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Perioperative Abstracts

Contents

A review of the implementation of team-based anesthesia care at a Canadian multicenter academic health sciences network

Submission ID

102

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INTRODUCTION

In Canada, anesthesia care has historically been delivered by specialist anesthesiologists or family practice-anesthesiologists in a 1:1 patient:physician ratio[1,2]. Team-based anesthesia care (TBAC), where physician anesthesiologists work with non-physician providers to care for more than one patient simultaneously[3] is practiced in other jurisdictions, but is poorly described in the Canadian context. In response to a critical anesthesiologist shortage, our institution, a multicenter academic health sciences network, implemented two novel approaches to TBAC in January 2023: 1. Tandem Care Anesthesia Model (TCAM), where one anesthesiologist supervised two anesthesia assistants in appropriately selected low-risk cases, 2. High Intensity Turnover (HIT), where one anesthesiologist and one anesthesia assistant worked together in two alternating operating rooms to eliminate case turnover time. We conducted a retrospective chart review to describe processes and outcomes from TBAC in this unique Canadian experience.

METHODS

This was a retrospective quality improvement initiative using observational methods, meaning requirements for research ethics board review were formally waived. The population included low-risk patients undergoing low-risk surgery who were managed within our TBAC model between January 1, 2023-February 28, 2025. Patient and procedural selection criteria were developed by a local team comprising specialist anesthesiologists and anesthesia assistants. TBAC exclusion criteria included known difficult airway, ASA 4-5, BMI > 40, thoracic/carotid/craniotomy surgery, and those with higher likelihoods of intra-operative or post-operative deterioration based on individual case pre-review.

Following guideline creation, a standard data collection framework was developed to retrospectively capture and describe patient and procedural details, process measures (adherence to guidelines, details of anesthesia care), and outcomes (anesthesia-related complications, post-operative pain, delirium, and postoperative nausea-vomiting, time to

post anesthesia care unit discharge readiness, unplanned admission, return to the emergency department or readmission, major morbidity or death). Clinical reviewers extracted data using a purpose-built tool. The first 10 cases for each extractor were reviewed by a senior team member to ensure data collection accuracy. Data were analyzed descriptively using measures of central tendency and variance. Exploratory inferential analyses were conducted to estimate associations between TCAM guideline adherence and outcomes.

RESULTS

A complete summary of results can be found in Table 1 (supporting files). 278 TCAM and 373 HIT cases were performed. Patients had mean ages of 57 and 58 years, BMI ≈28 kg/m^2, and were primarily ASA II–III. Adherence to TBAC selection criteria was high (TCAM 90.6%, HIT 92.2%); non-adherent cases (9.4% and 7.8%) largely reflected ASA IV status and/or BMI ≥40, with one HIT case booked despite a documented difficult airway. General anesthesia was the primary anesthetic in both models. Anesthesia-related complications occurred in 2/278 (0.7%) TCAM cases (one unanticipated difficult airway, one episode of significant hemodynamic instability), with none recorded in HIT. One major morbidity event occurred in TCAM (1/278, 0.4%): a POD 0 stroke which was not related to intra-operative anesthetic management. No perioperative cardiac arrests or 30-day deaths occurred. Postoperative metrics (recovery, discharge success, unplanned admissions, and 7-day ED presentations) were favourable overall.

DISCUSSION

In deploying a team-based anesthesia care model based on interdisciplinary collaboration with physician anesthesiologists and anesthesia assistants in an academic health sciences network we found >90% adherence to pre-specified guidelines in providing anesthesia care in main operating room settings. Descriptively, any anesthesia-related issues were minor and were mitigated by the presence of a physician anesthesia provider at key moments (e.g., induction, emergence). The one major episode of morbidity was not anesthesia-attributable. Our results support the use of team-based anesthesia care models, and future comparative analyses are warranted with standard 1:1 physician: patient care in the Canadian context.

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http://Ontariosanesthesiologists.ca/oa-blog/2025/11/3/why-Ontarios- anesthesiologists-support-team-based-anesthesia-care

Table 1. Summary of Tandem Care Anesthesia Model (TCAM) versus High-Intensity Turnover (HIT): patient characteristics, TBAC adherence, surgical case mix, anesthetic techniques, and perioperative outcomes.

Variable / Measure	TCAM (n=278)	HIT (n=373)
Baseline demographic and perioperative risk characteristics		
Age, mean ± SD (y)	57 ± 17	58 ± 17
BMI, mean ± SD (kg/m²)	28.5 ± 6.2	28.1 ± 5.6
BMI ≥ 40, n (%)	14 (5.0)	16 (4.3)
ASA I, n (%)	9 (3.2)	36 (9.7)
ASA II, n (%)	92 (33.1)	143 (38.3)
ASA III, n (%)	162 (58.3)	176 (47.2)
ASA IV, n (%)	15 (5.4)	18 (4.8)
Adherence to TBAC selection criteria		
Adhered to TBAC, n (%)	252 (90.6)	344 (92.2)
Non-adherent, n (%)	26 (9.4)	29 (7.8)
• ASA IV, n (%)	15/26 (57.7)	17/29 (58.6)
• BMI ≥ 40, n (%)	14/26 (53.8)	13/29 (44.8)
• Previously known difficult airway, n (%)	0	1/29 (3.4)
Surgical specialty distribution and case mix		
Gynecology, n (%)	136 (48.9)	18 (4.8)
Urology, n (%)	50 (18.0)	156 (41.8)
General surgery, n (%)	39 (14.0)	199 (53.4)
Plastics, n (%)	33 (11.9)	0 (0)
Orthopedics, n (%)	2 (0.7)	0 (0)
Other specialties, n (%)	18 (6.5)	0 (0)
Primary anesthetic techniques		
General anesthesia (GA), n (%)	241 (86.7)	270 (72.4)
Neuraxial anesthesia (NA), n (%)	22 (7.9)	54 (14.5)
Monitored anesthesia care (MAC), n (%)	4 (1.4)	47 (12.6)
Regional anesthesia (RA), n (%)	11 (4.0)	2 (0.5)
Intraoperative complications and postoperative outcomes		
Anesthesia-related complications, n (%)	2 (0.7)	0 (0)
• Types	Unanticipated difficult airway Significant intraoperative hemodynamic instability	–
Major morbidity, n (%)	1 (0.4)	0 (0)
• Details	POD0 stroke + POD8 neck hematoma requiring awake FOI + ICU	–
PONV, n (%)	22 (7.9)	13 (3.5)
Postoperative delirium, n (%)	0 (0)	3 (0.8)
Initial PACU pain score, median [IQR]	2 [0–5]	0 [0–3]
Time to PACU discharge ready, minutes, median [IQR]	109 [68–150]	66 [45–101]
Successful discharge as booked, n (%)	272 (97.8)	368 (98.7)
Unexpected hospital admission, n (%)	6 (2.2)	9 (2.4)
7-day ED presentation, n (%)	10 (3.6)	9 (2.4)
Perioperative cardiac arrest, n (%)	0 (0)	0 (0)
30-day mortality, n (%)	0 (0)	0 (0)

Footnote: Values are mean ± standard deviation (SD), n (%), or median [interquartile range], as indicated. TBAC = Team-Based Anesthesia Care; TCAM = Tandem Care Anesthesia Model; HIT = High-Intensity Turnover; BMI = body mass index; ASA = American Society of Anesthesiologists physical status; GA = general anesthesia; NA = neuraxial anesthesia; MAC = monitored anesthesia care; PONV = postoperative nausea and vomiting; PACU = post-anesthesia care unit; ED = emergency department; FOI = fibreoptic intubation; ICU = intensive care unit; IQR = interquartile range.

Alcohol use disorder and post-operative outcomes in surgical patients: A Systematic Review and Meta-Analysis

Submission ID

102

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INTRODUCTION

Alcohol consumption is a major global health concern, and harmful alcohol use contributes to approximately 3 million deaths annually. Alcohol use disorder is defined by the Diagnostic and Statistical Manual of Mental Disorders 5th ed. as “a problematic pattern of alcohol use leading to clinically significant impairment or distress” (1). Preoperative alcohol consumption has been associated with increased postoperative complications, yet alcohol use remains under-recognized and undertreated in surgical care despite the availability of validated screening tools (1). Proposed mechanisms include impaired wound healing and increased susceptibility to infection due to immune dysfunction, as well as altered regulation of stress hormones. As the previous systematic review was published over ten years ago, an updated synthesis was warranted (2). This systematic review and meta-analysis aimed to evaluate the association between excessive preoperative alcohol use/alcohol use disorder and postoperative complications.

METHODS

A protocol was registered with PROSPERO (registration number 420251010380) and PRISMA reporting was followed. Databases were searched from inception via five Databases. Searches were done from inception to March 11, 2025, limited to English-language, humans, and adults. Four independent reviewers working in pairs screened titles/abstracts and full texts in Covidence, with disagreements resolved by a fifth reviewer. Inclusion criteria were: adult (≥18 years) elective or emergency surgery; preoperative alcohol use measured using

diagnostic criteria, validated instruments/screening tools, or self-report; and at least one postoperative outcome within 12 months, in prospective/retrospective cohort or cross-sectional cohort designs. Outcomes included postoperative complications, length of stay, and mortality. Study quality was appraised using the Newcastle-Ottawa Scale and Meta-analysis of Observational Studies in Epidemiology. Random-effects meta-analysis used Risk Ratio for dichotomous outcomes and Mean Difference for continuous outcomes; the meta-analysis required at least three studies per outcome. Heterogeneity was assessed using Cochran's Q and I^2; publication bias and meta-regression were conducted when at least ten studies reported the same outcome.

RESULTS

Comprehensive searching yielded 12,560 citations; 618 full texts were assessed, and 35 studies were included in quantitative analysis (n=18,472,205). The mean age was 62 ± 10 years, and 46% were female. Eleven studies were prospective cohorts, one cross-sectional, and 23 retrospective cohorts. Most studies were non-cardiac (n=27), and eight were cardiac surgeries. Meta-analyses showed higher risk in alcohol use disorder vs non- alcohol use disorder patients for respiratory complications (8 studies; n=436,845; RR 2.59, 95% CI 1.51–4.45; P=0.0005), infections/wound complications (12 studies; n=383,024; RR 1.71, 95% CI 1.37–2.15; P<0.001), longer length of stay (10 studies; n=3,346,845; MD 0.76 days, 95% CI 0.24–1.29; P=0.004), and higher in-hospital mortality (10 studies; n=4,198,798; RR 1.67, 95% CI 1.21–2.29; P=0.002) [Figure 1].

DISCUSSION

Across diverse surgical settings, preoperative alcohol use disorder was associated with worse postoperative outcomes, including higher respiratory complications, higher infections/wound complications, longer length of stay, and increased in-hospital mortality. There is substantial heterogeneity, so precise effect sizes are uncertain, but the direction of effect consistently favoured non- alcohol use disorder patients. High preoperative alcohol exposure may be a modifiable risk factor with implications for adverse outcomes. These findings support targeted preoperative alcohol screening strategies.

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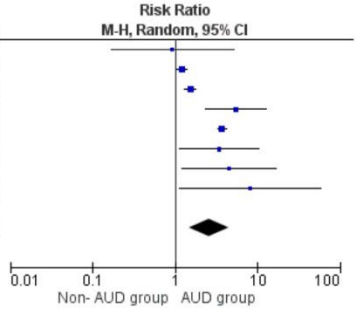
Respiratory complications

Study or Subgroup	AUD group Events	Total	Non-AUD group Events	Total	Weight	Risk Ratio M-H, Random, 95% CI
Azarasa 2009	1	4	91	340	6.5%	0.93 [0.17, 5.15]
Li 2024, TAAD	133	220	320	646	18.7%	1.22 [1.07, 1.39]
Maheshwari 2010	199	2235	629	10830	18.6%	1.53 [1.32, 1.79]
Paull 2004	14	19	5	37	12.8%	5.45 [2.31, 12.86]
Ponce 2014	317	5658	6250	416713	18.7%	3.74 [3.35, 4.17]
Sander 2002	13	25	3	20	10.5%	3.47 [1.14, 10.51]
Sander 2005	4	10	3	34	8.9%	4.53 [1.21, 16.98]
Spies 2004	11	31	1	23	5.4%	8.16 [1.13, 58.80]
Total (95% CI)		**8202**		**428643**	**100.0%**	**2.59 [1.51, 4.45]**
Total events	692		7302			

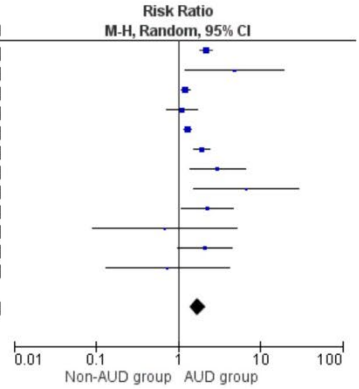
Heterogeneity: Tau² = 0.40; Chi² = 195.73, df = 7 (P < 0.00001); I² = 96%
Test for overall effect: Z = 3.46 (P = 0.0005)



Infections/wound complications

Study or Subgroup	AUD group Events	Total	Non-AUD group Events	Total	Weight	Risk Ratio M-H, Random, 95% CI
deWit 2013	397	12081	179	11960	15.9%	2.20 [1.84, 2.61]
Gold 2020	2	71	65	11312	2.3%	4.90 [1.22, 19.63]
Li 2024, CABG	324	5694	800	17315	16.7%	1.23 [1.09, 1.40]
Li 2024, TAAD	25	220	66	646	10.6%	1.11 [0.72, 1.72]
Maheshwari 2010	319	2235	1193	10830	16.9%	1.30 [1.16, 1.45]
Nath 2010	77	7631	1576	301994	14.9%	1.93 [1.54, 2.43]
Nissila 2024	9	107	18	651	5.7%	3.04 [1.40, 6.59]
Paull 2004	7	19	2	37	2.1%	6.82 [1.57, 29.67]
Sander 2002	17	25	6	20	6.3%	2.27 [1.10, 4.66]
Sander 2005	1	10	5	34	1.2%	0.68 [0.09, 5.17]
Spies 2004	17	31	6	23	5.9%	2.10 [0.98, 4.49]
Stearns 2009	2	37	3	41	1.5%	0.74 [0.13, 4.18]
Total (95% CI)		**28161**		**354863**	**100.0%**	**1.71 [1.37, 2.15]**
Total events	1197		3919			

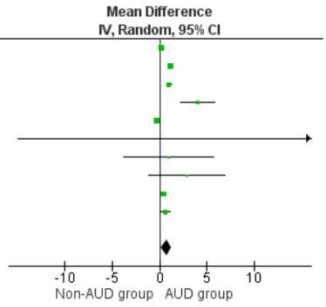
Heterogeneity: Tau² = 0.07; Chi² = 53.63, df = 11 (P < 0.00001); I² = 79%
Test for overall effect: Z = 4.69 (P < 0.00001)



Length of hospital stay

Study or Subgroup	AUD Group Mean	SD	Total	Non-AUD group Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI
deWit 2013	3.2	0.074	12081	3	0.074	11960	15.8%	0.20 [0.20, 0.20]
Han 2021	4.2	0.21	35837	3.05	0.74	3096355	15.8%	1.15 [1.15, 1.15]
Li 2024, CABG	11	8	5694	10	7	17315	15.3%	1.00 [0.77, 1.23]
Li 2024, TAAD	16	12	220	12	11	646	5.5%	4.00 [2.20, 5.80]
Nissila 2024	1.02	0.23	107	1.26	0.74	651	15.8%	-0.24 [-0.31, -0.17]
Sander 2002	39.3	84.1	25	17.3	38.3	20	0.0%	22.00 [-14.99, 58.99]
Sander 2005	10	6.9	10	9	6.2	34	1.1%	1.00 [-3.76, 5.76]
Schoenfeld 2010	16.7	6.8	12	13.8	2.07	13	1.5%	2.90 [-1.11, 6.91]
Stombaugh 2024	2.8	1.72	280	2.34	2.15	1058	15.3%	0.46 [0.22, 0.70]
White 2023	2.4	5.9	501	1.8	2	164026	13.7%	0.60 [0.08, 1.12]
Total (95% CI)			**54767**			**3292078**	**100.0%**	**0.76 [0.24, 1.29]**

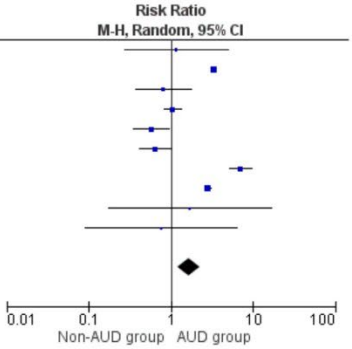
Heterogeneity: Tau² = 0.45; Chi² = 389776.02, df = 9 (P < 0.00001); I² = 100%
Test for overall effect: Z = 2.86 (P = 0.004)



In-hospital mortality

Study or Subgroup	AUD group Events	Total	Non-AUD group Events	Total	Weight	Risk Ratio M-H, Random, 95% CI
Azarasa 2009	2	45	13	340	3.7%	1.16 [0.27, 4.98]
Han 2021	11826	35837	309636	3096355	16.1%	3.30 [3.25, 3.35]
Klasen 2004	12	923	14	875	8.3%	0.81 [0.38, 1.75]
Li 2024, CABG	93	5694	269	17315	14.8%	1.05 [0.83, 1.33]
Li 2024, TAAD	17	220	86	646	11.5%	0.58 [0.35, 0.95]
Maheshwari 2010	22	2235	164	10830	12.3%	0.65 [0.42, 1.01]
Ponce 2014	40	5658	417	416713	13.8%	7.06 [5.11, 9.76]
Rolfzen 2022	639	17308	7687	586422	15.9%	2.82 [2.60, 3.05]
Sander 2005	1	10	2	34	1.7%	1.70 [0.17, 16.86]
Stombaugh 2024	1	280	5	1058	1.9%	0.76 [0.09, 6.44]
Total (95% CI)		**68210**		**4130588**	**100.0%**	**1.67 [1.21, 2.29]**
Total events	12653		318293			

Heterogeneity: Tau² = 0.16; Chi² = 247.42, df = 9 (P < 0.00001); I² = 96%
Test for overall effect: Z = 3.16 (P = 0.002)



AUD: Alcohol use disorder

Figure 1

Anesthesia and psychedelics: a narrative review on perioperative management of anesthetic patients receiving psychedelic-assisted therapy

Submission ID

33

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INTRODUCTION

Psychedelic-assisted therapies are re-emerging as treatments for major depressive disorder, post-traumatic stress disorder, anxiety disorders, substance use disorders, and end-of-life distress.[1 3] Agents such as psilocybin, lysergic acid diethylamide (LSD), 3,4-methylenedioxymethamphetamine (MDMA), ayahuasca (monoamine oxidase inhibitors), mescaline, and ketamine are increasingly encountered in both clinical and community settings.[1 4 5] As the use of these substances expands, anesthesiologists are more frequently caring for patients who may be acutely intoxicated, have recently completed psychedelic-assisted therapy, or engage in chronic or microdosing practices.[1] These substances exert complex serotonergic, glutamatergic, and sympathomimetic effects that may influence anesthetic requirements, hemodynamic stability, perioperative drug interactions, and postoperative psychological outcomes.[1 5] Despite increasing perioperative relevance, practical guidance for anesthesiologists remains limited and unclear. This narrative review synthesizes current evidence to highlight key perioperative considerations for anesthesiologists caring for patients with recent or ongoing psychedelic exposure.

