



**Karolinska  
Institutet**

Karolinska Institutet

<http://openarchive.ki.se>

---

This is a Peer Reviewed Published version of the following article, accepted for publication in *Prehospital and Disaster Medicine*.

2012-05-25

# A fundamental, national, medical disaster management plan : an education-based model

Djalali, Ahmadreza; Hosseinijenab, Vahid; Hasani, Azadeh; Shirmardi, Kianoush; Castrén, Maaret; Öhlén, Gunnar; Panahi, Farzad

---

*Prehosp Disaster Med.* 2009 Nov-Dec;24(6):565-9.

Cambridge University Press

<http://doi.org/10.1017/s1049023x00007524>

<http://hdl.handle.net/10616/41072>

*If not otherwise stated by the Publisher's Terms and conditions, the manuscript is deposited under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives License (<http://creativecommons.org/licenses/by-nc-nd/4.0/>), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited, and is not altered, transformed, or built upon in any way.*

# A Fundamental, National, Medical Disaster Management Plan: An Education-Based Model

Ahmadreza Djalali, MD;<sup>1,2</sup> Vahid Hosseinijab, MD;<sup>2</sup> Azadeh Hasani, BSc;<sup>2</sup> Kianoush Shirmardi, BSc;<sup>3</sup> Maaret Castrén, MD, PhD;<sup>1,4</sup> Gunnar Öhlén, MD, PhD;<sup>5</sup> Farzad Panahi, MD<sup>6</sup>

1. Karolinska Institute, Department of Clinical Science and Education, Södersjukhuset (KI SÖS), Stockholm, Sweden
2. Department of Emergency Management, Natural Disaster Research Institute, Tehran, Iran
3. Tehran's Social Security Organization, Tehran, Iran
4. Karolinska Institute, Department of pre-hospital and emergency medicine, Södersjukhuset (KI SÖS), Stockholm, Sweden
5. Department of Clinical Science, Intervention and Technology, Karolinska Institute, Stockholm, Sweden
6. Trauma Research Center, Baqiyatallah University of Medical Sciences, Tehran, Iran

#### Correspondence:

Dr. Ahmadreza Djalali  
Södersjukhuset (KI SÖS)  
Sjukhusbacken 10  
118 83 Stockholm, Sweden  
E-mail: ahmadreza.djalali@ki.se

Keywords: disaster management plan; education

#### Abbreviations:

MOHME = Ministry of Health and Medical Education

Received: 24 November 2008

Accepted: 04 December 2008

Revised: 26 January 2009

Web publication:

#### Abstract

During disasters, especially earthquakes, health systems are expected to play an essential role in reducing mortality and morbidity. The most significant naturally occurring disaster in Iran is earthquakes; they have killed >180,000 people in the last 90 years. According to the current plan in 2007, the disaster management system of Iran is composed of three main work groups: (1) Prevention and risk management, (2) Education, and (3) Operation. This organizational separation has resulted in lack of necessary training programs for experts of specialized organizations, e.g., the Ministry of Health and Medical Education (MOHME). The National Board of MOHME arranged a training program in the field of medical disaster management. A qualified training team was chosen to conduct this program in each collaborating center, based on a pre-defined schedule. All collaborating centers were asked to recall 5–7 experts from each member university. Working in medical disaster management field for  $\geq 2$  years was an inclusion criterion. The training programs lasted three days, consisted of all relevant aspects of medical disaster management, and were conducted over a six-month period (November 2007–April 2008). Pre-test and post-tests were used to examine the participants' knowledge regarding disaster management; the mean score on the pre-test was  $67.1 \pm 11.6$  and  $88.1 \pm 6.2$ , respectively. All participants were asked to hold the same training course for their organizations in order to enhance knowledge of related managers, stakeholders, and workers, and build capacity at the local and provincial levels. The next step was supposed to be developing a comprehensive medical disaster management plan in the entire country. Establishing nine disaster management regional collaborating centers in the health system of Iran has provided an appropriate base for related programs to be rapidly and easily accomplished throughout the country. This tree-shaped model is recommended as a cost-benefit and rapid approach for conducting training programs and developing a disaster management plan in the health system of a developing country.

