ORIGINAL ARTICLE

A GUIDE FOR MEDICAL INFORMATION SEARCHES OF BIBLIOGRAPHIC DATABASES – PSYCHIATRIC RESEARCH AS AN EXAMPLE

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ABSTRACT

Information overload, demanding work with strict time limits, and the extensive number of medical bibliographic databases and other research sources all underline the importance of being able to search for up-to-date information effectively. Medical journals play a key role in providing access to the latest information in medicine and health and bibliographic databases play an important role in accessing them. This paper sheds light on the role of the information search process and discusses how to approach key medical bibliographic databases and information sources, using the field of psychiatry as an example. Because of an increasing amount of information, the constant renewal within the discipline and a variety of services available, those seeking information must precisely define what kind of information they are looking for and from which sources the information needed may be found. (Int J Circumpolar Health 2009; 68(4):394-404)

Keywords: Information search, information sources, bibliographic databases, medicine, psychiatry
INTRODUCTION

The rapid increase in medical information poses a challenge for keeping up with the latest developments in the field. Information searches can be difficult without a basic knowledge of the way information is organized and indexed. In preparing scientific studies and in making clinical decisions, the key issue is to effectively scrutinize previous literature. That is why familiarity with medical information sources and the ability to use them effectively is important (1).

In a rapidly developing science, journals are an important channel for disseminating new information, and they are the primary publication medium for professional communication in medicine (2). It has been estimated that there are some 20,000 to 30,000 journals published on medicine and health, yet on the database PubMed just over 300 psychiatric journal titles found. Not only are printed journals being increasingly replaced by electronic journals but also the amount of medical information is approximately doubling every 5 years, which is why having a strong knowledge of bibliographic databases and the ability to locate relevant information are crucial skills (3).

It has been shown that training individuals how to conduct effective information searches has an important effect on the use of bibliographic databases. Adequate training in information-searches leads to an increase in the development of more sophisticated electronic information resources (4,5). The explosion of information, the emergence of evidence-based care, new Internet-based technologies, rapid growth of bibliographic databases and shifts to electronic publication practices means that knowing how to conduct effective information searches is that much more urgent.

This paper introduces key bibliographic databases and how to choose and access them and discusses the most useful search engines and portals. While the focus is on psychiatric research, the basic ideas for conducting an information search can be applied to other contexts, such as clinical work.

The information search process

Even though new technologies have widened the access to bibliographic databases and information sources, new opportunities have also brought along new challenges, like a need to evaluate and organize a great amount of information (2). The discipline of psychiatry is closely connected to psychology and the social sciences. Those working in the field of psychiatry often need information about a variety of psychiatry-related issues and often use information searches to retrieve that information. Different phases can be discerned in the information search process (6,7,8): precisely defining the information needed, formulating questions to guide the search, choosing suitable bibliographic databases, finalizing and implementing the search strategy, evaluating the results and improving the search if necessary.

These steps are presented in Figure 1 and discussed more fully in the following sections. This model can be used as a frame for an information search. However, an information search is seldom a simple one-way process. The ability to search for relevant and representative information depends not only on the experience of the searcher (e.g., knowledge of sources, systems, search language and possible use of key words) but also on the large number of journals, the quality of indexing and the inherent limitations in content description (9,10).
Defining the research problem and formulating the questions

When information is needed, asking certain questions can help to clarify precisely what kind of information to look for. There are several key questions to help focus the search. For example, What is the exact topic? What purpose will the information play? Which issues are included and/or excluded? What is essential information and what is already known on the topic? Is the needed information general or scientific? The answers to these questions can guide you in the next steps of the search process.

Background reading can also help to define the research question. A quick, basic search is a good way to become familiar with terms related to the topic and to get a general overview of the subject (11). A quick search can also provide facts needed in clinical decision-making or new information related to the subject at hand. For example, a quick search can provide an orientation to a diagnostic term or an overview of a drug’s side effects.
In addition to the information search process model (Fig. 1), the PICO model can be used to transform a clinical question into a searchable query. The PICO model defines the question on 4 key levels: patients, population or problem; interventions; comparisons; and outcomes (7). Here is an example of how to use the PICO model when researching schizophrenia:

- **P**: schizophrenia patients
- **I**: new antipsychotic treatment
- **C**: old antipsychotic treatment
- **O**: reduction in adverse events

The electronic tools used in an information search include library databases, reference books, various portals and Internet search engines. Information can also be hand-searched by researching hard copies of specific journals. Choosing the best articles in those journals can provide descriptors and keywords that can be used on a database search for other relevant information (12). When extensive information is needed, the search process should be planned and conducted systematically. To acquire comprehensive knowledge of a subject and to keep abreast with the latest developments calls for a systematic and advanced information search.

