

# Medical education system in Coronavirus Disease 2019 (COVID-19) pandemic: what has been changed from the past era?



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## ABSTRACT

The magnitude of coronavirus disease 2019 (COVID-19) pandemic leads to the significant difference in daily living. Less direct interaction between people is emphasized to prevent the spread of the virus. Consequently, the medical education had been affected considerably. The concept of medical education compromised of pre-clinical curriculum and clinical curriculum (clinical clerkship). Indeed, the implementation of self-distance makes the essence of clinical clerkship disappeared. In order to overcome this issue, several methods have been employed. The use of virtual or online learning method had been developed with the use of online platform. Regardless of the various approach, pros and cons still existed. The common challenge in the use of online learning method including technical issue and less interaction between patient and student. The hybrid combination of online learning with traditional method could be beneficial for the current medical education in this era.

**Keywords:** Medical education, pandemic, virtual learning, COVID-19, curriculum.

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## INTRODUCTION

The pandemic of coronavirus disease 2019 (COVID-19) caused several significant impacts in daily living, from the way of interaction between people, work place and education around the world. The impact on education makes it become the major priority to overcome this issue, since the main component in education is direct interaction between teacher and student. These also affect the education system in medical schools and hospitals. The main component of medical curriculum including teaching classes, clinical clerkships, direct observation or direct working and training. Since the pandemic started, this standard curriculum undergo cessation. The direct interaction between the staff and the student has to be limited to suppress the spread of the virus, causing disruption in medical education.<sup>1</sup>

Major decision had been made worldwide regarding the pandemic toward medical education system. The

Association of American Medical Colleges (AAMC) on March 23th, 2020 announce a guidance regarding involvement of medical student during the pandemic era. The AAMC recommended that medical students should not involved in direct patient care, in exception of the necessity of urgent workforce. They also emphasize that this should be on voluntary basis.<sup>2</sup>

Since the pandemic currently still ongoing, with various prediction on how long this pandemic will exist, raise a concern on the medical education will continue. In one hand, the education center should resume their curriculum for the medical student despite the pandemic in order to preserve the continuity of qualified medical personnel. This review discuss the approach that has been done to overcome this problem and what has been changing compared to the past medical education curriculum. Identify and recognize this issue will benefit for the next strategy of better medical pedagogy.

## MEDICAL EDUCATION SYSTEM BEFORE PANDEMIC

The standard teaching programs of medical education employed a direct person interaction for delivery of knowledge, workshops or group discussion. This has been well known as traditional model that has resume for a long time with great experience of this teaching method. Other approach to grasp the standard medical education curriculum is to realize that academic center encompass pre-medical preparation and medical specialty training, either in residency and fellowship education or undergraduate and graduate medical education.<sup>3,4</sup> This curriculum gives fundamental basis for medical professionalism, and this further upgraded by continuing medical education and life-long learning.

In the twentieth century, the medical education method directed by employing the principles of Abraham Flexner and William Osler. As Flexner emphasized

that medical schools should be in the form of university based with rigorous curriculum including laboratory and clinical science education and active research, Osler underlined the importance in bedside teaching, direct contact of medical students with the patients and the guidance of the clinician for the students in regards to these direct observation and experience.<sup>3,5,6</sup> These two different yet complementary concept leads to the emergence of two pillar in medical education system; foundational and clinical sciences.<sup>7</sup> This model gives the basis for education system in undergraduate medical education, consisting of pre-clinical years and clinical clerkship (Figure 1).

## IMPLICATION OF COVID-19 PANDEMIC TOWARD MEDICAL EDUCATION

A pandemic of COVID-19 has caused unprecedented problems in medical education processes and health care systems around the world. The highly contagious characteristics of the virus make it difficult to conduct medical education as before. Medical education in the clinical phase emphasizes patient-based learning, where the theory gained during the pre-clinical phase is applied in the field. Therefore, the COVID-19 pandemic has greatly affected the clinical phase of medical education, which is based

on lectures and patient-based education.<sup>8</sup>

The COVID-19 pandemic puts a person at risk of contracting life-threatening illnesses and conditions. This is a big challenge for medical education, since security for teaching staff is also an important aspect of education. In addition, ensuring the teachers are also necessary to ensure the continuity of the medical education process. These problems have resulted in the main focus being on the care of COVID-19 patients, thus limiting the opportunity for bed-side teaching for medical students.<sup>8</sup>

