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Sakiko Kanbara
Shoko Miyagawa
Hiroyuki Miyazaki *Editors*

Disaster Nursing, Primary Health Care and Communication in Uncertainty

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Sakiko Kanbara • Shoko Miyagawa
Hiroyuki Miyazaki
Editors

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Springer

Editors
Sakiko Kanbara
University of Kochi
Kochi, Japan

Shoko Miyagawa
Keio University
Kanagawa, Japan

Hiroyuki Miyazaki
University of Tokyo
Tokyo, Japan

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Preface

Disaster policies have been developed and implemented at the international, national, state, local, and hospital levels. Still, disasters continue to adversely affect communities and hospitals at all levels, causing injury and death to people and destroying infrastructure. Besides hospital preparedness, community people as first responders are to be prepared for various challenges of care responding to a wide range of natural disasters (e.g., floods, earthquakes, tsunami) activity for many years. After 2015, there were much more needs to build community resilience further and improve cooperation and sustainability, based on the Sendai Framework for Disaster Risk Reduction, the UN Sustainable Development Goals, and sustainable human security. From our experiences of field works, disaster projects and programs such as "Disaster Nursing Global Leadership Program," "Care for Disaster Risk Reduction," and "EpiNurse Project," we have witnessed outstanding disaster nursing that has opportunities to impact a survivor's experience, effectiveness, and efficiency of collaborative care at every level. Thus, the purpose of this book is to explain the experience, intentions, and phenomena of disaster response nurses who have understood and responded to health needs in unfamiliar places and during uncertain times and to help reduce disaster risk.

Natural disasters inevitably cause human casualties. Once a disaster occurs, healthcare practitioners, including nurses, have been expected to respond to these catastrophic times and research related to disaster response and disaster health care. But there have been many challenges implementing nursing care into practice, education, and study of disaster risk reduction. Given the extensive range and specialization of nurses from around the globe who are involved in the complex spectrum of disaster health (from pre-event planning to recovery), it is not surprising that there are uncountable healthcare needs. To have the best possible level of health security, the critical key is to understand "what is the capacity of community and people?" Capacity could be the human resources, organizational interaction, and people's ability to solve collective problems to maintain health and well-being in the event of a disaster.

Nurses who reside in a disaster-affected area know their community, owners of invaluable information and experience, for they can grasp the situation in a place even before a crisis has occurred. Most of them were not disaster specialists but survivors of the disaster naturally. Innumerable caregivers are constantly working in homes, communities, and hospitals with health crises in our uncertain society. Naturally, a nurse as a preventive practitioner, who

contributes to disaster prevention activities and reduces adverse health risks within the affected area, has experience with rehabilitation and staying at sites for long periods. It is impossible for one nurse to maintain community health on the affected disaster site and convert their thoughts and experiences into data. It is critical that disaster responders who are dispatched from outside of the affected area develop cultural awareness and sensitivity before arriving at disaster sites to integrate caring capacity. More information about the local situation and environment is needed before deployment.

Therefore, an emergency nursing collaborator as a leader is required, who has leadership skills, flexibility, coordination abilities, and cultural competence to link multi-disciplines to solve a wide range of community health issues.

Our team has been challenged to visualize the necessary concepts to co-create primary health care for the universal health coverage of the people. It was essential to show inclusiveness towards human security through open communication to prepare for uncertain future times, environments, and situations. The transdisciplinary practice of long-term care is vital with diverse expertise, such as epidemiology, ethnography, sociology, health informatics, and geographic information systems. Additionally, it was also required to build relationships with counterparts, local governments and community leaders, and international organizations during non-disaster times, work together more effectively, and arrange a communication system between countries to provide time-efficient support to the local people.

To reduce the impact of disasters on people and achieve SDGs, an innovative and ongoing health governance is needed to know and strengthen future disasters and social change immediately.

