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■ SPECIAL ARTICLE

Development and Publication of Clinical Practice Parameters, Reviews, and Meta-analyses: A Report From the Society of Cardiovascular Anesthesiologists Presidential Task Force

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The Society of Cardiovascular Anesthesiologists (SCA) is committed to improving the quality, safety, and value that cardiothoracic anesthesiologists bring to patient care. To fulfill this mission, the SCA supports the creation of peer-reviewed manuscripts that establish standards, produce guidelines, critically analyze the literature, interpret preexisting guidelines, and allow experts to engage in consensus opinion. The aim of this report, commissioned by the SCA President, is to summarize the distinctions among these publications and describe a novel SCA-supported framework that provides guidance to SCA members for the creation of these publications. The ultimate goal is that through a standardized and transparent process, the SCA will facilitate up-to-date education and implementation of best practices by cardiovascular and thoracic anesthesiologists to improve patient safety, quality of care, and outcomes. (Anesth Analg 2023;XXX:00–00)

GLOSSARY

ACC/AHA = American College of Cardiology/American Heart Association; **AGREE II** = Appraisal of Guidelines for Research and Evaluation; **AGREE-REX** = Appraisal of Guidelines for Research and Evaluation-Recommendations Excellence; **AI** = artificial intelligence; **CPG** = Clinical Practice Guidelines; **CPI** = Clinical Practice Improvement; **COR** = Class of Recommendation; **ECS** = Expert Consensus Statement; **GRADE** = Grading of Recommendations, Assessment, Development and Evaluations; **GSC** = Guidelines and Standards Committee; **ICMJE** = International Committee of Medical Journal Editors; **LOE** = level of evidence; **NOS** = Newcastle-Ottawa Scale; **NRSI** = nonrandomized studies of intervention; **PICO** = Patient, Intervention, Comparison, Outcome; **PRISMA** = Preferred Reporting Items for Systematic Reviews and Meta-Analyses; **PRISMA-S** = PRISMA

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Literature Search Extension; **PROSPERO =** The International Prospective Register of Systematic Reviews; **QSV =** Quality, Safety and Value; **RoB 2 =** Risk-of-Bias Tool For Randomized Trials; **ROBINS-I =** Risk of Bias In Non-randomized Studies of Interventions; **SCA =** Society of Cardiovascular Anesthesiologists; **WAME =** World Association of Medical Editors

The Society of Cardiovascular Anesthesiologists (SCA) as indicated by its mission statement "is an international organization of health care professionals committed to providing excellence in patient care through education and research." The SCA is committed to developing peer-reviewed publications on clinical topics to enhance education and facilitate implementation of best practices globally in cardiovascular and thoracic anesthesiology. Detailed practice guidelines exist for some aspects of cardiovascular and thoracic anesthesiology and surgical care, but only 50% of practices adopt such guidance, and integration of practice guidelines into routine clinical practice takes an average of 17 years.[1] Furthermore, there are topics within the specialty that have multiple recommendations in guidelines, conflicting recommendations due to local practice or temporal changes, or no published clinical guidelines. To address these gaps, in 2015, the SCA established the Clinical Practice Improvement (CPI) subcommittee of the SCA Quality, Safety, and Leadership Committee, which was renamed in 2023 to Quality, Safety and Value (QSV) Committee, designed to be multinational, multidisciplinary, and charged with the development of peer-reviewed educational documents that could be applied globally. These would include synthesized concise summaries of established guideline statements, practice advisories for topics where current guidelines did not exist, surveys of members' practice patterns in specific clinical areas, and narrative reviews. The publication of such documents in the SCA-affiliated journal would ensure widespread dissemination to all SCA members both nationally and internationally.

Now a stand-alone committee, the CPI committee continues to develop educational documents for publication in peer-reviewed journals such as *Anesthesia & Analgesia*, which is currently the official SCA-affiliated journal. These publications educate and provide implementation guidance to SCA members with the goal of optimizing quality, safety, and patient-related outcomes.

Many professional societies, realizing the complexity of developing and implementing guidelines, have developed other methods to promote best practice concepts (eg, practice parameters and standards, expert consensus statements, practice advisories, and reviews).[2] Confusion remains, however, regarding the consistent development of such documents across all specialties.[3,4]

Most journals abide by the International Committee of Medical Journal Editors (ICJME) Recommendations for the Conduct, Reporting, Editing and Publication of Scholarly Work in Medical Journals [5] and Enhancing the QUAlity and Transparency Of health Research reporting guidelines (Equator Network).[6] To complement these standards, the SCA has created a unique platform for educational material development. Recognizing a need to define consistent processes for writing and publication, the SCA President commissioned a Presidential Task Force on March 22, 2022, to define this process in a stand-alone document. This document was developed with input from expert authors, editors of primary anesthesiology journals, and SCA leaders with relevant experience and the ability to allocate SCA resources. The resulting document presented here is intended to serve as a resource for SCA-supported and endorsed document creation in terms of (1) document development, approval process, and publication targets, (2) clinical practice guideline (CPG) methodology, (3) appraisal of guidelines, and (4) format of publication (eg, clinical practice parameters, systematic review article, scoping review article, narrative review article, and meta-analysis).

DOCUMENT DEVELOPMENT AND APPROVAL PROCESS

The SCA has developed a systematic process for creating, funding, and disseminating the educational documents discussed here, as described below and detailed in Figure 1.

