COMMENTARY

Casting a Wider Net:
Improving Access to Medical Literature in Developing Countries

LEWIS R. ROBERTS, MBCHB, PHD; CLIFF MISSEN, MA; AND GIL C. GRIMES, MD

Delivery of high-quality medical care in less developed countries is well known to be hampered by limited resources such as medical equipment, supplies, and essential medicines. However, lack of access to current medical educational resources and training opportunities, particularly in basic life support and resuscitation skills, presents just as serious an impediment. The resulting knowledge gap militates against the provision of the best care for patients.[1-3]

Africa Partners Medical is a nonprofit organization of American and African physicians, nurses, and other health care professionals committed to improving medical care in Africa. It does so by sponsoring educational conferences in Africa and establishing long-term partnerships with African health care professionals. Its experience in providing annual continuing medical education courses in West Africa over the past several years has shown that a huge demand exists for current medical information and practical training in the concepts and skill sets necessary to provide high-quality health care. We present a proposal for an innovative way to improve the provision of educational materials to health care professionals in developing countries.

WHAT ARE THE PROBLEMS?

The problems that specifically limit access to online medical information in developing countries include the following: (1) inadequate and cost-prohibitive electronic access to medical journals, (2) slow Internet access speeds, and (3) the high cost of Internet access.

Many publishers of written and electronic medical literature provide their products either gratis or at concessionary rates to health care professionals and libraries in developing countries. In particular, a number of initiatives, notably the Health InterNetwork Access to Research Initiative (HINARI) program of the World Health Organization

(WHO) and its partner publishers, provide free Internet access to the online versions of many medical journals to individuals with Internet protocol addresses from less developed countries.[4] More than 3500 journals from more than 70 scientific publishers are currently available free of charge through HINARI, including journals from the 6 major founding publishers: Blackwell, Elsevier Science, the Harcourt Worldwide STM Group, Wolters Kluwer International Health & Science, Springer Verlag, and John Wiley. Also participating are many society and publishing group journals, including the American Association for the Advancement of Science (1 journal), American Gastroenterological Association Institute (2 journals), American Medical Association (10 journals), American Society for Biochemistry and Molecular Biology (4 journals), American Society of Clinical Oncology (1 journal), Australian Medical Association (1 journal), BMJ Publishing Group (27 journals), Nature Publishing (48 journals), Massachusetts Medical Society (1 journal), Rockefeller University Press (3 journals), and the journal *Mayo Clinic Proceedings*. The strong demand for health information in developing countries is reflected in the HINARI statistics: in 2005, individuals at 2000 institutions registered by HINARI in 106 countries downloaded more than 3.5 million articles.

Unfortunately, practical experience in many countries in sub-Saharan Africa suggests that access by health care professionals to these free resources is severely limited by slow Internet access speeds and the high cost of Internet access. For example, a unit of Internet access that costs $.03 to $.05 (US dollars) in India or China is estimated to cost $1.13 in Ghana. In economies in which annual health care expenditures are approximately $10 to $50 per person, such costs place current medical knowledge well out of reach of the average health care professional.

THE DIGITAL LIBRARY AS A SOLUTION

One attempt to bridge this "bandwidth gap" has been the installation of local Web-based digital libraries in African universities and other institutions. One excellent example is the eGranary implementation by The WiderNet Project based at The University of Iowa. Permission is obtained from publishers of educational material to download e-information from their Web sites onto a computer server with large storage capacity. Once installed as part of a local computer network at an institution in a developing country,

the digital library provides high-speed access to the downloaded Web pages, documents, and other digital media stored on the server. If most of the documents needed are available locally and an Internet connection is available, even one with relatively limited bandwidth, algorithms can be used to request new documents and materials from the World Wide Web for downloading when the system is relatively idle, as for example at night. These digital libraries provide extremely high access speeds for those on the local network and so are ideal for audio-visual educational media. The servers can be set up to be robust and tolerant of power fluctuations and outages through the use of inverters. These inverters convert direct current from deep cycle or automotive batteries to conventional alternating current to power the servers. In rural areas, solar power can also be used for this purpose. In the eGranary model, the educational content is updated by sending an updated CD-ROM each quarter.

Extra space is available on the digital library server for distribution of locally produced educational or other content. Creative ways to further leverage the content of a digital library server include development of local WiFi networks capable of serving entire health sciences school campuses. In this way, digital library access is made available to anyone with appropriate log-on permission through a wireless network card in a personal computer or through a personal digital assistant that is within range of the wireless network.

Within the past year, Africa Partners Medical faculty taught African medical professionals the principles and practice of evidence-based medicine using the eGranary digital library in conjunction with synthesized evidence reference tools. The digital library was then installed for use by medical students and faculty at the School of Medical Sciences and Komfo Anokye Teaching Hospital in Kumasi, Ghana. Africa Partners Medical faculty members have been impressed by the high level of interest shown by students and faculty participating in workshops on evidence-based medicine and on the use of digital library materials to develop best practices in delivery of care.

