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New Expectations for the Training of Medical Students

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By Meredith L. Greer

On June 4, 2009, a new report called for extensive changes in the mathematics and natural sciences training of medical students. The report identifies several competencies — that is, skills, knowledge, or attitudes — that students should master at both the undergraduate and medical school levels. For undergraduates planning to apply to medical school, this approach contrasts sharply with simply taking a collection of prescribed courses. For professors at undergraduate institutions, the new approach allows far greater freedom for curricular innovation than has existed previously. For mathematicians, the quantitative/mathematical component of the report deserves special note.

A committee of 22 scientists, physicians, and educators, convened by the Association of American Medical Colleges (AAMC) and the Howard Hughes Medical Institute (HHMI), created the report. Both AAMC and HHMI had concerns generated by the quickly increasing pace of biological and medical research. They believe that physicians must not only have strong science backgrounds, but also possess the inquisitiveness and skill set to integrate new scientific discoveries into their work for their entire careers. The committee felt that current medical school course requirements and the MCAT (Medical College Admission Test) did not reflect the most appropriate knowledge and thought processes. In fact, many undergraduate faculty had reported that current medical school requirements and testing actually *restrict* opportunities for innovation in undergraduate science curricula. Such concerns had been stated in *BIO 2010*, published by the National Academies in 2003, and had become a topic of continued conversation.

The committee describes two sets of expected competencies: one for students, frequently undergraduates, seeking to enter medical school, and one for students completing medical school. Accompanying each competency are several learning objectives, each with examples to illustrate specific goals.

For undergraduates, some of the competencies focus on a general area of knowledge — chemistry, basic physical principles, biomolecules, evolution — and how to apply that area to the study of living systems, cells, or the diversity of life on earth. One competency focuses on the process of scientific inquiry, and expects students to be able to explain how scientific knowledge is discovered and validated. Another competency asks students to apply their understanding of the principles of how molecular and cell assemblies, organs, and organisms develop structure and carry out function. Yet another competency states, "Explain how organisms sense and control their internal environment and how they respond to external change."

The remaining competency requires students to "[a]pply quantitative reasoning and appropriate mathematics to describe or explain phenomena in the natural world." The subsequent list of learning objectives provides important details. Students must demonstrate quantitative numeracy and be able to speak the language of mathematics. Working with data sets is extremely important: students need to be able to communicate data visually and otherwise, make statistical inferences, and extract information from large data sets. Mathematical modeling, algorithmic approaches, and principles of logic should all be familiar to an applicant to medical school. The detailed examples make clear that medicine is ever-changing. Long after medical school, physicians need to seek out new studies, sometimes reading multiple data-filled sources on a topic, then sort out conflicting information and ultimately draw their own conclusions.

"A fundamental component of any curricular change is to ensure that the faculty ultimately responsible for the education of students and physicians assume responsibility for determining the knowledge, attitudes, and skills required to achieve the competencies." With this, as with several other statements, the committee from AAMC and HHMI makes clear that its report is not a mandate. Other institutions will play their own parts in updating the expectations for medical students. While the committee has identified competencies, individual colleges, universities, and medical schools will have to determine the level of performance required within each of the competencies. Indeed, the report encourages curricular innovation, so that students can achieve excellence at the competencies via a wide variety of academic offerings.

Assessment is a longer-term project. This includes assessment of the competencies in students. The MCAT, which AAMC administers, is currently undergoing a comprehensive review. The suggestions from this report are part of those discussions. Ultimately, AAMC and HHMI plan to assess the system of competencies, its relationship to curriculum, and the assessment of students, altogether. In time, the competencies themselves are subject to change. This is an expected and important part of the new system. For now, undergraduate programs wishing to offer a liberal arts and/or integrated science approach have a report showing the enthusiastic support of the AAMC and HHMI.

For More Information

The Full Report:
http://www.hhmi.org/grants/pdf/08-209_AAMC-HHMI_report.pdf

Report Summary and Other Information:
http://www.hhmi.org/grants/sffp.html

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