

Clinical Research

Are Women Proportionately Represented as Speakers at Orthopaedic Surgery Annual Meetings? A Cross-Sectional Analysis

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Abstract

Background In spite of efforts to improve gender diversity in orthopaedic surgery, women remain underrepresented, particularly with increasing academic rank. Opportunities to speak at society meetings are an important component of building a national reputation and achieving academic promotions. However, little is known about the gender diversity of orthopaedic society annual meeting speakers. Data on this topic are needed to determine whether these speaking roles are equitably distributed between men and women, which is fundamental to equalizing professional opportunity in academic orthopaedic surgery.

Question/purposes (1) Is the gender diversity of invited speakers at annual orthopaedic subspecialty society meetings proportional to society membership? (2) Are there differences in the proportion of women invited to speak in

technical sessions (defined as sessions on surgical outcomes, surgical technique, nonsurgical musculoskeletal care, or basic science) versus nontechnical sessions (such as sessions on diversity, work-life balance, work environment, social media, education, or peer relationships)? (3) Does the presence of women on the society executive committee and annual meeting program committee correlate with the gender diversity of invited speakers? (4) Do societies with explicit diversity efforts (the presence of a committee, task force, award, or grant designed to promote diversity, or mention of diversity as part of the organization's mission statement) have greater gender diversity in their invited speakers?

Methods Seventeen national orthopaedic societies in the United States were included in this cross-sectional study of speakership in 2018. Each society provided the number of men and women members for their society in 2018. The genders of all invited speakers were tabulated using each society's 2018 annual meeting program. Speakers of all credentials and degrees were included. All manuscript/abstract presenters were excluded from all analyses because these sessions are selected by blinded scientific review. A Fisher's exact test was used to compare the proportion of women versus men in nontechnical speaking roles. The relationship between women in society leadership roles and women in all speaking roles was investigated using a linear regression analysis. A chi square test was used to compare the proportion of women in all speaking roles between societies with stated diversity efforts with societies without such initiatives.

Results Overall, women society members were proportionately represented as annual meeting speakers, comprising 13% (4389 of 33,051) of all society members and 14% (535 of 3928) of all annual meeting speakers (%

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difference 0.6% [95% CI -0.8 to 1.5]; $p = 0.60$); however, representation of women speakers ranged from 0% to 33% across societies. Women were more likely than men to have nontechnical speaking roles, with 6% (32 of 535) of women's speaking roles being nontechnical, compared with 2% (51 of 3393) of men's speaking roles being nontechnical (OR 4.2 [95% CI 2.7 to 6.5]; $p < 0.001$). There was a positive correlation between the proportion of women in society leadership roles and the proportion of women in speaking roles ($r = 0.73$; $p < 0.001$). Societies with a stated diversity effort had more women as conference speakers; with 19% (375 of 1997) women speakers for societies with a diversity effort compared with 8% (160 of 1931) women speakers in societies without a diversity effort (OR 2.6 [95% CI 2.1 to 3.1]; $p < 0.001$).

Conclusions Although the percentage of women in speaking roles was proportional to society membership overall, our study identified opportunities to improve gender representation in several societies and in technical versus nontechnical sessions. Positioning more women in leadership roles and developing stated diversity efforts are two interventions that may help societies improve proportional representation; we recommend that all societies monitor the gender representation of speakers at their annual meetings and direct conference organizing committees to create programs with gender equity.

Clinical Relevance Society leadership, national oversight committees, invited speakers, and conference attendees all contribute to the layers of accountability for equitable speakership at annual meetings. National steering committees such as the American Academy of Orthopaedic Surgeons Diversity Advisory Board should monitor and report conference speaker diversity data to create systemwide accountability. Conference attendees and speakers should critically examine conference programs and raise concerns if they notice inequities. With these additional layers of accountability, orthopaedic surgery annual meetings may become more representative of their society members.

Introduction

Cultivating gender diversity is indispensable for meeting challenges facing health care and encouraging innovation in medicine [9]. A study showed that diverse groups identify and solve problems, make sense of new information, and perform at higher levels when responding to unfamiliar situations more effectively than less-diverse groups do [26]. Workplace diversity is especially relevant in health care. Recently, academic institutions have been making concerted efforts to diversify their faculty and students [1, 2, 10, 11, 16, 24, 28, 29, 32]. Additionally, two studies have shown that diversity in the physician

workforce may help address health inequalities and lead to better patient outcomes [21, 30].

The percentage of women in United States medical schools has risen from 7% in 1965 [4] to nearly equal gender balance since 2000 [4]. Despite 20 years of gender parity in medical education, women physicians continue to be underrepresented in academic medicine, particularly in higher-level faculty positions. According to the 2014 Association of American Medical Colleges report, women constitute 39% of the full-time faculty members at academic medical centers [5, 6]. When categorized by academic rank, the percentage of women decreases to 25% for full professors, 18% for department chairs, and 16% for deans [25]. In the orthopaedic workforce, the gender disparity among medical school faculty is even more dramatic; women comprise 20% of assistant professors, 15% of associate professors, and 9% of full professors in orthopaedic surgery departments [7]. Of the 119 chairpersons of academic orthopaedic surgery departments in 2017, only one was a woman [8]. This phenomenon of decreasing numbers of women in higher academic ranks is often referred to as the "leaky pipeline" [27].

