

Were our hospitals prepared to face the COVID-19 epidemic?

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ABSTRACT

Background: *The rapid spread of coronavirus disease 2019 (COVID-19) has become a major challenge for hospitals, which plays a key role in local and national responses to different emergencies and disasters, including the outbreak of communicable diseases.*

Objectives: *This study aimed to determine the readiness of selected hospitals in one of the provinces of Iran in response to the COVID-19 epidemic.*

Methods: *In this descriptive, analytical, and cross-sectional study, we used a checklist developed by the World Health Organization for the COVID-19 pandemic to assess the readiness of hospitals. We assessed and compared the readiness of four hospitals and used Microsoft Excel 2013® to collect and analyze the data.*

Results: *The present results showed that the hospital, which was the main referral center for COVID-19, was in good conditions. However, other hospitals needed to increase their preparedness for the COVID-19 epidemic.*

Conclusion: *Besides the importance of hospital readiness to respond to natural and man-made disasters, these institutions and health policymakers should be also prepared to respond properly to the outbreak of highly contagious diseases.*

Key words: *COVID-19, epidemic, hospital preparedness, pandemic*

BACKGROUND

Considering the spread of bioterrorism and highly contagious and infectious diseases, it is necessary that hospitals and laboratories with diagnostic facilities be prepared for identifying, isolating, and treating

patients.¹ In December 2019, a new coronavirus infection, called coronavirus disease 2019 (COVID-19), was detected in Wuhan, China. The World Health Organization (WHO) declared the disease as a pandemic in early March 2020.^{2,3} Iran reported the first case of COVID-19 death on February 19, 2020,⁴ after which the rate of hospitalization and mortality increased rapidly. According to official reports by the Ministry of Health, 207,000 recoveries, 2,637 new diagnoses, and 1,455 hospitalizations were announced on July 7, 2020.⁵

Hospitals and other healthcare facilities play a key role in both local and national responses to crises or emergencies, including the outbreak of communicable diseases.⁶ Prolonged outbreaks can lead to the progressive spread of diseases and cause a rapid increase in demands for healthcare services, imposing a huge burden on hospitals and the healthcare system. Under normal conditions, hospitals often operate at full capacity. Therefore, even a relatively small increase in the hospital volume may impose enormous pressure on hospitals and lead to their failure. To increase the readiness of healthcare centers in the face of outbreaks, pandemics, or any other emergencies, hospital managers must ensure that action priorities are considered.⁷

With this background in mind, the current COVID-19 pandemic encouraged us to assess the readiness of four selected hospitals in the face of this pandemic in one of the provinces of Iran.

METHODS

This cross-sectional, descriptive, and analytical study was conducted in one of the provinces of Iran,

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affected by the COVID-19 epidemic in April 2020. We selected and studied four hospitals, using the purposive sampling method. The researchers collected data, using the standard WHO checklist, designed to measure hospital readiness during the COVID-19 pandemic. We also added three more indicators, according to the Iranian guidelines.

The aim of the previous checklist, which was developed and announced by the WHO in 2011, was to assess the readiness of hospital to respond to emergencies and disasters. The emphasis in this tool was on managerial and structural processes of disaster management.⁸ However, in addition to management processes, the new checklist emphasizes on clinical processes, and more attention has been paid to the details of treatment and care. The tool can be also localized by hospitals. The authors suggest the psychological issues of medical staff and patients, and medical records management should add to the tool as well. The WHO checklist assesses hospital specifications in 11 sections. These sections include incident management system (five items), surge capacity (eight items), infection prevention and control (15 items), case management (17 items), human resource (13 items), continuity of essential health services, and patient care (four items), surveillance: early warning and monitoring (nine items), communication (eight items), and logistics and management of supplies, including pharmaceuticals (11 items), laboratory services (seven items), and essential support services (seven items). This WHO rapid hospital readiness checklist for COVID-19 was created in collaboration with WHO staff and revised by international specialists, based on WHO's COVID-19 strategic plan for response and preparedness, hospital readiness for epidemics, and temporary versions of related checklists from WHO's Regional Offices and WHO headquarters. The goal of this checklist is to assist the hospital managers plan for the management of COVID-19 patients by leveraging the capabilities of each hospital. This document analyses hospital governance, structures, processes, strategies, and procedures to help countries quickly recognize existing hospital capacities and vulnerabilities to respond to the COVID-19 pandemic and to identify major areas needing investment and action, and to

establish plans for enhancing hospital readiness. This instrument may be used regularly to monitor the creation of hospital emergency operational readiness capability.⁷ Three components were added to the checklist including medical records (11 items), psychological and social support for staff (seven items), and psychological and social support for patients (eight items) based on national guidelines. We collected the data 1 month after the onset of the COVID-19 epidemic and observed the operational plans and measures in the selected hospitals. We analyzed the extracted data in Microsoft Excel 2013[®]. To facilitate reporting of the results and comparisons between centers, the researchers scored each item from 0 to 2. The items that were due for review were scored 0; the items that were in progress were scored 1, and the completed items were scored 2.

