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From bench to bedside: a call to expand physician pathways for PhDs

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There are about 200 accredited medical schools in the United States. Among these, about 160 are allopathic (MD) and nearly 40 schools are osteopathic (DO). Collectively, these schools graduate over 28,000 physicians each year. In addition, over 75% of the MD schools have MD/PhD programs that train physician-scientists. Despite these relentless efforts to prepare physicians to become scientists who comprehensively understand the molecular basis of diseases and facilitate drug discovery and development efforts, there remains a notable shortage of physician-scientists. Although training established PhD-level scientists to become physicians is an attractive strategy to mitigate the shortage, there doesn't appear to be a well-defined path that trains PhDs to earn their medical degree. This problem is even more daunting for PhDs who trained outside the United States or Canada. This review highlights the advantages of training established biomedical scientists to become physicians and makes a case for medical schools to launch PhD-to-MD or PhD-to-DO programs to equip these scientists with clinical acumen to help bridge the widening gap between basic science research and clinical care as well as to mitigate our heavy and unsustainable reliance on international medical graduates to supply our medical workforce.

KEYWORDS

PhD-to-MD, PhD-to-DO, bench-to-bedside, bedside-to-bench, physician-scientist

Background

PhD-level biomedical scientists play a critical role in dissecting molecular mechanisms of human diseases using biochemical, cell biological, and animal models. In addition, they are heavily involved in academic medicine through teaching undergraduate, graduate, and medical students, as well as leading administrative positions. As scientists, they contribute volumes of new knowledge and breakthrough discoveries of underpinning molecular mechanisms that drive human diseases; identify therapeutic targets for diseases; discover and develop life-saving drugs; document molecular changes in response to therapy; identify genetic and epigenetic factors associated with disease severity or treatment failure; as well as lead advances in diagnostics and nanotechnology. Similarly, the contribution of scientists to academic medicine extends from curriculum development and general academic support to advancing medical education through teaching and hands on training of medical students and residents. In other words, it can certainly be argued that academic (and industry) scientists are the driving force in the genesis and transformation of medicine. In the United States (US), a large proportion of PhD-level biomedical scientists are foreign-born. According to the National Science Foundation (NSF),

the Science, Technology, Engineering, and Mathematics (STEM) workforce in the US was composed of over 46% PhD-level foreign-born life scientists in 2021 alone (National Science Foundation, 2024). Therefore, there needs to be a mechanism that leverages the talent and expertise of US- and foreign- born American scientists to expand the scope of training to substantially increase the number of physicians and physician-scientists in the country. More specifically, the nuclear contributions of PhD-level scientists in conjunction with the forecast of severe shortage of healthcare workers in general and physicians in particular (Association of American Medical Colleges) warrant the need to consider expanding the outreach of medical schools to recruit competitive PhD-level scientists to earn their medical degrees.

Paradoxically, there does not appear to be a well-defined path that duly credits the expertise and experience of accomplished scientists to help them earn their medical degree. Apparently, there is a novel initiative by the *Consortium of Accelerated Medical Pathway Programs* (CAMPP) led by the New York University (NYU) Grossman School of Medicine (New York University Grossman School of Medicine). Founded in 2015, the goal of this program is to form a coalition of medical schools that provide an accelerated MD program targeted at reducing the shortage of physicians. Intriguingly, one of the members of this consortium, Columbia University's Vagelos College of Physicians and Surgeons, has a PhD-to-MD program that accepts and trains a cohort of PhD-level biomedical scientists (Columbia University Vagelos College of Physicians and Surgeons).

Unfortunately, this exemplary program is restricted in number and only considers candidates who earned their PhD in the US or Canada. Given the substantial number of foreign- born and/or trained American biomedical scientists, there needs to be thoughtful approaches to expand this program and launch new programs. In other words, more medical schools need to follow the footsteps of Columbia University to accept a cohort of PhDs into their MD programs and study their career trajectory and contributions to our research and healthcare enterprises including in narrowing the widening gap between basic science research and clinical care as well as in minimizing the reliance on international medical graduates (IMGs) to supply our medical workforce.

It is important to emphasize that awarding credit in such programs would be strictly limited to premed and preclinical foundational sciences in which PhD trainees have demonstrated significant proficiency through coursework, publications, and teaching experience. This would not reduce clinical exposure, as trainees would still be required to complete the full suite of core clerkships and meet all competencies in clinical medicine. Pilot programs like Columbia's offer a model for tracking clinical preparedness, licensing examination (USMLE) performance, and long-term practice outcomes among PhD-to-MD graduates.

As a pilot study, schools may accept 4–6 highly competitive PhD candidates annually using criteria that are similar to their established MD or DO admission programs with the additional requirements of an earned doctoral (PhD or equivalent) degree, significant research experience and an intent to combine the practice of medicine and research. In return, the scientists may receive credit for the research and additional relevant expertise (publications, leadership and other significant achievements) that they possess to accelerate their training period.

Furthermore, it is acknowledged that residency remains a critical bottleneck. The proposed initiative does not attempt to expand the total number of medical graduates without a corresponding increase in residency slots. Instead, it supports aligning with calls for federal expansion of graduate medical education (GME) funding. PhD-to-physician candidates—often already US residents with scientific careers—could bring unique translational expertise to residency programs. Their grant-writing skills, research experience, and maturity may make them strong contributors, not competitors, within this constrained pipeline.

