The New Knowledge Environment: Quality Initiatives in Health Sciences Libraries

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ABSTRACT

LIBRARIES AND LIBRARIANS MUST CHANGE significantly what they do in order to meet the challenges of the changing health care environment and the new technological era. Opportunities to strengthen partnerships, evolve new roles, and develop new high impact services in support of the clinical, research, and teaching are discussed. Quality initiatives in the management of health knowledge are described along with implications for the profession.

INTRODUCTION

The Summer 1993 issue of *Library Trends* was devoted to the topic of health sciences libraries and information centers. The issue editor noted that it had been almost two decades since this had last occurred. Similar themes were identified as still pertinent: "(1) changes in education for the health sciences professions; (2) increased accountability in an era of scarce resources; and (3) advances in the production, recovery, and synthesis of information (Dalrymple, 1993, p.1). Now, only two years later, there is the opportunity to reflect upon quality initiatives in health sciences libraries.

The task has been daunting for two reasons. It is tempting, but nevertheless impossible, to try to update all of the excellent state-of-the-art papers from the previous issue in this one article. Too much has occurred in the brief intervening time. Second, it is the belief of this author that the preponderance of health sciences libraries are carrying out quality initiatives, and that these represent the leading edge in librarianship. Be-

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cause space precludes the enumeration and description of such a wide range of initiatives, this article will focus on a few areas where changes have occurred most rapidly, and where the impact on and by the profession is the most profound. Not surprisingly, the themes previously identified continue to be relevant.

The Evolving Vision

"The fundamental idea of the library must change. . . .In the coming era of knowledge capitalism, those individuals and organizations will flourish who are able to apply knowledge to create knowledge and to organize it to produce knowledge" (Matheson, 1995, p. 1). In her presentation of the 1994 Janet Doe lecture, Matheson went on to say that, in the next decade, there will be a sharp differentiation of librarians and libraries, with libraries being transformed into "knowledge servers." Our profession can revitalize and reinvent itself, setting new boundaries and responsibilities. Matheson invited librarians to "seize the day" (pp. 1, 7). This message echoed that of a previous Janet Doe lecturer who spoke about "reinventing" the medical librarian. Attention must be paid to recruitment to the profession, innate qualities which could be considered prerequisites of effective professionals, and strategies for attracting the best and brightest to the field of medical librarianship (Anderson, 1989).

It is now generally accepted that the primary mission of an academic medical center is the discovery and dissemination of new knowledge to enhance health. It follows that medical librarians can help lead and shape the evolution of an information policy in the institution. Some have suggested, therefore, a convergence between the disciplines of medical librarianship and medical informatics. Common interests include delivery of relevant information to the site in which it will be utilized, a broadening of the primary client base beyond clinicians and researchers to policy experts and distributed communities, and a need to integrate diverse information systems into decision-support systems. Librarians and medical informaticians both serve as curators of archival knowledge and share concerns about quality and the economics of publishing and distribution of information. Both professions have led the way in using technology; they have a commitment in common to the furthering of medical education (Frisse et al., 1995).

The role of health sciences librarians is evolving into that of a knowledge worker, creating products and modifying services to meet client needs in the area of scientific communication. Their libraries are changing in basic ways as well: re-examining missions; re-engineering; and acclimating education staff to the new and ever-changing environment. Change is a constant in the academic health center, particularly in technology, economic conditions, and the need to position the institution competitively. Florance and Matheson (1993) argue that libraries must redefine

fundamental assumptions about their roles and services, examine management perceptions of libraries, and develop competitive strategies in basic services and in new arenas. Librarians need to demonstrate their value; they have the opportunity to market their expertise to the institution.

