

Emergency Medical System in Hyogo Prefecture and the Role of Hyogo Emergency Medical Center

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Abstract

1. Problems from the Great Hanshin-Awaji Earthquake

On January 17th,1995, a massive vertical-thrust earthquake deprived us of many precious lives and destroyed urban infrastructure. The scale of earthquake exceed all our expectations, giving rise to many problems in responding to the disaster. As regards medical services, the following problems resulted: unavailability of patients` transportation, severely reduced emergency medical services, inadequate utilization of medical staff and facilities ,and insufficient stocks of drugs and other medical supplies.

2. Countermeasures after the experience of the Earthquake

1) Establishment of disaster-related medical information network

A comprehensive network system is introduced to each of various regional institutions to collect and disseminate medical information in the situation of disaster.

2) Construction of Hyogo Emergency Medical Center

The Emergency Medical Center has hospital function ,as well as other functions such as providing medical information and instruction.

.3) Establishment of strategically located core hospitals in each region

Key words Great Hanshin-Awaji Earthquake. Disaster-related medical information network . Hyogo Emergency Medical Center. Core hospitals

On January 17th,1995, a massive vertical-thrust earthquake, known as the Great Hanshin-Awaji Earthquake deprived us of many precious lives and destroyed urban infrastructure. Houses and buildings collapsed, and fires broke out in many places. The result was a catastrophe which left more than six thousand people dead, more than forty thousand people injured, and many people whose houses were destroyed in the quake. The patients who were presented for treatment had an extensive spectrum of injuries from simple laceration to fatal crush syndrome. In addition, the blackout covered 2 million household, and gas and water supplies were cut off over an extensive area. The regional transportation was paralyzed immediately after the quake, and telephone lines were interrupted, causing major chaos in the affected area. Over thirty thousand people were made instantly homeless and victims who had lost their homes were forced to take refuge in schools and parks.

Table1

Damage in Hyogo Prefecture

- **Casualties :**
 - Dead 6,398 people**
 - Injured 40,082 people**
- **Houses destroyed :**
 - 240,932**
 - houses**
- **(+ Fire) (+7,456 houses)**

[the earthquake struck an aging society]

Inspection doctors inspected 2,416 bodies and estimated the death time. 92% of victims were dead within fifteen minutes after the quake.

Death Estimated Time

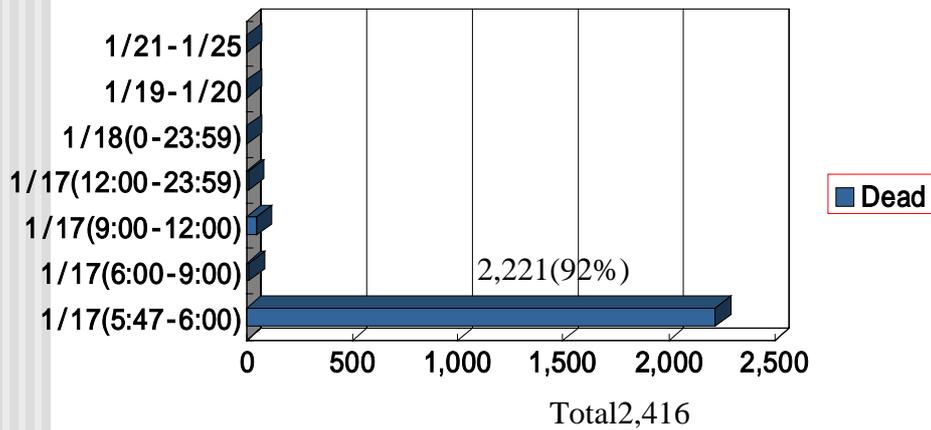


Fig.1

Inspection doctors checked the 3,651 records that many volunteer doctors made. Aging population is about 15% and producing population is about 70%, but the number of deaths of aging group is as same as the number of deaths of producing group.

