Turkish Online Journal of Qualitative Inquiry (TOJQI)
Volume 12, Issue 7, July 2021: 634-644

Medical Education during the Pandemic of Corona Virus: Challenges and Mitigations

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Abstract

The pandemic of Coronavirus started in late winter of 2019 has disrupted the medical education severely. To reduce the transmission chain of the virus, all types of educational institutions, including medical schools, switched to online learning to different levels. Due to socioeconomic variations among nations and individuals, the pandemic imposed barriers and challenges for medical education to various extents. Personal, technical and institutional challenges are the most barriers reported by medical students around the world. However, the transition to remote learning brought some benefits to students and communities struggling with the pandemic. New innovations and experience were gained through the years of pandemic which can be helpful implement technologies into the education more than the past century.

Keywords:COVID-19 pandemic, Online learning, Remote education

1. Introduction

A novel type of pneumonia had been reported in Wuhan city (China) during December 2019 that was subsequently identified as an infection of a new coronavirusnamed SARS-CoV-2 that became a pandemic within few months[1].According to the statistics of The Johns Hopkins University School of Medicine, this infection is designated as COVID-19 and resulted in a pandemic with more than 177million cases and 3.83 million deaths in192 countries/region as of 17th June 2021 (https://coronavirus.jhu.edu/). The pandemic drastically disrupted normal lifeand globaleconomies due to the triggered countermeasures and lockdownsimplementedto mitigate

theburden of the disease. Education is a vivid sector that was also forced to shut downits classical style (classroom lectures, group discussions, andpractical rounds)since gathering in closed spaces spreadsrespiratory infectionssignificantly [2].

Within the first months of the pandemic, no treatmentor vaccinewere available owing to scarcity of knowledge regarding the pathophysiology of this new virus. As an emergency response, medical classroom teaching and bedside tutorials were suspended in educational institutions [3]. Such response was mounted toensure safety of students and educators by reducing virus transmission chain within the institutions and community [4,5]. Reducing students' numbers and practical rounds in clinical placements has also conserved personal protective equipment for essential staff and supported the deployment of physicians and medical academicians to the frontlines in many countries [6,7].

The impact of COVID-19 pandemic is likely to have long-lasting repercussions on study and careers of biomedical students. The academic sector is currently struggling to effectively deliver courses and make assessments that both meet the curriculum goals without compromising integrity, ethics, and health safety [8,9].The curricula became compressed and elective rotations were suspended or minimized in many institutions. The continuous spread of the virus and lacking of effective containment procedures necessitated the introduction of online learning to greater context in biomedical institutions [9].

The virtual learning environment can be relied on to deliver the theoretical part of the curriculum,however, the physical space and face-to-face interactions remained vital for effective learning and teaching. The facial expression and voice would be compromised in online teaching to some extent. Additionally, on-campus learning provides a quiet study space by a classroom or library without potential distractions. Online learning will minimize the chances of building a better mentoring relationship between faculty and students as well. The lack of hands-on training in the preclinical years may also have serious implications on the training of the current cohort preclinical studentsas they are expected to struggle later in the clinical years where rotations involve direct interaction with patients[10]. In this review article, the challenges faced by students and faculty members were concisely reviewed along with the mitigations taken to cope up with the pandemic. The role of academic leadership and future perspectives were addressed to improve the quality of remote learning under such crisis.

2. Online learning during the pandemic

Although online learning was well-known and used before COVID-19 pandemic, it full implementationas the sole method for teaching ineducationalInstitutions has not been witnessed. Indeed, various online teaching platforms have been created and numerous simulation software were introduced in unprecedented rate [11,12].Open-source platforms andsimulation software were introduced in tremendous amount within the second half of2020.Nonetheless, the quality and efficiency of the emergingresourcesare questioned owing to time constraintsand their attempts to compensate for lack of exposure. The suddentransition to remote education resulted in different attitudes toward the capacityand efficiency of e-learning for all students and courses. Previous experiencewith online education may pose anegativeattitude and reluctancetoward the acceptance of e-learning. Indeed, some medical students who previously reliedon studying online were less likely to agree that they could cope withstudying during the pandemic. Many students admitted that they lacked self-discipline and drive to study [13]. The limited opportunities for peer discussions and interactions is expected to affected the performance of students and faculty [8,13].

3. Challenges of medical education

Switching to full online track was accompanied by diverse barriers and challenges for students and faculty members. Such barriers can be groupedintothree categories; personal, institutional, andtechnological and community barriers.

