Rethinking the mentorship system in neurosurgery

TO THE EDITOR: We read with great interest the systematic review by Berardo et al. (Berardo L, Gerges C, Wright J, et al. Assessment of burnout prevention and wellness programs for US-based neurosurgical faculty and residents: a systematic review of the literature. J Neurosurg. Published online October 30, 2020. doi: 10.3171/2020.6.JNS201531), which addressed the issue of preventing burnout among neurosurgery faculties and residents by the implementation of wellness programs. Because of the particular nature of the job of the neurosurgeon who is entrusted to operate in delicate anatomical regions, neurosurgical training programs are renowned as very demanding. Recently, concerns have been raised regarding the well-being of the physicians at work, leading to the adoption of new laws such as the maximum weekly working time for residents set at 48 hours in France. Nevertheless, this duration seems difficult to apply in neurosurgery because residents need to learn from emergency cases during night shifts, as well as from regular surgery that requires sufficient operating room exposure.

Residents are usually stressed by being in a low postgraduate year, insufficient operating room exposure, hostile mentors, additional social stress (family conflicts and financial issues), and work-life imbalance. New contemporary concerns are the mismatch between the growing number of students in the neurosurgery programs and the low number of fellowships available (which induces stressful uncertainty for the residents’ future early career), the limited access to neurosurgical literature and publication opportunities, and the fearful atmosphere caused by the recent judicialization of neurosurgical practice, which can lead to defensive attitudes and even professional disenchantment.

Beyond these considerations, Baumgarten et al. showed that specific personality traits such as openness, agreeableness, and conscientiousness were protective, whereas neuroticism was negatively associated with burnout. They also showed that pleasure at work was protective. Shakir et al. reported that the diminution of social and personal stressors was associated with increased grit and resilience among residents, and that these two characteristics were protective.

Neurosurgery residents are eager to learn the fundamentals of their future demanding job in decent conditions to acquire the surgical skills and the necessary theoretical knowledge to take care of their patients, and even to be introduced to an academic career. Rather than trying to implement measures to ease the burnout among their community, senior surgeons should stop encouraging the vicious circle of relentless work that is currently expected from residents. Instead, both sides could benefit from a meaningful buddy system, which could strengthen the confidence of the residents in their abilities and provide a lot of happiness to the senior surgeons in their mentorship.

For too long, the neurological community has adopted a passive attitude toward the issue of occupational health of its senior and junior practitioners; the fact that the majority of the references in the authors’ review were published after 2010 is concrete evidence of this matter. Perhaps it is time to accept that residency training does not mean unnecessary suffering and that becoming a neurosurgeon is compatible with having a family life. Spiotta et al. showed that the implementation of a wellness program was associated with improvement of the residents’ quality of life. We believe that rethinking the mentorship upstream would ease the heavy workload of neurosurgery residents and could make them happier in their professional and personal lives, which are often intermingled.

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Response
We would like to thank Drs. Beucler, Sellier, Desse, Joubert, and Dagain for their comments on our work and the candid opinions they have provided. The authors focused on several salient points identified by both our work and the work of others.

With respect to the comments on the difficulties of training in the era of work-hour restrictions, we concede that ensuring adequacy of training in this environment is difficult. This challenge is undoubtedly exacerbated in France, given the more stringent 48-hour duty restriction. However, as the authors allude to, the gravity of neurosurgical training inspires an eagerness to go beyond obligation in the pursuit of proficiency. Additionally, senior neurosurgeons, many of whom trained in environments where no such regulations existed, often encourage these displays of dedication.

We argue that a possible solution is to improve the efficiency of training within the confines of safety for patients and trainees. In the US, trainees are responsible for the completion of tasks that do not serve to further education, yet are a requirement to patient care within the framework of our health systems. Trainees would be much better suited, in these instances, to spend that time in direct patient interactions or learning operative techniques. We firmly believe that significant room for improvement exists across the board with respect to efficiency, focus of training, and the framework of support provided by training programs. Although patient care should remain the cornerstone of all training, that care could be provided while also ensuring that residents obtain the requisite knowledge to become excellent surgeons and clinicians without being overworked and while simultaneously having access to effective wellness programs and positive mentor-mentee relationships.

