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Are Female Radiation Oncologists Still Underrepresented in the Published Literature? An Analysis of Authorship Trends During the Past Decade

Sondos Zayed, MD,[a] X. Melody Qu, MD,[a] Andrew Warner, MSc,[a] Tina Wanting Zhang, MD,[b] Joanna M. Laba, MD,[a] George B. Rodrigues, MD, PhD,[a] and David A. Palma, MD, PhD[a,*]

[a]*Department of Radiation Oncology, London Health Sciences Centre, London, Ontario, Canada; and* [b]*Department of Radiation Oncology, BC Cancer Agency, London, Ontario, Canada*

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Abstract

Purpose: We examined whether female authorship, traditionally underrepresented in the radiation oncology (RO) literature, has improved during the past decade, and whether the introduction of double-blind peer review (where reviewers are blinded to author names and vice-versa) improved female authorship rates.

Methods: We analyzed authorship lists during a 10-year period (2007-2016) from the 2 highest impact-factor RO journals: *The International Journal of Radiation Oncology, Biology, Physics* (IJROBP) and *Radiotherapy and Oncology* (R&O). From each journal, 20 articles per year were randomly selected. Gender trends of the first, second, last, and collaborating authors (defined as all other positions), were analyzed. A one-sample proportion test was used to compare US female senior authorship (2012-2016) with the 2015 benchmark for female US academic radiation oncologists (30.6%).

Results: Across 400 articles, the mean ± standard deviation percentage of female authors was 30.9% ± 22.0% with 34.8% of first, 36.7% of second, and 25.4% of last authors being female. The total percentage of female authors per year increased from 2007 to 2016 ($P = .005$), with no significant increase in the percentage of first ($P = .250$), second ($P = .063$), or last ($P = .213$) female authors. Double-blind peer review was associated with an increase in the mean percentage of female authors (2007-2011: 27.4% vs 2012-2016: 34.0%; $P = .012$). The proportion of US female senior authors in the latter period (27.6%) and the proportion of female US academic radiation oncologists (30.6%) were not significantly different ($P = .570$).

Conclusions: Although the percentage of female authors in RO has increased during the past decade, this did not correspond to a higher representation of women in high-profile authorship positions. Introduction of double-blind peer review was associated with a rise in female authorship. The proportion of female US senior authors and academic radiation oncologists is similar, suggesting that senior authorship rates are approaching appropriate levels in the United States.

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* Corresponding author: David A. Palma, MD, PhD; E-mail: david.palma@lhsc.on.ca

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Introduction

Women have historically been underrepresented in academic publications across multiple disciplines. A seminal article by Jagsi et al established that although the proportion of original research published by first or senior female authors across several specialties (Internal Medicine, Surgery, Pediatrics, Obstetrics and Gynecology) had increased significantly during a period of 35 years (1970-2004), they remained the minority.[1] This discrepancy was observed despite a disproportionately larger increase in the percentage of female medical students.[2] The dearth of female representation in leadership and high-profile authorship positions can therefore only be partially explained as a pipeline issue.[2-6]

Publication of original research is vital for obtaining full-time faculty radiation oncologist positions and tenure.[3] This assertion is supported by the finding that there is no significant difference in the Hirsch index (H-index) of men and women who achieve senior faculty status in Radiation Oncology (RO), indicating that publication output, and subsequent number of citations, is critical.[2,7] The understanding of authorship patterns by gender is therefore critical to ensure equal opportunity between genders, yet few studies have addressed the status of female authorship in RO. Ahmed et al established that female first authors in the IJROBP increased significantly from 13.4% in 1980 to 29.7% in 2012. Similarly, the proportion of female senior authors improved significantly from 3.2% to 22.6% during the same time frame.[2] However, the past decade has been marked by greater awareness of societal gender biases, and little is known about changes in female authorship patterns in RO during this time. Diversity serves as a catalyst for creativity and generates opportunities to embrace new perspectives.[8,9] To harness such wealth, inequities, including those based on gender, must be swiftly addressed.[6]