METHODS

A structured narrative review was conducted to synthesize clinically relevant evidence on psychedelic pharmacology and perioperative implications. Literature was identified using PubMed/MEDLINE databases from January 2000 to December 2025, limited to English-language human studies. Search terms combined anesthesia and perioperative care concepts with psychedelic agents (psilocybin, lysergic acid diethylamide [LSD], 3,4-methylenedioxymethamphetamine [MDMA], ayahuasca, mescaline, ketamine), microdosing, psychedelic-assisted therapy, and perioperative safety outcomes. Given the heterogeneity of literature spanning anesthesiology, psychiatry, psychopharmacology, and toxicology, a narrative rather than systematic approach was employed. Representative

sources emphasizing mechanistic insight, perioperative relevance, safety considerations, and clinical applicability were selected for inclusion. Approximately 75 articles informed the final synthesis, focusing on pharmacologic mechanisms, physiologic and psychological effects relevant to anesthesia, drug–drug interactions, and perioperative management considerations across preoperative, intraoperative, and postoperative phases of care.

RESULTS

Key perioperative considerations across psychedelic classes included altered autonomic tone, variable anesthetic requirements, and clinically significant drug–drug interactions.[1] Serotonergic psychedelics and MDMA were associated with increased risk of serotonin syndrome when combined with serotonergic opioids or antidepressants, while ayahuasca-associated monoamine oxidase inhibitors posed risks of exaggerated sympathomimetic responses and adverse anesthetic interactions.[1] Ketamine occupies a unique position as both an anesthetic agent and a psychedelic-assisted therapy intervention,[4 5] with dissociative and glutamatergic effects that may influence anesthetic depth, hemodynamic stability, and emergence phenomena.[4] Evidence guiding perioperative washout period guidance was limited, and no validated perioperative guidelines were properly identified. Psychological sequelae such as anxiety, dissociation, and emergence agitation may persist beyond acute intoxication and impact postoperative recovery and patient experience.[1 4]

DISCUSSION

Psychedelic use is increasingly relevant to contemporary anesthesia practice, yet formal perioperative guidance and formal guidelines for anesthesiologists is lacking.[1] This narrative review highlights pharmacologic, physiologic, and psychological considerations that anesthesiologists may encounter when caring for patients receiving psychedelic-assisted therapies. Awareness of recent psychedelic exposure, careful medication selection, and attention to perioperative psychological support should be considered. Further interdisciplinary studies are still needed to inform anesthetic safety and guide the development of evidence-based perioperative frameworks.

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Application of large language models for American Society of Anesthesiologists physical status classification: a systematic review

Submission ID

62

AUTHORS

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INTRODUCTION

The American Society of Anesthesiologists Physical Status (ASA-PS) classification system is a six-point ordinal scale (I-VI) used worldwide for preoperative risk stratification, perioperative triage, and standardized clinical communication. Despite its widespread adoption, ASA-PS assignment demonstrates only fair to moderate interrater reliability,1 largely due to subjective definitions and challenges in applying the system to complex patients. Manual chart review required to formulate ASA-PS scores may further introduce inefficiencies, bias, and variability. Prior studies have demonstrated that machine learning (ML) and natural language processing (NLP) models can predict ASA-PS scores with good accuracy using structured data and preanesthetic notes. 2,3 However, these domain-specific approaches differ from foundation-scale large language models (LLMs) that enable broader contextual understanding and generative reasoning. Importantly, their reliability, sensitivity to input structure, and clinical utility for ASA-PS classification remain unclear. This review synthesizes current evidence on the use of LLMs for ASA-PS prediction.

METHODS

Given heterogeneity in model architectures, data sources, and outcome measures, we conducted a systematic review with narrative synthesis. We searched Ovid MEDLINE, PubMed, Embase, and Scopus from inception to January 12, 2026, for studies evaluating LLMs for predicting ASA-PS using structured or unstructured clinical data. Search terms combined keywords relating to ASA-PS with LLM terminology. NLP terminology was also included to capture early and overlapping usage. MeSH terms and keywords were used to maximize sensitivity. Eligible studies employed a foundation-scale LLM (e.g., GPT-4, Gemini, Claude, LLaMA) to predict ASA-PS, used anesthesiologist-assigned ASA-PS as the reference standard, and reported quantitative performance metrics (e.g., accuracy, AUROC, F1-score, or kappa statistics). Studies using only traditional ML or task-specific NLP models were

excluded. Title/abstract screening, full-text review, and data extraction were conducted independently by two reviewers. Extracted data included study design, model type, data modality, sample size, reference standard, evaluation methods, and performance outcomes, which were synthesized to assess performance trends, methodological limitations, and evidence gaps.

RESULTS

The search identified 35 unique studies, of which nine met inclusion criteria and evaluated LLMs for ASA-PS classification against anesthesiologist reference standards. Most studies (8/9) assessed OpenAI models (GPT-3.5/4 or o-series). Some studies (3/9) included evaluations of other LLMs (e.g. DeepSeek-R1, LLaMA). Input data varied across free-text clinical notes, standardized data forms, and hypothetical patient scenarios. Across studies, LLMs demonstrated performance comparable to anesthesiologists, particularly on hypothetical or structured inputs, but were sensitive to prompt design, with some models exhibiting clinically relevant hallucinations. Studies using free-text clinical notes reported modest absolute performance, though LLMs performed similarly to human raters when benchmarked against known interrater variability. Incorporation of structured prompting strategies or external domain knowledge (such as RAG) substantially improved performance.

DISCUSSION

This review highlights both the promise of LLMs for ASA-PS classification and limitations related to input structure, prompting, and clinical reliability. LLMs demonstrate performance comparable to anesthesiologists. However, agreement-based metrics reflect consistency rather than objective correctness, potentially positioning LLMs as tools for systematic application of an inherently subjective classification. Input structure and prompt engineering strongly influence performance, highlighting sensitivity to noise and variability in clinical records. Heterogeneity in reference standards and performance metrics limits cross-study comparability. Finally, LLMs do not consistently outperform NLP and traditional ML methods,[4,5] questioning their utility given increased complexity and computational cost.

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Association between wildfire smoke exposure and emergency room visit, readmission, and death after major inpatient surgeries: a retrospective two-centre population cohort study

Submission ID

214

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INTRODUCTION

Wildfires are becoming more frequent and severe. There has been no research on the impact of wildfire smoke on adult postoperative outcomes to guide planning for acute care delivery (1). The primary objective of this study was to investigate the association between wildfire smoke exposure 30 days preoperatively and a primary outcome of postoperative primary acute hospital care utilization (composite of emergency room [ER] visit, readmission, and/or in-hospital death) within 30 days after surgery.

METHODS

After institutional research ethics board approval, we performed a retrospective cohort study involving two hospitals. We linked data from the hospital electronic health records with environmental datasets (Canadian Optimized Statistical Smoke Exposure Model and National Aeronautics and Space Administration Modern-Era Retrospective analysis for Research and Applications Version two) and the Canadian Index of Multiple Deprivation (CIMD). We included all patients ^{3}19 years with surgery dates within July to October 2020, July to October 2021, and July to October 2022. We excluded patients with American Society of Anesthesiologists Physical Status (ASA PS) V and VI and minor procedures. The primary analysis included patients not admitted before surgery. The exposure to wildfire smoke within 30 days before surgery was quantified using cumulative daily PM2.5 based on postal

code. Cox proportional hazards (CPH) and logistic regression models were performed adjusting for age, gender, surgery type, emergency surgery, ASA PS, CIMD (economic dependency, residential instability, situational vulnerability, and ethno-cultural composition), heat wave (three consecutive days above 98th percentile), heart disease, and lung disease. Sensitivity analysis included subgroup analyses and alternative definitions of PM2.5. Missing data were handled by multiple imputation. Models were validated with 2000 bootstrap samples.

RESULTS

This study included 12,865 patients (mean [SD] age 55 (17), and 53.7% female), with 11,221 patients who were not admitted before day of surgery (primary analysis). The rates of the primary outcome was 12.1% (*n* = 1560) in the overall cohort, and 10.4% (*n* = 1170) amongst patients not admitted preoperatively. The CPH models did not meet the proportional hazard assumptions due to covariates of surgery type, ASA, emergency, and lung disease. Adjusted logistic regression models found no association between cumulative PM2.5 30 days before surgery and the primary outcome, with odds ratio (OR) 95% confidence interval (95% CI) of 0.990 (0.990 to 1.000), p = 0.117. The exposure to any PM2.5 > 15 μg/m^3 or wildfire specific PM2.5 > 15 μg/m^3 were not associated with the primary outcome (adjusted OR [95% CI] 1.05 [0.917 to 1.190] and 1.02 [0.89 to 1.15]). Sensitivity and subgroup analyses did not show associations.

DISCUSSION

There were no association amongst PM2.5 within 30 days before surgery and a composite of composite of 30-day ER visit, readmission, and/or in-hospital death. Limitations include discordance between environmental and exposed temperature due to behavioral modifications, limited sociodemographic data on a patient level, and measurement errors in clinical variables. Further research is needed to delineate the duration, severity, and timing of exposure that confers increased postoperative risk, impact on other outcomes, and at-risk groups.

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Comparison of intraoperative electroencephalographic measures of anesthetic sensitivity for predicting postoperative delirium in elderly surgical patients

Submission ID

232

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INTRODUCTION

Heightened sensitivity to anesthetics has been proposed as a marker of brain vulnerability associated with postoperative delirium (POD). Several intraoperative electroencephalographic (EEG) definitions have emerged: EEG suppression at lower volatile anesthetic concentrations using mixed-effects modeling[1], the Duke Anesthesia Resistance Scale (DARS) based on processed EEG[2] and intraoperative anesthetic dose-adjusted EEG alpha power[4]. However, these methods have not been directly compared. Furthermore, we previously showed that post-induction burst-suppression (BS) following standardized propofol induction identifies vulnerable patients with distinct preoperative EEG signatures. The relationship between this phenotype and other intraoperative sensitivity measures remains unknown. We aimed to compare four intraoperative anesthetic sensitivity definitions and evaluate their associations with POD in elderly surgical patients.

METHODS

This secondary analysis included 240 patients aged 70 years or older from an ongoing randomized trial (POEGEA study) undergoing major non-cardiac surgery. We calculated four anesthetic sensitivity measures: post-induction BS following standardized propofol induction (1-1.5 mg/kg); Fritz sensitivity defined as random intercept above population median from a mixed-effects logistic model predicting EEG suppression at each end-tidal volatile anesthetic concentration; low DARS defined as mean bispectral index divided by (2.5 minus age-adjusted minimum alveolar concentration) below 28.755; and low dose-adjusted

frontal alpha power. The optimal cutoff for dose-adjusted alpha power was determined using Youden's index with bootstrap resampling for confidence intervals. POD was assessed using the Confusion Assessment Method on postoperative days 1, 2, and 7. We compared delirium rates across sensitivity definitions using Fisher exact tests, calculated odds ratios with 95% confidence intervals, and evaluated diagnostic performance (sensitivity, specificity). Agreement between measures was assessed using Cohen's kappa coefficient.

RESULTS

POD occurred in 14 patients (5.8%). The prevalence of heightened sensitivity varied by definition: post-induction BS 19%, high Fritz sensitivity 50%, low DARS 31%, and low dose-adjusted alpha (optimal cutoff 3.5 dB) 28%. Fritz sensitivity showed the strongest association with POD (OR 14.5, 95% CI 2.8-266, p=0.01; POD rate 11.2% vs 0.9%), followed by intraoperative low dose-adjusted alpha power (OR 7.3, 95% CI 2.4-27.6, p=0.001) and post-induction BS (OR 6.5, 95% CI 2.2-20.9, p=0.001). Low DARS was not significantly associated with POD (OR 2.0, 95% CI 0.6-6.3 p=0.22). Fritz sensitivity captured 93% of delirium cases compared to 71% for low alpha, 57% for BS, and 43% for DARS. Agreement was moderate between Fritz sensitivity and dose-adjusted alpha power (kappa=0.42), but poor between DARS and other measures (kappa<0.20). Notably, 92% of patients with post-induction BS also demonstrated high Fritz sensitivity.

DISCUSSION

Intraoperative anesthetic sensitivity measures identify overlapping but not identical patient populations at risk for POD. Fritz sensitivity and dose-adjusted alpha power showed the strongest associations with delirium, while DARS did not predict POD in this non-cardiac surgical cohort. The high concordance between post-induction BS and Fritz sensitivity validates that both methods capture similar vulnerable phenotypes. These findings suggest that EEG-derived measures of anesthetic sensitivity may be more clinically relevant than processed EEG indices. Prospective validation is warranted.

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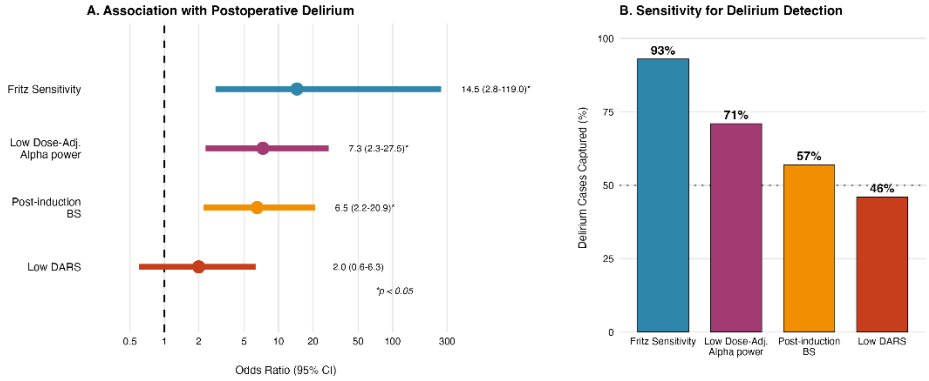
A. Association with Postoperative Delirium
Fritz Sensitivity
Low Dose-Adj. Alpha power
Post-Induction BS
Low DARS
14.5 (2.8-119.0)*
7.3 (2.3-27.5)*
6.5 (2.2-20.9)*
2.0 (0.6-6.3)
*p < 0.05
0.5
1
2
5
10
20
50
100
300
Odds Ratio (95% CI)
B. Sensitivity for Delirium Detection
Delirium Cases Captured (%)
100
75
50
25
0
93%
71%
57%
46%
Fritz Sensitivity
Low Dose-Adj. Alpha power
Post-induction BS
Low DARS

Figure 1

Completion pneumonectomy for cavitary mycobacterial–aspergillus coinfection: anesthetic management and radiologic–pathologic correlation

Submission ID

23

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INTRODUCTION

Chronic pulmonary aspergillosis (CPA) arises in the setting of pre-existing structural lung disease and may progress despite prolonged antifungal therapy. When compounded by mycobacterial coinfection, patients can develop multiloculated cavitary disease, dense pleural adhesions, and progressive lung destruction. When medical therapy fails, surgical resection, although high risk, remains a potentially curative option. Completion pneumonectomy in this context poses significant anesthetic, surgical, and perioperative challenges.

CASE PRESENTATION

We describe a 62-year-old woman with advanced left-sided bronchiectasis complicated by mycobacterial–Aspergillus coinfection who underwent complete left pneumonectomy. Preoperative evaluation incorporated multidisciplinary optimization and functional assessment, demonstrating preserved predicted postoperative pulmonary function (ppoFEV1 91% and ppoDLCO 76%) despite reduced exercise capacity. Computed tomography revealed a destroyed left hemithorax with multiloculated cavitary disease containing dense fungal material, with smaller contralateral cavities suggesting intermittent contamination.(Fig.1)

A thoracic epidural was placed preoperatively. Given the risk of rupturing thin-walled fungal cavities and contaminating the contralateral lung, anesthetic induction was performed using a modified rapid-sequence technique without mask ventilation. Lung isolation was achieved using a left-sided double-lumen tube, confirmed bronchoscopically prior to initiating ventilation. Lung-protective one-lung ventilation was employed using low tidal volumes, controlled plateau pressures, and avoidance of aggressive recruitment or suctioning. Restrictive goal-directed fluid therapy, vasopressor support, and multimodal analgesia were

used to maintain hemodynamic stability during a prolonged resection complicated by significant blood loss. The patient remained physiologically stable and was extubated awake at the conclusion of surgery.

Gross and histopathologic examination demonstrated a thick-walled cavitary lung containing an organized *Aspergillus fumigatus* fungal ball within necrotic lung parenchyma, closely correlating with preoperative imaging findings. (Fig.1)

This case highlights key anesthetic principles for pneumonectomy in infectious cavitary lung disease, including avoidance of positive-pressure ventilation prior to lung isolation, lung-protective ventilation strategies, and careful fluid and hemodynamic management to protect the remaining lung. Integrated radiologic–pathologic correlation provides substantial medical education value by bridging radiologic, surgical, and anesthetic perspectives in managing complex, destructive infectious lung pathology.

CONCLUSION

This case illustrates best-practice strategies for managing complex pneumonectomy in the setting of infectious lung destruction, underscoring the importance of meticulous anesthetic planning and multidisciplinary collaboration. Integrated radiologic–pathologic correlation enhances thoracic anesthesia and surgical education while supporting evidence-informed perioperative practice.

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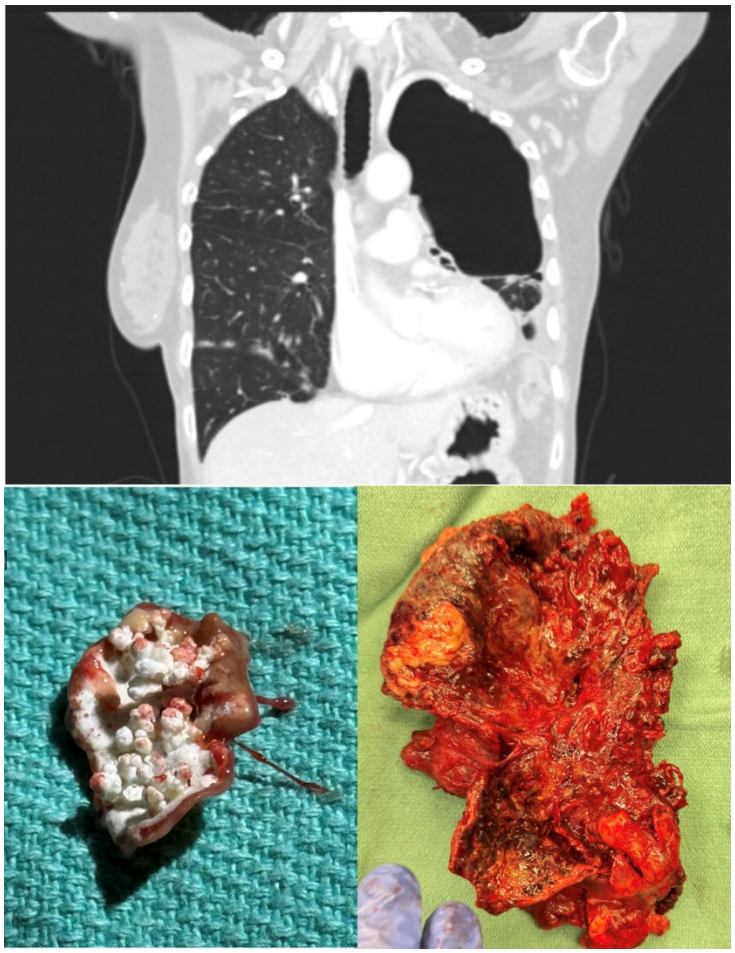

Figure 1

Dobutamine and goal-directed fluid therapy improves tissue oxygenation in deep inferior epigastric perforator flap breast reconstruction surgery: a randomized controlled trial

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91

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INTRODUCTION

Deep inferior epigastric perforator (DIEP) flap breast reconstruction is the gold standard for autologous breast reconstruction.[1] However, given the need for microvascular anastomosis, the blood supply is often interrupted for 60-90 minutes during the primary ischemic phase. The severity of flap ischemia may be further exacerbated in the setting of low intraoperative cardiac output (CO) and/or hypovolemia. Reduced flap tissue oxygen saturation (StO_2) is associated with postoperative complications including flap necrosis, flap loss, and infection.[2,3] Fluid administration during DIEP reconstruction is largely guided by subjective parameters (i.e., blood pressure, heart rate, urine output). Additionally, although vasopressors have traditionally been considered harmful to flap perfusion, dobutamine may be advantageous by improving CO through enhanced cardiac contractility while promoting peripheral (thus, flap/graft) vasodilation.[4] Our primary objective was to evaluate the effect of CO-guided intravenous fluid administration combined with low-dose dobutamine on breast StO_2. Secondarily, we examined the association with postoperative complications.

