Open Peer Review on Qeios

The use of tele-education in medicine, during and beyond the COVID-19 pandemic: A commentary

Sarwat Masud[1], Taimur Aslam[2], Jasvindar Kumar[3], Jasmeet Kour[4], Rafiullah Khan[5]

1 Aga Khan University
2 Lady Reading Hospital
3 Khyber Teaching Hospital
4 Fox Chase Cancer Center - Temple University Health System
5 The Christ Hospital

Funding: No specific funding was received for this work.

Potential competing interests: No potential competing interests to declare.

Abstract

Coronavirus disease 2019 (COVID-19), a disease caused by a novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), emerged initially as an isolated illness in December 2019 and later progressed into a global pandemic. Hard-hit areas were in lockdown, massively disrupting medical education activities. Tele-education, previously used as a means of long-distance education emerged as a solution in the field of medical education. Tele-rotations for medical students, journal clubs and lectures via Microsoft teams, medical conferences via zoom, residency, and fellowship interviews online, all emerged during this pandemic. Some medical students and trainees found it enjoyable, cost-effective, time-saving, feasible, unbiased, and preferred mode of education. Challenges related to supervision, availability, affordability, diminished communication, disturbance of streaming, or distractions due to environment. Tele-education has had a boom in the era of COVID-19. Research is needed further on effective mentoring and supervision of trainees via tele educational teaching models.

Sarwat Masud, MD, MPH, PhD[1,*], **Taimur Aslam, MD**[2], **Jasvindar Kumar, MD**[3], **Jasmeet Kour, MD**[4], **Rafiullah Khan, MD**[5]

[1] *Research Fellow, Department of Emergency Medicine, Aga Khan University Hospital, Karachi Pakistan.*

[2] *Resident Gastroenterology Unit, Lady Reading Hospital, Peshawar, Pakistan*

[3] *Resident, Medicine Unit, Khyber Teaching Hospital, Peshawar, Pakistan*

[4] *Fellow Hematology Oncology Fellow Fox Chase Cancer Temple University Hospital*

[5] *Hematology Oncology Attending, The Christ Hospital Network, Cincinnati Ohio USA*

[*]Corresponding author: Sarwat Masud MD, Sarwat.masud@scholar.aku.edu

1. Introduction

Coronavirus disease 2019 (COVID-19), a disease caused by a novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), emerged in December 2019 and soon became a global pandemic. It was first reported in Wuhan, China [1] [2], and then invaded almost every country of the world including the United States. By June 16, 2022, there have been over 542,677,962 confirmed cases, while 6,337,092 deaths occurred worldwide and 517,994,570 recoveries worldwide so far [3]. In the United States, there are over 87,759,180 total confirmed cases of COVID-19, 262,134 cases per 1,000,000 people, and over 83,505,111 deaths reported so far [4].

Lockdowns were imposed, and in-person interaction was discouraged to curtail the spread of infection. This measure severely affected educational activities in all medical training programs globally. Some of the activities that need mentioning are Journal clubs, case presentations, resident and fellow interviews, clinical rotations, tumor boards, grand rounds, certification and board examinations, and teaching modules and conferences.

Tele-education: previously used as a means of long-distance education was proposed as an alternative to in-person education. Tele-education has been defined as learning via the internet and web-based learning portals. It is of two types, synchronous and asynchronous modes [5]. In synchronous mode, interaction can take place between the instructor and learner at the same point in time and same location for example video conferences and zoom sessions. In asynchronous mode, no direct communication happens between the teacher and the learner, and course material is prepared in advance by the instructor and uploaded for students [6]. Transformation to tele-education was considered indispensable during the time of COVID-19. Keeping the above rationale in mind we aimed to write a commentary about the recent literature on tele educational modalities that emerged during the COVID pandemic. The purpose of creating a commentary is to report a concise review of the current literature highlighting the recent tele-education modalities. A brief methodology has been provided for readership.

