

Internet Access to the National Library of Medicine

The U.S. National Library of Medicine (NLM), the source of *Index Medicus* and MEDLINE, is a pioneer in using computers to make medical information available to scientists and health professionals. Today, the Library is using modern communication technology to make its unparalleled collections and other authoritative health information available directly to the general public.

The NLM, which is currently located on the campus of the National Institutes of Health (NIH) in Bethesda, Maryland, had its start more than 160 years ago in the office of the U.S. Army Surgeon General. *Index Medicus*, begun in 1879, is still published by the NLM and is found in many medical libraries around the world. MEDLINE, the on-line database of references and abstracts to journal articles (including *Effective Clinical Practice*), appeared almost 30 years ago. It has been called “the Model T of online databases”: Although it usually got you where you wanted to go, it required a pioneering spirit to master its intricacies and the patience of Job to deal with its idiosyncrasies. Even so, the NLM received more requests than it could handle from medical librarians who wanted to be trained so that they could provide literature-search services for health professionals and scientists in hospitals, universities, and laboratories. The original system covered 239 journals, and the NLM boasted that it was “capable of supporting up to 25 simultaneous users.”¹

In the past few years, the Library has made tremendous efforts to make its contents more accessible to health professionals and the general public through the Internet. In this Policy Matters, I review the origins of this effort and describe four of our Web sites (Table 1). I conclude with the Library’s recent efforts to provide Internet access to people in the United States who are not connected.

MEDLINE to PubMed

MEDLINE today has 11 million records from more than 4000 journals and covers the medical literature published since 1965. Michael DeBakey, MD, chairman of the Library’s Board of Regents in the mid-1990s, strongly urged the NLM to open up MEDLINE to all Internet users. Although the NLM had never restricted access to its collections and databases, such factors as search fees, limited access to computers and telecommunications, and the technical nature of much of the information in NLM databases discouraged their use by the general public and the libraries that serve them.

At DeBakey’s urging, Vice President Gore, in a June 1997 ceremony on Capitol Hill, introduced free MEDLINE searching via the Web and demonstrated a new system developed by the Library called PubMed (Figure 1). PubMed not only simplifies searching, it links MEDLINE users to publishers’ Web sites to retrieve the full text for the journal articles identified in a search; articles in some 1000 journals are currently available. Another useful feature is the “see related articles” button. If a PubMed user finds one suitable reference, clicking on the “See Related Articles” button will quickly identify such articles. The system’s flexibility and ease of use prompted Gore to say that free MEDLINE on the Web “may do more to reform and

TABLE 1

Internet Resources from the U.S. National Library of Medicine

WEB SITE	URL	START DATE	DESCRIPTION	ANNUAL SEARCHES, <i>n</i>
PubMed	www.ncbi.nlm.nih.gov/pubmed	June 1997	MEDLINE references/ full-text articles via the Web site of the publisher	250 million
PubMed Central	www.pubmedcentral.nih.gov	January 2000	Repository of full-text articles	2 million
ClinicalTrials.gov	clinicaltrials.gov	February 2000	Data on approximate- ly 5000 clinical trials	18 million
MEDLINEplus	medlineplus.gov	November 1998	Consumer health information	25 million

improve the quality of health care in the United States than anything else we have done in a long time.”²

Since its introduction in 1997, PubMed has been expanded to include not only MEDLINE, but “Pre-MEDLINE”—through which references are made available before they receive full indexing—and articles from selectively indexed journals that normally would not be chosen for MEDLINE indexing. A completely redesigned PubMed interface was introduced early in 2000 with a number of new capabilities, including a pull-down menu of “limits” (for example, language, gender,

ages) to focus a search; a history feature that displays all searches that the user has conducted in a particular session of PubMed searching; a clipboard that allows the user to collect, view, and print selected citations from one or more searches; and a new context-specific “help” feature.

