

VIEWPOINT

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Interview

The Inevitable Reimagining of Medical Education

Medical education is currently undergoing a gradual but significant change. Part of the ongoing transformation is reducing the time of education by shortening the preclinical education period from 24 months to 12 to 15 months and, therefore, potentially reducing the total time of medical school.¹ Another change is more training in the predominant site of care, the outpatient setting. Additionally, the confirmation and assessment of completed training will shift from time in school to proven competencies. Incorporating all these changes is slow—inordinately slow for many people. But these changes seem inevitable.

Yet these changes are only the start. They do not consider one of today's most important trends. At many schools, the majority of medical students no longer attend preclinical classes in person but rather watch lectures online.² Ultimately, it is quite possible that all preclinical preparation will be online, completed anywhere in the world by a multitude of learners from just a handful of the world's best professors. Students' competence will be confirmed by a standardized test or set of tests. Then clinical training could be reconfigured, merged with residency training at the medical schools' affiliated hospitals and, increasingly, outpatient clinical sites. Students will be promoted based on demonstrated clinical competencies, not time in service.

The End of Preclinical Classroom Instruction

At many medical schools, the proportion of the medical school class that attends in-person preclinical lectures has gradually declined. At some schools, unless attendance is mandatory, one-third or fewer students actually attend class in person when they have the option of watching the recorded presentations online. By playing the lecture at double speed, most students "get" the content of a 60-minute class in 30 minutes. They can rewind and review multiple times any portion of the lecture they did not fully grasp the first time through. This learning can be done at their convenience in their preferred environment.

This approach saves students time, provides greater flexibility, and allows more attention to the topics they find difficult. They can group similar lectures together, rewatch them, take breaks while watching, and view the lectures with small groups of other students.

Given the declining attendance at preclinical classes, any rationale for holding live classroom lectures seems to be disappearing. Why should professors give the same lecture on the cranial nerves or pharmacokinetics that they gave last year and the year before for a limited number of students? It is a waste of everyone's time. Given this trend, the presentations for all preclinical classes should be available exclusively online by 2025 if not sooner.

Once online education becomes the norm, the structure of these preclinical classes will change, too. Sixty-minute presentations are not optimal for online learning. Instead, a series of short—about 6 to 15 minutes—video

sessions, each covering 1 or 2 major points with an associated set of readings, is best.³ When preclinical courses are recorded with the primary goal of being used online, the short segments with cases or examples and associated readings could become the norm.

But if preclinical courses transition to being available exclusively online, another dynamic seems to arise. Why should medical students learning anatomy or microbiology or pharmacology be limited to learning from the professors who happen to teach at their particular medical school? Why can't they—why shouldn't they—learn from the world's 2 or 3 best instructors in any particular field? Indeed, medical students already learn pathology from sources such as Pathoma⁴ and lectures on YouTube. Consequently, worldwide there could be a handful of outstanding courses in each content area developed for all preclinical classes. Medical schools will purchase online courses as the content for their classes, or else students will find the best online courses and learn from them. This approach would allow students to learn from the best teachers in the world—certainly an important goal of education.

Objections to Relying on Online Learning

One objection to moving preclinical classroom instruction online is that there is more to preclinical medical education than basic science lectures. However, basic science courses still comprise 80% or more of preclinical medical education. Much of the additional material—small group discussions, cadaver dissection, and classes on ethics, professionalism, cultural competency, the health system, and the introduction to clinical medicine—also could be well addressed online. For instance, the University of Pennsylvania has available an online class, "The American Health Care System," with 45 presentations and 5 discussion sessions and an "Ethics of Research with Human Subjects" course with 25 brief, approximately 10-minute, presentations that cover the fundamentals of clinical research ethics.⁵ These are part of an online master's program that offers 18 courses. Furthermore, much of the other material, such as cultural competence and communication skills, is really about incorporating clinical content into the preclinical years. Some of this, such as clinical ethics and professionalism, is unlikely to be optimized for students with little experience of clinical encounters. It might better to include these topics in an expanded vision of clinical training.