Authorship patterns may also be affected by implicit bias among reviewers. A randomized double-blind study by Moss-Racusin et al revealed that science faculty rated student applications with a male name as significantly more competent and hireable than an identical application with a female name. This translated into a higher starting salary and more mentoring propositions for the male student. Science faculty conscious or unconscious gender bias was thought to fuel this partial behavior, thereby deterring female participation in academic science.[10] This is analogous to the predominantly gender-biased hiring system observed in symphony orchestra auditions before the 1950s. To overcome this, blind auditions were adopted, where screens were used to conceal the gender and identity of performing musicians. A dramatic increase was subsequently observed in the number of female musicians in symphony orchestras from 6% in 1970 to 21% in 1993.[11] Prior studies in other disciplines have documented an increase in female first authors of original research after the adoption of double-blind peer-review.[2,12] In 2014 Jagsi et al observed that after the adoption of double-blind peer review in the IJROBP, female last authors experienced a decrease in rejections, whereas male last authors experienced an increase in rejections. However, this qualitative difference did not reach statistical significance given the short duration of observation (3 months before and after the implementation of a double-blind system) and the underpowered sample size.[13] Conversely, our study offers a 10-year overview of recent female authorship in the RO literature with a 5-year observation period after the implementation of double-blind peer-review. To our knowledge, no prior study has measured the effect of a double-blind peer review process on female authorship in the RO literature during a period of 5 years.

The purpose of this study is 3-fold: (1) To describe gender authorship patterns in RO during the past decade, with a specific focus on high-profile versus low-profile positions; (2) to assess the effect of double-blind peer review on female authorship rates; and (3) to compare recent female authorship rates with the known benchmark of female academic radiation oncologists.

Methods and Materials

Data collection

We analyzed authorship lists during a 10-year period (January 1, 2007 to December 31, 2016) from the 2 highest impact-factor RO journals: *The International Journal of Radiation Oncology, Biology, Physics* (IJROBP) and *Radiotherapy and Oncology* (R&O). From each journal, 20 articles per year (400 articles total) were chosen at random using a random number generator. A minimum of 20 articles per year was calculated to power this study using a stratified sampling method (by year, for two 5-year time-periods). The gender breakdown of authorship was determined for each article, including the total number of authors, the number of female and male authors, and the gender of the holders of each authorship position. Collaborating authors were defined as those not in the first, second, or last authorship position. Author gender was determined by a single researcher, first by inspection of the first and last name. As in previous studies where author gender was determined, any uncertainty in discerning gender was clarified by consulting institutional websites or conducting an Internet search of the author for a professional photo or biography.[3,13] If the gender could not be ascertained by this search, the article was replaced with another random selection from the same journal

Table 1 Summary of article characteristics by gender

Characteristic	All articles (n = 400)
Median no. of authors per article (IQR)	7 (5-10)
Median no. of female authors per article (IQR)	2 (1-4)
Median no. of male authors per article (IQR)	5 (3-7)
Median no. of collaborating female authors per article (IQR)	1 (0-2)
Median no. of collaborating male authors per article (IQR)	3 (1-5)
Articles with any female author, n (%)	343 (85.8)
Articles with any male author, n (%)	395 (98.8)
Articles with only one female author, n (%)	95 (23.8)
Articles with only one male author, n (%)	16 (4.0)
Percentage of female authors, mean ± SD	30.9 ± 22.0
Female 1st author, n (%)	139 (34.8)
Female 2nd author, n (%)	146 (36.7)
Female last author, n (%)	101 (25.4)
Articles with any female collaborator, n (%)	262 (65.5)
Percentage of female collaborating authors per article, mean ± SD	16.0 ± 15.1

Abbreviations: IQR = interquartile range; SD = standard deviation.

and year. We did not account for nonbinary genders or gender fluidity, similar to prior studies.[1] Data on disease site (eg, lung, breast, gastrointestinal), article type (clinical, physics, basic science, or other), and region (Europe, North America, South America, Asia, Australia and New Zealand, or multiple) were also collected for each article.

Statistical analysis

Descriptive statistics were generated for all selected articles. Time trend analysis was performed by year to evaluate changes throughout time in female authorship based on year of article for all articles and stratified by journal (IJROBP or R&O), disease site, article type, and region. This was performed using the Cochran-Armitage test for trend for binary variables or the linear trend test (univariable linear regression with year as predictor) for continuous variables. No adjustments were made for multiple comparisons.

