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Gender Equality in Neurosurgery and Strategic Goals Toward a More Balanced Workforce

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The Women in Neurosurgery (WINS) and the American Association of Neurological Surgeons published a white paper in 2008 setting an ambitious goal for women to comprise 20% of neurosurgery residents by 2012 and 20% of practicing neurosurgeons by 2020. Although there has been steady progress, we have fallen short of these benchmarks. We take this opportunity to look back at the accomplishments made over the past decade and provide an update on our present status. We evaluate current barriers toward progress and propose new goals, highlighting the systemic changes necessary to accomplish them. We propose the following updated recommendations to recruit and retain diverse talent into the neurosurgical workforce. (1) Neurosurgical departments and societies should provide diverse, early formal mentorship opportunities for medical students, residents, and junior faculty members. (2) Parental leave policies must be delineated, promoted, and enforced for all neurosurgeons, with greater awareness of internal discrimination and normalization of the discussion surrounding this topic. (3) We need to strive for compensation equity, with transparency in compensation mechanisms and regular assessment of compensation metrics. (4) Departments and institutions must have a zero-tolerance policy for sexual harassment and discrimination and establish a safe reporting structure. Finally, we propose attainable benchmarks toward achieving gender balance in the neurosurgical workforce, with a goal for women to comprise 30% of the entering residency class by 2030 and to comprise 30% of practicing neurosurgeons by 2038. We hope that this will guide further progress toward our future of building a balanced workforce.

KEY WORDS: Neurosurgery, WINS, Women in neurosurgery, Gender equality

T
dee years ago, the Women in Neurosurgery Society (WINS) published their landmark paper: “The future of neurosurgery: a white paper on the recruitment and retention of women in neurosurgery” (White Paper) with a challenge to address the gender disparity in the neurosurgical profession. Most notably, the White Paper sets goals for women to comprise at least 20% of neurological residents by 2012 and 20% of practicing neurosurgeons by 2020. Review of recruitment and employment data from the past 12 years shows significant progress, and we recently have seen the inaugural female neurosurgeon presidencies of the American Association of Neurological Surgeons (AANS) and Society of Neurological Surgeons (SNS), as well as several women appointed as chairpersons of neurosurgical departments. However, despite this groundbreaking progress toward accomplishing the “20%” benchmarks laid out by the White Paper, we have ultimately fallen short of their achievement.

When published, the White Paper emphasized that “the progress toward these goals be regularly assessed and efforts toward them be adjusted as required.” The notable progress over the past decade and an evolving workforce landscape requires reframing the original paper in the context of our current era. Gender parity has trickled into nearly every subspecialty, including certain surgical subspecialties, and the field of medicine has begun to quantify women’s unique contributions to patient care with improved patient outcomes and communication. Neursurgery historically lags behind most other surgical subspecialties, second only to orthopedic surgery, when it comes to recruitment and retention of female surgeons, but steady growth over the past several decades lends optimism for the future. Still, recent events such as the
Women’s March in 2017 and the #metoo movement shed a renewed light on the persistent, ubiquitous challenges that exist for women that will not improve without true systemic change.

The 30th anniversary of WINS in 2020 affords a moment to reflect on the progress over the past century and consider how the achievements of determined women can dismantle systemic barriers to create opportunity for others to follow. It is detrimental to our patients if we fail to cultivate the “best and brightest” regardless of gender; yet, there remains substantial opportunity for improvement in the recruitment, retention, and promotion of women.

**PROGRESS ASSESSMENT**

The number of women who have followed in the footsteps of pioneers such as Ruth Kerr Jakoby, the first woman certified by the American Board of Neurological Surgeons (ABNS), and Alexa Canady, the first black female neurosurgeon, has increased exponentially every decade. As shown in Figure 1, although Dr Jakoby was the sole female graduate of the 1960s, there were 4 graduates in the 1970s, 24 in the 1980s, 72 in the 1990s, and 105 in the 2000s, and more than 300 in the 2010s.5,6

We have simultaneously seen a continuous rise of influential women assuming ceiling-breaking leadership positions. Dr Karin M. Muraszko made history as the first woman to chair an academic neurosurgery department in 2005.7 It took more than a decade for Dr Susan Durham (Division of Neurosurgery, University of Vermont) and Dr Linda Liau (Department of Neurosurgery, UCLA) to become the next women to hold this position.8 Soon after, Dr Aviva Abosch was selected as chair of the newly established Department of Neurosurgery at University of
Nebraska Medical Center College of Medicine in November 2018. In 2018, Dr Shelly D. Timmons was elected President of the AANS, the first time in the 86-year history of the organization that a female neurosurgeon held this role. She was subsequently appointed as the Department Chair of Indiana University School of Medicine.