Online education programs can also offer opportunities for interactive sessions such as synchronous question-and-answer sessions with faculty as well as student discussion groups. With more seamless, reliable technology and, more importantly, advances in augmented reality (AR) and virtual reality (VR), it will soon be possible to "feel" as if everyone in a virtual group is in the same room participating in a single discussion. In addition, histology lectures and slides are already largely

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online, and digital simulations for anatomy dissection are already available and will improve with VR.

Furthermore, when correctly structured with collective projects or discussion groups, online courses can allow and foster the formation of deep, shared learning connections among students. For instance, at the start of one 20-month online Master of Health Care Innovation program, a 4-day in-person meeting fosters deep esprit de corps among the students and helps facilitate regular interaction and mutual support as the students all proceed through subsequent online courses.⁵

Another objection is that learning exclusively online is challenging. Approximately 90% of students who start a massive open online course never finish.⁶ In part this is because online courses currently offer lower rewards for finishing and are not critical for graduation. However, when students have something at stake, such as course credit, retention for online programs is around 70%.⁷ Arizona State University had a first-year retention rate of 87%, with a 6-year graduation rate of 68%.⁸ Online training requires real motivation and persistence to learn as an individual.⁹ But rather than a fault, this is a feature. Being able to finish months of online education in molecular biology, anatomy, and other complex topics is a good test of some of the very qualities that are desirable in physicians—persistence, determination, and commitment to lifelong learning.

If medical students are learning exclusively online during their preclinical training from a few outstanding professors, they will not necessarily have to live in the same city where the school is located but could literally be anywhere in the world with high-speed internet access. This means medical schools will not have a monopoly on preclinical training. Students could complete the preclinical years in any number of ways. Through traditional medical schools. On their own, organizing the right courses. Or, undoubtedly, through new companies that will arise, offering a full suite of preclinical courses by great educators from around the world, facilitating discussions, simulations, and tests. Regardless of the educational path, students' competency to progress to clinical training will still need to be certified in a uniform manner, such as Step 1 of the United States Medical Licensing Examination.

What Is the Irreplaceable Value of Medical Schools?

If medical schools are not necessary for preclinical education, then why are they needed?

Medicine is irreducibly personal. In the future, there will be greater use of telemedicine, virtual office visits, and other online con-

tacts. Nevertheless, medical care will remain largely an in-person, face-to-face interaction between patients and physicians or other clinicians. Consequently, the clinical portion of medical education will remain focused on hospitals, physician offices, patients' homes, and other settings. The most pivotal aspect of teaching in these setting occurs in the apprenticeship model, in which an experienced physician and student share clinical situations and the imparting of knowledge and learning are inextricably woven into the actual caring for the patient. Medical schools are uniquely capable of organizing these experiences of clinical rotations with skilled mentors. The irreducible core role for medical schools will be organizing and overseeing clinical education.

Focusing medical schools' mission exclusively on students' clinical education will create an important opportunity to reimagine and reconfigure medical education. Students could work on their own for preclinical training and then apply to one institution for both the 2 years of clinical education and the 3 or more years of internship and residency at one of the medical institution's affiliated clinical sites. The clinical portion of medical training—from medical school through to the end of residency—would then be at a single institution.

Consequently, medical schools could increasingly be responsible for 5 or more years of training, from what now is the traditional third year of medical school through the end of residency. This could facilitate competency-based promotion to internship when students have the knowledge; clinical, communication, and collaborative skills; and maturity to assume the responsibilities of caring for patients.¹⁰ In addition, it could reduce some of the redundancy in the fourth year of medical school and internship, as well as some of the potential challenges of geographic relocation between the two.

Conclusions

The unique part of medical school is not classroom-based preclinical training. Increasingly, this educational component will be done exclusively online. Inevitably, that will disintermediate medical schools, leaving them to reconfigure clinical training. Medical school could then be a unified period that incorporates the traditional 2 years of clinical rotations of medical school with internship and residency.

This transformation will not be easy. Transformations never are. But reconfiguration of medical education seems inevitable, fueled by online educational technology and the need to transform clinical training to more outpatient settings with promotion based on competency, not time.

ARTICLE INFORMATION

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