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Women in leadership positions in European neurosurgery - Have we broken the glass ceiling?

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ABSTRACT

Introduction: The proportion of male neurosurgeons has historically been higher than of women, although at least equal numbers of women have been entering European medical schools. The Diversity Committee (DC) of the European Association of Neurosurgical Societies (EANS) was founded recently to address this phenomenon.
Research question: In this cross-sectional study, we aimed to characterize the status quo of female leadership by assessing the proportion of women heading European neurosurgical departments.
Material and methods: European neurosurgical departments were retrieved from the EANS repository. The gender of all department chairs was determined via departmental websites or by personal contact. The proportion of females was stratified by region and by type of hospital (university versus non-university).
Results: A total of 41 (4.3%) female department chairs were identified in 961 neurosurgery departments in 41 European countries. Two thirds (68.3%) of European countries do not have a female neurosurgery chair. The highest proportion of female chairs was found in Northern Europe (11.1%), owing to four female chairs in a relatively small number of departments (n = 36). The proportions were considerably smaller in Western Europe (n = 17/312 (5.5%)), Southern Europe (n = 14/353 (4.0%)) and Central and Eastern Europe (n = 6/260 (2.3%)) (p = 0.06). The distribution of female chairs in university (n = 19 (46.3%)) versus non-university departments (n = 22 (53.7%)) was even.
Discussion and Conclusion: There is a significant gender imbalance with 4% of all European neurosurgery departments headed by women. The DC intends to develop strategies to support equal chances and normalize the presence of female leaders in European neurosurgery.

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Abbreviations

DC	Diversity Committee
EANS	European Association of Neurosurgical Societies

1. Introduction

In recent decades, the proportion of women in medicine has greatly increased worldwide (Development and O, 2022). In Europe, almost half of the medical workforce are women (Development and O, 2022). Nevertheless, a great imbalance between the number of women in medicine and those in leadership positions prevails. This phenomenon has been termed "glass ceiling", whereby women experience a lower likelihood to be promoted to higher hierarchical positions despite equal seniority and productivity (Zhuge et al., 2011). A variety of reasons for this phenomenon is typically assumed, including career setbacks due to pregnancy and childcare duties, rarer exposition to female role models reducing self-identification with leadership positions, or less networking and mentoring compared to male colleagues (Voytko et al., 2018; Rangel et al., 2018). Neurosurgery belongs to those specialties prone to a traditionally higher proportion of men in leadership positions. North American data demonstrate that recruitment and retention of women in the specialty has been challenging, and an underrepresentation of women in leadership is also apparent (Woodrow et al., 2006). However, little information is available on European neurosurgery. The European Association of Neurosurgical Societies (EANS) has launched the Diversity Committee (DC) to better understand the gender distribution in European neurosurgical departments and provide strategies to bridge the gender gap (Hernandez-Duran, 2022). As a first initiative, we aimed to characterize the status quo of females leading Europe's neurosurgical departments.

2. Materials and methods

We conducted a cross-sectional study on the gender of the neurosurgical department heads in Europe. As information on the biological sex was not available, we used the term "gender" and assigned department heads the binary female or male gender form, according to their presentation to the public. We adhered to the SAGER (Sex and Gender Equity in Research) guideline (Heidari et al., 2016). All European neurosurgical departments' internet websites, as identified by the EANS online repository of units in the continent in January 2022 (Info@eans.org and European Neurosurgical Centers, 2022), were scrutinized to determine how many of their department chairs were women. If the information was not available online, the departments were contacted via email. Departments without final information on the gender of the department head were excluded. European countries not listed on the EANS website (Belarus, Iceland, Liechtenstein, San Marino, Vatican City) were not part of our analysis. As Israel was listed and is closely associated with the EANS, it was included into the analysis.

