Integrating knowledge resources at the point of care: opportunities for librarians*

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Health sciences librarians at the University of Washington (UW) are partners in the evolution of Internet-based clinical information systems for two medical centers, University of Washington Medical Center and Harborview Medical Center, as well as the UW Primary Care Network clinics. Librarians lead information resource and systems development projects and play a variety of roles including facilitator, publisher, integrator, and educator. These efforts have been coordinated with parallel development efforts by the Integrated Advanced Information Management Systems (IAIMS) clinical informatics group in developing electronic medical record systems and clinical decision support tools. The outcome is MINDscape, a very heavily used Web view of the patient medical record with tightly integrated knowledge resources as well as numerous Web-accessible information resources and tools. The goal of this article is to provide a case study of librarian involvement in institutional information systems development at UW and to illustrate the variety of roles that librarians can assume in hospital settings.

INTRODUCTION

Mooer's law [1] states that an information retrieval system will tend not to be used whenever it is more painful and troublesome for clients to retrieve the information than for them to act without it. This was the state of clinical decision support systems in the late 1980s when the University of Washington (UW) Health

Sciences Center launched its Integrated Advanced Information Management System (IAIMS) planning process [2, 3]. Locating articles to answer clinical questions required an inperson visit to the library, and probably an online search of MEDLINE, conducted most often at the library. Finally, there was a trip to the journal stacks to locate the article if the journal was owned or there was an interlibrary loan request if it was not owned. This process required not only time away from the clinical setting, but also represented a poor use of a busy clinician's time. Although a clinical librarian at each medical center was available to par-

ticipate in rounds, respond to questions, and do MED-LINE searches, many clinical questions were obviously going unanswered. A review of the literature confirmed the observation was not a strictly local phenomenon [4–8]. At the same time, the Rochester study had demonstrated the impact of the hospital library on clinical decision making [9] and the efficacy of MED-LINE to meet clinical information needs had been described [10].

During the IAIMS planning process, the library's vision for the future, in general, became "information at the point of decision making" and, in particular, access to answers to questions at the point of care from within the electronic medical record. The Internet and, later, the Web came along at an opportune time [11–13].

After ten years of effort by librarians, clinicians, researchers, and programmers, UW clinical staff have an environment in which access to not only MEDLINE but also factual answers to questions are only a click away within the electronic medical record. Thus, clinicians are able to meet their needs for patient specific information and medical knowledge simultaneously.

THE UNIVERSITY OF WASHINGTON ENVIRONMENT

The UW Academic Medical Center (UWAMC) consists of two large teaching hospitals, UW Medical Center (UWMC) and Harborview Medical Center (HMC), and an affiliated Primary Care Network (PCN) of clinics around the Seattle area. In addition, the UWAMC serves a regional educational and clinical role through the Washington, Wyoming, Alaska, Montana, Idaho (WWAMI) program. The Health Sciences Libraries (HSL) are the libraries for the two medical centers as well as the PCN clinics, the six schools of the Health Sciences Center (dentistry, medicine, nursing, pharmacy, public health and community medicine, and social work), and the WWAMI region. Harborview Medical Center located several miles from the campus, has a library that is a part of HSL. The primary user population numbers over 16,205 including 5,350 hospital staff and 10,855 faculty, students, and academic staff. The University of Washington Physicians (UWP) is comprised of more than 800 faculty physicians who offer primary and specialty care.

Through contract funding from the National Library of Medicine (NLM), HSL serves as the Pacific Northwest Regional Library of the National Network of Libraries of Medicine with broad responsibility for health information services to the WWAMI states (excluding Wyoming) as well as Oregon. UW health sciences librarians thus have broad responsibilities as well as challenges to serve such a large and distributed user population.

IAIMS PLANNING—1988 TO 1992

In the late 1980s, UW began an IAIMS planning process. At this time, hospital information systems were essentially stand-alone administrative and financial systems with a few clinical systems (e.g., laboratory system). Systems were not linked together and, in fact, applications often required separate terminals and very different interfaces to access data. This state was especially true of the library with its proprietary terminals providing access to the library's online catalog and nothing else. Virtually no clinical information was accessible outside of patient care areas and no online library resource information or databases were accessible inside patient care areas. Aggregating data—for example, laboratory results, patient problem list, and prescriptions—was a manual process. The patient record was maintained entirely as a set of print documents.

