essential during these difficult emergencies, and the attending surgeon must understand their role and be prepared to perform the most appropriate FONA technique, without delay, taking account of their skills and the clinical circumstances. The Difficult Airway Society has been tasked with producing summary guidance relevant for surgeons, and clinicians who may be involved in managing airway emergencies are advised to familiarize themselves with current algorithms. In the future, formal communication of guidelines between Colleges and Societies will be encouraged where there is the potential for overlap between specialties.

Declaration of interest

A.J.H.: expert witness to HM Coroner in index Inquest; expert witness (instructed by family) in second Inquest (ongoing); Editorial Board member, Anaesthesia since 2009, Chair since 2014; National Institute of Academic Anaesthesia Board member, since 2014.

T.M.C.: Associate Editor of the British Journal of Anaesthesia. L.B.: Board of Directors, British Journal of Anaesthesia. Other authors: no relevant conflict of interests to declare.

References


What makes a good systematic review and meta-analysis?

A. M. Møller1* and P. S. Myles2

1Department of Anaesthesiology and Intensive Care Medicine, Herlev Hospital, Herlev Ringvej 75, Copenhagen 2730, Denmark, and
2Department of Anaesthesia and Perioperative Medicine, Alfred Hospital and Monash University, Melbourne, Victoria, Australia

*Corresponding author. E-mail: ann.moeller@regionh.dk

A systematic review (SR) aims to retrieve, synthesize, and appraise existing knowledge on a particular subject. Meta-analysis is the statistical method used to combine results from the relevant studies, and the resultant larger sample size provides greater reliability (precision) of the estimates of any treatment effect.1 Clinical decisions should be based on the totality of the best evidence and not the results of individual studies. The value and credibility of an SR depends on the importance of the question, the quality of the original studies, the efforts undertaken to minimize bias, and the clinical applicability.2

The number and quality of SRs appearing in anaesthesia journals has increased, in part because these provide up-to-date, reliable, and clinically relevant information for readers.3 4 However, the acceptance rate for this journal is quite low, indicating a high proportion of low-quality manuscripts. This editorial has been written in order to help authors and readers
understand the basic features of the SR and improve their ability to write and read them critically.

The value of any SR depends heavily on the quantity, quality, and heterogeneity of the included studies, yet a good meta-analysis methodology is at least as important. Key elements to increase chances of acceptance include a clear and detailed analysis methodology, with a focus on generalizability and reproducibility. Using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist will help to include all essential elements (http://www.prisma-statement.org/PRISMAStatement/PRISMAStatement.aspx). A good SR also includes a comprehensive and critical discussion of the results, including strengths and limitations, such as assessment of bias, heterogeneity, and used definitions and categorizations. Ideally, the importance of the study is highlighted, considering clinical usefulness and the need for future research (Table 1).

The author team for an SR should include at least one person with some experience in the performance of SRs, one person skilled in statistics, and one person with content knowledge of the topic being addressed. The last of these, ideally, should have led at least one of the clinical trials being included in the analysis. For the inexperienced, the PRISMA guidelines2 can be useful, and in any case, it is strongly recommended that the conduct and reporting of the SR be in accordance with its principles.

Like any other paper, the SR has an introduction, a methods section, a results section, and a discussion. What makes the SR different is that the study data are derived from the reports of completed (and usually published) studies, and it does this in a very systematic way.

Before even starting the process of performing an SR, the authors should clarify their clinical question using the PICO (participants, intervention, comparison, and outcomes) approach. Recently, however many other types of SRs are being done that may not necessarily fit this formula. Examples include diagnostic tests, prognostic reviews, and qualitative reviews. The methodology for these reviews is still under development and will not be considered further in this editorial.

The clinical question should be described in detail at the protocol stage. The participants are the group of patients to be included. It is important to consider the characteristics of these thoroughly in order to include the group of patients relevant to the question in focus. The intervention must likewise be well described, whereas the control can be placebo, no treatment, or standard care. Of course, two different treatments can also be compared. There needs to be a nominally primary end point in any trial, including SRs.6 There is no fixed limit for secondary outcomes, but normally five to nine will be considered a maximum. The PICO is useful when designing the search strategy for the review. Subgroups and covariates should be carefully considered and prespecified in order to avoid data dredging.7

The search strategy for SRs needs to be comprehensive and include all relevant databases. The most common databases to search are PubMed (Medline), Cochrane Library CENTRAL, Embase, Cinahl, and Lilacs. As the main interest is usually the reported effect size, it is worthwhile for meta-analyses to consider inclusion of abstracts from major conferences in recent years. The search strategy is part of the review methodology, although for some journals it can be described as supplementary material on the journal website. The search methods need to be written in such a way that the search can be repeated by the reader, and by the authors, in case of updating the review.

