Development of a standardized set of core metrics to assess the quality of anesthesia, perioperative care, and acute pain management in Canada: scoping review and multidisciplinary consensus Delphi study

Study Protocol

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Protocol Abstract

Background

Improving anesthesiology care and perioperative outcomes is a growing field encompassing quality improvement and quality assurance, research, and continuing medical education. Multiple consensus initiatives have standardized perioperative endpoints. However, no standard set of metrics exist to evaluate the quality of Canadian anesthesia care delivery.

Objective

Develop a consensus core list of metrics which can be used to evaluate the quality of anesthesia, perioperative care, and acute pain management for adult inpatient non-cardiac surgical patients for use in quality improvement and quality assurance, research, and continuing medical education in the Canadian care context.

Methods

First, the steering committee will conduct a scoping review of the literature to identify candidate metrics, according to Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for scoping reviews (PRISMA-ScR) and Joanna Briggs Institute methodology for scoping reviews. Metrics will include patient-reported outcome and patient-reported experience measures, quality and safety indicators, process metrics, and Canadian Anesthesiologists' Society recommended practice standards. The search strategy will include English-language articles published or in use within the past seven years (2015/Jan-2022/March) in 1) MEDLINE, Embase, CINAHL, Web of Science, and Cochrane Database of Systematic Reviews, 2) grey literature, including guidelines, and 3) existing evaluation metrics used by Canadian departments for quality assurance and improvement. Screening and data extraction will be performed by two independent reviewers using Covidence.

Next, following approval from the Research Ethics Board and with written informed consent from participants, a multidisciplinary panel of anesthesiologists, people with lived surgical experience (patients, caregivers), surgeons, nurses, internal medicine and family physicians, hospital administrators, and researchers will iteratively review the list of candidate metrics using a modified Delphi process. Independent voting, using surveys over three rounds, will be used to identify the most important metrics to define the quality of anesthesia, perioperative care, and acute pain management. Additional cycles may be performed if required.

Impact and dissemination

This study will establish a core set of Canadian consensus metrics for evaluating anesthesia, perioperative care, and acute pain management.

Study Protocol

Introduction

Improving anesthesiology care and perioperative outcomes is a growing field encompassing quality improvement and quality assurance, research, and continuing medical education (1). With the scope of anesthesiology practice expanding further into the perioperative domain, a greater focus on postoperative recovery and longer-term outcomes is warranted (2). Multiple consensus initiatives have standardized perioperative endpoints (3–5). However, no core list of metrics exists to evaluate the quality of Canadian anesthesia, perioperative care, and acute pain management in the context of a broad range of existing patient-reported outcome and experience measures, quality and safety indicators, process metrics, and practice standards.

With the increasing adoption of Anesthesia Information Management Systems, Electronic Health Records, and patient-facing virtual care platforms, we have the opportunity to routinely and systematically collect patient-reported and system-collected data to measure anesthesiology performance. By enabling personalized feedback and learning health system approaches, a standardized set of metrics may provide the foundation for further targeted research and interventions to improve anesthesia, perioperative care, and acute pain management for Canadians (1). In this study, we will engage a diverse, multidisciplinary panel to answer the question: what defines quality in anesthesiology, perioperative medicine, and acute pain management in Canada, and how should we quantify it?

Objectives

The overall objective is to develop a consensus list of metrics which can be used to evaluate the quality of anesthesia, perioperative care, and acute pain management for adults undergoing inpatient non-cardiac surgeries that can be used for quality improvement and quality assurance, research, and continuing medical education in the Canadian care context.

The specific metrics will be obtained using the following approach:

1. Obtain a list of candidate metrics through a scoping literature review. For each metric, information will include a) definition(s), b) studies on validity/feasibility and level of evidence, c) timing of measurement, and d) population(s) studied
2. All outcome metrics, as well as process/structure metrics that have limited supporting evidence, will go through a multidisciplinary modified Delphi consensus process, using surveys, to 1) select and mark the importance for each metric, and 2) select a core set of the most important metrics.

