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WHAT'S THE VERDICT? VALIDATION TESTING OF A NOVEL MULTIPARAMETER CONTINUOUS VITAL SIGNS MONITOR

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Background: Postoperative changes in vital signs (VS), such as heart rate (HR), blood pressure, and temperature, can indicate impending complications. Wearable monitors that continuously and noninvasively monitor VS can enable earlier detection of physiologic deterioration. However, existing clinical-grade wearables are limited by a lack of multiparameter monitoring capability (>3 VS), cumbersome designs, and inadequate clearance from regulatory agencies (eg, Health Canada) for clinical use in ambulatory settings.

Objective: To validate the accuracy of the novel multiparameter Vitaliti™ Continuous Vital Signs Monitor (CVSM) against clinical regulatory standards for 3 VS metrics: HR (IEC 60601-2-27), continuous noninvasive blood pressure (CNIBP) (International Organization for Standardization [ISO] 81060-2), and temperature (ISO 80601-2-56) in a sample of ambulatory adults.

Methods: Thirty-nine healthy adults (aged ≥18 years) simultaneously wore the Vitaliti CVSM and Health Canada–approved reference monitors. VS were recorded in 60-second time-synchronized sessions in static (sitting, standing, and supine) and active (walking) positions. Regulatory criteria stipulated the necessary sample size and accuracy requirements based on each VS metric: HR, $n = 18$, ±5 BPM or ± 10% of the reference; CNIBP, $n = 18$, mean difference of 5 ± 8 mm Hg for systolic and diastolic pressures; and temperature, $n = 21$, clinical bias ≤ 0.2 ± 0.5 °C. A total of 493 VS sessions (>8.5 hours) of continuous VS data were included in the validation analyses. For all paired measurements, the mean error, SD, and 95% limits of agreement (LoA) were calculated using Bland-Altman analysis.

Results: For HR, the mean difference between the Vitaliti™ CVSM and reference monitor in the seated position ($n = 24$) was −0.13 BPM (SD = 1.09; 95% LoA, −2.27 to 2.01). Mean differences for standing ($n = 24$), supine ($n = 22$), and walking ($n = 22$) were –0.11 BPM (SD = 1.36; LoA, −2.78 to 2.57), 0.08 BPM (SD, 2.01; LoA, −3.87 to 4.04), and 0.35 BPM (SD = 2.52; LoA −4.58 to 5.28), respectively. For CNIBP, mean differences between the Vitaliti™ CVSM and reference device in the seated position ($n = 26$) were −1.78 ± 6.47 mm Hg for systolic pressure and –0.64 ±

2.91 mm Hg for diastolic pressure. Mean differences in systolic/diastolic CNIBP across standing ($n = 14$), supine ($n = 26$), and walking ($n = 3$) positions were $-0.94 \pm 3.85/0.68 \pm 2.47$ mm Hg, $1.27 \pm 7.88/1.15 \pm 2.87$ mm Hg, and $2.24 \pm 2.67/2.23 \pm 1.90$ mm Hg, respectively. Vitaliti™ CVSM continuous temperature measurements compared with episodic reference monitor readings demonstrated mean differences of -0.02 ± 0.44 °C and 0.02 ± 0.54 °C in the seated ($n = 22$) and supine ($n = 25$) positions, respectively. Observed mean differences in Vitaliti™ VSM and reference monitor measurements for HR indicated compliance with regulatory requirements. Included CNIBP data satisfied ISO accuracy criteria across static and ambulatory positions; however, poor signal quality for some recordings precluded the minimum sample size needed to meet regulatory requirements for the standing and walking positions. Mean differences in temperature measurements collected by the Vitaliti™ CVSM and reference device indicated adherence to regulatory requirements while seated but exceeded the LoA threshold by 0.04 °C in the supine position.

Conclusion: This validation study confirmed the accuracy of the Vitaliti™ CVSM according to current regulatory standards. Further validation testing is needed to meet regulatory sample size requirements for CNIBP in standing and walking positions. Future validation testing of the Vitaliti™ CVSM should also include individuals with clinically abnormal vital signs.

MELATONIN USE FOR PERIOPERATIVE SEDATION AND ANALGESIA: A SURVEY OF CANADIAN PERIOPERATIVE CARE PROVIDERS

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Background: Melatonin is an endogenous hormone produced in the pineal gland that is responsible for regulating circadian rhythms in mammals. Beyond its physiological role, melatonin has documented anxiolytic, sedative, and analgesic properties. Given melatonin's favorable safety profile, it is a promising potential intervention to improve perioperative outcomes. This is particularly relevant in the context of fast-track recovery pathways, which require effective pain relief, early mobilization, and minimization of adverse effects such as postoperative nausea, cognitive impairment, and fatigue. Many commonly used perioperative sedatives, analgesics, and anxiolytics carry undesirable risks, including respiratory depression, postoperative delirium, and postoperative nausea and vomiting. As such, the development and identification of safe and effective anesthetic agents remain priorities. Despite promising emerging evidence, the clinical adoption and use patterns of melatonin among anesthesiologists remain poorly understood. The purpose of this study was to describe the perceptions and current practices of academic anesthesiologists in Canada regarding perioperative melatonin and to inform the design and conduct of a future randomized controlled trial examining the use of melatonin as an anesthetic adjunct.

Methods/Results: A national cross-sectional survey of Canadian academic anesthesiologists was conducted. Anesthesiologists working in university-affiliated health care facilities were included; trainees, including medical students, residents, and fellows, were excluded. Department leads at eligible institutions were contacted by email with an invitation to facilitate the survey distribution within their institution. Eligible anesthesiologists received a nonbinding incentive, a $5 gift card, with an attached QR code linked to study information and the survey. A modified Dillman approach was used to maximize response rates. The 14-question multiple-choice survey was designed to assess participants' knowledge, perceptions, and clinical use of melatonin in the perioperative setting, as well as potential uses to study in a randomized controlled trial. The survey was developed through an iterative process informed by literature review, expert input, and pretesting. The sampling frame included 1689 academic anesthesiologists; 547 (32.4%) responded. Most respondents (94%) reported never administering melatonin perioperatively. The most commonly cited barriers to use were lack of personal knowledge (80%) and absence of clinical guidelines (38%). Many participants (46%) believed melatonin may have perioperative value, most

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commonly citing anxiolysis and reduction in postoperative delirium as potential benefits. When asked about outcomes of interest for a future study, respondents most frequently cited efficacy as a sedative (67%), melatonin's safety profile (60%), and ideal dosing regimens (58%).

Conclusion: Despite emerging evidence supporting the potential benefits of melatonin in perioperative care, its clinical use among Canadian anesthesiologists remains limited. Findings suggest that although many anesthesiologists recognize the potential benefits of melatonin, widespread adoption is hindered by a lack of knowledge and formal clinical guidelines. These results highlight the need for robust clinical trials and clear evidence-based recommendations to define melatonin's efficacy and safety in perioperative care.

TYPE OF ANESTHESIA, HEMODYNAMICS, AND MYOCARDIAL INJURY AFTER HIP FRACTURE SURGERY: A POOLED ANALYSIS OF THE HIP ATTACK TRIAL AND VISION COHORT STUDY

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Background: Myocardial injury after noncardiac surgery (MINS) is strongly associated with postoperative mortality. However, predictors of MINS focused on the type of anesthesia and likely perioperative hypotension remain unclear and have not been analyzed in a large international cohort. Data were pooled from the HIP ATTACK international randomized trial of patients with hip fractures and the international VISION cohort study, which included patients aged 45 years or older undergoing hip fracture surgery. This study investigated predictors of MINS in this population, with a focus on type of anesthesia and perioperative hypotension.

Methods: Patients aged 45 years or older who underwent hip fracture surgery under either general or neuraxial anesthesia and had troponin measurements after surgery were included. Patients who received combined general and spinal anesthesia or only a peripheral nerve block were excluded. Troponin was systematically measured at 6 and 12 hours and during the first 3 days after surgery. The primary outcome was MINS, which was determined according to previously published prognostic VISION criteria for troponin T (TnT) ($\geq$0.03 μg/L) and high-sensitivity troponin T (hsTnT) (increase of $>$ 5 ng/L if $>$ 20 but $>$ 65 ng/L, or absolute value $>$ 65 ng/L); levels above the 99th percentile of the upper limit of normal were used for troponin I (TnI) and high-sensitivity troponin I (hsTnI). The association between type of anesthesia and MINS was investigated, as was whether this association was independent of perioperative hemodynamics. Multivariable regression models were adjusted for age, sex, history of hypertension, diabetes mellitus, atrial fibrillation, congestive heart failure, coronary artery disease, peripheral vascular disease, stroke, preoperative estimated glomerular filtration rate, and medication history. Cox regression models (hazard ratios, 95% CI) were used for predictors of MINS, as MINS is a time-dependent variable. Logistic multivariable regression models (odds ratios, 95% CI) were used for the association of anesthesia with perioperative hypotension.

Results: A total of 3733 patients were analyzed. Baseline characteristics between the general and neuraxial anesthesia groups were similar. The mean age was 78.7 $\pm$ 11.3 years. Patients taking therapeutic anticoagulants, P2Y12 inhibitors, and statins, and patients enrolled in North America, were more likely to receive general anesthesia compared with neuraxial anesthesia. The overall incidence of MINS was 26.3% (n = 980/3733). MINS was not more likely with general anesthesia compared with neuraxial anesthesia (adjusted hazard ratio

[aHR], 1.13; 95% CI, 0.99–1.30; $p = 0.079$). General anesthesia was associated with higher odds of intraoperative hypotension (adjusted odds ratio [aOR], 1.48; 95% CI, 1.23–1.78; $P < 0.001$) and lower odds of hypotension in the postanesthesia care unit (PACU) (aOR, 0.48; 95% CI, 0.32–0.73; $P = 0.001$) compared with neuraxial anesthesia. However, only hypotension during the PACU period was associated with MINS (aHR, 1.35; 95% CI, 1.01–1.80; $P = 0.041$). The type of anesthesia was not significantly associated with hypotension occurring after the PACU period and on postoperative day 2, but hypotension during these periods was significantly associated with MINS.

Conclusion: There was no significant association between type of anesthesia and MINS within 30 days after surgery. However, the type of anesthesia differed in its association with perioperative hypotension: intraoperative hypotension was more frequent with general anesthesia, whereas postoperative hypotension was more frequent with neuraxial anesthesia. Only postoperative hypotension was associated with MINS. Therefore, a mediating role for perioperative hemodynamics, tailored to the anesthesia-specific timing of hypotensive episodes, may be more important for the occurrence of MINS than the choice of anesthesia itself.

MODIFIERS OF THE EFFECT ON DELIRIUM OF ACCELERATED SURGERY IN PATIENTS WITH HIP FRACTURE: A SECONDARY SUBGROUP ANALYSIS OF THE HIP ATTACK TRIAL

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Background: Delirium is a frequent complication in patients undergoing surgery for hip fracture, with reported incidences of up to 50%. It is associated with increased morbidity, mortality, and costs. In the HIP ATTACK trial, 132 patients (9%) randomized to accelerated surgery experienced delirium compared with 175 patients (12%) in the standard care group (odds ratio [OR], 0.72; 95% CI, 0.58–0.92; $p = 0.009$). This secondary analysis aimed to address whether the beneficial effects of accelerated surgery on delirium differed based on patient characteristics.

