# 1.3 Historical developments in Health EDRM policy and research: the case study of Japan


## Authors

**Shinichi Egawa**, **Hiroyuki Sasaki, Anawat Suppasri, Hiroaki Tomita** and **Fumihiko Imamura**, International Research Institute of Disaster Science (IRIDeS), Tohoku University, Sendai, Japan.

**Fuji Nagami**, Tohoku Medical Megabank Organization, Tohoku University, Sendai, Japan.

**Yasuhiro Kanatani**, Department of Clinical Pharmacology, Tokai University School of Medicine, Isehara, Japan.

**Akiko Eto**, Department of Health Crisis Management, National Institute of Public Health, Wako, Japan.

**Yuichi Koido**, Disaster Medical Assistant Team Secretariat, National Disaster Medical Center, Tokyo, Japan.

**Tatsuhiko Kubo**, Department of Public Health and Health Policy, Hiroshima University, Hiroshima, Japan.

**Hiroshi Kato**, Hyogo Institute for Traumatic Stress, Kobe, Japan.

**Yoshiharu Kim**, National Center for Neurology and Psychiatry, Kodaira, Japan.

**Sonoe Mashino**, Research Institute of Nursing Care for People and Community, University of Hyogo, Akashi, Japan.

**Ryoma Kayano**, WHO Centre for Health Development, Kobe, Japan.


## 1.3.1 Learning objectives

To understand the importance of research evidence for Health EDRM policy and practice, considering Japan as a case study, in order to be able to:

1. Review historical examples of disaster impact and response relevant to health.
2. Discuss how changes in health risks and resilience affect disaster impacts, and how disasters affect health risks.
3. Explain improvements in the methods used to assess and minimize health impacts of disasters.

## 1.3.2 Introduction

Disaster risk, which is defined as “the potential loss of life, injury, or destroyed or damaged assets which could occur to a system, society or a community in a specific period of time, determined probabilistically as a function of hazard, exposure, vulnerability and capacity” *(1)*. This definition of risk can apply to all types of hazardous events, including emergencies and disasters. These events are the outcome of the conditions of risk, that is the interrelationship between hazard, exposure, vulnerability and capacity, that are present in a community. This relationship can be expressed as follows:

$$Risk \propto function\ (hazard, exposure, vulnerability, capacity)$$

Disaster risk management relates to efforts to either reduce the hazards, exposure and vulnerability, increase the capacities, or do both.

As a disaster-prone country, Japan has developed a disaster risk reduction (DRR) policy and programme to manage the risks of the large-scale disasters it has experienced through its history, which include earthquakes, tsunamis, typhoons, floods and volcanic eruptions. Although the occurrence of a natural hazard largely depends on geographical and climate conditions, the impact of an event depends not just on the event’s magnitude, but also on vulnerabilities and socioeconomic conditions such as poverty and social development *(2)*. Poor infrastructure and limited disaster risk management lead to higher numbers of deaths, injuries and illnesses in the affected population *(3–6)*.The amounts of missing and out-of-date data that reflect the social development and stability of each community should be considered when calculating the overall risk *(2, 7–8)*.

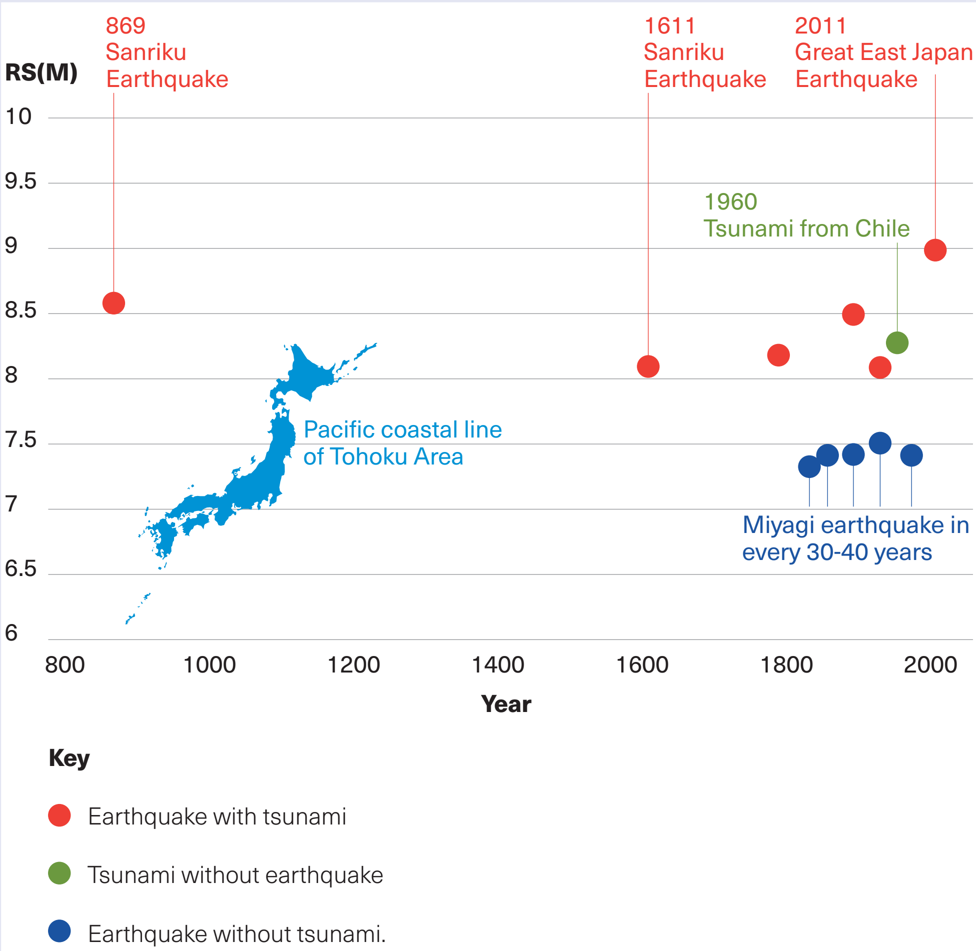
After the onset of a disaster, communities need to put an enormous effort into response, recovery, rehabilitation and reconstruction, as well as into reducing risks and anticipating or preparing for the next hazard event. These cyclical events can spiral into higher levels of risk and worse situations in future unless the aim of “Building Back Better” is achieved, but will worsen if this fails. Research and investment in Health EDRM provide an important means of identifying and managing the risk through these spiral cycles of disasters, and so are identified as priorities in the Sendai Framework *(9)*.

This chapter shows how the environment for conducting Health EDRM research has improved in Japan as a result of historical events *(10)* (see Case Study 1.3.1), and with the transformation and expansion of the country’s disaster medical system (see Case Studies 1.3.2 to 1.3.7). These experiences are also relevant to policy and programme development in other countries.

