The Impact of COVID-19 on Siriraj Anesthesiology Residency Training and the Use of E-Learning during a Pandemic

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Coronavirus disease 2019 (COVID-19) has pervaded across the globe, sending many countries into lockdown. The impact of the pandemic on residency training is discernible. Measures taken by various medical schools all over the world are based on the social distancing policy, inevitably disrupting medical education. An uncertain prediction of the outbreak severity and duration serve as urgent calls for educators to be versatile and innovative. Thailand is the second country in the world to report a confirmed case of COVID-19. Siriraj Anesthesiology Department has adopted e-learning to facilitate residency training during the outbreak. This paper intends to share our response to the COVID-19 pandemic and suggests possible implementation of e-learning to maintain the integrity of medical education which consists of cognitive skills, clinical skills and professionalism.

Keywords: Anesthesiology training, COVID-19, E-learning

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The spread of the coronavirus disease 2019 (COVID-19) infection has become pervasive. It only took a few months after the first report of a cluster of pneumonia in Wuhan, China for the World Health Organization (WHO) to declare COVID-19 a pandemic[1]. The numbers of infected cases and deaths continue to rise across the globe. The pandemic poses a myriad of challenges for various sectors across-the-board and inundates healthcare capacities worldwide. Medical education is no exception. Social distancing presents a threat to a patient-centered learning and precludes any face-to-face interaction among learners and teachers. It forces upon educators the need to be creative, innovative and flexible to deliver a nonetheless effective teaching during this unprecedented time.

On 13 January 2020, Thailand was the first country with a confirmed COVID-19 case outside of China[2]. The situation has then spiraled to its peak in March 2020 before observing a downward trend. As of 21 May 2020, Thailand has a total number of 3037 confirmed cases and 56 deaths[3]. Accompanying the lifting of some restrictions, however, a second wave of infection is almost certain. Siriraj hospital has been in the front line in the combat against COVID-19 infection, designating specific critical care units and cohort wards to accommodate COVID-19 patients. Siriraj has also been active in several nationwide broadcasting of COVID-19 situations, collaborating on a development of rapid test kits, and creating a COVID-19 tracking application.

As a teaching hospital, our Faculty of Medicine has also modified the teaching and training in compliance with the social distancing policy. Although the outbreak affected both undergraduate and postgraduate trainings, we speculate that the impact on the postgraduate training would be more palpable. This paper intends to report on the postgraduate training situation in Siriraj hospital, in particular anesthesiology training. The author will also explore on alternative teaching strategies to minimize residency training disruption amid the outbreak.

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Following the escalating cumulative COVID-19 cases in Thailand, Thailand health experts formulated a mathematical model predicting three possible outbreak scenarios based on the effectiveness of control measures put in place by the government[4]. The projection was in favor of the implementation of the social distancing policy. This is in agreement with a model proposed by Ferguson[5], suggesting that healthcare capacities could be overwhelmed in the absence of a proper intervention. In response to the recommendation, our department acted swiftly to mitigate such scenario. Due to the urgency of the situation, we were aware that our plan was not faultless and constantly amenable to change.

As a teaching hospital, our responsibilities extend beyond providing care to the patients. Educating our students while protecting their health and wellbeing are also taken into consideration. We began by defining our roles as anesthesiologists during a pandemic which include, but are not limited to, providing anesthetic care for surgical patients, organizing an intubation team, taking part in the critical care team, and sharing our knowledge and experience regarding intubation and surgical workflow.

The preceding step was to educate all residents and staff members on personal protective equipment (PPE) donning and doffing through video vignettes. In light of the fluidity of the situation, we updated relevant COVID-19 guidelines and surgical workflow through e-mails and messaging application. As Siriraj hospital decreased the surgical caseload by postponing all elective surgeries, we restructured our team to fit the situation. We divided the residents into two teams, each taking turn to participate in clinical duties every other week. The same rule applied for staff members. This was to comply with physical distancing, limit the exposure to the disease and contain the contagion in the event of an outbreak in the hospital.

