

FACTORS INFLUENCING THE MEDICAL STUDENT'S INTEREST AND CAREER CHOICE IN NEUROSURGERY

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Abstract

Objective: To determine the factors influencing interest and a career choice in neurosurgery among final year medical students.

Methodology: A mixed method study was conducted where primary data was collected from 120 final year medical students and three neurosurgery consultants in the University of Ghana Medical School, using quantitative cross-sectional study and qualitative Delphi panel study methods, respectively. The main study outcome was the choice of Neurosurgery as a specialty.

Results: About 90% of the students expressed interest in neurosurgery. Interest in neurosurgery (70%) and the will to make an impact in the specialty (75%) were the

top factors for the 13.8% of students who said they would apply for neurosurgical residency, while the long duration of training deterred 63% of respondents. The students had poor exposure to the clinical aspects of the specialty. Practicing neurosurgeons placed a high premium on student interest in the field.

Conclusion: To build interest among medical students to enter neurosurgical residency programs, students should be given more contact hours during their neurosurgery rotations, and neurosurgical mentorship programmes should be established in medical schools to give medical students insight into the typical life of practicing neurosurgeons.

Key words: Neurosurgery, career choice, medical students, Sub-Saharan Africa, residency.

Introduction

Sub-Saharan Africa suffers from a lack of qualified neurosurgeons and well-equipped neurosurgical facilities, despite a high demand. With a neurosurgeon-to-population ratio of 1:1,240,000 it is no surprise that only a minority of African neurosurgical patients have easy access to neurosurgeons available to serve them¹. Though there has been an increasing number of neurosurgeons in Ghana, the numbers are still not enough to meet the demand of the country's increasing population^{2,3}. These numbers emphasize the need to make the neurosurgical subspecialty more attractive to medical students to pursue by overcoming some of the barriers that deter them from considering a career in neurosurgery⁴.

Clinical knowledge and skills aside, medical students appear to have limited understanding of daily activities of neurosurgeons. This may result in negative attitudes and perceptions in the students concerning the field. A prospective study involving 60 medical students in their 3rd to 5th years of the Royal College of Surgeons in Ireland showed negative attitudes and perceptions towards neurosurgery, albeit well-founded⁵. Difficult work-life balance, long duration of residency, issues regarding adequate remuneration, likelihood of litigation and risk of burnout are other important factors

accounting for this trend of decreased neurosurgical pursuit in medical students⁶. Interestingly, some neurosurgeons report the highest percentage of job satisfaction compared to other surgical specialties, suggesting that these factors may be largely individual-specific or at least modifiable⁷. Some universities have improved the exposure of medical students to the professional, academic and personal lives of neurosurgeons by means of neurosurgical electives entered into existing curricula and neurosurgical interest groups. These have increased their overall neurosurgical turnouts^{8,9,10}.

This study thus sought to highlight factors influencing the choice of a career in neurosurgery among medical students at the University of Ghana Medical School as a means to determine ways to increase neurosurgical capacity in Sub-Saharan Africa.

Materials and Methods

A mixed method study was used, where a quantitative cross-sectional study and a qualitative Delphi panel study was conducted among final year medical students and neurosurgery consultants in the University of Ghana Medical School, respectively. Final year students were used as they were more likely to have decided on their specialty careers. Neurosurgical consultants were key to the study, having good knowledge of neurosurgery in Ghana and the professional, clinical, and personal demands of the specialty. This study design was chosen to ensure the critical input of these neurosurgeons and contrast findings from the students. Using the prevalence of medical graduates who choose neurosurgery as their long-term career specialty of 0.8%

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in a UK national survey due to limited data on such statistics in West Africa,¹² a sample size of 113 medical students was calculated using the Cochran’s formula $Z^2(pq)/e^2$ at a confidence level of 95% and margin of error 0.01. A sample size of 120 medical students was therefore used for the quantitative aspect of this study to offset anticipated non-response¹³. These were selected from the final year class list of 178 students by the Simple Random Sampling method using a Random Digit Table generated by Microsoft Excel® software. A self-administered questionnaire (Questionnaire 1) created using Google Forms online platform was distributed via WhatsApp® to the sampled students. With the aid of personal reminders, all participants completed the survey within 2 days.

