Questioning the Premedical Paradigm

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Questioning the Premedical Paradigm: Enhancing Diversity in the Medical Profession a Century after the Flexner Report.
Since approximately 1925, the vast majority of medical schools in the United States have relied on a single paradigm for the selection of new students from among those submitting applications. Candidates were evaluated primarily based on their academic achievement in the standardized premedical curriculum of chemistry, biology, and physics. That course sequence, first proposed in the late 1800s by educators such as Daniel Coit Gilman of Johns Hopkins and Charles W. Eliot of Harvard and first standardized by the Council on Medical Education between 1905 and 1914, became the norm for most schools. In many states, including California and New York, it was also the law. Medical schools also incorporated, to varying degrees, assessment of a candidate’s noncognitive strengths through personal interviews and written materials included in the application. However, for most of the last century an applicant’s performance in the premedical sciences predominated in the selection process.

I refer to a “paradigm of selection” for two reasons. A paradigm has at least two aspects: (1) it reflects a dominant model of organization or action, and (2) it represents a generally accepted view or perspective underlying the practice of a science or a discipline.1 The widespread adoption of a standardized model of the premedical science curriculum occurred nearly a century ago. Victor C. Vaughan described this model in 1914 in his address to the Council on Medical Education (CME): “No man is fit to study medicine, unless he is acquainted, and pretty thoroughly acquainted, with the fundamental facts in physical, chemical, and biological subjects.”2 By the mid-1920s, nearly every medical school in the United States had adopted Vaughan’s model of the premedical sciences required of entering students. In 2008 more than 90 percent of U.S. medical schools continued to do so.3

Premedical education requirements that are based on this model also reflect a dominant way of thinking—a particular view of what underlies medical science that
came to be generally accepted. Again, as described by Victor C. Vaughan in 1914, “The facts of the biological, physical, and chemical sciences are the pabulum on which medicine feeds. Without these sciences, everything that goes under the name of medicine is fraud, sham and superstition.”

Vaughan’s words echoed those of Abraham Flexner from his 1910 Report: “The normal rhythm of physiologic function must then remain a riddle to students who cannot think and speak in biological, chemical, and physical language.”

Vaughan, Flexner, and other medical educators from that era were in essence arguing two points: (1) medical schools should standardize their premedical entrance requirements to fit the chemistry-biology-physics model; and (2) it is impossible for anyone lacking early training in these sciences to become fully competent as a physician. Based on the belief that science is an absolute prerequisite for clinical competence, Flexner (and the CME before him) used the science-based standards of admission as one of the principal metrics with which he evaluated medical schools as part of his national study. Any school failing to establish and enforce the requirement of college-level courses in chemistry, biology, and physics for admission would, by definition, fail to meet the standards of quality set by the CME and would therefore not get a passing mark. Arguing in a tight tautological circle, Flexner defined “high quality” as having a premedical curriculum centered on chemistry-biology-physics and then defined as “lacking in quality” any medical school that failed to apply such a standard of admission.

Compare the comments of Vaughan and Flexner to those of Drs. Higgins and Reed made in 2007 and cited in chapter 1. Defending the continued role of chemistry and physics as anchors of premedical education, they argued that “these disciplines contribute a great deal to providing the framework for understanding basic principles of medicine.”

As part of any contemporary discussion of the appropriateness of the current premedical curriculum, many voices will be raised in support of the beliefs voiced by Vaughan, Flexner, Higgins, and Reed. Such beliefs hold that modern medicine, both medical knowledge and medical practice, is built specifically on a foundation of chemistry, biology, and physics and that the absence of these sciences will necessarily call into question the clinical and professional quality of any physician who lacks such a foundation.