Identify

Any SCA committee, committee member, or SCA member at large may identify a topic of interest. Most topics emerge from the QSV committee, the CPI Committee, and the Guidelines and Standards Committee (GSC). The committee designates a "leading author," who identifies potential coauthors with diverse and complementary backgrounds. The process of author selection involves identification of experts who are diverse in terms of sex, race, professional context (eg, university-based versus private practice), and geography. This will help establish a range of perspectives throughout the document creation process. Together, the authors define clinical goals, patients and interventions, and expected outcomes to be covered by the report. The leading author recommends the type of document the
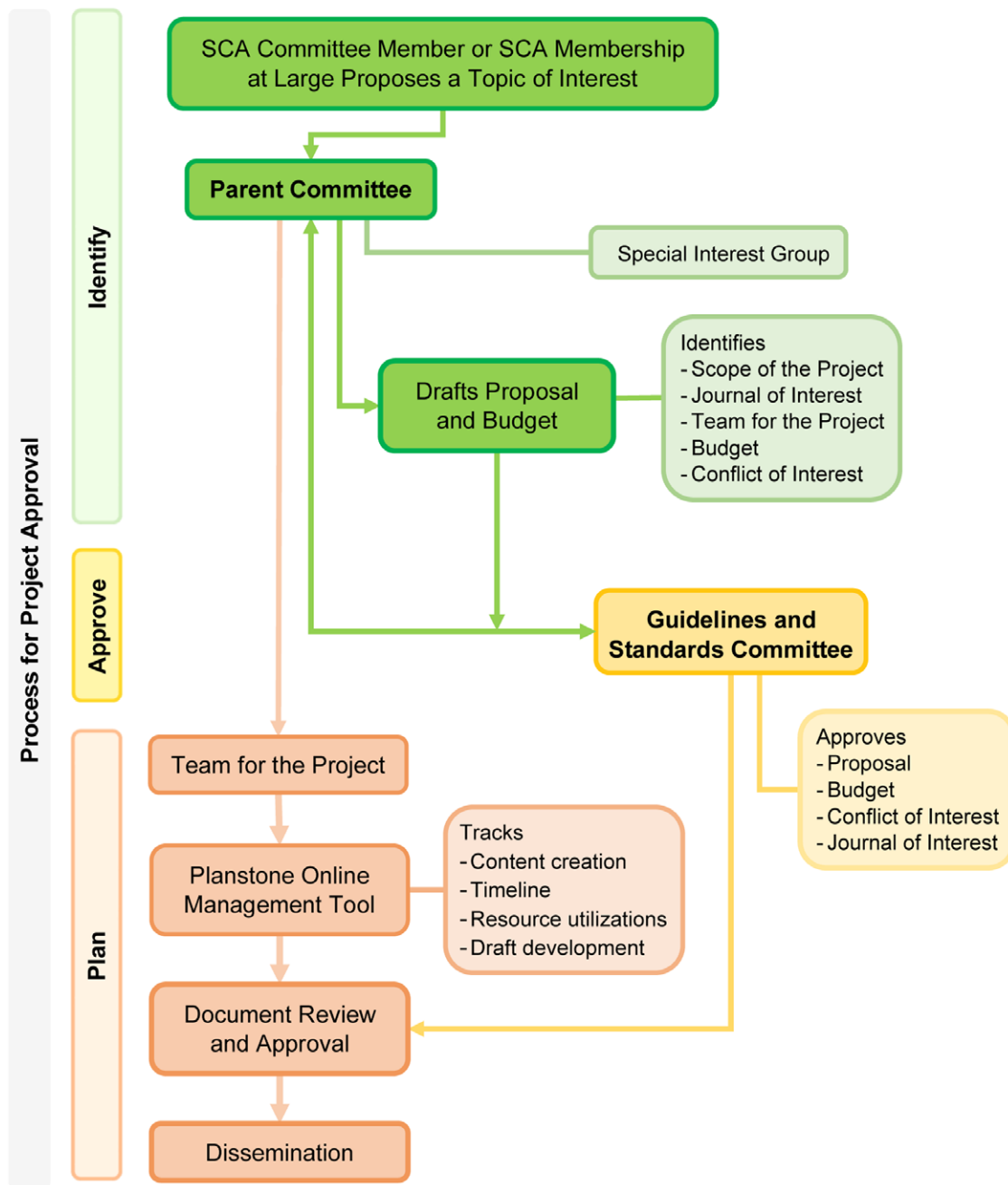
SCA Process for Project Approval

Figure 1. SCA process for clinical practice parameters, reviews, and meta-analysis project approval. SCA indicates Society of Cardiovascular Anesthesiologists.

group plans to develop (eg, a specific clinical practice parameter, review, or meta-analysis). A conceptualization survey information is used to create and refine an "evidence model," which encompasses inclusion and exclusion criteria for patient type, procedures, providers, settings, interventions, and outcomes.[7]

Subsequently, a systematic literature search explores all relevant health care bibliometric databases for studies reporting the original findings in peer-reviewed journals. This comprehensive literature review must be performed with assistance from a biomedical librarian or informationist, who will formulate questions and create or evaluate search strategies for a comprehensive, robust, and reproducible literature review. As stated by the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA)

Literature Search Extension (PRISMA-S), authors "should strongly consider having the search strategy peer-reviewed by an experienced searcher, informational specialist, or librarian."[8] The librarian's roles can also include protocol development, methodology, database searching, source selection, citation management, bias assessment, data synthesis, and manuscript assistance relevant to the librarian role.[9]

A systematic literature search should conform to the target journal's "Instructions for Authors." The search process should be transparent, reproducible, and accounted for in the manuscript. Identified studies are reviewed for design, statistical analysis, and potential bias. The selected studies should then be organized in a tabular format to report detailed information about design, sample size, type of intervention, and outcomes, thus allowing for clear interpretation and creation of a summary.[7]

Approve

The SCA GSC has assumed an important and increasing role in oversight of SCA-endorsed work products. Originally a subcommittee, it is now a full committee reporting directly to the Board of Directors. The GSC assesses funding needs and approves the creation of joint guidelines with other professional societies and endorsements of existing manuscripts. The SCA Board of Directors approves funding for a specific number of projects annually.

