

# The Effect of Activating Early Warning System on Motahari Hospital Preparedness

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## ABSTRACT

**Background:** One of the important aspects of hospital preparedness in disasters is implementing early warning system. In this study, the performance of this function was evaluated under the monitoring of disasters workgroup of the Ministry of Health (MOH) based on the national program of “hospitals preparedness in disasters” in Shahid Motahari Hospital.

**Materials and Methods:** This is an interventional study, with a quasi-experimental pre-test and post-test design. This hospital was chosen by MOH as a benchmark for implementing the national disaster programs. The data collecting instrument was the hospital disaster preparedness checklist which evaluates 9 indexes of “command and control,” “communications,” “safety and security,” “triage,” “increasing capacity,” “continuity of critical services,” “human resources,” “logistics and supply management,” and “recovery after disasters.” Data of pretest and posttest were analyzed through nonparametric Wilcoxon test, using SPSS software, version 16.

**Results:** The preparedness score before the intervention was 134, which represents the moderate level of hospital preparedness. The evaluation before and after the intervention indicated that “recovery after disaster” and “triage” had the least change with an increase of one score and the index of “logistics and supply management” had the maximum increase by 5 scores. The overall score of preparedness significantly increased from 134 to 159 ( $P < 0.05$ ) after the intervention, which represents a change from moderate to high hospital preparedness.

**Conclusion:** The preparedness of Shahid Motahari Hospital, which is the only specialized hospital of Tehran in burns, has significantly increased and reached a level of high preparedness to deal with disasters. This study indicates the importance of developing the activation of early warning system in hospitals for rapid and appropriate response to the disasters.

## Keywords:

Hospitals, Preparedness, Early warning, Disasters

## 1. Introduction

Developments on human life and the frequency of disasters present their inevitable occurrence. Up to now, disasters have caused great casualties in the society [1]. Reports of the disasters published by EM-DAT database indicates that

315 disasters occurred around the world in 2013 that have left 22279 people dead and 95349145 casualties, and Asia has the highest death toll among all other continents [2].

Lack of preparation to deal with disasters leads to unsustainable development of communities and creates heavy losses [3].

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On the other hand, the survival key in natural disasters is the health services [1]. At times of crisis, health care system must be able to provide a coordinated response and implement efficient programs to reduce the casualties. The responding time is a key factor in reducing irreparable injuries in disasters [4]. One way to reduce the risks of disasters is improving the preparedness of hospitals to respond accurately and rapidly which result in the reduction of mortality [5]. The hospitals generally respond late with inappropriate response to disasters [6]. Unpreparedness of hospitals in dealing with the disasters directly affects the vulnerability of the country [7].

The study conducted by Khankeh et al. indicates the insufficient preparedness of hospitals and health centers all around the country and the necessity of proper attention to this issue [6]. Hosseini Shokouh has also reported that preparedness of the 28.6% of their studied hospitals was at a low level and 61.9% was at an average level [8].

One of the important aspects of hospital preparedness during disasters is the early warning system so that the World Health Organization has declared the first part of the responding program is the early warning system [1].

Regarding the importance of the warning system for preparedness and on time response to disasters, the activation of rapid warning system was conducted in Shahid Motahari Hospital in Tehran under monitoring of disasters workgroup of the Ministry of Health and in collaboration with the Research Center in Disasters and Emergency Ward of the University of Social Welfare and Rehabilitation based on the national program of Hospitals Preparedness in Disasters.

## 2. Materials and Methods

In this quasi-experimental study with pre-test and post-test design, the effect of designing warning system on the preparedness of Shahid Motahari Hospital during disasters was studied [10]. In this study, the research environment was Motahari Hospital which was the pilot of MOH to conduct studies in disasters. As the largest educational centre in burn treatment, this hospital provides services for 3000 patients and more than 10000 outpatients annually. In addition, it has a crucial role in accepting and hospitalizing patients in case of possible accidents and disasters [11].

The data collection tool was a hospital preparedness checklist. This tool is provided to evaluate responding hospital emergencies and then help hospital staff and

emergency managers in providing an effective response to emergency events. It was translated and validated by Karimiyan et al. at the Centre for Health Research in Disasters at the University of Welfare and Rehabilitation, and conducted for the second time in Iran. It evaluates hospital preparedness in 9 key dimensions of [11]:

### Command and control

Decision-making system is responsible for activation, coordination, implementation, adaptation, and termination of a preset program. Also the optimum performance of the system is essential for effective implementation of disaster and emergency management.

### Communications

Clear and accurate communications are essential for ensuring safe decision-making, effective cooperation, public awareness, and ensuring.

### Safety and security

Advanced security mechanisms are essential for the effective performance of hospitals during disasters.

