Neurosurgical rotations or clerkships in US medical schools

Clinical article

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Object. Medical student exposure to neurosurgery is limited. To improve the educational interactions between neurosurgeons and medical students as well as neurosurgical medical student rotations or clerkships (NSCs) we must first understand the current status.

Methods. Two questionnaires were sent, one to every neurosurgery course coordinator or director at each US neurosurgery residency program (99 questionnaires) and one to the associated parent medical school dean’s office (91 questionnaires), to assess the current status of NSCs and the involvement of neurosurgeons at their respective institutions.

Results. We received responses from 86 (87%) of 99 neurosurgery course coordinators or directors and 64 (70%) of 91 medical school deans’ offices. Most NSCs do not have didactic lectures (53 [62%] of 86 NSCs), provide their medical students with a syllabus or educational handouts (53 [62%] of 86), or have a recommended/required textbook (77 [90%] of 86). The most common method of evaluating students in NSCs is a subjective performance evaluation. Of 64 medical school deans, 38 (59%) felt that neurosurgery should not be a required rotation. Neurosurgical rotations or clerkships are primarily offered to students in their 4th year of medical school, which may be too late for appropriate timing of residency applications. Only 21 (33%) of 64 NSCs offer neurosurgery rotations to 3rd-year students.

Conclusions. There is significant room for improvement in the neurosurgeon-to–medical student interactions in both the NSCs and during the didactic years of medical school. (DOI: 10.3171/2010.5.JNS10245)

Key Words • neurosurgery • medical education • clerkship • rotations

Medical student exposure to neurosurgery is limited. These limitations are multifactorial. Many medical schools do not have required NSCs and typically only offer elective NSCs in the last year of medical school. This may be too late in terms of the career decision making process for medical students, since most students initiate the residency application process in the beginning of their 4th year. An NSC taken at this time is less likely to influence their career choice than one taken earlier. The busy nature of a neurosurgical service at a teaching hospital leaves little time for structured, organized didactic lectures prepared specifically for medical students, let alone time for faculty members to regularly participate in basic science lectures during the didactic years of medical school.

Organized neurosurgery (the CNS and the AANS) has recognized that improvements are needed in the neurosurgical education of medical students.34 To improve the educational interactions between neurosurgeons and medical students as well as NSCs, we must first understand the current status, structure, and composition of these courses.

Methods

Two questionnaires were designed to assess the status of NSCs. The study protocol as well as the questionnaires were reviewed and approved by the internal review board at Baylor College of Medicine. The study was designed to target medical schools that have neurosurgery training programs as these would be more likely to have neurosurgical faculty and NSCs. Therefore, 190 questionnaires were distributed via email, one to every neurosurgery course director or clerkship coordinator at each US neurosurgery program (99 course directors) and one to each of the 91 associated medical school deans’ offices. The questionnaire sent to the course directors examined the structure, composition, amount and frequency of medical student lectures in NSCs, the degree of medical student participation in NSCs, NSC course ma-
terials, and methods of evaluating student performance in NSCs. The questionnaire sent to the deans’ offices assessed institution-specific graduation requirements in the clinical neurosciences, the prerequisite courses for and availability of NSCs (including electives and subinternships), and the frequency and degree of involvement of neurosurgical faculty members in teaching basic science courses, in medical student clubs and organizations, in clinical shadowing programs for preclinical students, in medical school curriculum planning, and in mentorship for students interested in neurosurgery. The 99 US neurosurgery programs, represent all the ACGME-accredited neurosurgery programs (www.acgme.org). There are 91 associated medical schools (2 programs share a common primary medical school, and 6 do not have a local medical school affiliation).

A cover letter including the study purpose and contact information was included with each questionnaire along with a notification of the right to decline participation. The questionnaire was anonymous and completion and submission constituted agreement and consent to participate. The course directors and deans were asked to complete the questionnaires to the best of their ability, and if unable to complete the questionnaire, to forward it to a more appropriate person. Our contact information was provided along with each questionnaire to address any questions, concerns, or technical difficulties.

All course directors and deans who did not return the questionnaire within 3 months were re-sent the survey. If the survey was not completed after another month, they were contacted via phone to see if there were any additional questions or impediments to completing the survey, if it should be sent to someone else within their institution, or if they did not want to participate.

