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The gender gap in European neurosurgical conference presentations

Julie Woodfield, PhD,^{1,2} Phillip Correia Copley, MRCS,¹ Mark Hughes, PhD,^{1,2} and Ellie Edlmann, PhD^{3,4}

¹Department of Clinical Neurosciences, NHS Lothian, Edinburgh; ²Centre for Clinical Brain Sciences, University of Edinburgh; ³Southwest Neurosurgical Centre, Derriford Hospital, Plymouth; and ⁴University of Plymouth Faculty of Health: Medicine, Dentistry and Human Sciences, Plymouth, United Kingdom

OBJECTIVE Within neurosurgery, there are fewer women than men at all levels. The authors aimed to assess whether opportunities and representation within neurosurgery are proportional to the existing gender gap.

METHODS The authors analyzed the program of the 2019 joint European Association of Neurosurgical Societies (EANS)/Society of British Neurological Surgeons (SBNS) conference to assess the proportions of presentations given through abstract submission and invitation by men and women. They compared proportions to the previous joint conference in 2007 and to the gender proportions of board-certified European neurosurgeons.

RESULTS Women delivered 75/577 (13%) presentations at the 2019 EANS/SBNS conference: 54/283 (19%) abstract submissions and 21/294 (7%) invited presentations. Fifteen of 152 (10%) session chairs were women. This increased significantly from 4/121 (3%) presentations delivered by women in 2007. When only presentations given by neurosurgeons (residents or consultants) were analyzed, the proportion of female speakers increased from 1/111 (1%) in 2007 to 60/545 (11%) in 2019. Pediatrics was the subspecialty with the highest proportion of invited female speakers. Across subspecialties, there were no differences in gender proportions for presentations from abstract submissions. Across the top 5 participating European countries, the proportion of female invited speakers (8%) and chairs (8%) was half the proportion of female board-certified neurosurgeons (16%).

CONCLUSIONS The proportion of women delivering invited presentations and chairing sessions at a European neurosurgical conference is lower than expected from the available pool of board-certified neurosurgeons. The proportion of women participating is higher through application (abstract submission) than through invitation. The higher proportion of presentations from abstract submission may reflect submission from a pool of trainees with a higher proportion of women. The authors suggest implementation of strategies that increase invited speakers from minority groups and have been shown to be effective in other disciplines, such as improving minority group representation in organizing committees.

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KEYWORDS neurosurgery; gender; congress; Europe; mentoring; training

IN 2018, only 27/331 (8%) neurosurgery consultants working in the National Health Service (NHS) in England were women.¹ This is proportionally much lower than the 19,369 (37%) women among all 52,130 NHS England consultants.² Fewer women than men enter neurosurgery training; in 2019, only 60/255 (24%) neurosurgery trainees in the United Kingdom were women.³ Women also leave neurosurgical training at a higher rate than men, with 17% of women leaving neurosurgery training programs in the United States between 2000 and 2009 compared with 5% of men.⁴

Studies investigating recruitment and retention in surgery identify mentorship, role models, departmental climate and culture, training experiences, and intensity of work as influential factors.^{5–11} Representation at conferences is important for providing leadership and relevant role models. Conference participation also facilitates networking, collaboration, and career development. In addition, diverse representation may prevent bias in research, clinical practice, and agendas that do not necessarily represent the broad needs of the population.¹²

We aimed to quantify the gender proportions of speak-

ABBREVIATIONS EANS = European Association of Neurosurgical Societies; NHS = National Health Service; SBNS = Society of British Neurological Surgeons.

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ers and chairs by presentation type and subspecialty at the 2019 joint European Association of Neurosurgical Societies (EANS)/Society of British Neurological Surgeons (SBNS) meeting. To assess change over time, we compared the 2019 program to the previous program at the 2007 joint EANS/SBNS meeting. We analyzed speaker proportions through comparison with the gender proportions of board-certified neurosurgeons in European countries.