In describing the development of a virtual library in the hospital/corporate sector, Jajko (1993) defines it as "an entity for knowledge management that effectively incorporates both the traditional library domain and the use of telecommunication and computer technology to facilitate rapid access and use of information" (p. 52). Technologies are utilized to provide a seamless integration of knowledge. In planning for the virtual library, Jajko identifies several premises about information: it is a critical resource; there are different types and uses of it; it will coexist in print and electronic form; it must be organized; and it must be planned and managed globally. The end-user is the focus of the information; customization will create the user base (pp. 55-59). Braude et al. (1995) discuss the challenge of digital bibliography, adding value and direction to the creation, organization, and dissemination of the new forms of publishing and communication of medical information. According to Creth (1993), there should be explicit discussion by health sciences librarians of the importance of leadership in the profession and in their specific library organization. Librarians need to discover ways to articulate and implement a vision involving them more fully in the work of health services if they expect to play a central role in those services.

Education and Training of Health Sciences Librarians

The Medical Library Association (MLA) has been a model for other library associations in developing and providing opportunities for continuing education and in promoting standards for lifelong learning among its membership. Education of health sciences librarians and the maintenance of standards of professional education have been a priority of the organization for the past fifty years. The topic of credentialing librarians was officially raised by then MLA President Mary Louise Marshall in 1946; the first certification code was implemented in 1949 (Bain, 1985). MLA has subsequently implemented several variations of credentialing and certification. The current Academy of Health Information Professionals is the most extensive and widely accepted in MLA's history. Qualifications for membership in the Academy of Health Information Professionals include fulfillment of competency requirements in ten areas. Mentoring of provisional and prospective members is an important aspect of the program. MLA offers a roster of thirty continuing education courses covering seven essential areas of knowledge. A dynamic list of "new perspectives" courses, taught by health sciences librarians and other specialists, is offered in conjunction with the MLA annual meetings.

Platform for Change (Medical Library Association, 1992) presented the educational policy of the association. It described the context of medical

librarianship, the need for a learning continuum, and required information science knowledge and skills in the health sciences. This publication is further discussed, along with implications of a major MLA membership survey on the importance, and acquisition, of knowledge and skills by Roper & Mayfield (1993).

Despite these far-reaching initiatives, many in the profession had been concerned that new librarians as well as current practitioners were not learning the skills needed to effectively deal with the rapid changes in the health information environment and the transformation of the health practice setting. Responding to this perceived need, the National Library of Medicine's Board of Regents initiated a study on the education and training of health sciences librarians carried out by a panel comprised of health professionals and administrators, representatives of library associations, health sciences librarians, medical informaticians, library school faculty, and NLM staff. They were charged with analyzing "the possible programs and activities of the NLM, of individuals, of professional associations, and of other institutions that might be undertaken over the next ten years to assure that society benefits from the skills of health sciences librarians; and persons who chose health sciences librarianship will be properly educated and trained..." (National Library of Medicine, 1995, p. 60).

Following a year of study, hearings, and deliberation, the panel's report was released. They recommended eight goals in four broad areas:

Evolving Roles for the Health Sciences Librarian
- Prepare for the new forms of information, new users, and new practice patterns that may be required for health sciences librarianship.
- Match the capabilities of health sciences librarians to the needs of employers.

Professional Educational Programs for Health Sciences Librarians
- Update and enhance the curricula of schools of library and information science.
- Explore new approaches and degree programs for preparation of health sciences librarians to assume new roles.

Lifelong Learning Programs for Health Sciences Librarians
- Foster educational programs enabling health sciences librarians already in the workplace to update and extend their professional education and training.
- Experiment with alternative methods and courses of study for adult learning.

Broadening Recruitment into Health Sciences Librarianship
- Attract the best and brightest candidates the current market can provide.
- Achieve greater cultural and ethnic diversity in the profession.

The report included findings, recommendations, and suggestions of implementation steps for each goal. One of the immediate outcomes of the report was the announcement by NLM of Challenge Awards to support planning in one of the four target areas. Organizations, libraries, or library schools could apply singly or collaboratively to undertake planning in order to propose an approach for achieving priority goals. The report focuses on skills necessary for health sciences librarianship, including an understanding of, and ability to, work in the health care milieu. However, much in the document should be of interest to employers and educators across the spectrum of librarianship, identifying essential skills and necessary educational programs and objectives which pertain to the profession in general.