**Case Study 1.3.1**
**Using the history of disasters to understand disaster risk**

Japan has a long history of preserving documents: the oldest historical record of a tsunami is from the 869 Sanriku Earthquake at Japan Trench, with an estimated magnitude of 8.6 *(11)*. The affected area, Tohoku in the northeast of Japan, has since been affected by several more earthquakes and tsunamis, including the 1611 Sanriku Earthquake, and has experienced magnitude 7 earthquakes every 30 to 40 years. In addition, the 1960 Valdivia Earthquake in Chile led to a tsunami that killed 142 people and affected nearly 150 000 more in Japan (Figure 1.3.1). These level 2 tsunamis occur every 400 to 800 years, and evacuation has usually been the only way to survive *(12)*. More recently, the region has improved its risk management of earthquakes and tsunamis, by building earthquake-proof housing and longer and taller sea walls, and by drawing on community tradition to educate people to evacuate after strong shaking. Although the 2011 Great East Japan Earthquake resulted in more than 20 000 deaths and displaced 480 000 people, the level of vulnerability reduction and capacity building  was not in vain. For instance, seismic-proof buildings that did not collapse and high seawalls, such as that in Taro Town, Iwate Prefecture *(13)*, along with early warning systems and the tradition of self-evacuation behaviour *(14)* all helped to reduce the number of victims.

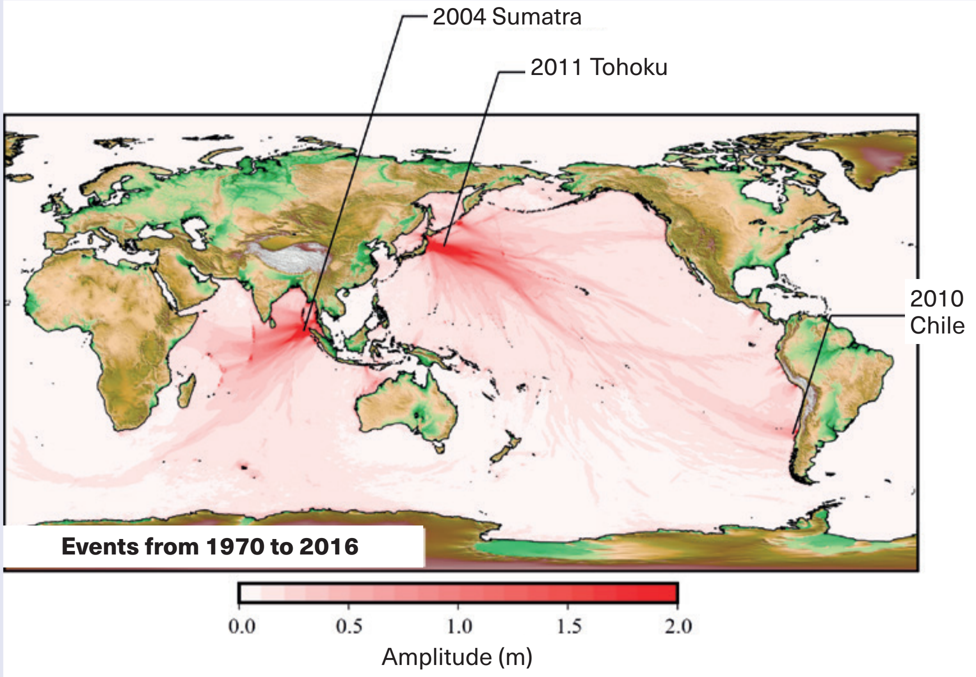
**Figure 1.3.1 History of earthquakes and tsunami in the pacific coastal line of Tohoku area, Japan**



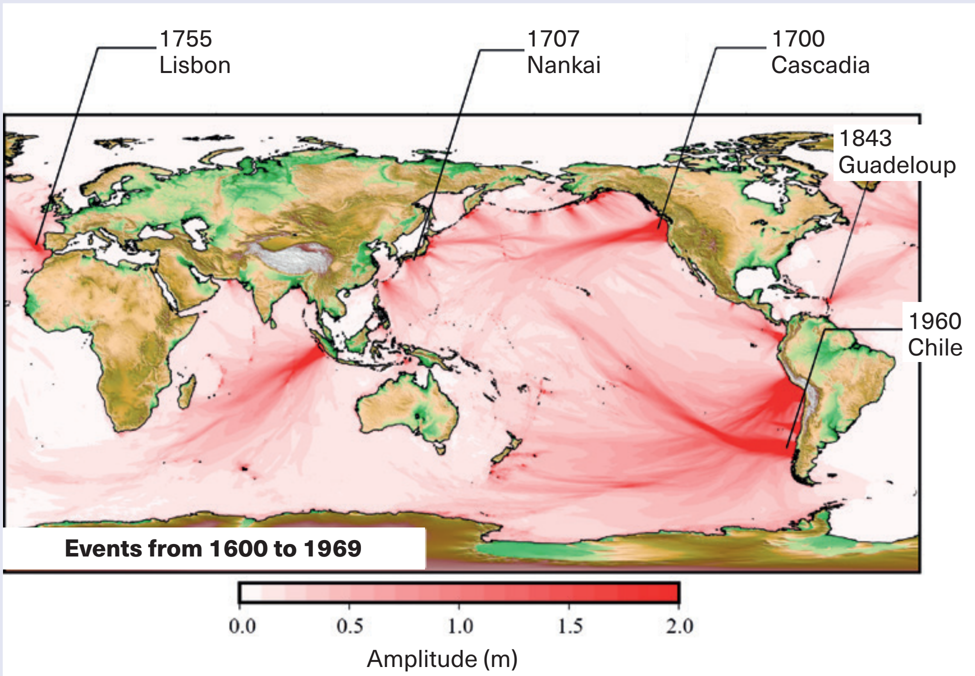
Although tsunamis occurred only in the western Pacific and Indian Ocean from 1970 to 2016, (Figure 1.3.2-A), in the 370 years from 1600 to 1969, major tsunamis had occurred in all areas of the world (Figure 1.3.2-B). This shows the importance of assessing and understanding hazards via historical events, and not relying solely on recent experiences.

**Figure 1.3.2 Simulated maximum tsunami amplitude (adapted from *(15)*)**

A: 1970 to 2016 (47 years)




B: 1600 to 1969 (370 years)