Age Distribution of the Dead

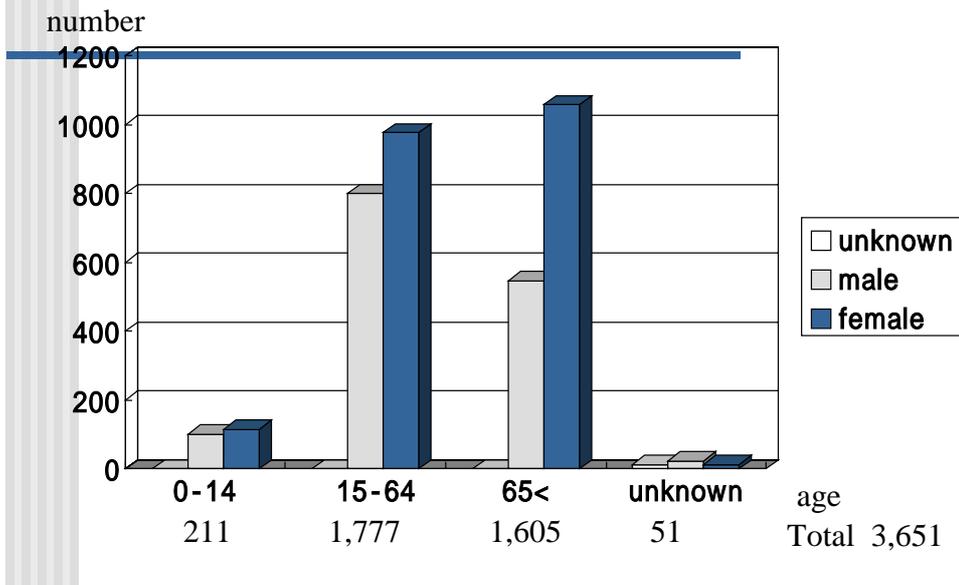


Fig.2

The earthquake struck a region with a rapidly aging population. When old wooden houses collapsed, many senior citizens died under the ruins of their houses or furniture 86.6% of victims were dead in their own houses.

Place of Death

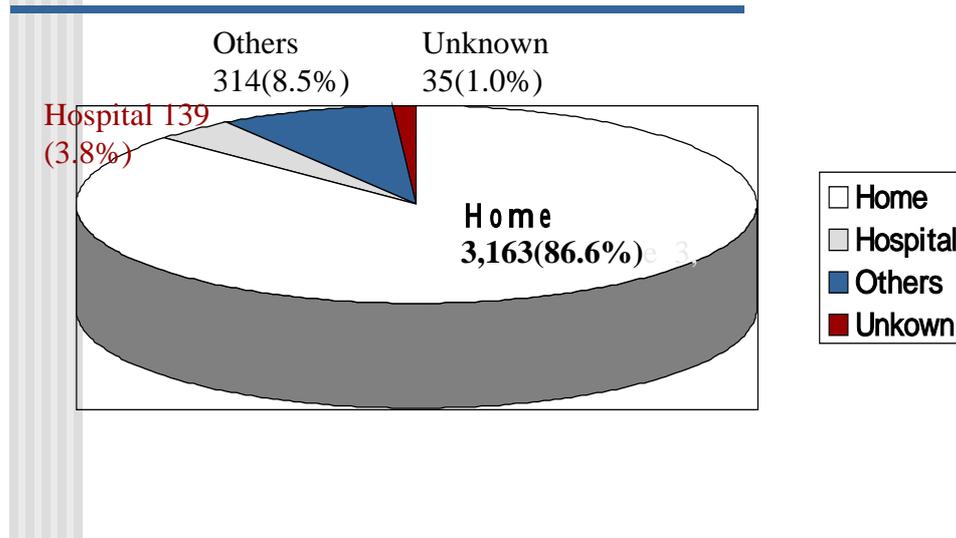


Fig.3

In other words, most of the deaths in this earthquake were caused by the collapse of old Japanese houses. And half of those people were over sixty since the elderly tend to live on the ground floor to avoid climbing stairs.

Furthermore, the survived elderly were forced to live in unfamiliar surroundings at the evacuation centers with great difficulty.

Typical old Japanese wooden houses were collapsed.



Fig.4

Three main causes of deaths were asphyxia, oppression and burn.