Three neurosurgery consultants, out of 6 working with the University of Ghana Medical School and Korle-Bu Teaching Hospital, were included in the study as experts for the Delphi panel for the qualitative aspect of the study. These were selected by convenience. An entirely open-ended questionnaire (Questionnaire 2) was created using the Google Forms online platform and mailed to them via Google Mail. The Delphi panel was run for 1 round.

Data Analysis

The main study outcome was the choice of neurosurgery as a specialty, explained by variables ‘student interest in neurosurgery’, ‘student exposure to neurosurgery’, and the ‘push-or-pull factors’ surrounding the specialty which influence the medical student. ‘Student interest’ was measured using a Likert scale with three statements (questionnaire 1: section B). The responses from the Questionnaire 1 were cleaned and the quantitative data analyzed using the Windows Excel software and the Statistical Package for the Social Sciences (SPSS) software. Percentages were used to summarize the categorical data. The Pearson Chi-square test was used to determine the strengths of associations (p -values < 0.05) between the choice of neurosurgery and other factors.

The data was presented using graphs and tables. Questionnaire 2 was aimed at qualitatively assessing the explanatory variables from the perspective of practicing neurosurgeons. The neurosurgeons were not limited in the length and style of the opinions and answers they provided. The qualitative data was analyzed by thematic analysis using the triangulation method to establish themes. Boxed displays were used to present the qualitative data.

Ethical Considerations

Ethical approval for the study was obtained from the Korle-Bu Teaching Hospital Institutional Review Board (protocol approval number: KBTH-STC/IRB/0038/2020). Participation was entirely voluntary.

Results

Socio-Demographics

Of the 120 medical students selected for the study a total of 116 medical students in final year completed Questionnaire 1 (response rate of 96.7%). The mean age of the participants was 23.8 years (range: 21-34 years, SD 1.5). The male-to-female ratio was 1.04:1. Five (4.3%) were married, engaged, or living together; and the rest were all single.

Interest in Neurosurgery

About 90% of the medical students were interested in neurosurgery in the clinical years. There was a statistically significant association between interest in neurosurgery and the choice to apply for neurosurgical residency (Table 1). 84.5% had interests in other specialties before their neurosurgical rotations. (Fig 1).

Table 1. Associations between Variables and the Choice to Apply for Neurosurgical Residency

Variable	Choice to apply for neurosurgical residency	
	Pearson Chi-square value	p-value
Interest in Neuroscience	13.238	0.034
Interest in Neurosurgery	13.228	0.040
Adequacy of neurosurgical teaching	5.177	0.521
Pure interest in Neurosurgery	46.390	0.000
Little time spent with Neurosurgery	23.118	0.000

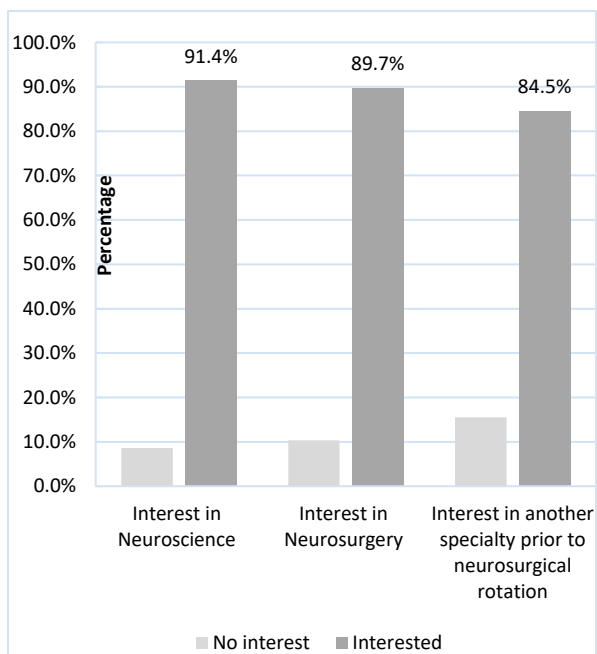


Figure 1. Interest in Neuroscience lectures and Neurosurgical clinical rotations

Exposure to Neurosurgery

Although 76.7% of the students believed their neurosurgery teaching was adequate, more than half of them agreed that they found it difficult obtaining neurosurgical histories and eliciting clinical signs from patients. Thirty-nine percent of the students had never spent time in the neurosurgical theatres. Nearly all of them (98.3 %) noted neurosurgery required a long training period and 91.4% felt that there were very few training facilities in Ghana. (Table 2).