If publication in an anesthesiology journal is appropriate, SCA-sponsored papers are submitted to the SCA-affiliated journal for primary publication. The GSC may also recommend other journal(s) for copublication or other medical society endorsements for dissemination (Figure 1). All SCA-sponsored papers undergo a peer-review process deemed appropriate by the target journal(s). For example, this manuscript underwent rigorous peer review by the editorial staff of *Anesthesia & Analgesia*. Individual journal requirements for practice parameters and similar manuscripts may change with time, thus it is imperative to consult the journal website and "Instructions for Authors" in addition to using the guidance contained here. The authors of this document also acknowledge that emerging technologies such as generative artificial intelligence (AI) tools may possibly be used to facilitate the preparation of medical manuscripts. If a generative AI tool is used to prepare an SCA-supported scholarly manuscript, the AI-generated content within the text should be disclosed within the Acknowledgement section of the manuscript. Further guidance is available from the World Association of Medical Editors (WAME) on chat bots, *ChatGPT,* and scholarly manuscripts.[10]

Plan

An online management tool such as Planstone[11] should be used to manage all aspects of the application process, its funding, and postaward distribution, solicit conflict of interest disclosures of the writing group members, allocate the distribution of funds, and track the timeline of document creation.

After the approvals, creation of the full author list and the SCA-sponsored manuscript may begin. During manuscript creation, the parent committee will provide oversight and help the workgroup form clear and concise recommendations based on scientific literature. The committee may seek input from other identified experts, conduct open forums at national or international meetings, or survey SCA members, and finally, oversee a final review and vetting (Figure 1).

CLINICAL PRACTICE PARAMETER METHODOLOGY

The creation of clinical practice parameters includes a structured stepwise approach to the clinical question. Once the project and author list have been approved, the methodology used to grade the Quality of Evidence and Strength of Recommendations should be selected. The first step includes a careful methodical literature review with the assistance of a biomedical librarian or informationist. Manuscripts for inclusion are selected and evaluated for the presence of bias. Subsequently, the evidence quality is graded, and the strength of the recommendations determined by a consensus methodology. The Delphi technique[12–14] is one of the most common methods of achieving consensus on a certain topic and will be further defined in the Expert Consensus Statement (ECS) section. After creation of the practice parameter, appraisal for several quality domains can be performed.

The steps that are common to clinical practice parameter creation are defined in the following section. Attributes unique to a particular type of clinical practice parameter will be described under the individual clinical practice parameter named.

Risk-of-Bias Assessment Tools

The Risk of Bias in Randomized Trials and Nonrandomized Studies of Interventions. The risk-of-bias tool for randomized trials (RoB 2)[15] assesses bias in 5 discrete areas: (1) the randomization process, (2) deviations from intended interventions, (3) missing outcome data, (4) measurement of the outcome, and (5) selection of the reported result. Answers to signaling questions within each area facilitate judgment of "low risk of bias," "some concerns," or "high risk of bias." The RoB 2 tool uses algorithms

to reach an overall risk-of-bias judgment. The Risk of Bias In Non-randomized Studies of Interventions (ROBINS-I) evaluates risk of bias in estimates of the comparative effectiveness of interventions from nonrandomized studies that allocated individuals or groups of individuals to comparison groups[16,17] (Figure 2). ROBINS-I is similar to RoB 2[15] but is more comprehensive given the higher risk of bias in nonrandomized studies of interventions (NRSI), namely, confounding, selection bias, information bias, and reporting bias. When planning, the review question must be clearly stated, and important confounders and cointerventions identified by subject-matter experts and through preliminary or scoping reviews. ROBINS-I variants for different study designs are available at www.riskofbias.info.[18] Within the ROBINS-I framework, the risk of bias in NRSI is evaluated by considering a hypothetical "target" randomized trial, and the authors explicitly identify the interventions that would be compared in this hypothetical trial. The risk of bias is assessed in relation to the effect of the assignment to the interventions at baseline, or the effect of adhering to the interventions as specified in the study protocol. The domains in ROBINS-I cover all types of bias that are currently understood to affect the results of NRSI. Similar to RoB 2,[15] the guideline for defining each domain uses a series of signaling questions, which aim to facilitate judgments about risk of bias for each domain ("Low," "Moderate," "Serious," or "Critical"), and an option to predict (and explain) the likely direction of bias. Free text boxes are also included to justify responses to the signaling questions and risk-of-bias judgments.[16,17]

The Risk of Bias in Case Control or Cohort Studies. The Newcastle-Ottawa Scale (NOS) is a risk-of-bias assessment tool for cohort and case-control studies (Figure 2).[19–21] It assigns points for the least risk of bias in 3 domains: (1) selection of study groups, (2) comparability of groups, and (3) ascertainment of exposure and outcomes for case-control and cohort studies, respectively. The highest quality studies receive 9 points. A cohort study and a case-control study can be awarded a maximum of 1 point for each of the selection and outcome categories and a maximum of 2 points for comparability.[19–21]

Quality of Evidence and Strength of Recommendations

The American College of Cardiology/American Heart Association Guideline Recommendation Classification System. In the American College of Cardiology/American Heart Association (ACC/AHA) Guideline Recommendation Classification

System,[22,23] level of evidence (LOE) grades the quality of the evidence that supports the recommendation. This is denoted by A (multiple randomized controlled trials), B-R (one or more randomized controlled trials), B-NR (one or more nonrandomized controlled trials), C-LD (observational studies with limitations of design or execution), or C-EO (consensus of expert opinion). The Class of Recommendation (COR) ranging from Class I to Class III relates to the strength of the recommendation and establishes the intervention's benefit-to-risk relationship. Class I COR is used if evidence is found to be beneficial, Class II COR indicates evidence is moderately (IIa) or marginally (IIb) useful, and Class III COR is used if the intervention is either not useful or may be harmful. For each recommendation, LOE and COR are determined independently. The American Association for Thoracic Surgery and Society of Thoracic Surgeons[24] have adopted the ACC/AHA Guideline Recommendation Classification System framework for developing clinical practice documents.