Methods

Study Design Overview

First, the steering committee will conduct a scoping review of the literature to obtain a list of metrics that have been validated and/or are in clinical use to evaluate anesthesia, perioperative care, and acute pain management, to use as a starting point for the modified Delphi process. Then, following approval from the University of British Columbia Research Ethics Board and with written informed consent from participants, a multidisciplinary panel will identify the most important metrics using a modified Delphi process, in accordance with existing literature including the Core Outcome Set-STAndards for Development (The COS-STAD) recommendations (3,6–11). In the last Delphi cycle, the panel will be asked to select the most essential items into a core set of metrics.

Stage 1. Scoping Review

We will first conduct a scoping review according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for scoping reviews (PRISMA-ScR) (12) and the Joanna Briggs Institute methodology for scoping reviews (13). The purpose of this scoping review is to explore the evidence on the use of metrics to assess the quality of anesthesia, perioperative care, and acute pain management as reflected in the literature. A scoping review has been selected as the methodology of choice for this review because standardized metrics in perioperative care are an emerging area of research. The scoping review was registered on 2022-03-21 as https://doi.org/10.17605/OSF.IO/8BNVW.

Search strategy

The metrics included in our scoping review are patient-reported outcome and patient-reported experience measures, patient satisfaction, quality indicators, safety indicators, practice guidelines, process metrics, and other existing metrics. An initial search (Appendix 1) of MEDLINE (Ovid) was co-developed with guidance by a research librarian (E.L.).

The search strategy for this review aims to identify both published and unpublished studies. A three-step search strategy will be utilized. An initial limited search of MEDLINE (Ovid) will be undertaken followed by an analysis of the text words contained in the titles and abstracts, and of the indexed terms used to describe the articles. A second full search strategy using all identified keywords and indexed terms will then be undertaken on MEDLINE (Ovid) and across all other databases. The other databases to be searched will include MEDLINE (Ovid), Embase (Ovid), CINAHL (EBSCOhost), Web of Science, and Cochrane Database of Systematic Reviews (Ovid). Third, the reference list of all identified reports and articles will be searched for additional studies.

Studies from 2015/Jan-2022/March will be considered for inclusion in this review. This start date was chosen because end of 2014 was the end date of the last comprehensive searches in this area from previous studies (4,14). Only articles published in English will be included because of a lack of resources for translating non-English articles. Also, grey literature including guidelines, and existing evaluation metrics used by Canadian departments for quality assurance and improvement will be searched.

Inclusion criteria:

- Human adults
  Note that this was conducted using search terms that excluded journal names in the field of pediatric patients. First, the filters for "adult" are not the same for all databases that will be searched. For instance, the limit for adult on MEDLINE (Ovid) is age 19+ years and Embase (Ovid) is 18 to 64 years. Second, we found that some articles were not indexed by the age filter, which we did not wish to miss. As such, we will manually filter for articles with an adult age group (18+).
- Must involve surgical patients requiring the presence of an anesthesiologist for anesthetic care, specifically for inpatients undergoing non-cardiac surgery.
  Note that cardiac surgery is not included as an exclusion in the search strategy but rather will be manually excluded during screening, as we found using search filters excluded non-cardiac surgeries.
- Must include at least one metric, with at least one definition for the metric. We will include patient-reported outcome and patient-reported experience measures, Canadian guidelines, and Canadian Anesthesiologists' Society recommended practice standards.
  Since there is an ongoing umbrella review registered on PROSPERO (15), we excluded quality indicators from the database search strategy and will use the results directly from the review. Since the umbrella review only included systematic reviews and may not account for metrics in recent guidelines and clinical use, we will include quality indicators from our grey literature search.
- Published or in clinical use within the past 7 years (2015/Jan to 2022/March), to focus on contemporary metrics and because end of 2014 was the end date of the last comprehensive search in this area (14).
  Note that only the latest version of guidelines will be included.
- For published studies only: full-text articles, study types being only experimental and epidemiological study designs (including randomized control trials, non-randomized control trials, quasi-experimental studies, before and after studies, prospective and retrospective cohort studies, case-control studies, and analytical cross-sectional studies), scoping/systematic review, and/or meta-analysis.

