

Determining Functional Preparedness of Selected Military Hospitals in Response to Disasters

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Abstract

Background: Iran is one of the most disaster-prone countries in the world. Hospital readiness is important for providing services to patients in times of crisis and can be considered an important indicator in crisis management.

Objectives: The present study was conducted to determine the functional preparedness of selected military hospitals in response to tragedy and disasters.

Methods: This cross-sectional-analytical study was conducted in two AJA-military hospitals in Tehran in 2020. A random sampling method was used to select hospitals. A checklist of functional preparedness of hospitals in response to disasters was used to collect data. Data were analyzed and coded with SPSS software.

Results: According to the results, the mean and standard deviation of the functional preparedness score for hospitals A and B were 86.17 ± 4.24 and 81.76 ± 10.52 , respectively, and the total average score was 83.97 ± 8.21 , which indicated good conditions. The results of the independent t-test showed that there was no significant difference in the preparedness between the two studied hospitals ($p=0.124$). In hospital A, Recovery after Disaster, Increase capacity and Continuation of vital services and in hospital B, Support and Procurement Management, Continuation of vital services and Human resources areas had the lowest level of readiness.

Conclusion: According to the results, the studied hospitals were weak in functional preparedness, and hence should be repaired and improved in this field.

Keywords: Military, Hospitals, Disasters.

Introduction

Humans have been struggled with various harms and disasters since the creation now and they have incurred bodily and financial losses.¹ In terms of the emergence of an unforeseen event, Iran has been classified among the top ten countries around the world. Statistically, 31 natural disasters out of 40 natural registered disasters have happened in Iran and it is not unlikely to happen again.² Iran's vulnerability to earthquakes is 1000 times more than America and 100 times more than Japan.³ It has been reported that 3.4 billion people around the world live in high risk area, 2.3 billion people are at risk of flooding and 328 million people live in the affected area by earthquake.⁴ Disasters occur suddenly and unexpectedly and can have serious and irreversible effects on the human health and healthcare system.⁵ More than 6% of disasters' victims are assigned to Iran while only 1% of the world's population lives in this country.⁶ Given the location of the land area of 11000 km² on the fault belts, high frequency of earthquake in more than 300 populous cities

and inhabiting 77% of them on quake fault, 35 cities of Iran are affected by floods, typhoon and coastal waves.^{7,8} Hospitals, especially military hospitals, are one of the leading centers and institutions in times of disasters.⁹ In case of occurring incidence and disasters many victims and injuries are referred to the hospitals for receiving medical services. Therefore, hospitals are the first units offering instant services to victims and play a determinative role in decreasing the death rates.¹⁰ Due to the important role of these centers in the treatment of injuries during disasters, they need to be properly organized to be able to manage their performance in the event of disasters.¹¹ Principally, health care centers are an active part of disaster management and undetectable part of national health.¹² The most important concern regarding the health systems is the readiness of hospitals in crisis situations. Hospital readiness is a multi-interdisciplinary word that would be achieved through active partnership.¹³ In most hospitals, preparation for events and disasters is the highest priority, because they are faced with

the interference of responsibilities and incongruity in operations.¹⁴ Hospital preparedness includes providing standard practical responsibility and guidance for emergent activity in different sections of hospitals during a disaster that could affect the hospital's staff, patients, visitors and society.¹⁵ According to the UN (Provide the complete name in the first use) office for disaster risk reduction, 1.2 billion people died out of 2.9 billion people affected by the disasters that happened from 2000 to 2012, which resulted in a financial burden of 1700 billion dollars.¹¹ Thus, they need a structured program to confront such events.¹⁶ In developed countries, hospitals often should have a structured program for achieving preparedness and promoting their performance during disasters.¹⁷ One of the important points of disaster management is assessing a level of preparedness in hospitals before occurring disasters.¹⁸ The importance of disaster research is related to reducing and preventing the repetition of past mistakes that help grow and increase the ability to adequately respond to disasters.¹⁹ In this regard, evaluating the preparedness level of hospitals for disasters is important for determining and improving the hospital preparedness.²⁰ This principle is doubly important in military hospitals, especially in Iran. Because military hospitals in Iran, as one of the most important health centers, have a special role in crises.²¹ On the other hand, evaluating the functional preparedness of the hospitals is closer to reality, and hence by improving this aspect of preparedness, more success can be achieved in disasters.³