The Grading of Recommendations, Assessment, Development, and Evaluations. The Grading of Recommendations, Assessment, Development, and Evaluations (GRADE) was developed to provide a reproducible systematic approach for developing CPGs; strength of recommendations is classified as strong (grade 1) or weak (grade 2) according to the balance between benefits, risks, burden, and cost. The quality of supporting evidence is graded as high (grade A), moderate (grade B), low (grade C), or very low (grade D) and is determined by assessing 5 factors: risk of bias, precision, inconsistency of the results, directness of the evidence, and publication bias[25–27] (Figure 2).

Appraisal of Guidelines

The Appraisal of Guidelines for Research and Evaluation II. The Appraisal of Guidelines for Research and Evaluation (AGREE II) tool was developed to assess the methodological quality of practice guidelines including presentation and reporting[28,29] (Figure 2). It does not grade the LOE for the supporting literature used, but rates how rigorously that process was performed. Specifically, AGREE II is used to assess the quality of guidelines, provide a methodological strategy for the development of guidelines, and inform *what* information and *how* the information should be reported in guidelines. The tool consists of 23 items within 6 quality domains: scope and purpose, stakeholder involvement, rigor of development, clarity of presentation, applicability, and editorial independence. Each item is rated using a 7-point scale, and 2 overall assessments are performed
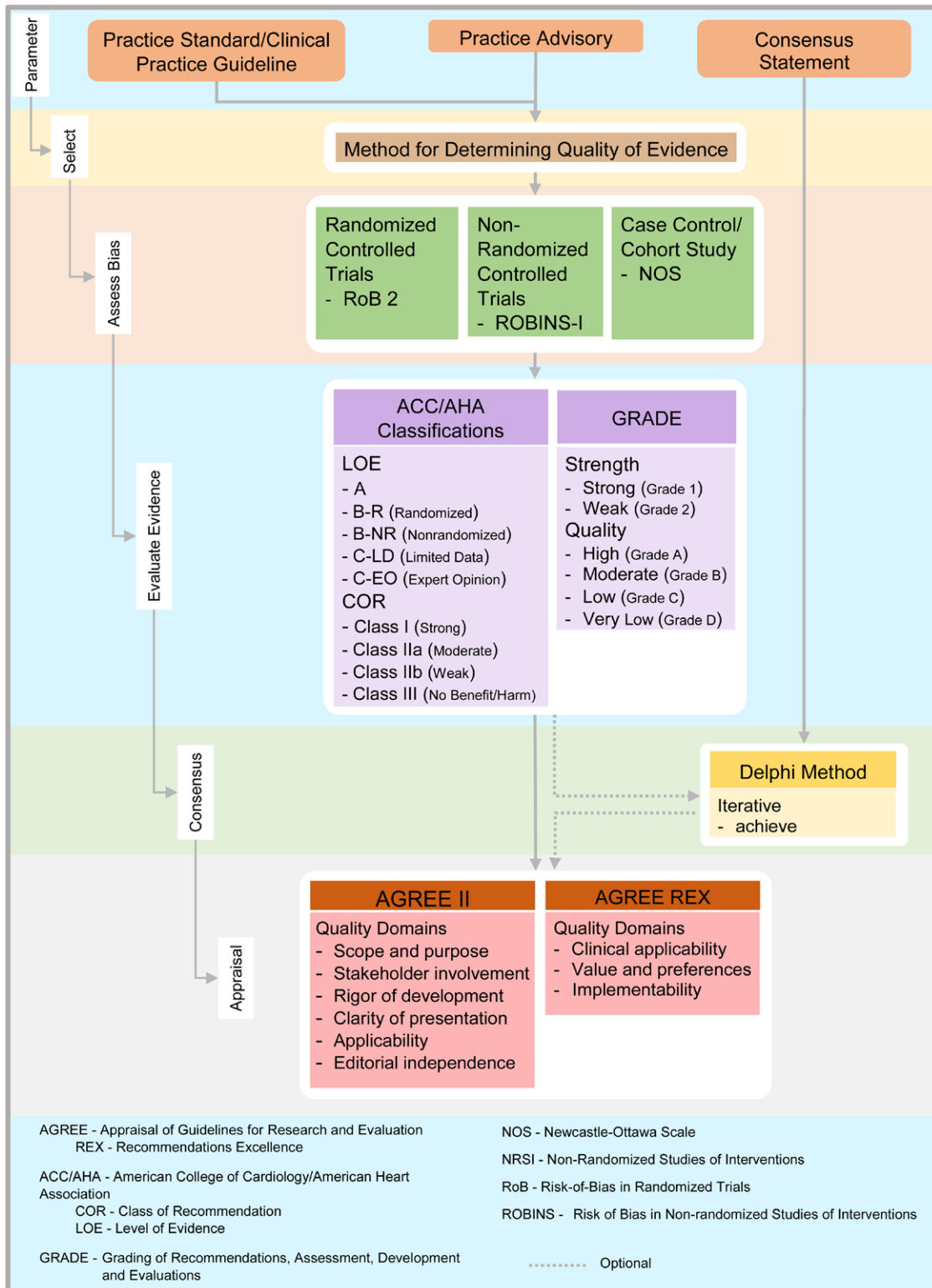
Figure 2. Techniques to evaluate the evidence and assess bias.

by at least 2 reviewers to evaluate the quality of the guideline (1–7) and whether the guideline would be recommended for use in practice (Yes, Yes with modifications, No).[28,29]

Appraisal of Guidelines for Research and Evaluation-Recommendations Excellence Tool. The Appraisal of Guidelines for Research and Evaluation-Recommendations Excellence (AGREE-REX) tool

was created in 2019 as a complement to the AGREE II[30] (Figure 2). It examines guideline clinical validity and ease of adaptation by clinicians, addressing the following:

1. Clinical credibility of the recommendations based on the available evidence and its appropriateness for the target users, context, and patients/populations,
2. Consideration of values of all relevant stakeholders, and
3. Implementability of the recommendations.

