Strengthening intensive care training in response to COVID-19: lessons for medical education

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Article Info

ABSTRACT

Frequent updates to clinical guidelines during the COVID-19 pandemic have posed significant challenges for audit processes, quality improvement, and the preparedness of healthcare professionals, particularly in intensive care settings. This study aimed to explore the impact of COVID-19–related demands on medical education and training from the perspective of healthcare teams working in intensive care units (ICUs) in Indonesia during the first wave of the pandemic. A qualitative design was employed using semi-structured interviews and focus group discussions with medical personnel directly involved in the care of COVID-19 patients at national referral hospitals. Purposive sampling was applied to recruit participants, including general practitioners, interns, residents, anesthesiologists, and ICU consultants. A total of 66 participants were included across eight focus group discussions, each consisting of eight to nine participants. Data collection continued until thematic saturation was achieved. Transcripts were analyzed using content analysis to identify key themes and subthemes. The analysis revealed five major themes: i) the need for continuous upgrading of knowledge and competencies, ii) the importance of innovative education and training approaches, iii) the role of professional organizations, iv) challenges encountered during training implementation, and v) time constraints. These findings highlight the urgent need for adaptive, continuous, and technology-supported training strategies to strengthen intensive care workforce preparedness during public health emergencies.

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1. INTRODUCTION

In December 2019, a cluster of pneumonia cases of unknown origin was reported in Wuhan, China, and was later identified as a novel beta-coronavirus, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), causing coronavirus disease 2019 (COVID-19). The pandemic has affected global health systems at an

unprecedented scale, with more than 2.44 million cases and 165,000 deaths reported worldwide as of April 20, 2020 [1]. Beyond its health impact, COVID-19 has disrupted multiple sectors, including education, where restrictions on physical gatherings have significantly limited conventional learning environments [2], [3].

Medical education has been profoundly affected by the pandemic, particularly in clinical training settings. Academic institutions have reduced or suspended in-person teaching, while medical trainees have been redeployed to support clinical services. The rapid transition to online learning presents challenges, especially for healthcare professionals working in intensive care units (ICUs), where heavy workloads and shift-based schedules limit participation in formal education sessions [4]. At the same time, the increasing demand for critical care services requires healthcare workers to rapidly acquire new competencies.

Despite these challenges, ICUs provide valuable opportunities for experiential learning, allowing healthcare professionals to develop skills in managing critically ill patients and performing advanced clinical procedures. Professional organizations in Indonesia have emphasized the need for physicians to extend their competencies beyond their usual scope of practice during the pandemic [2], [3]. Furthermore, physicians possess transferable clinical skills, such as data interpretation and routine procedures, which can be applied in critical care settings [5]. However, frequent updates to clinical guidelines during COVID-19 have created additional challenges for maintaining consistent training, audit processes, and quality improvement. Although the impact of COVID-19 on healthcare systems has been widely reported, there is limited evidence regarding how the pandemic has influenced medical education and training in critical care settings, particularly from the perspective of frontline healthcare providers. In Indonesia, where healthcare resources and training opportunities vary, understanding these experiences is essential to identifying existing gaps and challenges.

This study aims to explore the demand and burden of COVID-19 on medical education and training from the perspective of healthcare professionals working in ICUs in Indonesia during the first wave of the pandemic. Using a qualitative approach, the study examines experiences, challenges, and perceived needs related to training and professional development [6], [7]. The findings of this study are expected to inform the development of adaptive, responsive, and context-specific medical education strategies for critical care. Strengthening training systems is essential to enhance workforce preparedness, ensure the quality of care, and improve health system resilience during current and future public health emergencies.

2. METHODS
2.1. Study design
This study used a qualitative approach with a semi-structured interview of the medical team who provide direct care to the COVID-19 team in national referral hospitals in Indonesia. The online focus group qualitative design that we employed has numerous advantages. This design facilitates an interactive and thorough exploration of informants' perceptions and experiences. In addition, group interviews help clarify any thoughts or ideas that a face-to-face interview might not uncover. Also, it can find widespread perspectives on an issue and insightful differences between people and groups [8], [9]. Thus, our study-focused groups were most appropriate to achieve the study objectives. The conversations were held online because of the continuing COVID-19 pandemic, social distancing in Indonesia, and the fact that it was a cost-effective method [10]. It also ensured a thorough investigation of the participants' perspectives, expectations, and challenges, and it was timed to create recommendations for changes and ideas that could be evaluated in future studies.