We empathize with trainees’ disquiet in the face of medicolegal issues within neurosurgery. As the authors note, these concerns lead to defensive attitudes and professional disenchantment. However, we would like to draw attention to the assessment of Larkin et al. that poor physician-patient relationship is the most common underlying cause of medical malpractice suits in neurosurgery. Patients have cited poor listening skills and insufficient explanations of medical conditions and treatment options as detractors from the therapeutic alliance. We believe that neurosurgeon burnout, which is characterized by high levels of depersonalization and emotional exhaustion, is a likely contributor to poor physician-patient interactions. Thus, fear of litigation may be both a cause and a result of neurosurgeon burnout.

Several traits have been shown to be protective against burnout. However, rather than attempting to select for those traits, training programs should aim to create an environment that fosters wellness and career satisfaction. Although neurosurgery trainees experiencing burnout frequently state that they would choose neurosurgery again, 66% state that they would elect to train at another program. This emphasizes the importance of fit of both personality and academic interest between the trainees and their colleagues. While compatibility of academic interests fosters career advancement, genuine camaraderie may be a source of significant psychological and emotional support for trainees.

The only criticism we might direct toward the comments Dr. Beucler and colleagues provided is that most are again focused on trainees. We argue that neurosurgeons experience the peak of their career-related stress and are particularly susceptible to burnout as junior faculty members. The field as a whole is lacking with respect to systematically ensuring environments that lead to positive work experiences, adequate support staff, positive mentorship relationships with senior staff, personal and career advancement education, realistic clinical and academic goals, and access to faculty-specific wellness programs or measures to prevent burnout for faculty. This population has been woefully neglected in this regard. The dearth of literature identified by our review specific to this population is a testament to this point.

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So what are the differences among Simpson grades II, III, and IV? If grades II and III are indistinguishable, and radiosurgery can turn a grade IV into a grade II/III, then perhaps there are none? It makes little sense to include a traditional modality for tumor control (cautery) while excluding a modern one (radiosurgery) simply because it was unavailable in 1957. Rather than revalidating the Simpson scale, the Barrow data support a different interpretation: in the contemporary era, meningioma resections are either Simpson grade I or not.

The Barrow study has other limitations, including that out of 1435 patients with meningioma surgeries included in the study, only 117 (8.2%) had 5 years of follow-up. The risk of meningioma recurrence persists over decades, so this absence of long-term follow-up undermines claims that this new study is better powered than those that have called the Simpson grading into question.4

The goal of meningioma surgery should be maximal safe cytoreduction and control of symptomatic recurrence over the lifetime of the patient. Optimal approaches may require aggressive surgery with removal of involved dura, sinus, and bone. However, justification for complex, high-risk operations should not depend on a grading system devised in an era when little was understood about tumor biology, before the advent of neuroimaging, microsurgery, and radiosurgery. Moreover, the clinical utility of a resection grade based on a subjective intraoperative assessment by the surgeon is questionable in comparison with other more objective predictors of recurrence, such as molecular features,5–9 quantitative imaging techniques,7–9 and perhaps the ability to determine histologic diagnosis intraoperatively.10

The spirit of the Simpson grading system and its emphasis on aggressive surgery are still relevant today, but the actual scale is anachronistic and should not be used. The best objective assessment of meningioma surgery today is radiographic extent of resection. Standardized prospective databases and multi-institutional collaborations will aid further progress.

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Time to move beyond the Simpson scale in meningioma surgery

TO THE EDITOR: The Simpson grading system is a subject of ongoing debate: its accuracy in predicting recurrence after removal of WHO grade I meningiomas and its relevance in modern neurosurgery have been questioned.1 Przybylowski and colleagues2 recently assessed the prognostic value of the scale in a retrospective study of 492 patients who underwent resection of WHO grade I meningiomas at the Barrow Neurological Institute from 2007 to 2017 (Przybylowski CJ, Hendricks BK, Frisoli FA, et al. Prognostic value of the Simpson grading scale in modern meningioma surgery: Barrow Neurological Institute experience. J Neurosurg. Published online October 23, 2020. doi:10.3171/2020.6.JNS20374). The authors claim to demonstrate “a stepwise increase in meningioma recurrence with increasing Simpson resection grade.” Viewed critically, however, their data support a contrary interpretation, that the Simpson grade does not predict outcome in a stepwise fashion.

In 1957, Simpson3 assigned distinct rates of symptomatic recurrence to each group in a five-tiered classification. The Barrow data, by contrast, demonstrate only three tiers. Przybylowski et al. confirmed that radical resection (Simpson grade I) confers better radiographic outcomes than total or subtotal resection (≥ 95% vs 85%–88% vs 56% 5-year survival, respectively). Yet they also demonstrate that the recurrence rate for grade II (coagulation of involved dura) was not distinguishable from that of grade III (tumor removal without dural coagulation) or grade IV (subtotal resection) followed by radiosurgery (85%–88%). Only nonradiated grade IV resections exhibited worse outcomes (56%).

