

Evidence-based medicine - searching the medical literature. Part 1.

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All health professions should be practising 'evidence-based care'. This is defined as the "**integration of the best research evidence with our clinical expertise, and our patient's unique values and circumstances**"¹.

Evidence comes in two types:

1. Primary sources (individual research studies, case studies etc) and
2. Secondary sources (reviews/analysis of studies already done or condensed summaries of all the latest evidence).

Textbooks provide references to both these types of evidence, but are normally a year or more out of date. The latest evidence is best found by searching journals and internet sites, and this article concentrates on the retrieval of primary sources and reviews via PubMed. Part 2 will cover searching for secondary evidence, particularly in the Cochrane Library.

PubMed is the freely available version of Medline. Medline is a huge medical database compiled by the National Library of Medicine in the USA. There are other databases covering medicine/nursing/allied health/psychological literature, but these are only available on payment of a subscription. Most of these will overlap with the content of PubMed.

PubMed and these other databases retrieve only the citation (title, authors, journal etc) of the article and possibly an abstract indicating the content. Usually they will not give you the full text of the research study or review. If the full text of the article *is* freely available this will be indicated and it can be downloaded. If you have a password for access via HINARI² use that to log in. Then you can retrieve articles from the 6000 journals that will be available to you. You cannot retrieve the full text from journals that do not allow free access or HINARI access.

How to search the literature on the internet

Before you start your search take a moment to think what exactly it is that you wish to find out, then plan your 'search strategy':

1. Think of your question.
2. Consider the different parts (components) of your question. Sometimes it is helpful to consider these under the headings of **PICO** - what/who is the: **P**atient, **I**ntervention, **C**omparison, **O**utcome required.
3. Think of all the terms/keywords that you need to enter.

Below are two examples and an explanation of the terms used.

Example 1.

1. Question: "How should I treat malaria in children showing drug resistance?"			
i.e. treatment for drug resistant malaria in children			
2. Component terms (keywords/phrases)			
children	drug resistant	malaria	treatment
3. Alternative terms (synonyms)			
child	drug-resistant resistance multidrug specific drug names	antimalarial anti-malarial	therapy
4. MeSH			
0-18 years	Drug-resistant	Malaria	Therapy Therapeutics

^a The Access to Research Initiative (HINARI) provides free or very low cost online access to the major journals in biomedical and related social sciences to local, not-for-profit institutions in developing countries (including Southern Sudan).

Example 2.

1. Question: "Is conservative or surgical management best for knee injury?" i.e. conservative versus surgical treatment for knee injury			
2. Component terms (keywords/phrases) using PICO			
<i>Patient</i>	<i>Intervention</i>	<i>Comparison</i>	<i>Outcome</i>
knee injury	surgery	conservative management	most effective long term healing
3. Alternative terms (synonyms)			
	surgical procedure surgical treatment	conservative treatment	outcome
4. MeSH			
Knee injuries	Surgical procedures, operative	Therapy Therapeutics	Outcome assessment (Health care)

Explanation of terms used

- *Keywords* - normally when using the internet for searching we just use keywords, and the computer only retrieves an exact match for that word (or sometimes a shorter version of it - e.g. missing off the plural 's').
- *Truncation* - if there are several possible endings to a word then type in the stem of the word followed by an asterisk. For example. 'resistan*' picks up 'resistant' and 'resistance'; 'resist*' would also pick up 'resisting' etc.
- *Synonyms* - if there are a variety of possible words for the same thing then enter each one to be sure to find all the articles/items. For example 'heart attack', 'myocardial infarction', 'MI'.
- *Thesaurus* – some databases help you to search for synonyms by giving a list of similar terms. This is called a thesaurus. In Medline the terms on this list are known as **Medical Subject Headings**, or **MeSH**. So, for example, if you enter 'heart attack' in the search box, and MeSH is switched on, you will retrieve all the articles including the term 'myocardial infarction' as well as those with 'heart attack' or 'MI'. PubMed does this for you automatically.
- *Boolean operators* – these are the words 'AND', 'OR' and 'NOT', which you can use in all internet searching to link words or groups of words together. For example 'malaria AND drug resist* AND (child OR children) NOT' adult'. PubMed does this for you automatically.

