
CD-ROM MEDLINE use and users: information transfer in the clinical setting

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Effective delivery of biomedical information to health professionals depends on the availability of systems that are compatible with the information-seeking patterns of health professionals. MEDLINE is a major source of biomedical information, but has been available primarily through libraries via telecommunications networks. The recent availability of MEDLINE on CD-ROM has made it possible to provide MEDLINE directly to clinicians without the associated problems of telecommunications and online use charges. The MEDLINE on CD-ROM Evaluation Forum sponsored by the National Library of Medicine reported on clinicians' use of CD-ROM MEDLINE at seven different clinical settings. This article summarizes the findings from these sites and places them in the context of current understanding of information-seeking behaviors of health professionals. Key issues in the design and development of information technologies in the clinical setting are also articulated.

This article reports on health professionals' uses of six compact disc versions of MEDLINE† in seven clinical settings. The observations are drawn from clinical evaluations conducted in conjunction with the National Library of Medicine (NLM) and reported at the MEDLINE on CD-ROM Evaluation Forum held September 23, 1988 [1]. Details of these evaluations, including methodology and conclusions, are included in the published proceedings.

Most of the library-based evaluation studies looked at issues such as comparative system performance, impact on library staffing levels, need for instruction, and whether CD-ROM users constituted a new user group. By concentrating on in-library use, however, these studies were unable to determine whether CD-ROM would be a viable method of delivering health care information in the clinical setting. The studies presented here focused on direct CD-ROM MEDLINE use by health professionals. The findings from those studies are placed in the context of current knowl-

edge about clinicians' information-seeking behavior. Issues surrounding the design and evaluation of systems intended to deliver biomedical information and documents to health professionals at the point of patient care will also be raised.

INFORMATION-SEEKING PATTERNS OF HEALTH PROFESSIONALS

Our understanding of how health professionals seek and use information is based on studies begun in the '50s and '60s [2-3]. One of the difficulties in applying these findings to behaviors today is that the health care environment has undergone profound changes, due not only to rapid technological changes, but also to the increasing complexity of the financing of health care in the United States. From its earliest batch processing mode, MEDLINE has evolved by stages to an online mode requiring formal training for intermediaries, and hence to a gateway mode in which so-called user-friendly software offers access to the untrained user. Since the late 1970s, such value-added information service programs as Clinical Medical Librarians (CMLs) and Literature Attached to the CHart (LATCH) have been introduced [4-5]. Despite apparent satisfaction with CML programs, growing eco-

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conomic pressures on hospitals have placed such programs out of reach for most institutions. While it seems reasonable to expect that the impact of these changes on information use would be considerable, no longitudinal data are available.

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Another notable gap in research concerns the role and effectiveness of online search services for patient care. Interest has moved from a focus on the technology of information delivery to determining whether the results of the information search are useful. King's pilot study of the impact of hospital libraries on patient care suggests that when physicians received information from their hospital libraries, that information led to more informed clinical decisions and contributed to better patient care [6]. These findings have prompted several replications of the King study now in progress. Further research is needed to determine exactly which information services should be offered and to what extent they should be made available.

Studies of information-seeking behavior of health professionals have attempted to identify the variables that will predict certain behavioral patterns. In recent reviews, both Siegel and Osiobe presented a communications model to describe information-seeking behavior [7-8]. According to this model, information seeking is a form of communication, since it involves interaction between an information source and a recipient. The means or channel through which information is acquired or transferred can be further characterized as being either formal or informal.

Formal communication channels are generally those that are published, such as books and journal articles, and also include sources that aid access to those materials, such as printed indexes and bibliographic databases. Libraries may be regarded as a formal communication channel. Informal communication channels are generally face-to-face encounters between colleagues and include telephone consultations and attendance at meetings and seminars. Informal communication channels provide feedback and are direct and spontaneous, characteristics sometimes also associated with distribution of research findings either as preprints or in other prepublication formats. When formal channels incorporate characteristics of informal communication, such as immediacy and feedback, the distinctions between the two types of channels is obscured. It may be suggested that the more informal the publication or access appears to

be, the more users interact with it as they interact with other informal communication channels, most notably their colleagues.