METHODS

This single-center parallel-design blinded randomized controlled trial was conducted at a tertiary academic hospital following ethics board approval, Health Canada authorization for off-label dobutamine use, and clinical trial registration. Patients 18-80 years old, ASA

physical status I-III, undergoing unilateral or bilateral DIEP reconstruction were eligible. Enrolled patients provided written informed consent and were randomized using computer-generated block assignment with concealed allocation. Surgeons and assessors were blinded to CO monitors and all team members (including anesthesiologists) were blinded to StO_2 measurements.

Upon anesthesia induction, patients in the intervention group received CO-guided crystalloid boluses until they were deemed no longer fluid responsive, at which point a low dose dobutamine infusion was initiated and maintained until 4 hours postoperatively. Conversely, patients in the control group did not receive dobutamine infusion and their fluid therapy was guided by conventional clinical parameters. Otherwise, intraoperative management was identical between groups.

Breast flap StO_2 was measured using near-infrared spectroscopy (NIRS) 45 minutes after arterial clamp removal at the flap zone furthest from perforator vessels (primary outcome). Demographics, surgical characteristics, adverse effects, postoperative complications, and patient satisfaction were also recorded.

RESULTS

Forty patients were randomized to intervention (n=20) or standard care (n=20) with no patients lost to follow-up.

Significant differences were observed in flap StO_2 prior to venous clamp removal (median [IQR]: 78% [70-82] vs. 70% [62-76], P=0.026) and 45 minutes following anastomosis and arterial clamp removal (82% [78-88] vs. 76% [67-79], P=0.003), with both higher in the intervention/dobutamine group. The reduction in StO_2 from baseline to the timepoint prior to venous clamp removal was significant greater in the control group compared to the intervention group (mean decrease of 9.9 ± 5.6 for the control group vs. 5.7 ± 3.4 for the intervention group [p=0.013]).

The dobutamine infusion was reduced and/or discontinued due to tachycardia in one patient (5%) intraoperatively and six patients (30%) postoperatively. There were no differences between groups in perioperative fluids or vasopressors, postoperative infections, hematomas, necrosis, patient satisfaction, or length of hospital stay.

DISCUSSION

To our knowledge, this is the first study examining the impact of goal-directed intraoperative fluid administration and low-dose dobutamine on breast StO_2 during DIEP flap breast reconstruction. While the intervention improved breast StO_2, no significant difference was observed in postoperative complications. Although the current study was not powered to detect low frequency adverse events and was complicated by the fact that the flap/tissue of

interest became covered as part of the reconstruction in some patients, our results suggest the need for a large, multicenter trial to verify these findings and further examine the impact of this intervention on postoperative complications.

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Early postoperative bleeding and hospital utilization following adenotonsillectomy with and without myringotomy in children

Submission ID

120

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INTRODUCTION

Adenotonsillectomy/tonsillectomy (AT/T) is a common pediatric surgery, most often performed for obstructive sleep-disordered breathing/obstructive sleep-apnea (OSA), recurrent infections or both.[1] Concurrent myringotomy and tube (MT) placement is frequently performed for recurrent otitis media (OM), often related to adenoidal hypertrophy and associated with OSA, potentially increasing perioperative risk. Elective AT/T is a leading driver of post-discharge healthcare utilization, most notably post-discharge emergency department (ED) visits and hospital readmissions. A provincial health administrative data (HAD) analysis from 2002-13 showed 12.4% of children presented within 30 days with postoperative complications; most commonly pain, airway infection, dehydration, and bleeding,[2] with AT/T having the highest urgent readmission rate among common pediatric ambulatory surgeries (2.7% vs 1.5%).Given recent advances in pediatric tonsillectomy-related guidelines,[3,4,5] we used updated provincial HAD to describe hospital visits within 15 and 30 days following AT/T with/without MT. We hypothesized that concurrent MT would be associated with higher post-operative hospital utilization.

METHODS

After research ethics board approval, we conducted a retrospective, population-level cohort analysis of HAD via consolidation and integration of routinely collected provincial data which includes information related to hospital admissions, ED visits, physician billing claims, prescription medications, and population demographics. The cohort included publicly

funded health insurance eligible pediatric patients >1 month to <18 years undergoing their first AT/T with or without MT (primary exposure) and discharged directly home in fiscal years 2005 to 2022. The primary outcomes were reported frequency of death and risk of all-cause emergency department visits and hospital readmission and the commonly associated diagnoses for presentation (pain, dehydration, respiratory symptoms, and bleeding) within 15 days of the index surgery. Secondary outcomes were identical to those described above but allocated to a 16–30-day time interval after surgery. Postoperative bleeding was classified as Class II (seen in ED with/without hospital admission for observation) and Class III (underwent surgery). Data was described as a frequency, mean (SD), median (IQR) or proportion. Categorical and continuous variables were compared using chi-square tests and one-way analysis of variance, respectively. A p value <0.05 achieved statistical significance. A convenience sample-size was utilized.

RESULTS

Among 248,406 children, cohorts were divided between AT/T with (n=123,739) and without MT (n=124,667). Children with MT were younger (mean [SD] 3.63 [2.77] vs 7.57 [4.28] years), more often male (61.3% vs 49.2%), and more frequently ASA I–II (92.5% vs 84.1%). Socioeconomic quintiles and rural residence were similar. Most cases were same-day surgery (85.1%), with a one-day median length-of-stay. Surgical indications were airway obstruction, recurrent infections or OM. Overall 30-day ED visits and readmissions were 11.9% and 2.3%. Within 15 days after surgery, MT was associated with fewer ED visits (6.1% vs 13.4%) and readmissions (0.8% vs 3.1%), but higher ED visits (3.0% vs 1.4%) and readmissions (0.4% vs 0.2%) (all p<0.0001, Table-1) within 16-30 days after surgery. Bleeding events were less common with MT (p<0.02). Early revisits reflected pain, infection and bleeding while later visits were for respiratory complications and fever. Mortality was rare (N=7), all early postoperatively.

DISCUSSION

This large Canadian pediatric AT/T cohort, spanning nearly two decades, shows that although post-discharge ED visits and readmissions following AT/T have declined modestly after implementation of guideline-informed strategies (in 2014-2019), diagnoses related to pain, respiratory infection and bleeding persist. Unexpectedly, concurrent MTs were associated with lower early revisit rates but higher later hospital revisits, predominantly due to fever and respiratory-related complications, compared with AT/T alone. Future health administrative data analyses should examine how hospital-, provider- (surgeon and anesthesiologist), and patient-level factors contribute to variability in post-discharge hospital revisits to inform targeted care strategies.

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Table 1. Reported reasons for hospital visits and deaths within 15 and 16-30 days following adenotonsillectomy with/without myringotomy, years 2005 to 2022 (N=248,406)

Outcome	Adenotonsillectomy with Myringotomy and Tubes N (%) (n=123, 739)		Adenotonsillectomy without Myringotomy and Tubes N (%) (n=124, 667)	
	Within 15 days of surgery	Within 16-30 days of surgery	Within 15 days of surgery	Within 16-30 days of surgery
All cause ED visit	7,526 (6.1)	3,709 (3.0)	16,748 (13.4)*	1,688 (1.4)*
All cause readmission	1,051 (0.8)	456 (0.4)	3,888 (3.1)*	205 (0.2)*
Any death	†1-5	0 (0.0)	†1-5	0 (0.0)
£Any class II bleed; Blood transfusion	1,448 (1.2) †1-5	64 (0.1) †1-5	7,925 (6.4)** 61-65 (0.0)*	95 (0.1)** †1-5
£Any class III bleed; Blood transfusion	119 (0.1) 0 (0.0)	†1-5 0 (0.0)	1,158 (0.9)** 27 (0.0)*	†13-17** 0 (0.0)
§Pain	967 (0.8)	135 (0.1)	3,862 (3.1) *	86 (0.1)*
Respiratory Infection ŦUpper airway Lower airway	2,036 (1.6) 957 (0.8)	1,578 (1.3) 812 (0.7)	2,371 (1.9)* 561 (0.4)*	461 (0.4)* 253 (0.2)*
Volume depletion	512 (0.4)	80 (0.1)	1,775 (1.4)*	36 (0.0)*
Nausea +/- vomiting	337 (0.3)	104 (0.1)	1,373 (1.1)*	53 (0.0)*
Fever	810 (0.7)	309 (0.2)	959 (0.8)*	103 (0.1)*
Abnormal Breathing	252 (0.2)	197 (0.2)	245 (0.2)	77 (0.1)*
Persisting Airway Obstruction	51 (0.0)	8 (0.0)	386 (0.3)*	10 (0.0)
Asthma	174 (0.1)	198 (0.2)	116 (0.1)*	99 (0.1)*
Change in LOC	†1-5	†1-5	†4-8	0 (0.0)
‡Follow-up care	219 (0.2)	33 (0.0)	620 (0.5)*	26 (0.0)
^Other complications	1,443 (1.2)	48 (0.0)	7,904 (6.3)*	66 (0.1)
Medication related complications	217 (0.2)	110 (0.1)	706 (0.6)*	38 (0.0)*

*P-value < 0.0001 or **P-value < 0.02 when comparing AT/T-with MT to AT/T-without MT 15 and 16-30-day outcomes; 7 deaths in total were reported; †Small cell sizes (<6 patients) are suppressed; §Pain includes otalgia; ‡Follow-up care includes examination after treatment and specifically related to surgery; ŦUpper airway infection includes croup/epiglottitis, tonsillitis, pharyngitis, and unspecified upper respiratory infection; £Class II bleed is defined as going to the ED with or without admission to hospital while class III bleed underwent surgery; ^Other complications include those related to procedure, surgical and medical care.
Note: ED=emergency department; LOC=level of consciousness; Colored rectangles correspond to rank order of indications: Red=1st, Yellow=2nd and Green =3rd.

Effectiveness of preoperative management of alcohol use disorders in surgical patients: a systematic review and meta-analysis

Submission ID

92

AUTHORS

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INTRODUCTION

Approximately 7% of the world's population aged 15 years and older lives with alcohol use disorder (AUD) [1]. Preoperative alcohol consumption is a known risk factor for postoperative complications including infection, bleeding, and increased morbidity and mortality [2]. These complications are driven in part by pathophysiological changes caused by excessive alcohol consumption, including alterations in immune function, coagulation, cardiovascular physiology, and stress responses [3,4]. AUD represents a modifiable risk factor in surgical patients. To date, the effectiveness of preoperative AUD management on postoperative outcomes remains uncertain. Existing interventions vary widely in timing, intensity, duration, and delivery, and their implementation across surgical settings is inconsistent. Prior reviews have been limited by heterogeneous populations, narrow surgical focus, and limited evaluation of postoperative outcomes. This systematic review and meta-analysis evaluates the effectiveness of preoperative interventions targeting AUD in adult surgical patients, with an emphasis on postoperative clinical outcomes and alcohol-related measures.

METHODS

A pre-specified protocol was registered with PROSPERO (CRD# 420251032169), following PRISMA reporting guidelines. We systematically searched MEDLINE (including ePubs/In-Process), Embase Classic+Embase, and Cochrane databases, from inception to 22 February 2025. Case reports, reviews, and non-English articles were excluded. Four reviewers independently screened titles/abstracts and full texts, resolving disagreements with a fifth reviewer. Inclusion criteria were: adults (≥18 years); undergoing elective or emergency

surgery; intervention targeting excessive alcohol consumption in the preoperative period; at least one postoperative outcome; randomized controlled trials (RCTs) or observational cohort designs. Outcomes included postoperative complications (length of stay, readmissions, intensive care unit admissions, alcohol recidivism, postoperative alcohol consumption), and mortality and survival. Study quality was appraised using the Risk of Bias In Non-Randomized Studies – of Interventions (ROBINS-I) tool, and the Risk of Bias-1 tool for RCTs. We applied GRADE to evaluate overall evidence certainty. Random-effects meta-analyses in R generated pooled risk ratios or standardized mean differences with 95% confidence intervals (CI), with heterogeneity quantified by Cochran's Q and I^2 statistic.

RESULTS

Comprehensive searching identified 7,502 articles, from which 88 full texts were assessed. Twenty-one studies were included for qualitative analysis (n=2,602) and 12 studies for quantitative analysis (n=1,363). The mean age was 52.3 $\pm$ 5.2 years and 24.4% were female. Included studies comprised of seven RCTs, one non-randomized trial, 12 observational cohort studies, and one qualitative study. Eighteen studies used non-pharmacological interventions, one utilized pharmacological monotherapy, and two provided combined interventions. Meta-analysis demonstrated that at 1-year and greater than 5-year follow-ups, the intervention groups had a significant reduction in participants who relapsed to alcohol drinking (1-year follow-up: RR 0.59, 95% CI: 0.37-0.95; 5-year follow-up: RR 0.53, 95% CI: 0.33-0.85) [Figure 1]. No significant pooled effects were found for composite postoperative complications, length of hospital stay, or mortality. Overall evidence quality was very low; heterogeneity ranged from low to very low.

DISCUSSION

Preoperative interventions targeting AUD were associated with significant reductions in alcohol relapse at 1-year and 5-year follow-up but did not demonstrate consistent improvements in other postoperative outcomes. Reductions in relapse were driven largely by studies in liver transplant populations, where abstinence is closely monitored. Evidence from non-liver transplant surgeries was limited and underpowered, restricting conclusions regarding perioperative morbidity, mortality, and length of stay. Interventions initiated close to surgery may not allow sufficient time for physiological recovery from alcohol-related harm. These findings highlight important evidence gaps and the need for adequately powered trials of standardized preoperative AUD interventions across surgical populations.

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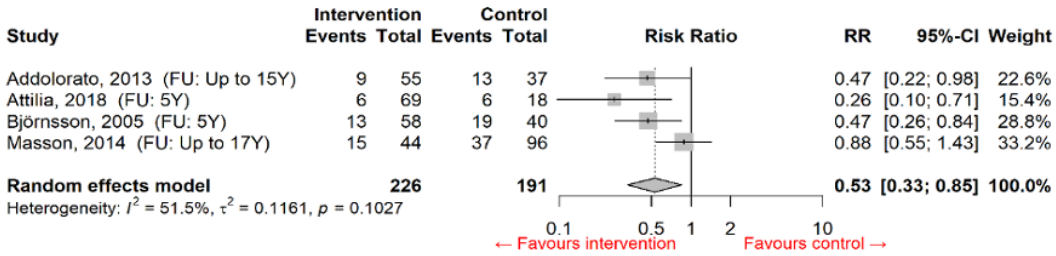
Alcohol recidivism at >5-year follow-up



Alcohol recidivism at 1-year follow-up

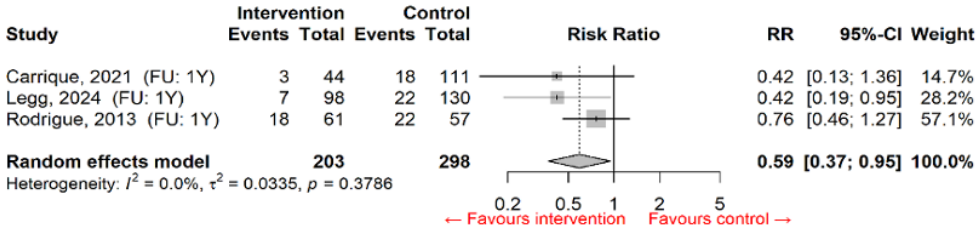


Figure 1

Effects of inhaled anesthetic in patients undergoing kidney transplantation

Submission ID

69

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INTRODUCTION

Renal transplantation is the optimal treatment for patients with end-stage renal disease. Delayed graft function, primarily caused by ischemia–reperfusion injury (IRI), is a common complication after kidney transplantation and is associated with prolonged hospitalization, acute rejection, and increased mortality. Experimental and clinical evidence suggests that inhaled anesthetics may attenuate IRI and improve transplant outcomes. We therefore conducted a systematic review to summarize clinical studies evaluating the impact of inhaled anesthetic administration during kidney transplantation on recipient outcomes.

METHODS

We conducted a comprehensive search strategy through major database (MEDLINE, EMBASE, SCOPUS, Cochrane library) from inception to April 12, 2025 (conference proceeding, trial registries, references of included studies) was also realized. We included randomized clinical trials and observational studies involving the administration of inhaled anesthetics to either intravenous anesthetics, another inhaled anesthetic or regional anesthesia in patient undergoing kidney transplantation.

Reviewers independently screened and selected studies, extracted data, and assessed the risk of bias. In case of disagreement, a third party took the decision. Our outcomes of interest were early graft function in recipient as defined by the authors, delayed graft function, graft loss, mortality and adverse effects. Where possible, we pooled results of studies using a random effect model. The risk of bias of the included studies were assessed using ROBINS-1 and the Cochrane ROB 2.0 tools. We used The GRADE approach to summarize the quality of evidence for each outcome.

RESULTS

Our search strategy identified 555 citations, 83 full-text articles were assessed for eligibility, and 10 met our eligibility criteria comprising 7 RCTs and 3 observational studies. Most

studies evaluated the effect of sevoflurane on surgical outcomes compared to total intravenous anesthesia (TIVA) or another anesthetic gas. When reported the range of time for inhaled anesthetic administration was 4,6 to 6,35 hours. Four studies assessed early graft function using serum creatinine level and reported no significant difference between groups. In 1 study, inhaled anesthetic were not associated with a reduction in acute rejection episodes. Inhaled anesthetic did not reduce the incidence of delayed graft dysfunction *(2 studies; N= 83 ; RR 0.42 [95%CI 0.06 to 2.70] ; I^2=0%, p=0.36)*. The overall risk of bias for each study was high.

DISCUSSION

In kidney transplantation inhaled anesthetic appear to have no effect on recipient outcomes. The current evidence is of low quality and larger, more methodologically rigorous RCTs are needed. Future research should specifically compare total intravenous anesthesia with inhaled anesthetic and evaluate their effects on delayed graft function in kidney recipients.

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Gastric contents in fasted semaglutide users: an observational pre-operative ultrasound study

Submission ID

14

AUTHORS

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INTRODUCTION

Use of GLP-1 receptor agonists (GLP-1RAs) has increased rapidly due to expanded indications for diabetes, obesity, and cardiometabolic disease, with semaglutide now the most prescribed long-acting weekly agent. Preoperative GLP-1RA use has risen dramatically, including a threefold increase among bariatric surgery patients from 2018–2023[1]. Perioperative concerns center on delayed gastric emptying and aspiration risk. A recent meta-analysis reported increased retained gastric contents (OR 5.56) and higher rates of aborted endoscopy among GLP-1RA users[2]. Guidance remains limited, although multiple consensus statements including multisociety gastroenterology/anesthesiology recommendations[3] support individualized assessment and selective use of gastric ultrasound. Point-of-care ultrasound reliably evaluates gastric contents and volume[4]. This study aimed to quantify delayed gastric emptying in semaglutide users and identify clinical predictors of high-risk gastric profiles, focusing on drug dose, discontinuation interval, and fasting duration.

METHODS

The Research Ethics Board waived formal review under institutional policy. We conducted an observational study of n=67 adult semaglutide users presenting for elective surgery. Appropriately fasted patients were included; emergency cases, non-fasted patients, and those with prior gastric surgery were excluded. Preoperative assessment documented comorbidities, semaglutide dose, days since last administration, and hours NPO for solids.

Gastric ultrasound was performed by POCUS-trained[5] anesthesiology residents using a low-frequency (2–5 MHz) curved-array transducer. The gastric antrum was scanned in both supine and right-lateral decubitus (RLD) positions. Video loops were uploaded to QPath for blinded staff interpretation by POCUS-certified anesthesiologists. Cross-sectional antral area (CSA) and qualitative gastric grade (0–2) were assigned based on established criteria[4].

