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REVIEW ARTICLE

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OPTIMIZING MEDICAL EDUCATION FOR CLINICAL STUDENTS DURING COVID-19 PANDEMIC: A LITERATURE REVIEW

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ABSTRACT

Background: COVID-19 pandemic has impacted numerous of matters and medical education is one of them. It is crucial to dissect measures that could be taken to optimize medical education for clinical students during COVID-19 pandemic. There is still limited evidence or data on how to approach this situation. The aim of this literature review is to unfold guidance on optimizing medical education for clinical students during COVID-19 pandemic.

Methods: The literature was searched by accessing the PubMed, PubMed Central, and Google Scholar databases. Literature search was conducted from December 1, 2019 to April 24, 2020, using the key words of "medical education", "clinical students OR clerkship students", "covid-19".

Results: Based on the literature search, 20 literatures related to medical education of clinical students during COVID-19 pandemic were obtained. Institutions have taken a differing approach during COVID-19 pandemic. Implementing teleteaching, creating an integrated learning environment, strategies to improve role models, telemedicine, training programs and psychological support are approaches in order to optimize medical education for clinical students during COVID-19 pandemic.

Conclusion: Institutions had to instantly alter medical education during COVID-19 pandemic. The lives of many students have been hugely impacted in terms of financial, psychological, delay in graduation, uncertainty, residency application and clinical placements. There are ways in which technology can ease some of these problems, albeit not fully resolving all these issues. Therefore, it is still crucial to further shine a light on how to optimize medical education during this unprecedented time.

Keywords: medical education, clinical students, clerkship students, COVID-19 pandemic

ABSTRAK

Latar belakang: *Pandemi COVID-19 telah mempengaruhi banyak hal dan salah satunya adalah pendidikan kedokteran. Sangat penting untuk mencari langkah-langkah yang dapat diambil untuk mengoptimalkan pendidikan kedokteran untuk mahasiswa klinis/koas selama pandemi COVID-19. Bukti dan data mengenai gimana menangani situasi ini masih sangat terbatas. Tujuan dari literature review ini adalah panduan mengenai mengoptimalkan pendidikan kedokteran untuk mahasiswa koas selama pandemi COVID-19.*

Metode: *Literatur dicari dengan mengakses database PubMed, PubMed Central, dan Google Scholar. Pencari literatur dilakukan dari 1 Desember 2019 hingga 24 April 2020. Menggunakan kata-kata kunci "medical education", "clinical students OR clerkship students", "covid-19".*

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Hasil: *Berdasarkan pencarian literatur, terdapat 20 literatur yang berkaitan dengan pendidikan kedokteran mahasiswa klinis selama pandemic COVID-19. Institusi telah memutuskan keputusan yang berbeda-beda mengenai pendidikan kedokteran selama pandemi. Menerapkan teleteaching, membuat lingkungkan belajar yang terintegrasi, strategi untuk meningkatkan role model, telemedicine, program pelatihan dan dukungan psikologis adalah beberapa cara untuk mengoptimalkan pendidikan kedokteran bagi mahasiswa klinis selama pandemi COVID-19.*

Kesimpulan: *Institusi harus segera menyesuaikan pendidikan kedokteran dengan perubahan kondisi yang drastis akibat pandemi COVID-19. Kehidupan mahasiswa sangat dipengaruhi dalam hal keuangan, psikologis, wisuda ketunda, ketidakpastian, aplikasi residensi dan rotasi klinis. Terdapat beberapa cara gimana teknologi dapat meringankan beberapa masalah ini tetapi tidak sepenuhnya bisa menyelesaikan masalahnya. Oleh karena itu, sangat penting untuk menggali lebih dalam lagi gimana mengoptimalkan pendidikan kedokteran selama pandemi COVID-19.*

Kata kunci: *pendidikan kedokteran, mahasiswa klinis, kepaniteraan klinik, pandemi COVID-19*

PRACTICE POINTS

- The strength and weakness of medical school come out especially in clerkship teaching.
- The COVID-19 pandemic has driven the fastest changes of medical education across the world to adapt in this time.
- There are ways in which technology can ease some of clinical teaching in the pandemic time.