3.1.Personal challenges

The personal barriers are embodied in failureto adapt an effectivelearning style and/or physical health issue. Indeed, difficulties in adjusting learning styles and mental health concerns were reported, especially among females and students with lower academic standings[13]. Procrastination and distraction byfamily or by unlimitedaccess to Internet were also reported alongside the lack of drive to study since the uncertainty and stress were introducedby the pandemic [13,14]. Moreover, small-spaced and noisy houses are not conducive for learning/studying. Stressful relationships and responsibilities may alsobe important obstacles to effective online studying[13]. The financialhardship was reported among medical students as an issue affecting their online learning [15,16].The pandemic had also caused psychological stress and distractionamong medicalstudents. Anxiety and mental health difficulties have been reported

in high rates among medical students in Turkey [17], Japan [18], and Australia [19]. Grief and hopelessness are also expected among students who had lost a family member in the pandemic[20]. Lastly, lack of proper study materials, including reference texts, at students' homes is also an expected issue. Prior to the pandemic, on-campus libraries provide study materials easily to students for basic knowledge and further readings to expand their backgrounds. As the lockdown measures were implemented, libraries and even out-campus bookshops are inaccessible easily.

3.2.Institutional challenges

Institutional barriers usually stem fromeducators or theadministration. In developing countries, institutions may not have a clear vision and plans for long-term online learning if the pandemic persist for the next years [13]. The lack of effective simulation software in such institutions creates a gap between theoretical knowledge and practical skills. Furthermore, inadequate skills for online teaching or unfilled commitments from educators have also been reported by students [13,16]. Indeed, it has even been practiced by some professors to give their handouts as presentation slides without any auditory notes or explanations [13]. Exposing students, especiallyfreshmen or sophomores, to new sophisticated topics in such a way is disappointing and frustrating as well.

4. Technological and community challenges

Technological barriers are the most common challenge for students in developing and developed countries [8,13,16,21]. Technical problems in Internet connection networks and learning platforms are faced by students in developed and developing countries alike [13,14]. In some developing countries, some students reported the lack of personal computers or smartphones as challenges to online learning [8,16]. The most apparent community barrier in developing countries is the shortage or continuous cuts of electricity. Of course most of the times online lectures can be recorded to become available for later watch, however, synchronousassessment sessions or examinvigilation processes are severely compromised once the electric current goes out.

5. Coping with patient-oriented courses

5.1.Anatomy and Radiology

In most system-based curricula, radiology is usually delivered in parallel with anatomy during the pre-clinical years. In subsequent clinical years, student shadow radiologists and technicians alongside the classical lecture-based learning. However, it has been also a challenge for educators to devise an effective e-learning method to substitute the classical hands-on radiology and cadaveric anatomy sessions during the pandemic. COVID-19 crisis has stimulated the emergence of digital software that display exquisitely detailed anatomy of human body that are expected to serve their purpose for e-learning. The development of virtual dissection platforms that based on computerized tomography (CT) improves students' understanding and clinical relevance of anatomy and radiology [21]. Such high-fidelity simulation software allows students to cut and dissects virtual models of human body that were created by coloring volumetric CT data. In absence of such platforms, 3D radiological imaging was also exploited to enhance the quality of e-learning of both fields [22]. The incorporation of such images to virtual learning environments with possible interactions between tutors and students is fruitful strategy. An authentic learning experience can be provided to students by radiology images that will be encountered most of the time in their careers as physicians. Nonetheless, a recent survey showed that some students prefer to learn anatomy from real-life patients' cases and clinical history rather that virtual radiology images [23].

5.2.Surgerycourses

Practical classes of different specialtieswithin the surgery discipline are mainlydependent on contact with patients in operating theaters. In response to such crisis, surgical simulation software was used to provide some practical experience to trainees outside operatingtheaters. As a new innovation inmedical education during the pandemic, virtual otolaryngology surgery rotations have been implemented recently in the USA at the University of Pennsylvania[24].The virtual rotations comprised interactive live-streamed surgeries where the surgeons perform theprocedures and aired alive to students viaaudio-video recording devices connected to interactive platform. In such rotations, students have the samevision field of the surgeons and avoiding the problems of traditional in-person experience such as limited space in smallsurgery theaters or limited visual angle toward the anatomical site of the surgery. On the other hand, the

procedural or technical skills are markedly hindered in such virtual education which necessitates the traditional hands-on approach for such courses[3,8].

6. Benefits acquired during COVID pandemic

Despite the above-mentioned drawbacks of the online learning, several benefits were reported in many cross-sectional studies [11,13,14,16]. Beside health safety, student benefitted from saving time and money usually expensed for travel to colleges.Additionally, online learning usually offers flexibility for students to study at their own pace [14]. Biomedical students can also benefit fromthe collaboration with institutions that have more resources viaonline learning [25]. Online learning might also be an effective method for provision of functional knowledge and confidence before engagement in real encounter with patients. Self-learning study skills and inter-professional education are also expected to improve upon e-learning approach [26].

7. Teacher perspective on education

Similar to students, academic tutors face technical difficulties in online teaching as this approach was not part of many courses prior to the pandemic. Lack of interactions with students affects tutor's ability to judge students understanding. Furthermore,many faculty instructorsbelievethat online teaching platforms are not conducive with their teaching style, especially in laboratory-based courses such as histopathology labs and other biomedical courses. Coronavirus pandemic also offers an opportunity to implement technologies into medical education. Of course, the traditional in-person didactic lectures and tutorials remains the cornerstone of teaching, yet under such pandemic, the heavy reliance on e-learning is the best available choice[5,20].

