Medical Librarian Rounding with an iPad

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Abstract

Beginning in July 2011, a medical librarian has accompanied physicians and students during rounds on the pediatric and neonatology units of the University of Illinois Medical Center. The librarian was invited as a direct result of her six-year involvement in the Evidence-Based Medicine initiative conducted by a pediatric attending and a professor in the Department of Medical Education. In order to facilitate reference provision in the hospital ward environment at the point of care, the librarian chose to use an iPad. Chapter 4 of Library Technology Reports *(vol. 48, no. 8) "Rethinking Reference and Instruction with Tablets" includes a description of the library and hospital context, a brief explanation of the clinical librarian and newly evolving informationist roles, the advantages that a tablet brings to the situation, specific downloaded applications that have proved helpful, and insights gained by her experiences in the hospital as part of the caretaking team.*

About the Author

Cleo Pappas is an assistant information services librarian and associate professor at the University of Illinois at Chicago Library of the Health Sciences. Her interests include evidence-based practice, clinical librarianship, librarians in medical education, and health literacy. In addition to her role as a clinical librarian, she is a wife, mother, grandmother, and fond companion to several Bichon Frises and Asian parrots.

Introduction and Context

The University of Illinois at Chicago (UIC) is located in the heart of urban Chicago. One of the top 200 research institutions in the world, UIC serves 16,911 undergraduate students and 10,669 graduate and professional students.[1]

The west campus of UIC sits in the heart of a huge medical district that includes the University of Illinois Hospital & Health Sciences System (UIHHSS), Rush Hospital, Stroger Hospital, and the Veterans Administration Hospital. In June 2011, Children's Hospital of University of Illinois (CHUI) celebrated its grand opening. Situated within UIHHSS, CHUI currently consists of a neonatal intensive care unit (NICU), a pediatric intensive care unit (PICU), and an inpatient pediatric floor. Plans are being developed to create a dedicated adolescent care unit.

The Library of the Health Sciences (LHS) was opened in 1973. Located on the west campus of UIC within the medical district, the 90,000 square foot building serves the College of Medicine, the College of Dentistry, the College of Nursing, the College of Pharmacy, and the College of Public Health. Because the library enjoys the status of a college within the university, librarians who are hired at the assistant professor rank pursue tenure-track requirements to gain permanent status with associate professor rank.

Project Background and Clinical Librarianship

During July 2011, a pediatric attending physician who supervises residents and medical students invited a librarian from LHS to attend rounds on the pediatric floor of CHUI. The librarian had been involved in the teaching of evidence-based medicine (EBM) to pediatric residents for six years and had subsequently

precepted critical appraisal sessions with the residents during morning report. The pediatric attending who issued the invitation had read the article by Davidoff and Miglus that argues convincingly that the presence of a librarian on hospital rounds is a meaningful and practical information-delivery system, a system that can "take into account the multidimensional nature of action-related patient care questions."[2] Essentially, EBM is "the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients,"[3] and the pediatric attending requested the librarian's presence on rounds in order to implement, in his words, "full-service EBM." The practice of evidence-based medicine means "integrating individual clinical expertise with the best available external clinical evidence from systematic research."[4] EBM encourages physicians to delve into medical literature for solutions to the conditions they encounter in their patients, while the role of the librarian in the EBM process is to assist in the search and to appraise the information conveyed in the retrieved articles according to study reliability and validity.

The presence of a librarian on rounds is an intervention called clinical librarianship. One formal definition of clinical librarianship is "the provision of information quickly to physicians and other members of the healthcare team; to influence the information seeking behaviour of clinicians and to improve their library skills; and to establish the medical librarian's role as a valid member of the health care team."[5] Clinical librarianship is point-of-care librarianship. Clinical librarians attend morning report, serve on hospital committees, or perform searches at the bedside. Clinical librarianship began in the 1970s with a program initiated by Dr. Gertrude Lamb and funded by a National Library of Medicine (NLM) grant.[6] It exists today in a variety of forms and on a continuum of service. Some librarians make themselves available to a clinical unit, familiarizing themselves with the vocabulary and most frequent clinical questions. They may take the questions by means of e-mail, telephone, or even instant messaging. Others actually visit patient rooms with the rounding team, either answering questions on the spot or accumulating them to search, synthesize, and distribute later.