Results

Course Directors’ Responses

Questionnaires were returned to us by 86 (87%) of the 99 course directors.

Medical Student Participation. Table 1 summarizes the average number of medical students completing NSCs per year at each of the institutions that responded to the questionnaire. Of the 86 NSCs for which a response was received, 53 (62%) were described as having fewer than 10 medical students completing their clerkship per year and 28 (33%) as having fewer than 5. Nearly all NSCs (83 [97%] of 86) allowed visiting medical students to complete clerkships at their institutions. Of those programs that allow visiting medical students, 47% (39 of 83) have fewer than 5 medical students complete NSCs at their institutions and 80% (66 of 83) have fewer than 10.

Didactic Lectures. The majority of the NSCs (53 [62%] of 86) do not currently have didactic lectures for medical students. Of the 33 NSCs that have didactic lectures: 19 clerkships (58%) hold 1, 7 hold 2, 3 hold 3, 3 hold 4, and 1 holds 5 lectures per week. The most common duration of lectures in NSCs is 30–60 minutes (reported by 26 [79%]), followed by 1–2 hours (reported by 5 [15%]), and less than 30 minutes (reported by 2 [6%]).

Clerkship Materials (Syllabus and Text). Most NSCs (53 [62%] of 86) do not provide their medical students with a syllabus or educational handouts; of those NSCs that do provide their students with a syllabus or handout, however, 67% (22 of 33) have formal learning objectives. Most NSCs (77 [90%]) do not have an associated textbook. Of those that do have a textbook, the most commonly used is the Handbook of Neurosurgery18 (used by 7); Neuroanatomy Through Clinical Cases7 is used by one NSC, and another uses an institutionally written guide.

Evaluation of Medical Students. The most common method of evaluating medical students in NSCs is a subjective faculty assessment of medical student performance (used in 79 [92%] of 86 programs); the second most common method is a similar assessment by neurosurgical residents (used in 58 [67%] of 86 programs). Only 10 (11%) of 86 course directors reported using formal written examinations as a part of the medical student evaluation and 5 (6%) have an oral examination. Other reported methods of evaluation were formal oral presentations on neurosurgery topics or interesting neurosurgical cases (used in 3 programs), nursing assessment of medical student performance, and 360° assessments by all team members (1 program).

Of the 81 NSCs that both allow visiting medical students to complete NSCs at their institution and also evaluate their own medical students (83 NSCs that allow visiting students to complete a NSC minus 2 NSCs that do not have a medical school and therefore no “home students” to complete the NSC), 85% (69) evaluate visiting medical students in the same way they evaluate their own medical students. Of the 12 NSCs that do not evaluate visiting medical students in the same way as their home medical students, 8 use the criteria provided in assessment forms that were sent along with the visiting students.

<table>
<thead>
<tr>
<th>No. of Medical Student Rotators</th>
<th>No. of NSCs (%)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3 (3.5)</td>
</tr>
<tr>
<td>2</td>
<td>4 (4.7)</td>
</tr>
<tr>
<td>3</td>
<td>12 (14)</td>
</tr>
<tr>
<td>4</td>
<td>9 (10.5)</td>
</tr>
<tr>
<td>5</td>
<td>12 (14)</td>
</tr>
<tr>
<td>6–7</td>
<td>9 (10.5)</td>
</tr>
<tr>
<td>8–9</td>
<td>4 (4.7)</td>
</tr>
<tr>
<td>10–15</td>
<td>11 (12.8)</td>
</tr>
<tr>
<td>16–20</td>
<td>4 (4.7)</td>
</tr>
<tr>
<td>&gt;21</td>
<td>15 (17.4)</td>
</tr>
<tr>
<td>cannot answer</td>
<td>1 (1.2)</td>
</tr>
<tr>
<td>no medical school†</td>
<td>2 (2.3)</td>
</tr>
</tbody>
</table>

* The number of NSCs reporting the given number of medical student rotators; the number in parentheses represents that value expressed as a percentage of the 86 NSCs that responded to the survey.
† Neurosurgery program that offers an NSC to visiting medical students but is not associated with a local medical school.

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from the students’ parent institutions, and 4 use faculty and resident evaluations alone (they do not require that the visiting medical students complete the written or oral examinations that they require of their home students).

Medical School Deans’ Responses

Questionnaires were also sent to the deans’ offices of each of the US medical schools that had an ACGME-accredited neurosurgery program. Questionnaires were returned from 64 (70%) of the 91 deans’ offices.