2.2. Participants
Purposive sampling was used in this study to collect the data. The inclusion criteria were: i) General practitioners, interns, residents, specialists in anesthesia, and intensive care unit consultants; ii) Providing direct care to COVID-19 patients; and iii) Being willing to participate in this study. In total, 66 medical teams took part in eight focus group discussions, with each group having eight to nine participants. The male-to-female participant ratio in discussions was kept at a suitable level (35/60). Focus group discussions were carried out until the saturation of new evidence was reached.

2.3. Procedure
Participants who choose to participate in our study received an email with instructions on how to use the virtual focus group discussion and an interview guide. A unique username and password were assigned to access the online forum using their log-in names and passwords. Only moderators had direct connections to the discussion board for data collection. The anonymity and confidentiality of the information contained in the transcripts and the final report were guaranteed. The participants agreed to participate by completing a data collection procedure on the Internet that obtained their informed consent by presenting them with all the relevant information.

2.4. Study setting and data collection

Researchers, in consultation with experts, developed a discussion guide for use in this study's electronic focus group synchronous discussions. All authors revised and approved the manual, which was then piloted with four people. Each participant was asked to answer seven open-ended questions, which allowed them to talk about as many topics as possible. The moderator led the focus group discussions during the months of July and August 2020. For each group, a forum was established at the beginning of the conference to provide an introduction, which contained questions that asked participants about their perceptions of education needs and barriers, their experiences with online learning and offline learning, and difficulties encountered and challenges. The website was used as a platform for live parallel discussion among participants. Using an online conferencing service, the participants had a conversation, and then their conversation was recorded. In general, group discussions took 90-120 minutes. The final two focus groups discussed saturation and reached the consensus that additional participants were unnecessary, and as a result, it was agreed to stop the study there.

2.5. Data analysis

The content analysis developed by Braun and Clarke [11] was applied to the transcriptions to build the theme. These methods helped summarize the data into relevant information that was laid out systematically using a sequence of steps. An inductive process was employed for analysis, and then codes were assigned to every meaningful sentence based on their underlying concepts [12]. Afterwards, similar codes were discovered in encompassing sub-themes. Finally, similar sub-themes were combined into a single central theme that reflected its sub-themes. Data was handled by all authors, who analyzed and coded it. The first two authors analyzed the data together, with the rest of the authors serving as second coders. Following that, the initial coding was examined and compared. Once all authors had reached an agreement, a new coding scheme, sub-themes, and themes were developed [13], [14].

3. RESULTS

In total, eight online synchronous focus group discussions were conducted. Each group included eight to nine participants. There were 66 respondents, and more than half (60%; n=36) of the participants were female. The participants were coming from all provinces (n=34) in Indonesia. Half of the sample participants (50%; n=33) were between 34 and 40.

During the analysis, sub-themes were identified and classified under four major themes, summarized below with relevant quotes from the participants. Four core themes included the following: i) the need for upgraded education and competency, ii) the need for innovation in education and training methods, iii) the role of a professional organization, iv) challenges encountered, and v) time constraints.

3.1. Theme 1: The need for upgraded education and competency

The first theme that emerged was the lack of understanding of the medical teams about patient care and management of COVID-19 in the ICU. Although the level of education required to meet a specific medical competency standard is individual for each team member, the medical staff has agreed on the minimum competency standards necessary to serve patients with critical conditions. With constantly shifting volunteers, the need for education and training on the same topic will be repeated.