Both Osiobe and King reviewed the literature of information-seeking among health professionals and summarized the findings of previous studies [9-10]. These findings are discussed here within the context of the formal/informal communications model described earlier. The choice of a formal or informal information source is associated with such characteristics as career stage, career focus, specialty, and location of practice. For instance, clinicians in urban locations use more informal sources and use them more often than rural practitioners. Younger clinicians use both formal and informal sources, and use more of them than clinicians who have been in practice for some time. In general, clinicians favor informal information channels over formal ones. Those engaged in research and teaching are the most likely to use formal information sources. Surgeons are more likely to use formal sources, while psychiatrists rely on informal sources. Formal information channels are often employed to elaborate and validate proposed activities and decisions.

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CD-ROM MEDLINE AS A COMMUNICATION CHANNEL

In attempting to characterize how CD-ROM MEDLINE functions as a communication channel, it is also helpful to distinguish the medium itself from the setting in which it is placed. Because CD-ROM, like MEDLINE or *Index Medicus*, is primarily an access tool to the formal literature, it functions as a formal communication channel. When CD-ROM MEDLINE is provided as one among many other such resources in medical libraries, the formal aspects of its role as a communication channel are supported. When CD-ROM MEDLINE is placed in an informal setting such as a clinic or office, it may enhance informal communication among health professionals because it enables (or even stimulates) professionals to turn to the formal literature to supplement informal discussions. Furthermore, when the particular CD-ROM system incorporates through its interface design or retrieval technique such features as immediacy and feedback,

the system's function as a stimulus to further investigation is further enhanced.

The communication model developed by Ackoff and adopted by Siegel contrasts information-seeking behaviors related to practice with those related to research [11]. In health care, this distinction is exemplified by information seeking undertaken primarily for patient care as opposed to information seeking related to research, teaching, and continuing education. Because information seeking in most hospital libraries is focused primarily on patient care, hospital libraries act as a particular type of clinical setting, similar to but distinct from settings such as offices, clinics, and conference rooms.

Hospital librarians, too, occupy a unique place on the spectrum of formal/informal communication channels. While libraries are generally regarded as formal channels, hospital librarians, by virtue of their being at the point of health care delivery, and by their ability to provide information and documents immediately to clinicians, may be considered actual participants in informal communication channels.

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Siegel has further suggested that such formal secondary channels as bibliographic databases and document dissemination services are generally inefficient transfer mechanisms for the busy health practitioner; the practitioner frequently lacks the time necessary to access the formal literature and the expertise necessary to process the massive amount of information likely to be available on any given patient management problem. Siegel continues by calling for the development of fundamentally new approaches to the organization of knowledge [12]. One approach studied by NLM is the knowledge base in which information on a topic has been selected, reviewed, condensed, and synthesized for a specific audience. An example of such a knowledge base is the Hepatitis Knowledge Base [13]. In their ideal form, knowledge bases are designed for direct access by the practitioner; they dispense with the standard bibliographic organization and structure and control for the level of skill needed to ensure that the user retrieves all needed materials and only appropriate materials. In other words, knowledge bases provide information of high quality as measured by precision and recall but avoid a traditional bibliographic for-

mat. Knowledge bases may reduce the need for document delivery services, often a problem in nonlibrary settings.

The final two stages of formal information seeking—obtaining the document and finally reading it—are usually not addressed in information-seeking studies. Yet experience shows that accessing the literature is only the first step. Once the practitioner actually obtains a reference, the articles must still be procured. Document delivery can be delegated, but the last step—reading the text—must be taken by the professional. In this respect, knowledge bases differ substantially from bibliographic databases such as MEDLINE.

CD-ROM MEDLINE IN THE CLINICAL SETTING

For the purposes of this study, clinical settings were defined as locations within health care institutions such as ambulatory care clinics, emergency rooms, nursing stations, departmental conference rooms, or hospital libraries. All the evaluations but one were conducted by health sciences librarians with several years of experience in providing information services to health professionals in clinical settings, both academic and community-based, urban and rural. (One evaluation was conducted by an emergency room physician.) In all the evaluations described here, a variety of typical biomedical information support services, such as mediated MEDLINE searching, document delivery, and reference service were provided to health care practitioners, but end-user information retrieval systems such as Grateful Med or PaperChase were not universally available. Clinician searchers were given no training prior to beginning to search, nor was assistance provided at the time of the search, in contrast to most library-based CD-ROM installations in which a variety of training and assistance are given.

