

A comprehensive evaluation of career trajectories of the American Association of Neurological Surgeons William P. Van Wagenen fellows

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ABSTRACT

Objective: To elucidate the current academic, demographic, and professional factors influencing the career trajectories of the American Association of Neurological Surgeons (AANS) William P. Van Wagenen (VW) fellows while also identifying trends that may influence future fellow selection.

Methods: Fifty-five VW fellows were identified from 1968 to 2022 from the AANS website, along with corresponding institutions, countries, and continents of study. Additional variables such as age at selection, accruing additional degrees, neurosurgical subspecialty, the number of publications at the time of selection, funding, and h-index were collected from various publicly available sources.

Results: Eighty-five percent of VW fellows were male and had a mean age of 34 ± 2.4 years. Ninety-one percent of fellows chose to study in Europe, and 40% had earned additional degrees. Univariate linear regression demonstrated a positive relationship between the year of selection and both age at selection ($p = 0.0094$) and the number of publications at hire ($p < 0.001$), while logistic regression revealed that more recently selected fellows were less likely to study in Europe ($p = 0.037$) and be of the white race ($p = 0.0047$). Logistic regression also exhibited a positive trend between the year of selection and both the likelihood that the VW fellow was currently enrolled in another fellowship ($p = 0.019$) and possessed additional degrees ($p = 0.0019$). Females were shown to have fewer publications at hire compared to males ($p = 0.04$).

Conclusions: Most Van Wagenen fellows are academically productive members of the neurosurgical community. Increased attention is likely to be placed on both academic, research, and individualized factors when selecting future fellows.

1. Introduction

In 1927, the American Association of Neurological Surgeons (AANS) co-founder and first president, William P. Van Wagenen, embarked on his year of research training in Europe following encouragement from his mentor, Harvey Cushing.¹ During that time, Van Wagenen studied under professor Walther Spielmeyer in Munich, Germany, before traveling to what was then Breslau, Germany, to work under professor Ottfrid Förster.¹ This year of intense laboratory study allowed Van Wagenen to elucidate the cell of origin of meningiomas² and kindle his interest in epilepsy surgery.¹ For the remainder of his life, Van Wagenen reflected positively on his experience in Europe and, upon his death, established a fund for future neurosurgeons to have similar experiences.¹

The William P. Van Wagenen (VW) Fellowship was established in 1968 and has supported over 50 young neurosurgeons who wished to engage in scientific enrichment programs outside the United States.³ The fellowship is considered to be one of the most prestigious awards and scholarships granted by the AANS. The VW fellowship was created with few stipulations regarding funding, enabling one young talented investigator to study where and how they thought best annually or biennially.^{3,4} Thus, neurosurgeons with varied interests and goals have studied at a manifold of international institutions since its establishment. Historically, the VW fellowship has supported senior neurosurgical residents to conduct basic science and clinical research in Europe upon their graduation.³

To date, there exist comprehensive analyses of neurosurgical chairs,⁵ residents,⁶ program directors,^{7,8} international medical graduates

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(IMGs),⁹ and others in the field of neurosurgery^{10–12}; however, only a single study has been conducted to analyze the academic and career characteristics of past VW fellows,¹³ while the influences demographic attributes play on fellow career trajectory and trends that may influence future fellow selection have not been investigated. Given the unique experiences and the impact of the fellowship, VW fellows represent potential future leaders in the field. Therefore, the aim of this paper was to elucidate career trajectories, selection factors, and attributes of the VW fellows to provide a model for young neurosurgeons and trainees interested in research and academic neurosurgery and to further build on prior studies focusing on this special group.

2. Materials and methods

2.1. Fellow and variable selection

Fifty-five VW fellows selected from 1968 to 2022 were identified using the AANS website (<https://www.aans.org>). The included variables were years of selection; the institution, country, and continent of study; the number of institutions studied at; age, gender, and race; additional degrees; current institution; institution at hire; current academic rank; academic rank at selection; country of medical school education (United States or international); neurosurgical subspecialty; the total number of publications, number of publications at hire; h-index; the average number of publications per year; the number of active research years; whether VW fellows became chairs, residency program directors, or presidents of either the AANS or Congress of Neurological Surgeons (CNS); history of National Institutes of Health (NIH) funding; total NIH funding amount; and number of R01 grants received.

