New Information Transfer Therapies

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A TYPICAL SEARCH for medical references includes locating one or two references which indicate the other references available, and in turn possibly stumbling over several interesting points which may or may not be connected with the original need.[1] John Shaw Billings thus described a typical search for information in 1887. The hunt technique which Billings described is still practiced by some persons today; however, the search for health-related information has changed dramatically since Billings's day. This paper outlines innovations in the transfer of health-related information and the impact on the medical community. Five areas of information transfer are considered: information transfer—new approaches, information centers, information transfer via computers, information transfer via media communication, and consortia.

INFORMATION TRANSFER—NEW APPROACHES

The philosophy of libraries toward meeting information needs in the past has been mostly passive. People arrive at the library with a specific question, or they want information. However, it is usually the user who contacts the library and not vice-versa. When contact is made, the library supplies either a citation which includes the location of the information, or the information itself.

There is currently controversy within the medical education sphere as to the present requirements for the education of physicians. The Student American Medical Association has, therefore, formed a committee to view the total structure of the medical educational system. In December 1972, it published *A*

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Handbook For Change: Recommendations of the Joint Commission on Medical Education. One of their recommendations was: "that medical centers participate in a computerized, telephone access center, a system for instant consultation and self-education on basic topics of diagnosis and therapy."[2] Those persons directly involved with health-related education are demanding that libraries become more aggressive in the transmittal of information.

There are several programs throughout the country that have assumed roles of leadership in the area of information transfer. The University of Wisconsin Medical Center in Madison started a program in April 1966 with dial access by telephone to tapes containing medical information for physicians in Wisconsin.[3] After an initial assessment of the need for transferring information to physicians, fifty tapes on medical subjects, running from 5 to 15 minutes, were prepared. The number of tapes was increased to eighty-eight in 1968, and later 230 programs were available 24 hours a day, simply by dialing a specific number and requesting a program. With eighteen months of use, the five most requested programs (with the number of calls in parenthesis) were: "Latest Trends in Management of RH Negative Pregnant Patient" (209), "Emergency Treatment of Cardiac Arrhythmias" (198), "Marriage on the Rocks" (164), "Management of Status Asthmaticus" (163), and "Treatment of Pulmonary Embolism" (157). Among the conclusions which affect the library's role that can be drawn from the Wisconsin program are: (1) such service has wide appeal for general practitioners and specialists in both urban and rural practice settings and for those in training; (2) a significant number of physicians will use the service if promotion is broad and continuous; (3) a significant percentage of library use involves specific patient management problems; (4) a significant percentage of library utilization is for continuing education, and the service does assist physicians in reviewing and updating medical knowledge; (5) users of the service report that the information obtained causes them to change behavior in a significant number of cases; and (6) library utilization gives a promise of providing guidance in curriculum planning of other continuing education activities for the physician population served.

As a result of the success with the physician dial-access program, the University of Wisconsin implemented a dial-access library for patients.[4] The patients from four Madison, Wisconsin hospitals are able to receive messages of four to five minutes regarding the

hospital, its personnel, diagnostic procedures, general medical subjects, X-ray studies, financial matters and other pertinent topics. After the patient makes a selection from the listing of audiotaped messages available, he dials a main number and requests to hear the selection of his choice. Between January 1971 and April 1973, a total of 12,101 requests were received—7,485 from patients and 4,616 from nonpatients. The patient response to the tapes has been very enthusiastic. The top five tapes requested by patients are: "Before and After Surgery" (342), "Your Hysterectomy" (216), "The Pill in Perspective, I" (186), "Bladder and Kidney X-Ray" (168), and "The Pill: Questions and Answers, II" (133). The top five tapes requested from nonpatients are as follows: "The Pill in Perspective, I" (232), "The Pill: Questions and Answers, II" (141), "IUD Facts" (108), "Marijuana: Fables and Facts" (93), and "Before and After Surgery" (86).

