DISASTER MEDICAL SYSTEM IN JAPAN

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2:46 p.m. March 11
HUGE TRAGEDY
HUGE TRAGEDY
HUGE TRAGEDY
Huge tragedy
- 12,431 death
- 15,153 missing
- 2,869 injured

April 6
The National Police Agency
OVERVIEW

- What were lessons learned from great Hanshin Earthquake.
- Development of the system of Japan DMAT.
- Activities of Japan DMAT on the Tsunami disaster
- Distinctive aspect of Medical Burden in this Tsunami Disaster
THE GREAT HANSHIN-AWAJI EARTHQUAKE
1995.1.17

(From the Cabinet Office PR video)
THE GREAT HANSHIN-AWAJI EARTHQUAKE
1995.1.17

- 6473 death toll
- The number of "preventable death" casualties, which could have been saved if standard emergency care was provided, has been estimated as more than 500.
Hospitals were overwhelmed
No power, No water, No line
Lack of staffs, medical supplies, beds
Insufficient surge assistance teams
No medical evacuations by air
Availability of the hospital function among 224 facilities within affected area on the disaster date.
No of Patients (death) treated at each hospital in Nishinomiya City on the disaster date
LESIONS LEARNED
FROM THE GREAT HANSHIN-AWAJI EARTHQUAKE
"THE COMMITTEE ON DISASTER MEDICINE
TO LEARN FROM EXPERIENCES OF THE GREAT HANSHIN-AWAJI EARTHQUAKE"

- The facilities of the local governmental administrations were damaged, and the overloaded telecommunication system severely restricted the availability of information.
- Over the devastating necessity of medical transportation, the co-existing demand of fire fighting, relief and rescue activities disturbed the smooth operations of medical services.
- Many hospitals were functionally restricted due to the damages to utilities (water, electricity and gas) and/or equipment and pipings.
- Due to the absence of adequate triage function, their medical resources were not optimally utilized in some hospitals.
- Due to a belief among people that no major earthquake could hit the Hanshin area, unfortunately disaster preparedness measures were not adequately provided.
- The coordination function of the health centers were appreciated as being very helpful.
THE GOVERNMENT HAS BEEN INTRODUCED

- Disaster Base Hospitals (DBHs) (1996–)
- Disaster/Emegency medical Information system (1996 –)
- Medical Helicopter System (Doctor Heli) (2001 –)
- Wide-area Medical Air Evacuation Plan (2004 –)
- Japan DMAT (Disaster Medical Assistance Team) (2005–)
DISASTER BASE HOSPITALS (DBHS)

- responsible for disaster management in the territory in charge

- Earthquake-resistant construction
- Heli-pad
- Private electric generators
- Earthquake-resistant water tanks
- Supplementary beds and enough space for surge capacity

6,400 hospitals have been designated
Disaster/Emergency Medical Information System

- Extended disaster information
- National extended disaster information
- Response information
- Back-up function
- On-duty doctor information, etc.
- Extended disaster back-up center
- Prefectures
- Mailing list
- Notice/electronic meeting room
- Input of information

Website of extended disaster

- Internet
- General people
- Participating hospitals
- Person in charge at ministries and government offices

In case of disaster

All-at-once reporting about disaster

E-MAIL, tel, fax, pocket bell

Website of extended disaster

Prefectures
Disaster/Emergency Medical Information System

Affected prefecture

Prefectural office
Information center
Local medical association
Public health center
Fire department
Hospital

Non-affected prefecture

Prefectural office
Information center
Local medical association
Public health center
Fire department
Hospital

Affected Area

Non-affected Area
JAPAN DMAT

- Hospital Based Team
- National Standard Training Course (4 days)
- Members Certified by Ministry of Health and Labor
BASIC CONCEPT OF DMAT