The library provided modem access to databases including MEDLINE through a number of vendors. Few users directly accessed databases from their offices or homes. Most chose to come to the library where they found an array of options, interfaces, and arcane search command syntax, or they consulted with a librarian who did the search for them. Needless to say, few clinicians in the midst of making clinical decisions could take the time to search out answers to all of their questions. And librarians were not a part of the institutional clinical information systems planning and implementation process.

As a result of an environmental scan and a recognition of the complexity of the UW environment, early in the IAIMS planning process, an overarching goal was developed that stated:

we would create a comprehensive and transparent information management environment which would complement and amplify the technological and organizational diversity of the UW Health Sciences Center and its affiliated institutions and programs. This means providing students, educators, clinicians, administrators, librarians, researchers and staff with convenient and timely access to the information they need to function optimally regardless of the physical location of the user, the resource or the system or the format of the information package. [14]

Considering this vision was developed long before the Internet and Web became house hold words, it was an ambitious and very long-term vision. The IAIMS leadership and the core group of individuals charged with carrying out the plan recognized that to accomplish the vision there would need to be an interdisciplinary group of individuals from across the Health Sciences Center who could work together to build integrated information systems.

In the late 1980s, health sciences librarians worked with the campus computing systems group to develop

a local version of MEDLINE with a graphical user interface. Eventually, this system was implemented at all UW libraries and provided a uniform graphical interface to over thirty databases at UW and beyond [15]. While this system will soon be phased out after ten years of heavy use, the project provided librarians with experience in information systems needs assessment, development, evaluation, and user training [16, 17]. Through this collaboration, UW MEDLINE became a ubiquitous tool on the clinical desktop and was available from office and home through the UW campus computing infrastructure. This success led to further needs analysis during the IAIMS planning process and resulted in a primary goal of integrating knowledge resources at the point of care through emerging Web technology. Drug reference, patient education, integrated MEDLINE with linkage to electronic full-text articles, and other text and image content were identified by clinicians as key resources in such an integrated system. Selected projects to illustrate strategies used, the role of librarians, and the multidisciplinary nature of the development process will be highlighted in the following sections.

ONLINE DRUG REFERENCE PROJECT—FEDERATED DRUG REFERENCE (FDRX)

A recurring request for information by clinicians is immediate, authoritative drug facts including drug safety, side effects and interactions, dosing, cost of therapy, formulary availability by payer, and patient education materials. Selection of the most effective drug therapy for a specific medical condition that also meets the patient's insurance parameters is an increasingly difficult information decision point for physicians [18–20].

Focus groups composed of UW pharmacists and physicians were used to develop the design for an integrated drug information resource. The prototype was created by a drug reference team composed of pharmacists, librarians, and IAIMS programmers. It integrated digital drug information including the UW formulary, drug reference, and pill images. The system, called Federated Drug Reference (FDRx) uses the United States Pharmacopoeia (USP) Drug Information for Health Professionals, volume 1, for authoritative, evidence-based information on drugs and drug products. The USP data is mapped to the UW and third-party formulary data, which is in turn mapped to linkages provided by the pharmacy system to both the FDRx and the clinical data repository [21].

Health sciences librarians were responsible for licensing the commercial components of FDRx, as well as testing and implementing the Web-based intranet version of another important drug reference tool, Micromedex. A programmed link to a predefined drug search was built to the (then) new open architecture

National Library of Medicine PubMed MEDLINE system in 1997. In 1998, to address the need for rapid access to new drug and drug safety information, the FDRx team developed a process for the Drug Information Center pharmacist to enter breaking news.