Only neurosurgical hospitals were included, while private practices or small departments, where a clear department head could not be identified, were excluded. Departments for pediatric or stereotactic neurosurgery were included into the analysis equally. National differences in hospital structure or hierarchy were considered as far as reasonable. Authors from all parts of Europe contributed with personal knowledge and language skills to the appropriate in- or exclusion of a neurosurgery unit from the study. For example, in Belgium, where neurosurgeons may work at several hospitals, multiple inclusions were avoided by identification of the department head supplemented by personal knowledge. Northern Cyprus and Turkey were analyzed together due to the incorporation of Northern Cypriotic residency into the Turkish system.

Female department heads were quantified as n (%) of all neurosurgical departments per country with IBM SPSS Statistics 26 (SPSS Inc., Chicago, IL, USA). The respective figure was created with GraphPad Prism 6 (GraphPad Software, Inc., La Jolla, USA). Female department heads were further stratified by their primary affiliation to a university- or non-university hospital. To identify regional trends in female neurosurgery leadership, a map of four distinct regions in Europe as defined by EU Vocabularies (EuroVoc) excluding Israel was created with mapchart.net and Microsoft PowerPoint 16 (Microsoft Corporation, Redmond, WA, USA) (Fig. 2) (Publications Office of the European, 2022). Differences in regional female proportions were assessed with Chi-square test.

3. Results

A total of 961 neurosurgical departments were identified in 41 European countries. The number of departments differed largely between countries with an average of 22.6 ± 33.0 departments per country with a range of 0 (Andorra, Monaco) to 145 departments (Germany).

A minority of neurosurgical departments were chaired by females (n = 41 (4.3%)). Nineteen (46.3%) of the female chiefs chaired a neurosurgery department associated with a university, while 22 (53.7%) headed non-university departments. Twenty-eight (68.3%) countries did not have any female department head (Fig. 1). The highest proportion of female department heads were reached in countries with relatively few neurosurgical departments: Denmark n = 1 female chair (25%) in 4 departments; Finland n = 1/5 (20%); Norway n = 1/6 (16.7%); Serbia n = 2/12 (16.7%); Sweden n = 1/6 (16.7%)). Nevertheless, most countries with a below-average (≤23) number of neurosurgical departments (n = 25 of 30 (83.3%)) did not have any female chair. In countries with an above-average number of neurosurgical departments (≥23 departments in Belgium, France, Germany, Greece, Italy, Poland, Romania, Spain, Turkey, Ukraine and UK), the proportion of female chairs ranged from 0% (Poland) to 6.4% (France). Divided into geographical regions (according to the geographical classification of Europe defined by EuroVoc), Northern Europe had the highest proportion of female department heads with four females out of 36 neurosurgical departments (11.1%) (Fig. 2) (p = 0.06). Western Europe represented the highest absolute numbers of female chiefs with 17 neurosurgical departments (11 of those in Germany), but with a lower overall proportion than Northern Europe (17/312 (5.5%)). Central and Eastern Europe together had 6/260 (2.3%) female chiefs and Southern Europe had n = 14/353 (4.0%) female chiefs.

4. Discussion

Female leadership in neurosurgical departments in Europe is rare. Only 4% of all neurosurgical departments listed by the EANS are currently chaired by women. A higher proportion of female department heads was encountered in Northern European countries (11%), but the overall number of neurosurgical departments in this region is low and female chairs stand for only 10% of all female chairs in Europe. Of the larger countries with a relatively high number of neurosurgical departments, no country reaches at least 10% female chairs.

Neurosurgery in Europe is not an exception. The percentage of female neurosurgeons chairing a department in the United States is also approximately 3% (Feng et al., 2021; Kearns et al., 2021; Renfrow et al., 2018). Recent analyses documented 34 and 16 female neurosurgery chairs in the Asian and Australian continents together and in Latin America, respectively (Drummond et al., 2021; Zanon et al., 2021). Data from the United States show that female chairs in other specialties were similarly underrepresented with 0% in orthopedic surgery, 3% in general surgery, 3% in urology, 4% in cardiothoracic surgery and 6% in plastic surgery (Weiss et al., 2014; Singh et al., 2021). Comparably few women were residency program directors, ranging from 3% (neurosurgery) to 10% (general surgery). Data on female leadership in other

surgical specialties across Europe are sparse, but are not assumed to differ significantly from their counterparts in the United States. For example, 8% of general surgery department chairs in Europe are female (Wu et al., 2019).