**Choice of databases**

Bibliographic databases are extensive compilations of references to documents. In this context, reference is the information included in the document, such as information on authors, abstract, journal title and year of publication (6,7). Many bibliographic databases include a link to the full text.

In the case of health science, the choice of which bibliographic database to use is not always easy, as some of the material may be in other bibliographic databases that focus on different disciplines. This means that restricting the search to a certain bibliographic database may result in omission of important references (13). When considering the choice of databases for an information search, the extent of the database’s coverage should be taken into account (14). For example, when conducting psychiatric research, information on previous studies can be found in psychological bibliographic databases in addition to medical ones. It is therefore recommended that several bibliographic databases be used in order to cover as much information available on the subject as possible (13). Different bibliographic databases also vary in such areas as types of publications they include and the periods of time they cover (14).

*Indexing* refers to a description of documents using certain rules, vocabularies and key words. *Thesaurus* is a special vocabulary where the relations between terms are expressed in a standardized manner. One should be aware that different databases use different keyword systems and different levels when indexing material. The translation of terms from one database to another is not the best strategy when devising a search strategy (15). A thesaurus is affected when there is rapid development in a field and recently introduced terms and concepts in the literature are not included in the vocabulary quickly enough. Searches may take considerably longer in bibliographic databases that emphasize description as compared to those whose articles are not indexed extensively and users are expected to utilize the free text search (13). A *free text search* makes use of freely chosen search words targeting all desired fields in the bibliographic database. Some databases, such as Medline, include a function that
automatically maps the natural language terms in the free context search and changes them into suitable key words. When authors are willing to answer queries concerning their texts, which helps to develop key search terms, their articles become more rapidly available.

Nieminen and Isohanni (16) have studied the coverage of Finnish psychiatric research in Medline, EMBASE and PsyclIT (cd-version of PsycINFO). According to the study, there are several international journals in Europe that are not indexed in Medline, and the majority of psychiatric research in Finland is published elsewhere than in journals indexed in EMBASE and Medline. This phenomenon is also common in other minor languages. McDonald et al. (10) have compared the coverage of psychiatric journals. Their results support the idea of including

| CINAHL (The Cumulative Index to Nursing & Allied Health Literature) | Elsevier ScienceDirect | EMBASE (Excerpta Medica) | LILACS (Latin American and Caribbean Literature on the Health Sciences) | Medline (Ovid) (Medical Literature Analysis and Retrieval System Online) |
|---------------------------------------------------------------|------------------------|--------------------------|---------------------------------------------------------------|---------------------------------------------------------------|
| - Bibliographic nursing and healthcare database of Ovid Technologies. | - A database maintained by Elsevier B.V. containing bibliographic data and full texts. | - A bibliographic biomedical and pharmacological database produced by Elsevier B.V. | - Open-access health science database of BIREME Systems in Spanish, Portuguese and English. | - Bibliographic database published by Ovid Technologies. |
| - About 1.5 million references to articles, congress publications and academic dissertations since 1982. | - About 6.75 million articles up to 1995 and 2.75 million articles from 1994 onwards. | - Over 11 million records from 5,000 magazines from 1974 onwards. | - About 150,000 records, such as books, congress and conference publications, and articles from 670 well-known medical journals (23). | - About 13 million references on medicine and related fields from 4,800 magazines since 1966. |
| - About half of the references are found in the PubMed database (20). | - Covers 25% of full texts and bibliographic data in science, technology and medicine in the world (21). | - More than 500,000 references and abstracts are added to the database each year (22). | | - An increasing number of references contain a link to freely available full text (24). |

| PsyclINFO | PSYNDEx | PubMed | Scopus | Web of Science |
|-----------|---------|--------|--------|---------------|
| - A bibliographic psychological database provided by EBSCO Publishing. | - A bibliographic psychological database from the German-speaking countries. | - A free service of the U.S. National Library on Medicine through which also Medline is available. | - Bibliographic database of Elsevier B.V. | - Bibliographic database of Thomson Reuters. |
| - 2.3 million references and abstracts from year 1887. | - All areas of psychology and related behavioural and social sciences from 1977, audiovisual media from 1932, and tests from 1945 (26). | - About 16 million references from the 1950s onwards. | - About 27 million abstracts, 230 million references, 200 million scientific www-pages, over 12,850 journals, 535 of which are OA journals. | - Databases accessible from 1986 on: Science Citation Index Expanded, Social Science Citation Index, Arts & Humanities Citation Index. |
| - References from sources such as articles, books and academic dissertations in all fields related to psychology (25). | | - Includes e.g. new references that are not yet indexed in Medline. | - Covers the Medline (Ovid) database, including full text links when applicable. | - 850,000 references including links to full texts when applicable. |
| | | - Links to full text if the organization subscribes to the magazine in question (27). | - Possibility to examine citedness (28). | - Possibility to examine citedness (29). |
several bibliographic databases in information searches because of such a varying degree of overlap between bibliographic databases. However, it is common to choose the most well-known bibliographic databases for the search because of cost and availability (13). For example, in many cases PubMed (Medline) is chosen as the only source, despite the fact that its coverage on some topics such as clinical trials has been shown to be relatively poor (17). The same conclusion was reached in a study on the sufficiency of Medline searches for a systematic review (18). PsycINFO seems to be an important source when looking for information on topics related to mental illness (19).