Rethinking Reference

"It is the mission of access engineers to design, develop, and operate methods of delivering library and other information on demand to users wherever they may be" (Campbell, 1993, p. 5). As the keynote speaker for the "Rethinking Reference" Institutes, Campbell challenged reference librarians and others to develop new models of user services in the context of the changing library institution. Speakers at the institute discussed new foundations for reference, the change process, new values, rethinking the reference desk, services in an online environment, new reference models, and unresolved questions regarding bibliographic instruction (Lipow, 1993). Health sciences librarians have attended these institutes and have wrestled with the issues of current and changing reference services in other venues. Calabretta (1994) discusses the breadth of knowledge, skills, and attitudes necessary for quality service, and the effects of new technologies on reference. She stresses that changes in service must be constantly evaluated to ensure that they lead to improvement and not to have "the latest technical wizardry in place" (p. 16).

For several years, health sciences libraries have experimented with new models of reference service. There has been an increasing use of paraprofessional staff assigned to a wide range of functional areas and duties (Makinen & Speer, 1993). Additionally, computer specialists and consultants are being brought into the realm of public services. Reports of removing or relocating the reference desk, reference service on a "by appointment only" basis, e-mail reference service, and other experiments were frequently discussed at conferences. At the 1994 annual meeting of the Medical Library Association, the Medical School Libraries, and the Public Services section held a widely attended "Great Debate: Removing/Replacing the Reference Librarian at the Reference Desk." The debate did not resolve the question nor did it present a single prescriptive model. It did focus energy and attention on the wide range of issues to

be considered and on the differences of opinion within the profession about the evolving directions of public services.

The two MLA sections followed up that debate at the 1995 annual meeting with the session "Rethinking Reference: The Debate Continues." The program took the form of a keynote address on "the need for change" and a panel discussion among library administrators and public services librarians. The following questions were posed to administrators:

- How do you maintain staff morale in a constantly changing environment, where responsibilities are fluid, additional services are added, and staff are reduced?
- Is a "reference librarian" needed to develop and provide instruction for electronic resources? Can't systems staff do this better?
- How do we bring other staff (nonlibrarians) into our reference/teaching activities and still keep clear lines among responsibilities, rewards, position levels, etc? Or, do we want to have those lines?

Public services librarians were asked:

- Are public services librarians losing their commitment to user service? Are they becoming overly fascinated and involved with the electronic world and forgetting how to apply it to their specific users' needs?
- How is service to users affected when reference desk hours are shortened so that staff can have more time to evaluate new electronic resources and develop print and on-screen guides for users?
- Is electronic access to reference the most effective way to answer reference questions? Isn't a reference interview important? Does effectiveness of electronic reference depend on the type of library (i.e., hospital versus academic)?
- How do you communicate with users you never see; how do you know what they need?
- To better serve clients, do we need to change their expectations of instant gratification—i.e., information on demand—to a response time that permits more thoughtful and thorough results as is typical of other professions (Robbins et al., 1995)?

Clearly, these questions relate to the overall concept of the changing vision of the library and to concerns with delivering quality assistance to clients. They have been brought back to staff meetings and are currently being discussed at statewide and regional meetings. The dialogue will continue for the foreseeable future. Performance measures and outcomes assessments are necessary to help articulate and evaluate solutions.

Impact on Quality Health Care

Recent studies have refocused the attention of administrators and clinicians on the added value that information and library services can

contribute to the delivery of high quality, cost-effective health care. Previously, although benefits of library services to the health care enterprise were acknowledged, most reports were anecdotal or subjective. There now exists a body of evidence which has utilized more rigorous research methodology to investigate and to quantify the contributions of librarians to quality care of the patient, the primary mission of the health center.

