



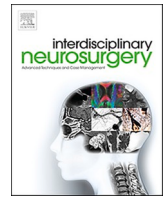
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Review Article

Virtual pedagogy in neurosurgery during the COVID-19 pandemic: Perspectives from university hospital in Nepal

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ABSTRACT

Objectives: Since the onset of the COVID-19 pandemic many large institutions have turned towards virtual education. Neurosurgery in our institute, recognizing its benefits, readily embraced the virtual learning experience using Zoom Inc (San Jose, California) beginning on May 21, 2020. The result of this form of educational experience may not be apparent readily. Hence, nearing the end of one year of monthly Zoom meetings, an effort was undertaken to assess the feasibility and the barriers of effective virtual teaching learning activity in neurosurgery among the participants.

Methods: The participants consisted of neurosurgeons and trainees from department of neurosurgery Tribhuvan University Teaching Hospital in Nepal, neurosurgeons based in Seattle, United States of America and neurosurgeons based in Sweden, who have been regularly attending the monthly virtual education organized by Dr. Wohns. At the end of one-year experience of monthly Zoom teaching and learning activities between the participants a questionnaire comprising objective questions related to their experience of virtual education in neurosurgery was distributed to the participants and answers were collected and analyzed.

Results: A total of 18 persons out of 25 responded to the questionnaire. Majority of participants responded favorably to virtual education. A few responders faced disturbance in internet connectivity affecting the quality of video and sound during the presentations. None of the participants faced inconvenience due to time difference. Most responders preferred to continue virtual education even after the pandemic.

Conclusions: Overall most participants responded favorably to virtual education which has helped them increase their participation and hence broaden their knowledge in the field. Most participants look forward to continuing this form of education even in future. Thus, this form of education may be incorporated at least in part in the future of neurosurgical training.

1. Introduction

Since the onset of the COVID-19 pandemic several institutions all over the world have turned towards virtual teaching and learning methods. Recognizing the convenience, ease of accessibility, the avoidance of travel and adherence to the rule of “social distancing,” this method rapidly changed the way teaching learning experiences were delivered. In Nepal, early restrictions on social gathering including meetings and seminars were imposed. This would have a severe impact on the education of the trainees. However, since the Zoom meetings were already getting popular throughout the world, our university, Tribhuvan University Teaching Hospital, readily converted from the real

time classes to virtual meetings.

The Department of Neurosurgery in the University in addition to daily academic Zoom meetings also conducted monthly virtual meeting with participants including residents and faculty from the department and senior neurosurgeons from the United States of America and Sweden.

Virtual teaching methods avoid the need to travel and can be conveniently participated from workplace or at home. This especially is valuable for residents during their training period. Of greater importance, during the Covid-19 pandemic, is that it avoids the need for any form of gathering, hence this method is safe. The drawback is its requirement of internet service and a computer. Another drawback is the

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difference in time zone, while conducting meeting overseas. The internet connectivity often would falter and often the connection would be lost or the video quality would be poor.

Neurosurgery at Tribhuvan University Teaching Hospital, Nepal, began with the arrival of Dr. Merwyn Bagan from US, in January 1995. His first endeavor was training Nepalese surgeons and nurses, and furnishing neurosurgical equipment and supplies. [1] Neurosurgery as a faculty was established in TUTH in January 1995. The program was supported by Foundation for International Education in Neurological Surgery (FIENS) and since then numerous neurosurgeons have visited and worked to strengthen the facility. Dr. Richard Wohms, from Seattle, USA was one of the faculties that visited the hospital in 2013. Since then he has been visiting the hospital yearly.

The 3-year MCh training program in neurosurgery in TUTH started in September 2007. Currently the programme trains two residents per year and has a faculty of 6 members who actively guide the trainees in clinical, research and teaching learning activities.

More than a yearlong pandemic and the associated lockdowns would have a detrimental effect on the training and teaching learning activities that would have been achieved otherwise in a robust three-year residency programme in the institute. Hence monthly virtual teaching learning activities was proposed as a method to continue high level of education at the same time maintaining the guidelines of "social distancing". The meeting, moderated by Dr. Wohms, from Seattle, included a presentation from one of the faculties followed by discussion of interesting cases in spine that were collected through the previous month. Neurosurgeons based in Seattle, United States of America participating in the virtual meeting were senior consultants' experts in their fields. The meetings were moderated by Dr Wohms from Seattle.

This study was conducted to assess the feasibility and barriers of effective communication encountered after one year of the start of this program.

