

# How to Find Evidence When You Need It, Part 3: A Clinician's Guide to MEDLINE: Tricks and Special Skills

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In Part 1 of this series, we introduced the reader to the use of resources, databases, and search engines in relationship to clinical questions.<sup>1</sup> Part 2 outlined some basic features of the MEDLINE database and several principles pertaining to designing MEDLINE search strategies.<sup>2</sup> In this article, we will outline some further principles and skills aimed at the needs of practitioners seeking to use this large and challenging resource to identify clinical evidence to inform their decisionmaking. Our discussion of MEDLINE is not intended to be comprehensive, and there are many tricks that we have omitted. Difficult MEDLINE searches require the skills of librarians trained in evidence-based methods. We are confident that clinicians who absorbed the information we have provided will be well equipped to avail themselves of such expertise when called for and will be able to acquire additional skills in the process.

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## HOW CAN QUALITY FILTERS BE USED TO FOCUS A SEARCH?

Given the large size of the MEDLINE database, a well-designed search strategy, following the principles outlined previously in this series, could yield many more citations than the busy clinician would wish to examine to answer a single clinical question. To address this concern, librarians have developed generic search strategies, conforming to specific types of clinical questions, that help to restrict the citations found to the types of studies most likely to provide valid answers to those questions.<sup>3-5</sup> These specially developed generic strategies are sometimes called "quality filters."

The best way to quality filter a search is to limit it to the study design that usually provides the best evidence according to the evidence pyramid (Figure) that is appro-

appropriate to the type of information sought.<sup>5</sup> A randomized controlled trial, as a single study, would usually provide the best evidence for a therapy question. However, there would have to be a large placebo arm of a randomized trial with adequate length of follow-up to provide an adequate answer to a prognosis question, and other study designs are more commonly the sources of the best evidence on such questions. The astute reader may have wondered at the absence of systematic reviews at the top of the evidence pyramid illustrated in the Figure. The omission is deliberate. A reliable MEDLINE search filter for systematic reviews, suitable for use by clinicians, has yet to be developed. Quality filters aimed at facilitating clinically oriented searches of MEDLINE are included components of several MEDLINE interfaces. PubMed has mounted a separate search feature called "Clinical Queries" (<http://www.ncbi.nlm.nih.gov:80/entrez/query/static/clinical.html>), which permits filtering of a search using the instruments developed by a research group headed by Brian Haynes.<sup>4</sup> The design of these filters is based on the results of a hand search of 10 peer-reviewed biomedical journals during the 2 years 1986 and 1991 for studies meeting basic methodologic criteria relevant to questions concerning treatment and prevention, diagnosis, harm, or prognosis of disease.<sup>4</sup> The articles found in the hand search were compared with the results of many computer searches of the

MEDLINE database limited to the same journal volumes. The search strategies having the greatest accuracy in finding articles reflecting the preferred study designs were identified. The resulting "quality filters," sometimes referred to as "hedges," can be incorporated into a search pertaining to a specific clinical topic area. A table that describes the methodology of the filter is available at: <http://www.ncbi.nlm.nih.gov:80/PubMed/clinicaltable.html>.

#### WHAT IS A PUBLICATION TYPE?

Quality filters use a combination of medical subject headings (MeSH), text words, and terms from MEDLINE's "publication type" field. Just as a MeSH term identifies the topic discussed in an article, a publication type identifies the article as falling into one or more of several predefined categories. Some of these categories conform to specific study designs. For example, an article entitled "Efficacy of inhaled steroids (beclomethasone dipropionate) for treatment of mild to moderately severe asthma in the emergency department: a randomized clinical trial"<sup>6</sup> was indexed with the publication types "clinical trial" and "randomized controlled trial." This study reports the results of a randomized controlled trial. To find this article in MEDLINE with a minimum of articles constituting commentaries, narrative reviews, or reports of weaker study designs, the searcher could restrict the search to "randomized controlled trial" in the publication type field. In this case, only studies classified by the National Library of Medicine (NLM) as randomized controlled trials would appear.

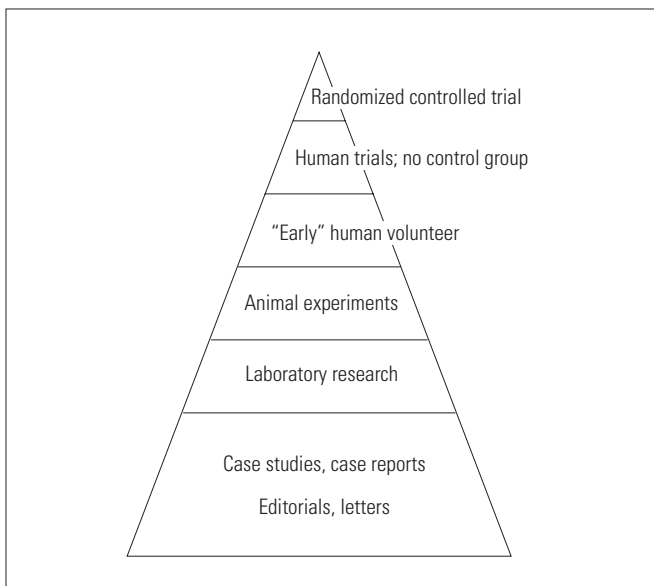
If a clinician is not comfortable with the task of selecting a particular search filter or if the existing options do not assist with the clinical question, she can speak to a health information librarian, who can help to design a search strategy that will meet her needs.