Not all medical schools have adopted this dominant model of premedical education, however. We will examine several schools that have stepped outside this premedical paradigm to differing degrees and look for evidence of how the clinical and professional quality of their graduates compares to the quality of graduates selected under the dominant paradigm.
Schools Accepting High School Students into the Study of Medicine

Recall from our discussion in chapters 2 and 3 that the current model of medical education in the United States evolved as an adaptation of the model of medical education that predominated in Europe in the late nineteenth and early twentieth centuries. That model was described extensively as part of the 1932 *Final Report of the Commission on Medical Education*. Students completing their secondary school education who excelled on national examinations such as the *Abitur* in Germany and the *Baccalaureate* in France were then accepted into the medical curriculum of a university. Over a period typically lasting six to seven years, the student would take general arts and humanities courses as well as the science and clinical courses necessary to complete the medical curriculum. There was no distinction made between “pre-medical” and “medical” courses. Those students who successfully completed the curriculum graduated with their medical degrees. It was only in the United States that educators chose to break this curriculum into two stages: the undergraduate pre-medical course, which included the sciences of chemistry, biology, and physics; and the medical course, which built on these scientific subjects with courses in physiology, biochemistry, and anatomy, followed by training in a clinical context.

In 1973, the City of New York faced the same problems as other areas of the country in providing for its future medical manpower needs. For New York, there were two principal issues: (1) training enough doctors in the crucial primary care areas of family practice, general internal medicine, and pediatrics to meet the medical needs of New York, especially its urban areas identified as medical manpower shortage areas; and (2) consistent with other areas of the country, making medical education more available to students from underrepresented minority (URM) racial and ethnic groups. To address both issues, in 1973 the City University of New York founded the Sophie Davis School of Biomedical Education located at the City College of New York. Roman and McGanney have described the philosophy behind Sophie Davis:

In retrospect, two assumptions were apparent in the planning of [Sophie Davis]. First, it was assumed that an alternative pathway to medicine could increase the chances of talented minority and educationally disadvantaged inner-city youths to overcome the premedical studies “screening” effect of the traditional pathway to medicine. . . . [E]vidence has shown that difficulty with introductory science courses causes many minority students to drop out of the medical school pipeline. We at Sophie Davis proposed that courses traditionally taught in the preclinical
years of medical school could be successfully integrated with baccalaureate education without diminishing the quality of the preparation of future physicians.  

This statement of the underlying philosophy of Sophie Davis offers a ringing endorsement of the historical European model of medical education, in which talented students coming out of high school are selected for an integrated baccalaureate/medical curriculum. It also underscores a principal thesis of this book—that the classical paradigm of premedical education, especially the introductory science courses, act to “screen” or “weed out” students based on their performance in these courses and that the students screened or weeded out in this manner tend disproportionately to be students from disadvantaged social or educational backgrounds.  

The statement of the second philosophical principal underlying Sophie Davis adds additional perspective to our discussion:

Second, it was assumed that the early introduction of a clearly defined institutional mission and an enriched exposure to the social and community health sciences, reinforced with community-based fieldwork experience, could motivate and encourage students to pursue primary care specialties even in the absence of a complementary clinical curriculum.  

This statement of the institutional mission of Sophie Davis, based on education in and an understanding of relevant social and community health sciences in addition to the premedical sciences, further differentiates Sophie Davis from the dominant premedical paradigm. Although premedical students have for several decades been encouraged to seek a broad liberal arts education while also completing the required courses in chemistry, biology, and physics, few medical schools have equated the importance of courses in the relevant social sciences with the importance of the natural sciences.  

Students at Sophie Davis are selected out of high school using the following criteria: “high-school grade-point averages, the New York State Regents Examination scores, American College Test (ACT) scores, Scholastic Aptitude Test (SAT) scores, personal statement and writing sample, high-school references, extracurricular and community activities, and two interviews.” Of the approximately 70 students admitted each year, most come from one of the five boroughs of New York City, with others coming from nearby counties.  

Once in Sophie Davis, students take a five-year curriculum at City College of New York that encompasses both a liberal arts curriculum and the social and natural science courses considered to be part of the medical curriculum. Students are required to maintain a minimum grade point average while at City College and, upon
completion of the five-year curriculum, to pass Part I of the USMLE exam. Students who meet both these requirements are then assured a clinical training slot in one of several collaborating medical schools in the New York area. The medical degree is granted by the school at which a student receives his or her clinical training.

Of the students who enter Sophie Davis coming out of high school, 82–85 percent successfully complete the program and transfer to another medical school for clinical training. Of 1,400 students graduating from the program between 1973 and 2004, more than 99 percent successfully completed their MD degree at one of the collaborating schools. Of these students, 6 percent were elected to Alpha Omega Alpha, the national medical honor society. Between 1999 and 2003, 83 percent of graduates entered primary care residencies. Data from the study by Roman and McGauney indicate that 65 percent of those graduating between 1977 and 1987 were practicing primary care medicine. Of those graduating between 1977 and 1990, 13 percent were on medical school faculties.