Methods: This was a post hoc analysis of the HIP ATTACK-1 trial. All participants with complete data on delirium were included. Delirium was assessed daily using the Confusion Assessment Method (CAM) up to 7 days after surgery. Patient subgroups were based on age range (45–64, 65–84, and ≥85 years), baseline function (autonomous or requiring assistance with ≥1 activity of daily living [ADL]), preoperative cardiac troponin elevation (based on troponin measurements performed on hospital admission after fracture and before randomization), and intensity of preoperative pain (mild, moderate, or severe). Descriptive analyses and comparison tests between groups were conducted according to the nature of the variables, using the Mann-Whitney U test for continuous variables and chi-square test and Fisher exact tests for categorical variables. The base model was a logistic regression model to estimate the effect of accelerated surgery vs standard care on the frequency of postoperative delirium. To test potential effect modification by subgroups, separate logistic regressions were modeled, each adding to the base model the interaction between the trial treatment variable (accelerated vs standard care) and the subgroup variable. Subgroup effects were considered potentially credible if the 2-sided α for the interaction term was < 0.05. The treatment effect in each subgroup was reported as relative risk (RR) with the corresponding 95% CI.

Results: A total of 2970 patients were included. Delirium occurred in 307 patients (10.3%). Patients who experienced delirium were older (mean age, 83 ± 9.3 years vs 78 ± 11.5 years without delirium), required greater assistance with ADL at baseline (46.3% vs 31.4%; $p <$ 0.001), and had troponin elevation at admission (12.7% vs 10.6%; $p = 0.021$). Accelerated surgery reduced the incidence of delirium compared with standard care (8.9% vs 11.8%; RR, 0.75; 95% CI, 0.60–0.94; $p = 0.01$). No statistically significant interaction was found with the

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prespecified subgroups (all p values >0.05). However, the effect of accelerated surgery on delirium was larger in patients without any ADL assistance at baseline (RR, 0.71; 95% CI, 0.53–0.97), patients without troponin elevation at admission (RR, 0.71; 95% CI, 0.55–0.91), and patients aged 65 to 84 years (RR, 0.68; 95% CI, 0.48–0.96). There was no effect modification by other age groups (45–64 years: RR, 0.63; 95% CI, 0.22–1.77; ≥85 years: RR, 0.84; 95% CI, 0.61–1.15; $p = 0.65$) or by preoperative pain (mild: RR, 1.01; 95% CI, 0.40–2.55; moderate: RR, 0.66; 95% CI, 0.40–1.09; severe: RR, 0.93; 95% CI, 0.60–1.45; $p = 0.51$).

Conclusion: Accelerated surgery reduced the risk of delirium in patients undergoing hip fracture surgery compared with standard care. This effect persisted across different age groups, whether patients required assistance with activities of daily living at baseline or did not, whether patients had troponin elevation at admission or did not, and across different intensities of pain at admission.

COLCHICINE TO PREVENT CARDIOVASCULAR EVENTS IN THORACIC SURGERY PATIENTS WITH OR WITHOUT CORONARY ARTERY DISEASE: A SECONDARY ANALYSIS OF COP-AF

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Background: Myocardial injury after noncardiac surgery (MINS) is a common postoperative complication and is associated with poor prognosis. Patients with coronary artery disease (CAD) may be at particularly high risk. Large cardiovascular trials have shown that long-term low-dose colchicine reduces major adverse events in nonsurgical CAD populations, but its perioperative efficacy is uncertain. This exploratory secondary analysis of the COP-AF randomized controlled trial examined the incidence of ischemic outcomes after noncardiac thoracic surgery in patients with and without CAD and investigated whether colchicine has a differential effect in these populations.

Methods/Results: Patients enrolled across 11 countries were randomized to colchicine, 0.5 mg, or matching placebo within 4 hours before surgery and continued twice daily for 10 days. Follow-up was 14 days. The primary outcome was MINS. A key secondary outcome was the composite of death, stroke, or MINS. Cox proportional hazards models were used to assess the association between CAD and outcomes, with interaction terms to explore whether colchicine had a differential effect in these patients. Of 3209 patients enrolled, 331 had CAD (10.3%). Compared with those without CAD, patients with CAD were older (71 ± 6.5 vs 68 ± 7.2 years; $p < 0.001$), and a higher proportion were male (69.8% vs 49.5%; $p < 0.001$). MINS occurred in 29.3% ($n = 97$) and 18.2% ($n = 523$) of patients with and without CAD, respectively; adjusted HR (aHR) was 1.53 (95% CI, 1.22–1.92; $p < 0.001$). For colchicine vs placebo, the HR for MINS was 0.82 (95% CI, 0.55–1.22) in patients with CAD vs 0.91 (95% CI, 0.77–1.08) in patients without CAD (p interaction = 0.61). The composite of death, stroke, or MINS occurred in 30.2% ($n = 100$) of patients with CAD vs 18.6% ($n = 535$) of patients without CAD, aHR 1.53 (95% CI, 1.22–1.91; $p < 0.001$). The HRs for colchicine for this outcome were 0.77 (95% CI, 0.52–1.14) in patients with CAD vs 0.91 (95% CI, 0.76–1.07) in patients without CAD (p interaction = 0.45).

Conclusion: Patients with CAD undergoing thoracic surgery had a higher risk of MINS and other ischemic outcomes than patients without CAD. The effect of colchicine was similar between the two groups, though this trial may have been underpowered to detect modest subgroup interactions.

PREVENTION OF INFECTIONS IN CARDIAC SURGERY STUDY (PICS): A PRAGMATIC CLUSTER-RANDOMIZED FACTORIAL CROSSOVER TRIAL

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Background: There is a wide range of prophylactic antibiotic regimens used for patients undergoing open-heart cardiac surgery. This study presents the results of a vanguard cluster-randomized factorial crossover trial, as well as the initial rollout progress of the full trial comparing cefazolin monoprophylaxis with a combination with vancomycin and short vs prolonged administration.

Methods: Four cardiac surgical institutions were randomized to one of four different orders of the four study arms. A waiver of individual informed consent with a patient opt-out option was approved by the ethics boards. Data collection was based on chart review and a phone call on or after postoperative day 90 to eligible patients who underwent cardiac surgery. In the vanguard phase, the feasibility of the study design was evaluated. The full trial will determine whether there is (a) superiority with adding vancomycin to cefazolin and (b) noninferiority of short-term compared with prolonged prophylaxis for the prevention of deep and organ/space sternal surgical site infections (s-SSI), with study enrollment planned to begin by January 2026.

Results: Four study sites were enrolled in a staggered manner, and 5989 patients were included during the vanguard phase. The proportion of patients not receiving pre-, intra-, and postoperative antibiotics according to the study protocol was 2.8%, 2.5%, and 3.0%, respectively. A total of 18.4% of patients could not be reached by phone on or after postoperative day 90. Deep/organ-space infections occurred in $n = 64$ (1.1%) and superficial infections in $n = 100$ (1.7%) cases. Only two outcome adjudication disagreements occurred during the vanguard trial for the primary outcome. Based on the intraclass correlation of 0.0028 and the overall event rate of 1.1% from the vanguard phase, an additional 20 study sites with 32 400 patients are required to achieve 83% power to detect a difference in the relative risk of 30% for the two study questions in hierarchical order at a significance level of 5%.

Discussion: The cluster-randomized factorial crossover design is feasible and highly efficient for addressing two study questions in one study. Four sites with 5989 patients were successfully enrolled, and work is ongoing toward launching the first sites for the full trial powered for clinical outcomes.

TEACHING SAFE OPIOID PRESCRIPTION IN CANADIAN MEDICAL SCHOOLS TO MITIGATE OPIOID USE DISORDER: SCOPING REVIEW AND WHITE PAPER

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Background: The ongoing opioid crisis is a major public health concern in Canada. However, addiction medicine is poorly represented in Canadian medical school curricula. Moreover, opioid prescription practices and the quality of medical training have been implicated as contributing to the opioid crisis. Given the paucity of literature on integrating evidence-based opioid prescription and management of opioid use disorders into medical education, this paper proposes an evidence-based curriculum framework with a 4-step implementation plan to guide Canadian medical educators in developing improved pain curricula.

Methods/Results: A comprehensive review of published work was performed in accordance with Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. An electronic search was performed using Google Scholar, PubMed, and the MEDLINE and EMBASE databases through the Ovid platform (title and abstract). Studies were included if they (1) related to the opioid crisis, opioid prescription, or opioid misuse or (2) related to pain and opioid prescription in medical education. Studies were excluded if they were (1) specific to pain (ie,

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palliative pain), (2) case reports, or (3) specific to a particular brand or company. The reference lists of included studies were then reviewed individually to identify additional relevant studies. Studies investigating the relationship between prescription opioids and opioid-related deaths in Canada reveal multiple potential contributing factors, including the overprescription of opioids, increasing potency and long-term use, and the increasing availability of illicit synthetic opioid analogues such as fentanyl. Given the increasing prevalence and ubiquity of the opioid crisis, most Canadian medical school graduates are likely to encounter and treat patients facing opioid use disorder in their practice. Several studies of international medical school curricula reveal inadequate resources allocated to teaching addiction medicine. Moreover, teaching hospitals generate significantly higher volumes of opioid prescriptions than nonteaching hospitals. Trainees rely primarily on experience, self-directed learning, and peer education to bridge this knowledge gap. A lack of formal training was also shown to lead to a lack of confidence in the knowledge of evidence-based strategies for opioid prescription, opioid dose conversions, and adjustments.

Conclusion: In light of this, Canadian medical school curricula should be adapted to include content related to evidence-based opioid prescription and pain management techniques, and structured education reflecting the multifaceted nature of opioid use disorder is required to train well-informed physicians. Evidence suggests that Canadian medical schools inadequately prepare graduates to competently assess and manage both acute and chronic pain and opioid use disorders in the context of the increasing prevalence and socioeconomic burden of the opioid crisis in Canada. Given the current lack of literature on integrating evidence-based opioid prescription and management of opioid use disorders into medical education, a 4-step implementation plan is proposed, encompassing a review of Canadian medical school pain curricula, establishing a medical education expert committee to design a standardized curriculum, and following it with implementation and evaluation of the new curriculum. It is imperative that Canadian medical schools provide adequate training to better prepare their graduates for safe opioid prescription practices as well as screening, diagnosing, and treating patients with opioid use disorders. This scoping review and white paper represent a promising step toward a concerted national effort to reduce opioid-related harms.

FEASIBILITY OF IMPLEMENTING AN IN-SERVICE POCUS CURRICULUM FOR PERIOPERATIVE CLINICIANS: A PILOT STUDY

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Objectives: Major barriers to point-of-care ultrasound (POCUS) in clinical practice are the lack of trained clinicians and the integration of training into clinical practice with real patients. This study evaluated the feasibility of delivering a POCUS curriculum for perioperative clinician-educators by integrating a short course into their clinical schedules.

Methods: This single-center pilot study on the feasibility of a POCUS curriculum had a convenience sample of 5 physicians/nurse practitioners working in the perioperative inpatient service at Juravinski Hospital, Canada, during 2023–2024. The curriculum was organized according to the 4C/ID framework, aiming to achieve "Whole-Task Learning," which includes the acquisition of knowledge, skills, and attitudes that are transferable to daily professional life. This pilot focused on internal jugular vein ultrasound (IJV-US) as a starting point, delivered across 5 phases: fundamentals, supervised hands-on training, self-directed learning, quality, and final assessment. The feasibility outcomes were the number of learners who completed the curriculum within 1 week and an online pre- and post-test. A POCUS specialist performed quality assurance on the images collected through self-directed learning and presented in a portfolio. Curriculum efficacy was assessed by comparing the online pre- and post-tests, a 60-day knowledge retention test, a mini-clinical evaluation exercise (Mini-CEX) that evaluated 2 components—patient approach and IJV-US assessment—and a survey on perceived effectiveness and satisfaction. The test

consisted of 12 questions and was the same in all phases. The level of satisfaction was assessed out of a maximum score of 10. The study was approved by the local ethics board (HiREB; ID: 16178). All participants provided consent before participation.