Methods

The data for this study were collected from the final scientific programs of the 2007 joint EANS/SBNS meeting in Glasgow, Scotland, and the 2019 meeting in Dublin, Ireland.

2019 Program

All academic sessions were reviewed. Sessions prior to the opening ceremony, the special guest, and the awards and poster sessions were excluded. Presentations were 8 to 20 minutes in length. The conference organizers confirmed that the 8-minute presentations were selected from anonymized submitted abstracts, whereas longer presentations were mostly invited lectures. Presentation length, session length, and assigned session subspecialty were recorded. Sessions were 25 to 100 minutes. Sessions described as “other,” “general,” or “multidisciplinary” were combined into a single “other” category. Time allocated for discussion was not included in speaker analysis. Most sessions had multiple chairs. Each chair was assigned the entire length of the session, including any discussion time, regardless of the number of chairs.

2007 Program

Each session lasted 90 minutes, with 3 or 4 presentations. Presentations were not assigned lengths in minutes; therefore, session length was divided by the total number of presentations per session, and an equal number of minutes was assigned to each presentation within the session. If there was more than 1 speaker named for a single presentation, the number of minutes for that presentation was divided equally between the speakers. Session chairs were not stated in the program. Session subspecialty was recorded as assigned in the program.

Demographic Data

Gender and country of employment were determined for each speaker or chair from the conference program. If this information was unavailable in the programs, an internet search of each speaker was conducted in December 2019. Gender was determined using knowledge of the person, available photographs, or use of gender-specific pronouns. Gender was not determined using names alone. Speakers without evidence of a neurosurgical qualification or affiliation, those working in an alternative specialty (e.g., oncology or radiology), those working in nonmedical professions (e.g., journalists), and medical students were assigned to the nonneurosurgeon category. Neurosurgical residents (e.g., trainees, registrars) were assigned to the neurosurgeon category.

Board Certification

The term “board-certified” is used throughout this report to refer to those with specialist registration or board certification as per the systems within their respective countries. The number and gender of board-certified neurosurgeons were determined for the top 5 participating European countries due to the small numbers of attendees from each individual country. In April 2020, the data for each country were extracted from the following sources: online General Medical Council Data Explorer for UK specialist registration in neurosurgery in 2007 and 2019;³ 2018 Medical Council Workforce Intelligence Report for Irish specialist registration in neurosurgery (no available data for 2019);¹³ online Information System of the Federal Health Monitoring for board certification in Germany in 2019;¹⁴ the Dutch Capacity Report for specialists in the Netherlands in 2019;¹⁵ and the online Swiss medical register for neurosurgical specialists in Switzerland.¹⁶

Statistical Analysis

Categorical data were compared in contingency tables using Fisher’s exact test for differences in proportions. The odds ratio (OR) and 95% confidence interval (CI) were reported. All statistical analyses were carried out using R version 4.0.0 “Arbor Day” (R Foundation for Statistical Computing).

Results

Gender Distributions of Speakers and Chairs in 2019

The 2019 conference consisted of 83 sessions and included 607 presentations. Thirty presentations were excluded because no speaker was listed ($n = 13$) or they were labeled as discussion time ($n = 17$). The remaining 577 presentations (total 5899 minutes) were included.

Seventy-five (13%) presentations were delivered by women and 502 (87%) by men. Women spoke for 674/5899 (11%) minutes, and men spoke for 5225/5899 (88%) minutes. The proportion of women delivering an 8-minute presentation as a result of abstract submission (54/283 [19%]) was higher than the proportion of women delivering a longer invited presentation (21/294 [7%]) (OR 3.1, 95% CI 1.8–5.5) (Table 1).