It seems apparent that Sophie Davis has been successful in attaining the two goals it set in 1973 when it was established: it has trained and continues to train substantial numbers of New York students who faced educational or social disadvantages upon completing high school; it has trained substantial numbers of primary care physicians who are now providing care to under-served areas of New York City and State. As summarized by Roman, “The Sophie Davis model suggests that those students who excel in mastering even average complexities of precollegiate sciences can rise to the challenge of our school’s rigorous medical school biomedical and sociomedical science curriculum when appropriate academic and personal supports are offered.”

The Sophie Davis school is not, of course, the only U.S. medical school that has combined, in one manner or another, the undergraduate baccalaureate curriculum with the medical curriculum. Others have operated successfully for decades. In a review published in 1992, Norman and Calkins identified such programs at 28 medical schools. In 2008, the AAMC identified 44 such programs, one of which is at the Baylor College of Medicine.

As reported by Thomson and colleagues, in 1994 Baylor College of Medicine and the University of Texas-Pan American jointly established their Premedical Honors College (PHC). PHC targets a 13-county region of South Texas in which the population is 82 percent Hispanic and which for some time has been a medically underserved area. By selecting qualified high school students from this area and providing them with combined baccalaureate and medical training, the program has the dual goals of increasing the availability of primary care services and increasing the racial and ethnic diversity of the medical profession in Texas. The program se-
lects high school students from this geographic area based on their academic performance in high school, their SAT scores, letters of recommendation, and an assessment of noncognitive characteristics such as maturity, life experiences, motivation, personality, and communication skills. Students are expected to take traditional undergraduate courses in chemistry and biology. They also work in local hospitals and clinics to become familiar with the process of health care delivery and with the health problems and conditions confronting the local population. If they maintain a minimum level of academic performance in these undergraduate activities, the students are then guaranteed a place in the Baylor medical school.

At the time of the report by Thomson and colleagues, 71 students had completed the undergraduate portion of the curriculum, 84.5 percent of whom had successfully matriculated at the Baylor College of Medicine. All of the students who did not enter medical school enrolled in another graduate or professional program in a health-related field. Comparing PHC students with other college students from similar social and educational backgrounds, the odds of a PHC student matriculating to medical school were seven times higher than for a non-PHC student. As with Sophie Davis, PHC has succeeded by identifying fully qualified high school students who come from otherwise disadvantaged social and educational backgrounds. As we have documented at both Stanford University and the University of California Berkeley (see chapter 1), and as has been the case at many other colleges and universities, these students typically face immense challenges when they enroll in the traditional premedical curriculum at a large college or university with the result that many leave the premedical pipeline and never submit an application to a medical school. Schools such as PHC and Sophie Davis present an eminently reasonable alternative for these students, with no evidence that students who successfully complete the curriculum are lacking in any aspect of clinical or professional quality.

Medical Schools That Accept Students Early in Their Undergraduate Experience

In 1920, two years of undergraduate study in an approved college or university was the norm for admission to most U.S. medical schools. By the 1950s that norm had grown to four years, where it remains today. A substantial majority of students applying to medical school do so after having completed a four-year undergraduate program; however, a few schools have elected to evaluate and admit students before those students have completed their undergraduate curriculum.

In 1983 Boston University School of Medicine (BUSM) established such a program in its Early Medical School Selection Program (EMSSP). As described by
Edelin and Ugbolue, EMSSP was established with the goal of increasing the enrollment of URM students and other disadvantaged students in medical school. It is a partnership between BUSM and 13 different colleges and universities, each of which has substantial URM enrollment among its undergraduates. Students from these institutions are eligible to apply to BUSM after they have completed their sophomore year of undergraduate study. Admissions evaluation involves a combination of high school grades, college grades, SAT scores, letters of recommendation, an admissions essay, and an interview. Those students accepted into the program spend the summer before their junior year at BUSM, returning to their home institution for their junior year. They then spend their senior year at BUSM, completing the requirements for their bachelor’s degree and taking science courses such as biochemistry and histology as a transition into medical school. All these courses are credited to the student’s bachelor’s degree requirements at his or her undergraduate institution. Students who maintain a minimum grade average, obtain their bachelor’s degree from their home institution, and perform adequately on the MCAT (no minimum score is specified) are then accepted as entering medical students at BUSM. Since its inception, approximately 60 percent of students admitted to EMSSP have successfully enrolled at BUSM.

