Searching for studies for Systematic Reviews: a brief guide

Note: this guide is based on resources available to RCSi staff and students.

If you have any queries regarding the content or need advice in carrying out systematic review searching, please contact Grainne McCabe (gmccabe@rcsi.ie) or Paul Murphy (pjmurphy@rcsi.ie) in the Mercer Library or Breffni Smith (breffnismith@rcsi.ie) in Beaumont Hospital Library.
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1.1 What is a systematic review?

A systematic review identifies, appraises and synthesizes the evidence that meets pre-specified eligibility criteria to answer a given research question.

Explicit methodologies are used, which are aimed at minimizing bias and producing reliable findings.

The search strategy used in the review ideally should follow established guidelines, should be comprehensive, reproducible and documented.

The Cochrane Handbook (6.1.1.2) states: Systematic reviews of interventions require a thorough, objective and reproducible search of a range of sources to identify as many relevant studies as possible. This is a major factor in distinguishing systematic reviews from traditional narrative reviews and helps to minimize bias and therefore assist in achieving reliable estimates of effects. ¹

1.2 Where to find guidance

1.2.1 Centre for Reviews and Dissemination (CRD), University of York.

CRD has produced a guide to researching and writing up systematic reviews. ²

Chapter 1: Core principles and methods for conducting a systematic review of health interventions
- Sections 1.3.1 to 1.3.10 deal with identifying studies: searching databases and other sources, guidance on search strategies, documenting your searches.

Check out also:
- Appendix 2 for an sample search strategy and an explanation of the process
- Appendix 3 for how to document the search process
- Appendix 4 for searching for adverse effects

1.2.2 Cochrane Collaboration

Essential if you are carrying out a Cochrane systematic review, and an excellent guideline for other reviewers.

1.2.2.1 Cochrane Handbook for Systematic Reviews of Interventions¹
- Chapter 6: Searching for Studies
  Lists of sources – including databases, trials registers
  Search hints and tips
  RCT filters for Medline
  http://www.cochrane-handbook.org/

1.2.2.2 The MECIR (Methodological Expectations of Cochrane Intervention Reviews) project

The MECIR project has drawn up standards for the conduct and the reporting of Cochrane Intervention Reviews. Very useful to follow even if you are not doing a Cochrane Review – use as a checklist.

Each standard is either mandatory or highly desirable and the exclusion should be justified. A rationale and elaboration of each standard is included as well as a reference to the relevant section of the Cochrane Handbook.

Methodological standards for the conduct of Cochrane Intervention Reviews, version 2.2, 17 December 2012

Items C24-C38 cover standards for searching for studies.

Item C24 Searching key databases
Item C25 Searching specialist bibliographic databases
Item C26 Searching for different types of evidence
Item C27 Searching trials registers
Item C28 Searching for grey literature
Item C29 Searching within other reviews
Item C30 Searching reference lists
Item C31 Searching by contacting relevant individuals and organisations
Item C32 Structuring search strategies for bibliographic databases
Item C33 Developing search strategies for bibliographic databases
Item C34 Using search filters
Item C35 Restricting database searches
Item C36 Documenting the search process
Item C37 Rerunning searches
Item C38 Incorporating findings from rerun searches

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2.1 Where to search – published literature

Links to the following resources can be found on the Library’s webpages: http://www.rcsi.ie/library

<table>
<thead>
<tr>
<th>Name</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core</td>
<td></td>
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<tr>
<td>Cochrane Library</td>
<td></td>
</tr>
<tr>
<td>– Cochrane Reviews</td>
<td>• Intervention &amp; diagnostic reviews</td>
</tr>
<tr>
<td>– Other reviews</td>
<td>• Critically appraised and re-structured abstracts</td>
</tr>
<tr>
<td>– Trials</td>
<td>• Register of clinical trials</td>
</tr>
<tr>
<td>Medline</td>
<td>Three different versions: PubMed, OVID Medline &amp; Ebsco Medline</td>
</tr>
<tr>
<td>Embase</td>
<td>Especially good for European studies, pharmacological literature, conference abstracts</td>
</tr>
<tr>
<td>Web of Knowledge</td>
<td>Good for conference abstracts, citation searching, Social science</td>
</tr>
<tr>
<td>SCOPUS</td>
<td>Good for conference abstracts, citation searching (from 1996), patents, scientific webpages</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subject / study dependant</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CINAHL</td>
<td>Nursing and allied health</td>
</tr>
<tr>
<td>PsycInfo</td>
<td>Psychology &amp; psychiatry</td>
</tr>
<tr>
<td>Web of Knowledge</td>
<td>Social Science</td>
</tr>
<tr>
<td>ERIC</td>
<td>Education</td>
</tr>
<tr>
<td>TOXLINE</td>
<td>Effects of drugs and chemicals</td>
</tr>
<tr>
<td>PedRO</td>
<td>Physiotherapy (systematic reviews and randomised controlled trials only)</td>
</tr>
</tbody>
</table>