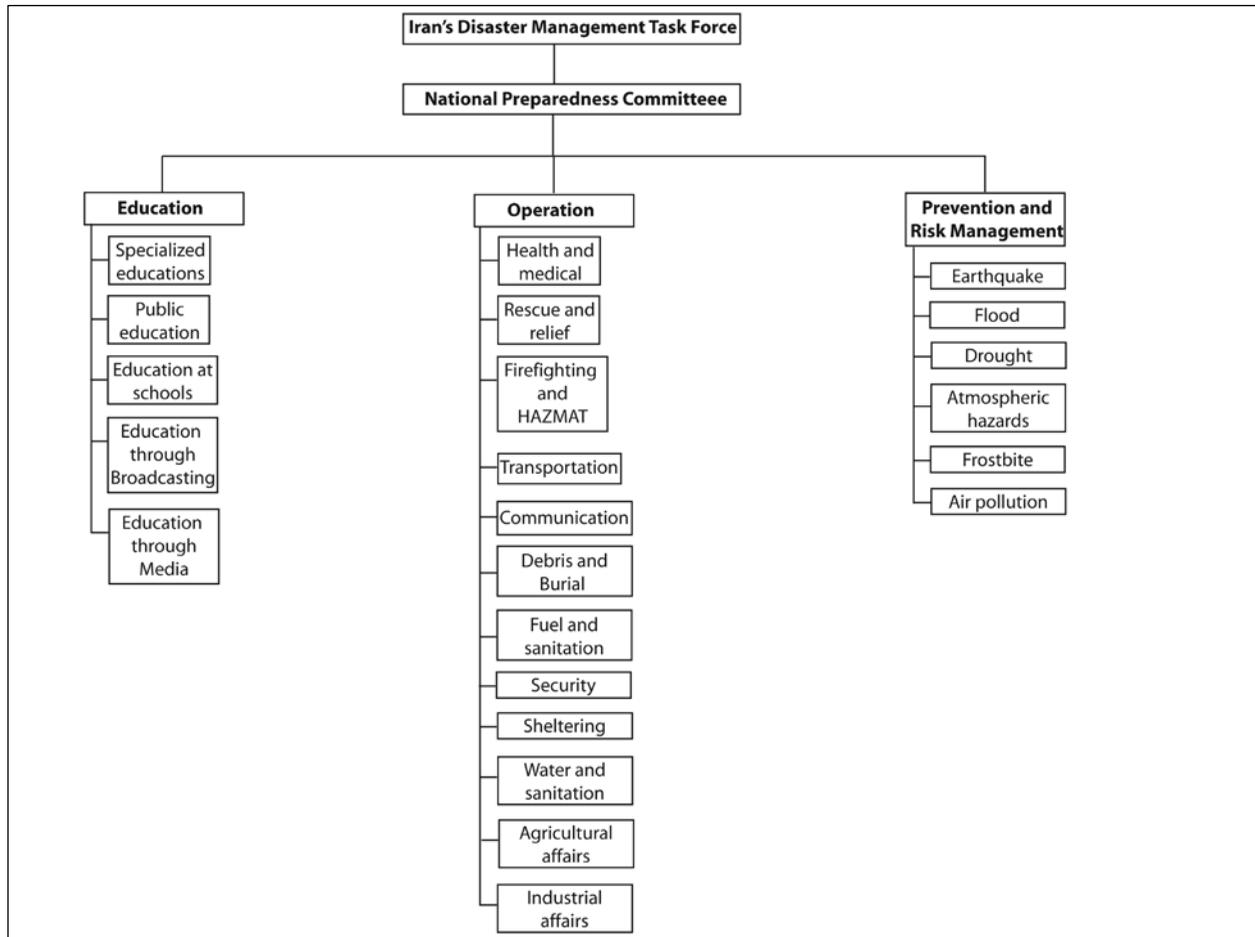
Djalali A, Hosseinijab V, Hasani A, Shirmardi K, Castrén M, Öhlén G, Panahi F: A fundamental, national, disaster management plan: An education-based model. *Prehosp Disaster Med* 2009;24(6):565–569.