Fifteen (10%) session chairs were women and 137 (90%) were men (Table 1). The proportion of female session chairs was significantly lower than the proportion of

TABLE 1. Number and proportion of presentations and chaired sessions by men and women in 2019 and 2007

Characteristic	Total	Men (%)	Women (%)
2019			
All presentations	577	502 (87%)	75 (13%)
8 mins	283	229 (81%)	54 (19%)
10–20 mins	294	273 (93%)	21 (7%)
Chaired sessions	152	137 (90%)	15 (10%)
2007			
All presentations	121	117 (97%)	4 (3%)

women delivering an 8-minute abstract presentation (OR 0.5, 95% CI 0.23–0.88). There was no difference in the proportions of women (3/10 [30%]) and men (32/94 [34%]) chairing more than 1 session (OR 0.8, 95% CI 0.14–4.0).

Change Over Time

The 2007 conference consisted of 35 sessions and included 121 presentations (total 3150 minutes), with 4 (3%) presentations given by women. Women were more likely to deliver a presentation in 2019 (13%) than in 2007 (3%) (OR 4.4, 95% CI 1.6–16.8) (Table 1) and spoke for a higher proportion of minutes in 2019 (674/5899 [11%]) than in 2007 (97.5/3150 [3%]) (OR 4.0, 95% CI 3.2–5.0).

Gender and Specialty

In 2019, 6% of presentations were delivered by nonneurosurgeons and there was 1 female nonneurosurgeon chair (1/152 [0.7%]). Men were more likely to be neurosurgeons than women across all presentation types in 2019 (97% vs 80%) (OR 7.1, 95% CI 3.1–16.0) and 2007 (94% vs 25%) (OR 42.9, 95% CI 3.0–2445) (Table 2). There was no difference in the proportion of nonneurosurgeon speakers in 2019 (32/577 [6%]) compared to 2007 (10/121 [8%]) (OR 0.7, 95% CI 0.3–1.5). However, the proportion of female speakers who were neurosurgeons increased from 2007 (1/4 [25%]) to 2019 (60/75 [80%]) (OR 11, 95% CI 0.9–637).

Gender and Subspecialty

The gender of the presenter by subspecialty in both years is shown in Fig. 1, with nonneurosurgeons excluded. No presentations were categorized as “skull base” in the 2007 program. In 2019, there were no gender differences between subspecialties for abstract presentations, but there was a higher proportion of female invited speakers and chairs in the pediatrics and other subspecialties.

Conference Gender Gap Compared to Neurosurgical Workforce

The gender distributions of the top 5 participating countries, contributing 45% of chairs (69/152) and 42% of invited speakers (124/294), were compared to the gender distributions of board-certified neurosurgeons in each

respective country (Table 3). The proportion of female board-certified neurosurgeons (16%) was twice the proportion of female invited speakers (8%) (OR 2.3, 95% CI 1.2–5.0) or session chairs (8%) (OR 2.1, 95% CI 0.9–6.0). The Netherlands and Ireland had higher relative proportions of female representation than their workforces, but no female chairs were from the Netherlands, and only a single female speaker and a single female chair who chaired 2 sessions were from Ireland.

The proportion of board-certified women in UK neurosurgery increased significantly from 22/414 (5%) neurosurgeons in 2007 to 91/863 (11%) neurosurgeons in 2019.³ Presentations given by UK female neurosurgeons increased from 0/17 in 2007 to 7/84 (8%) in 2019. Of the 8-minute abstract presentations, 5/35 (14%) were given by UK female neurosurgeons in 2019, which is higher than the proportion of board-certified women (11%) but lower than the proportion of female neurosurgical trainees (60/255 [24%]) in 2019.³

Discussion

The proportion of all presentations delivered by women at the joint EANS/SBNS conference in 2019 was 13%, an increase from 3% at the previous joint meeting in 2007. When considering only women who were neurosurgeons, the proportion increased from 1/121 (1%) in 2007 to 60/577 (10%) in 2019. Female neurosurgeons were more likely to deliver a presentation via abstract submission (44/283 [16%]) than to be invited to present (16/294 [5%]) or chair (14/152 [9%]) a session. The proportion of women invited to speak or chair was lower than the proportion of female board-certified neurosurgeons across the European countries analyzed.

