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Editorial

The Coming Revolution in Medical Education

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"See one, do one, teach one." Every doctor educated in the last 75 years is familiar with those words. They express the essence of an apprenticeship model of training physicians that has relied on the acquisition of factual knowledge through prolonged periods of study and the accumulation of clinical skills purchased at the cost of long hours in the hospital caring for patients, often in a sleep deprived, fatigued state. Once the young doctor completed training, the educational outcome of that entire endeavor was measured only once. The specialty board examination certified that the newly minted specialist was worthy of the public trust and would be trustworthy indefinitely.

This model of education was a vast improvement over what had come before. Prior to Abraham Flexner's 1910 report for the Carnegie Foundation, medical education was in an abysmal state [1]. There were no established standards for undergraduate medical education, no requirements for graduate medical education and little to no regulation of the practice of medicine. The public was subjected to poorly trained physicians, naturopaths and snake oil salesman all claiming to be legitimate medical practitioners. Our current system of undergraduate and graduate medical training was founded on Flexner's report. Regulatory mechanisms soon followed and resulted in the closure of inadequate schools and established allopath as the only legitimate basis for medical training. Flexner strongly favored the residency program established by John Hopkins in 1889 and this became the framework for all residency training in the United States.

Over the last two decades, it has become evident that this traditional system of medical education has failed to incorporate scientific developments in educational theory and practice that would lead to better outcomes [2]. In medical education that means selecting individuals who are suited to the modern practice of medicine, assuring that they are adequately prepared for a medical education, requiring the demonstration of competence at each stage of education and insisting that doctors take the necessary steps to maintain and improve their competence, incorporate new knowledge, and develop new skills throughout their careers.

Future doctors will be educated very differently. Organized medicine in the United States is a complex and unwieldy conglomeration of organizations with responsibilities for varying aspects of medical education. These organizations (AAMC, LCME, ACGME, ABMS), largely through the volunteer efforts of our colleagues, have begun a reform movement in medical education that rivals and may surpass the efforts in the last century.

In undergraduate education, efforts are being directed towards the selection process for medical students, pre-matriculation evaluation of the student's preparation, pre-matriculation remediation of any preparatory inadequacies, integration of core basic science material into clinically relevant educational modules, simulation training in procedures prior to clinical experience with those procedures, and careful evaluation of students' skills and knowledge at each stage of education to assure that each student has attained the desired educational outcome prior to advancing to the next stage of education. These approaches will require a much more flexible approach to the medical school curriculum than have traditionally existed. Medical schools will need, for example, to develop a flexible preparatory curriculum that can be adapted to meet varying student needs for additional education prior to their first day of medical school. Fundamentally, there are two goals of all this work. The first is to reliably produce medical graduates of uniformly high quality. As in other quality assurance work effort is directed towards reducing variance, in this case by assuring that there much less difference between students at the bottom of the class and those at the top. Ideally, we would want to legitimately give everyone in a medical school class an A. The second goal is to produce a residency ready graduate whose competencies enable them to meet the Level 1 Milestones (more about that next) in the specialty of their choice.

In 1999 the ACGME and ABMS expanded the fields of competence required for physicians to include Professionalism, Systems Based Practice, Problem Based Learning and Improvement, and Interpersonal Communication Skills in addition to Medical Knowledge and Patient Care [3]. These competencies have been incorporated into the evaluative processes for medical students, residents and practicing physicians. They were designed to be measures of the outcomes of various educational efforts in order to show that educational processes actually produced the intended result. In 2008, the ACGME began the development of the Milestones Project, the next step in measuring residency training outcomes [4]. The purpose of the Milestones is to describe the specialty specific resident competencies that should be attained during training. These Milestones are organized as developmental pathways with Level 1 representing skills and attributes expected of a beginning resident, the residency ready medical school graduate described above [5]. Levels 2 and 3 are intermediate stages of accomplishment. Level 4 describes the expected competencies of a graduating resident. Level 5 delineates advanced goals that some but not all residents will accomplish. The four levels do not correlate directly to the year of training as the skills and competencies do not develop at the same pace in all residents and are not taught at the same time in each residency program.

The Milestones for each specialty are highly specific and designed to promote objective evaluation of a resident's skills. They are intended at first to be a tool for measuring the quality of residency training programs since the examination off the aggregated data from

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a training program will reveal deficiencies in the program. Clearly, however, they can and almost certainly will be used as primary tool to measure individual resident's progress in attaining the skills necessary to practice their specialty. Rather than describing a resident's performance as satisfactory or 8/10, these tools portray the extent of a resident's progress towards attaining necessary skills and suggest the next steps needed. As in the medical schools, these developments enable and require more flexibility in residency training to assure that residents are uniformly excellent when graduating from their training program [6].

Unfortunately, the skills and knowledge acquired during residency decay over time unless deliberate efforts are made to maintain and improve them [7,8]. It has been clear for some time that continued education, self reflection and assessment, methodical efforts to improve practice and periodic objective testing are necessary elements to maintain competence in most professional, skill based occupations. It is really no surprise that physicians are no exception. Findings in the last decade have led to the ABMS requiring establishment of Maintenance of Certification programs in all specialties in addition to the now traditional re-certification exam. Many state licensing boards are considering similar ideas. All of these programs have similar elements. Continuing Medical Education is required along with Self Assessment activities which can indicate to the physician that there are areas of knowledge requiring updating. Physicians are required to obtain external feedback on their performance as well. Peer feedback and review, Patient feedback and other institutional mechanisms may be used to satisfy this requirement. There is also a requirement related to the competency of Problem Based Learning and Improvement. In Psychiatry and Neurology, this takes the form of examining one's own practice from the standpoint of a practice guideline, identifying opportunities for improvement and then re-checking at a later time. Passing the secure, recertification examination affirms that these other efforts have been successful.

Taken together, these developments are a true revolution in the way physicians are and continue to be educated. Medical Education rather than being cut into discrete pieces is conceptualized as a life-long learning process with feedback mechanisms to ensure that physicians practice at a uniformly excellent level. Much remains to be done but there is no doubt that medical education is changing and changing rapidly, in my view, much for the better.

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