The lag of women in European neurosurgery is also visible in training and scientific contributions. Female residents tend to perform fewer neurosurgical procedures (Stienen et al., 2020). Women were first authors in 12–20% and senior authors in 5–11% of publications in Acta Neurochirurgica, Journal of Neurosurgery, Neurosurgery, depending on article type (original or non-original) (Conzen et al., 2021). Eight percent of the respective journals' editorial board members were women (Conzen et al., 2021). These discrepancies are more or less pronounced in different neurosurgical subspecialties, with the highest proportion of females in Journal of Neurosurgery: Pediatrics (33.5%) (Taha et al., 2021; Phurtag et al., 2022). European women (led by the Netherlands) publish more spine-related articles than in other continents (Phurtag et al., 2022). Still, of all authors, women published fewer spine-related articles per person than men and were less likely to keep publishing follow-up research (Sing et al., 2017). While data for the EANS annual congresses are still under evaluation by the DC, illustrative data from the German annual neurosurgical society's meetings show that women gave a third of all oral presentations and chaired 10% of the sessions (Lawson McLean, 2020).

Based on our cross-sectional study only, the dynamics of these proportions cannot be determined and historical data are largely lacking. Looking at 4% female neurosurgery chairs today, a major trend reversal has probably not (yet) taken place. Critical mass theory, adopted from politics, assumes that around 30% of females in a certain position are needed to self-sustain this proportion (Helitzer et al., 2017). Nevertheless, in current European neurosurgical residency programs, the percentage of women opting for a neurosurgical career is about 25–30% and is assumed to be increasing, despite large geographic variations (Steklacova et al., 2017; Schaller, 2020). Women represent a quarter of all participants at the EANS training courses with slowly increasing tendency (Stienen et al., 2016). The number of female first authorships has tripled from the 1970's to the 2010's from about 5% to 15% (Taha et al., 2021; Phurtag et al., 2022; Sing et al., 2017). However, although senior authorships by women in neurosurgical journals have increased since 1950, they have not changed significantly from the 10% level since 1990 (Taha et al., 2021). Still, these data indicate an increasing readiness of women in the younger generation to take on the (academic) neurosurgical pathway. The visible progress in the recruitment of women into neurosurgical residencies may only become apparent in leadership positions in a delayed fashion.

Work-family conflicts are at the forefront of reasons to leave the academic trajectory at a critical timepoint in their career – more so for women than for men (Dyrbye et al., 2011). Lack of robust pregnancy-regulations for pregnant neurosurgeons can hold back surgical activities during pregnancy (Rangel et al., 2018; Simpson et al., 2021). More female than male neurosurgeons believe that having children impacts their career and are unmarried or do not have children (Dyrbye et al., 2011; Gadjradj et al., 2020). Lack of belief in oneself as a prospective female department head is another impediment (Sweet et al., 2019). Internal bias (i.e. that males are more fitting as leaders), dearth of successful female role models as department leaders or in scientific conferences, microaggressions from superiors, peers or patients, or lack of mentoring are possible contributors (Zhuge et al., 2011; Steklacova et al., 2017; Stienen et al., 2016; Sweet et al., 2019; Wolfert et al., 2019; Akhigbe et al., 2017; Benzil et al., 2020; Thum et al., 2021; Steffens et al., 2019; Braun et al., 2017). Granted that these phenomena may occur in men as well, these factors may at times erode some promising women's career ambitions. Accordingly, several recent studies demonstrated lower work satisfaction in female neurosurgeons as compared to males (Dyrbye et al., 2011; Gadjradj et al., 2020; Zeitlberger et al., 2022).

