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Original research

Academic productivity among fellowship associated adult total joint reconstruction surgeons

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ABSTRACT

Background: The Hirsch index (h-index) is a measure that evaluates both research volume and quality—taking into consideration both publications and citations of a single author. No prior work has evaluated academic productivity and contributions to the literature of adult total joint replacement surgeons. This study uses h-index to benchmark the academic impact and identify characteristics associated with productivity of faculty members at joint replacement fellowships.

Methods: Adult reconstruction fellowship programs were obtained via the American Association of Hip and Knee Surgeons website. Via the San Francisco match and program-specific websites, program characteristics (Accreditation Council for Graduate Medical Education approval, academic affiliation, region, number of fellows, fellow research requirement), associated faculty members, and faculty-specific characteristics (gender, academic title, formal fellowship training, years in practice) were obtained. H-index and total faculty publications served as primary outcome measures. Multivariable linear regression determined statistical significance.

Results: Sixty-six adult total joint reconstruction fellowship programs were identified: 30% were Accreditation Council for Graduate Medical Education approved and 73% had an academic affiliation. At these institutions, 375 adult reconstruction surgeons were identified; 98.1% were men and 85.3% had formal arthroplasty fellowship training. Average number of publications per faculty member was 50.1 (standard deviation 76.8; range 0-588); mean h-index was 12.8 (standard deviation 13.8; range 0-67). Number of fellows, faculty academic title, years in practice, and formal fellowship training had a significant ($P < .05$) positive correlation with both h-index and total publications.

Conclusions: The statistical overview presented in this work can help total joint surgeons quantitatively benchmark their academic performance against that of their peers.

Introduction

In the past decade, there has been a significant push toward benchmarking performance and productivity within the field of medicine, ranging from institutional rankings [1,2] to the academic productivity of individual faculty. Within academic medicine, research productivity remains a key determinant in professional achievement and eligibility for promotion. While tracking total publications, grant funding, and total citations are helpful in evaluating a surgeon's quantity of academic output, these metrics do not necessarily reflect the quality of academic production.

The Hirsch index (h-index) [3], however, accounts for both the quality of an author's impact in addition to the quantity of publications. An author's h-index is calculated by comparing the total number of publications with the number of citations per paper [3]. For example, an h-index of 5 indicates that an author has published 5 papers that were each cited at least 5 times. Originally developed as a predictor of scientific achievement in the realm of theoretical physics [3,4], the h-index has been widely adopted as a

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benchmarking tool in other scientific fields, including academic medicine [5-14]. Furthermore, within the orthopaedic literature, the fields of spine [15], hand [16], and sports medicine [17] have all identified the h-index as a reliable, objective metric of academic productivity.

As far as we are aware, no prior work has specifically evaluated the contributions to the literature and academic productivity of adult total joint replacement surgeons at fellowship training programs. We aim to synthesize an outline of academic productivity among fellowship associated total joint replacement surgeons. Furthermore, we intend to use the h-index metric to identify both fellowship program and individual faculty characteristics associated with increased research production and academic impact.

Material and methods

Study design

This was a cross-sectional study of total joint replacement surgeons in the United States and Canada associated with fellowship training programs. Seventy-one fellowship training programs were identified via the American Association of Hip and Knee Surgeons website as of January 31, 2016. From the San Francisco (SF) match website, 66 of these programs were confirmed to be active. From the Accreditation Council for Graduate Medical Education (ACGME) website, programs were split into ACGME vs non−ACGME-approved fellowships. For institutions that had both ACGME and non−ACGME-approved fellowships, faculty were classified as ACGME approved.

For each institution, fellowship program websites were queried to identify names of total joint faculty members. Inclusion criteria for this cohort were active practicing full-time faculty members with primary appointments as total joint replacement surgeons associated with a fellowship in adult total joint reconstruction. Faculty not affiliated with joint replacement fellowship training, or not actively practicing were excluded from this cohort. Furthermore, faculty were categorized as academic-affiliated if they practiced at an institution associated with a medical school.

Study variables—predictor (independent)

Predictor variables were identified via the SF match and program-specific websites. These included program specific characteristics: ACGME approval, academic affiliation, region, number of fellows, and fellow research requirement. Each of these characteristics was assigned to each faculty member at the selected institution. Faculty-specific characteristics were also identified for each specific faculty member. There were 4 academic title categories identified: Assistant Professor, Associate Professor, Professor, and Clinical Instructor. Any surgeon not on an academic tenure tract or associated with an academic institution was assigned to Clinical Instructor. Years in practice was calculated from last year of fellowship or residency training to year 2015.

Study variables—outcomes (dependent)

The Scopus database (Elsevier B.V., Waltham, MA) was queried to obtain faculty cumulative h-index and total number of publications. For surgeons with multiple profiles in the database (because of changes in practice location during training or afterwards), h-index and total number of publications were manually calculated to include all works. Both these variables were used as outcome variables in this analysis.

Table 1
Program-specific characteristics.

Characteristic	N (%)
ACGME approved	
Yes	20 (30)
No	46 (70)
Academic affiliation	
Yes	48 (73)
No	18 (27)
Research requirement	
Yes	14 (21)
No	52 (79)
Number of fellows	
1	28 (42)
2	21 (32)
3	6 (9)
4	6 (9)
5	0 (0)
6	4 (6)
7	1 (2)
Region	
Northeast	13 (20)
Southeast	20 (30)
Midwest	12 (18)
Southwest	6 (9)
Mountain	5 (8)
Pacific	8 (12)
Canada	2 (3)
Number of faculty members	
Mean	5.68
SD	4.18
Range	1-22

Statistical analysis

Multivariable regression was performed to identify statistically significant independent predictors of h-index and total publications. Variables that exhibited a P value <.05 and a 95% confidence interval (CI) that excluded 0 were considered independent predictors. R^2 statistic was used to determine each model's discriminative capacity. Multicollinearity between predictor variables was assessed using the variance inflation factor (VIF); a VIF <10.0 indicates the absence of multicollinearity. All testing was conducted with STATA, version 14.1 (STATA Corp., College Station, TX).

Results

Program-specific characteristics

Sixty-six total joint reconstruction fellowship programs were identified (Table 1). Twenty (30%) were ACGME approved and 48 (73%) had an academic affiliation. Of note, one institution had both an ACGME and a non-ACGME program; because common faculty were shared, this institution and their faculty were included in the ACGME-approved cohort. Fourteen (21%) programs stated an explicit fellow research requirement, 52 (79%) did not. By region, Southeast had the greatest plurality (30%, n = 20), followed by the Northeast (20%, n = 13), and then the Midwest (19%, n = 12). Mean number of faculty was 5.7 (standard deviation [SD] 4.2; range 1-22). Twenty-eight (42%) programs had a position for one fellow and 21 (32%) supported positions for two fellows.

Faculty-specific characteristics

Within the 66 programs, 375 adult reconstruction surgeons were identified (Table 2). Of these faculty members, 368 (98%) were men. Three hundred-twenty faculty members (85%) were fellowship trained in total joint replacement. The mean years in practice