#### WHEN ARE AUTHOR SEARCHES USEFUL?

A clinician is occasionally aware of an article that would answer a specific clinical question and would like the exact citation or the published abstract. On other occasions, a clinician may be aware of a colleague who has published about a particular topic and would like to review their publications selectively. In these instances, searching by author name is an option.

MEDLINE indexes the names of the first 10 authors listed on an article. Indexing is only done on the author's last name and first and middle initials. If the author has a common name, such as Jones or Smith, the number of

**Figure.**  
*A hierarchy of evidence for issues of therapy and prevention.*



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citations through which the searcher will have to wade may prove daunting. However, an author search, just as with any other MEDLINE search, can be limited by year of publication, text word, MeSH, or specific journal. Also, as with text word searches, author searches can be truncated. For example, suppose that the searcher is aware that someone named Richard Cardio authored a recent article on cardiopulmonary resuscitation techniques but is not sure of the author's middle name, or even whether he has one. By truncating after the first initial (using the particular truncation symbol of the MEDLINE search engine available to the searcher), all articles authored or coauthored by "Cardio R," no matter what middle initial is used, will be displayed. It is important that a searcher has a reasonable idea of the spelling of the author's name and that she uses the Boolean operator "OR" to connect the spelling variations. As with text words, the computer will only search what it is told to search.

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#### WHAT ARE THE DIFFERENCES IN MEDLINE SEARCH ENGINES?

MEDLINE, in some ways, is like vanilla ice cream; the same basic ingredients are present in every brand, but some have vanilla bean bits, some have chocolate chips, and some are just plain. Programs offered by different software manufacturers for accessing MEDLINE may vary in their performance in important ways.<sup>3</sup> The MEDLINE package that is used may depend on where the searcher works and on what support mechanisms are available. Many are available on the market, but not every one of them is available to every searcher.

An aspect of MEDLINE "brands" that has already been discussed is their differences in handling the relationship between MeSH term and "key word" or text word searching.<sup>2</sup> Another important difference between MEDLINE products is their update schedule. Because PubMed and Gateway are produced by MEDLINE's host institution, the NLM, they tend to have more up-to-date citations than do those produced by commercial vendors. MEDLINE, on these systems and on some subscription services like Ovid, will also search PreMEDLINE, a database of citations that have not yet received the elaborate indexing of the MEDLINE system. PreMEDLINE citations can only be searched by text word because no subject headings or publication type information have been appended. Another point to consider is that a MEDLINE system searched on a World Wide Web product is more likely to be up-to-date than is a CD-ROM-based product. If a CD-ROM system is being used, it might be advisable to run

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the same search on PubMed or Gateway, including PreMEDLINE, to check for the most recent information.

In addition to the aforementioned differences in "standard" MEDLINE search programs, the reader should be aware of several innovative approaches that have begun to be offered by some vendors. Natural language searching was first offered by Aries Knowledge Finder (<http://www.kfinder.com/newweb>). A natural language processing option is also in final testing stages as a potential component of the Ovid package. Natural language programs allow users to enter a clinical question itself as the "search strategy." For example, "What is the benefit of antibiotics as a treatment for uncomplicated sinusitis?" can be entered into the search engine. A natural language processor will determine the important words (benefit, antibiotics, treatment, uncomplicated, sinusitis), search those words, and determine the appropriate MeSH terms. When successful, this eliminates the need for specialized knowledge of search techniques. An analogous device, offered currently by the NLM's Gateway and PubMed, allows the user to directly link to a second set of citations identified as "Related Articles" by a built-in program feature. The searcher can select the most relevant article and, by clicking the "Related Articles" link, a new set, closely related to the selected article, will be displayed.

Some MEDLINE vendors, including Ovid, are adding links to the full text of articles published in standard biomedical journals and to other databases, such as components of the Cochrane Library. It is important for the reader to understand that such "add-on" features are not part of the MEDLINE database itself. Such links generally require a substantially higher user fee for either the individual or her institution. Finally, some programs (including PubMed, which provides the "Clinical Queries" search engine) have integrated quality filters into their search options. These predetermined search filters can assist the searcher in limiting a search to articles at the top of the evidence chart. The Table summarizes important differences and features of several commonly used MEDLINE access products.

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#### HOW CAN MEDLINE BE ACCESSED?

