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Original Article

Authorship Trends in 30 Years of the *Journal of Arthroplasty*Jason D. Lehman, MD^{*}, William W. Schairer, MD, Alex Gu, BS, Jason L. Blevins, MD, Peter K. Sculco, MD

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ABSTRACT

Background: While various studies have investigated trends in characteristics of authors in other medical literature, no study has examined these characteristics in the field of arthroplasty.

Methods: A database was created of all articles published in *The Journal of Arthroplasty* in 1986, 1990, 1995, 2000, 2005, 2010, and 2015. Degree(s) of authors, number of authors, number of references, and region of institution were recorded.

Results: A total of 1343 original articles were assessed over the study period. There was a significant increase in the number of authors per publication from 3.45 in 1986 to 4.98 in 2015 ($P < .001$) and number of references per article from 17.36 to 29.76 ($P < .001$). There was a significant increase in proportion of first authors with a bachelor's degree ($P = .001$), MD/PhD ($P < .001$), and MD/MBA ($P = .016$), with a significant decrease in first authors with an MD degree only ($P < .001$). There was a significant increase in number of last authors with an MD/PhD ($P = .001$) and MD/MBA ($P = .003$). There has been a significant growth in papers from outside North America ($P = .007$), with a decrease in articles from the UK/Ireland ($P = .003$) and an increase in contributions from the Far East ($P < .001$).

Conclusion: Trends of authorship characteristics in the arthroplasty literature largely mirror those seen in other medical literature including increased number of authors per article over time, changes in author qualifications, and increased contributions from international author groups.

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Within academic medicine, authorship in scholarly journals provides the ability to obtain research funding, serves as a way of promotion, and confers prestige and proof of scholarly accomplishment [1]. More recently, it has become an integral part of obtaining admission in medical school, residency, and fellowship programs. Various studies have investigated trends in authorship characteristics within medical literature [1–8]. Studies in orthopedics [9,10] as well as neurosurgery [11], plastic surgery [12], and cardiothoracic surgery [1] have also been performed. They have similarly shown a proliferation in the number of authors of published studies [1–7,9,10], a decrease in single-author publications [1,3,13], and a rise in the number of international contributions [1,7,9,10,14,15].

In 2013, Camp et al [9] examined authorship characteristics within the orthopedic literature from 1949 to 2009 and showed the

mean number of authors increased from 1.6 to 5.1 over the 60-year period. In addition, they found an increasing proportion of studies from outside North America, as well as increasing proportion of authors with advanced research degrees [9]. These trends have also been shown in orthopedic subspecialties. A recent study of articles published in a prominent orthopedic surgery sports medicine journal showed a significant increase in average number of authors, changes in the degrees commonly conferred by authors, and an increased proportion of articles published by non-US institutions over the last 20 years [10].

Although trends in authorship characteristics have been investigated in orthopedic literature in general as well as in sports medicine subspecialty journals, no study has investigated them within the field of arthroplasty. The purpose of this study is to investigate trends of authorship in *The Journal of Arthroplasty*. Specifically, we sought to determine changes in (1) the number of authors per article, (2) the number of references per article, (3) the academic degree(s) of contributing authors, and (4) the geographical region of authors from 1986 to 2015. We hypothesized that there are similar changes to those in other surgical subspecialties including increases in the number of authors per

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article, non-MD authors, and contribution from international groups.

Materials and Methods

The archives of *The Journal of Arthroplasty* (<http://www.arthroplastyjournal.org/issues>) were reviewed to compile a database of all articles published in the years 1986 (the journal's first year), 1990, 1995, 2000, 2005, 2010, and 2015. Editorials, Letters to the Editor, Outcomes Summit Reports, Frontmatter, and Retraction Notices were excluded from the analysis. In addition, any article without an author or reference was also excluded. For each article, the academic degree(s) of the first and last authors, the number of authors, the number of references, and the country of the authorship group were recorded. All non-US degrees were converted to the American equivalent. Joint degrees were recorded if they were MD/PhD or MD/MBA. For all other instances of multiple degrees, the highest degree was used. In cases where authors were from various geographical regions, the country of the corresponding author was recorded. In addition, the country of the corresponding author was classified into the same groups used by Camp et al [9]: North American (United States and Canada), United Kingdom and Ireland, European, Far East (China, Korea, Japan, and Taiwan), or "Other."

Descriptive statistics were used for each year of data, including interquartile range (IQR, 25th percentile and 75th percentile). Group comparisons for each time period were performed using a Kruskal-Wallis test for continuous variables. Trends over time were evaluated using Poisson regression, reported as an incidence rate ratio (IRR) over the entire study period, with 95% confidence intervals (CIs). P values less than .05 were considered statistically significant. All statistical analyses were performed with STATA software (version 14.1, StataCorp, College Station, TX).

