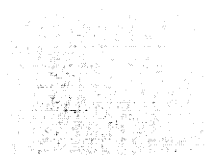
Chapter 3

MEDLARS: System- Related Issues



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INTRODUCTION

The only full-scale effort to review the effectiveness of the MEDLARS service was conducted in 1966-67, before the system was available on-line. At that time, very little was found to be critically wrong with the system (75). The study was conducted on an earlier version of MEDLARS, in essence examining a system vastly different from that in place today. (See app. C for a review of evaluative studies of MEDLARS.) A comparable examination of MEDLARS at this time would require a much greater effort and may be unwarranted.

From a review of the literature, interviews with trained users of the system, consultation with experts, and statistics on system utilization (see ch. 2), *OTA finds that MEDLARS, in general, is effective in disseminating health information, using the traditional criteria of recall and precision.* * The system does not retrieve information as efficiently as is possible with available technologies, but its retrieval and other capabilities will be enhanced when its successor, MEDLARS III, is developed.

OTA has reported on issues concerning MEDLARS' effectiveness in disseminating bibliographic health information in part in the staff paper "The National Library of Medicine" (116) and in part in the OTA report *Strategies for Medical Technology Assessment* (117). This chapter considers three system issues: 1) the subject content of the literature cited in the MEDLARS data bases, in particular MEDLINE; 2) the coverage of nonserial literature in the MEDLARS data bases, in particular MEDLINE; and 3) the evaluation of the methodological design of articles in literature cited in the MEDLARS data bases.

******Recall* **refers to the ability of an information system to retrieve "relevant" documents; i.e., documents of value in relation to an information need that prompted the request for an on-line search.** *Precision* **refers to the system's ability to hold back** "nonrelevant" **documents** (75). **These two measurements are considered to provide (by implication) an estimate of a system's ability to satisfy the information needs of its users.**

SUBJECT COVERAGE

The National Library of Medicine (NLM or the Library), like other organizations responsible for collecting and organizing biomedical literature and for providing information services, is faced with the difficult issue of delineating the field of biomedicine. Over and above the tremendous growth in the quantity of published biomedical literature, the boundaries of traditional medicine as a field of practice and research are continuously expanding to encompass new disciplines. Many disciplines are fragmented and becoming more and more specialized, and new interdisciplinary fields are created in the pursuit of scientific knowledge.

The fields crucial to the health of the Nation's people have become so numerous and diverse that discriminating between those central and those peripheral to health depends on one's point of view. Conventionalists maintain that the basic medical sciences and clinical medicine disciplines are at the core of health and should remain the primary focus of the Library's efforts. Others—who consider that social, psychological, and environmental factors influence health, or who are interested in the application of research findings or in the organization of health services and its effect on health—disagree. They propose that areas such as behavioral medicine, technology assessment, primary care, family medicine, and health services research are equally important, but are receiving insufficient or delayed attention by the Library for its collections and in its products and services such as MEDLARS.

NLM has tried to be responsive to all users and has expanded its subject coverage beyond the fields historically associated with biomedicine. In 1879, Billings classified the citations in Index *Medicus* into 14 categories, one of which, jurisprudence, may be considered outside the medical model. In 1973, there were 81 fields or disciplines used to classify *lndex Medicus* citations, with many new entrants from disciplines outside the basic sciences and clinical specialties of medicine (31).

One example of NLM's efforts to expand subject coverage is in its coverage of the health services literature. In 1966, NLM, at the request of the American Public Health Association (APHA), began to broaden its selection of journals and to expand its set of subject headings to index health services literature. APHA established a committee to advise NLM "in its efforts to improve the analysis, storage, and retrieval of literature pertinent to . . . medical care organization and financing" (105).

This effort, while important, was apparently insufficient. A 1976 report by the House Committee on Interstate and Foreign Commerce found that NLM had not adequately served the information needs of those concerned with health care delivery and health services research, and that attempts to retrieve information in the fields related to health care delivery had not been entirely satisfactory because of deficiencies in the vocabulary used for indexing and cataloging (149). The report did, however, commend the Library as "a world leader in library services for medical sciences and biomedical research" (149).

NLM renewed its efforts to become a primary source of information to professionals in health services research and health care delivery by convening additional advisory groups, entering cooperative arrangements with the American Hospital Association, and continuing to expand its vocabulary and the number of journals indexed for MEDLARS concerning health care delivery and health services research.

