Synthesis without meta-analysis (SWiM) in systematic reviews: reporting guideline

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In systematic reviews that lack data amenable to meta-analysis, alternative synthesis methods are commonly used, but these methods are rarely reported. This lack of transparency in the methods can cast doubt on the validity of the review findings. The Synthesis Without Meta-analysis (SWiM) guideline has been developed to guide clear reporting in reviews of interventions in which alternative synthesis methods to meta-analysis of effect estimates are used. This article describes the development of the SWiM guideline for the synthesis of quantitative data of intervention effects and presents the nine SWiM reporting items with accompanying explanations and examples.

SUMMARY POINTS

Systematic reviews of health related interventions often use alternative methods of synthesis to meta-analysis of effect estimates, methods often described as “narrative synthesis”

Serious shortcomings in reviews that use “narrative synthesis” have been identified, including a lack of description of the methods used; unclear links between the included data, the synthesis, and the conclusions; and inadequate reporting of the limitations of the synthesis.

The Synthesis Without Meta-analysis (SWiM) guideline is a nine item checklist to promote transparent reporting for reviews of interventions that use alternative synthesis methods.

The SWiM items prompt users to report how studies are grouped, the standardised metric used for the synthesis, the synthesis method, how data are presented, a summary of the synthesis findings, and limitations of the synthesis.

The SWiM guideline has been developed using a best practice approach, involving extensive consultation and formal consensus.
SWiM is not intended for use in reviews that synthesise qualitative data, for which reporting guidelines are already available, including ENTREQ for qualitative evidence synthesis and eMERGe for meta-ethnography.14 15

Development of SWiM reporting guideline
A protocol for the project is available,16 and the guideline development was registered with the EQUATOR Network, after confirmation that no similar guideline was in development. All of the SWiM project team are experienced systematic reviewers, and one was a co-author on guidance on the conduct of narrative synthesis (AS).9 A project advisory group was convened to provide greater diversity in expertise. The project advisory group included representatives from collaborating Cochrane review groups, the Campbell Collaboration, and the UK National Institute for Health and Care Excellence (see supplementary file 1).

The project was informed by recommendations for developing guidelines for reporting of health research.16 We assessed current practice in reporting synthesis of effect estimates without meta-analysis and used the findings to devise an initial checklist of reporting items in consultation with the project advisory group. We invited 91 people, all systematic review methodologists or authors of reviews that synthesised results from studies without using meta-analysis, to participate in a three round Delphi exercise, with a response rate of 48% (n=44/91) in round one, 54% (n=37/68) in round two, and 82% (n=32/39) in round three. The results were discussed at a consensus meeting of an expert panel (the project advisory group plus one additional methodological expert) (see supplementary file 1). After the meeting, we piloted the revised guideline to assess ease of use and face validity. Eight systematic reviewers with varying levels of experience, who had not been involved in the Delphi exercise, were asked to read and apply the guideline. We conducted short interviews with the pilot participants to identify any clarification needed in the items or their explanations. We subsequently revised the items and circulated them for comment among the expert panel, before finalising them. Full methodological details of the SWiM guideline development process are provided in supplementary file 1.

Synthesis without meta-analysis reporting items
We identified nine items to guide the reporting of synthesis without meta-analysis. Table 1 shows these SWiM reporting items. An online version is available at www.equator-network.org/reporting-guidelines. An explanation and elaboration for each of the reporting items is provided below. Examples to illustrate the reporting items and explanations are provided in supplementary file 2.

Item 1: grouping studies for synthesis
1a) Description
Provide a description of, and rationale for, the groups used in the synthesis (for example, groupings of interventions, population, outcomes, study design).

Item 2: describe the standardised metric and transformation method used
Description
Describe the standardised metric for each outcome. Explain why the metric(s) was chosen, and describe any methods used to transform the intervention effects, as reported in the study, to the standardised metric, citing any methodological guidance used.

Explanation
The term “standardised metric” refers to the metric that is used to present intervention effects across the studies for the purpose of synthesis or interpretation, or both. Examples of standardised metrics include measures...
of intervention effect (for example, risk ratios, odds ratios, risk differences, mean differences, standardised mean differences, ratio of means), direction of effect, or P values. An example of a statistical method to convert an odds ratio to a standardised mean difference is that proposed by Chinn (2000). For other methods and metrics, see Cochrane Handbook Chapter 6.

