Factors Associated With Publication Impact at Shoulder and Elbow Surgery Fellowships ☆

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OBJECTIVE: Quantitative metrics for comparing fellowship programs are lacking in orthopedic surgery. The purpose of this work was to determine the publication citation frequency at shoulder and elbow fellowships in the United States and to identify factors associated with increased productivity.

METHODS: American shoulder and elbow fellowship program faculty members in 2015 were identified. Research productivity metrics such as academic career duration, total publications, publications between 2010 and 2014 and total citations were recorded for each faculty member. Citations from total unique publications for each program were recorded. Factors associated with increased citation frequency of publications were identified.

RESULTS: A total of 28 shoulder and elbow training programs with a total of 43 fellowship positions were included for analysis, and a total of 84 surgeons were identified as fellowship faculty. The median [interquartile range] number of citations for total publications from 2010 to 2014 was 1594 [708-4048] per program and 743 [331-1321] per faculty member. Medical school affiliation, number of fellowship faculty, and the fellowship faculty members' cumulative years of academic career duration were significantly associated with higher numbers of total program citations on univariate analysis. However, only cumulative faculty years of academic career duration remained significant on multivariate analysis ($F = 10.4$, $p < 0.001$).

CONCLUSIONS: Total years of experience of a faculty in a fellowship program and medical school affiliation appear to be the most significant factors associated with increased publication citation frequency among many others. These data may be useful for prospective applicants evaluating fellowships and program leadership seeking to improve their academic productivity. (J Surg Ed ∎:∎∎∎-∎∎∎. © 2017 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

KEY WORDS: academic productivity, fellowship, training, publication, faculty, shoulder and elbow

COMPETENCIES: Medical Knowledge, Practice-Based Learning and Improvement

INTRODUCTION

As part of their academic mission, fellowship programs have the task of furthering medical knowledge in the subspecialty with the goal of improving patient care. One way to measure the extent to which each fellowship is contributing to this mission is through scholastic productivity as measured by the citation frequency of academic publications. Publication productivity metrics can be used to help quantify an individual's scholastic contribution to make decisions on hiring and promotions within the department.[1,2]

Research productivity of fellowship faculty has been reported in other academic medical specialties as a means of providing benchmarks for interspecialty and intraspecialty comparison. Research productivity indices have been used in fields such as esthetic plastic surgery, spine surgery, anesthesiology, and radiation oncology.[3-6] A recent study of 4663 academic orthopedic surgeons at 142 US academic

centers showed publication productivity metrics to be significantly correlated with academic promotion and tenure.[5] At the departmental level, cumulative program productivity can be used to recruit well-qualified fellowship and faculty candidates as well as retain talented academic surgeons.[7]

The use of research productivity metrics has been validated in many specialties; however, to date they have not been used in shoulder and elbow surgery fellowships. We hypothesized that there might be similar institutional or faculty-related characteristics associated with increased publication citation frequency. Therefore, the purpose of this is to investigate the relationships of total citation frequency for shoulder and elbow surgery fellowship programs with institutional characteristics (medical school affiliation and geographic region), number of fellowship faculty, as well as cumulative years of academic experience of those faculty members.

MATERIALS AND METHODS

Data Selection Criteria

The American Shoulder and Elbow Surgeons (ASES) website was accessed to obtain a directory of fellowship faculty and fellowship programs (current as of July 14, 2015). The ASES website includes a comprehensive list of current fellowship programs with their associated leadership and is updated yearly. Information taken from the ASES website included fellowship program name, location, website address, fellowship positions available per year, and fellowship faculty names. Program websites were accessed to ascertain whether or not the program had medical school affiliation. Programs were assigned a region (West, Midwest, South, and Northeast) based on the US Census Bureau classification.[8] Programs were classified as being in a major metropolitan area if the population exceeded 1,000,000.

Publication Productivity Metrics

The Scopus database (Elsevier BV, Amsterdam, Netherlands) was then used to investigate each fellowship faculty member individually to find the number of publications published between 2010 and 2014. All publications with the individual of interest as an author, regardless of authorship position, were included. The Scopus database was chosen because it contains the largest repository of citations and citation tracking of peer-reviewed literature.[9,10] The start of one's academic career was estimated by the date of first publication in Scopus; thus, academic career duration was calculated for each fellowship faculty member by subtracting the year of first publication from the year 2015. This definition of academic career duration was chosen because it most accurately indicates the amount of

experience that an author has with the research and publication process.

In addition to individual publication data, the Scopus database was further used to find the total number of unique publications for each program. To accomplish this, each program faculty member was included in a search to not count papers coauthored by faculty members at the same program more than once. Total publication numbers from each fellowship program between 2010 and 2014 were obtained using this combined search technique. All searches were initiated and completed in July 2015 to avoid inherent time bias. The number of citations for these publications in the Scopus database was then recorded.

Statistical Analysis

Programs were ranked by the sum number of citations for articles published between 2010 and 2014 by all faculty within a program designated as fellowship faculty members. The data were not normally distributed, so descriptive statistics included median and interquartile range (IQR) for continuous variables. Between-group comparisons of continuous variables were performed using the Kruskal-Wallis test, and between-group comparisons of categorical variables were performed using the Pearson's chi-square test. Relationships between 2 continuous variables were assessed by using linear regression analysis including the R-squared and F-test for overall significance. Variables with a $p < 0.2$ were entered into the multivariate model, and a multivariate linear regression analysis was performed. For all tests, a $p < 0.05$ was considered to be significant. All analyses were performed using JMP (version 12, SAS Institute Inc., Cary, NC).

RESULTS

Program Demographics

A total of 28 shoulder and elbow fellowship programs with a total of 43 fellowship positions were included for analysis, and a total of 84 surgeons were identified as fellowship faculty members. The median [IQR] cumulative years of academic career duration of all listed fellowship faculty members in a program is 59.5 [27.3-88.8] with a median [IQR] of academic career duration per fellowship faculty member in a program to be 21.1 [15.6-23]. The median [IQR] proportion of listed fellowship faculty members to fellowship spots is 2 [1-3]. Most included programs are in major metropolitan areas ($N = 25$, 89.3%), and more than two-thirds of programs are affiliated with a medical school ($N = 20$, 71.4%). Approximately one-third of programs are in the South ($N = 10$, 35.7%), another one-third are in the Northeast ($N = 9$, 32.1%), and fewer programs in the Midwest ($N = 6$, 21.4%) and West ($N = 3$, 10.7%).