2.2 Where to search - grey literature

Grey literature covers published material not indexed in databases such as Medline, Embase etc, which index principally journal literature. Grey literature includes technical reports, official publications, conference papers, dissertations, patents, research in progress, usually produced by academic, government and professional organisations.

It is important to search grey literature resources in order to minimise bias in your search results. See the Subject Resources pages on the Library’s website (http://www.rcsi.ie/library) for suggestions. This set of webpages link to professional websites in areas such as Pharmacy, Global Health (good for statistical websites such as WHO, OECD, CDC), General Practice and others.

Note: these pages are not comprehensive.
Guides to grey literature include:

- the excellent HSE Library’s Guide to Grey Literature http://www.hselibrary.ie/east, see the Helpsheets, Tutorials, Documents section
- New York Academy of Medicine’s bimonthly alerts to new health services research/public health topics: Grey Literature Report (http://www.greylit.org/home)

<table>
<thead>
<tr>
<th>Name</th>
<th>Note</th>
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</thead>
<tbody>
<tr>
<td>GoogleScholar</td>
<td>Good for initial background searches. Includes PubMed records, but the coverage, order and ranking is unclear – best to search PubMed separately</td>
</tr>
<tr>
<td>OpenGrey (<a href="http://www.opengrey.eu">http://www.opengrey.eu</a>)</td>
<td>System for Information on Grey Literature in Europe</td>
</tr>
<tr>
<td>Catalogue: <a href="http://locatorplus.gov/">http://locatorplus.gov/</a></td>
<td></td>
</tr>
<tr>
<td>Institutional repositories</td>
<td>Digital collections of scholarly output from academic and professional organisations</td>
</tr>
<tr>
<td>- OpenDOAR (<a href="http://www.opendoar.org/">http://www.opendoar.org/</a>)</td>
<td>International</td>
</tr>
<tr>
<td>- Bielefeld Base (<a href="http://www.base-search.net/Search/Advanced">http://www.base-search.net/Search/Advanced</a>)</td>
<td>European</td>
</tr>
<tr>
<td>- Lenus (<a href="http://www.lenus.ie/hse/">http://www.lenus.ie/hse/</a>)</td>
<td>Irish – HSE</td>
</tr>
<tr>
<td>- RIAN (<a href="http://rian.ie/">http://rian.ie/</a>)</td>
<td>Irish – academic</td>
</tr>
<tr>
<td>- e-publications@RCSI (<a href="http://epubs.rcsi.ie/">http://epubs.rcsi.ie/</a>)</td>
<td>RCSI</td>
</tr>
<tr>
<td>Social Science Research Network (<a href="http://ssrn.com/">http://ssrn.com/</a>)</td>
<td>Number of specialized research networks in each of the social sciences. Includes an abstracts database of forthcoming papers and working papers as well as Electronic Paper Collection of full text documents. Good for health service topics.</td>
</tr>
<tr>
<td>Websites of relevant professional organisations (<a href="http://www.rcsi.ie/library">http://www.rcsi.ie/library</a>) - see Subject Resources / Irish Resources for a list of Irish healthcare agencies</td>
<td>You will be aware of relevant organisations from your own professional work – check out the publications on their websites and consider contacting them for updates on the research they are in the process of carrying out.</td>
</tr>
<tr>
<td>Theses</td>
<td></td>
</tr>
<tr>
<td>Resources</td>
<td>Doctoral research theses from UK Higher Education Institutes European research theses</td>
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<tr>
<td>-----------</td>
<td>------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>EthOS (<a href="http://ethos.bl.uk/">http://ethos.bl.uk/</a>)</td>
</tr>
<tr>
<td></td>
<td>DART-Europe (<a href="http://www.dart-europe.eu/">http://www.dart-europe.eu/</a>)</td>
</tr>
<tr>
<td></td>
<td>Institutional repositories (see above)</td>
</tr>
</tbody>
</table>

### 3.1 Where to start – scoping the topic

Initial searches are scoping exercises, giving an overview of the topic, placing your work in the context of already published studies and working out:

- the size of the published literature
- gaps in the literature
- types of studies and research designs
- geographical spread of publications

Initial searches also identify:

- relevance to your topic
- concepts that appear in the results which are peripheral to your topic
- concepts within your topic which are missing from the results

At this stage, skim the results to identify the above. Look at titles, abstracts, subject headings. Initial search strategies will be amended for relevancy and accuracy following feedback from this appraisal of results.

