Women in neurosurgery: where does the United Kingdom stand?

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Despite over half of medical students in the United Kingdom (UK) being female, women represent only a small proportion of the workforce in the traditional “male” specialties, including neurosurgery. There is increasing global attention to and awareness of gender discrimination in the workplace across several industries, including health care. The authors set out to explore the opinions and attitudes of UK neurosurgeons and neurosurgery trainees on gender issues via a large-scale national survey. The results highlight key perceptions and gaps in mentorship and leadership and provide ideas for change. This should be used as a foundation to delve deeper and to address specific questions in order to achieve a fairer, more meritocratic environment in which neurosurgeons can thrive.

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WOMEN have been present in neurosurgery history since the 15th century, with reports describing Turkish Tabibes extracting fetuses with hydrocephalus and macrocephaly.¹ Four centuries later, in 1865, England saw its first woman qualify as a doctor, with Elizabeth Garrett Anderson² paving the way for all future generations of female physicians. It took another 74 years to see the first woman qualify as a neurosurgeon in the United Kingdom (UK). Diana Beck³ was trained by Hugh Cairns in Oxford and qualified in 1939.

Since then, there has been a real increase in the number of women graduating from medical schools in the UK. In 2018, the General Medical Council reported that 56% of all medical students were female.⁴ However, the number of women pursuing a surgical career is still lagging behind. Based on data from the Royal College of Surgeons of England (RCS Eng), the proportion of female consultant surgeons was only 3% in 1991 and 13.2% in 2020.⁵

Robert Spetzler's landmark paper in the field of women in neurosurgery⁶ sparked interest in the topic, but have things improved since its publication in 2011? Where does British neurosurgery stand in comparison to both other surgical specialties and international colleagues in terms of female representation?

With this study, we explored current perceptions and

challenges in gender disparity in neurosurgery by conducting a large-scale, UK-wide survey to gather opinions of existing neurosurgeons and trainees on the matter. To our knowledge, this is the largest survey of its kind in the UK to date.

Methods

We designed a 15-question survey (Supplemental Survey), which we then distributed electronically via Survey Planet.com to all Society of British Neurological Surgeons (SBNS) and British Neurosurgical Trainees' Association (BNTA) members. Responses were gathered anonymously. We present a qualitative analysis of the data with descriptive statistics, performed using Microsoft Excel. We report median scores for the questions assessed with a Likert scale.

Results

We received 308 responses, of which 291 were from the UK. We excluded 17 respondents who were international members of SBNS. In total, 189 respondents were male, 91 were female, 10 did not disclose their gender, and 1 was of nonbinary gender. A breakdown of respondents by grade and gender is shown in Table 1.

ABBREVIATIONS BNTA = British Neurosurgical Trainees' Association; CT = core trainee; LTFT = less than full-time; NHS = National Health Service; RCS Eng = Royal College of Surgeons of England; SBNS = Society of British Neurological Surgeons; ST = specialist trainee; UK = United Kingdom.

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TABLE 1. Survey respondents by grade and gender

Grade	Male	Female	PNTS	NBG	Total
Consultant	70 (37%)	21 (23.1%)	3 (30%)		94 (32.3%)
Post-CCT fellow (or equivalent)	20 (10.6%)	7 (7.7%)	2 (20%)		29 (10%)
ST3–8 (or equivalent)	57 (30.2%)	41 (45.1%)	2 (20%)	1 (100%)	101 (34.7%)
ST1–2 (or equivalent)	24 (12.7%)	20 (22%)	1 (10%)		45 (15.5%)
Retired consultant	14 (7.4%)	2 (2.2%)			16 (5.5%)
PNTS	4 (2.1%)		2 (20%)		6 (2.1%)
Total	189	91	10	1	291

CCT = certificate of completion of training; NBG = nonbinary gender; PNTS = prefer not to say.

Relationship Status and Impact of Neurosurgery on Relationships

Of the 280 respondents who disclosed their relationship status, 83.7% of men were married or in a long-term relationship versus 60.7% of women. Women were more likely to be single (22.5%) than men (9.8%). Although 81% of our respondents were in a long-term supportive relationship, 65.4% of men and 64.8% of women still felt that their relationship was impacted by their neurosurgical career. We received 167 qualitative responses describing the nature of that impact. Three respondents portrayed a positive impact, with neurosurgery being an impressive career that attracts partners. The remaining individuals all felt differently. The 5 most mentioned negative impacts of a neurosurgical career on their relationships were poor work-life balance, difficulties with childcare, strain on forming or maintaining relationships, working long and unpredictable hours, and lack of geographical stability.