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The authors report no conflict of interest.

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Response
We thank Drs. Rapoport, McDermott, and Schwartz for their thoughtful letter. They restate many of the points from the article by Drs. Schwartz and McDermott.1 We agree that the expanding knowledge of meningioma biology must augment the prognostication of intracranial meningioma. Additionally, recurrence risk profiling should be location specific due to the differences in meningioma genetic profiles in different brain locations.

However, many surgeons still use the Simpson grading scale as a common language to communicate with readers. In scientific writing, the Simpson grade provides a validated means to document the patient’s surgical treatment. Although the Simpson grade’s fundamentals draw on a legacy approach, modern neurosurgeons use Simpson grading as a surrogate for the extent of resection. We find that Simpson grading applied with postoperative imaging to supplement our intraoperative impressions is valuable in our clinical practice to capture the salient points of a patient’s meningioma surgery. We agree that the pursuit of maximal safe resection is paramount in meningioma surgery, although surgeons should not pursue Simpson grade I resection at the expense of patient morbidity. Naturally, we should incorporate multiple considerations in this pursuit, but the meaning of “maximal” resection must first be clearly defined using a scale that is widely understood.

It is important to note that we published these data in response to recent studies that found no difference in tumor recurrence rates after Simpson grade I, II, or III resections.2–5 We sought to test these conclusions against our experience. We acknowledge that our single-center retrospective study has the typical limitations of such studies. We would welcome the opportunity to collaborate with Drs. Rapoport, McDermott, and Schwartz to develop a validated modern scale that informs prognosis and clinical decision-making in patients undergoing meningioma surgery.

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Misconceptions in the field guide to big data for neurosurgeons

TO THE EDITOR: As an interdisciplinary team in applied artificial intelligence (AI) in healthcare, we share Raju and colleagues1 view on the need for a clear overview on this topic (Raju B, Jumah F, Ashraf O, et al. Big data, machine learning, and artificial intelligence: a field guide for neurosurgeons. J Neurosurg. Published online October 2, 2020. doi:10.3171/2020.5.JNS201288). Such assessments can profoundly influence how researchers approach experimental design and data interpretation. Therefore, it is important to avoid misconceptions or omissions.

Data science does not, in fact, encompass AI and robot-
ics as subspecialties (Fig. 1 in Raju et al.), as these fields have existed independently since the early 1960s and have much wider applications. In contrast to the definition proposed by Raju et al.,1 data mining is the process of deriving value from large structured or unstructured data, which typically utilizes some machine learning methods. Raju and colleagues1 explanation of unsupervised learning is oversimplified. A simple example would, in fact, be a cluster analysis in which the algorithm categorizes data into groups based on specified similarity and/or dissimilarity measures without prior labels. An artificial neural network (ANN) is actually a well-defined model characterized by a set of mathematical functions that broadly determine the network of neurons, propagation function, and bias.2 Concepts of ANN and deep learning (DL) are misrepresented since an ANN can have multiple hidden layers. Readers should be aware of these limitations in the description of terminologies relevant to understanding the health data science literature. Machine learning frameworks provide a structured approach to many machine learning applications. Those interested in these should refer to contemporary frameworks such as Scikit-Learn,3 TensorFlow,4 and PyTorch.5

An additional consideration is that a major challenge lies in the pre-processing of data into an analytic data set. Structured and unstructured health data hold different information and have a different quality. Equivalent to a robust study design in conventional research, rigor in data capture and processing must be an integral part of big data analytics. Second, cloud-based platforms are useful not only for storing data but also for performing analyses. High-performance computing is usually required for complex machine learning models including DL. Since healthcare systems cannot each have such facilities, the cloud-based platforms offer a scalable solution. Third, testing and evaluating the machine learning system on a distinct data set, preferably in a different institute or setting, can provide external validity. This requires appropriate and comparable measures such as the area under the receiver operating characteristic curve (AUROC), precision, and recall, to name a few. Using another data set also facilitates transfer learning, which enables the improvement of an existing model or application for another task. Lastly, there is a need for Explainable AI, especially for the more complex approaches. This is particularly relevant to health research because it relates to legality and ethics on fairness, accountability, and transparency in machine-based decisions.

