Publication Productivity of Early-Career Orthopedic Trauma Surgeons

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abstract

The goals of this study were to: (1) define the publication productivity of early-career orthopedic trauma surgeons over time; (2) compare the early-career publication productivity of recent orthopedic trauma fellowship graduates vs their more senior colleagues; and (3) determine the proportion of fellowship graduates who meet the Orthopaedic Trauma Association (OTA) publication criteria for active membership early in their careers. Orthopedic trauma fellowship graduates from 1982 to 2007 were analyzed. A literature search was performed for each fellow’s publications for the 6-year period beginning the year of fellowship graduation. Publication productivity was compared between early and recent groups of graduates, 1987 to 1991 and 2003 to 2007, respectively. Fulfillment of OTA publication criteria was determined. Seventy-nine percent of graduates contributed to 1 or more publications. The recent group produced more total publications per graduate (4.06 vs 3.29, \(P=.01\)) and more coauthor publications (2.60 vs 2.04, \(P=.019\)) than the early group. The number of first-author publications did not differ between groups (1.46 vs 1.25, \(P=.26\)). A greater percentage of the recent group met current OTA publication criteria compared with the early group (51% vs 35%, \(P=.04\)). The findings showed that recent orthopedic trauma graduates had increased publication productivity compared with their more senior colleagues, although a proportion had not qualified for active OTA membership 6 years into their career. Overall, these data are encouraging and suggest that young orthopedic trauma surgeons remain committed to sustaining a high level of academic excellence. [Orthopedics. 2016; 39(1):e26-e30.]

Orthopaedic trauma surgeons have been leaders in the advancement of fracture care. With the emergence of evidence-based medicine, there has been increased scrutiny of the value and utility of treatments and thus an increased need for high-value research studies. Despite this need, many factors impede academic surgeons from producing high-quality research. In other surgical subspecialty fields, these factors have led to an observed decrease in the publication productivity of younger surgeons compared with more senior cohorts. Understanding trends in the publication productivity of young orthopedic trauma surgeons may help to gauge the interest and experience of the next generation of surgeons who will further discoveries in orthopedic trauma.

During the past 2 to 3 decades, many factors have influenced the ability and desire of young orthopedic trauma surgeons to produce research in peer-reviewed literature. Increased interest in orthopedic trauma is reflected by the higher numbers of both trauma fellowship positions and applicants to fill these positions. At the same time, restrictions on resident work hours, growing requirements for oversight, and decreasing reimbursements have shifted more clinical and administrative responsibili

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bility to staff surgeons. The Orthopaedic Trauma Association (OTA) encourages high-quality research by requiring active members to act as the lead author of at least 1 scientific publication or as a coauthor of at least 3 scientific publications in orthopedic trauma or a related field published in a peer-reviewed journal within the 60 months immediately preceding the application deadline. It is unclear what proportion of fellowship-trained orthopedic trauma surgeons meet this eligibility requirement early in their careers.

Publication productivity is widely used as a measure of scientific output and academic performance. Although academic production is a career-long endeavor, the early stage of a surgeon’s career is likely a good predictor of future performance. Within this context, the goals of this study were to: (1) characterize the publication productivity of orthopedic trauma surgeons in the first 6 years after graduation from their fellowship; (2) determine whether there have been changes in the publication productivity of early-career surgeons by comparing a recent group of fellowship graduates (2003-2007) with a more senior group of fellowship graduates (1987-1991); and (3) determine what proportion of graduates of orthopedic trauma fellowships meet the OTA publication criteria for active membership.

Materials and Methods

The names of orthopedic trauma fellowship graduates from 1982 to 2007 were retrospectively gathered from alumni lists obtained through the OTA, from publicly available resources, and by contacting active orthopedic trauma fellowship programs. Programs were excluded from the study only after repeated unsuccessful attempts to obtain a list of alumni.

A literature search for each fellow was first performed with the Web of Science database (Thomson Reuters, New York, New York). Each search was performed with the graduate’s last name and first initial. All publications in English language peer-reviewed journals were found from the calendar year of fellowship graduation through 5 subsequent years, totaling a consecutive 6-year period. Each publication was analyzed by hand to ensure that it was attributed to the correct individual. To confirm the accuracy of the search and to include all major peer-reviewed publications, each author was then searched a second time with the PubMed database, again using the graduate’s last name and first initial. Publications were included if they were found in either database. A publication was defined as an original research article, a review article, or a case report. Commentaries, letters, abstracts, and presentations were not included. Each publication was then categorized as being in the field of or relating to orthopedic trauma. Publications on spine and pediatric trauma were included. The total number of publications and the total number of first-author publications were recorded for each graduate.