Exclusion criteria:

- For published studies only: we will exclude articles that are case reports, case series, letters, opinion pieces, commentaries, or editorials.
  Due to the availability of multiple reviews and consensus guidelines, these article types will likely not contribute relevant additional information that is not already covered by other included sources. Study protocols are not excluded as they may contain metrics being used in contemporary original research.
- Studies reporting on ambulatory or outpatient surgery (i.e., those who do not require at least an overnight stay).
- Articles published in a language other than English.

Grey literature search:

Since there exist multiple reviews on perioperative process and structure quality indicators to leverage, which included grey literature searches themselves, we will not perform grey literature search on these metrics. Instead, we will search websites of anesthetic and surgical societies in Canada, United States, United Kingdom, and Europe for guidelines and standards, and include existing standards from the Multicentre Perioperative Outcomes Group (MPOG) (published in 2015/Jan-2022/March as per above).

Sources of guidelines to be searched will include:

- CPG Infobase (https://joulecma.ca/cpg/homepage/)
- ECRI Guidelines Trust (https://guidelines.ecri.org/)
- Guideline Central (https://www.guidelinecentral.com/guidelines/)
- Guidelines International Network (https://g-i-n.net/)
- TRIP database (https://www.tripdatabase.com/

Existing metrics used in Canada:

We will contact all Canadian anesthesiology departments as listed in a recent national survey (16) through the Canadian Anesthesiologists' Society (e.g. Association of Canadian University Departments of Anesthesiology (ACUDA) and the electronic mailing list to department heads) and individually to obtain lists of metrics already being used to measure anesthesia, perioperative care, and acute pain management by email, with up to a maximum of two follow-up attempts by email. Departments will not be identified in which metrics they capture in their institutions.

Inclusion and exclusion of metrics

Based on previous literature, there are >200 potential metrics. In order to narrow down to a logistically manageable list of candidate metrics (approximately 50 prior to Cycle 1 of Delphi), we will use the following objective criteria.

Inclusion:

- The Delphi panel is most useful when evidence is limited. If there is a high level of trial evidence supporting a process indicator for influencing outcomes (e.g., Grade 1a), the metric will be part of the final metric (including core metric) lists without going through the Delphi cycles. Participants will be informed about these metrics at the start of the questionnaire for each Delphi Cycle.
- Since research in patient-reported outcome and patient-reported experience measures is limited, we will include these metrics regardless of level of evidence.
- Process metrics must have direct anesthesiologist involvement according to the standard of care.

Exclusion:

- Metrics specific to a certain surgery (i.e., not generalizable to the average patient undergoing inpatient surgery).

- Structural indicators that cannot be changed at an individual and/or departmental level (e.g., availability of blood bank near a hospital). Structural indicators may be reflected in other metrics and can be examined during root cause analysis.
- The process or structure indicator has strong evidence (Grade 1a) for lack of difference in patient or system outcomes.

Article selection

All articles found from the database searches will be uploaded into Covidence (Veritas Health Information, Melbourne, Australia) and duplicates will be removed. Titles and abstracts will be screened by two independent reviewers based on the inclusion/exclusion criteria for eligibility. Selected articles from screening will be retrieved in full-text and assessed by two independent reviewers against the inclusion/exclusion criteria to select studies for data extraction. Disagreements between reviewers will be resolved through discussion, and if not resolved, additional reviewer(s) will be involved in the discussion until a consensus is achieved. The search, screening, inclusion, and exclusion process will be reported in a final scoping review and demonstrated on the PRISMA flow diagram (12).

Data Extraction

Two independent reviewers will extract data from each article using a standardized data extraction form in Covidence that can be exported to Excel for further analysis (Appendix 2), including details about the participants included (cohort characteristics), methodology (definition(s) of metrics, validation of metrics, timing of measurement), and any other data relevant to the review questions (e.g., feasibility of implementation). Disagreements between reviewers will be resolved through discussion, and if not resolved, additional reviewer(s) will be involved in the discussion until a consensus is achieved. If required, the steering committee will contact authors for missing data, with up to a maximum of two attempts by email. If a systematic review is retrieved for a category of metrics, data will be directly extracted from the review, and only articles published after the search date of the review articles will undergo data extraction since the previous articles were likely already included. A draft data extraction form (Appendix 2) will be piloted on two studies and revised if needed and reported in the final manuscript.