INTRODUCTION

Novel coronavirus (COVID-19) outbreak has spread rapidly across the world and it was stated by the World Health Organization (WHO) as a global pandemic. This pandemic has made a profound impact towards different aspects and one of them is medical education. The traditional structure of medical education has taken a 180^0 turn for both pre-clerkship and clerkship students particularly in universities where using technology has not been fully integrated in their courses. In some universities they have made the final year of medical students graduate faster in order to voluntary take part in handling this pandemic time.[1]

There has still been a debate on whether it is the right step for medical students in their clinical years to still be doing their clinical rotations during this pandemic or whether it should be held on pause instead.[2,3] Early exposure to clinical teaching has played a pivotal role in medical education and was found to have a positive influence on their clinical performance. Unprecedented times like these has required educators and mentors to quickly adapt and create new educational strategies in order to still create an interactive and optimal education.

Technology and online platforms may be an apt solution for students in their pre-clinical years. However, the case is different for students in their clinical years because they require patient interaction and contact. As William Osler proclaimed, 'He who studies medicine without books sails an uncharted sea, but he who studies medicine without patients does not go to sea at all'.[4] Medical universities in various countries have a differing approach towards this pandemic. Association of American Medical Colleges (AAMC) stated on March 17, 2020 that they strongly support medical schools to pause all student clinical rotations, effectively immediately.[1] On the other hand, other universities have encouraged clinical students to lend a hand within their scope

of clinical training to help prevent overwhelming healthcare workers. There is limited evidence or data on approaching medical education for clinical clerkship students during pandemic. The aim of this literature review is to unfold guidance on optimizing medical education for clinical students during COVID-19 pandemic.

METHODS

This is a literature review study on medical education of clinical students during COVID-19 pandemic. Literature searching is done by accessing the PubMed, PubMed Central, and Google Scholar databases. Literature search was conducted from December 1, 2019 to April 24, 2020, using the key words of "medical education", "clinical students OR clerkship students", "covid-19". Based on the literature search, there was 37 literatures related to education but only 20 literatures were included in this review. Literatures included were related to medical education of clinical students during COVID-19 pandemic. Literatures that were excluded was published in more than 10 years, not specific to medical education and education during COVID-19 pandemic. Both authors screened and selected them and further read the full text of eligible articles. If there was a conflicting argument, the third expert from the same background would resolve. The steps of literature search strategy in identifying relevant articles is described in Figure 1.

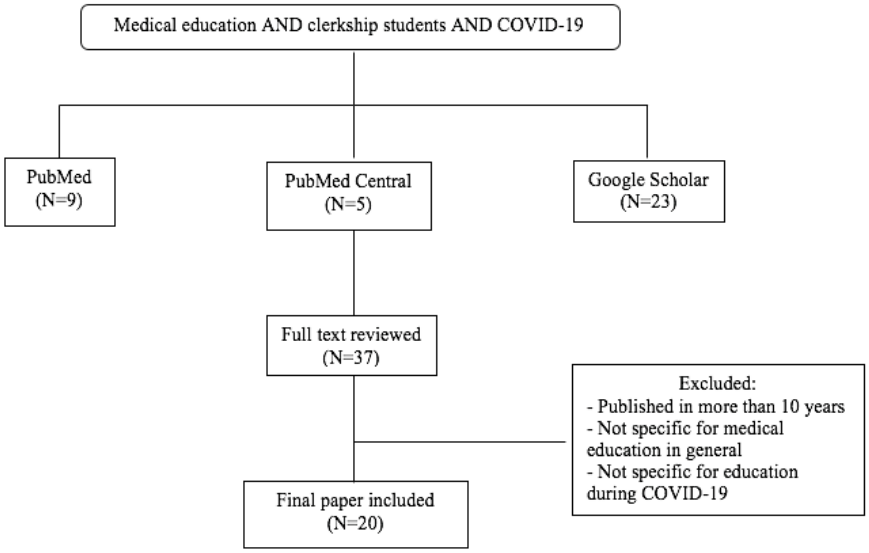

Figure 1. Literature search strategy

RESULTS AND DISCUSSION

Negative impacts of pausing clinical rotation

Mimicking clinical rotations by trying to create authentic patient interaction and contact for medical students through the use of an online platform is a challenge. This change will highly influence the student's learning environment and will widely restrict it. Not being able to have patient contact will influence the student's communication and interactive skills particularly for students who just began their clinical years. In addition to that, students will not be constantly surrounded by other medical students, fellows, nursing students, residents, physician assistant students and other learners in a clinical setting. Being physically surrounded by other learners will influence an individual to be curious and practice critical thinking.[5] Furthermore, the strain in educational systems such as educators and learners having to directly adapt and learn in an online setting, decrease in the availability of teachers

