

Hospitals Capability in Response to Disasters Considering Surge Capacity Approach

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ABSTRACT

Background: The man-made and natural disasters have adverse effects with sound, apparent, and unknown consequences. Among various components of disaster management in health sector, the most important role is performed by health-treatment systems, especially hospitals. Therefore, the present study aimed to evaluate the surge capacity of hospitals of Kerman Province in disaster in 2015.

Materials and Methods: This is a quantitative study, conducted on private, military, and medical sciences hospitals of Kerman Province. The sampling method was total count and data collection for the research was done by questionnaire. The first section of the questionnaire included demographic information of the studied hospitals and second part examined the hospital capacity in response to disasters in 4 fields of equipment, physical space, human resources, and applied programs. The extracted data were analyzed by descriptive statistics.

Results: The mean capability of implementing the surge capacity programs by hospitals of Kerman Province in disasters and in 4 fields of equipment, physical space, human resources, and applied programs was evaluated as 7.33% (weak). The surge capacity capability of state hospitals in disasters was computed as 8% and compared to private hospitals (6.07%) had a more suitable condition.

Conclusion: Based on the results of study and significance of preparedness of hospitals in response to disasters, it is proposed that managers of studied hospitals take measures to promote the hospital response capacity to disasters based on 4 components of increasing hospital capacity.

1. Introduction

Today, disasters have consumed a great part of governments' programs and resources. Also, the adverse effects and life and financial losses of these disasters have prominent and undeniable impact on the health of people, to the extent that these adverse and devastating

impact disturbs the capability of a community to fulfill its basic requirements and leads to death or injury of many people [1]. Disasters are incidents that disturb the ordinary social activities and this disturbance is higher than the capability of the damaged area for confrontation. Disasters have financial and life losses. The effective management of these disasters needs the prediction

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of their problems and adverse effects as well as planning for effective response to their related problems [2].

Iran is a disaster-prone country and 90% of its population are exposed to disaster risks [3]. Out of 40 natural disasters, 31 cases occur in Iran. Iran is in the six rank in the world, and in the fourth rank in Asia after India, Bangladesh, and China, in terms of losses and injuries due to the unexpected natural disasters [4].

Hospitals are the most important components in the health and treatment field during disasters [5]. Their preparedness to cope with the disaster is an important part of harm reduction. Indeed, today's international motto of preparedness for unexpected events, especially hospitals preparedness states the top priority in event management plans at national and international level, especially in disaster-prone countries [6].

The hospitals preparedness programs should be performed periodically, under normal conditions, and from quantitative and qualitative aspects to identify negative consequences and have the highest efficiency [7]. During disasters, health centers and hospitals are the first units which their timely and optimal health services could play a vital role in reducing mortality rate and saving injured people [5]. Health and treatment sector due to the nature of activities and its role in treatment, rehabilitation of injured, and health control, is one of the sensitive and strategic sectors. So, these centers, especially hospitals should present services around the clock during disasters. This is possible when these centers are prepared before disasters and ready to present a suitable response to disasters with all their capabilities [8].

History shows that during disasters and epidemic of diseases, hospitals are encountered with problems in presenting health care to patients and injured people [9]. The surge capacity of hospital is defined as the hospital ability to provide care in both critical and non-critical situations that demonstrates the ability to deliver emergency care in a disaster situation [10].

The hospital surge capacity is a dynamic plan that should be updated and corrected continuously. Execution of specialized or combinational exercises of this program and its exact evaluation and also execution of these programs in real events that could occur in hospitals can be useful in improving preparedness of hospital [11]. One of the important sectors of hospital surge capacity is program promotion and evaluation system [12]. The hospitals surge capacity has 3 main sectors of human resources, specialized and non-specialized

equipment, and physical space [13]. Surge capacity is performed based on evaluation and analysis of the risk. Thus, before implementing this program, the risks that threaten hospital should be identified and hospital vulnerability is found and then based on hospital risk analysis, the program of hospital surge capacity is formulated [14].

Randy et al. in a study entitled "Increase of capacity in disasters with high casualties" reported that surge capacity management during disasters requires planning, rapid response, and training of hospital's staff [9]. Thomas et al. performed a study entitled "improvement of surge capacity of regional hospitals in Pennsylvania." The results of their study showed that collaboration of effective agencies in response to disaster increased preparedness and improvement of surge capacity of hospital during disasters.

If responding agencies increase their preparedness through regular practice, surge capacity of the hospital is promoted during disasters [8]. Study of Matthias et al. entitled "Increase in hospitals surge capacity to admit patients during disasters in Australia" showed that general hospitals had no surge capacity during disasters with regard to physical aspects [15].

Regarding the necessity of hospital capacity increase and vital importance of this issue in effective response to disasters, the researcher attempted to evaluate surge capacity of hospitals affiliated to Kerman University of Medical Sciences during disasters.