Scoping review data analysis and presentation

The results of the scoping review will be synthesized narratively, in the form of tables and text, and supporting data will be directly extracted from the included studies or reports. For each metric, we will report definition(s) of metrics, type of metric per Donabedian category (structure, processes, and outcomes), validation, timing of measurement, number of patients and population studied, feasibility, type(s) of study. The steering committee may also group the metrics into specific themes or domains (e.g., patient comfort).

Metrics may be grouped together amongst similar metrics if their definitions were deemed sufficiently similar as agreed per consensus amongst the steering committee. Patient-reported measures will be grouped by the outcome or experience of interest with a list of the specific measures, rather than the measures as individual items (for example, quality of recovery instead of the specific Measuring quality of recovery-15 (QoR-15) scale).

The steering committee will work with the patient partner and the patient advisory group to ensure that the language describing the metrics is understandable to a general audience with at least grade six education, particularly for the process metrics. Within the Delphi survey, for each metric there will be a brief description of what it is and why it might be important, and expandable links for further explanation and details for each metric (e.g., the items for a patient-reported outcome or experience measure), as deemed necessary by the steering committee.

Stage 2. Modified Delphi consensus process

Study Population

We aim to recruit 77 participants with the following characteristics (accounting for 30% attrition rate (9,17)):

- 26 anesthesiologists
- 26 patients and/or their family members/caregivers
- 9 surgeons, one from each of the following specialties (may include clinician-researchers):
    - General surgery
    - Neurosurgery
    - Obstetrics and gynecology
    - Orthopedic surgery
    - Otolaryngology
    - Plastic surgery
    - Thoracic surgery
    - Urology
    - Vascular surgery
- 4 nurses
- 8 physicians: 2 each from internal medicine, emergency department, family practice, family practice anesthetists
- 4 health administrators or quality improvement leads

Inclusion Criteria: Adult participants aged 18 and above will be included. Patient/family participants must have undergone a surgical experience within the past three years, and have the capacity to provide informed consent. All other participants must be actively practising in Canada in the disciplines they represent.

Exclusion Criteria: Participants with self-declared conflicts of interest with this project.

While the study will primarily be conducted in English using BC Children's Hospital Research Institute's REDCap survey system (18,19), to ensure representation, participants will not be excluded based on language or technology limitations. During recruitment, patients could indicate accommodations required, including translation and submitting study materials through postal mail. The steering committee will review the degree to which accommodations would be feasible within the human resources and study budget.

Recruitment, consent, panel selection, and withdrawal

We aim to recruit a geographically and culturally diverse sample of participants that is representative of the Canadian population and care settings, following principles of equity, diversity, and inclusion (EDI). We will aim to recruit broadly to obtain representation in areas including but not limited to: provinces and territories across Canada, gender, indigenous communities, visible minority groups, urban vs. rural, academic vs. community, anesthesia and surgical subspecialties, and surgical procedures.

Information about the Delphi study will be distributed through multiple channels (2) including Canadian department administrators, Canadian Anesthesiologists' Society mailing lists, Perioperative Anesthesia Clinical Trials group, hospital and provincial support for patient oriented research (SPOR) organizations, established patient engagement platforms (e.g. REACH BC, an established patient research engagement and recruitment platform for BC's health authorities and partner universities), social media (Twitter, Facebook, Instagram), patients in participating hospitals, who granted permission to contact for research purposes, and targeted contact of pre-identified participants.