"High-risk" gastric states were defined as solid or thick-fluid content in either position, or clear fluid with calculated gastric volume >1.5 mL/kg in the RLD. Linear regression modeled associations between gastric volume/weight and semaglutide dose, discontinuation interval, and NPO time.

RESULTS

Gastric ultrasound demonstrated heterogeneous gastric emptying among 67 semaglutide users (mean age 59.6±12.8 years; 58% female; BMI 34.9±8.5 kg/m^2; 72% with diabetes) despite adherence to fasting guidelines. The median GLP-1RA discontinuation period was 16 days. Gastric grades were 0 in 26.9%, 1 in 10.4%, and 2 in 62.7% of patients. Semaglutide dose (mg) was not associated with gastric volume/weight ($r \approx -0.16$, $p > 0.20$). Discontinuation period (days) showed a modest negative correlation with gastric volume/weight ($r \approx -0.27$, $p \approx 0.026$), while NPO duration (hours) demonstrated a weak, nonsignificant trend ($r \approx -0.21$, $p \approx 0.09$). Qualitative grading identified high-risk contents not captured by quantitative thresholds, and ~10% of scans were inconclusive due to air artifact from early solid content but still represented clinically relevant high-risk profiles. Overall, gastric risk was not reliably predicted by semaglutide dose, fasting duration, or discontinuation interval alone, underscoring the importance of direct imaging in this population.

DISCUSSION

Semaglutide users demonstrated variable gastric emptying patterns that were not reliably predicted by dose, fasting duration, or discontinuation interval. Longer drug-holding intervals were associated with modest reductions in gastric volume, whereas semaglutide dose had no measurable effect. Qualitative ultrasound frequently revealed high-risk gastric content despite low calculated volumes, emphasizing limitations of relying solely on NPO duration or medication timing. These findings support individualized perioperative assessment and highlight gastric ultrasound as a valuable adjunct for aspiration-risk stratification in patients taking weekly GLP-1RAs.

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Table 1. Patient characteristics and gastric ultrasound findings (N = 67)

Variable	Value
Age, years	59.6 ± 12.8
Sex, female (%)	39 (58.2%)
Body mass index, $kg \cdot m^{-2}$	34.9 ± 8.5
Type 2 diabetes, n (%)	48 (71.6%)
Median GLP-1 discontinuation, days	16
Gastric grade 0, n (%)	18 (26.9%)
Gastric grade 1, n (%)	7 (10.4%)
Gastric grade 2, n (%)	42 (62.7%)

Data are presented as mean ± standard deviation or number (percentage).

High-flow nasal cannula versus conventional oxygen therapy in the post-operative period: a systematic review and meta-analysis

Submission ID

149

AUTHORS

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INTRODUCTION

Conventional oxygen therapy (COT) modalities such as simple face mask, nasal cannula or Venturi mask are used in patients after extubation to prevent hypoxia.[1] Development of respiratory failure despite COT often necessitates non-invasive ventilation (NIV) and/or mechanical ventilation.[2] High-flow nasal cannula (HFNC) has emerged as a promising non-invasive alternative for respiratory support due to its ability to wash out anatomic dead space, generate a low-level of positive end-expiratory pressure, meet a patient's inspiratory flow, and provide comfort with heat and humidity.[3] Prior meta-analyses demonstrate conflicting results on whether HFNC reduces the rate of reintubation in the postoperative period compared to COT.[4,5] Given the availability of more recent randomized controlled trials, we conducted an updated systematic review and meta-analysis to compare these two modalities in the postoperative period.

METHODS

We searched Medline, Embase and Web Of Science from inception to October 3, 2025 for randomized controlled trials comparing the effects of HFNC with COT in postoperative patients. Our primary outcome was all-cause reintubation at any time point. Our secondary outcomes included escalation of therapy to NIV, all-cause mortality, pneumonia, atelectasis, postoperative pulmonary complications, incidence of hypoxemia, hospital and intensive care unit length of stay, vital signs and blood gas measurements, and comfort level.

Articles were reviewed, screened, and extracted in duplicate. Random-effects meta-analyses were used to generate standard summary measures. Categorical data were presented as odds ratios (ORs) and continuous data as mean difference (MDs) with 95% confidence intervals (CIs) and an α of 0.05. Heterogeneity was assessed by I^2 statistics. The Peto method was used for rare events (<5%) or otherwise the Mantel–Haenszel method. Subgroup analyses were conducted (cardiac versus thoracic surgery, high versus average-

risk patients, and risk of bias) for their impact on the primary outcome. We assessed the risk of bias using the Cochrane risk of bias 2.0 tool and the quality of evidence using the Grading of Recommendations Assessment and Evaluation (GRADE) framework.

RESULTS

Our search yielded 2,337 studies, of which 25 trials (n = 4,260) were included for meta-analyses. Seven studies were judged to be low risk of bias, five with some concerns, and thirteen as high risk of bias.

Thirteen trials (n = 1693) investigated reintubation. HFNC did not reduce risk of reintubation compared to COT (OR 0.93; CI 0.26 – 2.38; I^2 = 47.1%; p = 0.86). The rate of re-intubation was 3.1% (27/867) with HFNC and 2.8% (23/826) with COT. Subgroup analyses showed no significant differences. HFNC reduced the incidence of atelectasis (n = 628; OR 0.33; CI 0.18 – 0.59; I^2 = 10.8%; p = 0.0046) and hypoxemia (n = 1276; OR 0.42; CI 0.21 – 0.83; I^2 = 78.3%; p = 0.017). No significant differences were detected in other outcomes. GRADE for certainty of evidence was low to moderate.

DISCUSSION

Our findings suggest that while HFNC reduces the incidence of atelectasis and hypoxemia, it does not impact important clinical outcomes such as reintubation, therapy escalation, mortality, and length of stay. Most trials were a high risk of bias and moderate to high heterogeneity, which limits interpretability. Subgrouping for type of surgery and patient risk profile did not demonstrate a difference in the primary outcome. Given the rarity of reintubation events, substantially more trials are needed to demonstrate a conclusive effect.

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Table. Summary of pooled effects of high-flow nasal cannula compared to conventional oxygen therapy on postoperative outcomes in adults, including subgroup analyses of the primary outcome.

Outcome	Studies	Patients	OR or MD	95% CI	I^2	P
Reintubation	13	1693	0.93	0.36 – 2.38	47.1	0.86
Subgroup analyses of primary outcome						
Risk of Bias	$P_{between\text{-}group}$ = 0.11					
High	7	879	0.64	0.29 – 1.44	63.8	0.54
Some concerns	3	440	0.73	0.17 – 3.26	0	0.30
Low	3	384	2.40	0.91 – 6.35	0	0.25
Patient Risk	$P_{between\text{-}group}$ = 0.57					
High	6	975	1.14	0.23 – 5.62	62.9	0.76
Average	7	718s	0.82	0.16 – 4.13	21.7	0.65
Surgery	$P_{between\text{-}group}$ = 0.045					
Cardiac	7	944	1.54	0.36 – 6.59	44.0	0.48
Thoracic	3	385	0.29	0.02 – 4.36	0	0.19
Secondary Outcomes						
Escalation to NIV	8	1190	0.64	0.31 – 1.32	57.8	0.19
Mortality	8	1172	0.71	0.18 – 2.78	0	0.53
Atelectasis	6	628	0.33	0.18 – 0.59	10.8	0.0046
Hypoxemia	11	1276	0.42	0.21 – 0.83	78.3	0.017
PPC	6	645	0.68	0.33 – 1.40	49.0	0.22
Hospital LOS	16	1877	-0.58	-1.17 to 0.01	71.0	0.053
ICU LOS	14	1770	-0.02	-0.19 to 0.15	37.3	0.085
pH	4	423	0.0002	-0.01 to 0.01	13.3	0.97
PaO2	9	767	43.0	-15.7 to 101.7	97.1	0.13
PaCO2	10	831	-1.1	-2.6 to 0.4	76.4	0.13
PF Ratio	6	447	33.4	-7.99 to 74.8	82.0	0.09
RR	4	343	-1.4	-3.0 to 0.3	61.6	0.075
SpO2	3	344	0.84	-0.61 to 2.23	58.5	0.13
HR	5	504	-4.6	-8.6 to -0.6	45.6	0.034
Discomfort	6	1000	-0.7	-2.3 to 0.9	92.6	0.32

Impact of cannabis use on the incidence of postoperative complications: a systematic review and meta-analysis

Submission ID

118

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INTRODUCTION

The prevalence of cannabis use in Canada has steadily increased following its legalization in October, 2018 [1,2]. As a result, clinicians are caring for an increasing number of patients who use cannabis or have a cannabis use disorder (CUD). Emerging evidence suggests a potential association between CUD and higher perioperative morbidity, though findings remain inconsistent across studies and specialities. This uncertainty is reflected in current perioperative guidelines which offer limited or sometimes conflicting recommendations regarding cannabis use. To date, no comprehensive systematic review or meta-analysis has evaluated how preoperative cannabis exposure affects postoperative outcomes across diverse surgeries. Our review aims to address this gap and synthesize available evidence on cannabis use and its impact on postoperative outcomes to better inform perioperative assessment and counseling.

METHODS

This systematic review and meta-analysis was registered in PROSPERO (CRD#420251077279) and conducted in accordance with PRISMA guidelines. A comprehensive search of CENTRAL, Embase, MEDLINE, and PubMed was developed with an information technologist. Search terms combined controlled vocabulary and keywords related to cannabis, surgery, and postoperative outcomes, restricted to English-language, adult human studies. Grey literature, conference abstracts, dissertations, and studies without postoperative outcomes were excluded. Additional articles were identified through citation searching. Eligible studies included randomized controlled trials and prospective or retrospective cohort studies reporting postoperative complications among adults (≥18

years) undergoing surgery with documented preoperative cannabis use. Case reports, case series, case–control studies, pediatric studies, and non-English articles were excluded.

RESULTS

Seventy-six studies were included in the systematic review and meta-analysis (n =8,446,061; mean ± SD age 52.6 +/- 15.9, 50.2% female). There was a 66% increased risk of respiratory complications in cannabis users at 90 days (RR 1.66, 95%CI: 1.05-2.61; p=0.03). Embolic complications at 90 days in cannabis users were increased by 46% when compared to non-users (RR 1.46, 95% CI: 1.23-1.74; p<0.0001). Compared to non-users, cannabis was associated with a 73% increase in infectious complications at 90 days (RR 1.73, 95% CI: 1.43-2.09; p<0.00001). No significant differences were found for neurological, hematological complications, length of stay or mortality between cannabis users and non-users.

DISCUSSION

Preoperative cannabis use significantly increased 90-day risks for respiratory, embolic, and infectious complications. These outcomes are biologically plausible given cannabis-induced airway inflammation, THC-mediated prothrombotic states, and cannabinoid-driven immunomodulation that impairs wound healing and increases risk for bacterial and viral infections [3-5]. Our findings underscore the importance of incorporating routine cannabis use screening into standard preoperative anesthetic assessments and counseling that could enable better patient optimization, earlier identification of high risk patients and theoretically reduce the risk of postoperative complications. Additionally, clinicians should consider preoperative cannabis cessation to further reduce postoperative risk in their patients.

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Impact of patient education on pre-operative facial hair shaving

Submission ID

133

AUTHORS

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INTRODUCTION

Anesthetic care includes airway management, components of which include pre-oxygenation, bag-mask ventilation, and laryngoscopy. Difficulty with these tasks can have significant consequences, such as hypoxic brain injury and death. Airway assessment and the identification of risk factors is essential to devise a safe airway management plan[1]; despite planning, anticipated and unanticipated difficult airway management can occur with associated morbidity and mortality. Most risk factors are non-modifiable and cannot be optimized preoperatively. However, the presence of facial hair (e.g. beard, moustache) - a known risk factor for both difficult bag-mask ventilation and difficult laryngoscopy[2] - is modifiable. This information exceeds the knowledge of most lay people and is not routinely provided to male patients before elective surgery. The objective of this study was to assess the impact of patient education on preoperative facial hair shaving.

METHODS

This was a two-phase prospective observational pilot study in adult (age ≥18 years) male patients who regularly have facial hair undergoing elective surgery. Female patients and those undergoing surgery where the operative field was within the distribution of facial hair were excluded.

Phase 1: A historical cohort (control group) was first established. Male patients in the preoperative holding area who identified as regularly having facial hair were surveyed to determine the proportion who shaved prior to elective surgery.

Phase 2: Male patients with facial hair presenting to the anesthesia preadmission clinic were provided a patient education intervention outlining basic airway management and the potential risks of having facial hair on anesthetic care. The intervention was a standardized patient education document delivered verbally (over the phone) or in written form.
On the day of surgery, participants were surveyed to assess for any effect on behaviour i.e. preoperative facial hair shaving.

The primary outcome was the proportion of men who identified as regularly having facial hair

that shaved before their elective surgery. Secondary outcomes included evaluation of the role of confounding variables (ethnicity, religion, primary language, self-reported English-language literacy, surgery type, pre-admission clinic attendance, receiving and reading preoperative information documents).

RESULTS

102 participants were recruited to both the control and intervention groups. 2 participants were excluded from each group due to surgery type (n=200). Mean age (S.D.) was 55.6 (16.7) years in the control group and 61.6 (13.9) years in the intervention group (P=0.007). The majority of patients were Caucasian, Christian Anglophones undergoing urologic procedures. Ethnicity, religion, first language, and surgery type are outlined in Table 1. Male patients who regularly had facial hair reported shaving in anticipation of surgery in 18% and 53% of the historical and intervention groups, respectively (OR 5.14 [95%CI 2.70 – 9.78] P<0.001;). Significance remained after adjustment for age, ethnicity, religious affiliation, first language, type of surgery, and PAC attendance [aOR 4.53 (95% CI, 2.27, 9.06, P<0.001)]. In those who shaved, 27.8% (5/18) of the control group and 45.3% (24/53) of the intervention group reported that shaving was motivated by safety (P=0.43).

DISCUSSION

Our results suggest a simple patient education intervention can impact the rate of preoperative facial hair shaving and act to reduce the risk of adverse airway events. In those who shaved, there was no difference in the proportion that reported their shaving was motivated by safety. This may be influenced by reporter bias or other variables. We did not capture grading or type of facial hair which likely influences its risk to airway management.

Given the significance of adverse events and established workflow to distribute this information, this intervention could provide an effective, low-cost means to improve patient safety.

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Table 1.
Demographic Characteristics of Study Participants

	Control		Intervention			
	100		100		X^2	p-value
Ethnicity					7.9	0.3
Caucasian	74	74.0%	85	85.0%		
Indigenous	4	4.0%	3	3.0%		
African	2	2.0%	3	3.0%		
Latino or Hispanic	2	2.0%	0	0.0%		
Asian	9	9.0%	2	2.0%		
Two or More	2	2.0%	1	1.0%		
Other:	6	6.0%	5	5.0%		
Prefer not to answer	1	1.0%	1	1.0%		
Religion					17.1	0.047
Christianity/Catholicism	50	50.0%	55	55.0%		
Islam	9	9.0%	2	2.0%		
Hinduism	1	1.0%	0	0.0%		
Sikhism	3	3.0%	2	2.0%		
Buddhism	1	1.0%	1	1.0%		
Judaism	2	2.0%	1	1.0%		
Agnostic	1	1.0%	11	11.0%		
Atheist	13	13.0%	10	10.0%		
Other (please specify):	6	6.0%	2	2.0%		
Prefer not to answer	14	14.0%	16	16.0%		
First language					3.48	0.18
English	85	85.0%	90	90.0%		
French	1	1.0%	3	3.0%		
Other	14	14.0%	7	7.0%		
Type of surgery					19.23	0.004
General surgery	14	14.0%	17	17.0%		
Orthopedic surgery	12	12.0%	8	8.0%		
Urology	36	36.0%	58	58.0%		
Neurosurgery	12	12.0%	9	9.0%		
Plastic surgery	14	14.0%	3	3.0%		
Cardiac surgery	8	8.0%	1	1.0%		
Other	4	4.0%	4	4.0%		
	Mean	**(SD)**	**Mean**	**(SD)**	***t***	**p-value**
Age	55.7	(16.7)	61.7	(13.9)	2.75	.007

Implementation of an opt-out electronic health record–based smoking cessation program in the preadmission clinic: a quality improvement study

Submission ID

200

AUTHORS

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INTRODUCTION

Smoking tobacco is associated with perioperative morbidities. Surgical patients who smoke have increased risks for complications, including a 50% higher chance of respiratory problems and a 65% higher risk of delayed wound healing and infection [1]. Current clinical guidelines recommend offering smoking cessation interventions, as stopping at least two weeks before surgery can reduce postoperative complications [2]. Despite these recommendations, many surgical patients who smoke do not receive support during the preoperative period due to barriers such as a lack of trained staff dedicated to providing smoking cessation support and time-constrained preoperative settings [3]. Electronic health record (EHR)-based approaches may address these implementation barriers by identifying eligible patients, providing prompts for clinicians, and facilitating automated referrals [3]. Therefore, this quality improvement study evaluated an opt-out, EHR-embedded smoking cessation intervention, aiming to increase smoking cessation support from 30% to 60% over two sequential 6-month Plan–Do–Study–Act (PDSA) cycles.

METHODS

After approval from the Quality Improvement Review committee, adults aged ≥18 years who smoked and were scheduled for elective surgery at two hospitals were automatically sent smoking cessation resources through the hospital's patient portal. The intervention was implemented over two sequential 6-month PDSA cycles, following the collection of six months of baseline data used to establish existing smoking cessation support. Resources included educational modules regarding positive smoking cessation practices, URLs to free nicotine replacement therapy programs, and referrals to counselling services. In pre-surgical clinics, nurses and anesthesiologists were prompted to deliver brief standardized counselling using a scripted prompt embedded within the EHR if the EHR identified the

participant as a smoker. To promote equitable access to smoking cessation support, participants who were not registered with the hospital's patient portal or who had language preferences were provided multilingual pamphlets; respectively. Following program implementation, a 30-day postoperative telephone follow-up was completed to assess patient engagement and abstinence rate. Changes in counselling delivery rates and patient engagement over time were evaluated using statistical process control methods, with variation examined across study periods and by social determinants of health such as sex and gender.

RESULTS

Between August 2025 and November 2025, a total of 12,510 surgical patients were assessed during the intervention period, of whom 1080 (8.6%) were identified as current smokers. The mean age was 54.3 ± 14.9 years, 44% were female, 70% identified as White, and 31.7% reported high school as their highest level of education.

During the pre-intervention period, smoking cessation counselling at the preadmission clinic (PAC) across the two sites was documented in 30.5% (292/956) of patients who smoked, compared with 40.8% (441/1080) during the intervention period. Counselling rates increased among nurses from 6.3% to 10.1% and among anesthesiologists from 23.3% to 28.3% following implementation of the opt-out smoking cessation workflow.

DISCUSSION

Implementation of an opt-out smoking cessation program in the PAC was associated with a modest increase in counselling rates compared with the pre-intervention period, with increases observed across multiple perioperative provider groups. These findings suggest that embedding smoking cessation prompts into routine preoperative workflows may improve multidisciplinary engagement. These findings are preliminary as data collection is ongoing, and postoperative data analysis will still need to be completed to evaluate patient engagement outcomes.

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Incidental inferior vena cava thrombosis detected during routine perioperative pocus: a case report

Submission ID

51

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INTRODUCTION

Intravascular tumor thrombus represents direct tumor extension into the vessel lumen and is a recognized feature of several malignancies, including adrenocortical carcinoma (ACC).[1] Malignancy, including ACC, is also associated with an increased risk of thromboembolic events.[2] Inferior vena cava (IVC) thrombus is present in approximately 10% of ACC cases, arising from venous invasion, hypercoagulability, stasis, or endothelial injury, and is associated with worse prognosis.[3]

Perioperative point-of-care ultrasound (POCUS) enables real-time bedside assessment of major veins, including IVC diameter, compressibility, intraluminal echogenic material, wall adherence, and flow abnormalities. Although evidence for POCUS-based detection of IVC thrombosis remains limited, case reports demonstrate its diagnostic utility, including detection of IVC thrombus extending into the right atrium.[4]

We report a 64-year-old woman with ACC in whom perioperative POCUS incidentally detected IVC thrombosis, resulting in major alteration of surgical management.