DMATs

NEEDs for life-saving medical care

Death

Ordinary Medical teams from
Red Cross Universities
Medical Associations

24 hr

48 hr
BASIC CONCEPT OF DMAT

- Focus on medical care for saving lives of severely injured during ultra-acute phase (<72 hr)
  - Assist disaster base hospitals (triage, emergency treatment, transport by land and air)
  - Engaged in wide-area medical air evacuation
  - Support US&R on site
ASSISTING DISASTER BASE HOSPITALS
SUPPORTING RESCUE TEAM ON SITE
WIDE-AREA MEDICAL AIR EVACUATION

Assembly

Stabilizing

Transporting into the aircraft

Care in the aircraft
WIDE-AREA MEDICAL AIR EVACUATION in Hanamaki Airport

Assembly

Stabilizing

Transporting into the aircraft

Care in the aircraft
JAPAN DMAT REGISTERED PERSONNEL

As of March 31\textsuperscript{st}, 2012

- 496 Medical facilities
- 1002 teams
- 6245 persons

Breakdown

- Physicians: 34%
- Nurses: 41%
- Logisticians: 25%

4-5 persons per team
- Physician: 1-2
- Nurse: 2-3
- Logistician: 1-2
United states：
Large team (>40 members), long mission (2 weeks)
Self-sufficient
Slow response

To make up sufficiently enough power, large number of teams have to assemble very quickly.

Japan：
640 Disaster Base Hospitals (DBHs)
Small team (5 members), short mission (<72 hrs)
DBH dependent and mobile
Rapid response
Disaster Notification: Alert for Stand-by

Disaster Affected Prefectural Office
Turn on “DISASTER MODE”

Ministry of health

Disaster Medical Information System

Prefectural office

DMAT Hospitals

DMAT members’ Mobile phone

E-Mail
When and How many DMATs Showed up at Disaster base hospitals in the affected area?

Saturday 8:43am

Holyday 10:13 am

Thursday 0:26 am

Erathquakes
Niigata Chuetsh-oki
Iwate-Miyagu Nairiku
Iwate Hokubu
Disaster Medical System

- Affected area
- On Site Medical Activities
- Hospitals
- DMAT
- Disaster Base Hospital
- Non Affected Area
- Wide-area Transportation

Site → Rescue → Affected area → DMAT → Disaster Base Hospital → Non Affected Area → Wide-area Transportation → Hospitals
Wide-area Medical Air Evacuation Plan
Analysis of 2,702 Traumatized Patients in the 1995 Hanshin-Awaji Earthquake.
Kuwagata Y, et al

<table>
<thead>
<tr>
<th>Category</th>
<th>No. of Patients</th>
<th>No. of Intensive Care Patients</th>
<th>No. of Nonsurvivors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crush syndrome</td>
<td>372</td>
<td>262 (70.4%)</td>
<td>50 (13.4%)</td>
</tr>
<tr>
<td>Injuries to vital organs</td>
<td>177</td>
<td>122 (68.9%)</td>
<td>36 (20.3%)</td>
</tr>
<tr>
<td>Intracranial injuries</td>
<td>37</td>
<td>22 (59.5%)</td>
<td>11 (29.7%)</td>
</tr>
<tr>
<td>Spinal cord injuries</td>
<td>29</td>
<td>20 (69.0%)</td>
<td>1 (3.4%)</td>
</tr>
<tr>
<td>Intrathoracic injuries</td>
<td>63</td>
<td>51 (81.0%)</td>
<td>5 (7.9%)</td>
</tr>
<tr>
<td>Visceral injuries of the body</td>
<td>48</td>
<td>29 (60.4%)</td>
<td>19 (39.6%)</td>
</tr>
<tr>
<td>Peripheral nerve injuries</td>
<td>42</td>
<td>2 (4.8%)</td>
<td>1 (2.4%)</td>
</tr>
<tr>
<td>Fractures of skull or face</td>
<td>30</td>
<td>4 (13.3%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Others</td>
<td>57</td>
<td>8 (14.0%)</td>
<td>7 (12.3%)*</td>
</tr>
<tr>
<td>Unknown</td>
<td>113</td>
<td>2 (1.8%)</td>
<td>67 (59.3%)</td>
</tr>
<tr>
<td>Total</td>
<td>2,702</td>
<td>513 (19.0%)</td>
<td>178 (6.6%)</td>
</tr>
</tbody>
</table>

