

Commentary

Hospital Management in Infectious Disease Outbreak: Lessons Learned From COVID-19 Epidemic



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ABSTRACT

Background: Biological events, including epidemics, pandemics, and emerging and reemerging infectious diseases, have significant adverse consequences on human health. Hospitals have a major role in the management of outbreaks and mitigation of their consequences. During pandemics, health systems, especially hospitals, are affected. The current study aims to collect and analyze hospital lessons learned during the COVID-19 epidemic in Iran.

Materials and Methods: The study data were collected through document analysis, direct observation, and taking the opinions of an expert panel (including hospital chiefs, hospital managers, disaster committee managers, matrons, and other hospital staff) at hospitals involved with coronavirus patients.

Results: The practical measures performed in Iran hospitals included the development of the hospital incident command system, screening and triage, establishing a call center, patient and family management, personnel management, volunteers management, education, planning, safety, environmental health, dead patients management, sampling, food hygiene of staff and patients, coordination and cooperation, sharing information, home treatment and care, infection prevention, and control and isolation.

Conclusion: COVID-19 pandemic has significant adverse consequences on human health, hospital, and medical staff. During COVID-19, hospitals will face a high surge in suspected and confirmed patients. Therefore, hospitals should perform the proper measures to manage an emergency.

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1. Introduction

The latest outbreak is the emergence of a novel coronavirus, known as COVID-19, which initially appeared in the Wuhan and Hubei provinces in China in December 2019. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was the virus responsible for COVID-19, which spread worldwide through global travel [1]. The COVID-19 pandemic has become a global health concern since it infects people worldwide [2]. The disease spreads quickly, and many countries have reported laboratory-confirmed cases of COVID-19. Moreover, the [World Health Organization \(WHO\)](#) confirmed 22000000 infected and 777000 death globally until August 19, 2020 [3]. In Iran, one of the countries involved in the disease, 348000 cases of COVID-19 have been confirmed since August 19, 2020, of whom 19972 died.

There are several challenges encountered by intensivists when caring for a patient suspected of infection with an emerging pathogen, such as SARS-CoV-2. These challenges are patient management, particularly regarding laboratory tests and diagnostic radiologic procedures, and healthcare workers' protection and unit organization. Based on two previous coronaviruses, severe acute respiratory syndrome (SARS) and the middle east respiratory syndrome (MERS), infected respiratory droplets are the major modes of transmission. There is also the possibility of transmission from contaminated objects near the infected patients [4]. COVID-19 spreads quickly, and scientists strive to discover new medicines to effectively treat the disease [1].

The ability to respond to any emergency before it occurs is a potential issue that crystallizes as operational readiness when an emergency occurs [5].

During pandemics, health systems, especially hospitals, may be affected not only by the absence of hospital staff but also by slowdowns in the transportation of medical supplies and support services, making it difficult for managers to effectively deal with hospital overcrowding. In addition to the unknown nature of the disease, issues such as high virus transmission rate and lack of facilities such as hospital beds, physician/nurse-to-bed ratio, equipment and care facilities, such as personal protective equipment and ventilators, and high elderly populations have posed significant challenges for health systems and policymakers [6]. Therefore, the current study aimed to collect and analyze lessons learned from hospitals in Iran. The data were collected through document analy-

sis, direct observation, and opinions of an expert panel (hospital chiefs, hospital managers, disaster committee managers, matrons, and other hospital staff) at hospitals involved with COVID-19 patients (Figure 1).

Hospital incident command system (HICS)

Disease outbreaks need incident management and a command system to integrate different response functions. A commander appoints infection physicians to activate the medical-technical specialist officer unit in the hospital incident command system (HICS) chart. Public information officers have an essential role during disease outbreaks; they can prevent the spread of rumors or non-expert interviews.

Screening and triage

Separate hospital wards were set up for coronavirus patients and suspected cases in the early days to identify and screen patients with fever, severe acute respiratory infections, and dry cough at emergency departments. A triage system in epidemic diseases must be population-based to prevent secondary transmission and control the outbreak [7]. Early recognition of suspected patients allows for timely initiation of infection prevention and control (IPC) and immediate optimized supportive care, and safe, rapid admission (or referral) to intensive care units. Hospitalization may not be required for patients with mild illness unless there is a concern about rapid deterioration. All patients discharged from home were requested to return to the hospital if the symptoms worsened.

Call center

The establishment of call centers reduced unnecessary hospital visits. They provided consultation and guidance to patients who might be at risk of hospital-acquired infection, also known as a nosocomial infection. This consultation can also be provided through a reliable application. When patients were discharged from hospitals, they were educated about home care. Furthermore, remote and online mobile care was available.