By 1977, 58 serial titles, recommended by organizations and individuals in health care management, economics, law, and manpower, had been added to MEDLINE. The Library was also adding indexing terms to its medical subject headings (MeSH) vocabulary: 150 by 1977, and an additional 50 to 100 in 1978. A 1977 House Interstate and Foreign Commerce Committee report congratulated NLM for making "substantial progress" in handling health care literature (148). By November 1978, the Library had established a distinct data base, HEALTH, that contained references to literature on health planning, organization, financing, management, manpower, and related subjects. The American Hospital Association assists with the updating of the data base.

The Library also began a collaborative effort about 5 years ago with the National Health Planning Information Center (NHPIC). In 1979, NHPIC started working with the Library to develop a common terminology, so that NHPIC's data base could be included in NLM's HEALTH data base. Serials from NHPIC's data base have been included in HEALTH since 1979. It is expected that by the end of 1982, the nonserial literature in NHPIC's data base back to 1975 will be indexed according to MeSH and will be available on HEALTH. While terms are continually added to MeSH, health services researchers and planners find some information retrieval problems that mainly stem from an absence of clear definitions and distinctions among indexing terms and from the inconsistent application of terms by NLM indexers in preparing HEALTH (24). Both factors are normal indicators of a relatively new and changing field.

Coverage of health care literature will probably remain a problem for NLM, because relevant articles and literature appear in so many diverse publications and reports. Selectively indexing *more* journals alone from law, management, and public affairs would be exceedingly difficult and expensive. Furthermore, NLM's experience with selectively indexing health planning administration journals since 1976 indicates a skewed distribution for the selected articles: a very few serial titles contain the vast majority of the relevant material. Improved coverage would require reviewing a larger number of journals containing few relevant articles per issue (24).

NLM continues its attempts to improve the subject coverage of many other new and emerging

fields. The Library is now concentrating on improving the literature collection and the MeSH vocabulary for the psychological and sociological aspects of medicine. But, according to certain observers and users, some other fields essential to health such as primary care are being overlooked by NLM. Because similar objections are being raised about NLM's coverage of the nonserial literature, these two issues will be considered in the discussion section of this chapter.

LITERATURE COVERAGE

An issue closely related to the issue of changes in the character of the content of biomedical literature is that of changes in the type and form of the literature. The format for presenting information often varies among disciplines. For example, in addition to books and serial publications, the health care literature, perhaps more than the literature in other biomedical disciplines, often includes unpublished technical reports, project descriptions, speeches, and presentations that are referred to as "fugitive literature" or "grey literature." All biomedical fields have seen a rapid growth in such literature in recent years. Strictly speaking, "fugitive" or "grey" literature is not subject to publishing and reviewing channels because of length, degree of detail, specialized language, or restricted interest, according to Public Health Service criteria (76). The term has also been used to refer to literature so widely dispersed in so many sources that it is difficult to find, or to literature that appears in channels not normally expected (e.g., an article on palliative care in Architectural *Forum) (76).*

Indexing services have traditionally covered the "fugitive" or "grey" literature only selectively, with NLM being no exception. MEDLINE, the largest and most extensively used data base in MEDLARS, concentrates on journal literature: 5 percent of its citations were from other literature, primarily proceedings of conferences and symposia. As of January 1982, MEDLINE included references only to journal literature. CATLINE, which includes citations for all post-1801 printed books and serials, contains citations for many published proceedings and theses as well as monographs. As noted in the previous section, by the end of 1982, NLM's HEALTH data base will include the nonserial literature in NHPIC's data base back to 1975, indexed according to MeSH.

As this country's biggest generator of information, the Federal Government through its various agencies and contractors uses technical reports and other unpublished documents as a means of communicating research and development progress. In many cases, such literature is the only communication link from the time a research project is initiated until its results have been formally published in a book or journal. The results of many research projects are of current interest only, or serve exclusively as a tool for furthering a more comprehensive research effort. In the latter case, results may never be published, making the "fugitive literature" the only source of information (152). Some believe that if information is worthwhile, it will in time be published in a journal, particularly if the information is about biomedical research. Others disagree with this view.

The intent of Congress over the years, however, has been to see that the professional and taxpaying publics receive information benefits from the technical missions that it authorizes (3). As a result, the clearinghouse function—to evaluate, package, and distribute unpublished biomedical information widely but selectively-has been used increasingly as a response to the information explosion phenomenon over the last decade. Clearinghouses typically identify, select, acquire, process, and store documents and other materials while providing "locator tools, " such as indexes, to this collection. In the United States, there are 41 clearinghouses with a health focus, the majority funded by the Department of Health and Human Services (DHHS) (12).