2. Materials and Methods

This is a quantitative study. The sampling is total count in all hospitals affiliated to Kerman University of Medical Sciences, as well as private, and military hospitals of Kerman province. After taking consent of Ethics Committee of Kerman University of Medical Sciences, the study instrument was completed through doing interviews in all hospitals of Kerman Province.

The studied hospitals included state and private hospitals and also hospitals affiliated to Kerman University of Medical Sciences. Totally, 20 hospitals were included in the study. The study instrument was designed by the educational group and research center of Medical Emergency and Disaster Health in Welfare and Rehabilitation Sciences University to estimate the existing capacity of health field and its increasing capacity. The study instrument consisted of 2 sections. First section included demographic information of the hospital such as its name,

affiliation (as state or private), address, number of beds, total active beds, bed occupancy coefficient, population covered, and the final degree of hospital evaluation. The second part of instrument evaluated surge capacity of hospitals in 4 fields of hospital equipment (69 items), physical space (10 items), human resources (44 items), and programs (114 items) during disasters. The study instrument was designed by the Emergency and Disaster Health Research Center of Welfare and Rehabilitation Sciences University [9]. The author referred to the obtained reliability and the questionnaire was given to 10 faculty members of Kerman University of Medical Sciences for validity support and their comments were also applied. To evaluate surge capacity of hospitals, experts' team through interview with secretaries of Crisis and Disaster Committees (who had BS in nursing) and also observation of surge capacity field and finally their evaluation by Excel software, classified hospitals in various fields of surge capacity into 5 levels (very weak, weak, average, good, excellent).

In this regard, 0%-5% surge capacity was considered as very weak, 5%-10% as weak, 10%-15% as average, 15%-20% as good, and finally above 20% as excellent. The data analysis was performed by descriptive statistics (mean, frequency and percent) through SPSS software, version 16.

3. Results

In this study, all hospitals of Kerman University of Medical Sciences were studied. The study questionnaire was completed by the researcher through interview. About 65% of studied hospitals were state and military hospitals and 35% were private hospitals. Among the studied hospitals, Afzalipour Hospital with 370 active beds, occupancy mean coefficient of 82% and regional hospital of army with 19 active beds and the mean occupancy coefficient of 10% were the greatest and smallest hospitals, respectively. The study findings showed that surge capacity of Kerman Province hospitals in

Table 1. The condition of hospitals of Kerman University of Medical Sciences regarding the surge capacity of equipment in disasters.

Hospital	Surge capacity, %	Capacity level
Afzalipour	11.39	Average
Bahonar	4.33	Very weak
Shafa	0	Very weak
Shahid Beheshti	0.08	Very weak
Sina	9.24	Weak
Khatamolanbiya Baft	0.96	Very weak
Ghaem Bardsir	42.40	Excellent
Imam Reza hospital of Sirjan	0	Very weak
Valiasr Shahr Babak	6.57	Weak
Ali Ibn Abitaleb Ravar	3.59	Very weak
Payambar Azam	19.71	Good
Seyedolshohada	0	Very weak
Hazrat Fateme	2.31	Very weak
Arjmand	0	Very weak
Mehregan	0	Very weak
Alzahra	0	Very weak
Imam Ali Zarand	56.66	Excellent
Razie Firooz	0.72	Very weak
Gharzi Sirjan	6.84	Weak
Army regional hospital	2.42	Very weak

Table 2. Condition of hospitals of Kerman University Medical Sciences regarding surge capacity of physical space in disasters.

Hospital	Surge capacity, %	Capacity level
Afzalipour	0	Average
Bahonar	17.14	Good
Shafa	0	Very weak
Shahid Beheshti	0	Very weak
Sina	0	Weak
Khatamolanbiya Baft	0	Very weak
Ghaem Bardsir	27.91	Excellent
Imam Reza hospital of Sirjan	0	Very weak
Valiasr Shahr Babak	4	Weak
Ali Ibn Abitaleb Ravar	8.5	Weak
Payambar Azam	0	Very weak
Seyedolshohada	0	Very weak
Hazrat Fateme	0	Very weak
Arjmand	0	Very weak
Mehregan	0	Very weak
Alzahra	0	Very weak
Imam Ali Zarand	0	Very weak
Razie Firooz	0	Very weak
Gharzi Sirjan	6	Weak
Army regional hospital	0	Very weak