PATTERNS OF USE

Not surprisingly, the presence of a teaching program within the health care institution was an important factor in determining the users of CD-ROM MEDLINE. In institutions affiliated with medical schools, many of the most enthusiastic users were students and residents for whom the introduction of the CD-ROM provided immediate access to MEDLINE without charge. Third- and fourth-year students, who spend the majority of their time in hospitals, were frequent users of the clinic-based CD-ROM MEDLINES, just as first- and second-year students comprised the heaviest group of users in academic medical libraries.

The location of the CD-ROM within the health care

setting also affected who used the system. When systems were placed in areas accessible to nurses, for example, they were the heaviest users. When the CD-ROM was located in a library, the most frequent use was by those who either had the time to visit the library or whose need to know was sufficient to motivate them to go to the library, despite the inconvenience. In most instances, the users of CD-ROMs located in libraries tended to be more heterogeneous than the users of systems placed in clinical areas. For example, when the CD-ROM was located on a nursing unit, other nurses from adjacent floors tended to use it because they regarded it as belonging to nurses in general but not to students or doctors. This pattern of use suggests that when the CD-ROM is located in a library, even a hospital library, it assumes the characteristics of a formal communication channel; but when it is located in a space associated with a particular group, such as a nursing unit or conference room, it assumes the characteristics of an informal channel.

A physician may send a secretary to the library to retrieve information, regardless of where it is located, while a nurse is likely to access an information system only if it is physically close to the primary work area, usually the patient care floor.

Physical proximity to the information sources seems to be less important to physicians who are in private practice in a community hospital than for hospital-based staff such as residents, nurses, and other health practitioners. Physicians are more likely to know their patients and to have developed treatment plans for their hospitalized patients. If these clinicians need to search for information, they delegate the task, just as they delegate many other aspects of patient care. A physician may send a secretary to the library to retrieve information, regardless of where it is located, while a nurse is likely to access an information system only if it is physically close to the primary work area, usually the patient care floor.

These observations suggest that the notion that physical location of an information source determines its use may be a more complex phenomenon than previously thought. That is, proximity may be inversely correlated with ability to delegate information seeking. When information seeking can be delegated, proximity does not matter; when delegation is not an option, physical proximity becomes an issue.

Location also affects the effectiveness of the CD-ROM as a communication channel. Placement in a library tends to make the information source appear more formal in nature, but it also is perceived as more open to a variety of consumers. When the information

source is placed in an office or clinical area, it serves as an informal channel to those associated with the unit, but it is perceived as being unavailable to others outside the group. If interest and motivation are absent, even having the system in the office next door does not entice individuals to use it, however. Intrinsic interest in the system as a new technology, level of motivation to seek information, and ability to delegate information-seeking tasks are all factors that, together with location, are influential in determining patterns of systems use.

SPONSORS AND GATEKEEPERS

The sociology of institutions, particularly the ways in which some individuals may function as gatekeepers or sponsors, can greatly affect how quickly and easily a new system is adopted. Many of the clinicians who initially expressed interest in having CD-ROM MEDLINE in their areas acted as sponsors who took responsibility for promoting its use, while others behaved more as gatekeepers who acted to control access. The level of responsibility that sponsors were prepared to deliver differed, as did their apparent motives for becoming involved. At one teaching hospital, the enthusiasm of the person initially requesting the system contributed to the successful integration of CD-ROM MEDLINE into the instructional program. The requester, a clinical faculty member, used it as a tool for clinical instruction. At another hospital, one individual who was willing to promote and manage the system contributed to its successful adoption on the neurology nursing unit.

