

Research Letter

Mentorship in Radiation Oncology: Role of Gender Diversity in Abstract Presenting and Senior Author Dyads on Subsequent High-Impact Publications



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Abstract

Purpose: To generate insights regarding the role of gender in research mentorship, we analyzed characteristics of abstracts selected for oral and poster discussion presentations at the American Society for Radiation Oncology annual meeting and subsequent high-impact publications.

Methods and Materials: Clinical radiation oncology abstracts selected for oral and poster discussion presentations at the American Society for Radiation Oncology annual meetings in 2014 and 2015 were reviewed. A multivariable logistic regression model evaluated factors associated with subsequent higher-impact publications among abstracts that led to manuscript publications. The primary independent variable was the presenting–senior (last) author gender dyad (divided into 4 groups based on gender of presenting and senior authors, respectively; eg, “MF” indicates male presenting and female senior). Dyads were classified as MF, FM, MM, or FF.

Results: Data were derived from 390 oral and 142 poster discussions. Presenting and senior author pairings were MM for 286 (53.8%), FF for 67 (12.6%), MF for 84 (15.8%), and FM for 94 (17.7%) abstracts. Overall, 403 abstracts led to subsequent

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publications, of which 52.1% (210) were in a higher-impact journal. Eventual publication in a higher-impact journal was significantly associated with senior author H-index (odds ratio [OR] 3.30 for $H \geq 41$ vs < 17 ; group $P = .007$), grant support for the study (OR 2.09 for funded vs not, $P = .0261$), and with the presenting and senior author gender pairing (group $P = .0107$). Specifically, FM pairings (OR 2.48; 95% confidence interval, 1.32–4.66) and MF pairings (OR 2.38; 95% confidence interval, 1.19–4.77) had higher odds of high-impact publication than MM pairings, whereas there was no significant difference in this outcome between FF and MM pairings.

Conclusions: Although unmeasured confounding remains possible, MF and FM dyads of presenting and senior authors were more likely than MM dyads to obtain journal publication in a higher-impact journal. Institutions and the profession should support the development and maintenance of respectful, collaborative cross-gender mentorship.

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Introduction

Mentorship has a profound impact on career development.¹ Studies have suggested that effective mentorship does not require same-gender pairings.^{2,3} To generate insights regarding the role of gender in research mentorship, we initiated a descriptive, hypothesis-generating study that analyzed characteristics of abstracts selected for oral and poster discussion presentations at a prominent annual oncology professional society meeting and subsequent high-impact publications.

Methods and Materials

Clinical radiation oncology abstracts selected for oral and poster discussion presentations at the American Society of Radiation Oncology annual meeting in 2014 and 2015 were reviewed and characteristics ascertained using data available in the abstracts and via publicly available institutional profiles. Physics and radiation biology tracks were excluded from this analysis. These years were selected to identify a period that would result in data reflective of the current research mentorship environment while also still providing adequate time for manuscript publication after abstract presentation. A multivariable logistic regression model evaluated factors associated with subsequent higher-impact publication (above the median impact factor [5.5] of journals publishing subsequent articles resulting from the abstracts in this data set). Cases where no subsequent publication was generated or where the presenting author was the senior author were excluded from the model. The primary independent variable was the presenting–senior (last) author gender dyad (divided into 4 groups based on gender of presenting and senior authors, respectively; eg, “MF” indicates male presenting and female senior). Theoretically prespecified independent covariates were year of meeting, presenting author H-index, senior author H-index, total author number, nature of research (prospective vs retrospective),

whether the abstract disclosed grant funding of the study, number of institutions, whether presenting and senior authors were from the same institution, whether the study used a national data source, and whether a presentation was in oral or poster discussion format. All statistical analyses were conducted in SAS v9.4.

