



Emergency Department Preparedness of Prof. Dr. R. Soeharso Orthopaedic Hospital against Coronavirus Disease-19 Pandemic: Understanding the Challenges

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Abstract

The potential conditions for a worldwide pandemic have been caused by the new coronavirus disease (COVID-19). Since February 2020, the World Health Organization has determined the COVID-19 pandemic status. As a result, all countries in the world, including Indonesia, must adjust to the current global conditions. The Indonesian Ministry of Health has directed all hospitals in the nation to prepare and remodel all facilities to assist the effective handling of COVID-19. As the first line, the Emergency Department has fundamental principles for controlling and treating COVID-19 spread. The challenges should be understood, and the preparations for the COVID-19 pandemic redesign orthopedic and trauma cases.

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Introduction

The novel coronavirus disease (COVID-19) epidemic in Wuhan, China, was caused by an unknown virus in December 2019. The virus was then known as Severe Acute Respiratory Syndrome Coronavirus 2. As of January 2020, 282 cases were confirmed. In January, six people died in Wuhan City. Two cases were also reported from Thailand among the 282 confirmed cases [1]. The World Health Organization (WHO) later declared COVID-19 a Public Health Emergency of International Concern [2]. As a result, most countries worldwide, including Indonesia, must be prepared to face the potential COVID-19 global pandemic situation.

The WHO Regional Office for the Eastern Mediterranean then created a checklist to help hospitals plan for and respond to COVID-19 patients [3]. An efficient COVID-19 hospital preparation plan includes data from the hospital associations, state,

regional, tribal, municipal health agencies, emergency management, and resource suppliers [4].

In this case, the emergency department (ED) is the first line of interaction for undifferentiated patients with various symptoms representing the condition. Therefore, the ED should take the lead in handling the screening of COVID-19 infection clusters and the role of surveillance research [5]. During the COVID-19 pandemic, patients with trauma episodes show various forms of infection. It includes previously healthy people, suspected infected persons, close contacts of infected persons, asymptomatic carriers, and confirmed infected patients [2].

In Indonesia, there was an upsurge in the number of COVID-19 pandemic cases in hospitals during December 2020–January 2021. Regarding this, Prof. Dr. R. Soeharso Orthopaedic Hospital has been designated as a COVID-19 referral hospital. It is a challenge for Prof. Dr. R. Soeharso Orthopaedic Hospital's ED, which was redesigned to handle emergency cases with COVID-19 while serving more patients related to trauma and orthopedic crises.

General Principles

Prof. Dr. R. Soeharso Orthopaedic Hospital's ED had core concepts of controlling the transmission and treating COVID-19 infection. It should be accomplished before admitting patients with trauma or orthopedic emergencies.

- ED: Preparing a triage area for all enrolled patients to be screened. The triage team had pre-hospital airborne illness screening for patients to detect COVID-19 infection early
- Emergency Radiology Department: A portable radiographic instrument for examining infected patients should be maintained on standby in isolation units. The radiographer would examine patients directly in their wards while wearing Personal Protective Equipment (PPE)
- Emergency operating room (OR): Patients requiring immediate surgery would be operated on in an isolated negative-pressure OR
- Intensive Care Unit (ICU): Patients with suspected or confirmed infection and requiring intensive care were placed in an ICU under negative pressure with high-efficiency particulate air (HEPA) filters
- Intra-hospital transfer: To reduce exposure, the intra-hospital transfer should be employed, and medical personnel should wear level 3 PPE and isolation capsule transfer. Meanwhile, patients should wear a medical mask.

Main text

Health standard protocol and PPE

There were defined precautionary procedures and equipment necessary for each worker and circumstance in trauma care. Personnel protection standards were based on established measures. It included hand hygiene, the use of a medical mask, and PPE based on individual risk.

For ED personnel, PPE included goggles or a face shield, a disposable water-resistant gown, disposable gloves, a medical mask or N95 mask, a disposable head cap, and a shoe cover. It was customized to the amount of protection required when interacting with patients. Level 3 PPE was used for the people in charge of managing patients infected with COVID-19 (Figure 1).

Apart from the usage of PPE, the ED also had infection prevention facilities. It involved alcohol-based hand sanitizer, a sink with soap and paper towels for handwashing, hospital disinfectant, and warning signs at entrances and strategic locations in providing hand hygiene and respiratory hygiene instructions.

Triage management in ED during pandemic

During the pandemic, triage management in the ED is essential for COVID-19 prevention and response. For example, there was triage management at Prof. Dr. R. Soeharso Orthopaedic Hospital before patients were examined by medical staff (Figure 2).



