Guidelines for writing systematic reviews

We frequently receive requests for help with writing systematic reviews. Here is a summary of the steps for writing a systematic review and a reference list of Library resources. Contact Mary (mary.simons@mq.edu.au) or Karen (karen.marks@mq.edu.au) for further assistance.

A systematic review is an overview of primary studies that used explicit and reproducible methods. Systematic reviews apply scientific strategies that limit bias by the systematic assembly, critical appraisal and synthesis of all relevant studies on a specific topic.

A meta-analysis is a mathematical synthesis of the results of two or more primary studies that addressed the same hypothesis in the same way.

Systematic reviews as well as meta-analyses of appropriate studies can be the best form of evidence available for health care practitioners.

SYSTEMATIC REVIEW STEPS:

1. Research Question
2. Research Protocol
3. Literature Search
4. Data Extraction
5. Quality Appraisal
6. Data Analysis and Results
7. Interpretation of Results

1. Research Question
The first step in performing a systematic review is to formulate a primary research question as part of the research protocol. Appropriate questions to be addressed include: (1) phenomena associated with disease or interventions, (2) disease or condition frequency, (3) diagnostic accuracy, (4) disease etiology and/or risk factors, (5) prognosis, and (6) intervention effects.
The aims of a systematic review can be varied and include: (1) clarifying the relative strengths and weaknesses of the literature on the question, (2) summarizing a large amount of literature, (3) resolving literature conflicts, (4) evaluating the need for a large clinical trial, (5) avoiding a redundant unnecessary trial, (6) increasing the statistical power of smaller studies, (7) improving the precision or identify a smaller treatment effect, and (8) improving the generalizability of treatment outcomes.

2. Research Protocol
Once the research question is formulated, the research protocol is developed. The goal of developing a research protocol is to develop formulation of the questions and methods of the review before retrieving the literature. The methods for literature searching, screening, data extraction, and analysis should be contained in a written document to minimize bias before starting the literature search.

3. Literature Search
Sources to search for studies for systematic reviews:

- Cochrane Central Register of Controlled Trials (via Cochrane Library)
- Cochrane Database of Systematic Reviews (via Cochrane Library)
- Database of Abstracts of Reviews of Effects (DARE) database – ie: other reviews (via Cochrane Library)
- Medline and Embase (Library does not subscribe to Embase)
- Other databases, eg CINAHL, Scopus, PsycINFO
- Journals
- Conference proceedings
- Bibliographies and references listed in primary sources
- Unpublished and ongoing studies, including known experts in the field (seek by personal communication)
- Raw data from published trials (seek by personal communication)
- Foreign language literature (do not limit searches to English)
- “Grey literature” (theses, internal reports, non peer-reviewed journals, pharmaceutical industry files)
- PubMed Clinical Queries (www.ncbi.nlm.nih.gov/entrez/query) includes search filters offering 4 categories of aetiology, prognosis, treatment, diagnosis, and choice of emphasizing sensitivity or specificity.
- Cochrane Handbook appendix contains a list of approximately 30 clinical trials registries for finding unpublished primary studies (See Reference List for Library call number)

A minimum of two reviewers performs a first-stage screening of titles and abstracts based on the research question and its study design, population, intervention, and outcome to be studied. Based on the initial screening, selected full-text articles are obtained for the second-stage screening. Using the full text a second-stage screening is performed by at least two reviewers. The studies selected are then submitted for data extraction.

4. Data Extraction
A standardized form (paper or electronic) assists in the task of data extraction. For example:

Sample Data Extraction Form Items:
- Reference— including journal, title, author, volume in page numbers
- Objective—the study objective as stated by the authors
- Study design— type of trial
- Population— demographics of the participants in the study
- Intervention— description of the intervention
- Control— description of the control group or alternative intervention
- Outcome— results of the intervention and how measured including statistics used
- Comments— details regarding the study quality

5. Quality Appraisal
A checklist to assess for biases is important: several quality scales and checklists have been developed for this.

Each trial should be evaluated in terms of its:

- Methodological quality—the extent to which the design and conduct are likely to have prevented systematic errors (bias)
- Precision—a measure of the likelihood of random errors (usually depicted as the width of the confidence interval around the result)
- External validity—the extent to which the results are generalisable or applicable to a particular target population

6. Data Analysis and Results
After including and excluding studies based on the quality appraisal, data analysis and results of the studies should be undertaken. The initial step for this process involves a simple descriptive evaluation of each study, commonly presented in tabular format. Tables should include the population under study, the interventions, and outcomes.

7. Interpretation of Results
Most of this information can be presented in the data analysis and results table in the manuscript. The strengths and weaknesses of the included studies must be discussed. Conclusions should be based on the best available scientific evidence. Recommendations regarding future studies can also be made.

PRISMA stands for Preferred Reporting Items for Systematic Reviews and Meta-Analyses (www.prisma-statement.org). It is an evidence-based minimum set of items for reporting in systematic
reviews and meta-analyses. PRISMA should be a helpful resource to improve reporting of systematic reviews and meta-analyses.

References used for this summary (all are available from the Library):


Mary Simons, 1 February, 2011