The IJROBP adopted a double-blind peer review process in October 2011, and therefore we considered articles published after December 31, 2011 as having undergone double-blind peer review.[2] We divided the data set into two 5-year time-periods: 2007 to 2011 and 2012 to 2016, corresponding to articles published before and after the implementation of double-blind peer review in the IJROBP respectively. R&O is a single-blind peer review journal and remained so throughout the study period. Time trend analysis was performed to evaluate differences by time-period for all endpoints and stratified by journal (IJROBP or R&O), using the χ^2 test, Fisher's exact test, 2-sample t test, or Wilcoxon rank-sum test, as appropriate.

A one-sample proportion test was performed to compare the proportion of female US senior authors from 2012 to 2016, with the benchmark of female US academic radiation oncologists in 2015 (30.6%).[14] Similarly, a one-sample proportion test was used to compare the proportion of female Canadian senior authors from 2012 to 2016, with the benchmark of female Canadian academic radiation oncologists in 2016 (26.9%).[15]

All statistical analyses were performed with SAS version 9.4 software (SAS Institute, Cary, NC) using 2-sided statistical testing at the .05 significance level.

Results

Article characteristics

A total of 400 articles were reviewed, 200 articles from the IJROBP and 200 articles from R&O. Characteristics of all articles are shown in Tables 1 and 2. The majority of the articles were clinical (58.5%), and most studies were conducted in either Europe (42.3%) or North America (41.3%). The median number of authors per article was 7 (interquartile range [IQR]: 5, 10), with a median of 2 (IQR: 1, 4) female authors per article. The majority (85.8%) of all articles had at least one female author, compared with 98.8% of all articles with at least one male author. The mean ± standard deviation (SD) percentage of female authors per article was 30.9 ± 22.0% with 34.8% of first, 36.7% of second, and 25.4% of last authors being female. The mean ± SD percentage of female collaborating authors per article was 16.0% ± 15.1%. Four percent (16 out of 400) of articles contained only one male author compared with 23.8% (95 out of 400) containing only one female author.

Authorship trends

Time trend analysis (Table 3) for all articles from 2007 to 2016 revealed a significant increase in the mean number of female authors per article ($P < .001$), the percentage of articles with any female author ($P < .001$), and the mean percentage of female authors ($P = .005$, Fig 1). There was a significant rise in the mean number and percentage of

Table 2 Summary of article characteristics by publication type

Characteristic	All articles (n = 400)
Articles categorized by disease site, n (%)	
Breast	33 (9.9)
Central nervous system	38 (11.4)
Gastrointestinal	46 (13.8)
Genitourinary	65 (19.5)
Gynecologic	17 (5.1)
Head and neck	44 (13.2)
Thoracic	55 (16.5)
Other	36 (10.8)
Articles categorized by type, n (%)	
Clinical	234 (58.5)
Physics	92 (23.0)
Basic science	47 (11.8)
Other	27 (6.8)
Articles categorized by region, n (%)	
Europe	169 (42.3)
North America	165 (41.3)
Asia	22 (5.5)
Australia and New Zealand	12 (3.0)
South America	1 (0.3)
Multiple	31 (7.8)

Abbreviations: IQR = interquartile range; SD = standard deviation.

female collaborating authors ($P < .001$ and $P < .001$, respectively) as well as in the percentage of articles with any female collaborating author ($P = .002$). However, there was no significant increase in the percentage of first ($P = .250$), second ($P = .063$), or last ($P = .213$) female authors during the 10-year time-period.

Double-blind peer review

After the adoption of double-blind peer review at the IJROBP, a significant increase in the mean percentage of female authors from 27.4% (2007-2011) to 34.0% (2012-2016; $P = .012$) was noted (Table 3). This corresponded to a rise in the mean percentage of female second (2007-2011: 28.0%; 2012-2016: 44.0%; $P = .018$) and collaborating (2007-2011: 14.9%; 2012-2016: 19.8%; $P = .021$) authors. No significant difference was observed in the percentage of female first (2007-2011: 32.0%; 2012-2016: 32.0%; $P > .99$) or last authors (2007-2011: 25.0%; 2012-2016: 31.0%; $P = .345$).

In R&O, without double-blind review, no significant increases were observed in the mean percentage of female authors (2007-2011: 28.8%; 2012-2016: 33.1%; $P = .059$) or in the percentage of female second authors (2007-2011: 35.4%; 2012-2016: 39.4%; $P = .557$) during the same time-periods. A similar significant increase in R&O mean percentage of female collaborating authors was noted between 2007 and 2011 (11.9%) and 2012 to 2016 (17.5%, $P = .004$).

