Medical Education in the era of COVID-19

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Abstract. All countries have taken strict precautionary measures to prevent the spread of COVID-19 disease. As a result, many medical schools have shifted from face-to-face to online teaching, learning, and assessment strategies. It is indeed challenging to strike a balance between the risk of getting students and faculty infected, and the utility of clinical teaching and learning. This paper summarizes the most common online teaching and learning strategies that can be used in undergraduate medical education. Online learning has also been found to be a more affordable, convenient, and cost-effective strategy for students and teachers alike. Time has come to shift to high fidelity simulation-based learning resources that can be used for teaching, learning, and assessment. Virtual medical schools once sounded like a dream that may now turn into reality, where all member schools can share their best practices.

Keywords: Medical education, online education, COVID-19, Saudi Arabia.

INTRODUCTION

After the declaration of SARS-II or COVID-19 as a global pandemic by the World Health Organization (WHO), almost all countries have taken strict precautionary measures to prevent the spread of the notorious disease. The five most universally implemented precautions are; wearing masks, practicing social distancing, avoiding handshakes, washing hands frequently, and avoiding crowded gatherings (Adhikari *et al.*, 2020). In line with other preventive measures, most countries have shut down their educational institutions, including medical schools, to prevent the spread (Taha *et al.*, 2020). These unforeseen circumstances have pushed the educational community to think out of the box and come up with a plan to streamline medical education. As a result, many medical schools have shifted from face-to-face to online teaching, learning, and assessment strategies (Ahmed *et al.*, 2020; Iqbal *et al.*, 2020). Despite all efforts, the clinical phase of undergraduate education remains a crucial dilemma. It is indeed challenging to strike a balance between the risk of

getting students and faculty infected and the utility of clinical teaching and learning. Being the national medical education scientific society in Saudi Arabia, The Saudi Society of Medical Education (SSME) and its board of directors propose online assessment strategies and guidelines that Saudi medical schools may follow in response to the COVID-19 crisis.

The effectiveness of online medical education

A recently published systematic review evaluated the effectiveness of online education in improving practicing medical doctors' knowledge, skills, attitude, and satisfaction (George *et al.*, 2019). In total, 93 studies were included, of which 76 compared between online, blended, self-directed, and face-to-face learning modalities. Overall, the effect of online education on post-intervention change was found to be inconsistent and ranged from no difference

Table 1: Online teaching, learning, and assessment strategies that can be used in undergraduate medical education during the COVID-19 crisis

Education phase	Traditional approaches	Alternative Teaching and Learning approaches	Assessment tools
Pre-clinical	Classroom-based teaching	Online Interactive lectures Online task-based discussion Online seminars Online problem-based tutorials Online video-based discussion	Online MCQ Online EMQ Online SAQ Online open book Online assignments
	Practical-based sessions (laboratories, skills lab, simulation centers)	Online digitized cadaveric* session 3D virtual anatomy learning resources** Online practical tutorials	Digital spotter
Clinical	Hospital-based teaching (clinics, in-patient wards, operation theaters)	Online Case-based discussion Online Task-based discussion Online clinical video-based discussion Online clinical seminars	-Online clinical vignettes MCQ -Online standardized clinical viva -Online clinical assignments

*Digitized cadaveric resources included "Acland's Video Atlas of Human Anatomy" (Acland, 2013), high-quality cadaveric images, bespoke videos of prosecuted/plastinated specimens, YouTube(TM) videos (YouTube, San Bruno, CA), and the Visible Human Project (U.S National Library of Medicine, Bethesda, MD) (Longhurst *et al.*, 2020)

**Three-dimensional virtual resources included "Visible Body" (Argosy Publishing, Inc., Newton, MA), "Complete Anatomy" (3D4Medical/Elsevier, Dublin, Republic of Ireland), 3D models using "Sketchfab" (Sketchfab, New York, NY), "Anatomy TV" (Primal Pictures Ltd., Colchester, UK), and "Sectra" (a virtual dissection table; Sectra AB, Linköping, Sweden) (Longhurst *et al.*, 2020)

to very high post-intervention scores between the two groups. The evidence suggested that online education and blended learning might be as effective as face-to-face learning. Some studies also suggest that online pedagogy has more pronounced educational outcomes as compared to self-directed or face-to-face learning (Shu and Gu 2018; Alghamdi *et al.*, 2020; Lazarevic and Bentz 2020).

Another meta-analysis, comparing online and face-to-face undergraduate medical education, reported that there is no evidence to support better outcomes of face-to-face modality (Pei and Wu 2019). Online learning has the potential to enhance the knowledge and cognitive skills of undergraduate students, which is why it can be considered as a viable alternative to continuing the delivery of education. In cases where training through virtual patients is possible, online learning also has to advantage of effectively improving clinical reasoning, communication, teamwork, and procedural skills (Kononowicz *et al.,* 2019).

Strategies to streamline medical education during the COVID-19 crisis

The movement to online teaching and learning during the

COVID-19 crisis was the most appropriate way to go (Samarasekera *et al.*, 2020). Table 1 summarizes the most common online teaching and learning strategies that can be used in undergraduate medical education. Moreover, online learning has also been found to be a more affordable, convenient, and cost-effective strategy for students and teachers alike (Sterling *et al.,* 2017; George *et al.*, 2019). Students can access online resources from any location, thus reducing the cost of in-person educational materials (Brockman et al. 2020). Another significant advantage of online educational resources is that students can frequently practice without jeopardizing patient safety (Berman *et al,.* 2016). In the assessment domain, an online formative assessment could be used to enhance the learning process and provide useful feedback to the students. Whereas, for the summative evaluation, different alternative options are given in Table 1, which can be used as the best possible replacement in the current situation. However, while preparing for a summative assessment, care should be taken to ensure adequate software and hardware resources, and a backup support system (Wadi *et al.,* 2020). Despite all efforts, assessing psychomotor

skills remains the most challenging issue during the COVID-19 crisis.

Lessons learned

The following lessons can be learned from the novel COVID-19 pandemic;

1.Time has come to shift to high fidelity simulation-based learning resources that can be used for teaching, learning, and assessment.
2. Virtual medical schools once sounded like a dream that may now turn into reality, where all member schools can share their best practices.
3. Preventive medicine, disease control, and public health education should be incorporated in all courses, particularly in clinical teaching, learning, and assessment.
4. Medical schools should invest in a technology-enhanced education system as it is the future.
5. Students, faculty, and supporting staff should be trained on how to deal with technology so that they can acclimatize themselves according to modern education.

Key messages

• Technology-enhanced education is the future trend, and we must prepare for it.
• Undergraduate medical curricula should emphasize more on public health, preventive medicine, and disease control.
• Medical schools and universities should play an active role in promoting preventive medicine as a specialty and as a career choice for aspiring young physicians.
• More venues should be created for the virtual commencement of continuing medical education programs and scientific meetings.

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