

Should Medical Schools Incorporate Formal Training in Informatics?

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Are we preparing future generations of physicians with the skills to practice in the information age? Has the health care IT industry matured to the stage that we can standardize training physicians in how to search and synthesize massive databases of clinical information and tease out complex diagnoses based upon scant information? Will literacy in information technology become a differentiator between physicians' abilities? For the proposition of changing existing curriculum in medical schools to incorporate formal informatics training is Michael Chen, a second year medical student at the University of Maryland School of Medicine. Taking the opposing position is Nabile Safdar, M.D., assistant professor of radiology at the University of Maryland School of Medicine.

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OPENING STATEMENT

Medical Informatics in Modern Health Care

Over the last two decades, medical informatics has emerged as a critical new tool in the physician's arsenal. Indeed, to a growing number of medical practices, it is every bit as important as the stethoscope. It has been integrated into virtually every area of medicine, but none more so than in radiology, which has become an almost entirely digital practice where computer literacy is mandatory. Medical informatics, which can be broadly defined as the storage, retrieval, and application of medical data and knowledge, has become widespread in recent years due to its efficiency, to advances in technology, and to the movement toward "evidence-based medicine." It grants physicians access to a wealth of information at their fingertips and emphasizes the importance of analytical skills over rote memorization. More importantly, it also helps physicians quickly and

confidently sort through this otherwise overwhelming volume of information. With recent federal mandates for adoption of computerized patient records and other medical technologies, informatics will only play an increasing role in the delivery of care.

A 2009 study found that physicians in IT-rich countries, such as the UK and The Netherlands, were significantly more confident in their ability to provide quality care, follow clinical guidelines, and maintain proper documentation.¹ Yet, only 19% of PCPs in the USA report high IT functionality compared to 83% in the UK. There is still much room for growth in the USA, and medical informatics will no doubt continue to play an increasingly larger role in health care.

Need for Medical Informatics in the Medical School Curriculum

Given the growing reliance of medicine on informatics, it would seem natural to incorporate this training into the medical school curriculum. Technology has become so integrated into common tasks—recording patient information in the Electronic Medical Record, referencing drug interactions on a PDA, etc.—that failing to provide training could undermine modern medical education and compromise future physicians' ability to provide care.

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There is consensus among current medical students regarding the need for proper informatics training. A 2006 survey found that 81% of medical students and residents agreed that “teaching of technology skills should be part of my medical curriculum,” while another found that 92% of medical students believed that technology should be taught in medical school.^{2,3} In addition, a 2006 survey of first and second year medical students at Case Western Reserve University found that students lacked confidence in skills such as “exposure and ability to use clinical information systems,” “accessing databases of clinical information,” and being “knowledgeable about advocacy resources.” The study recommended formal training to address these issues.⁴

There is no standardized curriculum for medical informatics training in the earliest stages of medical education. Although such training currently takes place in a number of residency programs, we should begin the process even earlier to ensure basic technological literacy across the board.

Current Progress

Prior attempts have been made to begin introducing medical informatics into the medical school curriculum. In 1998, the AAMC initiated the Medical School Objectives Project (MSOP) to identify the relevance of medical informatics to the physician and proposed a number of core objectives to be added to the medical school curriculum.⁵ In 2007, the impact of the MSOP guidelines was measured through a survey of 70 medical schools in the USA and Canada. It was observed that few schools actually had stated objectives and even fewer formally assessed competencies. The report concluded that “some progress has been made but much more needs to be accomplished”.⁶

Recommendations for the Curriculum

These findings suggest that the MSOP guidelines need further revisions in order to make a real impact. They recognize the impracticality of cramming entirely new components into the 4-year curriculum and instead advocate “enhancement of existing curricular elements.” They recommend a two-track strategy of implementation: one for schools transitioning to the new curriculum and another for schools further down the road.⁵

The initial track would consist of a series of single-block courses in the basic science years teaching fundamental computer skills such as performing a literature search and referencing clinical information through online databases. This is not intended as an ideal, long-term approach to integrating medical informatics into the curriculum but rather as an easy way for medical schools to begin the transition. In the second track, informatics training would be integrated into courses throughout all 4 years and would expand upon the initial track with clinically oriented skills such as accessing electronic medical records and using handheld devices on the wards to aid in diagnosis and decision making. The clinical years would be an especially critical period for students in which learning is done at the point of care. This approach would ensure that medical students learn the proper use of medical informatics in its real context and better retain this knowledge.

