

The Changing Library: What Clinicians Need to Know

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Abstract

Over the last two decades, changes in technology have allowed academic medical center libraries to bring the world of biomedical information to the physician's computer desktop. Because digital libraries have grown so rapidly and in so many ways, some clinicians may be uncertain about the services and resources that are available to them. This article explains how clinical faculty can best utilize their library to support their research and patient care. It addresses some of the most common myths about the "new" medical library, and it highlights innovations in library resources and services that can help physicians to better access, use and manage medical information.

Key Words: Medical libraries, academic medical centers, internet, information services, librarians, physicians, professional practice, continuing medical education, information management.

Introduction

MEDICAL LIBRARIES play a central role in information dissemination for their institutions by selecting the most useful and authoritative biomedical publications and making them available to faculty, students and staff to support patient care, research and education. Over the last two decades, changes in technology have transformed the way biomedical information is created, communicated and accessed. Academic health center libraries have moved rapidly to take advantage of new information formats and enhanced information access, cre-

ating "digital" libraries and networked systems for their users (1, 2).

These digital libraries have provided clinical faculty with a range of new resources as well as new ways to retrieve those resources. From their computer desktops using a Web browser and Internet connection, physicians now frequently have access to data collections that include thousands of electronic journals and hundreds of electronic books. At Mount Sinai School of Medicine, for example, the Gustave L. and Janet W. Levy Library licensed approximately 3,300 e-journals and over 1,600 e-books in biomedical subject areas in 2005. Clinicians may use information available in online formats that blur the traditional distinctions between books, databases and journals. And many libraries have set up remote access to their collections, allowing physicians to use online resources from their campus office, hospital workstation, and off-campus office computers, whether the physical library is open or closed. Medical information is also increasingly portable—physicians can quickly download, e-mail and save content to computers or personal digital assistants (PDAs), and even beam information from one PDA to another.

Because digital libraries have grown so rapidly and in so many ways, clinical faculty may underestimate the services and resources that are available to them. The converse is also true: physicians

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may feel overwhelmed by the range and variety of information and uncertain about which resources are most useful in their specialty areas. Furthermore, physicians familiar with print journals, standard textbooks and indexes such as *Index Medicus* may be unsure that they are using new databases and information formats efficiently and correctly. Studies have found that while many clinicians have adapted quickly to the new digital environment, at least 59% experience difficulty navigating or searching for medical information (3).

This article explains how clinical faculty can best utilize their library to support their research and patient care. It addresses some of the most common myths about the “new” medical library, and it highlights innovations in library resources and services that help physicians to better access, use and manage medical information.

Modern Library Myths

Myth #1: Everything Is Online

A completely digital library might be on the horizon—but it is not here yet. It is true that almost all academic library catalogs and indexes have been reconfigured as online databases, and that biomedical journal articles published after 2000 are likely to be online. Some biomedical journals, however, are still not being published in digital format. In 2005, for example, of Levy Library’s current biomedical journal subscriptions, about 350, or over 25% of print journals and over 9% of both print and online journals, were available only in print. Physicians should also be aware that a vast majority of older articles have not yet been published electronically. A journal article that predates 1995 (or even 2000) is much less likely to be available online than content published within the last few years.

There are exceptions to this rule. Subscribers may access *American Heart Journal* online back to 1925 (volume 1), and *Science* is now available electronically back to 1880 (volume 1). The amount of journal content available electronically will continue to grow as providers transfer journal backfiles into digital format. At this point, though, most libraries still have substantial print collections that are not duplicated online, and clinicians must usually obtain older articles from the library’s print journals.

Most medical books are not yet available online, although publishers are racing to make classic texts available. Levy Library’s collection of electronic books grew from 974 to 1674 titles, or 72% in 2005 alone, and now includes some core titles in almost all areas of clinical medicine. As a result,

faculty may want to check their library’s e-book holdings before purchasing a new reference book.

Myth #2: Everything Online is Free

Health sciences libraries seek to provide faculty with authoritative, evidence-based information, and very little of that information is free. To the contrary, the cost of scholarly databases, journals and books is increasing, and libraries must often acquire and pay for both print and electronic information formats. Open access initiatives such as PubMed Central (<http://www.pubmedcentral.nih.gov>) and Public Library of Science (<http://www.plos.org>), founded in response to the rising costs of journals, have begun to provide free access to a small number of peer-reviewed medical articles; however, there is often a delay in availability (4). The National Center for Biotechnology Information, a division of the National Institutes of Health, provides a number of free databases, including Medline/PubMed (<http://www.pubmed.gov>), and offers a small collection of e-books without cost. Most online biomedical information, however, is available only by paid subscription.