There is a clear role for applied health data science in neurosurgery. We recommend Artificial Intelligence: A Modern Approach2 for those interested in building a foundation in AI and encourage close interdisciplinary collaboration to succeed in deriving value from big data for our patients.

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Response

We thank Dr. Poon and his team for their thoughtful and knowledgeable comments. We agree that our attempt to oversimply the concepts of big data, machine learning, and AI can be confusing. As data science and AI are intricately related and dependent, many sources categorize AI as part of data science. However, we agree with Poon and colleagues’ comments that they exist independently and are to be considered a separate field. We are also aware that the ANN includes multiple layers. To foster understanding of the concept by neurosurgeons, we oversimplified the diagram, defining only a single layer rather than the multiple layers of DL. The additional challenges related to data integration, high-performance computing, and external validity are mentioned superficially within our paper. Though we agree and accept these additional details and corrections proposed by Poon et al., we believe that our paper was intended “for neurosurgeons, by neurosurgeons” and will aid in understanding the concepts and applications of big data.

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Ballistic trajectory in civilian penetrating brain injury

TO THE EDITOR: We read with great interest the article by Alexopoulos et al. (Alexopoulos G, Quadri N, Khan M, et al. Ballistic lobar trajectory outcomes in civilian firearm penetrating brain injury. J Neurosurg. Published online November 6, 2020. doi:10.3171/2020.6.JNS201837). In contrast to the military environment, where 54% to 76.9% of penetrating brain injuries (PBIs) are caused by a low-velocity blast fragment, which frequently cause multiple associated injuries and are responsible for a high mortality rate, ballistic craniocerebral wounds in civilians are usually inflicted by an isolated firearm gunshot. In such cases, the bullet trajectory and the areas of brain tissue damaged are highly correlated with patient survival and should guide the surgical decision.

In a recent meta-analysis reviewing 1774 civilian patients with isolated PBI, bi-hemispheric, multilobar, and transventricular gunshot injuries were associated with a significant increase in the mortality rate. Using more accurate cranial 3D CT reconstruction, Alexopoulos et al. described 32 discrete projectile trajectories. They reported that bitemporal and frontal-to-contralateral parietal projectile courses in penetrating and perforating brain injuries were universally fatal. In fact, a well-known midline area in the middle of the brain has already been described by a low-velocity blast fragment, which previously identified a potential ZF. The narrow ZF corresponds to the midbody of the lateral ventricle, which previously identified a potential ZF. The narrow ZF corresponds to the midbody of the lateral ventricle, the body of the corpus callosum, and cingulum. This ret-

The presence of poor outcomes in civilians after transventricular through-and-through PBIs is not new; most importantly, bi-hemispheric involvement has been found to be predictive of poor outcome in numerous series. In response to the comments by Sellier et al., we have recognized flaws and limitations in the study of Kim et al., which previously identified a potential ZF. The narrow ZF corresponds to the midbody of the lateral ventricle, the body of the corpus callosum, and cingulum. This ret-

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The authors report no conflict of interest concerning the materials or methods used in this study or the findings specified in this paper.

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Response
We are thankful for being given the opportunity to respond to this letter by Sellier et al. regarding our article. The presence of poor outcomes in civilians after transventricular through-and-through PBIs is not new; most importantly, bi-hemispheric involvement has been found to be predictive of poor outcome in numerous series. In response to the comments by Sellier et al., we have recognized flaws and limitations in the study of Kim et al., which previously identified a potential ZF. The narrow ZF corresponds to the midbody of the lateral ventricle, the body of the corpus callosum, and cingulum. This ret-

References
respective study by Kim et al. excluded all PBI victims who died before arrival to the emergency department and those who were unable to be resuscitated, introducing selection bias to the study population. In contrast, their study included 37 subjects with isolated PBIs, among whom only 10 patients sustained fatal injuries.\textsuperscript{4} Given the extremely small sample size with only 10 patients who progressed to death, we understand that the hypothesis testing of Kim et al. is mostly underpowered to distinguish an effect of the significant ballistic trajectories associated with poor prognosis. More specifically, the authors reported that civilian PBI through the ZF was correlated with fatality (two-tailed p = 0.0006).\textsuperscript{5} The omission of confidence intervals by Kim et al. further supports our opinion that their study could be underpowered. Statistical significance is a less informative substitute for a confidence interval giving plausible sizes for the effect, considering that even a powerful study can be nonpractical in the real world when the confidence intervals are extremely wide.\textsuperscript{6}

