Access to Internet resources and communications has rapidly become a necessity in many hospitals nationally. The results of a Pacific Northwest pilot Internet connections project provides important evidence of the value of librarians in establishing such connections in their institutions. The pilot project has resulted in a wealth of information regarding approaches to promoting the utility of the Internet to health professionals in hospitals. Roles that librarians are playing in support of such connections include facilitator, negotiator, provider, publisher, integrator, and educator.

INTRODUCTION

In 1991, the so-called information superhighway had yet to become a national rallying cry. Although Internet access was relatively common in academic health sciences centers in 1991, it was by no means ubiquitous. Much of the connectivity in health sciences centers was by means of low-speed dial-access modems, and most faculty did not have desktop access. Furthermore, very few hospitals nationally had any Internet access at all. At the same time, the National Science Foundation (NSF) was funding NSFnet connections to colleges and universities and providing improvements in speed and bandwidth in support of high-performance computing efforts. There was, however, little or no discussion of health care applications or needs.

In the Pacific Northwest, there was considerable discussion regarding how best to support hospital and health professionals' access to networked applications and telecommunications. Of particular concern was the need to support clinical and educational information needs of rural health professionals. The Regional Advisory Committee of the National Network of Libraries of Medicine—Pacific Northwest Region (NN/LM–PNR), composed of librarians and other health professionals, recommended exploring the feasibility of a health care Internet connections experiment. A proposal was developed in partnership with the regional network provider, NorthWestNet, and was presented to the National Library of Medicine (NLM). A contract pilot connections project was funded in 1992.

COMPONENT PROJECTS

The pilot project, titled "From Bench To Bedside: Research and Testing of Internet Connections in Community Hospitals," included three separate but mutually beneficial projects [1]. Each was developed to contribute findings toward delivering research information (hence "bench") to the clinical care providers wherever they might be ("bedside"). The first, Project Helix, centered on the development of a database of DNA Diagnostic Laboratories. The second project involved research on image transmission rates and bandwidth issues between Seattle and NLM and tested the feasibility of delivering the Digital Anatomist, a distributed set of three-dimensional image anatomical databases, over the Internet to NLM [2]. The third project proposed to connect seven community hospitals to the Internet.

The hospital connections project had the following
goals: establish connections of a number of types via high-speed modem, and support two hospitals to become stand-alone nodes on the network; test the utility of the connections for a variety of libraries as well as for hospitalwide purposes; test the hypothesis that librarians can serve as catalysts within their institutions; evaluate the project—expected and unexpected outcomes; and use the experience gained to create a path for other hospitals seeking to implement Internet connectivity [3].

WHAT DID WE LEARN?

We learned a good deal about use of the Internet and its resources by librarians and other health professionals. Early on, it was noted that there was rapid adoption of use of the Internet at the pilot sites by librarians who also were very creative in making use of Internet information resources. Despite very steep learning curves for hospital librarians and RML staff alike, there was a willingness to share information. In fact, frequently, the most useful aspect of the project was the connectivity for communications purposes—the ability to ask a question and get an answer from a knowledgeable individual almost instantaneously.

During the pilot project, the number of hospital libraries in the Pacific Northwest with Internet connections increased rapidly (Figure 1). In September 1992, only 5% of hospital libraries in the Pacific Northwest had an Internet connection (all were dial access via modem from the library). In April 1993, 43% of hospital libraries in the Pacific Northwest had an Internet connection. In addition, approximately eight hospitals had their own nodes on the Internet, thus providing distributed access to Internet resources and communications for staff throughout the hospital. By comparison, in a survey conducted by the NN/LM staff in late 1993, only 24% of hospital libraries nationally were found to have Internet access. Looking at Internet access by bed size, it is evident that the majority of the larger hospitals in the Pacific Northwest now have access to the Internet (Table 1). In the 1–49-bed category, 17% have Internet access as well.

Do librarians make a difference in whether or not the hospital has an Internet connection? Although not demonstrating "cause and effect," Table 2 indicates that 68% of hospitals with a professional librarian have a connection, while only 9% of those without a professional librarian are connected.

OBSERVING HOW HEALTH PROFESSIONALS WORK

To assess the value and increase the utility of the Internet for busy health professionals, it is necessary to understand how the health professionals work. It is likely they do many things at once, often making decisions of a variety of types simultaneously. They tend to be work flow oriented rather than database oriented; that is, their questions do not categorize themselves neatly by database type. Answers to a given series of questions (or a single question) could come from MEDLINE, the patient record, the drug database, and the hospital’s financial system. Health professionals wear multiple hats simultaneously: caregiver, educator, learner, and administrator. Most are overwhelmed by a flood of information and fre-