2.2. Data collection

Sex, current institution, the institution at hire, current academic rank, academic rank at hire, country of medical school education, additional degrees, and whether fellows became chairs were all ascertained by corroborating Doximity profiles (<https://www.doximity.com/>), departmental websites, online curriculum vitae, and publicly available newsletters and articles. Age at selection was determined using the Healthgrades database (<https://www.healthgrades.com/>) and various publicly available newsletters and documents. The race was recorded using available fellow biographies and was reported as a binary classification of white or non-white. This was done to reduce classification errors and avoid inaccurate reporting.

Neurosurgical subspecialty was determined using the AANS “Find a Neurosurgeon” (<https://www.aans.org/en/Patients/Find-a-Neurosurgeon/>) tool or by identifying a focused fellowship using Doximity profiles, departmental websites, and online curriculum vitae. The AANS “Find a Neurosurgeon” tool, Doximity profiles, online curriculum vitae, and departmental websites were employed to determine whether a fellow had accrued one or more additional degrees. If no subspecialty could be identified, the subspecialty was recorded as “general.”

Total publications and h-index were collected using the Scopus Database (<https://www.scopus.com/>). The active research years were approximated by summing the years between the first recorded scientific publication and the most recently published scientific work. These data were collected from the Scopus database when available and from PubMed (<https://pubmed.ncbi.nlm.nih.gov/>) in all other instances. The average number of publications per year was calculated by dividing the total number of publications by the number of active research years for each fellow. This variable served to correct for differences in the time fellows have spent researching and permit accurate comparison of fellows with differing career lengths. The NIH RePORTER database (<https://reporter.nih.gov/>) was used to determine whether fellows had ever received NIH funding, the total amount of funding received, and the number of R01 grants received.

2.3. Statistical analyses

Means are presented with accompanying standard deviations (SDs), while medians are presented with interquartile ranges (IQR). All continuous variables were assessed for normality using the Shapiro–Wilks test, and the Wilcoxon Rank–Sum test was used to analyze all continuous variables. Categorical variables were all assessed by Fisher’s exact tests. When categorical and continuous variables were compared across more than two groups, the Kruskal–Wallis test was employed.

To assess how VW fellow selection has changed over time, categorical and continuous variables were subjected to univariate logistic and linear regression models, respectively. Regression variables were assessed for normality, heteroscedasticity, and linearity prior to regression modeling and were only included if the assumptions were met. Regressions models analyzed how selected variables changed over time by using each fellow’s data as a data point for their respective year, permitting temporal analysis and identification of trends over time that may influence future fellow selection. Linear regressions are reported with R-squared (r^2) and Beta values (β), while logistic regressions are reported with McFadden’s pseudo-R-squared (pR2) values and Odds ratios (ORs). The threshold for significance was set at $\alpha = 0.05$. All statistical analysis was performed using *r* (version 4.2.0, *r* Foundation for Statistical Computing, Vienna, Austria).

3. Results

3.1. VW fellow characteristics

The average age of VW fellows was 34 ± 2.4 years, and 85.5% ($n = 47$) were male. Eleven percent ($n = 6$) were international medical graduates (IMGs), and 77.4% ($n = 41$) were white. Of the 55 analyzed VW fellows, 90.9% ($n = 50$) chose to study in Europe while 5.5% ($n = 3$) studied in North American countries outside of the United States and 3.6% ($n = 2$) studied in Oceania. Thirteen countries were selected as study locations (Fig. 1) with the United Kingdom (23.7%, $n = 14$), Germany (18.64%, $n = 11$), Sweden (16.95%, $n = 10$), and France (13.56%, $n = 8$) being the most common countries of study. VW fellows chose a total of 56 unique institutions to pursue research with the most common being the Karolinska Institute in Sweden (7.3%, $n = 4$) followed by University of Toronto, Queen’s Square, and The Institute for Neurological Sciences in the United Kingdom (3.6%, $n = 2$). While 90.9% ($n = 50$) studied in a singular location, 5.45% ($n = 3$) decided to study in two locations and 1.8% ($n = 1$) studied in three locations.

