Original Article
http://mjiri.iums.ac.ir
Medical Journal of the Islamic Republic of Iran (MJIRI)

Med J Islam Repub Iran. 2022 (6 Jun);36.59. https://doi.org/10.47176/mjiri.36.59

Indonesian Anesthesiologists Preparedness for COVID-19 Surge Capacity in the Early Pandemic

Mochamat Helmi[1]*, Djayanti Sari[2], Juni Kurniawaty[2], Calcarina FR Wisudarti[2], Andreasta Meliala[3], Laksono Trisnantoro[3]

Received: 25 Oct 2021 Published: 6 Jun 2022

Abstract

Background: Anesthesiologists play a crucial role in every disaster event, including biological disasters by COVID-19. This medical specialty should be prepared for a surge in patients due to a pandemic. The present study aims to evaluate the preparedness of anesthesiologists in facing the surge in the number of COVID-19 patients at the beginning of the pandemic in Indonesia.

Methods: This is a descriptive cross-sectional study using an online survey to Anesthesiologists in Indonesia, with snowballing sampling method. A distribution frequency was used to describe the univariate analysis results of the variables. Pearson correlation was used to test the correlation between perceived resource adequacy/availability and perceived preparedness to face the surge.

Results: A total of 141 anesthesiologists participated in our online survey; 47% of responders said they do not have enough staff, while 53% said that their staff did not have sufficient knowledge of handling the critical COVID-19 patients. They also reported limited resources, especially the limited isolation space and N95 masks. The correlation analysis indicated a strong and significant relationship between limited resources and the preparedness of anesthesiologists.

Conclusion: At the beginning of the pandemic, Indonesian Anesthesiologists felt that they still had very limited resources, leading to unpreparedness to deal with the surge in the number of COVID-19 patients with critical conditions.

Keywords: COVID-19, Anesthesiologist, Surge Capacity

Conflicts of Interest: None declared
Funding: None

Cite this article as: Helmi M, Sari D, Kurniawaty J, Wisudarti CFR, Meliala A, Trisnantoro L. Indonesian Anesthesiologists Preparedness for COVID-19 Surge Capacity in the Early Pandemic. *Med J Islam Repub Iran.* 2022 (6 Jun);36:59. https://doi.org/10.47176/mjiri.36.59

Introduction

Natural and non-natural disasters always bring emergency cases and critical illness, which become the responsibility domain of Anesthesiologists tang (1). The Coronavirus disease 2019 (COVID-19) pandemic has become a global health issue since March 2020 (2). The medical management in the pandemic caused by this virus is quite different from management in other natural disasters (3). This is mainly due to the highly contagious nature of the virus, which can spread through aerosols (3). Therefore, the hospital managers must prepare all resources to prevent viral transmission in the hospital area, including possible transmission caused by medical interventions (4, 5). This virus then becomes a threat for anesthesiologists thereby they need to prepare emergency and critical ill services properly in the case of a surge in the number of COVID-19 patients due to overcapacity (1, 4, 5).

The intensive care unit is one of the hospital areas that must prepare for the surge in the number of COVID-19 patients with critical conditions (5). This area is very vulner-

Corresponding author: Dr Mochamat Helmi, m.helmi@fk.untar.ac.id

1. Department of Anesthesiology, Faculty of Medicine Universitas Tarumanagara, Jakarta, Indonesia
2. Department of Anesthesiology, Faculty of Medicine, Public Health, and Nursing, Universitas Gadjah Mada, Yogyakarta, Indonesia
3. Center of Health Policy and Management, Faculty of Medicine, Public Health, and Nursing, Universitas Gadjah Mada, Yogyakarta, Indonesia

↑What is "already known" in this topic:
Surge capacity as the impact has been a major concern during the COVID-19 global pandemic. The disease demands a major concern for physicians, particularly anesthesiologists, to maintain the quality and safety of healthcare services.

→What this article adds:
This article explains what an Anesthesiologist should prepare during surge capacity due to a global pandemic.