The Metropolitan Detroit Medical Library Group developed a major outcome-based study "to examine the associations between: (1) the economic indicators of hospital costs, charges, and length of stay; and (2) the use of [library-mediated] MEDLINE searches for such cases" (Klein et al., 1994, p. 489). This objective, prospective study contained an economic evaluation. It was carried out from September 1989 to September 1990 at three teaching hospitals in metropolitan Detroit. The researchers derived 192 test cases from a consecutive sample of medical and surgical inpatients. MEDLINE searches were requested from participating libraries. A second component of the study examined 10,409 control cases from the same diagnostic related groups (DRGs) as the test cases but where MEDLINE searches were not utilized. The study found that statistically significant relationships existed between hospital expenses and the timing of the search. Those patients for whom searches were conducted earlier in their stay had lower costs, charges, and lengths of stay. The average savings per case were $7,379; the highest savings in a single case were $62,812. The Detroit study indicated, in the most objective study to date, the impact of librarian contributions to effective use of hospital resources.

In a significant study of the effect of information on clinical decision-making, Marshall (1991) directed a research project involving a sample of 448 physicians in the Rochester, New York, area from September 1990 to March 1991. They were asked to request information from their libraries in fifteen participating hospitals relating to a current clinical case. Following that, they evaluated the impact of the information on the care provided to their patients. The study showed that 80 percent of the respondents indicated that they definitely or probably handled the case differently because of the information given to them. Changes in care include the following: diagnosis (29 percent); advice to patients (72 percent); choice of drugs (45 percent); choice of tests (51percent); and length of hospital stay (19 percent). Physicians also indicated that the information provided to them by their libraries contributed to avoidance of hospital admission (12 percent); surgery (21 percent); additional tests or procedures (49 percent); and patient mortality (19 percent) (Marshall, 1992). The Rochester study has been viewed as significant in demonstrating the relevance of hospital library services to positive outcomes in patient care.

These studies confirm earlier findings by King (1987) who investigated the impact of hospital library services on 176 physicians, nurses,

and other health professionals in the Chicago area. The care providers requested information from their libraries relating to a current clinical situation or case. They evaluated the quality of the information provided to them, assessed its contribution to care of the patient, and its impact on their management of the case. The study found no differences between the overall assessment provided by the different categories of health care professionals. King found that 77 percent of the physicians and 74 percent of all the health professionals definitely or probably handled their case differently because of the library services provided to them.

The Medical Library Association and the Association of Academic Health Sciences Library Directors cited these studies and others in a joint statement they released entitled *Health Care Reform and the Health Sciences Librarian: Excellence in Health through Access to Information* (Medical Library Association, 1993). This statement and several similar ones prepared by state or regional health sciences library organizations responded proactively to the push for national health care reform. Although a reform initiative at the national level is no longer imminent, statewide legislative mandates for reform are occurring throughout the country. The statement prepared by the Joint Legislative Task Force of these two preeminent health sciences library organizations emphasized that information is integral to all health care processes. It advocated the inclusion of a strong information component in any reform package in order to provide U. S. citizens with affordable quality health care.

The paper described the ways in which health sciences librarians contribute to each of the components of health care reform—i.e., universal access to quality cost-effective health care; education and distribution of health professionals in appropriate combinations to meet national needs; networks of care; effective use of new technologies; and research and new discoveries. The document enumerated ways in which librarians helped promote excellence in health care and at reduced costs and provided assistance in preventing litigation for malpractice. Librarians are also committed to universal access to health care information, thus leading to improved participation by patients in their own decisions regarding health care. The report described the ways in which health sciences librarians are integrating the use of innovations in information technology and informatics in educational programs for health care professionals. Health sciences librarians have developed networks to support information dissemination, transfer, and use; they are leaders in the application of technology and encourage its use by health care providers. The NLM carried out a study to better understand the effect of computer-mediated literature searching on patient care and other activities of the health care professional. They utilized the Critical Incident Technique, a qualitative research methodology, to identify the range of instances where researchers and health professionals turn to online databases to access information, to identify the effect on their decisions and actions, and to

identify the outcomes perceived by the providers and their patients. A sample of 552 health care professionals in a variety of settings was interviewed, and 1,158 reports were analyzed. Incidents were divided into several categories including: used the most appropriate diagnostic test; proper diagnosis; development of an appropriate treatment plan; implementation of a treatment plan; maintenance of an effective physician-patient relationship; and assistance in modifying health behavior of patients. The highest number of incidents reported related to developing an appropriate treatment plan. Twenty-five outcome incidents of lives saved or longevity increase were noted. The authors concluded that rapid access to the biomedical literature is often critical to patient care and has a positive influence on outcomes (Lindberg et al., 1993).