Figure 1: (a-c) Security and medical personnel with protective personnel equipment Level 2 and 3

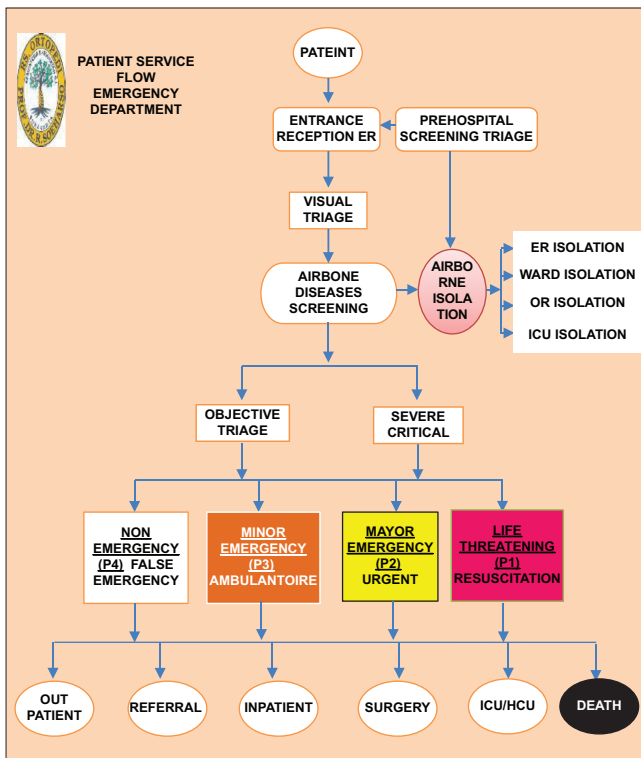


Figure 2: The emergency department patients service flow

Pre-hospital screening triage

The triage team in the ED would conduct a pre-hospital screening to assess the risk of COVID-19 transmission in the emergency room (ER), especially for patients before the health facility making the referral to send the patients. The government’s website triage, telemedicine application, and emergency call centers: SISRUPE – SISTEM INFORMASI RUJUKAN TERPADU (Integrated Referral Information System and SIRANAP – SISTEM INFORMASI RAWAT INAP RUMAH SAKIT (Hospital Inpatient Information System) also implemented pre-hospital screening strategies. The COVID-19 preventive screening measures included airborne disease screening for COVID-19 test findings (antigen test and Reverse transcription polymerase chain reaction [RT-PCR]), chest X-rays, and other laboratory tests. Patients who might be at high risk of COVID-19 transmission would be placed in an isolation room in an emergency unit or isolation ward.

Hospital screening triage

During the pandemic, the personnel at the ED were tasked with carrying out the triage process. The triage process during the COVID-19 pandemic comprised screening for airborne illness, determining the location to separate suspected COVID-19 and non-COVID-19 patients, and developing protocols for admitting patients with possible COVID-19. Patients at high risk of COVID-19 transmission would be placed in an isolation room in an emergency unit (Figure 3).



Figure 3: (a and b) Triage area and negative-pressure isolation room of emergency department

Patients would be assessed in the isolation room in general, involving a history taking, physical examination, COVID-19 examination (including antigen test and RT-PCR test), and blood count. In addition, the radiological evaluation would take place in the isolation room. Furthermore, once the COVID-19 result was verified, the triage personnel promptly notified the head of shift guarding the ER and the public health office.

Management of resuscitation and staff health care

When patients arrived at the ER with an airway disorder and required resuscitation, they were positioned on resuscitation installation (Figure 4). All patients with a low risk of COVID-19 transmission were sent to the three-bed resuscitation room. Meanwhile, patients at high risk of COVID-19 transmission were often handled in an isolation-type resuscitation area. Most intubated patients have been put in negatively pressurized rooms with HEPA filters, where cardiopulmonary resuscitation (CPR) should be performed for high-risk patients. It reduces the risk of endotracheal tube separation and aerosol emission. In certain regions, resuscitation equipment and monitors were made available.



Figure 4: (a and b) Critical Care Unit; (a) Resuscitation; (b) Major Emergency

The medical personnel who had examined the patient in the isolation room would be cleaned up right away. After the patients had been taken to the isolation ward or the operation room, the isolation room would be cleansed. It was done to reduce the risk of infection among medical personnel.

On a regular day, the ED was staffed by three shifts of doctors and nurses over 24 h, including orthopedic surgeon residents. However, throughout the pandemic, there have been minor shift modifications for doctors and nurses. It also impacted the amount of medical personnel working in a single shift. To optimize the number of people available each shift, all ED personnel switched to an 8-h shift structure.

Emergency surgery and post-operative management surgery

The COVID-19 pandemic has forced the health-care department to adjust to health-care delivery and patient safety problems. Because the acute care surgery service workload cannot be lowered, the administrator has a unique challenge in understanding health-care resources between the COVID-19 increase and routine patient administration. In health care, it is vital to preserving resources and personnel. It is critical to guarantee that surgeons and specialists can perform throughout this pandemic.

