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SHORT COMMENTARY

Newer Methods of Surgical Learning: Gifts of COVID-19 to Medical School

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Abstract

Background India has survived three waves of the COVID-19 pandemic. To adapt to the flow of life, hospitals metamorphosed into sanctums with all hands at the deck for containment of the pandemic. The training of residents in medical schools was hugely impacted during this time.

Methods Various educational aids to improve surgical training were reviewed and assessed.

Results Augmented, virtual and mixed reality devices, 3-D anatomy learning aids, and simulation programs were the main categories found.

Conclusion The global intelligentsia has worked at an exceptional momentum during COVID-19 to imbibe novel developments in the medical field for better surgical training. These advances are truly gifts of COVID-19 to medical school.

Keywords Surgical training · COVID-19 pandemic · Virtual reality · Augmented reality

Introduction

Training in all medical specialties has suffered during the COVID-19 pandemic, and to decipher which specialty has suffered more would be a difficult contemplation. However, elective surgical specialty training suffered the most as there was a significant curtailment in the routine outpatient visits at clinics & hospitals. Elective gynecological surgeries were no exception to this. Due to the reduction of quantity and typology of surgeries to face COVID-19 emergence, residents' didactical and professional growth dwindled [1]. A plethora of novel educational methods have evolved during the pandemic proving that necessity is the mother of invention. Some of the technological tools to augment surgical training are augmented reality devices like Google glass, virtual reality devices like Osso VR, mixed reality devices like Microsoft HoloLens, Anatomy learning aids like Anatomage table, and Magic Mirror, and Web-based solutions like WebSurg and Touch Surgery.

What are the Lacunae in Medical Learning?

Traditional methods of teaching like the didactic method have not been found to be effective owing to low student engagement and poor recall. The traditional live operating room teaching suffers from the limitations of poor visibility, bad lighting, uncomfortable positioning [2], increased student-to-operative case ratios, and time constraints. The current curricula lack mental well-being programs, a fact which was realized when the rates of anxiety disorder and depression were found to be as high as 26.6% and 23.8%, respectively, among those with frontline COVID-19 responsibilities [3].

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How These New Devices Can Help to Promote Medical Learning?

Augmented reality devices like google glass overlay computer-generated images onto the actual environment [2]. Trainees can view the surgical procedure through the eyes of an operating expert surgeon [4]. A junior trainee can take a second opinion from a senior expert, and even the hands of an expert colleague can be superimposed into the operative field. Software, battery life, ergonomics, photographic/video quality, and cellular/streaming capabilities can be improved. Patient confidentiality and technological failure, paucity of research data, and failure to interact with three-dimensional data packets are other concerns [2].

Virtual reality technologies involve a complete immersion into a computer-generated environment, participant's peripheral field of view is entirely taken over by a head-mounted display. The advantages of VR are increased haptic fidelity and integrated problem-solving. However, virtual reality sickness is a problem that results from locomotion in the virtual scene not directly translating to real-life motion, leading to a vestibular mismatch [5]. Also, there is no feedback from the actual environment, and this can have important implications for operating room use. Examples include Headsets like Osso VR, and Immersion VR.

Mixed Reality Systems like Microsoft HoloLens merge many benefits of virtual reality and augmented reality. Holograms are projected into the user's surroundings, 3D information can be integrated, and surgical plans created. Because this device provides interpupillary calibration, the transmission of visual information from the environment is not interfered with. The live feed can be broadcasted to any remote smartphone or computer, and bidirectional communication is possible. It has a good battery life, real environment feedback, and remote relay options. However, it is expensive, needs software development, and has the potential to cause nausea/vertigo with prolonged use, which is dangerous in the operating room [2].

3-D Anatomy learning aids- Anatomage table is a virtual dissection table that can be an important adjunct to traditional cadaveric teaching. It is more cost-effective, there is no time consumption for embalming, dissection, and disposal procedures, and CT/MRI imaging integration leads to better application of anatomical knowledge to clinical practice. However, there is no tactile feedback, and variations in the human body and differences in color of tissues cannot be assessed [6]. *Magic mirror* is a mirror, wherein user's body is projected into a mirror. Radiology images are projected in different intersection planes. There is no tactile feedback like Anatomage table.

Operating room simulation programs accessible from home- Incision Academy, WebSurg, Teach Me Surgery, Surgery Squad are some of the web-based solutions; Touch Surgery, My Virtual Surgery, CABG—OPCAB Surgery Training are some phone-based programs that can help provide simulation teaching [7].

How These New Aspects of Learning Can Improve Medical Teaching and Apprenticeship?

Webinars and video conferencing for teaching purposes in medical curricula have been successfully integrated to disseminate global best practices. The devices mentioned above can help improve medical training and optimize workflow by helping mitigate the decreased practical surgical training.

Cost

The approximate cost of Google Glass, Microsoft HoloLens, and Ocular Rift are $1500, $3000, and $600, respectively. The Journal of Medical Insight offers surgical videos at $50 per month or $500 per year for surgical residents. Economic affordability is an important element for the application of these devices in resource-limited countries like India. However, institutional investments into these novel solutions can have a positive and everlasting impact on the quality of medical professionals produced thereby proving more cost-effective for the nation in the long run.

A Future Application in Medical Science

The technological advances are not a substitute but an adjunct to traditional cadaver teaching along with assisting and exposure to surgeries with hand-holding in the operating rooms. The latter provides the medical student an additional dimension of peer learning, feel of human tissue, and accountability for the consequences of the procedures performed. One can look up to these devices and methods for better three-dimensional comprehension to improve surgical learning.

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Declarations

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