> *"Indeed, there is a medical team that is still lacking in knowledge or proper ICU management."*
> *"Due to the dynamic nature of information regarding COVID-19, we need to stay up to date, but there are barriers and hecticness involved in dealing with the unexpected increase in disabled patients.*
> *"Of course...we need much information, especially in these situations, we lack extensive management knowledge at the ICU."*

Additionally, there was a reduction in the level of confidence of the medical teams in providing direct care to the COVID-19 patients, such as administering injections or performing intubation on children and adults in critically ill COVID-19, when compared to carrying out similar actions on non-COVID-19 patients.

> *"In my opinion, I believe that doctors don't need to learn only about clinical matters. Because we have to have good management ability, we must also have good capability in managing the room."*
> *"Correctly. If you want to be a manager, you'll need to learn how to manage people. We must not be able to accommodate people's services when resources are minimal."*

Additionally, most respondents expect a process of increasing knowledge to provide services to COVID-19 patients in critical conditions to be better and safer. It is widely recognized that the initial management of emergencies in the emergency room, intensive care unit, and other emergency areas is highly dependent on the primary survey's evaluation. A statement states that the medical team needs to maintain emergency proficiency concerning treating COVID-19 patients, especially general practitioners, anesthesiologists, and intensive care consultants.

> *"The term for an initial emergency is called the airway; the circulation of consciousness is called the primary, correct? We concentrated on this general practitioner first..."*
> *"This physician recognizes that the patient is in shock and responds by managing first, then including the airway."*
> *"...an intensive care practitioner must know which patient must be intubated and not intubated."*
> *"This is COVID-19, as the procedure may become more complicated with COVID-19."*
> Furthermore, the Expert Team stated that:
> *"There are certain adjustments which must be made for specialized circumstances, such as mechanical ventilation, prone positioning, and so on, as not all hospitals can perform all of these procedures."*

Additional knowledge about COVID-19 for the medical team was also recommended, especially regarding the screening of COVID-19 patients. To strengthen and reinforce their current expertise, the participants advise that additional training on infection prevention and control be provided, which includes management of services associated with COVID-19 infection, isolation rooms, zoning systems, and proper management of personal protective equipment (storage, use, and disposal).

> *"Patients with COVID-19 have significantly different treatment outcomes compared to other patients because they use significantly more PPE."*
> *"PPE and infection control are linked. It is probably something that needs to be learned together. And, because it's a skill, merely seeing the simulation won't be the same as having him perform it personally."*

There were many unique desires to learn more about the treatment and management of COVID-19, especially for critical conditions. To assist the medical team in the management and treatment of COVID-19, the participants recommended that a COVID-19 educational and training package be compiled for the medical team to avoid confusion and to help avoid overlap of knowledge.

> *"Maybe one package for COVID-19 training and education can be made because most of them have graduated or become consultants, actually for psychomotor and others, that's all, but what needs additional knowledge, so it can be made in packages."*

3.2. Theme 2: The need for innovation in education and training methods

The second issue is the need for knowledge-enhancing methods. It is challenging to apply the way of increasing knowledge in pandemic conditions, particularly when it comes to motor skills knowledge. To overcome this inefficiency, the education and training unit uses information technology assistance by recording every activity that exists and creating educational videos. Therefore, the training process does not need to be performed repeatedly; new volunteers can playback the existing video recording, and then they are given a pretest and posttest to ensure knowledge improvement.

> *"...And, yes, we are here to educate them. There is a lab focused on developing special skills and a test where they can intubate. However, it is all based on the mannequin. It will be different for each individual, especially with the condition of COVID; if he is indeed positive, there should be no aerosol or something."*

At the same time, offline learning about personal protective equipment (storage, use, disposal), hand washing, and other motoric skills is essential. The most common approach is to provide instruction using videos that may be published on the internet and studied by the medical team repeatedly. It was also stated by one of the experts:

> *"Probably, we can make educational material using an interactive video that can be uploaded in social media so that everyone can see and learn."*

Hospital administration must ensure that all staff, including health care providers, can manage PPE correctly and adequately. Video-facilitated calls/conversations can be used to conduct evaluations using the online method (video calls).

"Maybe we can't go out, so to meet them, we'll be conducting a workshop via Zoom."