Results

Data were derived from 390 oral and 142 poster discussions (Table 1). Mean H-index was 12.41 (standard deviation [SD] 12.48) for presenting author and 32.18 (SD 20.06) for senior author; 69.6% of presenting authors and 71.6% of senior authors were male. Presenting and senior author pairings were MM for 286 (53.8%), FF for 67 (12.6%), MF for 84 (15.8%), and FM for 94 (17.7%) abstracts. Mean number of authors was 8.85 (SD 4.11) and institutions was 3.15 (SD 3.55). The breast clinical track had the highest percentage of FF pairings (31.5%) whereas the genitourinary (GU) track had the smallest percentage of FF pairings (1.41%) and the largest percentage of MM pairings (74.7%). The distribution of mentorship dyads by clinical track is shown in Table 2. Overall, 403 abstracts led to subsequent publications, of which 52.1% (210) were in a higher-impact journal. The distribution of publications in low- versus high-impact journals by gender dyad is shown in Table 3.

Eventual publication in a higher-impact journal was significantly associated with senior author H-index (odds ratio [OR] 3.30 for $H \geq 41$ vs < 17 ; group $P = .007$), grant support for the study (OR 2.09 for funded vs not, $P = .03$), and the presenting and senior author gender pairing (group $P = .01$). Specifically, FM pairings (OR 2.48; 95% confidence interval, 1.32–4.66) and MF pairings (OR 2.38; 95% confidence interval, 1.19–4.77) had higher odds of high-impact publication than MM pairings. The GU clinical track was associated

Table 1 Select characteristics of the study cohort (American Society for Radiation Oncology abstracts presented in oral or poster discussion format, 2014 and 2015)

	All, n = 532 (%)	Oral presentations, n = 390 (%)	Poster discussion presentations, n = 142 (%)
Presenting author characteristics			
Sex			
Female	161 (30.3)	121 (31.0)	40 (28.2)
Male	370 (69.6)	268 (68.7)	102 (71.8)
Unknown	1 (0.2)	1 (0.3)	0 (0.0)
H-index Mean (SD)	12.4 (12.5)	13.0 (12.6)	10.8 (12.1)
Senior author characteristics			
Sex			
Female	151 (28.4)	112 (28.7)	39 (27.5)
Male	381 (71.6)	278 (71.3)	103 (72.5)
H-index Mean (SD)	32.2 (20.1)	33.8 (20.5)	27.8 (18.2)
Presenting author–senior author gender dyad			
Male/Male	286 (53.8)	207 (53.1)	79 (55.6)
Female/Female	67 (12.6)	51 (13.1)	16 (11.3)
Male/Female	84 (15.8)	61 (15.6)	23 (16.2)
Female/Male	94 (17.7)	70 (18.0)	24 (16.9)
Mean no. of authors (SD)	8.9 (4.1)	9.1 (4.3)	8.3 (3.6)
Mean no. of institutions (SD)	3.2 (3.6)	3.4 (3.8)	2.4 (2.8)
Grant funding declared	76 (18.9)	56 (18.4)	20 (20.2)
National data source	47 (8.8)	38 (9.7)	9 (6.3)
Publication rate (SD)	403 (75.8)	304 (78.0)	99 (69.7)

Abbreviation: SD = standard deviation.

with increased odds of high-impact publication (group $P = .02$) (Fig 1).

Discussion

Although unmeasured confounding remains possible in this observational study, the finding that MF and FM dyads of presenting and senior authors were more likely than MM and FF dyads to obtain journal publication in a higher-impact journal suggests a possible independent benefit to gender diversity in research mentorship and authorship. This finding is the first of its kind to our knowledge within the field of oncology but is consistent with studies that have more generally demonstrated the contribution of gender diversity to collective

intelligence.^{4,5} Additionally, FF pairings had slightly higher odds of higher-impact publication, albeit with a confidence interval overlapping one. These data add to the existing body of literature supporting efforts to target the greater inclusion of women in all aspects of the field, not only for the sake of equity but also to enhance the quality of contributions from our specialty. Furthermore, specific fields within radiation oncology with a small number of female researchers may benefit from the inclusion of more females as part of research teams.

