ORIGINAL ARTICLE

Importance of First and Second Authorship in Assessing Citation-Based Scholarly Activity of US Radiation Oncology Residents and Subsequent Choice of Academic Versus Private Practice Career

Shearwood McClelland III, MD[a], *Timur Mitin, MD, PhD*[a], *Reshma Jagsi, MD, DPhil*[b], *Charles R. Thomas Jr, MD*[a], *Jerry J. Jaboin, MD, PhD*[a]

Abstract

Purpose: The Hirsch index (h-index) has been shown to correlate with radiation oncology residents' having a first job in academics versus private practice, but it is limited by its inability to distinguish between the differing significance of coauthor roles in articles.

Methods: A list of 2016 radiation oncology resident graduates and their postresidency career choices was compiled. The Scopus bibliometric citation database was then searched to collect h-index data for articles limited to first author only (h_f) and first or second-author only (h_s) for each resident.

Results: Mean h_f was 2.06 for all resident graduates, and mean h_s was 2.77. Residents with PhDs had significantly higher h_f (3.11 versus 1.76, $P < .01$) and h_s (4.50 versus 2.28, $P < .01$). There was no statistically significant difference between male and female residents for h_f (2.19 versus 1.61, $P = .11$) or h_s (2.91 versus 2.25, $P = .15$). Residents choosing academia had higher h_f (2.72 versus 1.44, $P < .01$) and h_s (3.57 versus 2.01, $P < 0.01$) than those in private practice. Fewer than 20% of graduates with $h_f = 0$ and only 10% of graduates with $h_s = 0$ secured academic jobs.

Conclusion: The average radiation oncology resident graduate has published a minimum of two first- and/or second-author articles cited at least twice. Graduates with PhDs and/or choosing academic careers were more likely to have higher h_f and h_s scores; there was no significant score difference by gender. Only 10% of graduates without any first- and/or second-author articles cited at least once secured academic jobs. These findings indicate that stratifying publications by first or second authorship when developing benchmarks for evaluating resident productivity and postresidency career type may be useful.

Key Words: First authorship, second authorship, h-index, radiation oncology residency graduates, academic radiation oncology

J Am Coll Radiol 2018;■:■-■.

INTRODUCTION

The Hirsch index (h-index) has become increasingly popular in assessing citation-based scholarly activity of physicians and has been shown to correlate with whether radiation oncology residents go on to academic versus private practice jobs [1-3]. A limitation of the h-index methodology is its inability to distinguish between the differing significance of coauthor roles in articles (ie, first author versus fifth author). For this reason, the first-author h-index (h_f) has been proposed as a means to assess the role of authorship in citation-based activity measurements, but has yet to be applied to radiation oncology [4]. Moreover, since the turn of the century, there has been an increasing designation of first and second authors as being equal primary contributors to articles. Hence, this study was performed to assess the role of first- and second-author publications and their

[a]Department of Radiation Medicine, Oregon Health and Science University, Portland, Oregon.

[b]Department of Radiation Oncology, University of Michigan, Ann Arbor, Michigan.

Corresponding author and reprints: Shearwood McClelland III, MD, Department of Radiation Medicine, Oregon Health & Science University, 3181 SW Sam Jackson Park Road, L337, Portland OR, 97239-3098; e-mail: drwood@post.harvard.edu.

The authors have no conflicts of interest related to the material discussed in this article.

1546-1440/18/$36.00 ■ https://doi.org/10.1016/j.jacr.2018.05.015

association with whether residents went on to academic or private practice jobs. Our hypothesis was that h_f and first- or second-author h-index (h_s) would have a relationship with the likelihood of a graduate's going into an academic position after residency.