Objectives

Based on the evidence, determining the preparedness in the face of accidents and disasters, especially functional preparedness using national and local tools is one of the necessities. Since no study has been conducted on the evaluation of the preparedness of military hospitals in Tehran as the capital of Iran, this study aimed to determine the functional preparedness of selected military hospitals in response to incidents and disasters.

Materials and Methods

The cross-sectional-analytical study was conducted to determine the functional preparedness of two AJA-military hospitals in response to disasters in Tehran in 2020. A random sampling method was used to select the hospitals. For this purpose, the city of Tehran was divided into five regions: north, south, east, west and center. Then, two

regions were randomly selected by lottery and again, one hospital was randomly selected from the AJA-military hospitals. In order to collect the data, a checklist of functional preparedness of hospitals in response to disasters with 262 items was used. This checklist as a national checklist has been approved by the Ministry of Health and Medical Education (MOHME) of Iran, and was first designed by Heidarnlu et al., (2015).²² This checklist consists of 250 questions in 17 aspects including 1- Command and Control (17 items), 2- Risk Assessment (9 items), 3- Rapid alert System (9 items), 4- Increase capacity (21 items), 5- Continuation of vital services (18 items), 6- Hospital Incident Command System (28 items), 7- Safety (14 items), 8- Security (12 items), 9- Communications (11 items), 10- Triage (10 items), 11- Hospital Evacuation Program (10 items), 12- Corpses and the dead (5 items), 13- Support and Procurement Management (36 items), 14- human resources (16 item), 15- Monitoring the hospital epidemiological care system (26 items), 16- Recovery after Disaster (12 items) and 17- Cultural considerations (8 items). Each item is scored zero (very poor), one (poor), two (average), three (good) and 4 (very good). The sum of the scores of the items in each aspect is the score of that aspect and the sum of the scores of the aspects is the total score of the functional preparedness, which is expressed as a percentage. The validity and reliability of the checklist were evaluated by Heidarnlu et al., (2015) in 30 hospitals. In the first part, the hybrid model concept analysis was used to explore the meaning of hospital functional preparedness and to generate the checklist items. In the second part, psychometric properties included face validity, content validity, construct validity, internal consistency and test-retest reliability. The face validity was approved by 15 experts in the field of health in accidents and disasters. The content validity index (S-CVI/Ave) was 0.87. The reliability was carried out by using Cronbach's alpha for internal consistency ($\alpha = 0.978$) and test- retest reliability was performed for stability with two-week interval ($r = 0.875$).²²

Data analysis

Data were collected from the two hospitals and entered into SPSS software (Version 19). Then the collected data were analyzed by descriptive (mean and standard deviation) and inferential statistics (Kolmogorov-Smirnov test and independent t-test).

Ethical Consideration

This study was approved by the ethic committee of the Baqiyatallah University of Medical Sciences (I. BMSU.REC.1398.327). Before conducting the research, all necessary coordination was conducted and the relevant license was obtained.

Results

According to the results, the mean and standard deviation of the functional preparedness score of hospital A was 86.17 ± 4.24 and in hospital B was 81.76 ± 10.52 . The average total

score was obtained to be 83.97 ± 8.21 , which indicated good conditions. The results of independent t-test also showed that there was no significant difference between the preparedness of the two studied hospitals ($p = 0.124$). In hospital A, areas Recovery after Disaster, Increase capacity and Continuation of vital services and in hospital B, Support and Procurement Management, Continuation of vital services and Human resources areas had the lowest level of readiness (Table-1).

