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Management of COVID-19 in Universitas Gadjah Mada (UGM) Academic Hospital: Balancing to save the patients and protect the staffs

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Abstract

Background: The Coronavirus Disease 2019 (COVID-19) is a worldwide outbreak disease caused by Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2). Indonesia is the fourth most populous country in the world and is predicted to be affected significantly over a more extended period. **Case:** Universitas Gadjah Mada (UGM) Academic Hospital is one of the COVID-19 referral hospitals located in the Yogyakarta Special Region, Indonesia. Since the early months of the pandemic, the hospital has prepared strategies to provide effective and efficient patient care. The focus has been safety for both patients and healthcare staff. Here, we will share our experiences activating a Hospital Incident Command System (HICS) as a hallmark for preparedness and response to the COVID-19 pandemic disaster so it can be adopted in other hospitals nationwide or worldwide. The HICS in the UGM Academic Hospital includes 1) surge capacity for isolation rooms, 2) infection prevention and control, 3) human resources, 4) continuity of essential health services and patient care, 5) communication, 6) logistics and management of supplies including pharmaceuticals, 7) essential support services, 8) case management system, 9) surveillance early warning and monitoring, 10) laboratory services, and 11) additional programs including community service programs. **Conclusion:** Based on our experiences, early preparedness with a proactive response, and adapting plans to local needs, the national and global current situation are the keys to managing patient care. Implementing all levels of the hierarchy of control infection and keeping the human resources adequate also could protect staff.

Keywords: *COVID-19, hospital incident command system (HICS), hierarchy of control infection*

1. Introduction

The Coronavirus Disease 2019, or COVID-19, is an emergent global pandemic affecting more than 35 million people worldwide, with more than one million deaths by the end of September 2020. It is caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV2) and was first detected in Wuhan, China, at the end of 2019 (1). The first and second confirmed COVID-19 cases in Indonesia were reported officially on March 2, 2020 (2). Since then, it has spread rapidly to all provinces in Indonesia. Testing and tracing are becoming vaster, and partial lockdown continues to be held by some local governments to limit the number of cases and deaths. However, until the end of September 2020, the efforts in Indonesia seem ineffective, looking at the continuously ascending epidemiologic graph showing confirmed cases of more than 275,000 with a 3.8% case fatality rate (3,4). The daily case graph has yet to show a peak point, and more cases are unavoidably expected.

The Ministry of Health of Indonesia has provided 140 COVID-19 referral hospitals for combating this pandemic. However, the ongoing growth of cases fuels the worry that the health system could collapse shortly (4). A flood of confirmed and suspected cases with variable severity was admitted to the hospital daily. The number of severe cases started to outweigh the Intensive Care Unit (ICU) capacity. Healthcare provider resources fluctuate due to isolation following infection and disease transmission, putting the health system at risk of imminent collapse and increasing the case fatality rate (3). Several decisive steps need to be taken to prevent this situation.

The Universitas Gadjah Mada (UGM) Academic Hospital is a COVID-19 referral hospital located in the Yogyakarta Special Region where more than 2,500 confirmed COVID-19 cases were diagnosed, resulting in 64 deaths during the first six months of the pandemic in Indonesia (4). Our hospital also receives referred patients from outside the Yogyakarta Special Region. In the early months of the pandemic, our hospital had prepared strategies to give adequate and efficient patient care, focusing on the safety of the patients and healthcare providers. Here, we share our experiences activating a Hospital Incident Command System (HICS) as a hallmark for preparedness and response to the COVID-19 pandemic disaster so it can be adopted in other hospitals nationwide or worldwide.

2. Case and Discussion

UGM Academic Hospital COVID-19 Incident Command System

The COVID-19 pandemic is a highly unexpected situation that occurred in 2020, affecting all sectors of life, not only the health sector but also the education, economic, social, and tourism sectors. It is the greatest plague in several decades (5). The government of Indonesia officially stated the pandemic as a non-natural national disaster in March 2020 and developed national and regional task forces. Following the national statement, hospitals, as one of the critical elements in the pandemic disaster response, must be prepared and quickly adapted to emergent changes (6).

In this pandemic disaster, heavy disruption challenges the regular health system. Disastrous patient management can lead to ineffective treatment, inefficient human resources and logistics use, and a collapsed health system. Hospital preparedness and response planning are needed to streamline the management amid this pandemic disaster (7,8). In the initial response, the UGM Academic Hospital activated an Incidence Command System (ICS) as a first step.