2. Methods

Relevant keywords were used which are as follows “tele education”, “tele medicine, “medical education”, COVID-19”, covid 19 pandemic. The databases searched included PubMed and Google Scholar. Any relevant articles that reported the use of tele education or any of its modalities during COVID-19 were included in the review irrespective of the study design.

3. Results: A literature review of telemedicine in the COVID-19 pandemic; a global picture

3.1. Tele-rotation clerkships and virtual reality cases for medical students

During the COVID-19 pandemic, all in-person student rotations were suspended due to a risk of infection among students. The Association of American Medical College (AAMC) discontinued all in-person medical student clerkships on 17 March 2020 [7][8]. This uncertain situation posed a unique challenge for medical students across the globe and a need for an

alternative route was felt in [9]. Many institutions in the United States provided tele-rotations for the students; including the Yale University School of Medicine New Haven [10]. Virtual reality which was previously used solely for entertainment purposes was introduced as a mode of tele-education for medical students at the University of Insubria, Italy. Through using Body Interact TM a virtual reality platform, 21 simulated scenario cases were created. This platform allowed the students to perform a history and physical examination by giving commands. A total of 122 medical students completed this online training with overall positive results [11]. South Asian universities were also quick to react to the changing needs of medical students by introducing virtual lectures via Microsoft Teams, in Pakistan [12] and other similarly online apps, and smartphones in India [13].

3.2. Journal Club for resident trainees via Microsoft teams

Journal Clubs are a means of keeping up to date with the current literature for medical trainees. Before the COVID-19 pandemic, the online journal club existed, albeit used seldomly [14]. The COVID-19 pandemic led to a shift to virtual journal clubs. In December 2019, the first virtual Journal Club of the gynecologic-oncology department was held in Colombia, South America, with 20 participants. The participants included fellows, gynecologic oncologists, and international guests. The overall response to the journal club was positive since the participants found convenience in scheduling and attending the meetings from home, very useful [14]. Microsoft teams emerged as a commonly used modality for conducting the journal club in Bradford Trust hospitals in the United Kingdom [15]

3.3. Tumor Board reviews through videoconferencing

Tumor boards comprise multidisciplinary board members that manage complicated cancer patients from various clinical dimensions. It is mostly conducted in person: however, due to the COVID-19 pandemic, it was arranged virtually via videoconferencing in different hospitals. The University of Pittsburgh Medical Center passaged to virtual multidisciplinary tumor boards during the COVID-19 pandemic for the first time [16]. Virtual multidisciplinary conferencing MDC was found feasible in the setting of a large hospital network setting. There were minor setbacks due to electronic documentation and data tracking which needed further exploration. [16].

3.4. Virtual grand rounds via Zoom

Grand rounds, a means of learning from interesting cases and imparting clinical wisdom were disrupted. “Traditional” grand rounds were replaced with test runs of virtual grand rounds at Cambridge University Hospitals NHS Foundation Trust. The virtual Zoom platform was selected to present to an online audience and discuss topics with the theme of COVID-19. When the perceptions of trainees were explored about the online grand rounds, the majority were positive, with 88% of respondents stating that they would be very likely to attend a future virtual grand round [17].

3.5. Continuing Medical Education (CME) via video conferencing

CME is a system of structured learning for physicians, which allows them to keep up with medical advances and maintain

their medical licenses. During the COVID-19 pandemic, virtual channels used for CME included video conferences, educational videos, and different e-learning modules [18]. Mayo Clinic developed several online CME courses for physicians learning about COVID-19 [19]. An online survey was conducted in November 2020, by 326 physicians and specialists from multiple countries. Results showed that 58% of attendees reported attending a higher number of virtual webinars during the COVID-19 pandemic, on average 3 per month. The majority (60%) were satisfied with the content of online CME courses and conferences. The most common challenge faced by them was the lack of regulations regarding online meetings [20]. Furthermore, online portals were used for the education and treatment of COVID-19. These were of benefit to the physicians as well as the general public fielded[21].