Such a strategy would, at the very minimum, ensure that future physicians are comfortable with medical informatics and gain fundamental skills that will never become obsolete. Armed with informatics, future physicians will be better able to synthesize information, practice with confidence, and operate within the health care environment.

OPENING STATEMENT

“I have never let my schooling interfere with my education.”

Mark Twain

When my family member or I are most vulnerable due to the confusion and uncertainty that comes with illness and we ask to speak with an available doctor in the middle of the night because of a new symptom, I sincerely hope the responding intern spent their last 4 years in medical school learning the core principles of diagnosis, medical management, and how to deal empathetically with patients at the bedside. Frankly, at that moment, I could not care less about how much my young doctor knows about the inner workings of regional health information organizations, technical standards, and protocols used in health care settings or compression algorithms. I would expect them to

be able to do a medical literature search and use the clinical systems where she works. If she pulls out her netbook to enter basic signs and symptoms into the neural network she designed, I will know that we are in trouble.

In principle, medical education should create the foundation of knowledge necessary for a lifelong career of healing. A vast array of faculty assault a typical medical student's precious neurons with overwhelming levels of detail regarding core curriculum topics such as anatomy, physiology, and pharmacology along with clinical competencies such as general surgery, internal medicine, and psychiatry. It has been likened by many to "drinking from a fire hose." All too often, the sheer amount of information presented in medical school can be overpowering, and to be sure, the amount of time in basic medical education is limited. Already a host of topics—interdisciplinary practice, population health, health policy, and the economic and political aspects of health services among others—compete with traditional biomedical content necessary to be a physician.⁷ Why then, would we add one more requirement—formal medical informatics training—to this cacophony of voices during the valuable years of medical education?

A more practical challenge to the relevancy of any medical informatics curriculum today is the rapid pace with which current technology evolves to deal with the challenges posed by trying to manage information in medical practice settings. While the goals of medical informatics may change slowly, the underlying technology with which medical information is managed—whether at a patient or population level—changes rapidly. The AAMC has published advice on how to incorporate informatics training into medical education (in 1998!).⁸ The panel's objectives explained "what students should be able to do with information technology and what knowledge and attitudes about information technology they require for these purposes." For most first year medical students, who could "log in" before they could even tie their shoes, this basic objective of a medical informatics curriculum has been achieved before ever setting foot on a medical school campus. The current generation of medical students cannot remember a time when computers were not an important part of their academic, eco-

nomic, and social lives. They are arguably more comfortable with computer and internet technology than any previous one. What they need is training regarding the appropriate attitudes and knowledge to serve their patients, not their social networks.

The AAMC's document made it clear that they would not address "how", in terms of hardware and software implementation, each of these tasks should be carried out. Addressing the latter would have made this document rapidly obsolete as the technology itself is changing so rapidly." Unfortunately, this is precisely the problem with any medical informatics curriculum presented prematurely. By the time students are ready to capitalize on the lessons taught, the whole technological landscape is likely to have changed. We cannot ignore the fact that medical informatics is a practical discipline that, by definition, is deeply rooted in implementations of technology. If medical student curricula will not, or cannot, address the "how," what exactly will they teach? From a pragmatic point of view, broad medical informatics training during medical school would be so dilute that it may be virtually useless.

I believe medical school education should focus on core knowledge without which a physician could not function, and acquisition of specialized skills and knowledge should be the role of residency training. Given that medical informatics is a broad and varied subject, differing significantly in its scope depending on the setting and specialty in which it is to be applied, I do not see how it is either wise or feasible to distract medical students from learning the fundamentals of medicine and professionalism with an extensive informatics curriculum. Furthermore, the practical considerations of creating such a curriculum are significant. Would a medical informatics curriculum concentrate on dealing with large imaging datasets, as seen in radiology or pathology, or should they concentrate on crunching variables or developing models as may be necessary in epidemiology or health services research? I have no doubt that medical professionals will be exposed to and interact with informatics problems and solutions the rest of their careers. For a limited time, early on, I believe they should be concentrating more on medical problems and solutions.

REBUTTAL

Dr. Safdar made some strong points against the case for informatics training in medical school. He points out that the MSOP, as it currently stands, is insufficient and fails to address how its objectives are to be fulfilled. There is no doubt that a large collaborative effort between medical schools will be needed to create a concrete plan for a revised curriculum. He is also correct that during the brief time allotted to medical school the focus should be on teaching the core knowledge of medical practice, including its emotional component. However, I believe that informatics is best incorporated alongside, not in replacement of, the current curriculum. As a tool to facilitate learning, it is a means to an end and not an end in itself.