VW fellows were selected from 31 different institutions, with University of Pittsburgh Medical Center (UPMC) being the most common home institution of VW fellows (11%, $n = 6$). Other institutions that produced multiple VW fellows included Washington University, Yale University, Stanford University, Massachusetts General Hospital, and the University of California, San Francisco (5.45%, $n = 3$ each). Eighty-four percent ($n = 44$) of VW fellows were selected when they were residents, and 16% ($n = 8$) were undertaking fellowships of another type when they were awarded the VW fellowship. Of those undertaking another fellowship at the time of selection, 25% ($n = 2$) were enrolled in enfolded fellowships while the rest pursued fellowships post residency.

A total of 40% ($n = 22$) of VW fellows earned additional degrees (Fig. 2), with the most common being a Ph.D. (29.1%, $n = 16$). As of November 2022, 76% ($n = 42$) of VW fellows remained in academic practice. Of that 76%, 62% ($n = 26$) achieved the rank of professor, while 19% ($n = 8$) and 16.7% ($n = 7$) were associate and assistant professors at the time of investigation, respectively. Twenty percent ($n = 11$) of VW fellows held the rank of chair at some point in their careers, while 9% ($n = 5$) served as presidents of the CNS and 1.8% ($n = 1$) served as an AANS president. Additionally, 3.6% ($n = 2$) served as residency program directors during their careers. VW fellows that remained in academics represented 32 institutions, with the University of Minnesota (7.3%, $n = 4$) and the University of California, San Francisco (5.45%, $n = 3$)

