

A Primer For Users Of Medical Bibliographic Databases

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Abstract: A database is electronic information. Perhaps one of the most important information sources in medicine is that which is accessed electronically through a database named MEDLINE, the core medical literature published since 1966. MEDLINE is sold by three major vendors (BRS, Dialog, and the National Library of Medicine) to information experts and to medical experts. Information experts (li-

brarians) and medical experts (physicians) can access MEDLINE by two different methods. This article discusses both and emphasizes use by the medical practitioner. An annotated guide to database vendors is provided, and guidelines are offered that will assist the physician in selecting equipment and assessing services. (J Am Bd Fam Pract 1989; 2:191-5.)

A database is data in electronic form, regardless of the type of data involved. This can mean the complete text of an article or book, a chemical formula, or bibliographic material on one or more subjects. The bibliographic database is the variety that is discussed in this article. The most commonly used bibliographic database in the field of biomedicine is called MEDLINE. A database search on MEDLINE results in a bibliography on a topic or articles by a specific author. MEDLINE is, for most practical purposes, identical to *Index Medicus* for the time period 1966 through the present (up-to-date within 2 to 6 months of publication of the article in the journal). In fact, *Index Medicus* is printed from MEDLINE. In addition to *Index Medicus* articles, the MEDLINE database includes articles in nursing, later printed as the *International Nursing Index*, and in dentistry, later printed as the *Index to Dental Literature*. MEDLINE also contains abstracts for approximately 60 percent of the articles in *Index Medicus* since 1975. The abstracts are one-paragraph summaries of the articles.

National Library of Medicine

MEDLINE is produced by the National Library of Medicine (NLM). Approximately 3200 journal ti-

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cles are included in MEDLINE, and the NLM is responsible for indexing and inputting the information into the database. The MEDLINE database is updated twice monthly, while *Index Medicus*-printed issues are published once a month. The data are then merged with the larger database, making cumulative searching possible. The NLM not only compiles *Index Medicus* and MEDLINE, but it also sells it, making the NLM both a producer and a vendor. As a vendor, the NLM establishes accounts with libraries and private persons who contract to use the database by paying monthly bills. The NLM also sells the MEDLINE database to vendor companies, most notably BRS and Dialog. These companies offer many other databases in all subject areas to clients (libraries and private persons) making it attractive to sign a contract for one-stop shopping. MEDLINE is not the only database the NLM produces; however, it offers only a limited number of databases in medicine and toxicology. The NLM's name for its searching service is Medical Literature Analysis and Retrieval System (MEDLARS).

Vendors

Vendors are companies that buy databases from producers. Producers may be organizations, government agencies, or other companies. The American Psychological Association (producer of *Psychological Abstracts*), National Library of Medicine (producer of *Index Medicus*), and Excerpta Medica (producer of *Excerpta Medica*) are examples of producers and their products. The printed copy of the index or abstract is often printed from the electronic version, but the electronic version

may contain much more information than is printed in the index or abstract. Vendors buy the electronic version of the index or abstract from the producer, mount the database on a mainframe that uses their specific software commands, and allow subscribers to search each database for a fee.

The individual databases differ vastly in content and cost. Vendors offer databases on subjects ranging from medicine to business to sports and recreation. When selecting a vendor, therefore, it is important to select databases first and then shop for the vendor that offers the majority of the databases that are needed. In some cases, two or more vendors may be necessary to make all databases of interest available.

BRS and Dialog are attractive alternatives to the NLM's MEDLARS, because their software commands are more flexible and easier to learn than the MEDLARS software commands. For years, it was also difficult to establish an account with the NLM because the required training courses were offered only in Bethesda, Maryland (home of NLM), and major United States cities. BRS and Dialog have recently popularized their databases by simplifying the software as well as streamlining the procedure for obtaining a password account.

This article is an attempt to clarify a complicated system of retrieving biomedical information for users. We address methods of performing database searches on the MEDLINE database. Once familiar with MEDLINE, the knowledge gained is easily transferred to other database use.

Searching Strategies and Software

Intermediary versus End-User Searching

An intermediary-produced search is defined as a search done by an intermediary (a librarian) who "mediates" between the database and the person who will be using the database search. The librarian, in effect, is speaking for the patron by translating the patron's terms into the indexing vocabulary of the individual database, efficiently using the software of the vendor to do the search, and providing a completed database search to the patron. An end-user-produced search is performed by the person who in the "end" will be "using" the search. An end-user contracts with the vendor directly and is billed monthly. The end-user may opt for expert mode searching or user-friendly mode searching, based on personal preference.

