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Research Article

Assessing Diversity of Invited Speakers at the AAOS Annual Meeting

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Introduction

Orthopaedic surgery remains one of the least diverse fields in medicine, particularly in the higher levels of academic medicine. There is limited literature examining representation of females as speakers and presenters at national meetings, although this is a common stepping stone in an academic career.

Purpose

The purpose of this study is to assess gender diversity among invited speakers at the AAOS Annual Meeting between 2015 and 2022 to determine if this increased over time.

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Conflicts of Interest Statement for Dr. Rahman

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g Dr. Stephanie Muh received her medical degree from Drexel University College of Medicine. She then completed her residency in orthopaedic surgery at Henry Ford Health System, followed by a shoulder and elbow fellowship at Case Western Reserve University. She returned to the Henry Ford Health System as a board-certified shoulder and elbow surgeon, where she also plays an integral role in educating medical students, residents, and fellows. She is the associate program director for orthopaedic residency program, and the deputy service chief for the Henry Ford-West Bloomfield Hospital department of orthopaedics. One of the top shoulder surgeons in the Midwest, Dr. Muh is also a member of the prestigious American Shoulder and Elbow Society as well as a Fellow of the American Orthopaedic Association. Due to her academic interests, she has authored over fifty manuscripts which have been published in many reputable, peer-reviewed journals, such as The Journal of Shoulder and Elbow Surgery and The Journal of Bone and Joint Surgery. Both her practice and research have garnered international recognition, as she has given presentations overseas and serves as an international visiting professor.

Visit Dr. Muh's Website

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Conflicts of Interest Statement for Dr. Muh

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Methods

The AAOS Annual Meeting final programs from 2015 to 2022 were reviewed to collect the names of all invited speakers (paper presentation session moderators, Ask an Expert session moderators, ICL moderators, and ICL presenters). An internet search of publicly available websites was conducted to determine the gender of each speaker. We then determined the percentage of female speakers in each category each year and compared these across years.

Results

There were non-significant positive trends in the percentage of female ICL presenters, paper presentation sessions moderators, and Ask an Expert sessions moderators, there was a significant positive trend in the percentage of female ICL moderators between 2015 and 2022.

Conclusions

Speaking at national meetings is an important component of advancing one's career in academic surgery and can also provide crucial role models to aspiring young surgeons. However, despite various efforts to increase gender diversity in orthopaedic surgery, there have been few significant changes in the representation of female invited speakers at the AAOS annual meeting since 2015.

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INTRODUCTION

Despite numerous efforts and a recognized emphasis on increasing diversity, orthopaedic surgery continues to be one of the least diverse fields of medicine. While the proportion of female physicians has increased dramatically over the last 50 years, the proportion of female orthopaedic surgeons has not. In 1970, 11.1% of incoming medical students and 6.8% of all surgical residents were female, by 2001 these numbers had increased to 47.8% and 38.4%, respectively (Blakemore, Hall, and Biermann 2003). Over this same time period, the percentage of female orthopaedic surgery residents increased from 0.6% to 9.0%, the lowest percentage of any primary surgical specialty (Blakemore, Hall, and Biermann 2003; Templeton, Wood, and Haynes 2007). From 2006 to 2015, this number increased further from 10.9% to 14.4%; however, this rate of change was significantly lower than that seen in any other specialty except urology (Poon, Kiridly, Mutawakkil, et al. 2019). These disparities continue after training as well. Data shows that females make up about 7-8% of practicing orthopaedic surgeons, about 6% of members of the AAOS. Within subspecialty organizations, female membership varies widely from about 21% in the Pediatric Orthopaedic Society of North America, to 10% in the Orthopaedic Trauma Association, to 0.5% in both The Hip Society and The Knee Society (Acuña, Sato, Jella, et al. 2021; Chambers et al. 2018). A recent study concluded that it would take 217 years for gender parity in the field of orthopaedic surgery to equal that of the medical profession as a whole (Acuña, Sato, Jella, et al. 2021).

There are many proposed reasons for the persistent underrepresentation of females in orthopaedics including lack of mentorship, beliefs about work life balance, concerns about pregnancy and childbearing, and perceptions about required physical strength (Mulcahey et al. 2019; Rohde, Wolf, and Adams 2016; Delva, Carcasset, Mouton, et al. 2022). It is well-established that diverse mentors and role models are essential in recruiting women and minorities to fields in which they are historically underrepresented

(Bratescu, Gardner, Jones, et al. 2020). Medical students from groups that are underrepresented in medicine (URM) have been shown to be significantly more likely to apply to orthopaedic surgery residency if their institution had higher URM representation amongst orthopaedic surgery residents and faculty (Okike et al. 2020). It has also been shown that institutions with more female faculty have a higher proportion of female residents (Green, Chye, Hiemstra, et al. 2020).

