Delivering medical information to the desktop: the UIC GRATEFUL-MED-via-the-Internet experience*

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The University of Illinois at Chicago (UIC) provides the campus community, including the main campus and three regional sites, with a local MEDLINE option through a GRATEFUL MED fixed-fee licensing agreement with the National Library of Medicine. Searching is available via the Internet. A password server and customized GRATEFUL MED clients were built in order to adapt this off-the-shelf product to match the look and feel of other UIC campus-wide Internet resources. Installation, documentation, and training issues affecting the success of the project are discussed.

Since 1989, the National Library of Medicine (NLM) has made GRATEFUL MED databases accessible on an experimental basis, with flat-rate pricing, to individuals within an institution [1]. An evaluation of one pilot project (McMaster University) was presented at the Seventeenth Annual Symposium on Computer Applications in Medical Care in 1993 [2]. After experimenting with flat-rate fee arrangements with several medical center libraries, a highly publicized agreement in 1992 between NLM and the American College of Physicians (ACP) provided ACP members with unlimited searching for one year for a flat fee of $200 [3]. This pricing structure was based on a fixed annual amount that would cover the online and telecommunications cost of searching for a predetermined number of NLM codes.

In 1993 the American College of Cardiology signed a similar agreement for its members [4]. At the 1993 Annual Meeting of the Medical Library Association, NLM representatives announced the availability of a similar program for Internet and direct-dial access to its MEDLARS databases for additional institutions and organizations [5]. Because of such fixed-fee agreements covering all users at a location, by 1994 the MEDLARS staff was able to project the possibility of having 100,000 user codes by year's end [6].

Early in 1993, the staff at the University of Illinois at Chicago (UIC) Library of the Health Sciences (LHS) began preliminary discussions with NLM about a fixed-fee arrangement for making GRATEFUL MED searching available to all University of Illinois faculty, students, and staff. After investigating several other MEDLINE options, GRATEFUL MED was judged the most viable because the up front costs were affordable. The start-up costs consisted of the fixed-fee payment to NLM plus enhancements to the institutional network. In many cases, costs for network enhancements were absorbed by existing budget lines. Also, GRATEFUL MED required little local, ongoing systems development or special equipment, offered access to databases other than just MEDLINE, and made use of a search engine that had proven itself user friendly—resulting in the likelihood of quick installation and minimal user training.

THE GRATEFUL-MED-VIA-INTERNET AGREEMENT

In negotiating the agreement, several concerns were addressed. GRATEFUL MED searching had to be accessible to all University of Illinois faculty, staff, and students who had university computer accounts. This included users throughout the UIC campus (main and health sciences) and its three regional sites (Rockford, Peoria, Urbana) and the sister campus community of the University of Illinois at Urbana (UIUC). (The UIUC campus was included because the libraries of the two institutions have agreed to license all future databases on behalf of the entire university.) The potential user

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population was defined as 60,800 students, 4,860 faculty, and 3,932 staff.

GRATEFUL MED searching via the Internet was assumed to be the only acceptable method of connecting due to its speed of operation and the resulting benefits in terms of both cost and time. The agreement with NLM to offer GRATEFUL MED searching via the Internet to all University of Illinois sites was finalized in December 1993. On January 4, 1994, UIC became the country's largest university to provide full access to the nonroyalty MEDLARS databases through the GRATEFUL MED fixed-fee access program [7].

Two other concerns, user authorization and user access, were resolved during negotiations and shortly after the agreement with NLM was reached. Normally, prior to Internet access, an individual user would buy the GRATEFUL MED software, be assigned a password, and thereafter pay an hourly, dial-up searching charge. One goal of the UIC project was to avoid distributing individual passwords and having to keep paperwork on each user. Search charges were to be prepaid by the university, but a method of access authorization for legitimate users had to be developed. Addition of a password server front end quickly resolved the issue of authorization. The UIC GRATEFUL MED clients then had to be built. The DOS client became available early in 1994 and the Macintosh client during the summer.