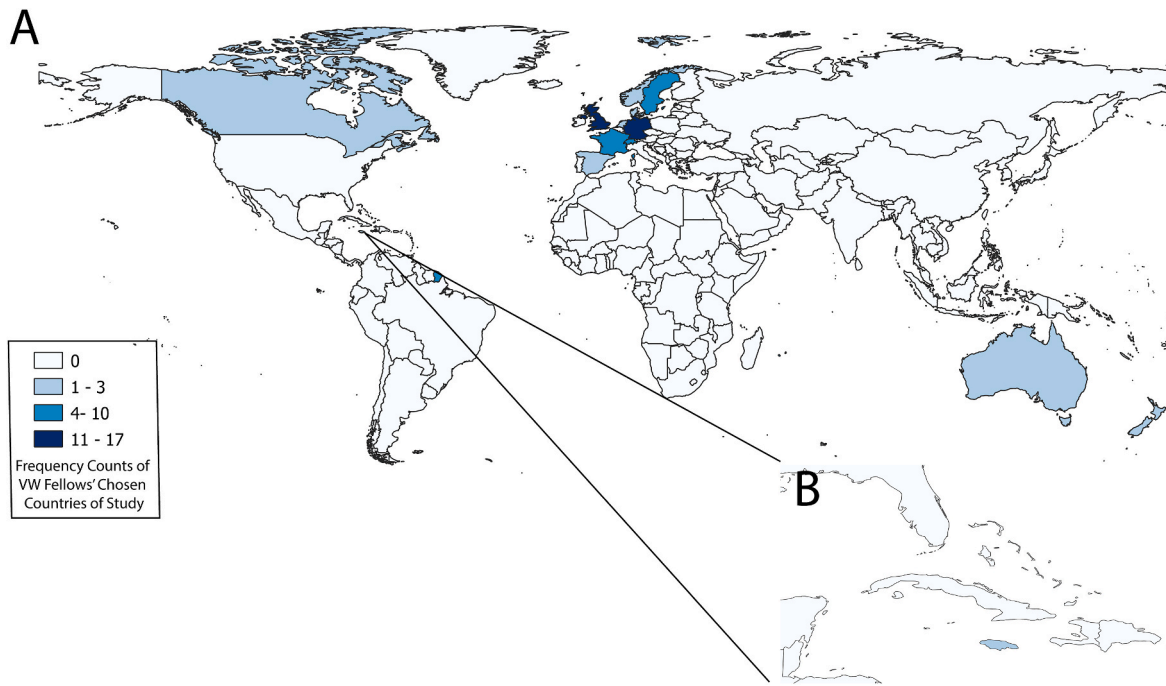


Fig. 1. A) World map depicting the frequencies of VW fellows' chosen country of study. B) Enhanced image to enable visualization of Jamaica.

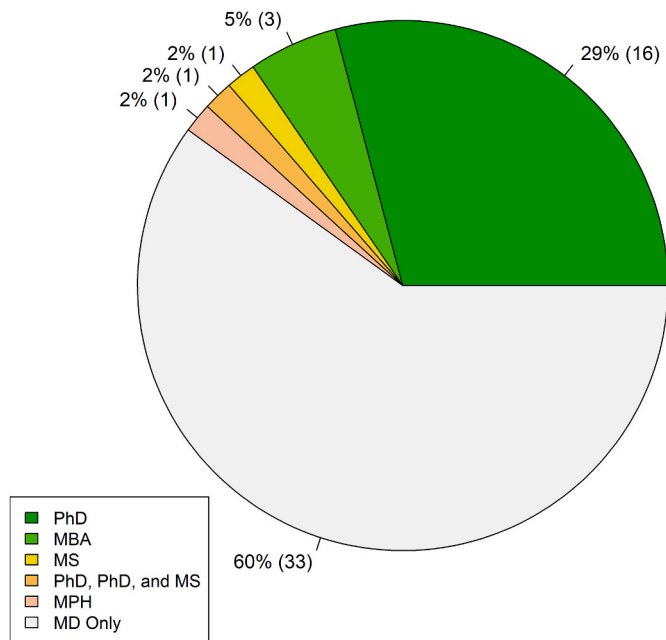


Fig. 2. Pie chart illustrating the proportions (counts) of additional degree(s) accrued by VW fellows.

= 3) being the most common institution of current practice. The most common subspecialty pursued by VW fellows was functional/epilepsy surgery (20%, $n = 11$), followed by neurosurgical-oncology and general neurosurgery (17%, $n = 9$), with spine/trauma, pediatrics, skull base, vascular, and peripheral nerve surgery all pursued less frequently (Fig. 3).

VW fellows have an average of 26.8 ± 12.5 years of active research and a median of 67 (IQR = 28.5–145.5) total publications. The median h-index for the cohort was 21 (IQR = 12–44.5) and an average of 3.8 publications per year. NIH funding was granted to 23.6% ($n = 13$) VW fellows at some point in their careers with median funding of \$713,927

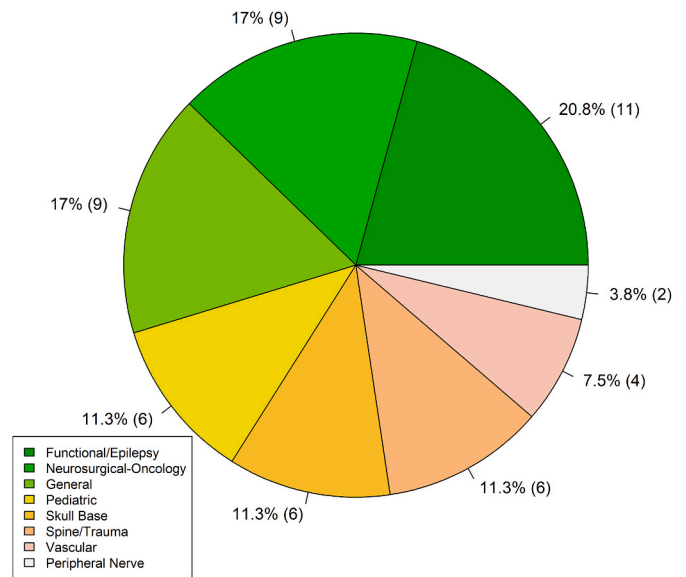


Fig. 3. Pie chart illustrating the proportions (counts) of subspecialty choices of VW fellows.