ETHNIC MEDICINE RESOURCE—ETHNOMED

Access to culturally appropriate information regarding their patients is vital to clinicians who increasingly are treating diverse patient populations [22, 23]. Health sciences librarians have facilitated and partnered in the development of a reference source called EthnoMed, which provides the cultural facts that a clinician should know before counseling patients from refugee groups [24]. This collaboration between the Harborview Medical Center Housecalls program and the HSL has received national recognition. Native American and other ethnic group collaborators have been identified to expand content. Integration with the electronic medical record, MINDscape, currently takes place through a link on the demographics view of the patient record if an ethnic indicator is present. The Harborview Medical Center librarian has served as the facilitator of the EthnoMed group, which includes physicians, undergraduates, and clinical staff from the International Clinic.

PATIENT EDUCATION MATERIALS ONLINE

Provision of patient education materials is an important component of care processes; however, maintenance and access to those materials in print formats can be very problematic. An early collaboration between librarians and the UWMC Patient and Family Services staff has led to licensure of the Health Reference Center product beyond the library walls, first through a CD-ROM network and currently through a Web interface. This product is now available on several patient kiosks throughout the UWMC, clinical library locations, and the University Bookstore. A second phase has led to a contractual arrangement to provide librarian support for the development of a database of patient education materials used throughout UWMC. The database is searched using a Web interface. Key librarian responsibilities included database specification, thesaurus development, interface design, and ongoing subject indexing of documents. The system has been designed to be a linked resource with the clinical system. The next phase will embed a patient education search capability in MINDscape, the Web view of the patient record. The design for a direct link from a retrieved description to the full portable document format (PDF) document for immediate printing has been completed.

E-MAIL-BASED TEACHING CASE DISCUSSIONS: INTERNAL MEDICINE REPORT

Providing convenient, distributed access to continuing education opportunities for clinicians is very important. Based on a popular international neonatal mailing list server, NICU-NET, and a local pediatrics morning report using Internet e-mail discussion list technology, the Department of Medicine began a new online case-based rounds for the entire WWAMI regional faculty [25, 26]. Residents prepared cases for presentation just as they would for rounds, however, the cases were then transformed into Web format with accompanying images. Clinicians from around the region then reviewed and discussed the case "virtually" using electronic mail. Librarians partnered in the development of evidence-based content, image manipulation, forum technology, and strategic development. The forum discussion was based on plain-text e-mail to allow for broader participation, and supplemental images and documentation were accessed through a Web browser [27].

INTEGRATING ELECTRONIC TEXTS AND JOURNALS AND DOCUMENT DELIVERY TO THE DESK TOP

One of the stumbling blocks in the road to integration through a Web interface has been licensing access for the UW distributed user population. A second issue is providing server access for deep linking to answers to questions (i.e., linking to the diagnosis section of the hepatitis A entry in the hepatitis chapter in the gastroenterology section of Harrison's rather than just to the table of contents for Harrison's). Only a few publishers are providing this functionality at this time. The HSL has been aggressive in pushing for Web format and open licensing, and by the end of 1998 all CD-ROM titles that were previously provided through a local CD-network have been available through intranet or Internet access (e.g., Cochrane Library, *Scientific American Medicine, Harrison's Textbook of Medicine*, STAT!Ref, MD Consult). Direct Web access is a much more efficient means of delivering content to the distributed user population than the CD-network technology.

The HSL has expanded its online journal collection as rapidly as content became available through the licensure of several large packages. Over 842 journals are now listed on the HealthLinks Web site. The major packages include Academic Press IDEAL, Ovid Biomedical Collection, Health Reference Center, UMI ProQuest Medical Library, HighWire, and Springer-Link. Several publishers who participate in PubMed system, provide direct linkage from the MEDLINE reference to the full digital article directly. Librarians are now in discussion with journal access aggregators,

university library colleagues, and PubMed developers to design a seamless linkage for all titles from MEDLINE. PubMed will become the primary UW MEDLINE system in 1999 as a result of its open architecture and the customization feature that maps UW clinicians to digital journals and seamless document delivery. In anticipation of seamless document ordering, library and IAIMS staff collaborated to implement a "post office" model for the delivery of PDF documents in 1997. This system stores PDF files on a Web server; a database tracks requests, sends e-mail notification messages, monitors PDF file downloads, and deletes PDF files automatically. Requesters retrieve the scanned articles using the e-mailed claim number [28]. This feature has been extremely well received by clients.