CASE PRESENTATION

A 64-year-old woman with a rapidly enlarging right adrenal mass was scheduled for elective laparotomy and adrenalectomy after serial imaging from May to August 2025 demonstrated progression from 2.8 × 1.5 cm to 7.4 × 5.2 × 6.4 cm, with possible invasion of the right renal upper pole. CT demonstrated a patent descending thoracic aorta with mural thrombus and ulcerated plaque, while the abdominal aorta and branches were patent. No IVC tumor thrombus or vascular invasion was reported.

Her history included osteoporosis, Raynaud's phenomenon, and ocular migraines. She denied hormonal symptoms but had bilateral leg edema, fatigue, headaches, and exertional dyspnea. Laboratory studies showed normocytic anemia and elevated inflammatory markers (ESR 56 mm/h, CRP 77.7 mg/L).
During a preoperative anesthesia POCUS teaching scan, an intraluminal echogenic, non-compressible mass adherent to the IVC wall was identified, extending cranially from the right renal vein. Spontaneous echo contrast ("smoke"), indicating flow stasis and turbulence, was also present (Figure 1). These findings were consistent with IVC thrombosis.

Multidisciplinary review concluded that the findings were most consistent with ACC-associated IVC thrombus, rendering the tumor surgically unresectable. Surgery was deferred, and the patient was transitioned to palliative care. She declined anticoagulation. Progressive fatigue, thoracic pain, and functional decline ensued, and she died under home-based palliative care.

CONCLUSION

This case highlights the value of preoperative POCUS in identifying clinically occult, high-risk pathology in patients with rapidly progressive disease. Although CT remains the standard modality for detecting intravascular thrombus in major veins, lesions may be overlooked, whereas bedside ultrasound offers immediate hemodynamic and vascular assessment. [1,5] Notably, contrast-enhanced ultrasound outperformed CT for portal vein thrombosis, supporting diagnostic superiority in selected patients. [5] Early detection of IVC thrombosis can influence surgical eligibility, embolic risk, and goals of care. Integrating focused venous POCUS into preoperative oncology evaluation improves diagnostic accuracy, enhances multidisciplinary decision-making, and promotes safer, more personalized patient management.

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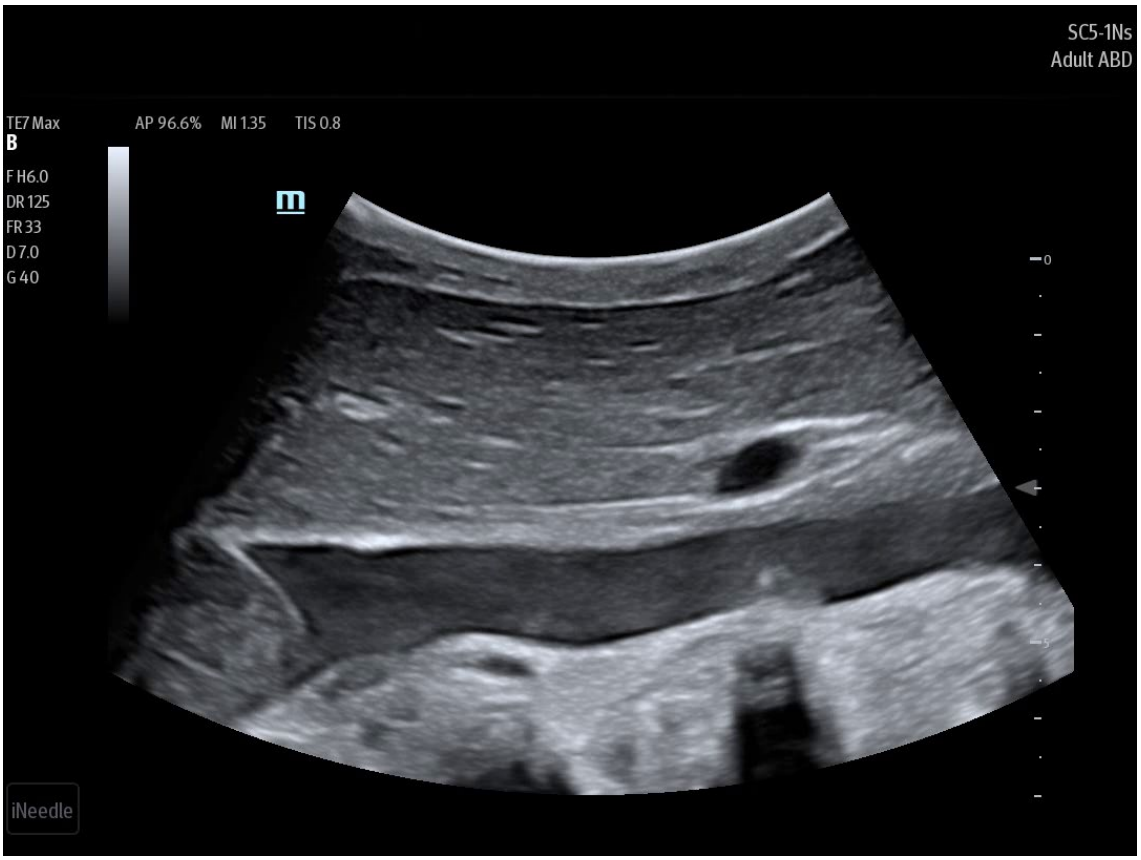

Intraoperative hypotension and the risk of postoperative delirium: a systematic review and meta-analysis

Submission ID

148

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INTRODUCTION

Postoperative delirium is a prevalent and serious complication, particularly among older adults.[1] It correlates with longer hospital stays, higher mortality rates, and higher healthcare costs.[2] Although its pathophysiology remains multifactorial and incompletely understood, impaired cerebral perfusion during surgery has been proposed as a potential contributing factor.[3] Several observational studies consistently demonstrate a relationship between intraoperative hypotension and postoperative delirium. However, definitive conclusions are limited by methodological differences, sample sizes, data limitations, and variations in the definitions of hypotension and in delirium assessment methods across studies. The aim of this systematic review and meta-analysis is to assess whether intraoperative hypotension is associated with a heightened risk of postoperative delirium in adult surgical patients.

METHODS

We systematically searched Embase, Web of Science, and the Cochrane Central Register of Controlled Trials from database inception to December 9, 2025, for observational studies evaluating the intraoperative hypotension with postoperative delirium. Eligible studies included prospective and retrospective studies in adults (≥18 years) undergoing surgery that reported intraoperative hypotension and postoperative delirium. Intraoperative hypotension was quantified using either a prespecified threshold or duration-based metrics. Random-effects models were used to pool crude (cOR) and adjusted (aOR) odds ratios, along with their corresponding 95% confidence intervals (CIs). The risk of bias was assessed using the ROBINS-E, and the certainty of evidence was assessed using the GRADE approach.

RESULTS

Thirty-one studies involving 420,190 surgical patients were included. The incidence of intraoperative hypotension was significantly associated with postoperative delirium in both crude (cOR: 1.73; 95% CI: 1.13-2.63; p = 0.011) and adjusted (aOR: 2.03; 95% CI: 1.37-3.08; p < 0.001) models. The duration of hypotension was significantly associated with postoperative delirium in the crude model (cOR: 3.07; 95% CI: 1.25-7.52; p = 0.014) but not in the adjusted model (aOR: 1.65; 95% CI: 0.97-2.82; p = 0.066). The studies were moderate to high risk, and the overall certainty of evidence was very low.

DISCUSSION

This systematic review and meta-analysis suggests that intraoperative hypotension and its duration are associated with an increased risk of postoperative delirium. These findings indicate that intraoperative hypotension may be a potentially modifiable risk factor for postoperative delirium. Further prospective studies are needed to define optimal blood pressure thresholds and durations to inform perioperative hemodynamic management strategies.

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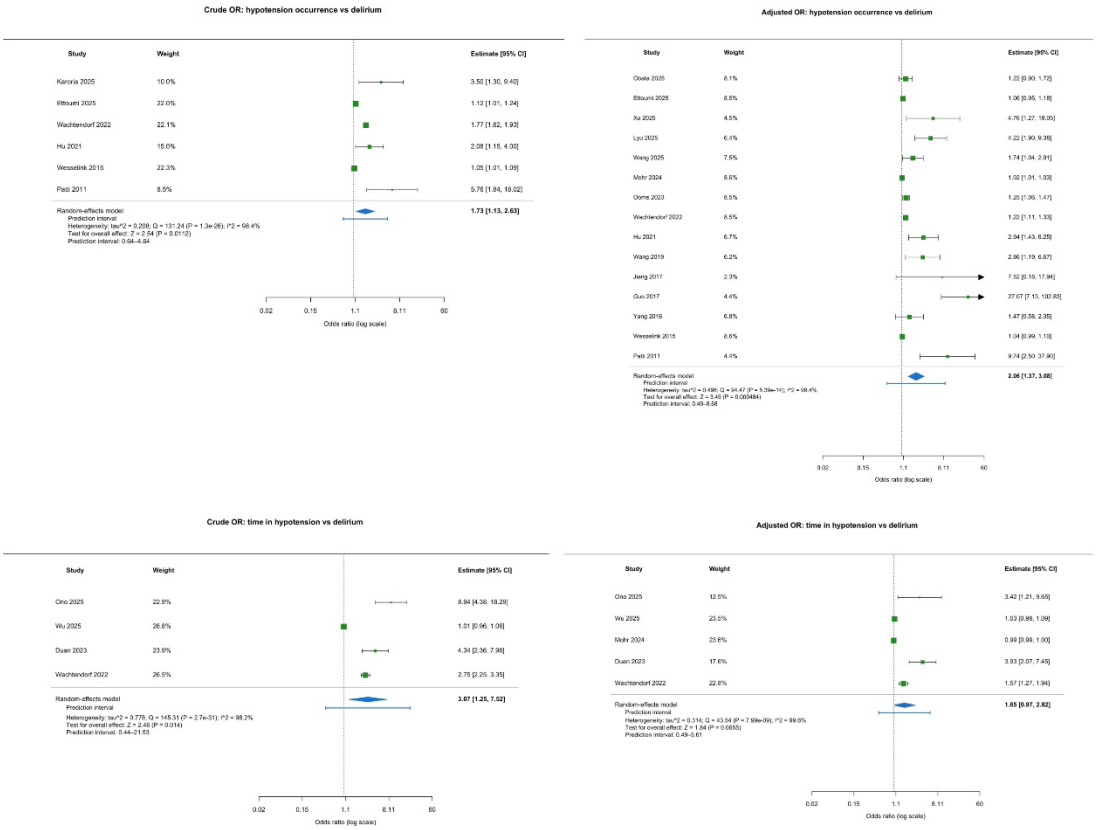
Crude OR: hypotension occurrence vs delirium
Study
Weight
Estimate [95% CI]
Karoria 2025 10.0% 3.50 [1.30, 9.40]
Ittiouni 2025 22.0% 1.12 [1.01, 1.24]
Wachtendorf 2022 22.1% 1.77 [1.62, 1.93]
Hu 2021 15.0% 2.08 [1.15, 4.00]
Wesselink 2015 22.3% 1.05 [1.01, 1.09]
Patti 2011 8.5% 5.76 [1.84, 18.02]
Random-effects model 1.73 [1.13, 2.63]
Prediction interval
Heterogeneity: tau^2 = 0.208; Q = 131.24 (P = 1.3e-26); I^2 = 98.4%
Test for overall effect: Z = 2.54 (P = 0.0112)
Prediction interval: 0.64–4.64
0.02
0.15
1.1
8.11
60
Odds ratio (log scale)
Adjusted OR: hypotension occurrence vs delirium
Study
Weight
Estimate [95% CI]
Obata 2025 8.1% 1.22 [0.90, 1.72]
Ittiouni 2025 8.5% 1.06 [0.95, 1.18]
Xia 2025 4.5% 4.76 [1.27, 18.00]
Lyu 2025 6.4% 4.22 [1.90, 9.38]
Wang 2025 7.6% 1.74 [1.04, 2.91]
Mohr 2024 8.6% 1.02 [1.01, 1.03]
Goms 2023 8.5% 1.25 [1.05, 1.47]
Wachtendorf 2022 8.5% 1.22 [1.11, 1.33]
Hu 2021 6.7% 2.94 [1.43, 6.25]
Wang 2019 6.2% 2.86 [1.19, 6.87]
Jiang 2017 2.3% 7.52 [0.15, 17.94]
Guo 2017 4.4% 27.07 [7.15, 102.83]
Yang 2016 6.8% 1.47 [0.58, 2.35]
Wesselink 2015 8.6% 1.04 [0.99, 1.10]
Patti 2011 4.4% 9.74 [2.50, 37.90]
Random-effects model 2.06 [1.37, 3.08]
Prediction interval
Heterogeneity: tau^2 = 0.490; Q = 94.47 (P = 5.39e-14); I^2 = 98.4%
Test for overall effect: Z = 3.46 (P = 0.000544)
Prediction interval: 0.49–8.58
0.02
0.15
1.1
8.11
60
Odds ratio (log scale)
Crude OR: time in hypotension vs delirium
Study
Weight
Estimate [95% CI]
Ono 2025 22.9% 8.94 [4.38, 18.29]
Wu 2025 26.8% 1.01 [0.96, 1.06]
Duan 2023 23.9% 4.34 [2.36, 7.98]
Wachtendorf 2022 26.5% 2.75 [2.25, 3.35]
Random-effects model 3.07 [1.25, 7.52]
Prediction interval
Heterogeneity: tau^2 = 0.778; Q = 145.31 (P = 2.7e-31); I^2 = 98.2%
Test for overall effect: Z = 2.46 (P = 0.014)
Prediction interval: 0.44–21.53
0.02
0.15
1.1
8.11
60
Odds ratio (log scale)
Adjusted OR: time in hypotension vs delirium
Study
Weight
Estimate [95% CI]
Ono 2025 12.5% 3.42 [1.21, 9.65]
Wu 2025 23.5% 1.03 [0.98, 1.09]
Mohr 2024 25.6% 0.99 [0.99, 1.00]
Duan 2023 17.6% 3.93 [2.07, 7.45]
Wachtendorf 2022 22.8% 1.57 [1.27, 1.94]
Random-effects model 1.65 [0.97, 2.82]
Prediction interval
Heterogeneity: tau^2 = 0.316; Q = 43.04 (P = 7.99e-09); I^2 = 88.6%
Test for overall effect: Z = 1.84 (P = 0.0655)
Prediction interval: 0.49–5.61
0.02
0.15
1.1
8.11
60
Odds ratio (log scale)

Figure 1

Intraoperative lactate levels and postoperative outcomes in head and neck reconstructive cancer surgery

Submission ID

171

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INTRODUCTION

Carefully selected patients with advanced head and neck cancers are amenable to resection and microvascular free flap reconstruction. These cases often involve prolonged surgical procedures, occasionally extending beyond 18 hours. The physiological stress of the surgery and prolonged anesthetic exposure can disrupt metabolism, resulting in intraoperative hyperlactatemia, occasionally reaching lactate levels normally associated with severe, life-threatening pathologies[1,2]. In oral head and neck oncosurgery (OHNS) patients, evidence to demonstrate an association between intraoperative blood lactate and postoperative outcomes remains limited and inconsistent. Although the mainstay of treatment for hyperlactatemia is fluid therapy, inappropriate intraoperative fluid administration is associated with an increased risk of tissue edema, poor wound healing, surgical site infection, failure of microvascular anastomoses, pulmonary complications, impaired gastrointestinal function and increased blood loss[3,4]. Clarification of the prognostic significance of hyperlactatemia could contribute to improved management of OHNS patients undergoing reconstructive surgery.

METHODS

In this retrospective observational study, we examined preoperative characteristics, intraoperative lactate levels, and postoperative outcomes in OHNS patients undergoing reconstructive free flap surgery. Individuals ≥18 years undergoing surgery from November 2019 to May 2024 were included for analysis. Of 655 eligible cases, 30 were excluded, due to missing lactate data (n=19) or procedures not classified as true free-flap surgery (n=11). From June 2024 to July 2025, charts were screened using both manual review and database drive data extraction. Mean peak intraoperative lactate level was classified as normal (≤2.2 mmol/L, n=339) or high (>2.2 mmol/L, n=286) for comparative analyses. Statistical analyses were performed using *IBM SPSS Statistics (Version 29.0)*[5]. Group comparisons employed

independent t-tests and chi-square tests. Crystalloid and colloid volumes were modelled using linear regression with log- and square-root transformation, respectively; predicted values were back-transformed for interpretation. For models with transformed outcomes, exponentiated coefficients were expressed as percent changes in fluid volume. Significance was defined as $p < 0.05$.

RESULTS

Compared to the normal lactate group, the high group had higher BMI (27.2 ± 6.34 vs 25.8 ± 6.42 kg/m^2; p = 0.007). Elevated intraoperative lactate was associated with male sex, non-smoking status, abscence of respiratory disease, and higher preoperative hemoglobin and albumin (all $p < 0.05$). Peak intraoperative lactate was 4.4 ± 1.0 versus 1.0 ± 0.3 mmol/L in the high and normal groups, respectively ($p < 0.001$). Lactate normalized by 24–48 h postoperatively, with no between-group difference (mean 0.12 mmol/L; p = 0.479). The high group received more intraoperative crystalloid (5.00 ± 2.45 vs 4.35 ± 2.61 mL/kg/h; p < 0.001) but less colloid (0.51 ± 0.27 vs 0.68 ± 0.37 mL/kg/h, p=0.044). Univariate analyses showed no association between intraoperative lactate and postoperative outcomes including in-hospital, 30-day, and 1-year mortality (p = 0.820, 0.358, 0.111, respectively), or hospital length of stay (p = 0.261)(Table 1).

DISCUSSION

Although elevated intraoperative lactate was associated with preoperative comorbidities and fluid requirements, hyperlactatemia resolved within 48 hours postoperatively. Intraoperative lactate was not an independent predictor of adverse outcomes.

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Variable	Normal Peak Intraoperative Lactate (≤2.2 mmol/L) n= 339	High Peak Intraoperative Lactate (>2.2 mmol/L) n= 286	P-value
Preoperative characteristics			
BMI, kg/m^2	25.8 ± 6.42	27.2 ± 6.34	0.007 *
Age, years	61.8 ± 12.9	61.6 ± 13	0.89
Total surgery time, minutes	889.2 ± 200.72	938.1± 159.4	<0.001 *
Hemoglobin	129.2 ± 22.4 (n=336)	135.8 ± 19.4 (n=282)	<0.001 *
Albumin, g/L	37.1± 6.8 (n=2-6)	38.8± 5.7 (n=165)	0.009 *
Female sex, n (%)	120 (54.2%)	80 (45.8%)	0.029 *
Smoking History, n (%)	252 (57.5%), n = 319	186 (42.5%), n = 277	<0.001 *
Respiratory Disease, n (%)	110 (63.6%)	63 (36.4%)	0.004 *
Intraoperative fluid administration (standardized to ml/kg/h)			
Crystalloid volume (ml/kg/h)	4.35 ± 2.61, n=330	5.00 ± 2.45, n= 281	<0.001 *
Colloid volume (ml/kg/h)	0.68 ± 0.37, n=32	0.51 ± 0.27, n=53	0.044 *
Postoperative outcomes			
Hospital length of stay, days	22.1 ± 23.3	24.9 ± 38.1	0.261
In hospital death	10 (50%)	10 (50%)	0.820
30-day mortality rate	7 (70%)	3 (30%)	0.358
1-year mortality	90 (60%)	60 (40%)	0.111

Table 1. Comparison of preoperative characteristics, intraoperative variables, and postoperative outcomes between participants with high versus normal intraoperative lactate. Data are presented as mean ± SD for continuous variables and n (%) for categorical variables. Table includes variables with statistically significant group differences as well as clinically relevant postoperative outcomes, regardless of statistical significance.

p-value; two-tailed unpaired t-test and chi-square test, * $p<0.05$

Machine learning prediction models for myocardial injury after non-cardiac surgery: a scoping review

Submission ID

191

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INTRODUCTION

Myocardial injury after non-cardiac surgery (MINS) represents a major contributor to postoperative morbidity and mortality, accounting for a substantial proportion of deaths within 30 days of surgery[1]. Despite its clinical impact, MINS frequently goes unrecognized due to its often silent presentation and nonspecific electrocardiographic findings[2]. While postoperative troponin surveillance is recommended in selected high-risk populations[2], clinicians currently lack reliable tools to identify patients at greatest risk prior to surgery. Traditional risk stratification approaches rely on limited clinical variables and demonstrate modest predictive performance[3,4]. In response, machine learning–based models have emerged as a potential strategy to improve preoperative risk prediction by integrating complex, high-dimensional perioperative data. This scoping review aims to summarize and characterize existing machine learning models developed to predict MINS.