New Web Sites Introduced in 2000

PubMed Central

The Library’s National Center for Biotechnology Information, whose staff created the PubMed retrieval

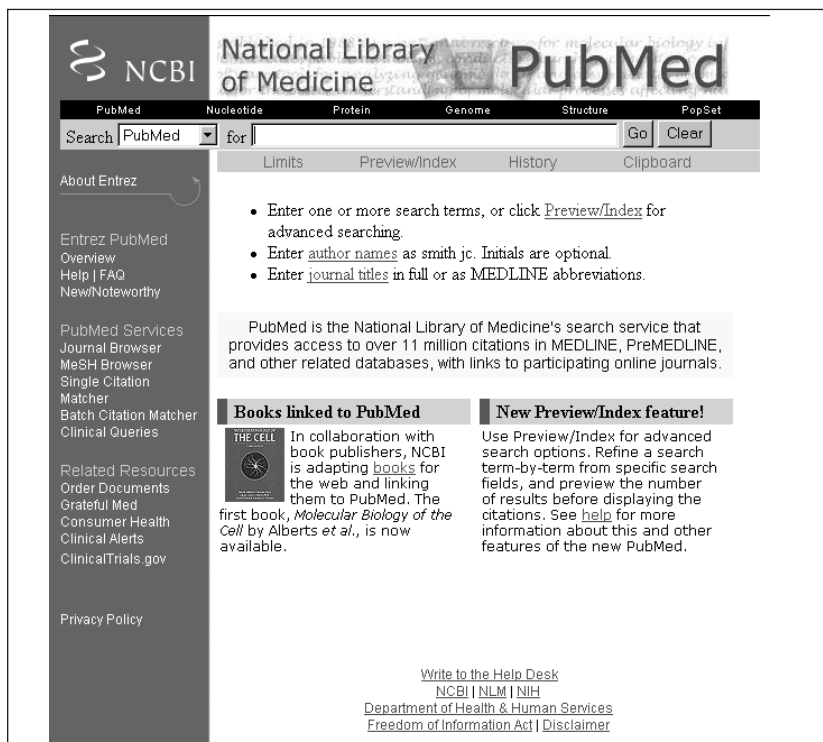


FIGURE 1. PubMed home page.

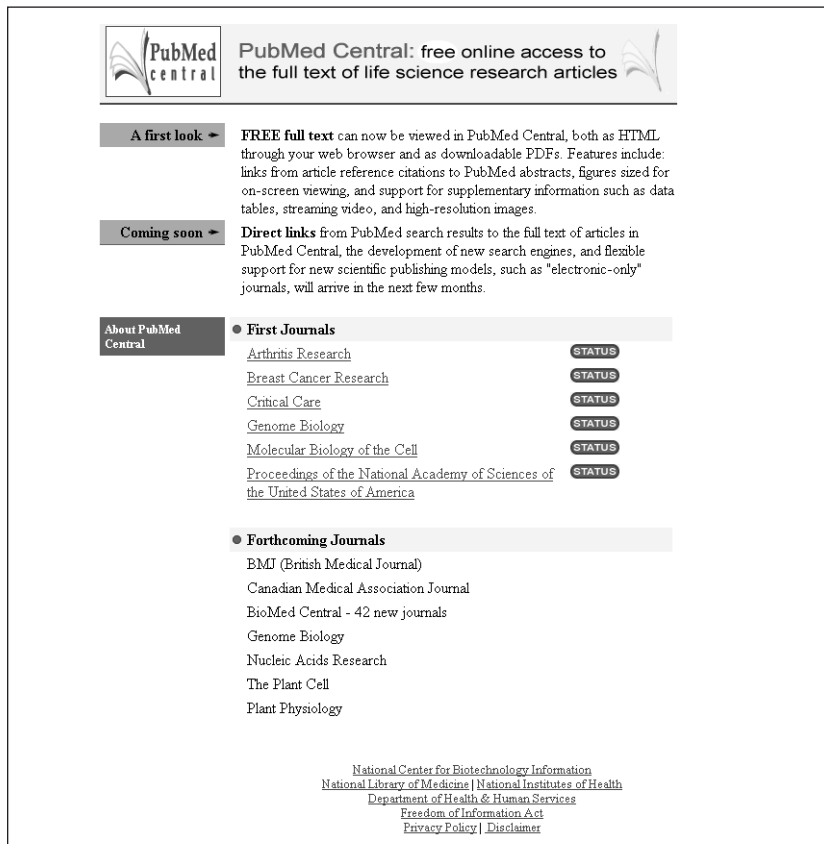


FIGURE 2. PubMed Central home page.

system, also created “PubMed Central” (Figure 2), a Web-based repository that was established in January 2000 at the request of the NIH to provide barrier-free access to primary reports in the life sciences. The full text of articles from a limited number of journals can now be viewed in PubMed Central, both as HTML through the user’s Web browser and as downloadable PDFs (portable document files). Features on this site include links from article reference citations to PubMed abstracts, figures sized for on-screen viewing, and support for supplementary information, such as data tables, streaming video, and high-resolution images. The new service, which will be expanded in the coming months, is available at www.pubmedcentral.nih.gov.

