



Guidelines for Disaster Medicine for Patients With Cardiovascular Diseases (JCS 2014/JSH 2014/JCC 2014)

– Digest Version –

JCS, JSH and JCC Joint Working Group

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I Introduction

1. Background and Purpose of the Guidelines

Japan has the amazing beauty of nature and a four-season climate that reflects the country's geography. As a volcanic country that locates to the east end of the Eurasian continent and faces the Japan Trench and Pacific Ocean, Japan has also experienced a large number of natural disasters. Over a long period of history, people in Japan have experienced and overcome earthquakes, tsunami, typhoons, volcanic eruptions, and floods,

among many other disasters, and have prepared for future disasters. This long history of natural disasters has affected the way people perceive the world and life, and created the concept of impermanence.

On March 11, 2011, at 2:46 p.m. local time, a magnitude-9.0 earthquake developed off the coast of Miyagi Prefecture. The huge tsunami generated by the earthquake hit the coast of Tohoku and other East Japan areas and caused serious human and material damage. The Great East Japan Earthquake induced a serious accident at the Tokyo Electric Power Company

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Fukushima Daiichi Nuclear Power Plant, causing widespread radioactive contamination. Since the disaster occurred in winter, people living in coastal areas lost their houses and stayed in evacuation centers and temporary housing, and public utilities were severely damaged in Tohoku and other East Japan areas, causing people to experience severe mental and physical stress as well as health problems. Tohoku University Hospital, located in the center of the area affected by the disaster, worked with other medical institutions, governments, and medical associations to provide disaster medical care in full force. The author and his colleagues provided cardiovascular care during disasters, and learned a lot from the experience.

The cardiovascular system is the most vulnerable of all body systems to stress, and appropriate acute phase treatment is especially important for the treatment of cardiovascular diseases. Large-scale earthquakes such as the Great Hanshin-Awaji Earthquake on January 17, 1995 and the Niigata-ken-Chuetsu Earthquake on October 23, 2004 have been associated with increased incidences of cardiovascular diseases. Reports have described that cases of acute coronary syndrome and takotsubo cardiomyopathy increased in association with the 7.3-magnitude Great Hanshin-Awaji Earthquake^{1,2} and those of pulmonary embolism and acute coronary syndrome increased in association with the 6.8-magnitude Niigata-ken-Chuetsu Earthquake.^{3,4} These two earthquakes occurred directly beneath the cities, and the affected areas were relatively small in size. On the other hand, the Great East Japan Earthquake was a trench-type earthquake that induced tsunami, which caused a substantial part of the human and material damage in a wide area.

The authors conducted a number of surveys to investigate the effect of the Great East Japan Earthquake on the prevalence of cardiovascular diseases, and reported that the disaster was associated with increased incidence of heart failure and ventricular arrhythmia, in addition to those of acute coronary syndrome and pulmonary embolism which were reported after the Great Hanshin-Awaji and Niigata-ken-Chuetsu Earthquakes, and that people became more prone to coronary spasm.⁵⁻⁸ The increased incidence of heart failure had not been reported in previous studies on earthquake-related health problems, but was confirmed in additional surveys in other prefectures affected such as Iwate and Fukushima Prefectures. These findings suggest that the profile of cardiovascular diseases that would be more prevalent among people affected by large-scale earthquakes may differ by type of earthquake (inland vs. trench-type earthquakes), time of occurrence, or the size of the affected area.

As it is highly likely that Japan will experience a Nankai Trough earthquake (trench-type) or a Tokyo Inland earthquake in the near future, Japan should prepare for these future disasters to ensure appropriate health care and other needed services during emergencies. Natural disasters will occur inevitably, but we can reduce damage caused by them. The concept of disaster reduction is important.

The Japanese Circulation Society, the Japanese Society of Hypertension, and the Japanese College of Cardiology have decided to prepare guidelines for disaster medicine for patients with cardiovascular diseases. Clinicians and researchers who actually provided medical care in areas affected by natural disasters were requested to write guidelines that include general principles and practical application for providing cardiovascular care during disasters as well as preventing disaster-associated cardiovascular diseases. The joint committee expresses its sincere gratitude to the authors of these guidelines.

We hope the guidelines will facilitate cardiovascular care during disasters in the future.

2. Basic Principles for the Preparation of the Guidelines

The Japanese Circulation Society (JCS) has prepared and published its guidelines for the management of typical patients with the relevant cardiovascular diseases in the common medical setting according to the style used in the American College of Cardiology/American Heart Association (ACC/AHA) guidelines. JCS guidelines have been written according to literature review of the results of multi-center, randomized, prospective clinical studies, and recommendations on diagnostic and treatment procedures are classified in terms of the level of evidence (from Level A to C) and the strength of recommendations (from Class I to III). However, as the present guideline document describes how to provide cardiovascular care in unusual conditions such as natural disasters, it is very difficult to provide recommendations of evidence-based medicine on the basis of randomized prospective clinical studies as in other treatment guidelines in the usual clinical setting. It has been suggested that the profile of disaster-associated cardiovascular diseases may differ by type of earthquake (inland vs. trench-type earthquakes), time of occurrence, or the size of the affected area. Accordingly, the level of evidence and the strength of recommendations are indicated only for recommendations based on literature review.

Classification of Recommendations

- Class I:** There is evidence and/or general agreement that a given methods of evaluation or treatment is useful and/or effective.
- Class II:** There is conflicting evidence and/or a divergence of opinion about the usefulness/efficacy of a given methods of evaluation or treatment.
 - Class IIa:** Weight of evidence and data and opinion is in favor of usefulness and/or effectiveness.
 - Class IIb:** Usefulness or effectiveness is less well established by opinion.
- Class III:** There is evidence and/or general agreement that the methods of evaluation or treatment is not effective and/or useful or may even be harmful and is not indicated.

Level of Evidence

- Level A:** Demonstrated with multiple multi-center randomized, controlled studies in ≥ 400 patients or meta-analyses.
- Level B:** Demonstrated with multi-center randomized, controlled studies in ≤ 400 patients, well-designed comparative studies, or large-scale cohort studies.
- Level C:** Only consensus opinion of experts, without data of randomized, controlled studies.

The present guideline document summarizes the experiences on disaster-related cardiovascular diseases during large-scale disasters, including the Great East Japan Earthquake, and the current policies and opinions shared by specialists who actually served medical care in areas affected by large-scale earthquakes. This document also contains suggestions for cardiologists who should prepare for large-scale earthquakes in the future. Guidelines provided in this document should be revised periodically to eliminate personal biases and reflect updates. The reader is encouraged to utilize the guidelines and provide feedback.

II General Principles

1. Disasters and Cardiovascular Diseases

On March 11, 2011, a magnitude-9.0 earthquake occurred, and caused serious human and material damage in east Japan, mainly the Tohoku area. After the earthquake and tsunami, more than 450 thousand people had to stay in evacuation centers. Many of them lived there for a long period of time. The significant change in the living environment and mental and physical stress due to sleep disorder or other factors were believed to be associated with diverse cardiovascular diseases (Figure 1).

1.1 Acute Myocardial Infarction

After the occurrence of the Great East Japan Earthquake, the incidence of acute coronary syndrome, which includes acute myocardial infarction and unstable angina, increased significantly in the affected areas.⁵ The number of sudden cardiac deaths increased shortly after the occurrence of the 1994 Northridge earthquake that hit the greater Los Angeles area, California,⁹ and many of these deaths were considered attributable to myocardial infarction. The increased incidence of acute coronary syndrome including myocardial infarction after disasters may be explained that physical and mental stress played as a trigger in people with atherosclerotic lesions.

1.2 Heart Failure

There had been no studies demonstrating an increased incidence of heart failure in association with earthquakes, but after the Great East Japan Earthquake in 2011, an increase in cases of heart failure was reported for the first time.⁵ It is believed that heart failure newly developed or became exacerbated due to the interactions of multiple factors such as activation of the sympathetic nervous system induced by disaster-related stress, which causes increased blood pressure and arrhythmias in the presence of additional risk factors such as shortage of medicine, increased salt intake due to relying on preserved food, low room temperature, and pneumonia and other infections.

1.3 Pulmonary Embolism and Deep Vein Thrombosis

The relationship between the increased incidence of deep vein thrombosis (DVT) and pulmonary embolism and an earthquake was first reported among people affected by the 2004 Niigataken-Chuetsu Earthquake.⁴ DVT developed mainly among people who sat in the car in the same posture for long periods of time during evacuation.

1.4 Disaster Hypertension

When activated by environmental changes, stress, and sleep disorder due to disasters, hyperactivation of the sympathetic nervous system causes peripheral vasoconstriction and increas-

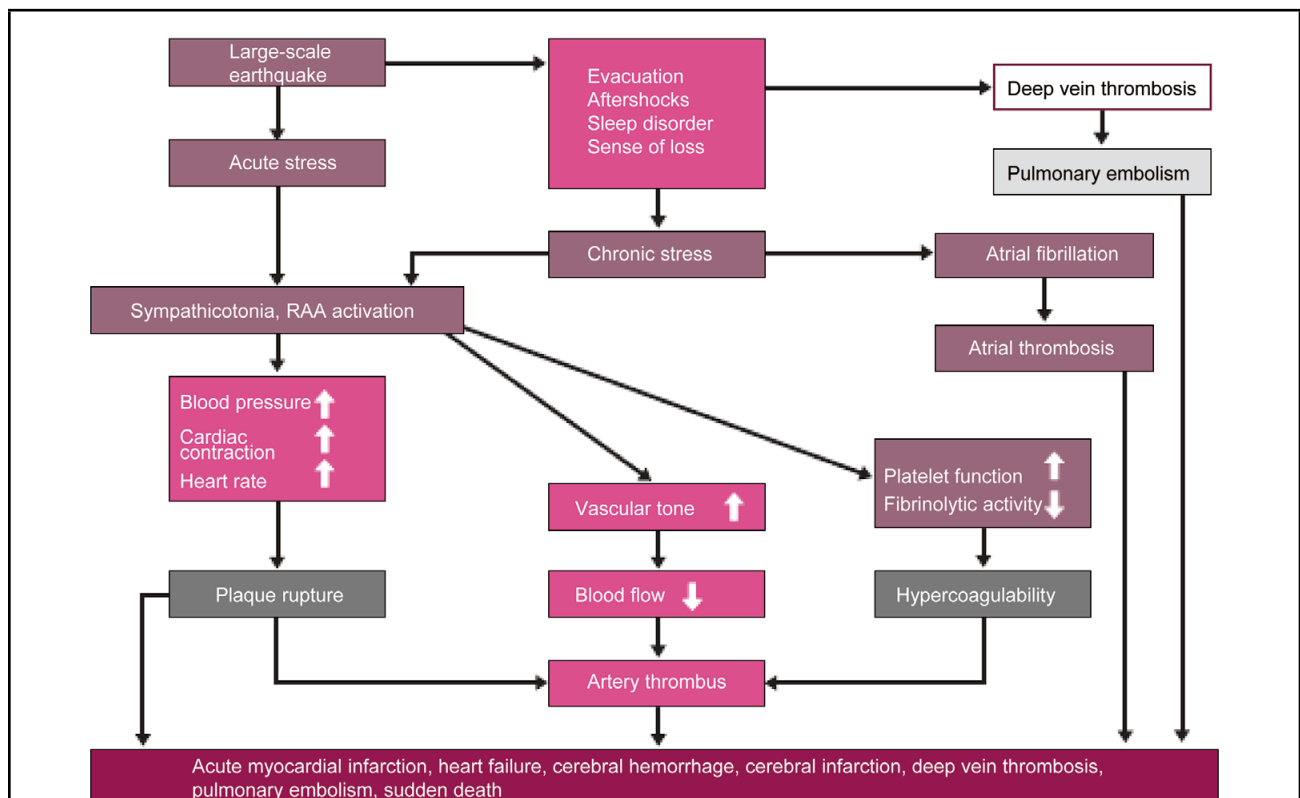


Figure 1. Mechanisms for increased incidence of cardiovascular diseases in the event of an earthquake. Earthquakes induce acute and chronic stress that activate the sympathetic nervous system and thereby induce diverse disorders. RAA, renin-angiotensin-aldosterone system.