[DOI: 10.47176/mjiri.36.59]

able because of its role to provide daily services using special care, with very specific and limited resources, especially to deal with the COVID-19 pandemic (5). There are several factors to be prepared to provide safe services, including the standardized isolation room, adequate medical equipment, personal protection equipment (PPE) in sufficient quantity and quality, trained staff, and modification of the service system to provide good and safe services to these patients (5, 6). This study was conducted to analyze the preparedness of anesthesiologists in facing the surge in the number of COVID-19 patients with critical conditions.

Methods

This cross-sectional descriptive study was conducted for Indonesian anesthesiologists through an online survey at the 15 national referral hospitals for COVID-19. The survey was distributed between 15 and 25 April 2020. The sample in this study was anesthesiologists who provided direct care to the COVID-19 patients and were willing to participate in this study. G-Power analysis was used to estimate the minimum sample size, assuming effect size was 0.20 (medium effect size), power level 0.08, and alpha was 0.05; thus, the sample minimum needed to be recruited was 120. In this study, a total of 152 Indonesian anesthesiologists agreed to join (response rate: 86%). The sampling technique was used linear snowball sampling to recruit participants.

Participants were asked yes or no questions about the availability of resources for COVID-19 patients in critical condition and their perceived preparedness (or not) to deal with the increase in patients with COVID-19. The question contains availability regarding ward rooms, medical equipment, personal protection equipment, and the number and quality of the trained staff. The research team developed the question due to a qualitative study and literature review. The content validity was reviewed by five experts (3 anesthesiologists consultants and two experts in the research method). The content validity index was ranged from 0.76 to 0.85, indicating a good content validity index.

Comprehensive Hospital Readiness Instrument to address the surge in the number of COVID-19 patients in critical condition, consisting of four sections: structure for planning and decision making (4 questions), developing a written COVID-19 plan (6 questions), elements of a COVID-19 plan (7 questions), communication facilities (7 questions), patient identification and management (7 questions), access and support movement within the facility (6 questions), and occupational health (8 questions). This instrument was a Likert scale with options of 1 to 5; one indicates strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree. High scores indicate very good readiness. The content validity index was ranged from 0.71 to 0.88, indicating a good content validity index. All items were declared valid, with the results $I^2 = 66.11$, df = 41, p-value 0.053. The Root Mean Square Error of Approximation (RMSEA) value was 0.063 with a probability of 0.05 to 0.088, meaning that the model was fit with the factor load data for each item ranging from 0.60 to 0.71.

This study was approved by the ethics committee of the affiliated institution (Faculty of Medicine, Universitas Gajah Mada), with reference number: KE/FK/0742/EC/2020. All participants provided informed consent. A consistent framework was utilized to tell respondents about the study's purpose and privacy procedures to ensure informed consent. Respondents may complete the survey using a computer or a smartphone, launching a website or verifying a fast response code.

The normality test using the Kolmogorov-Smirnov test showed the data were normal distribution with $p>0.05$. A distribution frequency was used to describe the univariate analysis results of the variables. Pearson correlation was used to test the correlation between perceived resource adequacy/availability and perceived preparedness to face the surge. The result was statistically significant if $p<0.05$. All data were analyzed using SPSS version 26 for Mac (IBM®, USA).

Results

This study collected responses from 152 Indonesian anesthesiologists, with 11 incomplete or multiple submissions. Therefore, 141 data were subsequently analyzed in this study consisting of 83 males and 58 females; the mean age was 42.5 (SD=7.6).

More than half of the respondents (62%) said that their workplace did not have enough standardized isolation space (negative pressure, anteroom, and zoning). Another

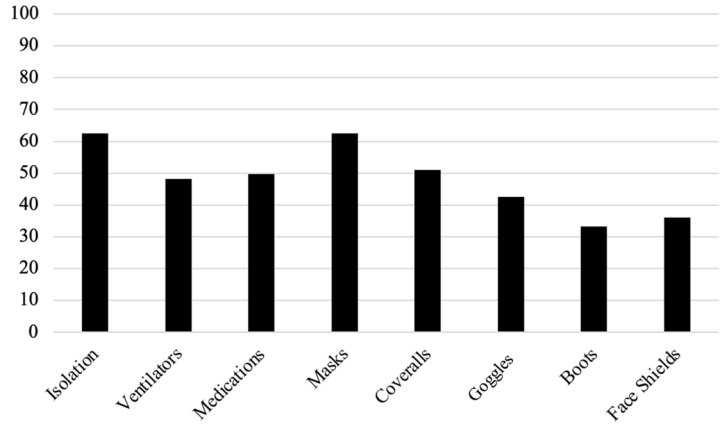

Fig. 1. Lists of perceived limited resources in a surge of COVID-19 patients with critcal conditions (scale in vertical lines are in percentages). Note: goggles is medical eyewear.

