Treatment management in disaster: A review of the Bam earthquake experience

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4 authors, including:

Masoud Saghafinia
BUMS

Nahid Nafissi
Iran University of Medical Sciences

Treatment Management in Disaster: A Review of the Bam Earthquake Experience

Masoud Saghafinia, MD;[1] Hassan Araghizade, MD;[2] Nahid Nafissi, MD;[3] Reza Asadollahi, MD[3]

1. Trauma Research Center, Baqiyatallah University of Medical Sciences, Tehran, Iran
2. Anesthesia Ward, Baqiyatallah University of Medical Sciences, Tehran, Iran
3. Iranian Mine Victim Rescue Center (IMC), Tehran, Iran

Correspondence:
Reza Asadollahi, MD
PO Box 14665-199
Tehran, Iran
E-mail: drezaa@gmail.com

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Abbreviations:
MOHME = Ministry of Health and Medical Education
TAG = Technical Advisory Group

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Abstract

In the early morning of 26 December 2003, Bam, an old city in southeastern Iran, was devastated by an earthquake measuring 6.6 on the Richter scale. Managing such situations always brings about many problems. In the case of the Bam Earthquake, two of the most serious problems were rescue operations and provision of appropriate treatment within a short period of time.

By conducting an opinion survey, this study aims to assess different aspects of treatment management, including personnel, the transfer of the injured, equipment, facilities, and treatment planning. Questionnaires containing open questions regarding the management of treatment at five levels were prepared. Those engaged in treatment at different levels, including physicians, treatment workers, military personnel, and executives, were questioned. Several problems were revealed concerning the composition of the treatment forces dispatched, into the region, distribution of the tasks among treatment workers, and the transferring of equipment, and facilities. The most significant problem was a lack of coordination among the organizations responsible for the management of the disaster.

A comprehensive disaster plan is required if prompt handling of mass-casualty incidents and coordinating the management of such large-scale disasters are to be ensured.

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Introduction

Disasters caused by natural hazards mostly are beyond the control of human beings. Since they interrupt the normal course of life and widely affect the availability of resources, they have the potential to create large-scale crises for any community.[1]

From 2002–2003, >800 million people have suffered from disasters caused by natural hazards in one way or another, which is far greater than the number for the period of the 20 years between 1976–1996. At the same time, this is a sign of increasing human vulnerability to disasters caused by natural hazards.[2,3] Although it is difficult to calculate the exact amount of damages caused by such disasters, including human casualties, displacement of people, destruction of homes, buildings, and urban facilities, disasters caused by natural hazards are estimated to cause >$100 billion damage every year.[4]

Rapid population growth, increasing urbanization, economic inequality, and climatic changes are considered to be among the most important factors increasing the impacts of disasters due to natural hazards on human communities, particularly in developing and underdeveloped countries. More than 90% of deaths caused by disasters due to natural hazards occur in these countries.[4] Consequently, in large-scale planning, special attention is paid to disasters caused by natural hazards and the resulting problems in these countries.

Iran and Disasters Caused by Natural Hazards

Due to its geographical location, climatic variety, and territorial vastness, Iran is a country widely affected by disasters caused by natural hazards. It stands

in the 10th position among all countries of the world in this regard. Of the 40 known types of hazards, Iran has experienced disasters due to 31, and these disasters have caused about 2,157 billion rials (about $232 million) worth of damage to the country during the last decade.

Earthquakes are the most damaging event due to natural hazards in terms of both material and human casualties. Iran is among the top 10 countries in terms of the frequency of earthquakes, which is due to its location on the earthquake belt.[5–7] There have been 950 earthquakes reported in different parts of the country during the last decade, leaving 37,600 dead and 53,300 injured. The largest earthquake that occurred within the last two decades was that of the Gilan and Zanjan Provinces, which hit the area on 21 June 1990. It measured 7.3 on the Richter scale, and within seconds, it destroyed 27 cities and 1,871 villages in an area approximately 1,100 km in diameter, leaving 35,500 dead.[8] The latest earthquake was the Bam Earthquake, which measured 6.6 on the Richter scale. It shook the city on 26 December 2003 at 05:26 hours (h) local time, while most people were asleep. It destroyed much of the city, leaving about 45,000 dead and 20,000 injured.[9,10]

Crisis Management in Iran

Iran's crisis management system is experienced in coping with difficult situations due to the constant threat of natural hazards. The system also is backed up with a nationwide emergency system and non-governmental organizations, such as the Iran Red Crescent Society. However, when faced with a large-scale, sudden onset disaster affecting large numbers of people, any qualified crisis management system might be required to provide a great number of rescue, sanitary, and treatment services that, in a short period of time, may exceed their capacities. Thus, handling such critical situations requires the properly coordinated use of substantial material and human resources at the national and international levels.