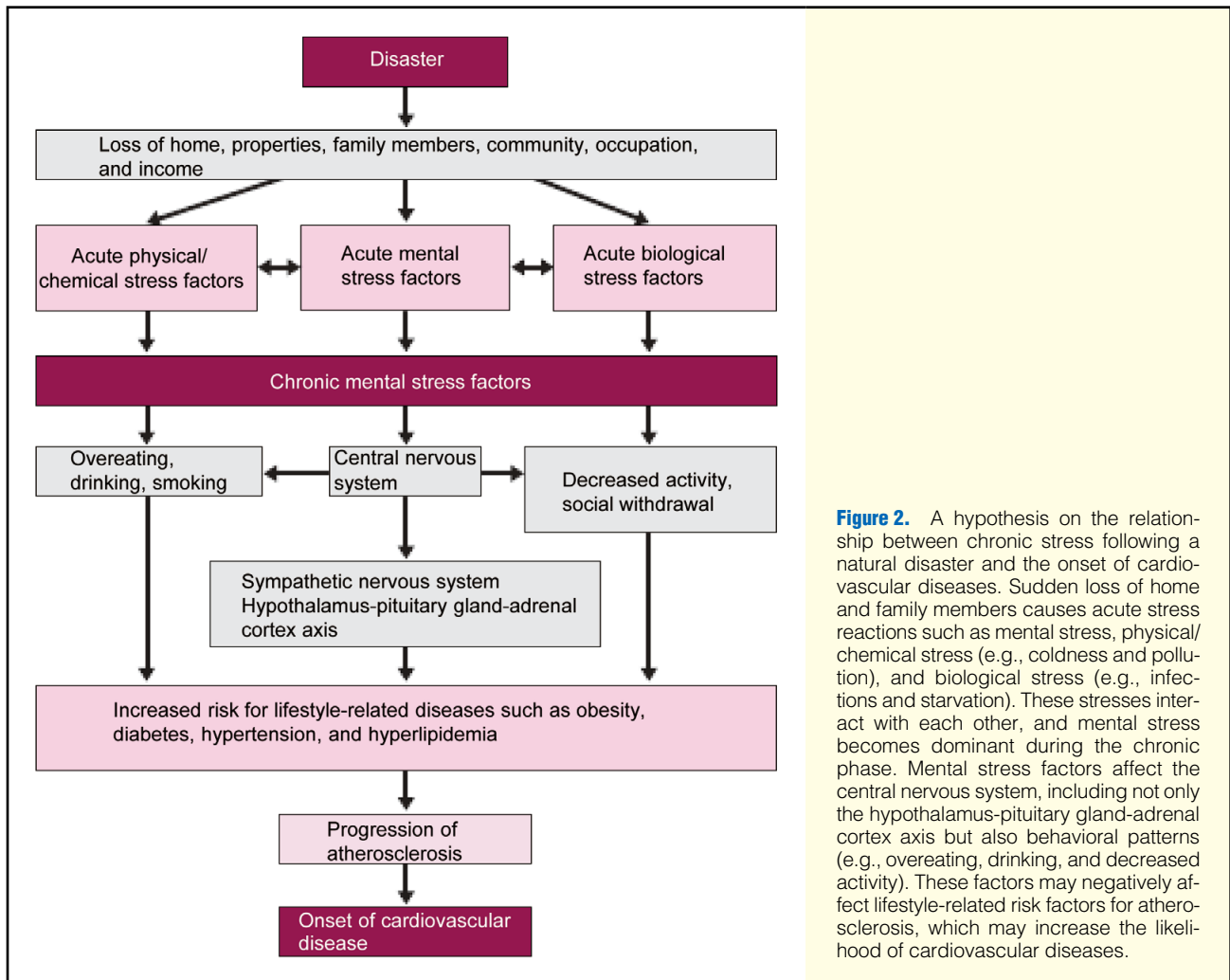


Figure 2. A hypothesis on the relationship between chronic stress following a natural disaster and the onset of cardiovascular diseases. Sudden loss of home and family members causes acute stress reactions such as mental stress, physical/chemical stress (e.g., coldness and pollution), and biological stress (e.g., infections and starvation). These stresses interact with each other, and mental stress becomes dominant during the chronic phase. Mental stress factors affect the central nervous system, including not only the hypothalamus-pituitary gland-adrenal cortex axis but also behavioral patterns (e.g., overeating, drinking, and decreased activity). These factors may negatively affect lifestyle-related risk factors for atherosclerosis, which may increase the likelihood of cardiovascular diseases.

es cardiac output, and thereby increases blood pressure. In a study of hypertensive outpatients affected by the Great East Japan Earthquake, mean systolic blood pressure (SBP) elevated by about 12 mmHg and mean pulse rate about 5 bpm after the earthquake with no changes in their oral antihypertensive medications.¹⁰

1.5 Other Cardiovascular Diseases That Occurred More Often After Earthquakes

1.5.1 Cerebral Infarction and Cerebral Hemorrhage

It has been reported that the incidence of cerebral hemorrhage increased after the Noto Peninsula Earthquake in March 2007.¹¹ It is believed that the elevation of blood pressure associated with the disaster played a role in the pathogenesis of cerebral hemorrhage. After the Great East Japan Earthquake, cases of stroke including cerebral infarction and hemorrhage increased sharply.⁵ Increased incidence of hypertension and arrhythmias are suggested to trigger stroke.

1.5.2 Ventricular Arrhythmia

The activation of the sympathetic nervous system not only increases blood pressure, but also may play a role in increasing the incidence of arrhythmias. It has been reported that the incidence of tachyarrhythmias including ventricular arrhythmia and atrial fibrillation among patients with implantable

cardiovascular defibrillators (ICDs) or cardiac resynchronization therapy defibrillators (CRT-D) increased after the Great East Japan Earthquake.⁶

1.5.3 Sudden Cardiac Death

On the day of the 1994 Northridge Earthquake (Los Angeles, USA), there was a sharp increase in the number of sudden deaths from cardiac causes.⁹ The data suggest that the early morning earthquake caused severe mental stress, which triggered sudden death.

1.5.4 Takotsubo Cardiomyopathy

Takotsubo cardiomyopathy is a reversible cardiac condition that is often induced by mental or physical stress. The relationship between an earthquake and takotsubo cardiomyopathy was first reported in terms of the 2004 Niigata-ken-Chuetsu Earthquake, where the relationship between disaster and pulmonary embolism was also pointed out.³

1.5.5 Pneumonia and Other Respiratory Infections

Respiratory infections are not cardiovascular diseases but are included in this section as they may worsen heart failure. After the 1995 Great Hanshin-Awaji Earthquake, there were increased cases of respiratory diseases including pneumonia and bronchial asthma.¹² The 2011 Great East Japan Earthquake caused

Table. Problems and Solutions in Ensuring Food and Nutrition at the Time of Disasters			
Phase	Problems in ensuring food and nutrition in the affected area	Solutions	Organizations involved
Phase 0 (Around the first 24 hours after occurrence)	<ul style="list-style-type: none"> Ensuring food (energy) and drinking water for disaster victims Ensuring baby food and powdered milk for babies and porridge for elderly people Ensuring food for special populations (especially for people with kidney disease or food allergy) 	<ul style="list-style-type: none"> Delivering relief supplies Solving the shortage of food Planning meal preparations at the evacuation center (Examining the framework of disaster response systems) Obtaining food for those with special needs Displaying messages and establishing consultation services for those with special food needs at the evacuation center 	<p>Disaster response headquarters of local governments, local government offices (health, welfare, and education departments)</p> <p>Disaster response headquarters of local governments, local government offices (health, welfare, and education departments), prefectural offices (regional institutions and head offices)</p>
Phase 1 (Around the first 72 hours after occurrence)	<ul style="list-style-type: none"> Same as above Serving hot meals 	<ul style="list-style-type: none"> Same as above Visiting evacuation centers to provide nutrition consultations Serving hot meals and coordinating cooking at evacuation centers 	Same as above
Phase 2 (Around day 4 to 30 of disaster)	<ul style="list-style-type: none"> Handling excessive supply of rice balls and bread Handling shortage of vegetables and protein-rich foods Providing hot meals Identifying and supporting people with special food needs Obtaining food for special populations (for those with conditions such as diabetes and hypertension) 	<ul style="list-style-type: none"> Cooking hot meals at the evacuation center After cooking support, local vendors start serving packed meals (bento) from around day 10 thereafter Visiting evacuation centers to provide nutrition consultations <ul style="list-style-type: none"> Patients with chronic diseases (e.g., kidney disease, allergy, and diabetes) Obesity, anorexia, stomatitis, and other conditions Eating habits among children Health education before moving to temporary housing 	<p>Disaster response headquarters of local governments, local government offices (health, welfare, and education departments)</p> <p>Disaster response headquarters of local governments, local government offices (health, welfare, and education departments), prefectural offices (regional institutions and head offices), prefectural dietitians associations</p>
Phase 3 (Around month 2 and thereafter)	<ul style="list-style-type: none"> Change in dietary habits by starting life in temporary housing Limited cooking environment (e.g., small cooking space, small number of burners, and changed location of local retailers) Loss of motivation for cooking due to stress 	<ul style="list-style-type: none"> Actions for people who start to live in temporary housing Establishing food retail (supermarkets and food vans) accessible by people living in temporary housing Implementing health support projects Actions for people who start to live in public housing for disaster victims, whenever necessary 	Municipal or prefectural organizations, prefectural dietitians associations, and prefectural health-mates councils

*Timetables for actions are listed as rough indications. Adapted from Niigata Prefecture guidelines for nutrition and food support during disasters, advanced edition in 2008.²⁹

substantial damage due to the tsunami, and aspiration pneumonia developed among tsunami victims who aspirated water during near drowning.¹³ It is believed that the crowded living conditions in evacuation centers was a cause of increased incidence of infections among disaster victims.

2. Disasters and Stress

2.1 Acute and Sub-Acute Phase

Stress is a defense mechanism for the human body, but may exert detrimental effects on organs.

Acute stress may be caused by surgical intervention, injuries, or acute physical exertion. Recent reports indicate that a high emotional burden may also cause stress. It has been reported that people may become vulnerable to cardiovascular incidences when they have emotional burdens such as sudden anger and mental stress or experience large-scale earthquakes, wars, or terrorism.^{14–16}

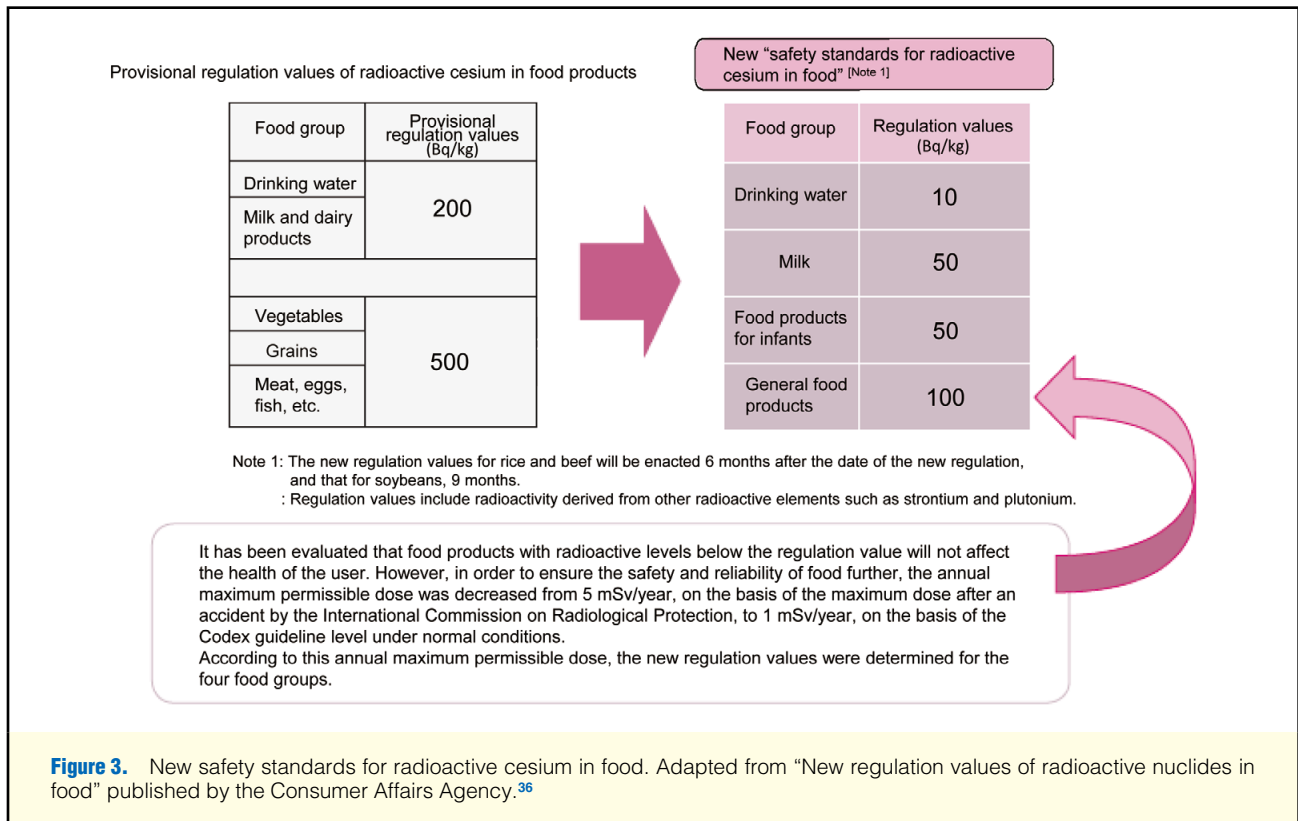
Little is known about how acute stress causes cardiovascular disorders. Findings from many observational studies indicate that acute stress may cause cardiovascular disorders by

inducing (1) enhanced sympathetic nervous activity or autonomic imbalance,^{17,18} (2) hypercoagulability,¹⁹ or (3) abnormal vascular reactivity, myocardial ischemia, or induction of microcirculatory disorder.^{20,21} Circadian rhythm,^{22–24} climate,^{25,26} and gender^{2,9} modify the risk of cardiovascular disorders due to acute stress.