Currently, there is a discussion in library literature regarding the evolution of the clinical librarianship role into the role of informationist. Although the definition of informationist remains ambiguous, it connotes a librarian's subject expertise in addition to a librarian's honed search skills. Some literature includes examples of informationists who have dual degrees, an undergraduate degree in biology, for example, in addition to the master's in library science.[7] Other examples include registered nurses who also have graduate degrees in library science or medical librarians who are also physicians. The informationist movement has inspired an awareness of the importance of keeping current within the context of the subject matter of the patron base. In order to do this, librarians may take continuing education classes in their subject matter in addition to library science or attend medical or nursing conferences in addition to librarian conferences. They may attend morning reports that have an instructional purpose, or they may ask to attend lectures given by attendings on topics suggested either by patients currently in house or on areas identified as weak by board scores.

The LHS librarian rounds with a supervising attending physician, residents, and medical students at the bedside of pediatric patients four mornings a week, alternating between the NICU and pediatric inpatient floor. In addition, she attends morning report and grand rounds. During morning report, residents present a teaching case to their peers and medical students who are currently rotating through pediatrics. Morning report has been described as an episode of *House* where a clinical problem is presented and participants ask questions, develop potential diagnoses (known as differential diagnoses), and suggest tests that will rule out some ideas and point to the treatments that will help the patient. Morning report begins with a wide spectrum of possibilities and gradually narrows down what the patient is experiencing by a process of elimination. The purpose of attending morning report for the librarian is to learn the processes, thinking patterns, and common syndromes and diseases pediatricians confront on the wards.

Grand rounds is a hospital-wide event attended by anyone who works in the hospital and with a previously announced theme and advertised expert speaker. In the rounds, the role of the LHS librarian is to follow and contribute to the presentation of the case. For example, if a child is admitted for suspected bronchiolitis, she will look that term up in one of our subscription databases and read along as the resident is presenting. Subscription databases also offer differential diagnoses for a variety of symptom combination presentations. If the attending asks, "What do you think is going on here?" and the residents omit an important potential diagnosis, the LHS librarian might suggest it. Additionally, when an attending asks a resident a question and the resident answers, it is not unusual for the attending to ask if the answer can be confirmed in the literature. After rounds, the LSH librarian will e-mail the attending and residents seminal articles on diseases or syndromes they have encountered. The time commitment is approximately three to four hours a day, four days of the week. This twelve to sixteen hour estimate does not include the time spent on mediated searches upon return to LHS, which can run anywhere from thirty minutes to several hours, depending on the complexity of the cases.

Integrating the iPad and Other Mobile Resources

Previously, the LHS librarian had used a laptop, netbook, and smartphone while attending morning report and morning rounds in order to augment her ability to provide information to attending physicians, residents, and medical students. She became increasingly aware of the difficulties of using these devices while walking during the rounds: the devices were either uncomfortable to hold or had a screen too small to read quickly or be shared with a group. However, in November 2010, residents at the University of Chicago participated in what has become a very successful iPad initiative. Early reports indicated that the young doctors could work faster and had more time for face-to-face interaction with their patients.[8] Because of initial anecdotal reports emanating from this study and because of the device's portability, weight, screen size, and battery life, the iPad seemed like an ideal solution to the LHS librarian.

The librarian's first tablet purchase for rounding was a Wi-Fi + 3G iPad with 32 GB of storage. Because the librarian wanted to use the iPad for personal as well as professional use, it was purchased with personal funds. The 3G enabled the librarian to access e-mail and a daily schedule during morning commute time prior to arriving at the hospital. When the third-generation iPad became available with 4G, she traded in the previous unit to have faster connectivity.

One of the first and most effective contributions the librarian offered to the residents was the compilation of all the library resources pertinent to pediatrics and neonatology into a single LibGuide. LibGuides enable librarians to create a single portal that includes proprietary resources as well as the integration of live chat and vetted free online resources with a single URL and are easily accessed with an iPad. The LibGuide enables pediatric residents to find the tools they need for their various rotations in a single web page on whatever device they use, be it a tablet, smartphone, netbook, or desktop computer. A further advantage to the LibGuide format is the ability to link to other LibGuides on various topics. For example, following a morning report discussion regarding the ethics involved in discontinuation of care and futility of treatment, the librarian linked the clinical bioethics LibGuide to the pediatrics guide, thus enabling the pediatric residents to access the information via their already-bookmarked pediatrics LibGuide.

