

Research Letter

Do Women Have Equal Chances for an Academic Career in Radiation Oncology in Canada? A Comparison With Related Specialties



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Abstract

Purpose: The progress of women in academic medicine appears to be curtailed. We evaluated gender differences in academia for residents in radiation oncology compared with 2 of its related specialties, radiology and medical oncology, across Canada.

Methods and Materials: We analyzed abstracts presented between 2013 and 2016 at the annual meetings of the Canadian Association of Radiation Oncologists and compared it to the corresponding data for the meetings of the Canadian Association of Radiologists and Canadian Association of Medical Oncology. We further evaluated gender composition of abstracts, presentations, and publications available on PubMed. Conversion rates according to gender and to medical specialties were assessed. Proportions were compared using Fisher exact test or the chi-squared test.

Results: Among the 198 presented abstracts, 103 (52%) were published. Radiation oncology had the highest publishing rate with 90% (oncology 56%, radiology 40%). The publication rate between the medical specialties was significantly different ($P < .001$).

Fifty-seven percent of abstracts presented by women were published versus 48% of abstracts presented by men. Overall, there was no significant difference between genders in terms of subsequent conversions into a scientific publication within each specialty ($P = .25-1.0$).

In radiation oncology, women presented 67% of abstracts and published 95% of their presented abstracts, and in medical oncology, 66% of abstracts were from women and 57% of the presented abstracts were published. Among the published abstracts, 83% had the same first author in the abstract and the publication. Among those who lost their first-authorship status, 59% were women. However, there was no statistically significant difference between specialties for loss of first-author status.

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Conclusions: We observed that from 2013 to 2016, women had the highest presentation and publication rate in radiation oncology. More prospective data are needed to monitor the progress of women in all specialties and their specific needs.

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Introduction

Historically, medicine has been a male-dominated field, especially in the academic medical workforce, where mostly men assume leadership and prominent positions. Over the last decades, the proportion of women entering medical school has significantly increased worldwide, closing this gender gap. In 2017, women earned over half (56.8%) of medical doctorate degrees in Canada, an increase of 12% since 1970.¹ Nevertheless, the lack of gender parity in academia persists, and data on this disparity is sparse.²⁻⁴

Authorship of scientific publications in medical journals is an objective measure of academic productivity.⁵⁻⁷ It has been widely used as a surrogate marker to study gender differences in academic medicine in previous reports.^{3,8-10} This is also mirrored by the observation that the amount of women who first-author abstracts at medical meetings that are later published in medical journals does not mirror the number of women in the medical profession. According to a recent analysis by Filardo et al, the trend for female first authorship is mounting, but not in all journals. In their analysis of the 6 journals with the highest 2012 Journal Citation Reports impact factors in the category “Medicine, general & internal,” they found that female first authorship increased significantly from 1994 to 2014. Although most journals showed increasing female first authorship over time, the New England Journal of Medicine showed the contrary trend.⁸

In this study, we aimed to assess the gender differences at annual scientific meetings for residents in radiation oncology compared with those in radiology and medical oncology in Canada.

Methods and Materials

We identified all abstracts selected for the resident competitions of the annual scientific meetings from 2013 to 2016 for radiation oncology (Canadian Association of Radiation Oncologists [CARO]), radiology (Canadian Association of Radiologists [CAR]), and medical oncology (Association of Medical Oncology [CAMO]). We chose the resident competition because this allowed identifying position of abstract submitters, as residents have to indicate their status when submitting their abstract.

To compare the data to a typically male-dominated field, because the Canadian Association of Urology does not label participants in the resident competition as such, we chose the data of the Association des Urologues du

Quebec. For abstracts from the Association des Urologues du Quebec, we had to exclude the abstracts from 2013 and 2014 as the position of first author was not specified.

Information in the abstracts included the names of the authors, the title of their abstracts, their positions, their countries of origin, and their affiliations. We performed a PubMed review to determine which abstracts had been published.

