Changing the Status Quo, Including How We Measure It

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In this issue of *Annals of Surgical Oncology*, Nguyen et al. show an expected association between surgical oncologists' h-index and academic rank.¹ One of the authors' main findings was that male gender was associated with higher h-indices across all ranks of Assistant Professor, Associate Professor, and Professor. There was not a statistically significant difference associated with administrative position (e.g., division chief or department chair). These data form the basis for important discussions about how current metrics of research productivity may inadvertently influence and perpetuate gender disparities.

Physicians are evaluated by many metrics throughout their training and as part of their clinical practice and research careers. Standardization of such metrics is critical in minimizing bias, although studies suggest that many standardized tests have flaws and/or limitations and many quality metrics have unintended consequences for patients, providers, and hospitals. Furthermore, these metrics may conceal underlying factors that are important contributors to each individual's achievements.

The h-index (Hirsch index) is a widely used measure of researchers' productivity and impact. Although an in-depth discussion of the merits and faults of the h-index are beyond the scope of this editorial, the measure is not without bias.² As such, we must consider how the index is calculated to assess the implications of the data that Nguyen et al. present. As with most composite measures, combining information accounts for potential weaknesses associated with individual numbers. Specifically, the h-index improves upon the metric of total number of

publications (productivity) by also accounting for how often work is cited (impact), although the h-index is relatively insensitive to a small number of highly cited articles, because the number of citations above a critical number are irrelevant to the calculation. The h-index also does not consider variation in publication practices across types of research (e.g., basic science research vs. clinical outcomes research) or the relative strength of the impact factor of journals in which papers are published (recognizing that number of citations correlate to impact factor).

Of particular interest with respect to Nguyen et al. is the correlation between gender and h-index, which has been described across other specialties. This study highlights the chicken or the egg causality dilemma ("Which came first, the chicken or the egg?"). Do the authors convincingly demonstrate that the h-index predicts the academic rank of surgical oncologists, or do they actually show the extent to which use of the h-index potentially contributes to the biases inherent in the process of academic promotion? Is the h-index an appropriate measure of research achievement, and should it be used to guide promotions for faculty members?

Men outnumber women by large margins in higher academic ranks and leadership positions in academic surgery and other medical disciplines.³ In the Nguyen study, male surgical oncologists made up a large fraction of the total cohort (61%). Men primarily comprised the ranks of Associate Professor (60.9%) and Professor (74.6%), whereas only 40.3% of Assistant Professors were men. At every rank, h-index was significantly higher for men than for women: Assistant Professor 10 versus 5; Associate Professor 18 versus 14; and Professor 33 versus 21, respectively. The same associations between gender and h-index were not statistically significant across division chiefs and department chairs, although there are manifold lower numbers of women in those roles.

There are well-described correlations between the length of researchers' careers and the h-index—that is, those who have a few highly cited papers in the past may still have a higher h-index than someone who has an increasing publication trajectory and is a major thought leader in cutting-edge scientific research.² It is unclear whether this legacy effect accounts for some of the gender disparities seen in this study or serves to underestimate the extent of disparity in h-indices between men and women, because data regarding time in rank is not shown. Other data have described disparities in rates of promotion, as well as time to promotion, for women in academic medicine. The ambiguities in the study metrics have relevance when considering that the h-index may influence decisions around when a promotion is recommended or even considered for promotion in the first place. Given the high proportion of women at the Assistant Professor level in the current study, it is important to consider implications of these data for the next generation of academic surgical oncologists.

The h-index does not account for order of authorship or for number of co-authors, rewarding all authors equally in its calculation regardless of relative contribution to the research. Nguyen et al. attribute a component of authorship (which may, in theory, include “honorary” authorship of senior faculty members) and subsequent citations to “research networking,” which tends to favor men in male-dominated fields, reinforcing gender disparities in a “positive feedback cycle.” In fact, recent research has demonstrated that gender differences in labor roles could explain some of the disparities in first author or senior author positions; women were more likely to be associated with so-called “physical labor” (contributing data or conducting the experiment), whereas men were responsible for the “conceptual labor” and hence recipients of more significant authorship status.⁴ Interestingly, it may be that the h-index has a slight protective effect for women in some Team Science publications, because an author's overall contribution to the publication does not influence that author's h-index calculation.

The role of mentorship warrants discussion. Efforts to enhance women's success in academic medicine are increasingly seen at all levels. The impetus for gender-based mentorship and networking starts in medical school and residency training years. However, for the many advantages afforded by gender-based mentorship and networking communities, there may be significant limitations as well. Women in medicine and surgery can be pigeonholed by their gender into mentorship and networking opportunities primarily with other women. Nguyen et al. cite previous research, which demonstrates that in academics faculty tend to network along gender lines. However, there are fewer women in the highest academic

ranks, and this may contribute to a perpetual disadvantage for women, including disproportionate expectations for women for the work of mentorship. There is much capacity and need for complexity and diversity in mentorship across genders and across all areas of academic surgery, which encompass distinct research, clinical, and educational missions. The future of academic surgical oncology depends on increasing the diversity of viewpoints and experience. Gender disparity is not just an issue for women—equal and fair promotion and advancement must be a shared priority if we are to maximize contributions from our entire workforce.

Few would deny the existence of inequality in academic medicine, but its root causes are debated. In today's society, frank discrimination, or explicit bias, is unlikely to be as important a culprit as it was in the past, although issues of salary disparity and disparities in resources afforded in research startup packages for women continue to be demonstrated.⁵ However, implicit biases, the unconscious attitudes or stereotypes that affect our understanding, actions, and decisions, are pervasive. We all have them. They reside deep in the subconscious but are malleable. Minimizing implicit bias itself relies on purposeful actions to see persons as individuals and to increase exposure to differences as key first steps in addressing disparities. The embrace of objective, standardized metrics helps in this effort but may not be enough, because the perception of having a meritocracy leads to a perception of objectivity and may support bias against women in career advancement.

Traditional standards tend to perpetuate the status quo. Change will be hard. Recognition of the problem, including a continued emphasis on the critical evaluation of data, is the first step. Next steps include the intentional and deliberate reevaluation of how we define academic success to achieve true equality.

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