The Mount Sinai School of Medicine in New York City also has a program that accepts students early in their undergraduate career, although with a focus that differs substantially from that of EMSSP. As discussed in chapter 5, in 1984 the Association of American Medical Colleges issued Physicians for the Twenty-First Century, reporting the findings of its Project Panel on the General Professional Education of the Physician and College Preparation for Medicine. The report was intended as a follow-up to the 1932 Commission on Medical Education report, which had cautioned against “the tendency of medical schools and regulatory bodies to define in detail the range and character of premedical preparation.” It argued instead that “a sound general education is of more value to students of medicine than a narrow technical training in the premedical sciences.”

The AAMC’s 1984 report reiterated this concern: “We perceive a continuing erosion of general education for physicians, an erosion that has not been arrested but is instead accelerating.” The report contained specific recommendations for how medical schools should respond to this “continuing erosion” of the quality of the general education that physicians obtain as undergraduates: “In framing criteria for admission to medical school, faculties should require only essential courses. Whenever possible, these should be part of the core courses that all college students must take. The practice of medical school admissions committees recommending additional courses beyond those required for admission should cease. Some institutions may...
wish to experiment by not recommending any specific course requirement” (emphasis added).22

Responding to this admonishment to try something different in the way medical students are selected, in 1989 Mount Sinai School of Medicine initiated its Humanities and Medicine Program (HMP). As explained on its Web site, the program “provides a path to medical school that offers maximum flexibility in the undergraduate years for students to explore their interests in humanities and social sciences at top liberal arts colleges and research universities.”23 Rather than focusing on students from disadvantaged backgrounds, HMP targets some of the top students nationally who are enrolled at highly selective institutions. Students apply to the program during the first semester of their sophomore year of college. Students are selected for admission based on a personal essay, high school and college grades, SAT scores, letters of recommendation, and personal interviews. Those students who are selected for HMP must choose an undergraduate major in the humanities or social sciences (i.e., not in the natural sciences); limit their undergraduate science courses to one year of biology and one year of chemistry and attain a grade of B or better in these courses; and attend an eight-week course at MSSM in the summer after their junior year of college, in which they take an abbreviated course that covers organic chemistry and physics, but only those principles of these sciences that have direct relevance to medicine. During this eight-week summer course, students also gain an initial exposure to clinical activities.

Students in HMP enter medical school with an undergraduate education that is substantially more broad-based than most medical students. They also, however, enter with an education in the premedical sciences that is more narrow than most other medical students. This brings up the inevitable questions: How will HMP students do in medical school as compared to their classmates whose premedical education followed the chemistry-biology-physics paradigm? Equally important, what kind of doctors do HMP students become?

These questions were addressed by Rifkin and colleagues in a report published in 2000, comparing the medical school experiences of 85 HMP students with matched cohorts of students with a traditional premedical education. The authors found that

• HMP students were more likely to fail one or more course in the first two years of medical school, with biochemistry being the course most often failed.
• HMP students were more likely to fail the USMLE-I examination on their first try, although all HMP students did eventually pass the exam (it was
noted that all HMP students who failed USMLE-I had a verbal SAT score of \( \leq 650 \).

- There were no significant differences in either the rate of failure in the clinical clerkships or in the rate of attaining honors in the clinical clerkships.
- HMP students were over-represented in those students receiving awards for community service and those students taking leadership positions in student organizations.
- HMP students were more likely than non-HMP students to receive a graduation award upon completing medical school.\(^{24}\)

Based on these data, Rifkin and colleagues identified two fundamental principles regarding premedical education: (1) “Our experience shows that although students in this program have more academic difficulties in the preclinical years, they excel in the clinical/community setting and have greatly enriched the medical school environment. This program demonstrates that success in medical school does not depend on a traditional premed science curriculum”; and (2) “The Humanities and Medicine Program challenges the long-standing belief that there is a necessary relationship between undergraduate science preparation and the successful completion of medical school and physician excellence.”\(^{25}\)

**McMaster University—Further Challenging the Paradigm**

As described above, the 1984 report Physicians for the Twenty-First Century, issued by the AAMC, included a recommendation that questioned the very basis of the premedical paradigm: “Some institutions may wish to experiment by not recommending any specific course requirements.”