Neurosurgery Rotations. Of the 64 deans that responded to questionnaires, 38 (59%) felt that neurosurgery should not be a required clinical rotation at their institution. Table 2 summarizes the clinical neuroscience core requirements at the responding institutions, and Table 3 summarizes their clinical prerequisites for clinical rotations in neurosurgery. At many institutions (43 [67%] of 64), a neurosurgical clinical rotation experience is an optional component of another required clinical clerkship. The required clerkships that allow for neurosurgical rotational experiences are general surgery at 42 (66%) of the institutions, neurology at 6 (9%), and psychiatry at 2 (3%). Sixty-three of the 64 deans reported offering a neurosurgical elective (1 replied “cannot answer”). The duration of the elective was less than 1 month in 9 institutions (14%), approximately 1 month in 49 (77%), options of 2 or 4 weeks in 4 (6%), and 8 weeks in 1 (2%); the dean at 1 institution responded “cannot answer.” Fifty-one (80%) of the 64 deans reported that a clinical subinternship was a graduation requirement at their institution. A subinternship in neurosurgery would fulfill the graduation requirement at 23 (45%) of 51 institutions. In 62 (97%) of 64 institutions, NSCs are offered to 4th-year medical students, and only 21 (33%) of 64 institutions offer neurosurgery rotations to 3rd-year medical students.

Neurosurgeon Participation in Lectures and the Curriculum. Forty-four (69%) of 64 deans reported that clinical neurosurgeons were involved in teaching lectures at least once weekly on average during the didactic portion (first 2 years) of medical school. Forty-one (64%) rated the degree of involvement of the neurosurgical faculty (including residents and fellows) in participating in the neuroscience lectures and/or labs given to medical students as, “somewhat involved.” However, only 27 (44%) reported some neurosurgeon involvement in curriculum planning.

Mentorship. Fifty-six (88%) of 64 deans responded that their institution has a clinical shadowing program that pairs up preclinical medical students with clinicians to help medical students gain further clinical exposure. Of these, 27 reported that neurosurgeons were involved as shadowing mentors at their institution. When asked what course of action their institution would take if a student developed an interest in neurosurgery during the basic science years, the majority (40 [63%] of 64) answered that they would provide the interested student with contact information within the department of neurosurgery. Ten (16%) reported that they had a formalized mentoring protocol for interested students. Fifty-four (84%) of the deans reported having general student surgical societies or clubs while only 17 (27%) reported having a specific student neurological society or organization.

Discussion

Despite neurological problems being among the most common disorders encountered by physicians, medical student exposure to neurosurgery is limited. In 1999, Resnick et al. evaluated how medical students across the country were learning about common neurological disorders. He found that other physicians (nonneurosurgeons, mostly primary care physicians) were the primary teachers of common neurological problems (neck and back pain, radiculopathy, and carotid artery disease) and their treatment. It is clear from the letters to the editor addressing Dr. Resnick’s publications that some believe that neurosurgeons do not need to teach these topics.13 This is probably why 38 (60%) of the deans who completed questionnaires responded that neurosurgery should not be a required clinical rotation at their institution. It also must be noted that the medical school deans have economic, social, and political pressures upon them to promote primary care and produce primary care physicians. These influences may have also biased their responses. However, as Resnick13 appropriately alluded to in his response to the letter to the editor, there are subtleties in diagnosis, treatment, and patient selection for surgery with regard to these disorders (neck and back pain, radiculopathy,}

<table>
<thead>
<tr>
<th>Table 2: Institutionally required clinical clerkships in neurosciences (neurosurgery/neurology)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graduation Requirement for Clinical Neurosciences</td>
</tr>
<tr>
<td>neurology is a required core clerkship, but neurosurgery is not</td>
</tr>
<tr>
<td>either neurology or neurosurgery will fulfill requirement</td>
</tr>
<tr>
<td>both neurology &amp; neurosurgery are required</td>
</tr>
<tr>
<td>neither neurology nor neurosurgery are required</td>
</tr>
<tr>
<td>cannot answer</td>
</tr>
<tr>
<td>total</td>
</tr>
</tbody>
</table>

* No respondent indicated that neurosurgery was a required core clerkship but neurology was not.