The extremely narrow zone previously identified by the authors as the ZF could also represent an exaggeration of the effect size, and the conclusions of Kim et al. are subject to type M error (magnitude or exaggeration ratio), given the small population size in the study that progressed to death.\textsuperscript{5} This could have led the authors to overestimate the effect size, and the conclusions of Kim et al. are subject to type M error (magnitude or exaggeration ratio), given the small population size in the study that progressed to death.\textsuperscript{5} This could have led the authors to overestimate the reported accuracy of the ZF. Kim et al. disregarded the bullet caliber and trajectory and focused on vector analysis. Moreover, the inclusion of anthropomorphic measurements that formed the basis of their vector analysis for standardized targeting of deep cortical lesions could have led the authors to significant inaccuracies in identifying the ZF.\textsuperscript{4} In contrast to Kim et al., we managed to identify significant intracranial ballistic trajectories that favor survival, as well as trajectories crossing the previously described ZF that did not necessarily correlate with poor outcomes. With the above said, we do not want to underestimate the significance of transventricular bi-hemispheric trajectories as predictors of poor outcomes following a PBI; rather than describing a narrow ZF, our goal was to emphasize the impact of individual ballistic lobar trajectories on PBI outcomes when combined with multiple different variables, such as the projectile wound type, the missile fragment type, the projectile entry site, and individual patient factors, in an attempt to create a predictive model that could accurately reflect the damage inflicted by the kinetic energy transferred to the underlying brain tissue during a PBI.\textsuperscript{1-3}

Smith et al. reported a difference in PBI mortality in the military setting caused by blast fragment compared with civilian gunshot wounds, with significantly higher rates of survival in the military group injured by blast fragments.\textsuperscript{6} This could further support the role of early DC by battlefield neurosurgeons, in addition to the need for early safe evacuation and transfer of these injured patients to tertiary military hospitals.\textsuperscript{7} In the civilian setting, given the widespread availability of intracranial pressure monitoring, the role of early DC is less well defined and mostly reserved for patients with intracranial pressure elevations refractory to medical treatment or space-occupying lesions.\textsuperscript{8,9} As such, we cannot support the use of early DC as an appropriate intervention until there are prospective safety and efficacy data in the civilian PBI setting.

Discrepancies in national databases for TBI estimates

TO THE EDITOR: We read with great interest the article by Stopa et al.\textsuperscript{1} (Stopa BM, Harary M, Jhun R, et al. Divergence in the epidemiological estimates of traumatic brain injury in the United States: comparison of two national databases. J Neurosurg. Published online November 20, 2020. doi:10.3171/2020.7.JNS201896), but believe readers deserve a better understanding of the landscape of the incidence data sets the authors utilized to determine whether their conclusions regarding commensurate funding for traumatic brain injury (TBI) are apt. The authors rightly note that to appropriately allocate funding to TBI research, the scope of the public health burden must be quantified, i.e., the true incidence of TBI in the US. Stopa et al. state that “HCUP [Healthcare Cost and Utilization Project] NIS [National Inpatient Sample] NEDS [Nation-\textsuperscript{5}Georgios Alexopoulos, MD \textsuperscript{6}Nabiha Quadri, MD \textsuperscript{7}Maheen Khan, MD \textsuperscript{8}Joanna Kemp, MD \textsuperscript{9}Jeroen Coppens, MD \textsuperscript{10}Richard Bucholz, MD \textsuperscript{11}Philippe Mercier, MD, PhD
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wide Emergency Department Sample] databases draw administrative data from mostly community hospitals and the NTDB [National Trauma Data Base] NSP [National Sample Program] draws clinical data from major trauma centers.” To best understand this statement, the composition of these national databases must be understood.

HCUP maintains data from all reporting acute care hospitals, of which trauma centers are a subset. In California, in 2019, for example, there were 406 acute care hospitals that provided data to the California OSHPD (Office of Statewide Health Planning and Development); 384 (95%) of these hospitals reported to HCUP. For trauma centers specifically, there were 61 American College of Surgeons (ACS)—verified adult and 17 pediatric trauma centers in the state of California. Of the 61 ACS adult trauma centers, 59 reported data to HCUP. Of the 17 ACS pediatric trauma centers, all reported data to HCUP. Thus, HCUP captured 97% of adult trauma centers and 100% of pediatric trauma centers. The NTDB, however, only draws registry data from ACS-verified trauma centers, which represent a subset of all trauma centers. According to the NTDB, the participation rate for trauma centers reporting information to their state ranges widely. For 10 states, the proportion of trauma centers that report is 0%–33%; for 4 states, 34%–66%; and for the remaining states, 67% or greater.