3.6. Medical conferences via zoom

Several national and international in-person conferences were canceled due to the COVID-19 pandemic. However, to cope with the pandemic, the conferences were later held virtually. In 2020, the University of Massachusetts Memorial Children's Medical Center hosted a conference on its Zoom platform. 99% of attendees found the online platform to be effective in delivering the conference content [22].

3.7. Research training via Microsoft Teams

Research has always been an integral part of medical education. It keeps its importance at both pre-and post-graduation levels. The COVID-19 pandemic affected research training initially [23]. However, virtual methods were used in the provision of research activities in [24]. The Aga Khan University in Pakistan also used Microsoft Teams as the main source of training for its graduate trainees [12].

3.8. Virtual interviews for trainees via zoom or skype

During the COVID-19 pandemic, many countries-imposed travel restrictions, and candidates could not travel for in-person interviews. The Accreditation Council for Graduate Medical Education (ACGME) hospitals started virtual interviews for the recruitment of residency and fellowship applicants during COVID-19 [25]. Experience from gastroenterology fellowship interviews in 2020 showed that 94% of the candidates were strongly satisfied with virtual interviews, with a high majority (89%) agreeing about the cost-effectiveness of virtual interviews and further continuation in the future (76%). With 100% of the faculty supporting the online interviews hence highly recommend the virtual platform for future interviews at [25]. A similar study done on 349 surgical applicants found online interviews "valuable" but preferred smaller breakout rooms and clearer instructions on the interview day. A shorter interview day (< 3 hours) was associated with less familiarity of the interviewer with the program and a 2-7 hours interview increased familiarity [26].

3.9. Mentoring trainees during the COVID-19 pandemic

Mentorship inside a clinical specialty like surgery is beneficial in advancing the career of the mentee. Mentors validate the knowledge of the learner and can contribute to the professional growth of the clinical or surgical student. In a specialty like

surgery, mentorship is particularly important for the trainee/ student. A review on the role of distance mentoring during the COVID-19 pandemic showed promise in the use of tele-education to enhance surgical skill (93%) or clinical knowledge (1.5%)[27]. This will further need exploration, especially in specialties where direct supervision is necessary for learning advanced skills.

3.10. Impact of COVID-19 on residency training

COVID-19 impacted the education of many trainees both directly and indirectly. A study was conducted among US plastic surgery residents where 58% of the residents reported a negative impact of COVID-19 on their education with a possible loss of supervised learning. Some anticipated a negative impact on future job prospects [28].

	INTERNET BASED TECHNOLOGY	VIDEO TECHNOLOGY	AUDIO TECHNOLOGY	PODCASTS
RESOURCES	• Online medical lectures • Electronic libraries • Online examination	Video conferences VIdeo lectures Video tapes	Audio conferences Audio lectures Audio tapes Audio books	• Uses both audio and video streaming
BENEFITS	• Online CME • Accessible worldwide • Cost effective • No geographi limitation	• Available online • Available offilne if recorded • Allows interactive sessions when used online	• Available online • Available offilne if recorded • Allows interactive sessions when used online	• Listeners can interact via chat or telephone • Available offline if recorded
DISADVANTAGES	Inaccessible when offline	• Lack of interaction when used offline	• Lack of interaction when used offline	• Lack of interaction when used offline
EXAMPLES	ZOOM MICROSOFT TEAMS GOOGLE MEET SKYPE	ZOOM MICROSOFT TEAMS	ZOOM MICROSOFT TEAMS SKYPE	APPLE PODCASTS

Table 1. Summary of different tele-education modalities used in miscellaneous medical activities.

