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Viewpoint

Introduction Biomedical science relies on individuals to make long-term commitments for education and training that extend over 7 to 10 years or longer. The US has led the way in innovative approaches to biomedical research education, pioneering creative opportunities: undergraduate and postbaccalaureate research programs, NIH-sponsored Medical Scientist Training Program (MSTP) training grants, research fellowships for medical students, and institution-centered Physician Scientist Training Programs (PTSP) for medical residents and fellows. These programs provide paths for acquiring unique and often simultaneous training in research and clinical care and have significantly improved recruitment and support of students and trainees. However, despite these efforts, there remain too few well-trained physician-scientists in the pipeline to support the growing needs of our complex and health-minded society. In 2013, the NIH Physician-Scientist Workforce Working Group (PSW-WG) was established to assess the workforce and make recommendations in support of a sustainable and diverse clinical research infrastructure (1). Subsequently, the Alliance for Academic Internal Medicine hosted a consensus conference to discuss workforce issues, which furthered recommendations around increasing entry into physician-scientist training and curbing attrition (2). These working groups identified several critical issues facing trainees and proposed solutions. Many of the recommendations have been implemented in various forms, and there is widespread bipartisan support for these efforts. This manuscript is an opinion piece, generated by members of the Advocacy [...]

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Balancing dual demands on the physician-scientist workforce

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Introduction

Biomedical science relies on individuals to make long-term commitments for education and training that extend over 7 to 10 years or longer. The US has led the way in innovative approaches to biomedical research education, pioneering creative opportunities: undergraduate and postbaccalaureate research programs, NIH-sponsored Medical Scientist Training Program (MSTP) training grants, research fellowships for medical students, and institution-centered Physician Scientist Training Programs (PTSP) for medical residents and fellows. These programs provide paths for acquiring unique and often simultaneous training in research and clinical care and have significantly improved recruitment and support of students and trainees.

However, despite these efforts, there remain too few well-trained physician-scientists in the pipeline to support the growing needs of our complex and health-minded society. In 2013, the NIH Physician-Scientist Workforce Working Group (PSW-WG) was established to assess the workforce and make recommendations in support of a sustainable and diverse clinical research infrastructure (1). Subsequently, the Alliance for Academic Internal Medicine hosted a consensus conference to discuss workforce issues, which furthered recommendations around increasing entry into physician-scientist training and curbing attrition (2). These working groups identified several critical issues facing trainees and proposed solutions. Many of the recommendations have been implemented in various forms, and there is widespread bipartisan support for these efforts.

This manuscript is an opinion piece, generated by members of the Advocacy

Committee of the American Society for Clinical Investigation, intended to engender discussion on the role of physician-scientists in shaping our national research agenda. We highlight personal and professional factors to be considered by individuals embarking on this career.

The Gemini effect

Physician-scientists assume dual roles in medicine and research and thereby provide dual perspectives that we refer to as the Gemini effect. Physician-scientists work simultaneously as researchers with expertise in human disease pathophysiology and as clinicians informed by basic research insights. These dual perspectives cannot be understated, especially in the settings of manuscript and grant reviews, advocacy, and education. This multidisciplinary view that physician-scientists bring to a clinical or research team places them in high demand in academics, industry, and government science venues. These diverse career options also offer an exciting array of professional choices for physician-scientists and provide unique niches with long-term job satisfaction. There are multiple perks of working as a physician-scientist: intellectual contribution, leadership in professional societies, advocacy, and opportunities for national and international interaction and collaboration. Moreover, the mentoring structure in research-intensive fields is often longitudinal and can be a source of great personal satisfaction.

Training-period considerations

One factor in physician-scientist training is the lengthy period required to complete research training and become qualified to practice medicine, which presents a barrier to both entry and retention in this career

path. American physician-scientist trainees commonly spend 15 or more years in training before being viewed as strong candidates for career development (K) awards, which facilitate obtaining tenure-track positions. The expectations of funding bodies for independent K grant applicants are increasingly heightened, and high-risk projects appear to be decreasingly valued. The average age of securing a first R01 for physician-scientists is 46 years. The effects of this timeline are obvious: years of effectiveness are diminished, and lengthy training can become a deterrent to program completion. It can be intimidating to young people viewing this trajectory in its entirety, factoring in desires to develop other aspects of personal life: spouse, children, housing, travel, hobbies, and recreation. These factors challenge the longitudinal training period that may not (at least be perceived to) accommodate such disruptions, and may disproportionately affect women, and further influence equity, diversity, and inclusiveness in the physician-scientist workforce.

Encouraging entry

Consideration should be given to shortening training in graduate school and residency for physician-scientist trainees. Focusing metrics for both MD and PhD completion less on the time involved and more on quality of experience, impact of findings, and grant-writing and communication skills could have a major impact, with robust skill-based metrics providing students with objective appraisals of their readiness and aptitude for the career path. Residency training could also be skill based (3) rather than time based, although this requires a larger discussion about how residents and students are assessed and integrated with the hospital workforce and the attainment of specialty insights necessary so that they can emerge as content experts.

Conflict of Interest: SFT owns equity in, is a paid scientific advisory board member of, and has licensed intellectual property to Rgenix.

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Strategies for attracting potential physician-scientists at later entry points may also be useful. For example, PhD training programs could follow MD training, or extended opportunities for research exposure in later years of training or early faculty periods could be fostered. Keys to shortening time for training include general principles around creating incentives for investment in the potential of young researchers, assumption of risk by the institution, and programs that launch junior researchers toward independent positions while providing salaries that are competitive and afford a lifestyle that is compatible with stage of life and level of training. Institutional mentoring and career development programs can greatly accelerate advancement (4) and should be implemented broadly to encourage and retain talent in this workforce.

Preventing workforce depletion

Institutionally, physician-scientists clearly benefit from focused periods of research development to balance and maintain a research-focused program. Incentives to entice department chairs and key decision makers to invest in physician-scientist pools could be established to support salary and career development for physician-scientists. Strategies for technical specialties may differ from those that are less procedure based. We contend that time spent in patient care should be rewarding and stimulating, and medical advances are needed in all specialties.

Specific mechanisms for early career grants are highly valuable. A specific recommendation made by the PSW-WG is that residency-training time not be counted toward early career status for federal grant applications, a factor placing these individuals at a disadvantage relative

to peers. Finally, a national program of career development during early investigator years is desirable, with increased exposure and emphasis on successful promotion of women and underrepresented minority physician-scientists. Several smaller foundations currently address this gap, notably the William Guy Forbeck Research Foundation, which provides mentoring and networking experience over a 5-year period for a small cadre of early career investigators.

The American Society for Clinical Investigation, an honor society of physician-scientists, promotes retention of physician-scientists by inviting young faculty to attend its annual conference through a Young Physician Scientist Award (YPSA) mechanism. This annual conference has expanded to embrace the youngest generation of physician-scientists in training, by partnering with the American Physician Scientists Association (APSA) in planning the annual meeting along with the Association of American Physicians (AAP). Recent efforts to include year-out medical fellows at the annual conference allow trainees on the cusp of these careers to learn networking skills and gain exposure to experienced physician-scientist role models. Feedback from this meeting is overwhelmingly positive, and expanding intentional opportunities for career mentoring could be valuable to the national commitment to the cultivation of physician-scientists.

Significant controversy exists over the best way to master the Gemini effect. Serial focused periods of tag-team clinical and research training are the traditional approach; however, early implementation of a more holistic research experience during clinical education may teach students how to best integrate research and clinical

demands. Significant flexibility and investment are needed at institutional and national levels to sustain this critical workforce.

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