Internet connections had to be installed where not already available throughout the campuses. The UIC has had a campus network since 1981. Initially, the network was primarily coaxial, but since 1987 the campus has been upgrading to fiber optic. There continues to be concern about direct Internet connections not being widely available at all sites. To be sure, all libraries and many department offices have some direct Internet hookups, but they are not nearly prevalent enough to permit the most effective, campus-wide use of GRATEFUL MED searching. This project has become the impetus, however, for many UIC offices and labs to become wired or upgraded from the original coaxial cable network to the fiber-optic network.

THE UIC SOFTWARE ADAPTATION

When the UIC version of GRATEFUL MED is invoked, it connects to the password server, the address of which is embedded in the UIC customized clients. GRATEFUL MED then presents the user with an identification and password log-on screen and quickly validates the information supplied using the computer center's standard accounting database. After validation (confirming the user's affiliation with the university) the software supplies one of the 2,200 MEDLINE accounts and passwords acquired with the fixed-fee contract. The campus password server keeps track of users and supplies the same password each time to a "regular user" (currently defined as a person using the system more than once in three months). Passwords used infrequently are rotated or reassigned as needed.

Changing the code and making the code available on a file-transfer protocol (FTP) server for downloading to local users' machines were relatively easy. The problems began when users attempted to install the client on their own microcomputers. A significant problem was the wide use throughout the UIC campus of the University of Maryland transmission-control protocol/Internet protocol (TCP/IP) kernel, popular telnet software that was free to users. At the time UIC signed the agreement with NLM, GRATEFUL MED only worked with National Center for Supercomputing Applications and Wollongong, two other telnet freeware packages that are incompatible with the University of Maryland package. UIC systems staff asked NLM to support two other products, FTP's PC/TCP and LAN Workplace for DOS, and NLM complied.

Unfortunately, UIC librarians and computer center staff already had begun to deploy the GRATEFUL MED DOS version that used the NCSA software. To solve this problem, UIC computer programmers built a customized configuration file that users would have to install and customize on their local computers along with the GRATEFUL MED client. Because other network services continue to use the Maryland freeware, GRATEFUL MED users also are required to do some editing in their autoexec.bat files. This ensures that the GRATEFUL MED packet driver installation and deinstallation are accomplished and that other network services continue to work.

For about six weeks, there was a variety of unanticipated problems when the GRATEFUL MED client was installed on local machines, but the library staff quickly developed troubleshooting skills. Librarians made appointments to help users install the client. Since then, the campus has acquired a site license to FTP's PC/TCP software and conversion to PC/TCP has been accomplished at most sites. This conversion eliminates the need for users to reconfigure the GRATEFUL MED client software.

Another project goal was to preserve as many of the customized features of the GRATEFUL MED software as possible. Most of the features, such as accommodation of personal preferences for downloading and printing, were immediately compatible. On the other hand, the LOANSOME DOC feature for electronic interlibrary loan delivery presented a challenge [8]. When a user has an individual GRATEFUL MED subscription, the user has to locate a lending library and sign a contract for pre-approved delivery of articles. The UIC staff wanted both to eliminate

the pre-approval process and paperwork and to use LOANSOME DOC as an internal electronic document delivery system for the campus libraries' collections. Therefore, the staff agreed to customize the client software prior to distribution, to include the LHS identification for the Chicago campus as the default. Users receive their first set of articles free. Included with the articles is notification that there will be a charge for future articles and a request for billing information and authorization to be kept on file.

The question of collecting statistics also arose. In a paper-based user registration system, the forms would have been sent to NLM. The password server, in conjunction with the UIC campus phonebook, was designed to provide the demographic data needed for NLM's statistical work. No personal data are given to NLM. This method is viewed as superior to a paper-based system in that confidentiality is provided and manual, paper-based computations are not needed.