In addition to mentorship, having female role models is also important in showing female students and residents that they can be successful in the field, be promoted through the academic ranks, and ultimately obtain leadership positions. Within academic medicine, performing research and presenting at regional and national meetings are essential in gaining recognition and career advancement. Studies show that abstracts authored by women are less likely to be published and have a longer median time to publication than those authored by men (Johnson et al. 2021; Johnson, Weber, Parambath, et al. 2023; Bram et al. 2022; Brown et al. 2020). Women are also underrepresented as speakers at national meetings, further limiting the presence of female role models in academic orthopaedic surgery (Gerull, Wahba, Goldin, et al. 2020). A recent study examining the proportion of female speakers at orthopaedic surgery annual meetings found that societies with a higher percentage of females in leadership had a higher percentage of females speaking at their annual meeting. They also demonstrated that societies with a stated diversity effort had a higher percentage of female speakers (Gerull et al. 2020).

The purpose of this study is to assess sex diversity among invited speakers at the AAOS Annual Meeting between 2015 and 2022. We examined the percentage of female research paper presentation session moderators, Ask an Expert session moderators, Instructional Course Lecture (ICL) moderators, and ICL presenters in each of these years to compare the trends in representation.

METHODS

The final program for the AAOS Annual Meeting was found online for each year from 2015 to 2022. Of note, the AAOS Annual Meeting initially scheduled in March 2020 was canceled due to the COVID-19 pandemic, however, the event program had already been published online and was thus utilized for this study. We reviewed the meeting programs to collect the names of all invited speakers (paper presentation session moderators, Ask an Expert Session moderators, ICL moderators, and ICL presenters). This study assessed only presenters who were invited speakers and thus chosen in an unblinded fashion; we did not examine presenters of abstracts, posters, or manuscripts as these are generally chosen in a blinded fashion. Gender was determined for each speaker through a predetermined process consistent with that used in previous similar studies (Gerull, Wahba, Goldin, et al. 2020; Gerull et al. 2020; Nwosu, Wittstein, Erickson, et al. 2023; Rynecki et al. 2020). An internet search of publicly available websites such as departmental websites, LinkedIn pages, and Doximity pages was performed. We then used a combination of name, visual examination of available photographs, and information on publicly available websites to determine gender. We then used this information to determine the percentage of female presenters each year and compared these values from year to year.

This study was classified as nonhuman subject research by our institutional review board (IRB) and therefore IRB approval was waived. No funding was necessary for this study.

STATISTICAL ANALYSES

All statistical analyses were performed in the SPSS software version 26 (IBM, Armonk, NY). Sessions were aggregated based on type of session (Ask an Expert, research paper presentation, and ICL) and conference year. The number of total and female speakers was determined for Ask an Expert session moderators, research paper presentation session moderators, ICL moderators, and ICL presenters each year as outlined above. This was used to calculate the percentage of female speakers in each category. Kruskal-Wallis (non-parametric ANOVA) analysis was conducted to assess the difference in speaker composition between any two consecutive years with statistical significance determined by a p-value <0.05. Additionally, simple linear regression models were performed to assess trend in percentage of female speakers in each category throughout the study period with statistical significance determined by a p-value <0.05.

RESULTS

Complete data was collected for the AAOS Annual Meetings from 2015-2022 and is shown in Table 1. The total number of moderators for paper presentation sessions ranged from 82 to 128 annually. The total number of Ask an Expert session moderators ranged from 24 to 32 per year. The total number of ICL moderators ranged from 169 to 255 annually and ICL presenters ranged from 520 to 930 annually. Throughout the study period, the average percentage of female moderators ranged from 5.7% to 9.6%.

The number of female moderators for paper presentation sessions ranged from 3 to 10 annually representing 2.8% to 9% of all paper presentation session moderators. There was an overall net positive trend in the percentage of female moderators between 2015-2022 (Figure 1), however Kruskal-Wallis analysis did not show a statistically significant difference between any pairwise comparisons of years ($p>0.05$) and linear regression modeling did not find this trend to be significant ($p>0.05$). A similar analysis was completed for the number of female moderators of Ask an Expert sessions with a range of 0 to 3 female speakers per year representing 0% to 12.5% of moderators. As shown in Figure 1, there was a net positive trend between 2015-2022, but Kruskal-Wallis analysis again did not show a statistically significant difference between any pairwise comparison of years ($p>0.05$) and linear regression modeling did not find this trend to be significant ($p>0.05$).