Patient and family management

After the outbreak of COVID-19, direct contact with patients with confirmed or suspected COVID-19 was prohibited, and families could use hospital phones (placed at the entrance of hospitals) or video calls to contact their patients. Because of the possibility of infection in patients' families, in a follow-up plan, hospi-

tals reached them by phone, assessed their health, and educated them about the principles of self-care and quarantine.

Preventive measures to support the elderly are essential to combat the COVID-19 pandemic. Furthermore, it is essential to focus on the specific health needs of the elderly, such as proper nutrition, wellbeing, and mental health promotion [8].

Personnel management

Health personnel, especially nurses, are at the forefront of the fight against the disease. Nurses should take care of people who are experiencing severe forms of the disease and should do so for long hours using protective equipment [9].

Daily monitoring and tracking of clinical symptoms in medical personnel are essential, especially in personnel without Personal Protective Equipment (PPE) and those in contact with coronavirus patients. Non-medical and administrative staff should be reduced to as many as possible. The presence of the personnel must be checked by using logbooks and pens for each person or by face registration devices. Personnel at high risk of infection, like pregnant women or those with underlying diseases, such as MS, diabetes, cancer, immunodeficiency, cardiovascular, and respiratory diseases, were discharged. Furthermore, a shield was designed in front of physicians or nurses to prevent droplets' transmission.

Medical facilities shortages, prolonged disease outbreaks, and other waves of infection can increase the mortality risk among health care workers, more reporting of physical and mental exhaustion, irritability, poor work performance, reluctance to work, and burnout [10].

Volunteers management

Because of the shortage of personnel and exhaustion caused by overwork, it is likely to recruit volunteer forces from students, clergypersons, and retired people. These people must be carefully selected based on their abilities and hospital needs. They should also be trained and provided with essential PPE and other materials and supplies.

Caring for pregnant patients

Pregnant and breastfeeding patients are among vulnerable groups and require special health care. Mothers with suspected coronavirus should be educated about safe breastfeeding and using and infecting bottles. Pregnant

women with suspected or confirmed COVID-19 should be treated with supportive therapies, and physiologic adaptations of pregnancy should be taken into account.

Education

Specialized skills training about COVID-19 includes triage, diagnosis, patient management, treatment, caring, PPE, disinfection, infection control precautions, and psychological intervention for the control of stress and reduction of fear is essential for hospital staff. These skills can be taught through workshops, clips, brochures, pamphlets, etc. The implementation of telemedicine is essential for patient care and therapeutic measures.

Hospital meetings

Unnecessary meetings should be canceled, but critical meetings inside hospitals or with other hospitals and organizations should be held with precautions; however, virtual and video conferencing are preferred.

Planning

Hospital-based emergency operations plan (EOP), incident action plan (IAP), and national and international guidelines should be designed following hospitals' conditions.

Safety

Hospital staff should be safe to perform their duties and treating coronavirus patients. Moreover, crowding around hospitals must be avoided. In doing so, hospitals' security guards, equipped with PPE and the police forces, manage crowding and protect hospital staff and patients.

Environmental health

Environmental health has a significant role in controlling infection and preventing the spread of contamination in hospitals. It can be achieved through disinfection and decontamination of air, surfaces, and equipment; medical and infectious waste management (collection and separation of waste from infectious and isolated parts); water quality monitoring; hospital wastewater treatment (preventing it from entering municipal wastewater); and food quality. Restaurants and hospital stores should be closed during disease epidemics.



Figure 1. Examples of measures performed in hospital

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Dead body management

Respect for the dead is a value that is deeply rooted in all cultures and religions [11]. However, coronavirus-infected dead bodies must be disinfected by using sodium hypochlorite [12], placed in disposable body bags and coffins, and kept in separate places in hospitals before transferring to the cemetery.

Sampling

It is impossible to perform coronavirus tests in hospital laboratories; samples of suspected cases must be transferred to the Pasteur Institute of Iran and other reference laboratories. Therefore, sampling and transferring of samples must be done carefully and correctly in accordance with biosafety protocols.

Food hygiene of staff and patients

Food hygiene in hospitals is the main problem, especially for patients who are more vulnerable to microbiological and nutritional risks [13]. To prevent cross-contamination in coronavirus patients and staff, hospitals

must take necessary measures, such as using disposable food containers, avoiding half-cooked food, and disinfecting food containers continuously.