TABLE 3: Institutional prerequisite courses for NSCs*

<table>
<thead>
<tr>
<th>Prerequisite</th>
<th>Yes</th>
<th>No</th>
<th>Cannot Answer</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>general surgery</td>
<td>44</td>
<td>12</td>
<td>8</td>
<td>64</td>
</tr>
<tr>
<td>neurology</td>
<td>31</td>
<td>25</td>
<td>8</td>
<td>64</td>
</tr>
<tr>
<td>family medicine</td>
<td>26</td>
<td>30</td>
<td>8</td>
<td>64</td>
</tr>
<tr>
<td>psychiatry</td>
<td>26</td>
<td>30</td>
<td>8</td>
<td>64</td>
</tr>
<tr>
<td>pediatrics</td>
<td>27</td>
<td>29</td>
<td>8</td>
<td>64</td>
</tr>
<tr>
<td>obstetrics &amp; gynecology</td>
<td>27</td>
<td>29</td>
<td>8</td>
<td>64</td>
</tr>
</tbody>
</table>

* Survey responses of medical school deans.
carotid artery disease) as well as other neurosurgical issues that are most appropriately explained by the expert to whom patients with these disorders are referred. In addition, he found significant errors and outdated information upon reviewing the teaching materials and lecture notes used by primary care physicians to teach medical students about neurosurgical topics at his institution.  

Although it can be somewhat labor intensive, education of medical students is at the core of academic medicine. This is a responsibility that all true academic physicians, including neurosurgeons, should embrace. In addition to the interpersonal rewards that stem from the mentor-student relationship, education of medical students in neurosurgery will help identify, attract, and inspire the best, brightest, and most appropriate students for a career in neurosurgery. Equally important, as we educate those medical students who ultimately will not become neurosurgeons, we train our future nonneurosurgical colleagues on issues such as which patients should be appropriately referred for neurosurgical consultation, when it is appropriate to send a patient to the neurosurgery clinic as opposed to the emergency room, and what pre-referral workup should be completed. This will result in more appropriate resource utilization. A rotation in neurosurgery will expose medical students to the ethical and end-of-life decisions associated with the neurosurgical patient population and teach students how to identify and approach neurosurgical emergencies. It will allow medical students to spend time in the intensive care setting and learn basic treatment approaches to neurotrauma, neurovascular, and postoperative neurosurgical patients. In addition, neurosurgical rotations will help medical students correlate patient-specific symptoms and physical examination and imaging findings with intraoperative anatomical relationships, which can then be related back to the decision making process for surgical intervention. Benzil et al.  

report that less than 10% of all medical students are exposed to neurosurgery in their medical school curriculum. How will we accomplish these goals if so few are exposed to the field?  

Multiple nonneurosurgical studies, primarily from the general surgery literature, have identified several positive factors that improve medical student education and influence medical students into a future surgical career choice. Some of the identified factors are resident involvement and enthusiasm in medical student education, the amount and quality of direct, positive interactions between medical students and faculty members, relationships with formal mentors and surgical role models, quantity and quality of didactic lectures given by clinical surgeons, positive medical student perception of clerkship experiences, and early clinical exposure.  

When is the ideal time for neurosurgeons to get involved in teaching medical students? In their paper on recruiting women into neurosurgery, Benzil et al. state that efforts need to be made to work with curriculum committees to expose and recruit medical students in their 1st and 2nd years of medical school. Other nonneurosurgical studies have found that the amount of preclinical exposure to a particular specialty is proportional to residency application rates in that field. Kozar et al. report that 59% of medical students make their decision on which career to pursue prior to beginning clinical rotations (3rd year of medical school). In particular, anatomy lectures, anatomy laboratory dissections, neuroscience lectures, and preclinical shadowing are ideal opportunities for neurosurgical faculty and residents to become involved and enhance the neurosurgical exposure of young medical students.  

Another opportunity for early medical student involvement is mentoring preclinical medical students in research. This will expose new medical students to the academic side of neurosurgery, establish a relationship with a neurosurgical faculty member and possibly a resident, and potentially allow them to add a journal publication or abstract to their résumé when it comes time for residency application. In the field of cardiothoracic surgery, Allen et al. began a program introducing preclinical medical students to research, and 80% of these students either presented an abstract at a national meeting or published a journal article in a peer-reviewed journal by graduation.  

