Editorial

The Future of the surgeon-scientist: A Journey Funneled through inspiration, Roadblocks and Resilience

Surgeon-scientists set themselves apart from clinicians with their ability to morph the knowledge acquired from the laboratory and clinical atmospheres into research opportunities that can improve the care of their patients and communities. Goldstein et al. defines a surgeon-scientist as a surgeon engaged in translation research in a wide-range of fields [1]. In more recent times, this role has evolved past the bench to become a part of an interdisciplinary team as pioneers of medicine. Remarkable examples of such pioneers include Nina Braunwald and her work on prosthetic mitral valves, solid organ transplantation developed by Joseph Murray and Thomas Starzl, and Frederic Mohs with the invention of Mohs micrographic surgery [2-4]. Individuals pursuing careers as surgeon scientists are charged with the task of advancing the surgical field. While talented young trainees will choose to follow this path, it is an uphill battle made difficult by barriers imposed by the current academic healthcare environment. It is because of this strenuous journey that we must recognize, support and encourage these diligent innovators.

As per the 2014 Physician-Scientist Workforce Report, the last decade saw a steady increase in the age of physicians receiving NIH research grants [5]. Currently, 50% of physician-scientists with NIH research grants are over the age of 50. This may imply declining opportunities for younger academic physicians with novel ideas and fresh perspectives. While age may play a factor in funding allocations, there also exist other demographic influences. Though no differences in research grant award rates between men and women were reported, lower rates were observed for underrepresented minorities compared to white applicants (Whites, 23.5%; Asians, 19.7%, p < 0.002; Hispanics, 17.7%, p < 0.002; African Americans, 15.6%, p < 0.002). In this group, Hispanics, African Americans, and Native Americans represented 5.4% of awardees despite making up 12.3% of the entire physician workforce [6,7]. This demonstrates less backing for physicians who are younger and underrepresented members of the workforce who could thrive with additional aid.

Aside from financial support, surgeon-scientists are pressured to generate revenue [8]. In a study conducted by Kibbe et al. surgeons expressed the cumbersome burden placed on their shoulders to produce revenue thus diminishing their realistic capabilities to conduct research [8]. Another onerous aspect to be considered is the salary support from the NIH [9]. There has been an increase in total NIH funding over the last 10 years but unfortunately, surgeons have not benefited from this trend [9]. The salary support from an NIH grant does not cover the lost revenue of a practicing surgeon, resulting in financial losses when engaging in high level active research [9]. This friction-filled situation creates role strains; obscuring the surgeon-scientist position [10]. Surgeons have greater and increasing collective responsibility than non-surgeons in terms of clinical activities and financial viability of academic health centers [10-14]. This responsibility has only become more pronounced since it was initially described in 1997. A 2004 predictive model estimated a significant rise in the amount of work across all surgical fields [15]. These predictions have become a reality, as patients that require treatment exceed the availability of active surgeons. This caused a shift in priority for surgical departments, away from funding new research, towards ensuring that surgeons meet clinical revenue metrics as primary performance indicators. This is manifesting as the number of academic surgeons indulging in research has declined [1].

Another aspect of the surgeon-scientist’s research environment to consider is the effects this setting may have on individuals. The evolving reimbursement landscape has made medical institutions more motivated to push surgeons to be clinically active rather than producing academic content. This affects the surgeon scientists in a number of ways. Notably, one of the most blatant and direct effects has been burnout in the surgical field. It is often suggested that the strenuous work hours, lack of autonomy and a perception of an unfulfilling career were associated with the development of burnout [1,16]. These concepts are exacerbated in a field such as surgery where individual agency continues to decrease to compensate for the needs of our healthcare system.