The Government Printing Office releases about 10,000 Government reports annually. The ultimate processor and repository of federally spon-

sored scientific research, development, and technical reports is the National Technical Information Service (NTIS) of the Department of Commerce. It has its own bibliographic data base (NTIS) that is available from commercial information services. About 10 percent of the NTIS document collection, which exceeds 1.2 million titles, comes from DHHS, indicating a substantial flow in health-related information to NTIS. Furthermore, NTIS has created working relationships for the computerized preprocessing of documents with at least three entities within DHHS: the National Cancer Institute, Project Share Clearinghouse, and NHPIC.

METHODOLOGICAL MERIT

The expansion in biomedical publication and the diversification of biomedicine in subject and format has been accomplished, as noted earlier, by a technological revolution. With massive increases in the storage capabilities of computers and improvements in communications systems, the volumes of information and data that can be accessed are overwhelming. A problem that is becoming more and more significant is that of "information overload" and the need for readers of the literature to separate the wheat from the chaff. The concept of quality filtering, which was first introduced by Etzioni in 1964 (47), has received attention from a number of investigators (119,136, 157) and at international] conferences (30,124).

The methodological design and the statistical analysis used in many articles, even in prestigious journals, may be questionable. For example, of 67 clinical trials reported in 1979 and 1980 in the *British MedicalJournal, Journal of the American Medical Association,* Lancet, and *The New England Journal of Medicine,* only 12 percent reported on the statistical power of the investigation (39).

It appears that journal editors who have acted as information gatekeepers of the scientific community are unable to continue filling this role—in part because of the growing complexity of scientific literature, in part because of the climbing standards of statistical adequacy. Journal editors have been considered winnowers of the scientific literature, "who, with the aid of peer review, sift the finest grains to assure that studies published in the scientific literature are well designed and scientifically and ethically sound and that the findings are valid and thoroughly explicated and that the work constitutes a true contribution to scientific knowledge" (44).

The referee system used in the process of selecting articles by journals is also open to question. It has been shown, for example, that the concurrence between two referees of each of some 500 papers submitted to *The New England Journal of Medicine* was only slightly better than chance (67). In addition, the cost of the referee process in the review of journal articles is high because of the need for input from subject experts (123).

It has been suggested that NLM, in preparing its data bases for MEDLARS, assist with the gatekeeper role by describing articles as to adequacy and appropriateness of the statistical and epidemiological aspects of the articles' experimental design and analysis. NLM currently performs some quality control in the selection of materials for the Library's collection and in the process of selecting literature to be indexed for *Index Medicus* and MEDLINE. However, the selection is based on the scientific merit of the journal as a whole and not on the quantitative accuracy of specific articles, although the merit of individual articles contributes to the choice of the literature.

Rigorous evaluation by NLM of the quantitative methodology used in specific articles would be extremely costly: it would require an increase in the Library's funding as well as an effort to locate and hire of personnel with the requisite expertise, neither of which seems realistic at a time of fiscal retrenchment. Further, it would delay the entry of references to published material into the bibliography *(Index Medicus* or MEDLINE). According to NLM, quality control of journal articles by the Library also "would unquestionably involve substantial debate about some articles where statistical issues are themselves unsettled among experts. Finally, the filtering of published

articles puts the Government in the position of a scientific censor, with all the unpleasant implications of Big Brotherism and excessive 'regulation' " (98).

The most advantageous points in the library process and elsewhere for filtering the literature are unknown and warrant serious investigation. NLM could well serve as the catalyst for research in this area, which is certainly germane to its mission. For the time being, NLM could provide minimal guidance to users by providing simple indications about articles (e.g., whether an article has data arrays in such formats as tables and graphs) without making any definitive value judgment as to their merit, or by refining the use of its present methodological subject headings.

DISCUSSION

Expanding the limits of MEDLARS with respect to the subject scope and type of literature covered in its data bases has been discussed in the past, but the funding to accomplish this goal was not forthcoming (65). NLM must operate within financial and personnel constraints. If it remains necessary to contain the perimeters of MEDLARS, a reordering of selection priorities might be conceivable in light of the changing boundaries of the biomedical field and other fields that benefit the public health. But the lack of general agreement as to the relative health contributions of each field is a serious deterrent.