Between 2012 and 2016, 27.6% of senior authors based in the United States were female. This was not significantly different from the known benchmark of female academic radiation oncologists practicing in the United States in 2015 (30.6%,[14] $P = .570$). Conversely, the proportion of Canadian senior authors between 2012 and 2016 (48.3%) was significantly greater than the known benchmark of Canadian female academic radiation oncologists in 2016 (26.9%[15]; $P = .009$).

Publication trends by disease site, article type, and geographic region of origin

Time trend analyses were performed for all 400 articles by year from 2007 to 2016, stratified for factors including disease site, article type, and region (Table E1). A statistically significant increase in the mean number of total female authors publishing articles in the gynecologic disease site was noted ($P = .001$). This corresponded to a significant rise in female first ($P = .040$), second ($P = .006$), and collaborating ($P = .017$) authors, but not in female senior ($P = .745$) authors. A significant increase in the mean number of female first and last authors publishing in the gastrointestinal disease site was noted ($P = .006$). In the genitourinary disease site, a significant rise in the mean number of female collaborating authors only was identified ($P = .039$). In the thoracic disease site, a significant increase in the mean number of total female authors was observed ($P = .023$). This corresponded to a significant increase in female collaborating authors only ($P = .007$), with no significant increase in female first ($P = .271$), second ($P = .319$), or senior authors ($P = .537$).

A significant rise in the mean number of female authors publishing physics ($P = .002$) or nonclinical ($P < .001$) articles was observed, corresponding to a rise in the mean number of female collaborating authors only ($P < .001$ and $P < .001$, respectively). Similarly, a significant rise in the mean number of total female authors of clinical articles was noted ($P = .010$), corresponding to a significant rise in female collaborating authors only ($P = .034$).

During the 10-year time-period, a significant increase in the mean number of total female authors was only observed in North America ($P = .002$), corresponding to an increase in the mean number of female collaborating authors only ($P = .002$). In Asia, there was no significant rise in the mean number of total female authors ($P = .206$); however, a significant increase in the number of female first ($P = .014$) and second ($P = .026$) authors only was noted.

Discussion

Career advancement in RO requires academic productivity as measured by the quantity and quality of

Table 3 Time trend analysis by year and by journal, before (2007-2011) and after (2012-2016) the adoption of double-blind peer review

Authorship (%)	Year											Green Journal (R&O)			Red Journal (IJROBP)		
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	*P* value	2007 to 2011	2012 to 2016	*P* value	2007 to 2011	2012 to 2016	*P* value
Percentage of female authors, mean ± SD	24 ± 28	29 ± 21	29 ± 22	27 ± 24	32 ± 23	33 ± 16	31 ± 21	33 ± 26	35 ± 17	35 ± 18	.005	28.8 ± 24.0	33.1 ± 20.5	.059	27.4 ± 23.3	34.0 ± 19.4	.012
Female 1st author, %*	23	30	25	45	43	38	43	38	33	33	.250	34.0	41.0	.307	32.0	32.0	>.99
Female 2nd author, %*	26	40	25	35	33	50	35	36	45	43	.063	35.4	39.4	.557	28.0	44.0	.018
Female last author, %*	18	25	23	28	18	30	25	33	30	25	.213	19.2	26.3	.235	25.0	31.0	.345
Percentage of female collaborating authors, mean ± SD	10 ± 15	15 ± 13	16 ± 15	10 ± 13	15 ± 16	19 ± 11	17 ± 17	15 ± 15	20 ± 14	23 ± 18	<.001	11.9 ± 14.2	17.5 ± 14.6	.004	14.9 ± 14.9	19.8 ± 15.7	.021

Abbreviations: IJROBP = International Journal of Radiation Oncology, Biology, Physics; R&O = Radiation therapy & Oncology; SD = standard deviation.

* Percentages calculated based on total available articles (40 for each year or 100 for each journal plus time period comparison).