### Triage

It comprises the process of classification and prioritization of patients with the aim of providing the best services with the available resources to a large number of patients.

### Surge capacity

The ability of health services to increase their natural capacity to meet the growing demand for clinical care is an important factor in the planning stages of a hospital.

### Continuity of essential services

The daily needs for essential services and operations (such as emergency care, urgent surgeries, caring mothers and children) during disasters, which exist under normal circumstances, will not be removed. Therefore, the availability of basic services must continue in parallel with the continuity or activation of an emergency response program.

### Human resources

It is essential to ensure the continuity and sufficient energy of the personnel in any event which results in the increased need for the human resources.

### Logistics and supply management

Continuity of logistics and hospital requirements and its supply chain is often underestimated during crisis, which requires careful planning and response.

### Post disaster recovery

Some activities are normal for restoring and returning the community to the normal life, but these services may start immediately after the crisis and overlap the activities to reduce the damages and injuries [12].

The total number of questions is 91. Each question has 3 options of under investigation, in progress, and finished. The options are scored 1, 2, and 3, respectively and the total score is calculated. The scores from 0 to 68 indicate low preparedness, 69 to 136 medium preparedness, 137 to 204 high preparedness, and 205 to 273 very high preparedness [11].

Before implementing the intervention, the necessary permits were acquired. Then, one day before the intervention, the checklists were completed in 9 dimensions by the researcher and cooperation of members of the disasters committee at the hospital through observation, interviews, and reviewing the documents available in the disasters committee of the hospital.

The intervention was conducted as a 3-day workshop entitled “the necessity of the warning system and developing its activation for disaster” in Shahid Motahari Hospital. Two weeks before the workshop, we tried to get permission from the Continuing Medical Education system with the aim of encouraging individuals to participate in the preparation of flowcharts as well as registering the workshop as the first one in activating the early warning system in the country. The provided outlines were developed from the study conducted by Khankeh et al. entitled “national program of hospital preparedness in disasters” [1].

On the first day after stating the concepts and definitions of disaster, the risk analysis was completed by the crisis committee members in the form of a few groups in the hospital environment. On the second and third day, the flowchart was activated by the participation of the committee members and the way of releasing news was developed in the hospital according to the preparation book and in accordance with the environment of Shahid Motahari Hospital. Then, it was reviewed through the active participation of the members of the crisis committee during a month and was sent to profes-

sors who were experts in this field and their views were considered regarding the national program for Hospital Preparedness in Disasters. Next, the final meeting about disasters was held in the presence of the Minister of the Health, the Secretary of the workgroup, Deputy of Iran University, Manager, Director, Nursing Director, Secretary of the Crisis Committee, and the senior officials of the hospital. In this session the activation of the warning system was taught after being approved in a 4-hour meeting with the presence of the officials and the hospital personnel.

Finally, the activation flowchart of the warning system and distribution of news (notification) were informed to all hospital units and its key parts by the hospital manager.

After the intervention, the checklist was refilled by the researcher and the collaboration of the crisis committee of the hospital.

The analysis of the collected data in pretest and post-test was done through nonparametric Wilcoxon test which was separately conducted for each index and also for all 9 indexes using SPSS software, version 16.

## 3. Results

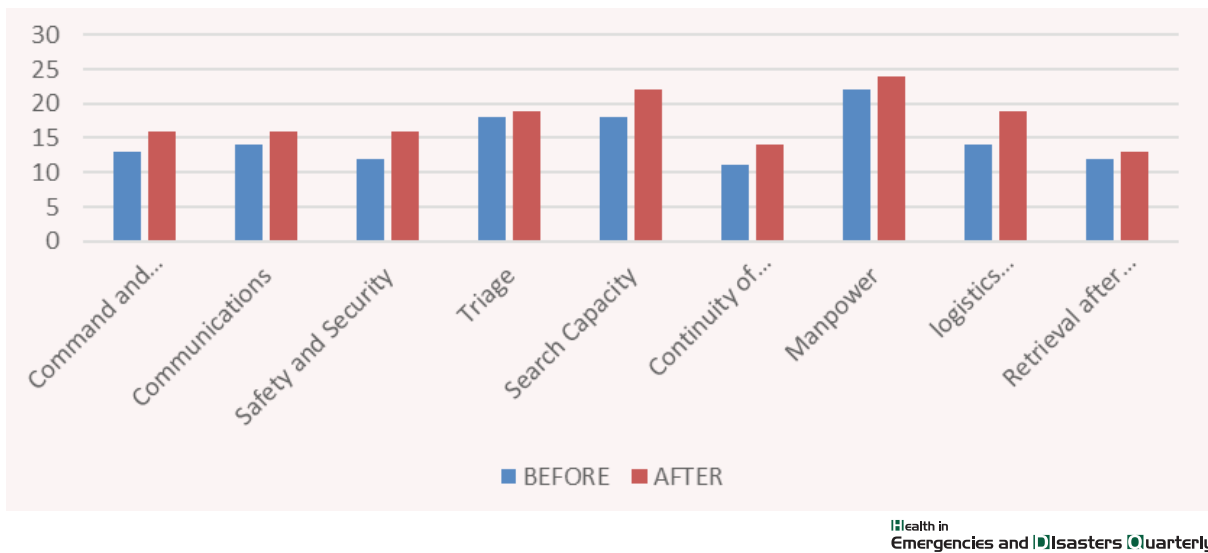
The main subject of the research was the preparedness of Shahid Motahari Hospital to respond the disasters that was evaluated by the hospital preparedness tool in the 9 dimensions before and after the intervention. Non-parametric Wilcoxon test was used to analyze the data and its significance was investigated.