#### Introduction

In the past 20 years, disasters caused by natural hazards have claimed >3 million lives worldwide, affected at least 800 million people, and resulted in property damage >(US)\$500 billion.<sup>1,2</sup> In addition, >500,000 earthquakes are documented each year; approximately 3,000 are perceptible by human populations, and 11 resulted in significant loss of life.<sup>3</sup>

During disasters, especially earthquakes, health systems are expected to play an essential role in reducing mortality and injuries,<sup>4,5</sup> and prehospital and hospital care systems are important components of the health system.<sup>6–9</sup> For appropriate medical response to these disasters, local medical services must have an effective disaster management plan, adequate equipment, and most importantly, trained workers.<sup>10</sup>





Djalali © 2009 Prehospital and Disaster Medicine

Figure 1—Diagram of Iran's disaster management system in 2007 (HAZMAT = hazardous materials)

Iran is a disaster-prone country. The most significant disaster due to natural hazards in Iran is earthquakes, as these events have resulted in >180,000 deaths in the last 90 years.<sup>11</sup> The most recent major earthquake in Iran occurred in Bam, and resulted in >31,000 thousand deaths. Many more were left homeless.<sup>12</sup>

A key lesson learned from the Bam earthquake was that Iran was inadequately prepared for disasters. Local medical services were especially unprepared.<sup>13,14</sup> Damages to the health facilities in the region were extensive (almost total) and the local medical system was not able to manage the casualties without national support.<sup>14</sup>

Since Iran is a high-risk country located on multiple earthquake fault lines, there is a high probability of a similar catastrophe occurring in the near future.<sup>11</sup> In addition, there is a documented lack of local preparedness for disaster response in the medical system.

The model used to develop a disaster management plan for the medical system in Iran and a train-the-trainer method used to educate the responders in the system will be presented.

#### Health and Medical Disaster Management System of Iran

In 2003, Iran revised the structure of its disaster management system. Almost immediately, the country was faced with the Bam catastrophe. Although the high capability

and prior experience of responsible parties ultimately resulted in a successful response, some problems with coordination and control operations were identified.

In Iran, the current (2007) disaster management plan is composed of three main work groups: (1) Prevention and Risk management; (2) Education; and (3) Operation (Figure 1).

One of the educational workgroups is a dedicated "specialized education" workgroup, which is responsible for developing specific training programs for experts of the various Ministry Offices, such as the Ministry of Health and Medical Education (MOHME). However, during a disaster, each of these Ministries actually is managed under the authority of operational workgroups for the preparedness and response phases of the disaster management cycle. As such, training is an especially important element for all of the Ministries.

Among the operational workgroups, the Health and Medical workgroup is responsible for: (1) establishing standard preparedness measures for all related parts of the MOHME, and (2) managing all of the teams and organizations toward a better disaster response. The key strength of this workgroup is the establishment of the Secretariat of Health Risk Management for disasters, which is in charge of coordinating the programs and activities of internal and external stakeholders as well as the utilization of all capac-

ities and capabilities in the Ministry and medical universities of the country.

In Iran, there are 41 medical sciences universities, which are all under the authority of the MOHME, and are responsible for establishing a provincial (or local) Disaster Management Task Force for the Health and Medical Workgroup, in the area of their authority.

In order to improve the level and quality of coordination and control during preparedness and response phase activities, the Iranian MOHME has organized these 41 universities into nine main regional collaborating centers, and all disaster related activities for each university are managed through the corresponding center.