* Includes six cases with asphyxia resuscitated after the extrication.
THE TARGET MALADIES OF WIDE-AREA MEDICAL AIR TRANSPORTATION

- Crush syndrome
- Extensive burn injury $20 \leq BI \leq 50$
- Injury to the trunk and limbs
- Head injury.
TRIAGE CRITERIA FOR PATIENTS WITH INJURY TO THE TRUNK, LIMBS OR HEAD

A
- Tracheal intubation
- Artificial respiration
- Intratracheal bleeding

B
- Thoracic drainage
- Massive air leakage
- Massive hemothorax (≥500 ml)

C
- FAST
- Pericardial fluid accumulation
- Fluid accumulation in abdominal cavity

D
- Pelvic X-ray
- Unstable pelvic fracture
- Stable pelvic fracture (shock +)

GCS ≤13 indicates:
- Decrease in consciousness level
- Pupillary inequality
- Hemiplegia
- Open skull fracture

Acute epidural hematoma
Acute epidural hematoma with primary causes other than cerebral contusion
Fracture extending across the middle meningeal artery and venous sinus

Brain injury detected by head CT
GCS ≤13
Head injury in patients predisposed to bleeding
Head injury requiring tracheal intubation
Skull base fracture

Peritoneal irritation symptom
Aortic injury
Tracheal/bronchial injury
Diaphragmatic injury

Multiple shaft bone fracture
Severe soft tissue injury

Stable pelvic fracture (hemostatic treatment required)

Other: Degree of urgency
Within 8 hours
Within 24 hours
Triage criteria for Crush Syndrome

克拉ッシュ症候群

病院へ搬入されるのは発災後3時間以降

診断のポイント

- 長時間、四肢臀部を重量物で挟圧されたエピソード
- 患肢の知覚運動麻痺
- 黒褐色尿

注意！（クラッシュ症候群の早期では、多くの場合）

バイタルサイン安定
患部皮膚は肉眼的には正常
患部の腫脹を認めない
疼痛を訴えない

初期治療のポイント

急速輸液が最も重要な初期救命治療！

- 生理食塩水または乳酸リンゲル1000mlを全開輸液
- 膀胱カテーテル留置

利尿なし

緊急度A
- 輸液をさらに継続しつつ
- 直ちに広域搬送

利尿あり

緊急度B
- 輸液速度をゆるめ、広域
- 搬送の待機
# Predicted Number and Priority of Target Patients of Wide-Area Medical Transportation (Tokai Earthquake Model)

<table>
<thead>
<tr>
<th>Target transportation time (time from onset of disaster to reception to the hospital outside the affected area)</th>
<th>Number of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>injury to the trunk and limbs</td>
</tr>
<tr>
<td>3 hours</td>
<td>3 - 10</td>
</tr>
<tr>
<td>8 hours (priority A)</td>
<td>30 - 50</td>
</tr>
<tr>
<td>24 hours (priority B)</td>
<td>50 - 80</td>
</tr>
<tr>
<td>72 hours</td>
<td></td>
</tr>
</tbody>
</table>

Predicted number of patients qualified the criteria for air transporta

<table>
<thead>
<tr>
<th>Within 8 hours</th>
<th>100 - 150</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within24 hours</td>
<td>400 - 600</td>
</tr>
<tr>
<td>After 24 hours</td>
<td>130 - 180</td>
</tr>
</tbody>
</table>
WIDE-AREA MEDICAL TRANSPORTATION PLAN FOR THE TOKAI EARTHQUAKE

