



Literature Searching and Systematic Reviews

If you are planning to carry out research it is essential that you are aware of the existing literature surrounding your given area. This is to ensure that you can evaluate the extent and quality of research in the area, identify any gaps in the research base and do not replicate work already published. A well planned literature review can form the basis of your research protocol and research governance and ethics committees will ask you to show evidence of your literature searching and what it has found.

Before you start your literature review we suggest you do the following:-

- Visit your university library for training and advice on literature searching
- Contact national library resources (see www.rddirect.org.uk for list of national libraries)
- Read the attached guide produced by the *University of Bath, RDSU*
- Identify which databases you wish to search and obtain username & password from your library
- Develop a search strategy that identifies the themes and keywords that you will use to search with, the date ranges, the type of studies and a list of databases. Discuss your search strategy with a supervisor or mentor

When you have identified the existing literature it is important that you can then evaluate its worth and quality. Our fact sheet on critical appraisal should help you to decide the value and contribution of the research findings you have accessed.

Systematic Reviews

Due to constraints of time and funding many published studies are limited in their scope, or fail to provide enough information on the value of health care procedures. One way of addressing this is by performing systematic research reviews. A research review examines results from a number of studies in a given area. The findings of a review can then be used to describe and investigate the differences between individual studies. This process provides more detailed information for healthcare professionals and can be a useful way of assisting informed decision making.

If you plan to carry out a systematic review we suggest you contact the Centre for reviews and Dissemination at York University (www.york.ac.uk/inst/crd/index.htm). The centre produces guides to help researchers plan, conduct, report and disseminate health related reviews. They offer documents on review methods and resources and offer training.

A further source of information regarding systematic reviews is the Cochrane Collaboration. They facilitate the creation, review, maintenance and dissemination of systematic reviews of the effects of health care. Their web address is www.cochrane.org. The Cochrane Library also produces a self-training guide, including an introduction to the definition and value of systematic reviews, the work of the Cochrane Collaboration and Centre for Reviews and Dissemination, and an explanation of the use of odds-ratios.



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Literature Searching for Research

1 Introduction

Most research projects begin with a literature search to identify the extent and quality of work that has already been carried out in the topic area. For many projects this may be a general sift through the literature identifying anything of relevance but, for more specific types of research, particularly systematic reviews, rigorous searching is required to identify as many relevant high quality studies as possible. A comprehensive search of the literature requires the effective use of the most appropriate database(s).

2 Choosing the right database

Selecting the most appropriate database or databases to search for the job in hand is crucial in literature searching. In health related research there is a wide variety of different databases to choose from. However, databases can offer very different kinds of information. The following are some of the factors to take into account when selecting databases to search:

2.1.1 Bibliographic or full text databases

Many databases are bibliographic, that is they contain citations and abstracts to a variety of articles, for example, journal articles, books, reports or grey literature. The best known example of this type of database in the health sector is Medline, the electronic version of Index Medicus produced by the US National Library of Medicine. There is an increasing number of full text databases which, as their name suggests, hold the full text of reports and articles. Many journals now publish electronically and the full text of articles is available.

2.1.2 Subject or methodology specific and value added databases

To some extent, all databases are organised along subject lines. Both Embase and Medline are biomedical databases, however, each has strong and weak subject areas within that broad framework. For example, Embase is considered to be stronger in physical and occupational therapy, biology, drug research, psychiatry, health policy and alternative medicine. There are also many databases that focus on a much narrower area of interest such as PsychInfo (psychology). Other databases focus on specific types of study methodology, for example, the Cochrane Database of Systematic Reviews (systematic reviews conducted by the Cochrane Collaboration). The Cochrane Library is freely available to NHS staff, patients and the public in England through the National electronic Library for Health (www.nelh.nhs.uk). The main benefit of these databases is that they perform some of the initial sorting of studies. They filter out a specific subsection of the literature that some researchers will be interested in. The additional benefit is that the compilers may have access to sources outside of the mainstream and may be able to achieve more comprehensive



coverage in the topic area than non-specific databases like Medline.

