EDITORIAL

International rotations and resident education

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THE August 2014 issue of the *Journal of Neurosurgery* devoted the first four articles to simulation and resident training, the effect of duty hour restrictions on outcomes in training hospitals, and the negative effect of duty hour restrictions on outcomes in cases of brain tumor and cerebrovascular disease.^{2,14,18,23} There is clearly an intimate interaction between resident training, patient outcomes, and duty hour restrictions. In a recent article in the *Journal of Graduate Medical Education* we have proposed a modification in resident training.²⁵

Although many factors are important in the training of residents, surgical experience stands out as critical; however, because of a number of factors highlighted by the Accreditation Council for Graduate Medical Education (ACGME) and Residency Review Committee (RRC) as tenets of residency, including “time for reflective learning,” the focus on hands-on operative training has been compromised. Furthermore, medicolegal as well as patient pressure has increased faculty involvement.

For example, a recent survey of 200 inpatients found that one-third did not want residents involved in any aspect of their surgery, and the majority wanted them to partake in only minor procedures.⁵ This, in spite of recent studies showing that resident participation was not associated with measured complications or worse outcomes.^{3,4,11,12,20–22,24,26,27}

But the greatest obstacle has been the initiation in 2003 of the common duty hour standards.^{9,13,17} Program directors and chief residents feel strongly that these restrictions have compromised surgical training.¹⁰ Moreover, the expected increase in educational opportunities has not materialized. In fact, there has been a decline in certification examination scores,¹⁶ and patient outcomes have either remained unchanged or worsened.^{2,23}

In a continuing effort to improve training, the Dreyfus paradigm has been adapted in neurosurgical training, whereby a trainee rises from novice to expert, passing

through graduated levels.^{7,19} Although time and observation are characteristics of this progression, neither can substitute for hands-on repetition and staged practice.

There have been four responses to this problem; namely surgical simulation, a transition to practice during the final year of residency, in-folded and post-residency fellowships, and opportunity to train abroad within the residency.

Surgical Simulation

Recently, there has been a significant rise in the number of publications concerning simulation models in neurosurgery training, with more than 40 publications appearing in the JNSPG journals (*Journal of Neurosurgery*, *Journal of Neurosurgery: Pediatrics*, *Journal of Neurosurgery: Spine*, and *Neurosurgical Focus*) and *Neurosurgery* in the last year. The benefits of simulation include skin closure,¹⁵ computer-assisted pedicle screw placement,⁶ endovascular catheter navigation,⁸ and clipping of aneurysms in a cadaveric flow model.¹ But these models do not have the life-like properties that can only be experienced in a staged and graded fashion within the operating room. Moreover, these modules do not account for the wide range of patient- and disease-specific characteristics. Additionally, they lack the mentored environment that allows one to learn appropriate measures following an initial complication. In summary, simulation is a valued addition to resident education, but direct operating room exposure is still essential.

Transition to Practice

Following the 2003 duty hour restrictions and the ACGME requirements, a number of centers adopted a transition-to-practice model to ensure that residents were prepared for independent surgical practice.^{9,17}

Residents would fulfill the ACGME requirements, including the chief year, during the first 6 years of residency.

The final year would then function as a transition to practice allowing clinical instructors to fine-tune clinical and surgical skills in a period of graded responsibilities in a setting of supervised independence.

This model was typically applied at programs that chose to extend residency to 7 years. Given that the RCC now defines neurosurgery residency as 7 years, a transition-to-practice model would not be possible unless residencies extend training to 8 years. Most have chosen to discontinue the transition-to-practice model.

Post-Residency Fellowship

The measures that have limited operative experience have fostered the development of fellowship training even after the completion of a 7-year residency. This comes at the cost of significant expansion of both time and financial expenditures as independent practice is further delayed. Moreover, all too often these fellowships further dilute operative experience for the residents in the program. They will, however, remain important.