Table-1. functional preparedness of two hospitals in response to disasters

Aspects	Received score from		Maximum score		Percentage of preparedness	
	A	B	A	B	A	B
	Hospital	Hospital	Hospital	Hospital	Hospital	Hospital
Command and control	37	33	44	44	84	75
Risk assessment	7	8	8	8	87	100
Rapid alert system	16	16	18	18	88	88
Increase capacity	63	66	76	76	82	86
Continuation of vital services	66	55	80	80	82	68
Hospital Incident Command System	105	94	110	110	95	85
Safety	25	24	27	27	92	80
Security	40	34	44	44	90	77
Communications	35	30	40	40	87	80
Triage	25	29	30	30	83	96
Hospital Evacuation Program	30	35	36	36	83	97
Corpses and the dead	14	14	16	16	87	87
Support and Procurement Management	120	80	135	135	88	60
human resources	40	34	47	47	85	72
Monitoring the hospital epidemiological care system	85	77	98	98	86	78
Recovery after Disaster	34	38	44	44	77	86
Cultural considerations	25	21	28	28	89	75
Total preparedness	independent t test		p= 0.124	t= 1.603	86.17	81.76

Discussion

In line with the purpose of the study, the results showed a suitable and high level of functional preparedness for the two AJA-military hospitals in response to disasters. In a research conducted by Mehri et al., on the investigation of hospital preparedness in Ardabil province against unexpected accidents, the results showed that the preparedness level of the hospitals was moderate.²³ In a similar research conducted by Kazemzadeh et al., on the preparedness of hospital emergency departments for responding to disasters in Iran, it was found that the average level of preparedness of the hospital emergency departments in Iran to respond to disasters was from moderate to high.²⁴ In another related research by Omidi et al., it was reported that the

preparedness of hospitals affiliated to Jondishapour University was in moderate status and Imam Khomeini Hospital had the highest level of accident and disaster preparedness.²⁵ Amiri et al., reported the moderate preparedness of the hospitals in the Northern provinces to deal with disasters.²⁶ Moreover, Jafari et al., demonstrated that the amount of preparedness of the hospital was on the acceptable level.¹⁰ One of the main differences between the present study and the previous studies are attributed to the type of hospitals in terms of being military and civilian, and the research methodology. Also, the researchers have measured the functional readiness descriptively with specific tools. Also, no study has specifically examined the functional preparedness.

Another finding of the present study was the measurement of functional preparedness in various aspects, which among them, the Risk assessment and Rapid alert system had the highest score and their functional readiness was high. On the other hand, the aspects of Support and Procurement Management and Continuation of vital services had the lowest score and their functional preparedness was poor. In Dargahi et al., study on the functional preparedness and nonstructural safety of different health units, it was found that fire extinguishing section showed the highest readiness percentage of 68%. However, the risk reduction measures and health insurance coverage had the lowest percentage of readiness in responding to disasters, which were 3% and 0%, respectively.²⁷ Ardalan et al., in a study on the estimation of hospitals safety in respond to disasters, reported that in recent years, the hospital safety has improved in the event of disasters in Iran, and more hospitals have joined the HSI program.²⁸ Moreover, Marzaleh et al., by studying the emergency department preparedness of hospitals for radiation, nuclear accidents, and nuclear terrorism, introduced the financial issue as an important aspect of dealing with accidents.²⁹ Bajow & Alkhalil by studying and evaluating the hospital's preparedness in the face of disasters showed that disaster mitigation needs more actions, including risk assessment, structural and non-structural prevention, and preparedness for contingency planning, warning and evacuation.³⁰

Conclusions

Given that in many assessments, there is a substantial difference between the hospital's preparedness score and its real performance in the event of a disaster, it is necessary to measure and monitor the functional preparedness of hospitals, especially military hospitals. Achieving a good level of functional preparedness in military hospitals is a positive point, while required measures should be considered in hospitals with lower scores to improve their preparedness.

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Authors' Contribution

All authors pass the four criteria for authorship contribution based on the International Committee of Medical Journal Editors (ICMJE) recommendations.

Conflict of Interests

The authors declared no potential conflict of interests with respect to the research, authorship, and/or publication of this article.

