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Gender of presenters at orthopaedic meetings reflects gender diversity of society membership

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ABSTRACT

Objective: To quantify the number of women presenters and their roles at national meetings across all orthopaedic sub-specialties.
Methods: A retrospective review of annual meeting programs for 2008 and 2017 from ten North American orthopaedic societies was conducted.
Results: A statistically significant increase was seen in the proportion of women presenting at society annual meetings between 2008 and 2017 ($p < 0.0001$). Women were more often authors presenting abstracts ($p < 0.0001$)) and less frequently faculty/instructors ($p = 0.0051$) and moderators/chairs ($p = 0.0003$) when compared to men.
Conclusion: Men continue to hold a higher proportion of more respected roles within orthopaedic academia.

1. Introduction

1.1. Background

While gender parity has been achieved in undergraduate medical education and multiple medical specialties, orthopaedic surgery continues to trail behind in this regard.[1–4] Female orthopaedic surgeons are not reaching equivalent levels of academic success or career advancement compared to men in the field.[2]

Scholarly and research productivity is a key determinant of academic success—as measured by academic promotion—in orthopaedics and is correlated with senior academic rank.[5] In many fields of medicine, women publish and present their work at lesser rates than men.[6–8] Recently, presentation of research abstracts at annual pediatric orthopaedic meetings was used as a novel marker of academic success showing lower rates of presentation for women than men with no trend of convergence over a five-year period.[9]

Low rates of female recruitment, attendance and leadership roles at annual orthopaedic society meetings may strengthen the gender incongruency that already exists within the speciality. This difference in meeting presentation rates has not been examined across other orthopaedic societies or for other types of meeting presentations.

1.2. Rationale

The purpose of this study is to quantify the gender gap at national orthopaedic meetings across multiple sub-specialties and to document how this has changed over the last decade. Specifically, we seek to determine the number of women that are presenting at orthopaedic society meetings compared to men. Secondarily, we will evaluate whether the representation of women at these meetings is proportional to their society membership. Finally, we will compare the roles of women participants in orthopaedic annual meetings. We hypothesize that women are presenting at significantly lower rates than men, in proportion to society membership, and in more junior roles as compared to men across all orthopaedic subspecialties in both 2008 and 2017. Further, we hypothesize that the percentage of female presenters has significantly increased across all subspecialties over the past decade.

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1.3. Study questions

(1) What percentage of presenters were women at national orthopaedic society meetings in 2008 and 2017?
(2) Are female presenter roles (including abstract author, faculty/instructor, moderator/chair and guest speaker) different than males at these annual society meetings?

2. Methods

2.1. Study design and setting

This is an IRB exempt study. A retrospective review of the final programs of ten orthopaedic society annual meetings was performed. The orthopaedic societies selected were the American Association of Hip and Knee Surgeons (AAHKS), American Association for Hand Surgery (AAHS), American Academy of Orthopaedic Surgeons (AAOS), American Orthopaedic Foot and Ankle Society (AOFAS), American Orthopaedic Society for Sports Medicine (AOSSM), American Shoulder and Elbow Surgeons (ASES), Canadian Orthopaedic Association (COA), Musculoskeletal Tumor Society (MSTS), North American Spine Society (NASS), Orthopaedic Trauma Association (OTA), and Pediatric Orthopaedic Society of North America (POSNA). These societies were selected to include all the major orthopaedic subspecialties in North America with the largest membership enrollment and annual meeting attendance.

2.2. Participants/study subjects

Data was collected from the 2008 and 2017 final annual meeting programs per society. Annual meeting final programs were obtained from the society websites. Orthopaedic societies were contacted via phone or email to request programs that were not readily available on their website. The 2008 final meeting programs were not available for POSNA and the OTA; their 2009 meeting programs were used instead. The societies were also contacted to obtain their membership demographics, specifically the number of men and women as well as their membership categories. We excluded inactive member categories to most accurately represent the members likely to present at a society meeting. Data was systematically collected on every individual listed in the meeting program. The study population included individuals presenting on any topic and any capacity, but only presentation formats involving interaction with meeting attendees (lecture, podium, symposium, award presentation) were included in analysis. E-posters, pre-meeting events, committee meetings, and ancillary staff or non-physician curricula (e.g. nurse practitioner forum) were excluded.