The ICS is a system created to organize an incident response effectively and efficiently by combining communication, facilities, human resources, inventories, and procedures into one integrated organizational system (9). It is used to make a quick but effective and efficient decision during a disaster. It needs good governance with multisectoral leaders and a clear organizational structure (10).

1. The COVID-19 Hospital Incident Command System

In our hospital, three days after the first confirmed case in Indonesia, the hospital's chief director generated the COVID-19 Hospital Incident Command System (HICS) to implement the ICS further. It is a multidepartment team aiming to prepare plans for receiving COVID-19 patients,

develop pandemic policies and protocols, ensure the safety of health resources, and educate people amid the pandemic. These are the key persons in our hospital COVID-19 team: hospital patron (the hospital chief director), hospital person in charge, chief of the COVID-19 HICS, vice chief of the COVID-19 HICS, secretary, rapid response and service coordinator, medical support coordinator, logistics coordinator, infrastructures coordinator, infection prevention, control, and surveillance coordinator, public relations and health promotion coordinator and support staff.

2. *Hospital Preparedness and HICS*

A well-coordinated work by the COVID-19 HICS is the key to implementing the hospital ICS. The COVID-19 HICS shows leadership to all hospital staff in their departments, so the ICS will work well. The hospital ICS is integrated and consistent with the general hospital management structure. Both are existing together to surge the capacity of intrahospital COVID-19 patient services. The HICS combines several functional components regarding managing COVID-19 patients and all aspects of the pandemic disaster. Figure 1 illustrates the service flow of COVID-19-confirmed or suspected patients in UGM academic hospital and its relation with the ICS.

Excellent COVID-19 patient service is approached by targeting the components of hospital preparedness. Table 1 lists the 10 components of hospital preparedness that need to be integrated by the ICS.

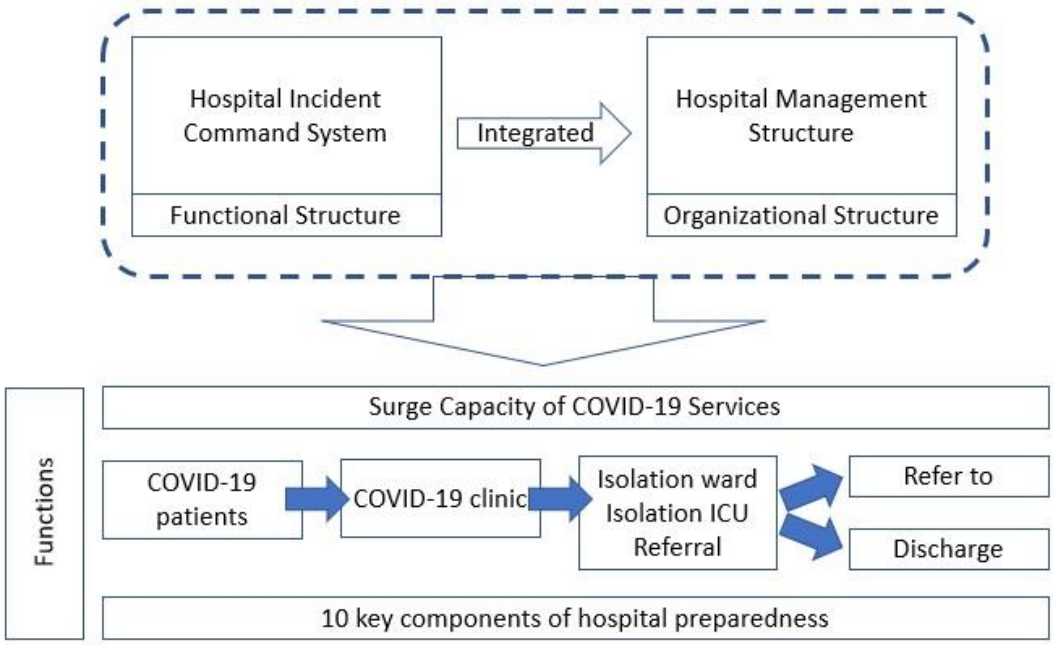

Figure 1. Implementation of Hospital ICS for surging the capacity of COVID-19 patient services

Table 1. Key components of hospital preparedness in UGM academic hospital

1.	Continuity of essential health services and patient care
2.	Communication
3.	Surge capacity of the isolation room
4.	Human resources
5.	Logistics and management of supplies
6.	Essential support services
7.	Infection prevention and control
8.	Case management
9.	Surveillance: early warning and monitoring
10.	Laboratory services
11.	Additional programs including community service programs

a. Surge Capacity of Isolation Room

Infectious disease, including COVID-19, is one of the occupational diseases among healthcare workers. Infection prevention and control is a composite effort comprising all levels of the hierarchy of occupational disease controls. The COVID-19 pandemic begins with engineering controls such as providing proper ventilation and negative pressure rooms. It continues with administrative controls such as social distancing regulations, patient placement policies, and health worker training. Finally, the last step is providing PPEs (11).