The AGREE-REX consists of 3 domains, clinical applicability, values and preferences, and implementability, each comprised of several items (Figure 2).

It is suggested that each guideline be appraised by at least 2 people, preferably 4, to increase the reliability of the assessment. The AGREE II[28,29] and AGREE-REX[30] checklists and instructions can be found in their respective user's manuals.

PUBLICATION FORMATS
Clinical Practice Parameters
Clinical practice parameters may include practice standards, CPGs, practice advisories, expert consensus statements, position papers, and practice alerts[3] (Table 1). The recommendations of clinical practice parameters are subject to revisions at regular intervals based on updates in the literature.[38] Multiple methodologies have been used to reach consensus for creating clinical practice parameters, with the most common and robust being the Delphi method (Table 1; Figure 2).[35,39] Clinical practice parameters should be distributed widely via high-impact peer-reviewed publications.[38]

The SCA members should interpret and apply clinical practice parameters in their own institutions,[40] as parameters are not intended as exclusive indicators of appropriate care.[40]

Practice Standards. Adverse perioperative outcomes can result from unnecessary variability in clinical practice.[4] Practice standards are developed by the professional society with scientific and clinical expertise in the care of particular patient populations[41] (Table 1). Practice standards are "the minimal desired and achievable level of clinical practice as defined by a professional society" and may be altered only under rare conditions (ie, life-threatening emergency situation or equipment inaccessibility).[4]

Practice standards are designed to

- Enhance patient safety and the quality of care;[7,38,41]
- Reduce variation in clinical practice;[38]
- Reduce medicolegal liability by supporting decisions related to patient care;[38,41]

- Reduce medical costs and inappropriate medical procedures,[41]
- Provide current evidence-based education to clinicians in training and practice.[38]

Clinical Practice Guidelines. As defined by the Institute of Medicine, CPGs are "statements that include recommendations intended to optimize patient care that are informed by a systematic review of evidence and an assessment of the benefits and harms of alternative care options"[26,33,35,37,42] (Table 1). Unlike practice standards, CPGs are not offered or proposed as minimal necessary clinical practice requirements; they serve as "guidance"[38] that may be accepted, revised, or rejected according to the clinical situation.[43]

A rigorous and systematic approach is required when creating a CPG to ensure a thorough investigation of the topic and the trustworthiness of the final document.

The general approval process for the creation of a CPG was described earlier in this report. Using a question-based framework for guideline development helps ensure that guidelines are developed in a comprehensive manner.[36] The guideline should be based on a PICO question format; addressing the **P**atient population, the **I**ntervention, the **C**omparator/control, and the **O**utcome.

The question-based framework should address the following:

1. Is the guideline—involving a proposed intervention, its alternatives, and recommended action—clear to the clinician?
2. Were the methods used to summarize evidence performed in a rigorous systematic literature review?
3. Did the panel consider and prioritize all outcomes relevant to patients?
4. Did the panel make appropriate recommendations by interpreting the evidence?
5. Does the recommendation apply to only specific patients?

The methodology that is used to create and grade a CPG should be selected at the project's outset. Guidelines should consider factors important to facilitating a shared decision-making model in patient-centered care. Some guideline development groups outline decision aids for this purpose. Information on how to use these approaches can be found within GRADE[25,27] and ACC/AHA documents.[44]

To achieve high quality, the 23 items on the AGREE-II checklist should be considered before producing the final guideline.[45] Before publication, the GSC must vet and approve the CPG.

Table 1. Comparison of Clinical Practice Parameters

Practice parameter	Practice standard/clinical practice guideline[a]	Practice advisory	Expert consensus statement	Position paper	Practice alert
Purpose	To assist decision-making about the most appropriate form of health care under specific conditions.[31]	To assist decision-making in specific areas of patient care.[32]	To counsel on the best possible and most acceptable way to address a particular decision-making area for diagnosis, management, or treatment.[33]	To promote discussion on emerging topics, where evidence is lacking or uncertain.[33]	To address specific aspects of patient management, patient care, and patient safety.[34]
Scope	Broad.[33]		Usually narrow.[33]	Narrow.[33]	
Composition of the working group	Multidisciplinary[33]		Mainly content experts may include other disciplines if needed.[35]	Multidisciplinary if needed.[33]	
Formulation of the clinical research question	In the format of PICO[33] (P = population, I = intervention, C = comparison, O = outcomes).		In PICO format.[35]	In PICO format, if necessary.[33]	n/a
Evidence availability	Evidence of moderate to high quality.[31]	Lacks controlled studies.[32]	Evidence is low in amount.[33]	Substantial quality evidence is not available.[31]	
Assessment of quality and strength of evidence	Studies are assessed for quality and strength of evidence using the ACC/AHA Guideline Recommendation Classification System[22,23] or the GRADE.[25,36]	Studies are assessed for quality and strength of evidence using ACC/AHA[22,23] or GRADE[25,36] system.			
Risk-of-bias assessment	Studies assessed for risk of bias. The tools are selected based on the type of studies included in the analysis.[15,17,21]				
Summary	Provides strength and directionality for the recommendations, based on best evidence and explicit consideration of benefits, harms, values, and preferences.[33,35]		Provides statements of fact, based on best evidence and expert consensus.[35]	n/a	n/a
Need for formal consensus	Yes, if applicable.[33]		Yes, by using Delphi method.[35]	Desirable.[33]	
External review	Review by identified expert consultant and membership opinion, open forums at national or international meetings. Commentary, and clinical feasibility data.[37]		Limited review, by relevant stakeholders.[35]	n/a	n/a
Appraisal	The quality of guidelines is evaluated using AGREE II and AGREE REX tools.[28–30]	n/a	n/a	n/a	n/a
Periodic updates	Yes, may require revision due to advancements of scientific evidence, technology, and practice.[37]	Yes, may require revision due to advancements of scientific evidence, technology, and practice.[32]	Yes, may require reevaluation periodically.[33]		

Abbreviations: ACC/AHA, American College of Cardiology/American Heart Association; AGREE II, Appraisal of Guidelines for Research and Evaluation; AGREE-REX, Appraisal of Guidelines for Research and Evaluation-Recommendations Excellence; GRADE, Grading of Recommendations, Assessment, Development and Evaluations.
[a]See text for detailed description for the definition of practice guideline and practice standard.