Recruitment, Retention, and Promotion

The percentage of potential female applicants has continued to grow with almost all medical schools now comprising greater than 50% female students. Subspecialties that remain underrepresented by women will suffer from a shrinking pool from which to draw qualified applicants if they continue to predominantly recruit men. Simultaneously, the neurosurgery workforce remains stressed with aging, geographically mismatched distribution, early retirement, the increasing need to provide emergency coverage, and the inability to flex the training pool in response.

Any recruitment effort must start with medical students, which includes both attracting them to the specialty and ensuring an equitable chance of acceptance. We have seen that over the past several decades, neurosurgery has begun to slowly attract more female applicants. Between 1990 and 2007, women made up 13.5% (473 of 3426) of applicants to neurosurgery programs, which nearly doubled over the study period from 10% to 17.4%. Perceptions about neurosurgical training and lifestyle seem to be a significant barrier to student interest. A survey of 104 female medical students concluded that although female students are interested in surgical subspecialties, 88.5% report that they felt there was a glass ceiling for women in medicine, with a significant proportion reporting that they would face inequality and adversity in a male-dominated field such as neurosurgery.
Although the number of total female residents has increased from 12.7% to 19.3% from 2010 to 2020 (Figure 2), women have faced recruitment barriers. During this period, male applicants had a higher likelihood of successfully matching, with 73% achieving a successful match compared with 62% of women, even when factors such as United States Medical Licensing Examination (USMLE) step 1 score, medical school ranking, and Alpha Omega Alpha (AOA) status were controlled. Although one might expect that an increase in female trainees would lead to a concordant number of female surgeons, the percentage of ABNS-certified female surgeons was stable from 1990 to 2010, hovering around 5%. The following decade saw meaningful improvement, and in 2019, this number rose to 12%. When divided by academic rank, women make up 15.4% of Assistant Professors, 13.3% of Associate Professors, and 5.8% of Full Professors. This clearly reflects a promising more junior cohort of female neurosurgeons, but may also incorporate elements of a “glass ceiling” effect, whereby women are promoted slower than their male counterparts.

**Leadership**

Neurosurgical societies have long been a mechanism for fostering community, providing mentorship and guiding academic progress. Currently, 28% (25 of 90) of board positions are held by women between AANS, Congress of Neurological Surgeons (CNS), SNS, ABNS, and Council of State Neurosurgical Societies (CSNS) which has nearly doubled over the past 5 years. There continues to be a gap, however, in the makeup of the executive leadership teams including only 1 female president of the AANS, no female presidents of the CNS, 1 female president of the SNS, 1 female chairperson of the board of the ABNS, and 2 female chairpersons of the CSNS. Among academic neurosurgical programs, in 2018, women held only 62 clinical directorship positions, including 7 program directors, 5 associate program directors, 5 fellowship directors, 3 vice-chairs, 1 chair, and 2 interim chairs. Since 2016, this has significantly improved with the recent promotions of Drs Liu, Durham, Trimmons, and Aboch, with concomitant increases in other leadership roles.

**Research**

High-impact publications are a critical pathway toward academic promotion. A review of manuscripts published by Neurosurgery and Journal of Neurosurgery from 2003, 2008, 2013, and 2018 for a total of 3247 articles found that the percentage of female authorship increased from 12% to 16.5% between 2003 and 2018. However, there was no concurrent increase in senior authorship. Interestingly, women were more likely to be published as first author with a female senior author than with a male senior author (30.4% vs 14.1%), highlighting the impact of senior female guidance and promotion. If senior female authorship improves overall female publication records, the gender composition of journal editorial boards should also be considered. The current gender makeup of the editorial boards of the 2 major neurosurgical journals, Neurosurgery and Journal of Neurosurgery, including their multiple subsidiary journals, is 15.3% female (33 of 215). Another study evaluated the fellowship trends and scholarly activity of 1641 academic neurosurgeons in the United States and found that although a higher proportion of women completed fellowships than men (P = .004), they had lower scholarly productivity. In a subgroup analysis of publications in spine and functional neurosurgery, the authors found that women had significantly lower h-indices than men even when total publication years were accounted for.

