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# Medical informatics education: an alternative pathway for training informationists

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Recognition of the growing complexity of health information needs has led to a call for the creation of a new health care professional, the informationist. Controversy exists as to the role of such individuals and what their training should be. A library science degree, augmented with clinical background or experience, is one pathway. Another to consider is training in medical informatics. With the right coursework, individuals trained in medical informatics should be equally well qualified to assume the role of informationists.

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## INTRODUCTION

The call for creating new health care professionals devoted to the information needs of the clinical team has created a stir in the medical library community. With the growth of end-user searching tools, relatively inexperienced users can now obtain access to essentially all the clinical information previously available only to those who worked in libraries. Furthermore, as it becomes clear that physicians have frequent information needs (on the order of two questions per three patients) [1], economics alone clearly dictate that librarians will be unable to take part in most clinical information seeking.

There will be instances, of course, when the services of information professionals will emerge as an important part of the clinical team, particularly in critically ill hospital patients. For these instances, Davidoff and Flornace have argued that a new professional, the informationist, must emerge [2]. The medical library community has responded by touting the virtue of clinical librarianship and affirming the value of library science training [3].

While the value of librarians to the information milieu of medical centers is unquestioned, it is not clear that clinical librarianship represents the only path to training informationists. Another path to consider for training such individuals is through education in medical informatics. Librarians' responsibilities and skills cover a broader range of institutional functions than the needs that would be met by informationists. Building and managing collections, supporting broad ranges of user services to diverse populations, and provid-

ing prudent fiscal management for their institutions' information resources are part of the overall role of librarians, but may not be required of all informationists. On the other hand, some of the unique aspects of medical informatics do address their specialized roles. While medical informatics and library science are not mutually exclusive (indeed our medical informatics training program at Oregon Health & Science University [4] has funding from the National Library of Medicine to provide fellowships for librarians), the majority of individuals who seek medical informatics training are not librarians. Not only is medical informatics training an alternative pathway for the required skills of informationists, but, in fact, individuals do not have to be librarians to become informationists.

## BACKGROUND ON MEDICAL INFORMATICS TRAINING

Medical informatics is the field concerned with acquiring, storing, and using information in health care, usually (but not always) involving the application of information technology [5]. It is a broad, multidisciplinary field, covering electronic medical records, access to knowledge-based information and digital libraries, digital imaging systems, telemedicine, clinical decision support, and more. Closely related to medical informatics (or perhaps a part of medical informatics) is evidence-based medicine (EBM), which focuses on creating tools to access and apply the best evidence for making decisions about patient care [6].

The boundaries of medical informatics are fuzzy. Are individuals who work in information technology

departments of medical centers medical informaticians? Are librarians informaticians? Are individuals who do research, performing complex analyses of the output of gene microarrays, informaticians?

Because of these fuzzy boundaries, there is no common medical informatics curriculum, nor any common job that anyone with training in the field could hold. (There probably is a core curriculum in medical informatics, but that is the topic of a different paper.) The lack of a common skill set and curriculum is different from librarianship or medicine, where there are basic skills that all with library science or medical degrees, respectively, can be expected to have.

Most training in medical informatics is provided by the dozen programs funded by the National Library of Medicine (NLM).<sup>\*</sup> A majority of trainees in these programs are postdoctoral, who often, but not always, have medical doctor degrees. A growing number of programs also offer academic degrees, either at the master's or doctoral level, in medical informatics or a related field, such as computer science, intelligent systems, or systems science. In most postdoctoral programs, the degree is optional.

There are additional routes for medical informatics training that do not require residence at an NLM-funded program. There are also a growing number of institutions without NLM funding that offer degree programs in medical informatics. Another pathway to training in medical informatics is the short course, with the offerings by NLM and Stanford University the best-known programs. Some institutions also offer more clinically focused training, such as the continuing medical course for clinicians at Oregon Health & Science University (OHSU), "Using Computers to Solve Clinical Problems."<sup>†</sup> A more recent phenomenon is the development of distance-learning programs in medical informatics, such as the graduate certificate program offered by OHSU.<sup>‡</sup>

There are also programs that offer training in informatics that substitute other adjectives in place of "medical" in front of "informatics." There is a long tradition, for example, of nursing informatics programs that focus on information issues for nurses. There are likewise programs in dental informatics that focus on issues for dentistry. More recent is the growth of bioinformatics, poised to expand dramatically due to recent infusions of funding from the National In-

stitutes of Health. Bioinformatics focuses on informatics issues related to molecular biology and genomics.