Since knowledge of the content and coverage of bibliographic databases helps in the planning of information searches, we present here some of the most important bibliographic databases in terms of medical research (Table I). The majority of these databases are in English.

LILACS is a Spanish and Portuguese bibliographic database including Latin American and Caribbean Health Science Literature. PSYNDEx includes German and English literature on psychology and its immediate disciplines from the German-speaking region.

When searching for evidence, a fast and effective way is to use bibliographic databases and websites that cover mainly evidence-based and high-quality material. A good principle to work with in a systematic information search and when solving a clinical problem is finding good-quality information. The 5S Model of Evidence-Based Information Services (Fig. 2) provides the hierarchical structure of information sources needed for researching evidence. The structure is in the shape of a pyramid and includes from the bottom to the top: single studies, syntheses, synopses, summaries, and systems. It is advised to start searching from the highest level possible in the 5S pyramid (30).

Figure 2. The "5S" levels of organization of evidence from health care research (6).
Qualified queries using databases like the PubMed Clinical Queries (www.ncbi.nlm.nih.gov/entrez/query/static/clinical.shtml) can help you select materials. This feature is also included in Medline (Ovid), EMBASE, PsycINFO and CINAHL (Ebsco). In addition to preparing queries, you can focus the search on certain publication types, such as reviews and meta-analyses, or on publication year or language, or by using suitable keywords. Vocabularies such as MeSH can improve search performances (31).

The Cochrane Library (www.cochrane.org) includes evaluated and controlled high-quality evidence-based information on reviews and clinical trials. Other information sources related to evidence-based information are Seek (www.shef.ac.uk/seek), EBM Guidelines (ebmg.wiley.com/ebmg), the TRIP database (www.tripdatabase.com/index.html), SUMsearch (http://sumsearch.uthscsa.edu/), and BMJ Clinical Evidence (www.clinicevidence.org/ceweb/index.jsp). DynaMed (http://www.ebscohost.com/dynamed) is a clinical reference tool for use primarily at the “point-of-care” with clinically organized summaries. UpToDate (http://www.uptodate.com) is an evidence-based, peer-reviewed information resource. PIER: The Physicians’ Information and Education Resource (http://pier.acponline.org/index.html?page=jhp) provides authoritative, evidence-based summaries.

Access to databases

Bibliographic databases are commercial products, which is why not all databases are licensed by individual research organizations. PubMed (www.pubmed.gov) is freely available on the Internet as is Medline. In addition to licensed material, there is a lot of information that is accessible to all users. Open access (OA) journals can be searched through the Directory of Open Access Journals (www.doaj.org) or through the free digital archive of biomedical and life sciences journal literature at PubMed Central (www.pubmedcentral.nih.gov). The Public Library of Science (PLoS) (www.plos.org) and BioMed Central (BMC) (www.biomedcentral.com) are independent OA publishers that offer several freely accessible journals and a wide coverage of the field of medicine.

There are also different OA repositories, like the Directory of Open Access Repositories – OpenDOAR (www.opendoar.org) and CiteSeer (www.citeeseer.ist.psu.edu), both of which store scientific literature. The advantage of OA journals is that published articles are freely available and the openness in dissemination is greater (32). According to Eysenbach (33), OA has at least 3 advantages: a citation count advantage, an end-user uptake advantage and a cross-discipline fertilization advantage. It was found that OA articles are cited earlier and more often than non-OA articles (30).

Search engines and portals

The most popular Internet search engine, Google (www.google.com), also has a version for scientific materials, Google Scholar (www.scholar.google.com), and a version to search only books (www.books.google.com), Google Books. Google Scholar makes it possible to search for essays, presentations, books, abstracts and articles in various fields and from different sources, such as academic publishers, associations and other scientific organizations. These search engines can access full-text versions of international
academic dissertations and presentations, which are not necessarily found in licensed databases. Other medical search engines and link collections include Sum-Search (www.sumsearch.uthscsa.edu), Scirus (www.scirus.com), Medical-Matrix (www.medmatrix.org) and the medical pages of Intute (www.intute.ac.uk/healthandlifesciences/medicine).