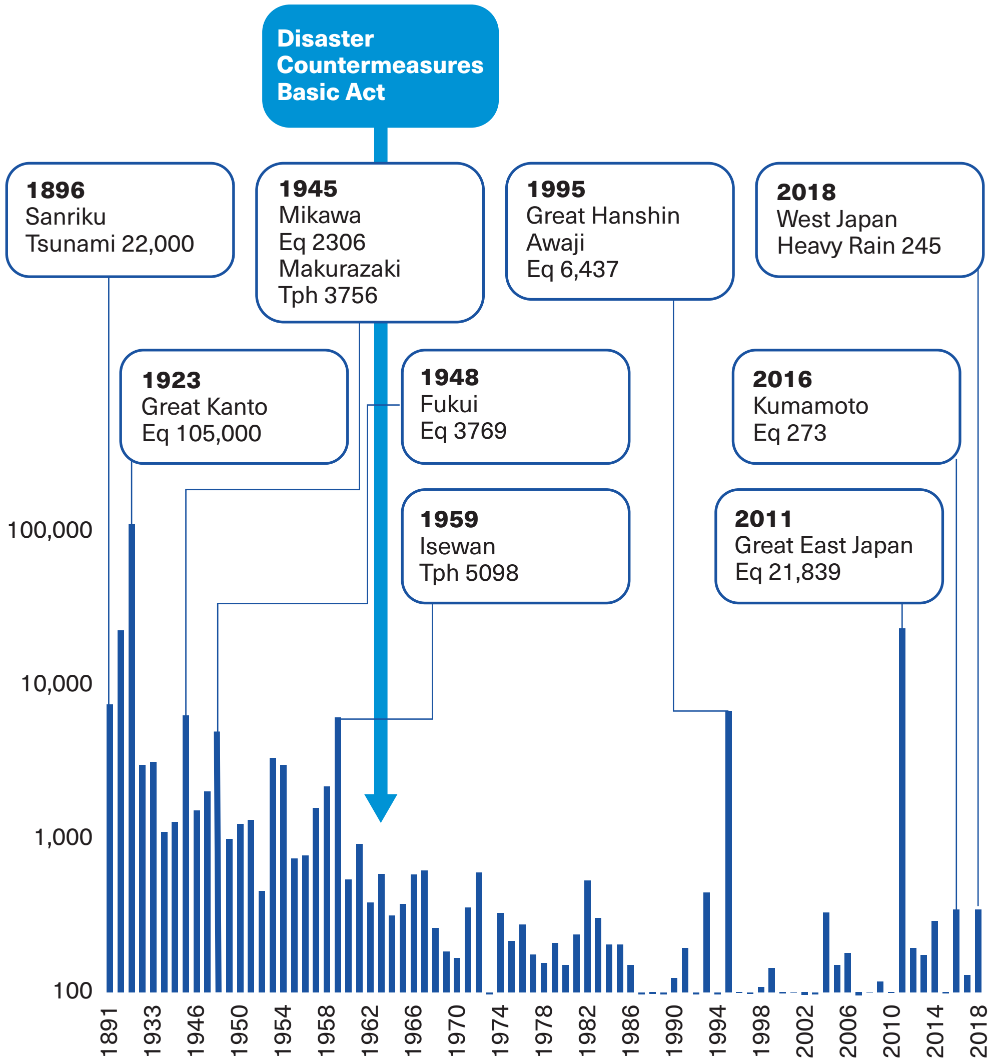
### 1.3.3 Large-scale disasters prompt policy changes to address health needs

On 1 September 1923, the Great Kanto Earthquake struck the Tokyo metropolitan area and more than 100 000 people were trapped in collapsed buildings or killed by fire. As a consequence, the building code first enacted in 1920 was modified in 1924 to triple the mechanical safety factor. After World War II, Japan experienced several earthquakes and typhoons that killed thousands of people (Figure 1.3.3), leading the Government of Japan to establish the Disaster Countermeasures Basic Act in 1961 (Act No. 223 of 15 November 1961; revised June 1997) and to develop comprehensive and systematic disaster risk management as a national priority *(16)*. Under the Disaster Countermeasures Basic Act, the Government of Japan prepares an annual report, the White Paper, which provides an overview of disasters in Japan, various statistical data and disaster management measures taken by the Government *(17)*.

The building code was revised again several times during the twentieth century, to include regulations to increase lateral seismic coefficient, strengthen reinforced concrete, and set allowable unit stress and horizontal load bearing capacity using evidence from surveillance and research on damaged buildings in earthquakes. After many buildings collapsed in the 1995 Great Hanshin Awaji Earthquake, the current version of the building code was enacted in 2000, requiring buildings to be able to endure at least one violent shake.

The building standard for nuclear reactors was established in 1981 and further modified in 2006. This requires nuclear reactors to be fixed to firm rock bed and countermeasures for possible tsunami inundation. After the 1979 Three Mile Island nuclear power plant incident in the United States of America (USA), the Japan Nuclear Safety Committee established the Disaster Measure around Nuclear Power Plant (Nuclear Emergency Response Guideline) in 1980. Then, after the 1999 Tokaimura critical nuclear incident, that guideline was revised and renamed "Disaster Measure around Nuclear Facility" in 2000. The Nuclear Regulation Authority enforced the current Nuclear Emergency Response Guideline in 2013, after the 2011 Great East Japan Earthquake and Fukushima nuclear power plant incident *(18)*.

**Figure 1.3.3 Number of deaths in natural disasters in Japan**




**Key:** Eq: earthquake, Tph: Typhoon.
The number of deaths in the 1995, 2011 and 2016 earthquakes include disaster-related deaths. Adapted from White Paper of Disaster Management *(19).*

On 17 January 1995, the Great Hanshin Awaji Earthquake (magnitude 7.3) struck the densely populated Kobe City and surrounding area. It caused 6437 deaths and injured nearly 44 000 people, and led to the concept of "preventable disaster death", which is defined as "death occurring during a disaster that would have been preventable under normal conditions of regional health systems" *(20)*. Analyses of the deaths found that 83.3% resulted from crush injuries due to the collapse of buildings and 12.8% were from burns *(22)*. This highlighted the main medical needs in the acute phase (within three days after the onset of the disaster), which were for the treatment of trauma, such as crush syndrome, and severe burns *(22–23)*. However, meeting these needs was especially difficult because 97.8% of the 180 hospitals and 84.0% of the 1809 clinics were damaged *(23)* (see Case Studies 1.3.2 to 1.3.4).

**Case Study 1.3.2**
**Development of disaster nursing support system**

The widespread damage to medical facilities caused by the 1995 Great Hanshin Awaji Earthquake meant that many hospitals and clinics were unable to function. Nurses were one of the main frontline health workers to provide medical support to survivors, but they were also greatly affected by the earthquake themselves. In order to provide the necessary surge capacity, the Japan Nursing Association (JNA) called on volunteer support nurses from across Japan and sent hundreds of nurses to the affected area. The Japan Nursing Association collaborated with Hyogo Nursing Association and the College of Nursing Art and Science Hyogo to coordinate the matching and allocation of volunteer nurses, based on the health needs of local communities. Volunteer nurses were sent to hospitals, elderly care homes and evacuation shelters to serve vulnerable populations, to screen for health problems among evacuees and to improve hygiene in the evacuation shelters.

Following this experience, the Japan Nursing Association established the volunteer nurses dispatching system for the response to disasters. Local nursing associations provide training to nurses willing to support this system and, once they qualify, register them as a Disaster Support Nurse. This system has worked well in several large-scale disasters, including the 2004 Niigata Chuetsu Earthquake, when 400 nurses were dispatched and the 2011 Great East Japan Earthquake, when 3770 nurses were dispatched *(24)*.

To support this initiative by the Japan Nursing Association, Japanese academia has developed disaster nursing capacity building. A national survey in 2005 found that approximately one in nine Nursing Schools in Japan had an independent subject of disaster nursing and 46% included disaster nursing as a part of other subjects *(25–26)*. Globally, the International Council of Nurses (ICN) and WHO have developed the International Council of Nurses Framework of Disaster Nursing Competencies *(27)*, which is being used to educate and train nursing students and professionals around the world *(28)*.