Coordination and cooperation

To supply PPE, drugs, and medical equipment, each hospital should sign a memorandum of understanding with other companies and holdings. Also, admission of coronavirus patients and overload of hospitals must be coordinated with the emergency operations center, emergency medical services, other hospitals, and health centers.

Sharing information

All hospitals shared their information and learned lessons from the experiences of referral hospitals involved with coronavirus outbreak. This collaboration was done through different means, such as telemedicine, video conference, office automation, and mobile applications. Simulation-based education is essential in hospitals that are not yet involved with infectious patients. Therefore, hospitals should take necessary measures to improve

their preparedness before an outbreak and an overload of patients. Simulation helps hospitals identify their weaknesses and shortcomings and prepares the staff, technically and mentally, to deal with COVID-19 patients.

Infection prevention and control (IPC)

During the outbreak of a disease, IPC is a critical and main part of the clinical management of patients and should be initiated at the point of patient entry to the hospital. Standard precautions should always be applied in all wards of the hospital. In the event of a massive influx of patients, the preventive measures will have to be degraded. An important component of IPC is staff education and preparation. IPC strategies have been adapted from IPC for suspected or confirmed cases of COVID-19. Hospital staff should consider contact, airborne, and droplet precautions. The most important component of personal protective equipment is wearing fit-tested FFP2 face masks [4]. COVID-19 spreads when patients get infected at various hospital places through unknown mechanisms. In addition, tests were performed only on clinically sick patients; possibly many presumably infected patients went undetected [14]. Infection prevention and control include hand hygiene, non-intact skin, and using PPE to avoid direct contact with patients' blood, body fluids, and secretions. Standard precautions include cleaning and disinfecting equipment, cleaning the environment, and daily disinfection of door handles. Hand disinfectant dispensers were installed on the walls and at the entrance of hospitals.

Isolation

Patients suspected of COVID-19 were isolated in separate wards, away from other patients. All principles of IPC should be observed for suspected and confirmed cases [4].

Communicable diseases surveillance system

The established communicable diseases surveillance system has performed well in controlling communicable diseases in the early years of its implementation; however, the results have not been satisfactory in subsequent years. The main reasons are as follows: legal penalties are negligible and are not binding, co-workers in the CDSS, especially in the private sector, do not have the incentive to take care of the proper implementation of CDSS, and public and professional education is not enough, and there is no internal and external performance evaluation [15].

2. Conclusion

Hospitals are the vital pillars of the health system. Hospital preparedness in epidemics is a dynamic, complex, and multidimensional process that shows the developed capacities and capabilities of the hospital in predicting and reducing the effects, resistance, response, and recovery in the face of biological events [16].

Previous plans and protocols for disaster and hospital management were developed based on the all-hazards approach. Measures implemented in the present study and field reports in Iran's hospital highlighted biological emergencies and disasters specifically. Some protocols and measures such as HICS, volunteer management, infection prevention and control, and environmental health and safety in all disasters are similar, but in biological disasters, for example, the COVID-19 epidemic becomes more critical. The specific measures include isolation of wards, sampling of COVID-19 cases, caring for pregnant patients, the management of COVID-19 victims, screening and triage for infectious patients, and the establishment of call centers. COVID-19 patient and family management were performed for the first time.

There are some challenges in implementing protocols. One of the most critical challenges is the differentiation between COVID-19 and non-COVID-19 patients. Management of COVID-19 and non-COVID-19 patients should be conducted by specific and different personnel in separate wards. Also, due to the new and unknown COVID-19 types, there is not enough knowledge and awareness among the personnel. Furthermore, staff education and training during the epidemic and response phase are challenging.

On the other hand, the stress and panic of staff and patients make it difficult to implement protocols. Another challenge is the need for budget allocation to conduct these protocols. Due to the spread of the disease in all parts of the country, managing and distributing resources is another challenge in which coordination is essential.

COVID-19 pandemic has significant adverse consequences on human health, hospital, and medical staff. During COVID-19, hospitals will face an increasing number of suspected confirmed patients. Therefore, hospitals must perform the proper measures to manage emergencies, including establishing HICS; surge capacity in staff and physical space; hospital staff protection and management; patient caring and treatment; internal and external coordination; environmental health; education and infection prevention and control. To face COV-

ID-19, hospitals have to forecast the impacts of the situation on all departments of the hospital, patients, and staff.

Ethical Considerations

Compliance with ethical guidelines

All ethical principles were considered in this article.

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Authors' contributions

All authors contributed equally in preparing all parts of the research.

Conflict of interest

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