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## Neurosurgery Residency Education in the Post–COVID-19 Era: Planning for the Future

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Though the pandemic persists in some regions of the United States, one can imagine a post–COVID-19 world in the not-too-distant future. However, new variants have delayed any resumption of normal activities. We caught a brief glimmer of what life after the pandemic may look like, but unfortunately, that window has faded. That said, when the time comes, it is worth discussing how medical postgraduate and neurosurgery education will look after COVID-19 has passed. Within academic neurosurgery, much has been written regarding the midpandemic response in New York city<sup>1</sup> and elsewhere,<sup>2</sup> to both care for COVID patients and treat neurosurgical emergencies without compromising resident teaching. However, less attention has been given to the postpandemic dynamics of neurosurgery education.<sup>3</sup> Whether departments will return to prior standard operating procedures or integrate novel virtual education techniques remains to be seen.<sup>3</sup> We identify 6 recommendations embraced by our department at Vanderbilt University Medical Center that may set a fruitful path forward in the postpandemic world of neurosurgery department educational activities.

1. **Return to in-person when possible.** Virtual “Zoom” conferences were a welcomed alternative while we all social distanced, as one report noted improved enthusiasm and educational debates among faculty members.<sup>2</sup> However, during the transition to virtual learning, many departments acknowledged that there was no replacement for learning in-person as a team,<sup>4</sup> which includes incorporating real-time feedback, engaging in the true Socratic method, and conducting team-oriented activities with learners of all levels.<sup>4</sup> Anecdotally, we have also noticed that opportunities for disengagement during virtual lectures become apparent, such as turning off video and multitasking. A return to in-person learning eliminates the temptation—and ability—to multitask. Not surprisingly, the return to in-person conferences may be met with some resistance. Time spent walking or driving to conference activities represents a real opportunity cost that the pandemic unmasked. However, we suspect the price for direct human interaction in neurosurgical education will pay long-term dividends for our trainees and, subsequently, their patients.
2. **Think globally to mitigate disparities.** While borne out of necessity, the adaptation to virtual platforms has created an unparalleled opportunity for international engagement. The ubiquitous nature of videoconferencing has ushered in multinational lectures and a voluminous library of educational content, most of which are available for free. Moreover, residents and junior faculty from across the globe can interact with experienced and renowned neurosurgery educators with the click of a button.<sup>5</sup> Air travel expense, immigration obstacles, and time spent away were once seen as fundamental barriers to international neurosurgery collaboration.<sup>6</sup> Though some

obstacles remain, virtual learning and collaborative media have reduced educational inequities and helped bridge the gap between neurosurgeons from both high- and low-income countries. Maintaining the open access and on-demand nature of these tools is a moral imperative for the welfare of resident education.

3. **Embrace local education.** Just as virtual platforms allow us to reach our partners in remote locations, placing educational activities online enhances our connection to local communities including medical students, undergraduate students, and neurosurgeons in private practice. While sometimes taken for granted among academic surgeons, the daily educational activities of a department represent rich learning opportunities. Medical students deciding on a career path may “Zoom-in” to Neurosurgery Grand Rounds to discover more about the field. The same can be said of college students deciding on a pre-medical track. Community neurosurgeons can benefit from improved access to up-to-date lectures on surgical techniques and controversies in the field. Reciprocal benefits for an academic department exist as well by offering trainees a window into how the majority of neurosurgery is practiced and providing insight into tenets of community neurosurgery, such as operating room efficiency.
4. **Maximize virtual clinic attendance.** Telehealth was rapidly expanded during the early phase of the pandemic and offers numerous benefits for patients and providers including an average 8-minute waiting room time, decreased time to first available clinic appointment, and improved imaging review with the screenshare function.<sup>7</sup> In our program, resident clinic attendance has historically been low due to a busy operative service. Consequently, our graduates often cite lack of clinic experience as a challenge in the first years of practice. A transition to telehealth means that residents can participate in clinic visits at off-site locations or when unexpected openings occur in the operative schedule, as has been described at other programs using a 3-way platform.<sup>2</sup>
5. **Make interinstitution visiting lectureships routine.** The pandemic has made access to leaders throughout the country exponentially easier. Prepandemic, visiting lectureships represented a significant financial and opportunity cost to both the host department and visiting professor. A normalization of virtual lecturing has simplified these events substantially, without sacrificing the valuable content discussed. During the pandemic, our department began to host national leaders in neurosurgery during weekly Grand Rounds. Residents may engage in teaching activities, case conferences, and didactic sessions in other programs. The silos of one’s own institution, where residents often think there is “only one way” to do

certain surgical techniques, can be broken down by providing a window into other training programs. Other departments have followed suit and embraced one of the true silver linings of the pandemic.<sup>2,8</sup>

6. **Acknowledge what has happened.** COVID-19 has affected us all emotionally in a way that remains to be seen.<sup>9</sup> Logistically, residents may have missed out on formative operating time and feel their surgical growth has been stunted.<sup>10</sup> This altered schedule should be acknowledged, and changes may need to be made such that residents can complete their required or desired rotations.

## CONCLUSIONS

Though we are still facing uncertain times, the postpandemic world of neurosurgery education will undoubtedly include an amalgamation of midpandemic education techniques. COVID-19 accelerated the development of previously unreliable technology into everyday use, which has potential to permanently improve neurosurgery resident education through lecture and clinic. Local and global audiences can now have access to outstanding educational activities. With continued expansion through virtual platforms, in-person education should be revisited, especially for neurosurgery residents in the midst of their critical 7 years of training.

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