and an increase in clinical educators being pulled to take more clinical work. All these ramifications will influence a learner's professional identity formation and as future physicians they will carry this identity for patient care. This is indicated in Cruess' schematic representation which is shown in Figure 2. It shows how factors such as learning environment, role models, isolation from peers and clinical/non-clinical experiences all plays a role in influencing the formation of a student's professional identity.[6]

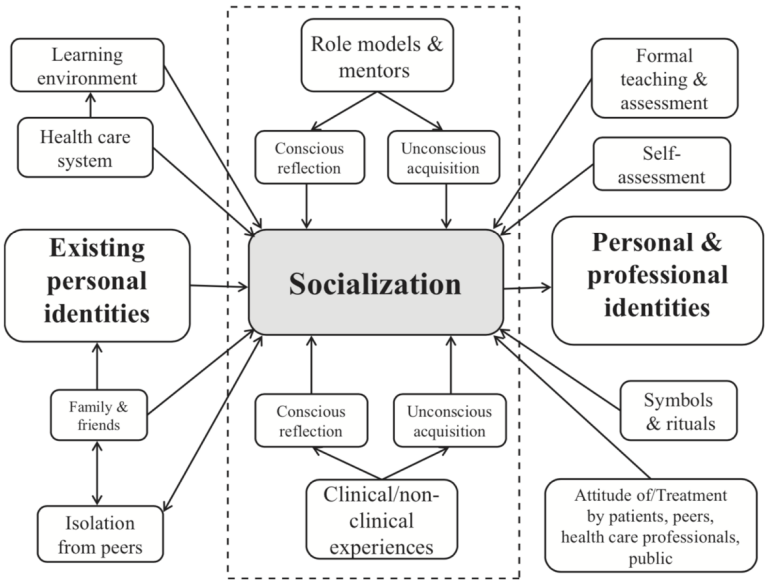

Figure 2. Cruess' schematic representation of multiple factors involved in the process of socialization in medicine and the dynamic process of personal and professional identities[3]

Another negative impact of pausing clinical rotations would be that there will be 2 full cohort classes of students in the clinical environment simultaneously.[4] Increase in volume of learners in a clinical environment can adversely affect education and it would be a challenge for educators to equally divide their attention to all individual learners in order to help them to fully grasp the concept.

In addition to that, there are also unfavorable effects toward student's mental health. This was evident from a survey response conducted in University of Washington towards medical students, residents and fellows. They found that among students there were feelings of anxiety, uncertainty, vulnerability and anticipatory loss. Students were concerned about whether they would graduate on time and about financial aid. Particularly for senior year students, apprehension about "being rusty" and maintaining clinical skills that will be required when they commence on their internship.[1]

Positive impacts of pausing clinical rotation

AAMC highlighted that "medical students are students, not employees...They are not yet MDs".[4] The decision of pausing clinical rotation can be presumed that it most likely stem from concerns on personal protective equipment (PPE) shortages and making students still come to their clinical rotation will further increase the usage of PPE or these students might not be ensured of being provided one. In addition to that there are also concerns about the risk of infection either from patient to student or the other way around as someone infected with SARS-CoV 2 virus can be asymptomatic and highly contagious. Pausing clinical rotation will also put further stress on physicians who have to educate learners while treating critical patients in urgent situations like these.

Optimizing medical education during COVID-19

Implementing teleteaching

There are various online platforms that can be utilized for teleteaching. This includes videoconferencing, lecture videos, online repository of patient interview and cases,[4] procedural simulation and procedure skills videos. Due to the advancement of technology, online platforms used for videoconferencing is able to facilitate a much more interactive teaching in comparison to medical education before the advancement of technology. Now, many online platforms used for videoconferencing have various features such as screensharing, power point sharing, white board feature, and using chat section for additional questions.