Expert Mode versus User-Friendly Mode Searching

Once connected to the vendor's mainframe computer by telephone line, the databases are searched individually. The software or commands that are used to sift through literally millions of references assist the patron or the librarian to gather the most relevant articles on a given topic.

Software is categorized in the professional literature into two varieties: expert mode and user-friendly. Expert mode searching allows for powerful searching of a database with sophisticated commands. It is used by librarians who usually perform so many database searches that the commands are second nature. End-users may decide to use expert mode commands, but this method will be efficient only when the user intends to do a large amount of searching. User-friendly searching is accomplished with a relatively small number of easy-to-remember commands. The simplification of expert mode commands into the user-friendly mode lessens the value of the complex indexing rules that allow for comprehensive searching. Therefore, by making a database accessible to private persons, the user-friendly mode makes portions of the database less accessible.

Equipment Requirements

To search a database through a vendor, you need to have the necessary equipment. Required are a terminal, keyboard, screen, and printer. Most personal computers meet these requirements. Also needed is a telephone line that connects the user to a local telecommunications network (either Tymnet or Telenet) to contact the computer in Latham, New York (BRS), Bethesda, Maryland (NLM), or Los Altos, California (Dialog) at reduced telecommunications rates. The telecommunications charges are incorporated into the monthly bill from the vendor. A modem is required that transmits keyboard commands as electronic tones for transfer by telephone lines. The rate the information is transmitted is called the baud rate. Simply put, 300 baud (30 characters per second) is very slow, 1200 baud (120 characters per second) is standard, and 2400 baud (240 characters per second) transmits at a rate faster than most people can comfortably read. If possible, obtain a 2400 baud modem that will shift down to 1200 baud. To ascertain what baud rates are accommodated locally, call the tollfree number for

Telenet (800-336-0437) or Tymnet (800-336-0149). To complete a search, a telecommunications software package is also required. This is needed to make the translation of keyed-in characters to tones possible. Grateful Med, an innovative software program that is especially user-friendly is, in itself, a telecommunications program. It may be used for NLM MEDLARS searching only. Other telecommunications programs include CROSSTALK, QMODEM, PC-TALK, SMARTCOM, and many others. Some programs are user-supported (almost free). Grateful Med specifically requires an IBM-compatible computer and a Hayes-compatible modem.

Mechanics of a Search

To use NLM MEDLARS, BRS, or Dialog, it is necessary to understand the medical subject heading (*MeSH*) field of a MEDLINE article record in the database. *MeSH* is the most complicated aspect of a MEDLINE search, but it is the key to the subject content of the article. An indexer assigns the *MeSH* subject headings to each article. Indexers are required to take a rigorous training course, assuring that the medical subject headings will be assigned consistently. Several books are published by the NLM that list *MeSH* headings used by indexers. The subject headings are categorized in three ways: alphabetically in *Medical Subject Headings—Annotated Alphabetic*, categorically in *Medical Subject Headings—Tree Structures*, and alphabetically by single word as it appears within a *MeSH* heading in *Permuted MeSH*.

Annotated Guide to Database Vendors

The following guide is presented to help you evaluate vendor services. Listed first is the vendor name; this is followed by a slash, and then the name of the searching package offered by the vendor is presented.

In reading through the following guide of database searching services, consider four points. First, what time of day will most searches be done? Not all services are available during daytime hours. Second, what specific databases will be needed (i.e., *Index Medicus* database, *Psychological Abstracts* database, *International Pharmaceutical Abstracts* database, *Biological Abstracts* database, *Sociological Abstracts* database)? Some of the services can have very limited offerings and may

not include the needed databases. Third, what is the relative cost? Most of the services are similarly priced, but the total monthly bill will depend on how much is charged for each individual database. In addition, sign-up fees and monthly minimums can sometimes seem excessive if searches are infrequent. Fourth, are there equipment requirements? All services require at least a terminal or microcomputer, a telecommunications package, and a telephone line and modem. Grateful Med even requires a certain type of microcomputer and modem. (A telecommunications package is included with the Grateful Med program.)