ClinicalTrials.gov

Another new site, which became publicly available in February 2000, will be of great help to both physicians and patients—ClinicalTrials.gov (Figure 3). Developed by the NLM at the request of the NIH and the U.S. Food and Drug Administration, the site contains a registry of some 5000 federally and privately funded trials of experimental treatments for serious or life-threatening diseases or conditions. It will soon be expanded to include more clinical trials sponsored by private companies and some performed in other countries. The

database includes a statement of purpose for each clinical research study, together with the recruiting status, the criteria for patient participation in the trial, the location of the trial, and contact information. An important feature of the database is an extensive series of links to other on-line health resources (including MEDLINEplus, discussed below) that help place clinical trials in the context of patients’ overall medical care. There is no registration, and complete privacy is assured to all users.

Public Access

MEDLINEplus

The introduction of free and convenient access to MEDLINE via the World Wide Web has had a profound effect on use of the database. Searching had been simplified to the point where all barriers to retrieving relevant journal references on any biomedical subject were removed. As a result, use soared from 7 million searches in 1996 to 100 million in 1998 and is projected to be 250 million this year. When we learned that about one third of all MEDLINE searching was being done by consumers, we realized that this presented a wonderful opportunity: Why not create a service that not only provides selective MEDLINE results that are useful to the consumer but also links the Web user to authoritative,

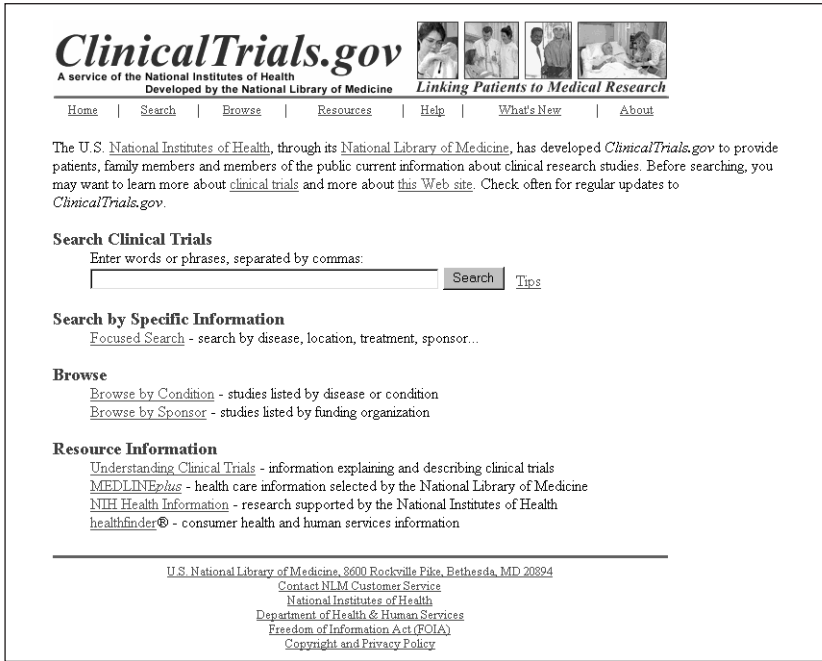


FIGURE 3. ClinicalTrials.gov home page.

full-text health information written for the general public? The Library created such a service and quietly introduced it in October 1998. Because the name MEDLINE already had a quarter-century exposure to the health professions and because that database was now also increasingly known to the public, the Library called the new service MEDLINE_{plus} (Figure 4).

Where did such authoritative information come from? Since the NIH publishes a wealth of consumer health information based on the medical research it sponsors, it was natural to start there. Also recruited were professional medical societies and voluntary health agencies, many of which issue, without commercial or

business motive, authoritative information that the public can trust. With help from members of the National Network of Libraries of Medicine across the country, NLM information specialists have selected and organized this information and extensively cross-linked it.