National recognition is a major determinant of academic appointment and promotion. Medical societies and their annual meetings are important platforms for physicians and their work to gain visibility. In fact, speaking roles are often used as a proxy for physicians' regional and national contributions to their field [33]. Since promotion depends largely on proving a national reputation, the opportunity to speak at conferences is inextricably linked to academic advancement and building a robust faculty pipeline. As such, gender disparities among speaking roles at annual meetings may contribute to the gender imbalance in senior faculty positions, and thus contribute to the leaky pipeline phenomenon [12, 20]. To understand and affect this process, data on the current state of speaker diversity at orthopaedic annual meetings are needed. A recent study showed that overall, women were proportionately represented as conference speakers at a subset of orthopaedic subspecialty societies in 2008 and 2017 [31]. However, this study did not evaluate differences in speaker representation according to session topic or investigate society-level factors that could contribute to speakership disparities. Data on these issues is critical for the leadership and membership of orthopaedic societies to understand the current climate; only with this insight can they develop evidence-driven interventions to create equitable conferences, build a robust orthopaedic promotion pipeline, and foster a culture of inclusion.

Therefore, we asked: (1) Is the gender diversity of invited speakers at annual orthopaedic subspecialty society meetings proportional to society membership? (2) Are there differences in the proportion of women invited to speak in technical sessions (defined as sessions on surgical outcomes, surgical technique, nonsurgical musculoskeletal care, or

basic science) versus nontechnical sessions (such as sessions on diversity, work-life balance, work environment, social media, education, or peer relationships)? (3) Does the presence of women on the society executive committee and annual meeting program committee correlate with the gender diversity of invited speakers? (4) Do societies with stated diversity efforts (the presence of a committee, task force, award, or grant designed to promote diversity, or the mention of diversity in the organization's mission statement) have greater gender diversity in their invited speakers?

Materials and Methods

Societies

This is a cross-sectional study of American Academy of Orthopaedic Surgeons (AAOS)-recognized, national

orthopaedic subspecialty or research societies in 2018 (Table 1) [3]. Nineteen societies met the inclusion criteria. Two societies, the Ruth Jackson Orthopaedic Society and J. Robert Gladden Orthopaedic Society, were excluded because they were founded with a primary focus on diversity. Societies with both open and closed membership structures were included.

Society Membership

Societies were contacted by email or telephone for aggregate gender data from their 2018 membership records. Societies were asked to include all membership categories (full members, candidate members, corresponding members, and any others) in their membership count (Table 1). All 17 societies responded to our request for information. One society, the Arthroscopy Association of North America,

Table 1. Orthopaedic societies and their membership

Society	Abbreviation	Total members	Number of men members	Number of women members	% women members
American Association of Hip and Knee Surgeons	AAHKS	3953	3712	241	6%
American Association for Hand Surgery	AAHS	1590	1211	379	24%
Arthroscopy Association of North America*	AANA				
American Orthopaedic Association	AOA	1186	1075	111	9%
American Orthopaedic Foot and Ankle Society	AOFAS	2015	1782	233	12%
American Orthopaedic Society for Sports Medicine	AOSSM	2755	2497	258	9%
American Shoulder and Elbow Surgeons	ASES	850	802	48	6%
American Society for Surgery of the Hand	ASSH	4553	3801	752	17%
The Hip Society	Hip	200	195	5	3%
The Knee Society	Knee	198	196	2	1%
Limb Lengthening and Reconstruction Society	LLRS	155	132	23	15%
Musculoskeletal Tumor Society	MSTS	344	284	60	17%
North American Spine Society	NASS	7252	6551	701	10%
Orthopaedic Research Society	ORS	3428	2511	917	27%
Orthopaedic Trauma Association	OTA	2410	2176	234	10%
Pediatric Orthopaedic Society of North America	POSNA	1470	1130	340	23%
Society of Military Orthopaedic Surgeons	SOMOS	692	607	85	12%
Total		33,051	28,662	4389	13%

*The Arthroscopy Association of North America was not able to provide demographic information for their membership.

was unable to provide membership data, so it was excluded from our analyses involving comparisons to membership. Two other societies did not track historical membership data and instead provided current membership information for 2019. Two societies did not track the demographic data of their members and instead provided a list of member names. For these societies, two coders (TC, DJK) undertook a prespecified process to assign gender to each member: First, traditional naming conventions were applied; for example, members with names such as “Gregory” or “Fred” were coded as men without further investigation. If there was any uncertainty about the gender of the member, a study team member conducted an internet search. Departmental websites, LinkedIn, and personal internet pages were sequentially investigated. If the gender of the individual could not be confirmed after this process, that individual was excluded from the analysis. To establish interrater reliability between the two coders (TC, DJK), 10% of content was cross coded to determine Cohen’s kappa. Cohen’s kappa for member gender was 0.9, indicating excellent agreement [14].

Overall, 13% (4389 of 33,051) of orthopaedic society members were women, ranging from 1% to 27% of members. In total, 6% (2012 of 33,051) of society members had an unknown gender, either because it was unknown to the society (that is, the member did not specify their gender in society records, $n = 1926$), or because the member’s gender could not be determined by the coders after exhausting the gender-coding process described above ($n = 86$). Gender remained unknown in less than 2% of members in each society, with the exceptions of AOSSM (30%, $n = 1161$), AOA (28%, $n = 461$), and ORS (8%, $n = 290$).