Table 2. Exposure of Medical Students to Neurosurgery

Items	Disagree (%)	Agree (%)
My neurosurgery teaching is adequate	27(23.3)	89(76.7)
It is difficult to obtain a neurosurgical history	40(34.5)	76(65.5)
It is difficult to elicit neurosurgical signs	57(49.1)	59(50.9)
Neurosurgical conditions are complicated	19(16.4)	97(83.6)
Most neurosurgical conditions have poor outcomes	16(13.8)	100(86.2)
I have spent time in the neurosurgical theatres	70(60.3)	46(39.7)
Neurosurgery requires a long training period	2(1.7)	114(98.3)
Neurosurgery is a physically and emotionally draining specialty	9(7.8)	107(92.2)
Neurosurgery faculty are friendly and collegiate	5(4.3)	111(95.7)
Huge prestige and income are attached to neurosurgery	5(4.3)	111(95.7)
Neurosurgeons have poor work-life balance	33(28.4)	83(71.6)
It is difficult to be a neurosurgeon and have a family	51(44.0)	65(56.0)
There are very few neurosurgery training facilities in Ghana	10(8.6)	106(91.4)
The Ghanaian neurosurgeon has limited job opportunities	60(51.7)	56(48.3)

The Choice of ‘Neurosurgery’ or ‘Not Neurosurgery’

In all 16 final year medical students (13.8%) said they will apply for neurosurgical residency after school. Of these three students (18.8%) planned on training in a foreign country. 14 of the students (12.1%) were not sure whether they would choose to do neurosurgery or not. All students married, engaged or living together chose not to apply for neurosurgical residency.

Top Factors Influencing the Choice of Pursuing Neurosurgery

Seventy-five percent of students who chose to apply for neurosurgical residency did so because they thought they could make an impact in the specialty. About 56% saw the specialty as a good source of income. (Figure 2).

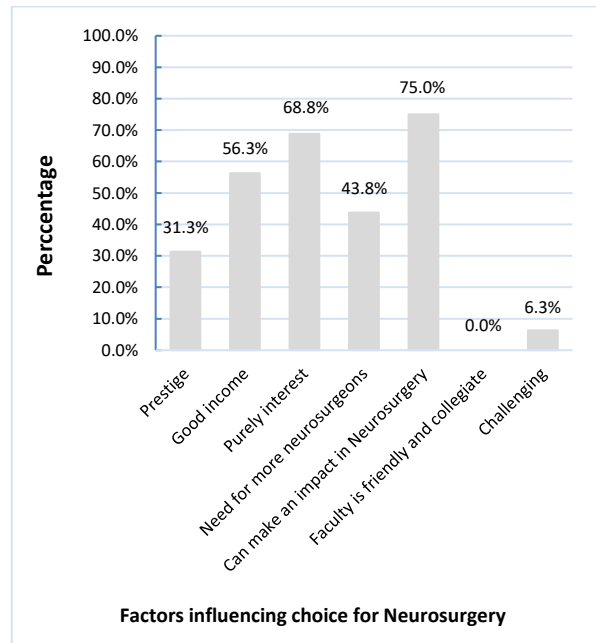


Figure 2. Top Factors Influencing the Choice for Neurosurgery

Of the respondents who chose not to apply for neurosurgical residency, 64.0% had already decided on another specialty, while 37.2% felt that too little time was spent during rotations in neurosurgery. About 63% said the period of training was too long, and 33.7% thought a neurosurgical career resulted in a poor work-life balance. (Figure 3).