Improving the Value of Information

Librarians have taken on new responsibilities in providing quality improvement programs in use of the literature for clinicians, educators, and researchers. This role is significant because of the limited time of clinicians to deal with the proliferation of literature in all forms. Emphasis is not on finding information but on obtaining the "best" information available for a given situation, to find answers to many pressing questions, and to winnow out the quality from the quantity of available information. In the past, health sciences librarians provided assistance through clinical librarian programs, participating in rounds and bedside conferences with providers, Literature Attached to Charts (LATCH), and other means of document delivery. These methods are still utilized but are being assessed in the context of the new environment of integrated end-user access to information (Demas & Ludwig, 1991; Veenstra, 1992).

The success of these clinical support services was due, in large part, to the quality filtering component which was added by librarians. Now quality filtering and other methods of identifying and assessing literature and information sources to provide validated results are being emphasized by librarians and by health care providers. Five objective indicators of quality have been proposed: methodological rigor; document attributes; peer recognition; reputation of the journal; and inclusion in a quality-filtered database. Methodological rigor assesses the nature of the research study with randomized controlled trials regarded as the most rigorous, followed by cohort studies, and then case-control studies. In applying document attributes, one identifies types of documents and certain components such as the presence of tables and charts. Peer recognition considers frequency of citation of one's work and evidence of grant support. Journal reputation considers the journal impact factor calculated by the Institute for Scientific Information (Johnson et al., 1992). Kuller et al. (1993) compared the effectiveness of quality filtering by librarians and physicians. They identified certain elements, such as Medical Subject

Headings, used more routinely by librarians, and concluded that librarians should provide this service in order to give more dynamic library service.

Quality filtering at the input end has also been suggested. This could take the form of increasing publication standards for writing, editing, and reviewing; use of structured abstracts; and the use of detailed requirements for reporting statistical information. Dissemination of information could be enhanced by the development of quality-filtered bibliographic databases which utilize expert assessment before the item is included. Finally, health care professionals need to learn how to obtain and critically appraise literature (Patrick, 1994).

Widespread attention has been focused during the past two years on critical appraisal of the literature by means of a series of articles published in *JAMA*. An editorial introducing the series stated that clinicians without these skills are "relatively helpless in deciding what new information to incorporate into their practice" (Guyatt, 1993, p. 2096). The articles update a set of readers' guides published in 1981 in *Journal of the Canadian Medical Association*. The *JAMA* series has transformed the readers' guides to users' guides, reflecting an approach to medical practice called "evidence-based medicine."

Evidence-based practice involves the ability to access, synthesize, and apply information in medical literature to the clinical situation. After the clinician identifies relevant studies, the next step is to decide whether to believe the information and then how best to use it in patient care. The importance of quantitative reviews, or "overviews," which summarize scientifically valid studies is recognized. Integrative studies using practice guidelines, decision analysis, and other factors are also stressed. The Evidence-Based Working Group, which produced the new users' guides, recommends that decisions about the best patient care should begin with a search for an overview or practice guideline. They state that "optimal patient care in the 1990s requires an ability to use the medical literature to solve clinical problems" (Guyatt, 1993, p. 2096).