2.2 Chronic Phase

During the acute phase of a disaster, physical stress (e.g., coldness, noise, and radiation), biological stress (e.g., inflammation, infection, and starvation), chemical stress (e.g., pollution, oxygen, and chemical substances), and mental stress (e.g., sadness, anger, and anxiety) interact with each other, and affect the body. On the other hand, mental stress is considered to become dominant during the chronic phase of a disaster (Figure 2).

Mental stress factors are delivered into the amygdala and the hypothalamus in the central nervous system as sensory information, recognized in the cerebral cortex where emotions and behavioral drives are produced. It is believed that stress response is mainly mediated by cortisol regulated in the hypothalamus-pituitary gland-adrenal cortex axis and by noradren-



aline/adrenaline regulated in the sympathetic-adrenal medullary axis. Persistent cortisol excess may induce central obesity, decreased glucose tolerance, dyslipidemia, or volume-dependent hypertension, and persistent sympathetic hyperactivity may increase the risk of cardiovascular diseases by inducing increased heart rate, hypertension due to peripheral vasoconstriction, cardiac myocyte hypertrophy or arrhythmogenic effect. Persistent mental stress may induce overeating, unhealthy lifestyles such as excessive drinking and smoking,²⁷ and thereby leads to decreased physical activity (disuse syndrome) or social withdrawal in the evacuation center or temporary housing. Disasters may increase the risk of cardiovascular diseases by worsening and persisting risk factors for lifestyle-related diseases and thereby promoting the progression of atherosclerosis (Figure 2).

3. Disasters and Environmental Factors

3.1 Environment of Evacuation Centers

The environment of an evacuation center depends on the severity of disaster damage, availability of public utilities, features of the facility used as the evacuation center, and the number of refugees in the facility. It is thus effective to assess the environment of the evacuation center promptly after starting use to improve the environment of the center. Assessment may reveal problems and needs in the center, and prompt interventions to solve them will improve the environment dramatically. Keeping a proper environment for refugees is an important measure to prevent infections as well as respiratory and cardiovascular diseases that are major causes of disaster-related deaths.

Disaster-related deaths may be prevented by understanding

the minimal requirements for the living environment at evacuation centers and identifying and improving problems without delay.

3.2 Change in Diet

3.2.1 Food Shortage and Nutritional Imbalance During the Acute Phase of a Disaster

a. Emergency Food Storage and Safe Cooking/Eating During Disasters

Recommendations for how to ensure food supply and eat safely during the acute phase of a disaster have been prepared according to the experience from the Niigata-ken-Chuetsu Earthquake and the Great Hanshin-Awaji Earthquake, and published as the basic²⁸ and advanced²⁹ editions of the "Niigata Prefecture guidelines for nutrition and food support during disasters", the "Guidelines for dietary and food during disasters" by Hyogo Prefecture,³⁰ and the "Disaster control guidelines for mothers and young children" by Tokyo.³¹ The National Institute of Health and Nutrition provides links to these guidelines (http://www0.nih.go.jp/eiken/info/saigai_syoku1.html). These guidelines describe the importance of proper food storage to prepare for disasters, and how dietitians working for local government agencies should work together with relevant divisions and functions to provide dietary support and serve meals to victims in different phases after disasters (Table),²⁹ and instructions to the general public on how to cook and eat safely during disasters.

b. Food and Water Hygiene

Disasters cause a shortage of clean drinking water. Floods and tsunami may damage foods, and electricity outage and destruction of storage facilities may cause food rot, which cause infections and food poisoning. The Emergency Preparedness and

Response published by the United States Centers for Disease Control and Prevention (CDC)³² should be referred to on how to prevent infections during disasters.

c. Securing Food and Nutrition to Reduce the Morbidity and Mortality of Cardiovascular Diseases During the Acute Phase of Disasters

Meals provided to disaster victims often contain excess salt and carbohydrates due to relying on preserved foods and lack the proteins, minerals (iron, calcium, potassium, and magnesium), and vitamins due to the shortage of meat, eggs, milk and dairy products, vegetables, and fruits. This nutritional imbalance may worsen hypertension and glucose/lipid metabolism disorders, or reduce protein synthesis and wound healing due to a shortage of potassium and magnesium.³³ The importance of securing nutrition and nutritional management from the acute phase of disaster has been suggested especially for patients with chronic diseases such as diabetes, hypertension, dyslipidemia, and chronic kidney disease.^{34,35} Dietitians and public health nurses working for local government agencies as well as staff members of medical institutions should play important roles in these situations (Table).²⁹

d. Contamination of Foods and Water with Radioactive, Biological, or Chemical Materials

Before discussing the effect of radioactive contamination of foods and drinking water, the magnitude of the risk should be understood. In response to the radioactive contamination with ¹³⁴Cs (cesium) and ¹³⁷Cs due to the Fukushima Daiichi Nuclear Power Plant accident after the Great East Japan Earthquake, the Ministry of Health, Labor and Welfare (MHLW) implemented a new standard for the annual radioactive dose limits for food groups with an annual allowance of 1 mSv in April 2012. The new dose limits are about a fifth of the provisional regulation values determined by the Food Safety Commission of Japan based on the "Emergency report on radioactive nuclides in foods" (Figure 3).³⁶

3.2.2 Health Problems and Nutritional Management During the Chronic Phase of Disasters

Some disaster victims/refugees may experience worsening or progression of chronic diseases such as diabetes, hypertension, rheumatoid arthritis, and obstructive pulmonary disease even during the chronic phase of (several months to 1 year after) a disaster.³⁷ Individual victims need not only treatment for the disease, but also measures to eliminate the exacerbating factors such as hygienic conditions (e.g., the dust produced by the debris), economic difficulties, living conditions that hinder appropriate room temperature, rest, sleep and relaxation, poor access to healthcare (e.g., adherence to drug treatment and clinic visits), nutritional problems (e.g., overeating, under-eating, nutritional imbalance, and excessive alcohol consumption), physical factors such as chronic fatigue and reduced physical activity, and mental factors such as feeling of desperation, anxiety about the future, and stress.

3.3 Sleep Disorder

3.3.1 Disaster-Related Sleep Disorders

One of the most significant health problems among disaster victims is insomnia associated with the disaster itself, loss experience, or stress due to environmental change. Insomnia may also represent as adjustment sleep disorder (acute insomnia) or be associated with depression, post-traumatic stress disorder (PTSD), or other mental disorders. Insomnia among disaster victims is also caused by fear of sleep, change in living/

sleeping environment during evacuation, increased activity at night, chronic pain due to physical disorders, skin itching due to poor hygiene, or frequent urination due to cold weather or cystitis. Adjustment sleep disorder may be induced by mental, physiological, physical, or environmental stress factors. Diverse stress factors including loss of property, loss of family or friends, evacuation to an unfamiliar place, and change in human relationships may prolong sleep latency, increase the number of awakenings and wake time after the disaster, and decrease total sleep time or the quality of sleep.

3.3.2 Insomnia and Cardiovascular Diseases

As insomnia and sleep deprivation are precipitating factors for cardiovascular diseases, it is important to ensure proper sleep to prevent the occurrence of cardiovascular events after the disaster.³⁸

3.3.3 Sleep Hygiene Education

Disaster victims are susceptible to insomnia as they have risk factors such as abrupt change in living environment, psychological trauma, and living in crowded evacuation centers. Healthcare professionals should express sympathy for disaster victims with difficult situations where insomnia may ineluctably develop, and explain that it may often disappear over time. However, some victims may need medical interventions such as sleep hygiene education and drug treatment as insomnia may decrease the physical and mental quality of life (QOL).

3.3.4 Drug Treatment

In patients who have received anti-anxiety or hypnotic drugs at high doses for a long period of time, abrupt discontinuation of treatment may induce convulsions or insomnia. When the same drug is not available after the disaster, patients should be instructed to continue using the drug at a lower dose or take other measures to extend the duration of treatment as possible.³⁹ Gradual dose reduction may decrease the incidence and severity of withdrawal symptoms.

Non-pharmacological approaches should be prioritized for the treatment of new cases of insomnia, but appropriate drugs should be prescribed for those not responding to non-pharmacological treatment. However, hypnotic drugs should be the last resort for disaster victims as it has been reported that the incidence of DVT is high among disaster victims using hypnotic drugs.^{40,41} Ultra-short acting or short-acting hypnotics are suitable for patients with difficulty in initiating sleep, while intermediate- or long-acting hypnotics are suitable for patients having difficulty in maintaining sleep, including those with nocturnal awakenings or early morning awakenings (**Level of Evidence: C**). The concomitant use of hypnotics and alcohol must be avoided.

3.3.5 Insomnia Due to Mental Disorders

Patients with anxiety disorder tend to have difficulty in initiating sleep, while patients with depression tend to suffer from difficulty in maintaining sleep such as nocturnal or early morning awakenings.

3.4 Shortage of Drugs or Prescription Information

Patients with cardiovascular diseases often receive multiple drug treatments for the treatment of cardiovascular complications. The Great East Japan Earthquake significantly affected local health care and drug information systems, which made disaster medical services more difficult. However, disaster medical services must be provided in challenging conditions that hinder ordinary medical practice to maximize the benefits to victims.

Recommendations for disaster medical services are as follows:

- After a large-scale disaster, people are exposed to substantial stress and environmental risk factors, which may induce an increase in blood pressure, a thrombophilic state or hypercoagulable state, and thereby cause diverse cardiovascular diseases. Discontinuation or inappropriate administration of antihypertensive, antithrombotic or antianginal drugs to cardiovascular patients may worsen their existing condition.
- When prescription information is unknown or usually prescribed drugs are unavailable, cardiovascular patients should be treated with alternative drugs with long-established efficacy and a low risk of adverse events.
- The management and use of cardiovascular drugs in places affected by disasters require expertise. Physicians should work closely with pharmacists to provide disaster medical service.

Appendix: Health Hazard Investigations During Disasters

When a large-scale disaster occurs, it is important to obtain data on health status, morbidity, and mortality of disaster victims promptly and efficiently. However, it is often difficult to collect health data after a large-scale disaster. Treatment of injuries and infections are prioritized, especially in the acute phase of disaster, and data on cardiovascular diseases cannot be collected.

As Japan has maintained detailed mortality statistics and ambulance transport data, the effect of a disaster on the prevalence of cardiovascular diseases may be estimated using these data. Data of local registration studies of cardiovascular diseases are also useful. The effects of the Great East Japan Earthquake on the prevalence of cardiovascular diseases are under investigation using mortality statistics and ambulance transport data

by the author of this chapter (Naito) in a Health and Labor Sciences Research Grant Program (H24-Cardiovascular-General-009, Chief Investigator: Hiroaki Naito). The study group found the following challenges and perspective during the investigation:

(1) Mortality statistics and ambulance transport data cannot be used in a timely manner as these data are collected and tabulated by the relevant local government agency before publication; (2) the exact number for the denominator cannot be obtained after a large-scale disaster like the Great East Japan Earthquake when victims moved out the affected area temporarily or people living in the evacuation zone surrounding the Fukushima Daiichi Nuclear Power Plant relocated to other places without changing their residential registration according to the special act for nuclear refugees; (3) as data do not contain personally identifiable information, individual risk factors such as the extent of disaster damage, lifestyle, and past illness cannot be considered in the analysis.

Data containing analyzable individual characteristics should be obtained in order to effectively accumulate and share disaster data without delay and prevent secondary health hazards. The local and national governments agency should establish measures to promptly, effectively collect and share health data after a large-scale disaster like the Great East Japan Earthquake. It is also necessary to establish information infrastructures such as cardiovascular disease management networks that allow physicians to register patient information, and use patient data after disasters by combining with disaster information. Appropriate information infrastructures would link usual medical practice with disaster medical service, and thereby facilitate medical and preventive interventions to disaster victims effectively.