Causes of Death

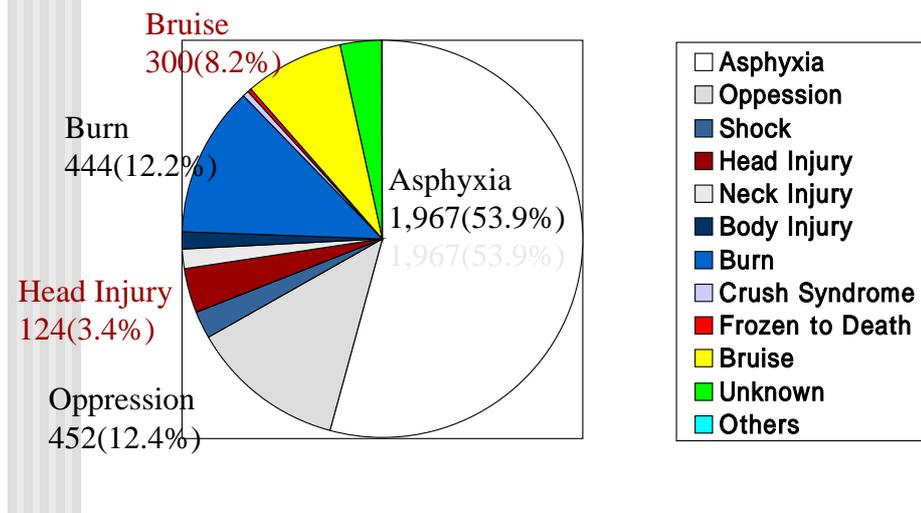


Fig.5

There were many patients suffering from acute renal failure and crush syndrome who

had been rescued from fallen buildings or furniture and admitted to hospital. We had a large number of injuries just after the quake, but later we also had an increasing number of patients with respiratory and circulatory disorders such as pneumonia ,hypertension.or heart disorders in the evacuation Centers due to crowded conditions and lack of sanitation. Furthermore, many people lost their medication and started to become ill several days down the road.

Table2

Inhospital Patents' Results

	Cases	Deaths(%)	Unknown(%)
Crush Syndrome	372	50(13.4)	20(5.4)
Other Injuries	2346	128(5.5)	30(1.3)
Diseases	3389	349(10.3)	334(9.9)
Total	6107	527(8.6)	384(6.3)

[the earthquake caused a severe reduction in the availability of medical services]

At that time, we performed an urgent survey of the inability of hospitals and clinics to function immediately after the quake, and we found that sixteen hospitals had been destroyed severely. Also, evacuation of patients was necessary from 52 hospitals, and hemodialysis was unable to be continued at 13 hospitals.

Table3

The Earthquake causes severe Reduction in the Availability of Medical Services

- Destroyed : 16 hospitals
- Necessity of Patients`
evacuation : 52hospitals
- Incapable of Hemodialysis : 13hospitals

Despite the awareness of Japan to earthquakes , the hospitals might have not been properly Prepared

The causes of reduced medical services were as follows; cut of water supply, interrupted telecommunication ,cut off gas supply , shortage of medical and assistant staff, destroyed facilities or equipment, electricity blackout, shortage of drugs and other medical supplies such as intra-venous solutions or local anesthetic ran out on the first evening.

Causes of Reduced Medical Services

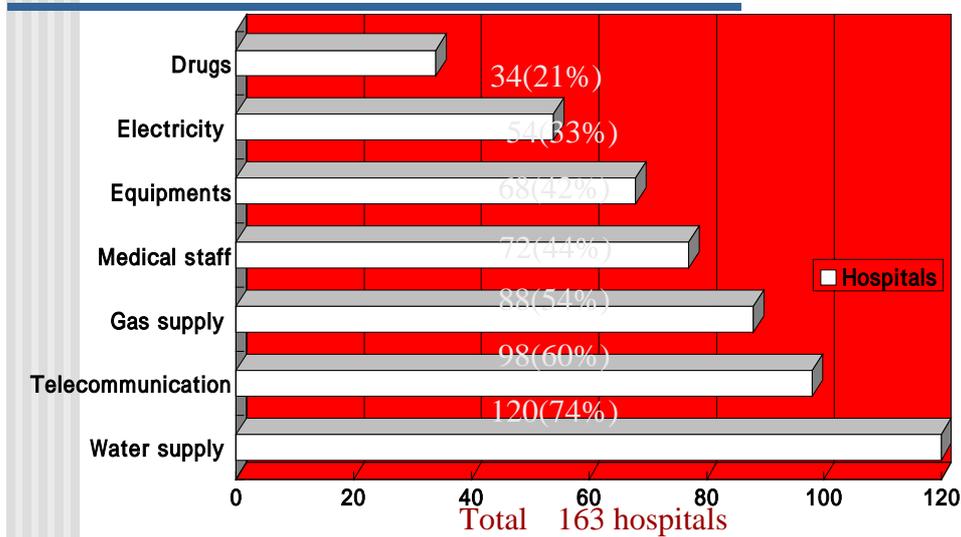


Fig.6

[countermeasures]

First-aid centers or stations were set up for primary medical care, and were manned twenty-four hours per day by medical and assistant staff. At one stage there were one hundred and sixty centers in operation.