2.1.3 Types of platform

When considering databases it is important to differentiate between the database and the software platform it uses. For example, Medline is made available from a host of suppliers, both commercial and non-commercial. These include OVID and SilverPlatter (commercial) and NLM (non commercial). The data is exactly the same, but the software to retrieve it can vary considerably. Generally, the software functionality available through commercial suppliers is greater allowing more sophisticated and (theoretically) more sensitive and specific searches to be performed

2.1.4 Overlap

Overlap is often present between different databases, which can be both positive and negative. Positive in that it can help to bring important articles to the widest possible audience. Negative in that it can artificially expand the volume of citations to be trawled. It is estimated that overlap between Medline and Embase ranges between 4% and 60%.

3 Sensitivity and specificity (Recall and precision)

Sensitivity (recall) is the proportion of all relevant studies in the database that your search retrieved

Specificity (precision) is the proportion of all studies retrieved by your search that are relevant

A highly sensitive search may identify all relevant studies, but unless it is also specific, there will be a large number of ‘false positives’ or irrelevant studies included too. Table 1 below illustrates how these concepts are related.

	No. of relevant studies in database	No. of studies retrieved in search	No. of relevant studies retrieved
High sensitivity / low specificity	100	1500	96
Low sensitivity / high specificity`	100	26	24
High sensitivity / high specificity	100	112	91

The aim of all literature searching is to optimise both sensitivity and specificity within the limits of a defined research question.

4 Combining terms with Boolean operators

The Boolean operators AND, OR and NOT are used extensively for database searching. They allow terms to be combined in different ways to enhance a search.



AND Combining terms with AND will retrieve all records containing both term 1 AND term 2

OR Combining terms with OR will retrieve records containing term 1 or term 2. This broadens the search retrieving more records;

NOT Combining terms with NOT will retrieve records containing term 1 but NOT those containing term 2

5 Using Indexing

Indexing of databases can significantly enhance the power of searching making it easier to achieve high specificity and sensitivity. Indexing is essentially a system of controlled keywords used to describe each record in the database. In this way, variations in the language and terminology used by the authors of articles can be compensated for. For example, there are many terms used by authors to describe what is essentially a randomised controlled trial:

..double blind multicentre randomised study ...

A controlled study of ...

A blinded trial on the ...

A double-blind placebo controlled study of the ...

A French-Canadian trial of the ...

Rather than trying to account for the different terms used in titles and abstracts and differences between English and US spellings (randomised or randomized?) it is much easier if each RCT has been designated as such using a single unambiguous term. A search on this term should retrieve all relevant articles. Many databases use indexing. Medline and several other major databases use MeSH (Medical Subject Headings) a highly structured thesaurus of some 19,000 terms used to describe each article. Embase uses Emtree, a similar thesaurus index.

Using complex indexes like MeSH takes some practice but is well worth the effort. An excellent article by Lowe and Barnett covers all of the salient points².

6 Using Truncation

Truncation is a facility offered by many databases which enables the searcher to look for several variations of the same word. For example, if searching for articles on hypnosis, the searcher would want to include hypnotise, hypnotise, hypnotised, hypnotising, hypnotics, as well as the US spellings hypnotize etc. Truncation enables the searcher to do this without having to type in the individual terms. Truncation symbols differ between databases although many use * or \$. To retrieve all words relating to hypnosis type:

Hypno*

Care is required to avoid retrieving irrelevant articles. For example rat* would retrieve rat, rats, ratio, rational, rationale, rate, etc.

Wildcard characters perform a similar function but in the middle of a word. Wildcard symbols are usually ? or #. For example, to retrieve records with the words woman and women type:

Wom?n

7 Developing a search strategy

Developing an effective search strategy is a difficult task and is often constrained by the limitations of software and search systems. Here is a basic procedure to use as a guide:



Break down your question into concepts or elements that can be searched separately at first and then combined;

Use boolean operators to combine terms and concepts in different ways: AND for records containing both terms, OR for records containing either term, NOT to screen out records with certain terms (in practice NOT is seldom used);

Select the appropriate thesaurus or indexing terms to represent your concepts (e.g. MeSH in Medline or Emtree in Embase);

Consider using text words and synonyms. These are best used in non-indexed fields like the title and abstract. Often text words can be truncated (using symbols like * or \$) to allow retrieval of words with a variety of endings. For example, use diabet* to retrieve diabetic, diabetes. Be careful as *phobia will retrieve agoraphobia, arachnophobia, xenophobia etc. etc.