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disasters in 4 fields of equipment, physical space, human resources and applied programs achieved the mean value of 7.33%. Based on the classification of experts' team, surge capacity of hospitals is weak. The results of study showed that surge capacity of state hospitals during disasters was 8% and for private hospitals it was as 6.07%. The study findings showed that among university hospitals, Shahid Bahonar Hospital with 21.82% and among non-university hospitals, Imam Ali (PBUH) Zarand Hospital with 14.15% surge capacity in 4 mentioned fields had the highest capability during disasters in comparison with other hospitals. Among the studied hospitals, Ghaem Bardsir and Imam Ali (PBUH) hospitals of Zarand with regard to surge capacity of equipment with 45.07% and 39.54% were at the best conditions. Majority of hospitals were in weak situation in this regard (Table 1). The study findings also showed that with regard to surge capacity of equipment during disasters, state hospitals of Kerman Province had higher capability compared to private hospitals. The study findings showed that in the field of increase in

physical space capacity during disaster, Ghaem Bardsir Hospital due to its physical and structural situation had a very suitable condition with 27.91%, while 80% of hospitals had very weak condition in this regard. In the field of increase in the capacity of human resources, majority of the hospitals of Kerman Province were in very weak condition, in such a way that only 3 hospitals had good condition in terms of the increase of human resources capacity as shown in Table 2. Table 3 shows that although the studied hospitals did not have good condition in 3 fields of equipment, physical space, and human resources, 60% of affiliated hospitals to Kerman University of Medical Sciences had better condition in applied program field.

4. Discussion

Based on the results, the capability of hospitals of Kerman University of Medical Sciences in implementing the 4 programs of surge capacity to cope with disasters was evaluated and found to be mostly weak. This find-

Table 3. Condition of hospitals of Kerman University of Medical Sciences regarding surge capacity of human resources in disasters.

Hospital	Surge capacity, %	Capacity level
Afzalipour	0	Very weak
Bahonar	46.90	Excellent
Shafa	0	Very weak
Shahid Beheshti	0	Very weak
Sina	16.47	Good
Khatamolanbiya Baft	0	Very weak
Ghaem Bardsir	11.2	Average
Imam Reza hospital of Sirjan	0	Very weak
Valiasr Shahr Babak	25.25	Excellent
Ali Ibn Abitaleb Ravar	0.75	Very weak
Payambar Azam	0	Very weak
Seyedolshohada	0	Very weak
Hazrat Fateme	0	Very weak
Arjmand	13.2	Average
Mehregan	0	Very weak
Alzahra	0	Very weak
Imam Ali Zarand	0	Very weak
Razie Firooz	0	Very weak
Gharzi Sirjan	0	Very weak
Army regional hospital	31.2	Excellent

ing is consistent with the study of Kantar et al. (2006) in New York hospitals. they showed that New York hospitals had no acceptable capacity to present services to children and other people, including the elderly in the incidents with high casualties and this capacity should have been improved in responding to such incidents [16]. Regarding surge capacity of bed and medical equipment, hospitals of Kerman University of Medical Sciences had an average condition with the mean value of 8.35%. This finding is inconsistent with the study of Higgins et al. on the evaluation of capability of Kentucky hospitals in surge capacity program. They computed surge capacity of hospital in bed and equipment very good as 27%, which was even above the standard value [17]. The capability of studied hospitals with regard to surge capacity of human resources in disasters was 10.4%, which was in the average range. This finding is consistent with the study of Kaji et al. [18]. The capability of hospitals of Kerman Province with regard to applied programs of surge capacity was 10.61% (av-

erage) which was consistent with the results of study of Welzel et al. on the applied programs running in the main hospital of Keptown [19].

5. Conclusion

In conclusion, as the capability of affiliated hospitals to Kerman University of Medical Sciences has been evaluated as average with the mean score 8.13%, it is required to take necessary measures to perform related procedures to increase hospital capacity in disasters, especially in the field of physical space via establishment of alternative spaces. Regarding the surge capacity of human resources in hospitals during disasters, it is proposed to use the capacity of retired employees, also create necessary mechanisms to use the capacity of students and volunteers. Formulation of the required policies to perform immediate change of use of health equipment can improve surge capacity in this field too.

Table 4. Condition of hospitals of Kerman University of Medical Sciences regarding applied programs in disasters.

Hospital	Surge capacity, %	Capacity level
Afzalipour	15.01	Good
Bahonar	16.49	Good
Shafa	19.82	Good
Shahid Beheshti	9.29	Weak
Sina	7.8	Weak
Khatamolanbiya Baft	8.59	Weak
Ghaem Bardsir	5.78	Weak
Imam Reza hospital of Sirjan	0	Very weak
Valiasr Shahr Babak	3.15	Very weak
Ali Ibn Abitaleb Ravar	9.82	Weak
Payambar Azam	15.43	Good
Seyedolshohada	16.31	Good
Hazrat Fateme	17.19	Good
Arjmand	3.15	Very weak
Mehregan	11.75	Good
Alzahra	0	Very weak
Imam Ali Zarand	0	Very weak
Razie Firooz	18.07	Good
Gharzi Sirjan	18.77	Good
Army regional hospital	15.78	Good

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