Table 1. Number of total and female invited speakers at the AAOS Annual Meeting from 2015-2022

Year	Paper presentation session moderators		Ask an Expert moderators		ICL moderators		ICL presenters	
	Total	Female n (%)	Total	Female n (%)	Total	Female n (%)	Total	Female n (%)
2015	128	5 (3.9)	30	2 (6.7)	255	19 (7.5)	799	52 (6.5)
2016	127	7 (5.5)	31	0 (0)	250	23 (9.2)	930	66 (7.1)
2017	107	3 (2.8)	32	1 (3.1)	233	20 (8.6)	874	62 (7.1)
2018	121	6 (5.0)	28	2 (7.1)	243	23 (9.5)	896	61 (6.8)
2019	123	8 (6.5)	26	1 (3.9)	228	22 (9.6)	897	67 (7.5)
2020	127	7 (5.5)	26	2 (7.7)	213	19 (8.9)	819	76 (9.3)
2021	82	7 (8.5)	24	3 (12.5)	216	28 (13.0)	783	78 (10.0)
2022	111	10 (9.0)	26	3 (11.5)	169	19 (11.2)	520	60 (11.5)
Overall	926	53 (5.7)	223	14 (6.3)	1807	173 (9.6)	6518	522 (8)

This table shows the total number of moderators per year and throughout the study period for each session type as well as the number and percentage of female moderators for each session type.

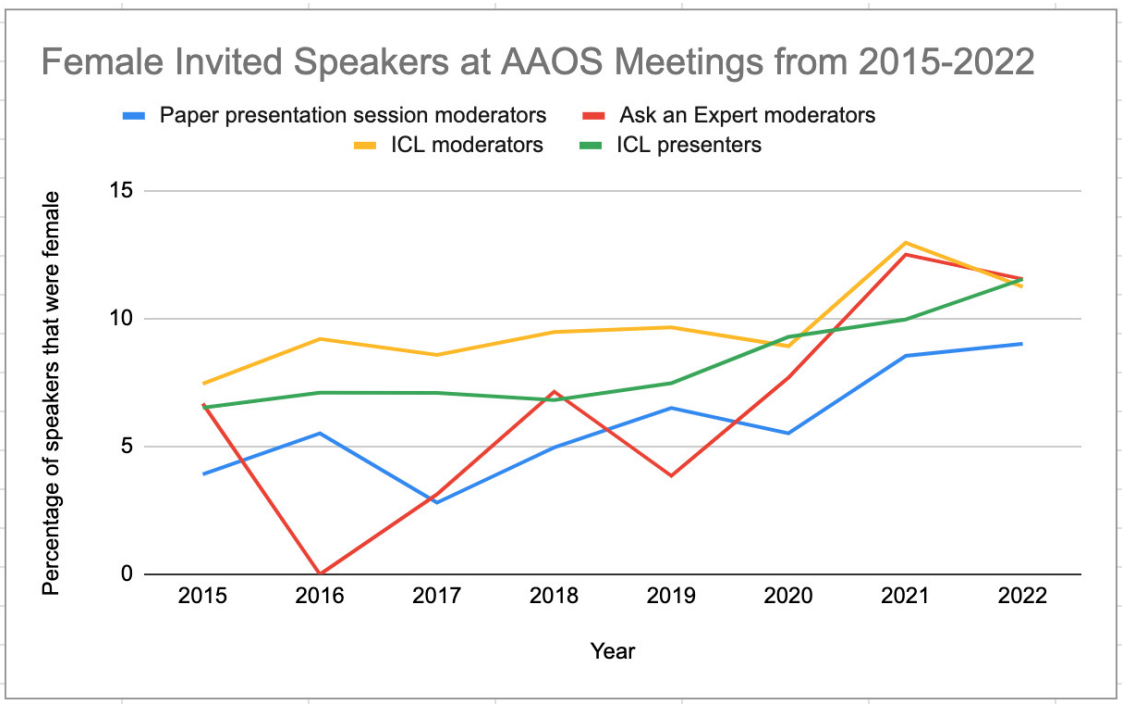

Figure 1. Percentage of Female Speakers at the AAOS Annual Meeting from 2015-2022

This figure demonstrates the annual percentage of female invited speakers for the roles of research paper presentation session moderators, Ask an Expert session moderators, ICL moderators, and ICL presenters from 2015 to 2022. Kruskal-Wallis analysis did not show a statistically significant difference between any pairwise comparison of years in any category ($p>0.05$). Linear regression did show a significantly positive trend in ICL presenters ($p<0.001$).

The number of female ICL moderators per year ranged from 19 to 28 representing 7.5-13% of all ICL moderators. The number of female ICL presenters ranged from 51 to 78 per year representing 6.3-11.5% of all presenters. There was an overall positive trend in both female ICL moderators and presenters from 2015-2022 but Kruskal-Wallis analysis did not show a statistically significant difference between any pairwise comparison in either category ($p>0.05$). Linear regression modeling did show this positive trend to be significant for ICL presenters ($p<0.001$) but not for ICL moderators ($p>0.05$). These trends are shown in Figure 1.