HEALTHLINKS

HealthLinks is a filtered, aggregate view of knowledge sources in the health sciences for UW faculty, staff, and students (Figure 1). Its purpose is to create simple and organized access to quality sources in a way that integrates with daily workflow. HealthLinks was launched in September 1994 at the outset of the proliferation of the Web. A new design released in February 1997 emphasized simple navigation for speed and a set of toolkits to bring together information by task (e.g., grant seeker or care provider). This design was based on inperson interviews and e-mail surveys of a representative user group, and has continued to evolve in response to user feedback. User comments also led to a new front page each month that focuses on topics such as pain management or age and gender in health service delivery. Hot news and UW resources are highlighted and linked, and a PubMed literature search to featured topics is included. Click logs are used to analyze which links on a menu page are actually used. Results from these logs are used to deselect or refine elements on a page.

The content of HealthLinks is the primary responsibility of librarians, and the overall HealthLinks design team is a partnership of HSL, IAIMS staff, and users. The HealthLinks team has developed a user-oriented resource discovery system based on the emerging Dublin Core metadata standard with an underlying database architecture to replace flat hypertext markup language (HTML) pages. This system creates dynamic Web pages and provides linkage for the Clinical Digital Library from the Web view of the electronic medical record. The database specification, output page design, input form design and documentation, and overall project planning has been lead by health sciences librarians. The database allows designated content experts to enter information about resources (e.g., uniform resource locator [URL], description, authors, keywords, publication information). Each re-

Figure 1
University of Washington HealthLinks Web site

Find on HealthLinks:

[ ]

Or go to Internet Search

Toolkits
Administrator
Care Provider
Grantseeker
Instructor
Researcher
Student
Writer
Topics
Basic Sciences
Clinical Specialties
Informatics
Public Health
Social Services
Your Health
Reference
Library Services
Computing
Databases/Texts
Journals
Legislation
News
Quick Info
Statistics
UW Health Sciences
Academic Med Center
Current Courses
Schools/Programs
Services
Training/Seminars
UW Home

About HealthLinks

—ᴧᴧ-*Health Links*

Connecting people with knowledge in the health sciences at the University of Washington

A project of the IAIMS Program and the Health Sciences Libraries

October 1998
Previous Front Pages

Space: Opening New Vistas

On October 29, 1998, Space Shuttle Discovery is scheduled for launch. This mission marks John Glenn's triumphant return to space. Glenn, the first American to orbit the earth, will be a mission specialist on this flight. Because aging and space flight produce similar physiological responses, this flight will provide more data for research into aging.

► Countdown to Launch

► New UW program in astrobiology

► PubMed search on aging and space flight

► Search SPACELINE to find references on topics such as the contributions of space flight to health and medicine and bone loss in astronauts.

► The Vanderbilt Center for Space Physiology and Medicine is committed to research in the physiological challenges of manned space flight.

MD Consult

MD Consult, an integrated online medical information service that provides access to journals and textbooks in medicine, pharmacology, and public health, is available for a six-month trial period. *UW restricted*

Try out MD Consult and send feedback.

October is . . . National Medical Librarians Month

Research shows that information provided by medical libraries has a direct impact on patient care.

Help the Health Sciences Libraries celebrate National Medical Librarians Month by asking us a question.

For more information, visit the library online.

National Medical Librarians

source is linked to any number of categories and topics organized in a hierarchy tree. HTML forms and Java Applets are used for data entry. Pages are defined by templates implemented by Sun's Java Server Pages. The system is designed to permit a broader group to maintain specific subject areas.