Practice Advisory. Practice advisories are systematically developed reports intended to assist decision-making in specific areas of patient care (Table 1).[26,32,33,46–48] They differ from other clinical practice parameters (eg, practice guidelines and practice standards) in that the supporting scientific evidence is not as robust and lacks high-quality data such as large prospective, controlled studies. Rather, practice advisories are typically supported by expert or membership-based consensus, or opinion surveys, that complements the available evidence. As such, practice advisories are more prone to bias.[49,50] Practice advisories should be periodically updated, to account for the evolution of scientific evidence, technology, and advances in clinical practice.[32,46–48]

In the creation of a practice advisory, the manuscript should include an introduction and state the need for the advisory. The Methods section should describe the working group, the search strategy used, data synthesis, and the system used for qualifying the LOE. The preparation of a practice advisory includes a thorough and methodological unbiased literature search. Use of a standardized reporting method, such as PRISMA, an organized method to document and report database and registry searches for systematic reviews, is recommended.[51] After finalizing the list of references, a grading system should be used to support the evidence presented. GRADE is one of the more common constructs for presenting summaries of the evidence, grading the quality of evidence, and providing a systematic approach for clinical practice recommendations.[27] The Discussion section should describe the LOE supporting the position or clinical actions, and the conclusion should summarize the findings.

Expert Consensus Statement. Put forth by a panel of experts, an ECS aims to provide unbiased, literature-supported recommendations on a specific scientific, medical, or administrative topic[33,35] (Table 1). ECSs embrace a large knowledge gap but do not have a strong evidence basis to support guidelines or standards. Thus, ECSs are by definition not fully evidence-based. Generally, 5 steps are followed: (1) topic selection, (2) composition of the writing group, (3) comprehensive literature review; (4) methodological formulation of recommendations; and (5) peer review. An ECS differs from a position paper in that the latter presents opinion without performing the same consensus development process. The Delphi technique is one of the methods of achieving consensus on a certain topic via a group communication process that utilizes consecutive iterations of questionnaires posed to expert panelists, who are then provided structured feedback following each iteration. Using the same group through survey iterations is fundamental to the Delphi technique's

method of obtaining and evaluating consensus[12–14] (Figure 2). The creation of an ECS for the SCA should follow the SCA's resources allocation and approval process (Figure 3). The final document should be submitted to the GSC for content approval.

Position Paper. Position papers are intended to build a case in support for one side of an often controversial topic[33] (Table 1). These well-constructed arguments may represent an individual person's or Society's perspective on the topic. After stating both sides of an issue, a position paper introduces the opposing side and uses available evidence to refute it. The 3 main elements of a position paper are: (1) an introduction stating the author's position on the topic, (2) a discussion with points and counterpoints, and (3) a conclusion.[3,4]

Practice Alert. Practice alerts are directives to guide evidence-based practice. Practice alerts are often used within electronic health record technology[34] (Table 1). They typically reflect new or recently published information including recent practice advisories or guidelines and make recommendations for or cautions against a particular clinical practice.[52]

SYSTEMATIC REVIEWS, SCOPING REVIEWS, META-ANALYSES, AND NARRATIVE REVIEWS
The creation of clinical practice parameters may be facilitated by conducting or referencing a published systematic review, meta-analysis, or scoping review. If authors plan to seek SCA resources for the creation of a review, they should follow the process used with various types of practice parameters.

Systematic Reviews
Systematic reviews are scientific investigations that focus on a specific question and use explicit, pre-specified methods to identify, select, assess, and summarize the findings of similar but separate studies.[53] Systematic reviews may include meta-analysis, which is a statistical procedure to pool results of individual studies to synthesize a single estimate of effect across individual trials.[54] Steps for conducting a systematic review are outlined by Murad et al[54] and summarized in Table 2.

Review Questions. Systematic review questions should be peer-reviewed to ensure they are well formulated and meaningful for clinical or health care policy decision-making. Review questions may be guided by the PICO mnemonic (patient, intervention, comparison, and outcome).[54]

