Over the recent years, the field of Neurosurgery has witnessed a major transformation in the dissemination of knowledge and professional development using virtual webinars. This change has primarily been accelerated after the COVID-19 pandemic and the associated ‘social distancing’. As the healthcare system was faced with unprecedented changes, the utilization of online platforms for neurosurgical education emerged pivotal in bridging the gap created by restricted in person interactions. Groups such as the Society for Neuro-Oncology (SNO), World Federation of Neurosurgical Societies (WFNS), Neurosurgery Cocktail, American Association of Neurological Surgeons (AANS) and Congress of Neurological Surgeons (CNS) committees have transformed their annual meetings and conferences into an online format. Neurotrauma webinars have been held with societies in Latin America (La Federación Latinoamericana de Sociedades de Neurocirugía [FLANC]), Asia (Asian Australasian Society of Neurological Surgeons [AASNS]), Africa (Continental Association of African Neurological Surgeons [CAANS]), and the Asian Congress of Neurological Surgeons (ACNS). All the above mentioned associations as well as European Association of Neurosurgical Societies (EANS) are effectively taking forward this dynamic approach of virtual education, not only for the neurosurgery residents and physicians but for the medical students in their academic years as well, aiding them in making better career choices.

Hence, this practice is on the rise and rightly so. These advancements in online neurosurgical education have dismantled the geographical barriers allowing neurosurgeons from all over the world direct access to knowledge and expertise. This makes the whole platform extremely inclusive. This inclusivity is further complemented by the live Q/A sessions, fostering the idea of better engagement and immediate feedback. Financially, it provides a cost effective alternative to the in person conferences by reducing expenses associated with travel and accommodation, something that significantly benefits doctors in low income areas and underdeveloped countries. Another great benefit in learning that virtual webinars provide is in the opportunity to review the recorded lectures at a later time. This reinforces the learning and enables better grasp on the knowledge at the ease of the learner. In a research conducted with neurosurgery residents, it showed that they demonstrated a keen interest and increasing appreciation for this medium of learning and as this new generation is the developer of the future curriculum, it speaks significantly of how the approach to medical education is rapidly becoming digitalized.
However, at the same time where online webinars provide easy accessibility to medical information they do reduce the avenues of professional networking. The sheer importance of face to face interaction for personal learning and professional skill building is something that is undeniable. Professional code of conduct and interaction is rarely something that can be efficiently learnt while being in the confines of one’s room, alone. Online webinars thus, can hamper the culture of team building that eventually might have an impact on the overall work place dynamic in the longer run\(^6\). Moreover, with the passage of time, various studies and interviews with the neurosurgery residents and physicians have demonstrated that despite advances in technology and virtual learning, it still is unable to mimic the in depth experience of learning and attainment of practical skills that the hands-on, in-person learning has to offer. This does mean that virtual learning platform cannot be relied upon as a sole means of education and that it still significantly requires improvements by the use of artificial intelligence technologies and new software facilities, something that is underway\(^7\). However, the technical difficulties related to the availability of stable internet connectivity and high quality 3D simulators to perform and practice procedures on continues to be an affordability issue for a major chunk of the under privileged nations. This creates a discrepancy in the quality of learning and medical practice demonstrated by the neurosurgical community as a whole\(^8\). In addition to that, viewer attention span and concentration during online seminars has also been noticed to have an impact on the outcome. Studies demonstrate that the maximum attention span of an adult is no more than 20 minutes and so a need to make the webinars more viewer-friendly exists\(^9\). This can be done by making webinars more interactive allowing active engagement of its viewers, reducing the duration of the webinar, and allowing break rooms something that EANS and AANS virtual webinars currently do incorporate. With this growing advancement in the technological field it is unfair to ignore the difficulty that the older generation of neurosurgeons and attending find in getting comfortable with this up rise of virtual education and demonstrated here\(^7\) and so due attention should be paid to this aspect as well.

Looking ahead, balancing the convenience of online webinars with irreplaceable value of hands on experiences and in person interactions remains crucial for the holistic development of neurosurgery as a field. The importance of in person learning for skill development cannot be denied and thus online education avenues can only be used as adjuncts to the traditional ways. Furthermore, improving the existing quality of virtual webinars is paramount as well. Webinar based neurosurgery can evolve by better incorporating specialized, hands-on virtual training modules, enabling surgeons to practice procedures in a simulated environment. Integrating advanced technologies like 3D modeling, augmented reality, or surgical simulations within these webinars can and will enhance the understanding and skill development\(^8\). Online medical education in neurosurgery should continue to be a collaborative platform where global neurosurgeons share experiences and innovative techniques to enrich the learning experience and advance the field collectively. With the world becoming so rapidly digitalized, it is only appropriate that medical field makes use of it in the most diligent way possible. However, avenues to make this virtual platform best suited to the demands of the field of neurosurgery is going to be an uphill continuous effort.

**NOTES**

**Author contributions**

Conceptualization: MF, NA, BC. Data curation: MF. Formal analysis: MF, NA, AB. Project administration: BC, Visualization: NA, AB, BC. Writing - original draft: MF. Writing - review & editing: BC.

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