



## Literature Review

# Medical education in clerkship: From here and out

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## ARTICLE INFO

**Submitted** : 15<sup>th</sup> December 2023

**Accepted** : 19<sup>th</sup> April 2023

**Published** : 25<sup>th</sup> July 2024

### Keywords:

Medical education, COVID-19, Pandemic

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## ABSTRACT

The COVID-19 pandemic has changed many things in the medical education system. This change requires adaptation and modification from education providers, teachers, and students. This literature review aims to discuss the change in the education system, especially in clinical clerkship, and its impact on the students. Literature was searched using the keywords “medical education”, “ covid-19”, and “pandemic” in search engines, covering original articles and reviews. A virtual learning system has been implemented instead of a face-to-face learning system during the pandemic. However, this creates several challenges that must be considered, such as techniques, facilities, infrastructures, effectiveness of learning activities, and clinical competency achievement. Several ways to overcome the challenges also have been implemented by prioritizing the principles of minimizing risk and taking strict precautions.



## INTRODUCTION

The COVID-19 pandemic has affected all aspects of life, especially the health system. Many changes were made in the hospital service system, considering the risk of infection. This change ultimately impacted the medical education system. (Niriella *et al.*, 2020) Since the start of the pandemic, the teaching and learning process has shifted from a face-to-face education system to an internet technology-based education system. The same condition applies to the medical education system, where student activities covering lectures, practicums, skill labs, tutorials, and hands-on discussions have transformed into internet-based distance learning. (Daroedono *et al.*, 2020; Loda *et al.*, 2020; Singh *et al.*, 2020)

Medical education is an educational process to form new doctors, with the main aim of providing knowledge and skills training to deal with patients, and one of the ways to achieve it is through the clerkship. This limitation is a new challenge for all parties involved, including institutions, educators, and students. Many institutions have modified the clerkship system by limiting the number and time of students, and some have even postponed educational activities. (Dedeilia *et al.*, 2020)

This change raises several problems that need to be resolved related to the quality of education and graduates. Students must continue to acquire knowledge and skills, while on the other hand, the current education system is feared to be inadequate to achieve these goals. It is important to note and comprehend the changes in medical education made in response to this national emergency to clarify how we are recovering from this pandemic. (Ferrel and Ryan, 2020) This review examines changes in the medical education system, strategy, and their impact on students.

## Challenges

*Changes to the medical education system during a pandemic are unavoidable. Face-to-face learning systems in classrooms, clerkships, and communities are not recommended during this global pandemic to avoid transmission. In Indonesia, by government laws of large-scale public restriction (Pembatasan Sosial Berskala Besar), there should not be any face-to-face sessions, hence the transition to virtual learning. (Ladyanna, 2021; Pramana *et al.*, 2021) Schedules, facilities, content, how to deliver material, and evaluation are components that must be considered during virtual learning.*

*The implementation virtual learning system offers its challenges, the change itself, and the techniques for applying theoretical knowledge in managing patients. Virtual learning gives easy access to lesson material and the flexibility of place and time without location constraints, but less interesting than learning together in a room. There is limited interaction between teachers and fellow students. (Chick *et al.*, 2020; Daroedono *et al.*, 2020; Tabatabai, 2020b; Torda, 2020) The crucial challenge erupted in teaching clinical skills. The transition from a hands-on approach to video-based learning, followed by group discussion, revealed lesser student participation and engagement. Other problems included how to carry out examinations and assessments through distance, as long-distance computer-based testing posed higher risks of rules bending and breaking (Rahayu *et al.*, 2022).*

The schedule is also another challenge. Since the COVID-19 pandemic, there have been restrictions on activities in the hospital that have reduced the exposure of medical students and residents to certain clinical cases and have had a significant impact on clinical clerkship evaluations and competency assessment exams. (Giordano *et al.*, 2020; Niriella *et al.*, 2020;



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Singh *et al.*, 2020) Due to the pandemic, the bedside teaching-learning system is carried out virtually. This setting makes students unable to be directly involved with patients, unable to practice physical examinations and some non-technical skills. Medical students do not get feedback through direct observation of clinical cases. (Ferrel and Ryan, 2020).