Organizational psychologists have demonstrated that workforce diversity among employees increases varied skill sets and information, thus facilitating knowledge-sharing that can improve productivity. Furthermore, diversity stimulates innovation such

Table 2 Percentage of presenting author–senior author gender dyads by clinical track

Presenting author–senior author gender dyad	Breast, %	CNS, %	GI, %	GU, %	GYN, %	HN, %	Lung, %	Rare tumors,* %	Non–site specific,† %
Male/Male	20.4	60.9	61.4	74.7	33.3	65.2	62.5	35.5	52.9
Female/Female	31.5	4.7	8.8	1.4	18.5	2.2	6.3	24.2	21.4
Male/Female	27.8	18.8	12.3	4.2	25.9	13.0	16.3	21.0	11.4
Female/Male	20.4	15.6	17.5	19.7	22.2	19.6	15.0	19.4	14.3

Abbreviations: CNS = central nervous system; GI = gastrointestinal; GU = genitourinary; GYN = gynecologic; HN = head and neck.

* Rare tumors: lymphoma, sarcoma, and pediatrics.

† Non–site specific: palliative, patient reported outcomes, patient safety, and health services research.

Table 3 Distribution of published manuscripts by high or low journal impact factor and presenting author–senior author gender dyads

Presenting author–senior author gender dyad	No. published in low-impact journals* (%)	No. published in high-impact journals (%)	Total, n = 403
Male/Male	118 (52.9)	105 (47.1)	223
Female/Female	27 (51.9)	25 (48.1)	52
Male/Female	23 (38.3)	37 (61.7)	60
Female/Male	25 (36.8)	43 (63.2)	68

* Low-impact journals at or below the median impact factor of 5.5, or high-impact journals above the median.

that diverse groups outperform others in a competitive market.⁶ In the present study, the diverse experiences of men and women in medicine working together to lead a collaborative effort may account for the performance differences observed (with impact

factor used as a proxy) compared with same-gender dyads.

This finding has immediate relevance given growing apprehension expressed regarding MF and FM mentorship in the #MeToo era.⁷ Survey studies have shown that some men have stopped meeting alone with women,⁸ and 74% of male senior business managers have cited fear as the main barrier for supporting gender equity in the workplace.⁹ These findings translated into medicine can have serious long-term implications, as women represent half of incoming medical students but a substantial gender gap remains in more senior positions.¹⁰

Indeed, the current study finding of approximately 70% of presenting and senior authors being male is consistent with the current composition of males and females in the radiation oncology workforce overall and is also similar to the proportion of women entering the field today. The persistent underrepresentation of women in radiation oncology compared with the medical student body underscores the importance of efforts to increase women’s entry into the field of radiation oncology. The results of this study are encouraging, as they suggest that