It was very pleased to see so many teams dispatched from various organizations to support our medical services such other cities or prefectures , the Self-Defense Force , Japan Red Cross Society, Universities and public hospitals, Doctors Associations, and volunteer groups.

Patients Treated at First-aid Station

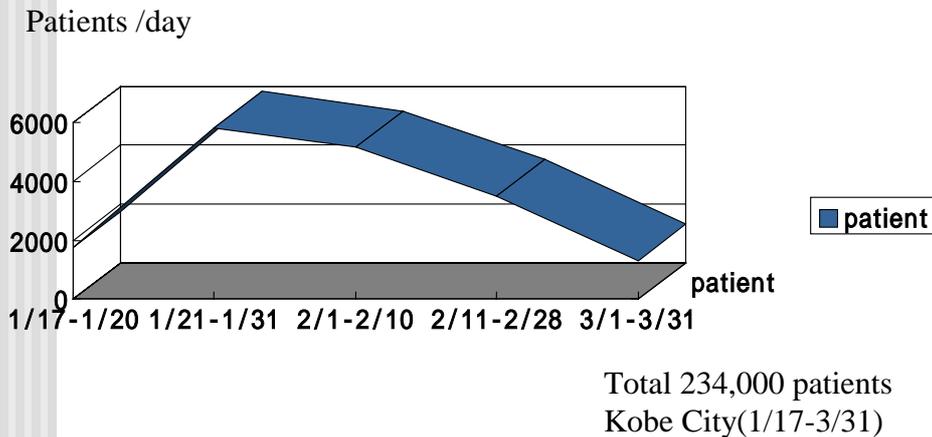


Fig.7

Classification of The Diseases at First-aid Center

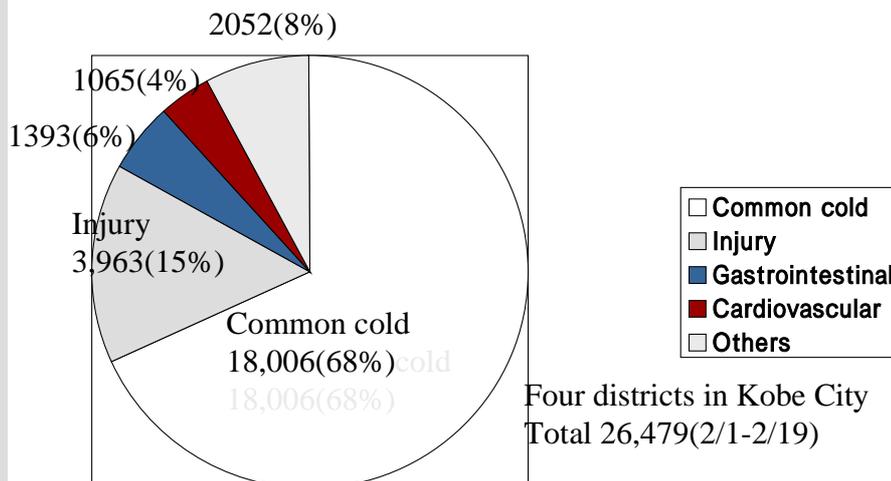


Fig.8

There were unavailabilities of patients transportation and medical supplies, severely reduced emergency medical services ,inadequate utilization of medical staff and facilities.

Very few patients were transported by Helicopter.

Transportation(Hospital to Hospital)