The issue of defining the fields of relevance to health is not unique to NLM; it has been debated in many forums over the years. The issue remains unresolved because virtually every aspect of human culture has some relevance to health. The burden of defining the fields essential to health cannot be assumed by NLM, but the issue is of importance to the Library because its mandate is open to interpretation. As noted in the Library's originating legislation, the purpose of NLM is to "assist the advancement of medical and *related sciences* and to aid the dissemination and exchange of *scientific and other information important to the progress of medicine and the public health"* (Public Law 84-941).

Thus, it would be helpful to the users of MEDLARS if NLM's Board of Regents, within the limits of the statutory language, were to define precisely the scope of subjects and type of literature to be included in the Library's collection and products. Although information on NLM's policy concerning subject coverage and literature coverage is available, the policy is not known by all MEDLARS users. Those interested in fields outside the basic sciences and clinical medicine are sometimes uncertain about the dimensions of the MEDLARS data bases, and some users are not always sure about the definitiveness of their search results. A more interactive mode of communication among the library, librarians and other information specialists, and the ultimate user would enhance the understanding of the situation. Another party at interest is the private sector of the information industry, where perceived inadequate communication about the limits of NLM's data bases and NLM's plans for their modification affects operational and investment decisions (166).

MEDLARS cannot technically or financially cover all aspects of all health-related fields, or comprehensively cover all literature, published or "fugitive, " in all health-related fields. Nonetheless, members of various health fields, particularly in new and emerging areas, have expressed a need for better bibliographic access to information of interest. NLM has assisted some professional organizations in the development of new bibliographic products. For example, the Library currently cooperates in the production of the *Family Medicine Literature Index (FAMLI),* an index to the international literature in family medicine. NLM decided against increasing the coverage of family medicine magazines to be indexed for *Index Medicus* and for the MEDLARS data bases or creating a special list of the journals. Instead, NLM prepares a recurring bibliography on family medicine from the data base which produces *Index Medicus.* The bibliography is incorporated into *FAMLI* and supplemented by the publishers with references to non-index *Medicus* journals,

which are indexed by the *FAMLI* staff, using MeSH and additional family medicine subject headings (52).

The *FAMLI* model is one of many that NLM could use for assisting health-related professional organizations improve bibliographic access to the literature in their specific fields. A Library policy that would permit the leasing of part of the MEDLINE data base and would permit the reproduction of the data base tape would be a way of developing new data bases of specialized interest. The publishers could then supplement MEDLARS data bases with information they deemed necessary, perhaps including "fugitive literature" citations or additional information subject headings in their subject fields.

The problem of constructing MEDLARS data bases in response to user needs is compounded by the absence of sufficient reliable data with which to construct a user profile. NLM is moving to obtain more data on its institutional user community in its new pricing policy, which requires the payment of a use fee every time one of its data bases is accessed through a commercial information service or a foreign center that leases MEDLARS tapes (see ch. 2). At present, it collects data only on institutions that access its data bases directly through NLM and State University of New York (Albany) computers. NLM needs information about the individual user. For example, data on the end user's profession would be helpful in developing data bases more truly reflective of user needs. Even so, the nature and needs of the user community are changeable, and potential users are difficult to identify.

If MEDLARS data bases were to include an assessment of the methods and statistics used in the articles it cited, the system would be extended beyond its current capabilities. Although the issue of assessment reflects users' needs, it is not specific to MEDLARS data bases only, but is important to all health-related data bases. As noted previously, it may be appropriate for NLM to use its research capabilities to explore this problem.

NLM has already started research on one method of filtering information in the construction of its Hepatitis Knowledge Base. The contents of the data base are not bibliographic references, but are reviewed and evaluated data and information synthesized by a consensus of experts and periodically reexamined and updated. Another type of valuable research is the current critical appraisal of the methodological subject headings in MeSH (83). More explorations into the area of quality filtering would continue NLM's leadership role as well as benefit the field of biomedical communication and the health of the country.

The diversity of demands by specialized groups will continue to strain NLM's ability to acquire and organize needed scientific literature in a manner acceptable to all users, and comments on system limitations can be expected to persist. Balanced against such comments should be an acknowledgment of the success of MEDLARS—as measured by many factors, including its continued wide use and the vending of many of its data bases in the offerings of commercial information services.