WEB ACCESS TO THE COMPUTER-BASED MEDICAL RECORD—MINDSCAPE

MINDscape (Figure 2) is an integrated Web interface to diverse sources of clinical information including patient-specific information (electronic medical record) as well as medical knowledge (the digital library) to provide "just in time" information at the point of care [29]. Users of MINDscape are a diverse group of clinicians including residents, nurses, fellows, and attending physicians in settings ranging from offsite primary care clinics to hospital-based subspecialty wards at UWMC and HMC. Users also include referring providers from across the WWAMI region who can contribute to the care of their patients while the patients are at the medical centers.

The development of MINDscape required a multi-

disciplinary group of collaborators including the multidisciplinary IAIMS Clinical Informatics group, health sciences librarians, and medical center information systems staff. The cooperation of the two service groups (the librarians and information systems staff) was paramount to the success of MINDscape as more than just a demonstration project. The Web was chosen to provide a platform-independent front end to heterogeneous databases, and permit rapid prototyping and iterative design based on user feedback.

The Web interface to patient data provides access to patient demographics; insurance coverage; clinician-selected problem list entries; the International Classification of Diseases, ninth revision (ICD-9) diagnoses; all transcriptions; selected pharmacy records; allergies; immunizations; automatically generated clinical alerts; stay or visit data; CPT procedures codes; laboratory data; pathology report; radiology reports; and, on a limited experimental basis, radiology images. Data entry tools are under development.

INTEGRATED KNOWLEDGE RESOURCES

From the large number of medical reference resources both produced by UW as well as acquired elsewhere,

Figure 2
MINDscape overview screen with patient demographics

there was a focus on an initial set of knowledge resources that included MEDLINE, drug reference information, laboratory reference information, and clinical guidelines targeted for integration into the electronic medical record. These resources were chosen based on previous needs assessments [30]. NLM's PubMed provided MEDLINE access from the first version of MINDscape. As described above, the FDRx had been developed as a stand-alone online resource but it too was easily linked through MINDscape. The third information resource tool linked was a locally developed, Web-accessible laboratory reference manual. The UW Physicians Practice Plan, in collaboration with the IAIMS group, developed locally reviewed, Web-accessible guidelines for managing common conditions of high morbidity and prevalence (e.g., diabetes, hypertension). The library and IAIMS staff assisted with the HTML and Web conversion of these guidelines.
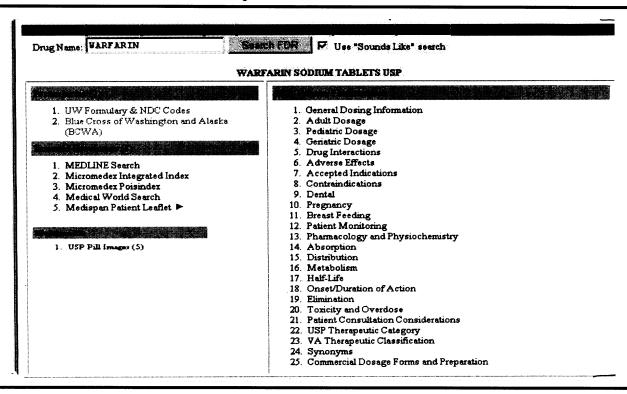
In order to alert users to the existence of reference resource information, the team has adopted the international symbol for information, a white "i" on a blue background, for hypertext links to resources. For instance, if users view the problem list in individual patient records, each problem has an "i" next to it. A click on the problem will launch a PubMed search (on the NLM computers) and return the search results. Further, if users have signed up with UW as NLM Loansome Doc users, a simple click on the selected references will send a request to HSL for copies of the articles. The library staff will return article copies to requesters within twenty-four hours (in electronic format, if requested). In the medication list, users also find the "i" icon next to each medication. A click on the medication launches a search of FDRx (Figure 3). In each case, the user does not have to type in the search statement; this entry is done automatically for the requester.