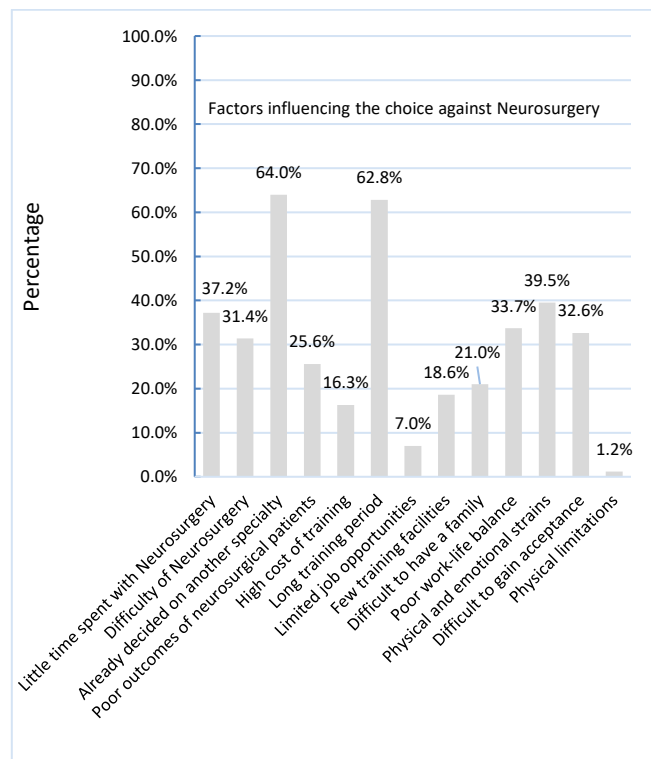


Figure 3. Top Factors Influencing the Choice Against Neurosurgery

Improving Medical Student Interest and Recruitment in Neurosurgery.

Each student suggested up to two ways they believed would best improve student interest and recruitment in neurosurgery. Nearly 40% of the responses focused on the need for more time to be allocated for neurosurgical rotations, including lectures, ward sessions, patient-clerking, and time to follow long-term clinical outcomes of patients. Only one response mentioned the need for earlier exposure to neurosurgery. (Table 3).

Table 3. Ways to Improve Student Interest and Recruitment in Neurosurgery

Ways to improve student interest and recruitment in Neurosurgery	Frequency of response (%)
Allocate more time for neurosurgical rotations	64 (38.8)
Organize Neurosurgery seminars for students	18(10.9)
Adopt a more practical approach to teaching	17 (10.3)
Improve residency factors	14 (8.5)
Faculty should be more friendly	12 (7.3)
Allow for more time spent in neurosurgical theatres	9 (5.5)
Increase remuneration and incentives	9 (5.5)
Increase training capacity	8 (4.8)
Better teaching of Neurosurgery	8 (4.8)
More emphasis and quality of Neuroscience lectures	4 (2.4)
Earlier exposure to Neurosurgery	1 (0.6)
Better integration with Neurology	1 (0.6)
<i>n (responses)=165(100)</i>	

Male-Female Imbalances in Neurosurgery

Of the 16 final year medical students who will apply for neurosurgical residency 6 (37.5%) were female. Most females (83.3%) chose not to apply because they believed it would be difficult to have a family as a neurosurgeon.

Assessing These Influencing Factors from the Perspective of a Practicing Neurosurgeon.

Two of the three neurosurgeon participants were able to answer the questionnaire 2 in this study. These neurosurgeons were of view that the student’s interest in neurosurgery is of sole and overriding importance over all other factors in making the choice to enter into the specialty.

“...though many factors influence one's choice of a specialty including duration, remuneration etc., the overriding factor is one's personal interest and capabilities.”
Participant 1

“Most students show a keen interest once they appreciate the importance of the rotation.”
Participant 2

They explained that medical students do not appreciate the challenge the specialty poses, viewing the specialty as too difficult and consequently barring themselves mentally from it.

“A lot of students are also not interested in challenging stuff as you may find elsewhere.”
Participant 1

“They see it as a difficult specialty as the basic science is not so attractive and the neurological exam/ neurological diseases are a bit far-fetched to identify with.”
Participant 2

They also expressed that being paid the same as colleagues in other specialty areas is a disincentive to some students.