As explained above, most medical students have an idea of which field they will enter prior to their clinical clerkships. For the other 41%, 3rd- and 4th-year rotations are a critical decision-making time. Our study confirms that few medical students are completing NSCs (Table 1). In addition, our study demonstrates that most NSCs are primarily offered to 4th-year medical students (as indicated by 62% [97%] of the 64 responding deans) and only 21 deans (32.8%) indicated that their institutions offer NSCs to 3rd-year medical students. The 4th year is too late for optimal medical student exposure because most medical students are putting together their residency applications during the first few months of that year.  

Organized leadership of neurosurgery at the national level has recognized that improvements are needed in the education of medical students with respect to neurosurgical topics. In 1997, the AANS and CNS sent a proposed curriculum of neurosurgical topics to the dean of every medical school in North America and to every neurosurgical residency program director. This curriculum contained what the neurosurgical leadership determined to be the basic minimum knowledge that all medical students and future general practitioners should possess regarding neurosurgical disorders. Resnick and Ramirez have shown that it can be effectively instituted into the 3rd-year medical student curriculum. Despite the curriculum efforts of organized neurosurgery, our study demonstrates that most NSCs do not have a formal didactic curriculum. Of those programs that do offer curriculum-based lectures, the majority only offer 1 lecture a week; it is difficult if not impossible to cover all the recommended curriculum topics in what amounts to 2–4 hours (depending upon the length of the rotation). What is the educational value of these clerkships?  

Currently, most medical students on neurosurgery rotations shadow neurosurgery faculty members and residents on rounds and in the operating room and are variably taught, at best, the topics related to the patients at hand. While engaging and involving medical students
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in the operating room and teaching patient-related topics are no doubt important, they should not and cannot replace a lecture-based curriculum in neurosurgery. Didactic sessions lay the foundation for clinical care, and subsequent patient interactions serve to build upon and solidify core concepts. Didactic sessions can range from formal podium lectures, to problem-based learning, to small group interactive discussions. Didactic sessions balance medical students’ exposures to topics despite differences in surgical services and experiences in different hospital settings. Characteristics of didactic lectures that have been proven to be educationally effective are well-structured courses, frequent lectures, clinical relevance of the lectures, frequent repetition of important concepts and terms, appropriate timing of critical information in lectures, and active learning processes and exercises.

It is important to note that although the initial time investment is considerable, once a comprehensive curriculum and lecture notes have been created, substantially less effort is required to keep materials up to date and prepare for lectures. Furthermore, the development of such curriculum and lecture notes can be divided among neurosurgery faculty members since each has his or her area of interest and expertise.

One of the biggest impediments to didactic lectures on NSCs is the busy schedule of the attending physicians and the busy nature of a neurosurgical service. Interestingly, because of faculty time constraints and because many medical students were assigned to work with physicians at hospitals across the city, Solomon et al. devised a digital lecture series and performed a study comparing the digital and live lecture formats. Students were randomly assigned to one or the other lecture format, and Solomon et al. found no significant difference in test performance between the 2 groups. Also, the students who were assigned to the digital lecture format overwhelmingly felt that the live lectures could be replaced by the digital lectures.

Most NSCs do not have educational handouts, a syllabus, learning objectives, or an associated textbook. While it can be very labor intensive to prepare handouts, many medical students were assigned to work with physicians at hospitals across the city, Solomon et al. devised a digital lecture series and performed a study comparing the digital and live lecture formats. Students were randomly assigned to one or the other lecture format, and Solomon et al. found no significant difference in test performance between the 2 groups. Also, the students who were assigned to the digital lecture format overwhelmingly felt that the live lectures could be replaced by the digital lectures.

Our study shows that the evaluation of medical students on NSCs is almost exclusively subjective. Although there is utility in performance evaluations, there also is a need for an objective assessment of what students learn during a rotation. While there is debate on the ideal way to objectively evaluate medical students on rotations, there are multiple options, including written (multiple choice or open answer) or oral tests, standardized patient assessment, surgical skills evaluation on simulators, or direct patient observations.