On the other hand, simply requesting the system did not guarantee a high level of use or satisfaction. Some departments that were eager for the system evidenced some of the lowest use, suggesting that other motives such as status or control may have prompted the request. For example, some requesters behaved as if they wanted the system to be available only to their group or departments so that they would not have to compete for access as they would in a library. In another institution, the sponsor provided instruction and assistance, partly in return for having the system located adjacent to an office and partly to maintain control. Being able to retreat to an office or conference room late at night to work uninterrupted is appealing, and the presence of attractive new technologies in a department or unit may reflect an enhanced status on the staff who work there.

INSTRUCTION AND EVALUATION

How to provide effective, accessible instruction and support to clinical users, and who should provide them, are important issues not only for the introduction of CD-ROM MEDLINE into the clinical setting,

but for the evaluation of its impact. While support in the form of telephone assistance with searching was available in most sites, users did not take the time to contact the librarian. The greatest difficulty searchers had was not with the technique of searching on the CD-ROM, but with the selection of search terms and the intellectual formulation of the search. As already noted, the willingness and ability of sponsors and gatekeepers to provide coaching or support varied. While a head nurse in one institution generously provided assistance (even mediated searches) for other health care personnel, the department chair at another institution insisted on providing instruction of questionable quality, prompting the clinical faculty to voice bitter complaints.

Support in the form of document delivery, even within the institution itself, was also a major factor in the success of CD-ROM MEDLINE. "One-stop shopping" enabling users to go to one place and get the search and the documents together was an attractive option. The comprehensiveness of the service was even more important to some users than its location.

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Instruction and counsel as to the system's capabilities is another component in successful adoption of CD-ROM MEDLINE. Initial, uninformed enthusiasm was sometimes followed by disappointment and lack of use when the system failed to perform as expected. For example, one ambulatory care practitioner was chagrined when the system gave her a bibliographic citation rather than a complete answer to her query.

Evaluators of CD-ROM MEDLINE in the clinical setting reported unanimously that users were very satisfied with the search results they obtained. Not every evaluator was willing to take these reports at face value, however. One evaluator commented

As we got further into the study, we became more and more concerned about the reliability of using the idea of satisfaction and what it really meant when somebody said that they were satisfied. Most everybody loved the system. They liked using it. It's fun. They get in and they get something out, but we can tell from our observations that a lot of them are not using the system terribly well and perhaps, not getting what they think that they're getting. This is a real concern for us. I had an extreme example of a woman who never got the hang of combining terms. So she would go in with a couple of search terms and she would print out her citations, and then she would put in the next term and

print out her citations. Then she would walk out with her two printouts, really happy, really satisfied. She loved the system. She was there a couple of times a week [14].

He then went on to note that the clinical setting makes it harder to identify users who are having difficulty because they cannot be observed while searching, and they are not likely to call or visit the library. Furthermore, many searchers are happy with their results, but display virtually no understanding of the information retrieval process. On the other hand, the user may still find information that is very useful for practice, despite not fully exploiting all the capabilities of the CD-ROM MEDLINE. From this perspective, the search is still successful even though it may not identify the "best" items or be comprehensive. The question of responsibility to this group is an important issue for librarians who work in clinical settings.

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Another factor contributing to user satisfaction is the journal coverage of the typical CD-ROM MEDLINE database. While users at some sites found the limited coverage less than adequate in both size and scope, others appreciated the more narrow focus. For example, users' satisfaction with one system was attributed to its covering 500 English-language journals for a three-year period, so that almost everything retrieved was available locally. One way of enhancing satisfaction is by tailoring the coverage of the CD-ROM database to a particular group in the same way that knowledge bases are tailored to user groups. For example, nurses were more satisfied with a MEDLINE subset that emphasized nursing literature than with the full range of MEDLINE titles.

KNOWLEDGE FINDER IN AN AMBULATORY CARE CLINIC

While the preceding section provides an overview of issues that affected the effectiveness of CD-ROM MEDLINE in a variety of clinical settings, this section takes a closer look at the evaluation of Knowledge Finder, a CD-ROM MEDLINE product developed by Aries Systems Corporation. The evaluation was conducted at the University of Illinois College of Medicine at Rockford (UICOMR) during the summer of 1988. Knowledge Finder runs on a Macintosh computer and exploits many of the features of the Macin-