**Case study 1.3.3**
**Development of an acute mental health support system**

Since 1995, the Government of Japan has organized annual workshops for disaster mental health, including treatment for Post-Traumatic Stress Disorder (PTSD), which have been attended by 12 000 mental health professionals. Each local prefectural government appointed the participants to contact when there is a need for mental trauma care in an emergency situation. The Government also tasked the National Center for Neurology and Psychiatry with developing a national guideline for community mental health treatment in disasters. This states that most psychological symptoms after a disaster are natural, common and transient reactions; that psychological debriefing was not proven to be effective for preventing PTSD, and that Psychological First Aid (PFA) was the most recommended psychosocial counter measure immediately after a disaster. The guideline was distributed to every local government in

Japan as a basic national principle for the management of post-disaster mental health and has been translated into Thai and Indonesian.

In Japan, under the Disaster Relief Act, it is the governor of an affected local government who is responsible for requesting assistance and rescue from central and other local governments. Since 1995, this has included the dispatch of mental health care teams, composed of psychiatrists, nurses, psychologists, social workers and clerks, who usually rotate over one or two weeks. In the 2011 Great East Japan Earthquake, 57 teams including 3419 members were sent to disaster areas, and worked in close collaboration with the local prefectural and municipal mental health and welfare centres *(29–30)*.

**Case Study 1.3.4**
**Development of a long-term mental health support system**

As well as establishing a system for acute-phase mental health response after disasters, Japan has also developed a long-term mental health support system for survivors of large-scale disasters (*31–32)*. In response to the need for mental health support among the survivors of the 1995 Great Hanshin Awaji Earthquake, a traumatic stress care centre was established five months after the earthquake and the Disaster-Affected People Assistance Programme was implemented. This provided nearly 21 000 mental health consultations including more than 17 000 outreach visits and nearly 5000 group activities for survivors during its first five years. In 2004, the centre was reorganized as the Hyogo Institute of Traumatic Stress, becoming the first institute in Japan specializing in PTSD treatment, research and training *(33)*.

Building on the work of this centre, mental health care centres for long-term psychosocial support were also established following the 2004 Niigata Chuetsu Earthquake, the 2011 Great East Japan Earthquake and the 2016 Kumamoto Earthquake. The mental health care centre for the 2004 Niigata Chuetsu Earthquake provided more than 9000 consultations for more than 16 000 survivors in ten years. Three mental health care centres were established after the 2011 Great East Japan Earthquake; in Iwate, Miyagi and Fukushima. In collaboration with local municipalities and local academia, each centre has provided specialized care and support based on local needs, including outreach support, in-house consultation, mental health support for healthcare providers, advocacy for local communities and capacity building. These initiatives also enabled long-term follow up of people at risk of mental health disease, providing important data for research, such as that discussed in Chapters 2.1 and 5.1.

1.3

## 1.3.4 The National Disaster Medical System

The experiences of the Great Hanshin Awaji Earthquake described in Case Studies 1.3.2 to 1.3.4 prompted Japan to initiate its National Disaster Medical System. This comprises four components to enhance surge capacity for health response during and after disasters, which are shown in Table 1.3.1.

**Table 1.3.1 Components of the Japanese National Disaster Medical System**

| | |
|---|---|
| **Disaster base hospital** | As of May 2019, 743 tertiary hospitals (with multiple hospitals in each of the 47 prefectures in Japan) are designated as disaster base hospitals, with the following requirements:<br>– Seismic-proof structure<br>– Emergency supply of power, water, medical gas<br>– Emergency department, intensive care unit and heliport.<br>– Business continuity plan (added in April 2019)<br>Disaster base hospitals provide a centre of disaster response in the designated area and host a Disaster Medical Assistance Team (DMAT), composed of its employees, to support affected hospitals. Outside of disasters, disaster base hospitals provide education in disaster medicine to health professionals. The recently added requirement for a business continuity plan aims to strengthen emergency power, water and medical supply based on experience in recent disasters that caused disruption of basic service. All disaster base hospitals had implemented a business continuity plan by August 2019 *(34)*. |
| **Disaster Medical Assistance Team (DMAT)** | DMATs are teams of specially trained medical professionals comprising up to five members, including medical doctors, nurses and logisticians, who are able to work together using a single car. As of April 2017, there are more than 1500 teams registered across all prefectures in Japan. In principle, a DMAT would arrive at the affected area within 24 to 48 hours, under the command and control of DMAT headquarters. DMATs assist affected hospitals, health and welfare facilities, municipal headquarters and manage Staging Care Units (SCU) for wide area transportation, including hospital evacuation. DMAT members update their knowledge and skills through periodic training *(35)* and their education programme was revised after the 2011 Great East Japan Earthquake to focus more on communication, coordination and hospital support, including hospital evacuation *(36)*.<br>The initial concept of DMAT was developed in the USA, and the Japanese version of DMAT and Emergency Medical Information System (EMIS) have been implemented in many medical facilities *(37)*. |
| **Staging Care Unit (SCU) and wide area transportation** | To reduce the number of preventable disaster deaths, Staging Care Units (SCU) are used to select patients who will be transported to non-affected areas. SCUs are often based at an airport close to the affected area and support coordination between medical responders and transportation agencies. The role of SCU with limited resources can be flexible according to the situation *(36–38)*. |
| **Emergency Medical Information System (EMIS)** | EMIS is used to share real-time information among fieldworkers, headquarters and central government. It collects, frequently updates and shares information about the function of disaster base hospitals and other hospitals in the affected area, the status of evacuation centres, field hospitals, DMATs, and road and airport conditions for transportation. The updated headquarters activity plan and record are also shared through EMIS *(37–38)*. EMIS was updated after the 2011 Great East Japan Earthquake to incorporate a geographical information system (GIS) (see Chapter 4.8) in order to allocate the hospitals, clinics, welfare centres and DMATs in real time on a single map to improve efficient data sharing and decision making. |

The Japanese National Disaster Medical System improved the health response to disasters and was successfully implemented in several large-scale disasters after its establishment. However, the Great East Japan Earthquake on 11 March 2011 (magnitude 9.0) that affected a wide area of northeast Japan, causing many tsunamis over 10 meters high and leading to 22 252 deaths and 6233 injured people, identified further health needs, especially in relation to the care of vulnerable populations.

As of October 2011, of 380 medical facilities in the three most affected coastal prefectures (Iwate, Miyagi, Fukushima), 191 had totally or partially lost their ability to have in-patients and 205 facilities were completely or partially unable to accept out-patients. Ten facilities were completely destroyed and 290 facilities were partially destroyed *(21)*. The large size of the affected area, the wide variety of population needs and the range of assistance available made clear the need for disaster medical coordinators *(39)*. For instance, disruption to haemodialysis as a result of loss of electricity and water was an emergent threat to life, and so the network of medical doctors related to haemodialysis collaborated successfully with DMAT to organize the large-scale evacuation of 80 haemodialysis patients from the Kesennuma area of Miyagi Prefecture to Hokkaido and 581 patients from the Fukushima Prefecture (154 to Niigata, 382 to Tokyo and 45 to Chiba), providing temporary dialysis before transfer if necessary *(40)*. This led to the inclusion of haemodialysis liaison as an additional component of the National Disaster Medical System.