RESULTS

We evaluated four selected hospitals, which provided services to patients with COVID-19 in the province 1 month after the announcement of the epidemic in the country. The specifications of these hospitals are presented in Table 1. To keep the information confidential, we assigned a letter to each hospital. Hospital D was the main referral center for the COVID-19 epidemic.

Table 2 presents the scores of each hospital regarding the key components of WHO hospital readiness checklist for COVID-19. Hospital D obtained a score of 207 out of 214 and was ranked the highest among the assessed hospitals. Also, the scores of hospitals B, C, and A were 152, 144, and 125, respectively. The analysis of the checklist items showed that hospital A scored less than 50 percent of the maximum score for management, continuity of essential health services and patient care, and logistics and management of supplies, including pharmaceuticals.

Table 3 indicates the scores of each hospital regarding three extra components according to the Iranian guidelines.

DISCUSSION

This study aimed to evaluate the readiness of the selected medical centers in the face of the COVID-19

Table 1: Description of hospitals

Hospital	A	B	C	D
Administrative status	University	Private	University	University
Beds	256	250	169	496
Annual occupied bed/year	90 percent	85 percent	54 percent	90 percent
ICU beds for adults	20 12 (COVID-19)	9 8 (COVID-19)	8 12 (COVID-19)	30 35 (COVID-19)
ICU beds for pediatrics	0	0	0	3
ICU beds for neonatology	0	0	0	0
Emergency beds	30	4 (COVID-19)	12	66 adults, 32 pediatric
Emergency isolated beds	4	0	4	4
Microbiology laboratory	Yes	Yes	No	Yes
Beds in negative-pressure rooms	6	1	0	6
Number of antibiograms/month	150	120	100	150
Beds for COVID-19	54	27	96	240
Beds for pregnant women	0	0	0	5

epidemic in one of the provinces of Iran. Since some patients need to be hospitalized, and some are in critical conditions and require special resources, eg, advanced oxygenation and ventilation facilities, hospitals are required to perform triage of patients, allocate resources, and staff the departments effectively.⁹ As discussed earlier, in the present study, hospital D showed the highest readiness among all medical centers, with a total score of 207 out of 214, and 125 for hospital A. We expected this result about hospital D because this center was prepared and selected as the core referral center for COVID-19 in the province. Iran has encountered severe economic problems, and it is strenuous to adjust and equip all hospitals and health centers. Therefore, to have a better response to the epidemic, one hospital would be equipped and prepared as a principal hospital. One of these principal hospitals contained three separate buildings and a few entrance route which was necessary in this case. Moreover, one of the hospital's managers was an emergency and disaster health specialist who was thoroughly educated

about disaster management, which was extremely helpful. This hospital obtained the experience of a full-scale operational exercise, which helped the recent preparation. However, the hospital A was not in the best condition to handle COVID-19 patients as it is actually the cardiology and neurology center and was not chosen as a COVID-19 response center at first. However, following the increase in the number of patients and referral of patients with cardiac symptoms and neurological problems, this facility was chosen as a COVID-19 center. Because of this, the managers did not have enough time to prepare the hospital as per the guidelines. Furthermore, the structure of this facility was not appropriate to separate patients at the entrance of the hospital. Based on protocols, hospitals should designate an exclusive waiting and establish a well-equipped triage station at the entrance of the healthcare facility to triage individuals with respiratory symptoms and/or fever. Because of shortage of space, human resources, and logistics, it was not possible to increase surge capacity in other centers.

	A	B	C	D
Incident management system (0-10)	7	9	7	10
Surge capacity (0-16)	9	14	13	14
Infection prevention and control (0-36)	31	31	32	35
Case management (0-34)	16	27	27	33
Human resources (0-26)	15	13	15	25
Continuity of essential health services and patient care (0-8)	2	2	0	8
Surveillance: early warning and monitoring (0-18)	5	7	9	16
Communication (0-16)	10	12	11	16
Logistics and management of supplies, including pharmaceuticals (0-22)	7	11	11	22
Laboratory's services (0-14)	13	13	8	14
Essential support services (0-14)	10	13	11	14
Total score (214)	125	152	144	207

	A	B	C	D
Medical records (0-22)	13	7	9	16
Psychological and social support for staff (0-14)	8	10	8	12
Psychological and social support for patient (0-16)	8	7	7	11