![Database Search Process](image)

### 3.2 Where to start - concepts

Break your topic down into constituent concepts. Depending on your topic, the PICO format may be used to identify the concepts:
Patient / population / problem
- Intervention: cause, prognostic factor, treatment
- Comparison / control (if appropriate)
- Outcome

### 3.3 Where to start – identifying search terms

Initial searches explore various keywords and subject headings and combinations of both.

Using key papers already known to you:
- Find the record on a database such as PubMed
- What words/phrases (keywords) does the author use in the title and abstract?
- What subject headings are used on the record?

Search a relevant database and narrow your words to the titles of the articles. Look closely at the records:
- What words/phrases (keywords) does the author use in the title and abstract?
- What subject headings are used on the record?
- Are there different subject headings to describe the same concept? Do you need to use several subject headings in your strategy?

Adapting the search strategy from a similar study:
- Be critical
- Amend for your topic

Textual/record analysis – use PubReMiner
- ![PubReMiner](http://hgserver2.amc.nl/cgi-bin/miner/miner2.cgi)
- PubReMiner analyses the frequency of words in Medline records
- Consider using some of these words and/or subject headings in your search

Example: Hypnosis smoking cessation

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3.4 Putting the search terms together

You are ideally looking for a combination of keywords and subject headings to describe each aspect of the topic.
Use OR to combine the words and subject headings which describe each aspect.
Finally combine the aspects together with AND.

EXAMPLE:

Wound Cleansing for Pressure Ulcers

Note: this is an abbreviated version of the search strategy. See Appendix 1 for full strategy.

Screenshots below from a search on the Ebsco CINAHL database, 16 Dec 2013

1. Identify keywords (authors’ words) and subject headings for Wound Cleansing.
2. Carry out the searches

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Keywords</th>
<th>Subject headings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wound cleansing</td>
<td>Normal saline OR</td>
<td>Solutions OR</td>
</tr>
<tr>
<td></td>
<td>Povidone OR</td>
<td>Alcohols+ OR</td>
</tr>
<tr>
<td></td>
<td>Water OR</td>
<td>Water OR</td>
</tr>
<tr>
<td></td>
<td>Soap*</td>
<td>Soaps OR</td>
</tr>
</tbody>
</table>

All keywords and subject headings to describe Wound Cleansing combined with OR to culminate into one set of results

Ulcer* = any word that begins with ulcer, eg ulcer, ulcers, ulceration. This is known as truncation

Example: Search Histories from CINAHL (16 Dec 2013)

3. Identify keywords (authors' words) and subject headings for Pressure Ulcers

4. Carry out the searches

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Keywords</th>
<th>Subject headings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure Ulcers</td>
<td>Pressure ulcer* OR</td>
<td>Pressure Ulcer</td>
</tr>
<tr>
<td></td>
<td>Pressure sore* OR</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bed ulcer* OR</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bed sore* OR</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bedsore* OR</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Decubitus ulcer* OR</td>
<td></td>
</tr>
</tbody>
</table>

All keywords and subject headings to describe Pressure Ulcers combined with OR to culminate into one set of results

Ulcer* = any word that begins with ulcer, eg ulcer, ulcers, ulceration. This is known as truncation

5. Finally, combine both sets with AND to give a set of results which discuss Wound Cleansing (any variation) as well as Pressure Ulcers (any variation)

Help

Search strategies are created according to the specifications of the database, for example whether * or $ is the truncation symbol; whether subject heading searching is possible; range of filters/limits offered etc.

See the on-screen help tutorials for each of the databases.

Give yourself plenty of time to learn the database: the content, structure, and features.
3.5 Testing the search strategy on a group of documents – looking out for other search terms / subject headings

See 3.1 Scoping the topic. Look at the set of results and again, look out for:
- concepts that appear in the results which are peripheral to your topic
- concepts within your topic which are missing from the results

Look at relevant records and identify the keywords and subject headings – make sure these are included in your search strategy.