An academic health center library’s costs for electronic resources are usually based on the number of affiliated faculty members and students at the medical center. In 2003–2004, 127 academic health sciences libraries in the United States and Canada reported spending \$177,030,359 on their library print and electronic collections: books, journals, databases and other resources (5). Because resources are licensed for and limited to valid users, clinical faculty must access library resources through the library’s Web site, and must authenticate (log on) with a user name and password to use library resources available from off-campus locations.

Myth #3: MEDLINE is Difficult to Use

PubMed, the National Library of Medicine’s (NLM’s) free search interface for the MEDLINE database, is designed to make the wealth of information in MEDLINE easily searchable by health professionals (6). As the technology underlying PubMed has become more sophisticated, searching has become faster and more intuitive. Fundamental to PubMed’s power is Automatic Term Mapping (ATM), an advanced “natural language” program that runs in the background of its search engine. ATM looks for synonyms to the words or phrases in a search query, and then uses a specialized algorithm to broaden the search statement with matching vocabulary.

Clinical Queries is a PubMed service specifically developed to support clinicians' evidence-based practices. Built-in search filters in Clinical Queries retrieve research studies using the best research methodologies for specific clinical question types—such as “therapy,” “diagnosis,” “etiology,” and “prognosis.” Type in your clinical keywords, select the appropriate question type and you will quickly retrieve research studies matching your query. PubMed's Related Articles link is another helpful search tool that retrieves citations that are closely related to a selected reference by comparing words from the title, abstract, and subject headings using a specialized algorithm.

Other convenient tools allow researchers to save searches and to e-mail selected citations. A helpful feature introduced in 2005 is spell-checking. Finally, PubMed's LinkOut service dramatically enhances MEDLINE's functionality by linking from the MEDLINE database to the full text of many journal articles. LinkOut and other article linking services will be described in more detail below.

Myth #4: Google Can Replace MEDLINE Databases

While Google is a valuable tool, it cannot replace commercial MEDLINE search interfaces provided by companies such as Ovid Technologies or by PubMed. Google (<http://www.google.com>), the most popular general search engine on the Internet (7), is quick and easy to use. It excels at locating medical news releases, the names of department chairs, or patient advocacy groups. Google also links to some full-text, open-access journal articles, and has even begun to link to MEDLINE citations in PubMed. However, Google has several shortcomings as a search tool for medical information. First, Google results typically contain sponsored links to commercial sites, and its search results often include commercial sites with a promotional focus. As a result, clinicians may find that their searches retrieve irrelevant information. A physician searching www.google.com for “traumatic brain injury,” for example, will find several medical malpractice Web sites at the top of the results.

Another drawback to searching Google for biomedical information is that Google searches the World Wide Web, an “ocean” of information of greatly varying quality. A new Google service, Google Scholar (<http://www.scholar.google.com>), is working with scholarly publishers to limit this ocean to works from research disciplines, but Google Scholar does not identify what publications it covers. Reviewers have also found that

Google Scholar's records from known sources such as PubMed often seem to be out of date and/or incomplete (8).

A final problem is that Google and Google Scholar results are retrieved by a formula that places Web sites at the top of results if they have many other Web sites linking to them—not if they are current publications. This relevance ranking formula can be useful if a searcher is looking for a classic article—one that has been cited often by other scholars—or a current article on a “hot” topic that is engendering public comment. Recent publications, however, may be buried within Google's search results (9). Physicians should not rely on Google to identify current, authoritative information to support their clinical practice.

Myth #5: Textbooks Are out of Date before They Are Published

Publishers have begun regularly updating the Web-based versions of some classic textbooks. One example is *Harrison's Online*, which includes daily updates and is always more current than its print counterpart, *Harrison's Principles of Internal Medicine*. Clinicians should also be aware that some texts are enhanced with extra features online. McGraw-Hill's AccessMedicine platform, for example, supplements *Harrison's Online*, *Hurst's the Heart* and their other online textbooks with PDA downloads and access to a drug database, patient handouts and a medical news service.

Changing Library Resources

Keeping Up: Knowledge Synthesis and Current Awareness

“Despair and consternation” about keeping up with medical advances is not new (10). Although the Web has intensified what has long been regarded as a crushing flow of information (11), it has also generated new tools to help clinicians manage the flow. Slawson and Shaughnessy suggest that tools to manage information can be divided into “foraging tools” that alert clinicians to new findings relevant to their practice, and “hunting tools” that allow clinicians to easily find information summaries when they have a question about a patient's care (12).

New hunting tools include the popular “clinical topic review” databases such as UpToDate and eMedicine. These peer-reviewed databases aim to synthesize the current “best evidence” to answer clinical questions at point of care, and are updated daily with the latest research findings (13). Hybrid

resources such as MD Consult offer both knowledge synthesis and current awareness, or foraging, tools. Physicians can browse MD Consult features such as “In this Week’s Journals” and “This Week in Medicine” to stay informed about the most important new journal articles and medical news. Within MD Consult, they can also search MEDLINE, read some full-text journal articles and review more than 50 full-text medical reference e-books.