In 1965, McMaster University in Hamilton, Ontario, established a new medical school. Now named the Michael G. DeGroote School of Medicine, the new medical school admitted its first class in 1969.\(^{26}\) McMaster approached medical education in a manner that differed in a number of ways from the approach of other medical schools in Canada or the United States at that time. The medical school adopted a continuous three-year curriculum rather than the standard four-year curriculum. McMaster was a pioneer in adopting a problem-based approach to medical education, an approach that has since been widely adopted by other medical schools. It does not list any specific premedical course requirements for admission.

From its inception, the goal of McMaster was to train “good doctors” for the people of Ontario. In 1972 Hamilton described how the faculty interpreted this charge: “In the elusive ‘good doctor,’ there are two interwoven sets of qualities: the
one, traditional academic qualities, and the other personal qualities of motivation, initiative, and social awareness.” Rather than listing any premedical course requirements, McMaster’s admissions Web page states, “The intention of the Michael G. DeGroote School of Medicine is to prepare students to become physicians who have the capacity and flexibility to select any area in the broad field of medicine. The applicant is selected with this goal in mind.” In its first decade, about one-third of entering medical students had little if any undergraduate instruction in the traditional premedical sciences. Currently about 20 percent of entering students lack the traditional premedical sciences.

McMaster does require clear evidence of academic ability in the students it selects for admission. It measures this academic ability by using the applicant’s overall undergraduate GPA without specific regard to courses taken or undergraduate major. In a paper from 1974 describing the “McMaster Philosophy,” Neufeld and Barrows described the personal, noncognitive qualities valued by the school and therefore used in selecting students for admission: “demonstrated abilities for independent learning, for imaginative problem-solving, . . . emotional stability, responsibility, motivation for a medical career, and the capacity for self-appraisal.” These standards are part of a two-step admissions process developed when the school first opened and still in use today.

As the first step in the admissions process, McMaster obtains an applicant’s undergraduate GPA and his or her autobiographical submission to the Ontario Medical School Application Service (a centralized application service similar to the American Medical College Application Service administered by the AAMC). Students are rank-ordered based on a z-scored combination of GPA and autobiographical submission. (Students who have had additional experience as a graduate student receive a slight bonus in the ranking.) The school then invites a predetermined number of these students to campus for an interview based on their initial rank-ordered position. Using the outcomes of the on-campus interview process, a second rank-ordered list of interviewees is created. Students are offered admission based on their position on this second list.

In the overall process of selecting students to whom an offer of admission is made, McMaster gives equal weight to measures of cognitive and noncognitive skills. McMaster has enacted the theoretical model described earlier in figure 5.3; however, they have done so in a way that measures overall academic strengths independent of any specified premedical curricular content. By giving approximately equal weight to cognitive and noncognitive qualities in the selection of applicants for medical school, and by viewing as essentially equal from a cognitive perspective an applicant who has majored in advanced biology with a 3.8 GPA with one who has majored in philosophy
with a 3.8 GPA (even though the philosophy student has not taken any courses in chemistry, biology, or physics), McMaster has consciously chosen not to follow the dominant paradigm of premedical education. The obvious question arises: What effect has this choice had on the quality of the students trained at McMaster?

It became apparent early on to researchers and educators at McMaster that the 20–30 percent of students who entered medical school with essentially no science background had a harder time in the first year of medical school than did students who entered with an extensive science background. In 1976 Hamilton summarized the early experiences of these students:

For many, there is essentially no problem. They recognize that they will need to work hard in the basic science areas and organize their work accordingly. Others work well, but suffer in the process and take about a year before they feel fully comfortable. The source of their discomfort is often not a real difficulty, but a sense of insecurity. This derives variously from the difficulty they have in joining in discussions with their science colleagues. Usually this is a matter of familiarity with topic matters and terminology rather than fundamental insights into principles. . . . In general, the difficulty of the non-biological science students seems to diminish by the middle [of the second year].