III Management of Disaster-Related Cardiovascular Diseases

1. Intervention for Disaster Victims

1.1 Cardiovascular Risk Assessment

Infections, respiratory diseases, and mental health disorders such as excessive stress and depression play important roles in inducing disaster-related cardiovascular diseases. Mental health disorders may suppress immune functions, increase the risk of infections, and affect the management of hypertension and glucose/lipid metabolism disorders. In disaster medicine, physicians must provide comprehensive medical care by considering these risk factors as well as regional factors and family circumstances to treat both acute disaster-related conditions and chronic diseases.^{38,42,43}

1.1.1 Points of Risk Assessment

- Physicians should assess disaster victims for cardiovascular risk during the acute phase of disaster and treat high-risk patients appropriately considering the fact that the incidence of cardiovascular events increases over time in areas severely affected by disasters. **(Class I)**
- Physicians should observe disaster victims carefully for initial manifestation of hypertension-related cardiovascular diseases, such as takotsubo cardiomyopathy that may develop immediately after the occurrence of a disaster; pulmonary embolism and DVT that may develop in the first few days of evacuation; and stroke, acute coronary syndrome, aortic

dissection and heart failure that may increase in incidence for months. **(Class I)**

- As infections may induce cardiovascular diseases, especially in elderly people, physicians should interview and examine for nonspecific symptoms such as generalized malaise, anorexia, and decreased physical activities. **(Class I)**
- As disaster-related cardiovascular diseases often develop at night, it is reasonable that patients presenting outside “office hours” be examined carefully. **(Class II)**
- Hypertension and thrombophilic state are common triggers of disaster-related cardiovascular diseases. **(Class I)**
- Disaster hypertension may develop when disaster victims, in whom sensitivity to salt increases as a result of sleep and circadian rhythm disorders and sympathetic hyperactivity due to excessive stress, consume excessive amounts of salt. **(Class I)**
- Thrombophilic state may occur when disaster victims under significant mental stress also have exposure to cold temperature, infections, dehydration, or decreased physical activity. **(Class I)**
- Physicians should instruct people with disaster hypertension to have good sleep and reduce salt intake as much as possible. **(Class I)**
- Disaster victims with thrombophilic state should be instructed to perform appropriate exercise, adequate hydration, and infection control measures. **(Class I)**
- Patients with cardiovascular diseases should be instructed to

		✓
1. Age (A)	- ≥ 75 years of age	<input type="checkbox"/>
2. Family (F)	- Death or hospitalization of partner, parents, or children	<input type="checkbox"/>
3. House (H)	- Completely destroyed	<input type="checkbox"/>
4. Community (C)	- Totally destroyed	<input type="checkbox"/>
5. Hypertension (H)	- Present (under treatment, or SBP of >160 mmHg)	<input type="checkbox"/>
6. Diabetes (D)	- Present	<input type="checkbox"/>
7. History of cardiovascular diseases (C)	- Present (myocardial infarction, angina, stroke, or heart failure)	<input type="checkbox"/>
Total score: _____ points		
<p>One point is given for each of the above seven criteria, and the total score will be recorded (0 ~ 7 points). People with a score of ≥ 4 points are considered at high risk for disaster-related cardiovascular diseases. People with a risk score of ≥ 4 should be treated to achieve a prevention score of ≥ 6.</p>		

Figure 4. DCAP risk score (AFHCHDC 7). DCAP, Disaster Cardiovascular Prevention; SBP, systolic blood pressure. Source: Kario K, et al. *JMAJ* 2005; **48**: 363–376.⁴³

		Check applicable items ✓
1. Sleep improvement (S)	- Turn off the lights at night in the evacuation center, and sleep for at least 6 hours	<input type="checkbox"/>
2. Continuation of exercise (E)	- Stay active (Walk for ≥ 20 minutes a day)	<input type="checkbox"/>
3. Good diet (D)	- Reduce salt intake, and eat potassium-rich foods	<input type="checkbox"/>
(Ideally, eat at least 3 different kinds of green vegetables, fruits, or seaweeds)		
4. Maintaining body weight (W)	- Keep your body weight within ± 2 kg from the weight before the disaster	<input type="checkbox"/>
5. Infection control (I)	- Wear a mask and wash your hands	<input type="checkbox"/>
6. Thrombosis prevention (T)	- Drink plenty of water	<input type="checkbox"/>
7. Continuation of medication (M)	- Take your antihypertensive drugs and other drugs for the treatment of cardiovascular diseases continuously	<input type="checkbox"/>
8. Blood pressure management (P)	- Measure your blood pressure, and consult a physician when the SBP is 140 mmHg or higher	<input type="checkbox"/>
* Please try to achieve the above criteria as much as possible.		

Figure 5. DCAP prevention score (SEDWITMP 8). DCAP, Disaster Cardiovascular Prevention; SBP, systolic blood pressure. Source: Kario K, et al. *JMAJ* 2005; **48**: 363–376.⁴³

maintain appropriate body weight and continue their antihypertensive or antithrombotic (antiplatelet/anticoagulant) therapy. (**Class I**)

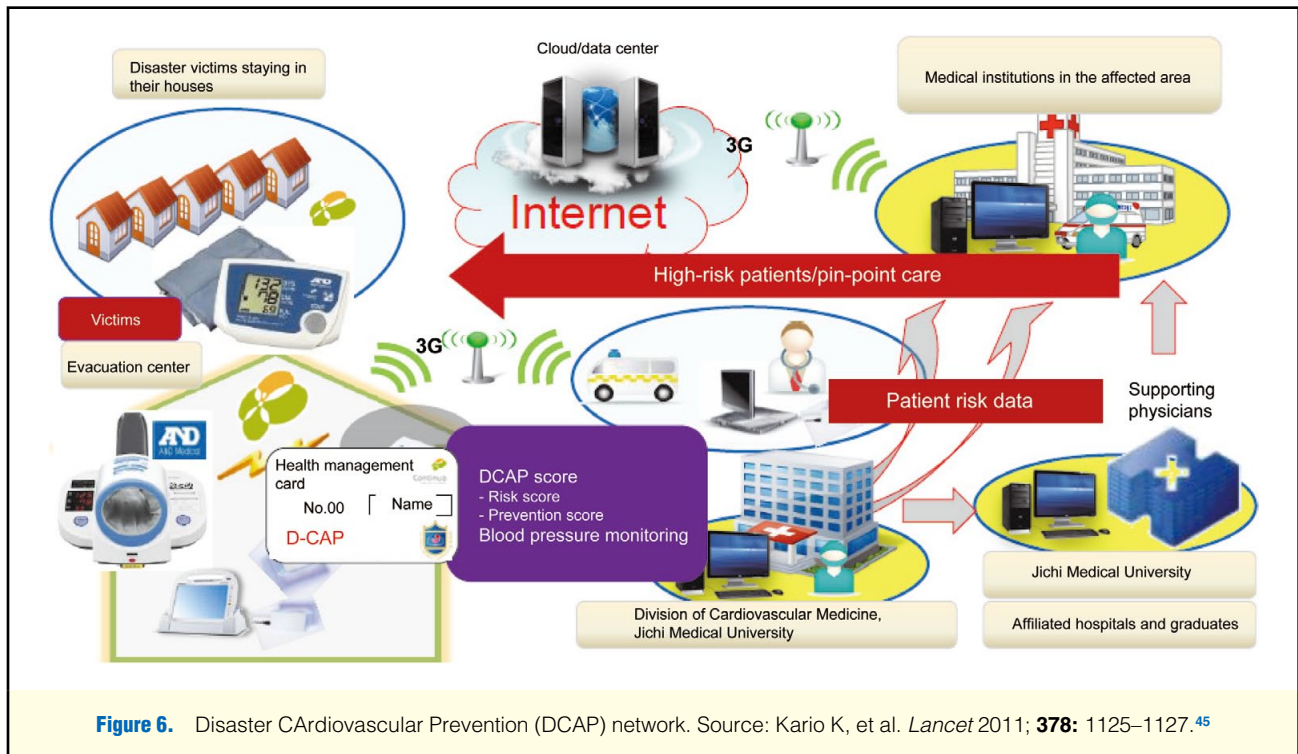
1.1.2 Disaster Cardiovascular Prevention Risk Score/Prevention Score

Five days after the occurrence of the Great East Japan Earthquake, Jichi Medical University published the “Disaster Cardiovascular Prevention (DCAP) Risk Score/Prevention Score” (Figures 4 and 5)^{43,44} on the medical portal site CareNet. These scoring systems were developed based on the known mechanism of onset of disaster-related cardiovascular dis-

eases, and medical volunteer teams were encouraged to treat victims with a risk score of ≥ 4 to achieve a prevention score of ≥ 6 in order to prevent the occurrence of cardiovascular diseases as much as possible.^{38,45} (**Class II**)

a. Risk Score (AFHCHDC 7)

The risk of disaster-related cardiovascular diseases is assessed in terms of (1) age ≥ 75 (A); (2) death or hospitalization of partner, parents, children or other family members (F); (3) completely destruction of the house (H); (4) totally destruction of the local community (C); (5) hypertension (under treatment or a SBP of >160 mmHg)(H); (6) presence of diabetes (D);



and (7) history of cardiovascular diseases (C). The number of applicable items (from 0 to 7) is recorded as the risk score. People with a risk score of ≥ 4 are defined as high-risk victims, for whom interventions should be made to achieve a prevention score of ≥ 6 . (**Class II**)

b. Prevention Score (SEDWITMP 8)

The prevention score is recorded as the number of items achieved for the disaster victim among (1) sleep improvement (S), (2) continuation of exercise (E), (3) good diet (D), (4) maintaining body weight (W), (5) infection control (I), (6) thrombosis prevention (T), (7) continuation of medication (M), and (8) blood pressure management (P). The score ranges from 0 to 8. A prevention score of ≥ 6 should be targeted in the relevant high-risk patients and in all people in the evacuation center.

c. Establishment of the DCAP Net System

Using the above-mentioned DCAP scoring system, a remote risk management support program called the DCAP net system has been established and is being implemented as a trial project (Figure 6).⁴⁵ This system uses sphygmomanometers with a card reader and communication function. The device, which is located in each evacuation center, recognizes individual disaster victims with their ID cards, and uploads their blood pressure measurements on the server. As this system may be used with home sphygmomanometers, blood pressures of people staying in their houses may be monitored. This system facilitates local healthcare professionals to focus on the management of high-risk patients and thereby supports efficient risk management of people in the affected area. This system is expected to become a medical telecommunication system between disaster victims in temporary housing and local medical institutions. (**Class II**)

1.2 Medical Services for Disaster Victims

Class I

1. Healthcare professionals who join to provide medical services in areas affected by disasters should bring necessary instruments by themselves. (**Level of Evidence: C**)

Class IIa

1. It is reasonable to follow instructions of disaster medical coordinators, when available, in order to consolidate the information, communication, and command systems. (**Level of Evidence: C**)
2. It is reasonable to keep medical records in a form that can be shared by different medical teams. (**Level of Evidence: C**)
3. It is reasonable to establish networks of local hospitals, clinics, and other organizations in advance to prepare for disaster relief activities in the future. (**Level of Evidence: C**)
4. It is reasonable to collect the latest information in the affected areas to provide medical services that meet urgent healthcare needs. (**Level of Evidence: C**)
5. Portable ultrasound diagnostic devices can be useful in the diagnosis of DVT and cardiac diseases in disaster victims. (**Level of Evidence: B**)

2. Disasters and Cardiovascular Diseases: Prevention in the Acute Phase of Disaster and Management of Multiple Patients

2.1 Heart Failure

Class IIa

1. As patients with heart failure may experience exacerbation of their disease after the occurrence of a large-scale disaster, it is reasonable to avoid risk factors for exacerbation, such as infection, hypertension, and treatment discontinuation. (**Level of Evidence: C**)

- As disaster-related exacerbation of heart failure may often persist for the first two months or so after the occurrence of a large-scale disaster, it is reasonable that patients be carefully controlled for precipitating factors during that time. **(Level of Evidence: C)**

2.2 Acute Coronary Syndrome

Class I

- The possibility of acute coronary syndrome should be considered when victims of a large-scale disaster are interviewed. **(Level of Evidence: C)**

Class IIa

- It is reasonable that disaster victims who are suspected to have acute coronary syndrome be examined with a portable electrocardiogram (ECG) monitor, a whole-blood rapid cardiac troponin T strip assay, or a human fatty acid-binding protein (H-FABP) ELISA (enzyme-linked immunosorbent assay) kit in order to ensure early diagnosis. **(Level of Evidence: C)**
- As acute coronary syndrome may become prevalent after the occurrence of a large-scale disaster, it is reasonable that medical institutions where revascularization is available be specified, and patient transportation routes to available institutions be ensured. **(Level of Evidence: C)**
- The management of coronary risk factors such as hypertension and dehydration is important in preventing acute coronary syndrome after a large-scale disaster. **(Level of Evidence: C)**