In our hospital, we made several efforts in IPC. We assembled two buildings designated as red zones where the droplet and airborne disease is treated, and the highest level of PPEs should be worn. Each building is engineered especially for COVID-19 with a negative pressure room and donning-doffing room. We also limit the patient's and staff entrances, and all are protected by screening personnel who separate red-zone patients.

At every weekly meeting, we educate and habituate our staff about PPEs, hand hygiene, and personal hygiene. At these meetings, we continually demonstrate the proper use of PPE, hand hygiene, and personal hygiene as refreshments. We regulate the patient movement inside the hospital and can fast-track high-risk patients to reduce intrahospital time and separate the red zone patient from the others. We also regulate patient placement inside the ward according to their infectious risk. They are regularly provided with patient care equipment, such as clean linens. Routine disinfection and waste disposal management by the trained cleaning personnel are also regularly done. The disinfectant liquid is provided in every door, elevator, room, and other necessary area.

The adequacy of standardized PPEs is regularly evaluated, and their usage in the field is monitored. We have an Infection Prevention and Control (ICP) committee, including a hospital infection control evaluator who regularly field-checks and gives updated recommendations such as the issuance of COVID-19 infection control protocol, the usage and removal of PPE protocol, segregation of service zoning according to infection risk, recommendation of PCR test for health officer, updates on COVID-19 transmission based on the latest research, and engineering control of service areas (installation of exhaust fans and air flow/ventilation engineering). UGM also developed the GAMA swab sampling chamber for safe outpatient oronasal swab sampling, which is currently used in the UGM academic hospital (12).

b. Human Resources

The availability of qualified human resources is essential amid a pandemic. All infrastructures are nothing without the human resources. Human resources move the wheel of ICS. Absenteeism of health care providers is a challenge during the pandemic (13). Health care provider availability is decreased due to infections and mortalities. Three main strategies are used in UGM academic hospital to keep the human resource adequate. Those are: (1) efficient scheduling to reduce burn out, (2) physical and mental support such as nutritional and PPE supplies, and (3) proportional incentives according to the role in the system. The

addition of human resources must also be considered when needed and preceded by a pre-course with primary material, including infection control, service flow, and updates on the management of COVID-19 based on their profession and with an interprofessional approach.

c. Continuity of Essential Health Services and Patient Care

The COVID-19 pandemic disrupts many aspects of patient care due to the surge of patient admission, disruption of the usual health services, absenteeism of the health care providers, and rapidly decreasing supplies. Organized steps must be made to ensure essential health services and patient care continuity. Failing in this aspect could result in cessation and neglect of patient services (14). We prepared two main steps in this aspect: (1) Hospital preparedness and response plan by developing new service flowcharts and holding daily and weekly evaluations of the patient services, and (2) Screening, isolating, grouping, and traffic controlling of the patients, by developing COVID-19 hospital standard operation procedures and localizing patients with COVID-19 in one building. We made building for those with COVID-19 symptoms early in the pandemic. The first part is for outpatient care, the second is for grouping patients, and the third is for confirmed cases. As the pandemic continued, we provided two buildings for COVID-19; one building has 4 parts of isolation wards, including an ICU and another with one part for outpatient care and grouping and three parts for isolation wards. Each building has an underground access for supplies loading.

d. Communication

A disaster is always a challenge for effective communication. Communication must be adequate to organize the ICS well and prevent system collapse. Effective disaster communication could prevent mass panicking, organize appropriate health-seeking behaviors, coordinate stakeholders, and mobilize resources. For effective communication, information is exchanged between hospital staff, healthcare providers, and the community (15,16). Inside the hospital, we regularly socialize and educate all hospital employees about the ICS, pandemic updates, current health protocols, recent research findings, and up-to-date hospital policies. Socialization and continuing education were delivered through offline or online conferences and media. We also used printed and digital media, such as flowcharts, flyers, posters, and videos for intrahospital socialization. Meanwhile, communication with the communities outside the hospital is conducted by distributing flyers, promotional banners and social media.

e. Logistics and Management of Supplies

The supply crisis happened in the early months of the COVID-19 pandemic. An imbalance between supply and demand increased the cost of health supplies to a nonsense level, worsening the crisis. A surge of community and charity power also emerged following the crisis, such as personal protective equipments from Kagama Health (17), coffins from the Faculty of Forestry UGM (18), food supplies in the form of eggs and chicken meat from the Faculty of Animal Science UGM (19), volunteers from the Student Community Service UGM (20). But, with proper management, logistics and supplies will be used efficiently, leaving healthcare dependent on external help. At some point, supplies were adequate and further good governance was needed to maintain the fragile but balanced condition (21).