We request waiver of the requirement for a formal informed consent process as the data for this minimal risk behavioural study is collected exclusively using surveys. With respect to TCPS2 3.7A: a) this research represents a minimal risk to our participants; b) the alteration to the consent process is unlikely to affect the welfare of our participants adversely; c) it would be impracticable to conduct the research if we adopted a formal consent process (involving scheduling phone calls with participants, mailing or emailing consent materials to review beforehand, following up with an electronic consent form), especially as we expect our participants to be distributed across multiple time zones in Canada; d) the initial survey (study information and eligibility check) explains that participants are not required to complete it or any subsequent surveys and we propose that this is sufficient to imply consent, as it is typical for survey-based research; and e) there will be no plan to debrief participants, but at each stage they can email the steering committee to request that their data be withdrawn up to the start of the next Delphi round.

Interested participants will be invited to complete a study information and eligibility check survey in REDCap, which will be available via a shared public link. This survey will present study information that will allow them to confirm their eligibility, and establish their willingness and ability to participate, before submitting their preferred contact email address, which will be used to route all subsequent surveys.

Participant data will be de-identified using study ID throughout the study. The participant will be informed that de-identified results from the eligibility survey will be collected to report the study inclusion/exclusion flow, and that if they do not want these data collected then they should not fill the eligibility survey.

A participant can withdraw from the study and/or their consent to data sharing for research at any time. If this happened prior to the start of the Delphi Round 1, the research team will attempt to recruit replacement(s) if possible.

Participants who completed all components of the study (demographics survey and Delphi) will each receive an electronic gift card of $75 by email as honorarium); those who only complete the initial round will receive an electronic gift card of $25.

Full demographics survey

After providing electronic informed consent, a full demographics survey will be sent to each participant for completion within two weeks. This is based on previous methodology and will include age (in decades), sex, gender, race/ethnicity, and geographical category (urban, semi-urban, rural) of hospital they most frequently interact with for the purposes of surgeries. For patients and/or family members only, we will also ask about their highest education level (grade school, high school, diploma or undergraduate degree, postgraduate degree), income (by Canadian tax brackets), ethnicity, home community location if different from the hospital location (urban, semi-urban, rural), occupation, and type(s) of surgery. For health professionals, we will also ask about primary practice area, years in practice (<5, 5-9, 10-19, >20 yrs), subspecialty training, practice setting (academic, community), and involvement in any of research, quality assurance/improvement, or teaching continuing medical education.

Delphi process

The multidisciplinary panel of participants will iteratively review the list of candidate metrics using a modified Delphi process. While specific guidance on consensus thresholds and the optimal scales are limited, the design will follow best practices from literature (3,6–11). In the last Delphi cycle, the panel will be asked to select the most essential items to include into a core set of metrics.

Independent, anonymous voting using REDCap over three rounds will be used to identify the most important metrics to define the quality of anesthetic care. Each round will be coordinated through the Department of Anesthesiology, Pharmacology and Therapeutics, Faculty of Medicine, UBC.

Participants will be given at least two weeks of notice about an upcoming round, and will have two weeks to complete the REDCap survey for a given round. Reminder emails will be sent 7 and 14 days after the survey opens to those who have not yet completed it. If a survey is still not completed, up to two additional reminders will be sent once a week, and if still no response, the round will be closed. The participant who missed a round will still be able to participate in future rounds. There will be at least two weeks between each round to provide time for the steering committee to analyze the data and prepare for the next round. Additional cycles (beyond the 3rd) may be performed if the objectives have not been achieved.

Delphi Round 1

The initial list of metrics and descriptions from the scoping review will be presented. Participants will independently score each of the listed metrics for importance on a five-point scale (from ‘1=not at all important’ to ‘5=very important’) (8). Participants may also enter comments in free-text if they have any specific feedback or suggestions on a given item, which will be summarized and shared with participants in Round 2. The mean and median scores for each metric will be calculated for overall panel and for subgroups of 1)

patient/caregiver and 2) health provider groups, and will also be presented in Round 2. Metrics receiving a mean score ≥4 by ≥65% of each subgroup and ≤2 by <20% of the subgroups will be retained for voting in Round 2 (8).

Delphi Round 2
Participants will score each metric using the same scale as in Round 1, and suggest revisions or comments as needed. Metrics receiving a mean score ≥4 by ≥65% of each subgroup and ≤2 by <20% of the subgroups will be retained for voting and prioritizing in Round 3.