Within the past few years, recording lecture videos have already been implemented in many medical faculties[7] as this is efficient for students to be able to efficiently learn at their own pace, replay sections where they require further comprehension, fast forward sections that they have already grasp.

In response to a decrease on a variety of patient cases during this pandemic an online repository of patient interview and cases can be utilized. This might not be able to provide students the authentic patient experience however it still serves as a benefit during unprecedented situations like these. Learners are still able to have an insight from online cases and this will prepare them when they encounter similar cases in the future. Medical faculty can also branch out with other local hospitals and expand clinical case conferences in order for students to have a broader range of clinical cases.

There are also various benefits in implementing procedural simulation as this will further prepare students to successfully apply obtained knowledge and project it in the form of procedural skills. The use of simulation-based training made improvements in learners' skills, performance, attitude and knowledge.[9] A study conducted in John Hopkins University School of Medicine also found that it boosted student's confidence significantly in performing the procedures on a real patient.[9]

The use of procedural skills video is not uncommon in the era of technology. Procedural skills videos such as suturing skills, lumbar puncture or chest tube placement will also help students to study efficiently, at their own pace and they can always come back to the video when they need to recall their memory of the certain skill.

Implementing technology in terms of altering written exams and OSCE in an online format would be a challenge. However, some institutions have given some suggestions on how they are able to conduct it virtually. University of Melbourne have suggested on using an academic integrity program called ExamSoft for students' written exams. This program takes over the students' computer to make sure that only the exam tab is open and automatically shuts down the computer when a suspicious action is suspected. Furthermore, Weil Cornell Medical College in Qatar developed comprehensible steps on how they conducted Web-OSCE using Zoom tele-conferencing.[10] Using Web-OSCE they were able to assess communication and rapport building, history taking, critical reasoning based on their history taking and patient's further investigation findings that are provided (i.e., lab results, physical exam findings). Figure 3 illustrates the flow of a learner and simulated patient (SP) in Web-OSCE. It is all conducted in a virtual setting and this includes briefing rooms and waiting rooms that are controlled by host and cohost of the Zoom conference room.[10]

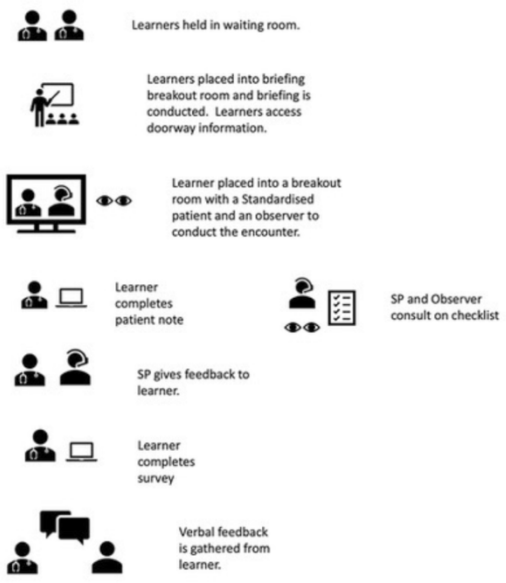

Figure 3. Journey of a learner and simulated patient during Weill Cornell Medical College's Web-OSCE using Zoom teleconferencing[8]

Learning environment

There are huge changes that has to be made in the learning environment and it became vastly restricted due to the need of conforming to physical distancing. Medical students in their clinical years will not be surrounded by other medical students, residents, nursing students, physician assistant students, fellows and other students. Being surrounded by other learners actually trains them to be more curious about what they are learning, to be more critical on the information being projected and to remind them of their own humanity. Therefore, it is important to make these learners feel integrated even though there has been a change in learning environment. Stanford medical school have suggested that advocacy, service, electives, research opportunities and telehealth opportunities are some ways to make learners feel integrated. Advocacy and service includes helping to fund PPE for local hospitals or encouraging students to take part in organizations that help provide other necessities for hospitals battling COVID-19. Electives can be converted virtually, or the faculty can create a new elective such as a COVID-19 elective. Other electives that can be converted virtually would be microbiology, global health or public health sector. These electives will broaden the students' knowledge as a future physician.

