Gender Differences in Promotion and Scholarly Impact: An Analysis of 1460 Academic Ophthalmologists

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OBJECTIVES: In recent years, gender differences in academic promotion have been documented within surgical fields. To the best of our knowledge, gender discrepancies in association with scholarly productivity have not been well assessed among academic ophthalmologists. Because research productivity is strongly associated with academic career advancement, we sought to determine whether gender differences in scholarly impact, measured by the *h-index*, exist among academic ophthalmologists.

DESIGN: Academic rank and gender were determined using faculty listings from academic ophthalmology departments. *h-index* and publication experience (in years) of faculty members were determined using the Scopus database.

SETTING: Academic medical center.

RESULTS: From assistant professor through professor, the *h-index* increased with subsequent academic rank ($p < 0.001$), although between chairpersons and professors no statistical difference was found ($p > 0.05$). Overall, men had higher *h-indices* ($h = 10.4 \pm 0.34$ standard error of mean) than women ($h = 6.0 \pm 0.38$ standard error of mean), a finding that was only statistically significant among assistant professors in a subgroup analysis. Women were generally underrepresented among senior positions. When controlling for publication range (i.e., length of time publishing), men had higher *h-indices* among those with 1 to 10 years of publication experience ($p < 0.0001$), whereas women had scholarly impact equivalent to and even exceeding that of men later in their careers.

CONCLUSION: Women in academic ophthalmology continue to be underrepresented among senior faculty. Although women surpass men in scholarly productivity during the later stages of their careers, low scholarly impact during the earlier stages may impede academic advancement and partly explain the gender disparity in senior academic positions. (J Surg 71:851-859. © 2014 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

KEY WORDS: *h-index*, gender disparities, academic promotion, academic ophthalmologists

COMPETENCIES: Professionalism, Practice-Based Learning and Improvement, Systems-Based Practice

INTRODUCTION

The disparity between men and women in senior academic ranks within various medical fields has been well documented.[1] Despite the increase in the number of women in medicine throughout the past 2 decades, they remain significantly underrepresented in these senior ranks in many specialties, particularly surgical disciplines.[2-4] This lack of representation may be partly because of the failure of academic medicine to produce an adequate number of women in senior faculty positions, as such role models are often necessary for the academic mentorship integral to career choice.[5-10] For example, a recent study among academic otolaryngologists noted that only 4 of 103 chairpersons were women.[11] Various factors may explain the paucity of academic female physicians in leadership positions, such as the reluctance of female physicians to undergo and continue subspecialty training combined with their disproportionate entry into primary care and nonsurgical careers.[12,13]

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Hiring and promotion committees within academic medicine generally take into account contributions to medical education, clinical performance, and scholarly activity when evaluating faculty for academic advancement.[14,15] Nevertheless, a candidate's research productivity is usually the factor of principal importance when being considered for promotion.[1] In the evaluation of research productivity, promotion metrics may focus on the candidate's total number of publications, the total citations attributed to the candidate's publications, grant awards, and academic recognitions.[16] A physician's research output can be measured by the total number of publications achieved (attempting to measure the quantity of research), or alternatively, by the total number of citations attributed to the author's publications (attempting to measure the significance of an investigator's work). Each of these bibliometrics alone, however, fails to completely capture the total scholarly impact of a physician's publication history. In this regard, an author's apparent scholarly influence can be adjusted for both quantity and importance by using the *h-index*. An author's *h-index* expresses the number of published articles (*h*) that have attained at least *h* citations each, excluding any articles cited fewer than *h* times.[17] The *h-index* may be valuable for quantifying the quantity and significance of an author's work, and its use has been studied in numerous medical fields.[4,18-47] Furthermore, there is a strong correlation between *h-index* and successive academic rank among academic physicians in a variety of surgical specialties, including ophthalmology.[4] To our knowledge, there has not been an in-depth analysis of academic ophthalmologists' *h-index* associated with their departmental rank and gender. One potential reason for the gender disparity in senior academic positions may be differences in scholarly impact, as research productivity is generally an integral component for academic promotion. The primary objective of this analysis is to characterize scholarly impact among male and female academic ophthalmologists using the *h-index* and correlate their scholarly impact with academic position.

MATERIALS AND METHODS

The American Medical Association's FREIDA database was searched for ophthalmology training programs in the United States. Online listings from the individual website of each academic department were searched for information regarding faculty, including academic rank. Division chiefs from institutions where ophthalmology was not an independent academic department were counted in the "chairperson" category for the purposes of this analysis. Faculty were also organized by gender, determined independently using names and photographs from online profiles by P.F.S., S.A.L., and J.A.E. Nonphysician, nonacademic, and part-time faculty were excluded from this analysis. Additionally, any faculty for which academic rank could not be determined from their online profile, and faculty from institutions whose websites did not contain pertinent information, were also excluded from this analysis.

Of 117 programs from the initial FREIDA search, 14 lacked online faculty listings or did not report academic rank, and 3 other programs only noted a departmental chairperson and did not report other faculty designations. After application of exclusion criteria, 1460 academic ophthalmologists from 100 departments (plus 3 departmental leaders) were included.

The Scopus database (www.scopus.com) was used for calculation of each individual's *h-index* as well as publication range (i.e., the publication experience, in years). This database covers more than 40 million publication records from 18,500 peer-reviewed venues and has been valuable in previous analyses of the *h-index* covering a wide variety of medical fields and topics.[4,18,28-34,48-50] Other available *h-index* calculators include those found on Google Scholar, ISI Web of Knowledge, and Publish or Perish; a recent analysis of the impact of the *h-index* on academic neurosurgeons revealed a strong correlation between results from Google Scholar and Scopus.[49] On initial search for each individual, multiple results may appear, especially if the individual has a common last name. Departmental affiliations as listed on Scopus, previous positions with other departments, and the presence (or absence) of ophthalmology or ophthalmology-related journals were used to ensure that the *h-index* and publication range obtained for each author was related to the appropriate individual. Data collection was completed in March 2013.

Statistical Analysis

Mann-Whitney *U* tests and Kruskal-Wallis tests were used for comparison of continuous variables as appropriate and Pearson chi-square for comparison of categorical variables, with threshold for significance set at $p < 0.05$. SPSS version 20 (an IBM Company, Chicago, IL) was used for statistical calculation.

RESULTS

The *h-index* of academic ophthalmologists increased with successive academic rank from assistant professor through professor (Fig. 1) ($p < 0.001$), although no statistical difference was noted among chairpersons and other practitioners at the rank of professor ($p > 0.05$). Women constituted 419 (29.3%) ophthalmologists and 271 (43.8%) assistant professors in this sample (Fig. 2A). They were less represented among more senior academic ranks and positions (Fig. 2A). When considered by gender, academic rank representation differed ($p < 0.0001$) (Fig. 2B), as a larger proportion of men were serving at more senior positions.

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