Delphi Round 3
Prior to Round 3, the study team will review the list of metrics, and aggregate and/or refine their wording as needed. Participants will be presented with a list of metrics with mean and standard deviation scores from the Likert scales, and be asked to vote on which metrics consist of a core set of problems (i.e., must be addressed by the health system as a priority) using a three-point scale of "definitely priority", "equivocal (either way)", and "not a priority" (10,20). Metrics where >70% participants voted "definite" will be marked in the publication as the core metric set. If no consensus is reached, there may be additional rounds of rating using a smaller sample of participants.

Statistical analysis
Analysis will be performed using R (R Foundation for Statistical Computing, Vienna, Austria). Cohort characteristics will be reported using descriptive statistics. Each round of Delphi will be analyzed as described above, and presented both as an overall group and as individual subgroups.

Sample size calculation
There is limited guidance regarding sample size for Delphi processes, but, in general, the key is to choose a broad representation from key stakeholders with a margin of safety built in for possible attrition. Delphi studies often involve a total of 17 members (9) and that adding more participants above 23 did not alter the consensus results (21). We have aimed for broad representation across all the key stakeholder groups. Thus, we chose n = 20 for each of the groups of anesthesiologists and patients. We chose the number of surgeons to represent the primary set of noncardiac surgical specialties. We also accounted for an attrition rate of 30% per literature (9,17) to ensure that there will be sufficient representation in the last cycle despite attrition.

Impact and future directions
This study will develop a set of national consensus metrics for evaluating the quality of anesthesia, perioperative care, and acute pain management that can be used for quality improvement and quality assurance, research, and continuing medical education in the Canadian care context. It aligns with the top ten priorities in Canadian anesthesiology research (2) by informing the core postoperative outcomes to measure. We will engage the Canadian Anesthesiologists' Society, particularly the Quality and Patient Safety and Standards Committees, for knowledge mobilization. The study will be published in an

anesthesia journal and presented at relevant conference(s). Future steps include the identification of the best measures for the core set of metrics according to the COnsensus-based Standards for the selection of health Measurement Instruments (COSMIN) guidelines (22).

References

1. Glance LG, Neuman M, Martinez EA, Pauker KY, Dutton RP. Performance Measurement at a "Tipping Point." Anesth Analg. 2011 Apr;112(4):958–66.
2. McKeen DM, Banfield JC, McIsaac DI, McVicar J, McGavin C, Earle MA, et al. Top ten priorities for anesthesia and perioperative research: a report from the Canadian Anesthesia Research Priority Setting Partnership. Can J Anaesth J Can Anesth. 2020 Mar 10;
3. Myles PS, Boney O, Botti M, Cyna AM, Gan TJ, Jensen MP, et al. Systematic review and consensus definitions for the Standardised Endpoints in Perioperative Medicine (StEP) initiative: patient comfort. Br J Anaesth. 2018 Apr;120(4):705–11.
4. Haller G, Bampoe S, Cook T, Fleisher LA, Grocott MPW, Neuman M, et al. Systematic review and consensus definitions for the Standardised Endpoints in Perioperative Medicine initiative: clinical indicators. Br J Anaesth. 2019 Aug;123(2):228–37.
5. Boney O, Bell M, Bell N, Conquest A, Cumbers M, Drake S, et al. Identifying research priorities in anaesthesia and perioperative care: final report of the joint National Institute of Academic Anaesthesia/James Lind Alliance Research Priority Setting Partnership. BMJ Open. 2015 Dec 1;5(12):e010006.
6. Graham B, Regehr G, Wright JG. Delphi as a method to establish consensus for diagnostic criteria. J Clin Epidemiol. 2003 Dec 1;56(12):1150–6.
7. Diamond IR, Grant RC, Feldman BM, Pencharz PB, Ling SC, Moore AM, et al. Defining consensus: a systematic review recommends methodologic criteria for reporting of Delphi studies. J Clin Epidemiol. 2014 Apr;67(4):401–9.
8. Boney O, Moonesinghe SR, Myles PS, Grocott MPW, Bartoszko J, Beattie WS, et al. Core Outcome Measures for Perioperative and Anaesthetic Care (COMPAC): a modified Delphi process to develop a core outcome set for trials in perioperative care and anaesthesia. Br J Anaesth. 2022 Jan 1;128(1):174–85.
9. Boulkedid R, Abdoul H, Loustau M, Sibony O, Alberti C. Using and reporting the Delphi method for selecting healthcare quality indicators: a systematic review. PloS One. 2011;6(6):e20476.
10. De Meyer D, Kottner J, Beele H, Schmitt J, Lange T, Van Hecke A, et al. Delphi procedure in core outcome set development: rating scale and consensus criteria determined outcome selection. J Clin Epidemiol. 2019 Jul;111:23–31.
11. Kirkham JJ, Davis K, Altman DG, Blazeby JM, Clarke M, Tunis S, et al. Core Outcome Set-STAndards for Development: The COS-STAD recommendations. PLOS Med. 2017 Nov 16;14(11):e1002447.
12. Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. Ann Intern Med. 2018 Oct 2;169(7):467–73.