The EANS DC was founded in 2019 to create structural support for women and minorities in European neurosurgery. The traditional stance of such programs is to counsel and support women foremost. Many universities or hospital networks have also created successful programs supporting women's career development. However, the role image of men in the younger generations has been changing as well. For instance, a survey among >10.000 participants in the United Kingdom revealed that most men believe they should be equally involved in all aspects of childcare as women and would use related policies if they were confident that these would not impact their career (Chambraud et al., 2018). Any department chair promoting gender-independently or accepting temporary parenting obligations by men and women alike can shift the scale towards equality. Many current male leaders in neurosurgery are actively advocating modern promotion structures, which is of utmost importance to creating a united and inclusive movement (Schaller, 2020; Spetzler, 2011). Other neurosurgical societies have arranged comparable networks much earlier, such as the WINS (Women in Neurosurgery, United States) or the Asian Women's Neurosurgical Association. The DC believes that the selection of leaders in neurosurgery should be based on performance and aptitude. To achieve this ideal scenario, creating organizations such as the DC or WINS currently seems necessary to help balance the scales. Creating awareness and networking opportunities is a first step the DC is taking to reduce this bias. An

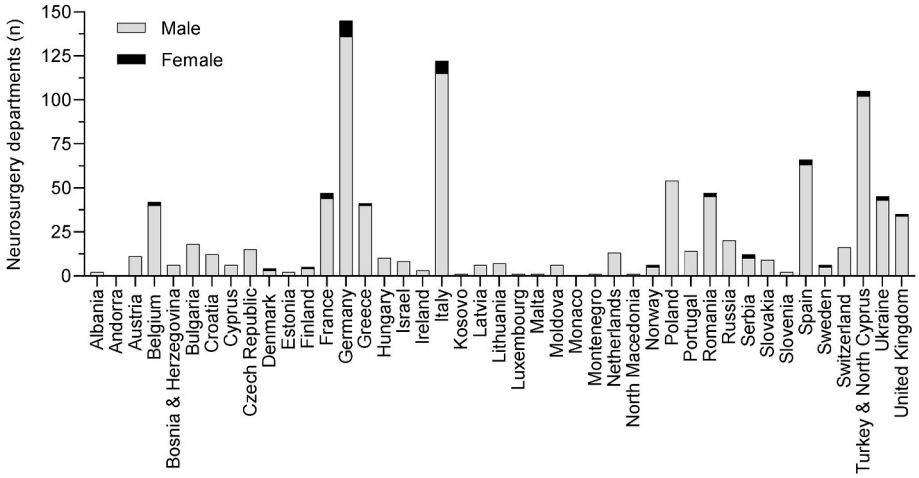

Fig. 1. Proportion of neurosurgical departments in Europe with a female head
The number of departments per European country varies greatly in proportion to the respective population, but the percentage of female department heads is comparably low in all countries.