2.3 Sudden Death

Class I

- Neighbors should work together to provide basic life support (BLS) for disaster victims who are unresponsive. **(Level of Evidence: C)**
- If a person, or his or her family members or neighbors, are at risk, they should secure the safety of themselves before providing BLS to unresponsive victims described under Item 1. **(Level of Evidence: C)**
- At disaster sites, physicians and other appropriate healthcare professionals should perform triage for injured persons to provide medical care and emergency treatment efficiently. **(Level of Evidence: C)**
- Life-saving interventions are not necessary for victims classified as deceased in the triage coding system (category 0-black). **(Level of Evidence: C)**
- At disaster sites, members involved in disaster medical support have regular meetings to consider measures to prevent sudden deaths in victims. **(Level of Evidence: C)**
- In order to prevent and manage diseases that may lead to sudden death, appropriate living conditions and health/hygiene education should be provided to disaster victims, and drug treatment should be given to those who need it. Medical devices should be available for use. **(Level of Evidence: C)**

2.4 Takotsubo Cardiomyopathy

Class IIa

- As the incidence of takotsubo cardiomyopathy may increase shortly after the occurrence of a disaster, it is reasonable that victims, especially elderly women, who present with abnormal hemodynamics be suspected to have takotsubo cardiomyopathy, and be considered for ECG, echocardiography, and hematology tests. It is also reasonable to consider coronary angiography for patients with severe conditions. **(Level of Evidence: C)**

Class IIb

- As mental and physical stress due to disaster may increase the risk of takotsubo cardiomyopathy in a later phase of disaster, it may be reasonable to initiate mental health intervention for disaster victims at risk in an early phase. **(Level of Evidence: C)**

2.5 Arrhythmias

Class IIa

- The incidence of tachyarrhythmias, especially that of ventricular arrhythmia, may increase after the occurrence of a disaster. It is reasonable that physicians consider the risk of tachyarrhythmias in patients with organic heart disease and those with a history of arrhythmic events before the disaster. **(Level of Evidence: C)**
- As stress may trigger the onset of arrhythmias, it is reasonable to create a less stressful environment for disaster victims with a high risk of arrhythmias. **(Level of Evidence: C)**

2.6 Crush Syndrome

Class I

- Patients with crush syndrome should be treated with aggressive fluid hydration and alkalization of urine. **(Level of Evidence: C)**
- Patients with hyperkalemia due to crush syndrome should be treated with hemodialysis. **(Level of Evidence: C)**
- Patients with crush syndrome should not be treated with calcium supplementation unless they have tetany, as hypercalcemia may occur in association with crush syndrome. **(Level of Evidence: C)**

Class IIb

- It may be reasonable to treat compartment syndrome caused by crush syndrome with surgical decompression. **(Level of Evidence: C)**

3. Disasters and Vascular Diseases: Prevention in the Acute Phase of Disaster and Management of Multiple Patients

3.1 Stroke

Class I

- Patients with stroke need to be transported rapidly to advanced medical care facilities. **(Level of Evidence: A)**

Class IIa

- Blood pressure management can be beneficial for hypertensive patients as the incidence of stroke may increase after the occurrence of a large-scale disaster. **(Level of Evidence: C)**

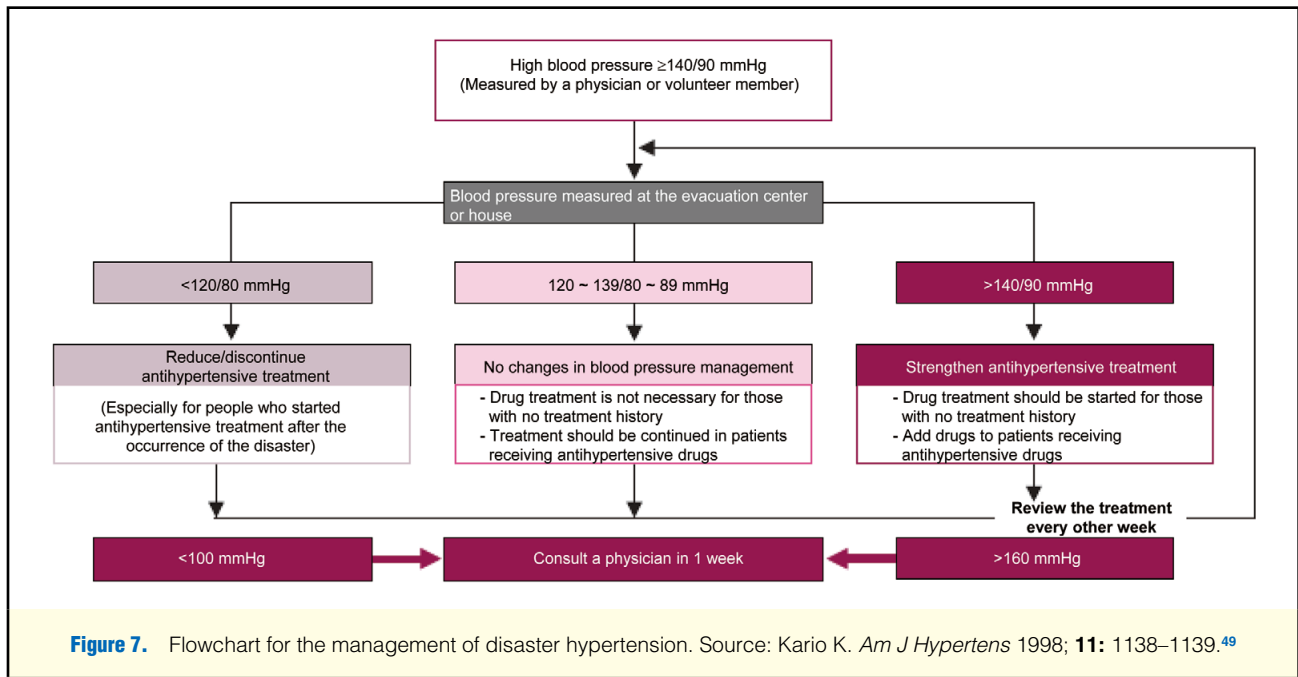
Class IIb

- Hydration may be considered in preventing ischemic stroke after the occurrence of a large-scale disaster. **(Level of Evidence: C)**

3.2 Hypertension

3.2.1 Definition of Hypertension

Disaster hypertension is defined as an increase in blood pressure to 140/90 mmHg or higher after the occurrence of a disaster.^{38,46,47} As disaster hypertension is a risk factor for disaster-related cardiovascular diseases, patients should be receive antihypertensive therapy. In Asians, the correlation between blood pressure and risk of cardiovascular diseases is particu-



larly strong, and Asians are particularly prone to salt-induced hypertension.⁴⁸ Blood pressure management is particularly important for disaster victims in Japan to prevent cardiovascular events. Blood pressure measurement is the first step in preventing disaster-related cardiovascular diseases. Blood pressure is a useful measure to detect disaster hypertension and assess the effect of disaster-related stress on the body and mind of victims.

3.2.2 Clinical Features

Disaster hypertension may develop immediately after the occurrence of a disaster, and persist until the victim's living environment/lifestyle is stabilized and returns to the prior condition. However, disaster hypertension may persist for a longer period of time in elderly people, patients with chronic kidney disease and microalbuminuria, obese people, patients with metabolic syndrome, and other patients with salt sensitivity.^{38,46,47}

3.2.3 Treatment

a. Non-Pharmacological Treatment

Disaster victims are prone to hypertension as they become more sensitive to salt due to stress, and consume more salt than usual by eating preserved food.^{38,46,47} It is thus important to maintain the circadian rhythm by ensuring a suitable sleeping environment and keeping physically active during the daytime, and to reduce salt intake as much as possible.^{38,46,47}

b. Drug Treatment

No clear evidence has been obtained regarding treatment goals and recommended drugs for the treatment of disaster hypertension. However, evidence obtained in non-disaster conditions and experience with disaster victims suggest that patients with a SBP of ≥ 160 mmHg should receive antihypertensive drugs to decrease the SBP to <140 mmHg.^{38,46,49} Blood pressure should be determined every other week to modify their antihypertensive treatment (Figure 7).^{38,46,49} Disaster hypertension that develops among previously normotensive victims may often disappear spontaneously as the environment improves. Accordingly,

continuing antihypertensive therapy without close monitoring may lead to hypotension that may cause decreased daily activities or falls, or may increase the risk of cardiovascular events among high-risk individuals.⁴⁹ Patients during antihypertensive therapy with a SBP of <120 mmHg should be observed carefully for hypotensive symptoms, and antihypertensive therapy should be discontinued at an appropriate timing, especially for patients who developed hypertension after the occurrence of a disaster.

3.3 Deep Vein Thrombosis and Pulmonary Embolism Class I

1. Disaster victims 40 years of age and older are prone to DVT and pulmonary embolism regardless of the method and place of evacuation. The incidence of DVT may be particularly high among people at evacuation centers in more severely affected areas such as those close to the epicenter and areas attacked by tsunami. (Level of Evidence: B)
2. Risk factors for DVT include being female, staying overnight in a car, having injury, and limiting fluid to reduce the frequency of urination. (Level of Evidence: B)
3. Staying overnight in a car for two or more nights is known to increase the risk of DVT substantially. However, pulmonary embolism may develop among people who stay in a car just one night. (Level of Evidence: B)

Class II

1. It should be noted that DVT has developed most frequently among people staying at evacuation centers for 1~2 weeks, especially those sleeping on the crowded floor. It is reasonable that at evacuation center, cot beds be available for disaster victims within one week after the occurrence of the disaster. (Level of Evidence: B)
2. At evacuation centers where victims sit and sleep on the crowded floor, encouraging hydration and exercise is not enough to prevent the occurrence of DVT. It is reasonable that disaster victims who stay one week or longer in such a place wear compression stockings to prevent DVT, and

that disaster victims at evacuation centers wear compression stockings for 24 hours a day as hospitalized patients do. **(Level of Evidence: B)**

3. It is reasonable to examine disaster victims with more than one risk factor for DVT or pulmonary embolism as described above, those at evacuation centers in severely damaged areas, and those who sleep on the crowded floor for a long period of time and examine with lower leg venous ultrasound imaging aggressively and blood testing for D-dimer whenever possible. DVT may affect veins in the femoral and inguinal areas, and the presence of DVT in these areas may be screened for with increased D-dimer levels. [Note: Hirooka et al. examined disaster victims who evacuated from Fukushima Prefecture to Yamagata City for the presence of DVT in the upper and lower legs, but DVT in the femoral vein was rare and was observed in only 1 of the 14 cases of DVT.⁵⁰ Victims of large-scale earthquakes that occurred during the period following the Niigataken-Chuetsu Earthquake and the Great East Japan Earthquake were examined for DVT in the lower leg only, but no particular problems were noted. These findings indicate that upper leg venous ultrasound imaging is not necessary for people in whom D-dimer levels may be determined with point-of-care testing (POCT).] **(Level of Evidence: B)**
4. It is reasonable that victims with leg swelling, leg pain, or other symptoms suspected for DVT wear compression stockings without delay, and undergo leg venous ultrasound imaging and D-dimer testing whenever possible. It is reasonable that victims with thrombi located proximal to the popliteal vein be treated in the hospital whenever possible. When they cannot visit the hospital, adequate hydration can be effective. It is reasonable that those with no risk factors for bleeding be considered for treatment with heparin or new oral anticoagulants whenever possible. It is reasonable to treat patients with symptomatic DVT in the lower leg in a similar fashion to those with proximal type DVT. Asymptomatic patients with a D-dimer level of ≤ 2.0 mcg/mL are probably recommended to wear compression stockings. It is reasonable to consider oral anticoagulants for patients with a D-dimer level of ≥ 2.0 mcg/mL who do not have any underlying diseases, subcutaneous hematoma, bleeding, or bleeding tendency (use warfarin for those who can undergo blood testing, and new oral anticoagulants for those who cannot). **(Level of Evidence: B)**

4. Disasters and Infections

4.1 Risk Assessment for Infections Associated With Natural Disasters

1. Understand the types of pathogens that are prevalent in the affected areas.
2. Assess the risk of infections among people gathering at the evacuation center.
3. Assess the effects of the disaster on the living environment.
4. Assess the risk of interruption of public utilities including water, sewerage, and electricity.
5. Assess the risk due to shortage of food.
6. Assess the risk due to loss of medical services.

4.2 Infections Commonly Associated With Natural Disasters

(1) Water-Borne Infectious Diseases

Water-borne infectious diseases, such as diarrheal diseases classified into bacterial food poisoning, hepatitis A, hepatitis

E, and leptospirosis, may occur.

(2) Infections Associated With Crowded Conditions

Influenza, norovirus infection, measles, tuberculosis, and *Neisseria meningitidis* infection may occur.