#### Planning for Specialized Education

Although each operational workgroup is responsible for maintaining an acceptable preparedness level in its region, educational planning is conducted by another workgroup, the Ministry of Science, Research & Technology. This complex structure has resulted in a lack of necessary training programs available to experts of specialized organizations, e.g., MOHME. As a result, as of 2007, the country still lacked a comprehensive training program for its Health Disaster Management Task Force from the MOHME. Furthermore, there was no comprehensive, integrated, disaster management plan for the MOHME, the nine regional collaborating centers, or the 41 medical sciences universities.

#### Regional and Local Educational Programs

As the first step for developing a medical disaster management plan for the medical sciences universities, the Secretariat of Health for Risk Management in Disasters decided to designate key stakeholders and experts from the nine regional collaborating centers so that they could begin to develop the health disaster management plans for their area and train the personnel who would be involved in these plans. A National Board of the MOHME, which was composed of center disaster planning experts and experienced personnel was established. The National Board arranged a training program to address medical disaster management. A qualified training team was designated to conduct this program in each collaborating center. All of the collaborating centers were asked to identify 5–7 experts (physicians, nurses, and paramedic technicians) from each member university. All participants had disaster management experience and had worked in the field of medical disaster management for  $\geq 2$  years.

#### Overview of the Training Program

The training programs consisted of eight units that covered relevant aspects of medical disaster management. The units included: (1) hazards identification; (2) risk management; (3) structural and non-structural mitigation in health facilities; (3) principles and methods of disaster management planning; (4) hospital disaster management plan; (5) medical and health incident management; (6) hospital incident command system; (7) contingency disaster management plans; (8) hospital-based management of hazardous materials (HAZMAT) emergencies; (9) conducting a tabletop exercise (Table 1).

#### Methods and Results

##### Developing Training Courses

Ten training courses were conducted over the course of six months in 2007/2008. Each training program lasted three days (27 hours). There were 30–35 people in each course, and a total of 323 participants were trained. The training program included classroom lectures, group work activities, movie presentations, and a tabletop exercise.

At each course, a 20-item pre- and post-test covering the course content was administered to each participant. The maximum score was 100; the mean score on the pre-test was  $67.1 \pm 11.6$ , while the mean score for the post-test was  $88.1 \pm 6.2$ . A comparison of average scores of the pre- and post-test for participants using the Student's *t*-test, determined that courses had a significant effect on improving the knowledge of participants ( $p < 0.0001$ ). In addition, participants were given a course evaluation survey to identify their attitudes about the course and their opinion of its quality. The evaluation consisted of 17 numerical scale-based questions with a value of one being least favorable and five being most favorable. Course participants reported that the courses were most favorable and they were completely satisfied (mean =  $4.34 \pm 0.7$ ). In this regard, six questions were related to knowledge, expression, and style of instructors; four questions were regarding quantity and quality of training materials; two questions were related to the efficacy of group work activities; two questions were regarding the practicality of the course content; and three questions were related to the length of the course and comfort of the training site.

All participants were asked to conduct the same training course in their organization, health center, hospital, and/or university for the purpose of enhancing the knowledge of key managers, stakeholders, and workers, and to build capacity at the local and provincial levels, in order to develop a comprehensive medical disaster management plan in Iran.

#### Discussion

Preparedness is the aggregate of all measures, activities, and policies taken by humans before the event; to be prepared for effective response to the event<sup>15</sup>, and a key component of disaster preparedness is education and training.<sup>16</sup>

Despite the 2003 establishment of a disaster management framework that addressed essential functions such as health and medical services in Iran, much still needed to be done. No integrated disaster management plan had yet been achieved, and there was also a lack of a comprehensive training program for the collaborating health centers that were part of the MOHME's Disaster Management Task Force. Furthermore, considering the report of the US Institute of Medicine, which reported that disaster preparedness training for healthcare workers was deficient,<sup>17</sup> there was enough reason to support the idea that Iranian healthcare workers needed to be trained before the country could achieve a comprehensive disaster management system.