Children

In total, 164 (56.4%) respondents had children (including adult children). Excluding individuals who did not answer the question, 68.3% of men, 30.8% of women, and the single nonbinary gender respondent have children. Of the 118 (40.5%) respondents without children, 24.2% of women and 9.8% of men declared not wanting children. Of note, the majority of male consultants (6 of 7) would like to have children, but the opposite was true for female consultants (5 of 8). All retired male consultants who replied to our survey have children, but the 2 retired female consultants do not.

Of the 134 respondents who described their childcare responsibilities, 68.6% of men and the nonbinary gender respondent said that their partner takes primary care responsibility, with only 1% of men being primary caregivers themselves. The situation for female neurosurgeons is very different, with 34.8% combining primary childcare duties with a neurosurgical career, a further 52.2% sharing childcare responsibilities with their partner, and a mere 13% who have a partner who takes care of most childcare duties. The same trends held true across all grades (Table 2).

Additional Caring Responsibilities

Only 45 respondents (15.5%) replied that they have additional caregiving responsibilities (29 men, 15 women,

and 1 nonbinary gender respondent). In total, 24 respondents (53.3%) were not the predominant caregiver, but when they were, men were more likely to be the main caregiver than women (24.1% vs 13.3%).

Called Away From Work for Caregiving Responsibilities

A total of 120 respondents reported being called away from work for caregiving responsibilities (48.4% of men vs 27.8% of women). When we looked at this answer for only respondents with children, women were slightly more likely to be called away than men (70.4% vs 67.7%). Twenty-seven (22.5%) respondents of both genders equally declared that they have faced negative consequences for being called away, with the most cited consequences being considered less committed, losing training opportunities, and being the focus of gossip at work. Four respondents (2 men and 2 women) reported having very supportive colleagues and departments.

Less Than Full-Time Work or Training

Twenty-four respondents (8.4%) hold or have held less than full-time (LTFT) positions (7 consultants and 16 trainees). All current LTFT consultants are male. Of the trainees, 15 are female and 1 is male. In total, 218 respondents (76.5%) had no intention to train or work LTFT (84.3% of men, 61.5% of women, and the single nonbinary gender individual). Of the 43 respondents (14.8%) who would like to work or train LTFT, 20 were women (22%) and 21 were men (11.4%). Fourteen respondents (58.3%) reported difficulties due to working LTFT, mostly related to departmental inability (or unwillingness) to adapt the neurosurgical week, fewer training opportunities, negative comments by colleagues, perceived lack of commitment, and being paid less for ultimately doing the same number of hours as a full-time employee.

Disparity Between the Ways Men and Women Are Treated in Neurosurgery

Of the 286 respondents, 44.5% feel that there is no gender disparity in neurosurgery. This represents the opinions of 52.2% of men and 29.2% of women. In total, 56.2% of female and 19.8% of male respondents believe their male colleagues are treated better in the workplace. Only 9.3% of our respondents feel that women are treated better than men in neurosurgery (12% of men, 1.1% of women, and

TABLE 2. Childcare responsibilities of respondents by grade and gender

Childcare Responsibility & Grade	Male	Female	PNTS	NBG	Total
Yes, I am responsible for most of the childcare duties	1 (1%)	8 (34.8%)			9 (6.7%)
Consultant	1 (1%)	4 (17.4%)			5 (3.7%)
ST3–8 (or equivalent)		4 (17.4%)			4 (3.0%)
Yes, I share childcare responsibility equally with my partner	32 (30.5%)	12 (52.2%)	2 (40%)		46 (34.3%)
Consultant	17 (16.2%)	5 (21.7%)	1 (20%)		23 (17.2%)
Post-CCT fellow (or equivalent)	4 (3.8%)	3 (13.0%)	1 (20%)		8 (6.0%)
ST3–8 (or equivalent)	5 (4.8%)	4 (17.4%)			9 (6.7%)
ST1–2 (or equivalent)	1 (1%)				1 (0.7%)
Retired consultant	3 (2.9%)				3 (2.2%)
PNTS	2 (1.9%)				2 (1.5%)
Yes, my partner takes care of most of the childcare duties	72 (68.6%)	3 (13%)	3 (60%)	1 (100%)	79 (59%)
Consultant	30 (28.6%)	2 (8.7%)	1 (20%)		33 (24.6%)
Post-CCT fellow (or equivalent)	14 (13.3%)				14 (10.4%)
ST3–8 (or equivalent)	25 (23.8%)	1 (4.3%)	1 (20%)	1 (100%)	28 (20.9%)
ST1–2 (or equivalent)	1 (1%)				1 (0.7%)
Retired consultant	1 (1%)				1 (0.7%)
PNTS	1 (1%)		1 (20%)		2 (2.5%)
Total	105	23	5	1	134