Search Strategy. Systematic reviews use explicit, transparent literature search strategies to identify relevant studies. Search strategies should be developed in consultation with a biomedical librarian
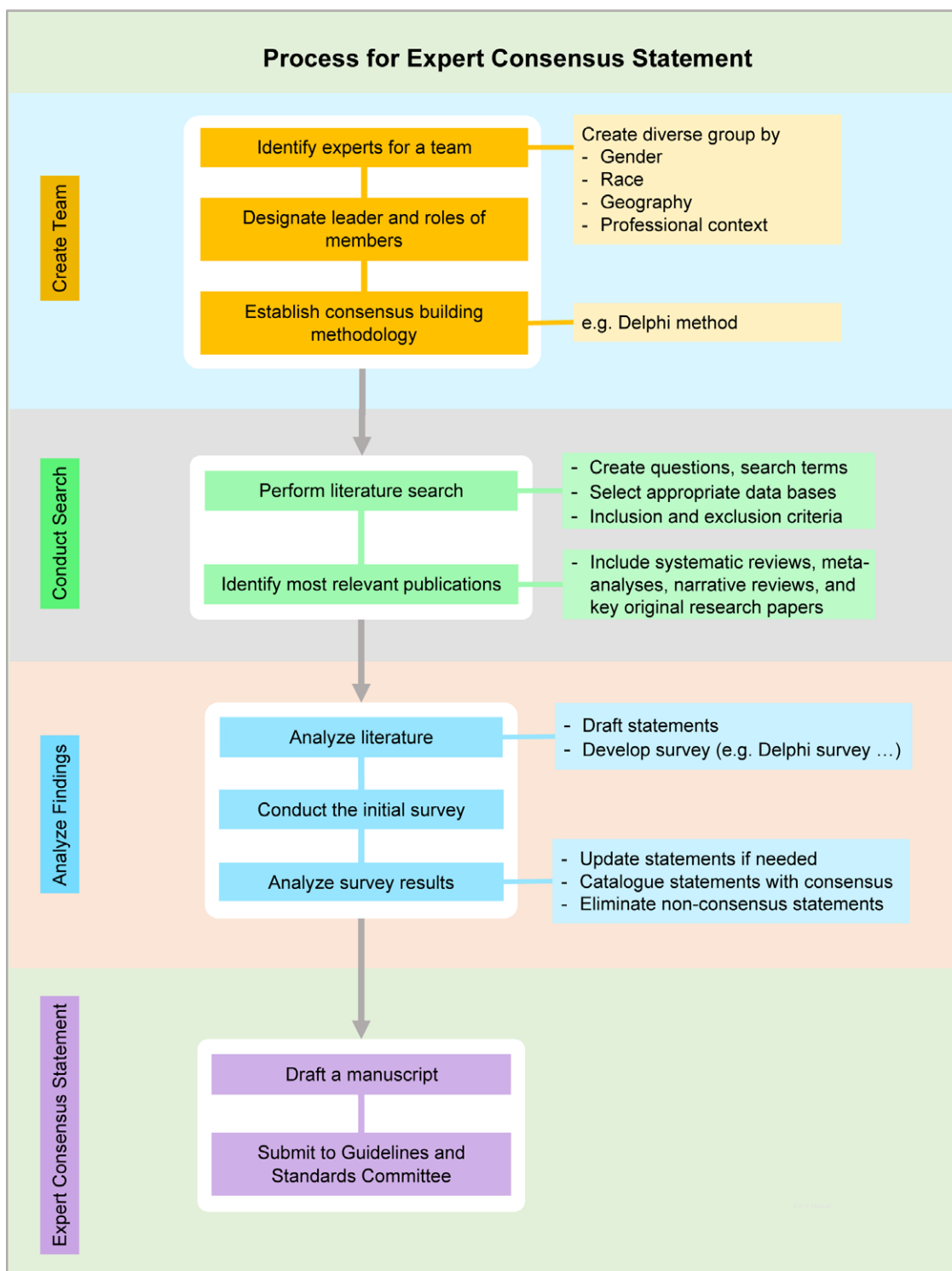
Process for Expert Consensus Statement

Create Team
- Identify experts for a team → Create diverse group by
  - Gender
  - Race
  - Geography
  - Professional context
- Designate leader and roles of members
- Establish consensus building methodology → e.g. Delphi method

Conduct Search
- Perform literature search →
  - Create questions, search terms
  - Select appropriate data bases
  - Inclusion and exclusion criteria
- Identify most relevant publications →
  - Include systematic reviews, meta-analyses, narrative reviews, and key original research papers

Analyze Findings
- Analyze literature →
  - Draft statements
  - Develop survey (e.g. Delphi survey …)
- Conduct the initial survey
- Analyze survey results →
  - Update statements if needed
  - Catalogue statements with consensus
  - Eliminate non-consensus statements

Expert Consensus Statement
- Draft a manuscript
- Submit to Guidelines and Standards Committee

Figure 3. Stepwise process of creating an expert consensus statement.

or an informationist and registered a priori with the International Prospective Register of Systematic Reviews (PROSPERO).[72]

Assessment for Bias. Quality of included studies must be critically appraised to minimize systematic error or bias.[73] Recommended tools for assessing bias are the RoB 2[15,74] for randomized trials and the ROBINS-I[17] tool for observational studies.

Publication or nonreporting bias (overrepresentation of studies with statistically significant results) has been shown to be a significant source of error

Table 2. Comparison of Systematic, Scoping, and Narrative Reviews

Study type	Systematic review	Scoping review or mapping review	Narrative review or traditional review
Objective	Sum up the best available research evidence for a specific question.[55]	Map the available literature related to a topic of interest.[55]	Provide a summary and analysis of the available literature on a specific topic of interest.[56]
Protocol registration	Yes—protocol registration with the Cochrane Collaboration or the PROSPERO is encouraged.[56]	Yes—Open Science Framework[58] or Figshare[59] registration.	No
Scope	Narrow.[60]	Broad.[55]	Broad or narrow.[60]
Formulation of the clinical research question	Focused research question, generally in the format of PICO[56,60] (P = population, I = intervention, C = comparison, O = outcomes).	Review question, typically broad,[61] in the format of PCC (P = population, C = concept, C = context)[57]	Broad overview of the topic.[56,60]
Guidelines for methodology	Provided by the Cochrane Library and Equator Network (PRISMA).[56,60]	Provided by the Equator Network, PRISMA Extension for Scoping Reviews (PRISMA-ScR)[61]	No standard guidelines exist.[62]
Literature search	Comprehensive searching.[63] Diverse search engines used[64] to include all pertinent studies.	Comprehensive searching.[65] Diverse search engines used to include published and unpublished evidence.[69]	May or may not include comprehensive searching.[63] Relevant data bases are searched.[56]
Search/selection protocol	Explicit predefined protocol-based search and selection strategy, which is transparent and reproducible.[55,56] Includes databases searched, inclusion and exclusion criteria, date of search, all search terms, and any limits.[67] Search results reviewed by at least 2 independent reviewers.[68]	Explicit pre-defined protocol-based search and selection strategy,[61] which is transparent and reproducible.[55] Inclusion criteria developed based on the research question.[66] Search results reviewed by 2 independent reviewers.[69]	No predefined search or selection criteria.[64] Depends on the author's intuition and research experience.[64]
Literature targeted	Obtain all primary research studies related to the topic.[62]	May include multiple types of evidence (ie, different research methodologies, primary research, reviews, and nonempirical evidence).[61]	High-quality studies and those containing most up-to-date information.[67]
Data extraction or charting of results	Protocol-based continuous or categorical statistical values.[64] Uses at least 2 independent reviewers for data extraction.[60] Uses standard form for data extraction.[64]	Protocol-based.[70] Uses 2 independent reviewers for data extraction.[70] Uses data charting form to extract variables.[70] Presented in a form or in a descriptive format.[66]	Not protocol-based,[64] simple description of study findings.[64]
Appraisal/risk-of-bias assessment	Formal quality assessment.[60] Critical qualitative and quantitative appraisal.[71] Studies assessed for risk of bias.[55]	No formal quality assessment.[63] Does not require appraisal/risk-of bias assessment for individual studies.[57,61]	May or may not include quality assessment.[63] Qualitative appraisal often influenced by personal views of author.[71]
Synthesis	Usually quantitative.[56] Based on data extraction and guidelines such as PRISMA.[64] Typically narrative with tabular format.[63]	Typically tabular and narrative format.[63]	Usually qualitative.[56] Based on the study findings that were selected by the author.[64] Typically narrative.[63]
Analysis	What is known: recommendations for practice. What remains unknown: uncertainty around findings, recommendations for future research.[63]	Descriptive numerical summary and qualitative thematic analysis.[70]	Analysis may be chronological, conceptual, thematic, etc.[63]