(IQR = \$377,995–\$899,389). Of the 13 VW fellows who received NIH funding, three received R01 grants, and the number of R01s received ranged from 4 to 25.

3.2. Temporal trends in VW fellow selection

To determine how the selection of VW fellows has changed over time and what factors may play a salient role in the selection of future fellows, we modeled several variables using regression analysis. Linear regression was employed to analyze continuous variables potentially influencing VW fellow selection. A positive linear relationship between the year of selection and both age at selection ($p = 0.0094$, $r^2 = 0.12$, $\beta = 0.058$) and the number of publications at hire ($p < 0.001$, $r^2 = 0.27$, $\beta =$

0.51) was observed. The average number of publications per year was also analyzed using linear regression but was not significant (Table 1).

Logistic regression demonstrated that VW fellows selected more recently were significantly more likely to hold additional degree(s) ($p = 0.0019$, $pR2 = 0.16$, $OR = 1.07$) and be enrolled in another fellowship at the time of appointment ($p = 0.019$, $pR2 = 0.18$, $OR = 1.09$). Additionally, more recent VW fellows were less likely to be of the white race ($p = 0.0047$, $pR2 = 0.21$, $OR = 0.91$) or to have selected to spend their year of fellowship in Europe ($p = 0.037$, $pR2 = 0.22$, $OR = 0.89$). Logistic regression was also employed to examine how VW fellows' gender, country of medical school education, and subspecialty choice have changed over time, but none were significant (Table 1).

3.3. Effects of country of fellowship on VW career attributes

To determine whether studying in a specific location correlated with lasting effects on fellow careers, we selected the top four countries of study (United Kingdom, Germany, Sweden, and France) along with a group of fellows who studied in other countries and compared them. Variables including average publications per year, h-index, NIH funding, NIH funding amount, number of R01s received, age at selection, subspecialty choice, whether the fellow held additional degrees, and publications at hire were all analyzed, but none were significant.

3.4. Subspecialty influences on VW fellow characteristics

Similarly, subspecialty choices were analyzed to determine whether they influenced the career attributes of VW fellows. Analysis revealed that subspecialty focus had no significant effect on VW fellow age at selection, average publications per year, h-index, likelihood of holding additional degrees, likelihood of receiving NIH funding, total funding amount, number of R01 grants received, or likelihood of entering non-academic practice.

3.5. IMG status and gender effects on VW fellow characteristics

Given that most VW fellows have been American males, we aimed to analyze how gender and IMG status have affected VW fellow academic and career attributes. Analysis revealed that IMGs, when compared to their non-IMG colleagues, were more likely to have additional degrees ($p = 0.03$, 83.33% vs. 35.41%) and be enrolled in another fellowship at the time of selection for the VW fellowship ($p = 0.04$, 50% vs. 10.8%); however, the mean age of selection IMGs did not differ from their non-IMG colleagues (35.3 vs. 33.9 years). Additionally, h-index (21.3 vs. 30), publications at hire (17.6 vs. 11.8), average publications per year (3.2 vs. 3.9), and decision to enter non-academic practice type (16.7% vs.

22.9%) did not differ between the two groups.

Gender analysis demonstrated men had a significantly higher mean h-index ($w = 257.5$, $p = 0.049$, 31 vs. 15.6) and average publications per year ($w = 256$, $p = 0.04$, 4.1 vs. 1.8) compared to women. Male and female VW fellows did not differ significantly in likelihood of holding additional degrees, number of publications at hire, age at selection, or decision to enter non-academic practice.