<table>
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<tr>
<th>Hospital size (beds)</th>
<th>No. of hospitals</th>
<th>Hospitals with Internet access (%)</th>
</tr>
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<tbody>
<tr>
<td>1–49</td>
<td>24</td>
<td>4 (17)</td>
</tr>
<tr>
<td>50–99</td>
<td>21</td>
<td>3 (14)</td>
</tr>
<tr>
<td>100–199</td>
<td>41</td>
<td>18 (46)</td>
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<tr>
<td>200–299</td>
<td>16</td>
<td>11 (69)</td>
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<tr>
<td>300+</td>
<td>32</td>
<td>20 (62)</td>
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<td>Totals</td>
<td>134</td>
<td>57 (43)</td>
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<th></th>
<th>No. of hospitals</th>
<th>Hospitals with Internet access (%)</th>
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<tr>
<td>With a professional librarian</td>
<td>77</td>
<td>52 (68)</td>
</tr>
<tr>
<td>Without a professional librarian</td>
<td>57</td>
<td>5 (9)</td>
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<tr>
<td>Totals</td>
<td>134</td>
<td>57 (43)</td>
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quently beg for less information rather than more. Often, they will not take the time to learn something new unless they see time savings resulting from the new skill. Clearly, Mooer's law of information retrieval—most people will choose to do without information if it is more painful and troublesome to obtain it—is in operation in hospitals and other healthcare institutions today [4].

To meet the information needs of health professionals, many librarians are using the Internet for access to NLM databases and other specialized databases for document transmission (e.g., using Ariel), direct access to NLM publications and other resources, professional discussion groups, and, most importantly, electronic mail. Uses of the Internet by health professionals themselves are not so different, including access to specialized databases, professional discussion groups, continuing education opportunities, image transmission, decision-support systems, clinical consults with colleagues, and sharing data from clinical trials with other institutions nationally. Both librarians and other health professionals are relying on the Internet more for a variety of communications purposes than for accessing specific types of information at the present time.

ENVIRONMENTAL SCAN

In order to play an effective role in an institution, it is important to study the real information needs and problems confronting the institution. This process entails making appointments to meet with key administrators, clinicians, and information systems staff members and asking questions and learning about the issues they currently face. They are likely to have heard of the "information superhighway" but may think it is irrelevant to their "real" needs. This provides an excellent opportunity to have them discuss their real information needs. It is also important to volunteer to serve on committees in an institution. Likely committees would be the patient records committee and quality assurance committee, as well as any information systems or computer policy committees that exist.

Although a wealth of information and tools for accessing that information currently exist on the Internet, for the typical community hospital clinician or administrator, the information available is not of the "life and death" variety. Most clinicians and hospital administrators are content to rely on the librarian for their network information access.

The current utility of the Internet is as a communications tool with other health professionals, as well as use of the network to move various types of data. At one of our pilot connections sites, the usefulness of the Internet became very clear when the systems vendor and hospital staff realized that they could save enormous amounts of time and travel expenses by updating software directly over the network rather than sending systems-vendor staff to the hospital to do the installations.

ESTABLISHING A NETWORK CONNECTION AT YOUR OWN INSTITUTION

Where to start?

The first step is to establish a dial-access connection for the library in order to gain experience. When NN/LM-PNR began its pilot project, there were very few providers of such connections. Now, however, there are many options, and one must look carefully at a variety of factors in choosing a vendor of Internet connections services. A list of vendors may be obtained from regional offices of the NN/LM. A summary of criteria for selecting vendors can be found in the appendix [5].

A subscription for a dial-access connection probably will cost approximately the same amount as electronic mail via OnTyme or another vendor. Justifying the cost in the budget then becomes easier, as a dial-access connection provides electronic mail access to not only colleagues but also to the vast array of information resources and tools on the Internet, including NLM's many databases. Once a dial-access connection has been established, exploration of the many resources available on the Internet can begin. Several good reference books are listed in the 1994 Rauch article. Contact other librarians for assistance. Finally, begin to introduce hospital staff to Internet resources. Others in your institution may already be familiar with Internet resources. If so, enlist their help in publicizing this new resource through demonstrations and educational events. Identify other hospitals using the Internet, and, in particular, try to provide useful information for the hospital administrator, gleaned from the Internet.

Assessing hospital readiness for full connectivity

Through the pilot connections project, it was determined that the following are key indicators of hospital readiness for institutionwide connectivity:

- distributed, networked workstations
- need for communications and data exchange with others (inside and outside the institution)
- informed systems staff
- "activist" librarian
- nonproprietary network protocols (transmission-control protocol/Internet protocol–compatible)
- high value placed on information access and sharing

In many cases, an "activist" librarian was instrumental in making a case for network connectivity within
the institution, particularly when an institutionwide network exists, and information access and sharing is an institutional value. The process used by hospitals to create a hospitalwide network infrastructure is not so different from the integrated advanced information management system (IAIMS) planning processes at many academic health sciences centers. As has been found in many IAIMS institutions, true utility of the Internet for communications and information access will not be achieved until busy clinicians, nurses, and administrators have easy, rapid, desktop access, integrated with the local information databases and information resources.