Mobile Access to Medical Literature

The library offers many medical databases, e-journals, and e-books, and, for the pediatrics LibGuide, the librarian selects those that deal with pediatrics and neonatology. Favorite tools the library subscribes to include AccessPediatrics, the Harriet Lane Handbook, the Red Book, DynaMed, and UpToDate. In addition, the LibGuide contains subsets of resources that deal with frequently recurring topics, such as necrotizing enterocolitis, neonatal resuscitation, and HIV/AIDS. The LHS pediatrics LibGuide is available online.

LHS Pediatrics LibGuide
http://researchguides.uic.edu/content.php?pid=256170&search_terms=pediatrics

The biggest challenge with point-of-care research is access to medical literature and other information, particularly MEDLINE, in a mobile format. There are many applications designed for this purpose, just as there are many opinions as to the value of the various formats. The librarian on rounds is working under pressure, and the easiest format to use is the one she uses most often, the full PubMed site.

The National Library of Medicine maintains an online Gallery of Mobile Apps and Sites. Here, users can find PubMed, LactMed, TOXNET, DailyMed, and Health Hotlines, a directory of organizations with toll-free telephone numbers. Health Hotlines is an authoritative resource for anyone dealing with a chronic disease, domestic abuse, alcoholism, or other situations that require support.

NLM Gallery of Mobile Apps and Sites
www.nlm.nih.gov/mobile

Because the iPad allows direct access to PubMed, the LHS librarian chooses to use the full site rather than the mobile site and has the most success with e-mailing article abstracts in the HTML format to the attending or residents while on the floor. The HTML format includes the link to the library's proxy server, so the recipient can, upon receiving the e-mail, link to the full text. Fellows and residents have provided anecdotal evidence that they, too, prefer going to the full site rather than a mobile version. The librarian uses it because of the proxy capability, but it is possible that the young doctors who are so pressed for time simply do not want to deal with a learning curve, no matter how slight, or with the possibility of missing an important article because of minimized search capabilities that are part of the PubMed mobile site. Mobile sites are ideal for smartphones, where the size of the screen limits what can be viewed, but the iPad screen is well suited to the full application of PubMed.

Mobile Diagnostic and Statistical Tools for EBM

There is a strong emphasis on EBM in the pediatric residency at UIC. Several morning reports per month are devoted to the concepts and processes involved, and the department is currently researching the efficacy of team-based learning in conveying EBM to residents. Professor Alan Schwartz of the Department of Medical Education at UIC has prepared a suite of online diagnostic tools that assist in the calculation of number needed to treat, confidence intervals, and likelihood ratios. Dr. Schwartz's entire suite of tools can be accessed on the UIC website, and a mobile version is also available.

Dr. Schwartz's online diagnostic tools
http://ulan.mede.uic.edu/~alansz/tools.html

Mobile version of diagnostic tools
http://araw.mede.uic.edu/mtestcalc.html

Number needed to treat (NNT) is a statistical calculation based on randomized controlled trials that tells a clinician how many patients need to take a drug for one person to receive a benefit. Its utility is contextual to the individual situation. For example, if a drug has few side effects and is relatively inexpensive, an NNT of 5 is reasonable. If the drug has serious side effects, is very expensive, and is unlikely to be covered by the patient's insurance, an NNT of 5 may give the physician serious reservations. "The NNT, Explained" is an accessible, visual online explanation of number needed to treat. The four-minute YouTube video pulls up nicely on an iPad; however, should hospital IT security prevent YouTube access, hardware with 3G capability should be able to allow viewing.

The NNT, Explained
www.thennt.com/the-nnt-explained

Dr. Schwartz's tools explain and allow computation of confidence interval. The confidence interval tells the physician the range likelihood that a patient will receive a benefit of a drug. The confidence interval is directly related to the size of the sample tested in the randomized controlled trial of the drug. The larger the sample size, the smaller the confidence interval. It is risky to prescribe a drug in which a patient has anywhere from a 25 percent to 90 percent chance of improvement. The side effects of the drug, its expense, the interruption to the patient's life, and the probability of the patient's compliance all come into play. However, if the confidence interval is between 80 and 90 percent that the patient will receive a benefit, the drug may prove a good choice.

