users. We used a Z-test to assess differences in full stomach incidence and logistic regressions to present unadjusted and adjusted odds ratios (OR) with 95% CIs. We used entropy weighted balancing for a sensitivity analysis to balance baseline characteristics between groups. $P < 0.05$ was considered significant.

RESULTS

Twenty (43%) and 16 (34%) semaglutide users were taking exclusively for T2DM or weight management. Six (13%) and 15 (32%) participants had full stomachs in the non-user and semaglutide groups ($P = 0.03$). Of the 15 full stomachs in semaglutide users, 13 were taking for T2DM. The unadjusted OR of a full stomach in semaglutide users was 3.2 (1.2 to 9.8; $P = 0.03$). The OR after adjusting for preoperative HbA_{1c} was 2.3 (0.73 to 8.0; $P = 0.17$). The entropy balanced adjusted OR was 3.8 (1.2 to 15; $P = 0.04$). Estimated median [IQR] preoperative gastric volumes were 0.48 [0.14-0.94] $mL \cdot kg^{-1}$ and 0.82 [0.56-1.7] $mL \cdot kg^{-1}$ in non-user and semaglutide groups ($P < 0.001$) (Figure 1). The anesthetic management plan was changed for 21 (24%) participants (16 taking semaglutide). Presurgical gastric emptying was required in 11 (13%) participants (9 using semaglutide). No surgical delays, cancellations, or aspiration events were reported.

DISCUSSION

Semaglutide use was associated with both increased full stomach incidence and residual preoperative gastric volumes despite adherence to standard fasting protocols. Among the 15 semaglutide users with full stomachs, all but two were participants taking it for T2DM management. These findings suggest a need for heightened perioperative vigilance and may warrant individualized fasting strategies or preoperative gastric ultrasound in this population. Analysis is ongoing to explore the interventions used successfully within our study for participants identified with full stomachs that reduced aspiration risk to avoid disruption or cancellation of their surgical procedures.

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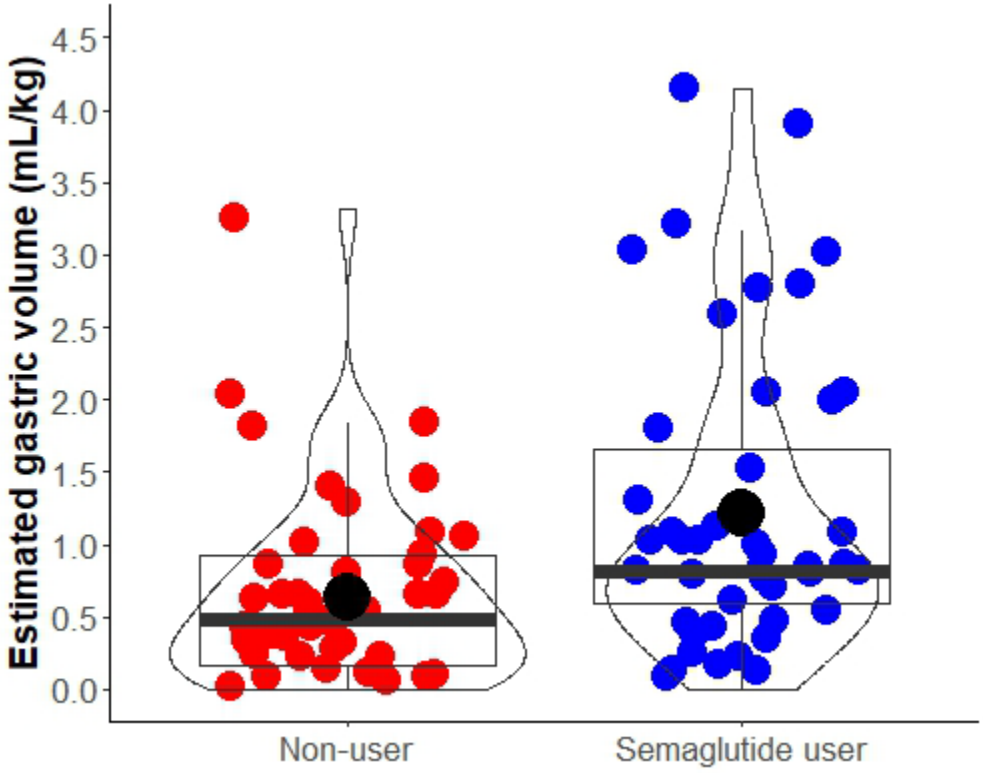

Figure 1

Small volume, big impact: a norepinephrine medication error and lessons for safer systems

Submission ID

55

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INTRODUCTION

Over the past decade, the use of norepinephrine in general anesthesia practice internationally has increased. This trend is supported by evidence suggesting potential advantages over traditional vasopressors such as ephedrine and phenylephrine, including fewer adverse effects and improved hemodynamic control in obstetrical patients undergoing neuraxial anesthesia for Cesarian delivery, as well as in patients undergoing major intra-abdominal surgery.[1,2] However, the expanded use of this high-risk cardiovascular medication is accompanied by an increased potential for medication error. Similar norepinephrine-related errors have previously been reported, including a correspondence published in the *Canadian Journal of Anesthesia* in 2021.[3] This case report describes a norepinephrine medication error, the contributing system factors, and the subsequent quality improvement initiative implemented at a tertiary care centre. The aim is to highlight this recurring safety issue and discuss safeguards applicable beyond a single institution.

