

elements, all of which minimize the influence of conscious and unconscious bias.

Since BUSM became engaged in holistic review, the profile of its entering class has changed dramatically. Other factors, including changes both at the school and within society at large, have certainly influenced the school's ability to select and recruit strong students, but holistic review is at the core of the process. Students are culturally, linguistically, racially, ethnically, and demographically more diverse than previous classes, and according to the standard measures of undergraduate GPA and MCAT score, they are at least as well prepared academically (the average GPA and average MCAT score were 3.66 and 33.62 for the entering class of 2012, as compared with 3.57 and 31.68 for the entering class of 2008). Students from groups underrepresented in medicine now make up approximately 20% of the entering class, as compared with 11 to 12% before the adoption of holistic review. We observe that students are more frequently

engaged in our campus community and in outside activities, and graduating students pursue a broad range of specialties and career paths. The general sense of the faculty, particularly those who teach our small-group problem seminars, is that the students are more collegial, more supportive of one another, more engaged in the curriculum, and more open to new ideas and to perspectives different from their own. Some of these observations are subjective and difficult to quantify, but there is a striking, and uncoached, consensus among the experienced faculty members.

Successful adoption of holistic review in medical school admissions requires a strong commitment by the school, but the process can be bolstered by support from the AAMC's Holistic Review Project, which has nurtured a community of physicians focused on the development and implementation of strategies for ongoing monitoring and improvement.⁵ This effort is led by a committed group of admissions officers, diversity directors, deans, medical

educators, students, and residents from around the country who continue to remind us that medical school admissions is not merely about selecting next year's first-year class, but also about selecting the physicians who will successfully lead a rapidly evolving 21st-century health care workforce.

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Reforming Premedical Education — Out with the Old, In with the New

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The most consistent and strident calls for medical education reform over the past century have focused on premedical preparation. The first attempt at standardizing requirements for medical school admission came in 1904 from the American Medical Association's Council on Medical Education. In 1910, Abraham Flexner recommended requiring biology, chemistry,

botany, and physics, and by 1930, today's premedical science preparation — biology, chemistry, organic chemistry, and physics — was firmly established. But criticism began as early as 1929, and in 1939 the Association of American Medical Colleges weighed in.¹

Recent years have seen many calls for enhancing, overhauling, or abolishing the traditional pre-

med requirements.¹⁻³ Critics argue that the pace of scientific discovery and its clinical application have outstripped the requirements; that information technology has made memorizing vast amounts of content unnecessary; that the requirements lack clinical, scientific, and social relevance; that they're used to cull the herd of talented aspiring physicians; that they disadvantage minority and female stu-

dents; that they crowd out studies of bioethics, social justice, and health policy; and that rigidly structured premedical and medical school curricula hinder students from becoming self-directed lifelong learners.¹⁻⁴ Furthermore, the current model has perpetuated “premed syndrome,” a culture of aggressive competition for grades that conflicts with the precepts of medical professionalism: academic and intellectual rigor, creative thinking, collaboration, and social conscience.²

Various solutions have been proposed, but little substantive change has occurred. Universities are neither equipped nor motivated to create new courses for medical school preparation. They have limited resources, siloed departments, educational inertia, and faculty with ingrained teaching habits.³

Expanding premedical education by requiring humanities, social sciences, or translational sciences without removing current requirements is untenable — it would further constrain what students could learn in college and add more courses in which they had to excel. Nor can current requirements simply be replaced with more relevant courses (organic chemistry with biochemistry, calculus with statistics), because the traditional requirements are often prerequisites for these courses and because the Medical College Admission Test (MCAT) still focuses on traditional content.^{1,2}

Others have described premedical education's ideal elements: academic rigor with less grades-driven competition; independent mentored scholarship; flexibility to pursue widely varied majors; self-directed educational plans that foster lifelong learning; more sci-

entifically and clinically relevant coursework; and more courses instilling an appreciation for medicine's social, political, and economic contexts.^{2,3}

At Mount Sinai's Icahn School of Medicine, we have a quarter-century's experience with an “early assurance” alternative to the traditional premedical track: the Humanities and Medicine Program (HuMed). Since 1987, humanities majors have been entering medical school here having neither undergone traditional premed science preparation nor taken the MCAT. HuMed students attend an 8-week summer program at Mount Sinai after their junior year in college that exposes them to clinically relevant organic chemistry, physics, and clinical rotations. They're encouraged to take time off after college, and they attend a 6-week, prematriculation summer enrichment program on basic concepts in biochemistry, molecular biology, and anatomy.