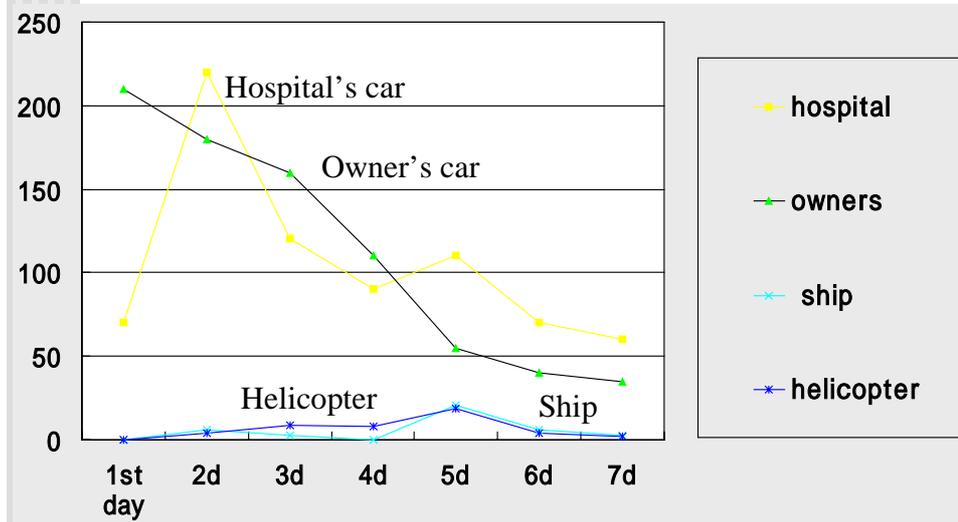


Fig.9

[disaster-related measures; overview]

It is necessary to fundamentally review existing disaster-related measures, and take into account lessons learned from this earthquake.

As regards medical services, the following serious problems were caused. First, the government office of Hyogo prefecture was centrally located in the disaster area, and sustained significant damage of the earthquake. This damage prevented government staff from taking a leading role, therefore our earthquake response plans were not well activated .

[problems from the Great Hanshin-Awaji earthquake]

The scale of earthquake exceeded all our expectations, giving rise to many problems in responding to the disaster, such as the shortage of management staff, a confusing information system, water supply for fire fighting , shortage of materials and equipment to conduct rescue activities, delay in securing emergency transportation routes. and insufficient mitigation function at the evacuation centers.

Table4

Lessons learned from the Great Hanshin
Awaji Earthquake

- 1. Shortage of Management Staff**
- 2. Confusing Information System**
- 3. Restricted the Availabilities of Patients Transportation and Medical Services**
- 4. Insufficient Stocks of Drugs and other Medical Supplies**

[emergency medical system of Hyogo Prefecture in the situation of disaster]

After the experience of this earthquake, we decided to take a leading role in establishing an emergency medical system for Hyogo Prefecture in the situation of disaster .

To cope with disasters of the same magnitude as the Great Hanshin-Awaji earthquake as well as to accommodate a large number of evacuees over long period, various first-aid systems will be prepared.

We are now establishing a disaster-related medical information network, and are planning to construct the Disaster Medical Center (Hyogo Emergency Medical Center), strategically located core hospitals in each region, retaining and training medical and assistant staff. And stockpiling drugs and other medical supplies.

Practical manuals have also been prepared for the improvement of disaster related medical care.

Table5

Emergency Medical System of Hyogo
Prefecture in the Situation of Disaster

- 1. Establishment of Disaster-related Medical Information Network**
- 2. Construction of Disaster Medical Center**
- 3. Establishment of Strategically located Core Hospitals in each Regions**
- 4. Training of Medical Staff**
- 5. Stockpiling of Drugs**

[establishment of disaster-related medical information network]

While keeping the existing system for emergency medical treatment , a comprehensive network system will be introduced to each of various regional institutions to collect and disseminate medical information in the situation of disaster.

The Disaster-related Medical Information Center is being established to distribute medical information and to issue Instructions to medical institutions and ambulance services. This is a wide-reaching telecommunication network, including high-speed dedicated ground or satellite lines, in order to increase the response speed in disasters. This can also be used as an emergency medical network during normal period.

[disaster-related medical information network of Hyogo Prefecture]

In addition to the previously established systems, it is planned to use formation of a new multi-centered network with the use of computers and multi-display phones in metropolitan areas,

This information and control system links Hyogo Prefectural Government with medical institutes, core hospitals. Regional medical information centers, fire departments and the Disaster-related Medical Information Center through high-speed dedicated digital , satellite, or public lines.

We have constructed a system which in normal situations can be used for exchanging

information, in the situation of a disaster , it will support prompt and exact emergency delivery