MD Consult was among the first medical databases to allow clinical faculty to create customized “personal accounts” as a way of managing the site’s information. Database customization, provided by MD Consult, PubMed and others, typically allows physicians to save articles, rerun searches, receive e-mail alerts and announcements tailored to their interests, and even modify the way the database’s Web pages are presented. Customization is not limited to databases; many electronic journal distributors offer free e-mailed table of contents alerts and other current awareness services.

Clinicians may have noticed that databases and Web sites are increasingly offering “news feeds” as an alternative to newsletters and e-mail alerts (14). News feeds are also known as RSS feeds, really simple syndication, or rich site summaries. A news reader or “aggregator” is required to use RSS services; many readers, such as Bloglines or MyYahoo, are free to download or to use on the Web. It is not yet clear whether clinical faculty will adapt “news readers” and switch from e-mail updates to “news feeds.” PubMed is supporting both options: in 2005 it enabled users to receive updated search results via RSS and via automatic e-mails, and gave extensive publicity to both services (15, 16).

Patient Education and Consumer Health Information

Much has been made of the use of the Internet by patients and its impact on doctor-patient relationships. Clinicians may feel concerned that patients are obtaining information from questionable online resources. They may also feel uncomfortable about managing “expert patients” who arrive at their offices with requests for new and unfamiliar treatments that were uncovered in Web searches (17, 18). Polls show, however, that clinicians are patients’ most respected source of health information (19). Most patients want and expect their physicians to interpret the information that they find independently (20).

To help physicians stay abreast of health care news that may be informing (or misinforming) their patients, some health care databases include synopses of reports from the popular press and

media. MD Consult, in particular, augments its review of “What Patients Are Reading” with links from news summaries to the professional literature, so that doctors can more easily research the new claims.

Doctors can correct or clarify patients’ understanding of their illnesses and treatment choices with evidence-based information, and reinforce their instructions with accurate patient education materials. Many biomedical databases provide patient education resources; Levy Library’s database collection, for example, currently includes six products that offer printable patient education handouts. Three of these resources allow handouts to be customized for the patient, and two—MD Consult and MICROMEDEX—include Spanish language leaflets. MICROMEDEX is primarily known as a drug information database, but its patient handout system includes CareNotes as well as DrugNotes. CareNotes covers a wide range of medical and surgical subjects, and the leaflets, written at a fourth to sixth grade reading level, are suitable for low literacy readers.

Physicians can also support their patients by directing them to authoritative consumer health information sources on the Web (21). No directory of consumer health sites would be complete without two library-affiliated information portals: MedlinePlus and the New York Online Access to Health (NOAH). The National Library of Medicine developed MedlinePlus (<http://www.medlineplus.gov>) to provide access to information produced by National Institutes of Health and Department of Health and Human Services components and other reputable organizations (6). NOAH (<http://www.noah-health.org>) is a librarian-curated directory to full-text consumer health information, and is drawn from a range of sources (22). Both MedlinePlus and NOAH provide access to information in English and Spanish. Many professional medical societies provide consumer health information; physicians should check their professional association’s Web site for consumer health information in their specialty area. Most health library Web sites also provide a list of reputable online consumer health information sources.

Changing Library Services

Full-Text Linking from Databases

The most popular new service offered by academic medical center libraries may be journal article linking. Article linking employs software to allow users to seamlessly connect from one library

resource to another. When an article-linking service is implemented, a clinician who finds a journal citation in a database such as MEDLINE, ISI Web of Science or PsycINFO can connect directly to a full-text copy of an article, if available; search the library's online catalog for print holdings; or automatically request the item through an online interlibrary loan system.

In addition to the link resolver services provided by libraries, many databases are also providing their own online links to journal articles. PubMed's LinkOut service is a case in point: LinkOut allows users to connect from PubMed references directly to many full-text journal articles. A library can participate in LinkOut—and increase its usefulness for its patrons—by providing PubMed with a list of its full-text electronic journal holdings. PubMed then adds links customized for the library's subscriptions and identifies them with a button bearing the library logo. The library's customized links (and buttons) are only displayed on a PubMed site available via a special Web address. To take full advantage of LinkOut, then, clinicians must access PubMed through the Web links on the participating library's Web site. Levy Library currently places its PubMed link at the top of its Databases page.

Online Interlibrary Loan Services

Many libraries have replaced their traditional interlibrary loan services with online systems. Clinicians can now enter requests for books or articles not held at their local library without leaving their office, and the requested materials can often be delivered electronically to their desktop. The turnaround time for electronically delivered articles is typically less than that for paper-based systems, and technology upgrades are expected to decrease this time even more.