One example of adaptation carried out by the Center for Medical Education in Singapore was ensuring the safety of stakeholders and minimizing adverse impacts on the curriculum by modifying activities with infection control. They also form a COVID-19 response team for decision-making, information dissemination, and timely updates. This team is responsible for improving coordinated responses through mass communication portals, conveying directives from health authorities and academic centers, making decisions regarding changes in the academic calendar (postponing rotations, lectures, clerks, and many more), postponing exams, and modifying them. The team also takes steps to ensure safety and infection prevention, encourages early symptom reporting, and facilitates detection, isolation, and management. (Ashokka *et al.*, 2020)

This rapid response team did several things, including ensuring the availability of hand sanitizers and other personal protective equipment, screening for fever and other symptoms at several points, managing visitor registers, decontaminating, and minimizing direct interactions in the educational environment. Students who have just returned from a transcontinental trip or quarantine will have social support. There are also student volunteers and peer support cooperating to reach students who need help during the pandemic. Education in hospitals is a pivotal aspect of medical education. That is why it is necessary to develop an educational strategy for clinical

clerkship training for medical students that provides opportunities to be actively involved in practical hospital training under strict safety guidelines to prevent transmission of the virus. (Ashokka *et al.*, 2020; Kim *et al.*, 2020)

With all these limitations, efforts are needed to maintain the quality of education even though it is done remotely and ensure that they have the same clinical experience (in different ways). Certain activities such as case discussions, watchkeeping reports, and the provision of materials can be carried out online but with various innovations to keep the discussions interactive. (Ferrel and Ryan, 2020; Tabatabai, 2020)

In addition, the virtual learning system is a big task for institutions to provide the necessary facilities and infrastructure. Currently, there is still an opinion that this system “does not require much preparation” because it does not need to prepare classes, transportation, and more. One of the factors that play a role in utilizing IT systems in the learning process is resources. Although technology has the advantage of flexibility, this system focuses on personal student participation, starting from devices’ availability, signals, and individual quotas. (Daroedono *et al.*, 2020)

One of the drawbacks of this online learning system is connection problems, bandwidth the need to quickly and adequately digitize teaching content, and the possibility of integrating medical students into the healthcare system. The outbreak is widening the gap between students who can access online learning opportunities and those who don’t. Many students experience this type of unequal access when they lack a digital connection. Maintaining performance standards and quality assurance is also a challenge to overcome. (Loda *et al.*, 2020)



## Strategy

While COVID-19 is considered a limitation in medical education, this pandemic is also likely to be a catalyst for the transformation of medical education that has developed over the last decade. This pandemic can increase innovation and application of technology in the learning system. (Lucey and Johnston, 2020; Torda, 2020) The first thing to prioritize in updating the education system is minimizing the risk of transmission by limiting face-to-face meetings to <10 people (or fewer), avoiding long shifts, and limiting the number of delayed elective surgeries. (Chick *et al.*, 2020; Tabatabai, 2020) It is undeniable that medical education, especially clinical clerkships, is closely related to face-to-face meetings in the ward, clinical procedures, shifts, and case presentations that require physical presence. Some institutions still hold face-to-face learning in hospitals with special attention, such as the use of personal protective equipment (PPE) and social distancing. (Gordon *et al.*, 2020)

Take into account and maximize existing resources. The resources needed to continue to run education include technology, educators, and institutional facilities. Several institutions around the world use video-conferencing applications, including Zoom™, Skype™, and Google Hangouts Meet™. This application allows virtual communication. Some institutions implement a flipped classroom system where students are given material before learning activities, thus shortening the meetings. The material provided varies, from modules to procedural teaching videos. (Chick *et al.*, 2020; Dedeilia *et al.*, 2020; Tabatabai, 2020a; Torda, 2020) The web conference application also records the meeting so that the video can be shared and re-listed. (Anjankar, Anjankar and Anjankar, 2020) Several online platforms also provide space for discussion

forums such as Blackboard.™, Moodle™ and Schoology™. (Nimavat *et al.*, 2021)