Conference Speakers

The final program for each society’s independent 2018 annual meeting was found online or provided electronically by that society. We did not study the AAOS Specialty Day meetings. We used conference programs to determine the number of men and women invited to speak at each society’s 2018 annual meeting, assigning gender according to the process described above. Speakers of all backgrounds were tabulated, irrespective of professional credentials (MD, PhD, RN). If we could not verify the gender of a speaker, the speaker was excluded from the analysis. The gender of less than 1% (23 of 3928) of speakers could not be identified by the two coders (TC, DJK) after exhausting the gender-coding process, and these individuals were therefore excluded. The Cohen’s kappa for speaker gender was 0.9, indicating excellent agreement [14].

Of note, this work studies invited meeting speakers, not speakers selected based on a blinded and/or peer-review process. Opportunities to present scientific abstracts,

posters, or manuscripts are generally assigned based on blinded scientific review, so these were excluded from all counts and analyses.

To differentiate levels of prestige within speaking opportunities, two coders (TC, DJK) categorized invited speakers as plenary speakers, moderators, or panelists. Plenary speakers were defined as those delivering a keynote address or named lecture. Moderators were defined as those leading a session that included other speakers and presenters. Individuals introducing plenary speakers were also coded as moderators. Panelists were defined as speakers who lectured in a larger session. The Cohen’s kappa between the two coders for speaker role was 0.9, indicating excellent agreement [14].

Individuals speaking in multiple sessions during a conference were counted once for each session in which they participated. If a speaker held multiple roles or had multiple lectures during one session, they were only counted once for their highest role in that session. For example, if a moderator of a session also spoke as a panelist during the same session, that individual was only counted as a moderator.

The presence or absence of a panel consisting only of men, sometimes colloquially referred to as an “all-male panel,” was noted for each session. We defined this as a session that had two or more speakers, all of whom were men.

Technical versus Nontechnical Sessions

Sessions were defined as “technical sessions” if they focused directly on surgical outcomes, surgical technique, nonsurgical musculoskeletal care, or basic science. Sessions were defined as “nontechnical” if they did not fit the definition of “technical sessions,” above. The major subject-matter themes in nontechnical sessions were: diversity, work-life balance, work environment, social media, resident education, medical education, and peer relationships (Table 2). Two coders (TC, DJK) examined the title of each session and independently coded it as a technical or nontechnical session. Because of the subjective nature of this categorization, both coders cross-coded 100% of session titles. The Cohen’s kappa for the two coders was 0.8, indicating excellent agreement [14].

Gender Diversity of Society Executive Committee and Annual Meeting Program Committee

For each society, we obtained the names of executive board members, annual meeting planning committee members (or an equivalent), and chair of the annual meeting planning committee. When possible, we obtained this

Table 2. Example sessions for technical and nontechnical categorization

Society	Technical sessions	Nontechnical sessions
ASSH	“Advanced Microsurgery Solutions”	“Emotional Aspects of Recovery”
ASSH	“Practical Pearls for Nerve Repair Algorithm”	“Excellence in Mentorship”
ORS	“In Vivo MicroCT Imaging: Longitudinal Assessment”	“Early Career After Party: Celebrate Diversity”
ORS	“Osseointegrated Prosthetic Limbs: Recent Developments”	“What Does Your CV/Resume Say About You?”
OTA	“Surgical Techniques: How I Do It: Elbow Injuries”	“Women in Orthopaedic Trauma”
OTA	“Chemicals and Compounds in Fracture Optimization”	“Maintaining Mid-Career Quality of Life”

Full society names and abbreviations can be found in Table 1.

information from the annual meeting’s brochure. If the program brochure did not contain this information, societies directly provided the missing data. We then determined the genders of executive board members, annual meeting planning committee members, and conference chairs using the process described above. Individuals on the executive committee and program committee were combined for overall leadership analyses.

Stated Diversity Effort

We coded societies based on the presence of a committee, task force, award, or grant designed to promote diversity, or if diversity was included as part of the organization’s mission statement. These data were obtained through an exhaustive internet search of each society’s webpage.

Statistical Analysis

We used a chi-square or Fisher’s exact test to evaluate the independence of cross-tabulated counts. The results of analyses are expressed as odds ratios with 95% confidence intervals and associated p values. Ordinary least-squares regression was used to fit expressions characterizing linear relationships between variables. All statistical analyses were two-tailed, and a significance level of 0.05 was considered significant. Statistical tests were performed using SAS Base software version 9.4 (Cary, NC, USA). Additionally, when appropriate, we used the MedCalc Comparison of Proportions Calculator to compare proportions and calculate percent-difference with 95% confidence intervals [23].

Institutional review board approval for this study was waived, because this study was deemed to be nonhuman subject research by the institutional review board at

Washington University School of Medicine in St. Louis, MO, USA.

Results

Gender Diversity of Invited Speakers Compared With Society Members

Overall, women society members were proportionately represented as annual meeting speakers. Women constituted a median (range) of 14% (535 of 3928, 0% to 33%) of annual meeting speakers compared with 13% (4389 of 33,051) of society members (% difference = 0.3% [95% CI -0.8% to 1.5%]; p = 0.60) (Fig. 1). Women constituted 11% (15 of 135) of plenary speakers, 15% (175 of 1162) of moderators, and 13% (345 of 2631) of panelists at 2018 annual meetings (Table 3). Ten of the 17 societies had no women as plenary speakers, which are the roles of highest prestige at an annual meeting. Of all conference panels, 59% (488 of 829) of panels were composed of only men, with a median (range) size of four speakers per all-men panel (two to 33 speakers) (Fig. 2).