As such, the hospitals that report to NTDB are completely within the Venn diagram of hospitals that report to HCUP. Therefore, there is no need (as stated in their policy recommendations) to combine NTDB and HCUP data (at least for counting purposes) because the addition of the NTDB data would be of little benefit to the existing state data. However, reporting data only from the NTDB would exclude data from the remaining 345 acute care hospitals in the state of California. As the incidence of TBI-related emergency department visits in the US was 62/100,000 per the NTDB NSP and 787/100,000 per the Centers for Disease Control and Prevention (CDC) report on TBI, which used HCUP data in 2013, if the NTDB NSP were the only reporting database in the country, we would have missed 92% emergency department visits for head injuries. Because the majority of all TBI is mild TBI (with a Glasgow Coma Scale score of 13–15) seen primarily in emergency departments, urgent care centers, and primary care offices (not accounted for by either data set), we would likely be grossly underreporting the true scope of the illness. Therefore, in reality, programs such as the CDC HEADS UP campaign, which aims to educate the public on the risk of head injury in children, are likely underfunded. Furthermore, several publications have highlighted that at least half of the patients who have sustained a TBI are discharged from the emergency department without a documented diagnosis of TBI, suggesting that the CDC statistics may actually underrepresent the true incidence of TBI in the US.

Simply because a patient with a head injury does not receive care in a trauma center does not mean that they should not be counted.

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References

Disclosures
The authors report no conflict of interest.

Response
We thank Madhok et al. for their thoughtful letter to the editor in response to our article.

We agree that all patients should be counted; that is indisputable. This does not, however, alter the significance of our main finding that these two databases, which represent overlapping patient populations, yield vastly different national estimates of TBI incidence. Regardless of how these estimates are derived, especially if the estimates represent similar data, they should be able to yield a more congruent and unified evaluation of the problem.

It is in the translation from count data into national estimates where we see the greatest opportunity for improvement. We suggest that rather than combining or excluding databases, a collaborative and shared approach to methodology could yield more accurate national estimates from each database. Until that is accomplished, we will remain lacking an accurate estimate of the magnitude of burden of TBI on our clinical and social structures.
Creating the conditions for gender equality to end sexual harassment in neurosurgery

TO THE EDITOR: We read with great interest the article by Benzil et al.1 (Benzil DL, Muraszko KM, Soni P, et al. Toward an understanding of sexual harassment in neurosurgery. J Neurosurg. Published online November 10, 2020. doi:10.3171/2020.6.JNS201649), in which the authors report that according to the results of the survey they created and administered, most neurosurgeons have experienced harassment during their careers, a finding that highlights the need to assess the depth of this issue.

Harassment strongly affects the lives and work effectiveness of victims and the functioning of the institutions where the harassment occurs.2,3 Sadly, studies have shown a high prevalence of harassment during medical school and residency, where the primary sources of harassment were attending surgeons.4 During their clinical training, medical students are not only exposed to sexual harassment from colleagues but are also vulnerable to other forms of mistreatment, such as gender and racial discrimination for which the principal sources may even be patients and their families.5 There is a multifactorial pattern, whereby a hierarchical structure exists and the student/trainee is under the supervision of a “superior” who feels dominant over the student,6 in a setting where long work hours mean long periods of exposure.6 In addition, social stereotypes create environments conducive to sexual harassment and gender discrimination.5

Hu et al.7 surveyed 7409 residents of all surgical residency programs across the United States to examine the association of harassment and burnout syndrome. These authors found that 31.9% of residents reported discrimination based on their self-identified gender, 16.6% reported racial discrimination, 30.3% reported verbal or physical abuse (or both), and 10.3% reported sexual harassment.4 Rates of all mistreatment measures were higher among women and were strongly associated with burnout and suicidal thoughts.3

Because harassment is a problem that is rarely discussed, we should encourage the medical community to foster education among students, trainees, and surgeons about each phase of harassment to be able to identify it and to have clear protocols when harassment occurs.6 New strategies are needed to promote the reporting of incidents of harassment and to assess the treatment of those who are willing to openly talk about it, creating a whole new support network that not only supports victims but also engenders vigilance on the part of work teams.3 We must change misconceptions of what constitutes “being professional” after harassment has occurred.6 We should do our best to create new convivence pathways where the boundaries of intimacy are far away from the professional area. But most of all, to prevent the feeling of supremacy in the perpetrators of harassment, we must alter conditions that foster acceptance of cultural stereotypes and stigmas and create conditions for women’s gender equality.3,6
TO THE EDITOR: We read with great interest the article published by White et al.1 (White MD, Fox BM, Agarwal N. The COVID-19 pandemic and the inequities of the neurosurgery match. Letter. J Neurosurg. 2021;134[4]:1351–1353), in which the authors express their concern regarding the new interview policies for students aspiring to enter neurosurgery programs. The new policies have been adopted due to the current COVID-19 pandemic, and virtual encounters have been chosen that in one way or another sow an inequity among applicants to medical residencies. We thank the authors for their interest in providing optimal and fair conditions to all those aspiring to the specialty of neurosurgery.