4. Discussion

4.1. Study findings

This study aimed to determine the effect of IMG status, race, and sex on VW fellow attributes and determine which trends—academic, demographic, or career—may impact future fellow selection of AANS VW fellows using existing data. Logistic regression revealed that more recently selected VW fellows were more likely to hold additional degree(s) ($p = 0.0019$) and be enrolled in another fellowship at their time of selection ($p = 0.019$) and were less likely to be of white race ($p = 0.0047$) or to have chosen to study in Europe ($p = 0.037$). Linear regression also demonstrated that age at selection ($p = 0.0094$) and publications at hire ($p < 0.001$) increased over time. Additionally, IMGs were shown to have an increased likelihood of holding additional degree(s) ($p = 0.03$) and being a fellow at the time of selection ($p = 0.04$). At the same time, on average, men were demonstrated to have higher h-indexes ($p = 0.049$) and average publications per year ($p = 0.04$). Neither country of study nor subspecialty choice had any detectable effect on the career trajectories and attributes of VW fellows.

4.2. Increased diversity of VW fellows and study locations over time

Increasing academic attributes were not the only trend observed over time. Both the proportion of VW fellows spending their fellowship outside of Europe and the number of non-white fellows has increased over time with the first non-European center of study chosen after the year 2000. The decreasing popularity of Europe as a study destination likely involves changing attitudes towards academic institutions outside of Europe. While studying outside Europe has increased, fellows still always choose to study in the western world, likely due to functional barriers such as language. Indeed, in recent years VW fellows have chosen to study in Australia, New Zealand, and Jamaica, suggesting that these locations have equally prestigious advanced centers as the more established European institutions.

Academic neurosurgery in the United States has been putting more emphasis on diversity, equity, and inclusion of minorities in the field. Recent neurosurgical residency cohorts have exhibited observable

Table 1
Regression model analysis results. IMG=International medical graduate, n/A = Not applicable.

Variable	Regression Type	Test Statistic	p-Value	R-Squared	Beta	Odds Ratio
Studied in Europe	Logistic	-2.086	0.037	0.22	n/A	0.89
White Race	Logistic	-2.823	0.0047	0.21	n/A	0.91
Additional Degrees	Logistic	3.099	0.0019	0.16	n/A	1.07
Male Sex	Logistic	-0.799	0.425	0.014	n/A	0.98
IMG Status	Logistic	1.401	0.161	0.059	n/A	1.05
Fellow at Appointment	Logistic	2.345	0.019	0.182	n/A	1.09
Subspecialty	Logistic					
Vascular		0.328	0.743	0.0038	n/A	1.01
Functional		0.892	0.373	0.015	n/A	1.02
Pediatric		0.623	0.533	0.010	n/A	1.02
Skull Base		-0.325	0.745	0.003	n/A	0.99
Spine/Trauma		-1.242	0.214	0.044	n/A	0.96
Peripheral Nerve		0.839	0.402	0.047	n/A	1.05
Neurosurgical-Oncology		0.282	0.778	0.002	n/A	1.01
General		-1.091	0.275	0.03	n/A	0.97
Age at Selection	Linear	7.34	0.0094	0.12	0.058	n/A
Publications at Hire	Linear	21.16	<0.001	0.27	0.51	n/A
Average Publications per Year	Linear	0.012	0.91	-0.02	-0.004	n/A

increases in non-white matriculants.¹⁴ Similarly, the VW fellows have reflected this in recent years; however, it must be noted that both black and Latino residents are severely underrepresented in the overall field,¹⁴ as well as the VW fellow cohort, though the proportion of non-white VW fellows is comparable to proportions in the field as a whole. Taken together, academic neurosurgery appears to be growing more diverse and inclusive, and the VW fellowship appears to be following this trend.