Proportion of Women Speakers in Technical versus Nontechnical Speaking Roles

Women were more likely than men to have nontechnical speaking roles. A total of 6% (32 of 535) of women’s speaking roles were nontechnical, whereas 2% (51 of 3393) of men’s speaking roles were nontechnical (OR 4.2 [95% CI 2.7 to 6.5]; p < 0.001). Women were overrepresented in nontechnical speaking roles compared with overall society membership. Women comprised 39% (32 of 83) of all nontechnical speakers but comprised 13% (4389 of 33,051) of society members (% difference 26% [95% CI 16.2 to 36.8]; p < 0.001).

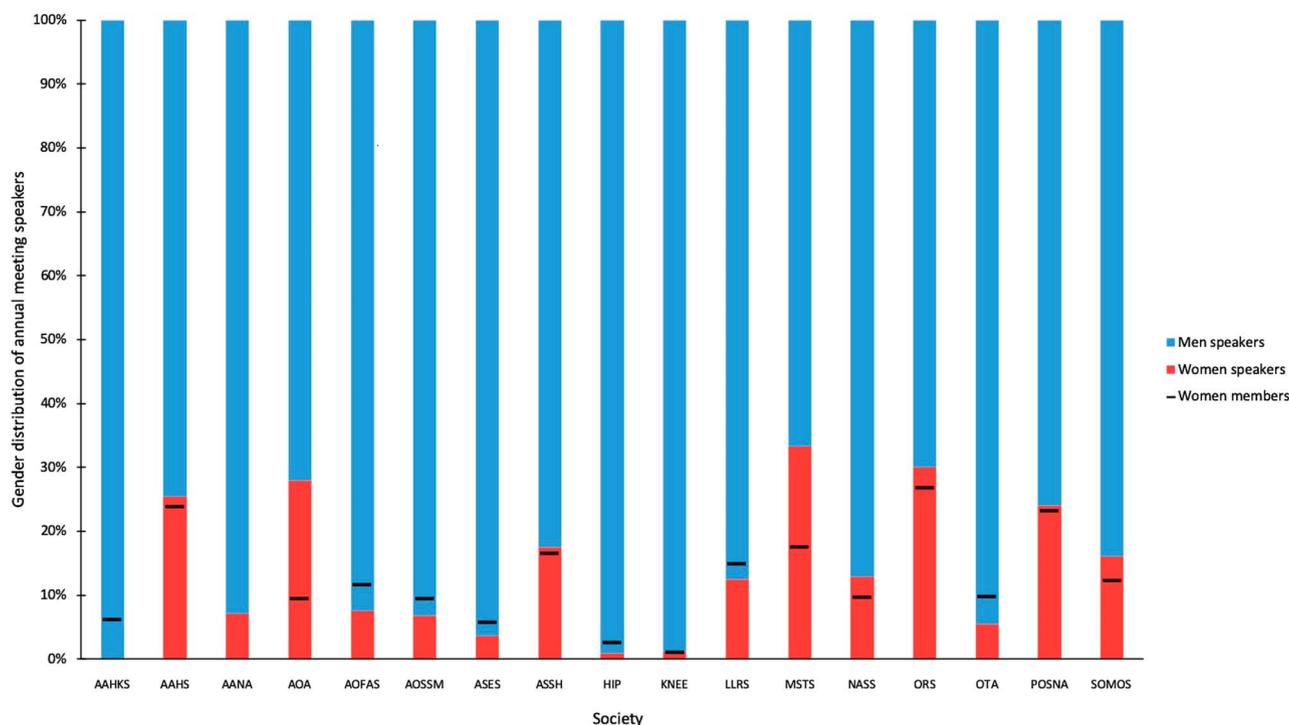


Fig. 1 This graph shows the gender breakdown of annual meeting speakers compared with corresponding society membership; AAHKS = American Association of Hip and Knee Surgeons; AAHS = American Association for Hand Surgery; AANA = Arthroscopy Association of North America; AOA = American Orthopaedic Association; AOFAS = Association of Foot and Ankle Surgeons; AOSSM = Association Orthopaedic Society for Sports Medicine; ASES = American Shoulder and Elbow Surgeons; ASSH = American Society for Surgery of the Hand; Hip = The Hip Society; Knee = The Knee Society; LLRS = Limb Lengthening and Reconstruction Society; MSTS = Musculoskeletal Tumor Society; NASS = North American Spine Society; ORS = Orthopaedic Research Society; OTA = Orthopaedic Trauma Association; POSNA = Pediatric Orthopaedic Society of North America; SOMOS = Society of Military Orthopaedic Surgeons.

Women in Society Leadership Roles and Gender Diversity of Invited Speakers

There was a positive correlation between women in leadership roles and women in speaking roles at a society's conference; that is, as the number of women in leadership increased across the societies surveyed, so did their presence in speaking roles in those societies ($r = 0.73$; $p < 0.001$) (Fig. 3). Women held 10% (24 of 250) of executive board positions and 9% (14 of 159) of program committee positions (Fig. 4). Twenty-three of 24 conference program chairpersons were men (Fig. 5).

Speaker Diversity in Societies With and Without Stated Diversity Efforts

Societies with stated diversity efforts had greater gender diversity in their invited speakers. Seven of 17 societies had a diversity statement or initiative. Societies with a diversity effort had 19% (375 of 1997) women speakers in their programs compared with 8% (160 of 1931) women

speakers in societies without a diversity effort (OR 2.6 [95% CI 2.1 to 3.1]; $p < 0.001$).