2. Materials and methods

2.1. Virtual teaching activity

Since the onset of the novel Coronavirus (Covid-19) pandemic, and the imposition of restrictions on gatherings for teaching learning purposes, the teaching learning activities have been severely restricted. However, we could carry on the monthly Zoom meetings consisting of various faculties of Neurosurgery from United States and residents and faculty from department of neurosurgery. The meeting, included a lecture by one of the faculties from US, followed by a case presentation by a neurosurgical resident doctor and discussion regarding the management of the case. The inaugural meeting was held on May 21st, 2020. The presentation was done by Dr. Wohms on "Safety and Efficiency of Cervical Disc Arthroplasty in Ambulatory Surgery Centers vs Hospital Settings."

Since then monthly meetings have been conducted with subject matter as listed below:

- Robotic Spine Surgery.
- Cervical Arthroplasty.
- Artificial Intelligence and Machine Learning in Neurosurgery.
- Updates on Anesthesia for Spine Surgery.
- Updates on Interventional Pain Management.
- Neuromonitoring.
- Coding and Documentation.
- Skull Base Surgery.
- Paper Writing and Publications.
- Medical-Legal Principles.

The presentations for the next few Zoom sessions include the following:

- MIS TLIFs.
- Online Learning for Spine Surgeons.
- Mazor X Robotic Spine Surgery.
- Thoracolumbar Truma.
- Minimally Invasive Approach to Spine Trauma.
- Cervical Arthroplasty vs Fusion.

This survey was conducted at the end of one year (June 2021) of virtual teaching and learning between the neurosurgical residents and faculty of the university in Nepal and the neurosurgical faculties in the United States. A questionnaire consisting of six questions were circulated to all the participants regularly participating in the meetings. Likert scale was used to record the responses (1 = strongly disagree, 3 = neutral and 5 = strongly agree). [2].

1. The virtual conferences have helped to expand my knowledge in the subject.
2. The virtual conference is more exciting than traditional teaching.
3. I would prefer to continue virtual conferences in the future even after the end of the pandemic.
4. I experienced a lot of disturbance in audio and visual experience due to poor internet connectivity.
5. Time zone difference was convenient for me.
6. My involvement in teaching/ learning activities has increased since the virtual education started

2.2. Statistical analysis

Statistical analysis was done using Microsoft Excel (Microsoft corp.). Median was used as a measure of central tendency for ordinal Likert data.

3.

The questionnaire was ed to 25 participants out of which 18 responded. All the respondents agreed (Strongly agree 50% and Agree 50%) that this form of education has helped to expand knowledge in the subject. Fig. 1.

Most participants (50%) were equivocal that the (Fig. 2) virtual form of education was more exciting than the traditional form of teaching.

Majority of the participants responded that their involvement in teaching/learning activities has increased (agree 27.78%, strongly agree 22.22%) since virtual education started. However, a few responders (11.11%) disagree to it. Fig. 3.

Most (61.11%) responders disagree that they faced a lot of disturbance in audio and visual experiences during the conferences. Fig. 4.

The time zone was convenient for most participants (66.67%). Fig. 5.

Most responders agree (agree 61.11%, strongly agree 27.78%) that they would continue with virtual education in the future even after the pandemic ends. Fig. 6.

4. Discussion

This was a descriptive study to see the feasibility and barriers of virtual conferencing for the training of neurosurgical residents during the Covid-19 pandemic. After the end of one-year period of the zoom meetings an effort was undertaken to see the effectiveness of this form of education.

The participants, most of whom were neurosurgical residents training in a university hospital in Nepal, attended the conferences from their homes. It was a monthly Zoom meeting consisting of guest lectures from prominent spine surgeons from the US and Sweden, case presentation by the neurosurgical residents and active discussion regarding management of current cases admitted in the hospital. Most participants did not face a lot of disturbance with internet connection and audio-visual quality and most agree that the time zone difference was