In Iran, the central problem regarding aid and rescue operations is a lack of coordination among organizations responsible for disaster management, which leads to inefficient use of resources. Article 44 of the 3rd major Political and Economic Plan adopted in 2000, required the government to prepare a "comprehensive aid and rescue plan" for the country.[11] The Iran Red Crescent Society prepared the plan and it was ratified by the Parliament on 06 April 2003. According to this plan, the Ministry of Interior is required to establish the "Natural Disaster Management Task Force" and the "Emergency Headquarters" headed by the Minister of Interior with the aim of developing comprehensive policies and strategies for the management of crises. Twenty-two specialized groups from relevant ministries and organizations cooperate with the Task Force and Emergency Headquarters. The specialized group from The Ministry of Health and Medical Education (MOHME), for example, has the responsibility of gathering information concerning health and treatment, conducting specialized research, developing the plans and policies required for coordinated management of treatment, establishing the required administrative structure, developing educational programs, and finally, performing specialized maneuvers.

This study attempts to assess treatment management after the Bam Earthquake in terms of management of personnel,transfer of injured victims, transfer of equipment and supplies, and treatment planning.

Methods

This is a cross-sectional, qualitative study aiming at evaluating treatment management in a disaster situation. It was carried out following the request by the Department of Health of the MOHME. A group of 12 researchers (including seven physicians) were on a mission to a quake-stricken region from 29 December 2003 to 01 January 2004. They monitored all stages of rescue operations, treatment centers, and international camps. They were instructed to keep records of their observations. Questionnaires containing open-ended questions regarding treatment management also had been prepared, and the physicians and treatment workers engaged in treatment were interviewed.

Results

The following results are obtained from the opinion survey as well as the observations of the researchers.

Personnel Management

Although the exact number of aid workers (official or volunteer) dispatched to the quake-stricken region is not known, according to reliable sources, there were more aid workers than needed. This made managing treatment and organizing of aid workers more difficult. This was due to the lack of planned programs for dispatching personnel to the region. The earthquake struck on early Friday morning, when it was impossible to gather and equip health and treatment forces quickly because all the relevant offices and organizations were closed. The first plane carrying specialized teams landed in Bam at about 19:08 h, almost 14 hours after the earthquake.

Organizations such as the MOHME, the Red Crescent Society, military forces, and the Medical Council Organization responsible for providing information sometimes acted in parallel, and therefore, contradicted each other in gathering and dispatching forces to the center of the crisis. The composition of the treatment forces regarding their specialty and efficiency was not appropriate. This was due to the lack of an overall organization responsible for mobilizing and organizing the personnel required. The treatment forces were not provided with sufficient supplies and equipment as required or a place to rest, especially when they were replaced by fresh forces. Consequently, there were occasions in which the treatment workers were strained both physically and psychologically.

Management of the Transfer of the Injured

The earthquake severely damaged roads and highways and thus, impeded the transportation of aid forces, equipment, and supplies. Maximizing the use of airplanes countered this problem. The private airport of Kerman Khodro (a car-making factory), which was not severely damaged, was immediately prepared to accommodate foreign and domestic airplanes. Headquarters were established at the airport to transfer a group of the injured to neighboring cities.

Day	Date (day.month.year)	No. of Flights	% of Flights	No. of the wounded transferred
1	26.12.03	19	4	693
2	27.12.03	127	26	3,543
3	28.12.03	82	17	369
4	29.12.03	107	22	465
5	30.12.03	47	9	34
6	31.12.03	31	6	207
7	01.01.04	33	7	79
8	02.01.04	43	9	118
9	03.01.04	7	1	3
Total	--	**496**	**100**	**5,511**

Table 1—Flights to the Bam region according to day[12]

Regarding the number of the injured transferred to other cities, there are different reports published by different organizations. However, according to the number of flights carrying the injured and the statistics on the number of the injured in each flight provided by the database of the Ministry of Roads and Transportation, the total number of injured transferred by 17:00 h, 03 January 2004 (nine days after the incident) was 5,511 (Table 1).[12] On the contrary, according to the statistics presented by the Commander-in-Chief of the Health Center of Sepah e Pasdaran (Iran Revolutionary Guards) at the 3rd Congress of Military Medicine (18–19 February 2004 in Tehran, Iran), the number of injured transferred by 06:00 h on 27 December 2003 (one day after the earthquake) was 7,300. Thus, the number of injured evacuated must be taken with caution.