A brief discussion of the master's of science in medical informatics program at OHSU indicates why such training can suitably prepare individuals to become informationists.<sup>§</sup> The OHSU program traces its lineage to the early trail blazers in the field, particularly Stanford University and the University of Utah. One divergence from these leaders is more emphasis on preparing professionals (as opposed to researchers), although the OHSU program is flexible enough to allow those interested in research careers to pursue them, particularly if they already have doctoral training in another field.

The OHSU program has courses in four major areas: medical informatics, health and medicine, computer science, and quantitative methods. The medical informatics courses cover the core of the field. An introductory survey course broadly covers the main areas of information and information technology applications in health care. A following course, "Clinical Systems," covers the issues surrounding patient-based information in health care, with particular focus on the electronic medical record. A third core course, "Information Retrieval," focuses on knowledge-based information, including the use of resources likely to be of great use by the informationist, such as MEDLINE and evidence-based compendia. The OHSU program may be somewhat anomalous in having an entire course on information retrieval, but most programs cover at least the basics of this area.

There are additional required courses in the medical informatics area. Courses in organizational behavior and management and project management teach students how to function in organizations and work as teams. A scientific writing course ensures that students are capable of written communication. There are also electives in other medical informatics areas, such as security and confidentiality, implementation of clinical systems, and individual research or practicum experiences arranged by the students.

The health and medicine area of the curriculum covers clinical medicine topics for those without clinical backgrounds. Students take part in portions of the principles of clinical medicine offered to OHSU medical students in their preclinical training [7]. This area of the curriculum also includes a course in ethical, legal, and social issues in informatics required of all students.

As with most medical informatics training programs, computer science is a required element of the curriculum. OHSU faculty believe that, while few of the graduates will become programmers (unless they

<sup>\*</sup> Information about the National Library of Medicine (NLM) programs may be viewed at [http://www.nlm.nih.gov/ep/curr\\_inst\\_grantees.html](http://www.nlm.nih.gov/ep/curr_inst_grantees.html).

<sup>†</sup> The Website for the Oregon Health & Science University (OHSU) course, "Using Computers to Solve Clinical Problems," may be viewed at <http://www.ohsu.edu/bicc-informatics/cme/>.

<sup>‡</sup> The Website for the OHSU distance-learning program may be viewed at <http://www.ohsu.edu/bicc-informatics/distance/>.

<sup>§</sup> The Website for the OHSU medical informatics program may be viewed at <http://www.ohsu.edu/bicc-informatics/ms/>.

had programming skills prior to entering the program), all of them should have a fundamental understanding of the computer science issues most relevant to medical informatics. They should also be able to converse as colleagues with programmers and other technicians who work with information technology. The OHSU computer science sequence focuses on basic computer programming, database organization and querying, and computer network operations. A recent survey of graduates, few of whom do significant computer programming, confirmed the value of this portion of their education [8]. Students seeking more advanced courses in computer science can take courses offered by the Department of Computer Science and Engineering in OHSU's School of Science and Engineering.

The final area of the curriculum is quantitative methods. The goal of this portion of the curriculum is to provide skills in and understanding of carrying out research and analyzing clinical data. After a first course in biostatistics, a second course covers the fundamentals of research design. A third course is devoted to outcomes research, surveying the variety of ways that the outcomes of clinical care are analyzed and compared. An additional elective covers medical decision making.

While other medical informatics programs organize their courses and subject areas differently, it is likely that most follow, or at least allow, a similar course of learning. Such training should allow individuals to pursue careers as informationists.

## MEDICAL INFORMATICS TRAINING AND THE INFORMATIONIST

Medical informatics trainees are not uniquely qualified to serve as informationists. However, medical informatics training can serve as another pathway to training the informationist. Individuals so trained are as well qualified to serve as informationists as those with library science training.