[DOI: 10.47176/mjiri.36.59]

Table 1. Perceived preparedness among anesthesiologists in facing the surge in COVID-19 patients

Variable	Mean±SD
Planning and decision making	1.03±0.46
Developing a written COVID-19 plan	1.23 ± 0.24
Elements of a COVID-19 plan	1.07±0.43
Communication facilities	1.25±0.21
Patient identification and management	1.12±0.76
Access and support movement within the facility	1.14±0.25
Occupational health	1.56±0.37

Table 2. The Pearson's correlation (r) between limited resources and the perceived preparedness of anesthesiologists in facing the surge in several COVID-19 patients

Limitation	r	*P*
Isolation rooms	0.79	<0.001
Ventilators	0.57	<0.001
Medications	0.32	0.082
N95 Masks	0.7	<0.001
Coveralls	0.69	<0.001
Goggles	0.57	<0.001
Boots	0.12	0.151

problem is a shortage of N95 masks, as mentioned by 62% of participants (Fig. 1).

Table 1 shows the perceived preparedness among anesthesiologists in facing the surge in the number of COVID-19 patients. The majority of participants reported low preparedness in terms of structure for planning and decision making (4 questions), developing a written COVID-19 plan, elements of a COVID-19 plan, communication facilities, patient identification and management, access and support movement within the facility, and occupational health.

The correlation analysis between limited resources and perceived preparedness in facing the surge in the number of COVID-19 patients with critical conditions is presented in Table 2. The biggest correlation coefficient was with the limited standardized isolation space (r=0.79 and p<0.001). Another very influential factor is the shortage of the N95 Mask and Coveralls (r=0.7 and 0.69, respectively, with p<0.001). Meanwhile, the smallest correlation coefficient was between participants' perceived preparedness and the availability of Boots (r=0.12 and p=0.151).

Discussion

The present study collected information on limited resources both in the availability of the number and quality of staff and the availability of isolation rooms, medical devices, and personal protective equipment. A previous study conducted in Australia reported that there are 175 ICUs ready for a surge (with 2228 intensive care); the maximum spike would add 4258 additional intensive care beds (191% increase) and 2,631 invasive ventilators (120% increase). Then the capacity was 45 bed level 3 for COVID-19 patients; 10 tier 3 ICU beds for non-COVID-19 patients; 40 tier 2 beds, and 200 tier 1 bed for COVID-19 patients outside the ICU (7). To date, hospital surge capacities have been virtually immeasurable and often have to face rising limitations in terms of materials, personnel, and space. However, highly flexible and adaptable management strategies can help overcome some of these limitations and stretch the system's capacity during times of extreme demand. Global pandemics due to infectious diseases have occurred repeatedly throughout history (8). The pandemic has a great potential to cause a discrepancy between the number of patients and the hospital's ability to provide quality services for all the patients. These imbalances include the limitations in providing services to patients with the disease that caused the pandemic, both in the number and qualifications of the appropriate staff (9, 10). The issue of staff availability is inseparable from the general number and distribution to provide good service to all regions in Indonesia. Furthermore, they are at risk of being infected with the pandemic disease, so this limited staff can become an additional burden because they become the patient who needs care (9, 10).