BRS Information Technologies

(1) BRS/General Search Service

Tollfree number: (800) 345-4277 and (800) 468-0908

Address: 1200 Route 7, Latham, NY 12110

Sign-up fee: Depends on type of subscription plan
Monthly minimum: None

Cost: Varies with database searched. MEDLINE ranges from \$20.30–\$39.00 per hour, depending on subscription plan. Each MEDLINE citation costs 14 cents.

Number of databases: Approximately 150

Days and hours available: Monday–Friday 5:00 a.m.–3:00 a.m., Saturday 5:00 a.m.–1:00 a.m., Sunday 6:00 a.m.–3:00 a.m.

Comments for end-user: This is a plan many libraries use. There is an expert mode and a user-friendly mode. BRS/General Search service offers a capability not offered by the other BRS services—the ability to save search strategies for later re-running against another database. This plan is most suitable for the frequent searcher. (Note: BRS has structured its pricing schedule so searching is fairly inexpensive, but printing full citations is comparatively expensive.)

(2) BRS/After Dark

Tollfree number: (800) 345-4277 or (800) 468-0908

Address: 1200 Route 7, Latham, NY 12110

Sign-up fee: \$95.00 (Fee includes manual.)

Monthly minimum: \$12.00

Cost: Varies with database searched. MEDLINE costs \$24.00 per hour. Each MEDLINE citation costs 3 cents.

Number of databases: Approximately 90

Days and hours available: Monday–Friday 6:00 p.m.–3:00 a.m., Saturday 6:00 a.m.–3:00 a.m., Sunday 6:00 a.m.–3:00 a.m.

Comments for end-user: Hours are limited to evening hours during the week, plus weekends.

(3) BRS/Colleague

Tollfree number: (800) 468-0908

Address: 1350 Avenue of the Americas, Suite 1802, New York, NY 10019

Sign-up fee: \$95:00 (Fee includes manual and 2 free hours searching on a practice database.)

Monthly minimum: \$20.00

Cost: Varies with database searched. Medically oriented databases are discounted, and there is an additional discount if user searches during “non-prime time” hours. MEDLINE costs either \$20.00 or \$30.00 per hour depending on time of day the database search is performed. Each MEDLINE citation costs 9 cents.

Number of databases: Approximately 130, plus 80 full-text journals and 25 full-text books

Prime time hours: Monday–Friday 5:00 a.m.–6:00 p.m.

Nonprime time hours: Monday–Friday 6:00 p.m.–3:00 a.m., Saturday 5:00 a.m.–3:00 a.m., Sunday 8:00 a.m.–3:00 a.m.

Comments for end-user: Designed for the health care professional who would like to take advantage of nonprime time discounts while still being able to search during the day, when necessary. All subject areas are covered since BRS combined this with their broader-based Breakthru package, which is now defunct. The addition of approximately 50 databases enhances the Colleague service.

Dialog Information Services, Inc.

(1) Dialog/General Search Service

Tollfree number: (800) 334-2564

Address: 3460 Hillview Avenue, Palo Alto, CA 94304

Sign-up fee: None (\$25.00 annual fee billed to each account in September.)

Monthly minimum: None

Cost: Costs vary depending upon database. MEDLINE costs \$36.00 per hour. Each citation costs 5 cents.

Number of databases: Approximately 340

Days and hours available: Monday–Friday 24

hours, Saturday 8:00 a.m.–8:00 p.m., Sunday 3:00 p.m.–12:00 a.m.

Comments for end-user: This is a plan many libraries use. It provides access to all Dialog databases, but the user must be fairly sophisticated to use the expert mode software. One-hundred dollars in free searching is permitted with each new account, which is to be used within 30 days of first log-on.

(2) Dialog/Knowledge Index

Tollfree number: (800) 334-2564

Address: 3460 Hillview Avenue, Palo Alto, CA 94304

Sign-up fee: \$35.00 (includes manual)

Monthly minimum: None

Cost: Same \$24.00 rate for all databases, including MEDLINE. No citation charges.

Number of Databases: Approximately 70

Days and hours available: Monday–Thursday 6:00 p.m.–5:00 a.m., Friday 6:00 p.m.–12:00 a.m., Saturday 8:00 a.m.–12:00 a.m., Sunday 2:00 p.m.–5:00 a.m.