tosh interface, such as graphics, pull-down menus, mouse manipulation, and windows. Knowledge Finder is designed to provide a simple and attractive approach to bibliographic searching that is accessible to the untrained user. One of its characteristics is its high degree of interactivity and its iterative approach to search formulation; it encourages users to "run" their searches several times using new terminology or different search parameters. Another feature is its probabilistic search technique that uses a combination of natural language and weighted searching. A search query can be entered in natural language or using MeSH or in any combination, and the output will be displayed so that the articles retrieved will be ranked and displayed according to the degree of probable relevance [15]. This technique differs from traditional information retrieval systems that use "exact match" searching and produce output in which the retrieved articles are displayed in reverse chronological order. Because of these features, the system differed considerably from the other CD-ROM MEDLINE products that were included in the NLM Evaluation Forum. Although Knowledge Finder is available in a full MEDLINE version, the version tested in Rockford was the clinical subset, consisting of 225 clinical medical and nursing journals covering the most recent five-year period.

Another unique feature of Knowledge Finder is an automatic logging device that could be used to capture basic information about the searches conducted. The data include such things as the date and time of the search; whether the search was by author, subject, or title; the number of items retrieved; the number considered by the system to be relevant; the number of citations displayed by the searcher; and the search formulation. It also indicates what sections of the database were searched: the entire MEDLINE core or only certain years, and whether the MeSH thesaurus was consulted. Any changes made by the user to the various parameters of the search (the "search controls") is also indicated. The findings are based on the transaction logs and interviews with two residents and the clinic director, and thus are impressionistic rather than systematic.

Knowledge Finder was placed in the Office for Family Practice at the University of Illinois College of Medicine's campus in Rockford, Illinois, a community-based medical school with a population of approximately 150 medical students and thirty family practice residents, a faculty composed of both full-time academics and part-time clinicians drawn from the community, and a small biomedical research department.

The Knowledge Finder was used primarily for questions prompted by patient care situations and by the residents' desire to keep abreast of the literature in their particular areas of interest. For these pur-

poses, the clinical subset turned out to be not only sufficient for their needs, but also of special benefit, since it automatically confined retrieval to clinical titles, eliminating articles published in research journals and in foreign languages. Having an abstract available was also a boon, because it often eliminated the need to obtain (and read) the full article. Searching Knowledge Finder was perceived as being easy and enjoyable, even by someone who had never touched a computer keyboard. Because of its location in an area that "belonged" to a particular group (the residents and associated staff), the Knowledge Finder performed more like an informal communication channel. Its iterative style of searching, the feedback provided through its ranked output, and the friendly Macintosh features quite likely enhanced the air of informality associated with its use, further emphasizing its role as an informal communication channel.

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One drawback to the use of CD-ROM MEDLINE in a clinical area such as the Office for Family Practice is that often a clinician's information need is not easily satisfied by a bibliographic citation. Specific information such as lab values, recommended dosages, or procedural details is not readily available in a bibliographic database such as MEDLINE. While using a computer-based information retrieval system to obtain answers to questions was not perceived as a barrier, the bibliographic format was less attractive than a database that could be consulted for quick reference information.

Searching databases directly appealed to the residents—probably because it was fun, and partly because it eliminated the need to express their information need to library personnel, who may not have (or may not be perceived to have) the subject expertise required to ferret out specific items of information. The need for specific information, together with the perceived difficulty of expressing certain information needs to librarians, may account for clinicians' stated preference for continuing to consult with colleagues and referring to textbooks to meet many of their information needs in the clinic. For bibliographic and research-related needs, they would continue to delegate searches to librarians.

TRANSACTION LOG ANALYSIS

Data from the transaction logs were analyzed to gain insight into the actual process of searching using

Knowledge Finder. According to the transaction logs, 26 searches were conducted, 5 of which could be identified as demonstration or tutorial searches and so were disregarded. Twenty-one searches were analyzed to see how they compared with the search experiences described by the three clinicians who were interviewed. It was impossible to link a search session with a particular individual, but in general, the transaction logs corroborated reports that abstracts were reviewed frequently. Similarly, the users' perception that Knowledge Finder had more power and flexibility than they knew how to exploit was reflected in the logs; most of the search controls remained in the default mode. Some searches were run as many as three or four times, each time with terminology variations, indicating a tendency to use the iterative quality of the user interface. Other searches were run several times with large retrieval sets and no refinements, almost surely indicating that the user was "stuck."