4. Discussion

In this discussion we focus on the pros in the first paragraph, followed by the challenges of virtual teaching and learning

modalities used during COVID-19. They have been summarized in Table 1. There is a huge geographic advantage for students that use tele education as it is available anywhere in the world, without visiting the classrooms, wards, and other teaching sites [29]. Virtual learning via tele education is also cost-effective, especially for trainees from low-resource countries [29]. Virtual online education can save time for the participating students and educators as well by achieving the desired course objectives in less time [30][31]. This is of advantage to both the student and the institutes that invest resources in students. Virtual lectures have the added advantage of being recorded, paused, forwarded, and downloaded, hence they can be watched more than once and shared with other students. [29]. Virtual education can solve issues related to the accessibility of teachers [29]. These virtual teaching can save travel charges, hostel charges, and other travel-related problems and hence can provide ease to participants [29][31]. Virtual COVID-19 courses helped many physicians and trainees that were fighting at the forefront by treating COVID-19 patients [19]. Virtual interviews emerged as a means of recruiting quality trainees at various levels of medical training (27). Some learners found virtual learning enjoyable [29]. Mentoring opportunities for students seeking guidance or validation in clinical or surgical careers was an added advantage[27]. Mental health and psychiatry training was continued uninterrupted using tele education[32].

Affordability of the devices used in the tele-education is among the most common challenges faced by students engaged in tele-education [8]. This issue is important in the context of low-income countries[33] where students have limited budgets. The availability of high-speed internet is another challenge for rural dwellers and developing world students [34]. Affordability of the data packages remains a challenge faced by some students [14] [30]. Visual disturbances, due to excessive exposure to electronic devices can lead to problems in young students who may not know how to operate these devices effectively [16] [35][36]. Communication between the learner and the instructor, especially for evaluation of the student's examination was a challenge faced in some regions [37]. Student-to-student interaction and student-to-teacher interaction, in an environment like class, may not be ensured at the same level as in-person attendance. [30][38] Interruption of the streaming may result in inconvenience and a poor quality experience[38] [39]. Progress and monitoring of the students may be affected and may not be as accurate in some cases [29]. Unethical activities were experienced in some settings of students which could not be monitored directly [29]. Distractions in the household e.g babysitting of children or pets can affect the progress of some students [35].

5. Conclusion

Tele-education has emerged as a solution for medical education needs across the globe, during the COVID-19 pandemic. Since candidates could not travel, interviewing was done online during the COVID-19 pandemic. The tele-education helped overcome the challenge of recruitment and training. It is convenient, equitable, cost-effective, and sustainable. Those using online interviews are recommended to take 3-7 hours for interviews to better acquaint candidates with the program. The use of tele-education for mentoring has been explored with positive reviews. Surgical specialties where direct supervision could be important for surgical skill development need further research in tele educational training of residents. Future job placement of COVID-19-era trainees is an area that needs explored further.

Statements and Declarations

Acknowledgements: We acknowledge the "Johns Hopkins Afghanistan-Pakistan International Collaborative Trauma and Injury Research Training program" [grant number D43-TW007292] from Fogarty International Center of the United States National Institute of Health (NIH) for supporting SM in her Ph.D. The content is solely the responsibility of the authors and does not represent the views of Fogarty or NIH.

Author disclaimers: Views that are reposted in this article are authors own views and do not reflect views of their official institutions.

Author contributions: SM contributed to design and final editing of manuscript. TK, JK, JK contributed to literature search. RK was involved in conception and review of the manuscript. All authors have reviewed and approved the final draft.

Funding Source: No specific grant from funding agencies in the public, commercial, or not-for-profit sectors was received for this study.

Conflict of interest statement: The authors have no conflict of interest to disclose.