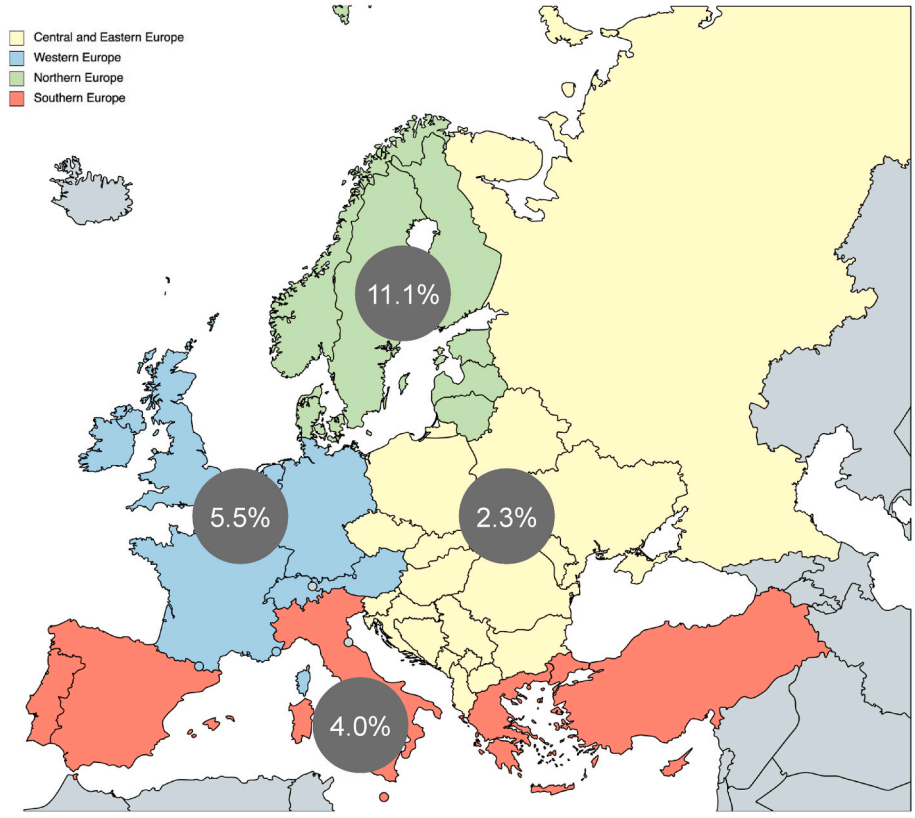

Fig. 2. Proportion of female department chairs by region.
Central and Eastern, Wester, Northern and Southern Europe as defined by EU Vocabularies (EuroVoc) (Publications Office of the European, 2022). Small countries below the map's resolution are depicted as circles (Andorra, Malta, Monaco). European countries not listed at the EANS website as having neurosurgical departments which are not part of this analysis (Belarus, Iceland, Liechtenstein, San Marino, Vatican City) are in grey color. EuroVoc defines Kosovo as part of Serbia. (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

example is the publication of biographies of female neurosurgeons with remarkable careers in the monthly EANS newsletter. Scientific investigations on female involvement in European neurosurgery are in preparation, as a large portion of the available evidence stems from the United States. Reliable data from within Europe are required to develop goal-directed strategies and document change over time. We believe that the presence of diversity committees, particularly under the umbrella of a powerful organization such as the EANS, can increase the sense of belonging of women and/or minorities in neurosurgery, offer guidance in individual cases, and foster an inclusive community for all.

4.1. Limitations

The included neurosurgical departments were retrieved from the EANS online repository. Although this list is extensive, it may be incomplete. Organizational differences between countries posed a challenge to precise in- and exclusion criteria, and impaired further Europe-wide characterization of other neurosurgical leadership positions, such as consultants. For the current study, we focused on chairs of academic or large-scale state- or private neurosurgical centers. While a certain selection bias can therefore not be excluded, we assume no major impact on the overall gender proportion. Finally, many references were retrieved from other countries or continents, as the pertinent information was often not available from Europe, hampering the comparability of studies with each other.

5. Conclusion

Currently, there is an underrepresentation with 4% females as department chairs in European neurosurgical departments. Although numbers of female residents and attendings in literature appear to be increasing, a long way lies ahead until this trend may become apparent in leadership positions. The DC intends to develop strategies to support this process and help normalize the presence of female leaders in European neurosurgery.

The Diversity Committee

The DC encourages any person interested in conveying feedback or becoming a member of the task force to contact us via diversity@eans.org.

Author contributions

SHD conceived and designed the analysis. RD, MW, SHD, HRJ, GHM, YMR, LD, SV, DE, KV, AF, TI, AM and collected the data. MW and RD drafted the manuscript. All authors reviewed the results and approved the final version of the manuscript.

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Availability of data and material

Data of this study can be obtained from the corresponding author on reasonable request.

Ethics approval

Not applicable.

Consent to participate

Not applicable.

Declaration of conflicting interest

None to be declared.

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