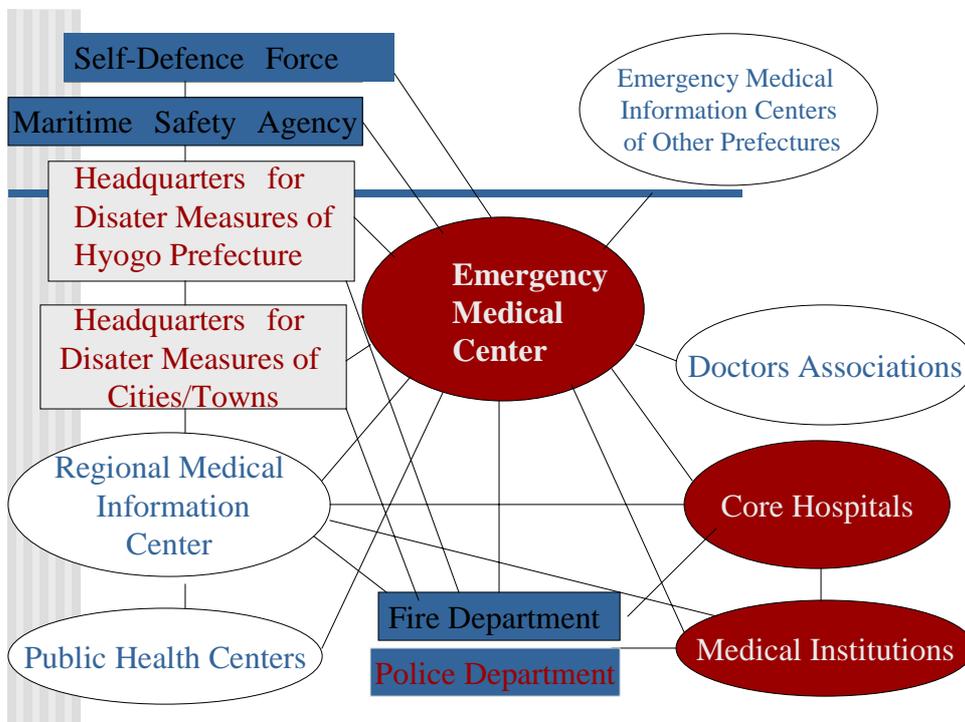


Fig. 10

[Disaster medical center (Hyogo Emergency Medical Center)]

We constructed the Disaster Medical Center named Hyogo Emergency Medical Center at August 1 in 2003.

Hyogo Emergency Medical Center was designated as a Disaster medical center (main core hospital in Hyogo Prefecture) equipped with teaching function to train EMS (Emergent Medical Services) crews, and stock of EMS supplies for emergency delivery.

Functions of the Hyogo Emergency Medical Center

{Every day operations}

Offer rescue and emergency treatment as a rescue and emergency medical center .Operate a doctor car service. Receive patients brought by helicopter.

Manage and operate the emergency information center.

Implement courses, research, and training .

Stockpile medical equipment and materials, drugs,etc.

{Operation during disaster}

Operate a disaster emergency information and instruction center.

Receive patients from the disaster area .

Dispatch relief workers

Hyogo Emergency Medical Center



Fig.11

[information and Instruction Center]

As a main disaster and emergency information center for Hyogo prefecture, the information and instruction center uses the internet to provide emergency medical information to fire stations, medical agencies, and it also provides information regarding medical agencies to the residents of the prefecture. During a disaster, the center collects information about the stricken area and patients received by the various medical agencies concerned, and then passes this information on to related organizations. Also, together with the local medical information centers and emergency hospitals specified for each secondary health care medical area, the center works with the fire fighting organizations, related to medical treatment, volunteers, etc, to secure disaster emergency medical treatment.

Information Control Center



Fig.12

There are ten regional areas in Hyogo prefecture. We also established strategically located core hospitals for providing emergency medical services to regional areas in Hyogo prefecture. There are 15 core hospitals

(4,Kobe,2,Tajima and Nakaharima,1,rest of each regions).

They are the regional bases for treatment of patients in a disaster, having earthquake-proof buildings, large storage facilities for keeping drugs and other medical supplies, large water storage tanks, and electrical power generators.

.These hospitals have a duty to retain and train emergency medical and assistant staff, and to dispatch first-aid teams to disaster area in the situation of disaster.

Ten regional areas in Hyogo Prefecture



Fig.13

(Training and disaster exercises of medical professions and medical volunteers)

Training and exercises are very important for health/medical professionals to understand and enhance their roles in disaster situation. Triage techniques and specific skills to manage common injuries and diseases associated with disasters should be required to understand and practice.

Triage Training



Fig.14

Volunteer induction course for physical therapists and occupational therapists



Fig.15

Conclusion

We must recognize the damage caused by this earthquake as a warning to urban civilization. Based on our experience, we have presented a proposal for an emergency care network designed to facilitate access to and level of medical care in the face of a disaster. We would like to create a society dedicated to public health in preparation for the 21st century.

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