MINDSCAPE PROBLEM LIST

The problem list in the patient record provides the specific diagnoses that have been recorded for each patient (Figure 4). Consistency of terminology and management of the problem list have been elusive goals of UW medical centers and medical centers nationally for years, even before the advent of the electronic medical record. Encoding problems in a stan-

Figure 3
WARFARIN "i" icon retrieves the FDRx view of this drug

Drug Name: WARFARIN   Search FDR   ☑ Use "Sounds Like" search

WARFARIN SODIUM TABLETS USP

1. UW Formulary & NDC Codes
2. Blue Cross of Washington and Alaska (BCWA)

1. MEDLINE Search
2. Micromedex Integrated Index
3. Micromedex Poisindex
4. Medical World Search
5. Medispan Patient Leaflet ▶

1. USP Pill Images (5)

1. General Dosing Information
2. Adult Dosage
3. Pediatric Dosage
4. Geriatric Dosage
5. Drug Interactions
6. Adverse Effects
7. Accepted Indications
8. Contraindications
9. Dental
10. Pregnancy
11. Breast Feeding
12. Patient Monitoring
13. Pharmacology and Physiochemistry
14. Absorption
15. Distribution
16. Metabolism
17. Half-Life
18. Onset/Duration of Action
19. Elimination
20. Toxicity and Overdose
21. Patient Consultation Considerations
22. USP Therapeutic Category
23. VA Therapeutic Classification
24. Synonyms
25. Commercial Dosage Forms and Preparation

dardized vocabulary is a key strategy toward improved clinical research, education, and practice. A project team—led by an IAIMS clinician and consisting of an IAIMS programmer, medical centers information systems programmers, and health sciences librarians—is prototyping a hypertext problem list (HPL) that should begin to solve the problems of integrated use of standardized taxonomies and multidisciplinary access and use [31].

The current UW clinical problem list is the set of diagnoses using ICD-9 for a given patient. Assignment of problems is not done in a consistent fashion using consistent terminology, even though ICD-9 is the basis for the nomenclature. The HPL will also address the need for information analysis for accreditation and reporting, drive the clinical reminders system, and support research. The HPL project will introduce users, specifically physicians and nurses, to the use of structured vocabularies thus demonstrating to them the benefit of consistent data entry, and will integrate the problem reporting of various disparate electronic recording systems. HPL will enable more precise mapping of clinical record resources to reference resources such as electronic textbooks for answers to specific questions. Finally, the HPL holds promise as a semantic network to organize the display of chart informa-

tion. The prototype is being built using Metaphrase by Lexical Technologies [32].

FDRX INTEGRATION INTO MINDSCAPE

The open architecture of the drug reference tool, FDRx permits easy interfacing of FDRx to the Web-based clinical data repository for a true point of care drug reference. This interface is accomplished by passing the unique UW drug identifier shared by the UW pharmacy system and MINDscape to FDRx. As illustrated in Figure 3, FDRx models the tight integration of content, independent query interface, and direct linkage from the patient record envisioned for all clinical reference resources.

CARE PROVIDER TOOLKIT AND THE CLINICAL DIGITAL LIBRARY

The HealthLinks Care Provider Toolkit (Figure 5) provides a practical set of primary care knowledge sources. The Care Provider Toolkit remains a work in progress as modifications continue based on user and test comments and requests. Current design work is focused on a consolidated quick search page for key resources. This interface is not linked within a particular

Figure 4
MINDscape problem list for test patient

Patient: PT ZZTEST
U6999999 Male Age: 19

Demographics	Problems	Select New Patient	Help	Email Feedback	Log Off
Lab	Visits	Medications	Allergies	Providers
EKG	Reminders	Transcripts	Radiology	Pathology
		Immuniz	Procedures	Findings

PATIENT HAS REMINDERS DUE. see them

◘Click to access University of Washington Healthlinks Care Provider Toolkit.
◘Click to access University of Washington Healthlinks Resources by Clinical Specialty.
◘Click to search Medline.

Problem List

Problems are recorded manually by clinic staff. To view any additional potential problems see symptoms.

ref. lib.	Problem Description click for detail	Date of Onset	Date of Episode	Nbr of Episodes	Status
◘ uw	ESSENTIAL HYPERTENSION	unreported	unreported	unreported	Active
◘	FOREIGN BODY ESOPHAGUS	unreported	unreported	4	Active
◘	HEADACHE THIS IS 3/23/98	unreported	unreported	unreported	Active
◘	INTRACRANIAL HEM NEC/NO	unreported	unreported	unreported	Active
◘	OTH CHR ISCHEMIC HRT DI	unreported	unreported	unreported	Active

medical record. Instead, the Care Provider Toolkit provides access to all students and faculty on campus or at remote sites.