Is informatics training sufficient for informationists? To answer this, the skills required of informationists must first be examined. Clearly, such individuals must be aware of the vast array of information resources and the ways to access them. They must be familiar with medical journals, literature databases, medical textbooks, practice guidelines, and the growing number of "synthesized" evidence-based resources, such as the Cochrane Database of Systematic Reviews\*\* and Clinical Evidence.†† Informationists must know not only what these resources are but also work with the ad-

ministration of their institutions to obtain access to them. They must also have expertise in searching these resources, from effectively using the Medical Subject Headings (MeSH) vocabulary to skillfully querying full-text resources that are not manually indexed.

The skills in the previous paragraph are what would be expected from any well-trained librarian. But informationists require more skills. They must also have some familiarity with the clinical setting. Background in a clinical area (e.g., medicine or nursing) is very helpful but not essential. However, some basic understanding of human health and disease, along with a perspective on how the health care system and the professionals within it function, are paramount. Also required is an understanding of EBM, including the ability to phrase an answerable question, locate and retrieve the best evidence, and critically appraise and apply it.

Graduates of the OHSU medical informatics program, and likely graduates of most any other medical informatics program with the proper coursework, would be capable of performing all of the tasks in the prior two paragraphs. OHSU's "Information Retrieval" course teaches the skills of being able to identify and search appropriate resources. The clinical background is present by virtue either of past clinical training or the "Principles of Clinical Medicine" course. Training in EBM is received in the introductory medical informatics course as well as throughout the quantitative methods sequence. The ability to function as part of a team is grounded in the "Organizational Behavior & Management" course.

This author can speak to the skills required of informationists not only as the head of a medical informatics training program, but also as an employer of an informationist. My institution has recently established a Web-based, asynchronous clinical consultation service that allows physicians in rural areas of Oregon to ask questions of specialists at OHSU, aiming for a turnaround time of one business day. Funded in part by the Eugene Garfield Foundation, the goal of this project is to determine whether such a service is valuable and cost effective without placing an undue burden on the specialists, who must take time from their already busy days to answer the questions. Another goal of the system is to reduce the cost and burden of the current phone-based consultation system, whose synchronous nature is an obstacle for both users of the service and the specialists who answer the questions. The informationist plays a key role in this project. The informationist triages the question to the appropriate specialists, interacts with them to obtain the answer, and provides assistance in designating appropriate resources (journal literature or otherwise) to back up the answers to the questions. This position requires a variety of technical, clinical, and organizational skills.

\*\* The Website for the Cochrane Database of Systematic Reviews may be viewed at <http://www.cochrane.org>.

†† The Website for Clinical Evidence may be viewed at <http://www.evidence.org>.

## CONCLUSIONS

As stated in the introductory article to this series, the need to provide information to clinicians and patients has never been stronger [9]. With growing concerns about the quality of health care as well as the patient experience when receiving that care, the ability to access the best information in a timely manner is paramount. One way to facilitate this process is through the training of informationists, individuals who have the skills to find appropriate information, extract the best evidence, and assist clinicians and patients in applying it to make the best decisions.

Clearly one pathway for training informationists is to augment the skills of traditional library science training with additional material in EBM, as well as the basics of clinical medicine and health care organization. A growing number of library science programs are already doing this. But another pathway to training informationists is via training in medical informatics. As long as there has been adequate instruction in information retrieval and EBM, along with either a background or additional training in clinical medicine and health care organization, individuals with training in medical informatics are equally well qualified to be informationists.

In light of the fact that the need for individuals with the skills of informationists will only increase as the volume of medical knowledge grows and as more educated patients demand a voice in their care, it is important to go beyond arguing whether or not a library science or a medical informatics background is the "best" training. Library science and medical informatics have developed as intersecting fields with similar interests but significant divergences in scope and activity. While the problems they seek to address are

related, they operate in independent spheres, both of which are relevant to the problem of getting the right information to busy clinicians at the point of need. We now have an opportunity for the two fields to work together to identify the appropriate skills for informationists and ensure that individuals of either training experience can apply and teach them effectively.

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