(3) Vector-Borne Infections Transmitted by Mosquitoes and Other Arthropods

There have been no reported cases of malaria infection in Japan. Appropriate measures against mites and chiggers should be taken to prevent vector-borne infections.

(4) Infections Caused by Wound Contamination (Tetanus)

Disaster victims have a greater risk of skin and soft tissue infection by common causative pathogens as well as that of tetanus.

4.3 Infection Control Measures

1. Ensure hygiene in evacuation centers.
2. Conduct infection surveillance to detect the occurrence of an outbreak without delay.
3. Restore the basic functions of local medical institutions.
4. Try to eradicate mosquitoes and other vectors.

4.4 Handling of Dead Bodies

It is unlikely that an outbreak of infectious diseases occurs due to inappropriate handling of dead bodies after a natural disaster. However, since there have been rare cases of cholera or viral hemorrhagic fever from contact with dead bodies, mortuary personnel should at least wear gloves to handle dead bodies with care and dispose used gloves appropriately.

5. Disasters and Mental Disorder

5.1 Mental Health Problems That May Occur Among Disaster Victims

Disaster victims may suffer from not only injuries and physical damage, but also mental damage, which may cause diverse psychiatric symptoms. Immediately after the occurrence of a disaster, people are surprised by experiencing earthquakes and the heat from fires, and are in shock at the sight of blood and death, which can cause psychological disturbance. After months or years, these memories may come back to disaster victims vividly as if they are having the same experience again. Disaster victims may often have great sorrow and grief reactions to the loss of their family members, assets, and livelihood.^{51,52} After their first response to the disaster, victims face significant changes in their lives and have anxiety for their life in the future, which increases the level of mental stress associated with their daily activities. Excessive mental stress may cause suicide, accidents, increases in alcohol consumption and smoking, conflicts with family or community, and delay in return to normal life. Some people may exhibit deviant behaviors. People are prone to anxiety or depression during this phase. Stress may exacerbate existing physical diseases and cause new diseases.

5.2 Mental Health Problems That May Develop Immediate After the Occurrence of a Disaster (in One Month)

- (1) Insomnia due to acute stress^{53,54}
- (2) Mental health impact of the disaster (realistic anxiety, emotional upset, or mental stunning)⁵¹

5.3 Mental Health Problems That May Develop After a Certain Period of Time From the Occurrence of a Disaster (Month 2 and Thereafter)

- (1) PTSD^{51,52,55}
- (2) Depression^{51,52}
- (3) Anxiety disorder^{51,55}
- (4) Inappropriate use of alcohol⁵⁶

5.4 Initial Mental Health Disaster Response in the Clinical Setting

(1) Response to Reality and Mental Health

Before addressing anxiety and other psychological responses to a disaster, the safety, physical health, and living conditions of victims should be secured. However, fear and anxiety may not be alleviated completely by securing the life and physical health of victims, and some may develop anxiety disorder or depression. Healthcare professionals should treat disaster victims on the basis of the fact that they are prone to mental disorders.⁵¹

(2) Early-Phase Intervention

Visiting the affected area to express a willingness to provide help to disaster victims is an essential step to establish a trustful relationship between mental healthcare professionals and disaster victims and facilitate further mental health support activities.⁵¹

(3) Screening Victims Who Need Careful Mental Health Monitoring

Mental healthcare professionals should screen disaster victims

appropriately to identify those who seem to have severe mental problems and need mental health support. During screening and monitoring, personal privacy should be protected.

(4) Mental Health First-Aid

The change of mental status immediately after the occurrence of a disaster is largely attributable to acute stress reactions, and is characterized with diverse and rapidly changing symptoms. The goal should be placed to identify those who seem to have severe mental problems and those who feel emotional pain. Conversations with victims are the best method to screen victims who need mental health support.^{51,52}

(5) Mental Health Screening

As mental health symptoms become more persistent after a certain period of time from the occurrence of a disaster, it is desirable that disaster victims be screened for mental health problems whenever necessary. As a rough indication, victims should be screened at week 5 or later after the occurrence of the disaster. Mental health screening should be conducted to identify individuals at risk for mental disorders on the basis of the severity of mental health problems and the effects of the disaster on their family members and community, obtain information that will facilitate further support, and refer those appearing to have more severe mental health problems to psychiatrists first.⁵¹ Mental health diagnosis is not always necessary during screening.

IV Prevention of Disaster-Related Cardiovascular Diseases

1. Interventions for Disaster-Related Stress

1.1 Acute and Sub-Acute Phases

It is assumed that disaster victims have significant mental stress during the period from the chaotic phase immediately after the occurrence of a disaster through the stabilized phase. In order to prevent excessive mental stress during the chaotic phase, preparation for future disasters is necessary to ensure that healthcare professionals provide prompt and consistent medical services that are covered with the National Health Insurance from immediately after the occurrence of a disaster.⁵⁷ Disaster preparedness should include (1) establishing disaster response coordination systems, (2) securing supporting systems including logistics, and (3) stockpiling resources.

Immediately after the occurrence of a disaster, healthcare professionals should focus on triage to provide optimal medical services with available resources, as well as on securing food and water among other necessities, medical and human resources, and logistic support and grasping the extent and severity of the disaster.

Several days after the occurrence of a disaster, medical problems due to poor living environment become prevalent.⁵ Specifically, living with others at crowded evacuation centers may cause fatigue, poor health conditions, infections, and exacerbation of existing diseases, and discontinuing treatment may cause acute exacerbation of existing chronic conditions. Mental health care is also necessary for the treatment of psychological trauma due to the disaster. Healthcare professionals should listen to disaster victims carefully and receptively.⁵⁷ Stress management is important not only for patients but also

for healthcare professionals.

Stress reduction measures suitable for both disaster victims and healthcare professionals include (1) having adequate sleep and rest; (2) eating meals regularly; (3) refraining from alcohol, tobacco, and drug abuse; (4) performing appropriate exercise to alleviate tension; and (5) talking about causes of stress with others or keeping them in a journal.⁵⁸

1.2 Chronic Phase

(See Section “3.1 Environment of Evacuation Centers” in Chapter “II General Principles”)

Chronic stress due to death of family members and change in living environment, including staying at evacuation centers, may exacerbate multiple risk factors for atherosclerosis.

1. These risk factors should be managed carefully through lifestyle interventions, drug treatment, or other appropriate measures.
2. Psychological care may be effective for high-risk disaster victims under chronic stress, such as those with a history of myocardial infarction.
3. Automated external defibrillators (AEDs) should be available in places where many people gather, and the public should be educated on how to use AEDs and conduct cardiopulmonary resuscitation. It is believed that influenza vaccination may reduce the risk of myocardial infarction and stroke.
4. The public should be educated to avoid behaviors and habits that are known to induce cardiovascular events, for example, conflicts with family or neighbors, going out or working in very cold or hot weather, and excessive salt and

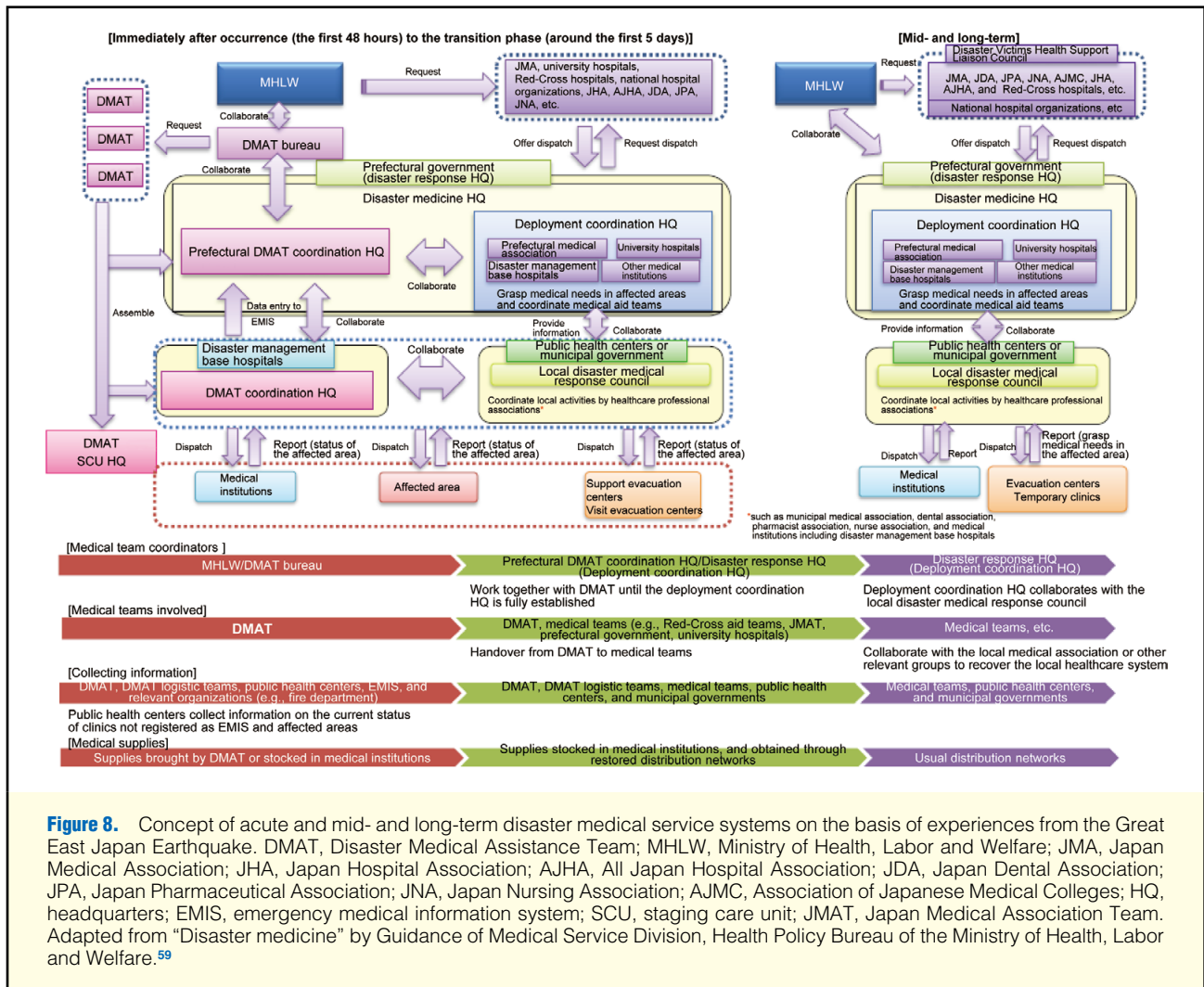


Figure 8. Concept of acute and mid- and long-term disaster medical service systems on the basis of experiences from the Great East Japan Earthquake. DMAT, Disaster Medical Assistance Team; MHLW, Ministry of Health, Labor and Welfare; JMA, Japan Medical Association; JHA, Japan Hospital Association; AJHA, All Japan Hospital Association; JDA, Japan Dental Association; JPA, Japan Pharmaceutical Association; JNA, Japan Nursing Association; AJMC, Association of Japanese Medical Colleges; HQ, headquarters; EMIS, emergency medical information system; SCU, staging care unit; JMAT, Japan Medical Association Team. Adapted from “Disaster medicine” by Guidance of Medical Service Division, Health Policy Bureau of the Ministry of Health, Labor and Welfare.⁵⁹

fat in the diet.

- It is likely that the preferential prescription of beta-blockers may be effective in reducing the risk of cardiovascular events in high-risk patients in the chronic phase of disaster.¹⁷ Regular use of oral aspirin and having nitrates available for use are considered effective as well.

2. Securing Healthcare Professionals and Medical Institutions

In order to prevent the unavailability of medical services during disasters, disaster medical systems should be established in advance to provide medical services continuously from the occurrence of disaster through long-term recovery. **Figure 8** illustrates the MHLW’s concept on medical services from the acute to mid- and chronic phase of a disaster that has been developed based on the experience with the Great East Japan Earthquake.⁵⁹ National and local governments and medical institutions throughout the country should follow this concept in order to be able to respond to disasters promptly, secure and dispatch healthcare professionals to the affected areas, and provide medical services to those who need them.

2.1 Securing Healthcare Professionals

During the first 48 hours after the occurrence of a disaster (ultra-acute phase), the Disaster Medical Assistance Team (DMAT) will lead disaster mitigation activities. During the following 5 days (the transition phase), healthcare professionals who provide necessary medical services in the affected areas should be dispatched by the Japan Medical Association (Japan Medical Association Team, JMAT), university hospitals, Red-Cross hospitals, national hospital organizations, the Japan Hospital Association, the All Japan Hospital Association, the Japan Dental Association, the Japan Pharmaceutical Association, and the Japan Nursing Association, among other groups. The groups involved in the transition phase will work together with the Disaster Victims Health Support Liaison Council and other relevant groups to continue mid- and long-term medical services.

