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Scientific Foundations for Future Physicians: Report of the AAMC-HHMI Committee

The Need for Change

Future physicians must be equipped with a strong scientific foundation to practice modern medicine. However, in recent years, the scientific knowledge important to the learning and practice of medicine has changed and expanded dramatically, while the approach to science education in the premedical and medical curricula has remained essentially unchanged. At the premedical level, the National Academies' *BIO 2010* report concluded that the undergraduate science faculty is concerned that the premedical course requirements and MCAT content may not accurately reflect the essential competencies that should be mastered by entering medical students and thus may be inhibiting innovation in undergraduate science education. Among medical educators, there is a perception that little has changed to move from teaching scientific facts to preparing physicians to actually use scientific knowledge. Most agree that advancing scientific knowledge and medical practice require a different set of scientific competencies than is currently taught; the current medical curriculum generally lacks sufficient emphasis on the fundamental scientific principles key to lifelong learning and biomedical scientific literacy.

Committee Composition and Charge

The AAMC and HHMI convened 22 scientists, physicians, and science educators from small colleges, large universities, and medical schools across the country. This group, representing most of the traditional scientific disciplines, was asked to identify the most important scientific competencies in the natural sciences required of students graduating from college prior to matriculating into medical school, as well as those which should be required of medical school graduates.

Science Competencies

The committee established science competencies as the basis for defining the preparation of medical school applicants and the proficiency of medical school graduates. In the report, a competency is defined as the knowledge, skill, or attitude that enables an individual to learn and perform in medical practice. The report outlines eleven overarching principles, eight scientific competencies that students should master before entering medical school, and eight competencies that they must demonstrate before completing medical school. The committee identified learning objectives and illustrative examples of elements within the stated competency.

Task Force Findings

The committee recommends that medical and premedical learning shift from required courses to competencies. A competency-based approach will give both learners and educators more flexibility in the premedical curriculum and allow the development of more interdisciplinary and integrative courses that maintain scientific rigor, while providing a broad education. The committee does not propose increasing the number of requirements; instead, it recommends substituting more relevant requirements for others that are less relevant to the practice of medicine. The committee believes that entering medical students should be more evenly prepared to study medicine, allowing medical schools to spend less time assuring mastery of basic competencies and more time on the scientific knowledge needed to practice modern medicine. The premedical and medical curricula must foster scholastic

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rigor, analytical thinking, quantitative assessment, and the analysis of complex systems in human biology. Scientific competencies should embrace recent advances in the foundational sciences that emphasize the increasingly close relationship of the physical and mathematical sciences to the practice of medicine.

Next Steps

The committee hopes that this report will stimulate a broad discussion within the undergraduate and medical communities and reinvigorate the scientific preparation of physicians. The report provides a rough blueprint that can be used by educators to design premedical and medical school science curricula. The committee's findings will be considered, along with other initiatives, in the AAMC's current comprehensive review of the MCAT. In addition, a separate AAMC panel on the behavioral and social science competencies for future physicians will release its report in late 2010.

The committee suggests that the competencies outlined in the report be reviewed on a regular basis and revised to reflect changes that occur in the sciences, in our expectations of physicians, and in the health care system. Although the committee recognizes that there are challenges in implementing a competency-based system, the report represents a first step in a continuing conversation about the appropriate skills, knowledge, values, and attitudes that future physicians should possess.

The full report is available at: www.aamc.org/scientificfoundations.

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