PubMed searches were done by combining keywords in the title such as the site of the cancer with the first author’s name. If this combination did not yield a result, other keywords, such as the technical methods or the molecular technique used, were then combined with either the first author’s name or different keywords. These searches were then double-checked by a different researcher. Finally, we determined the first author’s gender by searching Google, LinkedIn, and Facebook. We identified a total of 201 presented abstracts among all 4 specialties (including urology). We excluded 3 abstracts from our analysis because we were unable to determine the gender of the first author.

We used the chi-squared test for comparison of distributions and Fisher exact test to compare 2×2 contingency tables to examine proportions in gender composition within specialties and between medical specialties using the IBM Statistical Package for Social Sciences, version 25.0 (IBM Corp, Armonk, NY).

Results

Among the 198 presented abstracts, 103 (52%) were published. Radiation oncology had the highest publishing rate (90%) and radiology had the lowest (40%) (Table 1). Overall, women presented 45% of abstracts, and 52% of the published abstracts were written by women (Table 1).

There were too few abstracts per specialty for statistical analysis of differences between specialties. As an exploratory analysis, when excluding the data from the urology meeting, the publication rate between the medical specialties was significantly different ($P < .001$).

Fifty-seven percent of abstracts presented by women were published versus 48% of abstracts presented by men (Fig 1). Overall, there was no significant difference between genders in terms of percentage of abstracts published in conference proceedings or subsequently converted into a scientific publication within each specialty ($P = .25-1.0$). In radiation oncology, 67% of abstracts ($n = 20/30$) were presented by women and 95% of these were published compared with a publication rate of

Table 1 Number and gender composition of abstracts analyzed and published in PubMed per medical field

Specialty	No. of abstracts	Published, %	Abstracts presented by women, %	Abstracts published by women*, %	Loss of first authorship women/total loss, N
Radiology	119	40	35	41	2/6
Radiation oncology	30	90	67	95	4/4
Oncology	32	56	66	35	2/2
Urology [†]	17	59	35	50	1/3
Total	198	52	45	52	9/15

* As percentage of abstracts presented by women.

† Abstracts from 2013 and 2014 excluded.

80% (8 of 10) for men. In radiology, 35% of all abstracts were presented by women. However, men and women had identical publication rates of abstracts of 40% and 41%. In medical oncology, women presented 66% of abstracts, and again the difference in publication rate was very small, with 57% for women and 55% for men.

Eighty-two percent of women kept their first authorship (vs 85% of men) (Fig 1). And among those who lost their first authorship, 60% (9 of 15) were women. No exploratory analysis of difference between specialties was performed because only 15 authors lost first authorship.

Discussion

We found that gender differences varied among specialties: overall, we observed that during recent years, Canadian women in residencies presented 45% of all analyzed abstracts. The conversion rate from an abstract to publication differed between specialties, ranging from 40% (radiology) to 90% (radiation oncology), although these differences were not significant ($P = .25-1.0$). In none of the specialties did women publish fewer abstracts than men.

In Canada, women account for 42% of active physicians and 61% of active physicians under 35 years old. This high prevalence of women among young physicians may suggest that resident women were underrepresented as first authors.¹¹ On the other hand, presently, women represent only 38% of the specialists in radiation oncology, 32% in diagnostic radiology, 46% in medical oncology, and 11% in urology in Canada.¹²

Fifty-nine percent of women lost their first-author status. Although radiation oncology and medical oncology had the highest proportions of women presenting abstracts, they had the highest proportions of women losing their first-author status, respectively 80% and 100%.

Losing first authorship could indicate that women do not receive equitable credit for their work, as has been

shown in several publications. First-author status is especially sensitive to gender bias and needs further study. Macaluso et al showed that when men were first authors, they were less likely to have done the experiments themselves compared with women who were first or corresponding authors.¹³ Whether such a gender difference is applicable to our study is not known. West et al observed that women are more likely to be in less prestigious author positions in scholarly publications. One of the reasons, and one of the keys to solving gender differences in academic medicine, may be the lack of mentorship.¹⁴ On the other hand, several of the authors of this paper have held prominent spots at meetings to help students in their careers without necessarily having done the experiments. According to the aforementioned points, we have to assume that men were generally favored, and therefore more men were able to keep their first authorship although they did not necessarily do the main part of the research.