2.2 Securing Medical Institutions

Disaster medical services are provided at medical institutions, disaster sites, and evacuation centers. Those at disaster sites are provided during the ultra-acute phase by the DMAT. Medical services at evacuation centers are aimed to manage chronic diseases and prevent complications. Those who need acute medical care should be treated in medical institutions. Disaster

management base hospitals will play a central role in providing acute medical care during disasters.

2.2.1 Disaster Management Base Hospitals

In order to serve as the hub of disaster medical services, the disaster management base hospitals should have earthquake-resistant buildings and public utility services (i.e., telecommunication, electricity, and water); keep stockpiles of food, drinking water, and drugs for at least 3 days; and have a heliport which facilitates patient transportation by air ambulance.

2.2.2 Supporting Hospitals

When a large-scale disaster occurs, advanced medical services will be unavailable in many hospitals in the severely affected areas as buildings will collapse and utilities will be disrupted, which makes it difficult for local healthcare professionals to keep the usual level of medical care. It is essential to ensure that less-affected hospitals accept victims who need advanced medical care and establish patient transportation systems. Medical institutions should establish networks that facilitate communication between affected and less-affected hospitals to share information and send patients without delay. Medical institutions that may accept disaster victims should provide detailed information on geographical features as well as available medical services. As the temporary headquarters of patient triage to classify patients into those transferred to local hospitals and those to hospitals in intact areas, staging care units (SCUs) should be placed to ensure prompt transportation of disaster victims requiring emergency medical care. In order to provide disaster medical services promptly, it is essential to establish systems to ensure quick and smooth transportation of patients from the disaster-affected areas to medical institutions in less-affected or intact areas.

3. Storage of Drug Prescription Data and Drugs

Patients with cardiovascular diseases often take drugs for a long period of time, and discontinuation of treatment may worsen their condition or result in a fatal outcome. When the Great East Japan Earthquake occurred, the tsunami destroyed buildings and flushed away medical records at clinics, prescription records and stock drugs at pharmacies, and medication booklets (“Okusuri Techo”) and prescribed drugs at houses, causing difficulties for many patients with chronic diseases, including cardiovascular diseases, to receive continued treatment. It has been suggested that the disruption of clinical practice was a major factor causing the increased incidence of heart failure, acute coronary syndrome, and stroke after the occurrence of the Great East Japan Earthquake.⁵ On the other hand, disaster victims who needed medical services after the occurrence of the 1995 Great Hanshin-Awaji Earthquake were mainly those who were trapped under the debris and needed surgical management, and no significant increase in cardiovascular events was noticed. As indicated with these two major earthquakes which differ in terms of the type of treatment required, medical services required by disaster victims may differ substantially depending on the type and extent of damage, and disaster medical needs are diverse, ranging from surgical treatment of disaster-related injuries to maintaining drug treatment in patients with chronic diseases.

The followings are recommendations in terms of storing prescription data and stock drugs, and ensuring distribution of drugs, which were learned from the Great East Japan Earthquake.

- As discontinuing drug treatment during disaster together with disaster-related stress may raise the risk of cardiovascular events, approaches to ensure continued drug treatment after the occurrence of a disaster should be established at different levels including local government, medical institution, and individual.
- As patients’ medication booklets, which contain information on prescribed drugs to the patient, will facilitate physicians to make precise diagnosis and prescribe appropriate drugs even at the time of a disaster, patients should be educated to keep their medication booklet current and carry it with them.
- In order to prevent interruption of drug treatment at the time of a disaster, patients who are taking drugs regularly should store one or two weeks’ worth of drugs.
- Local pharmaceutical wholesalers associations should work with the relevant local governments, physicians associations, pharmacists associations, and the Japan Pharmaceutical Manufacturers Association to build systems to ensure drug delivery at the time of a disaster in order to provide all necessary drugs to the affected areas with no shortage or overage.

4. How to Handle Home Care Patients

Patients with cardiovascular diseases are increasingly treated in the home setting. Large-scale disasters may significantly affect home care patients because their medical devices may stop functioning due to a loss of electricity and other public utilities, and oxygen tanks and intravenous bags may become unavailable. The followings are recommendations in terms of disaster management and preparation for home care patients with cardiovascular diseases, which have been learned from large-scale disasters in the past.

4.1 Home Care Patients With Cardiovascular Diseases Who May Have Difficulties After the Occurrence of a Disaster

- Patients on home oxygen therapy
- Patients on home non-invasive positive pressure ventilation
- Patients on home epoprostenol therapy
- Patients carrying implantable devices

4.2 Problems That May Occur in Home Care Patients After the Time of a Disaster⁶⁰

1. Devices may stop working during a power outage.
2. Oxygen tanks and intravenous bags may become unavailable due to traffic damage.
3. The patient or family members may not know how to handle their devices or drugs in the case of an emergency.
4. Home medical devices may go wrong or break.

4.3 Preparations for Disasters⁵¹⁻⁵³

1. Working with the manufacturers of devices and drugs to prepare for disasters
2. Preparing a list of home care patients
3. Specifying medical institutions where patients will stay when their home-based treatment becomes difficult
4. Educating the home care patient and family about how to respond to disasters
5. Developing systems among medical institutions to handle home care patients during disasters
6. Conducting disaster drills

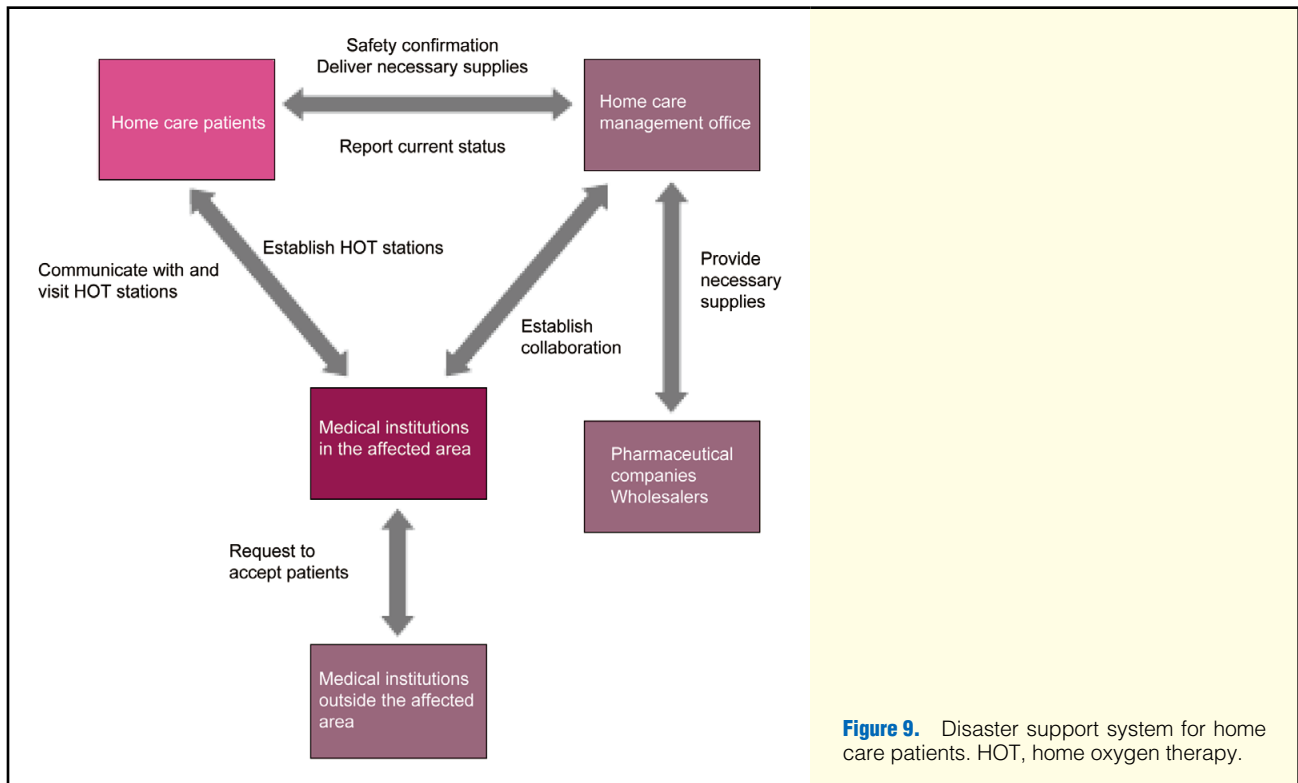


Figure 9. Disaster support system for home care patients. HOT, home oxygen therapy.

4.4 Handling Home Care Patients After the Occurrence of a Disaster^{61,64}

1. Confirming the safety of home care patients
2. Collecting disaster information
3. Providing practical support for home care patients affected by the disaster
4. Requesting appropriate medical institutions to accept home care patients affected by the disaster

4.5 Measures for Home Care Patients During the Disaster Recovery Period

1. Re-selecting medical institutions to which home care patients visit periodically
2. Understanding the health condition of home care patients

The above measures are listed on the basis of reports on disaster response, but are not based on evidence. Additional information on the experience of disaster management for home care patients should be accumulated and accessed to improve these measures. These disaster response activities become feasible only when patients, medical institutions, relevant service providers, and local/national governments work together to prepare for disasters. The authors hope that this guideline document will help these parties build a network system at disaster to support home care patients (Figure 9).

5. Nutritional Management in a Disaster

5.1 Important Points of Nutritional Management in a Disaster

(1) Quality of Meals

1. Are meals provided regularly (three times a day) at appropriate times?

2. Is potassium supplemented with non-salt vegetable juice or other appropriate meals when fresh vegetables and fruits are not available?
3. Are low-salt meals served (e.g., reducing the portion size of pickled vegetables and soups) to respond to the disaster situation where salt sensitivity may be higher than usual?

(2) Maintenance of Body Weight

An increase in body weight after the onset of a disaster may be caused by excessive energy intake from carbohydrate-rich meals or by edema. Continued body weight reduction may represent malnutrition.

(3) Infection Control

Are water and sewerage available? Disaster victims should be encouraged to wash (or disinfect) their hands whenever possible and keep toilets hygienic.

(4) Thrombosis Prevention

Disaster victims should drink at least 1L of water a day. Those who cannot eat sufficient quality and quantity of meals should be observed especially carefully to ensure adequate water intake.

(5) Others

a. Drug-Food/Drink Interactions

Patients receiving warfarin should not eat natto (fermented soybeans) or chlorella (algae supplement), and patients receiving calcium channel blockers should avoid grapefruit juice.

b. Meals for Disaster Victims With Cardiovascular Complications

i. Renal Diseases

Patients with renal diseases and high serum potassium levels should avoid potassium-rich foods such as raw vegetables,

fruits (especially bananas, as one banana contains 400–500 mg potassium, which accounts for a third of the daily allowance for this patient population), and vegetable juice.

ii. Diabetes

Diabetic patients should monitor their body weight, and adjust meal size to avoid body weight gain. Patients should avoid excessive consumption of sugar-rich foods such as sweets and juices. Extra caution should be taken for diabetic patients receiving drug treatment in whom the time and frequency of meals may differ significantly before and after the occurrence of a disaster.

5.2 Keeping Low-Salt Emergency Meals at Home

Emergency meals commonly available have long shelf lives and are shelf stable, but some products do not have detailed nutrition labeling or may contain a large amount of salt. It is desirable that each household keep food materials that can be used for disaster relief but can also be used under usual circumstances and rotated to remove the older items first. The amount of salt in the product may be calculated from the sodium content on the label using the following equation. One gram of salt roughly corresponds to about 400 mg of sodium.

$$\text{Salt (g)} = \text{sodium (mg)} \times 2.54 / 1,000$$

5.3 How to Prepare Meals at Home in the Event of a Disaster (When Public Utilities Are Unavailable)

(1) When Cooking Is Impossible, Such as Meals Immediately After the Occurrence of a Disaster

Meals should be prepared using canned food and bottled/canned beverages. Whenever possible, meals should contain carbohydrates (steamed rice, rice porridge, bread, or noodles), protein-rich foods, and vegetables.

(2) When Simple Cooking Is Possible Using Portable Gas Burners and Water

Food in cans and retort pouches may be warmed with hot water. Soups may be prepared when water can be heated.