In Alabama, the Medical Information Service Via Telephone was introduced to four counties of the state of Alabama.[5] Its prime purpose is to improve patient care by providing an immediate person-to-person consultation for Alabama medical practitioners with faculty from the University of Alabama School of Medicine. Once a call is received at the School of Medicine, the telephone operator acts as the questioner and determines the appropriate individual. Via an electronic alerting device in various locations, individual faculty members may answer the telephone and offer appropriate consultation. If the consultant is not available, the call is returned via the WATS telephone line. As an added benefit appropriate relevant literature on the subject of the consultation is forwarded to the practitioner within three days to provide an immediate educational reinforcement.

This program was offered as a six-month pilot study and, within this six months, all of the physicians within the four-county area were contacted via letter and other publicity. During that period, over 263 calls were received from 144 physicians. Within a nine-month period, 1,521 calls were received from 480 physicians. The latter figure indicates that approximately 20 percent of the practicing physicians in Alabama have used the service. The objectives of this service, according to the Alabama people, are being met, and the committee that is administering the service is planning further developments of the potential of the telephone as a means of improved transfer of medical education between the practitioner and the staff of the medical center.

TEL-MED is a public medical information service via telephone, sponsored by the San Bernadino (California) County Medical Society.[6] The public may obtain information on subjects ranging from birth control to venereal disease, from diagnosis and treatment to preventive medicine. The three- to five-minute tapes, available both in English and Spanish, are recorded by professional narrators selected for qualities compatible with the subject, e.g., a young woman for tapes on pregnancy and birth control, an older man for tapes on glaucoma. The concept has been widely accepted and represents a working method for transmitting information to the public via telephone lines.

All informational programs discussed thus far were not originated by libraries, but by other sources in the medical center. The University of Kentucky Health Science Information Service was established in 1969 to answer specific reference questions through the literature. Under the Extramural Division of the Ohio Valley Regional Program, the library obtained a WATS line so that all health professionals throughout Kentucky could contact the University of Kentucky Medical Center Library in Lexington with regard to specific patient care information or as a continuing education effort. For reference questions the library staff would survey the literature, prepare bibliographies and send either articles or books that answered the questions. From April of 1970 through March of 1971, over 3,200 questions were asked. The service supplied more than 6,800 journal articles and more than 380 books.[7]

At Kentucky, the health professional could request a consultation. More than 900 requests for consultant information were received. This type of request is transferred from the library staff to an appropriate member of the medical center. The Drug Information Department maintained an extension of the WATS line, and requests for drug information were transferred from the library. During the same period, over 500 requests for drug information questions were received on the WATS line.

In a survey completed by the University of Kentucky, a 62 percent response to the questionnaire indicated an overwhelming majority of respondents receptive to the idea of the information center. The survey also demonstrated that this service is available to all health professionals and is not limited to one category. Survey respondents included 253 physicians, 70 pharmacists, 55 nurses, and 21 dentists. In addition respondents included an alcoholism program coordinator, chaplains, dieticians, lawyers, nutritionists, paramedics,

psychologists, etc. The University of Kentucky Library has demonstrated that the two phases of information transfer, i.e., that of citation transfer and that of actual information, can indeed be accomplished by a library with a coordinated effort throughout the entire medical center.

All of the programs described are operative today in local areas. However, the future will have many libraries utilizing satellites. The NLM will utilize NASA's Applications Technology Satellite-F which is powerful enough to relay audio, video and data messages.[8] The launching of the ATS-F is scheduled for 1974. The system will transmit information to Alaska and other remote areas where normal ground communication is unsatisfactory. This system, along with satellite interconnections, can transmit information on a worldwide basis and will thus link the total medical community.

INFORMATION CENTERS

One response to the information explosion has been the establishment of specialized information centers. Each information center which has been established has developed separately with its own unique services, sources and methods, although certain general features can be seen in common.

The purpose of an information center is to form one source of information in a specific, but limited, field of scientific endeavor. Usually, the intention is to form a resource for all researchers in this field, both nationally and, potentially, internationally. Although the information centers are located at one institution, their patrons form a much wider group, and rather than relying solely on local resources, their funding usually has a national basis. Many information centers have been funded by the federal government, specifically by grants or contracts from the National Institutes of Health. Other information centers are funded by societies, and are concerned with the societies' fields of interest. Still others have originated as integral parts of other government institutions, such as the Atomic Energy Commission or the Department of Defense.