the nonbinary gender respondent). These findings hold true when assessed by grade (Table 3).

Forty respondents (13.7%) chose to write free-text answers, with the 5 most common comments being that women need to outperform their male colleagues to achieve similar levels of recognition at work, bias against

women is unconscious and inherent societal bias exists between men and women, disparity is due to historical preference for men but the situation is improving, women are discriminated against when they take time for childcare or work LTFT, and women feel that their ability to combine work and family life is undervalued by their colleagues.

TABLE 3. Disparity between the ways men and women are treated in neurosurgery by grade and gender

Disparity & Grade	Male	Female	PNTS	NBG	Total
No disparity	96 (52.2%)	26 (29.2%)	3 (42.9%)		125 (44.5%)
Consultant	43 (23.4%)	7 (7.9%)	2 (28.6%)		52 (18.5%)
Post-CCT fellow (or equivalent)	10 (5.4%)	3 (3.4%)			13 (4.6%)
ST3–8 (or equivalent)	25 (13.6%)	7 (7.9%)			32 (11.4%)
ST1–2 (or equivalent)	12 (6.5%)	7 (7.9%)	1 (14.3%)		20 (7.1%)
Retired consultant	6 (3.3%)	2 (2.2%)			8 (2.8%)
Other (free-text responses)	29 (15.8%)	12 (13.5%)	1 (14.3%)		42 (14.3%)
Men are treated better	37 (20.1%)	50 (56.2%)	1 (14.3%)		88 (31.3%)
Consultant	14 (7.6%)	10 (11.2%)	1 (14.3%)		25 (8.9%)
Post-CCT fellow (or equivalent)	3 (1.6%)	3 (3.4%)			6 (2.1%)
ST3–8 (or equivalent)	13 (7.1%)	27 (30.3%)			40 (14.2%)
ST1–2 (or equivalent)	5 (2.7%)	10 (11.2%)			15 (5.3%)
Retired consultant	2 (1.1%)				2 (0.7%)
Women are treated better	22 (12%)	1 (1.1%)	2 (28.6%)		26 (9.3%)
Consultant	3 (1.6%)				3 (1.1%)
Post-CCT fellow (or equivalent)	4 (2.2%)		1 (14.3%)		5 (1.8%)
ST3–8 (or equivalent)	11 (6%)	1 (1.1%)	1 (14.3%)	1 (100%)	14 (5%)
ST1–2 (or equivalent)	3 (1.6%)				3 (1.1%)
Retired consultant	1 (0.5%)				1 (0.4%)
Total	184	89	7	1	281

FIG. 1. Likelihood of listed options contributing to gender disparity in neurosurgery. Median values are shown.

Respondents also raised challenges of dealing with other forms of inequality due to race, ethnicity, and class.

Likelihood of Listed Options Contributing to Gender Disparity in Neurosurgery

A Likert scale of 1 (not likely at all) to 5 (very likely) was used to rank the likelihood of 10 predefined categories as contributors to gender disparity in neurosurgery (Supplemental Survey). Figure 1 shows the median scores of each category, excluding the scores of the nonbinary gender respondent due to the inability to calculate median scores. Women scored family/having children, issues with mentorship and ambition, confidence, and presence of a “boys’ club” mentality higher than their male counterparts. All respondents ranked family/having children as the main contributor to gender disparity in neurosurgery. No group reported emotionality, physical endurance, or issues with ambition/drive as significant contributors to the gender gap in neurosurgery. Our male respondents did not perceive these as being major hindrances to gender equality in neurosurgery.