Strategies vary between highly sensitive (high recall, but will retrieve irrelevant items) and highly specific (very precise, but may miss potentially relevant items)

The Cochrane Handbook (6.4.4) defines sensitivity versus precision as a balance between comprehensiveness and maintaining relevance.

3.6 Search filters

Search Filters – sit on top on your subject searches

Carry out your subject searches first, evaluate and make sure you are happy with the relevancy of the results. Then apply the filter.

Examples of filters are:
- Clinical Queries
  - Type in the final search number from your subject searches, eg #24
  - Choose from Etiology, Diagnosis, Therapy, Prognosis, Clinical Prediction Guides
  - Choose a Narrow (Specific/Precise) or Broad (Sensitive) approach
  - There is an automatic systematic review filter within Clinical Queries
  - See the links within Clinical Queries for further information about how the filters are structured

Warning – complex filters such as Clinical Queries differ from the range of other filters offered within databases, for example age, publication type. The database filters apply may (as in the case of PubMed) apply only to indexed items and will automatically exclude any recently added items (indicated by the terms “as supplied by publisher”, or “in process”).

3.7 Expanding your results: using core articles

Once you have identified the core articles, you can expand your results further by using:

- Reference lists: check out the reference lists in your core articles for other articles which may have been missed from your search strategy

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• **Cited by:** use the citation search in Web of Knowledge and SCOPUS databases and the *cited by* links in Google Scholar to find out who has cited your core articles in their work

• **Related citations:** a weighted algorithm is used to retrieve other items which are closely related to your item. Treat with caution, however, as the results may be on a tangent. (Not available in all databases)

• **Contact authors and organisations:** for further information on their research

• **Handsearching:** manually searching relevant journals to capture articles which may have been missed in a database search. See the Cochrane Handbook (6.2.2.1) for more details.

### 3.8 Translating your search into other databases

Each database provider (e.g., OVID, Ebsco) structures the databases differently. For example:

- **OVID databases** (Medline, PsycInfo): default search is by subject heading
- **EBSCO databases** (Medline, CINAHL): default search is by keyword
- **PubMed database** (Medline): default search is a combination of subject heading and keyword
- **Elsevier Embase database:** default search is a combination of subject heading and keyword

Each database (Medline, CINAHL, PsycInfo, Embase) has a different set of subject headings. Some databases (Web of Knowledge, SCOPUS, ERIC) don’t use subject headings, so you are relying on searching authors’ words – remember to think of different words to describe the topic.

It is a complex task to “translate” a search from one database to another and requires a lot of time and effort. Essentially, you need to start again with each database. Find out about the database structure and use your exploration of keywords, subject headings and filters on one database to start exploring the next.

### 4.1 Documenting the search strategy – saving searches, setting up alerts and updating the searches

For each database, set up a personal account (e.g., My NCBI on PubMed). Into your account, you can save:

- Search strategies to rerun at a later stage
- Set up alerts, whereby you will get an email alerting you to new items added to the database which match up with your search
- Individual items organised into collections or folders

**Note:** PubMed saves the search strategy as one long string:

```
Search (deep vein thrombosis) AND (aspirin) AND (travel OR aircraft OR airplane)
```

If you wish to capture all the elements of the search history (search number, description of words used, no of items found), use the Download History option (See Advanced Search) and the history will be saved into a spreadsheet.

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This is what a download history looks like:

If you set up alerts on each database, then you don’t need to run the searches again. However, if you haven’t done so, then it is important to re-run the searches exactly as you did originally in order to capture any additional studies published since your last search.

4.2 Documenting the search strategy - standards

There are several standards for the reporting of reviews, which include the reporting of the search strategies.

1.2.1 Cochrane Collaboration

4.2.1.1 Cochrane Handbook for Systematic Reviews of Interventions\(^7\)
Chapter 11.2 Results of the search and selection of studies
http://www.cochrane-handbook.org/

Concentrates on a study flow diagram, using PRISMA as an example

4.2.1.2 Methodological Expectations of Cochrane Intervention Reviews (MECIR) Project\(^8\)
http://editorial-unit.cochrane.org/mecir


The MECIR project has drawn up standards for the conduct and the reporting of Cochrane Intervention Reviews. Very useful to follow even if you are not doing a Cochrane review – use as a checklist.

Each standard is either mandatory or highly desirable and the exclusion should be justified. A rationale and elaboration of each standard is included as well as a reference to the relevant section of the Cochrane Handbook.