In the acute phase after the earthquake, particular challenges included providing support for damaged psychiatric hospitals and ensuring safety, food and medicine for hundreds of their hospitalized patients. Although some mental health professional teams voluntarily supported the affected areas, effective support was difficult to implement because of the lack of clear reporting lines or collaboration agreements *(41)*. In response to the need for mental health support for affected people and damaged facilities, the Disaster Psychiatric Assistance Team (DPAT) was established in 2013 *(42–43)*.

Government facilities and the public health workforce were also severely damaged in the 2011 Great East Japan Earthquake. A total of more than 140 000 person days were provided by external local municipality officials to support the affected areas, but the damage to facilities and the loss of officials meant that the host municipalities lost much of their management and coordination capability and could not effectively allocate or utilize the limited resources *(44)*. Therefore, to address the surge needs for public health and logistical management, Disaster Health Emergency Assistance Teams (DHEAT) were developed.

In addition, further health needs, including evacuation support and follow-up rehabilitation for disabled people and the need for special consideration and follow up for maternal and child health were also highlighted in the management of evacuations. These and other follow-up activities resulted in the development of the Japan Disaster Rehabilitation Assistance Team (JRAT) and Mother and Child Health Liaison.

Another of the significant gaps during the 2011 Great East Japan Earthquake was the lack of any standard medical record form for emergency medical teams. Teams from different organizations used different forms, making it difficult for them to share clinical information. This failure in continuity of care led to the creation of the Joint Committee for Disaster Medical Record of Japan, which proposed a standard disaster medical record form *(45)*. A special feature of this standard recording format is its inclusion of a daily medical report function called J-SPEED (see Table 1.3.2 and Case Study 1.3.5).

The earthquake also highlighted the concept of "disaster-related death" *(46)*. According to the Government of Japan's Reconstruction Agency, as of 21 August 2012 some 1950 people who had initially survived the earthquake and tsunami were confirmed dead due to disaster-induced fatigue, psychological trauma or the aggravation of existing chronic diseases. This concept was further highlighted in the 14 April 2016 Kumamoto Earthquake (magnitude 6.5) where nearly 80% of deaths (218 out of 273, as of 12 April 2019) fell into this category *(46)*. As a consequence, the SPHERE standard *(47)* is increasingly applied to the environmental improvement of evacuation shelters and to the lives of affected people to try to reduce these deaths that are not directly caused by the disaster.

Along with the developments in health response to disasters in Japan described above, there have also been important innovations to improve preparedness for better health response in the acute phase (Case Study 1.3.5) and research to increase health resilience in affected areas (Case Studies 1.3.6 and 1.3.7).

### Table 1.3.2 Additional components of the Japanese National Disaster Medical System introduced after the 2011 Great East Japan Earthquake

| | |
|---|---|
| **Disaster medical coordinators** | Disaster medical coordinators are officially appointed by prefectures and coordinate the activities of external and internal medical assistance teams to maximize their impact on the medical and public health needs of affected populations through close communication with local stakeholders. Following an initial initiative in Hyogo Prefecture after the 1995 Great Hanshin Awaji Earthquake, by 2011 only four prefectures had designated a disaster medical coordinator but, by 2015, 43 out of 47 prefectures (91%) had designated or were planning to designate such a coordinator *(39)*. |
| **Disaster Psychiatry Assistance Team** | Disaster Psychiatry Assistance Teams (DPAT) assist psychiatric hospitals and support surge mental health needs in affected areas after disasters by assessing the local psychiatric needs and collaborating with DMAT and other assistance teams and local psychiatric facilities to provide high quality psychiatric medicine *(43)*. With the support of the DPAT Secretariat, DPAT members update their knowledge and skills through periodic training *(44)*. |
| **Disaster Health Emergency Assistance Team** | Disaster Health Emergency Assistance Teams (DHEAT) assist the management function of the public health sector in affected local municipalities, through information collection, integration, analysis and sharing with fieldworkers. Local municipalities (prefectures, special assigned cities and political areas) are recommended to organize Disaster Health Emergencies Assistance Teams with public health professionals *(48-50)*. The operation plan has been developed since 2014 and has been available on the Ministry of Health, Labour and Welfare website since March 2018. Sixteen local municipalities dispatched Disaster Health Emergencies Assistance Teams to the areas affected by the 2018 West Japan Heavy Rain *(44).* |
| **Japan Disaster Rehabilitation Assistance Team** | Japan Disaster Rehabilitation Assistance Teams (JRAT) assist, in particular, older people and people with disability from the very early phase of evacuation. JRATs promote conversation with evacuated people, set up slopes and handrails in the evacuation centre or in temporary houses, and provide care and supervision. JRATs also provide temporary support devices and aids to promote rehabilitation of affected people. |
| **Mother and Child Health Liaison** | Paediatricians and obstetricians join the disaster medical headquarters team to coordinate mother and child health issues, including perinatal care and mental and physical support of children. |
| **Haemodialysis Liaison** | Physicians network to identify people who need haemodialysis in the affected area and coordinate their transportation to areas outside the affected region. This can include the provision of transitional temporary haemodialysis before patients are sent to more distant hospitals *(40)*. |
| **Standard disaster medical record /J-SPEED** | The disaster medical record has been standardized and all emergency medical teams use it regardless of their organization. This makes it easier to transfer clinical information among medical providers for continuity of patient care. One special feature of this standardization is a daily medical report function called J-SPEED (see Case Study 1.3.5). |

**Case Study 1.3.5**
**Development of health data management systems**

Timely and effective data collection during and after a disaster is key for better health response (see Chapter 4.4) and is a large challenge for national Emergency Medical Teams (EMTs) such as DMAT *(51)*. Having experienced these problems after the 2011 Great East Japan Earthquake, a joint committee was established and started a project to develop a standardized format for medical data collection to support effective information collection, sharing and analysis for the following response. This format was developed with reference to the Surveillance in Post Extreme Emergency and Disaster (SPEED) system, developed by WHO and the Ministry of Health of the Philippines *(52)* (see Chapter 2.2).

The newly developed format, referred to as the Japanese version of SPEED (J-SPEED) includes health conditions such as certain chronic diseases, which are more common in Japan *(53)*. It was successfully used by all national EMTs during recent disasters in Japan, including gathering medical data from 8089 consultations during the 2016 Kumamoto Earthquake, 3620 consultations during the 2018 West Japan Heavy Rains and 591 consultations during the 2018 Hokkaido earthquake. It enabled rapid assessment of the health needs of affected people and significantly contributed to the identification of people who required referrals to specialist teams, acute mental health support (who were referred to DPAT), and other specific health responses *(54)*.

This progress has taken place alongside the development of the WHO Emergency Medical Team (EMT) Minimum Data Set (MDS), a standardized medical data collection and reporting system adopted in 2017.

**Case Study 1.3.6**
**Cohort studies to evaluate longitudinal effects of a disaster on affected communities**

Many cohort studies have been designed and conducted to evaluate longitudinal effects of the 2011 Great East Japan Earthquake on the affected communities. These studies were established as a collaborative effort between local governments and academic institutes in the affected regions to better understand the health condition of residents. Care and follow-up activities were undertaken to improve the health condition of the affected communities based on the outcome of the surveys.