It is reasonable to have a common understanding focusing on SDG3 from the local and global health needs to disasters and other health emergencies. Global citizens are expected to have diverse specialty caring skills from various backgrounds that bring a wealth of different types and levels of expertise to the people experiencing a disaster. At the same time, research on the transdisciplinary approach for multisector collaboration is essential. The knowledge gained from disaster nursing, including the outlook for this book, provides the tip of education, research, practice, and health policies aimed at SDGs 3, which is related to pre-disaster, intra-disaster, and post-disaster care for individuals and responders. It highlights essential points, such as the need for community TRUST and tangible action for effective DRR.

This book can be the first step towards creating an innovative approach for action aimed at health and well-being.

Kochi, Japan — Sakiko Kanbara
Kanagawa, Japan — Shoko Miyagawa
Tokyo, Japan — Hiroyuki Miyazaki

Contents

Part I

Global Health and Care for Disaster Risk Reduction

1 Disaster Nursing Innovation for Sustainable Community

Sakiko Kanbara and Hiroko Minami

1.1 History of Disaster Nursing

Many disaster experiences have called for an expansion in the role of nursing. During the 1888 eruption of Mount Bandai, doctors and nurses were dispatched to carry out relief activities. The Japanese Red Cross Society dispatched doctors, which triggered the Japanese Red Cross Society to establish a system for post-disaster relief systematically. Relief activities by doctors and nurses were also carried out during subsequent earthquakes and tsunamis. Disaster nursing was established in Japan after the Great Hanshin-Awaji Earthquake in 1995. Since then, people's sense of values regarding disaster nursing has changed dramatically since. In 1998, the Japan Society of Disaster Nursing was established for "promoting the systematization of the knowledge and practice of disaster nursing and contributing to the lives and health of people through the development of disaster nursing." In 2007, the Japan Society of Disaster Nursing initiated a committee to establish an international society of disaster nursing. The World Society of Disaster Nursing (WSDN) was inaugurated in Kobe in 2008 (WSDN 2008). Recognizing the importance of a functioning bioregional emergency and disaster nursing network, the Asia-Pacific Emergency and Disaster Nursing Network was formed in 2007 as a critical outcome of the Joint Informal Meeting of Health Emergency Partners and Nursing Stakeholders convened in Bangkok, Thailand, by the World Health Organization (WHO) Regional Office for the Western Pacific and South-East Asia Regions in collaboration with the International Organization for Migration (IOM) (WPRO 2007).

The College of Nursing Art and Science, University of Hyogo, launched the twenty-first-century Center of Excellence for Disaster Nursing in a Ubiquitous Society to promote disaster nursing from 2003 to 2007 (Yamamoto 2004). Disaster nursing was introduced into the curriculum of basic nursing education in 2009. The aim of disaster nursing education is as follows: (1) to acquire the ability to creatively develop nursing practices by working in collaboration with many stakeholders at disaster sites where human resources and supplies are limited and (2) to cultivate the foundation of supportive human relationships by facing survivors with the attitude of respecting people, and the sense of ethics (Sakai 2006). At the time of the Great East Japan Earthquake of 2011, many nurses from all over Japan voluntarily rushed to the disaster areas to participate in health-related activities for the affected populace. However, knowledge of disas-