Users' guides published thus far cover such topics as how to use an article about therapy or prevention; a diagnostic test; harm; prognosis. Clinicians were then given guidelines to help determine if the studies were valid, and if so, what were the results, and how could they help the patient? Subsequent articles provided "guides to the literature" of overviews and decision analysis. Meta-analysis, where comprehensive literature reviews are prepared and the contents of each study analyzed and combined statistically, is also advocated. Librarians have long been teaching and preaching the need for critical analysis of the literature. This series has provided an enhanced opportunity for them to market these skills in the health center and to promote the use of library resources and services. Many libraries have publicized the series of articles in newslet-

ters and workshops. At the University of Rochester, "gold" or expert searches have been placed on their network utilizing evidence-based medicine and meta-analysis techniques (Nesbit, 1995).

New Educational Roles

The recommendations of two reports from the Association of American Medical Colleges (AAMC) have had profound effects on the evolving role of the health sciences librarian as educator. The *GPEP Report*, entitled *Physicians for the Twenty-First Century*, was a report of the AAMC's Panel on the General Professional Education of the Physician (1984). The panel addressed current educational methods in light of the needs of students who will be practicing medicine primarily in the twenty-first century. The report found that the traditional information-intensive approach to medical education is being made obsolete by rapid advances in biomedical knowledge and technology. It recommended that memorization of facts be replaced by acquisition of information-seeking skills. Physicians of the twenty-first century will have access to advanced information and telecommunications technologies. Involvement of health sciences librarians as participants in this new approach to educating students has been significant. *Medical Education in the Information Age* (Association of American Medical Colleges, 1986) described the need to incorporate medical informatics into the curriculum. It said that medical students need to learn how to organize and access computer-based information and to utilize bibliographic retrieval systems.

Resulting innovations in health sciences curricula; in undergraduate, graduate, and continuing education; and the increased use and availability of new technology have led to an expanding role for health sciences librarians. Educational challenges include teaching access to literature and other information sources; organization of information; critical appraisal skills; and the use of the emerging technologies to access and manage information.

Rankin and Sayre (1993) find tremendous variations in the content and instructional methods of librarians due to the fact that their teaching roles are now so closely tied to the missions of their institutions and to specific curricular opportunities. They report that librarians believe that increased education in information skills will change the use behaviors of students and practitioners alike. Timing of instruction is important, with the most effective teaching taking place when it is integrated into the rest of the curriculum. They note opportunities for teaching within the health care setting in support of the clinical teaching model. Patient education and outreach to referral networks are other focuses for teaching. Examples of teaching with and about the emerging technologies, provision of instruction in specialized subject areas, and new roles in collaborative teaching have been described (Kelly & Nagle, 1993).

It has been argued that, within the seemingly static confines of the four-year medical school, the curriculum is actually quite dynamic,

responding to, and instantly incorporating, new scientific discoveries into the preclinical years and eventually into clinical training. Teaching informatics skills and critical appraisal to future physicians, thereby enabling them to use the digital library, is vital. These skills should be taught by a partnership of librarians and medical informaticians (Florance et al., 1995). Florance et al. describe strategies for informatics education at nine institutions.

One fast-growing trend in health sciences educational reform is the move to problem-based learning (PBL). Pharmacy, nursing, and veterinary medicine programs, in addition to medical schools, are shifting in whole or in part to this new curricula. PBL represents a shift from the lecture-oriented didactic approach of the traditional curriculum to a problem-solving approach based on individualized active learning and small group interactions. In keeping with the *GPEP Report*, PBL teaches information-seeking and problem-solving skills rather than reliance on rote memorization. It represents a challenge and an opportunity to librarians, as well as to faculty, in the health sciences.

There have been numerous papers and discussions in the last few years describing the participation of health sciences librarians in implementing PBL-related programs. Impact on the library has been scrutinized and assessed. At the University of California, Irvine, in a pilot program, the medical school integrated library interaction with the second-year curriculum. Library instruction was presented in a four-hour sequence. Following that, librarians attended basic sciences sessions where simulated problem cases were presented to students. During a follow-up session for each clinical problem, students reported on the results of library research. Feedback from students regarding the library component was positive, but the librarians have recommended that they be involved at an earlier level of planning in order to maximize the information-seeking experience (Minchow et al., 1993).

