ELSEVIER

Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.

Check for updates

Stepping Up: How U.S. Neurosurgery Training Programs Can Innovatively Assess Resident Applicants in a Post-Step 1 World

Archis R. Bhandarkar[1], Christopher S. Graffeo[2], Jeremiah Johnson[3]

INTRODUCTION

Identifying and selecting optimal candidates for neurosurgery training are among the most important and challenging activities engaged in by residency programs in the United States. Although a range of objective and subjective metrics are routinely employed, the United States Medical Licensing Exam (USMLE) Step 1 score is among the most long-standing and widely embraced tool for initial screening and ranking of candidates. In early 2020, the organizations administering the USMLE—National Board of Medical Examiners (NBME) and the Federation of State Medical Boards (FSMB)—announced that Step 1 grading will transition from the familiar 3-digit score to Pass/Fail by 2022.[1]

According to NBME and FSMB representatives, this reconfiguration was motivated by "deleterious effects of high-stakes examinations like Step 1 on medical student well-being and the potential adverse effects of such an environment on medical school learning."[2] Given the competitive nature of our specialty, the considerable length of training, and the mandate to maintain high-resolution, high-fidelity selection processes, we sought to outline this sea change from the perspective of neurosurgery residency programs, with an eye toward avenues for improving our collective ability to identify those individuals most likely to demonstrate diversity, empathy, and clinical excellence in their training.

STRENGTHS AND WEAKNESS OF THE STEP 1 SCORE

Few rites of passage have loomed so large in the minds of neurosurgery resident applicants than the USMLE Step 1, which traditionally has provided the first yardstick by which candidates are measured. Ostensibly written to test examinees' abilities to "apply important concepts of the sciences basic to the practice of medicine, such as the biochemistry, pathology, and pharmacology relevant to multiple organ systems," the Step 1 has been widely criticized for its clinical irrelevance. However, despite this potential shortcoming, it has consistently ranked among the top-weighted factors in applicant selection. One analysis of neurosurgery residency match outcomes from 1990 to 2007 identified a Step 1 score >245 as the most significant predictor of successful match, with an odds ratio >20, when compared with applicants with a score ≤245.[3]

Numerous studies have sought to better characterize the relative strengths and weaknesses of Step 1 as a metric for resident applicant selection. Given the curricular heterogeneity between institutions, as well as the inherent biases of medical school grading, Step 1 does provide one of the few standardized metrics accessible to all candidates, independent of their pre-residency educational pathway. Notwithstanding, Step 1 score also has failed to predict eventual American Board of Neurological Surgery certification status, academic rank, or research productivity.[4] Indeed, the only specific achievement in neurosurgery training associated with a greater Step 1 score is a greater score on the American Board of Neurological Surgery written primary examination—an association that likely reflects test-taking acumen, rather than knowledge base or clinical competency. In addition, related studies from the radiation oncology literature identified Step 1 screening cutoffs as associated with a disproportionately negative impact on female and under-represented minority applicants—groups that are critical to improving diversity in the neurosurgery workforce.[5]

NOVEL STRATEGIES FOR IDENTIFYING EXCEPTIONAL CANDIDATES

Surrogate Standardized Testing Metrics

Perhaps the most obvious alternative to the Step 1 score is the Step 2 Clinical Knowledge (CK) score, which will continue to be reported as a numerical 3-digit score—at least for the foreseeable future.[2,6,7] Potential benefits of an increased reliance on Step 2 CK include the familiarity of the scoring system, standardization of the examination across medical schools, and significantly more clinically focused content. To this end, related studies from the internal medicine literature have identified the Step 2 CK examination as the strongest predictor of multimodal resident performance assessments.[8] Unsurprisingly, increasing emphasis on Step 2 CK after Step 1 converts to Pass/Fail has already been affirmed widely in a survey of neurosurgery program directors. Although the potential for excessively weighting a single assessment remains in play with Step 2 CK, alternative approaches, such as weighted or composite scores incorporating related metrics such as the numerical NBME shelf scores from key rotations (e.g., surgery, neurology, medicine), may have a role in offsetting this bias.[6]

Simulation-Based Interviewing

Looking outside of neurosurgery, several programs have developed novel tools for resident applicant assessment that may prove useful in our field. One such instrument is simulation-based interviewing, in which the formal resident applicant assessment includes a component of dedicated medical evaluation, with skills such as suturing, imaging interpretation, or laboratory result assessments. Although data are limited and not available in the specific cohort of neurosurgery resident applicants, preliminary analyses suggest that simulation-based interviewing is highly predictive of individual outcomes in related in-service training assessments, such as general surgical skills evaluations, or milestones review.[9] Using the general surgery experience as a template, one can readily imagine a parallel process for neurosurgery, with candidate activities ranging from suturing, to magnetic resonance imaging interpretation, external ventricular drain or lumbar puncture placement, bedside neurologic examination, and many more. However, expectations should be carefully tempered, as one can imagine such an unconventional, high-stakes assessment resulting in excessive performance anxiety. In turn, this runs the risk of not only biasing result but doing so in a way that disproportionately impacts those students already lacking in resources, such as access to a home program with opportunities for salient teaching, mentorship, and potentially simulation or participation in procedures.