The review process will start by retrieving and selecting relevant papers for inclusion as described in the protocol. Every paper must be evaluated to determine whether it meets the inclusion criteria. It is recommended to make a table of all included papers, and that the search and screening be done independently by at least two investigators. Double-data extraction by two independently working researchers is recommended to prevent errors.5 The papers need to fulfil inclusion criteria, specified in the methods section of the review. It is useful to provide a flow diagram describing the selection of papers for the review.

The SR protocol should be published before starting the review process. For Cochrane reviews, publication of the protocol has been standard procedure since the foundation of the Cochrane Collaboration in 1993. For other systematic reviews, it is now recommended to publish the protocol on PROSPERO (http://www.crd.york.ac.uk/prospero)9 or another comparable publically accessible website.

After selection, the papers must be screened for bias. A useful tool for this process is the Cochrane risk of bias tool,10 or

<table>
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<th>Table 1 Tips to improve the value of systematic reviews</th>
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<tr>
<td><strong>Key questions</strong></td>
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<td>(i) What is the contemporary relevance of the study question?</td>
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<td>(a) Is the study question clinically important?</td>
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<td>(b) Is there uncertainty and debate?</td>
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<td>(c) Is there demonstrable variation in practice?</td>
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<td>(d) Is there a need to inform the design and conduct of a definitive, large trial?</td>
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<td>(ii) Are the findings novel? Has the question been adequately addressed by a previous systematic review (and how recently)?</td>
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<tr>
<td><strong>Key steps</strong></td>
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<tr>
<td>(i) Define the research question clearly and completely</td>
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<td>(ii) Check that the research question is unresolved</td>
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<td>(iii) Include an experienced meta-analyst, content expert (ideally, a trialist), and statistician</td>
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<td>(iv) Write a detailed study protocol outlining end points, inclusion criteria, and a search strategy, and publish it in advance on a publically available website (e.g. PROSPERO)5</td>
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<td>(v) Be circumspect when interpreting the results; acknowledge the sources of bias; and consider heterogeneity, generalizability, and contemporary clinical relevance</td>
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<td>(vi) Report the study in such a way as to allow reproducibility of the results (PRISMA)5 or future updating of the systematic review</td>
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AMSTAR. Careful consideration must precede the performance of the meta-analysis in the review. Meta-analysis should be performed only when appropriate. There are two major factors that need to be evaluated before a decision about meta-analysis is made; one is heterogeneity between studies and the other is the existence of reporting bias.

Heterogeneity arises when the difference between trials is too big. The differences can be in the populations or in the interventions. The amount of heterogeneity can be quantified using the I² statistic. Heterogeneity can also be evaluated visually, by inspecting a forest plot. Although a random-effects meta-analysis can account for some heterogeneity, when significant heterogeneity exists, meta-analysis should not be performed.

Reporting bias is bias across trials. It arises when the result of a trial has an impact on the publications process. It is well known that a trial with a positive, significant result is more likely to be published faster (time lag bias), in a journal with a higher impact factor (publication bias), in English (language bias) than its non-significant counterpart, even if both trials are performed according to the highest standards of methodology. Reporting bias will therefore almost always tend to overestimate the treatment effect of an intervention. A funnel plot can be used to assess the amount of reporting bias, inducing asymmetry in the shape of the plot. Likewise, small trial bias occurs because small trials tend to overestimate treatment effects, and these typically populate SRs in anaesthesia heavily. Appropriate selection of treatment effects or risk estimates, and decisions regarding the use of fixed-effect or random-effects meta-analysis, and the software used, are important.

Cochrane reviews are often published in a paper journal as a co-publication. This is most often done in order to reach a broader audience. Although the printed version of the Cochrane reviews in most instances will be shorter and more digestible, the overall methodology and the results and conclusion must remain the same.

In conclusion, SRs and meta-analyses synthesize and update knowledge on a topic of interest. The methodology should also be presented clearly and in sufficient detail, and the strength of the evidence should be evaluated cautiously.

References


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