The gender gap was smallest for 8-minute abstract presentations. This may reflect increased abstract submission by trainees and students, that women are more likely to apply to participate than to be invited, or that women are more successful at being selected for a presentation when assessment is blinded to gender. In 2019, 24% of UK trainee neurosurgeons were women, but only 14% of 8-minute presentations from the UK were delivered by women. Women remain underrepresented, even with inclusion of trainees in the available speaker pool. However, because the gender proportions of rejected abstracts and declined

TABLE 2. Neurosurgeon and nonneurosurgeon speakers by gender in 2007 and 2019

Characteristic	Men		Women	
	Neurosurgeon	Nonneurosurgeon	Neurosurgeon	Nonneurosurgeon
2019				
All presentations	485 (97%)	17 (3%)	60 (80%)	15 (20%)
8 mins	219 (96%)	10 (4%)	44 (81%)	10 (19%)
10–20 mins	266 (97%)	7 (3%)	16 (76%)	5 (24%)
Chaired sessions	137 (100%)	0 (0%)	14 (93%)	1 (7%)
Total	622 (97%)	17 (3%)	74 (82%)	16 (18%)
2007				
All presentations	110 (94%)	7 (6%)	1 (25%)	3 (75%)

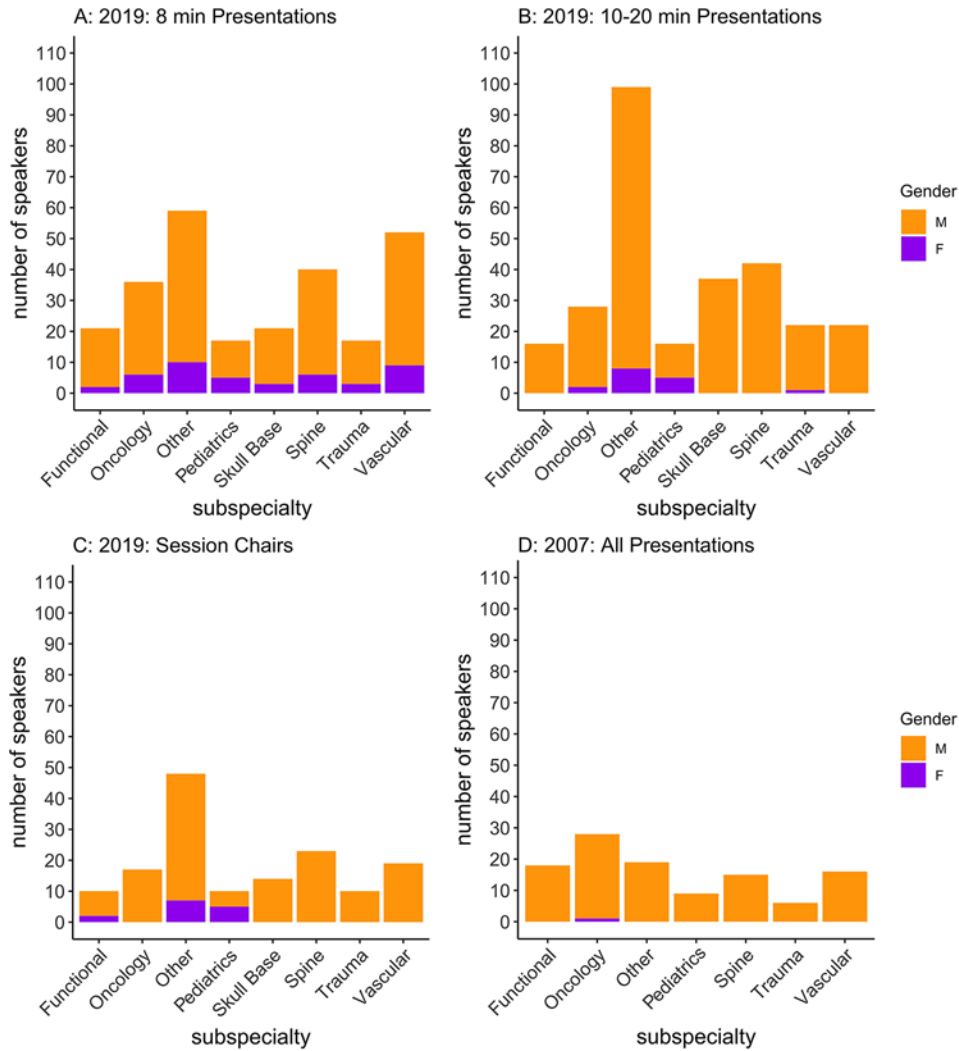


FIG. 1. Gender by subspecialty of presentation. **A:** Eight-minute presentations from submitted abstracts, 2019. **B:** Ten- to 20-minute invited presentations, 2019. **C:** Session chairs, 2019. **D:** All presentations, 2007.

TABLE 3. Proportions of female speakers, chairs, and board-certified neurosurgeons from the top 5 highest-participating countries in 2019

Country	Board Certification (%)	Speakers (%)*	Session Chairs (%)
UK	91/863 (11%)	2/49 (4%)	2/29 (7%)
Ireland	2/27 (7%)†	1/9 (11%)	2/14 (14%)
Germany	524/2713 (19%)	4/31 (13%)	2/16 (13%)
Switzerland	27/202 (13%)	0/18 (0%)	0/6 (0%)
The Netherlands	26/183 (14%)	3/17 (18%)	0/4 (0%)
Total	670/3988 (16%)	10/124 (8%)	6/69 (8%)

* Includes only those invited to give 10- to 20-minute presentations.
 † 2018 data.

speaker and chair invitations are unknown, we cannot determine the extent to which rates of submission or invitation contributed.

An often-presented argument against including more minority speakers on panels is that experienced experts are unavailable.¹⁰ Our numerical data suggest otherwise. Across the European countries analyzed, there were half as many female speakers and chairs than female board-certified neurosurgeons. The length of time each speaker or chair had been fully qualified was unknown. Because the proportion of female UK invited speakers in 2019 was broadly in line with the proportion of female board-certified neurosurgeons in 2007, the proportion of women speaking at conferences may be broadly in line with those available if speaker invitations are restricted to those with at least 12 years of experience after board certification. However, other specialties have found that women are underrepresented as invited conference speakers even when overrepresented in the specialty. For example, 33% of keynote addresses were given by women at pediatric confer-