Results: Among the 5 participants, 4 were women, and the age range was 39 to 47 years. All 5 participants (2 physicians and 3 nurse practitioners) completed the training within 1 week. The response rate was 100% in all phases. Most participants (80%) had no prior education, training, or experience with POCUS. The median pretest score was 7/12 (IQR, 6–9), the immediate post-test score was 9/12 (IQR, 9–10), and the 60-day post-session test score was 10/12 (IQR, 10–12). Each participant presented at least 2 portfolio cases (IQR, 2–3). Of the 12 cases presented, image gain was adequate, correct identification of the IJV was noted, and appropriately minimal pressure applied to the skin was demonstrated in 9/12 cases. The median Mini-CEX score for general patient approach was 9/10 (IQR, 8–10), with all achieving the expected level; the median score for IJV-US assessment was 9/10 (IQR, 9–9), with 80% of participants achieving the expected level. The mean overall satisfaction was 8.8/10 (SD + 1.09), and the mean overall agreement that the course satisfied their expectations was 8.8/10 (SD + 1.09). The main barrier to knowledge retention was the availability of a dedicated POCUS machine; 3/5 participants reported that the ultrasound machine was never available.

Conclusion: A short in-service course is a feasible and innovative way to learn POCUS. Data are encouraging that it can improve learners' knowledge and support knowledge retention among practicing clinical providers. Despite the small sample size, the pilot study results encourage the implementation of a full POCUS curriculum using this framework.

MANAGEMENT OF ADRENAL INCIDENTALOMAS IN A PATIENT UNDERGOING NONADRENAL SURGERY

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Background: Adrenal incidentalomas are adrenal gland masses equal to or greater than 1 cm in size identified on imaging performed for an unrelated reason. Adrenal incidentalomas occur more commonly in females and are present in 4% of the general population. Adrenal incidentalomas are mostly benign, and 10% secrete excess hormones. When identified in the preoperative setting for a nonadrenal surgery, adrenal incidentalomas require balancing surgical urgency with the risk of an undiagnosed, untreated functional adrenal adenoma.

Case: A 69-year-old female was assessed before an elective hip arthroplasty for an incidental adrenal adenoma. She had no other past medical or surgical history and was not taking medications. Family history was unremarkable. On history and examination, there were no signs or symptoms of excess adrenal hormonal secretion. The clinical assessment, available investigations (normal serum sodium, potassium, and random glucose), and imaging (radiographic features of the adrenal incidentaloma) suggested that the incidentaloma was benign and nonfunctional. The patient and surgical and anesthesia teams were informed of a possible undiagnosed functional adrenal incidentaloma, and surgery proceeded as planned without additional preoperative investigations. There were no intraoperative or postoperative complications. Postoperative testing for hypercortisolism, pheochromocytoma, and hyperaldosteronism was normal.

Discussion: All adrenal adenomas should be investigated for malignancy with a dedicated computed tomography study and assessed for hypercortisolism with a 1-mg dexamethasone suppression test. Patients with signs or symptoms of excess catecholamines or imaging features of malignancy should be screened for pheochromocytoma with a serum metanephrine level or 24-hour urine metanephrine. Patients with hypertension or spontaneous hypokalemia should be screened for hyperaldosteronism with a serum aldosterone-renin ratio, and patients with virilization should be screened for adrenocortical carcinoma with serum sex hormones. Excess adrenal hormones are associated with perioperative risks, including impaired wound healing, hyperglycemia, hypercoagulability, electrolyte abnormalities, arrhythmia, and labile blood pressure, with pheochromocytoma posing the highest perioperative risk. When an adrenal incidentaloma is encountered in the periop-

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erative period, a decision regarding surgical urgency, the potential risk of an undiagnosed functional adrenal adenoma, and the timing of additional investigations must be made. Emergent surgery should proceed without delay, with postoperative completion of investigations. For time-sensitive and elective surgeries, best efforts should be made to rule out pheochromocytoma in appropriate patients preoperatively, with deferral of other investigations to the postoperative period. When preoperative adrenal adenoma evaluation cannot occur, the perioperative health care team should be aware of the risk and prepared to deal with possible consequences of an undiagnosed functional adrenal incidentaloma, specifically pheochromocytoma.

Conclusion: This case report outlines a pragmatic approach to assessing adrenal incidentalomas in the context of nonadrenal surgery based on surgical urgency. Pheochromocytoma poses the greatest perioperative risk, and whenever possible, pheochromocytoma testing should occur preoperatively in appropriate patients. When preoperative adrenal evaluation cannot be completed, the patient and care team should be aware of and prepared for complications associated with an undiagnosed, untreated functional adrenal incidentaloma. Testing for hypercortisolism, hyperaldosteronism, and hyperandrogenism can occur postoperatively. A multidisciplinary, individualized approach balancing surgical urgency and the risk of an undiagnosed, untreated functional adrenal adenoma can minimize perioperative complications while avoiding unnecessary delays in surgical care.

QUALITY GAPS AND PATIENT OUTCOMES IN DAY-OF-SURGERY GLUCOSE MANAGEMENT FOR PATIENTS WITH AND WITHOUT DIABETES: A RETROSPECTIVE COHORT STUDY

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Introduction: Perioperative hyperglycemia is associated with adverse outcomes in patients with and without diabetes, including increased risk of surgical site infections and greater 30-day mortality. Data from the United States and United Kingdom suggest that approximately 20% of people with known diabetes do not have glucose measured appropriately on the day of surgery and that hyperglycemia is commonly undertreated. The aim of this study was to characterize gaps in day-of-surgery glucose measurement for adult patients in Alberta, Canada, in preparation for a province-wide quality improvement project (NCT05036655).

Methods: This multicenter retrospective cohort study used electronic health records and administrative health data to describe processes, outcomes, and balancing measures related to glucose management on the day of a noncardiac surgery that required hospital admission for adults with and without diabetes. Surgical services included colorectal, gynecologic oncology, vascular, urologic, and orthopedic surgery. Patients were stratified as having diabetes (HbA1c $>$ 6.5%), prediabetes (HbA1c 6.0%–6.4%), no diabetes (HbA1c $<$ 5.9%), or unknown diabetes status (no HbA1c). Process measures included glucose measurement in preoperative holding, intraoperatively during surgeries longer than 120 minutes, and in the postanesthesia care unit (PACU); as well as the administration of insulin for hyperglycemia ($>$10.0 mmol/L). The primary outcome measure was hyperglycemia (glucose $>$ 10.0 mmol/L). Balancing measures included hypoglycemia (glucose $<$4.0 mmol/L) and severe hypoglycemia (glucose $<$2.0 mmol/L). Logistic, linear, and quantile regression were used to estimate associations between day-of-surgery hyperglycemia and outcomes of interest, which were adjusted for age, sex, and HbA1c.

Results: Of 12 275 eligible procedures, 3164 (25.8%) were performed on patients with diabetes. Overall, 85.4% of patients with diabetes (n = 2703) had at least 1 glucose measurement on the day of surgery. Of these, 37.1% had hyperglycemia (n = 1,004). Approximately half of patients with diabetes and hyperglycemia received insulin (51.4%, n = 516). In preoperative holding, 71.3% of patients with diabetes had a glucose measurement (n = 2,256), 23.4% had hyperglycemia (n = 529), and half received insulin (48.8%, n = 258). Intraoperatively, 40.9% of patients with diabetes had a glucose

measurement ($n = 870$), 34.5% had hyperglycemia ($n = 300$), and 57.0% received insulin for hyperglycemia ($n = 171$). Hyperglycemia occurred in the PACU for 16.3% of patients with prediabetes, 15.1% of patients without diabetes, and 17.6% of patients with unknown diabetes status. Despite this, hyperglycemia was found in more than 10% of patients without diabetes on at least 1 measurement, and these patients received insulin less often compared with patients with diabetes.

Discussion: There were important quality gaps in glucose measurement and hyperglycemia treatment for patients with diabetes during surgery and in the PACU. Less than half of patients with diabetes who had hyperglycemia received insulin. Although glucose measurement was uncommon in patients with prediabetes, no diabetes, and unknown diabetes status, approximately 15% of these patients had hyperglycemia.

PATIENT EXPERIENCES WITH PERIOPERATIVE GLUCOSE MANAGEMENT: A MIXED-METHOD INVESTIGATION

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Background: Improved perioperative glycemic management is associated with fewer surgical site infections and shorter length of stay. Quality improvement work in perioperative glycemic management must also improve patient experiences. This mixed-method study, designed by patients with diabetes who have undergone surgery in Alberta, aimed to describe patient preferences and experiences with perioperative glycemic management.

Methods: Patients with diabetes ($n = 6$) and researchers with expertise in qualitative methods codesigned a survey exploring patients' experiences and attitudes regarding perioperative glycemic management. Following pilot testing by patients ($n = 5$), the survey was distributed to postoperative patients with diabetes at 5 hospitals in Alberta. After initial analysis of the survey, the patient partners and research team cocreated an interview guide to explore unexpected and noteworthy findings. Participants with diabetes were recruited before surgery during preoperative internal medicine consultation and were given a workbook to complete throughout their perioperative journey. After surgery, participants were invited to a one-on-one semistructured interview and discussion of their workbooks. Interview transcripts and workbook notes underwent inductive thematic analysis.

Results: There were 75 survey participants and 10 interview participants. More than half of patients surveyed ($n = 39$, 51.4%) did not know whether they should or should not take their diabetes medication before surgery, 54.8% of participants ($n = 40$) did not know what they should eat and drink during their hospitalization, and 41.8% did not know how frequently their blood glucose would be measured after surgery. Thematic analysis found that many participants received conflicting instructions from health care workers on diabetes management before surgery, and several felt that their diabetes was undermanaged in the postoperative period.

Conclusion: Current approaches to preoperative patient education on diabetes management are not meeting the needs of patients with diabetes. This may be due to inconsistent recommendations from different health care providers before surgery. After surgery, patients were unsure whether their diet and diabetes management were appropriate.

TAPIA SYNDROME: AN UNDERRECOGNIZED COMPLICATION OF OROTRACHEAL INTUBATION PRESENTING WITH HYPOGLOSSAL AND RECURRENT LARYNGEAL NERVE INJURY

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Background: Tapia syndrome is a rare complication of airway manipulation characterized by concurrent palsy of the hypoglossal nerve and the recurrent laryngeal branch of the vagus nerve. Early recognition is imperative to achieve restoration of function. This case presents Tapia syndrome following laparoscopic hepatic segmentectomy.

Methods/Results: A 48-year-old female with American Society of Anesthesiologists (ASA) class 3 and Mallampati III airway underwent laparoscopic hepatic segmentectomy for metastatic rectal carcinoma. Intubation was reported as successful on the first attempt using direct laryngoscopy with a Macintosh size 3 blade. Following extubation, the patient developed leftward tongue deviation, ipsilateral tongue weakness, numbness, and dysphonia. Swallowing assessment revealed impaired oral clearance, while pharyngeal and accessory nerve function remained intact. Imaging excluded intracranial pathology. The clinical findings supported a diagnosis of Tapia syndrome. Management included a modified diet and corticosteroid therapy with intravenous methylprednisolone for 3 days followed by oral prednisone for 2 days. Marked symptom improvement was noted, with complete resolution at 2 months.

Conclusion: This case highlights Tapia syndrome as a rare but important complication of orotracheal intubation, particularly in patients with narrow airways. Early diagnosis and prompt management with corticosteroids and supportive care can lead to full recovery. Awareness of this condition is essential for perioperative teams to ensure timely recognition and rehabilitation.