2.3. Description of experiment, treatment or surgery

Gender was first determined based on presenter's name. In cases of uncertainty, an internet search using the Google search engine or LinkedIn was performed. Gender was determined based on pictures and/or institutional biography pronoun (he/she) when used. In cases of continued ambiguity, the name-to-gender assignment algorithm Gender API (https://gender-api.com/en/) was used. The lead author was assumed to be the presenter in all cases except when an alternate presenter was clearly indicated in a meeting program. Subsequent data collected for presenters who were women included the topic of the presentation and their title (MD, DO, PhD, MS, BSc).

2.4. Demographics, description of study population

Presenter name, presenter gender, presenter type (abstract author, faculty/instructor, moderator, chair or guest speaker) and session type (poster session, paper session, educational session, feature lecture) were recorded.

2.5. Statistical analysis, study size

The percentage of female presenters, the percentage of female members of that society and the distribution of presenter types was calculated. Only the gender of the primary presenter was included in statistical analysis. Data was compared between men and women between 2008 and 2017. Categorical variables were compared using Fisher's exact test or chi-square test depending on group size ($p < 0.05$ was considered significant).

3. Results

3.1. What percentage of presenters were women at national orthopaedic society meetings in 2008 and 2017?

Over all society meetings, there was a significant increase in the proportion of women presenting between 2008 and 2017 (7.4% vs 11.6%, $p < 0.0001$). Subgroup analysis revealed this to be statistically significant for the following societies with percent of female presenters in 2017 vs 2008 respectively; AAHS (22.5% vs 13.1%, $p = 0.0004$), AAOS (10.6% vs 6.5% $p < 0.0001$), COA (14.5% vs 9.9% $p = 0.0367$), NASS (11.5% vs 4.1% $p < 0.0001$), and POSNA (16.9% vs 5.9% $p < 0.0001$), (Table 1 and Fig. 1).

Further assessment of the data revealed that in 2017, women comprised 8.2% of active orthopaedic society membership in the ten selected societies overall. The rates of female members varied between each individual society from 2.8% for the AAHKS up to 22.2% for POSNA (Table 2). There was variability among the different societies in the gender proportionality of annual meeting presenters compared to their current membership demographics (Table 3). Combining all societies, women presented at these meetings at rates higher than their cumulative society membership numbers (11.6% versus 8.2%, $p < 0.0001$). However, POSNA had the greatest discrepancy, with a significantly lower representation of women at national meetings compared to their membership (16.9% vs 22.2%, $p = 0.0256$); while AAOS, AOSSM, and NASS had higher representation of women presenting compared to their membership demographics (10.6% vs 6.5%, $P < 0.0001$, 9.6% vs 7.0%, $p = 0.021$, and 11.5% vs 9.1%, $p = 0.041$), respectively.

3.2. Are female presenter roles (including abstract author, faculty/instructor, moderator/chair and guest speaker) different than males at these annual society meetings?

The distribution of presentation types varied between men and women between 2008 and 2017. Overall, when compared to men, women were more often authors presenting abstracts (49.5% vs 39.8% $p < 0.0001$) and less frequently faculty or instructors (36.1% vs 40.8% $p = 0.0051$) (Table 4). Women were also less frequently moderators or

Table 1
Percentage of presenters that are female at the 2008 and 2017 annual meetings per orthopaedic society.