For example, the Fukushima Health Management Survey is conducted by the Fukushima Prefectural Government and the Fukushima Medical University to alleviate residents' concerns over radiation and facilitate appropriate health care of residents in the Fukushima Prefecture. The surveys assess longitudinal health conditions of people who lived in the Prefecture between 11 March and 1 July 2011 *(55-56)*.

As another example, the Center for Community Health was established in Tohoku University to assess the longitudinal effect of the earthquake on affected communities in Ishinomaki city, Shichigahama town and Sendai City *(57)*. The Shichigahama Health Promotion Project was designed and conducted as a collaboration between Shichigahama town and Tohoku

University. The project team conducted annual surveys and follow-up of all residents whose houses suffered major damage *(58)*.

Knowledge accumulated from these activities can be useful not only for improving the health of residents affected by this specific disaster, but also for reducing exposure and vulnerability, disaster preparedness, response to, and recovery from future disasters. Similarly, using the same or a similar format for the collection of health information for people affected by future disasters will support research consistency and should facilitate ethical approval (see also Chapters 3.4 and 6.4).

**Case Study 1.3.7**
**Long-term follow up using registers and biological data**

Tohoku University is one of Japan's leading national universities  and is located in the area affected by the 2011 Great East Japan Earthquake. It initiated the Tohoku Medical Megabank Project in order to restore community medical services in the areas heavily damaged by this earthquake and tsunami disaster, and to establish an advanced medical system to meet the global trend towards large-scale medical information technology. The project is executed in corporation with Iwate Medical University and funded by the national Government of Japan.

The earthquake caused catastrophic damage not only to health facilities but also to the health workforce in the Tohoku District. While the reconstruction of health facilities was implemented relatively successfully with support for infrastructure reconstruction, there was a notable decline in the number of medical professionals in Tohoku. This became alarmingly severe in more recent years and recruiting health professionals to work in the re-constructed medical facilities became critical. This urgent need led to a unique project to develop a centre of future-oriented medical services in Tohoku and to make this a driver for attracting medical practitioners.

Through the Tohoku Medical Megabank Project, an integrated biobank was established of biospecimen and information from cohort studies focused on the effect of the disaster on health *(59)*. There are two initial cohort programmes in the Tohoku Medical Megabank Project: (i) the Birth and Three-Generation Cohort Study and (ii) the Community-Based Cohort Study. Both are predominantly targeting the earthquake-affected areas and consist of multiple components including genomic studies. Along with assessment of the effects of the disaster, participants in these studies can contribute to other independent biomedical research to address knowledge gaps relating to differences between those with and without the same illness who lead the same lifestyle, and differences between individuals who are responsive or non-responsive to various forms of exposure. Several reports from the project have already clarified the influence of the disaster on vulnerable populations *(60)*. This project has enabled the long-term follow up of biomedical aspects of disaster-affected people, as well as promoting large-scale research more generally, which will use the voluntary contributions of the study participants to address other areas of uncertainty.

In Japan, the national Government's disaster management policies are decided by the Central Disaster Management Council, which is chaired by the Prime Minister and includes all Cabinet members. During and after a large-scale disaster, the Cabinet Office is engaged in the collection and dissemination of accurate information, reporting to the Prime Minister, establishment of the emergency activities system (including the Government's Disaster Management Headquarters), and the overall wide-area coordination of disaster response measures. DRR has been carried out using the concept of "Building Back Better" through consultation with scientific experts to help with prediction of hazards, assessment and reduction of exposure and vulnerability, and building of response capacity *(17)*.

Improvements to the National Disaster Medical System is a key part of DRR. Research into Health EDRM is promoted by a grant-in-aid from the Japanese Society for Promotion of Science, Ministry of Education, Culture, Sports, Science and Technology (MEXT) and the Ministry of Health, Labour and Welfare of Japan, while the budget for implementing countermeasures and response comes from the Cabinet Office. Awareness of these mechanisms for research promotion and implementation among researchers is also promoted in order that science and technology can be used to enhance DRR.

### 1.3.5 Conclusions

The long history of large-scale disasters in Japan and the substantial events of recent decades have provided the country with many opportunities to learn from the past to improve Health EDRM for the future. This has made use of evidence from research of many different types, and has led to the implementation of the National Disaster Medical System. This has continued to be refined as new evidence has accumulated, helping to ensure that disaster risk management, including prevention, preparedness, response and recovery, make an important contribution to the health of the nation, and encouraging partnerships between policy makers, practitioners and researchers to lead to further improvements in the future.

### 1.3.6 Key messages

- **Health EDRM requires the continual enhancement of policies and programmes using both historical evidence and up-to-date, reliable, scientific evidence from research. This requires high-quality research, which needs capacity building in research methods and timely, accurate and appropriately collected data.**
- **This chapter featured Japan as an example of applying the principle of Building Back Better through its spiral cycles of disasters. The development of health systems and the health workforce over time in response to the health needs identified in emergencies and disasters has improved data collection, assisted the management of survivors and produced a better environment for research and subsequent policy making.**
- **This chapter illustrates how policy development and the enhancement of health systems have built on evidence from before, during and after emergencies and disasters in Japan, and provides a practical example for other countries.**

## 1.3.7 Further reading

**Hazards and health:**

Menne B, Murray V, editors. Floods in the WHO European Region: health effects and their prevention. 2013. http://www.euro.who.int/en/publications/abstracts/floods-in-the-who-european-region-health-effects-and-their-prevention (accessed 7 February 2020).

**History and perspective of disasters:**

Burkle FM. Challenges of Global Public Health Emergencies: Development of a Health-Crisis Management Framework. Tohoku Journal of Experimental Medicine. 2019: 249(1): 33-41.

**International framework:**

WHO Health Emergency and Disaster Risk Management Framework. https://apps.who.int/iris/bitstream/handle/10665/326106/9789241516181-eng.pdf (accessed 7 February 2020).

Kayano R, Chan EY, Murray V, Abrahams J, Barber SL. WHO thematic platform for health emergency and disaster risk management research network (TPRN): Report of the Kobe Expert Meeting. International Journal of Environmental Research and Public Health. 2019: 16(7): 1232.

UN/ISDR and WHO. Bangkok principles to implement the health aspects of Sendai Framework for Disaster Risk Reduction 2015–2030. 2016. https://www.preventionweb.net/files/47606_bangkokprinciplesfortheimplementati.pdf (accessed 7 February 2020.

**Disaster Medical Needs and Responses in Japan**

Suda T, Murakami A, Nakamura Y, Sasaki H, Tsuji I, Sugawara Y et al. Medical Needs in Minamisanriku Town after the Great East Japan Earthquake. Tohoku Journal of Experimental Medicine. 2019: 248(2): 73-86.