References

1. ^*Zhou P, Yang XL, Wang XG, et al. Addendum: A pneumonia outbreak associated with a new coronavirus of probable bat origin. Nature. 2020;588(7836):E6.*
2. ^*Umakanthan S, Sahu P, Ranade AV, et al. Origin, transmission, diagnosis and management of coronavirus disease 2019 (COVID-19). Postgraduate medical journal. 2020;96(1142):753-758.*
3. ^*Worldometers. Reported Cases and Deaths by Country or Territory. https://www.worldometers.info/coronavirus/?utm_campaign=homeAdvegas1. Published 2021. Accessed.*
4. ^*CDC. COVID Data Tracker (Center for Disease Control and Prevention) https://covid.cdc.gov/covid-data-tracker/#cases_casesper100k. Published 2021. Accessed.*
5. ^*Lim EC, Seet RC. In-house medical education: redefining tele-education. Teaching and learning in medicine. 2008;20(2):193-195.*
6. ^*Curran VR. Tele-education. Journal of telemedicine and telecare. 2006;12(2):57-63.*
7. ^*Harries AJ, Lee C, Jones L, et al. Effects of the COVID-19 pandemic on medical students: a multicenter quantitative study. BMC medical education. 2021;21(1):1-8.*
8. a, b*Edigin E, Eseaton PO, Shaka H, Ojemolon PE, Asemota IR, Akuna E. Impact of COVID-19 pandemic on medical postgraduate training in the United States. Medical Education Online. 2020;25(1):1774318.*
9. ^*Smith TM. How medical schools are making clerkships virtual during COVID-19. Medical School Life Web site. https://www.ama-assn.org/residents-students/medical-school-life/how-medical-schools-are-making-clerkships-virtual-during. Published 2020. Accessed.*

10. ^Goldenberg MN, Hersh DC, Wilkins KM, Schwartz ML. Suspending Medical Student Clerkships Due to COVID-19. Med Sci Educ. 2020;30(3):1-4.
11. ^De Ponti R, Marazzato J, Maresca AM, Rovera F, Carcano G, Ferrario MM. Pre-graduation medical training including virtual reality during COVID-19 pandemic: a report on students' perception. BMC medical education. 2020;20(1):1-7.
12. a, bQazi SH, Saleem A, Pirzada AN, Hamid L-R, Dogar SA, Das JK. Challenges to delivering pediatric surgery services in the midst of COVID 19 crisis: experience from a tertiary care hospital of Pakistan. Pediatric surgery international. 2020;36(11):1-7.
13. ^Hasija S, Das A, Rai P, Chatterjee P, Kumar V, Das S. Students' Perspectives on Online Medical Education During the COVID-19 Pandemic: A Cross-Sectional Study. Interdisciplinary Journal of Virtual Learning in Medical Sciences. 2021;12(2):129-135.
14. a, b, cHoegl J, Rodriguez J, Estrada EE, Heymann M, Pareja R. Virtual journal club during the pandemic: a valuable learning tool. International Journal of Gynecologic Cancer. 2021:ijgc-2021-002712.
15. ^Aulakh GS, Duggal S, Sutton D. Findings from an OMFS journal club: is COVID-19 the catalyst we have needed to embrace technology? Br J Oral Maxillofac Surg. 2020:S0266-4356(0220)30447-30442.
16. a, b, cDharmarajan H, Anderson JL, Kim S, et al. Transition to a virtual multidisciplinary tumor board during the COVID-19 pandemic: University of Pittsburgh experience. Head Neck. 2020;42(6):1310-1316.
17. ^Sparkes D, Leong C, Sharrocks K, Wilson M, Moore E, Matheson NJ. Rebooting medical education with virtual grand rounds during the COVID-19 pandemic. Future Healthc J. 2021;8(1):e11-e14.
18. ^Kanneganti A, Sia C-H, Ashokka B, Ooi SBS. Continuing medical education during a pandemic: an academic institution's experience. Postgraduate medical journal. 2020;96(1137):384-386.
19. a, bMayoclinic. COVID-19 Online Education, Resources and Updates. Mayo Clinic School of Continuous Professional Development (CPD) Web site. https://ce.mayo.edu/content/covid-19-online-education-resources-and-updates-0. Published 2021. Accessed.
20. ^Ismail II, Abdelkarim A, Al-Hashel JY. Physicians' attitude towards webinars and online education amid COVID-19 pandemic: When less is more. PloS one. 2021;16(4):e0250241.
21. ^Song X, Liu X, Wang C. The role of telemedicine during the COVID-19 epidemic in China—experience from Shandong province. In: BioMed Central; 2020.
22. ^Niro K, Gibson T, Zanger K, Rauch D, El Saleeby C. Going Virtual Amid a Pandemic: Perspectives on a Web-Based Hospital Medicine Conference. Hospital Pediatrics. 2021;11(1):e9-e11.
23. ^Sohrabi C, Mathew G, Franchi T, et al. Impact of the coronavirus (COVID-19) pandemic on scientific research and implications for clinical academic training–a review. International Journal of Surgery. 2021.
24. ^Loucks TL, Tyson C, Dorr D, et al. Clinical research during the COVID-19 pandemic: The role of virtual visits and digital approaches. Journal of Clinical and Translational Science. 2021;5(1):e102.
25. a, bWright AS. Virtual interviews for fellowship and residency applications are effective replacements for in-person interviews and should continue post-COVID. Journal of the American College of Surgeons. 2020;231(6):678-680.
26. ^Hemal K, Sarac BA, Boyd CJ, Runyan CM, Gosman AA, Janis JE. Applicant preferences for virtual interviews: insights from the 2020–21 Integrated Plastic Surgery application cycle. Plastic and Reconstructive Surgery Global