Dispatch of DMATs
1. Kobe Airport
2. Hiroshima-Nishi Airport

Transport of patients
1. Camp Utsunomiya
2. Camp Somagahara

Kose Sports Park

1. Itami Airport
2. Kobe Airport
3. Kansai International Airport
4. Fukuoka Airport

Haneda Airport

Nagoya Airfield

Itami Airport

Fukuoka Airport

Shizuhama Airbase

Hamamatsu Airbase

Sendai airport

Ashitaka Athletic Park

Chitose airport
The activities of Japan DMAT in this devastating disaster
Summary of Japan DMAT activity

Number of DMATs: 383 teams, 1852 personnel
Active period: 3/11 ~ 3/22 (12 days)
Dispatched to:
  - Iwate 94 teams, Miyagi 108 teams
  - Fukushima 44 teams, Ibaragi 27 teams
Activities:
  - Support hospitals, Patient transport,
  - Wide-area air evacuation,
  - Patient evacuation from hospitals

Dispatched by Air
DMAT 82 teams 407 personnel
DMATs in Action (March 11) 45 TEMAS (115 Teams Moving)
DMATs in Action (March 12) 277 teams (14 teams moving)
DMATs in Action (March 13) 264 teams (21 teams moving)

- Ishinomaki
- Hanamaki Air port
- Kuji
- Miya
- Kamaishi
- Hanamaki Red-Cross Hospital

- Sendai city
- Sendai Medical Center
- Sendai city hospital
- Camp Kasuminome
- Shelters

- Fukushima Medical University
- Minami Soma
- Fukushima Air port
- Mito
- Kita Ibaragi

- Tsukuba Medical Center
- Outside base
- Chitose Air port
- Osaka Air port
- Haneda Air port
- Fukuoka Air port
DMAT Activities

Support Hospitals inside the affected area

Red area

Yellow area  (electrical power down)
Hanamaki Air Port Staging Care Unit

Neighboring hospitals: 120 patients

Wide-area medical transport: 16 patients
DMAT operations for the Great East Japan Earthquake
Wide-area Medical Transport
(Transporting patients from the affected areas to the non-affected areas)

Number of patients transported: 19

Airplanes used:
Five C1 cargo planes
(March 12 to 15)

3 persons: 3/12 21:38
3 persons: 3/14 19:50
3 persons: 3/15 14:55
6 persons: 3/13 21:25

Hanamaki Airport
Chitose Base
Haneda Airport
Fukushima Airport
Akita Airport

SDF's C1 cargo plane
INPATIENTS EVACUATION FROM HOSPITAL
ISHINOMAKI CITY HOSPITAL
ALL INPATIENTS EVACUATION FROM ISHINOMAKI CITY HOSPITAL
OPERATION OF WHOLE HOSPITAL EVACUATION

Ishinomaki City Hospital

Ishinomaki Athletic Park

To Camp Kasuminome
By aircraft of JSDF
DMAT Activities in Fukushima Prefecture

- Additional Mission
  - Evacuation from the medical facilities in the contaminated area
Situation

- March 15, Government ordered the measure to stay in door
- Area 20km～30km from the plant. Cities and towns lost function without any supplies from outside
- Hospitals unable to continue
- About 1000 patients to be evacuated

Operation

- May 18～22
- DMAT: 25 teams
- actions: At staging base - Survey for radioactive contamination, Triage, First aid, Offer medical care during transportation by land and air
- Total evacuated No. 509 inpatients
The DMAT system worked adequately. Provide the medical support in the ultra-acute phase.
DISTINCTIVE ASPECT OF MEDICAL BURDEN IN THIS TSUNAMI DISASTER
**Medical Needs Were Not High During the Ultra-Acute Phase**
(A Characteristic of Tsunami Disasters)