METHODS

This scoping review was conducted in accordance with PRISMA-ScR guidelines and registered on the Open Science Framework. A scoping methodology was used to map machine learning (ML) approaches developed to predict myocardial injury after non-cardiac surgery (MINS).

A comprehensive literature search was performed in January 2025 using MEDLINE, EMBASE, CENTRAL, Scopus, and Web of Science. The search strategy was developed by one reviewer and refined with a biomedical librarian. Reference lists of included studies were screened, and citations were managed in Covidence following duplicate removal.

Studies were included if they applied at least one ML-based model to predict MINS in adult surgical populations and reported model performance metrics. Editorials, conference abstracts, and studies without MINS-specific outcomes were excluded.

Two reviewers independently conducted screening and data extraction, resolving disagreements by consensus. Data were synthesized narratively and summarized descriptively. Formal risk of bias assessment was not performed, consistent with scoping review methodology.

RESULTS

A total of 2,463 records were identified, with 65 undergoing full-text review and nine studies included. Six studies were retrospective and three were prospective cohort studies, conducted across Asia, Europe, and one international multicentre cohort. Models were internally validated (n=6) or externally validated (n=3), with a median sample size of 3,633 participants (IQR: 732–8,632). Definitions of MINS and troponin surveillance varied, with reported prevalence ranging from 9–31.5% in internally validated cohorts and 7.1–15.2% in externally validated cohorts.

Logistic regression was the most common top-performing model (n=6), followed by boosting algorithms (n=2) and neural networks (n=1). Median AUROC was 0.777 (IQR: 0.770–0.788) for internal validation and 0.805 (range: 0.790–0.821) for external validation. Calibration and secondary metrics were infrequently reported. Age, hemoglobin, and renal function markers were the most common predictors.

DISCUSSION

This scoping review demonstrates that machine learning models, most commonly logistic regression, have been applied to predict MINS across diverse surgical populations. Model performance varied across studies, with considerable heterogeneity in predictor types, timing of variables, and modeling strategies. Logistic regression remains dominant due to its interpretability and feasibility, while more complex modeling approaches appear underutilized. Heterogeneity in study populations, MINS definitions, and predictor selection limits comparability across studies. Nonetheless, machine learning based prediction has potential to support personalized perioperative risk assessment. Future research should prioritize advanced models, larger datasets, and prospective validation to support clinical implementation.

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Operating room extubation and postoperative pulmonary complications after adult liver transplantation

Submission ID

178

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INTRODUCTION

Postoperative pulmonary complications (PPCs) are frequent after adult liver transplantation and are associated with increased morbidity and healthcare resource utilization. Early extubation, including extubation in the operating room, has been increasingly incorporated into enhanced recovery pathways[1], yet its relationship with PPCs remains uncertain in contemporary practice.

METHODS

We conducted a retrospective cohort study of adult patients undergoing liver transplantation between January 1, 2019 and December 31, 2024 at a single high-volume academic center. The exposure of interest was extubation in the operating room compared with extubation within the first 24 postoperative hours. Patients ventilated preoperatively or extubated beyond 24 hours postoperatively were excluded. The primary outcome was the occurrence of PPCs, defined according to the Standardized Endpoints for Perioperative Medicine (StEP) consensus[2] definitions.

Baseline demographic, perioperative, and transplant-related variables were extracted from institutional clinical records. Univariable logistic regression analyses evaluated associations between extubation timing and PPCs. Variables associated with PPCs on univariable analysis ($p<0.1$) were included in multivariable logistic regression models to estimate adjusted associations.

RESULTS

The cohort included 1,155 adult liver transplant recipients, of whom 534 (46.2%) were extubated in the operating room. PPCs occurred in 56% (297/534) of patients extubated in

the operating room and in 66% (404/621) of those extubated within the first 24 hours postoperatively.

On univariable analysis, operating room extubation was associated with lower odds of PPCs (OR 0.66, 95% CI 0.52–0.83; p=0.001). Body mass index, metabolic-associated steatotic liver disease, autoimmune etiology, and intraoperative transfusion of red blood cells, fresh frozen plasma, and platelets were also associated with PPCs and were included in multivariable models. After adjustment, the association between operating room extubation and PPCs was attenuated and did not reach conventional statistical significance (adjusted OR 0.79, 95% CI 0.60–1.04; p=0.097).

DISCUSSION

In this retrospective cohort of adult liver transplant recipients, operating room extubation was associated with a lower occurrence of postoperative pulmonary complications on univariable analysis. After adjustment for relevant covariates, this association was attenuated and did not meet conventional thresholds for statistical significance, although the point estimate continued to favor operating room extubation. These findings highlight the importance of considering patient characteristics and intraoperative management when interpreting the relationship between extubation timing and pulmonary outcomes after liver transplantation.

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Perioperative management of breastfeeding patients undergoing day surgery

Submission ID

28

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INTRODUCTION

The perioperative period poses unique challenges to patients who are breastfeeding and undergoing day surgery. These may include separation from baby, breast engorgement and mastitis, and inadequate pain control[1]. Current guidelines recommend that the majority of patients should be encouraged to resume breastfeeding as soon as they are awake and alert after surgery[2]. However, some providers may routinely instruct all breastfeeding patients to discard breastmilk immediately after surgery, based on past practices that were not evidence based. Additionally, there may be excessive reluctance for practitioners to prescribe, and for patients to take, pain medication post-operatively. Limited provider knowledge of hospital policies pertaining to access to pumps, milk storage, and bringing baby to the hospital can also cause challenges in the perioperative period. Our study aims to survey breastfeeding patients undergoing day surgery to determine the amount and quality of preoperative information and instructions they receive from healthcare providers.

METHODS

After obtaining approval from our local ethics board, a brief survey was designed and distributed to breastfeeding patients undergoing day surgery in five local hospitals. The survey was completed by patients prior to their day surgery procedure. Patients self-identified as breastfeeding in order to be included in the study. Data collection spanned from November 2023 to August 2025. The survey consisted of 10 optional multiple choice questions that addressed the following topics: patient demographics, breastfeeding challenges, and perception of the amount and quality of information received from health care providers regarding perioperative breastfeeding management. Descriptive analysis of the resulting data was then completed to identify trends and patterns. To be included in analysis, a minimum of one answered question was required.

RESULTS

A total of 60 responses were received and analyzed. The most common type of surgery that respondents underwent was gynecological surgery (52%), with general surgery (22%) also being common. The majority of respondents (60%) reported experiencing challenges with breastfeeding, with the most common challenges being painful engorgement (35%) and low supply (33%). 37% of respondents responded neutral, disagree or strongly disagree when asked if they were provided with sufficient information regarding managing breastfeeding around their operation. 45% of respondents responded neutral, disagree or strongly disagree when asked if they were provided with sufficient information regarding managing breastfeeding around their operation from their surgeon. The majority of respondents (57%) still had questions about the perioperative management of their breastfeeding before their surgery, the most common being regarding pumping and dumping (33%), painkiller safety (38%), and access to baby (13%).

DISCUSSION

This study demonstrates that breastfeeding can be challenging for many patients, and inappropriate management in the perioperative period could potentially exacerbate these challenges. The majority of respondents still had questions regarding the perioperative management of their breastfeeding after speaking with a provider. This demonstrates that patients who are breastfeeding would benefit from the provision of standardized information, particularly focusing on topics such as resuming breastfeeding after surgery, pain management, and access to baby. Future education initiatives could target surgical services, anesthesiologists, and nursing staff to ensure consistent knowledge of current breastfeeding best practices, which can then be disseminated to patients.

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Perioperative midazolam and risk of postoperative delirium in adults undergoing elective surgery: a systematic review and meta-analysis

Submission ID

103

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INTRODUCTION

Postoperative delirium (POD) is a common complication associated with increased morbidity, prolonged hospitalization, and patient distress.[1] Midazolam, a benzodiazepine commonly used for perioperative anxiolysis and sedation, has demonstrated inconsistent associations with POD. While some studies report an increased POD risk with midazolam exposure,[2] others demonstrate no association[3] or a potential protective effect.[4] These discrepancies likely reflect heterogeneity in study design, including inconsistent comparators, limited randomization, variable delirium assessment measures, and inadequate control for confounding variables. To date, no systematic review has focused on the association between perioperative midazolam and POD. This knowledge gap complicates evidence-based sedative decision-making, particularly in older adults and other cognitively vulnerable populations. Therefore, we conducted a systematic review and meta-analysis to evaluate the association between perioperative midazolam exposure and POD in adult elective surgical patients.

METHODS

A systematic review and meta-analysis were conducted in accordance with PRISMA guidelines. MEDLINE, Embase, CENTRAL, and Web of Science were searched from inception to June 25, 2025. Eligible studies included randomized controlled trials, cohort studies, and case-control studies comparing perioperative midazolam with no midazolam or alternative sedatives in adults (≥18 years) undergoing elective surgery. Studies including patients with pre-existing delirium or severe dementia were excluded, as were emergency, cardiac, or neurosurgical procedures. Midazolam exposure included both pre- and intraoperative administration. The primary outcome was POD assessed with validated tools (e.g., CAM, CAM-ICU, 4AT), typically within 24–72 hours postoperatively or during hospitalization. Two

reviewers independently screened studies, extracted data, and assessed methodological quality using JBI critical appraisal tools, with discrepancies resolved by a third reviewer. A meta-analysis was conducted, in which study-level relative risks (RRs) were calculated, log-transformed, and weighted by the inverse of their variance to obtain a pooled RR using a fixed-effects model, with heterogeneity assessed via Q and I^2 statistics. Due to extreme heterogeneity in the initial analysis ($I^2 > 99\%$), a secondary meta-analysis was performed, including only studies comparing midazolam with another sedative.

RESULTS

Eleven studies met the inclusion criteria, with populations predominantly older (≥65 years) undergoing elective non-cardiac, non-neurosurgical surgery. Midazolam was most commonly administered intravenously, with dosing ranging from single boluses of 1-2 mg or infusion protocols of 0.03-0.10 mg/kg/hr, with one study reporting a daily median use of 38 mg. Two studies used oral premedication (3.75–7.5 mg). The timing of administration varied: preoperative (n=6), intraoperative (n=2), postoperative ICU sedation (n=1), or mixed timing (n=1). Among five studies comparing midazolam with another sedative, midazolam exposure was associated with a statistically significant increased risk of POD (pooled RR = 1.58, 95% CI: 1.18 – 2.13), with substantial heterogeneity ($I^2 = 84.04\%$). Study quality was variable, with common limitations including residual confounding and inconsistent delirium assessment.

DISCUSSION

This systematic review and meta-analysis showed that the association between perioperative midazolam and POD is comparator-dependent, suggesting that midazolam may confer a higher POD risk relative to sedatives like dexmedetomidine, melatonin, or propofol. The high between-study heterogeneity likely reflects variability in study design, patient populations, sedative comparators, and confounder control, emphasizing the difficulties in synthesizing evidence across diverse clinical contexts. Collectively, these findings highlight the clinical importance of sedative selection in older surgical patients and support the need for further high-quality comparative trials to guide evidence-based perioperative sedation practices.

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Perioperative predictors and consequences of delayed extubation in spine surgery: a systematic review and meta-analysis

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154

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INTRODUCTION

Respiratory complications are a significant but often overlooked issue in spine surgeries.[1] Among them, delayed extubation serves as a key sign of perioperative stability failure and can indicate early postoperative deterioration.[2] As spine surgeries become more common and complex, clinicians encounter more patients at risk for airway, lung, and systemic issues. While its effects on ICU admission, airway safety, and postoperative outcomes are well established, delayed extubation has not been extensively studied across various spine surgery populations. A better understanding of its predictors and consequences could aid with risk assessment, improving intraoperative strategies, and enhancing recovery. This systematic review and meta-analysis compiles current evidence to identify patient- and procedure-related factors associated with delayed extubation and to outline the associated postoperative outcomes.

METHODS

We systematically searched MEDLINE, EMBASE, Web of Science, and CENTRAL from inception to September 2025 for studies comparing patients with delayed versus immediate extubation after spine surgery. Eligible studies reported at least one risk factor or postoperative outcome. Data were extracted in duplicate, and the risk of bias was assessed using the ROBINS-E tool. Random-effects meta-analyses were performed for outcomes reported by at least three studies, pooling odds ratios or mean differences with 95% confidence intervals. Sensitivity analyses and publication bias assessments were conducted when sufficient data were available using R statistical software.

RESULTS

Twenty-three studies (188167 participants) were included. Patients with delayed-extubation differed from those extubated early across multiple domains. They were older (MD 4.59; 95%CI 2.52–6.66) and had higher ASA status (OR 2.69; 95%CI 2.00–3.62). Hypertension (OR 2.48; 95%CI 1.65–3.73), diabetes (OR 5.06; 95%CI 1.79–14.29), and COPD (OR 2.46; 95% CI 1.08–5.63) were also more common. Delayed-extubation patients underwent longer procedures (MD 73.8 min; 95%CI 3.9–143.7) with greater blood loss (MD 825 mL; 95%CI 426.9–1,223.7). They received more transfused blood (MD 1,078 mL; 95%CI 710.9–1,445.6), total fluids (MD 1,011 mL; 95%CI 615.5–1,405.8), and crystalloid (MD 1,916 mL; 95%CI 1,279.5–2,552.1). Delayed-extubation was associated with higher mortality (OR 55.26; 95%CI 28.86–105.81) and increased risks of all-cause (OR 23.13; 95%CI 1.16–459.95), major (OR 7.98; 95%CI 1.37–46.47), pulmonary (OR 14.71; 95%CI 3.05–70.95), cardiac (OR 12.65; 95%CI 1.61–99.27), infectious (OR 16.14; 95% CI 2.76–94.23), neurological (OR 10.95; 95%CI 2.20–54.57), and thromboembolic complications (OR 22.72; 95%CI 6.20–83.33).

DISCUSSION

Delayed extubation in spine surgery is associated with older age, higher ASA status, cardiopulmonary comorbidities, and greater intraoperative physiological stress. It also corresponds with markedly higher risks of mortality and multisystem postoperative complications. These findings highlight delayed extubation as an important marker of perioperative vulnerability and should be recognized as a clear indicator of patients who require closer perioperative monitoring and support. Recognizing this can help clinicians anticipate which patients are likely to deteriorate and ensure that timely postoperative surveillance and support are directed toward those at greatest risk.

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Table Meta-analysis results

Risk factors or Outcome	Pooled Effect	Studies (n)	Pooled Estimate	95% CI	p-value	I^2 (%)
Patient factors						
Age (years)	MD	10	4.59	2.52 – 6.66	<0.001	64.8
Sex Male	OR	10	0.75	0.49 –1.15	0.198	69.5
ASA class ≥3	OR	8	2.69	2.00 – 3.62	<0.001	56.4
Medical disease						
Hypertension	OR	4	2.48	1.64 – 3.73	<0.001	8.0
Diabetes Mellitus	OR	4	5.06	1.79 – 14.29	0.002	90.8
COPD	OR	3	2.46	1.07 – 5.63	0.033	53.3
Current smoker	OR	3	0.73	0.41 – 1.30	0.289	0.0
Intraoperative factors						
Surgery time (min)	MD	7	73.80	3.87 – 143.73	0.039	98.9
Blood loss during surgery (mL)	MD	6	825.30	426.85 – 1223.74	<0.001	96.5
Intraoperative blood transfusion (mL)	MD	3	1078.26	710.87 – 1445.64	<0.001	87.7
Intravenous fluid (mL)	MD	3	1010.65	615.47 – 1405.83	<0.001	44.4
Intraoperative crystalloids (mL)	MD	3	1915.79	1279.46 – 2552.12	<0.001	94.3
Associated Complications						
Mortality	OR	3	55.26	28.86 – 105.81	<0.001	0.0
All-cause complications	OR	4	23.13	1.16 – 459.95	0.039	96.4
Major complications	OR	3	7.97	1.37 – 46.47	0.021	96.9
Length of Hospital Stay (days)	MD	4	7.12	-0.47 – 14.72	0.066	94.2
Pulmonary Complications	OR	6	14.70	3.04 – 70.95	<0.001	93.5
Cardiac Complications	OR	4	12.64	1.61 – 99.26	0.016	90.9
Infectious complications	OR	4	16.13	2.76 – 94.22	0.002	89.1
Neurological complications	OR	4	10.95	2.19 – 54.57	0.003	78.1
Thromboembolic Complications	OR	3	22.72	6.19 – 83.32	<0.001	67.4

Pre-operative anesthesia consultations: a comparative analysis of CMPA guidelines and international standards

Submission ID

100

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INTRODUCTION

Pre-operative anesthesia consultations are an essential part of overall patient care and play a significant role in optimizing perioperative risk, identifying important comorbidities, and ensuring that informed consent is properly obtained and documented. In Canada, the pre-operative assessment guidelines are primarily published by the Canadian Medical Protective Association (CMPA) and the Canadian Anesthesiologists Society (CAS). However, these guidelines are more advisory than definitively enforced, resulting in variability across domains such as documentation practices and consent processes across Canadian institutions. In contrast, several international jurisdictions have adopted more rigid guidelines for pre-operative consultations. These differences highlight the need for a systematic qualitative comparative analysis of national anesthesia consultation guidelines to identify ways to improve perioperative safety, enhance consistency, and reduce medico-legal issues.

METHODS

A structured, systematic qualitative comparative analysis was conducted using multiple pre- operative anesthesia consultation guidelines from different countries and officially endorsed jurisdictions. These included Canada and the CMPA and CAS, the United Kingdom, the United States, Australia and New Zealand, and Europe, which were identified through searches of professional-endorsed society websites and many peer-reviewed studies. Inclusion criteria included guidelines published between 2021 and 2025, which were analyzed across five domains: legal enforceability and governance, documentation practices, delegation and accountability, informed consent documentation, and quality assurance.

RESULTS

Across all five jurisdictions, substantial differences were found between the Canadian guidelines and other international frameworks for pre-operative anesthesia consultation. International jurisdictions adopted structured documentation standards, including minimum documentation requirements, clear national frameworks for delegation and professional accountability, and structured governance of guidelines. These international guidelines also standardized consent documentation through certain documentation processes and embedded quality assurance and audit mechanisms. In stark contrast, Canadian pre-operative anesthesia guidelines are more principle-based, without nationally defined minimal standards for domains such asdocumentation, delegation, and consent processes. This results in greater variability in pre- operative anesthesia consultations across Canadian institutions.

DISCUSSION

In conclusion, Canadian preoperative anesthesia consultation guidelines demonstrate that the advisory approach to consultations differs significantly from the more standardized international frameworks. As a result, the absence of minimum standards in Canada opens the door to greater variability in documentation, the delegation process, consent documentation, and quality assurance across all institutions. Aligning Canadian practices with selected elements of international frameworks could achieve greater consistency and improve perioperative care for all patients.