The main difference between traditional and technology-based education sessions is that virtual-based education allows students to learn flexibly. Technological solutions facilitate teaching for groups or individuals and can process individual student responses in real time. Several articles suggest that the online delivery of lectures shares the same approach as offline. Some approaches include providing seminars/ colloquial through video conferencing media, team-based learning, simulations, and clinical skills. Students are involved and participate in lectures through online conversation room features, “hand-raising” and polls. In group work, there are “breakout rooms” that can accommodate up to 25 students. In simulation and skills, there are instructors, and participants can participate directly. (Anjankar, Anjankar and Anjankar, 2020; Dedeilia *et al.*, 2020; Gordon *et al.*, 2020) Another application available is podcasts. Podcasts are audio recordings generally used for entertainment and news. However, podcasts have begun to be used and become an alternative way of teaching. (Dedeilia *et al.*, 2020)

Clinical education is more challenging to transfer online, but some are modifiable to gain clinical experience. Several institutions have provided access to an online video library, a video-based website where teachers will upload lecture materials, videos of clinical skills, or the active process in hospitals. Online video libraries can also contain recorded online learning processes that allow them to repeat and learn independently. (Dedeilia *et al.*, 2020) Online-based education should incorporate as much interactive technology as possible to provide active and interesting learning. Quizzes with pictures to provide diagnostic material at stations such as dermatology or radiology can be a tool. (Atreya and Acharya, 2020; Dedeilia





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*et al.*, 2020) The provision of practicum videos is also given to students as material to learn the practical process. (Anjankar, Anjankar and Anjankar, 2020)

During the transition period, some activities in the hospital can still be carried out under the requirements that the activities are safe and strictly supervised. Elective surgical observation activities may not be possible, but outpatient emergency patient observation activities, for example, can still be carried out. Rotations are arranged in such a way that rounds and patient encounters can still provide a clinical experience. Other institutions apply “website teaching” innovation, namely semi-online rounds, where doctors and some students can still deal directly with patients while broadcasting them from a teleconferencing application so that other students can observe the action directly. (Hall *et al.*, 2020; Suh *et al.*, 2020)

One of the reasons for the postponement of clinical clerkships is the lack of institutional capacity to provide and ensure protection for students. In addition, the institutions also lack the need for training and supervision regarding the usage of personal protective equipment. Therefore, when the pandemic situation is under control, the ability to test, and the availability of personal protective equipment is sufficient, medical students should have the opportunity to return to the hospital environment. Several surveys suggest that medical students have a high desire to continue clinical clerkship only if there are strict regulations regarding preventive measures, the ability of hospitals to handle pandemics, and guarantees of family safety. (Rolak *et al.*, 2020; Koh *et al.*, 2021; Michno *et al.*, 2021; Norton *et al.*, 2021)

*Adapting to the impossibility of face-to-face learning, medical faculties in Indonesia changed a large portion of their learning*

*method. Among the many working adaptations are the implementation of online learning or hybrid methods. These included the assessment method, which resolved to an online and online-on-site combination. The Objective Structured Clinical Examination (OSCE), formerly offline, was also must be held in hybrid to minimize the transmission of COVID-19 (Batubara, 2021; Rahayu *et al.*, 2022). Related to infrastructure, the Indonesian Government has subsidized data and quotas through the Ministry of Education and Culture to support its continuity. Several medical faculty had taken the option to withhold clinical rotation and preclinical education. These were done to prevent the risk of infection (Daroedono *et al.*, 2020; Turana *et al.*, 2022).*