Society	% Female presenters 2017	% Female presenters 2008	p-value
AAHKS	2.5%	3.6%	0.7366
AAHS	22.5%	13.1%	**0.0004**
AAOS	10.6%	6.5%	< **0.0001**
AOFAS	9.4%		
AOSSM	9.6%	5.6%	0.0589
ASES	3.5%	3.1%	1.0000
COA	14.5%	9.9%	**0.0367**
NASS	11.5%	4.1%	**0.0001**
OTA	11.2%	7.7%	0.2251
POSNA	16.9%	5.9%	< **0.0001**
TOTAL	**11.6%**	**7.4%**	< **0.0001**

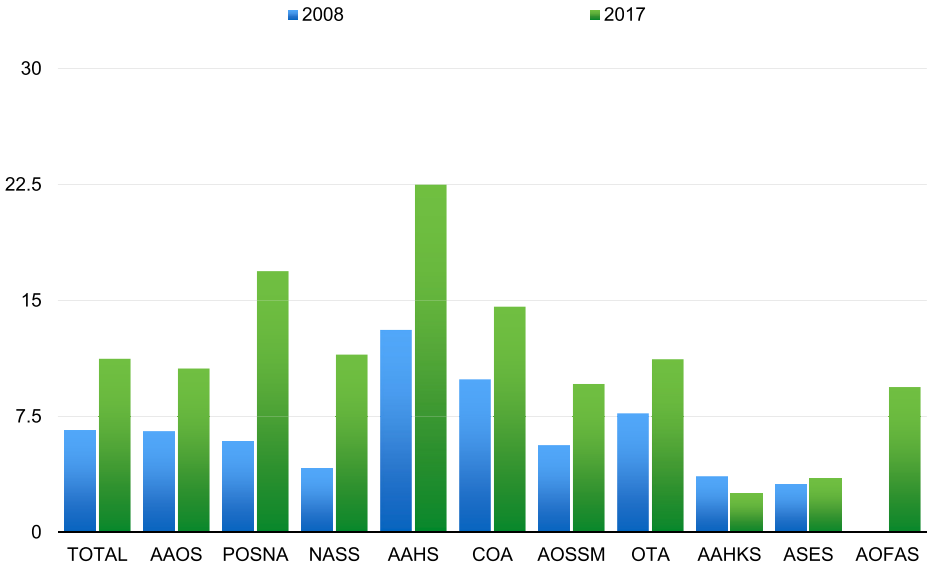

Fig. 1. Comparison of percentage of presenters that were women per orthopaedic society for 2008 and 2017.

Table 2
Membership gender distribution per orthopaedic society in 2017.

Society	# Female members 2017	# Male members 2017	Total	% Female members 2017
AAHKS	83	2856	2939	2.8%
AAHS	296	1124	1420	20.8%
AAOS	1925	27658	29583	6.5%
AOFAS	232	2007	2239	10.4%
AOSSM	258	3427	3685	7.0%
ASES	41	747	788	5.2%
COA	345	1582	1927	17.9%
NASS	770	7718	8488	9.1%
OTA	234	2137	2371	9.9%
POSNA	317	1112	1429	22.2%
TOTAL	**4501**	**50368**	**54869**	**8.2%**

Table 3
Percentage of female members compared to percentage of female presenters at 2017 annual meetings per society.

Society	% Female members 2017	% Female presenters 2017	p-value
AAHKS	2.8	2.5	1
AAHS	20.8	22.5	0.5072
AAOS	6.5	10.6	**< 0.0001**
AOFAS	10.4	9.4	1
AOSSM	7.0	9.6	**0.021**
ASES	5.2	3.5	0.5
COA	17.9	14.5	0.1144
NASS	9.1	11.5	**0.041**
OTA	9.9	11.2	0.444
POSNA	22.2	16.9	**0.0256**
TOTAL	**8.2**	**11.6**	**< 0.0001**

chairs when compared to men (13.5% vs 18%, p = 0.0003) (Table 4). Differences between men and women for the role of guest speaker did not reach statistical significance (Table 4 and Fig. 2).

