**docMD: Document Mediated Delivery :**

**Bringing Electronic Document Delivery to Small Hospital Libraries**

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INTRODUCTION

docMD is a project of the John A. Prior Health Sciences Library at the Ohio State University in Columbus, OH, USA with assistance from the Cleveland Library at Case Western Reserve University and funded by an $85,000 subcontract with the National Network of Libraries of Medicine, Greater Midwest Region (1,2).  The goal of the docMD project is to develop a service model which would allow 12 small and rural hospitals to implement Internet document delivery (IDD) services by overcoming technical and staffing issues that serve as barriers to implementation.  The primary objectives of the project included determining the technical and economic requirements to support such a service and to develop a model for use by other resource libraries in other regions of the country.

At the core of the docMD model is a centralized document mediation center.  All documents requested by any of the project libraries through the National Library of Medicine's DOCLINE® service, and delivered using the Ariel® protocol are routed to the mediation center instead of to the hospital libraries.  The mediation center then processes and redistributes all the documents electronically to the health care professionals using a

web interface.  docMD hospital librarians do not handle the documents and simply receive notification that a specific document has been made available to their customer.

BACKGROUND

The impact of literature searching on the reduction of hospital length of stay, lowering patient care costs, and positively affecting patient care has been well documented (3,4,5).  Research materials that are not available as a part of a hospital library's print or electronic collections are obtained by the library through interlibrary loan.  A majority of hospital libraries in the United States offering interlibrary loan services utilize the DOCLINE system, which routes a request electronically to libraries until one of them agrees to fulfill it. Traditionally, the documents are sent to the requesting library using mail or FAX services.

Using the Internet to send and receive documents electronically between libraries is also more cost effective than FAX and has been shown to dramatically reduce library paper consumption (6,7).  A 1986 study of libraries using traditional delivery methods revealed a document turnaround time of 13.76 days (8).  The advent of the Internet brought new delivery systems which utilized the global computer network technology to allow libraries to send articles to requesting libraries in electronic format (9).  A study in 1995 that included traditional and Internet delivery options indicated a turnaround time of just over 7 days (10).  The use of IDD alone systems reduced the mean turnaround time between libraries to 2.52 days (11).  Although Internet-based solutions have been on the market for over a decade there are many hospital libraries in the United States have not implemented them.

An informal telephone survey of hospital libraries in the state of Ohio conducted in 2001 indicated that smaller and rural hospital libraries rarely implemented IDD.  When

asked why they did not take advantage of IDD services their responses resulted in some common human, technical, and financial resource barriers.   It is not uncommon for libraries not have all the human resources needed to provide a full complement of traditional library services let alone computer enhanced ones.  Small and rural libraries can have minimal staff while others are staffed by a single library professional.  Staffing issues makes integrating IDD services into the daily workflow a significant challenge (12). Getting support from information technology staff to implement an IDD solution is also a challenge.  Hospital libraries frequently rely upon their hospital's computing staff for technical support.  Hospital librarians most often comment that hospital information systems staff may not be as responsive to the basic needs of a library let alone attempting to implement an IDD services.  Many of their challenges are detailed in reports from the Bill & Melinda Gates Foundation's 2004 Rural Libraries Workshop (13).

A major technical impediment to hospital library implementation of IDD services are Internet "firewalls" that secure hospital Intranet sites (14).  Firewalls are computers which filter Internet traffic that are placed between the hospital network and the Internet as a way to provide security to various systems, particularly patient records.  Unfortunately, the traffic that is blocked often includes the Internet "communications ports" which are utilized by IDD systems.  One IDD system uses plain FTP that utilizes ports which are commonly used by hackers to break into systems.  Security issues aside, few hospital librarians can identify the proper communications channels or have the authority to unblock these ports. Even if proper contacts are made, bureaucratic and technical obstacles frequently slow and often prevent the ports from being opened to allow IDD implementation.

Implementing information technology solutions such as IDD is a long-term commitment that requires one time and ongoing financial resources.  Small and rural hospital libraries have difficulty finding ongoing funds to create and sustain new electronic

services when budgets to support basic materials purchases are already small or under constraint.  While the cost of dedicated computer hardware prevented many libraries from implementing IDD in the early 1990's, hardware has evolved to the point an inexpensive desktop computer can now be used for IDD services.  However, the cost of the software and annual software subscription costs alone still pose a barrier for IDD participation.  The Internet has made the tools of software development more commonplace and increased competition in software industry has lead to generally lower prices.  However, the lack of open IDD standards and competition in the IDD software industry has gone against the trend and the cost of IDD software licensing and maintenance has risen.

While there has been some discussion regarding the impact and implementation of IDD world-wide in countries such as Pakistan (15), a literature review reveals no research on the challenges of implementing IDD in hospitals in developing and economically challenged countries.  While lack of a national broadband infrastructure would seem to remain a major obstacle in countries such as Kenya (16), one could assume the human, technical, and financial resource barriers being faced by small and rural hospitals in the United States would be universal, although to differing degrees.