Overall, all face-to-face training, including clerkships, clinic rotations, and small group sessions were suspended at the start of the pandemic. Clinical orientation activities such as clinical rotation and clerkship are reactivated by several institutions taking into account local factors. However, this educational process can still undergo changes taking into account the pandemic period. An important consequence of the pandemic is the cancellation of many clinical rotations of medical students, thereby limiting opportunities for hands-on learning.<sup>9</sup>

## PSYCHOLOGICAL BURDEN OF PANDEMIC FOR MEDICAL STUDENT

Faced with an unprecedented shortage of health professionals, several institutions are implementing alternatives to increase

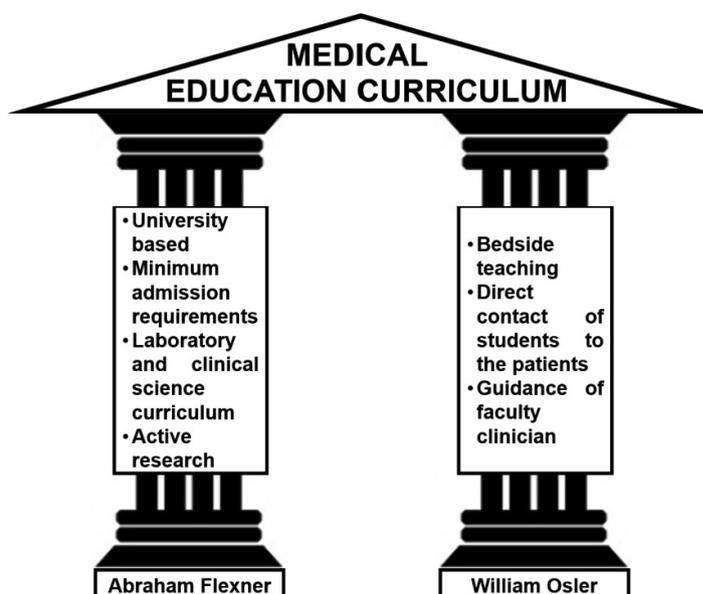
the workforce, including the placement of qualified and willing medical students, at the discretion of the institution. Some countries such as Italy, Ireland, and England have involved their students as health workers early. Meanwhile, in Canada, students were withdrawn from clinical assignments. A number of medical schools in America graduate some students early. The guidelines developed by the AAMC ensure that student participation in direct patient care is voluntary, with guarantees of adequate personal protective equipment, adequate testing, and health insurance.<sup>9</sup>

The mental health burden as a result of this pandemic can be linked to anxiety, coping with illness and high mortality rates. In addition, an increase in working time accompanied by a significantly reduced rest time, the impact of illness on colleagues and family, economic pressure, and isolation and social pressure also have an impact on the mental health of students. The World Health Organization (WHO) notes that health workers are at increased risk of mental health problems. This is not only due to the emotional stress of social isolation, but also to exposure to death and illness, shortages of personnel and personal protective equipment (PPE), and the moral burden of patient care.<sup>9</sup>

The effect of the pandemic on increasing levels of anxiety and depression in medical students has been shown in various studies. An American study showed that there was a 61% increase in anxiety levels and 70% in depression levels.<sup>10</sup> A study in Uganda involving clinical-phase medical students found that 30.3% of students felt they were not getting adequate preventive equipment. In fact, the majority of students (81.7%) felt they were at risk of contracting COVID-19. This will increase the pressure for clinical medical students and will affect the students' anxiety and depression levels.<sup>11</sup>

## CHANGING IN MEDICAL EDUCATION SYSTEM IN PANDEMIC SITUATION

From the beginning of the pandemic up to this day, medical educators and professionals all around the world tried various approach to delivered the



**Figure 1.** Pillars of medical education curriculum

educational content. Several platforms that provides features for live lectures or recording materials have been utilized by medical and university centers worldwide.<sup>12</sup> The most adopted technology for the delivery of the educational content is online platforms. The teaching comprising live lectures, interactive discussion, or presentation by medical students.<sup>13</sup> However, more preparations are needed to deliver the educational content to senior medical students, since their main method is direct interaction to the patient with implemented the theory toward the patient.<sup>14</sup> In this setting, teleconferencing may assist to demonstrate medical procedures.<sup>15</sup> Despite all the benefits offered with online teaching, this method also has controversies. Online learning method provide more flexibility in regards to location and timing, also more efficient, However, the disadvantages including technical issues and lack of interaction between patient and medical student. Therefore, the main problem exist for the clinical clerkship medical student.<sup>12</sup>

