

PREMEDICAL EDUCATION, TRADITION, AND THE HUMANITIES

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Of the many excellent articles in this issue, I would like to focus on the essay by Christopher Magoon,¹ a third-year medical student at the Perelman School of Medicine of the University of Pennsylvania. From the front lines, so to speak, he provides a personal perspective on premedical education, a crucial topic that continues to stir vigorous debate; it has prompted changes in the admission requirements at several medical schools.

THE CASE FOR CHANGE

During an interval after college he worked for an educational nonprofit in China and observed students preparing for the *gaokao*, China's national college entrance examination. Many of the questions test memorized facts, which the Chinese students deemed largely useless. Mr. Magoon realized that the American system of premedical education is not so different. Chinese students study intensively for an exam that decides their future, while the purportedly more flexible American system is also capped by a determinative national exam. Much of the MCAT assesses factual knowledge, and most medical schools overweight the MCAT score in winnowing the applicant pool, thus eliminating some otherwise worthy students.

Mr. Magoon also thinks that certain premed science requirements, notably organic chemistry, are nearly useless for future physicians, who would be better served by greater exposure to the humanities. Many leaders in medical education share these concerns.² Are the old requirements still relevant when medicine is advancing so rapidly that much of what practitioners need to know was not taught, or even known, when they attended medical school?

The current system of medical education, with its emphasis on basic science in the first two years of medical school, stems from the 1910 Carnegie Foundation report by Abraham Flexner,³ which also specified

rigorous premedical science courses as prerequisites for admission to medical school. By the 1930s these had become standardized as two semesters each of chemistry, biology, and physics, and at least one semester of organic chemistry.

A 2009 study by the AAMC-HHMI,* "Scientific Foundations for Future Physicians," encouraged greater flexibility in the premedical curriculum by attempting to resolve the dichotomy between "teaching scientific facts" and "preparing physicians to...use scientific knowledge."⁴ The committee of scientists, physicians, and science educators identified 11 *knowledge principles* and eight *scientific competencies* in which proficiency would be needed for medical school, and hoped to inaugurate a shift toward assessing competencies rather than testing facts.

The AAMC convened another panel to consider the important role of the *behavioral and social sciences* in medical education. Their 2011 report⁵ focused on the medical school curriculum, but they expected that their recommendations would also influence the premedical curriculum.

THE CASE FOR TRADITION

(Or, Don't Throw Out the Baby with the Bath Water)

I contend that stringent premed requirements *are* relevant, perhaps more so than ever. Even organic chemistry, a favorite whipping boy, has benefits that are not immediately obvious. Traditional science requirements should be retained, though the courses could be modified somewhat to enhance their relevance for premedical students.

The increased emphasis in medical education on learning how to process and use scientific information, how to sustain lifelong learning, and how to practice humanistic, holistic medicine, is surely auspicious, but it cannot lessen, much less eliminate, the reality that in medical school one is abruptly confronted by the need

* Association of American Medical Colleges in concert with the Howard Hughes Medical Institute.

to master an unprecedented flood of information that is growing ever more vast and complex.

Even students who eased through college find that medical school can be overwhelming if they do not quickly develop the habit of almost continuous study. Before they can analyze and process what they are learning, they must first absorb and memorize information. The processes of reasoning and algorithmic thinking that characterize every good physician must be founded on an abundant store of facts. A premedical education that does not require students to memorize large numbers of facts will leave them unprepared for medical school. Challenging courses such as organic chemistry and physics have value simply because they encourage necessary habits of study and mental discipline.

It should not be politically incorrect to note that such courses also have value in “weeding out” students who are not equipped to master the content of a medical education. That function should not be disparaged, since it not only serves a societal good, but saves the student from later disappointment and even heartbreak.

It has also been contended that some required premedical courses contain much useless information.⁶ These arguments are offered by those who have already taken those courses, and assimilated that information into their general fund of knowledge, with benefits they may not themselves appreciate. To take one example, it might seem obvious that the structure of a benzene ring isn’t relevant for a neurosurgeon, but in fact, studying the structure of organic compounds can refine one’s ability to visualize graphic information and to grasp spatial relations, abilities that are necessary attributes for any surgeon.

The requirement for a year of physics is also often denigrated, but electricity and magnetism are essential for cardiologists who deal with pacemakers, an

understanding of levers is crucial for the kinesiology inherent in orthopedics, optics is indispensable for ophthalmologists, etc.

Physicians are scientists, and they should have a broad grounding in the sciences. It would be absurd to begin the process of specialized study as early as college, by permitting premed students to skip the topics that they, in their infinite wisdom, consider unimportant. When medical students tell me they aren’t sure what specialty interests them, I applaud their uncertainty because it will help them avoid narrowing their focus prematurely, and will keep them interested in everything they’re taught.

WHAT ABOUT THE HUMANITIES?

Finally, I am surprised by complaints that the emphasis on science courses in the premedical curriculum precludes studying the humanities. That attitude seems a lazy one. When I attended college more than 50 years ago, the requirements for a premed major included two years (four semesters) of biology, three years of chemistry, one year of math (including integral calculus), and one year of physics. All but math also had time-consuming labs. Nonetheless, I found time for one English course every semester, and I graduated with more credits in English than in the sciences. I couldn’t have predicted those English studies would equip me for my current position; I simply enjoyed literature.

Yes, some premed science courses can be modified profitably, such as teaching more statistics and less calculus during the required year of math. But such modifications shouldn’t cause us to overlook the other values of science courses.

Finally, I must add that in this era of “alternative facts,” memorizing actual facts has its own special merit.

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