Publications per fellowship graduate were tracked over time. The proportion of fellowship graduates in each class who had at least 1 publication and 1 first-author publication was calculated. The number of graduates who met the OTA publication criteria during the first 6 years after fellowship graduation was also calculated. To determine whether changes occurred over time, an early group of fellows, graduating from 1987 to 1991, was compared with the most recent group, graduating from 2003 to 2007. The early period was chosen to begin in 1987 because that was the earliest group that included at least 7 graduates per year who were available for analysis.

Descriptive statistics were computed, including mean, median, and standard deviation of fellows for each year. The 2 groups of graduates were compared with respect to the mean number of publications using a Poisson (log-linear) regression at the level of each fellow and reported as incident rate ratios. The incident rate ratio is the multiplicative factor of the mean number of publications in the older group compared with the younger group. Author clustering was evaluated with Poisson regression by comparing the number of surgeons in each group who had produced at least 1 publication. Comparisons of the number in each group who met the OTA criteria were made with Fisher’s exact test. All P values were 2-sided, and P<.05 was considered statistically significant.

Results

The study included 447 fellows who completed an orthopedic trauma fellowship at 32 different programs between 1982 and 2007. A total of 1868 publications were analyzed. Among this group, a steady increase occurred in the number of fellows per year from 1982 to 2003. The rate of new fellowship graduates included per year then rose quickly in 2004, and this increase continued through 2007 (Figure 1). From 1982 to 2007, no significant linear trend over time was found in the mean number of publications per surgeon, mean first-author publications per surgeon, or median publications per surgeon (Figures 2-3). Wide variations in publication rates were seen from year to year.

Of the early-career surgeons, 79% authored or coauthored at least 1 publication. This ranged from a low of 58% of graduates in 1991 and 2001 to 100% of graduates in 1992 (Figure 4). The most productive year was 1999, with 6.71 publications per graduate. Of the publications, 78% were related to orthopedic trauma.

Comparison of the Early and Recent Groups

The mean number of total publications per fellow increased from 3.29 in the early group to 4.06 in the recent group, corresponding to 24% more total publications (incident rate ratio, 1.24; 95% confidence interval, 1.05-1.47; P=.01). Coauthor publications increased from 2.04 in the early group to 2.60 in the recent group (incident rate ratio, 1.29; 95% confidence interval, 1.04-1.59; P=.019). The increase in first-author publications from 1.25 in the early group to 1.46 in the recent group was not...
significant ($P=.256$) (Figure 5). The recent group also produced 73% more nontrauma publications (incident rate ratio, 1.73; 95% confidence interval, 1.18-2.55; $P=.005$).

Differences in academic productivity observed between the early and recent groups may be caused by a small number of surgeons who were responsible for a large number of publications (Figure 6). The recent group, which included 177 surgeons, produced a total of 719 publications, with the 7 (4%) most produc-
tive surgeons in this group accounting for more than 26% of these publications and the 20 (11%) most productive accounting for 50%. Similarly, the early group, which included 52 surgeons, produced a total of 171 publications, with the 2 (6%) most productive surgeons accounting for 29% of these publications and the 6 (12%) most productive accounting for 50%.

**Proportion of Early-Career Surgeons Meeting the Orthopaedic Trauma Association Criteria**

Over the study period (1982-2007), 46% of fellowship graduates had a trauma-related first-author publication and 22% had 3 or more trauma-related coauthor publications. Overall, 49% (221 of 447) of the fellowship graduates had either a first-author publication or 3 or more coauthor publications related to orthopedic trauma in the 6-year period beginning with trauma fellowship graduation (Figure 7). The proportion of fellowship graduates who were the first author of at least 1 or a coauthor of at least 3 publications related to orthopedic trauma in the 6-year period after fellowship graduation increased from 35% (18 of 52) in the early group to 51% (90 of 177) in the recent group (P=.0416).