“...same remuneration as other specialties who do less...”
Participant 1

“Some may not be comfortable with ... the fact that you get remunerated like everybody else.”
Participant 2

They expressed the need for Neuroscience in the pre-clinical years to be taught by practicing physicians and surgeons, and that mentorship sessions were key for any career choice in any specialty.

“There probably should be a neurosciences day where students can interact with clinical neuroscientists...”
Participant 1

“Mentorship is key. Medical school should help students about career choices by inviting relevant doctors to interact with students.”
Participant 2

“Neuro-anatomy and some of the neurosciences should be taught by clinicians- neurosurgeons and neurologists.”
Participant 1

“Practicing physicians should be enlisted to teach at the basic science level.”
Participant 2

Discussion

This study demonstrates a high level of interest in neuroscience among medical students, with more than 90 percent having interest in their pre-clinical neuroscience lectures. Similar to the study by

Kashkoush et al, it shows that this early interest fails to translate into neurosurgical residency applicants, revealing a sharp decline to the 14% who actually decide to apply for neurosurgical residency¹⁰. This sharp decline may be due to other competing specialties, with 64% of respondents choosing not to apply because they had already decided on another specialty. The association found between pure student interest and the choice to enter into neurosurgery ($p=0.00$) was reechoed by this quote from a neurosurgeon: “though many factors influence one's choice of a specialty including duration, remuneration etc., the overriding factor is one's personal interest and capabilities”, expressing that student interest is a key factor driving the medical student to choose neurosurgery. This study revealed that most medical students have an unfavorable disposition towards Neurosurgery as a specialty with over 90% indicating that the specialty was physically and emotionally draining. A study by Zuckerman et al. in 2016 showed that after students were exposed to the professional and personal lives of neurosurgeons these attitudes towards the specialty changed for the better⁸. Unlike in the study by Akhigbe & Sattar, where most medical students reported that their neurosurgical teaching was inadequate and that neurosurgical histories and signs were difficult to elicit, almost 80% of our study participants said their teaching was in fact adequate⁵. Few neurosurgical sessions may explain why perceived adequate teaching still left the students with difficulties in history-taking and examination. This premise supports that lacking exposure to the non-academic aspects of the specialty such as the work-life balance of a neurosurgeon may explain this poor disposition towards the specialty.

In all, 16 final year medical students (13.8%) reported that they will apply for neurosurgical residency. An interest in neurosurgery, which overrides the negative dispositions in these students, and their perceived adequacy of the neurosurgical teaching they have received may be the reasons for such a high percentage of the students opting for neurosurgery seeing as 70% of them chose the specialty purely based on interest. This supports the claim by Haggerty et al reporting neurological interest as necessary in increasing neurosurgical recruitment of medical students¹⁵.

About 45% of the students wanted to pursue neurosurgery as there is a need for more neurosurgeons in Ghana, and 75% did so because they believed they could make an impact in the specialty. These numbers represent students who similar to Dewan et al. have come to realize the acute need for more neurosurgeons in a middle-income country like Ghana and believe their contributions may change the face of neurosurgery in these countries. The increased neurosurgical demand, reflected by the West-African neurosurgeon-to-population ratio of 1:6,500,000, may serve to encourage more students to pursue the specialty¹⁴. The perceived benefits the specialty brings is another reason for some to apply into neurosurgical residency. Benefits include

better income and prestige. Indeed, about 56% of students chose neurosurgery because they believed it would be a good source of income. Surprisingly, the admissions by the neurosurgeons suggest that, barring private practices and supplemental income streams, the Ministry of Health-structured income is the same as that for other specialties in Ghana and that this may be a disincentive for students. In Canada, Wilson & Pugh identified financial remuneration as an important factor for students to be aware of⁸. Admittedly, none of these students chose neurosurgery because faculty was friendly and collegiate despite the general consensus that faculty actually was friendly (95.7%).

