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Gender Trends in Radiation Oncology in the United States: A 30-Year Analysis

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Summary

This study analyzes women's participation as authors in the Red Journal in the context of trends in the radiation oncology workforce and trends at journals in other medical specialties. Female first and senior authorship in the Red Journal has increased significantly, as has women's participation among full-time faculty, but women remain underrepresented among radiation oncology residents. Understanding such trends is necessary to develop appropriately targeted interventions to improve gender equity in radiation oncology.

Purpose: Although considerable research exists regarding the role of women in the medical profession in the United States, little work has described the participation of women in academic radiation oncology. We examined women's participation in authorship of radiation oncology literature, a visible and influential activity that merits specific attention.

Methods and Materials: We examined the gender of first and senior US physician-authors of articles published in the Red Journal in 1980, 1990, 2000, 2004, 2010, and 2012. The significance of trends over time was evaluated using logistic regression. Results were compared with female representation in journals of general medicine and other major medical specialties. Findings were also placed in the context of trends in the representation of women among radiation oncology faculty and residents over the past 3 decades, using Association of American Medical Colleges data.

Results: The proportion of women among Red Journal first authors increased from 13.4% in 1980 to 29.7% in 2012, and the proportion among senior authors increased from 3.2% to 22.6%. The proportion of women among radiation oncology full-time faculty increased from 11% to 26.7% from 1980 to 2012. The proportion of women among radiation oncology residents increased from 27.1% to 33.3% from 1980 to 2010.

Conclusions: Female first and senior authorship in the Red Journal has increased significantly, as has women's participation among full-time faculty, but women remain underrepresented among radiation oncology residents compared with their representation in the medical student body. Understanding such trends is necessary to develop appropriately targeted interventions to improve gender equity in radiation oncology. © 2014 Elsevier Inc.

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Introduction

In the past 3 decades, the US physician workforce has seen a rapid influx of women (1). As of May 2012, women comprised 47% of medical school applicants, 46.2% of residents, and 37% of full-time faculty (2). The increasing number of female medical students entering the pipeline is rapidly increasing the number of women in medicine as a whole compared with 20 to 30 years ago (1). However, the distribution of women across medical fields and specialties is not equal. In fields such as obstetrics and gynecology, pediatrics, and primary care, women comprised more than half of full-time faculty in 2012, whereas they were substantially underrepresented in surgical disciplines (2).

The representation of women in senior leadership positions in radiation oncology has been a source of concern in recent years (3). However, little is known about the pipeline of women in the field or about their participation in the highly visible and influential role of authoring original research (4). Conducting basic science and clinical research is an important aspect of academic medicine in general. There may be particular importance of scholarly activity in radiation oncology, an increasingly competitive discipline, in which the proportion of matching applicants with a PhD is the highest for any specialty of medicine (5). Publishing one's research findings is an integral part of scholarly research. The nature, quantity, and quality of research activity are increasingly used in decisions regarding hiring and may influence the composition of the faculty who serve as role models and teachers for the large numbers of female medical students considering the field, as well as the residents already training in it. Thus, we believe that patterns of authorship by gender merit attention not only because authorship is visible and influential but also because it is linked to career outcomes.

The proportion of female physician-authors of original research in major US medical journals has increased during the past 35 years. A study evaluating authorship in 6 major medical journals showed female first authors increased from 5.9% in 1970 to 29.3% in 2004. The increase in female representation was not evenly distributed among specialty journals, however, with the sharpest increases seen in obstetrics and gynecology and pediatrics journals and smaller increases seen in surgical journals (6).

This inspired interest in documenting women's participation in other regions and specialties. A study of first and senior authors in 6 major British journals showed female first authorship increased from 10.5% in 1970 to 36.5% in 2004, but female senior authorship only from 12.3% to 16.5% (7). An observational study of 6 dermatology journals looking at the period from 1976 until 2006, showed female authorship increased from 12% to 48% in first authorship and 6.2% to 31% in senior authorship (8). In 5 family medicine journals, women made up 33.5% of first authors between 2006 and 2008 (9). Orthopedics has one of the lowest proportions of female faculty and residents. Between 1970 and 2007, women first authors increased from 0.8% to 6.5%, women senior authors increased from 0 to 4.3% (10).

To our knowledge, a gender analysis of authorship has not been done in the field of radiation oncology. This study examines gender trends in authorship in the field of radiation oncology compared with other fields, as well as in the context of trends in the gender composition of the medical student body, radiation oncology residents, and full-time faculty.

Methods

Data collection

This study examined articles from the *International Journal of Radiation Oncology, Biology, Physics*, the journal of the American Society of Radiation Oncology, colloquially known as the "Red Journal." The journal covers areas of interest relating to cancer treatment and radiation therapy. We chose to focus on the Red Journal because of its specificity to radiation oncology, its relatively high impact factor, its popularity within the field, and because it is the major journal of the American Society for Radiation Oncology (ASTRO). We examined all original articles published in 1980, 1990, 2000, 2004, 2010, and 2012. We selected these years as representative points in time and to allow comparison to studies completed in other fields (6). For each of these articles, we determined the type of article, both the first and senior (last) authors' gender, graduate degrees, and institutional affiliation. An author's gender was determined by initial inspection of his or her first name. For cases in which an author's gender was not certain, attempts were made to discern it by visiting the institutional website and performing Internet searches with the use of the Google search engine.

In addition to the Red Journal, 6 prominent medical journals published in the United States were included for comparison in this study: the *New England Journal of Medicine* (*NEJM*), the *Journal of the American Medical Association* (*JAMA*), the *Annals of Internal Medicine* (*Ann Intern Med*), the *Annals of Surgery* (*Ann Surg*), *Obstetrics & Gynecology* (*Obstet Gynecol*), and the *Journal of Pediatrics* (*J Pediatr*).

Statistical analysis

Our analysis was restricted to investigators from US institutions with an MD degree; those whose gender could not be determined (2%) were omitted from the analytic sample. The tabulated data were stored in a Microsoft Access database and analyzed with the use of R statistical software (R Foundation for Statistical Computing, Vienna, Austria) to determine the gender distributions of the first and senior (last listed) authors of original articles for each journal.

We used logistic regressions for grouped author data to examine time trends in the proportion of female authors. For all journals, the change in female authorship was examined over time from 1980 to 2004 with the year 1980 used as the reference point for comparison. For the Red Journal, the years 2010 and 2012 were also examined to coincide with full-time faculty data. Additionally, interactions between individual journals with various years are examined using the journals with the greatest increase and least increase in female authorship over time as references for comparison. For first authorship, the journals used for comparison were *Obstet Gynecol* and *NEJM*, and for senior authorship, the journals used for comparison were *J Pediatr* and *Ann Surg*.

Results

Statistically significant trends of increased female representation are shown for each of the 7 journals during a 24-year period