Patients undergoing emergency surgery would be carefully selected at Prof. Dr. R. Soeharso Orthopaedic Hospital. It was done to decrease the COVID-19 transmission level while ensuring the medical staff's safety. The high-risk patient with COVID-19 transmission would be put in an isolation room in the emergency unit or straight to the isolation room with negative pressure.

In addition, the patient who needed emergency surgery would be sent immediately to the negative pressure OR (Figure 5). The HEPA filters were installed in the OR.



Figure 5: (a and b) Operating Room and ICU Isolation with the negative pressure

The equipment stored in any OR should be kept to a minimum unless absolutely essential on a case-by-case basis. When the operation began, the crew should be limited to transiting in and out of the OR, and every effort should be made to use what was available in the OR. All surgical materials should be sterilized in sterilizable steel wire baskets before use. The anesthetic trolley had to be replaced with one prepared explicitly with limited and enough supply. Disposable materials, especially linen, should be preferred in general. Infected and sharp disposable equipment should be disposed of in infectious-risk health waste receptacles.

Before meeting patients with infectious status, all operators should be coated with level 3 PPE. The medical personnel who received patients within the transit room with the filter area should wear complete PPE and practice hand hygiene. To reduce the amount of time spent in the OR, all operators had to enter the OR on time. They should not leave the OR until the surgery was over and should not re-enter it.

Patients who have had emergency surgery would be transferred to the room based on their post-operative status. The COVID-19 sample examination was conducted after the procedure on individuals who required emergency surgery. Due to the COVID-19 results being released one day later, patients at high risk of transmission would be admitted to an isolation ward or ICU with negative pressure.

Discussion

The WHO Regional Office for the Eastern Mediterranean created a checklist to help hospitals plan for and respond to COVID-19 patients [3]. The WHO hospital readiness checklist was used to evaluate Prof. Dr. R. Soeharso Orthopaedic Hospital. Prof. Dr. R. Soeharso Orthopaedic Hospital has made numerous efforts to prepare for COVID-19 transmission prevention and management since its inception as a COVID-19 referral hospital. However, on the other hand, the hospital must be designated as a safe, easily accessible, and well-equipped Hospital Emergency Operations Center, with working communication systems and a specialized emergency operations manager [3]. Therefore, Prof. Dr. R. Soeharso Orthopaedic Hospital has also built an ER communication management system that is simply accessible and functional.

The Indonesian Ministry of Health has set rules for monitoring and assessing hospitals during the COVID-19 pandemic. Monitoring and evaluation are performed regularly based on a self-assessment completed by the hospital both online and offline in the form of checklists that can be obtained at <http://bit.ly/INSTRUMEN-KESIAPAN-RS>. The checklists were adapted from the WHO Rapid Hospital Readiness Checklist [3], [6], [7]. During the COVID-19 pandemic, Prof. Dr. R. Soeharso Orthopaedic Hospital implemented these checklists for monitoring and evaluation (Figure 6).

Pre-hospital and hospital triage have been used at Prof. Dr. R. Soeharso Orthopaedic Hospital. It makes it easy for medical personnel to distinguish between individuals at high risk of COVID-19 transmission during pre-hospital and hospital screening to be immediately placed in an isolation room. The medical personnel who cared for the patient within the isolation room followed a three-level precaution approach. In epidemic regions, the vigilance level must be increased since all patients may be regarded as potentially questionable patients [2].

Asides from the protection of infection to medical personnel, visitor limits play an essential role in infection management. The WHO said in its checklist that restricting visitors are critical for patient assistance. In addition, the hospital should ensure that visitors use

contact and droplet precautions. Consequently, the overall number of arrivals to the University of New York ED significantly reduced. From March to June 2020, the number of avoidable ED visits decreased by over 30% [3], [8].

Furthermore, Prof. Dr. R. Soeharso Orthopaedic Hospital has been rebuilt to handle patients with COVID-19 infection after being designated as a referral hospital for COVID-19 infection. The orthopedic hospital has everything ready to manage COVID-19 patients as quickly as possible and in a reasonably short time. Prof. Dr. R. Soeharso Orthopaedic Hospital was evaluated for hospital preparation under the Indonesian Ministry of Health and WHO guidelines for COVID-19 preparedness. It was revealed that the orthopedic hospital had met most of the Ministry of Health's standards for hospital readiness for COVID-19.