Significance and strategies to improve role models and mentors

In medical school clinical educators or student's mentors are example of role models for students. Role models plays a role for professional identity formation in medical students as indicated in Cruess' schematic representation (Figure 2).[6] Thus, it should be essential to implement right strategies in order to improve role modelling during uncertain times of COVID-19 pandemic. These strategies include awareness of being a role model, time to teach and the importance of reflection. Awareness of being a role model means having a conscious recognition of the role an educator holds. They should also be aware of the negative and positive impact of what they are projecting in order to improve their performance as educators. Time to teach will be challenging as some clinical educators would have to be called to take clinical roles however it is still essential to still be able to provide a facilitated dialogue, reflection and debriefing when they are teaching. When they are being clinical educators, they should always be present, open to questions, open to discussion and try to encourage and integrate all learners to take part in the discussion. Lastly, being able to reflect on and be conscious of the attributes and behaviors that clinical educators are projecting in front of their students is crucial to improve role modelling.[10] They can reflect on the negative and positive actions or experiences as a role model and at the same time help students to also learn how to reflect upon themselves in order to obtain a valuable lesson. They can also implement what is called "reflection on action" when they reflect their present experiences to future actions.

Telemedicine

Telemedicine is defined by the World Health Organization as the delivery of health care services at a distance with the usage of technology for "diagnosis of treatment, and prevention of disease and injuries, research and evaluation, education of health care providers" to efficiently improve health.[11] There are 5 types of telemedicine, which includes tele-visit, tele-supervision, tele-monitoring, tele-interpretation and teleconsultation. Implementing all these types of telemedicine will be beneficial for both learners and healthcare system during this COVID-19 pandemic. For instance, with the use of zoom, Webex or any other online platform, clinical educators are able to let medical students observe, experience, or do history taking for their inpatient and outpatient visits through videoconferencing. In addition to that, telemedicine can be used to help assess and triage for COVID-19 which can be done by medical students. Students can also use telemedicine for the management of chronic conditions such as immunodeficiency and asthma.[12]

Training programs

It is crucial to learn from previous countries that have battled this pandemic such as China. It was found from data obtained on February 2020, that provinces which has a low mortality rate such as Jiangsu

and Zhejiang province had a greater number of physicians who were enrolled in the Chinese Critical Care Certified Course (5C) program in comparison to provinces that has a high mortality rate such as Henan province.[13] As critical care medicine holds a crucial role in public health emergency it is important to slowly expose these training programs to future physicians in order to further prepare them when they face future pandemics. Medical faculties can start creating electives of critical care program or a beginner course of this program in order for learners to have a strong foundation on critical care medicine. In addition to this, a safety training programs is also crucial in pandemics in order to decrease the risk of infection. This program might include training students proper donning, doffing procedures or how to use mask in a clinical care setting. Implementing these programs for future physicians will be highly valuable for them as physicians as it further prepares and instills in them confidence when they have to battle a similar virus as COVID-19 in the future.

Psychological Support

Study survey regarding the psychological impact of COVID-19 on medical students in China found that 24.9% experienced anxiety due to the COVID-19 pandemic. This anxiety might have been related to how this pandemic effected their studies, future employment and in addition to that it could also be due to an increasing distance between people from having to practice physical distancing.[14-16] This indicates how crucial it is for institutions to facilitate mental support for learners. This can be done by providing telephone and internet-based counselling, hotlines to provide psychological counselling services and to create social support systems for international students who are currently not living with their family or students who are undergoing quarantine alone. Videoconferencing can be used to create these social support systems to check up, encourage each other, increase social interaction and build relationships even though learners are not meeting each other physically. In addition to that, the faculty could create training programs for mental health such as ways on how to deal with anxiety and stress.