S. Kanbara (✉)
University of Kochi, Ike Kochi City, Kochi, Japan
e-mail: kanbara@cc.u-kochi.ac.jp

H. Minami
Kobe City College of Nursing, Kobe, Japan

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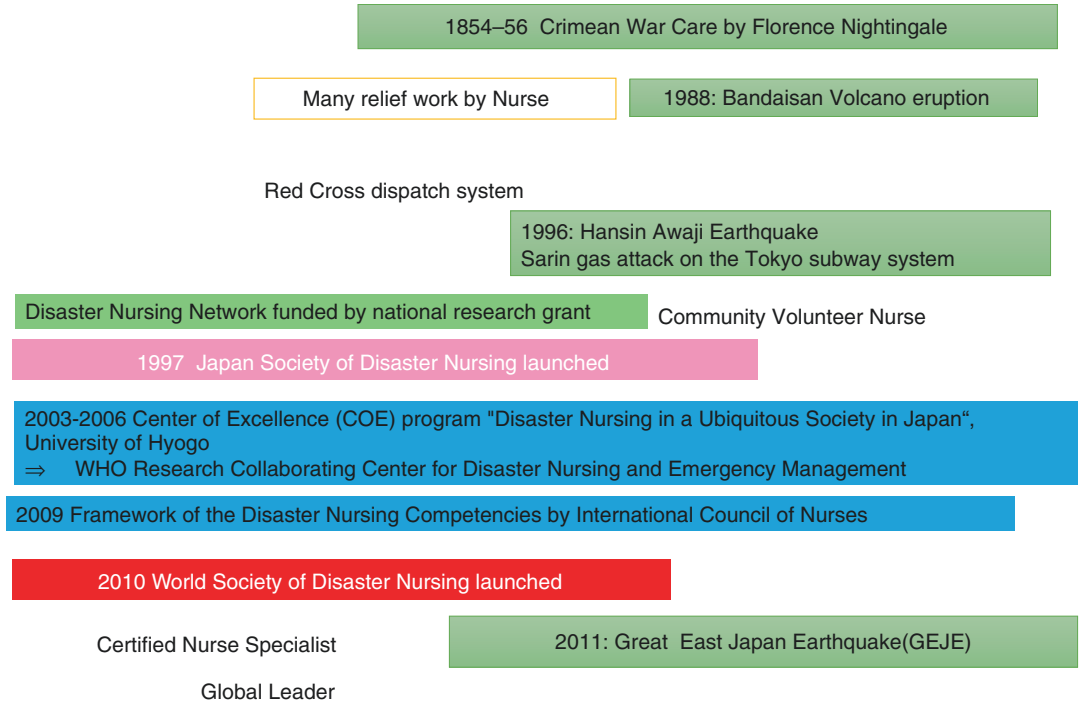

Fig. 1.1 Nursing on disaster and health emergency in Japan

ter nursing was inadequate and identified in a general manner, and the number of disaster nursing experts was insufficient (Sakashita 2014) (Fig. 1.1).

1.2 Paradigm Change After Great East Japan Earthquake 2011

On the Great East Japan Earthquake in 2011 Japan, survivors found it tough to access daily medical care and were rarely concerned about public health, and it become complex to take preventive measures in an environment far removed from medical care. Due to the vast amount of information, including paper, and the lack of human resources immediately after the disaster, the collection of data on the damage situation was delayed, and insufficient assessments could not be made, which prevented the delivery of various human and material supports. Due to the emergency response, it was not possible to assess the precise and fluid requirements of the people. Local government officials had expected to be the core support for the community, however they were also survivors and needed to rebuild their lives like other community members. Flexible preventive approaches to gaps in the healthcare system were not easily recognized, and many care needs were overlooked.

It was revealed that nursing care should be factored in as a critical component of human security of patients and survivors of natural disasters by complex disaster 2011. Particularly, it is vital for a long-terms, community care plan to sustain the health security of individuals. For sustainability, disaster nursing required a paradigm shift as follows: (1) reconstruct the focus of disaster nursing to include a long-term perspective in maintaining a healthy community; (2) train nurses to be competent in bringing together regional cooperation; (3) expand the responsible mechanism in disaster response beyond the organizational level; (4) provide consistent and seamless support to the need, the community, and other healthcare providers in times of and beyond disaster; (5) introduce policy recommendations