6. Infection Control

The likelihood of infections depends on the living environment, hygiene, and availability of public utilities. In the event of a disaster, precautions should be taken to prevent outbreaks of infections, and infection surveillance should be performed in affected areas. Every possible measure should be taken to improve the living environment and hygiene using limited resources efficiently. When an outbreak occurs, the source and route of infection should be specified to avoid further expansion. The effect of infection control measures should be assessed periodically to improve the measures whenever necessary. Systematic infection control measures starting immediately after the occurrence of a disaster will facilitate the prevention of spreading infection. Diverse functions should work together to control infections. At the time of the Great East Japan Earthquake, the authors received valuable advice from infection specialists, and private entities helped obtain temporary lavatories. The prefectural government and the Self-Defense Forces helped set up hand-wash stations, and public health nurses helped educate disaster victims on how to ensure hygiene and provided suggestions to establish a good hygienic environment. In the event of a disaster, cooperation with various functions is more important than usual. Successful infection

control depends on whether initial signs of an outbreak can be detected immediately and whether effective measures can be taken by cooperating with other functions.

7. Mental Health Care and the Prevention of Cardiovascular Diseases

7.1 Disaster Mental Health Care and the Effect of Mental Stress on the Occurrence of Cardiovascular Diseases

Traumatic stress experienced by disaster victims who have anxiety, fear, and loss experience stimulates the stress adaptation mechanism in the brain, which activates the sympathetic nervous system and the hypothalamo-pituitary-adrenal axis and thereby increases heart rate and peripheral vascular resistance in an early phase. Sleep disorders, including insomnia known as a cause of mental health disorders, were experienced by about 60% of affected people in the 1995 Great Hanshin-Awaji Earthquake, the September 11 attacks in 2001 in the USA, and the 2004 Indian Ocean earthquake and tsunami. Insomnia and increased blood pressure are often left untreated in the event of a large-scale disaster as healthcare professionals are occupied by emergency cases. However, prompt intervention should be made to treat people with these signs/symptoms of stress and mental health problems in order to prevent the occurrence of cardiovascular diseases.

7.2 How to Deal With Stress and Mental Health Problems of Disaster Victims

(1) The Period When Mental Health Care for Disaster Victims Is Especially Important

As researchers have suggested that one month after a disaster is a turning point for whether acute stress disorder will disappear or progress to PTSD,⁶⁵ measures to prevent stress-related cardiovascular events are particularly important in the first one or two months after a disaster.

(2) Basic Stance on Mental Health Care in Affected Areas

Healthcare professionals should be aware of the fact that traumatic stress may cause physical problems, which are called general adaptation syndrome, before mental problems.

(3) Physical and Mental Problems Due to Traumatic Stress

Physicians who have not built a rapport (a close and harmonious relationship) with the victim yet should interview about physical problems due to the disaster rather than their mental problems, and make open questions to respond to victims who start to express their feelings.

7.3 Lessons From the Great East Japan Earthquake

Victims who experienced a serious disaster and are living in a difficult condition with damaged infrastructures should be encouraged to feel free to ask for support. Providing websites and online bulletins that facilitate communication among disaster workers is useful to provide effective mental health and medical services for people affected by the disaster.⁶⁶ Individuals who work to save and support victims in chaotic disaster situations tend to be exposed to significant stress as they feel strong social responsibilities. In fact, disaster workers have a higher incidence of mental health problems than disaster victims.⁶⁷ Healthcare professionals and individuals who provide disaster support should share knowledge on the risk of disaster stress among disaster workers as part of individual or organizational preparation for future disasters.

Recommendations for mental health care of disaster victims/

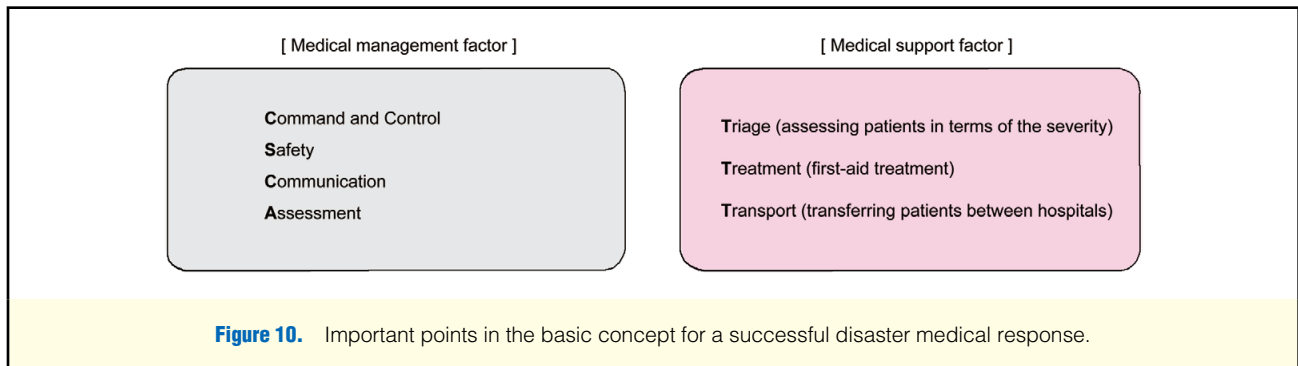


Figure 10. Important points in the basic concept for a successful disaster medical response.

workers and prevention of cardiovascular diseases are as follows:

- As excessive mental and social stress is a major risk factor for disaster-related cardiovascular diseases both in disaster victims and workers, appropriate mental health care is essential for all those involved in the disaster.
- Insomnia and increased blood pressure are important signs of mental health problems during the first one or two months after the occurrence of a disaster. Those with these signs should be treated carefully to prevent stress-related cardiovascular events.

8. Development of Disaster-Resistant Healthcare System

8.1 Changes Made After the 1995 Great Hanshin-Awaji Earthquake

CSCATTT is a basic concept for a successful disaster medical response (Figure 10).⁶⁸

CSCATTT consists of four medical management factors (CSCA), and three medical support factors (TTT). In order to provide medical practice successfully at the affected area, CSCA systems must be established. CSCA consists of Command and Control (C), Safety (S), Communication (C), and Assessment (A). Command and Control means establishing well-organized command and control systems operated by empowered leaders. This is necessary to provide disaster relief activities immediately after the occurrence of a disaster. Safety means ensuring the safety of (1) Self (rescue workers), (2) Scene (condition of the affected area), and (3) Survivors. Communication means collecting and exchanging information necessary to provide appropriate medical care in the disaster setting. Assessment is made on collected information to prepare action policies and plans. When actions are made, further information should be collected to modify policies and plans to be deployed. By repeating these steps, medical systems that meet the changing needs of the affected area may be built.

TTT means Triage, Treatment, and Transport, which are actions to be made at the scene. Triage is performed to utilize limited manpower and resources by assessing disaster victims in terms of the severity of their injuries and the necessity of emergency treatment to decide the priority of treatment and transport. Treatment means emergency treatment. Transferring casualties at the scene to the aid station for triage is prioritized. At the aid station, measures to stabilize vital signs are prioritized. Transport means transporting patients requiring treatment to appropriate medical institutions as soon as possible.

8.2 Further Strengthening of the Disaster Medical Care System

8.2.1 Lessons From the Great East Japan Earthquake

After the Great East Japan Earthquake, the Health Policy Bureau of MHLW issued a notification entitled “Enhancing and Strengthening Disaster Medical Systems”,⁶⁹ and indicated the following points to be emphasized to provide better medical care in the disaster setting in the future.

- a. Encouraging healthcare professionals to participate in local disaster prevention councils
- b. Concluding collaborative disaster aid agreements
- c. Establishing emergency medical information systems
- d. Establishing disaster management base hospitals
- e. Strengthening the function of public health centers in disaster medicine
- f. Conducting public awareness activities, education, and training on disaster medicine

8.2.2 Roles in Cardiologists in Disaster Medicine

Reports have indicated that natural disasters are associated with the increased risk of cardiovascular events. It is believed that disaster-related cardiovascular events are a major intrinsic cause of death in a disaster. Cardiologists may contribute to strengthening disaster medicine services by organizing in advance disaster response teams who will visit aid stations to prevent and detect the early occurrence of cardiovascular events, and creating a system to dispatch teams to affected areas without delay.

8.2.3 Possibility of Telemedicine for the Treatment of Cardiovascular Diseases

In the event of the Great East Japan Earthquake, the Disaster Cardiovascular Prevention network (DCAP Net) was run on a trial basis.⁴⁵ The DCAP Net allows medical institutions in affected areas to work with disaster management base hospitals in remote areas to screen disaster victims using the DCAP Risk Score, manage data through cloud services, efficiently manage patients with a high risk for cardiovascular diseases, prevent the occurrence of disaster-related cardiovascular events, and support local medical institutions.

Patients with cardiovascular disease should be instructed to keep two weeks’ worth of their prescription drugs, and patient pocketbook or medication booklet, which describes the history of disease and treatment as a measure to save their life in the event of a disaster. Cardiologists can perform these educational activities as the first step to build disaster-resistant healthcare systems.

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- (The affiliations of the members are as of June 2014)

Appendix 2 Disclosure of Potential Conflicts of Interest (COI): Guidelines for Disaster Medicine for Patients With Cardiovascular Diseases (JCS 2014/JSH 2014/JCC 2014)

Author	Employer/ leadership position (private company)	Stakeholder	Patent royalty	Honorarium	Payment for manuscripts	Research grant	Scholarship (educational) grant/ endowed chair	Other rewards	Potential COI of the marital partner, first-degree family members, or those who share income and property
Chairs: Hiroaki Shimokawa				Daiichi Sankyo Bayer Kyowa Hakko Kirin Nippon Boehringer Ingelheim		Bayer Asahi Kasei Pharma	MSD Kowa Pharmaceutical Teijin Pharma Mitsubishi Tanabe Pharma Takeda Pharmaceuti- cal Company Daiichi Sankyo AstraZeneca Kyowa Hakko Kirin Nippon Boehringer Ingelheim Dainippon Sumitomo Pharma Novartis Pharma Bayer Medtronic Japan Asahi Kasei Pharma Tesco Terumo St. Jude Medical Japan Nihon Kohden Hitachi Aloka Medical		
Chairs: Kazuomi Kario				Takeda Pharmaceutical Company Daiichi Sankyo Mochida Pharmaceutical Dainippon Sumitomo Pharma Shionogi Bayer Nippon Boehringer Ingelheim AstraZeneca Astellas Pharma	Takeda Pharma- ceutical Company Daiichi Sankyo		Nippon Boehringer Ingelheim Daiichi Sankyo Takeda Pharmaceutical Company Novartis Pharma Mochida Pharmaceutical Dainippon Sumitomo Pharma Astellas Pharma Teijin Pharma		
Chairs: Hiroyuki Daida				Medtronic Japan AstraZeneca MSD Ono Pharmaceutical GlaxoSmithKline Shionogi Daiichi Sankyo Takeda Pharmaceutical Company Nippon Boehringer Ingelheim Bayer Terumo Astellas Pharma		MSD	Takeda Pharmaceutical Company Daiichi Sankyo Nippon Boehringer Ingelheim Astellas Pharma Sanofi Aventis MSD Kaken Pharmaceutical AstraZeneca Dainippon Sumitomo Pharma Pfizer		

(Appendix 2 continued the next page.)

Author	Employer/ leadership position (private company)	Stakeholder	Patent royalty	Honorarium	Payment for manuscripts	Research grant	Scholarship (educational) grant/ endowed chair	Other rewards	Potential COI of the marital partner, first-degree family members, or those who share income and property
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Members: Masao Daimon					Bunkodo				
Members: Morimasa Takayama	Kaneka Abbott Vascular Japan			Daiichi Sankyo					
Members: Yasuchika Takeishi						ADTEX Alexion Pharmaceuticals	Philips Respironics Medical Corporation Heishinkai Dainippon Sumitomo Pharma Nippon Boehringer Ingelheim St. Jude Medical Japan Fukuda Denshi Japan Lifeline		
Members: Mashio Nakamura				Daiichi Sankyo Nippon Boehringer Ingelheim					
Members: Motoyuki Nakamura							Takeda Pharmaceutical Company		
Members: Yoshihiro Fukumoto				Daiichi Sankyo Bayer Mitsubishi Tanabe Pharma Kowa Pharmaceutical GlaxoSmithKline Pfizer Takeda Pharmaceutical Company			Takeda Pharmaceutical Company Dainippon Sumitomo Pharma Mitsubishi Tanabe Pharma Daiichi Sankyo		
Members: Satoshi Hoshide							Teijin Pharma		

(Appendix 2 continued the next page.)

Author	Employer/ leadership position (private company)	Stakeholder	Patent royalty	Honorarium	Payment for manuscripts	Research grant	Scholarship (educational) grant/ endowed chair	Other rewards	Potential COI of the marital partner, first-degree family members, or those who share income and property
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Companies are listed only by name. The following members have no COI to disclose. Members with no COI to disclose.

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Members: Yoshihiro Miyamoto	None	Collaborators: Fumihiko Koyama	None
Members: Yuji Morisawa	None	Collaborators: Jun Takahashi	None
		Collaborators: Takanao Hashimoto	None