To optimize the effectiveness of learning objectives, it is necessary to collaborate with various platforms that support distance learning, particularly those that provide enhanced assessment and certification. Further cooperation is required to ensure that the timing of online education does not overlap with other forms of education.

".... professional organizations that host such webinars can take part in other webinars."
"All of this knowledge must be disseminated to the entire medical team in a timely, effective, and correct manner."

3.3. Theme 3: The role of a professional organization
Adding knowledge about the handling of COVID-19 patients with critical conditions to this medical team can be among the responsibilities of associations and collegia, as claimed by the practitioners listed below:

"Yes, associations, because this relates to alumni who work in the regions; perhaps associations or collegiums assist by providing materials and resource persons."

The participants claim that professional associations or organizations have a significant obligation to increase the medical team's knowledge to serve better patients who are dealing with critical conditions such as COVID-19 disease, as explained by the following member's statement:

"So, if you're still in school, the faculty can pursue it, but if you've graduated, I believe it's the responsibility of professional groups to provide counseling to members to improve their expertise."

3.4. Theme 4: Challenges encountered
There were many barriers and challenges to knowledge acquisition, some of which were unique to online courses, such as pedagogical methods and the presence of technical challenges. Modification and interaction in the new system were viewed as impediments to developing and implementing online learning, and there were numerous issues with lecture material delivery, duration, and arrangement of learning sessions. The following are some of the participants' perspectives on these issues:

"I thought some of the online lectures were assigned unnecessarily for a long time. The lectures were also not sequenced well, and lecture timing changed frequently."
"That session was full of lectures scheduled over a long period! I didn't have enough time to study them thoroughly."

Internet connectivity and the use of online tools are the technical challenges faced by participants. Participants identified numerous technical difficulties encountered during online sessions, as indicated by the following statements:

"I was plagued by technical problems like slow Internet and broken communication software daily while I was taking the course. We also encountered a big issue in that the majority of our teachers had no prior experience using online lectures."
With online training being quite common these days, I frequently face internet disconnection while participating in online lectures, and it is challenging for me to follow..."

3.5. Theme 5: Time constraint
The subject of time constraints emerged as a standard-issue across participants, and they all said that their business of providing direct care to patients had become the most significant impediment to improving their knowledge and skills. The following statements demonstrate this:

"We need to upgrade, but we also need to work very hard, especially during this time, the new case always increasing dramatically."

They also experience difficulty in upgrading their knowledge and skills, which could be affected by the increased transmission risk of COVID-19. Thus, they suggested that the education and training division be very content to provide the information with strict regulation. For example, all medical staff should attend the basic training related to COVID-19; if not, they would be fined. Then, the hospital also needs to manage all the human resources so that even when the workload is high, they still have a scheduled time for training. They expressed their views in the following statements:

"Of course, the important thing is the education and training division; they have to provide better management and schedule to arrange training for each staff member in the ICU."
"I think we need strict regulation regarding the training needed for medical staff in the ICU and also need consensus or guideline to arrange it."

4. DISCUSSION

Currently, competency-based medical education has been accepted as a necessary trend that needs to be followed in medical education and training to deal with the COVID-19 pandemic. The traditional approach begins with the question "what should health workers know about COVID-19?" and then "must be modified to determine what skills health workers require to deal with COVID-19." This situation presents a challenge for which an organizationally designed pattern of competence that includes components of knowledge, skills, values, and behavior is required. In total, showed 52 essential competencies required of the medical team in servicing COVID-19 patients, including seven etiology-related competencies, seven assessment, and diagnosis-related competencies, 34 management-related competencies, and four prognosis-related competencies. In addition, wherever possible, the education and training division can and must be refocused on COVID-19-related topics-for example, training on modified intubation protocol, essential mechanical ventilation, and ventilator troubleshooting.