EFFECTIVENESS OF SMOKING CESSATION INTERVENTIONS THROUGH THE POSTOPERATIVE PERIOD: A SYSTEMATIC REVIEW

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Introduction: Although preoperative smoking cessation is recommended, many patients struggle overall with cessation. To improve surgical success by limiting postoperative complications, the postoperative period is a critical window for ongoing intervention. The effectiveness and associated outcomes of cessation interventions when continued postoperatively remain underreported. Evidence is dispersed across surgical specialties and intervention types, with limited synthesis of long-term postoperative outcomes and cessation trajectories. The goal of this study is to highlight the role of postoperative smoking cessation programs in improving surgical outcomes and abstinence.

Methods: A systematic review was conducted using Ovid MEDLINE, Embase, Emcare, Global Health, and Cochrane CENTRAL, identifying 18 studies between 1994 and 2025 across 6 countries. Eligible studies enrolled patients aged $\geq$ 18 years with active tobacco use undergoing surgery; applied postoperative smoking cessation interventions ($\pm$ preoperative intervention), such as pharmacologic agents (varenicline, bupropion, and cytisine), nicotine replacement therapy (NRT), electronic nicotine delivery systems (ENDS), or multimodal approaches $\pm$ behavioral therapy; and compared these with usual care, placebo, or alternative cessation. Outcomes included smoking abstinence at 1 to 12 months, adverse events, and clinical management. Risk of bias was assessed using ROBINS-I and ROB 2. Weighted means and pooled risk ratios (RRs) were calculated in Google Colab and Dataparty. The protocol was registered on OSF.

Results: Participants were aged 54.9 $\pm$ 3.94 years in the cessation group (60.9% male) and 53.2 $\pm$ 4.07 years among controls (55.5% male). Surgical populations were heterogeneous, including orthopedic ($n = 9$), vascular ($n = 5$), cardiothoracic ($n = 5$), urologic ($n = 5$), and general surgery ($n = 6$). The mean intervention duration was 9 weeks (range, 2–24 weeks), predominantly through the preoperative period. NRT was used for cessation in 11 of 18 studies, while pharmacotherapy, primarily varenicline, and ENDS were each used in 3 of 18 studies. Behavioral therapy was involved in 15 of 18 studies. Five single-arm studies were included. Mean adherence to intervention was 75.9% ($n = 7$). Compar-

ing abstinence risk ratios, the RR was 1.52 at 1 month (95% CI, 0.41–5.61; $I^2 = 77\%$) ($n = 4$), 1.42 at 6 months (95% CI, 1.14–1.77; $I^2 = 0\%$) ($n = 7$), and 1.47 at 12 months (95% CI, 1.09–1.99; $I^2 = 30\%$) ($n = 4$). In the cessation group across single-arm and comparison studies, abstinence rates were 186/544 (34.3%) at 1 month ($n = 8$), 135/716 (18.8%) at 6 months ($n = 8$), and 132/442 (29.9%) at 12 months ($n = 4$). Complications ($n = 6$) were present in 85/377 cessation subjects (22.5%) compared with 93/361 control subjects (25.8%). Hospital length of stay was 7.52 days in the cessation group vs 8.03 days in the control group.

Discussion: Over 6–12 months postoperatively, abstinence RRs stabilized to display improved abstinence with cessation aids. Data synthesis was limited by heterogeneous time points and reporting methods; advanced time-varying analyses could improve the display of longitudinal adherence. Reasonably, studies initiated smoking cessation preoperatively to optimize surgical risk profiles. However, continuing monitored cessation into the postoperative period may still be a feasible strategy to enhance recovery and sustain abstinence. Evidence of surgical postoperative clinical tracking with monitoring of sustained abstinence will provide a comprehensive understanding of smoking cessation's role in patients' clinical course while reinforcing continued abstinence.

EFFECT OF ERECTOR SPINAE BLOCK ON POSTOPERATIVE OPIOID CONSUMPTION IN LUNG SURGERIES: A SYSTEMATIC REVIEW AND META-REGRESSION ANALYSIS

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Background: Lung surgery is often accompanied by significant pain, leading to high opioid use and related adverse effects. This systematic review and meta-analysis examined the effectiveness of the erector spinae plane block (ESPB) in reducing postoperative pain, opioid consumption, and postoperative nausea and vomiting (PONV) after lung surgery.

Methods/Results: A systematic database search was conducted in PubMed, PMC, Embase, and Scopus for randomized controlled trials (RCTs) comparing ESPB with control in patients undergoing lung surgical procedures. The primary outcome was intravenous opioid consumption in morphine milligram equivalents (MME) 24 hours after surgery. Mean differences (MDs) with 95% CIs were calculated using an inverse-variance random-effects model. Twenty RCTs with 1348 patients were included for meta-analysis (ESPB vs control: 668 vs 680). Most of these studies included at least lobectomy, either by video-assisted thoracoscopic surgery (VATS) (18 studies) or thoracotomy (2 studies). Age (54 ± 7 vs 54 ± 7 years), male sex (52% vs 53%), and body mass index (BMI) (25 ± 9 vs 25 ± 9) were comparable between the 2 groups. All studies used ultrasound-guided preoperative unilateral ESPB at the T5 level. Ropivacaine ($n = 10$) was most commonly used, followed by bupivacaine ($n = 9$). The most common concentrations used were 0.25% ($n = 5$) and 0.5% ($n = 10$), with volumes ranging from 20 mL ($n = 11$) to 30 mL ($n = 4$). The 24-hour postoperative opioid consumption was significantly lower in the ESPB group compared with the control group (MD, −9.6; 95% CI, −14.6 to −4.5; I^2: 98%; $P = 0.0002$). The early and late resting pain scores were lower in the ESPB group, with a decreased incidence of PONV. The meta-regression analysis did not significantly alter the results. The level of evidence was low, with a moderate grade of recommendation.

Conclusion: This meta-analysis of RCTs demonstrates that ESPB may significantly reduce 24-hour postoperative opioid consumption, resting pain score, and the incidence of PONV compared with control. However, further pragmatic RCTs of adequate power with unified protocols, including identical local anesthetics, concentrations, and volumes, and clearly defined endpoints are warranted.

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RISK STRATIFICATION AND FUNCTIONAL OPTIMIZATION: "ON-DESK" CARDIAC SCREENING AND PREHABILITATION FOR HIGH-RISK SURGICAL PATIENTS

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Background: While the overall mortality associated with surgery is low, approximately 80% of postoperative morbidity is concentrated in a high-risk population characterized by advanced age, multiple comorbidities, and frailty. Preoperative assessment and surgical optimization before procedures are widely recognized as essential, yet their implementation in clinical practice shows marked disparities, reflecting socioeconomic, institutional, and provider-related differences.

At Ospedale di Circolo Varese ASST Settelaghi, 2 complementary perioperative quality improvement initiatives were designed and implemented:

1) a structured preoperative cardiac evaluation pathway, based on desk-based ("on-desk") screening, aimed at streamlining assessment and reducing unnecessary surgical delays. Cardiovascular complications remain the leading cause of perioperative morbidity and mortality, affecting up to 3%–5% of high-risk surgical patients and accounting for nearly 40% of postoperative deaths within 30 days.
2) a multimodal prehabilitation program, supported by instrumented functional testing, to strengthen physiological reserve and resilience in frail patients scheduled for major surgery. Prehabilitation—combining targeted exercise training, nutritional optimization, and psychological support—has demonstrated improvement in functional capacity and reductions in postoperative complications, length of hospital stay, and time to recovery.

The endpoint is to minimize surgical delays, improve resource utilization, strengthen patient functional capacity, and promote better postoperative recovery and outcomes.

Methods/Results: The on-desk cardiac evaluation pathway was developed to streamline the preadmission process for candidates undergoing noncardiac surgery (NCS) while maintaining adherence to national and international perioperative guidelines. To improve early identification of at-risk individuals, the pathway integrates validated and widely used tools: the American Society of Anesthesiologists (ASA) Physical Status Classification, the Revised Cardiac Risk Index, and the Duke Activity Status Index, a patient-reported measure strongly correlated with peak oxygen uptake and functional capacity. These structured assessments are combined with a targeted review of electronic health records by both cardiologists and anesthesiologists, enabling rapid, standardized, and resource-efficient risk stratification. The multimodal prehabilitation program targeted patients scheduled for major abdominal surgery, aiming to improve physical resilience before the procedure. Over 4 weeks, patients underwent 6 weekly sessions (30 minutes each) alternating aerobic and resistance training, combined with twice-daily respiratory exercises. This is complemented by individualized nutritional support and cognitive training. Baseline and postintervention assessments included the 6-minute walk distance test, handgrip strength, quadriceps isometric testing, spirometry, and muscle ultrasound (rectus femoris thickness and cross-sectional area, vastus lateralis pennation angle, and diaphragmatic excursion). In addition, patient-reported outcomes are assessed by the EQ-5D-5L questionnaire and the Hospital Anxiety and Depression Scale (HADS).

Conclusion: The programs integrated a preoperative structured cardiac risk assessment with targeted multimodal prehabilitation. This process represents a synergistic perioperative strategy addressing both optimization of perioperative risk and implementation of functional physical status. The cardiac pathway could reduce surgical delays, ensuring individualized cardiac risk stratification and identifying patients who would benefit from targeted preoperative testing. In parallel,

the prehabilitation program enhances cardiorespiratory fitness, muscle strength, and psychological readiness, thereby potentially reducing postoperative complications and accelerating recovery. Together, these initiatives exemplify a proactive, multidisciplinary approach to perioperative care that shifts the focus from reactive management to preventive optimization.

THE EFFECT OF INTRAOPERATIVE MUSIC ON POSTOPERATIVE PAIN, NAUSEA, AND COMFORT IN ADULTS UNDER GENERAL ANESTHESIA: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Background: Postoperative pain following surgical intervention under general anesthesia remains a significant clinical concern. Music interventions have shown benefit in preoperative and postoperative settings, but their intraoperative role remains unclear. This systematic review and meta-analysis evaluated the efficacy of intraoperative music for surgeries under general anesthesia on postoperative pain, opioid use, and postoperative nausea and vomiting in adult patients.

Methods: A systematic search of MEDLINE, Embase, CINAHL, Cochrane Library, and PsycINFO was conducted from inception to May 9, 2025. This systematic review and meta-analysis was prospectively registered with PROSPERO (CRD420251032326). Meta-analysis was completed using a random-effects model to account for heterogeneity in anesthetic protocols and music interventions. The inclusion criteria were randomized controlled trials (RCTs) that evaluated intraoperative music in adults undergoing surgery under general anesthesia, trials including concurrent preoperative or postoperative music interventions, and the English language. The primary outcome was postoperative pain measured by validated scores such as the numerical rating scale (NRS) or visual analog scale (VAS). The secondary outcomes were intraoperative and postoperative opioid requirements and postoperative nausea and vomiting (PONV). Risk of bias was assessed according to Cochrane guidelines, including sequence generation, allocation concealment, blinding, and completeness of outcome data.