Medical volunteer opportunities are also an alternative way of learning. Several surveys suggest that medical students want to participate in handling the COVID-19 pandemic. The underlying motivation for this is a sense of responsibility, altruism, and high curiosity. An institution in the UK opens volunteer opportunities for medical students as assistants to participate, in providing medical services. Through this program, medical students can experience clinical exposure and develop interprofessional collaboration, especially during the pandemic. (AlSaif *et al.*, 2020; Rose, 2020; Tempski *et al.*, 2020) The volunteer program provides medical students with a learning environment that meets their educational needs and practical skills. However, the tasks and responsibilities need to be adjusted to the level of knowledge of medical students. Supervision is also needed during the program. (Klasen *et al.*, 2020; Samaraee, 2020)

In addition to direct volunteer opportunities, volunteers in the form of telemedicine will also help during a pandemic. Some institutions have begun to develop curricula in which medical students participate in telemedicine



activities, but other problems arise from the ethical side of its implementation. Some of the ethical issues that arise include inadequate information transfers, interrupted communication between doctors and patients, inaccurate and unclear reporting, security of personal health information maintained in electronic form, reliability, and housing risks, how much responsibilities of the doctor during a consultation with the patient, what will happen if the consultant doctor does not come with an agreement with the patient's doctor, and how to inform the patient's consent. (Atac, Kurt and Yurdakul, 2013)

The latest innovation these days is interactive simulation learning. (Tabatabai, 2020b) Simulation is a pivotal part of medical education by utilizing the latest technology. Virtual Reality Simulation (VRS) can provide an environment similar to real situations. Virtual Reality Simulation utilization in the medical world is widely known as a surgical and cardiology simulator. Users can enter an interactive "virtual" world and experience 3-dimensional sensations such as sounds, textures, and vibrations. With this system, users can practice with objects in the form of virtual illusions. Integrating VRS into medical education has enabled medical educators to provide simulated clinical experiences to more medical students in less time. (Herlambang and Aryoseto, 2016; Tabatabai, 2020)

Assessment of clinical skills is one of the main parts of clinical education to assess practical qualifications. Routine exams held in medical education include Multiple Choice Questions (MCQ), Short Answer Questions (SAQ), and Long Answer Questions (LQAs), case exams to assess the ability to diagnose and interpret clinical problems. Examinations for evaluating clinical skills include the Objective Structured Clinical Examination (OSCE) and the Direct Observation of Procedural Skills (DOPS). (Nimavat *et al.*, 2021)

Organizing exams and evaluations is also a problem in itself. Most universities have implemented an online exam system that can analyze and assess exam results at once. Examination assessment is generally carried out normatively rather than summatively. The exam applications used include Quizlet Live, Kahoot, and Nearpod, where questions are given through the Google forums. (Nimavat *et al.*, 2021) One of the things to consider is exam cheating. Some of the solutions are using remote direct supervision and biometric-based supervision to ensure exam integrity. Both use special applications that can monitor students remotely. Several other institutions have also implemented open-book exams with a cognitive skills approach and plagiarism detection. (Giordano *et al.*, 2020; Gordon *et al.*, 2020; Tabatabai, 2020b; Prigoff, Hunter and Nowygrad, 2021)

The clinical skills exam or OSCE is currently administered using an on-site and virtual approach. The implementation of this exam still pays attention to infection control and personal hygiene, group division, social distancing, and online briefing. Innovation in the implementation of this exam also continues to develop with the existence of virtual simulation technology. Several educational institutions are seeking to use virtual simulation applications in the OSCE as a method to increase the objectivity of their assessment process. (Piryani *et al.*, 2020; Tabatabai, 2020b)

### Impact on students

*The COVID-19 pandemic gives medical education a sudden change with a lot of consequences. As the traditional pedagogy method was postponed and then shifted to online learning, questions of how to train clinical skills and deliver knowledge in sufficient amounts were blown out. It was best believed that the core of delivering medical education involves*



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*integrating the essential skills, knowledge, and attitudes required to provide the best patient-centered care. Face-to-face learning was considered essential to give chance for students to develop the main skills of a healthcare provider; especially for interviewing, effective communication, physical examination, and other procedural skills (Ferrel & Ryan, 2020; Saad et al., 2023).*