(freeing up about 30 percent of beds, planning for extremely ill patients, and managing patients in need of advanced care, such as ventilators); and a regional coalition by coordination with other centers and organizations to increase the available bed capacity.¹⁰

One of the most important factors in the outbreak of infectious diseases is infection control. The present results showed that in the selected centers, the infection control index score was high and acceptable. In this regard, a study by Loutfy et al. from Canada described the preparedness of a hospital during the 2004 SARS epidemic. The hospital provided two private isolation wards and rooms with negative pressure. The minimum equipment was provided in each room, including a chair, a side table, a trashcan, and a hand sanitizer, and outside each room, there was a personal protective equipment (PPE) storage area for employees entering the room. Outside each section, there were rooms for the staff to change and scrub at the beginning and end of the shift. Also, outside every fully equipped and glass-enclosed ICU room, there was a change-room for the staff to change in and out of scrubs.¹¹

AQ1

Since this study is the first report using the WHO hospital readiness checklist in the context of the COVID-19 epidemic, it is not possible to compare the readiness of medical centers in Iran or other countries. A study by Chopra et al. on the preparedness level of American hospitals for the COVID-19 epidemic showed the necessity of the following items: having a full-time emergency manager; having an operational task force; having a well-resourced infection prevention team; planning to increase the bed capacity

Surge capacity was another key factor in the study by Chopra et al.. Since hospitals often provide services at full capacity, it is advisable to pay attention to different spaces in hospitals, such as lobbies, postoperative care wards (recovery rooms), and waiting rooms, which can be used as patient admission halls.¹⁰ In our study, the surge capacity index was acceptable in the assessed centers, especially the main referral center. Another important component was employee protection. Due to disease transmission through droplets and direct contact, the use of appropriate PPE can reduce the risk of hospitalization. It is also important to educate the employees about the appropriate use of PPE, test the fitness of N-95 masks and respirators, and adhere to the basic principles of infection prevention, such as proper handwashing.

Moreover, controlling the use of equipment, limiting the number of involved personnel, paying attention to incentives and compensatory strategies, and supporting the families of employees are among issues that need to be addressed. Besides, all employees should monitor themselves for infection signs and symptoms. Overall, in times of crisis, hospital managers must allocate their resources morally, rationally, and structurally in a way that most patients can benefit in the best possible way.^{1,10} The results of the present study showed that some centers initially faced a shortage of PPE, although later, they could manage this problem. These results are comparable to the findings reported by Loutfy et al., which showed that the initial shortage of PPE was resolved later during the SARS epidemic.¹¹

Additionally, building readiness and engineering are of particular importance in hospital preparedness. In this regard, Loutfy et al. emphasized the importance of private isolation rooms, rooms with negative pressure, special beds, emergency departments, special disease clinics, and the ratio of nurses and physicians to patients.¹¹ Our results showed that the main center for COVID-19 had the highest compliance with these standards; however, both hospitals B and C had very poor conditions.

One of the biggest challenges described by Loutfy et al. was the lack of workforce. It is important to note that the evaluated hospitals had high standards. The ratio of nurses to patients was four to five patients

per nurse. If the patients required monitoring, the patient-to-nurse ratio would be 1:1. On the other hand, if the patient's condition was more stable, this ratio would be 2:1. In the special ward, the nurse-to-patient ratio was 2:1, with one nurse attending each patient during each shift. Also, the physician-to-patient ratio was five to 10 patients per physician. In each SARS ward, an infectious disease specialist provided counseling for the patients.¹¹

In our study, there was no staff shortage in the main referral center for COVID-19; however, this shortage was obvious in the other selected centers. Also, another finding of this study was the poor response to continued hospitalization in three out of four hospitals. It should be noted that in disaster management studies, the main referral hospital must continue its other activities while providing care for the victims during disasters, including epidemics.^{12,13}

In order to conduct prospective studies in the future, we need to regularly and precisely register medical records, which is highlighted in the national guidelines as well. One of the strengths of the national guidelines is the emphasis on the psychosocial support for staff and patients, of which the outcomes are presented in this study.

CONCLUSION

Based on the present results, the main center for the COVID-19 epidemic was in good conditions. Other centers, however, were required to adhere to the WHO guidelines. Besides preparedness for responding to natural and man-made disasters, hospitals and health policymakers should also plan for epidemics of highly contagious diseases to show proper responses. Therefore, managers and authorities of healthcare centers, in addition to higher-level managers of universities and the health ministry, must allocate budget and human resources to support the logistics of these centers.

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contributed to the development of the protocol and critical revision of the manuscript.

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