Hospital systems/issues
A number of hospital systems issues needed to be addressed in making the move from single dial-access connection to broad institutional access (either dial access via modem pools or direct connect node on the network). Data security ranked high among the concerns of hospital systems staff and administrators (as well as those of the business community). Security concerns included confidentiality issues related to the patient record as well as malicious break-ins by those outside the institution. It was important to assist hospital staff in learning about network and system security issues. A second important issue was that many small-to-medium-size hospitals prided themselves on having no on-site systems staff. They relied entirely on vendor support. Managing a direct connection node in this type of situation could be challenging and likely required purchase of a package of services, including on-site support from the network vendor.

ROLES FOR LIBRARIANS
There are a number of roles we found that librarians can play and are playing in their own institutions in support of Internet connectivity as well as in the broader information management environment [6]. These roles include facilitator, negotiator, provider, publisher, integrator, and educator. Librarians at several pilot connections sites found themselves serving as facilitators among a number of information groups in their institutions, such as administrative computing, clinical computing, clinical, and systems staff. A second role that librarians at a number of institutions are playing is as negotiators for contracts and licenses to information resources. In addition to the obvious role with MEDLINE and other bibliographic databases, librarians are negotiating institutionwide licenses for decision-support software (e.g., DXPLAIN, QMR), as well as full-text databases such as Micromedex. Another role increasingly seen in academic health sciences centers and a likely opportunity for hospital libraries is as a presenter and publisher of hospital information.

A number of librarians have created information resource lists for their institutions (using Gopher or World Wide Web software). At the present time, these resource lists tend to be of existing electronic information, either local or national; however, at the University of Washington and elsewhere nationally, librarians have taken responsibility for preparing useful print information resources (e.g., the Hospital Formulary, departmental and medical center newsletters, policy documents and handbooks, etc.) for online delivery through a health sciences information navigator, such as HealthLinks at the University of Washington.

Finally and, perhaps, most importantly, is the role of librarian as teacher. Learning to use Internet resources effectively is very time consuming. Providing leadership in the development of classes to support institutionwide training is a key role that librarians can play effectively in their institutions.

FUNDING SOURCES
A number of funding opportunities exist to assist in providing Internet connectivity for hospitals. Librarians can provide vital assistance to their institutions in locating relevant funding opportunities and can assist in developing a grant proposal. NLM and the National Science Foundation (NSF) have joined together to provide a funding program for network connectivity. Now in its third year, the funding program is expected to continue. Program information can be requested from NLM. Other relevant funding initiatives are being announced regularly by a variety of governmental agencies. Such announcements can often be found on the Internet. Regional NN/LM offices can be a good source of such funding announcements.

CONCLUSION
Our experience with the Pacific Northwest pilot connections project taught us a good deal about hospitals and the communication and information needs that network connections could meet. A number of forces are coming together to provide a forum for hospital librarians who are involved or interested in leading information initiatives in their institutions. The Joint Commission on Accreditation of Healthcare Organizations' newly revised standards for information management provide an outstanding opportunity for librarians, information systems staff, medical staff, and medical records staff to work together to create a seamless information environment for hospitals. Health care reform is resulting in new alliances of health care institutions, including not only hospitals
but also physician offices, clinics, and departments of health. Communications among these geographically distributed institutions and individuals is vital. Librarians, through the wealth of information resources and communications capabilities of the Internet, can play a vital role in the newly emerging national health information landscape.

ACKNOWLEDGMENTS

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APPENDIX A

Internet provider: checklist for evaluation*

Reliability
Does the connection work at all hours of the day?
Are there peak time overloads?
Is there a refund for downtime?
Does the connection support the speeds/types of hardware you have?

Troubleshooting
Is support part of normal service or an added cost?
What are the hours of coverage for network operations?

Training/User Support
Is there technical help available via e-mail?
Is there help and/or manuals available online?
Is there a user-friendly interface to Internet resources?
What software is provided?
Are Internet tools such as e-mail, telnet, FTP, Gopher, WAIS, WWW, and Lynx available?

Business Arrangements and References
Are free trial connections available?
What local and 800 phone numbers are available for your use?
Are there surcharges for any types of connections or particular hours of the day?
What kind of contract or services agreement is required?
What options are available for payment?
Are there any options that will reduce (or increase) your costs?
Are group discounts available?
Are there charges for file storage?
If you travel and want to access the Internet while you are on the road, is there dial access from the cities you visit?
How long has the provider been in business?
Can you get answers to your questions in writing?
Ask for names of two to three other similar users and check with them regarding their experience.

* Source: Selecting an Internet Service Provider [brochure]. Available from: National Network of Libraries of Medicine, Pacific Northwest Region, University of Washington, SB-55, Seattle, WA 98195.