Number of Victims at the National Sendai Medical Center

<table>
<thead>
<tr>
<th>Date</th>
<th>Red Tag</th>
<th>Yellow Tag</th>
<th>Green Tag</th>
<th>Black Tag</th>
<th>Total</th>
<th>Patients Admitted</th>
</tr>
</thead>
<tbody>
<tr>
<td>March 11</td>
<td>13</td>
<td>30</td>
<td>22</td>
<td>0</td>
<td>65</td>
<td>31</td>
</tr>
<tr>
<td>March 12</td>
<td>13</td>
<td>50</td>
<td>81</td>
<td>0</td>
<td>144</td>
<td>44</td>
</tr>
<tr>
<td>March 13</td>
<td>7</td>
<td>30</td>
<td>78</td>
<td>0</td>
<td>115</td>
<td>28</td>
</tr>
<tr>
<td>March 14</td>
<td>10</td>
<td>55</td>
<td>87</td>
<td>0</td>
<td>152</td>
<td>43</td>
</tr>
<tr>
<td>March 15</td>
<td>14</td>
<td>44</td>
<td>103</td>
<td>2</td>
<td>163</td>
<td>42</td>
</tr>
<tr>
<td>March 16</td>
<td>6</td>
<td>24</td>
<td>35</td>
<td>1</td>
<td>66</td>
<td>21</td>
</tr>
<tr>
<td>March 17</td>
<td>7</td>
<td>14</td>
<td>25</td>
<td>0</td>
<td>46</td>
<td>21</td>
</tr>
<tr>
<td>Total</td>
<td>70</td>
<td>247</td>
<td>431</td>
<td>3</td>
<td>751</td>
<td>230</td>
</tr>
</tbody>
</table>

Patient with Hypothermia
Great Hanshin-Awaji Earthquake  
Jan 17th, 1995

Dead and Missing      6,437  
Injured             43,792

morbidity/mortality  6.80

Great Eastern Japan Earthquake  
Mar 11th, 2011

Dead and Missing      18,716  
Injured             6,109  
(as of August 15, 2012)

morbidity/mortality  0.32
DISTINCTIVE ASPECT OF MEDICAL BURDEN IN THIS TSUNAMI DISASTER

- Types of Human damages were **all or nothing**
  - Dead or no injuries
  - Very few severe patients
- Large and many **hospital evacuation** were needed.
  - Isolated area in the Pacific coast
  - Radioactive contaminated area by Nuclear Power Plant
Japan DMAT had been developed focusing on life saving medical management on severe trauma and crush syndrome. In the great east Japan earthquake, however, Japan DMAT had to cope with quite different medical needs.

Aoki T, Shimokawa H, et. al. European Heart Journal 2012
BASIC CONCEPT OF DMAT

NEEDs for life-saving medical care for casualties

Preventable death

DMATs

Ordinary Medical teams from Red Cross Hospitals Medical Association

↑ disaster
NEW MEDICAL BURDEN
IN GREAT EASTERN JAPAN EARTQUAKE

NEEDs for life-saving medical care for crush and trauma

DMATs

Ordinary Medical teams from Red Cross Hospitals Medical Association

↓ disaster

↑ 7 day
Number of Medical Teams dispatched to the Earthquake

DMAT
193 teams

As of July 8th
cumulative total
11,467 personnel
2,421 teams
NEW MEDICAL BURDEN IN GREAT EASTERN JAPAN EARTHQUAKE

DMATs

Blank of Medical resources

Ordinary Medical teams from Red Cross Hospitals Medical Association

NEEDs for life-saving medical care for crush and trauma

↑ disaster
NEW MEDICAL BURDEN
IN GREAT EASTERN JAPAN EARTHQUAKE

New Medical Needs
In non-trauma cases and Hospital Evacuation

Preventable Death

Blank of Medical resources

Ordinary Medical teams from Red Cross Hospitals Medical Association

DMATs

↑

disaster
THE NEXT STEPS OF JAPAN DMAT SYSTEM

- Seamlessly provide sub-acute disaster medical support
- Upgrade the telecommunication equipment
  - Available to connect to internet during a heavy congestion
- Brush-up the wide-area medical evacuation strategy
- Reinforce the logistic support function

Undefeated people
Tokyo Inland Earthquake