All emergency cases were subjected to screening by infectious disease specialists to stratify patients into 'green', 'yellow' or 'red' groups, designating low risk group, patients under investigation (PUI) group, and confirmed COVID-19 group accordingly. Residents were only assigned to 'green' cases whereas the rest was overseen by staff anesthesiologists. We added 'COVID-19 duty', consisting of staff anesthesiologists and anesthetic nurses, to the usual on-call schedule to perform emergency intubation and provide anesthetic service for PUI and confirmed COVID-19 cases.

Concerning the resident academic activities, we utilized both synchronous and asynchronous e-learning modalities. Regarding synchronous modalities, cloud platform for video conferencing was used in place of the usual conferences. To compensate for reduced clinical exposure, virtual case discussion was conducted on a daily basis via video conferencing. As for asynchronous e-learning resources, Siriraj hospital adopted the Learning Management System (LMS) to facilitate e-learning. Residents can enroll on provided online courses and gain access to power point slides of lectures, topic reviews, and an online self-assessment. Although PUI and confirmed COVID-19 cases were outside of their responsibilities, residents were taught to intubate such groups of patients via small group simulation. Outside of the anesthesiologists' scope of work, residents and staffs were involved in patient screening at the acute respiratory infection (ARI) clinic. Last but not least, to comply with the travel restrictions issued by the government, all local and international electives were cancelled.

Upon the latest development as of May 2020, our hospital has lifted certain restrictions to allow for time-sensitive surgical procedures such as cancer surgeries to be performed. Residents were thus gradually able to resume their near normal clinical duties. Preoperative evaluation was carried out predominantly over the phone.

Apart from the aforementioned changes, some issues remain ripe for discussion. These involve examination format and postponement, residents' case log, and repeating certain clinical rotations. In the meantime, our department will continue to closely

monitor the COVID-19 situation and make adjustment on an ad hoc basis.

The Use of E-Learning during a Pandemic

Following the 2003 SARS outbreak in Singapore, Lim[6] has developed a decision tree for medical schools suggesting the use of web-based teaching and online conferencing in place of the conventional mode of learning during a pandemic/epidemic. E-learning indeed appears to be a promising mode of teaching delivery as it circumvents physical contact and transcends geographical barriers. Although inherent differences exist, the term "e-learning" is often used interchangeably with online learning or web-based learning[7]. The definition of e-learning is ongoing as technology is forever evolving, but essentially entails the use of a digital device and networks to provide education[8,9].

The current postgraduate training is centered on the idea of a competency-based medical education (CBME)[10]. One prime example of such initiative is the Outcome Project by ACGME (The Accreditation Council for Graduate Medical Education) which advocates that residents be evaluated based on six competencies[11]. Medical education can indeed be constructed upon Benjamin Bloom's three domains of educational objectives-cognitive, affective, and psychomotor domains[12]. The challenge now is to replicate all three aspects online. In this section, we elaborate on the teaching of cognitive skills, clinical skills and professionalism in the social distancing era.

Cognitive skills

Bloom originally classified cognitive skills into six categories-knowledge, comprehension, application, analysis, synthesis and evaluation-ranging from least to most complex[12]. These were later referred to as lower - order and higher - order skills, with the latter being associated with critical thinking skill. Imparting lower-order thinking skills via online learning is supported by a wealth of evidence[13]. Learning modalities such as prerecorded power point slides and podcasts provide learners with convenience and accessibility to the content. These online resources also allow learners to revisit the content as many times as they require to maximize their learning efficiency. However, facilitation of higher-level thinking skills might not be equally effective, as pointed out by Kurup and Hersey that these online contents are more suited for imparting lower-order thinking skills[14].

Higher-order thinking skills are usually considered as skills higher up in Bloom's revised cognitive skills including analysis, evaluation, and creation[15]. Critical thinking is characterized by the application of those skills to reach a logical understanding and action[16]. It is a skill deemed desirable for physicians to aid in their logical judgment and appropriate clinical decision, particularly in the information age and with the endorsement of CBME. Some of the practiced pedagogic strategies in the teaching of critical thinking include problem-based learning and journal appraisal[17]. Fortunately, the current state of technology has made online replication of such educational activities possible. An example is an instructor-led online discussion which allows for a monitored exchange of ideas and collaborative learning[18]. Al-Mubaid has proposed a framework where the teaching of critical thinking can be done online[19]. The author divided online learning into an individual component and a team-based component. An individual component requires learners to study on their own before taking part in a team-based component whereby the learners engage in online discussion and debate. A similar idea that has been used in medical education is otherwise known as a 'flipped classroom' whereby students do their own studies before participating in a group discussion[20]. Group discussion to promote critical thinking can also be carried out asynchronously as long as the learners are properly engaged and coached by the instructor[21]. Examples include asynchronous discussion forum[22] and reflective writing[23].