How to search PubMed

Access PubMed via the HINARI website², or direct at <http://www.ncbi.nlm.nih.gov/pubmed/>

First note that there is a 'PubMed Quick Start' link under the heading **Using PubMed** on the lefthand side of the screen. This gives various brief guides on how to search PubMed, and it is worth looking at them.

PubMed is designed to be simple to use, so you should not need much training to understand the basics. More advanced searching is possible if required, but PubMed automatically searches keywords and MeSH headings together, so saving time.

Basic searching

- Enter your string of keywords/phrases in the main search box (at the top of the screen) in any order e.g. "treatment drug resistant malaria children", and click **Search**
- 20 of the total number of results will be shown on the screen with basic details of the article only.
- The most recent articles are shown first and generally appear in reverse date order (getting older).
- Scroll down the screen and on the righthand side you will see a **Search Details** box, showing you which terms/synonyms and MeSH were used - you can check here how PubMed has used the Boolean operators.
- *Note:* as you continue searching you can return to previous searches by clicking the links in the **Recent Activity** box on the righthand side of the screen.

Results

- To see the Abstracts either change the **Display Settings** (at the top of the results list) to **Abstracts**, or look at them individually by double clicking the relevant article title.
- The Abstract display will also give links to the full text where this is free (and where available via HINARI if you are logged in to that service).
- Click in the box beside any of the citations that you might want to save, print or email later.
- Use the **Next** button to move through the pages of results.
- To display or email your chosen citations click **Send to** (top right of the list of results) and choose your preferred method for saving - to a **File** (to save or print) or **E-mail**. *Note:* you can also save the citations to a **Clipboard** if you are going to continue your search - your Clipboard shows at the top of the righthand panel of the screen.
- If you email the citation it will include any link to the full text.
- *Note:* titles enclosed in [square brackets] indicate that the article is not written in English (although the Abstract may be).

Reducing the number of results

If you have too many results you can reduce the number by using 'Filters' or 'Limits'.

1. On the righthand side of the screen you can click one of the following links under the **Filter your results** heading:

- 'limit to Reviews' or
- 'only those available in Full text'

2. To see more options for 'limits' click the **Advanced Search** option above the main search box and scroll down the new screen to see ways to limit your results. For example:

- add another term/concept, or author, or journal title, etc.
- choose only those with full text available.
- limit by dates; age groups; language; etc.
- limit by type of publication, e.g. clinical trial; practice guideline; review, etc.

Choose those you wish, and click **Search** at the bottom.

Note: Any of these options you choose will automatically attach themselves to the last search you did *and to future lines as you continue searching*. To attach your options to a different search line on your list (shown in the **Search History** box at the top of the Advanced search page):

- clear the main search box at the very top of the screen and
- type the number of the search line in prefixed by # - e.g. #3.

To remove the limits look under **Limits Activated** at the top of the righthand column on the main screen to see them listed and click the link **change/ remove** (or click back in to **Advanced Search**).

Pre-set Filters

Scroll further down to the **More Resources** section on the **Advanced search** page to find pre-set filters (search strategies) for example for aetiology, diagnosis, therapy, prognosis, etc. These will focus your search by adding in pre-selected terms. For example:

- Under **More Resources** click **Clinical Queries**.
- Under **Search by Clinical Study Category** choose the appropriate **Category** and **Scope**.
- In the Search box just above these options either retype your search phrase, or put in the line number prefixed by #. e.g. #1
- The **Search Details** and **Recent Activity** boxes on the righthand side of the results screen will show you what you have searched.

Saving your searches

You can save your search results in order to keep a record or continue another day. You will need to have registered (free) with **My NCBI** to do this (see top righthand corner of the screen).

- Make sure you are logged in to **My NCBI**.
- Click the **Save Search** link above the main search box (next to the **Advanced Search** link).
- Name your search and complete any other boxes you wish.
- Next time you come to search, go to **My NCBI**, sign in, find the search you want under **Saved Searches**, double click the name of the search you want – it should then open up!

References

1. Straus S. E., Richardson, W. S., Glasziou, P., Haynes, R. B (2005) 3rd ed. Evidence-based medicine: how to practice and teach EBM. *Edinburgh: Churchill Livingstone*.
2. See <http://www.who.int/hinari/about/en> See footnote on first page of this article.