In several recent years, telemedicine has developed significantly. The application of telemedicine have expanded from the phone triage, electronic visit to follow-ups of postsurgical operation. The telemedicine market has grown considerably even before pandemic. It has been predicted to grow from 38.3 billion to \$130.5 billion, from 2018 to 2025.<sup>16</sup> However, clinician that still not used to telemedicine will find it difficult to implement their interview and history taking of the patient to the virtual setting.<sup>17</sup> The other issue in implementing the use of online learning is technical challenges, which stated as the most common reason for failure in adapting this method.<sup>18</sup> These barriers added with other factors, e.g., patients' discomfort, stress to adapting the new environment and technological literacy will make the adoption of online learning becomes difficult.<sup>17</sup> Furthermore, the use of computer screen or phone call could make the patients feel more detached, hampering the usefulness of doctor and patient relationship. This indirectly will make the delivery of educational content also becomes failed.<sup>17</sup> This issue has been evaluated with several studies. One study found that inexperienced care providers to telemedicine will make them difficult

in obtaining detailed history and data or giving appropriate subsequent approach and jumping straight to requesting unnecessary in-person visits.<sup>19</sup> Other systematic review found that through dedicated curriculum, courses have been successful in teaching.<sup>20</sup>

As direct interaction of student to patients provides crucial method of learning, many medical institutions tried to find methods to maintain patient and students interaction during this pandemic era. One study by Chandra et al in 2020 evaluating the virtual clinical experience of medical students in Emergency Medicine clinical clerkship.<sup>21</sup> The recently examined patients by the clinician were undergo virtual call-backs by the students, with supervision. This method has received favorable feedback from both the patients and students. One study by Escalon et al in 2020 found that as many as 86.5% psychiatrists practicing with the use of virtual learning during pandemic in United States.<sup>22</sup> These studies gives suggestion that telemedicine can be served as the bridge to overcome the issue of direct interaction of students with the patients, providing the continuity of medical education.

As for specific skill set, a video-based coaching is another approach to delivered the procedural skills needed. In the pandemic era, interventional procedure can be taught by the instructors remotely. One study found that with the same exposure to laparoscopic skills training, video-based coaching method increase the performance quality of laparoscopic surgical, both in virtual reality and porcine models. However, it comes with the cost of time needed for teaching. The study concluded that video-based coaching is a decent method to maximize performance enhancement from every clinical exposure.<sup>23</sup>

The efficacy of virtual or online learning method with the aim to delivered proper medical education is promising. In a study by Pape-Koehler et al,<sup>24</sup> they found improved surgical performance of laparoscopic cholecystectomy when used in isolation or when combined with a practical training session compared to practical training alone. Another study by Smeekens et al in 2011<sup>25</sup> found an improvement in the ability of the nurses

to identify child abuse in emergency department after online session. This included higher quality of history taking. In other study, a hybrid method is useful. A study found that medical students benefits from online learning of palliative care. However, they need to be given experience-based training and direct encounters with the patients.<sup>26</sup>

Another thing that need to be considered for medical education in pandemic era is mental health support for the student. Establishing a mentoring group may help them to share ideas, suggestion and encounter their feeling of isolation. This approach may useful for international students that may feel isolated and considered as minority groups.<sup>27</sup> The group may employed the senior medical students to junior medical students, in order for the senior medical students giving guidance to junior medical students. They can resolve the stress issue for the medical students and encourage them in other areas, e.g., research.<sup>28</sup> As discussion with other students will improve their knowledge, they also feel a sense of unity. International students and parents may be placed together to further enhance understand the challenge and develop empathy with each other.<sup>29</sup>

## FUTURE ISSUES

Direct comparison of online learning method with traditional learning is hard since the groups are heterogenous, lack of uniformity, and various confounding variable that will defy the adjustment.<sup>30</sup> Hybrid method which consists of combination between traditional learning method with online learning could be utilized and may serve as potential teaching method in this pandemic era.<sup>31-33</sup> Another thing that should be emphasized is that the mentoring groups or network could be resumed beyond this pandemic. The mentoring groups provide medical students an opportunity to interact and active study, more comprehensive guidance regarding research and future training prospects.<sup>34</sup>

## CONCLUSION

Medical education has undergone significant changes in this pandemic.

Several methods have been developed to delivered the standard curricula needed for medical students. The use of telemedicine and other online learning methods had been developed in the past and this pandemic situation haste its implementation. However, despite the pandemic situation, standard medical education which consist of fundamental science and clinical science still needed to be given to the students. What need to be improved is the method of delivery.

## CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest in this study.

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## ETHICS APPROVAL

Not applicable.

## AUTHOR CONTRIBUTION

The authors responsible for the study from the literature search, data gathering, data analysis, until reporting the results of the study by a narrative form of the review.

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