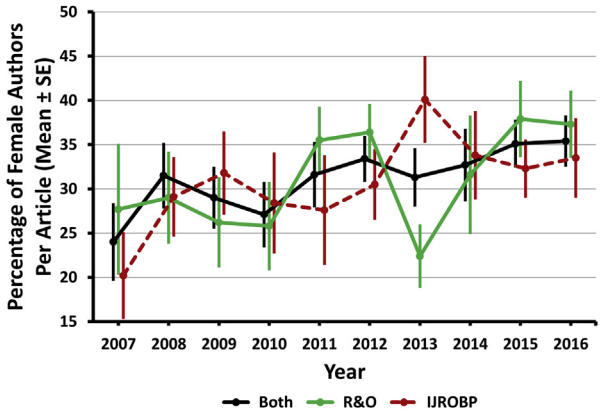

Figure 1 Percentage of female authors by year for the *International Journal of Radiation Oncology, Biology, Physics* (IJROBP), the *Radiotherapy and Oncology* (R&O) journal, and both journals. *Abbreviations*: Red = Red Journal or IJROBP; Green = Green Journal or R&O.

publication of original research, editorials, and expert opinions.[1] Historically, female radiation oncologists have been underrepresented in the literature.[7] By evaluating articles from the 2 highest impact factor journals in RO, this study aimed to provide the most recent update of female RO authorship trends during the past decade, and to determine the effect of double-blind peer review on female authorship rates.

We found that from 2007 to 2016, there was an increase in the mean percentage of female authors, primarily attributed to a rise in the percentage of female collaborating authors, with no increase in female first, second, or senior authors. The increase in female authorship throughout time, only partially explained by a rise in the number of women entering the field,[1,16] did not translate into an increase in high-profile authorship (first, second and senior positions). A concerning lag in impactful authorship clearly persists despite the deceptive increase in overall female authorship during the past decade.

The proportionally smaller percentage of female senior authors (25.4%) relative to the percentage female first authors (34.8%) may represent a smaller pool of women who have achieved a level of seniority and expertise which allows them to oversee research projects by trainees.[17] However, this finding may also be explained in part by a relative increase in the number of female radiation oncology trainees as well as radiation oncologists entering the field and participating in research.[18] A paucity of effective mentorship has been cited as a barrier to the career advancement of women in academic leadership positions in medicine.[4,19-21] Despite the rise in female RO full-time faculty members (from 11% in 1980 to 26.7% in 2012), they remain underrepresented relative to the proportion of female senior faculty members in other specialties.[2] Male radiation oncologists constitute 86.1% of chairpersons and full professors compared with 13.9% female radiation oncologists.[6,7] These faculty members serve as role models and mentors for residents and medical students alike, and often shape trainees' career outcomes.[5,13] However, female radiation oncologists face numerous obstacles on their journey toward achieving full professorship and senior authorship. These include gendered societal norms compelling them to focus on teaching and clinical activities as opposed to research,[1,16] a persistent salary gap between genders,[6,22] and institutional barriers for funding and administrative support.[7,23] These obstacles hinder professional confidence and career advancement, which may negatively affect publication output. They also prevent women from reaching their full professional potential, advancing cancer care globally, and mentoring trainees to do the same along the way.[6,24]

Although Ahmed et al commented on a possible rise in the percentage of first and last female authors in 2012 after the adoption of double-blind peer review by the IJROBP, its significance was questionable due to a short period of observation.[2] Similarly, Jagsi et al noted that manuscripts submitted by female last authors were more likely to be accepted after the implementation of double blind-blind peer review compared with manuscripts submitted by male last authors. However, this was statistically insignificant in the context of a short 3-month observation period.[13] Our data suggest that the introduction of double-blind peer review is associated with a significant increase in the mean percentage of female authors in the IJROBP. The strength of this association is supported by the finding that the same increase was not observed in the single-blind peer reviewed articles from R&O during the same time-period. This implies that double-blind peer review at least partially alleviates gender bias and should be seriously considered by all journals.[12] The rise in female authorship noted after double-blind peer review is largely attributed to a rise in female second and collaborating authors only. Double-blind peer review alone is therefore not sufficient to improve high-profile female authorship.[6]

It is challenging to determine female authorship representation based on first authorship. First authors may be residents, medical students, or other researchers who are not formally considered as active contributors to the RO workforce. The proportion of each of the aforementioned groups' contribution to first authorship positions is unknown, and so female representation cannot be accurately determined. However, senior authorship in RO journals is more likely to reflect publications where licensed academic radiation oncologists are the senior responsible authors. Notably, female radiation oncologists who achieve senior faculty positions have been shown to be as academically productive as their male counterparts.[7] This is supported by the fact that the proportion of female senior authors based in the United States between 2012 and 2016 (27.6%) was not significantly different from the

proportion of female academic radiation oncologists in the United States in 2015 (30.6%).[14] Female academic radiation oncologists based in the United States are therefore relatively well represented as senior authors in the more recently published literature. Female academic radiation oncologists in Canada (26.9%[15]) represent a significantly greater proportion of Canadian senior authors (48.3%), suggesting that female Canadian senior authorship exceeds expected levels. Given that the proportion of female academic radiation oncologists in other countries and regions is unknown, an evaluation of female representation in the form of senior authorship could not be performed.