Another calculation Dr. Schwartz's tools allow is likelihood ratios. Likelihood ratios are used when analyzing the results of diagnostic tests. Literally, they tell us if a test is positive, how likely is it that the patient really does fall into the group of patients that have the disease. Consumers assume that diagnostic tests and drug therapies are infallible, but clinicians rely on medical literature to tell them how reliable these interventions are. Having diagnostic tools right at your fingertips impacts the decision-making process of clinicians and aids them in choosing stronger, evidence-based solutions.

Furthermore, the FDA provides a free, downloadable PDF version of *Communicating Risks and Benefits: An Evidence-Based User's Guide.* The book may be opened in a PDF reader such as GoodReader or PDF Reader Pro for a portable reading experience. Although PDF Reader Pro is pricey at $9.99, it is a powerful tool for organizing material into folders, renaming files, and e-mailing files.

Communicating Risks and Benefits: An Evidence-Based User's Guide
www.fda.gov/AboutFDA/ReportsManualsForms/Reports/ucm268078.htm

Other Mobile Tools for Pediatric Care

In addition to utilizing diagnostic and statistical mobile tools in order to participate in the full-service EBM that she works toward, the LHS librarian uses and recommends several more mobile tools for pediatric care. These tools include LactMed, DIRLINE, and Carb Counting with Lenny. Each of these resources is free or provides a free app for easy use within the clinical setting.

The focus of LactMed is on the clinician and the nursing mother. Doctors use it frequently when dealing with neonates whose mothers have ingested legal or illegal drugs prenatally and in determining the safety of drugs and breastfeeding. The full site offers free, downloadable apps for both the iPhone and Android devices. The full report of a drug includes references with live PMIDs to PubMed article abstracts. PMIDs are the unique identifying number assigned to every article in PubMed. It can be thought of as a fingerprint.

LactMed
www.nlm.nih.gov/news/lactmed_announce_06.html

DIRLINE is another database provided and maintained by the National Library of Medicine. DIRLINE

is a directory of health organizations. It is particularly useful for pediatricians who may need to suggest a support group to the parents of children with chronic situations such as attention deficit disorder or cerebral palsy.

DIRLINE full site
http://dirline.nlm.nih.gov

DIRLINE mobile site
http://toxnet.nlm.nih.gov/pda/dirline.htm

Carb Counting with Lenny is a nice online tool to suggest that doctors recommend to pediatric diabetics who are beginning to monitor their own glucose levels and who sometimes resist their caregivers' attempts to monitor their diets. Lenny the Lion offers games and pictures of popular foods with associated carbohydrate content. It is available for download on both iPhone and Android. A one-minute video introduction is also available online.

Carb Counting with Lenny introductory video
http://medgadget.com/2010/08/carb_counting_with_lenny_from_medtronic.html

Managing Mobile Information

While many of the tools described here will allow users direct access to mobile information that ultimately enhances clinicians' and patients' experiences, managing and disseminating that information can sometimes be a bit frustrating. In particular, e-mailing, organizing, and storing documents on the iPad can present unique challenges to a librarian participating in rounding or other situations involving EBM.

Always on the go, the LHS librarian often e-mailed information to a resident or to an attending without paying close attention to the keyboard on the iPad; sometimes the autocorrect function would e-mail information to an incorrect e-mail address that it had constructed. Somewhere on campus there may be a person who has regularly received PubMed citations about self-mutilation or sexually transmitted diseases with annotations like "We talked about this this morning" or "This might help." In these sorts of situations, disabling the autocorrect function is definitely recommended. Instructions on how to disable autocorrect on the iPad or iPhone can be found through Apple user communities and other technology-oriented websites.

Despite the many free applications for storing documents on an iPad, nothing available to date can match the versatility and intuitive interface of PDF Reader Pro for reading, storing, organizing, or e-mailing PDF documents. It is a relatively expensive app ($9.99), but with the tool bar, the help manual, and the ability to rename files quickly and easily, it turns the iPad into a full-service device. When a librarian performs a search on the fly during rounds and needs to get the retrieved article disseminated quickly to the attending, residents, or medical students involved, nothing equals or surpasses PDF Reader Pro in ease or speed. The ability to rename PDF articles is vital because, often, when PDFs are retrieved from various databases, their titles reflect an alphanumerical jumble that was generated by the database. It is important, then, for organization and retrieval, that the renaming process be quick and simple.

