Writing a Systematic Literature Review: Resources for Students and Trainees

Australian Paediatric Surveillance Unit

This resource provides basic guidance and links to resources that will help when planning a systematic review of the literature. It does not replace guidance from your research project supervisors and your university or hospital librarians.

- A systematic literature review is often the first and essential step in the research process.
- A rigorously conducted literature review will help you to:
- Determine what is already known about your proposed research topic /question
- Appraise the quality of the research evidence
- Synthesise the research evidence from studies of the highest quality
- Identify research gaps and priorities for generating new evidence to fill these gaps
- Avoid unnecessarily duplication of research
- Shape your future research project and inform your research plan

Ensure you have a clearly defined question/ questions for the literature review and describe these in terms of **P**articipants, **I**nterventions, **C**omparisons, **O**utcomes, and **S**tudy design (PICOS).

What's the difference between a systematic literature review and a meta-analysis?

A systematic review is a review of the literature that addresses a clearly formulated question and uses systematic and explicit methods to:

- identify publications,
- select publications relevant to the question
- critically appraise the publications
- analyse the data reported in the relevant publications
- report the combined results from relevant publications.

Meta-analysis is a statistical method that integrates and summarises results from relevant publications selected in the systematic review. NOT ALL systematic reviews use meta-analysis. Meta-analysis is particularly useful where the systematic review aims to determine the magnitude of quantifiable effects attributable to e.g. a drug, a behavioural intervention, etc.

The above are based on definitions published by the **Cochrane Collaboration**, which is *"…a global independent network of health practitioners, researchers, patient advocates and others, responding to the challenge of making the vast amounts of evidence generated through research useful for informing decisions about health."* To find out more about meta-analysis and Cochrane reviews please go to http://www.cochrane.org/

The Cochrane Collaboration website also provides a link to the Cochrane Register of Reviews which can be searched to determine whether any reviews have been registered or completed.

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Some key resources are highlighted in the next few pages – researchers around the world have found these useful – it's worth a look and it might save you a lot of time!

Keep these tips in mind:

1. Define your question clearly (remember PICOS); discuss with your supervisor and colleagues
2. Write a brief protocol according to guidelines for systematic reviews (e.g. PRISMA or Cochrane)
3. Talk with a librarian once you have a draft protocol
4. Search literature databases using agreed MeSH headings and key words
   - **Save all search strategies** and limits used – you will need to report these
   - Use EndNote or similar to manage the references you found, cite as you write
5. **Always ASK YOUR SUPERVISOR OR YOUR UNIVERSITY/HOSPITAL LIBRARIAN for help**

PRISMA: Preferred **R**eporting **I**tems for **S**ystematic reviews and **M**eta-**A**nalyses: the PRISMA statement (Moher et. al. 2009) http://www.prisma-statement.org/statement.htm

The PRISMA statement is essential reading before starting a systematic literature review. Editors increasingly expect authors of systematic reviews to use PRISMA or similar guidelines.

The **PRISMA checklist** will guide you on HOW to develop a **systematic review protocol** and WHAT to include when writing up your review. In your protocol you should set down a clear method including:

- Databases to be searched; additional sources used e.g. scanning bibliographies of relevant articles
- MeSH terms or key words to be used in the search strategy
- Limits applied e.g. published between 2004 and 2013; English language; children < 18 years
- Screening process e.g. scanning titles and abstracts for relevance according to inclusion and exclusion criteria
- Data to be extracted from the relevant articles identified
- Summary data to be reported – this must be closely linked with the initial aims or "questions" of the literature review

All systematic reviews should include a **Flow Diagram** to demonstrate how many publications were identified and screened for eligibility, how many publications were excluded and why. The PRISMA website provides excellent resources including a checklist and an example of a flow diagram.

The PRISMA Checklist and Flow Diagram is attached to the end of this guide. You will also find these resources on the PRISMA website.

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PROSPERO: University of York Centre for Reviews and Dissemination

http://www.crd.york.ac.uk/PROSPERO/

PROSPERO is a register of systematic reviews. It provides links to useful resources about different kinds of reviews. It also provides a searchable database of registered reviews. When embarking on a systematic review, it is wise to search PROSPERO and Cochrane databases for any registered reviews to ensure that you are not duplicating efforts.

EQUATOR Network: Enhancing the **QU**Ality and **T**ransparency **O**f health **R**esearch

http://www.equator-network.org/

The EQUATOR Network strives to improve the reliability and value of medical research literature by promoting transparent and accurate reporting of research studies. There are useful toolkits for authors reporting on health research including a toolkits on reporting systematic literature reviews http://www.equator-network.org/toolkits/

Searching the literature

Your supervisor should provide guidance regarding access to library services, including access to databases of literature. The most commonly used databases include:

- **Medline / PubMed** http://www.ncbi.nlm.nih.gov/pubmed (this resource is free)

  Useful Medline/PubMed resources: http://www.nlm.nih.gov/bsd/pmresources.html
- **SCOPUS** http://www.scopus.com/
- **Web of Science** http://thomsonreuters.com/thomson-reuters-web-of-science/

SCOPUS and Web of Science are available via your university portal or the Hospital library portal.

Clinical Information Access Portal (CiAP) http://www.ciap.health.nsw.gov.au/home.html is a portal through which you can access a number of literature databases and other resources (eg. Medline, PsychInfo, BMJ Best practice). CIAP is available to all NSWHealth employees.

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Managing your references

Using reference management software will enable you to:

- Categorise the articles identified in your search – you can create groups of articles that answer specific questions
- Cite as you write – insert citations in a predetermined format in your report or paper as you write
- Generate a list of references cited in your report according to a predefined format eg. Vancouver

Commonly used reference management software:

- **EndNote** http://endnote.com/ there is a cost – most universities and possibly some hospital libraries provide access for free – check with your supervisor or local librarian
- **RefMan** http://www.refman.com/ there is a cost for this – some universities / hospitals provide access to RefMan

A comparison of reference management software is published here:
http://www.libraries.psu.edu/psul/lls/choose_citation_mgr.html

OTHER RESOURCES

Peat J, Mellis C, Williams K, Xuan W. Health Science Research: A handbook of Quantitative Methods. Allen and Unwin, 2001 (especially chapter 1)

Bernard Becker Medical Library, Washington Medical School of Medicine, St. Louis

http://beckerguides.wustl.edu/SystematicReviews

Duke University

http://guides.mclibrary.duke.edu/sysreview

University of Edinburgh Centre for Cognitive Ageing & Cognitive Epidemiology

http://www.ccace.ed.ac.uk/research/software-resources/systematic-reviews-and-meta-analyses

PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	

Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(6): e1000097. doi:10.1371/journal.pmed1000097 For more information, visit: www.prisma-statement.org

PRISMA 2009 Flow Diagram

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). *P*referred *R*eporting *I*tems for *S*ystematic Reviews and *M*eta-*A*nalyses: The PRISMA Statement. PLoS Med 6(6): e1000097. doi:10.1371/journal.pmed1000097

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