The study shows that the medical team required knowledge, competence, and ethical behavior to provide services during the COVID-19 pandemic [15]. According to a study, the medical team's knowledge, competence, and ethical behavior must provide services during the COVID-19 pandemic [15]. According to Miller [16], there are three domains of competence: knowledge (cognitive), skills (psychomotor), and behavior (affective). For instance, if a medical team is tasked with providing services in a pandemic situation, the medical team must understand the disease's etiology (cognitive area), be able to conduct a physical examination (psychomotor area), and be able to communicate effectively while demonstrating the ability to cooperate under duress (affective area). The medical team can maintain a high level of confidence in their ability to provide excellent service to patients by developing the skills of "understanding how" and "understanding why." A similar study was conducted in Henan, which concluded that it is critical to carefully consider the knowledge, behavior, and skills of medical personnel when dealing with COVID-19, not only to ensure that care is provided according to recommended procedures but also to prevent or minimize the risk of exposure to health workers.

The results of this study also underline the lack of knowledge of medical teams in ICU on providing direct care to the COVID-19 patients, which reduces their confidence level in medical services. Prior research has shown that clinicians still lack an understanding of the clinical characteristics of critical COVID-19 patients [15]. There are many issues to consider, such as different levels of disease severity and uncertainty about developing essential conditions, when dealing with COVID-19 patients in ICU. In the pandemic era, the most important aspect of paying attention is to keep the learning process safe from the risk of COVID-19 transmission [17], [18]. It is also necessary to screen what learning topics are the most crucial to be delivered to the students to be effective [19]. If required, a staff supervision process can be carried out so that the process of knowledge enhancement can be tailored to the needs of each individual [19]. Comprehensive training with specific regulations is needed to upgrade and improve medical teams' confidence in providing direct care.

The method of strengthening knowledge in the pandemic era has to shift from the traditional classroom with a large number of online learning [20], [21], and in case practical methods are required, activities must be carried out with a limited number of people involved and by implementing strict health protocols. The concept of volunteering requires proper education and training due to frequent staff changes [8], [22], [23]. However, one of the issues raised in this study is how to choose the most effective method for increasing knowledge. Learning methods are also being forced to evolve to aid in acquiring knowledge and competence at a distance. This approach modification also necessitates academics and students studying a system that can allow distance learning methods while retaining a high level of learning quality. Another study explains that e-learning has more advantages than direct training because it can adapt to daily activities [24].

Information technology has become the best hope in the process of knowledge and skill enhancement for staff in COVID-19 governance. For this reason, the supervisors and students must quickly be able to get the most of information technology that supports the education and training process, including improving the quality of the devices used so that the knowledge transfer process can run seamlessly [25], [26]. Knowledge enhancement using such method remains a challenge for educators to be able to find proper learning types and ways to maximize the learning process, maintain the effectiveness of the delivery of care to patients, and ensure students achieve the expected competency targets [27]. Therefore, educators should focus on the quality of the delivery communication, innovation of the sharing process, collaboration with various parties to help the learning process, increase flexibility, and proper preparedness of plans for knowledge enhancement activities that will be carried out [28]. In addition, it is also vital to have a good internet connection to communicate and even simulate effectively or sound quality of the audio and video [29], [30].

There are some limitations to this study. The findings of this study cannot be generalized due to the limited sample size; even all participants were coming from all national referral hospitals for COVID-19 in 34 provinces in Indonesia. Although four core themes and several subthemes emerged from our study, the authors are aware that this modality must be other potential strengths and weaknesses for medical teams in ICU.

5. CONCLUSION

Education and training are essential to strengthen the capacity of healthcare teams in responding to the COVID-19 pandemic, particularly in emergency hospitals that rely on volunteer staff with diverse backgrounds and levels of experience. Immediate and continuous training is critical for managing critically ill COVID-19 patients, including rapid knowledge updates, regular refresher courses, and systematic evaluation of online education platforms. Information technology remains a primary method for delivering training while minimizing infection risks. Given the frequent rotation of volunteer staff, training initiatives must be repeated and continuously updated to ensure competency across all team members. Future research should explore both online and offline teaching modalities to identify the most effective approaches. Developing a structured training model that integrates an optimal balance of online learning with practical, hands-on experience will be essential to enhance the knowledge, clinical skills, and preparedness of ICU medical teams. Strengthening these education and training strategies is not only critical for the current pandemic response but will also improve resilience and readiness for future public health emergencies.

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