In the year and a half since its introduction, MEDLINE_{plus} has grown tremendously, both in terms of the quantity of material it covers and the amount of public use. As of June 2000, MEDLINE_{plus} was receiving some 2 million hits per month. The original two-dozen “health topics,” containing detailed consumer information on various diseases and health conditions, have been increased to almost 400, and more are added weekly.

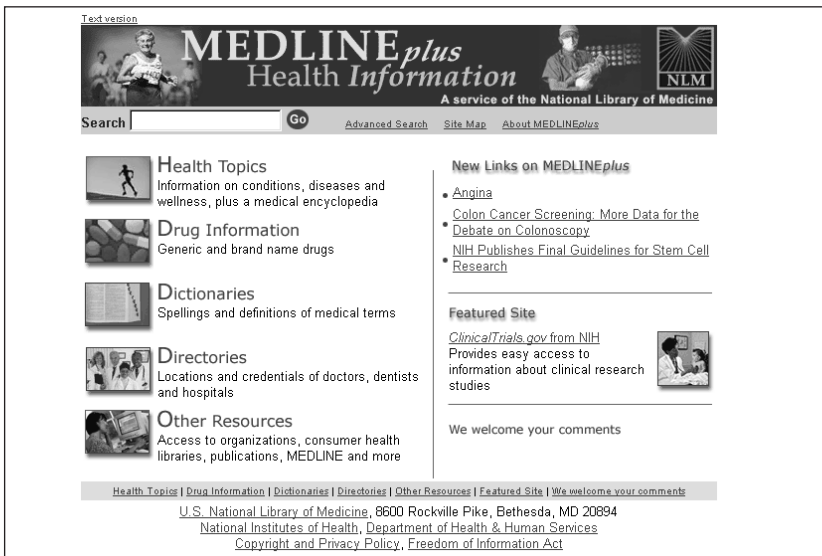


FIGURE 4. MEDLINE_{plus} home page.

Other information available through MEDLINEplus includes:

- Consumer health information in other languages (primarily Spanish)
- Medical dictionaries
- An extensive medical encyclopedia, with thousands of entries and illustrations, written in lay language
- Detailed information about prescription drugs
- Directories of health professionals and hospitals
- Links to a variety of organizations that disseminate information on various health problems
- Links to libraries around the United States that provide health information for the public
- Preformulated MEDLINE searches for recent articles (in journals likely to be available) that will be of interest to consumers seeking information for themselves or family. In the extensive MEDLINEplus section on diabetes, for example, the consumer does not need to know any searching strategy to locate useful current information, such as review articles and practice guidelines, about diabetes and “nutrition and diet” or diabetes and “eye problems.”

The NLM has also learned that health professionals of all kinds are finding MEDLINEplus to be an excellent source of information. Many physicians use it to keep up-to-date on medical subjects outside of their specialty. Others are referring their patients to MEDLINEplus for up-to-date and authoritative information about their health conditions.

Bridging the Digital Divide

We realize that many U.S. residents who could benefit from services like MEDLINEplus and ClinicalTrials.gov do not have ready access to the Web. Almost everyone in the United States does, however, have access to a public library. Thus, at the same time we introduced MEDLINEplus, we began a pilot project with 200 public

libraries in 10 states to train local librarians in use of the Internet to find health information pertinent to their patrons' needs. This had the dual advantage of providing health information to citizens who lacked personal access to the Web and also of creating an experienced cadre of public librarians who could guide consumers to sources of reliable health information.

Encouraged by our success with the public library program, we have started a more ambitious outreach program to support members of the National Network of Libraries of Medicine who agree to work with their public library counterparts and with churches, municipal and state agencies, and other organizations that have frequent contact with consumers. In January 2000, the Library announced 49 awards to Network members to help them increase Internet access in a variety of settings, from middle schools serving low income and educationally underserved students to shopping malls and senior centers. These imaginative and well-targeted projects are helping the Library determine how best to provide access to health-information resources to millions throughout the United States who are still not connected to the Internet. They are stimulating medical libraries, local public libraries, and other organizations to work together to provide new electronic health information services for all citizens in a community.

In just the past few years, there has been a remarkable change in how health professionals and consumers seek health information. The NLM is doing its best to provide high-quality information services to both groups. I encourage you to make use of these services for both yourself and your patients.

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