When users did refine their searches, they did so most often by trying different terminology or by adding more terms to the search string. For example, "HEMORRHAGE, POST PARTUM" became "HEMORRHAGE, POST PARTUM, [AND] REVIEW," reducing the retrieval from seventy-five items to thirty. In another instance, "DYSPRAXIA AND HYPERACTIVITY OR ATTENTION DEFICIT DISORDER," which yielded over 100 relevant items, was refined to only "DYSPRAXIA." In still another example, "CYST" yielded thirty-three relevant items, but after reviewing some of the output, the user reran the search using the terms "CYST ARACHNOID." This time the retrieved set numbered thirty-three items, but the items included in the second set differed from those in the first. Presumably, the second set was more useful, since fifteen were reviewed with abstracts.

This evaluation revealed the difficulty users have with terminology, but since Knowledge Finder is a highly interactive system in which a trial-and-error process of searching is tolerated, even encouraged, users seem able to overcome the terminological barriers. The interface is particularly rich, offering a variety of features; but in this study, most users did not exploit the power of these features. It would be of particular interest to observe the use of the online thesaurus compared with the instances in which new terms were generated by the user and added to the search. It would also be interesting to determine whether interface design may lead to the development of differential searching behaviors between new and experienced searchers.

While the insights yielded by the transaction logs may be useful to system designers and evaluators as well as researchers in human-computer interaction, most clinicians are more interested in the results they obtained, not in how they got them. As Sewell and

Teitelbaum observed in the eleven-year study of end users' experiences with online searching:

'If they find something that leads to the information, where it comes from isn't important.' This may explain the apparent success of the new 'user-friendly systems' even though valuable references are sometimes missed because the simplified procedures limit searching options [16].

CD-ROM MEDLINE AND OTHER INFORMATION SOURCES

The sites selected for clinical evaluations represented both rural and urban environments. CD-ROM technology has great potential use in remote or rural areas where telecommunications are problematic and online searching is impossible. A subset of MEDLINE, such as the *Abridged Index Medicus* journals (including abstracts), would likely be attractive to rural clinicians for whom access to libraries and librarians is difficult. The ease with which many systems can be installed—simply plugging the system into an electrical outlet—without worrying about modems and telephone connections is appealing to staff who are busy with patient care. Most CD-ROM MEDLINE systems are designed to be directly accessible to end users and were found to be relatively trouble-free. As the user interfaces continue to improve in power and ease of use, CD-ROM technology presents a viable way for health care practitioners to obtain access to the biomedical literature.

CD-ROM MEDLINE represents an important innovation in medical information access, but its role in medical information transfer remains complex.

CD-ROM MEDLINE represents an important innovation in medical information access, but its role in medical information transfer remains complex. When it is placed in a traditional information resource setting, such as a library, it takes on the characteristics of a formal communication channel. As such, it is one among many sources used to provide access to medical literature. It differs from mediated and online searches in that it can provide direct access to users without time or money constraints. In its role as a formal communication channel, CD-ROM MEDLINE facilitates access to a wide variety of users, and is likely to attract a new class of users to the library. These users might not otherwise request a mediated search or conduct a systematic manual (or online) search of their own.

When the CD-ROM MEDLINE is placed in a location other than a library, such as a clinic, conference

room, or nursing station, it takes on some of the characteristics of an informal communication channel. It instills a sense of ownership, which can increase use among those who identify with the group's sense of ownership, but can restrict use by "outsiders." The kinds of information that clinicians want from an informal communication channel are different from those desired in a formal communication channel. Specific data or consultative advice is most needed in the clinical setting, and while CD-ROM technology and interface design (particularly an interface like Knowledge Finder's) adapts nicely to the clinical setting, the presence of a bibliographic database in an otherwise informal channel creates a kind of dissonance.

