Beginning a systematic review of the healthcare literature

This guide provides a brief introduction for postgraduate researchers to the steps involved in conducting a systematic review of the healthcare literature. In the examples it is assumed that a health intervention is being considered. However, the general principles outlined below apply to other types of review question such as the likely causes of a condition, the best diagnostic test or people’s views and opinions on a topic.

What is a systematic review?

Systematic reviews are summaries of existing research on a particular topic. They use the same principles and rigour that is expected of primary research, using methods that are pre-planned and documented in a systematic review protocol and in the completed review.

Although estimates vary depending on the topic area, it’s generally the case that a good systematic review take 60-90 working days and be carried out by at least two researchers who require a range of searching, critical appraisal and research synthesis skills (eg meta-analysis or thematic synthesis depending on the question and the types of study being included).

There are eight main steps in the systematic review process:

1. **Identify a clear healthcare question**

   Systematic reviews answer specific healthcare questions rather than providing general summaries of the literature on a given topic. They are often used to assess the effectiveness of particular interventions and, where an intervention is being considered, a good review question would define clearly:
   (a) the specific population/problem under investigation (P)
   (b) the intervention being evaluated (I)
   (c) the comparison or control under scrutiny (C)
   (d) the outcome of interest (O)
2. Develop a review protocol

A review protocol is a detailed description of the scope, aims and methods of the study. It states the review question(s), details how and where studies will be located, selected, appraised and synthesised. The search strategy should also be included in the protocol. For examples of protocol templates see libguides.city.ac.uk/learninghealthcare?p=1038501

Register your protocol with Prospero: www.crd.york.ac.uk/PROSPERO/. This will ensure transparency, and let others know that your review is ongoing.

3. Search the literature

The aim is to identify (published and unpublished) studies using bibliographic databases and other information sources of relevance to your research question. For researchers in medicine and healthcare an initial search would normally use a combination of keywords and MeSH (medical subject heading) terms in Ovid Medline. The search would then be adapted as appropriate for other databases such as Embase, PsycINFO, HMIC and AMED. For researchers in nursing the initial search strategy might be developed in CINAHL. Other important general databases are the Web of Science, Scopus and ASSIA.

In order to retrieve types of studies pertaining to the review question, search filters can be added to the search strategy. See the link to the Cochrane Handbook or the InterTASC Information Specialists' Sub-Group Search Filter Resource

Ask your subject librarian for advice: www.cardiff.ac.uk/insrv/libraries/contacts/list.html

In addition, other information sources should be searched, such as websites, key journals, grey literature and trials registers. Reference lists of all included papers should be scanned and subject experts (authors of relevant studies) contacted. In particular, this is to find unpublished studies to help minimise the risk of ‘publication bias’ (where positive findings are more likely to be published than negative findings).

Where possible non-English language papers should be included in a systematic review; exclusion of this literature due to lack of funding for translation costs should be mentioned.

To evaluate the effectiveness of the search strategy, the researcher needs to identify some relevant papers in the research topic area (by speaking to experts in the field); if the search strategy doesn’t retrieve these it needs to be amended. The search results should be imported into reference management database such as Endnote, Reference Manager, Zotero.

All searches should be documented to include information about the databases and interfaces searched (including the dates covered and when the search was run), full detailed search strategies and the number of records including supplementary searching and contact with experts.

A study flow diagram should be included to represent the flow of information through the different phases of a systematic review See www.prisma-statement.org/statement.htm

4. Identify relevant studies

Relevant studies are selected and assessed for their actual relevance from the reference management database. This task should be performed independently by two or more researchers.

Inclusion and exclusion criteria should be stated in the protocol; these may relate to specific populations or outcome measures. This information protects the review from allegations of investigator bias, where the reviewer consciously or unconsciously selects studies for inclusion based on their results.
5. Critically appraise relevant studies

Critical appraisal should be performed independently by two or more researchers to avoid bias. This considers the research methods used in a study to determine how reliable its results are likely to be. Insufficient rigour in the design and conduct of studies is likely to introduce error and bias. In the case of randomised controlled trials it may identify sources of bias in four stages of the research:
(a) selection of participants (particularly randomisation and allocation concealment)
(b) treatment provided to the study groups
(c) follow-up of participants
(d) measurement of outcomes

For examples of CA checklists see: www.cardiff.ac.uk/insrv/libraries/sure/checklists.html

6. Collect data from individual studies

Data extraction should be performed independently by two or more researchers.

Data collection tools are used to:
(a) ensure all relevant data is collected
(b) minimise the risk of transcription errors while data is being collected
(c) allow the accuracy of data to be checked
(d) serve as a record of the data collected.

This phase of the review is complicated by issues such as incomplete reporting of study findings and the different ways in which outcomes and other data are reported and presented. For recently published research it may be possible to contact the authors to obtain incomplete data.

7. Summarise studies’ conclusions

The aim is to synthesise the findings from individual studies to provide a judgement on the effectiveness of a particular intervention. It also allows the reviewer to investigate whether the effect of a treatment is roughly comparable in different studies. The synthesis may be achieved by a narrative summary of studies using written summaries of findings supported by brief descriptions of each study in ‘evidence tables’.

For an intervention review, it may also be possible to combine the data statistically in a meta-analysis to get an overall estimate of the effectiveness.

Meta-analysis can only be undertaken when studies address the same question, use the same population, administer the intervention in a similar manner and measure the same outcomes. Where this is not the case a meta-analysis is not appropriate.

The results of a meta-analysis can be displayed graphically for ease of interpretation. This allows a visual comparison of the findings of individual studies (example below):


The position of the black squares to the left of the vertical line indicates that the specified treatment was found to be beneficial; to the right of the line would indicate that the treatment was not effective.

See Khan 2011 in further reading for case studies of summary methods used in other types of review.
8. Publicise review findings

Systematic reviews are often undertaken to inform policymakers and practitioners. Report production and dissemination are therefore crucial parts of the process. Such reports will usually include an introduction, outline of the methodology, a commentary on the nature of the evidence identified and detailed findings, conclusions and recommendations. The detailed methods need to be included to enable a reader to judge the validity of the techniques employed.

Conclusion

Systematic reviews provide a summary of the best available evidence. The risk of human error during the review is reduced by having two or more people undertaking each stage of the process. The conclusion of the review is not merely a summary of what we know about a topic, it is also an indicator of what future research needs to be done.

Further Reading and useful links

- The Campbell Collaboration: The steps in producing a Campbell systematic review (reviews of social interventions) [www.campbellcollaboration.org/systematic_reviews/index.php](http://www.campbellcollaboration.org/systematic_reviews/index.php)
- The InterTASC Information Specialists’ Sub-Group Search Filter Resource [sites.google.com/a/york.ac.uk/issg-search-filters-resource/home/search-filters-by-design](http://sites.google.com/a/york.ac.uk/issg-search-filters-resource/home/search-filters-by-design)

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