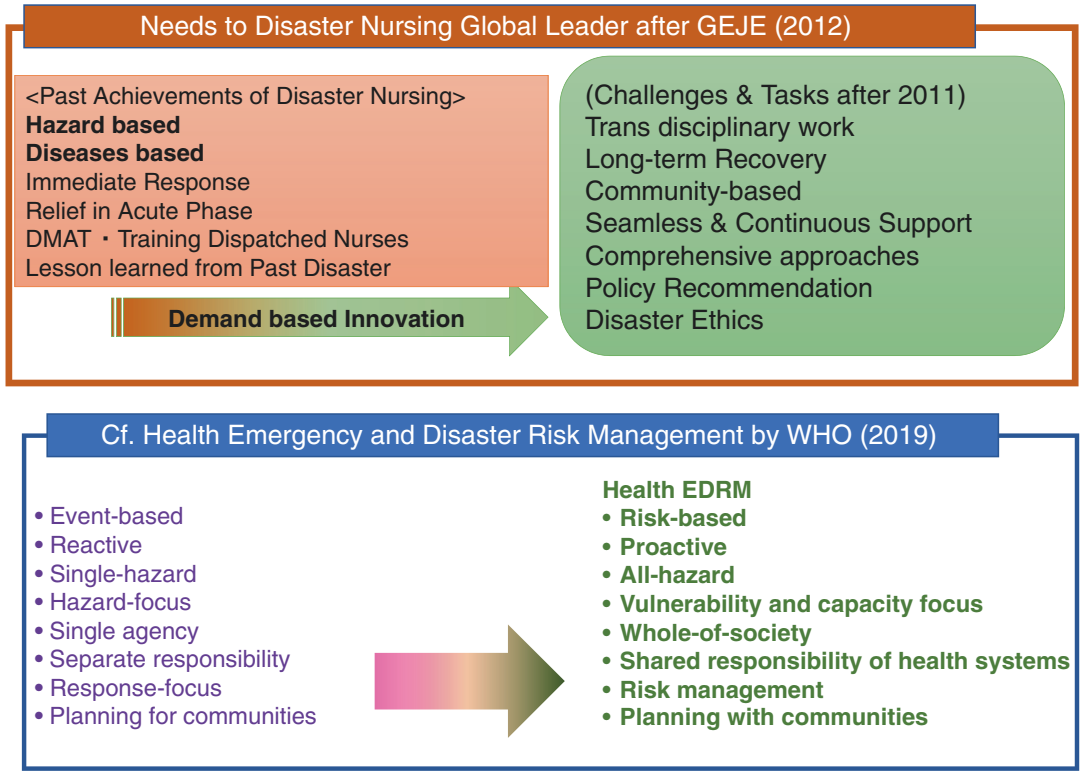

Fig. 1.2 Needs of disaster nursing global leader

to amend the current and past policies in disaster prevention and responses; (6) recharge the entire nursing staff including those in an administrative post, research, and practice; and (7) produce experimental verification, pioneering activities, and exploration of ethics. In addition, it is important to look at the more immediate responsibilities of nurses in disasters: to create a system to protect the lives of the medical staff; establish the system of disaster mitigation; establish a respectful approach toward the culture of the people in the affected areas; assist the affected community with reconstruction and regeneration and provide international medical and humanitarian aid.

In 2012, the Disaster Nursing Global Leader Degree Program (DNGL) was launched which was led by the University of Kochi, funded by the Leading Graduate School scheme of the Ministry of Education, Culture, Sports, Science, and Technology. Five graduate schools from five Japanese national, public and private universities playing a leading role in disaster nursing (the University of Kochi, University of Hyogo, Tokyo Medical and Dental University, Chiba University, and the Japan Red Cross College of Nursing) jointly launched the project. The philosophy of the program was based on ensuring human security. In 2014, the world's first international academic journal on disaster nursing, "Health Emergency and Disaster Nursing," was published (HEDN 2014). The journal was the first to contribute to disaster prevention and regeneration by bringing together the wisdom of nursing science (Fig. 1.2).

1.3 Request to Disaster and Nursing on Global Agenda on 2015

In March 2015, the Third UN World Conference on Disaster Risk Reduction was held in Sendai, Japan (UNISDR 2015). At this conference,

disaster experiences and disaster prevention measures in each country were widely disseminated. In nursing, there was a movement to share the experience of disasters, including nuclear disasters. In September 2015, the UN Sustainable Development Summit was held, building on the Millennium Development Goals (MDGs) (UN 2015). The 2030 Agenda adopted at this summit listed "Sustainable Development Goals" consisting of 17 goals and 169 targets, to eradicate poverty and realize a sustainable world. As the primary providers of health care to all communities in all settings, nurses are crucial to achieving sustainable development goals. Disaster nursing is evolving and has witnessed great disaster response practices for nursing, contributing to the Sendai Framework for Disaster Risk Reduction, the UN Sustainable Development Goals, and sustainable human security.