Discussion

Annual meetings are important platforms for physicians to gain visibility and build a national reputation, both of which are important for promotion and tenure decisions [33]. As such, gender disparities within speaking roles at annual meetings may contribute to the gender imbalance in senior faculty [12, 20] that has been described as the leaky pipeline of women in academic medicine [27]. Although a preliminary study of conference speakership in orthopaedic surgery has been conducted [31], it was still unknown whether there are gender disparities in speaking roles based on session topics or whether there are society-level factors that could be associated with speakership disparities.

There are several limitations to our work. Most importantly, as a cross-sectional study, it does not provide information about trends in gender representation over time, and our results may not reflect the true gender

Table 3. Plenary, moderator, and panelist speaker data for each society

Society	Plenary speakers		Moderators		Panelist speakers		All speakers	
	Number of men	Number of women	Number of men	Number of women	Number of men	Number of women	Number of men	Number of women
AAHKS	1	0	33	0	46	0	80	0
AAHS	14	4	44	11	103	40	161	55
AANA	20	1	76	4	166	15	262	20
AOA	4	0	13	5	14	7	31	12
AOFAS	17	0	61	5	141	13	219	18
AOSSM	3	0	64	5	262	19	329	24
ASES	9	0	60	1	91	5	160	6
ASSH	10	2	139	40	722	143	871	185
Hip	3	0	20	1	88	0	111	1
Knee	2	0	0	0	75	1	77	1
LLRS	1	1	11	0	2	1	14	2
MSTS	3	0	15	9	2	1	20	10
NASS	3	1	125	20	183	25	311	46
ORS	9	4	136	57	55	25	200	86
OTA	6	2	111	4	208	13	325	19
POSNA	4	0	31	11	25	8	60	19
SOMOS	11	0	48	2	103	29	162	31
Total	120	15	987	175	2286	345	3393	535

AAHKS = American Association of Hip and Knee Surgeons; AAHS = American Association for Hand Surgery; AANA = Arthroscopy Association of North America; AOA = American Orthopaedic Association; AOFAS = Association of Foot and Ankle Surgeons; AOSSM = Association Orthopaedic Society for Sports Medicine; ASES = American Shoulder and Elbow Surgeons; ASSH = American Society for Surgery of the Hand; Hip = The Hip Society; Knee = The Knee Society; LLRS = Limb Lengthening and Reconstruction Society; MSTS = Musculoskeletal Tumor Society; NASS = North American Spine Society; ORS = Orthopaedic Research Society; OTA = Orthopaedic Trauma Association; POSNA = Pediatric Orthopaedic Society of North America; SOMOS = Society of Military Orthopaedic Surgeons.

representation of a society's annual meeting speakers if 2018 was an anomalous year. We were unable to compare historical society speakership and membership because of the lack of membership records kept by each society; for this reason, we encourage societies to maintain yearly membership records that include demographic information to assess trends, both for internal monitoring and future research efforts. In spite of this limitation, our study uniquely comments upon the current diversity environment at annual meetings, which we hope will provide a baseline for future comparison and inspire data-driven improvements.

Our study is also limited by the imperfect comparison of society speakers to the membership denominator. A society's annual meeting speakers are not only drawn from its membership (that is, speakers are often but not always members), and societies may have nonphysician members (such as midlevel providers) who may be less likely to speak. Additionally, several societies were missing substantial amounts of gender data for their membership. Although our approach captures speakers and members of all types, including nonclinical researchers, midlevel

providers, and physical therapists, it does not evaluate gender representation within specific professional identities (for example, midlevel provider speakers compared with midlevel provider members). Considering all of these factors, we felt that broadly comparing society speakership to membership would best reflect who was on the stage versus in the audience at meetings, thereby providing a perspective on overall gender representation and inclusion. In addition, our choice to compare speakership to society membership may actually underestimate the true speakership disparities in academia. Given that women comprise 13% of society members and 19% of orthopaedic faculty members, women may in fact be underrepresented on the level of society membership [7]. In several societies, membership requires some form of nomination, sponsorship, or invitation. If membership itself is a barrier to inclusion, the exclusion of women from speaking roles would not be captured by using membership as a denominator; for example, minimal representation of women would still be considered proportional in a "closed" society that admits very few women as members.