When the category of faculty/instructor was further subdivided between 2008 and 2017, statistical significance was only achieved in 2017. In 2008 33.6% vs 39.3% (p = 0.07) women vs men were faculty/instructor, whereas in 2017 37.3% vs 41.8% (p = 0.027). This discrepancy was not seen in the category of abstract author or moderator/chair for men and women in 2008 and 2017.

4. Discussion

To our knowledge, no studies have investigated the representation of academic activity of women across orthopaedic society meetings or within other specialties. However, many studies have reported increasing publication rates by women in various medical specialties, albeit at markedly lesser rates than men. Okike et al. found that the number of women publishing in two prominent orthopaedics journals increased significantly over the last four decades; Nonetheless, these increased rates were still lower than those observed in other fields of medicine.[10] Jagsi et al. observed a similar trend across multiple specialties, with the smallest increase in their chosen surgical journal (Ann Surg) and in senior authorship.[7] It is unclear whether the reported numbers of female-authored publications were proportional to the number of women in the medical specialty of interest. Thus, it is possible that these results reflect the relative distribution of women across various disciplines.

This study demonstrates that variability exists in membership gender demographics between the different orthopaedic societies, with an almost 20% difference between societies with the highest and lowest percentage of women members. The gender gap among medical school graduates has been steadily improving. Since 2005, women have consistently made up 47+% of U.S. medical school graduating classes,

Table 4
Distribution of presenter types at orthopaedic annual meetings according to gender and year.

Presenter role	% Female 2008	% Male 2008	p-value	% Female 2017	% Male 2017	p-value	% Female total	% Male total	p-value
Abstract Author	53.4	41.4	**0.0001**	48	37.8	**0.0001**	49.5	39.8	**< 0.0001**
Faculty/Instructor	33.6	39.3	0.07	37.3	41.8	**0.027**	36.1	40.8	**0.0051**
Moderator/Chair	12.4	15.3	**0.02**	13.8	15.1	**0.01**	13.5	18	**0.0003**
Guest Speaker	0.68	1.37	0.58	0.86	1.6	0.18	0.9	1.5	0.2011

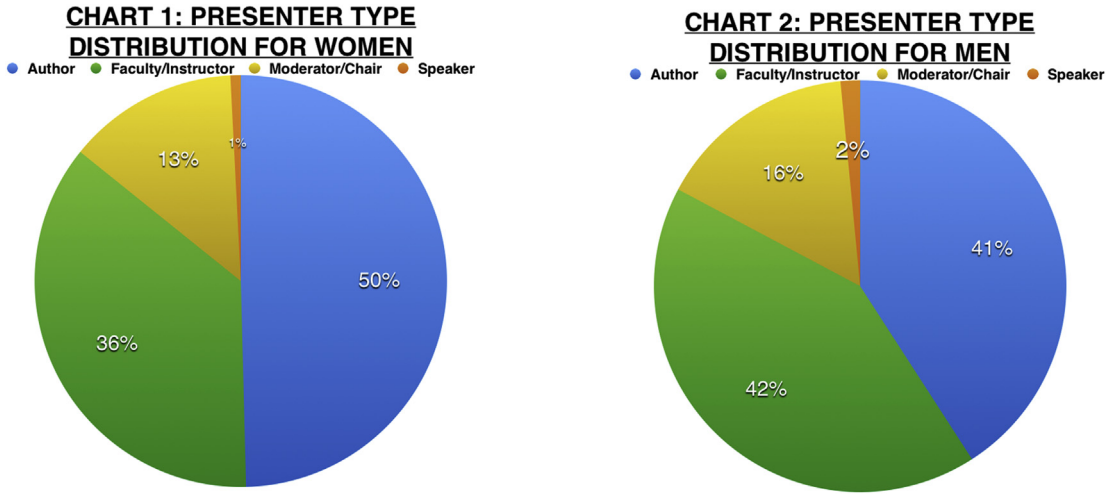

Fig. 2. Distribution of presenter types for society meetings overall according to gender.