ences between 2016 and 2017 despite 42%–72% of pediatricians being women.¹⁷ Therefore, an increasing proportion of senior female neurosurgeons may not translate to more invited female speakers.

The increase in the proportion of female neurosurgeons is slow. In the UK, female neurosurgery specialty trainees increased from 49/278 (18%) in 2012 (first available online data) to 60/255 (24%) in 2019.³ A similarly small increase was seen in rates of women participating in the EANS training course, from 19% in 2009 to 26% in 2016.¹⁸ A survey of EANS member societies in 2016 found the proportion of female board-certified neurosurgeons ranged from 0% in Cyprus and Kosovo to 21% in Portugal, with an overall European average of 11%.¹⁹ Comparing these latest available 2016 proportions to the 2019 overall proportion of invited speakers (5%) or session chairs (9%) suggests that women are underrepresented as speakers from across Europe. A recent study of German national neurosurgical conferences also supports this, reporting only 11% of conference chairs but 19% of board-certified neurosurgeons are women.²⁰

There was a higher proportion of female chairs and invited speakers in pediatric neurosurgery compared to other subspecialties. Pediatric neurosurgery is the most common subspecialty fellowship undertaken by US female neurosurgery residents⁷ and an intended subspecialty for female European residents more often than for male residents.¹⁸ During the 2019 conference, a head count performed during a pediatric session with 2 female chairs and multiple female speakers found 31/99 (31%) attendees were female. During a spine session with 2 male chairs and all male speakers, only 11/84 (13%) attendees were female. It is unclear whether this difference in the gender gap across subspecialties reflects preexisting choices and preferences, opportunities, or the effect of role models and mentorship. There was no subspecialty difference in gender in the 8-minute abstract presentations, suggesting that a gender difference in subspecialty does not initially exist. Female neurosurgeons responding to a European survey were less likely to agree that they worked in the subspecialty of their choice than male neurosurgeons.¹⁹

The disproportionate number of female speakers from outside neurosurgery may represent an effort by organizing committees to address the gender gap. Alternatively, it could represent the conscious or unconscious bias of organizing committees in valuing and recognizing the contributions of women in other specialties or careers more than women within neurosurgery.