Comments for end-user: No daytime searching is allowed except on weekends. There is also a limited number of databases from which to choose; however, Knowledge Index is competitively priced with other packages for MEDLINE searching. Two hours of free connect time are permitted with each new account, which is to be used within 30 days of first log-on.

(3) Dialog/Medical Connection

Tollfree number: (800) 334-2564

Address: 3460 Hillview Avenue, Palo Alto, CA 94304

Sign-up fee: \$95.00 (includes manual)

Monthly minimum: None

Cost: Costs vary depending upon database. MEDLINE costs \$36.00 per hour. Each citation costs 5 cents.

Number of databases: Approximately 22

Days and hours available: Monday–Friday 24 hours, Saturday 8:00 a.m.–8:00 p.m., Sunday 3:00 p.m.–12:00 a.m.

Comments to end-user: Provides access to a limited number of databases. The system may be used in user-friendly mode or, for more sophisticated searching, may be used in command mode. One-hundred dollars in free searching is permitted with each new account, which is to be used within 30 days of first log-on.

NLM/MEDLARS

(1) NLM/MEDLARS General Search Service

Tollfree number: (800) 638-8480

Address: MEDLARS Management Service, National Library of Medicine, 8600 Rockville Pike, Bethesda, MD 20894

Sign-up fee: None

Monthly minimum: None, plus \$40.00 in free searches within the first month of receiving your password.

Cost: Varies with database. Most MEDLARS databases, including MEDLINE, are either \$16.50 per hour or \$23.50 per hour depending upon time of day searched (these are approximations based on a pricing algorithm). (Note: students and residents will receive 50 percent discounts upon request through NLM.)

Number of databases: Approximately 20

Prime time hours: Monday–Friday 9:00 a.m.–4:00 p.m.

Nonprime time hours: Virtually all other hours not included above.

Comments for end-user: This is a plan many libraries use. The MEDLARS searching software is somewhat cumbersome but allows maximum use of the databases. See MEDLARS brochure for list of databases offered because some popular databases are not available through MEDLARS. The MEDLARS brochure may be ordered by calling the toll-free number.

(2) NLM/Using Grateful Med Software

Tollfree number: (800) 638-8480

Address: MEDLARS Management Service, National Library of Medicine, 8600 Rockville Pike, Bethesda, MD 20894

Sign-up fee: You may pay \$33.00 for software and documentation or you may be permitted to make copies from your local medical library (neither software nor documentation is copyrighted). No fee for the password.

Monthly minimum: None, plus \$40.00 in free searches within the first month of receiving your password.

Cost: MEDLINE costs either \$16.50 per hour or

\$23.50 per hour depending upon the time of day the search is performed (these are approximations based on a pricing algorithm). (Note: students and residents will receive 50 percent discounts upon request through NLM, but they do not receive the \$40.00 worth of free searches mentioned above.)

Number of databases: Eleven using Grateful Med, excluding backfiles. All 20 may be accessed if the user switches into expert mode.

Prime time hours: Monday–Friday 9:00 a.m.–4:00 p.m.

Nonprime time hours: Virtually all other hours not included above.

Comments for end-user: This program requires an IBM compatible computer and a Hayes compatible modem.

Conclusion

Before signing up for any service, call the tollfree numbers listed for each vendor and ask for current brochures. We also recommend the following selected reading list of books and articles to help evaluate your special medical needs:

1. The basics of searching Medline: a guide for the health professional. Bethesda, MD: National Library of Medicine, 1988.
2. Feinglos SJ. MEDLINE: a basic guide to searching. Chicago: Medical Library Association, 1985.
3. Haynes RB, McKibbin KA, Walker CJ, et al. Computer searching of the medical literature. An evaluation of MEDLINE searching systems. *Ann Intern Med* 1985; 103:812-6.
4. Haynes RB, McKibbin KA, Fitzgerald D, Guyatt GH, Walker CJ, Sackett DL. How to keep up with the medical literature: V. Access by personal computer to the medical literature. *Ann Intern Med* 1986; 105:810-6.
5. Herin NJ. Dial M for MEDLINE: a how-to guide for the clinician. *South Med J* 1987; 80:1024-30.
6. Watson L. Grateful Med Version 2.0: an overview for searchers. *Med Ref Serv Q* 1987; 6:1-17.