If it is safe to assume that such high numbers of medical students who will apply for neurosurgical residency exist in all Ghanaian medical schools, why then does Ghana suffer only few well-trained neurosurgeons? Perhaps only few ultimately get admitted into these residency programmes, emphasizing the need to expand training colleges for neurosurgery in Ghana. Nearly 75% of the final year medical students chose not to apply to match into neurosurgical residency. 64% of these students had already decided on another specialty. According to the literature, 23% of medical students would have decided on their specialties of choice by their second year in medical school¹⁵. The little time spent for Neurosurgical clinical rotations may then prove too little too late to change their minds.

As expressed in the study by Agarwal et al., the long duration of residency accounts much for the trend of decreased neurosurgical pursuit in medical students⁶. About 63% of students decided against the specialty on this account. Students in the study by Akhigbe and Sattar, invariably agreed that neurosurgery had a long training period and impeded family life⁵. This may be the reason why all students married, engaged or living together chose not to apply for neurosurgical residency. About 40% chose not to venture into a specialty where this very prospect may leave them overwhelmed. Over 30% chose against the specialty because they thought it too difficult, despite nearly 80% of respondents agreeing that their neurosurgical teaching was adequate. The neurosurgeon's quote, “A lot of students are also not interested in challenging stuff as you may find elsewhere” may explain this. In truth, only one student decided to choose neurosurgery as a career because it was challenging.

The most frequent suggestion by the students as a way to improve their interests and choice of neurosurgery was to allocate more time for the neurosurgical rotations. They expressed that they needed more time to experience the specialty by way of lectures, ward sessions and patient-clerking, and explained that this would mean enough time to see the outcomes of neurosurgical patients on the wards. This may be achieved by the fairly recent concept of neurosurgical electives implemented in already existing curricula to expose medical students to the professional and personal lives of neurosurgeons⁹. About 11 percent of responses

suggested Neurosurgery seminars and mentorship programmes as ways to humanize and publicize the specialty. This is supported by the neurosurgeon's submission, "Mentorship is key. Medical school should help students about career choices by inviting relevant doctors to interact with students." The University of Pittsburg increased their neurosurgical recruitment by establishing a neurosurgery interest group whose goals were to meet very similar demands, and to dismiss misconceptions regarding the work-life balance in a neurosurgical career¹¹. Interestingly, only one response pled for earlier exposure to neurosurgery. It would seem that the timing of exposure, though critical to foster early interests, is not a focal area needing improvement for these students.

The dominance of male neurosurgeons is observed all over Africa¹. In this study, three female students indicated that they will apply for neurosurgical residency for every five males who apply. A reason for this disparity may lie in the gender inequalities which exist in acceptance at residency, promotion and gaining leadership roles in the specialty⁸. Many more females (83.3%) chose not to apply because they believed it would be difficult to have a family as a neurosurgeon. It follows then that issues regarding self-development and family life in neurosurgery may be of more concern to female medical students than their male counterparts, and that these may be the reasons for the male-dominating outlook of the specialty.

Limitations

A larger study involving medical students at all levels and perhaps in different schools, and more practicing neurosurgeons, would have lended the study more generalizability. Although a high response rate of 96.7 percent was achieved for Questionnaire 1 with the help of reminders, the use of a mailed questionnaire to collect qualitative data from the neurosurgeons lacked the interactivity that comes with personal interviews. Future studies with comparable objectives and methods must ensure adequate study durations to accommodate the longer periods of data collection notable of web-based methods.

Conclusion

This study to determine the factors influencing the choice of a professional career in neurosurgery among final year medical students showed that medical students have high early interest in neurosurgery. Although teaching in the specialty may lend good academic exposure, the same cannot be said for the non-clinical aspects concerned with life as a neurosurgeon. Pure interest in the specialty, a will to make an impact in neurosurgery, and the prospects of a good source of income were found to be the top factors influencing students who will apply for neurosurgical residency (13.8%). The leading factors deterring medical students from choosing the specialty were the choice for other specialties, the long period of neurosurgical training,

physical and emotional strains of the job, short durations of their neurosurgical rotations, and difficulty gaining acceptance into neurosurgical residency programmes. Practicing neurosurgeons agree that student-interest in the field is chief amongst these factors, bearing an association with the choice to apply and match into neurosurgery ($p=0.04$).

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