

cated physiotherapy instruments that could operate on a battery, so they could be used in smaller villages. It also contained a mobile X-ray machine. Allied services offered included supplies of prosthetics, wheelchairs, etc., and the free hospitalization and surgeons services through honorary consultants.

This project completed one year of operation on 31 March 1995. So far, it has served around 400,000 of the population; and with the help of one full-time doctor and physiotherapist, has served around 1,528 patients in 42 villages. This is a pioneering effort for the restoration of the physical health of disaster victims.

### 087. Emergency Medical Care for Victims of the Great Hanshin Earthquake

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Quite a big earthquake of magnitude 7.2 (Richter scale) occurred on 17 January 1995 in Hanshin area of Japan. More than 5,000 lives were lost. We established a nongovernment organization (NGO) medical project in Nagata Ward, which is one of the most heavily damaged zones in Kobe city. We opened a 24-hour clinic in the public health center and started to provide medical care in some shelters. Given the nutritionally and environmentally bad conditions, most of the people in the shelters were suffering from a common cold. Some needed DIV and/or antibiotics. Severe dehydration due to fever and diarrhea induced pre-shock states in a few patients.

During the next stage, we managed patients with chronic diseases such as hypertension, diabetes, asthma, and mental disorders because they had left their daily drugs in their destroyed houses. The stress associated with the incident worsened their conditions. We not only waited for the patients to come to the clinic, but we went to the field and into the shelters to seek the patients. This was very important because some victims were living in places where the administration could not check, and some had no one to help take care of them. Participation of medical specialists, such as pediatricians and psychiatrists, is desirable; and logistics were also considered to be important

### 129. Hospital Damages at the 1995 Great Hanshin-Awaji Quake

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At 05:46 hours on 17 January 1995, the worst earthquake in postwar-Japan occurred in Hanshin area (population: 2 million). The epicenter was under Awaji-shima island, 20 km south of the major port of Kobe city, and the intensity was magnitude 7.2 (Richter scale). This quake killed more than 5,500, injured nearly 35,700, and left 320,000 homeless.

As we already have reported at the 8th World Congress of Disaster and Emergency Medicine,<sup>1</sup> hospital preparedness in this area was not sufficient. After the quake, hospitals in the affected area accepted many patients, but those hospitals were confused and could not triage the victims systematically because of the lack of a hospital disaster plan. Moreover, 72% of hospitals did not have water available because of distraction of the piping system or emergency water-supply tanks; 34% did not have generator systems available because the cooling system for them required water; and 28% did not have oxygen and compressed gas supplies available because of distraction of the piping systems.

More detail will be provided concerning hospital vulnerability against earthquakes.

#### Reference

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### 057. Earthquake Scenarios—A Tool for Earthquake Disaster Preparedness

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One of the more difficult tasks in initiating earthquake preparedness plans is to estimate what might happen during a strong earthquake. Many of the complications relate to the fact that this is a multidisciplinary problem where different professionals speak different "languages."

We are trying to overcome this problem by preparing a detailed and practical earthquake scenarios using "Enigma," a personal computer-based Geographic Information System (GIS). Our first pilot project is the town of Eilat, located in a part of the Dead Sea rift zone, which is seismically active and potentially may produce strong earthquakes at close proximity to the town. It is the first time that actual requirements for earthquake loss assessments in Israel have been fully explored. We have undertaken to:

- 1) Use the Enigma GIS software (a commercial product) for database management, map zooming (from regional dimensions to neighborhood size), information overlay, and parameter computation;
- 2) Collect physical data such as distribution and physical dimensions of buildings, population density, building functions, critical facilities (ports, oil storage tanks, factories, etc.) and life lines;
- 3) Collect geological and geotechnical information such as main active faults, soil distribution, slope information, underground water levels, and geotechnical properties of the underlying soil layers;
- 4) Collect engineering parameters; types of structures and their associated vulnerability and expected damage matrices as a function of seismic intensities and ground-shaking parameters; and
- 5) Collect seismological information: distribution of seismicity.

genic zones and their seismicity parameters, attenuation functions, response functions for different soil and structural conditions, and conversion functions of seismological parameters.