According to the Figure 1, two indexes of “recovery after disaster” and “triage” had the least change (one score increase) and the index of “logistics and supply management” had the maximum increase by 5 scores. With regard to overall score of preparedness, it increased from 134 to 159, which indicates a change from medium to high hospital preparedness.

Figure 1 clearly shows the scores obtained from the hospital evaluation of the 9 indexes before and after the intervention.

## 4. Discussion

Since hospitals are the first reception centers for victims of disasters, they should have enough readiness to deal with accidents and disasters. Hospital preparation in this study is investigated separately in 9 dimensions.



**Figure 1.** Comparing the scores obtained before and after the intervention in 9 indexes of the hospital preparedness tool.

In addition, the sum of these 9 indexes was evaluated. There were some increase in preparedness scores of “command and control” and “communication,” but the difference was not significant ( $P>0.05$ ). Regarding the third index, “safety and security,” the readiness score improved, which was significant ( $P<0.05$ ), and in accordance with the results of Hojat et al. research which investigated 13 hospitals [14]. This agreement can be due to need in identifying vulnerabilities in the workshop and asking authorities of wards to identify risks as one of their tasks [15].

Regarding the fourth key index, “triage,” the preparedness score improved, but the difference was not significant. The increase in the fifth index, “capacity increase,” of hospital preparedness was also significant ( $P<0.05$ ), considering replacement places for transferring nonemergency patients and identifying alternative sites outside the hospital in coordination with local authorities improved from “under investigation” to “in progress.” In addition, identifying problems and barriers in providing health services and having plans and programs to prioritize the provision of services in emergency situations and canceling unnecessary services (such as elective surgeries) has been changed into the “terminated projects” that was one of the strengths of the hospital [17]. On the other hand, although hospital preparedness scores in indexes of “continuity in essential services,” “human resources,” “management and logistics support,” and “recovery after disasters” have improved, but the differences were not significant. The results of the study in these aspects were in accordance with Vahedparast et al. study, which concluded that preparedness of hospitals in Bushehr City was low [18].

In general, this study indicates that Shahid Motahari Hospital has had a medium level of preparedness before the intervention and this finding was consistent with the results of the study conducted by Maleki et al. who evaluated the preparedness of Iran University of Medical Sciences [16]. After developing the activation process of the warning system and informing, the preparedness level of the hospital increased significantly ( $P=0.0001$ ) and reached a higher level of preparedness in dealing with the disasters. Karimiyani has also obtained the positive and effective impacts of contingency plan on the disaster preparedness to deal with the disasters [13].

Poor management and communications, structural problems, lack of facilities and improper organization of available resources are among the most important problems of the hospitals dealing with disasters. Bazrgar et al. significantly evaluated the establishment of crisis management model on the preparedness of Shahid Rajaei Hospital in Shiraz in simulated conditions [19].

Regarding the results of this study, the one conducted by Amiri et al. in evaluating the preparedness of Semnan hospitals as average [7], also the research conducted by Shokouhi et al. to evaluate the preparedness of hospitals in earthquakes, 61.9% of hospitals had an average preparedness, 28.6% had poor preparedness, and only 9.5% of the hospitals had the desirable preparedness in the disasters [7].

## 5. Conclusion

Regarding the unfavorable position of our country in terms of disaster, to enhance the preparedness level of the



hospitals, the implementation of the national program for disaster preparedness is essential in hospitals. The most important component in this regard is the early warning system and the development of the activation process of the system for rapid and proper response at times of disasters which is recommended for all the hospitals of the country.

The limitations of this study include the lack of implementation of all phases of the National Disaster Preparedness program due to time constraints, as well as single specialization, and unavailability of a similar hospital.

For future studies, it is recommended to implement the hospital preparedness plan based on the national program in order to respond properly to disasters.

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