Issues Personally Experienced or Witnessed That Could Be due to Gender Within Neurosurgery

We received 191 (65.6%) responses, with a total of 208 issues/comments (Table 4). Both men and women mentioned undermining comments made to women and issues due to maternity/parental leave as the two main issues they experienced or witnessed. The third most mentioned issue by women was the “old boys’ club” mentality and feeling excluded, whereas the male cohort reported women being favored in the workplace. For our female cohort, the fourth and fifth issues were the lack

of role models and women in senior positions and men being treated better at work. The male cohort diverged by reporting female stereotypes and attributes as the issues they witnessed/experienced that could affect gender disparity in neurosurgery.

Suggestions to Improve Gender Inequality in Neurosurgery

We received 221 (76%) responses, with a total of 261 suggestions (Table 5). In our survey, the need to champion and support women at work as well as promote career flexibility were the two most commonly mentioned suggestions by both men and women. Our male cohort’s third and fourth options were doing nothing (given that the majority felt that there was no disparity in the first place) and striving to achieve gender neutrality by regarding every member of the neurosurgical community as a surgeon rather than as an individual of a specific gender. They also mentioned the need for education in the workplace. For women, it was the need for a change of culture in the workplace, as well as a focus on education, that were their third and fourth most mentioned suggestions. Other options, such as speaking up against disparity and female networking groups, were also mentioned by both genders.

Discussion

We have conducted a UK-wide survey of neurosurgeons and neurosurgery trainees to garner opinions and attitudes toward gender differences in the UK neurosurgical community. The issue of gender disparity in the workplace is receiving wider media and societal attention across several industries and professions, including health

TABLE 4. Issues personally experienced or witnessed that could be due to gender within neurosurgery, classified by grade and gender

Issue	Consultant			Post-CCT Fellow (or equivalent)			ST3–8 (or equivalent)			ST1–2 or Senior House Officer		Retired Consultant		PNTS		Total
	F	M	PNTS	F	M	PNTS	F	M	PNTS	F	M	F	M	M	PNTS	
Inappropriate comments or undermining or sexual harassment	4	3					12	5	1	1	1		2			29
Female maternity/parenting issues	3	3		2	1		7	4		3	2		2			27
Exclusion/boys' club attitude	4	3					9	2		2						20
Female stereotypes		4			3		4	2		5	1					19
Childcare regardless of gender	1	1	1	1	1		5	4				1	2			17
Lack of role models/women in senior positions	2						4	4		4	3					17
Female attributes	3	7			1		1	1		1	1		1			16
Males treated better	2	1					4			4	2		1			14
Females treated better		2			2			3	2		1		2	1		13
Other	2	2					2	1					1			8
Positive discrimination						1	1	3	1		1				1	8
Patients/nurses treating differently	1	1					1	2		2						7
Females feel they have to try harder		2					1	1			1					5
Lack of support/isolation at consultant level for females	3	1														4
LTFT issues		1						2			1					4
Total	25	31	1	3	8	1	51	34	4	22	14	1	11	1	1	208

care, and this is the first large-scale survey of the neurosurgical community in the UK.

Workforce Data

As of March 2020, a total of 470 consultants and associate specialists were identified by a census conducted by the UK and Eire Workforce Planning Committee for Neurosurgery (K. Whitehouse, written communication, October 28, 2020). Gender information was provided for 448 consultants, and of these 41 were female. This equates to 9% of all consultant neurosurgeons in the UK and Ireland

being female. This is consistent with National Health Service (NHS) Digital neurosurgical workforce statistics for England (Table 6), with the percentage of female consultant neurosurgeons remaining around 8% between 2010 and 2020.^{7,8}

In the same period, the neurosurgical workforce grew very significantly in England, with the number of consultants increasing by 55% from 236 to 366. Despite a net recruitment of 130 additional consultants, the percentage of women barely increased from 7.2% (n = 17) to 7.9% (n = 29) of the total.^{7,8} It is also worth noting that this occurred

TABLE 5. Suggestions to improve gender inequality in neurosurgery classified by grade and gender