reaching a peak of 49.8% in 2016.[11,12] In sharp contrast, women made up only 14.8% of first-year fellows and orthopaedic surgery residents in 2015 and 6.5% of orthopaedic surgeons in 2016[13,14] — numbers that have remained relatively stagnant over the last decade. An increase in female orthopaedic surgeons in-training is promising; however, not everyone will enter the pipeline of academic medicine. It is thus imperative that we search for ways to actively recruit, retain, and promote female orthopaedic surgeons in academia. We believe that strong, active mentorship and support from senior colleagues form the crux for recruitment and retention of diversity within orthopaedic academia. Without these, the low visibility of women within orthopaedic academia may promote attrition or discourage entry into the academic pipeline.

Sharkey et al. reported that women at 2009–2013 POSNA annual meetings were abstract authors at proportionally lower rates than their male peers compared to the society membership demographics and that these discrepancies persisted even when years of membership were considered[9]; a finding that is partially supported by our study results. Despite having the highest percentage of female members, this discrepancy has continued through to 2017 for POSNA.

Orthopaedic surgery has the lowest representation of women residents and faculty.[15] The Association of American Medical Colleges looked at the distribution of full-time orthopaedic surgeon M.D. faculty by department and Rank in 2015. Women as a percentage of women and men M.D. instructors was 16%, women as a percentage of women and men M.D. assistant professors was 16%, women as a percentage of women and men M.D. associate professors was 10%, and women as a percentage of women and men M.D. full professors was 7%.[2] This shows that women are not reaching equivalent levels of academic success and advancement compared to men.

The distribution of presentation types between women and men was also unequal in this study. Women were more frequently abstract authors while men were more frequently session faculty instructors, moderators, and chairs. Given the former are projects submitted by authors and the latter are invited, this difference is important. Although it did not reach statistical significance due to very small numbers in each group, the percentage of male guest speakers was still nearly double that of women (1.6% vs 0.86%, $p = 0.18$) in 2017. This relative lack of women in these more respected roles may reflect unconscious biases among the meeting organizers. It is imperative that we not solely rely on the pipeline of new women graduates entering orthopaedics but instead business models should intentionally be promoting qualified women from within an organization and meeting organizers should be purposefully highlighting and inviting senior rank women to conferences as faculty instructors, moderators and chairs.

Secondarily, certain presenter roles may have greater impact professionally than an abstract presentation, with the most prestigious position being that of a guest speaker. Ence et al. reviewed 142 academic orthopaedic surgery departments in 2014 and reported significantly fewer women in senior faculty positions than men (29.9% [n = 114] compared with 39.6% [n = 1232]; $p < 0.001$). They suggest that years of experience rather than gender determines academic productivity and promotion to senior rank.[5] While the percentage of female abstract author appears to downtrend and female faculty/instructor/moderator/chair/guest speaker percentages appear to increase between 2008 and 2017, we found no significant change in the distribution of these roles between men and women since 2008, suggesting that career duration may not be the sole contributor to these differences. Although both participating and being invited to a conference are important, as the latter allows an opportunity to network and the former provides visibility, more prestigious roles have a higher professional impact given its potential reach nationally and internationally. The visible lack of women at these high-ranking roles not only impacts trainees going into academics but also with retention.