1.3

## 1.3.8 References


1. Terminology on disaster risk reduction. Geneva, Switzerland: UNISDR. 2017. https://www.preventionweb.net/terminology/view/477 (accessed 7 February 2020).
2. Inter-Agency Standing Committee (IASC) (2019). INFORM report 2019. https://www.preventionweb.net/publications/view/62347 (accessed 7 February 2020).
3. CRED and UNISDR. Poverty & Death Disaster Mortality 1996-2015. 2016. https://www.unisdr.org/files/50589_creddisastermortalityallfinalpdf.pdf (accessed 7 February 2020).
4. CRED and UNISDR. Tsunami Disaster Risk 2016: Past impacts and projections. 2016. https://www.preventionweb.net/files/50825_credtsunami08.pdf (accessed 7 February 2020).
5. CRED and UNISDR. Economic Losses, Poverty & Disasters 1998-2017. 2018. https://www.unisdr.org/files/61119_credeconomiclosses.pdf (accessed 7 February 2020).
6. European Union, United Nations, World Bank (2019). Guidelines for Assessing the Human Impact of Disasters. https://www.undp.org/content/undp/en/home/librarypage/crisis-prevention-and-recovery/guidelines-for-assessing-the-human-impact-of-disasters.html (accessed 7 February 2020).
7. Marin-Ferrer M, Vernaccini L, Poljansek K. INFORM index for risk management: Concept and methodology Version 2017. 2017 https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/inform-index-risk-management-concept-and-methodology-version-2017 (accessed 7 February 2020).
8. Egawa S, Jibiki Y, Sasaki D, Ono Y, Nakamura Y, Suda T, et al. The correlation between life expectancy and disaster risk. Journal of Disaster Research 2018: 13: 1049-61.
9. Sendai Framework for Disaster Risk Reduction 2015–2030. UN and UNISDR. 2015 https://www.unisdr.org/we/inform/publications/43291 (accessed 7 February 2020).
10. Imamura F, Suppasri A, Latcharote P, Otake T. A global assessment of tsunami hazards over the last 400 years. 2016. http://irides.tohoku.ac.jp/media/files/archive/global_assessment_tsunami_hazards_400yrs.pdf ( accessed 7 February 2020).
11. Namegaya Y, Satake K. Reexamination of the A.D. 869 Jogan earthquake size from tsunami deposit distribution, simulated flow depth, and velocity. Geophysical Research Letters. 2014: 41: 2297–303.
12. Muhari A, Imai K, Sugawara D, Imamura F. A method to determine the Level 1 and Level 2 tsunami inundation areas for reconstruction in Eastern Japan and possible application in pre-disaster areas. In: Santiago Fandino V, Kontar YA, Kaneda Y, editors. Post-Tsunami Hazard: Reconstruction and Restoration edited by. Post-Tsunami Hazard: Reconstruction and Restoration. 2015: pp.133-55.

13. Miyako City. The Great East Japan Earthquake and Tsunami: Records of Miyako City. Volume 1, History of Tsunami [Summary version in English]. 2015 http://iwate-archive.pref.iwate.jp/wp/wp-content/uploads/2017/02/records_of_miyako_city.pdf (accessed 7 February 2020).

14. Yamori K. Revisiting the concept of tsunami Tendenko: Tsunami evacuation behavior in the Great East Japan Earthquake. In: Kawase H, editor. Studies on the 2011 Off the Pacific coast of Tohoku Earthquake. Natural Disaster Science and Mitigation Engineering: DPRI reports. Springer, Tokyo. 2014.

15. Otake T, Suppasri A, Latcharote P, Imamura F. A global assessment of historical and future tsunami hazards based on seismic records over the last 400 years [Japanese with English abstract]. Journal of Japan Society of Civil Engineers Series B2 (Coastal engineering). 2017: 73 (2): I_1609-I_1614. doi.org/10.2208/kaigan.73.I_1609.

16. National Land Agency. Disaster Countermeasures Basic Act [provisional English translation]. 1997 https://www.adrc.asia/documents/law/DisasterCountermeasuresBasicAct.pdf (accessed 7 February 2020).

17. Cabinet Office, Government of Japan. Disaster management in Japan. 2015 http://www.bousai.go.jp/1info/pdf/saigaipamphlet_je.pdf (accessed 7 February 2020).

18. Itoya S. Nuclear Emergency Preparedness and Response in Japan following Fukushima Accident. Presentation in Regional Workshop on Observing a Nuclear. Radiological Emergency Exercise. 2013 https://ansn.iaea.org/Common/topics/OpenTopic.aspx?ID=13148 ( accessed 7 February 2020).

19. Cabinet Office, Government of Japan. White Paper on Disaster Management [Japanese]. 2019 http://www.bousai.go.jp/kaigirep/hakusho/pdf/R1_fuzokusiryo.pdf (accessed 7 February 2020).

20. Yamanouchi S, Sasaki H, Tsuruwa M, Ueki Y, Kohayagawa Y, Kondo H, et al. Survey of preventable disaster death at medical institutions in areas affected by the Great East Japan Earthquake: A retrospective preliminary investigation of medical institutions in Miyagi Prefecture. Prehospital and Disaster Medicine. 2015: 30(2): 145-51.

21. Ministry of Health, Labour and Welfare (MHLW). Medical Support Activities after the Great East Japan Earthquake [Japanese]. 2012 http://www.bousai.go.jp/kaigirep/kentokai/tamokutekisen/3/pdf/shiryou1.pdf (accessed 7 February 2020).

22. Baba S, Taniguchi H, Nambu S, Tsuboi S, Ishihara K, Osato S (1996). The Great Hanshin earthquake. Lancet 347(8997): 307-9.

23. Ukai T. The Great Hanshin-Awaji Earthquake and the problems with emergency medical care. Renal Failure. 1997: 19(5): 633-45.

24. JNA. Chapter 1 Dispatching disaster support nurses, Efforts of Japanese Nursing Association in the Great East Japan Earthquake [Japanese]. 2012 https://www.nurse.or.jp/nursing/practice/reconstruction/support/report/pdf/hokoku-1.pdf (accessed 7 February 2020).

25. Yamamoto A, Mashino S, Watanabe T, Uyama O, Okuno N, Minami H. Research of current status on disaster nursing education in Japan [Japanese]. Research Report of Education Project for Disaster Nursing. 2006.

26. Yamamoto A. Development of disaster nursing in Japan, and trends of disaster nursing in the world. Japan Journal of Nursing Science. 2013: 10: 162-9.

27. WHO/International Council of Nurses (ICN). ICN Framework of Disaster Nursing Competencies. World Health Organization: Geneva, Switzerland. 2009 http://www.wpro.who.int/hrh/documents/icn_framework.pdf.

28. Hutton A, Veenema TG, Gebbie K. Review of the International Council of Nurses (ICN) Framework of Disaster Nursing Competencies. Prehospital and Disaster Medicine. 2016: 31(6): 680-3.

29. Kim Y, Akiyama T. Post-disaster mental health care in Japan. Lancet. 2011: 378: 317.

30. Kim Y. Great East Japan Earthquake and early mental-health-care response. Psychiatry and Clinical Neurosciences. 2011: 65: 539–48.

31. Tanaka M, Takahashi C, Ueno Y. The conditions of “isolated death” occurrences and its background in public temporary housing for disaster. Case of the Great Hanshin-Awaji Earthquake [Japanese with English abstract]. Journal of Architecture Planning. 2010: 75(654): 1815-23.

32. Tanaka E, Tennichi H, Kameoka S, Kato H. Long-term psychological recovery process and its associated factors among survivors of the Great Hanshin-Awaji Earthquake in Japan: a qualitative study. BMJ Open. 2019: 9(8): e030250.

