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State-of-the-Art Searches: Tips for Success

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Searching the literature is a critical part of any scientific research. Constructing and executing a successful search is the key to performing good research, conducting a thorough literature review, and solving clinical problems. Errors in search methodology will yield biased results or incomplete evidence-based answers. Developing skill in the search process requires training and practice (Vieira & Dunn, 2005). Many questions may go unanswered, which can be attributed to a lack of skill in formulating a question or executing an effective search strategy, and the inability to access the most appropriate database to identify the best level of evidence (Volk, 2007).

Fortunately, with the availability of electronic data bases and the expertise of health science librarians, authors and researchers have a vast amount of data at their fingertips. Electronic resources provide more current and extensive options along with faster results. Therefore, searching for up-to-date information on the Internet is the most effective and efficient method (Virgilio, Chiapa, & Palmarozzi, 2007). But the first steps involve the knowledge and resourcefulness of the individual researcher.

Starting Your Search

Begin by brainstorming about your topic and some related concepts. Read some general information and gather background on the subject, paying particular attention to synonyms and key terms related to your question. Write down your ideas, talk with colleagues, and remain open to suggestions for new thoughts. A librarian can be of great help here by suggesting the exact wording in various database thesauri that will guarantee consistency in your search efforts. At this point you should have some definite key words with which to initiate your search.

Selecting an appropriate database and search engine is the next step. Some of the most common in the health sciences include:

MEDLINE, organized by Medical Subject Headings (MeSH), is the world's most commonly used bio-medical database. It was constructed by the USA National Library of Medicine (NLM) and contains citations for an enormous number of journal articles (Vincent, Vincent, & Ferreira, 2006). MEDLINE can be searched using the Web-based search engine, PubMed, or alternatively through Ovid.

EMBASE is a biomedical and pharmacological database similar to MEDLINE and used most frequently in Europe. Searching the same terms in both MEDLINE and EMBASE will retrieve some overlapping results, but there will also be a large number of unique retrievals from each database (Vincent, Vincent, & Ferreira, 2006).

CINAHL is similar to MEDLINE but includes other terms designed specifically for nurses and other allied health professionals. The Cochrane Library is a high-quality, independent collaboration designed to facilitate access to systematic reviews and meta-analyses of evidence to assist in improving and providing the best healthcare decision making globally. It is one of the cornerstones to the evidence-based medicine (EBM) movement.

The appropriate database depends upon your search question and search criteria. When trying to answer a clinical question in EBM, the Cochrane Library is likely to be the fastest way to find a systematic review or a meta-analysis that answers the question; however, PubMed also has added features to facilitate clinical problem-solving. Formulating answerable clinical questions and searching for the best evidence to answer them requires some knowledge of the EBM movement (see the excellent tutorials available on the website of Centre for Evidence Based Medicine at Oxford <http://www.cebm.net/?o=1011>).

For anyone conducting a systematic review for publication, multiple databases are the rule. In areas where the subject matter crosses over to other disciplines, it is essential to consult with a research librarian to find the most appropriate databases. The rationale for selecting databases must be presented as part of the search strategy in such reviews.

Constructing a Strategy

A search strategy will save time and effort. List your key words from your initial reading and brainstorming session and place them first in the title field. To narrow a wide search, tick the box "Restrict Search to Major Topic Headings Only"; main MeSH headings are assigned as the main focus of each article.

Other useful strategies include searching author names to improve both the sensitivity and specificity of free-text searches. In your initial readings you should have identified the key researchers and thinkers in your topic of interest. Add quotation marks around longer phrases to help find words commonly used together. Use filters to narrow your search further to the type of article you desire, such as reviews, randomized clinical trials, case studies. Sometimes the most efficient search will be a mixture of truncation, + and - modifiers, and quotation marks to obtain the desired result. **Figure 1** includes a summary of a few commonly used search modifiers.

In most databases Boolean logic is used to combine key words. The three terms AND, OR, and NOT are applied to improve search specificity. In PubMed, they must be typed in capital letters. As the three connector names imply, AND retrieves search results containing all given search terms, OR retrieves information in which any of the terms appear, and NOT should be used precisely and with caution as it might eliminate some relevant citations.

Once a search result list is obtained, scan the titles and abstracts and locate those that fit your research needs. If you retrieved no relevant articles, go back to the beginning and rethink your search strategy (Holst & Funk, 2005). Keep a list of your search terms and results either in the search engine or in a separate file on your computer. Harris (2005) has some global suggestions for searching and using the results of your searches that apply for clinical and research settings:

1. Formulate and define the assigned problem
2. Locate and select the studies
3. Assess study quality
4. Collect the data
5. Analyze and present the results
6. Interpret the results
7. Improve and update the results

Developing Your Searching Skills

Executing a good literature search is a skill that must be learned and practiced (Holst & Funk, 2004).

Searchers generally speaking are considered “expert searchers” if they have ten or more years of searching experience (Vieira & Dunn, 2005). Librarians are the experts in searching who can guide you in your development as well as validate your search strategy. Here are some suggestions from expert searchers for developing and improving searching skills:

- Read professional literature to maintain currency in your field
- Subscribe to e-mail from publishers and the National Library of Medicine to follow new trends in search technology
- Read help files and vendor documentation to maximize your use of the database
- Practice doing searches at every opportunity
- Consult with colleagues who are knowledgeable about searching in their respective fields
- Look for and read product (software) updates, especially at professional conferences
- Participate in search clinics (in-service training) offered by many libraries and publishing companies

Conclusion

Developing searching skills requires learning from experts and conducting actual searches. Professional searching skills are needed both for the practice of EBM and academic or research work. The ability to conduct a successful search depends upon understanding technical concepts and the reasoning behind the search itself as well as acquiring the skills needed to actively implement the search through a specific interface. Health sciences librarians play a vital role in expert searching and serve as guides and mentors in this learning process.

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