So far, we have relied on generally obtainable statistics from the USA for estimating the dimensions of the medical problem, i.e., slightly and severely injured people and expected death toll. We lack statistics for a more detailed differentiation of the medical parameters to be estimated, and do we know how to categorize them. Current evaluations and the main problem of making the evaluations in Eilat will be demonstrated and discussed.

#### 144. Medical Supports by Emergency Medical Centers in Osaka following the Great Hanshin Earthquake

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At 05:46 hours on 17 January 1995, the Great Hanshin Earthquake struck Kobe and its surrounding area. These regions are one of the most densely populated areas in Japan. The toll from the earthquake has reached 5,400 dead and 32,000 injured. Many of hospitals in Kobe area also suffered severe damage. On the other hand, Osaka, which is only 30 km to the east of Kobe, experienced almost no damage. The medical-support activities performed by nine emergency medical centers in Osaka prefecture will be described. The activity associated with the use of a doctor car on the disaster site also is reported.

A total of 260 patients were hospitalized in these emergency medical centers from the affected areas by 24 January. Only 19 patients were transferred to Osaka on the day of the earthquake. Two hundred twenty-eight patients (88%) were transferred the afternoon of 18 January. Out of 260 patients, 18 patients were transferred using helicopters. The reasons for the delayed transfer of these patients were: 1) hospitals in the affected areas did not get accurate information because telecommunications had become crowded and entangled; 2) heavy traffic congestion on routes between Kobe and Osaka made transportation by ambulance almost impossible for the first two days; and 3) emergency medical systems using helicopters were not organized.

Communication systems for the exclusive use of medical facilities and emergency transportation system using helicopters are necessary even in urban areas.

#### 151. Medical Aspect of a Nuclear Power Plant in Hokkaido Southwestern Offshore Earthquake

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**Introduction:** On 12 July 1993, a severe, offshore earthquake, magnitude of 7.8, and a subsequent tidal wave struck the Hokkaido Island which is 22% of the territory of Japan. A nuclear power plant, named Tomari power station, was only about 116 km from the epicenter, but was undamaged. There are 49 nuclear power plants in Japan. Considering the worst scenario, we investigated the medical aspects of an accident at the Tomari power station.

**Result:** The power plant is constructed on hard rock. It was designed with a safety margin against earthquake, and the nuclear reaction stops automatically on the occurrence of a great earthquake. If an accident occurs and a person is injured, this person automatically is transferred to the decontamination room, then to the emergency room in the plant, and eventually to the hospital. If the contamination is difficult to remove, minor surgery can be accomplished in the emergency room. Personnel are required to consult a specialist in nuclear and critical care medicine.

**Conclusion:** An accident of nuclear power plant can cause serious and long-lasting damage to residents in the wide area surrounding the facility. It is important to evaluate the medical aspects of nuclear power plants in case it breaks down.

#### 097. Casualties of Hanshin Big Earthquake Transferred from Disaster Area to the Critical Care Medical Centers in Osaka

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The Hanshin Earthquake that struck Kobe and the adjacent cities early in the morning of 17 January 1995, killed more than 5,300 and injured about 26,000 people. Densely populated modern cities were left in ruins by the strong quake that lasted only about 20 seconds. On the first day, the hospitals in the disaster area were almost isolated because of interrupted telephone lines, destroyed roads, and traffic congestion.

Hospitals in Osaka, where the damages sustained were only slight, prepared many vacant beds and waited for the transfer of the wounded. However, they failed in making contact with the hospitals and ambulance services system of the disaster area, and only 22 casualties were transferred during the first 24 hours to nine critical care medical centers in Osaka. Among them, Osaka City General Hospital accepted 16 severely wounded patients from disaster area in the first day, 25 on the second day, and 16 on the third day. In total, 98 casualties were transferred. Twenty-one of these cases were crush injuries. Fourteen cases were transported by helicopters. Problems with the prehospital care, as a result of the damages to the hospitals, and with the patient transfer system by this unprecedented large-scale earthquake also will be reported.