The sudden onset of COVID-19 directly and indirectly affected the study and work conditions in the health arena, limiting participation in the hospital field and making it necessary to opt for virtual mechanisms for the exercise of the academic practice–medical clinic. However, and despite the strategies used, the total restriction on attending a care center, whether for university practice or professional practice, has led to disinterest and a decline in academic productivity, especially in undergraduate students.2 An alternative to encourage all those students who have not found continuity in their praxis is the interest groups and research academy, in which mentors who are experts in certain topics can encourage the search, appropriation, and dissemination of academic and scientific knowledge. Rallis et al.3 showed that oncology tutoring had a positive impact on educated students by significantly increasing knowledge about multidisciplinary work and oncology-related specialties, including academia and research, even though interest in the tutor’s specialty did not develop.2 That is why groups should be open to the student’s interest, in this case, in neurosurgery.

We must bear in mind that the success of this type of project lies in the communication between the mentor and his or her pupils,3,4 because arising from there, the quality of the activities that can be carried out is reinforced. Besides, it should be emphasized that this is a dynamic and bidirectional process, where both parties must propose and contribute so that everything is carried out harmoniously, giving space for feedback and constructive criticism.5 Of course, the mentor is the one who must take the lead in the project, assuming and giving responsibilities to the participants that allow them to succeed at the proposed goal, without forgetting that they have their mentor’s help. This process must be holistic and not only focus on the academic part, because among the most fruitful actions on the part of the mentor are the sharing of frustrations and old experiences, the creation of support networks, and providing support in times of crisis.3

Models such as ASPECT (The Accelerate Scholarship through Personal Engagement with a Collaborative Team) promote longitudinal and collaborative research focused on a common research topic, provide tutorials to overcome personal and academic adversities, and provide a forum for students at all academic levels.4 This model supports what we have said above regarding the need to cultivate a relationship of friendship between mentor and pupil, beyond just an academic exercise, to enhance the results. The simultaneous participation in multiple projects, the identification and strengthening of the virtues of each member of the team, and the periodic telephone calls in which personal and professional issues are shared are some of the strategies that are used and that have shown good results.5 However, this is not the only existing model, just an example of the advantages that a mentoring process has applied in an organized way.

In this way, we invite students to participate in interest groups of academia and research in neurology and neurosurgery, as well as inviting the participation of residents, teachers, and other professionals who may encourage the continuity of the academic exercise, especially in this time of the pandemic, to achieve different objectives but with equally formative value. Although the shared experiences are not unique to the neurosurgery program, they can be applied to it with the certainty that very similar or even better results will be obtained in the context of academic neurosurgery.
The COVID-19 pandemic has created many challenges for neurosurgery as a whole, and these challenges extend all the way to medical students considering and applying to neurosurgery programs. Immediate effects were caused by the cancelation of sub-internships and the transition to a virtual residency interview process. However, more long-term effects are certain, and the authors highlight the importance of not leaving behind students whose interest in neurosurgery is still developing while the field adapts to the current situation. Interest groups in neurosurgery have previously demonstrated success and represent a solution that can function at full capacity while in full compliance with pandemic restrictions. At the national level, an analysis of institutions with AANS medical student chapters, which function as neurosurgery interest groups, demonstrated that a greater degree of chapter activity at an institution was associated with higher match rates. These results demonstrate the ability of this approach to foster student interest in neurosurgery and promote academic productivity without any requirement for direct exposure to patient care.

The COVID-19 pandemic has caused rapid and dramatic changes in the way medical education is administered. These changes have impacted nearly every aspect of the educational process, and the downstream consequences of some of these changes are only now becoming evident. The authors raise concerns regarding the pandemic’s effect on medical student interest in neurosurgery, which is particularly important in our field—where interest is often developed, confirmed, and matured in the direct clinical environment. However, necessary restrictions on the clinical environment disproportionately constrain opportunities for medical students. If neurosurgery as a field is going to continue to attract the brightest medical students, there must be a focus on other methods of engaging these students to overcome the decreased opportunity for direct clinical exposure during the pandemic. Specialty-focused interest groups could be one component of the solution to this problem by providing students with mentored academic and research opportunities that can be easily conducted in compliance with pandemic guidelines.