Management of Facilities and Equipment

Due to delays in transfer of equipment and supplies, there was no correspondence between the requirements and the aid received. Moreover, treatment forces had not been provided with living facilities, such as food and sanitary services or a place for rest, which led to their inefficiencies. An ineffective medical information system, a lack of guiding signs to lead people to treatment centers, a lack of uniforms for treatment and rescue workers, and a lack of communication facilities for treatment centers to contact each other were among the most significant problems in the management of facilities and equipment.

Treatment Planning

In the absence of a comprehensive plan, tasks were not properly divided among treatment workers and no one knew who had the authority to issue orders. Consequently, managing treatment personnel was difficult. The transfer of the injured was not organized properly; some outpatients were transferred to other cities as if their condition was severe. The physicians and treatment workers had not received special training for aid, rescue, and treatment in critical conditions, and had not been given instructions on how to deal with special cases such as insect bites or extensive wounds.

Discussion

The key point in the management of supplies and equipment during a disaster is to provide what is needed at the right time. For instance, the treatment, health, and welfare requirements during the first 48 hours after the primary event obviously are different from those for the following days. The priorities during the first hours after the event include supplies and equipment for excavating the ruins, finding survivors trapped under the ruins, treatment facilities, and emergency surgeries. The things needed mostly on the following days included items such as food, drinkable water, shelter, definitive surgical operations, and treatment of chronic diseases.

A planned program to cope with the needs and requirements of the situation is what guarantees effective performance of a treatment center in a disaster. In the absence of such a plan, it is not possible to respond to the health and treatment requirements on time.

The lack of coordination in the process of aid and management operations was one of the most important problems identified by the participants. Therefore, this mechanism requires improvement concerning each unit involved in wide-scale disasters. The following recommendations are provided (Figure 1);

1. A permanent Crisis Center should be established by MOHME and its affiliated universities;
2. In times of crisis, the Minister of the MOHME will be in charge of this Center and in normal conditions, a substitute will be assigned;
3. This Center should be equipped with full communication systems to obtain information from universities;
4. In times of crisis, the authorities and experts in the Center should not be involved in any other activities except the problems and issues of coordination;
5. In normal conditions, information on every aspect of treatment system will be gathered by the permanent secretariat of this Center;

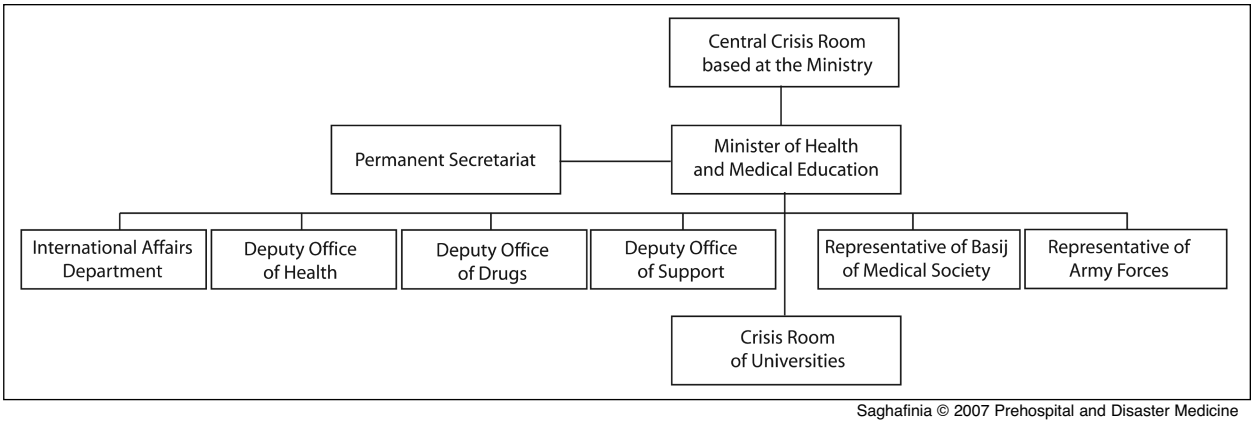

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Figure 1—Organization chart of the Central Crisis Room