*The delay of clinical rotation and decrease in face-to-face sessions were thought to reduce the chance for students to gain competence and to get live experience in managing patients. These were considered to affect students' knowledge and skills, especially those from the last years of study and about to enter a career (Samarae, 2020). Clinical experience was also related to one's confidence, and the Covid-19 pandemic risked disrupting the integration of their knowledge, skills, and confidence (Guldner et al., 2023; Hamamoto Filho et al., 2022; Nofi et al., 2022). Studies in Indonesia provide varying results, one study concluded that the clinical achievement of the offline method group was higher than that of a mixed (offline-online) group (Juwita et al., 2021). Another study revealed the opposite. Visuddho et al stated in their study that the total knowledge score was significantly higher in students who undertook online learning (Visuddho et al., 2023). This is comparable to a systematic review conclusion that stated there was a significant difference in knowledge and skills scores among online and offline student groups, with the online group showing higher scores. These indicated that online learning was not always worse and thus it could be an alternative for students learning media (Pei & Wu, 2019).*

The COVID-19 pandemic has put mental pressure on medical education. Many of the medical students are unable to undergo clinical clerkships and are turning to virtual learning systems. Medical students are vulnerable to

mental health problems in the COVID-19 situation. The policy of social distancing and self-isolation can trigger acute stress reactions, fear, panic, emotional distress, and anxiety symptoms for medical students, and the mental burden added from procrastination and changes in academic activities. (Akers, Blough, and Iyer, 2020; Chandratre, Knight, and Dodson, 2021)

A study found that medical students had higher levels of stress, depression, and anxiety. It resulted from the effects of the pandemic, the economy, media exposure, and a lack of knowledge and ability to deal with a pandemic. Other research states that changes in the learning system also trigger symptoms of emotional mental disorders, related to lack of attention and focus and decreased motivation to learn during the COVID-19 pandemic. Virtual learning systems are associated with reduced motivation, efficacy, and student involvement/participation. In a study involving 30,000 students from 62 countries undergoing a transition phase, students were concerned about problems related to future career opportunities, in addition to boredom, anxiety, and frustration. (Cao et al., 2020; Bolatov et al., 2021)

The transition from traditional to virtual learning systems makes medical students feel isolated and have low self-esteem. Most indicated difficulty concentrating, fear and concern about academic progress and performance, and adjustment to distance learning as the dominant academic problem. However, other studies suggest the opposite, where virtual learning provides less mental burden marked by lower scores of depression and anxiety. Virtual learning is also associated with improving students' academic abilities, and the only factor in online learning that triggers stress is the fear of possible lengthening of the study period. (Wang et al., 2020; Baticulon et al., 2021; Bolatov et al., 2021)





Institutions play a pivotal role in supporting students academically and non-academically, including physical, and mental health, and safety during the pandemic. Preventing burnout is very important. Medical institutions must be aware that digital learning can affect mental health, and that it needs thorough consideration. (Nurseskasatmata *et al.*, 2020; Zis *et al.*, 2021)

## CONCLUSION

Changes in the medical education system during the COVID-19 pandemic were unavoidable. On one hand, the COVID-19 pandemic has limited various activities that require face-to-face contact, while on the other hand, medical education must continue. Reducing the quantity of face-to-face learning creates various technical problems and requires institutions to carry out reforms to maintain quality and teach clinical skills effectively. Some of how this is done include using virtual meeting applications, flipped classroom systems, increasing interaction in online classes, providing an online video library, adjusting schedules and rotation activities, conducting volunteer activities, and updating the exam system. Changes in the education system during the pandemic also have an impact on the mental health of medical students therefore mental problems also need to be a concern of the institution.

## RECOMMENDATION

The pandemic has proven to alter the medical education system worldwide, where it brings forth changes that lead to innovation on how to adapt and adjust during the pandemic. Nevertheless, challenging times like this also give rise to problems and issues such as mental problems in this case. Medical institutions need to be aware of the mental health risks these changes bring to the students.

## COMPETING INTERESTS

The authors declare that there are no competing interests related to the study.

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