CASE PRESENTATION

A healthy 39-year-old male presented for elective right wrist open scapholunate ligament reconstruction under brachial plexus block with sedation. He was transferred from day surgery to the block room, where he received intravenous midazolam 2 mg followed by fentanyl 50 mcg. Within 30 seconds, the patient developed tachycardia (160 beats/min), tachypnea, and abdominal and back pain. Blood pressure measurement obtained approximately one minute later was 180/110 mmHg. Symptoms began resolving rapidly, and within three minutes, heart rate and blood pressure had returned to baseline, with only minimal residual back discomfort.

A member of the anesthesia care team identified a potential medication error, suspecting that 1 mL from a 1,000 mcg/ml norepinephrine vial had been drawn up instead of the 50 mcg/ml fentanyl vial. The vials were visually similar, and the patient was determined to have received an inadvertent 1,000 mcg norepinephrine bolus. This was confirmed upon review of the operating room medication supply. Disclosure of the error was made to the patient.

Following consultation with vascular surgery, and given the rapid symptom resolution, the procedure proceeded uneventfully under regional anesthesia. Postoperatively, the patient reported mild persistent back discomfort. A CT aortogram was normal; however, high-sensitivity troponin peaked at 1,720 ng/L. The patient was admitted overnight for observation, with normal echocardiography and rapidly down-trending troponins. He was discharged the following day asymptomatic.

In response, a quality improvement initiative was implemented, including routine availability of dilute norepinephrine syringes and high-alert labeling of concentrated norepinephrine vials when needed clinically.

CONCLUSION

This case highlights a concerning and recurrent medication safety issue at a international level. Most reported norepinephrine-related errors internationally are attributable to look-alike medication packaging.[3] As norepinephrine use in general anesthesia continues to increase, proactive system-level interventions are essential to mitigate patient harm. Reliance on staff vigilance, label reading, or awareness bulletins alone is insufficient. Strategies such as standardized dilute norepinephrine preparations, high-alert labeling, alternative packaging, or ready-to-use syringes or infusions should be considered. We strongly advocate for adoption of additional safeguards across all institutions internationally to prevent recurrence of similar errors.[4]

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System-level barriers to rapid identification of perioperative total local anesthetic exposure in hip fracture patients receiving peripheral nerve blocks: a retrospective cohort study

Submission ID

64

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INTRODUCTION

Local anesthetics are widely used across perioperative and emergency settings, and inadvertent overdose can result in local anesthetic systemic toxicity (LAST), a rare but potentially catastrophic complication. In high-volume regional anesthesia centres, local anesthetic administration may be delivered by multiple clinical teams, across the perioperative periods. This risk is particularly relevant in hip fracture populations, who are often older, frail, and physiologically vulnerable, placing them at increased risk of LAST.[1] However, total local anesthetic exposure is frequently documented across disparate sections of the electronic health record (EHR), making cumulative dosing difficult to rapidly ascertain and representing a potential patient safety risk. The aim of this study was to characterize the scope and nature of perioperative local anesthetic documentation and to quantify the extent to which cumulative local anesthetic exposure is captured in the central medication administration record (MAR) in hip fracture patients receiving peripheral nerve blocks.

METHODS

Following Research Ethics Board approval, we conducted a retrospective chart review of all adult patients undergoing hip surgery at our institution from 2020–2025. Patients who did not receive peripheral nerve blocks were excluded. All perioperative local anesthetic administrations and their documentation locations within the EHR (Cerner, Oracle Health) were identified. The primary outcome was the proportion of patients with any local anesthetic administration documented in the MAR. Secondary outcomes included the number of distinct chart locations containing local anesthetic documentation, the proportion of patients with a clearly identifiable cumulative dose, and incidence of LAST. Descriptive statistics were used.

RESULTS

A total of 410 hip surgery patient charts were reviewed, of which 177 (43.2%) included a peripheral nerve block. Among these, 155/177 (87.5%) had a clinical note documenting local anesthetic administration and dose, but only 8/177 (4.5%) had nerve block local anesthetics recorded in the MAR. Perineural catheters were used in 35/177 (19.8%) patients; none of the initial bolus doses were documented in the MAR, whereas 100% of maintenance infusions were recorded. Local anesthetic doses were documented across eight different EHR locations by multiple providers, including emergency physicians, regional anesthesiologists, surgeons, nurses, and operating room anesthesiologists. No documented cases of LAST were identified.

DISCUSSION

In hip fracture patients receiving peripheral nerve blocks, central documentation of total local anesthetic exposure in the MAR occurred in fewer than 5% of cases, and 12.5% of peripheral nerve blocks lacked any clinical note documenting local anesthetic administration and dose. Cumulative local anesthetic exposure could not be easily and reliably determined in real time, precluding assessment of whether recommended dose limits were exceeded. Fragmented documentation across multiple providers and EHR locations impairs situational awareness and increases the risk of dosing errors. System-level and automated approaches to centralized documentation represent an important opportunity to improve perioperative medication safety at our institution.[2]

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