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References

1. Djalali A, Della Corte F, Segond F, Metzger M-H, Gabilly L, Grieger F, et al. TIER competency-based training course for the first receivers of CBRN casualties: a European perspective. *European journal of emergency medicine*. 2017;24(5):371-6. doi:10.1097/MEJ.0000000000000383
2. Al-Dorzi HM, Aldawood AS, Khan R, Baharoon S, Alchin JD, Matroud AA, et al. The critical care response to a hospital outbreak of Middle East respiratory syndrome coronavirus (MERS-CoV) infection: an observational study. *Annals of intensive care*. 2016;6(1):101. doi:10.1186/s13613-016-0203-z
3. Heidaranlu E, Ebadi A, Khankeh HR, Ardalan A. Hospital disaster preparedness tools: a systematic review. *PLoS currents*. 2015;7doi:10.1371/currents
4. Kenny C. Why do people die in earthquakes? The costs, benefits and institutions of disaster risk reduction in developing countries: The World Bank; 2009. doi:10.1596/1813-9450-4823
5. Top M, Gider LI, Tas Y. An investigation of hospital disaster preparedness in Turkey. *Journal of Homeland Security and Emergency Management*. 2010;7(1):18. doi:10.2202/1547-7355.1781
6. Yaghoubi T, Ardalan A, Zavareh DK, Khankeh H, Nejati A, Ebadi A. Decision-making on hospital emergency evacuation in disasters and emergencies: findings from a systematic review. *Iranian Red Crescent medical journal*. 2017;19 (11); e14214. doi:10.5812/ircmj.14214
7. Jacobs-Wingo JL, Schlegelmilch J, Berliner M, Airall-Simon G, Lang W. Emergency Preparedness Training for Hospital Nursing Staff, New York City, 2012-2016. *Journal of nursing scholarship*. 2019;51(1):81-7. doi:10.1111/jnu.12425
8. Olivieri C, Ingrassia PL, Della Corte F, Carenzo L, Saporì J-M, Gabilly L, et al. Hospital preparedness and response in CBRN emergencies: TIER assessment tool. *European Journal of Emergency Medicine*. 2017;24(5):366-70. doi:10.1097/MEJ.0000000000000399
9. Amerion A, Aghighi A, Tofih S, Sadeghi AA, Shahedi A, Rasekh F. Assess the disaster preparedness of the selected military hospitals. *J Army Univ Med Sci*. 2014;11:353-6.
10. Jafari MA, Farahmand Rad R, Zolfaghari Sadrabad A, Haghighi Tafti MR. Determining the Level of Preparedness in Yazd Shahid Sadoughi Hospital for Confronting to Emergencies and Disasters after Development of Hospital Disaster Response Plan. *Journal of Disaster and Emergency Research*. 2020;3(1):33-9. doi:10.18502/jder.v3i1.2566
11. Khankeh HR, Lotfolahbeygi M, Dalvandi A, Amanat N. Effects hospital incident command system establishment on disaster preparedness of tehran hospitals affiliated to law enforcement staff under simulated conditions. *Health in Emergencies and Disasters*. 2018;3(4):207-14. doi:10.32598/hdq.3.4.207
12. Shaw KA, Wilson KD, Brown JE. Hospital incident command system: tool for a TJC accreditation survey. *Journal of Healthcare Protection*