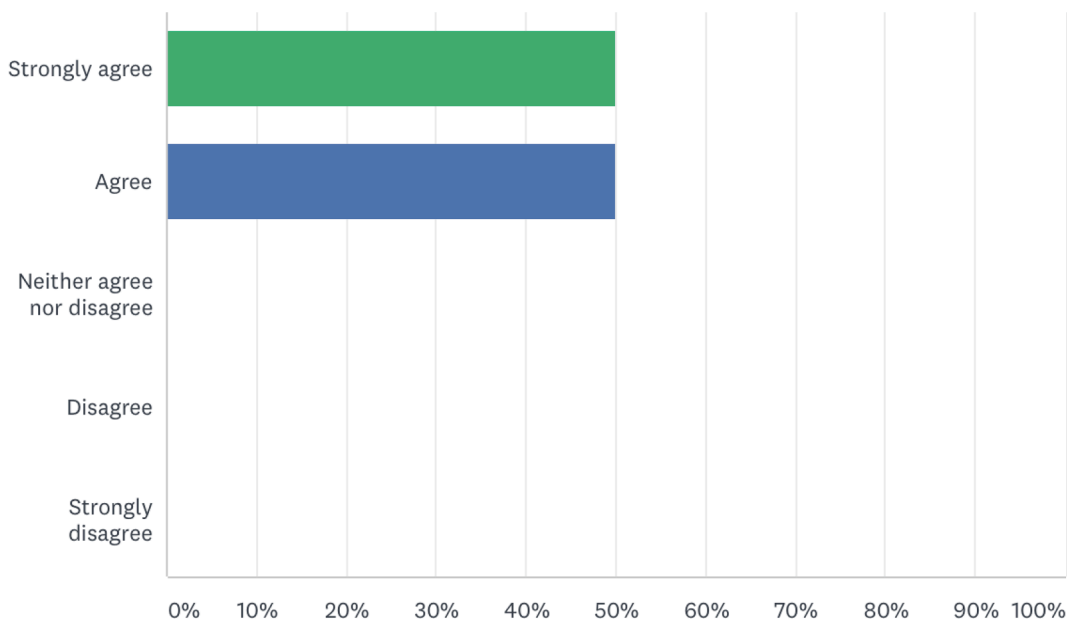


Fig. 1. The virtual education has helped me to expand my knowledge in the subject.

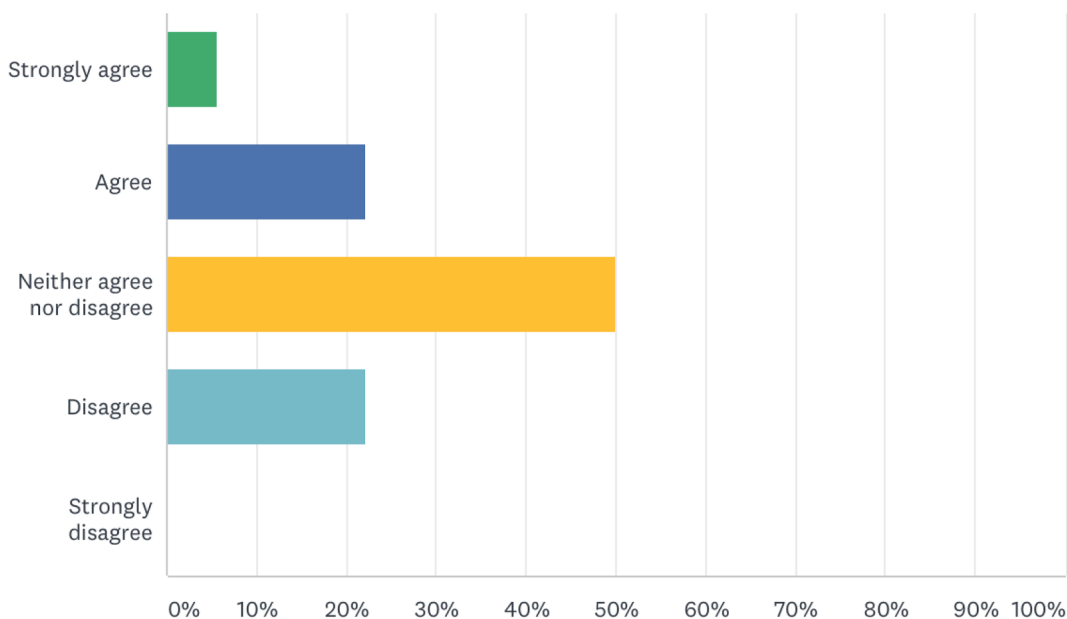


Fig. 2. The virtual education is more exciting than traditional teaching.

convenient. Overall most participants agree that they benefited from the virtual meeting. Moreover, most participants would prefer to continue virtual education in the future even after the pandemic.

Since the beginning of the pandemic, and imposition of early lockdowns, in person meetings for teaching learning activities were severely affected in Nepal. This potentially had a detrimental effect on the three years of neurosurgical residency period in our institution. However, the department of Neurosurgery in our institution was quick to embrace virtual teaching/ learning methods in the form of daily virtual morning briefing, case presentation and topic presentations. Of particular mention was the monthly Zoom meetings between the residents and faculty of the department of our institution in Nepal and senior neurosurgeons from United States of America and Sweden.