The Clinical Digital Library (CDL) interfaces to the medical record via knowledge resources links (the "i" icon) and provides access to the toolkit, clinical specialty topics, and top twenty outpatient visit conditions diagnoses. The CDL uses the same HealthLinks database framework with added functionality. The CDL infrastructure includes a module that allows URLs to be specified in templates. Each URL template specifies what information is needed to build a query to the resource that has all known information filled in by the CDL application. An example of this structure is a resource entry for PubMed that describes the resource and has a link to the main search engine. However, if this link is followed, users are taken to a blank search screen where they must fill in the pertinent information. If users click the "i" icon in MINDscape, the data may already be known (e.g., an entry in the medication list or problem list in the medical record). The templates specify what information is needed in order to "fill in the blanks" of the query and give a customized query. Many of the placehold-

ers in the templates consist of codes and labels from standard vocabularies such as ICD-9, MSH98, and SNOMED. The vocabulary server allows terms to be translated to all known equivalents in the standard vocabularies and used in the CDL templates. For example, an ICD-9 coded entry in the problem list can be translated to the relevant MeSH terms for linkage to PubMed. Currently, the links are hard coded into the MINDscape software making concurrent maintenance of the links, parameter passing, and new knowledge resources a major problem. A key part of the solution will be a knowledge server that will take both context (e.g., clinician looking at a medication list in MINDscape) and specific parameters (e.g., warfarin) to return an organized list of relevant electronic knowledge resources. This generalizable knowledge server architecture has been designed collaboratively by librarians, clinicians, and programmers working in the IAIMS program to permit much tighter and more specific integration of knowledge resources within the medical record. In the future, the group plans to explore the role of intelligent software agents for more precise knowledge retrieval.

Figure 5
UW Care Provider Toolkit

University of Washington

-W-*Health*
Links

Find on HealthLinks:

[   ]

Or go to Internet Search

Toolkits
  Administrator
  ▶ Care Provider
  Grantseeker
  Instructor
  Researcher
  Student
  Writer
Topics
  Basic Sciences
  Clinical Specialties
  Informatics
  Public Health
  Social Services
  Your Health
Reference
  Library Services
  Computing
  Databases/Texts
  Journals
  Legislation
  News
  Quick Info
  Statistics
UW Health Sciences
  Academic Med Center
  Current Courses
  Schools/Programs
  Services
  Training/Seminars

UW Care Provider Toolkit

An alternative view of the Care Provider Toolkit is available for users who aren't directly connected to a UW Computer or don't use UWICK software. Comments and feedback are welcome. Results will be used to improve the content and format of the site.

Key: ▲ UW Only   ● More Information

MEDLINE and full-text Journals

● PubMed MEDLINE - citations, abstracts, and a small number of full-text links.

▲ ● If no web access use UW MEDLINE via Telnet for text-based citations and abstracts

▲ ● Ovid Full-Text Journals | other full-text journals packages | Order article from UW HSL

Drug Reference

▲ ● PDR: drug reference includes USP DI v1 and UW formulary

● UW Managed Care Combined Drug Formulary Guide (June 1998 edition)

▲ ● Micromedex for drugs, toxicology, trauma

● FDA Drug Information includes New and Generic Drug Approvals

Patient Information

▲ ● Micromedex CareNotes Choose 'CareNotes System' from main menu

● EthnoMed for cultural beliefs in medical care

▲ ● Health Reference Center

● Patient Leaflets: AAFP | AMA Health Insight | US DHHS Healthfinder

Evidence-Based Medicine & Guidelines

● PubMed Clinical Queries using Research Methodology Filters

▲ ● Best Evidence CD Win95/NT only - requires special setup

● ACP Journal Club and Evidence-Based Medicine for updates since last Best Evidence CD

▲ ● Cochrane Library | alternate access (password needed)