In the same year 2015, Margaret Chan, Director-General of the World Health Organization (WHO), in her keynote address at the International Council of Nurses (ICN) conference in Seoul, warned the audience that "a world out of balance is neither stable nor secure." The instability and insecurity that Dr. Chan referred to were linked to severe issues such as poverty and lack of health care and nurses' role in addressing these issues. She regarded nurses as part of the solution to the broader problem of inequity and asked to solve these more general problems that create insecurity and undermine people's health (Wakefield 2018).

Disaster has occurred more frequently and violently, severely impeding progress toward sustainable development. All of this requires global citizens to take concrete actions while living in a single community. Ongoing research, education, and practice are needed in communities to inform and strengthen policies to reduce disasters' impact and prepare for future natural disasters. The concept of disaster nursing is closer to development and social science models than to healthcare services. Nursing needs transdisciplinary discussion with which initiates the issue forward to targets such as in Table 1.1. Disaster nursing knowledge should be more involved in community disaster management and preparedness discussions.

Disasters are an unavoidable impediment to sustainable development. They lead to mortality and infrastructure loss, and loss of economic productivity, human capital, and health. In other words, the entire community should be temporarily committed to "SDG 1 end poverty in all its forms everywhere" and SDG 2 end hunger, achieve food security and improved nutrition end hunger, achieve food security and improved nutrition, and promote sustainable agriculture. The result is a phenomenon that directly or indirectly runs counter to the target of SDG 3 ensure healthy lives and promotes well-being for all ages. On the other hand, it is also important to increase health resilience and reduce vulnerability to disaster-induced health risks. Much of people's vulnerability to disasters is a social determinant of health, and a stronger commitment to the SDGs in public health measures will lead to resilience. Understanding disaster risk is a priority action 1 for disaster management, as in health promotion." SDG 4, "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all," is essential. Being a "woman" is categorized as a vulnerable population in disaster management, and the gender perspective is overlooked. It is also true that many nurses are women and have not had the opportunity to speak out on disaster risk reduction in their communities. The achievement of "SDG 5 achieve gender equality and empower all women and girls" will benefit risk reduction in all aspects before and after disasters.

During disasters, many people also lose their jobs. When people lose their jobs, they are not only unable to maintain their livelihood and income, but they also lose their connection to society, which leads to mental instability and social isolation. This negative chain leads to loneliness and suicide in many cases. Therefore, it is essential to promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all, even in the face of disasters.

Disaster health can lead to reducing these vulnerabilities in terms of global health and in terms of "SDG 10 reduce inequality within and among countries," which can be disaster risk reduction.

Table 1.1 Sustainable development goal and keyword on target related to disaster nursing

1. End poverty in all its forms everywhere	
1.3	Substantial coverage of the poor and the vulnerable
1.5	Build the resilience of the poor and reduce vulnerability to disasters
2. End hunger, achieve food security and improve nutrition, and promote sustainable agriculture	
2.4	Ensure sustainable food production systems that strengthen capacity for adaptation to climate change
3. Ensure healthy lives and promote Well-being for all at all ages	
3.1	Reduce the global maternal mortality ratio
3.2	End preventable deaths of newborns and children under 5 years of age
3.3	End the epidemics of AIDS, tuberculosis, malaria, and other communicable diseases
3.4	Reduce mortality from noncommunicable diseases
3.5	Strengthen the prevention and treatment of substance abuse
3.6	Reduce deaths and injuries from road traffic accidents
3.7	Ensure universal access to sexual and reproductive healthcare services
3.8	Achieve universal health coverage, including financial risk protection, access to quality essential healthcare, affordable essential medicines
3.9	Protect from hazardous chemicals and air, water, and soil pollution
3.c	Increase development, training, and retention of the health workforce
3.d	Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction, and management of national and global health risks
4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all	
4.2	Ensure quality early childhood development, care and preprimary education so that they are ready for primary education
4.7	Ensure knowledge and skills, through education for sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and nonviolence, global citizenship
5. Achieve gender equality and empower all women and girls	
5.1	End discrimination against all women and girls everywhere
5.4	Recognize and value unpaid care and domestic work and the promotion of shared responsibility within the household
5.5	Ensure women's participation and equal opportunities for leadership
5.b	Enhance the use of technology to empower women
6. Ensure availability and sustainable management of water and sanitation for all	
6.2	Achieve access to adequate and equitable sanitation and hygiene
6.b	Participation of local communities for water and sanitation
7. Ensure access to affordable, reliable, sustainable, and modern energy for all	
8. Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all	
9. Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation	
9.1	Develop resilient infrastructure with a focus on equitable access for all
9.c	Significantly increase access to information and communications technology and strive to provide universal and affordable access to the internet in least developed countries by 2020
10. Reduce inequality within and among countries	
10.7	Facilitate safe mobility of people
11. Make cities and human settlements inclusive, safe, resilient, and sustainable	
11.2	Sustainable transport systems for all
11.3	Enhance inclusive urbanization by participatory plan
11.5	Reduce the number of deaths and the number of people affected and substantially decrease the economic losses relative to gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations
11.7	Universal access to safe, inclusive, and accessible space
11.b	Human settlements adopting and implementing integrated policies