Suggestion	Consultant			Post-CCT Fellow (or equivalent)			ST3–8 (or equivalent)			ST1–2 or Senior House Officer		Retired Consultant		PNTS		Total
	F	M	PNTS	F	M	PNTS	F	M	Other	PNTS	F	M	F	M	(all male)	
Champion women & support	9	14		2	1		14	11			6	7		2		66
Career flexibility	3	13		1	7	1	10	11		1	6	3		2		58
Culture change	2	3	2	2	3	1	10	4			4	4		1		36
Education	4	3		1	1		8	4		1	2	3	1			28
Do nothing	1	9		1	2		2	3						1	2	21
Gender neutrality	1	8						4	1		1	2	1	3		21
Other	1	2			2		1	4			1			2	1	14
Speak up	2	2			1		2	1		1	1	1		1		12
Female networking groups	1							2				1				4
Safe space to raise issues											1					1
Total	24	54	2	7	17	2	47	44	1	3	22	21	2	12	3	261

TABLE 6. Neurosurgical female workforce statistics, 2010–2020

Grade	% Female											
	March 2010	March 2011	March 2012	March 2013	March 2014	March 2015	March 2016	March 2017	March 2018	May 2019	Sept 2019	May 2020
Consultant	7.20%	6.58%	7.92%	6.95%	6.99%	7.64%	6.40%	7.26%	8.16%	7.95%	8.36%	7.92%
Specialty registrar	19.20%	17.12%	18.81%	18.81%	20.25%	20.36%	19.65%	23.12%	23.14%	25.47%	25.13%	22.28%
CT	25.76%	21.74%	25.00%	27.42%	34.33%	32.73%	26.09%	38.30%	27.94%	31.82%	28.85%	26.96%
Foundation doctors	32.61%	38.18%	39.62%	46.00%	37.74%	46.00%	37.25%	42.86%	62.50%	47.73%	53.85%	42.22%
Other	7.69%	9.52%	10.00%	14.29%	13.33%	25.00%	25.00%	16.67%	18.75%	13.04%	9.09%	10.53%
Total	16.17%	15.29%	16.81%	16.99%	17.72%	18.13%	16.09%	18.75%	19.73%	19.89%	19.85%	17.90%

Data obtained from NHS Digital^{7,8} and K. Whitehouse, FRCS, personal communication, October 28, 2020.

despite the consistently higher percentage of women in training positions (25.8%–27% of core trainees [CTs] and 19.2%–22.3% of specialist trainees [STs]) throughout the same period (Table 6). This may be because women take longer to complete training—because of maternity leave, for example—but it raises concerns of a higher attrition rate for women. For example, Renfrow et al.⁹ reported a 17% female attrition rate compared to a 5.3% male attrition rate for neurosurgery residents in the US between 2000 and 2009.

Underrepresentation of women at the consultant level is not unique to neurosurgery or the UK. Classic “male-dominated” specialties, like cardiothoracic and trauma and orthopedic surgery, show below-average percentages of female consultants: 8.8% and 6.5%, respectively, versus a 14.5% average (Table 7).¹⁰ We note the slight inconsistency in the different NHS Digital data sets, which cannot be explained totally by different dates—for example, one data set reports that 8.16% of consultants are female,⁶ and the other reports 6.8%.¹⁰ However, we have decided that it is beneficial to include the second data set because it is consistent (but not identical) and allows us to compare neurosurgery to other surgical specialties. Comparing neurosurgery in the UK to other parts of the world, we found similar percentages as Steklacova et al.,¹¹ who reported that 12% of neurosurgeons across Europe were women in 2017

(highest in Italy with 36%, lowest in Kosovo and Cyprus with 0%), and Renfrow et al.,⁹ who reported 12.1% in the US and Canada between 2000 and 2009. Focusing on the proportions of female residents and board-certified neurosurgeons, Renfrow et al.⁹ reported these proportions to be 16.3% and 6.1%, respectively, in the US in 2016, whereas Steklacova et al.¹¹ reported proportions of 32% and 11% across Europe in the same year (18% of trainees and 8% of consultant equivalents in the UK).

Survey Findings

Based on the UK census, we estimate that we surveyed 15.6% (70/448) of male and 51.2% (21/41) of female consultants. It is difficult to obtain reliable numbers for other grades, but we provided estimates by scaling data from NHS Digital for England by 30%^{7,8} (i.e., the ratio we see by comparing the number of UK consultants according to the UK census to the number according to NHS Digital for England). This allowed us to estimate that our survey responses accounted for approximately 20% of male and 45% of female staff with ST and CT grades.