Consider using limitors or filters: some databases will allow searches to be limited by age group, sex, human / animal, language, study type (SR or RCT etc.);

Run the strategy, view the results then think about how it can be improved for greater accuracy.

7.1 Predefined search strategies

Interest in identifying particular types of study has led to the development of some comprehensive search strategies. Randomised controlled trials and systematic reviews are the two major types of study that are frequently sought and well developed search strategies to identify these studies on Medline have been developed by the Cochrane Collaboration and the NHS Centre for Reviews and Dissemination. Other organisations have also published methodological filters, Medline strategies to filter out specific types of study³.

8 Health information sources

8.1 Major health related databases

8.1.1 Medline

Bibliographic database produced by the US National Library of Medicine, the electronic version of Index Medicus. Produced from 1966 onwards it holds citations and abstracts from 4,600 journals in 70 countries.

8.1.2 Embase

Bibliographic database produced by Elsevier Science in the Netherlands, the electronic version of Excerpta Medica. Available from 1974 onwards it contains citations and abstracts from 3,800 journals in 70 countries. Its strengths over Medline are its European coverage and coverage of pharmaceutical topics.

8.1.3 CINAHL

US produced database of nursing and allied health literature. Coverage is from 1982 onwards and includes citations from 950 journals and publications of the American Nurses' Association and the National League for Nursing.

8.1.4 British Nursing Index

BNI brings together the previously existing Nursing Midwifery Index (NMI), RCN Nurse ROM, and Nursing Bibliography. It includes references from 220 health related journals and has strong UK coverage.



8.1.5 AMED

Allied and Complementary Medicine is a bibliographic database of published journal articles in fields allied to medicine and alternatives to conventional medicine. The database, created by the Health Care Information Service of the British Library, covers a selection of journals in three separate subject areas: professions allied to medicine, complementary medicine and palliative care.

8.2 Topic and methodology specific databases

8.2.1 Cochrane Library

The Cochrane Library is an electronic publication designed to supply high quality evidence to inform people providing and receiving care, and those responsible for research, teaching, funding and administration at all levels. It is available freely in England through the National electronic Library for Health. The Cochrane Library is a collection of seven separate databases. Five of these provide coverage of evidence-based medicine, and the other two provide information on research methodology. The databases are:

[The Cochrane Database of Systematic Reviews](#) (CDSR)

A database of the full text of systematic reviews on the effects of health care interventions prepared by the international Cochrane Collaboration to strict quality guidelines.

[The Database of Abstracts of Reviews of Effectiveness](#) (DARE)

Critical appraisals of systematic reviews published elsewhere. Prepared by reviewers at the NHS Centre for Reviews and Dissemination at the University of York, England.

[The Cochrane Controlled Trials Register](#) (CCTR)

The largest register of controlled trials in the world, including hand-searched information from unpublished reports and conference proceedings as well as records from MEDLINE, EMBASE and other bibliographic databases

[The Cochrane Database of Methodology Reviews](#) (CDMR)

[The Cochrane Methodology Register](#) (CMR)

[The Health Technology Assessment Database](#) (HTA)

[The NHS Economic Evaluation Database](#) (NHS EED)

Assessments of economic evaluations of health care interventions

8.2.2 PsycInfo

Bibliographic database of abstracts of articles in the psychological literature from 1800 to date

8.2.3 HMIC

Three health management databases: Department of Health United Kingdom Library & Information Services, the King's Fund Library & Information Service, and the Nuffield Institute for Health.



9 Current Research

9.1.1 The Department of Health Research Findings electronic Register (ReFeR)

The Department of Health Research Findings electronic Register (ReFeR) is freely available through the National electronic Library for Health. The database provides 'prompt sight' of the findings of completed research from the NHS R&D Programme and the DH Policy Research Programme.

10 References

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