● UW Physicians Guidelines

● AHCPR Clinical Practice Guidelines

▲ U.S. Guide to Clinical Preventive Services 2nd ed. 1996

EVALUATING MINDSCAPE IMPACT

Very high usage has been the rule since the first version of MINDscape was introduced for general use in 1997. MINDscape is in production at UWMC and HMC with almost 11,000 users and over 30,000 hits per weekday. Providers at Harborview Medical Center and UW Medical Center (4 miles apart) and UW Physicians Network clinics in a fifty-mile radius around UWMC/HMC applaud the ability to view records of patients who have been seen in multiple care locations. Referring physicians around the WWAMI region can, through ULINK, view the MINDscape records of their patients and follow and contribute to their care.

Currently the e-mail feedback button results in 9:1 positive comments about MINDscape. Enhancements are recommended but overall there is high praise for the utility of the system and the fact that no formal training sessions have been required. The interface has been deemed so intuitive that most clinicians simply begin using it. MINDscape has greatly improved emergency room service when the paper chart is miss-

ing. Evaluation of the impact of MINDscape and integrated knowledge resources on care is ongoing.

CHALLENGES AND OPPORTUNITIES FOR LIBRARIANS NOW AND IN THE FUTURE

The delivery of health care in the United States is undergoing fundamental and radical change. There are many forces driving this evolution—escalating costs, variable quality, growing limitations in access to name but a few—but it is increasingly clear that solutions to all of these dilemmas will be based on the acquisition and delivery of timely and accurate information. Although many in health care may not recognize it yet, health sciences librarians have historically been the keepers of much of this information. Too often as a result of limitations in time and technology, the information has not reached decision makers when and where they need it. With the advent of powerful computers ubiquitously linked through the Internet, many of these obstacles can be overcome. Empowered with this technology, health sciences librarians are becom-

ing an integral part of the health care information systems team [33].

As has been described in this article, UW health sciences librarians are partners in the evolution of Internet-based clinical information systems for two medical centers as well as the Primary Care Network clinics throughout the greater Seattle metropolitan area and the WWAMI region. Librarians at UW lead information resource and systems development projects and assume a variety of roles including facilitator, publisher, integrator, and educator.

Librarians must become even more active participants not only in support of the day-to-day delivery of care, but also in strategic planning of future health care information systems. To build the health information systems of tomorrow successfully will require the creative thinking of health sciences librarians and their collaboration with clinical colleagues and information systems specialists. Klein wrote about the applicability of the IAIMS model to a hospital library setting in 1989 [34]. Now, with the ubiquitous Internet and the Web, IAIMS principles are even more relevant to hospital librarians [35]. A trend that is becoming increasingly clear is that with the shift from inpatient to ambulatory care the very term "hospital library" is becoming a misnomer as more and more care is being delivered in the outpatient environment. A key issue facing hospital librarians now and in the future is how to support practitioners in these geographically dispersed clinics. Integrated information systems will be a necessity to respond to these distributed care settings.

In a recent article, Schardt [36] pointed out that hospital librarians can look beyond the "Management of Information" chapter in the Joint Commission on Accreditation of Hospitals manual (JCAHO) [37] and find interesting opportunities to collaborate with departments and services who are also working toward meeting JCAHO standards. The University of Washington Medical Center recently had its triennial visit from the JCAHO accrediting team. MINDscape received very high praise from the reviewers for its integration of knowledge resources, comprehensiveness, and ease of use. In fact, Schardt concluded that the hospital library's most important contribution to the accreditation process might be in applying knowledge-based resources and services to all pertinent chapters in the accreditation manual.

Hospital librarians are in a prime position to seize new opportunities through careful analysis of the big picture to understand the real information needs and challenges facing clinicians, administrators, and the entire hospital staff. By identifying key challenges and collaborating to develop strategies for responding to those challenges, librarians can contribute immeasurably to the success of their medical centers and health care alliances. Through the application of appropriate Internet and Web technologies to the delivery of information resources and tools, librarians can have a vital impact on their hospitals and institutions.

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