Family Planning and Childcare

Challenges due to family planning and childcare are a recurrent theme throughout our survey results. Maehara et

TABLE 7. Surgical workforce statistics for consultants, specialty registrars, and CTs, January 2018

Specialty	All Grades			Consultant			Specialty Registrar			CT		
	Female	Male	% Female	Female	Male	% Female	Female	Male	% Female	Female	Male	% Female
All surgical groups	6,505	17,281	27.3%	1,389	8,164	14.5%	2,013	4,394	31.4%	721	1,239	36.8%
Cardiothoracic surgery	166	738	18.4%	33	343	8.8%	75	281	21.1%	29	41	41.4%
General surgery	2,341	4,819	32.7%	388	2,051	15.9%	563	1,061	34.7%	268	392	40.6%
Neurosurgery	162	671	19.4%	22	301	6.8%	84	289	22.5%	21	54	28.0%
Ophthalmology	1,126	1,769	38.9%	403	957	29.6%	351	385	47.7%	29	35	45.3%
Otolaryngology	565	1,291	30.4%	115	633	15.4%	211	277	43.2%	79	88	47.3%
Pediatric surgery	155	264	37.0%	52	141	26.9%	77	89	46.4%	14	16	46.7%
Plastic surgery	380	819	31.7%	99	401	19.8%	174	258	40.3%	79	88	47.3%
Trauma & orthopedic surgery	1,070	5,145	17.2%	166	2,390	6.5%	321	1,390	18.8%	147	417	26.1%
Urology	465	1,505	23.6%	89	804	10.0%	133	305	30.4%	46	94	32.9%
Vascular surgery	78	274	22.2%	23	154	13.0%	25	59	29.8%	9	14	39.1%

Data obtained from NHS Digital.¹⁰

al.¹² surveyed women who quit full-time employment as neurosurgeons in Japan and reported difficulty balancing motherhood and a neurosurgical career as the main reason for attrition. Rangel et al.¹³ reached similar conclusions in the US, warning that the challenges of having children during training could significantly impact the workforce.

Women in our cohort reported juggling demanding work duties with childcare responsibilities because they were either the main caregiver or sharing duties equally with their partner. In contrast, the majority of male neurosurgeons do not report having to do the same. This is corroborated by Grandis et al.,¹⁴ who found that male otolaryngologists rely more on their partners for childcare than their female colleagues. Jolly et al.¹⁵ reported that high-achieving male physician-researchers were more likely to have partners who were not employed full-time, unlike their female counterparts, thereby indirectly reinforcing this statement. The World Health Organization¹⁶ highlights the greater burden of household work, responsibility for family, maternity leave, childcare, and time for breastfeeding as some of the causes of occupational segregation for women.^{17,18}

Although most respondents without children state that they would like to have a family, the proportion is lower for women than men. This potentially suggests that women feel they have to choose between a neurosurgical career and having a family. Championing role models and increasing the visibility of women who successfully combine a neurosurgical career and a family life may help shift this balance in the future.

Mentorship and Women in Leading Positions

Mentorship contributes to higher career satisfaction rates and academic productivity,^{19–22} and it is an influential factor in guiding specialty choice for medical students.^{23,24} As a result, women in our survey and worldwide^{25–27} strive for better mentorship in the workplace. Although some countries, like the US, seem to have better established mentoring schemes,^{22,28,29} more needs to be done in the UK. RCS Eng offers a guide on mentoring,³⁰ and the Royal College of Physicians and Surgeons of Glasgow offers mentoring schemes and support to both mentors and mentees,³¹ but organizations are often left to set up their own schemes.³² The University College London Women in Surgery Mentoring Scheme is targeted at students,³³ but more is needed for existing neurosurgical trainees and consultants. In Switzerland, just over half the female surgeons and trainees have a mentor.³⁴ It is unclear whether it is more beneficial for women to have female mentors.^{35,36} In the study by Kaderli et al.,³⁴ mentor-mentee relationship and satisfaction of mentees with career advancement support was not rated higher with female mentors. The low number of senior female neurosurgeons²⁵ should therefore not hinder mentorship. Men can be equally effective mentors to female neurosurgeons and should be encouraged to take up these roles.