METHODS

As previously described, a list of 2016 radiation oncology resident graduates (163 residents from 76 ACGME-certified programs) and their first postresidency career choices (academic versus private practice) was compiled, with an academic radiation oncology job defined as an attending staff position or postresidency fellowship directly affiliated with an ACGME-certified radiation oncology residency program and all other career choices considered to be private practice [3,5]. This compilation was derived from a combination of Internet searches (to elucidate premedical school productivity to minimize errant attribution of publications for graduates with common surnames and determine the surnames of married female graduates before marriage), telephone interviews (to more clearly delineate postresidency job choice), and the 2015 Association of Residents in Radiation Oncology directory, comprising 83% of ACGME-certified programs and 86% of 2016 graduates [3,5]. The Scopus bibliometric citation database was then searched over a 30-hour period in March 2017 to collect h-index data for articles limited to first author only (h_f) and first or second author only (h_s) for each resident. Demographics included in analyses were gender and PhD status. Data were then coalesced for statistical analysis; unpaired *t* tests were performed to evaluate the relationships between each of the variables and h-index score, with statistical significance assigned at $P < .05$ (GraphPad Software, San Diego, California).

RESULTS

Fifty-two percent of residents (84 of 163) had an h_f of at least 2; 23.3% of residents had an h_f of 0 (Fig. 1, Table 1). More than 60% of residents (99 of 163) had an h_s of at least 2, with 18.4% of residents (30 of 163) having an h_s of 0 (Fig. 2, Table 2). The mean h_f was 2.06 ± 1.92 for all resident graduates; mean h_s was 2.77 ± 2.44.

Residents with PhDs (n = 36) had significantly higher h_f (3.11 versus 1.76, $P < .01$) and h_s (4.50 versus 2.28, $P < .01$). There was no statistically significant difference between male (n = 127) and female (n = 36) residents for h_f (2.19 versus 1.61, P = .11) or h_s (2.91 versus 2.25, P = .15).

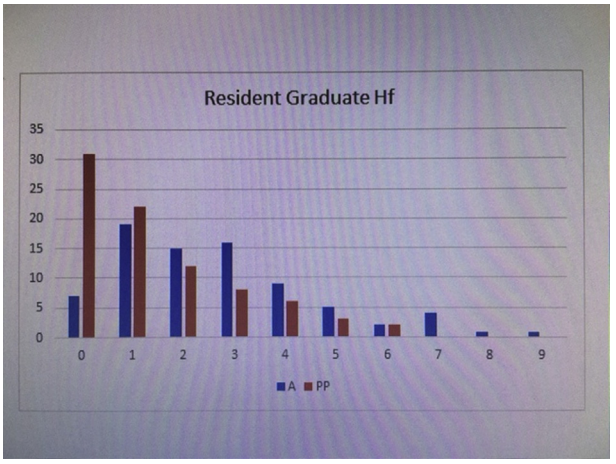

Fig 1. Depiction of relationship between radiation oncology resident h_f (first author h-index) and choice of academic (A) versus private practice (PP) career. The mean h_f score for all resident graduates was 2.1 (median, 2). h-index = Hirsch index.

With regard to career choice, residents choosing academic careers (n = 79) had higher h_f (2.72 versus 1.44, $P < .01$) and h_s (3.57 versus 2.01, $P < .01$) than those choosing private practice (n = 84). Fewer than 20% of graduates with h_f of 0 chose academic careers, and only 10% of graduates with h_s of 0 chose academic careers (Fig. 2, Table 2). Receiver operating characteristic curves were plotted for graduate choice of academic career with respect to h_f, h_s, and previously published h-index data [3] (Fig. 3).

DISCUSSION

The increasing popularity of the h-index in assessing academic radiation oncology scholarship has the potential to devalue authorship status on articles (because this does not contribute to the h-index formula) and create pressure on physicians to focus more on quantity over quality with regard to article contribution (ie, choosing to spend the same amount of time being fourth author on five

Table 1. Proportion of radiation oncology residents choosing academic careers stratified by h_f (first author h-index)

h_f	Proportion of Radiation Oncology Residents Choosing Academic Careers
0	18.4%
1	46.3%
2	55.6%
3	66.7%
4	60.0%
≥5	72.2%