EDITORIAL

Challenges in Surgical Training- Exploring the role of virtual and augmented reality

Prof. Dr. Rehan Ahmed Khan[1]

1 Editor in Chief, Health Professions Educator Journal Lahore, Pakistan

doi: https://doi.org/10.53708/hpej.v3i1.751

In the field of surgery major changes that have occurred include advent of minimally invasive surgery and realization of importance of the 'systems' in the surgical care of the patient (Pierorazio & Allaf, 2009).Challenges in surgical training are twofold: (i) to train the surgical residents to manage a patient clinically (ii) to train them in operative skills (Singh & Darzi, 2013). In Pakistan, another issue with the surgical training is that we have the shortest duration of surgical training in general surgery of four years only, compared to six to eight years in Europe and America (Zafar & Rana, 2013). Along with it, the smaller number of patients to surgical residents' ratio is also an issue in surgical training. This warrants a formal training outside the operation room. It has been reported by many authors that changes are required in the current surgical training system due to the significant deficiencies in the graduating surgeon (Carlsen et al., 2014; Jarman et al., 2009; Parsons, Blencowe, Hollowood, & Grant, 2011). Considering surgical training, it is imperative that a surgeon is competent in clinical management and operative skills at the end of the surgical training. To achieve this outcome in this challenging scenario, a resident surgeon should be provided with the opportunities of training outside the operation theatre, before s/he can perform procedures on a real patient. The need of this training was felt more when the Institute of Medicine in USA published a report, 'To Err is Human' (Stelfox, Palmisani, Scurlock, Orav, & Bates, 2006) , with an aim to reduce the medical errors. This is required for better training and objective assessment of the surgical residents. The options for this training include but are not limited to use of mannequins, virtual patients, virtual simulators, virtual reality, augmented reality, and mixed reality.

Simulation is a technique to substitute or add to real experiences with guided ones, often immersive in nature, that reproduce substantial aspects of the real world in a fully interactive way. Mannequins, virtual simulators are in use for a long time now. They are available in low fidelity to high fidelity mannequins and virtual simulators and help residents understand the surgical anatomy, operative site and practice their skills. Virtual patients can be discussed with students in simple format of text, pictures and videos as case files available online, or in the form of customised software applications based on algorithms. In a study done by Courtielle et al, they reported that knowledge retention is increased in residents when it is delivered though virtual patients as compared to lecturing (Courteille et al., 2018). But learning the skills component requires hand on practice. This gap can be bridged with virtual, augmented, or mixed reality.

There are three types of virtual reality (VR) technologies: (i) non-immersive, (ii) semi-immersive, and (iiii) fully immersive. Non-immersive (VR) involves the use of software and computers. In semi-immersive and immersive VR, the virtual image is presented through the head mounted display (HMD), the difference being that in fully immersive type, the virtual image is completely obscured from the actual world. Using handheld devices with haptic feedback the trainee can perform a procedure in the virtual environment (Douglas, Wilke, Gibson, Petricoin, & Liotta, 2017).

Augmented reality (AR) can be divided into complete AR or mixed reality (MR). Through AR and MR, a trainee can see a virtual and a real-world image at the same time, making it easy for the supervisor to explain the steps of the surgery. Similar to VR, in AR and MR the user wears an HMD that shows both images. In AR, the virtual image is transparent whereas in MR, it appears solid (Douglas et al., 2017). Virtual, augmented and mixed reality have more potential to train surgeons as they provide a fidelity very close to the real situation and require fewer physical resources and space compared to the simulators. But they are costlier, and affordability is an issue. To overcome this, low-cost solutions to virtual reality have been developed. It is high time that we also start thinking on the same lines and develop this means of training our surgeons at an affordable cost.

Correspondence:
Prof. Dr. Rehan Ahmed Khan,
Editor in chief, Health Professions Educator Journal, Lahore, Pakistan.
E-mail: *surgeonrehan@gmail.com*

REFERENCES

Carlsen, C. G, Lindorff-Larsen, K., Funch-Jensen, P., Lund, L., Morcke, A. M., Ipsen, M., & Charles, P. (2014). Is current surgical training efficient? A national survey. Journal of Surgical Education, 71(3), 367-374.

Courteille, O., Fahlstedt, M., Ho, J, Hedman, L., Fors, U., Von Holst, H., Möller, H. (2018). Learning through a virtual patient vs. recorded lecture: a comparison of knowledge retention in a trauma case. International journal of medical education, 9, 86.

Douglas, D. B., Wilke, C. A., Gibson, D., Petricoin, E. F., & Liotta, L. (2017). Virtual reality and augmented reality: Advances in surgery. Biol Eng Med, 2, 1-8.

Jarman, B. T., Cogbill, T. H., Mathiason, M. A., O'Heron, C. T., Foley, E. F., Martin, R. F., Webb, T. P. (2009). Factors correlated with surgery resident choice to practice general surgery in a rural area. Journal of Surgical Education, 66(6), 319-324.

Parsons, B. A., Blencowe, N. S., Hollowood, A. D., & Grant, J. R. (2011). Surgical training: the impact of changes in curriculum and experience. Journal of Surgical Education, 68(1), 44-51.

Pierorazio, P. M, & Allaf, M. E. (2009). Minimally invasive surgical training: challenges and solutions. Paper presented at the Urologic Oncology: Seminars and Original Investigations.

Singh, P, & Darzi, A. (2013). Surgical training. British Journal of Surgery, 100(3), 307-309.

Stelfox, H. T, Palmisani, S., Scurlock, C, Orav, E. J., & Bates, D. W. (2006). The "To Err is Human" report and the patient safety literature. BMJ Quality & Safety, 15(3), 174-178.

Zafar, Z, & Rana, H. N. (2013). Surgical Training in Pakistan: Challenges & Directions. Education, 70(1), 24-30.