The establishment of nine disaster management collaborating centers in the health system of Iran has provided an appropriate base for related programs that could be accomplished across the country, both rapidly and easily. Many experts working in the medical sciences universities were able to be trained effectively. Although designing and con-

#	Topic	Content	Length
1	Hazards identification	Concepts: hazard, event, damage, capacities Type and characteristic of hazards: technological, geological, hydro meteorological, biological	2 hours
2	Risk management	Risk, prevention, mitigation, structural and non-structural vulnerability, risk assessment, risk transfer, retrofitting, and reinforcing	2 hours
3	Principles and methods of disaster management planning	Elements of planning, step-by-step planning, strategic planning, contingency planning, forward planning, cycle of disaster management, elements of preparedness	3 hours
4	Hospital disaster management plan	Principles of HDP, local disaster management plan, related local organizations, planning committee, expected hazards, roles and responsibilities, organization, training and drills, MOUs, maps, documentation, quality assurance, and update of plan	4 hours
5	Medical and health incident management	Incident Command System, coordination of health response in disasters, related response organizations, prevention of diseases and hazards, epidemiology in disasters, mental support, emergency and disaster medicine system, logistics of health system, IT, finance, legal, data process	4 hours
6	Hospital incident command system	Hospital Command Center, incident commander, safety officer, liaison officer, public information officer, technical specialists, elements of finance/administration section, elements of logistics section, elements of planning section, elements of operation section	3 hours
7	Contingency disaster management plan	Internal Scenarios: evacuation of facility, fire, disturbance in heating, ventilation, air conditioning systems, loss of power, loss of water External Scenarios: earthquake, flood, explosive attack	3 hours
8	Hospital-based management of HAZMAT emergencies	Concepts of CBRN, level of medical response to HAZMAT, preparation of an emergency department for HAZMAT emergencies, decontamination kits, PPE, antidotes, procedures	2 hours
9	Tabletop exercise	30 predetermined questions on medical management of an earthquake	4 hours

Djalali © 2009 Prehospital and Disaster Medicine

Table 1—Content of the training course (CBRN = chemical, biological, radiological, or nuclear; HAZMAT = hazardous materials; HOP = hospital disaster plan; IT = information technology; MOU = memorandum of understanding; PPE = personal protective equipment)

ducting this comprehensive training program for all medical universities was the first experience of MOHME's Disaster Management Task Force, similar programs have been conducted by other international health systems.<sup>16-19</sup>

As it was unlikely that a three-day training course alone could lead the learners to achieve required disaster preparedness competencies, MOHME's Disaster Management Task Force directed the collaborating centers to nominate participants who had prior disaster management experience, knowledge, and capabilities. Consequently, a significant improvement of knowledge among the participants was achieved.

This program focused on disaster management methods, however, mass-casualty management competencies were included as secondary objectives. Although a mass-casualty training program is essential for preparing a med-

ical system for responding to disasters, it is being considered as another division of the country's disaster preparedness action plan.

Using this tree-shaped model for training personnel from the 41 medical sciences universities has increased the availability of health and medical disaster management trainers in all collaborating centers in the country. Furthermore, these trained experts will be used as resources for future disaster management planning programs. This tree-shaped model is recommended as a cost-effective, efficient approach for conducting training programs and developing a disaster management plan in a health system for a developing country.

While this is a step in the right direction, it is only a start, and the MOHME's Disaster Management Task Force should implement a defined schedule for developing a standard disaster management system for all of the col-

laborating centers, medical sciences universities, and medical centers in Iran.

### Conclusions

Personnel training is one of the most important elements for capacity building and developing a disaster preparedness plan. Using this tree-shaped model is an effective and practical model for building capacity for national and regional educational programs. This is especially true for health sectors where the target group is selected based on proper criteria (such a prior experience and knowledge) in a developing country.

Course participants showed a significant increase in their level of knowledge and reported high satisfaction from their participation in the training course. Furthermore, many experts were trained and a base for development of a medical disaster management plan for the entire country has begun.

In the future, more attention must be paid to evaluating the actual competency and effectiveness outcomes for these training programs related to developing a medical disaster management plan.