**Unique Obstacles**

A recent study highlighted that issues surrounding pregnancy and family leave continue to pose significant challenges. In this study, 33% of women surveyed planned to have children, 21% did not plan to have children, and 57% currently had children. Among the cohort who planned to have children, 92% anticipated insufficient time to care for newborns and 77% anticipated discrimination by coworkers related to pregnancy and childcare. A minority of respondents (35%) endorsed the presence of a formal policy within their department, with substantial variability in the experiences of women nationwide.

A survey of female medical students found that they were aware of the difficulties with pregnancy, breastfeeding, and inadequate parental leave policies in surgical fields and many cited these factors as influential in career planning. Absence of clear and equitable policies regarding family leave, along with perceived stigma from coworkers, significantly affects female neurosurgeons if they desire to have a family, delays women in training from having children during their prime child-bearing years, and importantly, discourages women who plan to have children from entering the field at all. A recent survey published in Journal of the American Medical Association found that female surgeons were more likely to have major pregnancy complications than nonsurgeons, and the risk was greater for those operating more than 12 hours per week during the third trimester. Miscarriages were more than twice as common in female surgeons as the general population.

Alarmingly, a recent study by the One Neurosurgery Summit Professional Taskforce found that of 622 neurosurgeons surveyed, 334 (55%) personally experienced sexual harassment, and over 62% witnessed sexual harassment in some form, with males in “superior positions” identified as offenders in 86% of allegations. Nearly all respondents perceived barriers to taking action against these offenses, including retaliation (87%), impact on future career (85%), and concern for reputation (72%).

In addition, a gender wage gap continues to haunt all medical specialties and is particularly notable in neurosurgery. Female physicians and surgeons across medical and surgical specialties in academic medicine are consistently paid on average $20K less than their male colleagues or 90 cents to the dollar. The differences found were even greater for specialists than for primary care physicians.

Given these real systemic barriers to advancement, it is not surprising that women leave the field at greater rates than men. During the 2000s, despite increasing enrollment, 17% of female
TABLE. Proposed Recommendations

1. Mentorship
   There should be a targeted effort toward the retention of female neurosurgeons in academic medicine and the fostering of their career goals. This will inherently increase the pool of positive female role models for aspiring neurosurgeons and create greater opportunities for mentorship. Departments should provide a diverse pool of early formal mentorship opportunities for medical students, residents, and junior faculty to foster their academic growth. Furthermore, society leadership and journal editorial staff should work toward 30% female representation to provide more visible role models and support the career growth of women.17

2. Parental leave policies
   Neurosurgical departments must delineate, promote, and enforce family leave policies for all neurosurgeons, discourage administrative and peer-to-peer discrimination regarding pregnancy and parental leave, and normalize discussion surrounding this topic. Departments should consider offering greater flexibility in elective rotation scheduling and the use of vacation time to accommodate trainees requiring temporary time away from rigorous clinical rotations.26

3. Compensation equity
   Departments, hospitals, and practices must develop transparent compensation mechanisms with clear mechanisms to ensure equal pay for equal work. Departments should systematically analyze their own data and hold themselves accountable for internal metrics. Publicly reported compensation should be reviewed regularly on an institutional and national level.

4. Harassment
   The current hierarchical, male-majority field of neurosurgery has bred an alarming rate of harassment, and in particular, of sexual harassment. Each department must cultivate awareness of harassment including unconscious biases and microaggressions, promote a zero-tolerance policy, and establish a safe-reporting structure to obviate fear of retaliation. Given the apparent ubiquity of this unfortunate culture, every department should engage in active exploration and introspection of where and how this may be occurring.23

5. Updated recruitment goals
   - 30% of all neurosurgical trainees are women by 2030
   - 30% of practicing neurosurgeons are women by 2038

We further propose specific recommendations, outlined in Table, with efforts targeting improvements in areas surrounding (1) mentorship (2) parental leave policies, (3) compensation equity, and (4) harassment policies. This growth requires substantial cultural shift that we believe will benefit all neurosurgeons. As a neurosurgical community, we must make active efforts to adapt to the shifting workforce emphasis on work-life balance and burnout avoidance in a way that is inclusive and yet does not sacrifice our culture of excellence.

CONCLUSION

The act of caring for neurosurgical patients is a privilege afforded to few. The future of our field depends on our ability to recruit and retain the talent required to advance our field, regardless of gender. Although we have made great strides over the past decade, we hope the next decade will bring us closer to creating and maintaining a balanced workforce, where women in neurosurgery will not only survive but thrive. These gains will not be made without targeted change in addressing critical, systemic barriers starting with emphasis on mentorship, elimination of sexual harassment in our workplaces, the cultivation of parental leave policies, and attention to wage equity.

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