Abbreviations: PRISMA, Preferred Reporting Items for Systematic reviews and Meta-Analyses; PROSPERO, The International Prospective Register of Systematic Reviews.

in systematic reviews and meta-analyses published in anesthesiology journals.[75] Since publication bias can lead to incorrect conclusions surrounding treatment effect, reviews performed to inform clinical or policy decision-making should use methods to systematically evaluate for publication bias and should use strategies for mitigation, such as funnel plots and tests of funnel plot symmetry.[76] Gray literature searches for unpublished data can also be considered as a tool to identify publication bias, including searches within sources such as the ClinicalTrials.gov database of privately and publicly funded clinical studies (https://www.clinicaltrials.gov; Accessed January 23, 2023).

The process for summarizing study characteristics and preparing for synthesis are outlined in the Cochrane handbook.[77]

Scoping Reviews

Scoping reviews are useful to identify the types of available evidence, to identify and analyze gaps in the evidence, and may be performed as a precursor to a systematic review.[57] Like systematic reviews, scoping reviews use explicit, transparent, and peer-reviewed search strategies (Table 2) and may be required to be prospectively registered. An initial review of the literature may be useful before defining inclusion and exclusion criteria for scoping reviews. Importantly, scoping reviews do not include a formal assessment of methodological quality or risk of bias since they are intended to provide an overview or map of the available evidence on a given topic. Therefore, if authors intend to produce CPGs, practice advisories, or policy statements, a systematic review must be undertaken.[22]

Best practice methodology for scoping and systematic reviews are outlined in the PRISMA 2020 statement[51] for reporting systematic reviews and the PRISMA extension for scoping reviews.[78] The PROSPERO registration is strongly recommended for all systematic reviews,[72] and Open Science Framework[58] or Figshare[59] is recommended for scoping reviews.

Meta-analyses

A meta-analysis is a mathematical synthesis of the results of 2 or more primary studies that address the same hypothesis in the same way, to estimate a combined (summary) intervention effect. Meta-analysis may be undertaken if qualitative analysis determines that included studies have sufficiently similar PICO characteristics. Meta-analysis involves extraction of data from individual studies and conversion of results to a common measure of effect size, followed by statistical analysis using prespecified methods developed in consultation with an expert methodologist.

Although a meta-analysis can increase the precision of a result, it is important to ensure that the methods used for the reviews are valid and reliable.[79] The steps in conducting a meta-analysis are similar to those of systematic reviews and should include the following:[80]

definition of the research question
systematic, reproducible, and transparent literature search
choice of the effect size measure
choice of analytical/statistical methods
choice of the analytical software package
coding of effect sizes
actual statistical analysis, and

interpretation and publication of results

Some common analytic methods used in meta-analyses include univariate meta-analysis, meta-regression analysis, meta-analytic structural equation modeling, and qualitative meta-analysis.[80]

Narrative Review (Traditional Review or Nonsystematic Review)

If a narrative review is part of the process of creating a clinical practice parameter and specific SCA resources are to be used (eg, a biomedical librarian and a medical editor), its conception and approval should follow the SCA process outlined herein.

A narrative review is a "comprehensive summation and analysis of available literature on a specific topic of interest"[56,62,63] (Table 2). Narrative reviews provide a broad perspective or examination of the literature on a topic and present the information in an easily readable format.[62,81,82] In addition, narrative reviews do not need to be registered a priori. They are generally produced in a less formalized manner than clinical practice parameters. The search methodology used is not as well defined as that of a systematic[60] or scoping review,[61] and sources may include only a select list of publications[62] (Table 2). The source selection process may be subjective and lack explicit criteria for inclusion and exclusion, which can lead to bias.[62,71] The appraisal of the literature is variable and may be qualitative.[55,61,71] Also, the assimilation, synthesis, and conclusion are subjective and may be influenced by the authors' personal review of literature. Therefore, the results of the review may not be replicable[71] (Table 2).

SUMMARY

The SCA has long supported its mission of enhancing patient outcomes through education and research by promoting internal committee work aligned with its strategic goals. Development of documents such as clinical practice parameters, meta-analyses, systematic review/scoping reviews, and narrative reviews facilitates the synthesis and dissemination of information relevant to the clinical practice of cardiovascular and thoracic anesthesiology. We describe here the standard processes required for the development of these clinically valuable documents. This report will assist all SCA members and content experts by elucidating the rigorous approach required and SCA support available to create these manuscripts. ■

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