Results: Literature and citation searches yielded 1705 articles, with 1123 remaining after duplicates were removed. Twenty-three studies (2436 patients) were included in the review. For quality assessment, 20 of the 23 studies were scored as low risk for sequence generation, and 3 were scored as unclear. Ten of the 23 studies were scored as having a high risk of bias due to the blinding of participants and personnel. The most common type of music intervention was patient choice of music (9 studies). Four studies additionally used calming/hypnotherapy voiceovers. The most common surgeries were laparoscopic (6 studies), abdominal (5 studies), and a variety of surgeries under general anesthesia (3 studies). Twenty-one studies reported postoperative pain scores, and 12 studies found a statistically significant effect of music on postoperative pain ($p < 0.05$). Eleven studies reported postoperative opioid consumption, and 7 studies reported PONV. The meta-analysis of 7 RCTs ($n = 480$ patients) showed that listening to music intraoperatively can reduce pain scores compared with the control groups during postanesthesia care unit (PACU) stay or immediately after surgery (weighted mean difference [WMD], −1.03; 95% CI, −1.30 to −0.75; $I^2 = 0\%$). Similarly, for pain assessment at 24 hours or on postoperative day 1, a meta-analysis of 6 RCTs ($n = 743$ patients) showed that the pooled effect resulted in favor of the intervention group (WMD, −0.30; 95% CI, −0.47 to −0.13; $I^2 = 61\%$). Meta-analysis of opioid use and PONV was not possible due to significant clinical variation among the included studies.

Conclusion: This systematic review and meta-analysis showed that intraoperative music decreased postoperative pain 24 hours after surgery. This effect was clinically significant during the PACU stay or immediately after surgery but was reduced at 24 hours postoperatively. Future trials with better blinding and collection of postoperative pain at regular increments after surgery

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are necessary to elucidate the period over which this analgesic effect is significant.

EFFECT OF IPACK BLOCK ON POSTOPERATIVE OUTCOMES IN KNEE SURGERIES: A SYSTEMATIC REVIEW AND NETWORK META-ANALYSIS OF RANDOMIZED CONTROLLED TRIALS

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Background: The infiltration between the popliteal artery and capsule of the knee (IPACK) block is a novel analgesic technique often used alongside other methods to alleviate posterior knee pain in patients who have undergone knee surgery. Surgical outcomes, including pain scores, opioid consumption, and ambulation, after the IPACK block were compared with those observed using other techniques to demonstrate its efficacy in enhancing patient recovery.

Methods: Multiple databases were searched from 1946 to November 2024. Randomized controlled trials examining the IPACK block in adult surgical patients following various knee surgical procedures were included. Studies with any comparison groups were included. The primary outcome was pain scores at 6 hours and 24-hour postoperative opioid consumption in morphine milligram equivalents (MME). Continuous variables were pooled as means and SDs, whereas discrete variables were pooled as numbers and percentages. The quality of the studies was assessed using the Cochrane Risk of Bias 2 (RoB 2) tool for randomized controlled trials. Statistical analysis was performed using Cochrane software.

Results: The literature search and screening identified 27 eligible studies involving 2380 patients. Of these, 1228 patients received the IPACK block, while 1152 received control blocks. The baseline demographic data were comparable across all studies. Mean pain visual analog scale (VAS) scores (mean difference [MD], −0.69; 95% CI, −0.92 to −0.46) and opioid consumption (MME: MD, −4.56; 95% CI, 2.63 to −0.69) were lower in the IPACK group compared with the control groups. Additionally, mobilization occurred earlier in the IPACK group than in the control groups. There were no complications from the nerve blocks. The quality of the study was low to moderate, whereas the quality of the evidence was low grade.

Conclusion: The IPACK block is an effective analgesic technique for reducing pain, lowering opioid consumption, and promoting earlier mobilization in patients undergoing knee surgery compared with control techniques. However, further large-scale, multicenter, randomized controlled trials are needed to validate these findings across diverse patient populations and surgical procedures.

POSTOPERATIVE MYOCARDIAL INJURY IN A YOUNG MALE WITH FAMILIAL HYPERCHOLESTEROLEMIA: A PERIOPERATIVE RISK MANAGEMENT CHALLENGE

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Background: Perioperative myocardial injury (PMI) is a major cause of morbidity and mortality after noncardiac surgery, affecting up to 18% of surgical patients and often occurring silently without classic ischemic symptoms. High-sensitivity troponin monitoring has emerged as a valuable tool to detect PMI, but routine implementation remains variable. Patients with familial hypercholesterolemia (FH) represent a particularly high-risk but underrecognized group, especially when cardiovascular risk factors remain unoptimized. This case underscores the importance of systematic perioperative risk stratification, optimization, and surveillance in the era of precision perioperative medicine.

Case Description: A 44-year-old male with heterozygous FH and a history of tobacco use presented for an annual physical examination. Baseline low-density lipoprotein cholesterol (LDL-C) had previously been approximately 200 mg/dL; however, after initiating a strict carnivore diet, his LDL-C increased to 700 mg/dL. Despite repeated counseling, he declined statin therapy and other lipid-lowering interventions. Several months later, he underwent emergent laparoscopic cholecystectomy for acute cholecystitis. In the immediate postoperative period, the patient developed chest discomfort with anterior ST-segment depressions on electrocardiogram (ECG). Serial high-sensitivity troponin measurements confirmed a perioperative non–ST-elevation myocardial infarction (NSTEMI). He was stabilized with antiplatelet therapy, beta-blockade, and initiation of high-intensity statin therapy. The patient recovered uneventfully and was discharged with structured secondary prevention counseling and outpatient cardiology follow-up.

Discussion: Patients with FH, particularly those untreated, may appear deceptively "low risk" due to younger age and absence of prior events, yet their baseline atherosclerotic burden can be substantial and underestimated by conventional perioperative risk calculators. This creates a hidden high-risk subgroup vulnerable to PMI, especially in emergent surgical settings where preoperative optimization is limited. The patient's refusal of pharmacologic therapy highlights another critical barrier: patient beliefs and health behaviors significantly influence perioperative outcomes. Recent data have shown that even modest troponin elevations confer increased short- and long-term mortality.

Conclusion: Familial hypercholesterolemia, particularly when unoptimized, confers substantial and often underappreciated perioperative cardiac risk. This case highlights the need for vigilance in perioperative cardiovascular assessment, the importance of systematic postoperative troponin monitoring, and the value of patient-centered counseling to address both pharmacologic and lifestyle contributors to risk. Wider adoption of guideline-directed perioperative monitoring strategies has the potential to reduce the burden of PMI in high-risk but often overlooked populations.

EVALUATION OF A PROVINCIAL VIRTUAL MULTIDISCIPLINARY PREOPERATIVE ASSESSMENT PATHWAY

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Background: Virtual care has recently gained momentum yet remains underutilized for preoperative assessment. A virtual preoperative assessment pathway was developed using implementation science methodology, piloted in 3 preadmission clinics, and evaluated for its impact on patients and health care providers.

Methods/Results: Based on the results of a formative evaluation of virtual preoperative assessments, multidisciplinary virtual preoperative assessments were deployed in 3 preadmission clinics located in Saskatchewan. Preoperative assessments were completed using a web-based virtual care platform accessible through a personal computer, smartphone, or tablet device. Patient and provider satisfaction was evaluated using adapted virtual care surveys. Follow-up surveys with patients and health care providers were conducted by telephone or through a web-based survey. Medical records were reviewed using a standardized case report form to identify relevant complications. Data were analyzed using descriptive statistics. Two hundred patients received a virtual preoperative assessment. One patient had a same-day postponement, which was related to operating room availability. Two patients had postoperative medical complications (sepsis [$n = 1$] and DVT [$n = 1$]). One hundred sixty-four patients and 28 health care providers completed the follow-up surveys. Virtual care visits were associated with substantial reductions in travel (mean, 326 km/patient) and out-of-pocket expenses (mean, Can$172/patient). Patients reported high levels of overall satisfaction with virtual appointments (median score, 5; IQR, 4–5) and

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provided high scores for items pertaining to scheduling, technology, provider, and personal satisfaction. Health care providers were neutral on whether virtual visits provide good medical care (median score, 3; IQR, 3–4); most preferred to communicate with patients in person (median score, 4; IQR, 3–4).

Conclusion: Virtual preoperative assessment is safe, associated with high levels of patient satisfaction, and results in significant cost, travel, and time savings for patients.

IMPACT OF IPACK ON POSTOPERATIVE OUTCOMES IN KNEE SURGICAL PROCEDURES: A SYSTEMATIC REVIEW AND META-REGRESSION ANALYSIS OF OBSERVATIONAL STUDIES

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Background: The infiltration between the popliteal artery and capsule of the knee (IPACK) block is an emerging regional anesthesia technique that aims to provide adequate analgesia for knee surgeries while reducing motor blockade.

Objective: This systematic review aimed to assess postoperative outcomes associated with the use of the IPACK block in adult patients, including pain intensity, opioid consumption, postoperative complications, and length of hospital stay, by comparing it with standard control anesthetic techniques following knee surgery.

Methods: A literature search was performed in multiple databases to identify observational studies evaluating the use of the IPACK block in adult patients undergoing knee surgeries. Only observational studies in which adult patients received the IPACK block for knee surgical procedures were included. The primary outcomes were 6-hour pain scores and 24-hour postoperative opioid consumption. The secondary outcomes were functional recovery, complication rates, and length of hospital stay. Continuous variables were pooled as means and SDs, whereas discrete variables were pooled as numbers and percentages. The quality of the studies was assessed using the Newcastle-Ottawa Scale scoring system, and statistical analysis was performed using Cochrane software.

Results: The meta-analysis included 15 studies with 2215 patients. The baseline demographic data were comparable between the groups. Patients receiving the IPACK block reported significantly lower visual analog scale (VAS) pain scores at rest and during movement. The 24-hour postoperative opioid consumption was significantly reduced in the IPACK group compared with the control group. The pooled estimate showed a trend toward reduced hospital length of stay and higher patient satisfaction in the IPACK group compared with the control group. The quality of the study was low to moderate. The quality of the evidence, as assessed by the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach, was low.

Conclusion: This meta-analysis shows that the IPACK block effectively reduces postoperative pain and significantly decreases postoperative opioids with minimal adverse effects. However, further randomized controlled trials (RCTs) of adequate power and clearly defined endpoints are warranted.

DIRECT ORAL ANTICOAGULATION VERSUS VITAMIN K ANTAGONIST AFTER CARDIAC SURGERY TRIAL: VANGUARD PHASE FEASIBILITY RESULTS FROM THE FIRST 400 PATIENTS

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Background: Atrial fibrillation (AF) is a frequent postoperative complication among patients undergoing cardiac surgery. Nearly one-third of patients require oral anticoagulation by hospital discharge, yet the optimal anticoagulation strategy remains uncertain. Vitamin K antagonists (VKAs) have historically been the mainstay of treatment, but their use is complicated by a narrow therapeutic window, drug and dietary interactions, and the need for regular monitoring. Direct oral anticoagulants (DOACs), in contrast, offer fixed dosing and minimal monitoring, though their role in the early postoperative period is not well established. The perioperative phase presents a complex clinical landscape, requiring careful balance of thromboembolic and hemorrhagic risks. Existing guidelines are based on low-quality evidence, underscoring the need for robust evidence to inform practice in this high-risk population. The Direct Oral Anticoagulation vs Vitamin K Antagonist after Cardiac Surgery (DANCE) trial will determine whether DOACs are noninferior to VKAs for major bleeding at 30 days after cardiac surgery in patients requiring anticoagulation for AF.

Methods: DANCE is an international, randomized, open-label, blinded endpoint (PROBE), multicenter, noninferiority trial. The 400-patient vanguard phase assessed feasibility before full-scale trial implementation. Adults who underwent open-heart surgery within the last 10 days requiring anticoagulation for AF were randomized 1:1 to receive either a DOAC (initiated on postoperative day 5 or at discharge) or a VKA (initiated as early as postoperative day 1). Key exclusion criteria included mechanical valve replacement, significant renal or hepatic impairment, active bleeding, or contraindications to study drugs. Randomization was stratified by site and anticoagulation indication (preexisting vs new postoperative AF). Follow-ups occurred at 30 days, hospital discharge, and at 3 and 6 months. Vanguard feasibility metrics included recruitment rate (5 patients/center/month), follow-up completion ($\geq$95% at 30 days), and crossover rates ($<$5% crossover at 30 days). The primary endpoint for the full trial is major bleeding within 30 days.