The referees themselves could have influenced the gender distribution of presented abstracts, being more likely to select abstracts with male first authors. A recent study showed that both faculties consisting of men and those consisting of women were equally biased against female applicants for a laboratory managing position.¹⁵ Milkman et al¹⁶ showed such a bias by faculty against women in their study. When students (including female students) requested mentoring, white males were preferred over other candidates. This underlines the importance of further researching how mentoring can be improved. As illustrated in a recent survey of faculty members in radiation oncology from Canada and the United States, over half of responding participants indicated difficulty in identifying role models.¹⁷

The main weakness of our study is that we have analyzed only a small number of abstracts and are therefore underpowered to detect smaller differences. Furthermore, we don't know the percentage of women in residency programs during the years that we analyzed nor how many abstracts men and women submitted. Another limitation of our paper

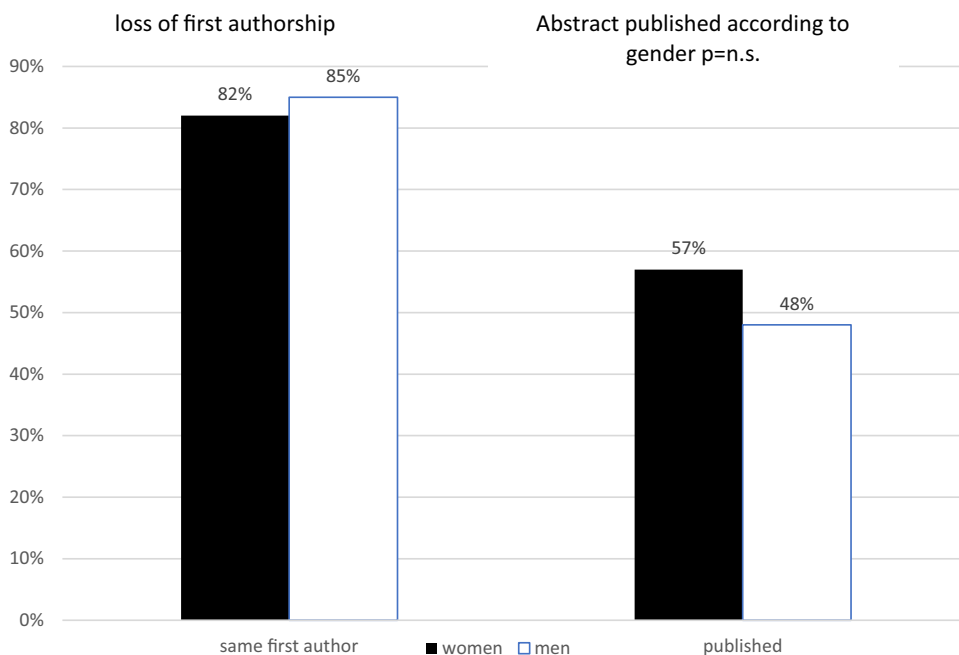


Figure 1 Total published abstracts according to gender (right). Maintenance of first-author status (left).

is that we only analyzed 4 years, and we are therefore unable to report on trends in the analyzed specialties. Furthermore, if such data were available, comparison to other countries would be important to analyze the situation of women in Canada more broadly. Although we know that submitted abstracts are often blinded for the review process, we ignore whether this is the case in all specialties. If they are not, there could already be a gender bias at the time of the review. Such a strong gender bias is unlikely, in our opinion.

Conclusions

We found women presented less than half of the abstracts at the residents' competition of Canadian annual meetings in radiation oncology and its related specialties.

Women in radiation oncology seem to do generally better than those in the related specialties. Because of the limited amount of analyzed abstracts, these differences were not significant. We encourage each specialty to evaluate prospectively how well women are doing and what their needs are for them to have success equal to their male colleagues.

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