An information center will form a centralized means of synthesizing the output of several other information resources. For example, an information center will cull the relevant literature from BIOSIS, CAS, and MEDLARS to form an integrated list of relevant literature. By having the information center extract the relevant literature from the various sources, the individual researcher is not

required to consult a variety of resources himself. Rather, he can depend on the information center in his field to present him with pre-selected relevant citations.

In addition to consolidating the output of various information sources, an information center can make the information derived more specifically related to interest. This can be done by having an improved, more specific vocabulary for the analysis of the literature, or it can take the form of detailed abstracts for each citation. Retrospective, as well as current awareness, services may be offered by an information center. In carrying on its work, an information center may or may not use its own computer system and facilities. As the information explosion continues, however, more and more information centers are utilizing computerization. In general, the advantages for a researcher of an information center in his field lie in the fact that the services of the center, whatever form they may take, will be tailored to fit the specific requirements of this particular field, rather than having to fit the requirements of a broad area of science, such as the major indexing and abstracting tools are forced to do.

The specialized information center can be seen as an extension of the invisible college concept. This idea refers to the fact that researchers in a specialized field are usually aware of and communicate with many of the other researchers who are doing similar research. When large enough, these invisible colleges have become organized into specific societies or sections of interest within societies. The personal communication aspect of scientific information transfer has long been known to be subtle, and often undocumented, but nevertheless vastly important. In a way, the information center can be seen as an attempt to provide services to these small, specialized groups of researchers.

An example of an information center is the Brain Information Center at UCLA. Established in 1964, it is funded by a contract from the National Institute of Neurological Diseases and Strokes.[9] The center not only repackages information for investigators in the field of brain research, but it also generates more information and holds workshops. Bibliographies and a bulletin are published, and both retrospective and current awareness searching are offered to researchers. A special vocabulary for brain research has been developed. The staff numbers twenty-two, which includes scientists and librarians, as well as supplementary personnel. The Brain Information Center, while not part of the library administratively, is

located in the library and works closely with it.

Another information center is the Environmental Mutagen Information Center at the Oak Ridge National Laboratory in Tennessee.[10] It was established in late 1969 in order to cope with the information explosion in chemical mutagenesis. Information is collected from the widest possible sources and made available to researchers. Annual indexed bibliographies of the chemical mutagenesis literature are issued. Special ways of dealing with the chemically complex literature of this field have been developed, and more services are planned for the future.

Particularly in the physical sciences, many information centers deal not only with bibliographic information, but actual data collections as well. In the medical library field we have become so used to sophisticated ways of distributing bibliographic citations, that we sometimes forget that there is another dimension to the information picture. After the bibliographies have been distributed, patrons still must go to the original articles and derive from their reading the information needed. The ultimate product of a search is not citations, but information. Some information centers have taken the additional step of going beyond the citation to the information itself, rather than requiring the user to take this step. For example, the National Oceanographic Data Center provides many sophisticated types of analysis of data in this field.[11] In medical libraries, it is often felt that distributing bibliographies is as far as librarians can go since they are not qualified to evaluate information. Obviously, the information centers which do this type of work have many scientists in the field and other subject specialists on their staff. However, although this is not an area where medical librarians have been active in the past, it is a potential area for the future.

Information centers currently exist in a variety of medically related fields. The Brain Information Center at UCLA, the Visual Science Information Center at Berkeley, and the Information Center for Hearing, Speech and Disorders of Human Communication at Johns Hopkins, are three of the most prominent in the medical field. Many researchers are unaware of the existence of information centers which would be highly helpful to them. Increasing their awareness is part of the function of every medical librarian. Information centers can be a very effective way of dealing with the information explosion, and the future establishment of centers in other areas of medicine can be anticipated.

INFORMATION TRANSFER VIA COMPUTERS

One of the long-range solutions to the current crisis in health care is the education of more health professionals of all kinds who will be prepared to fill the growing demand for health care and to cope with the developments which the future of medicine will bring. Schools for health professionals are faced with the task of teaching more students more information more efficiently. One of the most exciting ways to deal with this problem has been the development of computer-assisted instruction.