Neurosurgical interest groups had been implemented at the medical school level prior to the COVID-19 pandemic, and the success of these programs supports the argument of Maiguel-Lapeira et al. that interest groups could prevent some of the negative consequences of students’ limited clinical exposure during the pandemic. The Neurological Surgery Interest Group (NSIG) at the University of Pittsburgh School of Medicine is a prime example of how interpersonal engagement with faculty and residents from neurosurgery departments can cultivate interest and productivity among students. The Pittsburgh group published double-digit publications in neurosurgical journals, had a 100% acceptance rate of abstracts to the American Association of Neurological Surgeons (AANS) conference 2 years in a row, and, most importantly, had an increased number of students matching into neurosurgery from their institution. Similar success has been noted with other interest groups as well. Furthermore, many of the group’s activities, such as faculty panels, workshops, and networking events, can all be conducted virtually to comply with current restrictions. At the national level, an analysis of institutions with AANS medical student chapters, which function as neurosurgery interest groups, demonstrated that a greater degree of chapter activity at an institution was associated with higher match rates. These results demonstrate the ability of this approach to foster student interest in neurosurgery and promote academic productivity without any requirement for direct exposure to patient care.

The authors report no conflict of interest.
Missing Glasgow Coma Scale verbal component scores

TO THE EDITOR: We went through the article written by Brennan et al.\(^1\) with great interest and found their report remarkably interesting and useful (Brennan PM, Murray GD, Teasdale GM. A practical method for dealing with missing Glasgow Coma Scale verbal component scores. \textit{J Neurosurg}. Published online September 8, 2020. doi:10.3171/2020.6.JNS20992). As rightly concluded by the authors, the verbal scores derived by imputation will help clinicians arrive at a Glasgow Coma Scale (GCS) sum score which will help in filling in missing data while calculating prognostication scores. We commend in particular the development of the visual aid for imputation of a verbal score based on the eye and motor scores of the GCS. We look forward to using the described method while collecting data for our own research purposes.

However, a single issue that we would like to address here did catch our attention when we were going through the data tables. Table 2 in the paper by Brennan et al. shows the distribution of verbal scores based on eye and motor scores that were collected from the Trauma Audit and Research Network (TARN), Victorian State Trauma Registry (VSTR), and Corticosteroid Randomisation After Significant Head Injury (CRASH) trial databases. The verbal scores corresponding to eye and motor scores of 1 (E1M1) ranged from V1 to V5. Though V1 accounts for 94.2% of the responses (Table 3 in the paper), we could not help but wonder if it is possible for an E1M1 patient to have a verbal score of anything other than V1. Brennan et al.\(^1\) reported that 24 E1M1 patients had a full verbal score of V5 (Tables 2 and 3). Likewise, 26 M2 patients had shown full verbal scores. There seems to be an error in the data collection of the registries used by the authors.

Finally, we would like to congratulate the authors on coming up with such an innovative tool, which will surely help researchers in data collection and analysis with respect to the GCS.

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References

Disclosures
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Response
We are pleased that Dr. Gaonkar and colleagues find merit in our practical method for dealing with missing Glasgow Coma Scale (GCS) verbal component scores as reported in our article.

Gaonkar et al. raise a concern about the spread of the scores for the verbal component of the GCS for each eye and motor component combination (EM). They contend that in a patient with component scores of E1M1, the verbal component score (V) can only be V1. This is probably not the case. From the data presented in Table 2 of our article, 4.5% of people who were E1M1 had a verbal component score of 2, which from clinical experience is entirely plausible. V component scores of 3, 4, or 5 seem less plausible clinically, and indeed, the component category for each of these scores has fewer than 0.6% of patients.

The data in Table 2 were kindly made available to us by the primary investigators and we cannot say if they represented coding or transcription errors—which in addition to the V component might have been in the M or E component—or some extremely unusual clinical scenario. For this reason, the data should not be changed or discarded. It is the large number of patients included in our analysis that gives a clear picture of the most characteristic associations between EM combination and V component scores and highlights the robustness of our practical approach to imputation. We note too that the small number of questionable values in the database have no impact on the conclusions of our analysis.

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