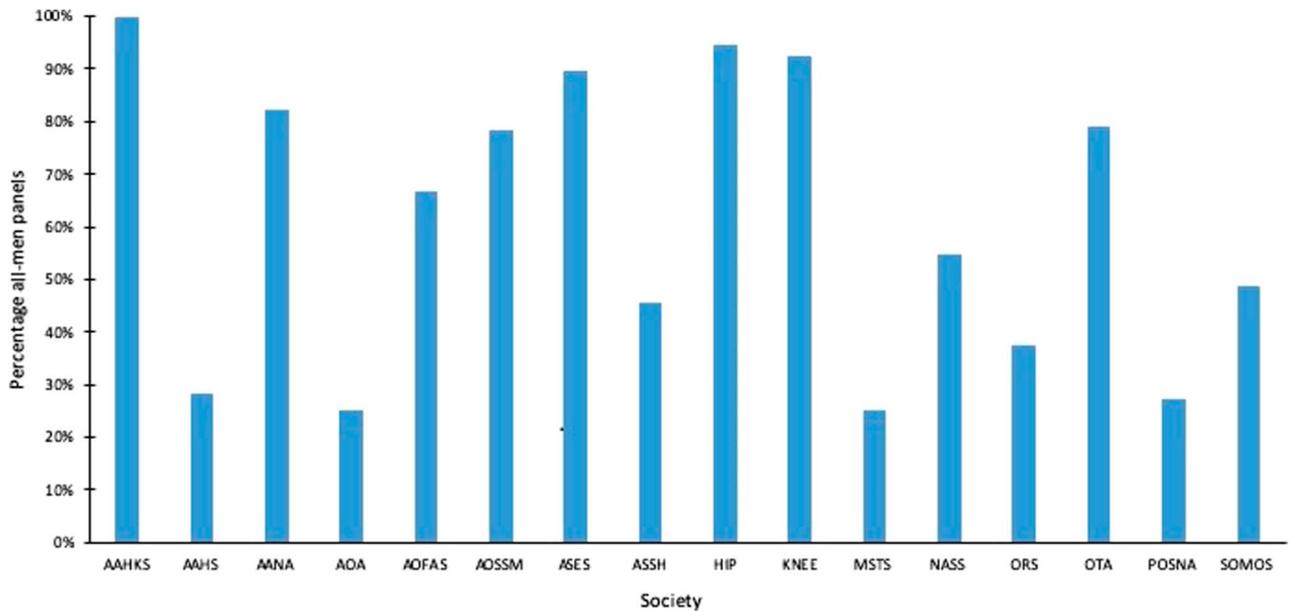


Fig. 2 This graph shows the percentage of all-men panels at each society's annual meeting. The Limb Lengthening and Reconstruction Society is excluded from this figure because they had only one panel at their meeting; AAHKS = American Association of Hip and Knee Surgeons; AAHS = American Association for Hand Surgery; AANA = Arthroscopy Association of North America; AOA = American Orthopaedic Association; AOFAS = Association of Foot and Ankle Surgeons; AOSSM = Association Orthopaedic Society for Sports Medicine; ASES = American Shoulder and Elbow Surgeons; ASSH = American Society for Surgery of the Hand; Hip = The Hip Society; Knee = The Knee Society; MSTs = Musculoskeletal Tumor Society; NASS = North American Spine Society; ORS = Orthopaedic Research Society; OTA = Orthopaedic Trauma Association; POSNA = Pediatric Orthopaedic Society of North America; SOMOS = Society of Military Orthopaedic Surgeons.

Other limitations of our study include the subjective classification of sessions as technical and nontechnical. We attempted to mitigate this by requiring both coders to categorize independently all sessions and resolve discrepancies through consensus; we also note that even before the consensus process, the interobserver agreement was excellent (kappa of 0.8), so any impact of subjectivity should have been minimal here. Finally, we recognize that gender diversity is only one form of diversity. Given the demographic data available, we were unable to examine racial, ethnic, religious, sexual orientation, disability, or other forms of diversity, or assess the effects of intersectionality. These are important areas of future research.

Gender Diversity of Invited Speakers and Society Members

Our finding that, in general, women were proportionately represented as annual meeting speakers is aligned with a previous study on gender diversity across orthopaedic society meetings [31]. However, within this overall finding, our data revealed a large variation in proportionate representation, from no women speakers in one society to the proportion of women speakers being twice that of women

members in another society. This is consistent with prior research on general surgery meetings, which describes roughly proportionate representation of speakers overall, with a wide range between societies [17]. Societies with speaker representation disproportionate to their membership should critically analyze the inclusivity of their

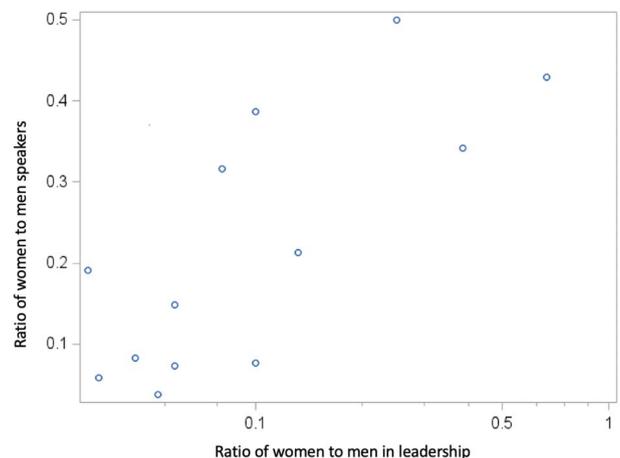


Fig. 3 This graph shows the relationship between the proportion of women as meeting speakers and the proportion of women as society leaders.