- Management: Publication of the International Association for Hospital Security. 2016;32(1):63-70.
13. Sauer LM, Romig M, Andonian J, Flinn JB, Hynes N, Maloney R, et al. Application of the incident command system to the hospital biocontainment unit setting. *Health security*. 2019;17(1):27-34. doi:10.1089/hs.2019.0006
 14. Liu BF, Fowler BM, Roberts HA, Herovic E. Keeping hospitals operating during disasters through crisis communication preparedness. *Public Relations Review*. 2018;44(4):585-97. doi:10.1016/j.pubrev.2018.06.002
 15. Skryabina E, Reedy G, Amlot R, Jaye P, Riley P. What is the value of health emergency preparedness exercises? A scoping review study. *International journal of disaster risk reduction*. 2017 Mar 1;21:274-83. doi:10.1016/j.ijdrr.2016.12.010
 16. Aminizadeh M, Farrokhi M, Ebadi A, Masoumi GR, Kolivand P, Khankeh HR. Hospital management preparedness tools in biological events: A scoping review. *Journal of Education and Health Promotion*. 2019;8.
 17. World Health Organization. Risk reduction and emergency preparedness: World Health Organization six-year strategy for the health sector and community capacity development. World Health Organization (WHO); 2007.
 18. Mulyasari F, Inoue S, Prashar S, Isayama K, Basu M, Srivastava N, et al. Disaster preparedness: looking through the lens of hospitals in Japan. *International Journal of Disaster Risk Science*. 2013;4(2):89-100. doi:10.1007/s13753-013-0010-1
 19. McEntire DA. Disaster response and recovery: strategies and tactics for resilience: John Wiley & Sons; 2015.
 20. Kollek D, Cwinn AA. Hospital emergency readiness overview study. *Prehospital and disaster medicine*. 2011;26(3):159. doi:10.1017/S1049023X11006212
 21. Rahmati-Najarkolaei F, Moeeni A, Ebadi A, Heidaranlu E. Assessment of a military hospital's disaster preparedness using a health incident command system. *Trauma Monthly*. 2016;22(2): e31448-e. doi:10.5812/traumamon.31448
 22. Heidaranlu E, Khankeh H, Ebadi A. Designing and validation of Hospitals functional preparedness in response to disasters assessment tool. Tehran: Baqiyatallah University of Medical Sciences; 2015.
 23. Saeid M, Khankeh H, Habibisoola A, Mohammadali M, Hamidkol G, Dadkhah B. Investigating hospital preparedness in Ardabil Province against unexpected accidents. *Health in Emergencies and Disasters*. 2019;4(3):127-34. doi:10.32598/hdq.4.3.127
 24. Kazemzadeh M, Shafiei E, Jahangiri K, Yousefi K, Sahebi A. The preparedness of hospital emergency departments for responding to disasters in Iran; a systematic review and meta-analysis. *Archives of academic emergency medicine*. 2019; 7 (1): e58.
 25. Asgari H. Evaluation of accident and disaster preparedness of hospitals affiliated to Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran. *HDQ*. 2019;4(2):79-84. doi:10.32598/hdq.4.2.79
 26. Amiri M, Chaman R, Raei M, Shirvani SDN, Afkar A. Preparedness of hospitals in north of Iran to deal with disasters. *Iranian Red Crescent Medical Journal*. 2013;15(6):519. doi:10.5812/ircmj.4279
 27. Dargahi A, Farrokhi M, Poursadeghiyan M, Ahagh MMH, Karami A. Evaluation of functional preparedness and non structural safety of different health units of Kermanshah University of Medical Sciences in coping with natural disasters. *Health in Emergencies and Disasters*. 2017;2(4):201-6. doi:10.29252/nrip.hdq.2.4.201
 28. Ardalan A, Kandi Keleh M, Saberinia A, Khorasani-Zavareh D, Khankeh H, Miadfar J, et al. 2015 estimation of hospitals safety from disasters in IR Iran: the results from the assessment of 421 hospitals. *PloS one*. 2016;11(9):e0161542. doi:10.1371/journal.pone.0161542
 29. Marzaleh MA, Rezaee R, Rezaianzadeh A, Rakhshan M, Haddadi G, Peyravi M. Emergency Department Preparedness of Hospitals for Radiation, Nuclear Accidents, and Nuclear Terrorism: A Qualitative Study in Iran. *Iranian Red Crescent Medical Journal*. 2019;21(5). doi:10.5812/ircmj.87107
 30. Bajow NA, Alkhalil SM. Evaluation and analysis of hospital disaster preparedness in Jeddah. *Health*. 2014;6(19):2668. doi:10.4236/health.2014.619306