Bibliographic Management

Gone are the days of handwritten note cards and bibliographies typed by hand. Bibliographic management programs are huge timesavers for researchers and clinicians. Services like EndNote, Reference Manager, and RefWorks are now available through many academic libraries. These tools allow users to organize their research, import references from online databases, automatically produce bibliographies and insert citations into papers. Bibliographic management programs also facilitate collaboration among authors by allowing multiple users to contribute references for a paper to a shared account.

Each program has different strengths. EndNote allows users to embed graphics, including tables and charts, into references and to link them to papers. Both Reference Manager and RefWorks allow clinicians to publish their databases on the Web. RefWorks, an online bibliographic service, allows clinicians to access their personal databases from any computer with Internet access and to connect directly to full-text articles provided through the library. EndNote Web, an online version of EndNote, will be introduced sometime in 2006.

Virtual Reference and Instruction Services

Clinicians increasingly find and use library services and resources without visiting the physical library, and their questions about the library arise outside its walls as well. To support library users, librarians are supplementing in-library reference services with online reference services. Librarians have added e-mail, instant messaging and/or chat services to the telephone and in-person support that they have traditionally offered. E-mail reference allows librarians to provide clinicians with well-researched, detailed answers to their questions. Instant messaging and chat, like telephone and in-person interactions, give patrons immediate feedback. All forms of virtual reference have the advantage of allowing librarians to deliver additional documentation—sample search results, a journal article in PDF format, or an online reference—as attachments to their answer (23).

Physicians and other patrons should note that their library Web site may already provide the answer to their questions about how to use a library resource or service. Librarians are supplementing classroom instruction and reference desk brochures with Web-based tutorials and information guides (24). At Mount Sinai School of Medicine, for example, medical librarians compile and answer "Frequently Asked Questions" (FAQ's); develop customized, hyperlinked resource guides for clinical specialty groups; and offer online instruction on topics ranging from obtaining library cards to conducting database searches. As a result, the library's Web site has become a gateway to its reference and instruction services as well as to its electronic resources. Links to reference services, FAQ's and other library information are usually available from a library's home page.

Summary

The Internet has allowed academic medical center libraries to bring the world of biomedical information to the clinician's desktop. It has also

TOP TEN TIPS For Getting the Most from Your Medical Library

1. You don't need to visit your library to use your library. Get a user name and password and access your virtual library from your home or office. Most library e-resources are licensed, so make sure that publishers recognize you as a valid user by accessing your library's resources through the library's Web site.
2. Most recent biomedical journal articles are available online; most older articles are available in print only. Virtually all current catalogs and indexes in academic libraries are online. Electronic book collections are growing, too, so check your library's e-book holdings before purchasing a new reference book.
3. Databases such as PubMed are getting "smarter" and easier to use. Many also provide some full-text content, or links to full-text articles. Clinical Queries is a PubMed service that helps clinicians find articles to support evidence-based practice.
4. To find current, accurate information about the latest research and best practices, check resources that cover peer-reviewed journals (e.g., Medline/PubMed) or that provide regularly updated, peer-reviewed, evidence-based summaries (e.g., UpToDate, eMedicine, Harrison's Online). While Google is a valuable tool, physicians should not rely on it to identify current, authoritative information to support their clinical practice.
5. Online resources such as MD Consult are streamlining your ability to keep up with changes in your field—and with what your patients are reading. Many also provide current, clear patient education handouts. And remember, clinicians remain patients' most trusted source of information.
6. Full-text linking is now available from many library databases. A clinician who finds a journal citation in a database such as MEDLINE, ISI Web of Science or PsycINFO can often link directly from the database to an online copy of the article.
7. Faculty can now enter requests for books or articles not held at their local library through online interlibrary loan services. There is no need to leave your office, and the requested materials can often be delivered electronically to your desktop.
8. Bibliographic management programs, available through many academic libraries, can help to organize the references for your publications. They also facilitate collaboration among authors by allowing multiple users to contribute references to a shared account.
9. Your library's homepage is a gateway to your library's services as well as its resources. Check your library's Web site for answers to your questions, guides to using library resources and links to services such as virtual reference and interlibrary loan.
10. Ask a librarian—in person, by phone, by e-mail, or by an online chat service—to show you the quickest, easiest ways to get the best information. Librarians have gone online, so even if you can't come to the library, you can still ask your questions by e-mail as well as by phone, and often via an instant messaging or chat service.

spurred the development of new services and resources that help clinicians find, use and manage information to support their research and patient care. Because online content has grown so rapidly, physicians may underestimate what is available to them or be unsure of how best to use it. A library's homepage is the gateway to its services and resources, and medical librarians can provide guidance online, by phone, or in person on choosing and using the best resources.

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