Awards for career development often depend on the number of years since graduation or appointment, thereby penalizing women who have taken any maternity leave, which delays their productivity peak.[1,17] It has also been observed that at an institutional level, female physicians with children received less research funding, less secretarial support, and published less often compared with their male colleagues with children.[6,7,23] The use of the Hirsch index (h-index) or the m-index (h-index divided by the number of years from first publication) to compare male and female candidates for senior faculty positions may be unjust, as they inherently depend on time (to publish more articles and for them to accrue citations), thereby penalizing physicians who take parental leave.[7,14] We propose an adjustment to the m-index by subtracting the number of years a physician has been academically inactive (no publication output) for parental leave or health related reasons. The modified m-index would be calculated by dividing an individual's h-index by the number of years they were actively working (not on parental or sick leave) since their first publication. This would help eliminate the duration bias posed by such indices and lessen gaps between the genders in promotions, research funding, and research productivity.

Several limitations of this study warrant mention. The data collected are observational in nature and therefore causal relationships cannot be inferred. Although this study encompassed both the IJROBP and R&O, which are the highest impact journals in RO, we did not include all RO journals, or all RO publications from other journals. Due to resource constraints, it was not practical to collect authorship data for every article published in both journals during a 10-year period. We therefore relied on random sampling to improve generalizability. The analysis did not account for the proportion of female relative to male radiation oncologists who work in the community as opposed to academic centers and whose primary mandate is therefore not to publish original research or become editorial commentators. Moreover, collaborating authors from disciplines other than radiation oncology were not accounted for, as author specialty was not individually verified. Similarly, no distinction was made between female residents, medical students, or licensed radiation oncologists in authorship lists. This limits the inferences that can be made specifically about RO authorship. As in previous studies, an assumption that gender is binary (male and female) was also made for simplicity.[1,2,13] No presumptions or modifications were made to incorporate transgender individuals. The number of articles discarded owing to gender ambiguity or the researcher's inability to ascertain the gender from a name belonging to a different language or culture despite an Internet search, was not recorded. This may introduce a sampling error where an unforeseen association between female authorship and authors with gender-ambiguous names or from cultures which differ from the researchers', may be missed. Furthermore, no adjustments were made for multiple comparisons. Lastly, this study examines a 10-year time-period, which may be too short to appreciate trends of female authorship that are more likely evolve during a time-span comparable to a radiation oncologist's career of several decades.

Conclusions

Our profession has an obligation to ensure that scientific publication is merit-based and blind to gender or other minority and contingent identities.[25,26] We present a unique study of the RO literature, which reveals a discouraging stagnation in the incidence of women in high-profile authorship positions, despite a rise in female authorship during the past decade. We propose several interventions, including the introduction of double-blind peer review and the adoption of a modified m-score to assess publication productivity, with the aim of eliminating barriers to impactful authorship for women in RO. Female US and Canadian academic radiation oncologists are well represented as senior authors in the more recently published literature and may serve as indispensable mentors for women entering the field.

Supplementary data

Supplementary material for this article can be found at https://doi.org/10.1016/j.adro.2019.09.002.

References

1. Jagsi R, Guancial EA, Worobey CC, et al. The "gender gap" in authorship of academic medical literature—a 35-year perspective. *N Engl J Med.* 2006;355:281-287.
2. Ahmed AA, Egleston B, Holliday E, et al. Gender trends in radiation oncology in the United States: A 30-year analysis. *Int J Radiat Oncol Biol Phys.* 2014;88:33-38.

