Preparing Physician-Scientists for an Evolving Research Ecosystem

Physician-scientists, by combining their clinical experience with investigative skills, are uniquely poised to address critical issues in medical care and human health. However, the future of a robust physician-scientist workforce in the United States is uncertain.1 Multiple factors account for this long-standing issue, perhaps most prominently is limited federal biomedical research funding. Following strong growth of the National Institutes of Health (NIH) budget in the previous decade, from 2003 to 2015, the NIH’s research-funding capacity declined by 22%.2 Even though the 2019 federal budget proposal would increase the total NIH budget to approximately $34.8 billion, this increase will not likely compensate for the reduced funding rates for research project grants over the past 4 years.3

Aside from the research funding challenge, young physicians still must surmount multiple hurdles to pursue a research-predominant career, including prolonged training requirements with substantial undergraduate and medical education debt, challenges in finding and maintaining mentors, difficulty achieving work-life balance (particularly for dual-career households), and obligations to engage significant time in revenue-generating activities such as direct clinical care.4 Confronted with these challenges, many physicians with an interest in research choose instead to pursue full-time clinical careers with greater job stability and higher incomes than research grant-dependent positions.

What steps can be taken to sustain the physician-scientist workforce? Leaders from the NIH and academic medical centers have proposed various solutions. The 2014 NIH Physician-Scientist Workforce Working Group (PSW-WG)5 outlined 9 recommendations, ranging from increasing support for MD-PhD programs to developing new funding mechanisms for early-career and new investigators, as well as proactively supporting physician-scientists from underrepresented groups. Others1 have called for greater allocation of funds for loan forgiveness, improved research mentorship programs, replacement of the research “pipeline” metaphor with the concept of multiple “on-ramps” to research efforts throughout a physician’s career, and diversifying academic biomedical research career track options. Some professional societies have begun to provide research support for young investigators. Given unpredictable NIH funding, many of these goals will be challenging to achieve.

While NIH funding has not kept up with inflation over the past decade, investment from diverse private sources has increased substantially, notably, from biotechnology and pharmaceutical companies, technology companies, philanthropy, and foundations.5 From 1994 to 2012, as a proportion of the total research funding, private sources for US medical research increased from 46% to 58% (approximately $15.2 billion to $67.9 billion).5 Likewise, between 2011 and 2017, total venture funding for digital health ventures increased from $1.1 billion to $5.8 billion.6 Technology companies, both large and small, have entered into biomedical research, further expanding the role of the private sector.7

Should this increasing private sector role in research funding be matched by a commitment to research training, or should the NIH and academic medical centers serve as the only funding sources for preparing the next generation? Could a commitment from private entities to research training, from medical school through residency, help sustain, and even expand, the physician-scientist workforce? Such efforts could begin with research experiences (“rotations”) in private industry during (or perhaps even before) medical school. Later in their training, residents could engage in site-based internships. Examples include internships through the design and consulting firm IDEO in which residents engage in clinically relevant design projects, as well as summer or year-long research internships offered by industry sponsors such as Merck and Janssen, and foundations, such as the Allen Institute and the Howard Hughes Medical Institute’s Janelia Research Campus. Furthermore, the Icahn School of Medicine at Mount Sinai and Verily (Alphabet Inc’s life science research division) have formed a partnership in which a limited number of medical students spend 2 years engaged in a research fellowship at Verily, and MD-PhD students can choose to complete their thesis work at Verily.

Incorporating private-sector opportunities and experience into physician-scientist training may enrich and expand the scope of biomedical research.
place physician-scientists in teams composed of colleagues from vastly different disciplines, including business development, manufacturing, public policy, data science, engineering, and user experience. Early-stage physician-scientists may be accustomed to working in interdisciplinary clinical and academic teams; however, it is unlikely that they have collaborated with the engineering, design, and business development colleagues of a technology company or the medicinal chemists, quality control experts, and product managers of a biotechnology or research-driven pharmaceutical company. Innovation thrives at the intersection of disparate and complementary disciplines. Early exposure to private-sector biomedical research could allow trainees to acquire additional skills to effectively work as part of diverse teams.

Within this changing research ecosystem, prospective and early-career physician-scientists may perceive 2 distinct career paths: a publicly funded academic institution–based track or a track funded exclusively by the private sector, which some academics have stigmatized as the “dark side.” Biomedical advances depend on the strengths of both tracks. There are still significant gains to be made in basic science; compared with a career in the private sector, physician-scientists in academia may be more likely to explore topics that advance scientific foundational knowledge, to have more control over the direction and focus of their work, and to mentor the next generation of scientists. However, science needs physician-scientists who understand how to take foundational knowledge and apply it to develop novel therapeutics or policy decisions. Increasingly, their research, especially high-risk research in academia, may be supported by private sources, including philanthropy. Although positions in industry may be less stable and more subject to market forces than academic medical center–based research careers, physician-scientists in the private sector may explore diverse projects in multiple roles (including product development, regulatory affairs, bioassay design, marketing strategy, and policy drafting), particularly in larger organizations. The technology industry, a significant new entrant in the biomedical research ecosystem, offers biomedical workforce. Proc Natl Acad Sci U S A. 2015;112(2):313-318.