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Preoperative hemoglobin, a risk factor for perioperative red blood cell transfusion in kidney transplant recipients

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199

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INTRODUCTION

Anemia is commonly associated with end-stage kidney disease, resulting in up to 30 to 50% of kidney transplant recipients being transfused at least one unit of red blood cells (RBC) during their transplant hospitalization.[1] However, perioperative RBC transfusion is associated with adverse outcomes ranging from, early graft loss, impaired graft function, prolonged hospitalization, and patient mortality.[2-4] Although kidney transplant surgery commonly results in minimal blood loss, patients may still be treated with a RBC transfusion, primarily to manage preoperative anemia.[2] RBC transfusions may be reduced if hemoglobin concentration is optimized prior to transplant surgery. The objective of this study is to determine the optimal preoperative hemoglobin range to mitigate the risk of perioperative RBC transfusion in kidney transplant recipients.

METHODS

Following research ethics approval (REB 23-6036), data were obtained from adult patients undergoing kidney transplant surgery, receiving either a living or deceased donor transplant. Participants were excluded if undergoing a multi-organ transplant (e.g., liver-kidney), or data on RBC transfusions or preoperative hemoglobin were missing. An analysis using preoperative hemoglobin as the predictor of perioperative (i.e., within 0-7 days post-transplant) RBC transfusion was conducted using logistic regression, adjusted for, age, sex, type of donation, revised cardiac risk index, changes in creatinine between postoperative days 1 and 3, and whether the patient received postoperative dialysis within 7 days of

transplant. Receiver operating characteristic (ROC) analysis and area under the curve (AUC) were used to assess model discrimination. Bootstrap resampling (n=1000 iterations) was used for model calibration. The Youden index was used to identify an optimal hemoglobin threshold associated with perioperative RBC transfusion.[5]

RESULTS

Kidney transplant surgeries took place between January 1, 2012 and November 30, 2023, with N=1392 included in this analysis. Perioperative RBC transfusion occurred in 30% (n=405) of cases. Patients primarily received a transfusion postoperatively (n=297), while the remainder (n=108) received an intraoperative transfusion. Preoperative hemoglobin was inversely associated with the likelihood of a perioperative RBC transfusion (coefficient=-0.0637, $p<0.001$). Each 1 g/L increase in preoperative hemoglobin reduced the odds of transfusion by 6% (OR: 0.94, 95% CI: 0.93-0.95). This corresponds to a 46% reduction in the odds of perioperative RBC transfusion for each 10 g/L increase in preoperative hemoglobin (OR: 0.54, 95% CI: 0.49-0.60). Modest model discrimination was observed (AUC=0.763). The Youden index identified a transfusion threshold corresponding to a preoperative hemoglobin of 104.5 (95% CI: 102.5-111.5) g/L, with a sensitivity of 54% and specificity of 75%.

DISCUSSION

Lower preoperative hemoglobin was associated with perioperative RBC transfusion following kidney transplant surgery. A preoperative hemoglobin threshold of ~105 g/L was identified, demonstrating moderate specificity, suggesting a potential target for pre-transplant anemia treatment. These findings support the importance of optimizing anemia prior to transplant surgery to mitigate RBC transfusions. This, in combination with other treatment, may ultimately contribute to the reduced likelihood of adverse outcomes following kidney transplant.

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Preoperative risk score for red blood cell and fresh frozen plasma transfusion during orthotopic liver transplantation: development and internal validation

Submission ID

208

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INTRODUCTION

Massive transfusion during orthotopic liver transplantation (OLT) remains associated with increased morbidity and mortality[1]. Early identification of patients at higher transfusion risk is essential to support perioperative planning, anticipate blood product requirements, and optimize resource allocation[2]. We aimed to develop a preoperative predictive models and practical risk scores to estimate the likelihood of intraoperative massive red blood cell (RBC) transfusion and frozen plasma (FFP) use in adult patients undergoing OLT.

METHODS

We conducted a single-center retrospective cohort study of adult OLT procedures performed between January 2016 and December 2024. Recipients of both living and deceased donor grafts were included. Combined liver–kidney or multivisceral transplantation and cases with incomplete intraoperative data were excluded. Two outcomes were assessed: (1) massive transfusion (MT), defined as transfusion of >5 units of RBC in the operating room, and (2) FFP requirement (>3 units) in the operating room. Preoperative recipient and donor demographics and clinical variables were evaluated using logistic regression. Predictor selection was performed using the least absolute shrinkage and selection operator (LASSO). Selected variables were incorporated into multivariable

logistic regression models to generate weighted risk scores standardized on a 0–10 scale. Model performance was assessed with internal validation, including discrimination and calibration metrics.

RESULTS

Among 1,739 OLT screened, 1,545 were included in the RBC analysis and 1,510 in the FFP analysis. Median age was 58 years (IQR 49–64), 65.4% were male, and 27% received living-donor grafts. Etiologies included metabolic-toxic (44.4%), viral (25%), autoimmune (16.2%) and others (15.4%); hepatocellular carcinoma was present in 37.1%. Median MELD-3.0 was 20 (IQR 11–29). Weighted preoperative risk scores (0–10) were developed. For RBC: MELD-3.0, INR, ascites and hepatorenal syndrome increased risk, while hemoglobin 92–121g/L or higher, platelets, and living donation were protective. Risk ranged from 2% (score near 0) to 45–52% (score near 10). For FFP: MELD-3.0, INR, portal hypertension, ascites, hepatorenal syndrome, encephalopathy, smoking increased risk, while hemoglobin 92–121 or higher, platelets, and living donation were protective. Risk increased from 6–8% (score near 0) to 75–78% (score near 10). Internal validation showed respectively optimism-corrected AUC 0.82/0.83, calibration 0.98/0.96, overfitting 0.005/0.004 and calibration error of MAE 0.007/0.026.

DISCUSSION

We developed and internally validated two preoperative risk scores to predict intraoperative massive transfusion during OLT, and need for FFP. Both models showed strong discrimination and very good calibration, suggesting potential value for preoperative risk stratification and blood product planning. External validation in independent cohorts is needed prior to broader clinical implementation.

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Readability, understandability, and actionability of preoperative patient questions: anesthesiologist responses vs GPT-4

Submission ID

88

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INTRODUCTION

The Canadian Anesthesiologists' Society holds anesthesiologists responsible for optimizing patients' preoperative medications, including ensuring patients understand and adhere to preoperative instructions [1]. However, most perioperative patient materials exceed average reading skills, contributing to non-adherence, surgical delays or cancellations, adverse outcomes, and widening healthcare disparities [2]. Effective communication requires more than an appropriate reading level: materials must also be understandable (clearly organized, plain language) and actionable (patients can identify concrete steps). Recent advances in large language models (LLMs), such as GPT-based chatbots, may generate patient-tailored content that is easier to read, understand, and act upon [3]. However, their suitability for preoperative patient communication remains uncertain [4,5]. Lower readability grade levels and higher PEMAT-P understandability/actionability scores indicate content that may be easier for patients to comprehend and translate into the intended preoperative steps. We compared the readability, understandability, and actionability of perioperative responses generated by anesthesiologists versus ChatGPT (GPT-4) using standardized metrics.

METHODS

We conducted a research ethics board–approved, single-centre pilot study in a tertiary-care preoperative assessment setting. Consecutive adults (≥18 years) scheduled for elective, non-cardiac surgery were enrolled. Inclusion criteria were capacity to consent and proficiency in English and French; exclusions included inability to communicate in either language or lack of in-person consultation. Each participant submitted one self-selected, open-ended preoperative question (114 questions). For each question, two written responses were generated: (1) a general anesthesiologist response and (2) ChatGPT (GPT-4) without fine-tuning, produced via an independent API call without conversational history (228 total responses). Content adequacy was assessed by an anesthesiologist with expertise in perioperative medicine; only responses judged adequate were included, then anonymized and randomized. Readability was assessed using Flesch–Kincaid Grade Level

(FKGL; primary outcome) and the Simplified Measure of Gobbledygook (SMOG). Understandability and actionability were assessed using PEMAT-P by two independent assessors. Paired t-tests compared continuous outcomes; Pearson correlation evaluated association in readability across matched questions; grade-12 dichotomization used chi-square testing. Inter-rater reliability was assessed using ICC (two-way random-effects, absolute agreement). Significance was $p < 0.05$.

RESULTS

All responses were deemed acceptable, yielding 228 total responses. ChatGPT produced text at a lower grade level than physicians: SMOG 14.06 vs 14.68 ($p = 0.0076$) and FKGL 12.03 vs 12.83 ($p = 0.0106$). Variability was markedly lower for ChatGPT. Correlation between physician and ChatGPT readability for matched questions was weak (SMOG $r = 0.12$; FKGL $r = 0.06$), suggesting divergent communication styles. When dichotomized at grade 12, ChatGPT responses were more likely to fall below this threshold by FKGL ($X^2 = 5.77$, $p = 0.016$) but not by SMOG. PEMAT-P ratings favoured ChatGPT for understandability (70.48 vs 53.17; $p < 0.001$) and actionability (45.00 vs 33.18; $p < 0.001$). Inter-rater reliability was excellent for SMOG (ICC = 0.94 for both) and for ChatGPT FKGL (ICC = 0.94), but poor for clinician FKGL (ICC = 0.09); PEMAT-P ICCs ranged 0.23–0.62.

DISCUSSION

Compared with anesthesiologist-authored responses, ChatGPT-generated answers to preoperative patient questions had significantly lower reading grade levels and higher PEMAT-P understandability and actionability scores, with less variability across outputs. LLMs may offer a scalable approach to improving the accessibility of perioperative communication, but clinical use should remain guided by human oversight to ensure accuracy, appropriateness, and equity in patient care.

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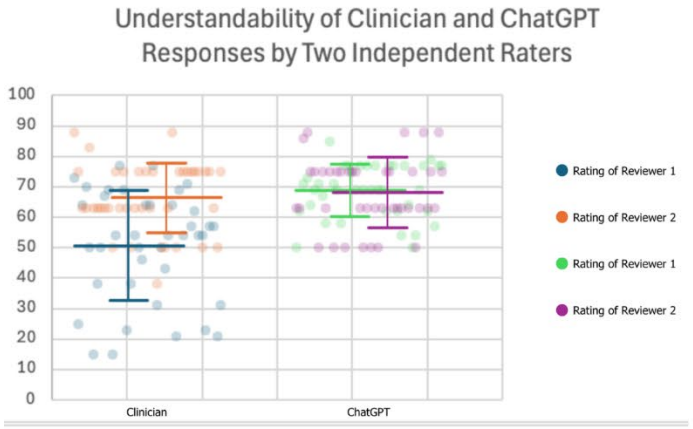
Understandability of Clinician and ChatGPT Responses by Two Independent Raters
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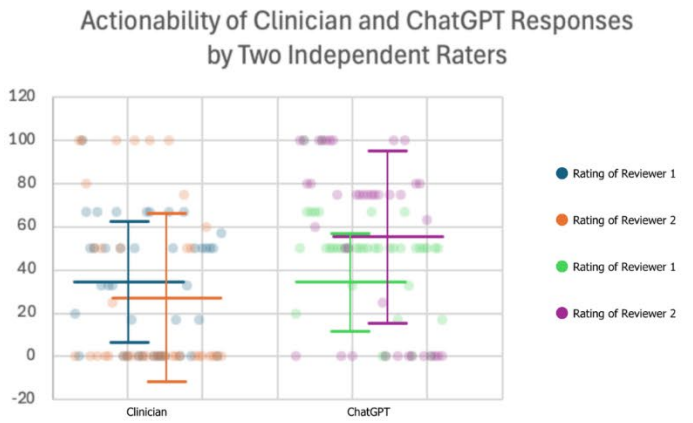
Rating of Reviewer 2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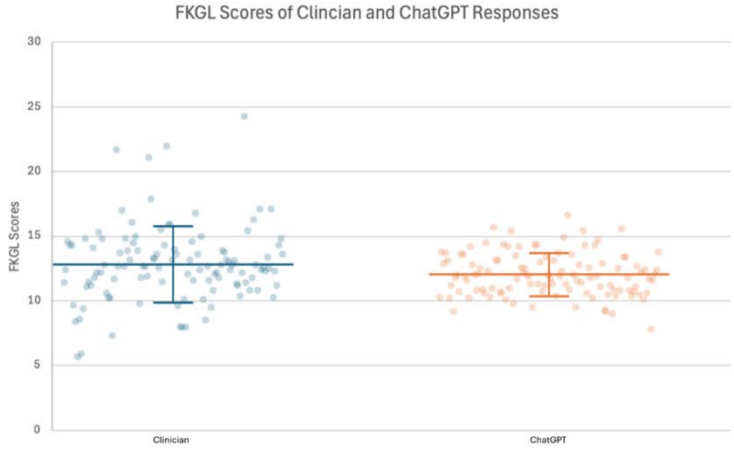
FKGL Scores of Clincian and ChatGPT Responses
FKGL Scores
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10
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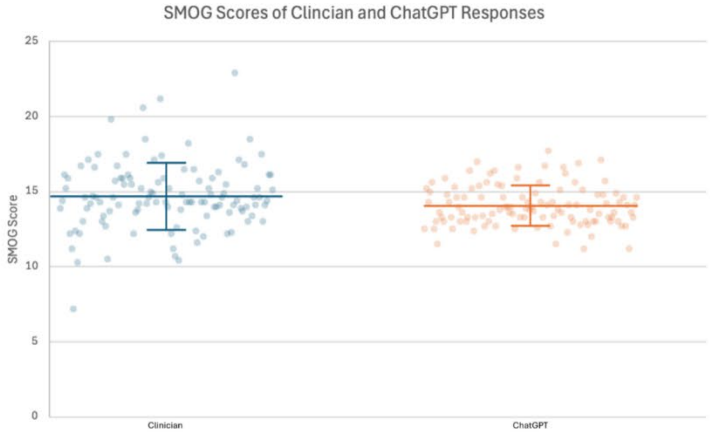
Clinician
ChatGPT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SMOG Score
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Clinician
ChatGPT

Figure 1

The association of air pollution on postoperative mortality after inpatient scheduled surgery: a systematic review and meta-analysis

Submission ID

123

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INTRODUCTION

In Canada, nearly 5% of patients die within 1-year after inpatient surgeries of which approximately 2.2 million are performed annually.[1] Few interventions improve these rates, suggesting that broader determinants of health, such as environmental factors, influence postoperative outcomes.[2] The World Health Organization attributes 23% of global deaths to environmental factors.[3] In the general population, air pollutant exposure is associated with inflammation, oxidative stress, and endothelial dysfunction – mechanisms that increase postoperative risk.[4] Although small observational studies have linked air pollution exposure to postoperative mortality, existing evidence remains limited to transplant populations and has not been comprehensively summarized.[5] Clarifying the impact of air pollution on outcomes after surgery could inform patient-level risk stratification and influence policy changes to mitigate population-level exposure. We conducted a systematic review and meta-analysis to quantify the association between air pollution exposure and postoperative mortality among patients undergoing scheduled inpatient surgery.

METHODS

This systematic review (PROSPERO CRD420251081067) is reported according to PRISMA guidelines. We searched MEDLINE, Embase, and Web of Science for English language studies published from January 2005 to March 2025. We included studies of adults (≥ 18 years) undergoing scheduled inpatient surgery and excluded emergency and outpatient

procedures. Eligible environmental exposures were ambient $PM_{2.5}$, PM_{10}, NO_2, and O_3 measured using fixed-site monitoring data, geospatial models, or individual monitors. Eligible study designs included randomized and observational studies. Two reviewers independently screened titles and abstracts, assessed full texts, and extracted data with disagreements resolved by a third reviewer. Risk of bias (ROB) was assessed using the Newcastle-Ottawa Scale. The primary outcome was postoperative mortality over any reported follow-up duration after surgery. Maximally adjusted hazard ratios were pooled with random-effects meta-analysis using restricted maximum likelihood estimation for between-study variance. Confidence intervals were calculated using Knapp-Hartung adjustments to account for small numbers of studies. Heterogeneity was quantified using the I^2 statistic. Pollutant exposure estimates were rescaled to a 10 $\mu g/m^3$ increase. Prespecified subgroup analyses examined type of surgery (transplant versus non-transplant), exposure measurement timepoint (preoperative versus postoperative air pollutant measurement), exposure duration (averaged pollutant exposure over less than a year or greater), and follow-up duration.

RESULTS

Our search identified 3861 records and included 13 studies; there were sufficient studies reporting associations between each of $PM_{2.5}$ and PM_{10} with mortality for meta-analysis. Each 10 $\mu g/m^3$ increase in $PM_{2.5}$ exposure was associated with higher risk of postoperative mortality (11 studies; HR 1.24, CI 1.06-1.46; I^2 = 97%). In subgroup analyses, associations between $PM_{2.5}$ and mortality differed by exposure measurement timepoint (postoperative HR 1.33, CI 1.02-1.72 versus preoperative HR 1.03, CI 0.76-1.41; subgroup differences $p < 0.001$) and exposure measurement duration (>1 year HR 1.35, CI 1.05-1.74 versus $\leq$1 year HR 1.08, CI 0.88-1.17; subgroup differences p = 0.03). Associations did not differ by transplant versus non-transplant surgery (p = 0.13) or follow-up duration (p = 0.73). PM_{10} exposure was not associated with postoperative mortality (6 studies; HR 1.15, CI 0.83-1.61; I^2 = 83%). Most studies were of low ROB in terms of outcome ascertainment.

DISCUSSION

Higher $PM_{2.5}$ exposure was associated with increased postoperative mortality after scheduled inpatient surgery. Heterogeneity was substantial due to diversity in included procedures, countries, and exposure assessments. Subgroup analyses suggested associations between $PM_{2.5}$ and mortality in subgroups with exposure measurement periods longer than one year, and included the postoperative period. These findings support considering exposure to airborne fine particulate matter over longer durations and during the postoperative period as a potential risk factor for death after surgery. Future research is needed to identify mechanisms underlying this association, and to identify pollutant exposure thresholds that support postoperative recovery.

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A

Study	Design	Sample Size (N)	Pollutants	Type of Surgery	Exposure Timepoint	Exposure Duration (>1 year or ≤1 year)	Follow-up Duration (years)[a]
Al-Kindi et al. (2019)	Retrospective Cohort	21,800	PM2.5	Heart Transplant	Postoperative	>1 year	Median 4.8
Ambuieya et al. (2024)	Retrospective Cohort	18,265	PM2.5	Lung Transplant	Postoperative	>1 year	Maximum 10
Chang et al. (2021)	Retrospective Cohort	112,098	PM2.5	Kidney Transplant	Postoperative	>1 year	Median 6
Chuang et al. (2024)	Retrospective Cohort	7426	PM2.5, PM10, O3, NO2	Orthopedic	Preoperative and Postoperative	>1 year	1 year
Dehom et al. (2021)	Retrospective Cohort	93,695	PM2.5, O3, NO2	Kidney Transplant	Postoperative	>1 year	Median 14.91
Deo et al. (2024)	Retrospective Cohort	26,403	PM2.5	Cardiac	Postoperative	>1 year	Median 4.9
Feng et al. (2021)	Retrospective Cohort	87,223	PM2.5	Kidney Transplant	Preoperative and Postoperative	≤1 year	Median 5.3
Kim et al. (2021)	Retrospective Cohort	1146	PM10	Kidney Transplant	Postoperative	≤1 year	1
Liu et al. (2023)	Prospective Cohort	3327	PM2.5, O3	Thoracic	Postoperative	≤1 year	Mean 2.14
Oh et al. (2024)	Retrospective Cohort	244,766	PM2.5, PM10, O3, NO2	Abdominal/Thoracic	Preoperative	≤1 year	1
Spencer-Hwang et al. (2011)	Retrospective Cohort	32,239	PM10, O3	Kidney Transplant	Postoperative	>1 year	Maximum 7
Urbanowicz et al. (2024)	Retrospective Cohort	283	PM2.5, PM10, NO2	Cardiac	Postoperative	>1 year	Median 5.3
Yoon et al. (2020)	Retrospective Cohort	398	PM2.5, PM10, O3, NO2	Neurosurgical	Preoperative	≤1 year	1

[a] Follow-up duration reported as presented in the original studies. Participants were followed until the outcome of interest, or follow-up was administratively censored at the study-specified maximum duration or at a fixed analytic window (e.g., 1-year mortality).