MEDLINE can be accessed in many ways. PubMed (<http://www.ncbi.nlm.nih.gov/PubMed/>) and Gateway (<http://gateway.nlm.nih.gov/gw/Cmd>) are both available free of charge on the Internet from the NLM and are easily available to anyone with a computer, modem, and Internet provider. Most other MEDLINE options require a subscription. Some packages, such as Ovid and Silver Platter,

**Table.**

*A comparison of several frequently used MEDLINE access packages with respect to features important to clinicians.*

Search Engine	PubMed	Ovid	NLM Gateway	Aries Knowledge Finder
URL	http://www.ncbi.nlm.nih.gov/PubMed/	http://www.ovid.com/	http://gateway.nlm.nih.gov/gw/Cmd	http://www.kfinder.com/
Access	Web; free	Web/CD-ROM; institutional subscription	Web; free	Web; personal or institutional subscription
Text word searching	Searches text words as entered. Maps to relevant subject heading.	Text word will search title, abstract, registry number word, and MeSH fields. "Search fields" button allows selection of specific fields.	Searches text words as entered. Maps to relevant subject heading.	Natural language option. System automatically truncates and looks for logical synonyms and for MeSH terms.
Phrase searching	Searches from a predigested set of phrases. Does not do true adjacency searching.*	Yes.	Searches from a predigested set of phrases. Does not do true adjacency searching.*	Yes. Adjacency searching* active when Logic is set to "Boolean" and "word variants" is set to "no."
Truncation†	Right-handed truncation only. "*"=wild card.‡	"\$"=wild card‡ for right- handed truncation.† "# "=wild card‡ for internal truncation.†	Right-handed truncation only. "*"=wild card.‡	When "word variants" is on, auto- matically truncates from the "logical root."
Subject searching	MeSH browser allows selection of specific subject headings. Limit section allows searching of "floating" subheadings.	If selected, the system will automatically map to a MeSH term. The searcher must verify/ select a term for it to be used.	"Find terms" searches for MeSH and Unified Medical Language System (UMLS).	Concept mapping feature allows system to search for most relevant MeSH term.
Order of citations	Most recent first.	Variable.	Most recent first.	User may choose either "relevancy" or "recency."
Extra features	"Clinical queries" search engine. Full-text journal link (if free or if searcher has own online access). PreMEDLINE. Related articles search. "History" permits a previous search to be refined using a combination of specific search lines.	Ovid full-text journals link (if institution subscribes). "EBM Reviews" (if institu- tion subscribes). User may e-mail results. Continuously running history (permits combination of any number of search lines to refine a previous search).	Portal to NLM products. Search results include access to books, audiovisuals (LocatorPlus), consumer health articles (MedlinePlus), older materials (OLDMEDLINE), and PubMed (including PreMEDLINE). "History" permits a previous search to be refined using a combination of specific search lines.	Natural language searching. Related articles (output changes based on original settings). User may e-mail results.
Limits	Limitation may be added at any time in the search process. Limits: language, year of publication, publication type, human or animal, document subset (AIDS, core clinical journals, toxicology, etc), ages (child, adult, elderly), searching only in a particular field (title word, title/ abstract word, author).	Limits may be added at any time in the search process. Available on search page: English language, human only, review articles, articles with abstracts. Other limits available under the "limits" button.	Limits may be added at any time in the search process. Limits: language, year of publication, categories searched (journals, books, consumer health).	Limits available only on the initial search screen. Changing limits after running the search requires the search be rerun from the "New search" screen. Limits: word in title only, English language, article with abstract, review articles.

\*"Adjacency searching" means that the individual words in a phrase specified by the searcher must come together in the same order in the citation to be recognized by the search engine.

†"Truncation" means all possible completions will be incorporated into the search. "Right-handed truncation" means all possible completions to the right of the truncation symbol will be incorporated.

"Internal truncation" means all possible completions within a word or phrase will be incorporated.

‡A "wild card" is a symbol that designates that a word or phrase has been truncated and the type of truncation that is to be performed by the search engine.

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are offered for institutional subscription only. We advise readers to determine what MEDLINE package their own library subscribes to and to seek help from a research librarian in determining the “ins and outs” of that program regarding the basic features we have reviewed.

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#### HOW CAN I GET GOOD AT MEDLINE SEARCHING?

For many questions, you will be able to find the answer yourself, using the skills and tips we have provided in this series. When you are stumped, contact your medical librarian for assistance. Before you call the library, consider the following:

1. Talk to the librarian yourself rather than going through an intermediary. The reference interview works best when the librarian can understand the researcher's precise needs.
2. Be prepared to provide the librarian with the details of the searches you have already attempted. Most MEDLINE programs allow search strategies to be saved and stored for future access.
3. Work actively with the librarian on the search. Cooperative searching of MEDLINE, using the physician's knowledge of clinical practice and the librarian's knowledge of the database and search engine, produces the best search results and will serve to enhance your own skills.

How do you get good at MEDLINE searching? It's like the old joke about getting to Carnegie Hall: “Practice, practice.” Successful MEDLINE searching is largely a matter of comfort with the database and with the search engine you are using. As much as possible, use one or, at most, 2 MEDLINE search engines. Don't assume that, if you are good at one, the same techniques will get you an equally satisfactory result using a different search engine. Use your research librarian as a mentor in this area, not just as someone who will do a search for you. Finally, remember that MEDLINE is not always the best choice. Another database (like the Cochrane Library) may be more on target. MEDLINE is just one arrow in the clinicians' search quiver. Part 4 of this series will examine the specific usefulness of some of these other databases to emergency physicians seeking answers to clinical questions.

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