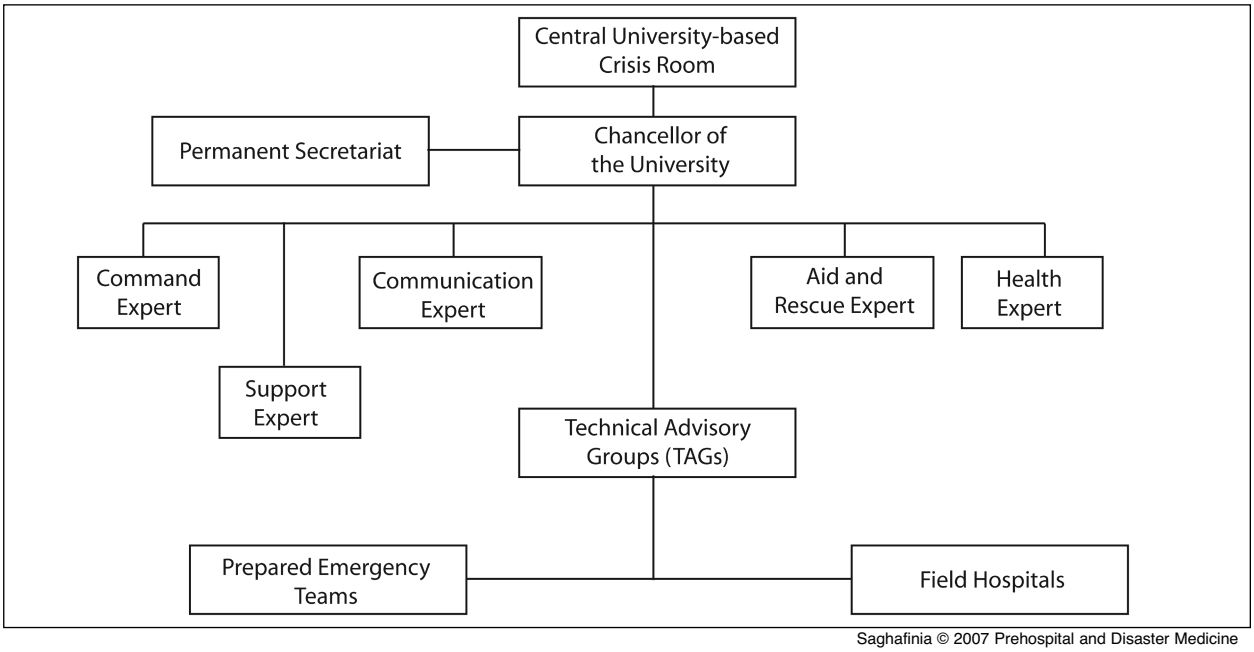

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Figure 2—Organization chart of the Local Crisis Room

6. The secretariat will assign permanent representatives to key locations such as airports, terminals, and train stations;
7. All treatment workers should be dressed uniformly;
8. Exercises should be performed regularly regarding aid, health, and treatment for unexpected disasters; and
9. The Department for International Affairs in the MOHME, in collaboration with the Ministry of Foreign Affairs, should organize international aid teams to be dispatched to the disaster-stricken regions.

The following are suggestions for managing and organizing local operations (Figure 2):

1. The University Chancellor for each locality will head a Crisis Center;
2. In normal conditions, the secretariat of the local Crisis Center should act under the direct supervision of the University Chancellor;
3. The secretariat will be in charge of the medical and public health aspects of any crisis, under the supervision of the University Chancellor, and will dispatch teams if appropriate;
4. The Crisis Center of universities always should have access to up-to-date information concerning hospitals, available beds, ambulance facilities, etc., and report the same information to the headquarters;
5. Trained emergency teams with standard equipment always should be ready to act;
6. Basij of Medical Society (a mobilizing institution) should organize specialized forces from outside of the university to perform as emergency teams; and
7. Technical Advisory Groups (TAGs) should be established for the enhancement of specialized knowledge in health. Emergency teams and field hospitals should act under the supervision of these groups.

The following are suggestions for organizing emergency teams. Emergency teams are organized at three levels under the supervision of the TAGs to perform the most effective operations.

These teams include:

1. *Rapid-response teams (1st level)*—These teams should have highly organized communication systems, special aid, rescue training, salaries with extra pay, and

always should be prepared to be dispatched to the affected regions.

2. *Emergency teams (2nd level)*—Emergency teams should have flowcharts to provide aid, health, and treatment services. Having passed annual training courses, they will begin working. They should substitute for the rapid-response teams after the acute phase is over (48 to 72 hours after a sudden-onset event). However, these teams could be activated from the very beginning depending upon the acuteness of the crisis.
3. *Back-up teams (3rd level)*—Back-up teams include all personnel and employees working in the health and treatment services of the country and voluntarily organized medical teams (domestic or foreign). When the requirements of the disaster-stricken region are known, they will be dispatched there.

Conclusions

A comprehensive plan is required in every disaster to ensure a quick response. Meanwhile, in an incident that results in many casualties, the coordination among different management services is essential. This might directly influence the fate of numerous patients.

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