We focused on developing good management in three principal supplies: nutrition, pharmaceuticals, and PPEs. The pharmacy department plays a central role in the logistics and management of supplies. The pharmaceutical formulary was adapted according to the recent clinical practice guidelines. The high quality and quantity of PPE were well managed. In June 2020, more than 5,800 coverall suits, 93,000 surgical masks, and 3,800 N95s were managed effectively. Nutritional supplies for the patients and health workers were successfully coordinated with the nutrition department.

f. Essential Support Services

COVID-19 is a newly emerging disease, and the knowledge about it is rapidly being updated (1). Evidence-based clinical practice guidelines were made to ensure the efficacy of therapy. The scientific methods of the COVID-19 team provide

essential support services in managing the patients. Thus, our hospital works monthly and on-demand updates for medical personnel to increase the quality of patient management. Our hospital also conducts some ongoing research concerning COVID-19 as support.

Like any other patient, COVID-19 patients must be managed by many professionals, including doctors, nurses, nutritionists, pharmacists, midwives, etc. We consider good interprofessional collaboration practice (IPCP) as essential support for the management of patients with COVID-19 (22, 23). Referral and post-mortem management are also needed to be included among the many serious concerns. Thus, forensic and ambulance services are essential supports.

g. COVID-19 Case Management (CCM)

The COVID-19 pandemic is a global public health emergency. Managing suspected COVID-19 patients cannot be done only in the hospital but also in the community, and it needs multidisciplinary coordination and proactive advocacy (3). The UGM academic hospital implements CCM in managing COVID-19 or suspected cases. These efforts include telemonitoring a self-isolating patient by phone, developing an IPCP team to manage COVID-19 cases, holding interdisciplinary case discussions, and creating a 'doctor meet family' service to provide stay-at-home services. The CCM is regularly adapting to the government's COVID-19 management national guidance.

h. Surveillance: Early Warning and Monitoring

The health workers in the hospital are at risk of being affected by COVID-19, so regular staff screening and surveillance are obligatory. We conduct monthly COVID-19 rapid diagnostic tests (RDT) and daily online self-monitoring for symptoms. On-demand RDT or polymerase chain reaction (PCR) testing is performed if indicated. Late surveillance can increase the possibility of transmission among health workers, which could collapse the system. The hospital also provides quarantine facilities for staff in hotels and wards for those who need them. Monitoring of the donning and doffing of PPE is also done to ensure the excellent quality implementation of health protocols.

i. Laboratory Services

The accuracy and timing of the diagnosis of COVID-19 are still challenging. The reverse transcriptase PCR from an oronasal swab sample is considered the gold standard in diagnosing COVID-19, but it is costly and takes time. Minimally, the hospital must prepare trained personnel in oronasal swab sampling so every suspected COVID-19 case can be confirmed. A partnership with RT-PCR laboratories should be organized to receive the patient results as soon as possible. We regularly send PCR samples to other laboratories as needed, such as Faculty of Medicine UGM and LPPT (Integrated Laboratory for Research and Testing) UGM. Apart from that, aids in the form of PCR machines and reagents were assigned to be managed by UGM Academic Hospital (24, 25). Since not all patients can be swabbed, the hospital must screen which patients need PCR testing the most. Alternative laboratory indicators are required and should always be ready in the hospital (26). Our laboratory services always ensure the swab sampling and RDT materials are available. Our hospital also has prepared not only a clinical pathology laboratory but also radiology, anatomical pathology, and microbiology services to optimize the management of COVID-19 patients.

3. Conclusions

Based on our experiences, early preparedness with a proactive response and adapting plans to local needs and the current national situation are the keys to effective and efficient hospital preparedness during the COVID-19 pandemic. Integrating components of hospital preparedness with the hospital incident command system is a valuable method to prevent healthcare system collapse.

Competing Interests

The authors declare that they have no competing interests.

Authors' Contributions

S and AFL conceived the study. S and OSU drafted the manuscript. S, NZA, and APS critically revised the manuscript for valuable intellectual content. S, OSU, and AFL facilitated all project-related

tasks. All authors have read and approved the manuscript and agreed to be accountable for all aspects of the work, ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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