International Rotations

To ensure proficiency, many centers have allowed residents to travel to overseas, accredited training centers to gain additional operative experience. For example, since 1971 residents at the University of Virginia have spent one senior year abroad at an educational neurosurgery training program prior to their chief year. Residents are required to have completed 3 years of neurosurgery residency prior to participating in the rotation, but the average resident had completed 5 years of neurosurgery residency. During this year, residents act as functioning chiefs of the neurosurgery service. In a similar manner as a neurosurgery chief in the US, they oversee the service, run a neurosurgery clinic that is mentored by a senior faculty member, participate in 3 to 4 mentored operative cases, and take clinical consult and operative back-up call. We recently compared neurosurgical logs provided by the ACGME for overall, index, and required neurosurgery cases for chiefs in the US for the July 2011–June 2012 residency year to those carried out by residents at 2 neurosurgery training centers in New Zealand (NZ) over the last 3 years. There was no significant difference in the mean number of cases carried out in NZ and US national data for chief year. The mean number of cases done in NZ was above the 50th percentile for US national averages for all adult cranial cases. This included the 70th–90th percentile for aneurysms and 50th–70th percentile for craniotomies for tumor treatment. The average number of cases carried out in 1 year in NZ per specific required index case was enough to satisfy the cranial case requirements for 4 to 6 adult areas and 2 of 3 pediatric areas for an entire residency.

Additionally, the numbers of cases carried out in each of these cranial areas in NZ was enough to satisfy all adult and pediatric cranial surgery requirements for an entire residency. The minimum, maximum, and standard deviations for case numbers for both NZ and the US national data for chief year varied substantially in all case categories, reflecting a transition to practice whereby a chief can decide to do the cases he/she is more likely to do after

residency or cases for which he/she needs further experience. All residents participating in the NZ abroad program noted that this was a vital year that provided supervised independence leading to improved neurosurgical education, operative autonomy, and burden of responsibility for patient care. These data illustrate that an international rotation at an approved educational training center can provide comparable surgical numbers to the chief year in the US and essentially double the number of cranial cases performed at the chief level of participation.²⁵ Moreover, sending residents overseas does not dilute the experience of residents at the home institution.

Conclusions

Unfortunately, models of training that include a transition to practice or a year of training abroad at an accredited program may not be sustainable. Beginning in 2013, the RRC and ACGME requirements for neurosurgical training increased in length to require a total of 84 months of neurological surgery residency of which 54 are clinical neurological surgery education (CNSE) and 30 months are elective. Of the 54 months of CNSE, 42 months are operative neurological surgery (ONS) and the remaining 12 months must include 6 months of structured education in general patient care (GPC), 3 months of critical care, and 3 months of basic clinical neuroscience education (BCNE). BCNE may include neurology, critical care, neuropathology, medical neuro-oncology, neurorehabilitation, neuroophthalmology, or neuroradiology, but these rotations do not count toward CNSE. With the increases in the RRC 2013 guidelines for neurosurgical residency training to 84 months, with 54 months of CNSE and 30 months of elective time, these transition-to-practice models may no longer be possible, as requirements cannot be fulfilled in 6 years.^{9,17}

The RRC has previously defined the elective time as including international rotations, but does not also count for CNSE. Several US training programs in neurological surgery follow these guidelines and send residents for rotations in international settings. Clinical rotations in established foreign-accredited training programs in neurological surgery provide important education in all of the ACGME competencies, but in particular, provide a unique experience in system-based practice. Importantly, unlike fellowship positions, these rotations do not dilute the operative experiences of residents at the home institution. For the majority of programs that were already 84 months long, the more stringent residency guidelines effectively decreased the overall elective time, which threatens both research time and international rotations for select residents. Without changes in the ACGME and RRC regulation to allow transition to practice and opportunities for further surgical experience abroad, simulation-based training or post-residency fellowships will become a necessity. But both have problems, as outlined above, that compromise resident education. A realistic solution would be approval of the year abroad as part of clinical neurological surgical education (CNSE).

<http://thejns.org/doi/abs/10.3171/2014.9.JNS142171>

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