**Item 3: describe the synthesis methods**

*Description*

Describe and justify the methods used to synthesise the effects for each outcome when it was not possible to undertake a meta-analysis of effect estimates.

*Explanation*

For various reasons, it may not be possible to do a meta-analysis of effect estimates. In these circumstances, other synthesis methods need to be considered and specified. Examples include combining P values, calculating summary statistics of intervention effect estimates (for example, median, interquartile range) or vote counting based on direction of effect. See table 2 for a summary of possible synthesis methods (for further details, see McKenzie and Brennan 2019). Justification should be provided for the chosen synthesis method.

**Item 4: criteria used to prioritise results for summary and synthesis**

*Description*

Where applicable, provide the criteria used, with supporting justification, to select particular studies, or a particular study, for the main synthesis or to draw conclusions from the synthesis (for example, based on study design, risk of bias assessments, directness in relation to the review question).

**Item 5: investigation of heterogeneity in reported effects**

*Description*

State the method(s) used to examine heterogeneity in reported effects when it was not possible to undertake a meta-analysis of effect estimates and its extensions to investigate heterogeneity.

**Explanation**

Criteria may be used to prioritise the reporting of some study findings over others or to restrict the synthesis to a subset of studies. Examples of criteria include the type of study design (for example, only randomised trials), risk of bias assessment (for example, only studies at a low risk of bias), sample size, the relevance of the evidence (outcome, population/context, or intervention) pertaining to the review question, or the certainty of the evidence. Pre-specification of these criteria provides transparency as to why certain studies are prioritised and limits the risk of selective reporting of study findings.

**Item 6: certainty of evidence**

*Description*

Describe the methods used to assess the certainty of the synthesis findings.

**Explanation**

Certainty of evidence. Pre-specification of these criteria provides transparency as to why certain studies are prioritised and limits the risk of selective reporting of study findings.

**Item 7: data presentation methods**

*Description*

Describe the graphical and tabular methods used to present the effects (eg, tables, forest plots, harvest plots).

**Explanation**

Informal methods to investigate heterogeneity in the findings may be considered when a formal statistical investigation using methods such as subgroup analysis and meta-regression is not possible.
Table 2 | Questions answered according to types of synthesis methods and types of data used

<table>
<thead>
<tr>
<th>Question asked</th>
<th>Synthesis method</th>
<th>Minimum data required</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is the common intervention effect? What is the average intervention effect? Which intervention, of multiple, is most effective? What factors modify the magnitude of the intervention effects?</td>
<td>Meta-analysis of effect estimates and extensions (eg, sub-group analysis, meta-regression, network meta-analysis)</td>
<td>✓ ✓ - -</td>
</tr>
<tr>
<td>What is the range and distribution of observed effects?</td>
<td>Summarising effect estimates</td>
<td>✓ - - -</td>
</tr>
<tr>
<td>Is there evidence of an effect in at least one study?</td>
<td>Combining P values</td>
<td>- - ✓ ✓</td>
</tr>
<tr>
<td>Is there any evidence of an effect?</td>
<td>Vote counting based on direction of effect</td>
<td>- - ✓ -</td>
</tr>
</tbody>
</table>

Abbreviated from table 12.2.a of McKenzie and Brennan 2019.11

- - - -
- - - -
- - - -

Item 8: reporting results

Description
For each comparison and outcome, provide a description of the synthesised findings and the certainty of the findings. Describe the result in language that is consistent with the question the synthesis addresses and indicate which studies contribute to the synthesis.

Explanation
For each comparison and outcome, a description of the synthesis findings should be provided, making clear which studies contribute to each synthesis (for example, listing in the text or tabulated). In describing these findings, authors should be clear about the nature of the question(s) addressed (see table 2, column 1), the metric and synthesis method used, the number of studies and participants, and the key characteristics of the included studies (population/settings, interventions, outcomes). When possible, the synthesis finding should be accompanied by a confidence interval. An assessment of the certainty of the effect should be reported. Results of any investigation of heterogeneity should be described, noting if it was not pre-planned and avoiding over-interpretation of the findings. If a pre-specified logic model was used, authors may report any changes made to the logic model during the review or as a result of the review findings.10

Item 9: limitations of the synthesis

Description
Report the limitations of the synthesis methods used and/or the groupings used in the synthesis and how these affect the conclusions that can be drawn in relation to the original review question.