13. Peters MDJ, Marnie C, Tricco AC, Pollock D, Munn Z, Alexander L, et al. Updated methodological guidance for the conduct of scoping reviews. JBI Evid Implement. 2021 Mar;19(1):3–10.

14. Chazapis M, Gilhooly D, Smith AF, Myles PS, Haller G, Grocott MPW, et al. Perioperative structure and process quality and safety indicators: a systematic review. Br J Anaesth. 2018 Jan 1;120(1):51–66.

15. Nguyen F, McIsaac D, Lalu M, Pysyk C, Hamilton G. Evaluation of important quality indicators in the perioperative period: an umbrella review. PROSPERO 2020 CRD42020164691 [Internet]. [cited 2022 Feb 12]. Available from: https://www.crd.york.ac.uk/prospero/display_record.php?RecordID=164691

16. Kazemi P, Lau F, Simpao AF, Williams RJ, Matava C. The state of adoption of anesthesia information management systems in Canadian academic anesthesia departments: a survey. Can J Anaesth J Can Anesth [Internet]. 2021 Jan 29; Available from: https://rdcu.be/cesb5

17. Bamber JH, Lucas DN, Plaat F, Allin B, Knight M, collaborators for the Obstetric Anaesthetists' Association Quality and Outcomes Working Group. The identification of key indicators to drive quality improvement in obstetric anaesthesia: results of the Obstetric Anaesthetists' Association/National Perinatal Epidemiology Unit collaborative Delphi project. Anaesthesia. 2020 May;75(5):617–25.

18. Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap)--a metadata-driven methodology and workflow process for providing translational research informatics support. J Biomed Inform. 2009 Apr;42(2):377–81.

19. Harris PA, Taylor R, Minor BL, Elliott V, Fernandez M, O'Neal L, et al. The REDCap consortium: Building an international community of software platform partners. J Biomed Inform. 2019 Jul;95:103208.

20. Lange T, Kopkow C, Lützner J, Günther K-P, Gravius S, Scharf H-P, et al. Comparison of different rating scales for the use in Delphi studies: different scales lead to different consensus and show different test-retest reliability. BMC Med Res Methodol. 2020 Feb 10;20:28.

21. Akins RB, Tolson H, Cole BR. Stability of response characteristics of a Delphi panel: application of bootstrap data expansion. BMC Med Res Methodol. 2005 Dec 1;5(1):37.