**DISCUSSION**

Orthopedic trauma fellowship graduates who finished between 2003 and 2007 produced more total publications per fellow than graduates who finished between 1987 and 1991. Although no trend was found over time, these data show that early-career orthopedic trauma surgeons remain committed to producing high-quality research. This was also reflected in the increased proportion of fellowship graduates in the recent group who met the current OTA publication criteria in the first 6 years after fellowship. These findings are encouraging and show that young orthopedic trauma surgeons remain committed to the advancement of fracture care.

The increase in the publication productivity of early-career orthopedic trauma surgeons may be related to some simple observations and to maturation of the field. Orthopedic trauma has become a more attractive subspecialty in recent years, based on increasing numbers of applicants to fellowship training in this area. Orthopedic trauma has become a more attractive subspecialty in recent years, based on increasing numbers of applicants to fellowship training in this area. The production of research during residency is 1 way that applicants can set themselves apart in this competitive environment. The research experience gained early in training has been shown to lead to more publications in the years after graduation. Another explanation is the increase in the number of journals publishing subspecialty research on orthopedic trauma over the study period. These include the *Journal of Orthopaedic Trauma* in 1987, the *Journal of Shoulder and Elbow Surgery* in 1992, and *Injury* in 1994. Many of the surgeons included in this study published their work in these journals. As the total number of orthopedic trauma surgeons has increased over time, collaboration has likely become more prevalent, both within and between institutions.

The stable first-author publication productivity between the early and recent groups suggests that the academic mentality within orthopedic trauma has remained strong over time (Figures 4-6). The proportion (11% to 12%) of those who accounted for half of their associated graduates’ cohort was similar between the recent and early groups, further suggesting a similar makeup of academically inclined fellows with time. Although in other surgical subspecialties concern has been raised about the declining publication productivity of early-career surgeons, the current findings suggest otherwise for early-career orthopedic trauma surgeons. The increase in coauthor publications per surgeon in the recent group compared with the early group is open to multiple interpretations. Camp and Escott described a proliferation of authorship within the *Journal of Bone and Joint Surgery* (American and British volumes), with an increase from 1.6 authors per publication in 1949 to 5.1 authors per publication in 2009. The authors proposed that this may be the result of increased acknowledgement of colleagues and research assistants who may not have received credit in the past, the increased complexity of modern research, and the “pressure to publish.” Authorship always has been the currency of academic medicine. As its perceived value continues to increase, the desire...
for authorship has extended to a larger and younger group of surgeons. For most trauma fellowship graduates, however, judgment, ability, and availability are still the most marketable traits.

Full, active OTA membership currently requires either a first-author publication or 3 coauthor publications relating to orthopedic trauma within the 5-year period preceding the application. This criterion was met by an increased number of fellowship graduates in the recent group. It is unclear what role the OTA publication requirement had in these findings. Many orthopedic trauma surgeons willingly pursue academic endeavors, and others focus on alternative career goals. It is likely that the publication requirement for membership provided extra incentive for some to publish in peer-reviewed journals, although this could not be determined from our current findings. Further studies are needed to elucidate why a proportion of fellowship graduates (49% in the recent group) did not fulfill this requirement and thus remain ineligible for active OTA membership.

Limitations

This study had several limitations. First, although attempts were made to gather the names of all trauma fellowship graduates from multiple sources, many graduates could not be included. Great effort was made to include all fellowship programs. Information was gathered from the OTA website and from individual program websites. Ultimately, all current programs were contacted by telephone and e-mail in an attempt to gather alumni names. The authors estimate the number of total fellows trained by 2007 to be between 550 and 650, which would mean that 69% to 81% of fellows were included in this study. Another limitation of this study was the search method used to find publications. Although the method of searching each author with 2 large, publicly available databases roughly doubled the effort of simply using the PubMed database, omissions were inevitable. Name changes, spelling errors, and various other issues relating to searching fellow names could lead to incomplete data or incorrect assignment of credit for a publication.

Conclusion

This study shows continued interest in producing high-quality research by early-career orthopedic trauma surgeons. The publication productivity of recent fellowship graduates has increased, and these graduates are fulfilling the OTA publication criteria at a higher rate early in their careers than their counterparts did 16 years earlier. Still, a remarkably small proportion of total fellowship graduates meet the OTA publication criteria early in their careers. These findings suggest that the academic focus of orthopedic trauma has not decreased with time and that interest in research remains strong.

References