As highlighted by our survey, there is a need for more women in leadership and academic positions in neurosurgery.^{26,27,37} According to the SBNS, 2 of 56 academic neurosurgeons are women,³⁸ and in the US, women holding full professor positions are a minority (5.84%).²⁷ Of the 10 elected SBNS council members, only 1 is a woman,³⁹

and 3 of 13 BNTA committee representatives are female.⁴⁰ With the launch of inclusivity schemes, such as the Lady Estelle Wolfson Emerging Leaders Fellowship,⁴¹ more women are encouraged to apply for senior and leadership roles. In 2019, the SBNS welcomed its first “Women in Neurosurgery” forum run by two female neurosurgical trainees,⁴² where neurosurgeons of all genders and grades had the opportunity to network and discuss issues they face at various stages of their careers. We hope that the interest generated by this forum⁴² will encourage the creation of a new SBNS committee, similar to the “Diversity in Neurosurgery Task Force” of the European Association of Neurosurgical Societies,⁴³ to foster a more inclusive neurosurgical environment.

“Old Boys’ Club” Mentality

An independent investigation of reports of sexism and sexual harassment at the British Medical Association found a lingering “old boys’ club” mentality,⁴⁴ with some women feeling “undervalued, ignored and patronised because they are women.” Women surveyed by the Association of Surgeons of Great Britain and Ireland in 2017,⁴⁵ as well as those in our cohort, raised similar concerns. It is interesting to notice that men do not tend to view this as a contributor to gender disparity in neurosurgery. However, it is important to not demonize men and acknowledge the fact that bias can sometimes be unintentional. Salles et al.⁴⁶ conducted the Implicit Association Test and identified clear and consistent gender bias in surgery that can affect the career success of women. Coe et al.⁴⁷ highlighted the importance of inclusive leadership positions, self-awareness about implicit bias from men and women alike, and academic societies taking a role in cultural change and advocating for gender equality. Dossa and Baxter⁴⁸ stated that the ubiquity of gender bias needs to be addressed if we hope to give women the same opportunities as men when it comes to leading a successful and fulfilling surgical career. For example, we hope to see equality, diversity, and unconscious bias courses required for people involved in hiring and training neurosurgeons.

Perceived Discrimination Against Men as an Emerging Theme

The former president of RCS Eng has said, “Quotas may be needed to increase the number of women working in surgery if other interventions fail,”⁴⁹ but some of our male respondents fear that women are benefitting, ahead of them, from positive treatment for consultant positions in neurosurgery. Although positive discrimination is prohibited under the Equality Act 2010,⁵⁰ positive actions taken to address imbalance of opportunities are permitted. The 2017 study by Besley et al.⁵¹ on the quality of work in the Swedish political system found that quotas for female workers raised the competence level of their male counterparts. The reason for this change was the resignation of less competent males; therefore, quotas actually improved overall levels of competence. We all aspire to meritocratic career advancement. Although this paper is aimed at raising awareness of low female representation in neurosurgery, it is important to acknowledge the impact that measures to address gender imbalance may have on men, as

ultimately the success of such measures also requires the full support of neurosurgeons of all genders.

Conclusions and Future Directions

Despite an increase in overall staff, the proportion of female staff in UK neurosurgery has remained flat over the past decade. This survey provides a broad overview of current opinions and attitudes about the gender gap in UK neurosurgery, and the majority of women reported being treated worse than their male colleagues. More work is needed to deepen our understanding of this situation, and better UK data is needed to monitor the progress of women in neurosurgery.

Future work should be targeted to identify and address specific issues holding back the realization of gender equality in UK neurosurgery. The implementation of any solutions and changes to address culture, behaviors, and biases will require strong leadership and political will from the highest authorities in the profession, as well as engagement from all genders at all levels. UK neurosurgery could also benefit from collaboration with other surgical specialties and neurosurgeons in other countries given the common issues faced.

As Spetzler said in his landmark paper regarding the gender gap issue in neurosurgery, “The primary goal should be, as it always has been, to attract the best and brightest candidates and leaders who are passionate about neurosurgery, regardless of their gender or any other minority status.”⁶ We must all work together to continue the promotion of cultural change and awareness of diversity in neurosurgery.

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Disclosures

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Author Contributions

Conception and design: Amarouche, Uberti, Singh. Acquisition of data: Amarouche, Uberti, Evans. Analysis and interpretation of data: Amarouche, Uberti, Evans. Drafting the article: Amarouche, Uberti, Evans. 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: Amarouche. Statistical analysis: Amarouche, Evans. Study supervision: Amarouche, Singh.

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