Virtual conferencing for continued medical education has, during the pandemic, taken a major role as one of the preferred methods hence

most fields of medicine have already taken up this form of education. This method has the advantage of convenience, low cost, accessibility and is a more student-centered form of learning.

Of greater importance is the fact that the participants' involvement in teaching and learning activities have increased as compared prior to the pandemic. In person participation in international conferences, which otherwise in normal circumstances would happen only once or twice a year, have increased.

This was an internal evaluation of this novel form of teaching learning activity, hence definitive conclusions cannot be drawn due to limited number of participants.

Similar study has been conducted evaluating the use of virtual education in neurosurgery using Likert scale, at academic institutions by Lazaro et al. Their study did not show a clear preference of virtual education as compared to traditional teaching however there is a strong

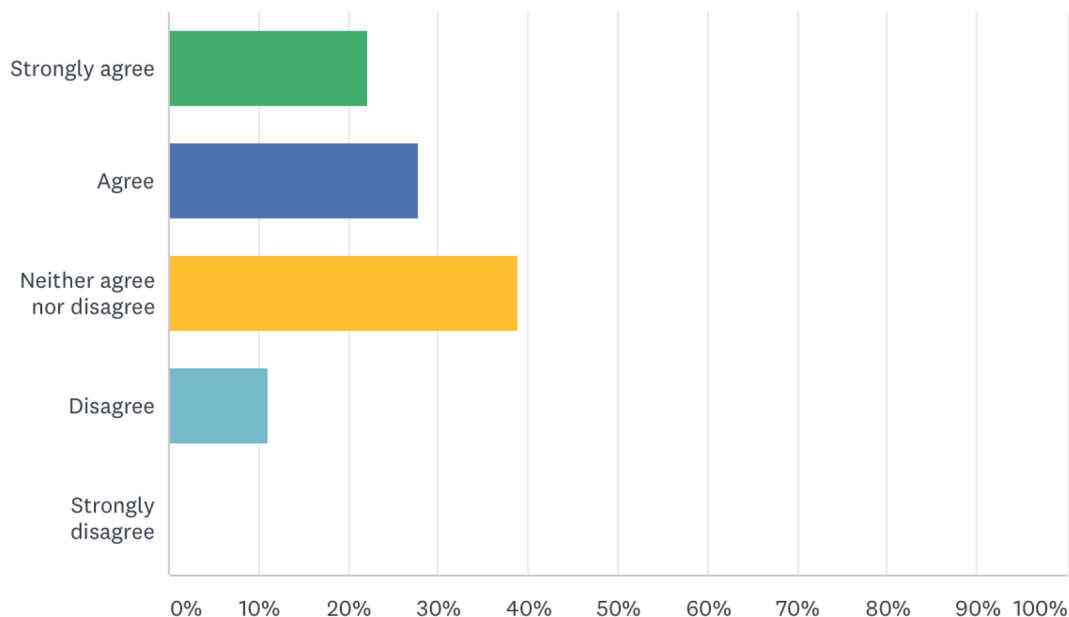


Fig. 3. My involvement in teaching learning activities has increased since the virtual education started.