B

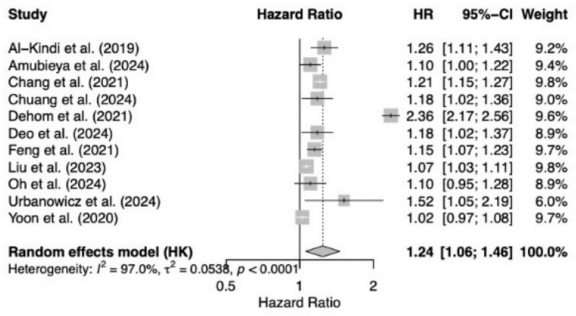

Figure 1. The association between air pollutant exposure with postoperative mortality following scheduled inpatient surgery. **(A)** Characteristics of included studies. **(B)** Primary analysis of association between PM2.5 exposure with postoperative mortality following scheduled inpatient surgery.

The digital teammate: real-world validation of a multidisciplinary AI platform for preoperative patient education

Submission ID

121

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INTRODUCTION

Preoperative education is essential for patient understanding, adherence to instructions, and optimization of surgical outcomes.[1] However, traditional approaches to patient education often rely on paper-based materials and brief clinical encounters, which may be insufficient in complex surgical settings and are further limited by fragmented delivery and time constraints.[2,3] These limitations may disproportionately affect individuals with language barriers or limited health literacy, leaving some patients uncertain about perioperative expectations and how to follow instructions. Artificial intelligence (AI) models offer a potential solution, but remain largely untested in clinical contexts and may be vulnerable to factual inaccuracies or hallucinations.[4] Retrieval-augmented generation techniques have been developed to improve the clinical reliability of AI models by constraining outputs to a curated knowledge base.[5] AI systems enhanced with retrieval-augmented generation may provide consistent, accessible, and institution-aligned preoperative education, potentially improving the reach and reliability of perioperative communication while complementing existing clinical workflows.

METHODS

Our multidisciplinary team developed the *Digital Teammate*, an AI-powered perioperative education platform that is bilingual (English/French) and multimodal (text, audio, video). The system is built on an open-source LLaMA large language model framework using retrieval-augmented generation grounded in an institution-specific perioperative knowledge base to support locally aligned information delivery. User acceptance testing (UAT) of the *Digital Teammate* was carried out at a Canadian tertiary care hospital between October 10 and November 5, 2025. A QI exemption was granted by our institution's REB. The UAT consisted

of a bilingual survey of both clinicians and patient partners who were asked to rate statements on a 5-point Likert scale (1=strongly disagree, 5=strongly agree) based on their experience using the *Digital Teammate*. The domains assessed by the UAT were understandability & actionability, conversational quality & personalization, multimodal features, and anesthesia & surgery education. Multimodal and system usability was also assessed through the same Likert scale. Acceptability in these domains was summarized using mean item ratings, domain means, and a pooled endorsement rate defined as the proportion of ratings ≥4 ("agree/strongly agree"). Technical support need was recorded as Yes/No.

RESULTS

23 patient partners and 35 clinicians completed the UAT. Across the core acceptability items, mean (SD) rating was 4.49 (0.55) for patient partners and 4.19 (0.69) for clinicians, with pooled endorsement 87.5% and 79.3%, respectively. Domain means were highest for multimodal features (patient partners 4.64 [0.49]; clinicians 4.44 [0.69]) and anesthesia & surgery education (patient partners 4.60 [0.57]; clinicians 4.38 [0.93]). Usability items were comparatively lower: mean 3.85 (0.78) for patient partners and 3.81 (0.79) for clinicians; endorsement 68.3% and 66.9%, respectively. Few respondents reported needing technical support (2/23 [8.7%] patient partners; 3/35 [8.6%] clinicians). Notable responses within the acceptability items for patient partners were that 78% reported they would use the *Teammate* again, 70% felt more prepared for surgery and 65% had a better understanding of their surgery after using the *Teammate*.

DISCUSSION

A bilingual, multimodal, institution-grounded AI perioperative education platform demonstrated strong acceptability among patient partners and clinicians, with particularly high ratings for clarity, multimodal support, and perioperative education content. Usability scores were modestly lower than content ratings, suggesting opportunities to streamline interaction design and multimodal delivery before broader clinical workflow integration. Based on the success of the preliminary testing, further research is planned to prospectively evaluate the *Digital Teammate's* effects on comprehension, anxiety, adherence, and perioperative operational outcomes in preoperative patients.

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The impact of preoperative opioid education on postoperative opioid consumption in adult surgical patients: a systematic review

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210

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INTRODUCTION

The opioid crisis in Canada continues to underscore the need for effective strategies aimed at reducing opioid use. Opioid associated years of lost life (YLL) have increased by 142% in Canada between 1990 and 2014 while globally it reduced by 10.1% (Orphana et al., 2018), and overall, opioids are the third largest substance use-associated cost to the Canadian economy, accounting for $7.1 billion and has increased from 2007 to 2020 by 66.6% (CSUCH, 2023). Despite these concerns, opioids remain a key component to multimodal pain management strategies and thus necessitate innovative risk reduction techniques. Preoperative opioid education has been explored across various surgical fields and demonstrates promise as a method to decrease opioid consumption (Darville-Beneby et al., 2023). This study aims to systematically evaluate the effects of preoperative opioid education on postoperative opioid consumption among adult surgical patients.

METHODS

We conducted a literature search using the Ovid MEDLINE, Embase, and EBM Reviews CCRCT databases of articles published between January 1946 – November 2024. The review included all study types published in English involving preoperative opioid education to adult surgical patients and assessed their postoperative opioid consumption. Results were summarized in a tabular format. The Newcastle-Ottawa Scale and the Cochrane Risk of Bias assessment tool were used to assess study quality, and the GRADE approach was used to assess evidence quality.

RESULTS

Twenty-five studies that met the inclusion criteria were screened and assessed. A total of 2,015 patients were included in this review, with 1,095 patients receiving opioid education

and 920 patients not receiving any education. Most studies are randomized controlled trials, while some are observational. Most studies are from the USA, with one each from Canada, Hong Kong, and the Netherlands. The methods of preoperative education included a short film, a brochure, a learning session, a booklet, a pamphlet, video sessions, tutorials, handouts, education cards, and counselling sessions. Due to heterogeneity in type of outcome and surgical procedure, a meta-analysis was not performed. Nineteen studies concluded that preoperative opioid education reduced postoperative opioid consumption, while six studies reported no significant differences in postoperative opioid consumption. The quality of the studies ranged from low to moderate, and the overall level of evidence was low.

DISCUSSION

Opioid addiction and overdose continue to present a critical public health challenge, contributing significantly to morbidity and mortality. Each post-opertive opioid perscription refill or week of opioid use is associated with a 44% increased risk of misuse (Brat et al., 2018). Nonetheless, opioids remain an important component of perioperative multimodal pain management, therefore, strategies designed to facilitate safe and appropriate opioid use is fundamental to reduce the risk associated with its use. Preoperative opioid education may be associated with reduced postoperative consumption. Further research is needed to determine the best methods for delivering preoperative education to surgical patients.

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The relative efficacy of different exercise prehabilitation components on postoperative outcomes in adult patients undergoing elective surgery: a systematic review and component network meta-analysis

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111

AUTHORS

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INTRODUCTION

Prehabilitation proactively prepares patients for surgery through exercise, nutrition, psychological support, cognitive training, or a combination thereof (1,2). Previous network meta-analysis (NMA) suggest that exercise, along with multimodal prehabilitation inclusive of exercise, may meaningfully reduce complications, shorten length of stay (LoS), improve health-related quality of life (HRQoL) and enhance physical recovery (3). However, exercise includes subcomponents such as aerobic, respiratory, strength, and functional interventions. Which of these exercise subtypes are most effective remains unknown.

We estimated the relative efficacy of different exercise subcomponents and their combinations in adults preparing for elective surgery. We conducted a systematic review with both NMA and component NMA (CNMA) to compare and rank strength training, aerobic exercise, functional exercise, and respiratory training on complications, LoS, HRQoL, and physical recovery.

METHODS

This review did not require ethics approval. Methods followed Cochrane guidelines; a protocol was registered. A PRESS-reviewed search strategy was used across Medline, Embase, CINAHL, PsycINFO, Web of Science, and the Cochrane Database (through April 2025). Screening and data extraction were done in duplicate.

We included randomized controlled trials (RCTs) of adults (>18 years) receiving exercise prehabilitation for at least 7 days prior to elective surgery, compared to usual care or other interventions. Eligible studies reported at least one critical outcome (complications, LoS,

HRQoL, physical recovery). Risk of bias was assessed in duplicate.

Random effects NMA, after checking appropriate assumptions, was used to estimate odds ratios (OR) for binary outcomes, and mean differences (MD) or standardized MD (SMDs) for continuous outcomes, compared to usual care. The I^2 statistic estimated heterogeneity, interventions were ranked using P-scores. Certainty of evidence was evaluated using CINeMA. We conducted CNMA as a sensitivity analysis.

RESULTS

Of 5,518 citations, 54 RCTs (n=4,717) were included. Aerobic exercise was most frequent (67%), followed by respiratory (44%), functional (37%), and strength training (37%); 59% employed multimodal interventions.

For complications (43 RCTs, n=3,257; I^2 52%), combined aerobic, respiratory, and functional training was most effective (P-score 0.74; OR 0.34, 95% CI 0.11–0.99). Respiratory training alone also significantly reduced risk (OR 0.40, 95% CI 0.22–0.70).

For LoS (54 RCTs, n=4,717; I^2 76%), combined aerobic, respiratory, and functional exercise had the greatest effect (P-score 0.89; MD -2.0 days, 95% CI -3.7 to-0.4), as well as aerobic plus respiratory (MD −2.0, 95% CI −2.8 to−1.2), and respiratory training alone (MD −0.8, 95% CI −1.3 to−0.2).

For HRQoL (29 RCTs, n=2,115; I^2 39%), only aerobic plus strength training improved outcomes (P-score 0.97; SMD 1.00, 95% CI 0.22–1.78).

For physical recovery (35 RCTs, n=1,726; I^2 66%), isolated strength training improved recovery (SMD 0.34, 95% CI 0.005–0.68).

DISCUSSION

This systematic review and network meta-analysis suggests that benefits of exercise prehabilitation vary by subcomponent and outcome. For clinical outcomes, including complications and LOS, programs combining aerobic and respiratory training were most effective, while component analysis identified respiratory training as the only modality beneficial in isolation. For patient-centered outcomes, strength training improved physical recovery, whereas combined aerobic and strength interventions improved HRQOL. Overall, these findings emphasize tailoring prehabilitation programs to outcomes prioritized by patients and health systems. Future research should define optimal combinations, dosing, and delivery strategies, and prioritize multicenter randomized trials to evaluate high-impact interventions and guide clinical implementation.

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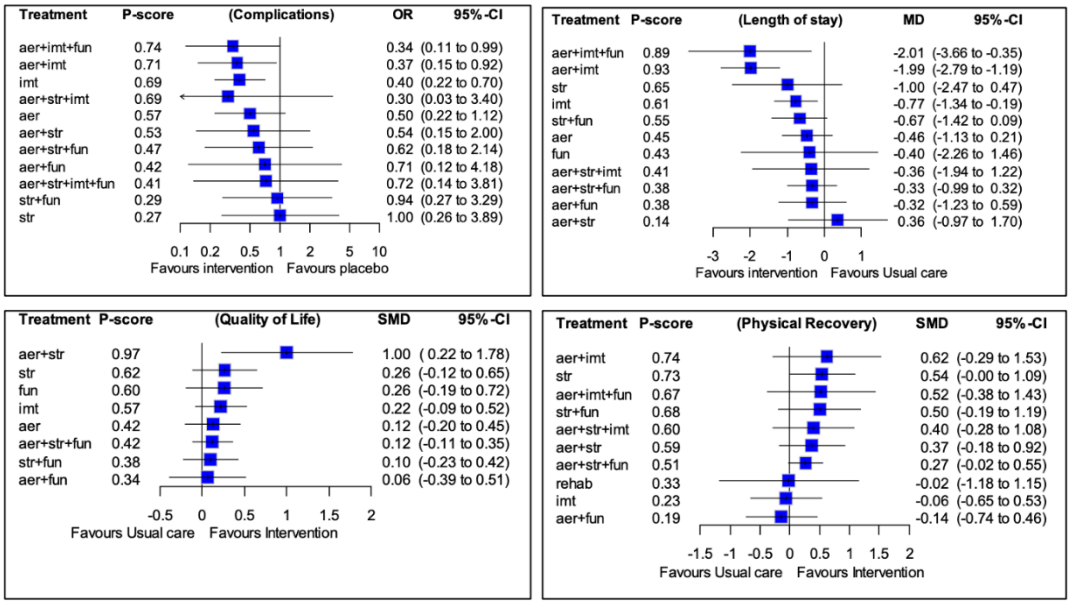

Figure 1

Utilizing electronic health record based interventions to promote smoking cessation: a systematic review

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179

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INTRODUCTION

Recent national data estimate that 11% of adults in Canada smoke, representing a significant population encountered across both inpatient and outpatient care settings [1]. Although smoking cessation support has been associated with increased abstinence and improved health outcomes, its delivery remains challenging and inconsistent across healthcare settings [2]. Hence, many patients who smoke are not receiving timely or systematic support during their care.

Electronic health records (EHRs) may facilitate smoking cessation interventions by embedding support such as automated screening, clinician prompts, referrals, and patient-focused digital tools [3]. Despite growing adoption of these approaches, their effectiveness in improving smoking cessation support and patient-related outcomes has not been comprehensively evaluated in recent years [3]. This systematic review examines the impact of EHR-based interventions on smoking cessation support delivery and cessation outcomes.

METHODS

We conducted a systematic review following PRISMA guidelines [4]. This review evaluated the effectiveness of EHR-based smoking cessation interventions across all healthcare settings. Randomized and non-randomized studies published in English were eligible, including observational and pre-post design studies. Studies involving adult patients (≥18 years) who smoke and evaluated EHR-enabled smoking cessation interventions were included. Eligible interventions incorporated EHR components including automated identification of smoking status, clinician prompts, electronic referrals, prescribing pharmacotherapy, or patient-directed digital messaging. Comparator conditions included usual care or standard clinical workflows without EHR-based smoking cessation support.

Databases including MEDLINE, Embase, PubMed, Cochrane, Web of Science, BIOSIS, LILACS, Global Index Medicus, African Index Medicus, and Scopus were searched from inception until June 16, 2025. Four reviewers in pairs screened the studies and extracted data on study characteristics, interventions and outcomes. Outcomes of interest included delivery of smoking cessation counselling, documentation of smoking status, and smoking-related behavioural outcomes. Risk of bias was assessed independently by four reviewers working in pairs using the Cochrane Risk of Bias 2 tool for randomized studies and ROBINS-I V2 for non-randomized studies, with disagreements resolved by consensus or a third reviewer. Where appropriate, data were pooled using random-effects meta-analysis; otherwise, results were synthesized narratively.

RESULTS

Thirty-five studies were included, characterizing patients seen in primary care clinics, inpatient clinics, and outpatient-based clinics. Sample sizes ranged from 100 to 150,000 participants, with mean age ranging from late 20s to late-80s. Of the included studies, 11 (31%) were randomized controlled trials (RCTs) and 24 (69%) were non-RCTs.

Twenty-five of 35 studies reported documentation of smoking status and/or providers delivering counselling. Among these, 22 of 25 studies reported increased documentation, and 12 of 25 studies reported higher rates of providers delivering counselling. Twenty-six of 35 studies reported greater prescription of cessation pharmacotherapy, and 13 of 26 studies reported increased Quitline referral rates following EHR-based interventions.

Smoking abstinence rates were reported in 12 studies. Three showed increased abstinence immediately following the EHR-based intervention, four of six reported increased abstinence at 3-6 months, and three found no difference at 12-months compared with usual care.

DISCUSSION

This systematic review suggests that EHR-based smoking cessation interventions are associated with improved documentation of smoking status and prescription of pharmacotherapy across various healthcare settings. However, outcomes including quit attempts were reported infrequently, and long-term abstinence data were often insufficient to support definitive analysis due to low follow-up response rates. Although a few studies reported increased short-term abstinence, future research should focus on collecting data on abstinence to determine whether EHR-based smoking cessation interventions improve long-term abstinence.

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Virtual, innovative, postsurgical care to optimize return home for older people with frailty: the VICTORY pilot randomized trial

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220

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INTRODUCTION

30-40% of older American adults live with frailty, a multidimensional state of vulnerability to adverse health outcomes.[1] Among older surgical patients, frailty is associated with a >2-fold increase in morbidity and patient-reported disability; non-home discharge is increased 5-6 times.[2] Using Integrated Knowledge Translation, we partnered with older surgical patients and caregivers to identify gaps in perioperative care. To address these, a frailty-tailored Postoperative Virtual Care (PVC) program was developed to provide remote monitoring and support after surgery. While PVC in older adults without frailty have demonstrated improved patient satisfaction/outcomes and reduced resource use, a frailty-specific PVC program has not been evaluated.[3] Establishing feasibility is essential prior to wide-scale efficacy testing. The VICTORY Pilot Trial aimed to demonstrate the feasibility of a fully powered, multicenter randomized trial.

METHODS

We conducted a parallel-arm, multicentre randomized vanguard trial at two hospitals in Ontario. Ethics approval was obtained through Clinical Trials Ontario (CTO Project ID 4745). Eligible participants were adults >60 years with frailty (CFS >4)[2,4] undergoing planned, noncardiac surgery. Participants randomized to the intervention received a frailty-tailored PVC program comprising a cellular-enabled tablet, Cloud DX remote monitoring for vital signs and wound assessment, and virtual nursing support for 7 days post-discharge. Remote monitoring recorded twice-daily vitals, daily recovery surveys, nurse assessments every two days, and automated escalation to physician review when concerns or predefined thresholds were met. Frailty-specific enhancements followed the geriatric 4Ms framework,[5] including delirium screening (Mind), medication review and analgesic support (Meds), identification of functional deficits (Mobility), and monitoring of food intake (Malnutrition). Feasibility outcomes included recruitment (>6 participants per centre per month), intervention fidelity (completion of four assessments), and follow-up (>90%). As a vanguard

trial, we also collected clinical outcomes for the planned full trial, including Days Alive at Home and healthcare utilization. A sample size of 96 participants was selected to ensure adequate precision around feasibility estimates.

RESULTS

Of 305 individuals screened, 117 were eligible (38.4%), and 96 (82.0% of eligible) consented and were randomized (49 to PVC; 47 to usual care), achieving a recruitment rate of 6 participants per centre per month. In the PVC arm, 1 participant was excluded due to surgical cancellation, 2 formally withdrew from the trial, 2 were discontinued from the intervention but remained in follow-up, 4 opted out of the intervention but continued follow-up, and 3 remain in the intervention period. Among the 37 participants who completed the PVC intervention, all (100%) completed the required four assessments; 2 required brief readmission during the intervention window but completed assessments after discharge. To date, 91 participants have reached the 30-day outcome assessment; after accounting for 2 withdrawals and 1 exclusion, 88 were eligible for analysis, of whom 80 (90.0%) completed the 30-day assessment.

DISCUSSION

A pragmatic, multicenter randomized vanguard trial of the PVC program, combining remote monitoring and virtual nursing support for older adults living with frailty, appears to be feasible based on strong recruitment, intervention fidelity, and participant retention. Findings from this vanguard phase support progression to a fully powered trial designed to determine whether randomization to PVC leads to clinically meaningful improvements in patient-centered outcomes, including Days Alive at Home and healthcare utilization.

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