In general, CAI involves the on-line interaction of a student individually with a computer which has been programmed by a teacher. CAI has sprung up independently at a number of institutions throughout the country. Many different types of computers have been used, and many different types of programs have been developed. Uses of the computer in instruction have ranged from the relatively simple use of a computer to administer and score tests, to highly sophisticated patient simulation, complete with dialect and misunderstanding.

If the computer were merely a mechanized lecture giver, spewing out tidbits of information in a routine manner, there would be little justification for the effort and expense which go into its use. However, the computer is more than a new toy doing the same old tasks in a novel way. Used properly, the computer has several advantages over other methods of instruction when handling certain types of materials. By necessity, the traditional lecture course must be aimed at the average student. There is not enough time to provide a variety of approaches for the variety of students which exist. However, a well-programmed CAI course can take the student at his level and interact with him as an individual. This is more than the feature of programmed learning which insures that each student can move at his own pace. Not only can a student move as slowly or as quickly as he wishes, but a good program will respond to his incorrect answers with exactly the information he needs. Alternative answers to questions are anticipated and responses are prepared which will point out why the wrong track is the wrong track. Although some people fear that computer instruction is depersonalized, the professor preparing the program actually has an opportunity to give much more individualized instruction to each student.

In clinical patient-oriented instruction, the computer can provide a unique opportunity to have patient-physician or patient-nurse

interaction without actually having a real patient around. Particularly at the beginning stages of patient-student interaction, students are usually taught clinical methods by watching an experienced health professional. Rarely do students have an opportunity to make important decisions and carry them out in patient management, since human patients cannot be used as guinea pigs for students to make their mistakes on. The computer can take it, however. Programs presenting simulated cases to students have been developed with amazing detail. Information about a patient is given to the student only when he asks for it. As the student orders diagnostic tests, the computer can be programmed to inform him when a test is unnecessary or when there will be a probable time delay in obtaining results. The patient can respond or not respond to therapeutic measures which the student may order, and, if the student dilly-dallies too long, the patient can die. Thus, students can learn, sometimes in a dramatic way, what the potential effects of their decisions will be on a typical patient. Computer simulation of patient cases does not necessarily become routine. Various probable outcomes to various situations can be programmed into the computer for its random selection, so that the student can become familiar with the frequently unpredictable ways of medicine.

CAI can also be used in the area of continuing education. It can simulate rare or emergency cases where either there are not enough patients to provide experience for physicians and nurses or things happen too fast to allow for adequate instruction on the scene. For example, one of the programs which has been developed at the Massachusetts General Hospital is a patient simulated model for teaching cardiopulmonary resuscitation.[12] An additional advantage discovered in relation to this type of instruction is that the private self-assessment provided by CAI is more acceptable to doctors than graded tests which somebody else will know about.[13]

Obviously, CAI is by no means easy for the professor. A great deal of thought and consideration must be put into an effective computer-assisted program. Professors who are used to aiming their lectures at the average student must now provide alternative comments for all levels of students.

The faculty at a number of institutions have by now gained a great deal of experience in developing a number of programs. At Cornell University, A Tutorial System (ATS) has been developed for the teaching of anatomy.[14] The Cornell system stresses a program which has ease of authoring, in an attempt to deal with the chief problem

of CAI—the interaction with the computer of a professor who is usually not familiar with computers.

The University of Wisconsin has developed a simulated patient program which, by giving the cost and time of various tests, stresses cost effectiveness in diagnosis.[15] Some nursing schools are also using computers to good advantage in instruction. For example, the Houston Baptist College and Memorial Hospital have developed a number of independent study units to fit in with their concept-oriented education program.[16] Many institutions, such as the Massachusetts General Hospital complex, have been using CAI long enough to have built up a considerable array of programs.[13]

Obviously, a great deal of effort is being duplicated at institutions across the country. Although CAI is still a bizzare concept in many places, it has been around long enough so that inter-institutional cooperation and sharing of development is beginning. The basic programs for authoring and running CAI programs can easily be shared. When it comes to sharing the actual instructional programs, however, there are both advantages and disadvantages. Obviously, by sharing programs, there is a great saving of expense and effort. However, the programs easily lose their feature of being tailored to specific course content at specific institutions. This is a dilemma that is yet to be resolved.