4.3. Gender discrepancies and female VW fellow research output

The current study demonstrated that female VW fellows had lower h-indices (31 vs. 15.6) and, when corrected for years of practice, lower average publications per year (4.1 vs. 1.8) compared to their male colleagues. While there was inadequate sample size to permit analysis, it was noted that none of the female VW fellows received NIH funding. It may be suspected that these differences may arise from women VW fellows being selected more recently; however, logistic regression suggested that the number of female VW fellows has not increased over time ($p = 0.425$). Indeed, the rate of women VW fellows has remained relatively constant with one of the first fellows ever selected being female. Rather, historical gender disparities may explain these discrepancies within the field of neurosurgery. Women make up only 8% of United States neurosurgeons,¹² 12% of current neurosurgery residency program directors,⁷ and five have been selected as chairpersons.¹⁵ Women are less likely to be promoted to full professorship and other leadership positions than males.^{12,16} The lower rate of promotions for female neurosurgeons may partially explain why female VW fellows have lower h-indices, as years of active research did not differ significantly between males and females and increasing academic rank tends to enable more prolific publishing. It should also be noted that while the proportion of female neurosurgeons has been increasing over time,¹² this trend was not mirrored by the VW fellows. Such a finding could have numerous explanations, thus further study is required to make any definitive claims. Together, these data call for an increased attention toward making neurosurgical research appointments accessible to those interested regardless of their sex.

4.4. IMG competitiveness

Similar to more recently selected VW fellows, IMGs were more likely to have accrued additional degree(s) and to have been enrolled in another fellowship at the time of selection for the VW fellowship. Given that IMGs must often meet higher standards to secure a residency position in the United States,^{9,17} it is unsurprising that they would choose to pursue additional education to strengthen themselves as applicants. IMGs are more likely to enter academic neurosurgery,¹⁷ where additional degrees play a significant role in securing promotions.^{5,7} Likewise, academic neurosurgery has trended towards increasing specialization,¹⁸ potentially explaining the increased proportion of IMGs enrolled in fellowships at the time of selection. Given their proclivity for academics and the heightened standards they must meet, IMGs may find themselves more competitive applicants for the VW fellowship award; however, given their previous experience with medical research outside of the United States, they may be less likely to elect to spend an additional year conducting research.

4.5. Research focused centers produce VW fellows at higher rates

This study noted that many of the VW fellows were selected from institutions that have historically placed a large emphasis on research as a component of neurosurgical training. Indeed, many programs such as University of Pittsburgh, Massachusetts General Hospital, and University of California, San Francisco now have devoted research years built into their training program to help foster research competency in neurosurgical trainees. Additionally, many of the departments that housed multiple VW fellows are among the top departments in the

United States for research output as measured by aggregate faculty h-index with University of Pittsburgh and University of California, San Francisco being two of the top five most generative programs.⁵ These data suggest that an increased attention to research during residency may influence young neurosurgeons to pursue prestigious fellowships such as the esteemed Van Wagenen fellowship; however, given the low sample size, the effect size a fellow's residency institution plays cannot be definitively determined. This attention to academic excellence appears to follow most VW fellows throughout their careers, as the average h-indices of VW fellows at each academic rank is higher than the average for all United States neurosurgeons also holding that rank.¹³ Taken together with the observation that over 70% of VW fellows remain in academics, it seems likely that both the fellowship itself and the residency from which fellows are selected prepare VW fellows for a robust career in academic neurosurgery.

4.6. Increased academic competitiveness among VW fellows

The VW fellowship has supported neurosurgical research for over fifty years, during which time the field of academic neurosurgery has changed dramatically; thus, it should be expected that the selection of VW fellows should mirror the changes observed in the field. Given the increased emphasis on research and surgeon-scientists throughout the field in recent years,^{7,19,20} it is unsurprising that over time the number of publications at selection has increased for VW fellows. Likewise, increased competitiveness and changing dynamics of the field have influenced many academic neurosurgeons to pursue additional degrees,^{5,7} a trend also observed in VW fellows.