The University of Pittsburgh implemented the initial phase of its revised curriculum in 1992 with an emphasis on PBL. The Falk Library has developed a large-scale program to integrate information-seeking skills into the year one curriculum. Librarians stress the importance of gathering and using information for PBL and for student skills development in general. Five cases were studied during a two-week course on the patient-doctor relationship. The 144 students were divided into sixteen groups assigned to two faculty facilitators and one librarian each. The librarians were also designated as information coordinators for the cases. One outcome reported by the library and by librarians at several other institutions using PBL was the intensive use of, and need for, significant library resources. The library became the hub of activity during independent study time. In preparation for subsequent offerings of the program, librarians assumed increasing leadership in planning the course. Librar-

ians reported a closer partnership with teaching faculty in the educational process (Schilling et al., 1995).

A survey of second-year students at four medical schools found that PBL students used the library more frequently, used resources which supported independent learning, and acquired information skills at an earlier time in their education. The PBL students also indicated greater ease in use of these skills (Rankin, 1992). McGowan (1995), however, questions the assumptions that such differences should exist, arguing that appropriate integration of information skills can take place in traditional curricula if basic principles of curricular correlations are followed. McGowan postulates a role for librarians in teaching the knowledge and skills of acquiring information.

The Virtual Library Building

Some may believe that, in this era of electronic access, unprecedented connectivity, distributed systems, and distance learning, the library as a building is no longer important. This is far from the case for health sciences buildings, as one can deduce from two important recent symposia on quality library buildings for the future. Some heightened interest may be due to the aging of a large number of health sciences libraries, which were built when federal funds were available in the 1960s. However, most of the interest in remodeling, renovating, and planning new structures is in response to new information management challenges and library environmental changes necessitated by the new technologies.

In the symposium "Building the Information Frontier: New Libraries" (Ludwig, 1995), topics of papers ranged from new hospital libraries as a new marketing opportunity, to ergonomics in the electronic library, to the concept of the library from brick face to cyberspace. Authors considered whether the library will be all infrastructure, and how it, in a digital library information space, complements information. Planning and construction of the award-winning Eskind Medical Library at Vanderbilt University was described. It is suggested that the library may be regarded as a model for the twenty-first century.

The symposium, "Building the Library/Information Center of the Future," held in April 1994, was co-sponsored by the University of Maryland at Baltimore and NLM. Librarians and architects shared the podium and described works in progress and in the planning stages. Speakers discussed the evolution of library buildings, trends in library design, resources for PBL, and tomorrow's building. Case studies in new construction and in renovation were presented. It was made explicit that libraries will be judged by how they respond to the environment of ever-present change in mission, technologies, information storage and dissemination, and curriculum (Ball et al., 1994).

National Library of Medicine Initiatives

Any discussion of quality initiatives in health sciences libraries must acknowledge the extraordinary accomplishments of the National Library of Medicine as well as the leadership and support NLM has provided to libraries throughout the United States. NLM has emphasized the importance of equal access to information by all health professionals through its outreach grants program and by its continued support of the National Network of Libraries of Medicine (NN/LM). In addition to the traditional bibliographic and factual databases which it has provided for several decades, NLM has sponsored research and training in medical informatics and encouraged investigators to contribute to advances in biomedical communication.

Roderer (1993) describes several NLM programs of special significance: the NN/LM; Integrated Academic [now Advanced] Information Management Systems (IAIMS); and the Unified Medical Language System (UMLS). The IAIMS concept was enunciated by Matheson and Cooper (1982) in a study developed by the AAMC and sponsored by NLM. Their report recommended that libraries take a leadership role in the development of integrated information management in the health center. To date, twenty-five institutions have received forty grants from NLM supporting the planning or implementation of an IAIMS model.