More and more people find references and abstracts included in PubMed by using Google Scholar (34). According to a study on the research possibilities provided by Internet search engines, there are several approaches to information searches and an increasing amount of material can now be located by using Google and Google Scholar, with no need to be familiar with database-specific search methods. The possibilities of the Google search engines as aids for physicians in making a diagnosis were evaluated in a recent article. Searches yielded the correct diagnosis in 15 out of 26 cases (35). However, it is important to note that when using search engines, search results include a lot of irrelevant information as well, emphasizing the importance of having a critical approach when evaluating the information provided.

It is also more difficult to focus on and export citations to reference software when using Internet search engines. The relevance ranking system can be problematic when it is important to be aware and to be able to distinguish the free Internet sources that are non-federated (e.g., Google) and federated (e.g., TRIP database).

There are also several research portals for mental health and psychiatry. For example, Schizophrenia Research Forum (SRF) (www.schizophreniaforum.org) can search for citations on current papers dealing with schizophrenia and related diseases that are added weekly from PubMed. This type of search can be achieved with certain keywords. The SRF database covers articles from the year 2000 onward. A Portal for Mental Health Professionals (www.psyplexus.com) includes a tool for a free search of journals in psychiatry, psychology and related disciplines, as well as the latest headlines from 308 journals, free-access review articles and selected websites on mental health. Evidence-Based Mental Health (http://ebmh.bmj.com) provides alerts to important advances in treatment, diagnosis, aetiology, prognosis, continuing education, economic evaluation and qualitative research in mental health. A wide range of international medical journals are surveyed with strict criteria for quality and validity. Details of essential studies are presented in an informative abstract with commentaries on their clinical applications.

Information follow-ups can be provided through different alert and updating services in most of the databases. For example EvidenceUpdates (http://plus.mcmaster.ca/EvidenceUpdates/Default.aspx) includes free email alerts about the best databases. My NCBI (http://www.ncbi.nlm.nih.gov/sites/myncbi/about) is another free service that saves your searches and sends email alerts and updates.

**Formulating a search strategy**

Once the research problem is defined and the database selection is done, the next step is to formulate a search strategy. A search strategy includes choice of search terms and relationships between concepts. Free text words and the thesauri of a database can be used. Boolean Operators (AND, OR, NOT) are used to expand, exclude or to join selected search
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terms. The operator AND is used to combine search terms and search clauses to narrow and make the search more specific. OR is used to broaden the search by including optional search terms and NOT is for excluding certain search terms and topics from the strategy. Other limits such as publication year, type, source and language can be set. It is advisable to take into account the possible differences among databases and the database-specific search practices when building a strategy.

The role of documentation in the information search is emphasized in dissertations and research articles, particularly in systematic reviews and meta-analyses where search strategies are described in the methods section. It is recommended that the search strategy be documented to make the process more thorough and to improve the comprehensiveness and repeatability of research.

Conducting the search and evaluating search results

Evaluating sources and search results is important in any kind of search. There are different definitions and reasons for conducting an evaluation. When evaluating search results, it is important to pay attention to how the retrieved results cover the subject and how useful the retrieved information is in the prevailing context. When evaluating the scope, it is important to take note of the extent of discussion as well as geographic and other existing point of views on a subject (36). As well, it is important to pay attention to which search strategy was used, information sources explored and other things that may have affected the results.

As mentioned above, the information search process is not usually a simple one-way process. When evaluating the results, it is possible that irrelevant information might be identified, or that the search resulted in too few references, leading you to decide that a reformulation of the search is necessary. At that point, new and more relevant search terms can be included in the strategy.

DISCUSSION

The ever-increasing network of the information search environment has changed the way we work, study and do research and underlines the importance of having strong information search skills. These skills are described as enabling a person to survive successfully in an ever-increasing flow of information and to achieve the goals at hand. In today’s world, the ability to locate, evaluate and use relevant information can be regarded as a basic skill.

Besides information overload, there has also been a significant rise in the number of information resources, which has affected the localization of information. Choosing which bibliographic databases in health science to search is not an easy task, as the materials might be located in bibliographic databases in different fields (13). While scientific journals act as a channel for publishing new information in medicine, bibliographic databases play a key role in accessing them. With the aid of bibliographic databases, the information needed can be used extensively and economically.

Information search tools have improved greatly for the benefit of users and will continue to do so. This will lead to changes in the way information is acquired, but the basic ideas behind the information search
will remain unaltered. The increasing amount of medical information and the services and sources that are available means that those searching for information must be able to define more precisely what kind of information they are looking for and how the information needed can be found. An organized, well-planned and critical approach to an information search is extremely important and will become even more so as our world of knowledge continues to expand.

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