The assessments and examinations of students are more challenging academic tasks. One solution for such a problem was to set up a formative assessment after each studied topic in which students post their response via Google forms and Google thread platforms within a limited timeframe [27]. Nonetheless, the credibility of such approach in assessing the knowledge of students is largely depending on students' honesty during their response to the task or assignment. The King's College London and Imperial College London adopted an open-book online examinations that students take from homes [28]. Such option may be the best option to dispense with the impractical invigilation of numerous test takers at their homes. Nonetheless, The Aga Khan university hospital in Pakistan followed another approach [29] where several video-conferencing platforms were tested in non-graded exams to choose the most useful one

and to acclimatize students to online tests. The faculty members were trained to be the invigilatorsfor the graded examination process through cameras. A timed and well-structured exam were taken successfully online.However, the deceitful act may still possible.

8. Tips for successful online education

Educators are requiredto understand learners' needs, motivations, mental health, and past experiences to maintain engagement in an online curriculum. To achieve academic success, students need to be guided for developing self-regulated learning strategies, which include time management, metacognition, critical thinking, and effort regulation [30]. The instructors are recommended to use technology effectively to engage students in a fruitful discussions and feedback during the online sessions to help students to cope with the material as in the traditional face-to-face sessions[8,14]. To avoid technical difficulties, instructors are highly advised to review the video-conferencing platform before conducting or recording the lecture. Instructors should also beer in minds that self-motivation of students is to be maintained during the e-learning classes. Students who has been actively engaged in hands-on practical work such as anatomy, surgery, and histopathology well probably suffer a fade-out of their self-motivation after transition to online learning[27].

For students, they should remain committed to learning to cope up with this tough situation. Turning on their webcams during online sessions will limit their distraction and increase commitment tothe session and course. Avoidance of multi-tasking is also an essential part in successful online learning. Additionally, using of chat box function in video-conferencing platforms to raise questions and arguments during discussion sessions is advised to normalize the virtual meeting or to provide constructive feedback to improve incoming sessions.

9. Academic leadership during the pandemic

Administrative responsibilities of academic leaders during COVID-19 pandemic became more stressful. During such unpredictable crisis, academic leaders should adjust their strategies and approaches within three major trajectories; connections with individuals, sharing responsibilities, and clear communications.

Connection with people during this pandemic within the academic institutions is of paramount importance to strengthen accountability, trustworthiness, integrity as well as mental health and emotional stability. Humble and intuitive academic leader can considerably regulate the stress of

students, staff, and even stakeholders. Commitment and continuous improvements are contributing factors for gaining mutual trust and cooperation with students and faculty staff along with a full support from higher authorities and/or stakeholders for a real transformative change. Such relationships are fruitful investments that will be a continuous source even after the pandemic has ended. To build an effective connections and relationships during crisis, academic leaders need to be authentic, active listener without judgment, advice-accepting, and willing to embrace constructive criticism with full confidence and consideration. Additionally, new interpersonal and task-related conflicts are highly expected during the transition from traditional education to e-learning style. Patience and logical evaluation of different perspectives are to be encouraged providing that it is functional[9].

The top-down leadership model is not productive during unusual situations such as natural disasters and pandemics. The academic leader would select a culturally diverse team of qualified individuals with supportive and creative characters to share the responsibilities during this pandemic. The diversity in perspectives and anonymity during voting for decision making are important factors to improve the quality of responses taken to copeup with the pandemic. Moreover, the latitude in problem-solving and motivation of team members are maximized by distributing leadership responsibilities as long as mutual trust and adequate sources are maintained.The academic leaders are also required to maintain clear communications with faculty staff and students. The communication channel is different for each group as staff and colleagues usually prefer to use e-mails or direct messages to receive updates. On the other hand, students are usually more oriented toward social media platforms. Students only perceive the message communicated with credibility if their leaders are known for their integrity and credibility. Messages from incredible leader will not be positively received even if the message is truly credible[9].

10. Conclusion and Perspectives

Coronavirus pandemic has severely affected and re-shaped medical education around the world. Online learning has become the sole method to deliver lectures during the academic years and it isexpected to remain as an integral part of medical curricula for curtain courses. However, this easy approach should not be implemented at the expense of practical and clinical skills required for medical doctors' career.The commitment to teach and learn is a crucial factor for successful online education. Barriers and challenges to online education are expected to affect the quality of

newly graduated physicians as well as the national healthcare services. Medical schools, authorities, and academic leaders should make student-centered improvements and changes to mitigate e-learning obstaclesduring the pandemic. Lastly, academic leaders should maintain accountability, mutual trust, clear communication, and credibility toward students, staff, and the medical education as important part of human life.

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