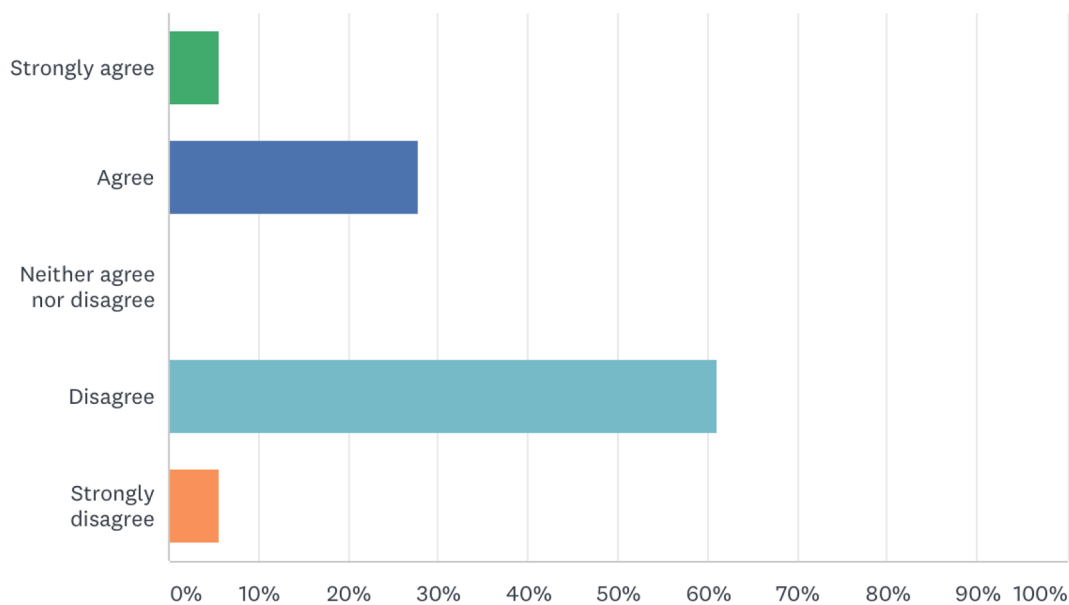


Fig. 4. I experienced a lot of disturbance in audio and visual experiences during the conference.

suggestion that virtual education will likely continue as a component of neurosurgical education in the future. [3].

A recent Cochrane review stated that when compared to traditional learning, e-learning may make little or no difference in patient outcomes or health professionals' behaviors, skills or knowledge. [4].

David et al. have been successfully utilizing Zoom Inc to deliver neurosurgical education to the neurosurgical residents since the start of the pandemic in Emory University Medical Center. [5] Nasser et al in their study found that despite its limitations, virtual learning has been well received by majority of neurosurgeons. Lower income countries in particular are embracing this technology. [6].

Virtual education although overcomes several barriers over in person education, however the real challenge is its limitation in transferring psychomotor skills to the residents. However recent studies evaluating simulation and augmented reality in neurosurgical training have been done with promising result. Therefore, virtual learning may in future

replace a major portion of teaching learning activity especially neurosurgical training program.

5. Conclusions

The conferences have helped mutual understanding of the way similar cases are managed in Nepal, US and Sweden. They have provided ample sharing of experience and opportunities of learning from each other. The virtual format has conveniently allowed neurosurgical education and collegiality to continue at a high level even during the COVID-19 pandemic.

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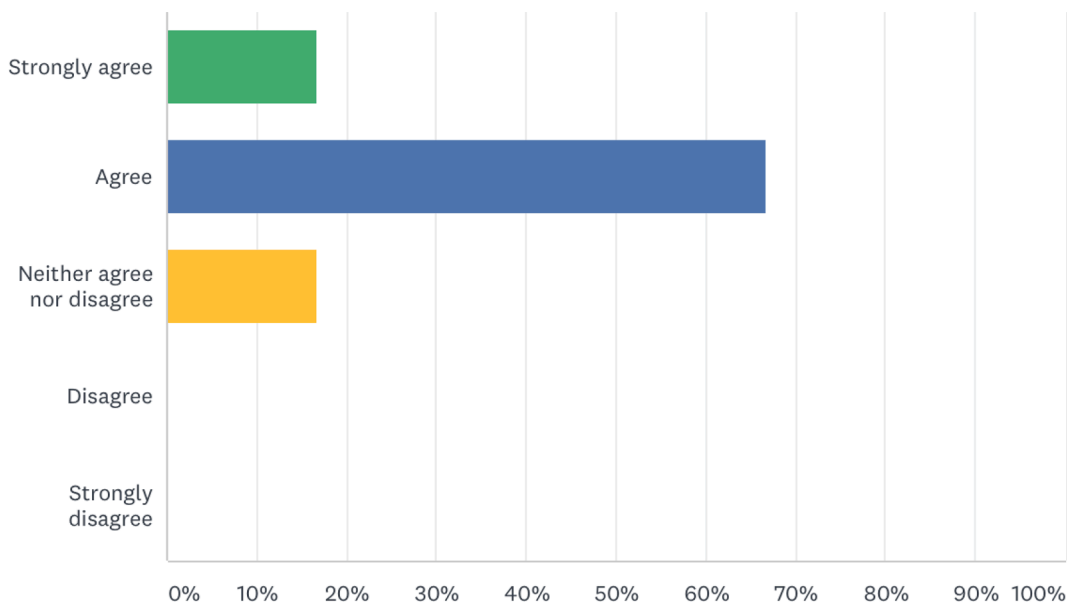


Fig. 5. The time zone difference was convenient for me.