On the other hand, many clinicians expressed a desire to have a resource such as CD-ROM MEDLINE available to them on-site. Many suggestions for adapting the CD-ROM system to the clinic emerged from the evaluations. The ability to tailor MEDLINE subsets to user groups appears desirable. Clinicians rarely require immediate access to basic research literature; reducing the size of the files could eliminate the management problems presented by multiple-disk systems. The experience of having MEDLINE on CD-ROM in clinics and hospitals has prompted some to wish for MEDLINE on local networks, along with patient records. Users of other information resources, such as MicroMedex or Emergindex, would like to be able to move from that system immediately into MEDLINE, either online or on CD-ROM. Users would like a single entry point or gateway into multiple systems and varied formats, such as textbooks, knowledge bases, or bibliographic files.

Just what information should be available on the CD-ROM and in what form is another question. In teaching hospitals, it is clear that MEDLINE should be available easily, cheaply, and at all times so that both faculty and students can find the most recent articles for use in both patient care and in preparing rounds; however, the needs of community-based physicians are more complex. In these reports, the belief was expressed that the capabilities of CD-ROM MEDLINE may be more useful in an inpatient setting than in an outpatient setting, in an academic setting rather than a community hospital or clinic. In an emergency room, for example, it may be that the need for information is so acute that a clinician has neither the time nor the desire to look at a recent article on a given topic. All that matters is identifying the disease and its treatment. Textbook-like material, together with a brief bibliography, might provide an immediate answer as well as an incentive to use MEDLINE later to follow up on more recent literature. This suggestion supports a recent study of office information needs of primary care physicians. The study found that "more efficient access to printed infor-

mation needs to be developed" and "a system that incorporates the efficient organization of appropriate up-to-date textbooks and periodicals with easy retrieval of specific points of information needed in office practice would be a boon to today's practitioners" [17].

Another important consideration is the perceived ease with which practitioners can access the information source. The ability to formulate a question so that it can be answered via a formal communication channel (librarian, printed index, or computer system) is frequently a problem for clinicians. Computer interfaces that assist the user in formulating a query, such as the interface incorporated in Knowledge Finder, are an important first step in helping practitioners obtain access to the information needed to solve clinical problems.

The ability to formulate a question so that it can be answered via a formal communication channel (librarian, printed index, or computer system) is frequently a problem for clinicians.

Since the perceived costs in terms of time, money, and effort can act as a barrier to information seeking, the easy, unlimited access to current information that CD-ROM technology makes possible can be a strong argument for placing such a system in the clinic or office. Easy access must also be coupled with the perception of reward for effort, however. Clinicians must believe that their searches will result in accurate, reliable answers to their questions. Such beliefs are built over time, through repeated positive experiences. The issue of quality, not only of the information itself, but also of the indexing and other access mechanisms, is central to establishing trust in the information source. CD-ROM MEDLINE, because it uses the high-quality database produced by the National Library of Medicine, is already perceived as a trustworthy and reliable access point into biomedical literature. Other information sources that are packaged in the CD-ROM form would need to establish similar reputations. Finally, the varied information needs of clinicians suggest that while MEDLINE CD-ROM does not replace technologies already available, it has features that enable it to acquire some of the characteristics of an informal communication channel, thus differentiating it from services traditionally provided by health sciences libraries. Further development and diversification of both the technical medium and the information content will enable librarians and system designers to support more completely the clinical information needs of health professionals.

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FROM THE BULLETIN—75 YEARS AGO

Book binding

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This brings us to the point that specifications blindly followed are quite as likely to result in harm as benefit, for to attain any degree of success in binding it must be adapted to the quality of the paper throughout. A workman to do the best work must have good tools and good material. We cannot make good books of bad paper, but we can learn its limitations and how to make the best of it.

Few general binders are able to undertake with any degree of success the work of library binding, for there is no other class of work subjected to so severe a strain and to such sustained wear and tear. The public are in a measure responsible for the methods employed, for they demand the lowest figure on rebound work, and every reduction made by a binder is accompanied by a corresponding reduction in the quality of the materials or the workmanship.

Those who have specialized in library binding for any length of time have learned the lesson, that the first cost of the labor and materials is not the place for economy, and that the volume that will endure the most use without further attention is the most economically bound. They have developed improvements in sewing, forwarding, and finishing that are the results of years of experience and patient experiment.

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