**Methodological standards for the reporting of Cochrane Intervention Reviews, version 1.1, 17 Dec 2012**

Item R34-R39 cover reporting on the search methods for identification of studies

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>R34</td>
<td>Search sources</td>
</tr>
<tr>
<td>R35</td>
<td>Latest searches</td>
</tr>
<tr>
<td>R36</td>
<td>Search timeframe</td>
</tr>
<tr>
<td>R37</td>
<td>Searches for different types of evidence</td>
</tr>
<tr>
<td>R38</td>
<td>Search strategies for bibliographic databases</td>
</tr>
<tr>
<td>R39</td>
<td>Search strategies for other sources</td>
</tr>
</tbody>
</table>


The Statement consists of a 27-item checklist and a flow diagram. It has been published in several journals, together with an Explanation and Elaboration document. See the PRISMA website for links to the journal articles.

Liberati et al⁹ explain the PRISMA statement in detail. Relevant to the search process and reporting of the searches are:

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>7</td>
<td>Information Sources</td>
</tr>
<tr>
<td></td>
<td>Includes an example of how to describe the sources searched</td>
</tr>
<tr>
<td>8</td>
<td>Search</td>
</tr>
<tr>
<td></td>
<td>Includes an example and explanation of a search strategy</td>
</tr>
<tr>
<td>1</td>
<td>PRISMA Flow Diagram</td>
</tr>
<tr>
<td></td>
<td>Illustrates the flow of information through the different phases of a systematic review. (see Appendix 2)</td>
</tr>
</tbody>
</table>

The Cochrane Handbook (Chapter 11.2) has published an example of using the PRISMA flow diagram.¹⁰

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4.2.3 Centre for Reviews and Dissemination (CRD), University of York.

In Systematic Reviews: CRD’s guidance for undertaking reviews in health care\textsuperscript{11}, Appendix 3 deals with documenting the search process and has a useful sample OVID search strategy which could be added as an appendix. It also explains how to describe the search strategy within the text of your review.

APPENDIX 1  -  A Sample Search Strategy


Appendix 5. EBSCO CINAHL search strategy
S28 S22 and S27
S27 S23 or S24 or S25 or S26
S26 TI (bed sore* or bedsore* ) or AB (bed sore* or bedsore*)
S25 TI decubitus or AB decubitus
S24 TI (pressure ulcer* or pressure sore*) or AB (pressure ulcer* or pressure sore*)
S23 (MH ”Pressure Ulcer“)
S22 S1 or S2 or S3 or S4 or S5 or S6 or S7 or S8 or S9 or S10 or S11 or S12 or S13 or S14 or S15 or S16 or S17 or S18 or S19 or S20 or S21
S21 TI ( wash* or scrub* or swab* or shower* or bath* or soak* or irrigat* or whirlpool ) or AB ( wash* or scrub* or swab* or shower* or bath* or soak* or irrigat* or whirlpool )
S20 TI ( wound clean* or wound cleans* ) or AB ( wound clean* or wound cleans* )
S19 (MH ”Hydrotherapy“)
S18 (MH ”Bathing and Baths“)
S17 (MH ”Irrigation“)
S16 AB ( normal saline or hypochlorit* or iodophor* or povidone or iodine or chlorhexidine or hibitane or betadine or antiseptic* or disinfectant* or antiseptic* or detergent* or soap* or hydrogen peroxide or benzoyl peroxide or gentian violet or eusol or dakin* or permanganate or water or alcohol*1 or solution* )
S15 TI ( normal saline or hypochlorit* or iodophor* or povidone or iodine or chlorhexidine or hibitane or betadine or antiseptic* or disinfectant* or antiseptic* or detergent* or soap* or hydrogen peroxide or benzoyl peroxide or gentian violet or eusol or dakin* or permanganate or water or alcohol*1 or solution* )
S14 (MH ”Solutions“)
S13 (MH ”Alcohols“)
S12 (MH ”Water“)
S11 (MH ”Gentian Violet“)
S10 (MH ”Hydrogen Peroxide“)
S9 (MH ”Soaps“)
S8 (MH ”Detergents“)
S7 (MH ”Disinfectants“)
S6 (MH ”Antiinfective Agents, Local“)
S5 (MH ”Povidone-Iodine“)
S4 (MH ”Chlorhexidine“)
S3 (MH ”Saline Solution, Hypertonic“)
S2 (MH ”Sodium Hypochlorite“)
S1 (MH ”Sodium Chloride“)
APPENDIX 2 – PRISMA flow diagram

References


Liberati, A et al. The PRISMA Statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. PLoS Medicine 2009 6(7): e1000100