Results: A total of 400 patients were randomized across 6 centers between July 2021 and February 2024, with a mean age of 69.6 years (SD = 7.9) and 24.7% female. The mean recruitment rate was 3.7 patients per center per month. Follow-up completion was 96.3% at 30 days and 94.3% at 90 days. Crossover rates were 5.8% and 12.3% at 30 days and 90 days, respectively. Data quality was high, with 99.7% of electronic case report forms completed. The aggregate incidence of major bleeding was 5.3% at 30 days and 7.3% at 90 days, consistent with anticipated event rates. At 90 days, stroke occurred in 1.5% of patients, and all-cause mortality was 2.0%.

Conclusion: The DANCE vanguard phase had a lower enrollment rate than anticipated but high retention and event rates consistent with initial projections. Based on these results, the full trial will proceed in more centers than initially planned, and recruitment projections have been adjusted. The crossover rate was higher than anticipated, which led to operational adjustments at recruiting centers to improve it. Patients enrolled during the vanguard phase will be included in the full DANCE trial, through which high-quality evidence will be generated to inform anticoagulation strategies following cardiac surgery.

THE EFFECT OF PERIOPERATIVE HYPERTONIC CRYSTALLOID ADMINISTRATION IN PATIENTS UNDERGOING CARDIAC SURGERY: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Background: Fluid administration is essential in perioperative care for adult cardiac surgery to support hemodynamic stability and organ perfusion. However, excessive administration, particularly during cardiopulmonary bypass (CPB), can result in fluid overload linked to complications such as tissue edema, acute kidney

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injury (AKI), and increased mortality. Hypertonic saline, by exerting greater osmotic pressure, may provide equivalent volume expansion with reduced fluid volumes, potentially mitigating these risks. Although promising in trauma and military settings, its role in cardiac surgery remains uncertain, with inconsistent findings across studies. This systematic review and meta-analysis evaluated the effects of hypertonic vs isotonic saline administration on outcomes in adult patients undergoing cardiac surgery requiring CPB.

Methods/Results: A systematic search of MEDLINE, EMBASE, ISI Web of Science, and CENTRAL was conducted from inception to January 7, 2025, without language or publication restrictions. Additional studies were identified through clinical trial registries (ClinicalTrials.gov, ISRCTN, ANZCTR, WHO ICTRP), conference abstracts (2018–2025), and reference lists. Randomized controlled trials comparing perioperative hypertonic vs isotonic saline administration in adults undergoing cardiac surgery with CPB were included. Outcomes of interest included all-cause mortality, AKI, need for renal replacement therapy (RRT), fluid balance, hemodynamic indices, electrolyte disturbances, duration of mechanical ventilation, ICU/hospital length of stay, and cardiovascular morbidity. Outcomes were assessed at short-term (approximately 1 hour postoperative) and longer-term (approximately 24 hours postoperative) time points. Study selection, data extraction, and risk-of-bias assessment (Cochrane Risk of Bias Tool) were conducted independently by 2 reviewers, with adjudication by a third. Data were pooled using random-effects models with risk ratios (RRs) for dichotomous outcomes and mean differences (MDs) for continuous outcomes in Dataparty. Of 5228 records identified, 108 full texts were screened, and 21 RCTs comprising 915 participants were included. Clinical outcomes were infrequently reported (mortality: 6 trials, 0 events; RRT: 2 trials, 0 events; heart failure: 1 trial, 0 events), with no significant differences in arrhythmia, AKI, mechanical ventilation duration, or ICU/hospital length of stay. Hypertonic saline was associated with significantly lower fluid balance at both short-term (MD, −504 mL; 95% CI, −882 to −126) and longer-term (MD, −812 mL; 95% CI, −1268 to −357) time points. CPB time was modestly shorter with hypertonic saline (MD, −4 minutes; 95% CI, −7 to −1). Sodium (short-term: MD, 5; 95% CI, 2 to 8; longer-term: MD, 5; 95% CI, 3 to 6) and chloride (short-term: MD, 9; 95% CI, 7 to 11; longer-term: MD, 5; 95% CI, 4 to 6) concentrations were significantly higher in the hypertonic saline group at both time points. No consistent differences were observed in hemodynamic measures, aside from a transient reduction in systemic vascular resistance index (SVRI) at 1 hour (MD, −197; 95% CI, −323 to −71).

Conclusion: In this systematic review and meta-analysis of 21 RCTs (915 participants), perioperative hypertonic saline reduced fluid balance at both early and late time points but had minimal impact on hemodynamic or clinical outcomes. Importantly, clinical outcomes were infrequently reported across studies, limiting the ability to draw definitive conclusions. A large, adequately powered trial incorporating patient-important outcomes is needed to determine whether the observed physiological effects translate into clinically meaningful benefits for perioperative cardiac surgery care.

UNDERSTANDING THE VARIABILITY IN ADOPTION OF SURGICAL ABLATION OF ATRIAL FIBRILLATION (SAFARI): AN INTERNATIONAL SURVEY OF CARDIAC SURGEONS

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Background: Atrial fibrillation (AF) is the most common cardiac arrhythmia and is associated with long-term morbidity and mortality. Cardiac surgery presents the opportunity to perform ablation for AF, a procedure aimed at restoring sinus rhythm that has been shown to improve long-term outcomes. Surgical ablation of AF is endorsed in clinical guidelines. However, only approximately 43% of eligible patients receive concomitant surgical ablation during cardiac surgery. This study

aimed to understand the variability in the adoption of surgical ablation of AF among cardiac surgeons and to identify factors influencing the decision to perform the procedure.

Methods/Results: The survey included items designed to assess respondents' demographic characteristics. For those who perform ablation, additional questions explored the methods used and decision-making factors. For nonperformers, the survey examined perceived barriers to performing ablation. The instrument was piloted to ensure clarity, eliminate redundancy, and incorporate feedback. A convenience sample was drawn from cardiac surgeons involved in LeAAPS and LAAOS III trials. The survey was distributed electronically and anonymized using REDCap, and all statistical analyses were conducted using Python (3.12.8). Of the 362 surveys distributed, 79 were completed (22% response rate). After excluding 3 incomplete responses, 76 surveys were included in the final analysis. A total of 47% of respondents were based in North America, 45% in Europe, 5% in Oceania, and 3% in South America. Respondents reported a mean of 22 years in practice (SD, 10) and an average annual surgical volume of 190 cases (SD, 73). A total of 63% of respondents reported a primary focus on coronary artery bypass grafting and 62% on aortic valve procedures. Most respondents (67/76, 88%) reported performing surgical ablation of AF. Based on respondents' reported likelihood of performing AF ablation in patients with AF, notable deterrents included the following clinical factors: increased left atrial size, more persistent forms of AF, more severe left ventricular dysfunction, reoperation, minimally invasive surgeries, and complex cases with long pump times. Among nonperforming surgeons (9/76, 12%), common factors reported to increase future adoption of AF ablation included stronger clinical evidence and more affordable and accessible equipment.

Conclusion: The findings reveal that while surgical ablation of AF is commonly performed by survey respondents, variation exists in how and when it is used by cardiac surgeons. This supports the need for a well-designed, definitive trial to guide future care and address the gap between recommendations and practice.

ASSESSING INTRAOPERATIVE TEMPERATURE MANAGEMENT IN CARDIAC SURGERY (AIM): A SURVEY OF CANADIAN PERFUSIONISTS

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Background: Temperature management during cardiopulmonary bypass (CPB) for cases not requiring circulatory arrest varies, with some using systemic hypothermia (<35 °C) as a strategy to prevent end-organ complications and others adopting systemic normothermia (≥35 °C) based on the lack of evidence supporting hypothermia's benefits and potential harms. Although hypothermia may reduce metabolic demands, it has also been linked to increased bleeding, higher transfusion requirements, and longer operative times. Evidence comparing the 2 strategies remains inconclusive, and, as a result, guidelines offer few recommendations. Understanding current practice patterns and the rationale behind them is essential to inform future research and guideline development. This study aims to assess the proportion of Canadian cardiac perfusionists who routinely target normothermia vs hypothermia during CPB, whether there are discrepancies between targeted and observed temperature during CPB, and to identify clinical, institutional, and provider-related factors influencing temperature target selection.

Methods: A cross-sectional, national survey of all practicing clinical perfusionists in Canada will be conducted (estimated $N \approx 300$). The bilingual (English/French) electronic survey will be distributed via REDCap, with up to 2 reminders sent at 2-week intervals. No individual identifiers will be collected. Survey content was developed by a multidisciplinary team and refined through expert review. The survey begins with demographic questions, including location and type of practice (academic vs community) and annual institutional case volume. Respondents will be asked to indicate their

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typical temperature target during on-pump cardiac surgery without circulatory arrest and the lowest core temperature typically observed during CPB. To evaluate decision-making, respondents will be asked to rate the influence of clinical, institutional, and provider-related factors on their temperature target using a 5-point Likert scale. Perfusionists' perceived level of influence on the temperature target will be assessed on a unipolar continuous scale ranging from "no input" to "full input." Respondents will be asked to identify the primary temperature monitoring site used during cooling and rewarming and the widest arterial–venous temperature gradient they are comfortable with during rewarming. After ethical approval is obtained, the survey will be distributed in September. Results will be presented at the Perioperative Care Congress.

Conclusion: By identifying national practice patterns and the factors driving temperature management decisions during CPB, this study will inform future research, thereby facilitating the development of evidence-based guidelines to optimize patient safety and clinical outcomes in cardiac surgery.

TEMPERATURE MANAGEMENT IN ADULT CARDIAC SURGERY: A PROSPECTIVE COHORT SUBSTUDY OF THE THERAPY TRIAL

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Background: Cardiopulmonary bypass (CPB) is routinely used in cardiac surgery to create a still and bloodless surgical field; however, the optimal temperature management strategy during CPB remains uncertain. Historically, hypothermia has been employed for its presumed end-organ protective effects. In the absence of conclusive evidence to support its benefits, normothermia is increasingly considered a viable alternative. The TheRAPy trial, designed to evaluate the effect of retrograde autologous priming of the CPB circuit on postoperative transfusion, is prospectively collecting detailed data about CPB conduct. Leveraging this dataset, this prospective cohort study of patients enrolled in TheRAPy compared the characteristics of patients undergoing hypothermic (<35 °C) vs normothermic (≥35 °C) CPB.

Methods/Results: A total of 695 adults (27% female) undergoing on-pump cardiac surgery were included from 2 participating sites, with a mean age of 65 years (SD, 11 years). Patients were stratified based on whether they did ($n = 27$) or did not ($n = 668$) undergo deep hypothermic circulatory arrest. Among patients without deep hypothermic circulatory arrest, 368 (55%) underwent hypothermic CPB, 286 (43%) underwent normothermic CPB, and 14 (2%) had no recorded temperature. The most common procedures in both groups were isolated coronary artery bypass grafting (CABG; hypothermic: 166 [25%], normothermic: 191 [29%]), CABG with single valve replacement or repair (hypothermic: 52 [8%], normothermic: 22 [3%]), and other cardiac surgeries (hypothermic: 121 [18%], normothermic: 61 [9%]). Operative time was significantly longer in the hypothermic group compared with the normothermic group (287 ± 100 vs 250 ± 79 min; $p < 0.001$), as were CPB time (143 ± 74 vs 108 ± 48 min; $p < 0.001$) and aortic cross-clamp time (109 ± 58 vs 82 ± 40 min; $p < 0.001$). Among patients undergoing deep hypothermic circulatory arrest, the mean operative, CPB, and cross-clamp times were 522 ± 202, 298 ± 124, and 189 ± 89 min, respectively. Mean circulatory arrest time was 43 ± 27 min, with a corresponding arrest temperature of 21 ± 3 °C. The majority (26; 96%) received cerebral perfusion: 24 via anterograde circulation and 2 via retrograde cerebral perfusion. When used, the average duration of cerebral perfusion was 37 ± 17 min.