The UIC version of the GRATEFUL MED client is distributed to individual users primarily through FTP, as the file is very large. GRATEFUL MED is only one of the software programs included in a Network Services Kit (NSK) distributed by the UIC Academic Computer Center. Other programs in the NSK include TCP/IP software (for either PCs or Macs), PC e-mail programs (such as Eudora and NUPop), newsreaders, Gopher, Mosaic, and a PC disk backup utility. This package approach to networking campus departments and offices has simplified greatly the process of establishing GRATEFUL-MED-via-Internet stations. It is anticipated that disk versions of UIC GRATEFUL MED will be needed when the local network provides for serial line Internet protocol (SLIP) dial-up access from homes and offices. Future plans call for SLIP dial-up access in Chicago, Peoria, and Rockford—perhaps as early as fall 1994 after upgrading of some telecommunications equipment.

A policy addressing access to GRATEFUL MED on public machines in the libraries is still under development. At present, only users with UIC computer accounts have access. SilverPlatter and KnowledgeFinder MEDLINE CD-ROM stations and the printed *Index Medicus* remain as options for non-affiliates. Future plans call for an automatic sign-on and reboot for the public stations, so that users without UIC accounts will have access to the GRATEFUL MED databases from the libraries.

The customized UIC client has some limitations, particularly on machines available for public use. Software on the public machines will not support LOANSOME DOC, and any search not downloaded to floppy disk will not be saved for future reference. Further, any other feature an individual may have customized on the public machines for printing or downloading during a search session will be lost at the end of the session.

The GRATEFUL MED documentation is available only in Postscript format. UIC programmers wrote a file to allow users to print the documentation on the networked Postscript printers attached to the UIC mainframe. The documentation includes the introduction, table of contents, and a beginner's section with preselected important chapters—or users can pick the chapters they wish to print.

While there were myriad technical issues related to the installation of GRATEFUL MED via the Internet, in retrospect it seems amazing to the LHS staff that so much has been accomplished with what might be described as novice networking expertise. This success can be explained in large part by the cooperation of the many parties who were involved to one degree or another—including NLM staff, university library systems experts, Academic Computer Center systems experts, LHS online searchers, network enthusiasts, and library administrators.

TRAINING

Like most health sciences libraries, all sites of the UIC LHS have strong programs of library instruction for students in the various health professions schools. At UIC, this training has included MEDLINE instruction in the first- and second-year medical school curriculum and instruction in the use of both commercial CD-ROM MEDLINE databases and GRATEFUL MED dial-up access to MEDLARS databases. Several staff workstations had GRATEFUL MED available for both instructional and mediated online search purposes. LHS sites at Peoria and Urbana have received NLM outreach grants to train "rural health professionals" in GRATEFUL MED searching and LOANSOME DOC document retrieval [9–10]. The National Network of Libraries of Medicine (NN/LM), Greater Midwest Region staff, based at the UIC LHS, also has extensive experience in training and exhibiting GRATEFUL MED and LOANSOME DOC.

With the implementation of prepaid, no charge-back GRATEFUL-MED-via-the-Internet searching for all UIC-affiliated users, training has taken on an even greater sense of urgency than before. A report by the LHS Information Services Department documents about thirty separate instructional sessions from November 1993 through June 1994 (the period immediately following the decision to negotiate a fixed-fee agreement). The audience for these sessions included faculty in several departments, library professional and support staff, and affiliated professionals involved in continuing education programs. In some cases faculty and students in scholar or research groups have been targeted for GRATEFUL-MED-via-the-Internet training. For all these groups, online tutorials, the GRATEFUL MED manual, and the video

Table 1
Growth in GRATEFUL-MED-via-Internet searching

	Jan–Mar 1994	Apr–Jun 1994	Jan–Jun 1994
Unique passwords (NLM)	236	344	580
Total hours (NLM)	95.88	167.73	263.61
Total served passwords (UIC)	365	460	825
No. of times password requested (UIC)	2,756	4,536	7,292

A Closer Look at GRATEFUL MED [11] are readily available.