This study found that isolation rooms were the major resource limitations that can impede the services for the COVID-19 patients. Similar to the previous study, only a few hospitals have adequate isolation rooms, especially to receive COVID-19 patients at a time of dramatic increase in the number of admitted patients to the hospital (8, 11). Furthermore, isolation owned by hospitals generally does not follow infection prevention and control principles, such as being equipped with negative pressure, anteroom, and contaminated areas (10). The isolation room in the ICU becomes an even harder challenge for hospitals to prepare, apart from the limitations previously described. There is still a transmission risk of COVID-19 to other critical patients who are admitted to the ICU even though they are not in the same room (5, 10, 11). Thus, hospital managers can consider the concept of remote/mobile ICU to reduce the risk of patient transport to non-COVID-19 areas and reduce the risk of exposure to large numbers of other critical patients and staff due to additional clusters of infection spread after transfer of patients between units (2, 5). Preparing this isolation room is the biggest challenge because it requires special considerations, including redesigning or selecting an area dedicated to the COVID-19 patients in critical conditions that are safe for patients, families, staff, and the environment (12). In addition, ICU re-modeling or construction in a new area does not only make expensive but also requires cooperation and consideration from various units, including technicians, infection control, logistics and pharmacy, and staff (5, 8).

The availability of equipment and logistics is the second problem facing a pandemic. In this case, the equipment involves PPE (especially N95 masks), mechanical ventilators, other supporting equipment for critical and special care (CRRT, ECMO, hemodynamic monitors, etc.), and consumables for treatment that became a global problem at the beginning of the COVID-19 pandemic (5, 10, 13). On the other hand, PPE, especially hazmat and eye protection and face shields, have a large risk of landfilling waste, while reuse must go through a good decontamination process (12, 13). Medical equipment supplies, including drugs and consumables, including equipment that supports respiration management and PPE, should be maintained properly. PPE and ventilator machines play such a pivotal logistic that their availability should be attended to, especially for the COVID-19 patients' (12). Standardized PPE

[DOI: 10.47176/mjiri.36.59]

that becomes a crucial element in providing care for COVID-19 patients is currently very difficult to obtain, especially at a reasonable price. From the existing PPE problems, the hospital needs to consider strategies to ensure that PPE is as safe as possible, including by educating caregivers about the limitations and working with the infection control team to minimize exposure under limited PPE availability (12, 14).

Meanwhile, mechanical ventilator has become a concern because most hospitals do not allocate all their ventilators for only COVID-19 patients, assuming they will still accept non-COVID-19 patients (4). Thus, hospitals are likely to implement this special allocation policy Field to prevent transmission related to unidentifiable risk management of the ventilator field (14). The current expansion of intensive care rooms for COVID-19 patients does not necessarily solve the problem of increasing patient service capacity. This is because, at this moment, ventilators are not available for sale due to global shortages (14).

This study found a very strong and significant correlation between limited resources and the perceived preparedness among Indonesian anesthesiologists in providing services to COVID-19 patients with critical conditions at the beginning of the pandemic. Previous studies found similar results as conducted by (15, 16). Naser (17) assessed hospitals' disaster readiness in South Yemen. The findings indicated that hospitals had not yet attained an intolerable level of preparation. Samsuddin (18) conducted a cross-sectional study in Malaysia found that the most significant traits are human resources and training and the ability to change promptly. The hospital management must appropriately plan for catastrophe preparedness. Therefore, hospitals require disaster management plans because they ensure that when a disaster strikes, the hospital is prepared, there is no confusion, and the response is more efficient, effective, and sensible (19).

Conclusion

This study found that at the beginning of COVID-19 hit Indonesia, there were limited resources and a lack of preparedness to face the surge in the number of COVID-19 patients with critical conditions. There was a strong correlation between limited resources and the perceived preparedness among Indonesian anesthesiologists in providing services to COVID-19 patients with critical conditions. Coordination and assessment must be carried out appropriately and regularly in the face of the COVID-19 epidemic with limited resources. A mutually supportive structure between units and institutions is planned to be built with strong coordination between units and institutions. Move resources from redundant areas to places of greatest need.

Ethical Approval

This study was approved by the ethics committee of the affiliated institution (Faculty of Medicine, Universitas Gajah Mada), with reference number: KE/FK/0742/EC/2020.

Acknowledgment

The authors thank all participants in this study.

Conflict of Interests

The authors declare that they have no competing interests.