One of the major forces helping to network CAI is the Lister Hill National Center for Biomedical Communication. A system called the CAI Experimental Network is now being reviewed in several institutions across the country.[17] Through Lister Hill the many programs developed at Massachusetts General Hospital, Ohio State University and the University of Illinois, as well as other institutions, are available to all participating institutions. At the moment, 56 preclinical programs and 128 clinical programs are available. Six of the clinical programs are national exams from the American Board of Internal Medicine. An institution can become a temporary or "trial" user for a time before officially joining the system. It is Lister Hill's intention to eventually phase over responsibilities and funding to the educational community.

An institution wishing to join the experimental network must give careful forethought to how they plan to use the system and how they plan to evaluate its effect on their educational program. The trial user facet provides a way to introduce faculty members to CAI. However, the high initial interest of a good number of faculty members is an essential prerequisite.

"A Guide to Computer Assisted Instruction in the Health Sciences," by C. R. Brigham, will be published by the Department of Commerce in the near future.[18] This will provide a useful guide to existing computer courses and should facilitate further interaction among institutions.[19]

What is the library's role in CAI? At many, perhaps most, institutions, CAI has developed completely independently of the library. At other institutions, the terminals have been located in the library and the librarians have been active participants in planning to make this new learning resource available. The librarian's role is a matter of individual choice. The opportunity to become involved in an exciting new area of medical education is there. If the library is to become a true learning resource center, if it is to remain a good place for a student to come to learn, whether by reading a book, talking to a colleague, or talking to a computer, it would seem to be essential that the librarian be interested in all facets of the learning environment. With CAI, librarians have a special opportunity to work in partnership with other faculty members in improving the education of the students for whom they are responsible.

INFORMATION TRANSFER VIA MEDIA COMMUNICATION

The concept of media communications has existed for many years, but its impact is not completely known in medical centers. Previously, this concept has been thought of as only audiovisuals. Now all types of media, both print and nonprint, are utilized within medical libraries to assist with the educational process. Since medical libraries support educational objectives for the instruction and education of professional students, including the interns and residents, and continuing education of all health professionals and all allied health persons, it is important that the total concept of health-related education be represented in the media resources of the library.

New approaches within medical education require the libraries to keep pace. Students might be sent for training and experience to outlying communities and may be more than fifty miles from the nearest library. It becomes the libraries' responsibility to assist with the educational process of the students by supplying the necessary information, whether by print or nonprint means. To this effect, medical centers must create learning resource centers which have the potential of serving not only those persons located at the medical center, but also persons in outlying areas.

There are two approaches to the concept of a learning resources center. The first is the horizontal approach. Within this center, there are five basic concepts: (1) design, (2) production, (3) evaluation and selection, (4) support and supply, and (5) utilization and dissemination. This is the center which works with the faculty to ascertain the needs, and assists with establishing educational objectives and preparing scripts for the production of nonprint media. The second phase is the actual production, whether that be slide/tape, videotape filmstrip, television, or audiotape. Evaluation and selection within this concept regard a total perspective of both what is produced in-house and what is available elsewhere. From the selection process comes the need for fiscal support and purchase of the items necessary to supply the learning resource center with a wide range of informational concepts. The final area is the actual dissemination of this information, whether it be intramural or extramural. The utilization of these programs becomes essential to determine if additional media within certain areas are necessary or if the programs currently available are adequate to meet the needs and educational objectives of the institution.

The second type of learning resources center implies a vertical approach. The only difference between the horizontal and vertical is that there are no production capabilities in the vertical approach. The majority of the centers that follow the vertical approach are libraries. The libraries can assist with the design, evaluation and selection, support and supply, and utilization and dissemination, but they normally do not assist with production.