Internet training also is offered. Although not a part of curriculum instruction, the UIC library has played a significant role in promoting the Internet and in providing Internet documentation and training for individuals and departments in the university community. There is a multitude of health-related resources on the Internet. The speed and power of GRATEFUL MED searching via the Internet provide a very important incentive for UIC users to be Internet literate. As with GRATEFUL MED, the urgency of Internet training has increased. Most Internet training has occurred on demand, with individuals or small groups. Basic introduction and training presentations have been provided for a couple of consortia of the NN/LM. An electronic class, "Ride the eTrain," consisting of sixteen lessons, has been developed for use throughout the campus and is available on the UIC Gopher.

Once the likelihood of campus-wide Internet access to GRATEFUL MED was known, informing and training LHS clientele and library staff became a high priority. Nevertheless, the previous training programs provided a good foundation. This foundation, along with GRATEFUL MED's ease of use, has allowed students, faculty, and staff to adapt readily to GRATEFUL-MED-via-Internet searching.

CONCLUSION

As would be expected, statistics for the first half year (January–June 1994) maintained by NLM and the UIC Academic Computer Center show considerable growth in use of GRATEFUL-MED-via-Internet searching (Table 1). The data reflect use prior to the time when GRATEFUL-MED-via-Internet searching became available on the public workstations in the various campus libraries. To be sure, as the public workstations in the libraries have become available, use has escalated dramatically.

At present, LHS-Rockford has three public workstations in the library plus several installations on staff machines. In addition, GRATEFUL-MED-via-Internet searching is available on three PCs and three Macs in a twenty-four-hour computer lab. LHS-Peoria has two public GRATEFUL MED stations in the library and two in a lounge/lab area. Approximately twenty installations are located in individual offices and labs at Peoria. Six public workstations exist at LHS-Chicago, and the staff has assisted with numerous installations in academic departments and offices. LHS-Urbana, the Science Library in Chicago, and the Main Library in Chicago each have one public GRATEFUL MED station.

Several installations have been carried out independently using the UIC FTP server, and there is no precise count of the number of installations in offices and academic departments at this time. As more direct Internet connections become available, it is anticipated that hundreds of installations of the UIC version of GRATEFUL MED software will be completed among all sites.

Assessing what has been learned with the "GRATEFUL MED via the Internet" experience is a continuous process for UIC librarians. It is too early, of course, for an evaluation of either the contract with NLM or the system and network performance of GRATEFUL MED at UIC. Of most significance is the preliminary observation that the software performs MEDLINE/MEDLARS searches very quickly and easily. The user only has to enter his or her user identification and password once at the beginning of a search session. Thereafter, the user can perform as many specific searches as needed without the need for re-authorization. After exiting the GRATEFUL MED software it is necessary to re-enter the user identification and password to begin another search session. The ability to quickly edit the search strategy menu and the speed of searching via the Internet make the process comparable to a continuous online searching session.

A future trend may be the increased use of native mode searching (using NLM ELHILL commands), which allows users who become familiar with GRATEFUL MED to bypass the preformatted screen. The LHS staffs in Chicago and Peoria already have scheduled classes in ELHILL command language searching for GRATEFUL MED users. Of course, librarians use GRATEFUL MED for mediated searching, creating current awareness profiles, verifying interlibrary loan citations, ready reference, and other tasks—with all charges covered by the prepaid, fixed-fee contract. And, to keep all staff abreast of progress and new developments, brown bag lunches sponsored by the Lectures and Forums Committee have been scheduled for reports and discussions of research topics related to the project.

The project illustrates how an off-the-shelf product can be customized to meet a particular institution's needs and environment. Using an existing NLM product, GRATEFUL MED, through a fixed-fee pricing agreement, the UIC has been able to provide unlimited free searching to the entire campus commu-

nity by adapting the product to the "look and feel" of the other UIC campus-wide Internet resources.

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