3. Jagsi R, Tarbell NJ. Women in radiation oncology: Time to break through the glass ceiling. *J Am Coll Radiol*. 2006;3:901-903.
4. Butkus R, Serchen J, Moyer DV, et al. Achieving gender equity in physician compensation and career advancement: A position paper of the American College of Physicians. *Ann Intern Med*. 2018;168: 721-723.
5. Banerjee S, Dafni U, Allen T, et al. Gender-related challenges facing oncologists: The results of the ESMO Women for Oncology Committee survey. *ESMO Open*. 2018;3:e000422.
6. Foster CC, Hasan Y, Son CH, McCall AR. Linearly accelerating toward gender equity in radiation oncology. *Int J Radiat Oncol Biol Phys*. 2019;104:974-978.
7. Holliday EB, Jagsi R, Wilson LD, et al. Gender differences in publication productivity, academic position, career duration, and funding among US academic radiation oncology faculty. *Acad Med*. 2014;89:767-773.
8. Stoll BJ. Reflections on leadership: Seizing and embracing opportunities-holding up half the sky. *JAMA*. 2019;321:2165-2166.
9. Lightfoote JB, Fielding JR, Deville C, et al. Improving diversity, inclusion, and representation in radiology and radiation oncology part 1: Why these matter. *J Am Coll Radiol*. 2014;11:673-680.
10. Moss-Racusin CA, Dovidio JF, Brescoll VL, Graham MJ, Handelsman J. Science faculty's subtle gender biases favor male students. *Proc Natl Acad Sci U S A*. 2012;109:16474-16479.
11. Goldin C, Rouse C. Orchestrating impartiality: The impact of" blind" auditions on female musicians. *The American Economic Review*. 2000;90:715-741.
12. Budden AE, Tregenza T, Aarssen LW, Koricheva J, Leimu R, Lortie CJ. Double-blind review favours increased representation of female authors. *Trends Ecol Evol*. 2008;23:4-6.
13. Jagsi R, Bennett KE, Griffith KA, et al. Attitudes toward blinding of peer review and perceptions of efficacy within a small biomedical specialty. *Int J Radiat Oncol Biol Phys*. 2014;89:940-946.
14. Zhang C, Murata S, Murata M, et al. Factors associated with increased academic productivity among US academic radiation oncology faculty. *Pract Radiat Oncol*. 2017;7:e59-e64.
15. Loewen SK, Doll CM, Halperin R, et al. Taking stock: The Canadian Association of Radiation Oncology 2017 Radiation Oncologist Workforce Study. *Int J Radiat Oncol Biol Phys*. 2019;105:42-51.
16. Fung CY, Chen E, Vapiwala N, et al. The American Society for Radiation Oncology 2017 Radiation Oncologist Workforce Study. *Int J Radiat Oncol Biol Phys*. 2019;103:547-556.
17. Holliday EB, Siker M, Chapman CH, et al. Achieving gender equity in the radiation oncology physician workforce. *Adv Radiat Oncol*. 2018;3:478-483.
18. Chapman CH, Hwang WT, Deville C. Diversity based on race, ethnicity, and sex, of the US radiation oncology physician workforce. *Int J Radiat Oncol Biol Phys*. 2013;85:912-918.
19. Yedidia MJ, Bickel J. Why aren't there more women leaders in academic medicine? The views of clinical department chairs. *Acad Med*. 2001;76:453-465.
20. Osborn VW, Doke K, Griffith KA, et al. A survey study of female radiation oncology residents' experiences to inform change. *Int J Radiat Oncol Biol Phys*. 2019;104:999-1008.
21. Barry PN, Miller KH, Ziegler C, et al. Factors affecting gender-based experiences for residents in radiation oncology. *Int J Radiat Oncol Biol Phys*. 2016;95:1009-1016.
22. Guss ZD, Chen Q, Hu C, et al. Differences in physician compensation between men and women at United States public academic radiation oncology departments. *Int J Radiat Oncol Biol Phys*. 2019; 103:314-319.
23. Carr PL, Ash AS, Friedman RH, et al. Relation of family responsibilities and gender to the productivity and career satisfaction of medical faculty. *Ann Intern Med*. 1998;129:532-538.
24. Knoll MA. Defining and shattering the glass ceiling in radiation oncology. *Int J Radiat Oncol Biol Phys*. 2017;98:978-979.
25. Lightfoote JB, Fielding JR, Deville C, et al. Improving diversity, inclusion, and representation in radiology and radiation oncology part 2: Challenges and recommendations. *J Am Coll Radiol*. 2014; 11:764-770.
26. Clark J, Horton R. What is The Lancet doing about gender and diversity? *Lancet*. 2019;393:508-510.