Clinical roles for medical students during COVID-19 pandemic

There are contradicting opinions to what is stated in the AAMC guideline. These opinions disagree that medical students should only be clinically involved when there was critical healthcare personal shortages.[1] Instead the faculty should provide students clinical opportunities in order to benefit patient care and to potentially help reduce the burden of healthcare workers. These clinical opportunities include assisting with outpatient clinical care, inpatient services that are not patients with COVID-19 and lastly, they can remotely assist in the care of patients with COVID-19.[17-18]

Ways in which medical students are able to assist in outpatient clinical care is by taking histories, educating patients, calling patients with laboratory test results and documenting visits. Patients which chronic conditions still require ongoing care during this pandemic and medical student can help take part in this clinical responsibility.[1] In addition to that, they can also assist in discharged patients that require follow up and routine check-ins for pregnant women.[19] Most of these tasks should be possible via telemedicine however it should be taken into consideration whether certain patients have access to online platforms required.[20]

Additionally, students can help with inpatient services under the supervision of attending physicians or senior residents. This involvement will require students to be given appropriate PPE in order to reduce the risk of infection, to help them feel safe, and to give them confidence in doing their clinical responsibility.[21]

Furthermore, they can also remotely assist in the care of patients with COVID-19 under physician supervision. They can monitor patients with mild COVID-19 symptoms who are not admitted, help review charts of admitted patients, ensuring tests and performed, and following up patients after discharge.[8] All these roles require physician supervision however they still would reduce the overall burden of healthcare workers.[1]

Future perspective

After COVID-19 pandemic is over there should be a reflection on changes in medical education that should remain. This include the advantages of teleteaching such as providing lecture videos, students being able to observe inpatient and outpatient services virtually before going directly to a clinical setting, procedural skill videos and simulation-based training before performing procedures to direct patients. In addition to that, telemedicine should be furtherly embedded in the healthcare system.[21] Furthermore, educators should hone and maintain new skills that are obtained during COVID-19 pandemic such as strategies to improve communication skills for educators, skills to improve role modelling or adapting to technological advancements. Implementing psychological support in a medical education system should also be a permanent change.[22]

Future pandemics might result in extreme health care worker shortage and students must be directly called to decrease the burden of healthcare workers and be embedded in a clinical environment.[23-24] These actions have already been taken in some geographical areas for COVID-19 pandemic. This shines a light for educators to find ways to further equip these future physicians in such situations that are bound to occur in the future.[25, 26]

Additional academic issues such as students unable to take standardized examinations when testing centers are closed, deadline for residency applicants, and their ability to meet requirements for certain applications will require further attention and evaluation.[27]

This study was done in the early pandemic time, so the results gave us insight about difficulties, problems, and limited way out for medical teaching especially in the clerkship. The included study were only 20 studies. Further studies were needed to be done to add the knowledge regarding medical teaching in the pandemic time.

CONCLUSION

It is crucial to evaluate, reflect and learn from COVID-19 pandemic in terms of medical education as many individuals are affected. Implementing the advancement of teleteaching, telehealth, creating an integrated learning environment, strategies to improve role modelling, embedding psychological support to medical education are all ways in order to optimize medical education not only during pandemics but it can also leave a permanent mark on today's educational system.

Medical schools all have a differing approach on how they are handling COVID-19 pandemic. There are universities that encourages students to volunteer in taking clinical responsibilities in this pandemic or directly deploy them to take part. On the other hand, there are also universities that pause all clinical rotations. There are various considerations that should be taken when involving students and each medical university carries a unique situation in which they will have to arrive on the best decision based on their case.

RECOMMENDATION

Institutions and educators need to further shine a light on ways to approach the issues that appeared due to COVID-19 pandemic. It is crucial for them to come together, integrate different perspective, ideas and learn from each other in order to holistically approach these issues. Implementing teleteaching, creating an integrated learning environment, strategies to improve role models, implementing telemedicine, training programs and psychological support are all ways that institutions can follow through in order to optimize medical education. However, optimizing medical education should not be restricted to this only as it is pivotal to further bring to attention other effective ways for medical education to rise above this obstacle.

COMPETING INTEREST

The authors report not conflicts of interest. The authors are solely responsible for the content and writing of this article.

LIST OF ABBREVIATIONS

WHO :World Health Organization
AAMC :Association of American Medical Colleges
PPE :Personal Protective Equipment
SP :Simulated Patient

AUTHORS' CONTRIBUTION

Patricia Budimulia – designed research, performed the analysis, wrote the paper.

Andree Kurniawan – designed research, proofread the article.

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