Explanation
When reporting limitations of the synthesis, factors to consider are the standardised metric(s) used, the
synthesis method used, and any reconfiguration of the groups used to structure the synthesis (comparison, intervention, population, outcome).

The choice of metric and synthesis method will affect the question addressed (see table 2). For example, if the standardised metric is direction of effect, and vote counting is used, the question will ask “is there any evidence of an effect?” rather than “what is the average intervention effect?” had a random effects meta-analysis been used.

Limitations of the synthesis might arise from post-protocol changes in how the synthesis was structured and the synthesis method selected. These changes may occur because of limited evidence, or incompletely reported outcome or effect estimates, or if different effect measures are used across the included studies. These limitations may affect the ability of the synthesis to answer the planned review question—for example, when a meta-analysis of effect estimates was planned but was not possible.

Discussion
The SWiM reporting guideline is intended to facilitate transparent reporting of the synthesis of effect estimates when meta-analysis is not used. The guideline relates specifically to transparently reporting synthesis and presentation methods and results, and it is likely to be of greatest relevance to reviews that incorporate diverse sources of data that are not amenable to meta-analysis. The SWiM guideline should be used in conjunction with other reporting guidelines that cover other aspects of the conduct of reviews, such as PRISMA.31 We intend SWiM to be a resource for authors of reviews and to support journal editors and readers in assessing the conduct of a review and the validity of its findings.

The SWiM reporting items are intended to cover aspects of presentation and synthesis of study findings that are often left unreported when methods other than meta-analysis have been used.7 These include reporting of the synthesis structure and comparison groupings (items 1, 4, 5, and 6), the standardised metric used for the synthesis (item 2), the synthesis method (items 3 and 9), presentation of data (item 7), and a summary of the synthesis findings that is clearly linked to supporting data (item 8). Although the SWiM items have been developed specifically for the many reviews that do not include meta-analysis, SWiM promotes the core principles needed for transparent reporting of all synthesis methods including meta-analysis. Therefore, the SWiM items are relevant when reporting synthesis of quantitative effect data regardless of the method used.

Reporting guidelines are sometimes interpreted as providing guidance on conduct or used to assess the quality of a study or review; this is not an appropriate application of a reporting guideline, and SWiM should not be used to guide the conduct of the synthesis. For guidance on how to conduct synthesis using the methods referred to in SWiM, we direct readers to the second edition of the Cochrane Handbook for Systematic Reviews of Interventions, specifically chapter 12.11 Although an overlap inevitably exists between reporting and conduct, the SWiM reporting guideline is not intended to be prescriptive about choice of methods, and the level of detail for each item should be appropriate. For example, investigation of heterogeneity (item 5) may not always be necessary or useful. In relation to SWiM, we anticipate that the forthcoming update of PRISMA will include new items covering a broader range of synthesis methods,12 but it will not provide detailed guidance and examples on synthesis without meta-analysis.

The SWiM reporting guideline emerged from a project aiming to improve the transparency and conduct of narrative synthesis (ICONS-Quant: Improving the CONduct and reporting of Narrative Synthesis).10 Avoidance of the term “narrative synthesis” in SWiM is a deliberate move to promote clarity in the methods used in reviews in which the synthesis does not rely on meta-analysis. The use of narrative is ubiquitous across all research and can serve a valuable purpose in the development of a coherent story from diverse data.33 34 However, within the field of evidence synthesis, narrative approaches to synthesis of quantitative effect estimates are characterised by a lack of transparency, making assessment of the validity of their findings difficult.7 Together with the recently published guidance on conduct of alternative methods of synthesis,11 the SWiM guideline aims to improve the transparency of, and subsequently trust in, the many reviews that synthesise quantitative data without meta-analysis, particularly for reviews of intervention effects.

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Web appendix: Supplementary file 1

Web appendix: Supplementary file 2