The need to increase medical-student exposure to neurosurgery is not just an issue of quantity, but also an issue of quality; the medical-student–neurosurgeon interactions must be positive experiences. Studies have shown that a student’s negative perception of a rotation will drive him or her away from pursuing that discipline as a career. The lack of a positive surgical role model during the first 2 years of medical school accounts for 80% of medical students’ negative opinion of surgical fields. Studies have shown that mentoring and the presence of role models have the strongest influence in career selection, more influence than lifestyle. A survey of new house officers found that 42% of them felt that they were not prepared well for the tasks required of them at work, and multiple studies have suggested that medical schools inadequately prepare medical students for their internship. For this reason, medical schools across the country have created “subinternships” and “boot camps.” A subinternship is viewed as the culmination of medical school and a time to prepare senior medical students for the transition to internship. The subinternship has been identified as the most important preparatory rotation for residency. A senior medical-student surgical boot camp was shown to increase medical students’ confidence levels with regard to anatomical dissections, administrative skills, technical skills, and patient management skills, which they needed for their surgical internship. Our study shows that 80% of medical schools have a subinternship requirement for graduation, a rate similar to what has been previously reported.

In a recent study, residency program directors from multiple specialties across the country were surveyed, and 93% of them recommended that students complete a subinternship in the field in which they were applying for residency. Is this even a possibility for most medical students pursuing a residency in neurosurgery? Unfortunately, our study reveals that less than one-half (45%) of the medical schools surveyed that have a graduation requirement of a subinternship also have a neurosurgery subinternship that would fulfill the requirement. Most neurosurgery residency programs no longer require an internship in general surgery and the American Board of Neurological Surgery now only requires 3 months of general surgery training. Therefore, a general surgery subinternship would be less useful than a subinternship in neurosurgery.

The local neurosurgical leadership at each institution with a medical-student subinternship graduation requirement should petition curriculum leadership to allow neurosurgical subinternships to fulfill the requirement. This, however, would also require the creation of an organized and structured 4th-year subinternship in neurosurgery at each of these institutions.
Limitations and Weaknesses

Survey studies are inherently biased. We sent questionnaires to neurosurgery clerkship course directors as well as medical school deans, which limits our study to the biases and knowledge of these individuals with respect to these limited questions. Our survey responses were not tested for validity or reliability. We did, however, ask the course directors and deans to forward the questions and/or ask for help if they were not able to answer the questions. Our questionnaire also provided respondents with a limited number of answer choices and did not allow for free text responses and therefore may not entirely represent the respondent’s correct answers to the questions. Our study was anonymous, therefore it is possible that the questionnaire sent to a course director or dean was forwarded to and completed by a different individual. In addition, our study does not address the 40 (131–91) US medical schools without neurosurgery residency training programs. Some of these schools undoubtedly have educational experiences in neurosurgery for medical students, and these opportunities and experiences could be addressed in future studies.

Another limitation was that we were not successful in our attempt to correlate those programs with better educational experiences with the number of applicants into neurosurgery. Our questionnaires were distributed in waves and some of the earlier questionnaires included an additional question asking how many students had applied from their medical school over the last 5 years. We received too few responses and decided to drop the question from subsequent questionnaires. In addition, we contacted the San Francisco matching program to obtain this information and were told that they were unable to release it.

Conclusions

Medical-student exposure to neurosurgery is limited and there are multiple areas for improvement in teaching neurosurgical topics to medical students. Neurosurgical leadership at the local, institutional level should reassess the current status of their NSCs and begin to institute positive educational changes and get involved with curriculum planning. Appropriate neurosurgical mentors should be involved early in the medical school experience to grab medical students’ attention and expose them to the possibilities of a career in neurosurgery. Well-structured NSCs should be made available to all medical students, not just those interested in neurosurgery, preferably in the 3rd year, and these should be positive educational experiences. A structured capstone experience in neurosurgery, or subinternship, should be available for all 4th-year medical students interested in pursuing residency in neurosurgery.

Disclosure

The authors report no conflict of interest concerning the materials or methods used in this study or the findings specified in this paper. Author contributions to the study and manuscript preparation include the following. Conception and design: Sawaya, Fox, Jea. Acquisition of data: Fox, Amhaz. Analysis and interpretation of data: Sawaya, Fox, Amhaz, Patel, Fulkerson, Jea. Drafting the article: Fox, Amhaz. Critically revising the article: all authors. Reviewed final version of the manuscript and approved it for submission: all authors. Statistical analysis: Fox, Amhaz, Suki. Administrative/technical/material support: Sawaya, Suki, Study supervision: Sawaya, Fox.

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