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Results

A total of 1343 original articles were assessed over the 30-year period (1986, $n = 33$; 1990, $n = 68$; 1995, $n = 141$; 2000, $n = 166$; 2005, $n = 190$; 2010, $n = 282$; 2015, $n = 463$). The mean number of authors per article increased significantly over time from 3.5 (IQR 2-4) in 1986 to 5.0 (IQR 4-6) in 2015 ($P < .001$) (Fig. 1). The mean number of references per article increased significantly from 17.4 (IQR 9-21) to 29.8 (21-37) over the study period ($P < .001$; Fig. 2).

Examination of degrees held by the first author over the study period showed a significant increase in number of publications by authors with a bachelor's degree (IRR = 1.41, CI 1.16-1.72, $P = .001$), MD/PhD (IRR = 1.30, CI 1.13-1.49, $P < .001$), and MD/MBA (IRR = 1.56, CI 1.08-2.24, $P = .016$) (Table 1). There was a significant decrease in first authors with an MD degree over time (IRR = 0.96, CI 0.95-0.98, $P < .001$) with only 71.5% of publications having an MD author in 2015 compared with 93.9% in 1986. There was no change in proportion of first authors with a PhD degree (IRR = 1.06, CI 0.92-1.22, $P = .451$).

Last authors with dual degrees increased over the study period. There was a significant increase in last authors with an MD/PhD degree with zero in 1986 and 16.0% of last authors in 2015 (IRR = 1.17, CI 1.07-1.29, $P = .001$; Table 2). The number of publications with an MD/MBA last author also increased significantly from zero in 1986 to 1.3% of all publications in 2015 (IRR 2.64, CI 1.39-5.00, $P = .003$). There were significant decreases in degrees types of "Other" (IRR 0.82, CI 0.72-0.94, $P = .004$) and MD (IRR = 0.98, CI 0.96-0.99,

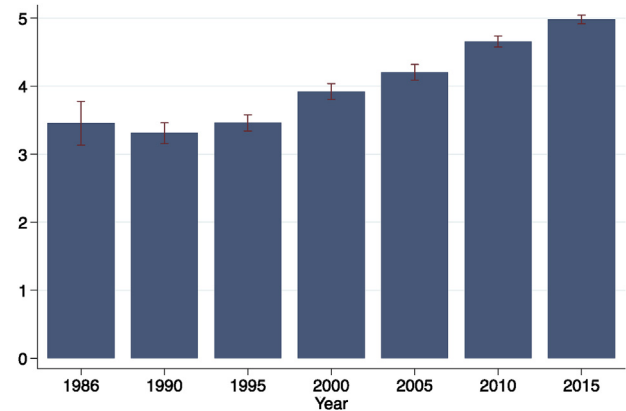


Fig. 1. Average number of authors per article.

$P = .025$). There were no significant changes in last authors with a bachelor's degree or PhD.

Although in 1986, North America contributed 90.1% of all articles, there has been a significant growth in the proportion of papers outside North America (IRR = 1.06, CI 1.02-1.10, $P = .007$), showing increased diversity of geographic contribution (Fig. 3). In addition, the average trend showed a decrease in the proportion of articles from the United Kingdom/Ireland (IRR = 0.87, CI 0.79-0.95, $P = .003$), whereas there has been a significant growth in articles from the Far East (IRR = 1.30, CI 1.20-1.41, $P < .001$). The average contributions of articles from Europe or "Other" have not changed significantly over the study period ($P > .05$).

Discussion

We found an increased number of authors per article, which largely mirrors the trends observed in other surgical fields. Various reasons for this recent authorship proliferation have been explored. One hypothesis is that the complexity of research conducted has increased over time leading to the need for and participation by additional contributors. There is some evidence that this is true. A study of articles published in the *Journal of Bone and Joint Surgery* (JBJS-Am) showed an increase in level I, II, and III studies and a decrease in level IV studies from 1980 to 2010 [14]. This mirrors the increase in number of authors showed in the same journal over that time [9]. It is unlikely, however, that increasing research complexity can fully account for authorship proliferation. Tilak et al [16] looked at trends in number of authors in 3 prominent medical journals while controlling for study type (eg, observational, single-center

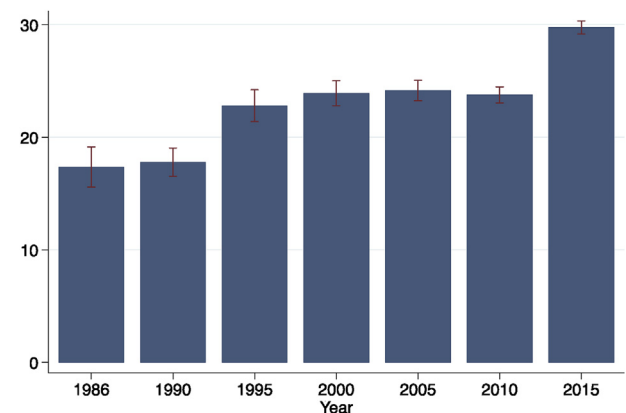


Fig. 2. Average number of references per article.

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