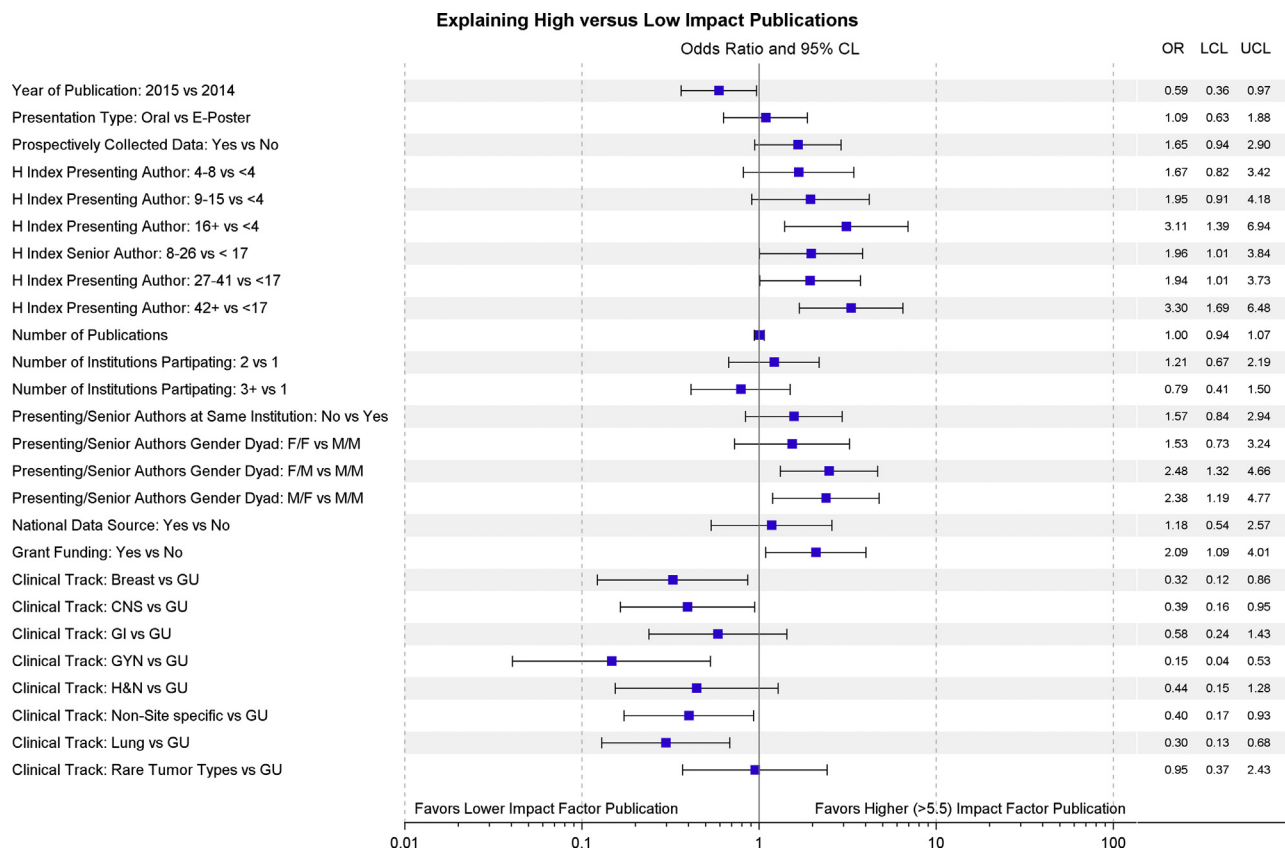


Figure 1 Multivariable model of publication in a higher-impact journal. This figure depicts the odds ratios from a multivariable logistic regression model evaluating factors associated with subsequent higher-impact publication (defined as having an impact factor above the median [5.5] of journals publishing articles resulting from the abstracts presented in oral or poster discussion form at the 2014 and 2015 American Society for Radiation Oncology Annual Meetings).

women need not be limited to female mentors to be successful academically.

Limitations of this study include the small sample size, the observational study design, and the inability to control for possible confounding variables such as unmeasured nuances relating to the type of study. Nevertheless, our preliminary analyses do generate interesting hypotheses and also support future investigation of additional variables such as gender diversity among all of the coauthors. Further research should also consider the role of gender in mentorship pairings within other medical specialties and at other large cancer meetings.

Conclusions

Ultimately, this study's findings suggest that well-intended efforts to diminish sexual harassment should be careful not to discourage cross-gender mentorship. Institutions and the profession should support the development and maintenance of respectful, collaborative mentorship, including the mentorship of women by men. It adds to the growing evidence that efforts to include women in the field of radiation oncology may not only permit access to the full pool of talented potential researchers in an era of gender parity in medical school enrollment but also potentially elevate the quality of scientific investigation itself.

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