The Laryngoscope

Editorial

Re-engineering the Surgeon-Scientist Pipeline: Advancing Diversity and Equity to Fuel Scientific Innovation

The start of this decade has seen a palpable shift in tensions of race, class, and gender, exposing health disparities and inequality in the United States. This greater attention to diversity, equity, and inclusion is not simply important for its own sake; there are clear benefits of its presence and long-term consequences for its absence. In art and music, we often find the most memorable moments arise through novelty and fresh perspective.[1] The role of diversity in scientific advancement is akin to this. A comprehensive analysis of data from over 5 million investigators and nearly 10 million published articles over across 24 subfields of science revealed that ethnic diversity was most highly correlated with scientific impact, outperforming nondiverse comparators independent of year, number of collaborators, and number of authors on published work.[2]

And yet, despite the scientific contributions of diverse groups, the pipeline of surgeon-scientists has remained exceptionally constrained for women and underrepresented in medicine (URiM). While the underrepresented minority population in the U.S. continues to rise as a percentage of the country's overall population, the number of URiM matriculants to medical schools continues to lag behind, thereby not representing national demographics.[3] This lack of diversity in medicine extends to physician-scientists. From 1975 to 2014 medical scientist training programs (MSTPs) graduated approximately 10,000 MD-PhD students, with a total of 356 (3.7%) Black and 386 (4%) Hispanic students,[4] or approximately a quarter of the corresponding percentages in U.S. census statistics. Unfortunately, the NIH-funded biomedical workforce portfolio shows a similar picture when it comes to diversity. White females with advanced degrees are underrepresented, with approximately half the grants relative to their male counterparts.[5] Similarly, Black males and females with R01s are woefully underrepresented relative to the labor market. Overall, there was no significant difference in the R program grant funding rate (the number of awardees relative to applicants reviewed) between men and women from 2002 to 2016; however, women only make up one-quarter of the awardees and less than 30% of all applicants, signaling a pipeline problem.[6] In contrast, there was a persistent 7.5% lower funding rate for underrepresented minorities when compared to majority research project grant applicants from 2002 to 2016. Underrepresented minorities make up only 2.8%, 2.1%, and 1.0% of the early-stage investigators, new investigators, and experienced investigators.[6] These issues are compounded by the already difficult path of the surgeon-scientist. Of the academic surgical faculty, 68% believe it is unrealistic for a surgeon to be a successful basic science researcher.[7] Thus, women and URiM are working against staggering odds in the pursuit of surgeon-scientist careers.

An additional impetus for change is the realization that structural racism—the systematic perpetuation of racial inequity—is an etiological factor in poor health outcomes in marginalized groups in the US. At the intersection of precision medicine and health disparities is a recently acknowledged need for discovery—a potential clarion call for greater diversity in the biomedical research workforce.[8,9] The presence of more diverse researchers can increase the trust of diverse patient populations enrolled in precision medicine studies,[10] thereby helping to limit the dangerous potential of exacerbating further health inequities through inadequately executed studies. This phenomenon adds to the urgency of addressing the leaky pipeline for URiM in medicine.

However, there is room for optimism. Concrete steps can be taken at every step of the pipeline to have our future workforce of surgeon-scientists more closely mirror that of the populations we serve. To rebuild a robust pipeline of female and URiM surgeon scientists, we must start developing programs at the high school and college level. Recruitment and retention remain key challenges throughout the duration of a surgeon-scientist career,

Dear Laryngoscope Reader,

At times, thought leaders will be invited to pen an editorial for the Laryngoscope. Below please find carefully considered comments for your review.

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TABLE I.
Several Prior Interventions for the Leaky Pipeline in Science, Technology, Engineering, and Mathematics (STEM), as Well as Outcomes Where Available, Are Outlined Here.

Stage of Career	Notable Examples of Prior Interventions
Undergraduate	At Harvey Mudd College, introductory courses for computer science have been split into groups based on existing experience, which is often something that women and minorities do not have access to. This has allowed for the fostering of confidence and community among underrepresented groups, leading to dramatic and tangible improvements in women graduating with STEM degrees.[12]
Undergraduate	The Meyerhoff Scholars program at the University of Maryland, Baltimore County (UMBC), provides financial, academic, and social support to underrepresented minority students. Since implementing this program, UMBC has become, among predominantly white universities, the number one institution by number of African American baccalaureates who go on to pursue doctoral degrees in the natural sciences and engineering.[13,14]
Medical training	In 2009, the Liaison Committee on Medical Education introduced requirements for emphasis on diversity into accreditation standards for medical education. Following implementation of these standards, female and black matriculants saw an increase in enrollment, whereas previously their enrollment had been decreasing annually.[15]
Medical training	The Ohio State University implemented implicit bias training for members of the medical school admissions committee. The subsequent matriculating class was the most diverse in the medical school's history to that point.[16]
Medical training and academic faculty	Several private and federal programs aim to support the development of underrepresented minorities in science. Some notable examples are the Ruth L. Kirschstein NRSA Institutional Predoctoral Training Grants, NIGMS Individual Predoctoral Kirschstein NRSA Fellowships, and the NSF Louis Stokes Alliances for Minority Participation (LSAMP).[17] Relatedly, the Burroughs-Wellcome Fund Physician-Scientist Institutional Awards aim to support the development of MD-only scientists.[18]
Academic faculty	The University of California San Diego implemented a junior faculty development program, spanning career counseling, grant writing workshops, and proactive mentoring by senior faculty. This led to an increase in the retention rate of underrepresented minority faculty members from 58% to 80% and retention in academic medicine from 75% to 90%.[19]

These may serve as inspiration for continued, proactive efforts at all levels in the development of the next generation of surgeon-scientists.

including at the level of the promotions pathway. Mentorship is a key aspect in the development of a scientific career,[11] and thus a critical mass of representative faculty is of utmost importance in the sustainability of building up similar representation among surgeon-scientists. Several notable examples of interventions by stage of career are outlined in Table I.

Most importantly, these efforts will need to be coordinated along the different stages of the pipeline ranging from high school programs to diversity initiatives for medical faculty. Funding agencies and private foundations should also become active participants in diversity, equity, and inclusion initiatives to change the face of surgeon-scientists of the future.

Maximizing the existing potential while improving diversity in Otolaryngology research will require long-term initiatives that seek to grow the ranks of women and underrepresented minorities as surgeon-scientists. Our readership may not always be positioned to directly implement these changes; nevertheless, a greater awareness of these challenges and opportunities is of utmost importance. As Otolaryngologists usher our specialty into a new era in which diversity, equity, and inclusion are of vital importance for the future, we must strive to go far beyond words and turn these initiatives into tangible actions.

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