Conclusion: In patients undergoing on-pump cardiac surgery without circulatory arrest, 53% underwent hypothermic CPB. These patients had significantly longer operative, CPB, and aortic cross-clamp times than those who underwent normothermic CPB. Further research is required to determine the factors that influence clinicians' temperature management during CPB. Furthermore, contemporary evidence evaluating whether hypothermia compared with normothermia improves postoperative outcomes is required to generate

evidence-based guidelines for CPB use during cardiac surgery.

POSTOPERATIVE PAIN AND OPIOID CONSUMPTION OF PERICAPSULAR NERVE GROUP BLOCK IN ADULTS UNDERGOING HIP SURGERIES: SYSTEMATIC REVIEW AND NETWORK ANALYSIS

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Background: The pericapsular nerve group (PENG) block is an ultrasound-guided regional anesthesia technique targeting the femoral, obturator, and accessory obturator nerves for postoperative analgesia while preserving motor function in patients undergoing hip surgery. It reduces pain scores and opioid use and enhances early mobilization, but its effectiveness compared with other techniques remains underexplored.

Objective: To evaluate the effectiveness of PENG block in reducing postoperative pain and opioid consumption in adult patients undergoing hip surgical procedures.

Methods: A systematic literature search was conducted from 1946 until November 2024 across Ovid EBM Reviews, the Cochrane Central Register of Controlled Trials, Ovid Embase, and Ovid MEDLINE using MeSH keywords. All randomized controlled trials (RCTs) published in the English literature that compared PENG block with an active nerve block group or control group in adult patients undergoing hip surgical procedures, such as hip arthroplasty, hip scope, and hip fractures, were included. Articles on PENG blocks for nonsurgical hip pain were excluded. The primary outcome was pain score at 6 hours and 24-hour postoperative opioid consumption. Continuous data were extracted and summarized as mean difference (MD) and 95% CI with a random-effects network meta-analysis model. The Cochrane risk-of-bias tool was used for quality assessment of the studies, while the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach was used to evaluate the quality of the pooled estimate.

Results: A total of 35 RCTs were included in the systematic review, with 24 studies involving 1,478 patients in the network meta-analysis (nerve block, $n = 1202$ [81.3%] vs control, $n = 276$ [18.6%]). These studies assessed 6 block groups: PENG (24 studies, $n = 726$), fascia iliaca block (12 studies, $n = 334$), femoral nerve block (1 study, $n = 30$), quadratus lumborum block (1 study, $n = 30$), erector spinae block (1 study, $n = 25$), periarticular infiltration (2 studies, $n = 57$), and control (8 studies, $n = 276$). The network meta-analysis indicated that the PENG block significantly decreased pain scores at 6 hours (PENG vs control: 49.1% vs 18.6%; MD, −1.02; 95% CI, −1.519 to −0.529) and reduced 24-hour postoperative morphine milligram equivalent opioid consumption (MD, 4.5 mg; 95% CI, 1.15 to 7.84). Although all included studies were assessed as having low risk of bias, the overall quality of the pooled estimate from the network meta-analysis was considered low.

Conclusion: This network meta-analysis of RCTs demonstrates that the PENG block may be effective in decreasing postoperative pain and opioid consumption in adult patients undergoing hip surgical procedures when compared with the control group. In the future, multicenter pragmatic randomized controlled trials with sufficient power and clearly defined endpoints will be required to confirm these findings.

PERIOPERATIVE OUTCOMES IN ADULT SURGICAL PATIENTS ON GLP-1 RECEPTOR AGONISTS: A SYSTEMATIC REVIEW OF RANDOMIZED CONTROLLED TRIALS AND OBSERVATIONAL STUDIES

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Background: Glucagon-like peptide-1 (GLP-1) receptor agonists are increasingly used for managing type 2 diabetes and obesity, but their perioperative effects remain a topic of growing interest. Emerging evidence suggests potential implications for perioperative outcomes, such as length of stay and hemorrhage, necessitating a comprehensive evaluation of their impact on surgical outcomes. The objective of this study was to assess the impact of GLP-1 receptor agonists on perioperative outcomes in adult surgical patients.

Methods: A comprehensive literature search was conducted using PubMed, MEDLINE, and EBMR databases from 1946 until November 2024. RCTs and observational studies published in the English literature were included if they involved adult surgical patients on GLP-1 receptor agonists and reported at least 1 perioperative outcome. Exclusion criteria included studies involving pediatric and nonsurgical patients. The quality of the included studies was assessed using standardized tools, such as the Risk of Bias 2 (RoB 2) tool for randomized controlled trials and the Newcastle-Ottawa Scale (NOS) for nonrandomized studies in meta-analyses.

Results: A total of 51 studies were identified, with 9 included in the analysis. Six studies were randomized controlled trials ($n = 729$), and 3 were retrospective studies ($n = 102\ 973$). These studies collectively involved 103,702 patients, with demographic data varying across studies. Patient ages ranged from 18 to 85 years, and both genders were represented. Six studies used the GLP-1 receptor agonist in patients undergoing cardiac surgery, 2 in total shoulder arthroplasty, and 1 in spine fusion procedures. In 5 studies, GLP-1 receptor agonists significantly reduced the insulin requirement while improving perioperative glycemic control. In 2 studies, GLP-1 receptor agonists improved postoperative outcomes; in another study, GLP-1 receptor agonists better maintained normal myocardial function. In 1 study, GLP-1 receptor agonist use was associated with an increased risk of postoperative complications (eg, need for transfusion, readmission, among others).

Conclusion: This systematic review indicates that GLP-1 receptor agonists may be associated with improved perioperative glucose control and maintenance of normal myocardial function in adult surgical patients, with no significant increase in major postoperative complications. However, further RCTs of adequate power and clearly defined endpoints are warranted to inform evidence-based perioperative protocols.

PREOPERATIVE TROPONIN AS A PREDICTOR OF MORTALITY IN HIP FRACTURE PATIENTS UNDERGOING SURGERY: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Background: Patients with hip fractures have a 90-day mortality risk of 10%. In the HIP ATTACK trial, accelerated surgery showed a potential mortality benefit for patients with hip fracture and elevated preoperative troponin, which may identify patients at high mortality risk. This systematic review and meta-analysis investigated this association.

Methods/Results: This systematic review was registered with PROSPERO (CRD42020203499). The objective was to evaluate whether elevated preoperative troponin is associated with 90-day mortality (primary outcome) and major adverse cardiac events (MACE), myocardial infarction (MI), atrial fibrillation (AF), heart failure (HF), stroke, and long-term mortality (secondary outcomes). Ten studies of patients aged $\geq$ 50 years with low-energy hip fractures were included. Random-effects models were used to pool risk ratios (RRs) based on unadjusted event rates and 95% CIs, and risk of bias was evaluated using QUIPS and certainty of evidence using GRADE. A total of 3,428 participants from 10 studies were included in the meta-analysis. The 90-day mortality was 14.6% in patients with elevated preoperative troponin compared with 8.4% in those without elevated preoperative troponin (RR, 1.94; 95% CI, 1.56–2.42; $I^2 = 0\%$; moderate-certainty evidence). Patients with tro-

ponin elevation may have a risk of MACE (RR, 2.16; 95% CI, 1.37–3.42; $I^2 = 74\%$; moderate-certainty evidence), MI (RR, 3.38; 95% CI, 0.85–13.41; $I^2 = 77\%$; very low-certainty evidence), HF (RR, 2.89; 95% CI, 1.97–4.24; $I^2 = 0\%$; low-certainty evidence), AF (RR, 1.33; 95% CI, 0.15–11.47; $I^2 = 79\%$; very low-certainty evidence), stroke (RR, 1.64; 95% CI, 0.54–5.01; $I^2 = 0\%$; low-certainty evidence), and long-term mortality (RR, 1.38; 95% CI, 1.19–1.60; $I^2 = 36\%$; moderate-certainty evidence), although the estimates for secondary outcomes were imprecise, inconsistent, or at high risk of bias.

Conclusion: Elevated preoperative troponin may be associated with higher 90-day mortality, MACE, and long-term mortality in patients with low-energy hip fracture. No definitive conclusion can be drawn about secondary outcomes.

POSTOPERATIVE OUTCOMES ASSOCIATED WITH PREOPERATIVE ORAL HYGIENE IN ELECTIVE SURGERY: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Background: Postoperative complications substantially increase morbidity and health care costs. Preoperative oral hygiene has been proposed as an intervention to reduce postoperative complications, yet it remains inconsistently implemented across surgical practices.

Methods/Results: This systematic review and meta-analysis evaluated the effect of preoperative oral hygiene interventions on adverse postoperative outcomes. A systematic search of MEDLINE, Embase, Cochrane Central Register of Controlled Trials, and Cochrane Database of Systematic Reviews was conducted. Included studies were randomized controlled trials (RCTs) or prospective cohort (PC) studies of adult patients undergoing elevated-risk elective surgery. Interventions included any preoperative oral hygiene measure. Primary outcomes were pneumonia; infection (nosocomial, surgical site, respiratory, and urinary tract); hospital and intensive care unit (ICU) length of stay (LOS); and all-cause mortality. Risk of bias (ROB) was assessed using the Cochrane ROB tool and Newcastle-Ottawa Scale (NOS). Meta-analyses were performed using pooled odds ratios (ORs) and mean differences (MDs), each with 95% CIs. Nineteen studies comprising 5757 patients were included. Compared with controls, preoperative oral hygiene significantly reduced the odds of pneumonia (OR, 0.42; 95% CI, 0.27–0.66; $p < 0.001$), nosocomial infection (OR, 0.56; 95% CI, 0.44–0.71; $p < 0.001$), surgical site infection (OR, 0.62; 95% CI, 0.42–0.92; $p = 0.02$), and respiratory infection (OR, 0.62; 95% CI, 0.41–0.93; $p = 0.02$). On average, patients receiving oral hygiene also had shortened hospital LOS (MD, −1.09 days; 95% CI, −1.73 to −0.45; $p < 0.001$) and ICU LOS (MD, −0.14 days; 95% CI, −0.27 to −0.00; $p = 0.04$). No significant association was identified with urinary tract infections or mortality.

Conclusion: These findings support incorporating oral hygiene into standard preoperative protocols to improve surgical outcomes. Further research is warranted to investigate the relationship between preoperative oral hygiene and mortality.

EFFICACY OF ERECTOR SPINAE BLOCK ON POSTOPERATIVE OUTCOMES IN BARIATRIC SURGERY PATIENTS: A SYSTEMATIC REVIEW AND META-REGRESSION ANALYSIS

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Background: Bariatric surgery is effective for severe obesity, but recovery is often complicated by pain,

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nausea, and high opioid use. This systematic review and meta-analysis (SRMA) evaluates the role of erector spinae plane block (ESPB) in reducing pain, opioid consumption, and postoperative nausea and vomiting (PONV) after bariatric surgery.