Table 1: Overview of hospital readiness: Key components

1. Leadership and incident management system
2. Coordination and communication
3. Information and surveillance management
4. Prompt communication and community involvement
5. Administration, finance, and business continuity
6. Human resources
7. Surge capacity
8. Continuity of essential service
9. Patients management
10. Occupational health, mental health, and psychosocial support
11. Identification and rapid diagnostic
12. Infection prevention and control

Emergency surgery, which offers contamination abatement, bleeding management, and compartment pressure release, is critical for severe trauma patients. Successful surgery is a crucial signal for efficient COVID-19 transmission prevention using normal intraoperative protective measures [2]. Without adequate methods, the acute care surgical cases could not be canceled. In addition, acute care surgery, including general emergency surgery, critically ill patients, and trauma management, would compete for limited hospital resources [9]. Until this study, there were only two examples of patients requiring emergency surgery without pre-PCR swab testing at Prof. Dr. R. Soeharso Orthopaedic Hospital. There was acute compartment syndrome and a Grade 3 Gustilo-Anderson open fracture. The RT-PCR test was performed following the procedure.

On the other hand, an upgraded acute care surgery paradigm was created at Singapore General Hospital to decrease COVID-19 health-care worker and patient cross-infection on trauma patients and emergency general surgery patients. Patients with a moderate or high risk of COVID-19 transmission were admitted to the acute respiratory infection and isolation wards. Patients requiring surgery would be accommodated in a COVID-19 approved OR with a HEPA filter [9]. Negative pressure OR would be perfect for reducing infection spread. A filter region with a high air exchange cycle rate of more than 25 cycles/h might successfully contribute to decreasing viral load within ORs [10].

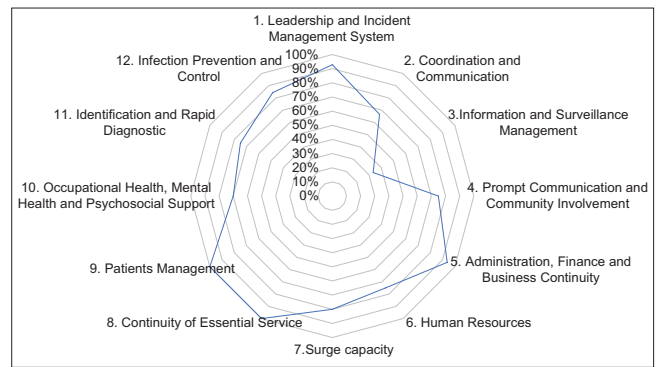


Figure 6: Overview of hospital readiness: Key components assessment of Prof. Dr. R. Soeharso Orthopaedic Hospital

The COVID-19 negative pressure OR must have an elevator and a specialized route. It focuses on minimizing outdoor distances, reducing human interaction, and decreasing time spent in polluted regions [2]. Negative pressure OR with HEPA and a high air exchange cycle rate, as well as the design of a specific tunnel, have been introduced at Prof. Dr. R. Soeharso Orthopaedic Hospital. Patients requiring emergency surgery would be housed on the second level in an isolation unit. Following that, surgery would be performed on the third level of the same building. It might be minimizing the amount of time spent and minimizing interpersonal contact.

Furthermore, procedures for patients infected with COVID-19 should be scheduled with a specific on-call shift. In addition, a filtration area was created for patients with COVID-19 infections to enter the OR, complete with PPEs, a hand hygiene station, and a specifically infectious-risk health waste receptacle [10]. All personnel at Prof. Dr. R. Soeharso Orthopaedic Hospital remained outside the OR during the intubation process and the person who performed it was supposed to wear an N95 face-mask respirator, face shield, and goggles. Before seeing an infected patient, all operators and personnel who received patients within the OR must wear complete PPE, just like the other patients [9], [10].

Procedures prone to produce aerosolized particles are linked to COVID-19 transmission. Non-invasive or manual ventilation, tracheal intubation, tracheostomy, and CPR are among the methods used. Patients receiving post-operative care at Prof. Dr. R. Soeharso Orthopaedic Hospital who needed the above surgery were instructed to be placed in a negative pressure chamber. The technique would be carried out by personnel wearing level 3 PPE. The methods followed the 2020 American Heart Association's recommendation for CPR and intubated operations [10], [11]. This effort aimed to reduce transmission among employees and patients at Prof. Dr. R. Soeharso Orthopaedic Hospital.

Conclusion

During the COVID-19 pandemic, Prof. Dr. R. Soeharso Orthopaedic Hospital was redesigned as soon as feasible to handle patients with orthopedic and trauma emergencies who were infected with COVID-19. Strict safety rules for emergency treatment for patients should be implemented. The COVID-19 pandemic has prompted various concerns about patient and personnel safety. Caution and protection should be emphasized in regions with a high incidence of COVID-19 transmissions, such as the ED and OR, to provide optimal health care with maximum safety. We believe that our research will assist other hospitals worldwide, particularly in Indonesia, in preparing for future outbreaks and infection management under unpredictable settings.

Author Contribution

Pamudji Utomo, Kshanti Adhitya, Panji Arga Bintara, and Mochmadsyah Beizar Yudistira contribute the same and equally in conceptualization, collecting data, analyzing, writing, and reviewing the manuscript.

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