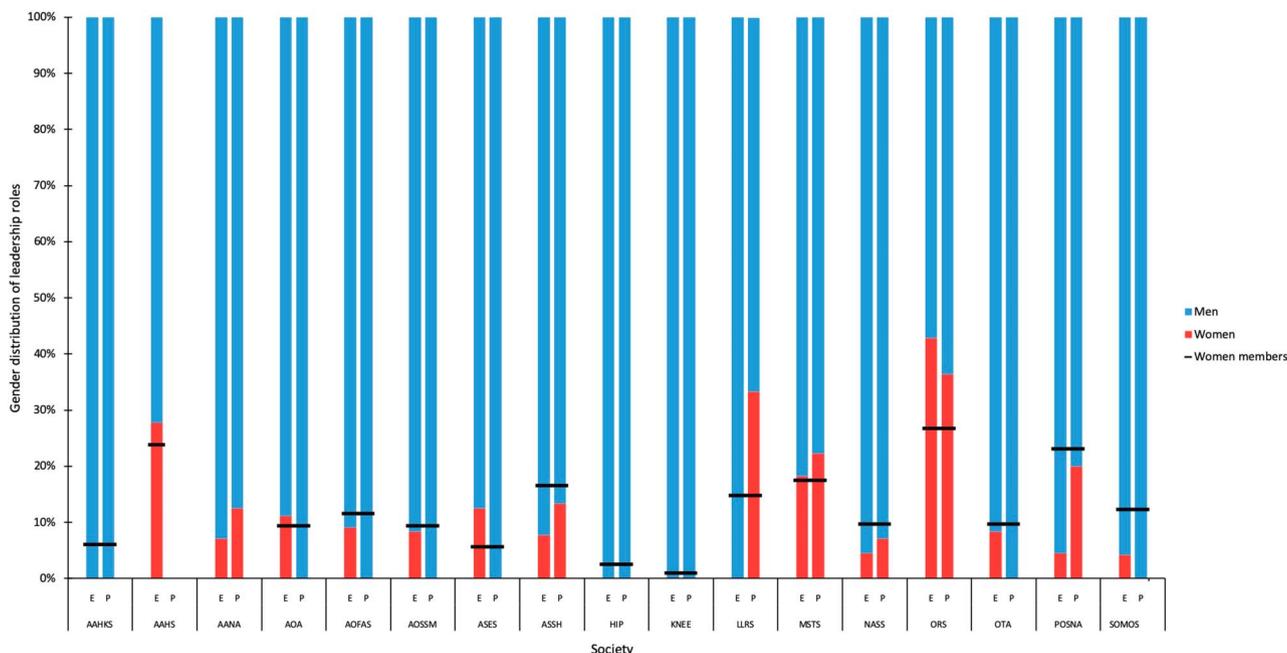


Fig. 4 This graph shows the gender breakdown of executive board and program committee leadership roles by society; E = executive board; P = program committee; AAHKS = American Association of Hip and Knee Surgeons; AAHS = American Association for Hand Surgery; AANA = Arthroscopy Association of North America; AOA = American Orthopaedic Association; AOFAS = Association of Foot and Ankle Surgeons; AOSSM = Association Orthopaedic Society for Sports Medicine; ASES = American Shoulder and Elbow Surgeons; ASSH = American Society for Surgery of the Hand; Hip = The Hip Society; Knee = The Knee Society; MSTS = Musculoskeletal Tumor Society; NASS = North American Spine Society; ORS = Orthopaedic Research Society; OTA = Orthopaedic Trauma Association; POSNA = Pediatric Orthopaedic Society of North America; SOMOS = Society of Military Orthopaedic Surgeons.

speaker selection process, and society leaders should direct conference planning committees to proactively monitor the gender balance of their meeting programs. Based on solutions proposed in general surgery, orthopaedic surgery societies could improve gender equity among speakers by decreasing the proportion of all-men panels and including women as plenary speakers in conference programs [17].

Proportion of Women Speakers in Technical versus Nontechnical Speaking Roles

When assessing gender balance on the podium, it is important to consider the subjects on which women are invited to speak. In our study, women were overrepresented in nontechnical speaking roles. Similar patterns have been reported in studies of political legislative structures, which have found that women tend to be overrepresented on women’s issues and social issues committees, while underrepresented on power and economics committees [18]. In both the political and the orthopaedic arenas, women seem to be relegated to secondary topics, which may be associated with lower prestige. This is not to say that nontechnical topics are less important, but they may be seen as less substantial in the context of a meeting where the primary stated

focus of the society is technical. Limiting the roles available to women prevents their full inclusion; as such, over-representing women in nontechnical sessions and under-representing them in technical sessions effectively constitutes a form of professional marginalization within orthopaedics. This could be improved by reassessing the gender balance of technical session roles and making intentional efforts to include women as experts on clinical and surgical topics in addition to sessions about work-life balance, mentorship, and diversity. Societies have the opportunity to encourage or require meeting planning committees to achieve proportional gender representation in both non-technical and technical speaking roles. Doing so would promote equality of opportunity and help move the specialty away from gender-stereotyped topics.

Women in Society Leadership Roles and Gender Diversity of Invited Speakers

Our findings regarding the positive association between diversity in society leadership and gender diversity of meeting speakers are well-supported by prior work. Studies of speaker diversity in several scientific disciplines have shown that the gender diversity of conference organizing