Methods: Electronic databases were systematically searched from inception to March 2025 for randomized controlled trials (RCTs) assessing bilateral ESPB in adults undergoing bariatric surgery. This review included studies that compared ESPB with a control group and reported at least 1 postoperative outcome. The primary outcome was resting pain at 6 hours and 24 hours. Mean differences (MDs) and 95% CIs were calculated for individual studies and pooled using a random-effects model. Meta-regression and trial sequential analysis were performed to evaluate the impact of confounding variables and sample size on the pooled estimate. Risk of bias and certainty of evidence were assessed using the Cochrane Risk of Bias 2 (RoB 2) and Grading of Recommendations Assessment, Development, and Evaluation (GRADE) assessment tools.

Results: Twelve RCTs ($n = 825$; ESPB = 412, control = 413) were included. ESPB significantly reduced resting pain at 6 hours (MD, 1.79; 95% CI, 0.80–2.78; $p = 0.0004$) and 24 hours (MD, 1.09; 95% CI, 0.38–1.79; $p = 0.002$). Six RCTs ($n = 509$) reported lower movement-evoked pain at 6 hours (MD, 1.28; 95% CI, 0.68–1.88; $p < 0.0001$) and 24 hours (MD, 0.79; 95% CI, 0.44–1.14; $p < 0.0001$). Nine RCTs ($n = 673$) showed reduced 24-hour opioid consumption (MD, 9.0; 95% CI, 2.72–15.27; $P = 0.005$). Five RCTs ($n = 448$) reported a lower incidence of PONV with ESPB (risk ratio, 1.47; 95% CI, 1.08–1.98; $p = 0.01$). Meta-regression to adjust for baseline confounding factors and trial sequential analysis did not materially alter the results. Risk of bias was low, and certainty of evidence was rated as moderate to low.

Conclusion: This SRMA of RCTs demonstrates that ESPB may significantly reduce postoperative pain, 24-hour postoperative opioid consumption, and PONV compared with control in patients undergoing bariatric surgery. However, further RCTs of adequate power with unified protocols and clearly defined endpoints are warranted.

DEFINITION, ANALYSIS, REPORTING, AND INTERPRETATION OF PERIOPERATIVE BLEEDING IN SURGICAL TRIALS: SYSTEMATIC REVIEW

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Background: Perioperative bleeding is a common surgical complication associated with significant morbidity and mortality. Despite its frequent use as a primary outcome in randomized controlled trials (RCTs), it lacks standardized definitions. This limits comparability across studies and clinical applicability. This systematic review aimed to summarize how perioperative bleeding is defined and measured in surgical RCTs, whether assumptions underlying sample size calculations are justified, which analytic and reporting practices are used, and how treatment effects are interpreted.

Methods: The Cochrane Central Register of Controlled Trials (CENTRAL) was searched for RCTs published between January 2024 and April 2025 that evaluated any pharmacological or procedural intervention in surgical settings, with perioperative bleeding specified as the primary outcome. Eligible trials were screened in duplicate, and 2 independent reviewers extracted data using a standardized form. Extracted information included trial characteristics, outcome definitions, timing of assessment, analytic approaches, reporting of estimates, sample size assumptions, and interpretation of results. Findings were descriptively summarized and grouped into conceptually similar categories.

Results: A total of 115 RCTs with 116 bleeding-related primary outcomes were included. Thirty-six unique definitions of perioperative bleeding were identified, with wide variation in constructs and assessment timing (intraoperative to > 30 days postoperatively). Gravimetric and volumetric methods were most common ($n = 45$, 39%), followed by formula-based estimations ($n = 14$, 12%) and transfusion-related metrics ($n = 10$, 9%).

Although most trials (n = 98, 85%) reported sample size calculations, more than one-third (n = 36, 37%) did not justify the assumed effect size. When justifications were provided, they most often cited prior trials (n = 27, 28%), pilot data (n = 9, 9%), or standardized metrics such as Cohen d (n = 7, 7%). Only 10 trials (n = 10, 10%) explicitly defined a clinically meaningful difference, and just 1 described how this threshold was derived. Analytic approaches varied considerably. Continuous outcomes (n = 77, 66%) dominated, followed by binary (n = 19, 16%) and ordinal outcomes (n = 13, 11%). Other outcome types (composite, ordinal, and time-to-event) each accounted for < 3% of outcomes. Most analyses relied on parametric tests (n = 81, 69.8%), and only a minority adjusted for baseline covariates (n = 19, 16.4%). Only one-quarter of studies reported an effect estimate (n = 31, 27%), and even fewer reported CIs (n = 28, 24%). Nearly half (n = 49, 47.6%) of superiority trials interpreted findings solely based on statistical significance. No noninferiority or equivalence trial provided discussions of prespecified margins, and only 1 (n = 1, 8%) presented CIs to substantiate claims.

Conclusion: Recent surgical RCTs showed high heterogeneity in the definition, measurement, analysis, and interpretation of perioperative bleeding outcomes. Many relied on surrogate or poorly validated measures, provided limited justification for sample size assumptions, and interpreted findings mainly in terms of statistical significance rather than clinical relevance. Standardized, patient-centered definitions and clearer guidance on analytic and interpretive practices are needed to improve the quality and comparability of future trials.

POSTOPERATIVE OUTCOMES FOLLOWING PENG BLOCK IN PATIENTS UNDERGOING HIP SURGICAL PROCEDURES: A SYSTEMATIC REVIEW OF PROSPECTIVE AND RETROSPECTIVE STUDIES

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Background: Hip surgical procedures are frequently performed to investigate and treat various hip pathologies. Nevertheless, severe pain and opioid use during the postoperative period can lead to complications and impede recovery. The pericapsular nerve group (PENG) block is a regional anesthesia technique that targets the femoral, obturator, and accessory obturator nerves. It has been demonstrated to decrease postoperative pain and opioid consumption. However, its effect compared with other regional anesthesia techniques for hip surgeries remains to be explored.

Methods/Results: A systematic literature search was conducted from 1946 to November 2024 across Ovid EBM Reviews, the Cochrane Central Register of Controlled Trials, Ovid Embase, and Ovid MEDLINE using MeSH keywords. The search included observational studies published in the English literature involving adult surgical patients undergoing hip surgeries, such as hip arthroplasty, hip scope, and hip fractures, who received a PENG block. The comparison groups consisted of either an active nerve block group or a passive control group. The studies were required to report at least 1 postoperative outcome, such as postoperative pain or opioid consumption. Articles on PENG blocks for nonsurgical hip pain were excluded. The summary of the review is presented in a tabular column. Study quality was evaluated using the Newcastle-Ottawa Scale scoring system. This systematic review analyzed 17 observational studies published between 2021 and 2024 that met the inclusion criteria: 2021 (1 study), 2022 (5 studies), 2023 (7 studies), and 2024 (4 studies). Nine studies were conducted in North America, 6 in Europe, and 2 in India. Four were prospective cohort studies, and 13 were retrospective. Seven studies used general anesthesia (GA), and 9 used spinal anesthesia (SA) as the anesthetic type. In 1 study, 37 participants underwent SA, while 1 received GA. Sample sizes in each study ranged from 30 to 226. Several comparison groups were used across the studies. Two studies compared PENG with quadratus lumborum (QL) block, 5 compared PENG with fascia iliaca block (FIB), and 9 studies used passive controls. Other comparison interventions included femoral nerve (FN) block, FN + LFCN, and epidural, each used in 1

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study. The identified studies comprised 4 on hip fracture surgeries, 7 on hip arthroplasties, and 6 on hip arthroscopies. The average age of the PENG group was 52.5 ± 13.5 years, and the average BMI was 26.6 ± 5.1. Across all studies, 50.7% of the participants were male. PENG blocks were generally associated with improved postoperative outcomes, although the certainty of evidence was uniformly low. Nine studies demonstrated lower resting pain scores, while 7 found no significant difference. For movement pain, 2 studies showed benefit and 1 reported no difference. PENG blocks were associated with lower opioid consumption in 10 studies, though 4 showed no significant impact. Rescue analgesia requirements were lower for patients who received PENG block in 1 study, while 3 reported no difference. Evidence for functional outcomes was limited, with 1 study suggesting benefits for muscle strength and ambulation, while 4 others found no difference. Four studies reported shorter hospital stays with PENG blocks, and 2 reported no difference. Regarding postoperative complications, 2 studies observed fewer complications, while 3 found no significant association.

Conclusion: The PENG block may decrease early postoperative pain and opioid consumption in adult patients undergoing hip surgery compared with other groups. However, randomized controlled trials with sufficient power and clearly defined endpoints are required to confirm these findings.

PERIOPERATIVE BENZODIAZEPINES ON POSTOPERATIVE NEUROCOGNITIVE OUTCOMES IN ADULTS UNDERGOING CARDIAC SURGERY: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Background: Postoperative delirium and cognitive dysfunction affect more than 20% of cardiac surgery patients and are associated with increased morbidity, mortality, and health care utilization. Benzodiazepines are frequently used during cardiac surgery for their presumed protection against intraoperative awareness. In contrast, several guidelines recommend restricting perioperative benzodiazepine use due to their association with adverse neurocognitive outcomes, although these recommendations were based on expert opinion. This systematic review and meta-analysis of randomized controlled trials evaluated the effect of perioperative benzodiazepines on postoperative delirium and cognitive dysfunction in adults undergoing cardiac surgery.

Methods: CENTRAL, CINAHL, Embase, MEDLINE, and PubMed databases were searched from inception to June 17, 2025. Trials of adults undergoing cardiac surgery comparing the use of perioperative benzodiazepines with a placebo, nothing, or another agent were included. The primary outcomes were postoperative delirium and cognitive dysfunction. Secondary and safety outcomes included the duration of mechanical ventilation, intensive care unit (ICU) length of stay, hospital length of stay, and the incidence of intraoperative awareness and mortality. Study quality was assessed using a modified Cochrane Risk of Bias tool. Results were pooled using either random- or fixed-effects meta-analysis, as appropriate, and standardized mean differences (MDs) were reported for continuous outcomes and odds ratios (ORs) or risk ratios (RRs) for binary outcomes, as appropriate, all with 95% CIs. The Grading of Recommendations Assessment, Development, and Evaluation (GRADE) approach was used to assess the certainty of evidence for each outcome.

Results: A total of 2782 publications were identified, 217 full texts were screened, and 20 RCTs, including 21 951 participants, were included. Most trials (15/20; 75%) were at low risk of bias. Perioperative benzodiazepines probably result in a slight increase in postoperative delirium (6 studies, $n = 20\ 171$; OR, 1.1; 95% CI, 1.0–1.2; moderate certainty). In contrast, the evidence was very uncertain about the effect of perioperative benzodiazepines on postoperative cognitive decline (2 studies, $n = 120$; MD, 0.8 Mini-Mental State Examination points lower; 95% CI, −1.7 to 0.1). Perioperative benzodiazepines slightly increase the duration of postoperative mechanical ventilation (10 studies, $n = 778$; MD, 3.4 hours; 95% CI, 1.95–4.86) and hospital length of stay

(7 studies, $n = 20\ 209$; MD, 0.7 days; 95% CI, 0.1–1.3) but may have no effect on ICU length of stay (10 studies, $n = 20\ 813$; MD, 0.3 days; 95% CI, −0.2 to 0.8). With regard to their benefits for patient safety, perioperative benzodiazepines probably do not decrease mortality (10 studies, $n = 20573$; OR, 0.9; 95% CI, 0.8–1.1) or prevent intraoperative awareness (5 studies, $n = 20\ 652$; RR, 0.7; 95% CI, 0.1–3.8).

Conclusion: Perioperative benzodiazepines probably result in small increases in postoperative delirium, duration of mechanical ventilation, and hospital length of stay and likely do not decrease mortality or prevent intraoperative awareness. Given the lack of benefit and potential harms of perioperative benzodiazepines, clinicians should avoid using them in adults undergoing cardiac surgery.

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