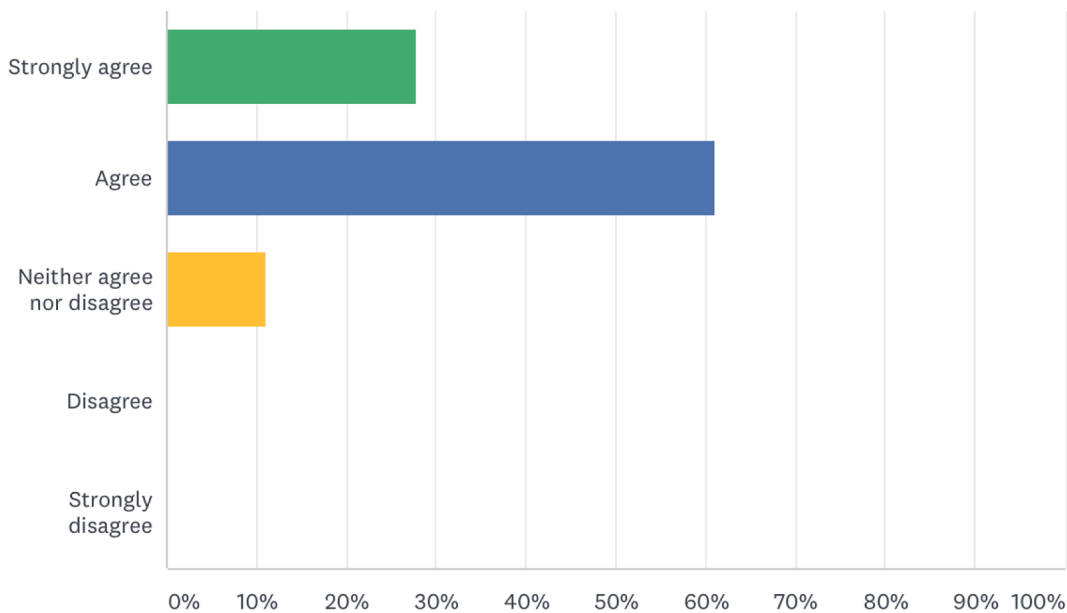


Fig. 6. I would prefer to continue with virtual education in the future even after the end of the pandemic.

Uncited References

[7,8]

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

[1] K. Mukhida, S.K. Shilpakar, M.R. Sharma, M. Bagan, *Neurosurgery at Tribhuvan University Teaching Hospital, Nepal*. *Neurosurgery*. 57 (1) (2005 Jul 1) 172–180.
 [2] R. Likert, A technique for the measurement of attitudes. *Arch. Psychol.* 1932, 22 140:55–55.

[3] T. Lazaro, V.M. Srinivasan, M. Rahman, A. Asthagiri, G. Barkhoudarian, L. B. Chambless, P. Kan, G. Rao, B.V. Nahed, A.J. Patel, *Virtual education in neurosurgery during the COVID-19 pandemic*, *Neurosurg. Focus* 49 (6) (2020) E17.
 [4] A. Vaona, R. Banzi, K.H. Kwag, G. Rigon, D. Cereda, V. Pecoraro, I. Tramacere, L. Moja, *E-learning for health professionals*, *Cochrane Database Syst Rev.* 2018 (8) (2018).
 [5] D.P. Bray, G.P. Stricsek, J. Malcolm, J. Gutierrez, A. Greven, D.L. Barrow, G. E. Rodts, M.F. Gary, D. Refai, *Letter: Maintaining Neurosurgical Resident Education and Safety During the COVID-19 Pandemic*, *Neurosurgery*. 87 (2) (2020) E189–E191.
 [6] N.M.F. El-Ghandour, A.A.M. Ezzat, M.A. Zaazoue, P. Gonzalez-Lopez, B.S. Jhawar, M.A.R. Soliman, *Virtual learning during the COVID-19 pandemic: a turning point in neurosurgical education*, *Neurosurg. Focus*. 49 (6) (2020 Dec) E18.
 [7] R. Breese, M. Piazza, C. Quinsey, J.E. Blatt, *Tactile Skill-Based Neurosurgical Simulators Are Effective and Inexpensive*, *World Neurosurg.* 137 (2020 May) 319–326.
 [8] J. Cho, S. Rahimpour, A. Cutler, C.R. Goodwin, S.P. Lad, P. Codd, *Enhancing Reality: A Systematic Review of Augmented Reality in Neuronavigation and Education*, *World Neurosurg.* 139 (2020 Jul) 186–195.