Importantly, training a large number of physicians in the US through the traditional MD or DO path, as well as through PhD-to-MD or PhD-to-DO programs will allow us to progressively reduce our heavy reliance on IMGs to fill in our residency programs and, eventually, our medical workforce.

Surprisingly, a recent report indicates that in comparison to any of the medical schools in the US, the largest contributor of physicians into our first-year residency programs each year for the last 13 years is located outside the US [Saint George University (SGU), 0000]. The Association of American Medical Colleges (AAMC) US Physician Workforce Data Dashboard also shows that about 25% of our physician workforce in 2022 were IMGs (Association of American Medical Colleges, 2023).

Perspective

As a foreign- born and trained American PhD-level biomedical scientist interested in earning my medical degree to become a physician-scientist, I have been closely studying the admission criteria to US medical schools. I found that although almost all schools have clear requirements for admissions, most of them only consider applicants who completed their prerequisites or their undergraduate degree in the US or Canada. This means that a foreign-trained scientist, regardless of the level of education or tenure in the US, has to retake all the prerequisite courses including basic biology lecture with labs, general chemistry lecture with labs, biochemistry, organic chemistry lecture with labs, physics lecture with labs, English, statistics, and psychology at a US-based institution. For biomedical scientists who have already taken these (and more) courses and possess substantial laboratory experience with scientific publications in various aspects of medicine, this is likely a deterring factor that could shut down any appetite to pursue a degree in medicine. This compounded with the lack of consideration for research experience by some schools becomes an insurmountable barrier to fulfilling the dream of becoming a physician-scientist. If one manages to confront the system and retake all the prerequisites (over 2 years of premed coursework) and apply to medical school, the application is reviewed with the traditional pool of applicants using criterion that is primarily developed to evaluate undergraduate students. Ideally, however, one would conceive a path that thoughtfully leverages the expertise and experience of seasoned scientists who have conducted cutting edge biomedical research, built oral and written communication skills, secured several competitive grants, trained undergraduate, graduate and medical residents to be separately evaluated in PhD-to-MD or PhD-to-DO-like accelerated programs. When formed, such programs would curtail unnecessary repetition of coursework

and efficiently prepare interested scientists to become physicians to focus on patient-informed basic or translational research activities and care for patients on a day-to-day basis.

Moreover, concerns that these trainees would not maintain engagement with research are important. However, PhD-to-MD/DO candidates differ significantly from MD/PhD students, who may explore research as an emerging interest. These candidates already have established research programs, publication records, and funding history. Their motivation to integrate medicine is often driven by a desire to directly apply their discoveries or design more clinically informed research. This anchorage increases the likelihood that they will persist as practicing physician-scientists.

It is important to emphasize that the proposed expansion of PhD-to-MD programs does not replicate but supplement the existing MD/PhD programs. For example, established PhDs have substantial grant writing skills that could attract extramural funding to sustainably support research projects. In addition, the research track they built would serve as an anchor to retain them to continue to do research while caring for patients.

Lastly, the paper acknowledges that a major limitation in implementing this vision is the disconnect between funding for undergraduate medical education and the finite number of GME slots. We call upon Congress to not only sustain but increase support for GME to ensure that any expansion in medical school pathways is matched by sufficient residency opportunities. Without such alignment, systemic bottlenecks will persist (Lakhan, 2025).

Given the potential contribution of such physician-scientists to advancing research and healthcare, Congress needs to appropriate sufficient funding for medical education so that schools may be able to expand their existing programs and establish new ones aimed at bridging the gap between basic science and clinical practice while addressing the growing nationwide shortage of physicians. Bridging the bench-to-bedside gap may increase the number of drugs and/or diagnostics in clinical practice while addressing the severe shortage of physicians may increase the quality of care we provide.

Conclusion

Given our heavy and unsustainable reliance on IMGs to supply our medical workforce, and the moral and ethical challenges of potentially brain-draining developing countries with already low per-capita physicians and looming global health threats, it is logical that we develop proactive initiatives and long-term strategies that enable us to tap into all available national resources to grow our own medical workforce in sufficient quantities. One potentially large resource of competitive and well-prepared candidates to medical school are foreign-trained PhDs who have permanently immigrated to the US. These biomedical and other life scientists have substantial expertise and possess many of the qualities that are necessary to train competent physicians. However, if PhD-level scientists are to be encouraged to consider becoming physician-scientists, our admission requirements will need to be thoughtfully re-evaluated. Here, medical schools with significant research track could take the lead in developing platforms (e.g., PhD-to-MD, PhD-to-DO) that allow efficient training programs that duly credit the research experience. Training highly established scientists to become physicians is expected to have many advantages including bridging the gap between bench research and clinical care, as well as minimizing our heavy reliance on IMGs. One of the most pressing lessons from the COVID-19 pandemic is the importance of having a robust and scalable healthcare workforce prepared to respond to both routine and emergency situations. This experience has made it clear that strengthening our medical education infrastructure is not just a matter of public health, but also of national preparedness. A well-trained and adequately staffed physician workforce is essential for ensuring continuity of care during future public health crises, natural disasters, or mass casualty events. Thus, Congress should increase, not decrease, funding for undergraduate and graduate medical education so that schools may be able to increase their annual intake and perhaps implement new training initiatives like PhD-to-MD or PhD-to-DO programs.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

YG: Writing – original draft, Writing – review & editing.

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Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Generative AI statement

The author(s) declare that no Gen AI was used in the creation of this manuscript.

Publisher's note

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