CLINICAL REFERENCE TOOLS AS A SOLUTION

Connectivity obstacles can also be overcome by placing clinical reference tools designed for point-of-care use by physicians on their local servers and in their hands. Designed for use on personal digital assistants, these digital reference tools allow the health care professional to answer many clinical questions at the patient's bedside. In studies in the United States, these tools have been shown to improve clinical decisions and answer the clinical questions of users more efficiently.[5] At its most recent conference, the Africa Partners Medical team used 2 of these tools

(DynaMed [EBSCO Publishing, Ipswich, Mass] and Info-Retriever [John Wiley & Sons, Inc, Hoboken, NJ]) to teach African health care professionals, residents, and students the fundamentals of evidence-based medicine. Using these resources, physicians can review a critical appraisal of the literature and take advantage of a number of useful clinical decision tools, such as links to original articles and full access to the abstracts of Cochrane Library reviews. Workshop participants indicated that the use of handheld devices equipped with such resources would improve the care that they delivered to their patients.

IMPROVING THE AVAILABILITY OF MEDICAL CONTENT FOR DIGITAL LIBRARIES

Medical content in the digital libraries is not always current. For example, the current eGranary implementation has a variety of materials including the Virtual Hospital Web site developed at the University of Iowa (but which, unfortunately, is no longer being updated), materials from the Cochrane Collaboration, and materials from e-TALC (sponsored by the organization Teaching-aids At Low Cost). These resources include abstracts from the Cochrane Collaboration on Evidence-Based Medicine, *Community Eye Health Journal*, and numerous Web sites, CD-ROMs, and journals addressing primary trauma care and management of human immunodeficiency virus/acquired immunodeficiency syndrome. However, since the current eGranary is a general educational implementation that is not specifically focused on health information, medical journal content is limited. That medical content could be substantially enhanced using the large number of available digital medical resources.

In one model currently under discussion, a separate eGranary hard drive would be developed exclusively for the medical teacher and researcher, but it would integrate seamlessly into a standard eGranary server. This model would allow The WiderNet Project to provide medical schools with wide access to journals without overloading other subscribers with content they are less likely to use. This limited distribution model may also be more attractive to publishers concerned with the unregulated dissemination of their intellectual property. The content can be encrypted so that it can only be accessed from a server with a current key code, with each access tracked and reported.

The HINARI program, set up by WHO together with major publishers, enables developing countries to gain access to one of the world's largest collections of biomedical and health literature, which includes more than 3500 journal titles now available to health institutions in 113 countries. This is a testament to the inherent philanthropic and "good citizenship" interests of the medical publishing community. The eGranary team is currently working with

WHO and the US National Institutes of Health to identify a strategy for making more medical information available through eGranary. Recently, *Mayo Clinic Proceedings* granted eGranary access to its entire digital archive.[6]

Care must be taken in selecting the most appropriate content for medical personnel and other users in developing countries. Whereas medical journals are in high demand for the academic researcher and clinician, educators also require content optimized for teaching nurses, medical students, residents, and fellows. Health care professionals need continuing education materials that summarize recent research and make it relevant for them and their practices. Students would benefit from tutorials and resources that would allow them to explore their chosen fields and identify potential specialties. Patients and their families need educational materials focused on their particular diagnoses so they can care for themselves or their loved ones. Thus, clinical reference collections need to be targeted to specific user groups. The WiderNet organization and its partners are currently compiling collections of patient education materials including brochures, posters, handbooks, videos, and curricula that can be used by clinics and schools in developing countries.

SUMMARY

The digital library model represents an opportunity to make an exponential advance in providing high-bandwidth access to critically needed health care information at a relatively low cost. Journal editorial boards and medical publishers have expressed their enthusiastic support for the digital library model in developing countries. In appropriate settings, handheld tools with access to synthesized medical information can also facilitate the provision of high-quality evidence-based medicine. One of the purposes of this commentary is to stimulate additional support and innovation around these concepts. As Dr Larry Ebert, one of the founders of Africa Partners Medical, often stated, "No one of us can solve the immense health care needs of the African continent, but together we can make a difference." Working together, medical publishers, medical educators, and computer technologists can improve access to current medical literature and thereby improve the delivery of quality health care in less-developed countries around the world.

REFERENCES
1. Pakenham-Walsh N, Priestley C, Smith R. Meeting the information needs of health workers in developing countries [editorial]. *BMJ*. 1997;314:90.
2. Godlee F, Horton R, Smith R. Global information flow [published correction appears at: http://bmj.comcgi/content/full/321/7270/1198/a] [editorial]. *BMJ*. 2000;321:776-777.
3. Aronson B. Improving online access to medical information in low-income countries. *N Engl J Med*. 2004;350:966-968.
4. Katikireddi SV. HINARI: bridging the global information divide. *BMJ*. 2004;328:1190-1193.
5. Alper BS, White DS, Ge B. Physicians answer more clinical questions and change clinical decisions more often with synthesized evidence: a randomized trial in primary care. *Ann Fam Med*. 2005;3:507-513.
6. Lanier WL. *Mayo Clinic Proceedings* 2007: enriching our service to authors and readers [editorial]. *Mayo Clin Proc*. 2007;82:16-19.