Staying Up to Date on Mobile Resources

The mobile world is fluid, ever-changing, and evolving. It is helpful to have a few dependable resources to check regularly just to make sure that when a new tool becomes available, the librarian can both become aware of its introduction and read a reliable evaluation. Michelle Kraft's blog, *The Krafty Librarian,* keeps lists of iPad apps. Additionally, iMedicalApps is a website authored and edited by medical professionals especially as a reference for other medical clinicians, medical consumers, and analysts. The site bases its evaluations on direct experience within hospitals and other medical settings and is organized by device, application type, or medical specialty. The EBM Librarian, a highly specialized and comprehensive website, offers tutorials, notification of conferences and meetings, news, seminal articles and studies, and sources for teaching scenarios. Connie Schardt of Duke University and Karen Odato of Dartmouth College maintain EBM Librarian. For a comprehensive and systematic list of mobile applications, see Susan Fowler's LibGuide, Mobile Medicine.

The Krafty Librarian
http://kraftylibrarian.com/?cat=23

iMedicalApps
http://www.imedicalapps.com/about

EBM Librarian
https://sites.google.com/site/ebmlibrarian

Mobile Medicine LibGuide
http://beckerguides.wustl.edu/content.php?pid=92697&sid=1542827

Conclusion and Future Implications

"When you first came, we did not know what to do with you. . . . now we have many good ideas," stated one department head when the LHS librarian's work at the hospital had reached its eighth month. At that point in time, the LHS librarian and her library supervisor met with the head of the hospital, the head of the neonatology unit (NICU), the directors of the residency program, and the chief residents to discuss and assess the impact of the librarian's involvement and the success of her rounding with a mobile device. The results of the meeting reaffirmed the value placed by the doctors on the nascent program and, ultimately, has led to several research collaborations between the librarian and the hospital.

The librarian and her colleagues are considering several different perspectives as they assess the impact of her involvement. The director of the children's hospital has stated she wants to measure the extent that librarian involvement increases the level of intellectual discourse during morning report and on rounds; therefore, the residents will look to see if there is a correlation between rounding with the librarian and an improvement in board scores. The director of the NICU is initiating a plan whereby the levels of evidence of typical NICU interventions will be analyzed to determine if they arise from consensus, guidelines, or evidence.

Furthermore, one of the attending physicians invited the librarian to present with her at a national pediatric hospital conference. The topic of the presentation, which was enthusiastically received by attendees, was "Novel Rounding Methods." The head of the NICU has listed the librarian as a consultant to the neonatology fellowship. This formalizes the role of the librarian within the fellowship program and is used as an additional incentive to encourage pediatric residents to enroll in the fellowship. None of these research, presenting, and publishing opportunities would have occurred had the librarian not been a visible, mobile presence in the hospital.

Notes

1. "UIC Today," University of Illinois at Chicago, accessed August 31, 2012, www.uic.edu/uic/about/UICtoday/index.shtml.
2. Frank Davidoff and Jennifer Miglus, "Delivering Clinical Evidence Where It's Needed: Building an Information System Worthy of the Profession," *Journal of the American Medical Association* 305, no. 18 (May 11, 2011): 1907.
3. David L. Sackett, William M. Rosenberg, J. A. Muir Gray, R. Brian Haynes, and W. Scott Richardson, "Evidence Based Medicine: What It Is and What It Isn't," *BMJ* 312, no. 7023 (January 13, 1996): 71.
4. Ibid.
5. K. Cimpl, "Clinical Medical Librarianship: A Review of the Literature," *Bulletin of the Medical Library Association* 73, no. 1 (January 1985): 23.
6. Ibid.
7. Frank Davidoff and Valerie Florance, "The Informationist: A New Health Profession?" *Annals of Internal Medicine* 132, no. 12 (June 20, 2000): 996–998.
8. Bhakti K. Patel, Christopher G. Chapman, Nancy Luo, James N. Woodruff, and Vineet M. Arora, "Impact of Mobile Tablet Computers on Internal Medicine Resident Efficiency," *Archives of Internal Medicine* 172, no. 5 (March 12, 2012): 436–438, doi:10.1001/archinternmed.2012.45.