Quality versus Quantity of Publications

Research accomplishments are already prominent among the factors weighted in neurosurgery resident applicant selection, and the elimination of a Step 1 examination is anticipated to increase the role played by academic achievements in candidate assessment. However, the specific ways in which this will be realized remain to be seen. Candidly, one hopes that an emphasis on quality will emerge as preferred to the present preference for quantity, which is an easier metric to assess, but ultimately less reliable. This reality is emphasized by a recent study of neurosurgery residency applicants to Vanderbilt University 2006–2012, which determined that the percentage of applicants misrepresenting the number and authorship of their publications had increased from 33% to 45% during the study period.[10]

A variety of existing bibliometric tools, such as h-index, or impact factor of the journals publishing the applicant's research may be of value. However, these approaches could potentially be biased against applicants without access to a home program, or whose program lacks robust scholarship at the staff or resident level. Alternatively, consideration may be given to requesting that each individual applicant submit a brief portfolio of 1–2 representative publications of their choosing, which can then be subject to more direct scrutiny by the program. Still other iterations of the process can be imagined that parallel the "simulation-based interview," in which a journal club or study design component is incorporated into the candidate assessment exercises.

Standardized Letters of Evaluation

In tandem to the increasing emphasis placed on research portfolio, interpersonal assessments such as letters of evaluation from sub-internships are also anticipated to rise in prominence as resident applicants are assessed outside the purview of a scored Step 1 examination. To improve the generalizability and standardization of these tools, an argument has been proposed and recently ratified by the Society of Neurological Surgeons that residency programs should incorporate standardized letters of evaluation (SLOEs) in lieu of personal letters.[7] In these example SLOEs, studied during the 2018–2019 application cycle, evaluators were prompted to rate candidates on prespecified criteria (e.g., work ethic, subspecialty knowledge, ability to work on a team, etc.) using an objective, 3-point, relativistic Likert scale (e.g. "above peers," "at level of peers," "below peers"), with opportunity for a supplemental 250-word commentary.[11] Although still vulnerable to bias, these steps would potentially elevate letters as assessment tools beyond the anecdotal value they currently contribute. Also, given the unpredictable long-term impacts that the coronavirus disease 2019 (COVID-19) pandemic may have on the existence of medical student rotations, SLOEs may be of limited utility during the initial roll-out of post-Step 1 practices.

CONCLUSIONS

As ratified by essentially all neurosurgery residency program directors, the transitioning of USMLE Step 1 to a Pass/Fail grading scheme by NBME and FSMB will have sweeping impacts on candidate identification and selection in our field. Although this change clearly challenges the traditional screening and ranking models developed, it also constitutes a critical opportunity for the neurosurgery community to fundamentally transform and improve resident selection for the next generation of neurosurgeons in the United States, with an eye toward minimizing bias, optimizing diversity, and incorporating metrics that are significantly more predictive of in-residency and long-term performance of individuals as trainees, surgeons, and academicians. Numerous strategies warrant consideration and, ideally, formal testing in the years ahead. Key examples include a weighted sum of Step 2CK and neurology/surgery shelf scores, simulation-based interviewing, objective assessments of publication quality in lieu of quantity, and sub-internship SLOEs. Although these candidate metrics may warrant consideration, we also anticipate that a range of novel assessments will be developed and studied as neurosurgery evolves, with the ultimate goal of continuing to attract and select the strongest candidates, despite the shifted testing landscape.

REFERENCES

1. Federation of State Medical Boards. USMLE program announces upcoming policy changes. 2020. Available at: https://www.newswise.com/articles/usmle-program-announces-upcoming-policy-changes; 2020. Accessed June 2, 2020.

2. Chaudhry HJ, Katsufrakis PJ, Tallia AF. The USMLE Step 1 Decision: an opportunity for medical education and training [e-pub ahead of print]. JAMA https://doi.org/10.1001/jama.2020.3198, accessed June 26, 2020.

3. United States Medical License Exam. Overview. Available at: https://www.usmle.org/step-1/#overview. Accessed June 2, 2020.

4. Gelinne A, Zuckerman S, Benzil D, Grady S, Callas P, Durham S. United States Medical Licensing Exam Step I score as a predictor of neurosurgical career beyond residency. Neurosurgery. 2019;84:1028-1034.

5. Fernandez C, Lopez BL, Kushner M, Leiby BE, Den RB. Overemphasis of Step 1 scores may affect application pool diversity in radiation oncology. Pract Radiat Oncol. 2020;10:e3-e7.

6. Crane MA, Chang HA, Azamfirei R. Medical education takes a step in the right direction: where does that leave students [e-pub ahead of print]? JAMA https://doi.org/10.1001/jama.2020.2950, accessed June 26, 2020.

7. Humphrey HJ, Woodruff JN. The Pass/Fail Decision for USMLE Step 1—Next Steps. JAMA. 2020;323:2022-2023.

8. Sharma A, Schauer DP, Kelleher M, Kinnear B, Sall D, Warm E. USMLE Step 2 CK: best predictor of multimodal performance in an internal medicine residency. J Grad Med Educ. 2019;11:412-419.

9. AlJamal Y, Prabhakar N, Rivera M, et al. A simulation-based selection process for trying to identify medical students who will become outstanding general surgery residents. Am J Surg. 2020;220:76-82.

10. Kistka HM, Nayeri A, Wang L, Dow J, Chandrasekhar R, Chambless LB. Publication misrepresentation among neurosurgery residency applicants: an increasing problem. J Neurosurg. 2016;124:193-198.

11. Council of Residency Directors in Emergency Medicine. Official cord standardized letter OF evaluation (SLOE). Available at: https://www.cordem.org/globalassets/files/sloe/sloe-2018-em-subspecialty.pdf. Accessed June 2, 2020.