### References

1. Peak-Asa C, Kraus JF, Bourque LB, et al: Fatal and hospitalized injuries resulting from the 1994 Northridge earthquake. *Int J Epidemiol* 1998;27(3):459–465.
2. Schultz CH, Koenig KL, Noji EK: A medical disaster response to reduce immediate mortality after an earthquake. *N Engl J Med* 1996;334:438–444.
3. Marizen Ramirez, Corinne Peek-Asa: Epidemiology of traumatic injuries from earthquakes. *Epidemiol Rev* 2005;27:47–55.
4. World Health Organization: Guidelines on non-structural safety in health facilities. Available at [http://www.searo.who.int/en/Section1257/Section2263/Section2304\\_13272.htm](http://www.searo.who.int/en/Section1257/Section2263/Section2304_13272.htm). Accessed October 2008.
5. Pan American Health Organization. Principles of Disaster Mitigation in Health Facilities. Available at <http://www.paho.org/English/PED/mitigation3.pdf>. Accessed July 2008.
6. Barbera JA, Macintyre AG: Medical and health incident management (MaHIM) system: A Comprehensive Functional System Description for Mass Casualty Medical and Health Incident Management. Available at <http://www.gwu.edu/~icdrmpublications/MaHIM%20V2%20final%20report%20sec%202.pdf>. Accessed May 2007.
7. Angus DC, Pretto EA, Abrams JI, et al: Epidemiologic assessment of mortality, building collapse pattern, and medical response after the 1992 earthquake in Turkey. *Prehosp Disaster Med* 1997;12:222–231.
8. Fawcett W, Oliveira CS: Casualty treatment after earthquake disasters: development of a regional simulation model. *Disasters* 2000;24:271–287.
9. Tanaka H, Iwai A, Oda J, et al: Overview of evacuation and transport of patients following the 1995 Hanshin-Awaji earthquake. *J Emerg Med* 1998;16:439–444.
10. Mohammad J: Emami, Strategies in evaluation and management of Bam Earthquake victims. *Prehosp Disaster Med* 2005;20(5):327–330.
11. National report of the Islamic Republic of Iran on disaster reduction. Available at <http://www.unisdr.org/eng/mdgs-drr/national-reports/Iran-report.pdf>. Accessed October 2008.
12. World Health Organization. The Government of the Islamic Republic of Iran and WHO Joint Project for: Reconstruction of Health Services in Bam. Available at [http://www.preventionweb.net/files/2619\\_BamPlan16.pdf](http://www.preventionweb.net/files/2619_BamPlan16.pdf). Accessed November 2008.
13. Saghafinia M, Araghizade H, Nafissi N, Asadollahi R: Treatment management in disaster: A review of the Bam Earthquake experience. *Prehosp Disaster Med* 2007;22(6):517–521.
14. World Health Organization: Health sector response to Bam earthquake. 2005. Available at [http://www.emro.who.int/publications/Book\\_Details.asp?ID=195](http://www.emro.who.int/publications/Book_Details.asp?ID=195). Accessed September 2008.
15. Birnbaum ML, Sundnes KO: Health Disaster Management: Guidelines for Evaluation and Research in the “Utstein Style.” Glossary of Terms. *Prehosp Disaster Med* 2002; 17(Suppl 3):144–167.
16. Kulling PEJ, Holst JEA: Educational and training systems in Sweden for pre-hospital response to acts of terrorism. *Prehosp Disaster Med* 2003;18(3):184–188.
17. Collander B, Green B, Mollo Y, et al: Development of an “all-hazards” hospital disaster preparedness training course utilizing multi-modality teaching. *Prehosp Disaster Med* 2008;23(1):63–67.
18. Hsu EB, Thomas TL, Bass EB, et al: Healthcare worker competencies for disaster training. *BMC Med Ed* 2006;6:9.
19. Hsu EB, Jenckes MW, Catlett CL, et al: Effectiveness of hospital staff mass-casualty incident training methods: A systematic literature review. *Prehosp Disaster Med* 2004;19(3):191–199.