References

1. Tang LY, Wang J. Anesthesia and COVID-19: what we should know and what we should do. In: Seminars in cardiothoracic and vascular anesthesia. SAGE Publications Sage CA: Los Angeles, CA; 2020. p. 127–37.
2. Jardine R, Wright J, Samad Z, Bhutta ZA. Analysis of covid-19 burden, epidemiology and mitigation strategies in muslim majority countries. East Mediterr Heal J. 2020;26(10):1173.
3. Giacomelli A, Ridolfo AL, Milazzo L, Oreni L, Bernacchia D, Siano M, et al. 30-day mortality in patients hospitalized with COVID-19 during the first wave of the Italian epidemic: a prospective cohort study. Pharmacol Res. 2020;158:104931.
4. Gopalan PD, Joubert IA, Paruk F, Baker D, Coetzee I, De Vasconcellos K, et al. The Critical Care Society of Southern Africa guidelines on the allocation of scarce critical care resources during the COVID-19 public health emergency in South Africa. South African Med J. 2020;110(8):700–703.
5. Cammarota G, Ragazzoni L, Capuzzi F, Pulvirenti S, De Vita N, Santangelo E, et al. Critical care surge capacity to respond to the COVID-19 pandemic in Italy: a rapid and affordable solution in the Novara hospital. Prehosp Disaster Med. 2020;35(4):431–3.
6. Carmona MJC, Quintão VC, Melo BF de, André RG, Kayano RP, Perondi B, et al. Transforming operating rooms into intensive care units and the versatility of the physician anesthesiologist during the COVID-19 crisis. Clinics. 2020;75.
7. Carenzo L, Costantini E, Greco M, Barra FL, Rendiniello V, Mainetti M, et al. Hospital surge capacity in a tertiary emergency referral centre during the COVID‐19 outbreak in Italy. Anaesthesia. 2020 Apr 1;75.
8. Collins T, Akselrod S, Bloomfield A, Gamkrelidze A, Jakab Z, Placella E. Rethinking the COVID-19 Pandemic: Back to Public Health. Ann Glob Heal. 2020;86(1).
9. DeCaporale-Ryan L, Goodman J, Simning A, Press-Ellingham L, Williams L, Hasselberg M. Addressing skilled nursing facilities' COVID-19 psychosocial needs via staff training and a process group intervention. Am J Geriatr Psychiatry. 2020;28(8):894.
10. Corrigan JM, Clancy CM. Assessing progress in health care quality through the lens of covid-19. JAMA. 2020;324(24):2483–4.
11. Michard F, Saugel B, Vallet B. Rethinking the post-COVID-19 pandemic hospital: more ICU beds or smart monitoring on the wards? Intensive Care Med. 2020;46(9):1792–3.
12. Ishikawa Y, Hifumi T, Urashima M. Critical Care Medical Centers May Play an Important Role in Reducing the Risk of COVID-19 Death in Japan. SN Compr Clin Med. 2020;2(11):2147–50.
13. Iyengar K, Bahl S, Vaishya R, Vaish A. Challenges and solutions in meeting up the urgent requirement of ventilators for COVID-19 patients. Diabetes Metab Syndr Clin Res Rev. 2020;14(4):499–501.
14. Crosby L, Crosby E. Applying the precautionary principle to personal protective equipment (PPE) guidance during the COVID-19 pandemic: did we learn the lessons of SARS? Can J Anesth Can d'anesthésie. 2020;67(10):1327–32.
15. Fallah-Aliabadi S, Ostadtaghizadeh A, Ardalan A, Fatemi F, Khazai B, Mirjalili MR. Towards developing a model for the evaluation of hospital disaster resilience: a systematic review. BMC Health Serv Res. 2020;20(1):1–11.
16. Verheul MLMI, Dückers MLA. Defining and operationalizing disaster preparedness in hospitals: a systematic literature review. Prehosp Disaster Med. 2020;35(1):61–8.
17. Naser WN, Ingrassia PL, Aladhrae S, Abdulraheem WA. A study of hospital disaster preparedness in South Yemen. Prehosp Disaster Med. 2018;33(2):133–8.
18. Samsuddin NM, Takim R, Nawawi AH, Alwee SNAS. Disaster preparedness attributes and hospital's resilience in Malaysia. Procedia Eng. 2018;212:371–8.
19. Helmi M, Sari D, Meliala A, Trisnantoro L. What Is Preparedness and Capacity of Intensive Care Service in Indonesia to Response to COVID-19? A Mixed-method Study. Open Access Maced J Med Sci. 2021;9(B):1686-94.

[DOI: 10.47176/mjiri.36.59]