According to a retrospective analysis, these students performed as well as their peers on metrics including clerkship honors, selection to honor societies, participation in scholarly-year research, first-author publications, leadership activities, and community service. Scores on the U.S. Medical Licensing Exam Step 1 were lower for HuMeds than for traditional medical students (221 vs. 227, $P=0.0039$), and more HuMeds required a nonscholarly (personal or medical) leave of absence (because of lingering uncertainty about a medical career or difficulty with the science curriculum, according to anecdotal evidence). There were no differences in the proportion who failed courses, were required to repeat a year of medical school, or withdrew or were dismissed from medical

school. No significant differences were found in their choices of specialties.⁵ Almost 45% of HuMeds have been ranked in the top 25% of the past six graduating classes.

Analysis of long-term outcomes reveals that a higher proportion of HuMeds than other graduates are affiliated with a medical school and hold an academic position. Although a lower proportion have National Institutes of Health funding, more HuMed graduates have publications in peer-reviewed journals.

The most important lesson of HuMed is that there are viable alternatives to traditional premed preparation. The next step in this evolution is recruiting undergraduates from all majors into an early-assurance program and comparing their short- and long-term outcomes with those of their premed peers. Starting in 2013–2014, we'll begin recruiting half of each class in their sophomore year of college and offering them assurance of acceptance by the following summer. Applicants will have to complete 1 year of chemistry or biology before applying. After acceptance, requirements before matriculation will include two semesters of biology, two semesters of chemistry, one semester of physics (or a score of 4 or 5 on the physics Advanced Placement test), two semesters of any science lab, one semester of statistics, one semester of ethics, and one semester of health policy, public health, or global health. The traditional year each of organic chemistry with a lab and physics with a lab won't be required. Students will be strongly encouraged to gain proficiency in Spanish or Mandarin. Those who haven't had advanced science courses will have to participate

in a 6-week summer program at Mount Sinai before matriculation to gain basic competency in cell biology, biochemistry, and genetics.

Admitted students will have to earn at least a B in all required courses and maintain a grade-point average (GPA) of 3.5, but they won't have to take the MCAT. The GPA requirement will help balance the importance of maintaining academic rigor with the need to relieve students of the burden of achieving the highest possible grades in every course. A senior thesis or its equivalent will be required, and students will be encouraged to take time off for scholarly or professional pursuits before matriculating. To reduce these students' risk of requiring a nonscholarly leave of absence, we'll enhance the guidance and advising provided between acceptance and matriculation.

We will continue to fill half of each entering class with traditionally prepared premed and post-baccalaureate students to maintain diversity. Metrics and outcomes in medical school, residency, fellowship, and careers will be tracked in a longitudinal study comparing these students with their traditionally prepared peers.

We believe this program, called FlexMed, could dramatically expand the educational, cultural, and socioeconomic diversity of

entering classes and our health care workforce. By eliminating MCAT use, outdated requirements, and "premed syndrome," we aim to select students on the basis of a more holistic review of their accomplishments, seeking those who risk taking academically challenging courses; are more self-directed than traditional medical students; pursue more scientifically, clinically, and socially relevant courses; and pursue independent scholarship.

Finally, despite recent changes, the MCAT will maintain a focus on content (organic chemistry and physics) with little relevance to medical practice or translational science. Though the MCAT score has proved valid, reliable, and predictive, it's being used in unintended ways: as a surrogate for individual academic excellence and a metric for medical school rankings.

Moreover, medical schools' reliance on the MCAT leads students to devote much time and money to achieving the highest possible score and effectively excludes bright, creative, motivated students who aren't strong test takers. And just as chemistry courses dissuade minority students and women from pursuing premed preparation,⁴ the MCAT may inhibit diversification of our applicant pool. Uncoupling premed preparation from the MCAT

will encourage us to develop more appropriate criteria for admission.

Flexner's proposals for more structured curricula were right for his era and revolutionized the teaching, investigation, and practice of medicine. But we have failed him by allowing premedical curricula to ossify despite advances in science, clinical practice, and technology. Our times, too, require the objectivity, commitment, and courage to pursue better ways of preparing students for careers in medicine and biomedical science.

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The Opportunities and Challenges of a Lifelong Health System

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A health system's goal should be to optimize health and minimize disease burden over the life span, for both individuals and the population. Challenges to achieving this goal include health

care's traditional focus on immediate outcomes, payment and incentive systems geared toward short-term goals, and an annual enrollment cycle for insurance and other health care choices.

Under the Affordable Care Act (ACA), the Centers for Medicare and Medicaid Services (CMS) and states will confront new time-horizon issues: given the new insurance exchanges as well as