While acknowledging the difficulties that the non-science students sometimes face, Hamilton also commented on problems encountered with some of the students with a strong science background: “I have personally found most difficulty with students with degrees in physiology or biology who have learnt the stories but not the critical discipline of science and who cannot re-examine their preconceptions. These students are unaware of their own insecurity but create insecurity in others by turning the discussion to matters of detail and ‘fact.’” In the context of McMaster’s pioneering problem-based curriculum, it appears that too much science was just as likely to cause problems as not enough science.

The issue of the impact of the admissions process with its lack of science prerequisites on the ultimate clinical skills of the students selected for admission was evaluated by Woodward and McAuley. They gathered evaluations from the internship supervisors of 368 recent McMaster graduates, rating the young doctors on eight aspects of competence, then compared the evaluation profile of students who had completed the traditional premedical science curriculum, students who had partially completed that curriculum, and students who had no science courses as an undergraduate. (The internship supervisors were unaware of the premedical background of the interns they were evaluating.) The authors found no difference in the competency ratings among these groups of students.
Of further interest are the results of a question added to the evaluation of the last cohort of students in the study. This question asked the internship supervisor to rate the intern specifically on “knowledge of basic concepts and principles of basic medical science important to patient care.” As with the other eight measures of competence, the internship supervisors saw no difference among the student groups in this area of competence. Based on these results and those reported earlier by Hamilton, Woodward and McAuley were able to report: “Taken together, the data we have gathered suggest that medical schools can expand their admissions criteria without feeling that the final product will be inferior because of the lack of traditional preparation for medical school.”

In interviews with administrators at McMaster today, the picture described above remains accurate. Many of the approximately 20 percent of students admitted who do not have a strong undergraduate science background have to work harder in the first year to year-and-a-half to catch up to their classmates. However, once they do, they become largely indistinguishable in terms of performance. A few of these students do experience academic difficulty early in their medical school experience.

It will be valuable to focus our attention for a moment on the original methodology with which McMaster measured noncognitive strengths as described by Neufeld and Barrows in 1974. In evaluating an applicant’s noncognitive strengths, each applicant’s autobiographical submission was reviewed and scored by a three-member team, with one member from the faculty, one from the student body, and one from the community. In subsequently constructing the rank-ordered list for offers of admission, candidates selected for an admissions interview were evaluated in a two-step process: a typical, face-to-face interview with a three-person team representing the same three constituencies, followed by a simulated tutorial in which a group of six applicants was observed, often through a one-way glass, while they discussed a pre-assigned health problem. This second step was intended to measure a candidate’s skills in communicating in a group context.

As any advisor to premedical students is well aware, an applicant’s written personal statement and responses to written questions submitted as part of the admissions package often undergo multiple drafts, frequently involving input from multiple reviewers. Hanson and colleagues have questioned the validity of such written autobiographical submissions. For the 2005 admissions cycle at McMaster, all applicants submitted written answers to five questions as part of their autobiographical submission. Those candidates selected for an on-campus interview were then asked, while on campus, to submit written answers to eight questions in a time-limited context. Candidates’ scores on the questions written off-site were then compared to their
scores on the questions written on-site. While the average scores given to the off-site submissions were higher than those for the on-site submissions, the two scores were uncorrelated. The authors concluded that the evidence was “weak” that the written answers submitted for the off-site questions were actually answered independently by the applicants and raised the issue of how this process can be improved.

Eva and colleagues have also questioned the reliability and validity of the typical face-to-face on-campus interview in accurately reflecting an applicant’s noncognitive strengths. As discussed in chapter 5, there is considerable research questioning the inter-rater accuracy and test-retest reliability of the interview process and the predictive validity of the score resulting from it. Eva and colleagues posited that the admissions interview, like the traditional clinical oral examination, was limited by the context specific to that one interaction and that by taking multiple “biopsies” instead of one large “chunk,” a more reliable and valid measure could be derived. Accordingly, researchers at McMaster developed and extensively tested a multiple mini-interview assessment tool, which they refer to as “an admissions OSCE [objective structured clinical examination].”