New initiatives at NLM include the Visible Human project, a digital image data set of the entire body utilizing magnetic resonance imagery (MRI) and computed tomography (CT) scans; DocView, a Windows application that can provide document images over the Internet; and Online Images from the History of Medicine (almost 60,000 images are available). The National Center for Biotechnology Information is responsible for building, maintaining, and distributing GenBank, the National Institutes of Health genetic sequence database that collects all known DNA sequences from scientists worldwide. The Communications Engineering Branch of NLM is developing and providing several biomedical image engineering projects including MIDAS (Medical Image Database Access via Satellite); a machine-readable archives in biomedicine; and SAIL (System for Automated Interlibrary Loan). NLM has played a leading role in the High Performance Computing and Communications (HPCC) initiative (reports and fact sheets on all of these programs and projects are available from NLM and are accessible via HyperDOC, the NLM Home Page). If health sciences libraries are innovators in quality knowledge management, much credit for that goes to NLM for its pioneering work.

Quality Initiatives: A Sampler

As has been previously noted, quality initiatives in health sciences libraries are too numerous to do justice to all of them in the confines of this space. Many have been described above. The following are consid-

ered to be representative of the kinds of knowledge management projects currently being implemented in health sciences libraries.

HealthWeb is a collaborative effort by health sciences librarians and information professionals from the Committee on Institutional Cooperation (CIC) member universities. They are building HealthWeb, a tool to facilitate access to health-related information resources found on the Internet. The project will provide an integrated interface to a collection of selected and evaluated resources. Each participating library will concentrate on areas of excellence, disciplines in which it and its institutions have particular strengths (Cooperative Web Project, 1995).

The Ohio Valley Community Health Information Network (OVCHIN) is a community-based, consumer-defined, publicly- and privately-funded demonstration grant program developed to evaluate the efficacy of delivering health information to rural residents in southern Ohio and to the urban and suburban communities in the Cincinnati area. An initiative of the University of Cincinnati Medical Center and Ohio University, the project is funded in part by a grant from the Telecommunications and Information Infrastructure Assistance Program (TIIAP), sponsored by the National Telecommunications and Information Administration (NTIA). The project has forged partnerships to provide access to databases and other electronic medical resources. Access to information for several topics of high interest—including aging, cancer, substance abuse, AIDS, and others—will be facilitated. Access will be via a Free-Net and from public access workstations in public libraries, health clinics, pharmacies, and community centers (Guard et al., 1995).

LUMEN, the Loyola University Medical Education Network, is a World Wide Web-based demonstration project to support the provision of information about a major curriculum reform at the Stritch School of Medicine (Ludwig, personal communication, July 11, 1995). Specific goals of the project are to: integrate health sciences curricular content; enhance access to medical information worldwide; encourage self-directed learning; nourish intellectual interactions; prepare students for future technological advances; and promote the development of hypermedia projects.

The JEFFLINE Digital Office is a project of Academic Information Services and Research at Thomas Jefferson University. It provides a graphical table of contents to the information on the university's electronic library information system. Choices include the Library Electronic Bookshelf, the online catalog, OVID databases, graphics, sound, and digital video. Affiliated research centers are linked to the system. Other research resources and access to federal and international institutes and databanks are provided (New JEFFLINE..., 1995).

Conclusion

Challenge to Action, a joint report of the Joint Task Force of the Association of Academic Health Sciences Library Directors (AAHSLD) and

the Medical Library Association (1987), was published in 1987. The report provided detailed guidelines for the planning and evaluation of health sciences libraries in the academic medical center. It advocated a role for the library as a partner in the center and suggested a framework for library self-evaluation and strategic planning. The report stressed the value of coordinating information management efforts within the context of institutional planning and development. It emphasized the unique position of the library and the importance of developing new partnerships. The document focused on strategies to enhance the library's contributions to the research, education, and clinical missions of its institution.

Technological advances have burgeoned since *Challenge* was issued; curricular innovations have proliferated; and health centers have been re-engineered. Nevertheless, the roles identified in the report and the guidelines for libraries and librarians as institutional leaders in information management remain as accurate and compelling now as when *Challenge* was first issued. Today an unprecedented value has been placed on information management. Unparalleled changes in the health care environment mandate the need for quality information. Opportunities abound for health sciences librarians to assert their leadership to bring quality knowledge management to the health sciences enterprise.

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