Open. 2021;9(7).

27. [a, b]*Raborn LN, Janis JE. Overcoming the impact of COVID-19 on surgical mentorship: a scoping review of long-distance mentorship in surgery. Journal of Surgical Education. 2021;78(6):1948-1964.*
28. [^]*Crowe CS, Lopez J, Morrison SD, Drolet BC, Janis JE. The Effects of the COVID-19 Pandemic on Resident Education and Wellness: A National Survey of Plastic Surgery Residents. Plastic and Reconstructive Surgery. 2021;148(3):462e-474e.*
29. [a, b, c, d, e, f, g, h]*Shahzad SK, Hussain J, Sadaf N, Sarwat S, Ghani U, Saleem R. Impact of Virtual Teaching on ESL Learners' Attitudes under COVID-19 Circumstances at Post Graduate Level in Pakistan. English Language Teaching. 2020;13(9):1-9.*
30. [a, b, c]*Al-Balas M, Al-Balas HI, Jaber HM, et al. Distance learning in clinical medical education amid COVID-19 pandemic in Jordan: current situation, challenges, and perspectives. BMC medical education. 2020;20(1):1-7.*
31. [a, b]*Masic I. E-learning as new method of medical education. Acta informatica medica. 2008;16(2):102.*
32. [^]*Kalayasiri R, Wainipitapong S. Training of psychiatry and mental health in a low-and middle-income country: Experience from Thailand before and after COVID-19 outbreak. Asia-Pacific Psychiatry. 2021;13(4):e12493.*
33. [^]*Aboagye E, Yawson JA, Appiah KN. COVID-19 and E-learning: The challenges of students in tertiary institutions. Social Education Research. 2021:1-8.*
34. [^]*Nicolau C, Henter R, Roman N, Neculau A, Miclaus R. Tele-Education under the COVID-19 Crisis: Asymmetries in Romanian Education. Symmetry. 2020;12(9):1502.*
35. [a, b]*Sepulveda-Escobar P, Morrison A. Online teaching placement during the COVID-19 pandemic in Chile: challenges and opportunities. European Journal of Teacher Education. 2020;43(4):587-607.*
36. [^]*Pokhrel S, Chhetri R. A literature review on impact of COVID-19 pandemic on teaching and learning. Higher Education for the Future. 2021;8(1):133-141.*
37. [^]*Rajab MH, Gazal AM, Alkattan K. Challenges to online medical education during the COVID-19 pandemic. Cureus. 2020;12(7):e8966.*
38. [a, b]*de Oliveira MMS, Penedo AST, Pereira VS. Distance education: advantages and disadvantages of the point of view of education and society. Dialogia. 2018(29):139-152.*
39. [^]*Gonzales-Zamora JA, Alave J, De Lima-Corvino DF, Fernandez A. Videoconferences of Infectious Diseases: An educational tool that transcends borders. A useful tool also for the current COVID-19 pandemic. Infez Med. 2020;28(2):135-138.*