DISCUSSION

Females remain vastly underrepresented in orthopaedics despite increased awareness of the field's lack of diversity and efforts to improve it. A paucity of early mentorship and visible role models may be one of many contributory factors. Given that females make up approximately 7-8% of practicing orthopaedic surgeons and 6% of members of the AAOS, this study demonstrates that females were relatively proportionately represented as invited speakers at the AAOS national meeting most years, with some years of

overrepresentation and some years of underrepresentation. However, if the field is attempting to recruit more females, more representation at these higher levels is an important step. Despite efforts to increase diversity during the study time period, there was no significant change in the percentage of female invited speakers at the AAOS national meeting between 2015 and 2022. Serving as a moderator at a national meeting implies expertise and leadership in the field. The lack of female representation in these roles may convey that they do not have the knowledge or ability required to be experts and leaders. One recent study found that even when women did serve as moderators at the AAOS Annual Meeting, they were significantly more likely than men to be speaking on a non-technical topic (work-life balance, mentorship, etc.) than on a technical topic (surgical technique, surgical outcomes, etc.) (Nwosu, Wittstein, Erickson, et al. 2023). Without visible leaders and role models, female medical students, orthopaedic surgery residents, and those early on in their career may be deterred from pursuing research or academic careers, or from even entering the field, further contributing to the commonly discussed "leaky pipeline" and "glass ceiling" (Surawicz 2016).

There are ongoing efforts to improve diversity in orthopaedic surgery through early exposure to orthopaedics, mentorship, increasing faculty diversity, and promoting pipeline programs such as the Perry Initiative and Nth Dimensions. There is promising data showing that completion of the Nth Dimensions program increases the odds of women and underrepresented minorities applying to orthopaedic surgery residency (Mason et al. 2016). One recent study found that between 2007 and 2019, there was a 64% increase in the proportion of female applicants to orthopaedic surgery and a 24% increase in female representation among residents (Onuoha et al. 2022). There have also been top-down initiatives recognizing the importance of increasing diversity in the field of orthopaedic surgery. In 2019, the AAOS announced the 2019-2023 Strategic Plan and Core Values with a goal of increasing gender, sex, and racial diversity within the board and volunteers. The AAOS Diversity Advisory Board provides recommendations on how to achieve this and helps to create new initiatives focusing on recruitment, selection, and retention of diverse members and creation of a culture that values diversity, inclusion, and equity. Progress can be tracked through the AAOS Diversity Dashboard and the Governance Diversity Report (American Academy of Orthopaedic Surgeons, n.d.).

There are several limitations to this study. One limitation is the subjective determination of sex. It is possible that some presenters may not identify as the sex indicated by their name or the appearance portrayed in their photograph and may have inadvertently been misidentified. We also were unable to identify any one who may identify as transgender or non-binary using publicly available data. This study looked at only one specific conference, thus the sample size is limited and may not be representative of the field of orthopaedic surgery as a whole. An additional limitation is that the makeup of invited speakers at the AAOS annual meeting is not necessarily reflective of the makeup of AAOS membership or of orthopaedic surgeons in the United States. Speakers at national meetings may practice in more academically-oriented medical centers, which represent only a portion of the healthcare system in the United States. It is possible that more women are in private practice and therefore less likely to be invited to speak at the AAOS annual meeting. It is also possible that invited speakers at national meetings may be more advanced in their career so the percentage of diverse speakers may not be reflective of the number of women entering the field and in the early stages of their career.

The importance of increasing diversity is well understood and frequently discussed within the orthopaedic community. The numerous pipeline programs in place as well as the announcement of the AAOS Strategic Plan and Core Values highlight the emphasis being placed on recruiting and retaining diverse talent to the field. However, our study found that there have been no significant changes in the representation of female invited speakers at the AAOS annual meeting from 2015 to 2022. Increasing the number of diverse orthopaedic surgeons in prominent positions at national meetings would increase the visibility of role models, encouraging future generations of orthopaedic surgeons to enter and remain in the field and to pursue academic and leadership positions. Serving on professional society boards and committees is often a stepping stone toward being invited to speak at national meetings. Many of these board and committee roles are filled on a voluntary basis, female orthopaedic surgeons should be encouraged to volunteer or apply for these positions. Everyone in the orthopaedic surgery community, regardless of race or gender, should also be encouraged to act as both mentors and sponsors to younger surgeons, particularly those who have historically been underrepresented. We hope that this study raises awareness of the paucity of female representation at the national level and can serve as a benchmark by which we can judge future progress.

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