Additionally, the current workload model for surgeons makes protected research time difficult to establish. Surgeons need to remain readily available for their patients, making it difficult to set aside protected dedicated research time [1,10,17,18]. While there may be surgeons interested in pursuing research, they are unable to do so given the structure by which our institutions operate [8,10,17,18]. The road to protecting this career path requires leadership in surgery to validate the importance of the surgeon-scientists which is demonstrated by establishing protected research time. Surgeon-scientists should be recognized as multidisciplinary investigators who could benefit the most from protected time and new funding opportunities [6,10,19]. Their expertise allows them to collaborate and share their perspectives on a broad spectrum of scientific questions. Thierry Carrel, Professor of surgery at the University Hospital of Bern, explained in a 2002 article, that in the past “The bedrock of surgery, in those days was gross anatomy.” Today this has changed to include basic sciences, specifically molecular biology, and advances in biotechnology [20]. The unique relationship between basic scientists and surgical specialists depends on the support of our institutions.

Given the notable challenges for surgeon-scientists to thrive let alone persist, we have the following recommendations. Beginning in medical school, a formal research course ought to be incorporated into the curriculum for all students to partner with current clinician-scientists [10]. This establishes a mutually beneficial relationship where the medical student gains valuable “on-the-job” training and exposure to research as well as a

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mentor. The surgeon-scientist in this scenario would gain an extra set of hands to help contribute to the research process. As a strong background in research is typically expected of future surgical residents and surgeons, this allows for early exposure and improvement of research skills [17,18,21].

Another recommendation revolves around the partnerships of institutions with other research powerhouses and funding sources. Either through professional associations or the private sector, these relationships can create effective mentorship that will lead to concrete career development for their own trainees. It can be done by the creation of formalized mentoring programs or sponsored institutional grants, especially from large academic centers. Until sufficient changes can be made in this area, young trainees will have to collaborate with competent and reliable peers in academia to facilitate the production of new research. This can alleviate the stress associated with managing clinical and academic work as well as provide further incentive for cooperation within the field.

To achieve success, trainees will need to overcome challenges and perhaps the best advice for maintaining relevance while doing so, especially in medicine, is to remember that healthcare requires teamwork. While there are fewer researchers in this field, young trainees must find opportunities of mentorship wherever available. The advent of social media has made this process easier for trainees to identify and communicate with mentors from anywhere in the world. Mentorship and networking are pivotal to support the growth of surgeon-scientists in this field, especially for individuals who are underrepresented in medicine. The qualities that represent a great mentor include enthusiastic, collaborative, skilled clinician, insightful and compassionate [22]. Mentors can help guide their mentees by creating career plans, setting high standards, advising on research activities, and tailoring their mentorship skills to each individual mentee [22]. Those who receive mentorship are more likely to receive grant support and report greater career satisfaction. Finding strong research mentorship ensures that trainees learn how to develop their ideas, transforming them into funded studies. Inversely, for established members of the field, providing mentorship through these platforms will help new trainees and students, who are unsure of their next steps, find a rewarding career path. According to Paice et al., “The opportunity to hear different views and see things from a different perspective was a revelation for many young doctors.” [23] This remains a fact regardless of the progression of the field of medicine, and it may be key towards increasing the number of future surgeon-scientists.

Despite hindrances, the resilience of the surgeon-scientist has shone through. They have increased their grant publication impact while maintaining a high success rate converting ROI-equivalent grants with less access to new opportunities [5]. Though clinical and administrative responsibilities present barriers to success as a surgeon-scientist, expanding the field is not impossible, nor improbable. There are plenty of trainees eager to pursue careers in academia. Leaders in the field must recognize this and work together to provide these young investigators with the opportunities to learn and develop their skills and contribute to the knowledge base. Institutional investments in these areas will help grow the field and create a new age of surgical pioneers that will continue to advance medicine. As for the individual trainee, you must recognize that the strength of a surgeon-scientist lies in your resilience, passion, and perspective. Your success will be determined by your ability to balance your clinical work with your research studies. Considering the barriers ahead, failure is bound to come, so do not be surprised by them, rather use them as tools to ensure your longevity and accomplishments in the field.

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