Clinical skills

Clinical skills are often taught via face-to-face interaction and require hands-on practice. E-learning has been successfully assimilated to compliment the conventional teaching of clinical skills; an approach known as 'blended learning'. Regarding the teaching of communication skills, a blended learning can take a form of an online module paired with role play or small group discussion[24]. A randomized study comparing the use of virtual and live patients shows that both were rated equally by the students, and overall equally improved their diagnostic capabilities[25].

Peyton's four-step approach has received growing attention in the teaching of new clinical skills. A number of studies have shown its superiority over the 'see one, do one' strategy[26,27]. The first step of the Peyton's approach is 'demonstration' whereby the teacher demonstrates a skill at a usual pace without an explanation. The second step is 'deconstruction' whereby the teacher goes through the procedure with an explanation. The third step is 'comprehension' which invites the learners to rehearse the steps while the teacher follows their instructions. The fourth step, 'performance', is when the learners perform the procedures on their own[28]. Online videos of procedures undoubtedly serve as valuable tools in augmenting the first and second steps, especially in times of physical distancing.

A timely publication by Hamed Khan has suggested the modification of Peyton's four-step approach to teach clinical skills amid the COVID-19 outbreak[29]. All of the steps were carried out online. The author used an online video to demonstrate a skill before dividing the students into smaller groups whereby the responsible peer tutors will break down and discuss each step with the students. To substitute the third step, the students were asked to verbally rehearse each step to the peer tutor. The fourth step was replaced by a question and answer session. Although this approach is yet to be validated, it can certainly be implemented by other medical schools with institutional modification according to the outbreak severity and stringency of physical distancing policy. Otherwise, the students can defer their hands-on practice until some of the restrictions are eased and normal clinical activities resumed.

Professionalism

In response to the change in roles of doctors and the societal expectations, professionalism has long been recognized as a competency in medical education[30]. There are various definitions to professionalism. The Charter on Medical Professionalism proposed that professionalism incorporates three main principles including 'patient welfare', 'patient autonomy' and 'social justice'[31]. Swick argued that professionalism ought to be defined based on the desirable behaviors of physicians such as honesty, compassion, and excellence[32]. The disparity in its definition is further influenced by globalization and cultural differences. However, it has been suggested that institutions should seek to identify their own definition to design an appropriate curriculum[33]. Our department's professionalism interpretation entails non-technical skills, continuous professional development, responsibility, altruism and upholding of ethical values and appropriate attitudes towards the patients, colleagues, and society.

The teaching of professionalism should be a combination of an explicit teaching outlining the content of professionalism and an integrative learning by means of situated learning and experiential learning[33]. A move towards an online module might be relatively simple for the theoretical component of professionalism which can usually be delivered via formal lectures. Reflective learning through simulated scenarios via digital modalities have also been reported. These include among others, the use of 'cinemeducation' whereby the students watched films on issues surrounding professionalism before engaging in a group discussion[34], and video-conferencing[35].

Although social distancing undermines patient contact and collaborative experiences integral to the development of professionalism, residents gain invaluable lessons during the pandemic. Involvement

of residents in the screening of patients at the ARI clinic teaches them important lessons on empathy and selflessness. The fluidity of the situation compels the residents to consistently update their knowledge, a character regarded as one of physician's professionalism.

Conclusion

COVID-19 has affected residency training in an unprecedented manner. Its chronicity and a speculation of COVID-19 recirculating seasonally[36] inevitably force educators to remain vigilant and respond innovatively to minimize residency training interruption. E-learning serves as a mean to facilitate the training during the social distancing era. Since medicine is an interplay of knowledge, skills and attitude, efforts should be made to ensure that no single element is neglected. Although the importance of patient contact is not to be undermined, this crisis should be perceived as an opportunity to rethink the future of medical education.

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