33. Hyogo Institute of Traumatic Stress. The Great Hanshin-Awaji Earthquake (1995) and mental health issues. 2004. http://www.j-hits.org/english/hanshin_awaji/index.html (accessed 7 February 2020).

34. MHLW. Surveillance of hospital business continuity plan [Japanese]. 2019. https://www.mhlw.go.jp/content/10800000/000533729.pdf (accessed 7 February 2020).

35. Kondo H, Koido Y, Morino K, Homma M, Otomo Y, Yamamoto Y, Henmi H. Establishing disaster medical assistance teams in Japan. Prehospital and Disaster Medicine. 2009: 24: 556-64.

36. Anan H, Akasaka O, Kondo H, Nakayama S, Morino K, Homma M, et al. Experience from the Great East Japan Earthquake response as the basis for revising the Japanese Disaster Medical Assistance Team (DMAT) training program. Disaster Medicine and Public Health Preparedness. 2014: 8: 477-84.

37. Koido Y, Kondo H, Ichihara M, Kohayakawa Y, Henmi H. Research on the DMAT response to the 2011 East Japan Earthquake [Japanese with English abstract]. Journal of National Institute of Public Health. 2011: 60(6): 495-501.

38. Homma M. Development of the Japanese national disaster medical system and experiences during the Great East Japan Earthquake. Yonago Acta Medica. 2015: 58(2): 53-61.

39. Egawa S, Suda T, Jones-Konneh TEC, Murakami A, Sasaki H. Nation-wide implementation of disaster medical coordinators in Japan. Tohoku Journal of Experimental Medicine. 2017: 243: 1-9.

40. Masakane I, Akatsuka T, Yamakawa T, Tsubakihara Y, Ando R, Akizawa T, et al. Survey of dialysis therapy during the Great East Japan Earthquake Disaster and recommendations for dialysis therapy preparation in case of future disasters. Renal Replacement Therapy. 2016: 2: 48.

41. Matsumoto K. Mental health care systems and provisions in the immediate and acute phase of the Great East Japan Earthquake: situational and support activities in Miyagi Prefecture [Japanese with English abstract]. Seishin Shinkeigaku Zasshi. 2014: 116(3): 175-88.

42. MHLW. Disaster Psychiatric Assistance Team (DPAT) Activity Guidelines [Japanese]. 2013. https://www.mhlw.go.jp/seisakunitsuite/bunya/hukushi_kaigo/shougaishahukushi/kokoro/ptsd/dpat_130410.html (accessed 7 February 2020).

43. Kawashima Y. Disaster psychiatric assistance team (DPAT): the present situation and future measures to address disaster psychiatry in Japan. Prehospital and Disaster Medicine. 2017: 32: S15.

44. MHLW. Disaster Health Emergency Assistance Team (DHEAT) Activity Guidelines [Japanese]. 2018. https://www.mhlw.go.jp/file/06-Seisakujouhou-10900000-Kenkoukyoku/0000198472.pdf (accessed 7 February 2020).

45. Joint Committee for Disaster Medical Records of Japan. Standard Disaster Medical Record - Report 2015 [Japanese]. http://www.jhim.jp/disaster/pdf/saigai.pdf (accessed 7 February 2020).

46. Ichiseki H. Features of disaster-related deaths after the Great East Japan Earthquake. Lancet. 2013: 381(9862): 204.

47. SPHERE Project. The SPHERE Handbook: Humanitarian Charter and Minimum Standards in Humanitarian Response. 2018. https://reliefweb.int/sites/reliefweb.int/files/resources/Sphere-Handbook-2018-EN.pdf (accessed 7 February 2020).

48. Kanatani Y, Tachibana T, Okuda H, Shimazaki D, Kobayashi K, Tamaki Y, et al. Establishment of a support system for patients with intractable diseases at the time of earthquake disaster [Japanese with English abstract]. Journal of National Institute of Public Health. 2011: 60(2); 112-7.

49. Kanatani Y, Tsuruwa M, Harada N. Education and training program for public health provider in strengthening disaster risk management for health [Japanese]. Japanese Journal of Disaster Medicine. 2015: 20: 255-61.

50. Ichikawa M, Ishimine Y, Kondo Y, Deguchi H, Kanatani Y. Healthcare support activities and management in the event of a disaster [Japanese with English abstract]. Journal of International Association of P2M. 2017: 12: 21-35.

51. Morton M, Levy JL. Challenges in disaster data collection during recent disasters. Prehospital and Disaster Medicine. 2011: 26(3): 196-201.

52. Health Emergency Management Staff, Department of Health, Republic of the Philippines. SPEED Operations Manual for Managers. 2011. https://www.medbox.org/disaster-preparedness/speed-operations-manual-for-managers/preview (accessed 7 February 2020).

53. Kubo T, Takada Y, Seto H, Otomo H, Tomioka J, Nakase K, Hirao T. Development of Health Status Reporting System during Disaster: J-SPEED [Japanese]. Japanese Journal of Disaster Medicine. 2014: 19: 190-7.

54. Kubo T, Yanasan A, Herbosa T, Buddh N, Fernando F, Kayano R. Health Data Collection Before, During and After Emergencies and Disasters - The Result of the Kobe Expert Meeting. International Journal of Environmental Research and Public Health. 2019: 16(5): 893.

55. Fukushima T, Suzuki S, Ohira T, Shimura H, Midorikawa S, Ohtsuru A, et al. Prevalence of ectopic intrathyroidal thymus in Japan: the Fukushima health management survey. Thyroid. 2015: 25: 534-7.

56. Suzuki Y, Yabe H, Yasumura S, Ohira T, Niwa S, Ohtsuru A, et al. Psychological distress and the perception of radiation risks: the Fukushima health management survey. Bulletin of the World Health Organization. 2015: 93(9): 598-605.

57. Tomata Y, Suzuki Y, Kawado M, Yamada H, Murakami Y, Mieno MN, et al. Long-term impact of the 2011 Great East Japan Earthquake and tsunami on functional disability among older people: A 3-year longitudinal comparison of disability prevalence among Japanese municipalities. Social Science and Medicine. 2015: 147: 296-9.

58. Nakaya N, Nakamura T, Tsuchiya N, Tsuji I, Hozawa A, Tomita H. The Association Between Medical Treatment of Physical Diseases and Psychological Distress After the Great East Japan Earthquake: The Shichigahama Health Promotion Project. Disaster Medicine and Public Health Preparedness. 2015: 9(4): 374-81.

59. Fuse N, Sakurai YM, Katsuoka F, Danjoh I, Shimizu R, Tamiya G, et al. Establishment of Integrated Biobank for Precision Medicine and Personalized Healthcare: The Tohoku Medical Megabank Project. JMA Journal. 2019: 2: 113-22.

60. Miyashita M, Kikuya M, Yamanaka C, Ishikuro M, Obara T, Sato Y et al. Eczema and Asthma Symptoms among Schoolchildren in Coastal and Inland Areas after the 2011 Great East Japan Earthquake: The ToMMo Child Health Study. Tohoku Journal of Experimental Medicine. 2015: 237: 297-305.