We would be remiss if we did not mention reasons that could explain our data and this lower rate of representation of women. One such factor could be that women may be less likely to travel to meetings/conferences to due to family constraints and obligations. A recent study published in JAMA oncology, outline the importance of onsite childcare at conferences as this would help many women who are parents attend these meetings.[16] In addition, women researchers are less likely to receive funding, impacting their ability to perform research. A study looking at National Institute of Health (NIH) grants from 2006 to 2017 showed that first time female principal investigators received a median grant of $126,615 and first-time male principal investigators received a median grant of $165,721. This was across all types of grants and institutions in that time period, which is nearly a $40,000 difference.[17] At the beginning of a researcher's career, this difference will have a very large impact. Lastly, previous reports have identified common reasons why women may choose not to pursue a career in orthopaedics. Among these is the lack of role models or strong mentorship within the field.[15,18] The underrepresentation of women at the organizational and society levels is thought to perpetuate the problem.[15]

National and/or international recognition is an instrumental factor for promotion to associate and full professor. As moderators, faculty instructors, and guest speakers are more likely to be nationally recognized than an abstract presenter, our results suggest that women are less likely to advance in professorial rank within orthopaedic academia. Cochran et al. evaluated the differences in perceived barriers to academic surgery careers between senior residents and early-career faculty

members.[19] They reported that junior faculty members identified networking difficulties—specifically inadequate mentorship, few role models, and lack of support from senior colleagues—as barriers for career advancement. Many authors propose that women are less likely to choose a male-dominated field or speciality.[20] The limited number of women in senior academic positions in orthopaedics may limit the visibility of women and strengthen the gender incongruency that already exists within the speciality by hindering orthopaedic trainees from considering an academic career.

The study of gender parity and diversity is more than just a need to meet a quota. Research across multiple fields shows that diversity leads to more positive outcomes within organizations across many disciplines.[18] Gender parity, specifically, improves group performance and raises the collective intelligence of teams.[21] This could, in turn, lend itself to more efficiency, productivity and innovation in medical research groups. It must be said that other forms of diversity, such as race and ethnicity, have been linked to these positive outcomes and, although less readily discernible from a meeting program, also warrant further focus in orthopaedics.

4.1. Limitations

There are limitations to our study. While care was taken to ensure that our dataset was as comprehensive as possible, we were unable to obtain data for every year from every society. As such we had to exclude the MSTS and the 2008 AOFAS meetings from our analysis. With the OTA and POSNA annual meetings, we had to use 2009 as a surrogate for 2008 as this information was not available. Of note, previous studies have shown little if any change in gender distribution within orthopaedics from year to year and thus did not feel it would impact our results.[3] Further, ASSH (American Society for Surgery of the Hand) may better represent orthopaedic surgeon numbers over plastic surgery, however, we were unable to obtain sufficient data from this society to include them in our study and thus, included AAHS instead.

We selected only North American orthopaedic societies, limiting our ability to generalize our findings globally. Our analysis is a comparison of two single years, which could introduce sampling bias. Additionally, society rules regarding acceptance of papers or invited lectures by members and non-members may bias the results of this study. Furthermore, some academic surgeons may prefer to focus their efforts on publishing rather than participating in these meetings. This study evaluated only the gender of the presenters and the type of presentation. Thus, we could not control for the possibility that experience, rather than gender, is the reason for the discrepancies in academic success, specifically presenter roles. Still, we advocate that an interplay of multiple influential factors (e.g. lack of strong mentorship, role models) have an instrumental role in the persistence of these gender inequities within orthopaedic academia. Further, we cannot be certain that every presenter was a member of the orthopaedic society in question which could alter the results of our proportionality assessment. In a future study, normalizing groups according to years in practice, professorial rank, professional degree, or society membership category could allow for direct quantitative comparison of women and men participating at these society meetings.

5. Conclusion

In conclusion, this study highlights the progress made and the continued need for improvement in attaining gender congruency in academic orthopaedics. Ensuring proportional representation of women in senior roles at meetings would help increase their visibility within the field and potentially recruit more women into academia and orthopaedic surgery. The achievement of gender congruency could enrich the field of orthopaedics through enhanced innovation, productivity, and efficiency.

Author contributions

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Each author certifies that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangements, etc) that might pose a conflict of interest in connection with the submitted article.

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Declaration of competing interest

None.

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