Whether a health-related institution establishes a vertical or horizontal learning resources center, it will have the assistance of the National Medical Audiovisual Center, which is a branch of the NLM. The mandate of the NMAC is to develop a national program to improve the quality and use of biomedical audiovisuals in health professional schools. In order to accomplish this goal, NMAC has created seven program areas: (1) clearinghouse function—an effort to assemble all catalogs and disseminate data describing instructional media, systems, facilities and programs relevant to basic and continuing educational processes; (2) evaluation and acquisitions—provides for the identification, peer review, and gathering of data and instructional materials; (3) distribution—provides user access to instructional materials; (4) advisory services—encourages direct interchange and assistance to the health professional community; (5) training—facilitating necessary interchange of knowledge and exper-

tise to instruct faculty and professionals in audiovisual instructional technology; (6) applied research—studies problem areas through state-of-the-art information or actual research; and (7) media development—establishes means and systems for the development of prototype instructional media programs, and learning systems.

An institution need not be sizeable to have a learning resources center. The following two examples indicate that the size range is not as important as the implementation of the concept.

A 272-bed hospital in Madisonville, Kentucky, started filming operations, physical therapy treatments, and other work efforts within the hospital.[20] (Madisonville, population 15,000, is located in Western Kentucky more than 100 miles from any of Kentucky's larger cities, i.e., Louisville or Lexington.) The films were housed in the library so that the entire hospital staff could view, learn and benefit from the work that was ongoing with the patients. As a result of this media communications project, the hospital discovered that there was improvement in patient care as well as increased continuing education of all staff members directly related to patient care. The library in Madisonville has been the central source of information, and the librarian will locate information in support of this program.

The Dana Medical Library at the University of Vermont has developed an organized and well-publicized media program consisting of all types of media incorporated into the library in support of the educational programs at the University of Vermont.[21] During the development, the library was supplying a need and not creating one. Now, however, the center has created more of a need for media. The center contains information for all health-related disciplines and has developed with this objective in mind. Cooperation in funding and development were paramount in the program's development.

A relative newcomer to media education and information transfer is cable television. Since television signals travel in a straight line, many areas are unable to receive good quality reception. Cable television signals, however, are transmitted via cables to receivers;[22] it has the potential for a two-way communication system. When this becomes a reality, medical libraries can transmit information to the health practitioner's office. Within the next ten or so years, this system will change the expectations of library users. The current problem of how to send information or how to have the person in an

isolated area request information will be answered. The only question is how libraries will reorganize for the new system.

CONSORTIA

During the past decade, the Biomedical Communications Network has come a long way toward becoming an established reality. With the growth of the Regional Medical Library program, a large step has been made toward the organization of all biomedical libraries in the country into various interrelationships with each other. However, developments have also occurred on a smaller scale, and these developments also have important implications for the future. Many groups of local librarians have found that they need not wait for the prompting of a national system to band together in cooperative projects.

For many years, librarians have been working together locally for the purpose of interlibrary loan. Other projects, particularly in the area of union lists to facilitate interlibrary loan, have also been accomplished. In the past few years, however, such local groups have become more formalized and have undertaken new types of projects. This "consortium tendency" is amply illustrated by developments in the Detroit area.

The Metropolitan Detroit Medical Library Group has been formally organized since the early 1960s.[23] Since 1963, it has published and updated a union list of serials to facilitate cooperation in interlibrary loan. In 1969, it began work on a formal interlibrary loan code. By this formalization, cooperation was established on a firmer basis. The code included an evaluation committee in order to insure equal responsibilities and privileges for all members. This code was accepted and put into operation by July 1970.

New technologies in libraries have now become areas for projects. Five of the libraries in the metropolitan Detroit area have banded together to form a unique consortium for the use of MEDLINE.[24] The group consists of four hospital libraries—Beaumont, Henry Ford, Harper, and Sinai—and the library of the University of Detroit Dental School. Given the limited number of access lines to MEDLINE now available, it is difficult for the NLM to justify giving one of these access points to an institution which will not make great use of MEDLINE. However, by grouping together five low-usage institutions which can cooperate with one another, one access point can be shared effectively. This is exactly what has been done in the

Detroit area, so far with considerable success. It was necessary for each of the institutions to be willing to make the commitment of finances and personnel which are required for MEDLINE use. These are requirements which not all local hospital libraries can meet. Fortunately, the five libraries involved in the Detroit consortium have been able to meet these standards of participation.