The small number of female neurosurgeons makes reliable analysis of proportions difficult. We reported ORs with 95% CIs and only analyzed country data of those countries with the highest participation rates. One woman can dramatically change the overall proportions. This reiterates the scale of the issue but also demonstrates the ease of positive change. Other limitations of this study include the small proportion of missing speaker names in the program (13/607 [2%]), restriction of the analysis to male and female genders, no confirmation with the speakers regarding their gender identity, and no investigation of other sociodemographic characteristics.

Finally, although board certification was used as the

benchmark for proportional representation, it does not necessarily equate to working at the specialist level in that country. Neurosurgeons may be registered in more than 1 country, work in a different country than the country providing certification, or not practice at all. For example, in 2019 there were 863 people with the UK General Medical Council specialist registration in neurosurgery,³ but only 416.5 whole-time equivalent consultant neurosurgeons.²¹ In 2018, 27/331 (8%) consultant neurosurgeons working in NHS England were women,¹ but published gender data for 2019 were unavailable. The reasons behind this difference in numbers and proportions and the limitations of the sources used for other countries are not clear, but overall the use of board certification or equivalent appears to be a reasonable benchmark estimate.

Closing the gender gap at neurosurgical conferences could improve the gender gap in neurosurgery overall.^{5,6,10,22} Invited speakers and chairs benefit from improved career prospects, increased likelihood of future speaker invitations, and an increased chance of influencing agendas.^{10,23,24} If talented women cannot develop careers within neurosurgery, they may choose to go elsewhere, representing lost intellectual capital and a cost to society as highly trained individuals look elsewhere for opportunities to excel.^{10,12} Increasing diversity is equally beneficial to those who are currently overrepresented because it has a tendency to drive up standards.¹⁰

Practical methods for increasing speaker diversity that have been successfully implemented in other fields include publishing a speaker policy, monitoring speaker characteristics, maintaining speaker databases that include minorities, defaulting all abstract submissions to oral presentations and assigning posters on merit rather than choice, including minorities on organizing committees, and invited speakers refusing to take part in nonrepresentative meetings.^{23,24} Including 1 woman on the convening team for microbiology conferences between 2011 to 2013 was associated with an increase in the proportion of female speakers from 25% to 43%.²⁵ There was 1 woman (of 27 members) on the scientific committee for the 2019 EANS/SBNS meeting, representing pediatric neurosurgery, and pediatrics had the highest proportion of female invited speakers and chairs.

Conclusions

A significant gender gap exists in speakers and chairs at the joint EANS/SBNS conference. The proportion of female speakers has increased from 2007 to 2019, but fewer women still participate through invited talks compared to abstract submission. The gender gap of invited speakers is higher than in the available speaker pool of board-certified neurosurgeons.

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Disclosures

The authors report no conflict of interest concerning the materials or methods used in this study or the findings specified in this paper.

Author Contributions

Conception and design: Woodfield, Copley, Edlmann. Acquisition of data: Woodfield, Copley, Edlmann. Analysis and interpretation of data: Woodfield, Copley, Edlmann. Drafting the article: Woodfield, Edlmann. Critically revising the article: all authors. Reviewed submitted version of manuscript: all authors. Approved the final version of the manuscript on behalf of all authors: Woodfield. Statistical analysis: Woodfield, Edlmann. Study supervision: Woodfield, Edlmann.

Correspondence

Julie Woodfield: Department of Clinical Neurosciences, NHS Lothian, Edinburgh, United Kingdom. julie.woodfield@ed.ac.uk.