Although medical informatics is indeed a broad subject with many specialized applications, there are some fundamental skills common to all areas of medicine. Training in medical school does not need to cover imaging datasets or computer models, which can and should be taught in a radiology residency. Rather, it needs only to cover the core competencies that form a foundation to build on in residency and beyond. We cannot assume that incoming medical students already possess these core competencies simply by being products of the digital age, and thus standardized training should be mandatory.

Technology changes rapidly, but does this necessarily imply the skills learned in medical school will be out of date within a decade? Informatics training is not about learning to use a single application or memorizing a particular user interface, which will change over time. Rather, it is about teaching a fundamental set of skills that enable future physicians to rapidly adapt to new technologies that will inevitably appear over the course of their careers.

Another argument is that there is such a wide range of informatics applications on the market, each with its own user interface and protocol, that there is no way to teach everything. However, as with other examples of technology, these applications are steadily becoming standardized so that usability will likely improve in the foreseeable future.

Informatics frees physicians from the burden of rote memorization by providing easy and instant access to virtually unlimited information. As the body of medical knowledge grows exponentially, the

most astute physicians will no longer be differentiated by those who remember the most facts but by those who sort and synthesize information the fastest. With rising workload and hours, physicians must adopt the “smarter not harder” philosophy, and what better way to work smarter than by taking advantage of technology? Technology, when properly applied, can boost productivity, decrease overhead, and improve quality of care. Proficiency in utilizing decision support tools that tap into the current state of the art in medical expertise will not only enhance a medical school education but establish habits for life long learning.

The climate of modern health care demands competence in medical informatics. As our medical system grows increasingly high-tech, relevant training must begin earlier in the young physician’s education. The MSOP has already proposed strategies for medical schools to integrate informatics into their curriculum efficiently and effectively. The next step is to develop a concrete and standardized informatics curriculum and see that it is implemented in our medical schools. Anything less would be leaving our physicians unprepared for the modern medical practice.

REBUTTAL

I will concede some of the stronger points made for formal more medical informatics training in medical school. I agree that physicians able to leverage informatics for decision support and managing their educations have the advantage over those that cannot take advantage of the great amount of tools created for this purpose. I even agree that leverage of medical informatics is a critical step for health systems to undertake in order to maintain a high level of quality health care.

To me, it is telling that nearly a decade after the AAMC made recommendations for the incorporation of informatics training into medical school, few schools had stated objectives or formal assessments to this end. To me this represents a failure of medical schools to meaningfully incorporate medical informatics into medical education. I have no doubt that when asked, medical students agree on a need to incorporate informatics training into their medical education, but this question does not reflect the time and resource limitations associated with attending medical school. It would be more

relevant to ask students to rank the importance of medical informatics training in comparison with other subjects competing for their time during medical school. My guess is that medical students would then put medical informatics training near the bottom of the list compared to other traditional biomedical subjects like pharmacology, infectious disease, surgery, or anatomy.

The lack of formal objectives and assessments among medical schools leads me to believe that this ranking has already occurred on an institutional level and informatics training ranked near the bottom of the list. If anything, this phenomenon reflects the primary failure mode facing the incorporation of informatics training into medical education. If medical schools are serious about teaching informatics, they need to spend resources to train medical educators on how to better incorporate the use of information technology into their treatments of the basic and clinical sciences. Without this step, we end up in the situation we are in today, in which many tout the need for informatics training, but few institutions have even taken the basic steps of declaring educational objectives geared toward this end.

As it is with so many things, the “devil is in the details.” It remains unclear to me that medical schools will have any more luck developing meaningful curricula in the future than they have in the past. Because health care delivery systems and the needs of physicians vary so widely from one setting to the next, the details of which faculty will train medical students and what precisely they would teach remains an overriding practical concern. Unlike with many of the more traditional biomedical fields, the nature medical informatics implementations can vary so widely from one

setting to the next that it remains likely that the skills learned specific to one setting cannot be transferred to another.

I would love as much as anybody else for medical students to have effective, goal-oriented medical informatics training with assessment of their skills. To accomplish this though, we should add 2 months to the usual 4 years of medical education or allow less vacation during medical school. When a survey demonstrates administrators and medical students are willing to concede this, I will concede it is time to make it a formal requirement.

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