Academic factors are not the only trends that increased in VW fellows over time; in recent years, selected VW fellows were more likely to be enrolled in other fellowships rather than pursuing the VW fellowship immediately following residency, reflecting the high competitiveness of academic neurosurgery nowadays. Increasing subspecialization is not unique to VW fellows; rather, the field of academic neurosurgery has seen increased enrollment in fellowships since the early 2000s and likely reflects increasing sophistication of operative strategies and techniques.¹⁸ Therefore, this finding likely mirrors a trend observed in neurosurgery as a whole. As academic neurosurgery becomes increasingly technical, sub-specialization is only likely to grow, and it is reasonable to speculate that additional research endeavors will follow. If the observed trajectory of academic neurosurgery continues, VW fellows will likely have to accrue additional degrees and clinical expertise through additional fellowships while also increasing their research output to remain competitive. These trends are complimented by a trend demonstrating that VW fellows are being selected at increasingly older ages. Such a finding is logical and is supported by the increasing amount of training VW fellows have elected to pursue in recent years. The observation that increasing numbers of VW fellows are selected from non-enfolded fellowships argues that training time is vital to being selected as a VW fellow; however, nine years of training along with the task of relocating internationally for an entire year may be dissuasive to many competitive applicants. Additionally, while funding is currently \$120,000 and covers various expenses,³ competitive applicants may sacrifice academic opportunity in favor of beginning their careers as attending physicians, thus limiting potential applicants.

4.7. Country of study and subspecialty do not influence career trajectories

While many other factors influenced VW fellows' career trajectories and selection process, the country of study and neurosurgical subspecialty played no role in either. Despite certain countries being selected for study at a higher rate, no difference between VW fellows was noted based on where they chose to study. Indeed, study location likely serves to satisfy fellow preference and goals rather than to offer any long-term career benefits.

While previous reports note that functional neurosurgeons tend to

pursue research most frequently,¹⁸ they did not represent a significantly higher proportion of VW fellows, nor did they outperform any other subspecialty in terms of research metrics. Indeed, regardless of subspecialty choice, all VW fellows tended to continue to produce research at similar rates for an average of 26.3 years of their careers, and nearly 80% of the cohort remained in academics. This long-term devotion to research likely explains why many of the fellows have gone on to become department chairs (20%), full professors (60%), and presidents of the field's most prominent societies (9%).

The VW fellowship was established on the foundation of promoting innovation and research, whether clinical or basic science. These data are encouraging, as they verify that the mission of Dr. Van Wagenen has been preserved throughout the years. The fellowship was established to ensure that young neurosurgeons pursue research without restriction; therefore, future VW fellows need not feel pressured to pursue their interests and begin cultivating an enriched academic career. Given the renown garnered by the VW fellowship and its recipients, a need exists to elevate this award to a status more reflective of its esteem. Just as both Rhodes and Fulbright scholarships carry with them the veneration achievable only through a lifetime of academic pursuit, so too does the VW fellowship, thus a renaming to the Van Wagenen Scholarship seems an appropriate step forward for the AANS and its future fellows.

4.8. Limitations

This study, while conducted meticulously, is not without limitation. Mainly, the study suffers from small sample size, especially for subgroups such as women and IMGs, thus limiting analysis. Additionally, given the age of the fellowship, some data was unavailable for the more senior fellows, limiting analysis power.

5. Conclusions

The findings from this study corroborate with the vision of Dr. Van Wagenen and his fellowship to promote research and build academic careers among young neurosurgeons. William P. Van Wagenen fellows have exhibited a trend of accruing additional degrees and increasing research output prior to selection. Fellows have also shown increased diversity both racial background as well as their choice of study location. Knowledge of the attributes and career trajectories of the VW fellows may help future young neurosurgeons and trainees interested in the fellowship prepare early for their future in academic neurosurgery and research pursuits. Given its renown, the VW fellowship should be elevated to the rank of other nationally and internationally recognized scholarships such as the Fulbright and Rhodes scholarships.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Abbreviation List

AANS =: American Association of Neurological Surgeons
 β =: beta
 CNS =: Congress of Neurological Surgeons
 IMG =: International Medical Graduate
 IQR =: Interquartile Range
 NIH =: National Institutes of Health
 SD =: Standard Deviation
 OR =: Odds Ratio
 pR2 =: Pseudo R-Squared
 R2 =: R-Squared
 VW =: Van Wagenen