22. COnsensus-based Standards for the selection of health Measurement Instruments (COSMIN). COSMIN - Improving the selection of outcome measurement instruments [Internet]. COSMIN. [cited 2022 Feb 27]. Available from: https://www.cosmin.nl/

Appendix 1. Scoping Review MEDLINE Search Strategy

Ovid MEDLINE(R) and Epub Ahead of Print, In-Process, In-Data-Review & Other Non-Indexed Citations, Daily and Versions <1946 to March 16, 2022>

#	Query	Results from 17 Mar 2022
1	exp Anesthesia/	200,448
2	exp Anesthetics/	255,070
3	Anesthesiology/	32,529
4	Anesthesia Recovery Period/	5,440
5	(an?esthesia* or an?esthetic* or an?esthesiolog*).tw,kf.	323,470
6	or/1-5	539,493
7	exp Perioperative Care/	157,136
8	Perioperative Medicine/	92
9	(perioperative adj2 (car* or medicine* or period*)).tw.	17,106
10	(perioperative and (car* or medicine* or period*)).kf.	2,218
11	or/7-10	170,469
12	Patient Comfort/	567
13	Patient Safety/	24,260
14	Patient Satisfaction/	87,426
15	(patient* adj2 (comfort* or safet* or satisfaction*)).tw.	95,583
16	(patient* and (comfort* or safet* or satisfaction*)).kf.	13,730
17	Patient Reported Outcome Measures/	11,066
18	(patient reported adj4 (outcome measure* or experience measure*)).tw.	8,214
19	(patient reported and (outcome measure* or experience measure*)).kf.	3,051
20	Postoperative Complications/	389,613
21	Intraoperative Complications/	33,217
22	((peroperative[1] or postoperative or intraoperative) adj2 complication*).tw.	90,933
23	((peroperative or postoperative or intraoperative) and complication*).kf.	10,527
24	Outcome Assessment, Health Care/	79,846
25	((health care or healthcare) adj4 outcome assessment*).tw.	27
26	((health care or healthcare) and outcome assessment*).kf.	1,119
27	or/12-26	719,962
28	6 and 11 and 27	6,932
29	exp animals/ not humans.sh.	4,973,232
30	28 not 29	6,842
31	(child* or adolesc* or pediat* or paediat*).jn.	281,321

[1] This is not a misspelled word, the MeSH term uses this wording.

32	30 not 31	6,679
33	exp case-control studies/	1,296,071
34	(case$ and control$).tw.	557,532
35	(case$ and series).tw.	213,282
36	case reports.pt.	2,255,114
37	(case$ adj2 report$).tw.	638,230
38	(case$ adj2 stud$).tw.	282,881
39	(comment or editorial or letter).pt.	2,044,294
40	opinion piece.tw.	447
41	or/33-40	5,990,942
42	32 not 41	4,949
43	limit 42 to english language	3,816
44	limit 43 to yr="2015 -Current"	1,200

Appendix 2. Scoping Review data extraction form

Extractor 1 initial	
Extractor 2 initial	
Citation details	
Title	
Author	
Year	
Doi link	
Publication type	Multiple choice: systematic review +/- meta-analysis, scoping review, other review type, randomized control trials, non-randomized controlled trials, quasi-experimental studies, retrospective cohort, prospective cohort, before and after studies, case-control studies, analytical cross-sectional studies, guideline, departmental metric, other (free text)
Participants	
Country	
Region(s)	
Hospital setting	Academic vs. non-academic Urban vs. regional vs. rural
Population (e.g. disease, age group, etc)	
Sample size	
Surgery type(s)	
Duration of follow-up	
Age (mean)	
Age (median)	
Age (standard deviation)	
Age (range)	
Sex or gender	
American Society of Anesthesiologists Physical Status	
Length of stay	
Other demographics information	
Metric(s) information Please fill in the below for each complication investigated in the study	
Metric name	
Donabedian category	Structure, process, and outcomes - Can select multiple
How was the metric defined?	
How was the metric validated in this study? If not available, what references were cited in this study from previous validations?	

Measurement instrument for the metric (e.g. questionnaire name, special equipment, AIMS, history, physical exam, imaging, lab test)	
Mode of delivery of the measurement instrument (e.g. paper questionnaire, emailed; online tool, EHR extraction)	
Timepoint(s) of measurement	
Response rate(s)	
Any additional comments or results in the study related to feasibility. If not, what references were cited in this study from previous feasibility studies?	
Any additional results related to reliability. If not, what references were cited in this study from previous publications?	
Sampling strategy used for the metric (e.g. everyone, random sampling, stratified, etc.)	
Any other potentially relevant information	