SERVICE MODEL

The docMD service model is actually quite simple. To participate in the project each hospital library modified their NLM DOCLINE "DOCUSER" record by adding the address of the docMD central server into the "Ariel" field.   Project libraries then could request journal articles using the DOCLINE system as they did before, except the address of the central docMD server is printed on each request.  Documents intended for any of the project libraries, and could be delivered using the Ariel protocol, are sent to the docMD central server instead of being delivered using traditional mail and FAX services.  A custom software suite was built for the docMD project which captures documents sent using the Ariel protocol, converts those documents to the Portable Document Format (PDF), and makes them accessible through a web interface.

As a document intended for a project library comes into the central site the project staff begins the mediation process by opening the each document. They first identify which customer the document is intended for.  All customer names and email addresses are added to a user database and a PIN number assigned.  The project staff then identifies the title of the article and processes the document by associating it with a customer and filling in the title field.  The system then posts the document to the web server, which makes it available for download from a public web site.

As a document is processed, the software sends an e-mail notification to the customer alerting them that a document is available.  This e-mail contains the web site address they use to download the document as well as a reminder of the login / password required to access the system.  The project library requesting the document also receives a copy of the notification.  Each document is made accessible directly to the customer

through a web interface and is converted into PDF on the fly when the customer selects it for viewing.   The docMD customer logs into the system using their email address and the assigned PIN to gain access to their documents.  The customer can then open, read, and print it using the Adobe® Acrobat® Reader software.  The documents could be deleted off the system by the customer or were automatically removed after 21 days or five viewings.

The hospital librarians had no involvement in the mediation process beyond receiving notification that the transaction has occurred.

## OUTCOMES

One of the main objectives of the docMD model was to overcome the barrier of hospital libraries not having the human resources to implement IDD services.  Since all documents are delivered to the docMD site hospital library staff did not have to process almost 5000 documents.  The time required to process each incoming document took docMD staff less than a minute each, which is much less than the time to manual process of a document.  However, there were a high number of documents (40%) which were being sent, at the librarian's request, to the librarian instead of direct to the customer.  The primary reason that the librarians gave for this was that their customers preferred the librarian gather and repackage their research materials.  In doing so, the librarian was not taking advantage some of the major benefits of using the system, including the reduction of staff workload and a decrease in document turnaround time

Another goal of the project was to be able to eliminate the firewall issues that hospital libraries face.  During the entire project period there were no reports of firewall related issues.  This was due to two factors.  First, no servers or networking equipment was needed at the hospital sites.  All the IDD hardware and software were located at the

central site that was behind a firewall which allowed all the necessary traffic.  Secondly, the service distributed documents to the customers utilized the very common Web port open on almost all firewalls, port 80.  Any customer with a web browser and network access could gain access to their documents; from their office, clinic, or home.

Another barrier to IDD participation is that it does require technical support to install and maintain the hardware and software.  The centralize model meant that technical support for IDD participation was required only at the central site.  During the project there was the need for some level of technical support.  Some hospitals did not have the Adobe Acrobat Reader, or a recent version, installed on customer machines.  The email sent to the health care professional included a link to the Adobe site to help them install the software at home or office.  Some sites needed to have local information technology staff install Acrobat Reader.  Once the Reader was successfully installed there was no local information technology support needed for the hospital libraries.

The most significant outcome of the docMD service was the reduction in interlibrary loan turnaround time.  A pre-docMD study revealed the hospital libraries collectively had an average document turnaround time of 6.5 days using traditional delivery methods.  A post-study indicated that docMD reduced turnaround time to 3.5 days, a reduction of 46%.  It should be noted that the pre-study tracked turnaround time from the time of request to the time of delivery of the article to the library.  It does not take into account the time required to repackage and get it into the hands of the requestor.  Final physical processing to get the item out to the customer can add one day.  The post-study tracked the time from the request from when the library received notice the document was available for customer access.  The step of physically processing documents at the hospital libraries that were sent by docMD was eliminated.

The impact of getting literature into the hands of the health care professional nearly three days quicker has had on patient care is impossible to measure.  Unquestionably, access to the docMD service provides health care professionals with an opportunity to make quicker, more informed health care decisions.  Over time, an inequity may emerge between the quality of health care services provided by those organizations with access to electronic document delivery services like docMD and those that do not.

## SUMMARY

The underlying motivation of the docMD project embodies the overall theme of this conference: a commitment to equity.

Information requested by health care professionals is often time sensitive since patient treatment options often depend on it.  Any hospital library, large or small, that uses Internet document delivery systems can get information in the hands of the health professional faster.  Libraries that are able to use such technologies can provide health care professionals with an opportunity to get information more quickly that ultimate could reduce length or stay and overall health care costs. However, hospital libraries are faced with significant barriers that prevent them from utilizing electronic document delivery systems.  docMD was successful in overcoming the barriers that prevent the small or rural hospital library to take advantage of the benefits of electronic document delivery that larger libraries have enjoyed for over decade. It provides health professionals affiliated with small or rural hospitals with an equal opportunity for gaining access to professional literature as soon as possible in order to make quicker, well informed patient care decisions.

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