As described by Eva and colleagues, the multiple mini-interview (MMI) involves an applicant’s going sequentially to seven or more different stations, each set up in a different room. At each station the applicant is given a card explaining the context of the station. Sometimes a trained actor will be part of that context, analogous to the standardized patient of the OSCE. The following are examples of the types of questions and issues posed to applicants:

**Station A: Parking Garage.** The parking garage at your place of work has assigned parking spots. On leaving your spot, you are observed by the garage attendant as you back into a neighbouring car, a BMW, knocking out its left front headlight and denting the left front fender. The garage attendant gives you the name and office number of the owner of the neighbouring car, telling you that he is calling ahead to the car owner, Tim. The garage attendant tells you that Tim is expecting your visit.

Enter Tim’s office. [Tim is an actor]

**Station B: Air Travel.** Your company needs both you and a co-worker (Sara, a colleague from another branch of the company) to attend a critical business meeting in San Diego. You have just arrived to drive Sara to the airport.

Sara is in the room. [Sara is an actress who explains to you that she has a fear of flying and does not want to go on the trip.]

At both stations, the applicant’s interaction is observed by a trained evaluator. Other stations might not involve actors; rather, they would involve the evaluator
posing a question pertaining to an issue of ethics or one’s knowledge of the health care system. Each station lasts no more than eight minutes. The evaluator then rates the applicant, using a 7- or 10-point scale. An aggregate score for each applicant is computed by combining the scores of all stations.

In a research context, Eva and colleagues compared the results of the MMI with those for the traditional interview format. The overall test-retest reliability for the MMI was significantly higher than that for the traditional interview. There was no significant correlation between an applicant’s MMI score and his or her score on the traditional interview or his or her undergraduate GPA. (In the years when the MMI was being evaluated in a research context, an applicant’s MMI score was not actually used in the admissions decision.)

In follow-up research, Eva and colleagues evaluated the association between a student’s MMI score and that student’s performance in medical school. Consistent with the research discussed in chapters 4 and 5, the MMI was a strong predictor of a student’s score on the OSCE, while a student’s undergraduate GPA predicted how well a student would do on multiple choice examinations of medical knowledge. They subsequently followed students through their clinical years, evaluating the association between the MMI and a student’s clinical skills. They re-confirmed that the MMI was the best predictor of a student’s OSCE score. They also found that the MMI predicted a student’s performance on the following sections of the Medical Council of Canada Qualifying Examination (analogous to the USMLE in the U.S.): Population Health; the Considerations of the Legal, Ethical and Organisational Aspects of Medicine; and Clinical Decision Making. The MMI most strongly predicted students’ performance in clinical clerkships. While a student’s undergraduate GPA predicted his or her performance on a 180-item multiple-choice test used to evaluate a student’s scientific and clinical knowledge, the GPA had no power to predict the outcomes associated with the MMI. Based on the outcomes of this research, McMaster now relies heavily on the MMI in evaluating the noncognitive strengths of applicants invited for an interview.

The researchers at McMaster have identified a core principle of the medical school admissions process that reinforces the conclusions drawn from the discussion in chapter 5: “If personal qualities are domains deemed vital to the selection of medical students, then a sufficiently reliable measure of those domains must be applied if an appropriate counterbalance is to be struck with reliably measured cognitive qualities.”

For more than four decades, McMaster has followed an approach to premedical education that essentially equates the value of cognitive abilities and noncognitive abilities in the selection of applicants for admission. In the evaluation of cognitive
ability, McMaster has focused on overall academic performance, with no additional weight and no specific requirements for courses in chemistry, biology, or physics. They have been able to evaluate noncognitive ability using the MMI instrument they developed.

In an interview with Dr. Harold Reiter, chair of MD admissions at McMaster, I asked for his reaction to the concept of approaching the traditional premedical sciences in an integrated, problem-based curriculum rather than continuing to offer them as individual free-standing subjects. In response, he asked why any predefined curriculum is necessary. If students elect not to take science as an undergraduate, let them do so and then get the needed science as part of medical school. So long as the person is a strong student as reflected by the overall GPA, he or she will be able to catch up in medical school (though also required to work harder than other classmates) and will become fully qualified as a physician.

In choosing not to follow the dominant paradigm of premedical education, McMaster has not sacrificed any increment of quality in the clinical and professional skills of their graduates. Their success in this regard can only call into question the continued appropriateness of the premedical paradigm followed by most other medical schools and undergraduate institutions.