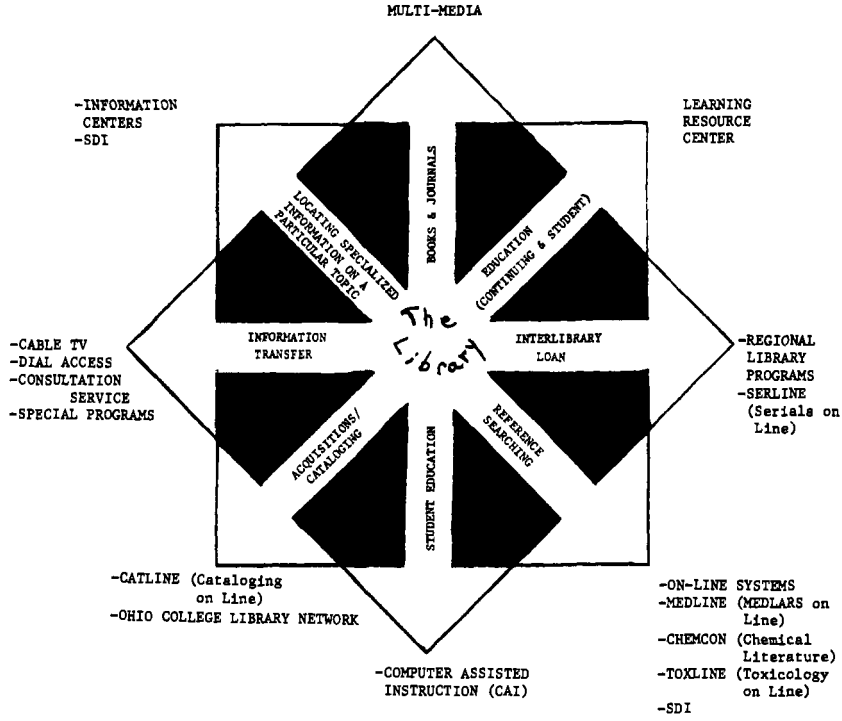
Another form of cooperation has been demonstrated in the Pontiac area. The Pontiac Area Institutional Resources Group includes nine institutional members who have also been members of the Detroit group.[25] Their primary area of work has been that of the audiovisual field. They have been involved not only in union listing of media materials, but also in the cooperative production of new media programs. Cooperative acquisitions will be the next step. By careful work, these libraries will be able to specialize in subject areas which a small institutional library would not otherwise be able to collect in depth.

We now seem to be entering a time of somewhat limited financial resources, particularly from national fountains. In the Kentucky-Ohio-Michigan Regional Medical Library Program, for example, serious cutbacks in the level of funded interlibrary loans have been necessary. In view of these developments, it seems likely that local cooperation will be more essential than ever. While the medical library scene has often appeared to be dominated by the large medical school libraries, and those of a few major research institutions, this does not necessarily have to be so. New developments, such as MEDLINE and media technology, do not have to be confined to major institutions. By cooperation and the sharing of financial resources, smaller hospital libraries can participate in future developments also. All that is required is an innovative imagination, a sincere desire to cooperate, and energy.

Due to both internal and external pressure for expanded formats and sources of information, libraries are changing from a concentration on traditional methods of reference searches, interlibrary loan, etc., to new concepts that result in more effective delivery of information. Figure 1 represents the changing dynamics of libraries. The library is the central core, and traditional services are represented in the spokes. The arrows are pointed to new directions. Librarians must not only be ready, but must assist in the development of the new directions.

Instead of the library approach that John Shaw Billings described

Figure 1. CHANGING DYNAMICS OF LIBRARIES



above, we should all consider the goal of the Lister Hill Center at the National Library of Medicine:

> The Lister Hill National Center for Biomedical Communications . . . should have as its eventual goal the development of educational methods which will render obsolete the current systems of libraries, textbooks, medical school curricula and total dependence on memory and pattern recognition in clinical decision-making and problem-solving. These major changes will come only with the development of new sources and new types of manpower ready to devise new approaches to the problems of medical education and the delivery of health care. Their long-term objective will not be limited to improving existing systems but will include devising newer systems using a different mix of men and machines than now familiar.[26]

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