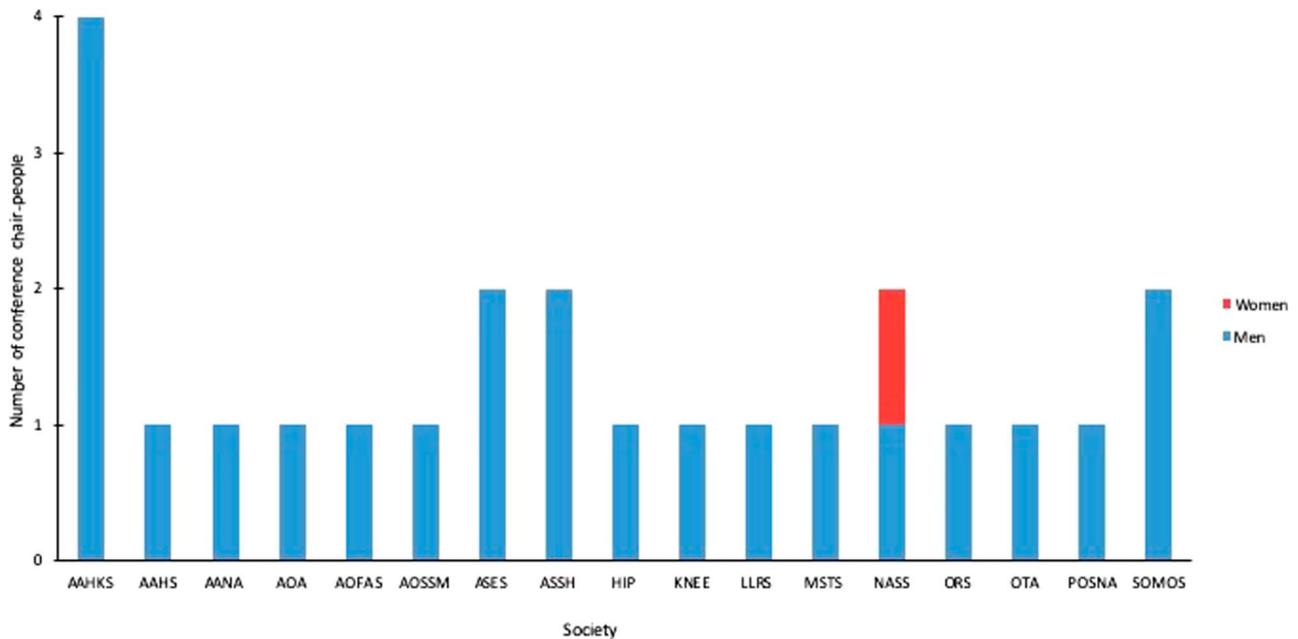


Fig. 5 This graph shows the number and gender of conference chairpersons by society; AAHKS = American Association of Hip and Knee Surgeons; AAHS = American Association for Hand Surgery; AANA = Arthroscopy Association of North America; AOA = American Orthopaedic Association; AOFAS = Association of Foot and Ankle Surgeons; AOSSM = Association Orthopaedic Society for Sports Medicine; ASES = American Shoulder and Elbow Surgeons; ASSH = American Society for Surgery of the Hand; Hip = The Hip Society; Knee = The Knee Society; MSTS = Musculoskeletal Tumor Society; NASS = North American Spine Society; ORS = Orthopaedic Research Society; OTA = Orthopaedic Trauma Association; POSNA = Pediatric Orthopaedic Society of North America; SOMOS = Society of Military Orthopaedic Surgeons.

committees is directly correlated with the gender diversity of conference speakers [13, 17, 19]. Increasing the representation of women within society and program committee leadership could be one possible intervention to generate greater diversity in conference programming. It has been theorized that the positive relationship between women in society leadership positions and women speakers could be a function of underlying society values that generally support the contributions of women, or that women in leadership roles are more likely than men to recommend women for open positions [13, 17]. For societies aiming to improve the gender diversity of their meeting programming, we would recommend increasing the representation of women on program committees and within other society leadership roles.

Speaker Diversity in Societies With and Without Stated Diversity Efforts

We found that societies with stated diversity efforts had greater proportions of women speakers at their annual meetings. Although our data cannot establish causality or explain the mechanism of this association, we speculate that such diversity efforts can have an impact on several

levels. Including diversity in society mission statements can encourage individuals who share this value to feel included and apply for membership or leadership positions. By establishing equity as an organizational and cultural value, this can also encourage individuals to raise concerns about observed disparities or suggest opportunities for improvement. Another type of effort was the creation of taskforces, subcommittees, or specific initiatives with a focus on diversity. In a world of competing demands and interests, this ensures that resources including effort, time, and funding are directed toward diversity measures, which might otherwise be easily and inadvertently overlooked. As with all initiatives, tracking progress is critical to measure effectiveness [22]; however, to our knowledge, such evaluation of diversity efforts has been lacking to this point. We recommend that societies obtain and compare demographic data about their membership, leadership, and speakers over time to determine whether diversity efforts are achieving their intended goals.

Conclusions

Gender diversity has been recognized as a need in orthopaedic surgery but has not yet been comprehensively

examined in the context of annual meeting speakers. We observed that representation of women speakers was largely proportionate to the membership of women in societies overall; however, it varied widely between societies, and women were underrepresented in technical compared with nontechnical sessions. Individual societies, national oversight committees, invited speakers, and conference attendees all contribute to improving these disparities by creating layers of accountability. We encourage all societies to critically examine the inclusivity of their speaker selection practices to promote equitable representation of women. There are several actionable findings from our work that societies can leverage to improve in this respect. Women were overrepresented as speakers in nontechnical sessions compared with technical sessions. Societies should actively monitor the gender balance of topic assignments and direct conference organizing committees to create programs with equitable gender representation across session types. Societies with more women in leadership roles and stated diversity efforts had higher proportions of women speakers, representing two strategies that may help promote equity in annual meeting visibility.

In addition to societies independently monitoring their own speakership data, we would recommend that oversight committees, such as the AAOS Diversity Advisory Board or AAOS Board of Orthopaedic Specialty Societies, monitor speakership diversity data to create system-wide accountability. Transparent reporting of long-term trends will expand upon our data to further inform strategies for change. We encourage conference speakers to inquire about the gender-diversity of the sessions in which they have been asked to participate, and to raise awareness when they notice gender imbalance. As an example, Dr. Francis Collins, Director of the National Institute of Health, recently stated that he would refuse to be a meeting speaker if attention to inclusiveness was not evident in the meeting agenda [15]. Similarly, conference attendees should notify organizers when they see inequities in conference programs and draw attention to their concerns [20]. With these four layers of accountability, orthopaedic surgery annual meetings can truly become representative of their society members.

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