(continued)

Table 1.1 (continued)

12. Ensure sustainable consumption and production patterns	
13. Take urgent action to combat climate change and its impacts	
13.1	Resilience and adaptive capacity to climate-related disasters
13.2	Integrate climate change measures into national policies
13.3	Human and institutional capacity on climate change
13.b	Capacity focused on women, youth, local, and marginalized community
14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development.	
15. Protect, restore, and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss	
16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all, and build effective, accountable, and inclusive institutions at all levels	
17. Revitalize the global partnership for sustainable	

SDG 11 is the most relevant goal in the book, after SDG 3. It focuses on issues related to housing, and in nursing, the living environment affects health. In some areas, people cannot live comfortably due to a lack of infrastructure, etc. Disasters undermine their places of residence, and when they cannot find a new place to live immediately, they are forced to migrate. This migration causes serious livelihood security and environmental problems, making the lives of vulnerable people even more difficult.

Modes of consumption and production of goods used only for high-cost emergency response may contain much waste. Food shortages that cause poverty and health problems are occurring at all levels. Achieving SDG 12 "ensure sustainable consumption and production patterns" and improving living standards by reducing waste and overconsumption will lead to a secure and sustainable future. In livelihoods, it is also said that "better development can reduce the need for emergency relief.

Water and sanitation are essential determinants of health, and disasters often cut off access to them. Clean water supply and sanitation are essential and should be restored as a top priority. Their shortage during disasters can easily lead to outbreaks of water-related diseases and has cascading effects on the water for health services, food preparation, and rescue services. SDG 6, "ensure availability and sustainable management of water and sanitation for all," needs to be robust against disaster risks. SDG 7, "ensure access to affordable, reliable, sustainable, and modern energy for all," is essential to rebuilding people's lives and livelihoods, while energy sources and the global economy are affecting climate change and causing new disasters; it is also necessary to consider disaster reduction comprehensively in the aspect of "SDG 7 Ensure access to affordable, reliable, sustainable and modern energy for all.

Then, "SDG 9 build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation." In this context, it is vital to build critical infrastructure such as electricity supply, information, and communication technology (ICT) systems, and road and transportation systems according to local risks. These systems can be reliably operated or quickly restored in a disaster. These innovations must be updated so that they coincide with regional development and disaster management and are consistently linked to resilience in people's lives.

SDG 13, "take urgent action to combat climate change and its impacts." SDG 14, conserve and sustainably use the oceans, seas and marine resources for Conserve and sustainably use the oceans, seas and marine resources for sustainable development." "SDG 15, protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss." These three and other SDGs require a holistic review and assessment of health risks and intervention strategies in overlapping areas. Mentioned above is the all-hazard approach.

Climate change not only makes natural disasters more likely but also increases the frequency

and intensity of hazards, such as climate-sensitive diseases (e.g., dengue fever and malaria). As forests diminish, the soil loses these functions and becomes more prone to disasters. As disasters and livelihoods become more complex, people can no longer live on the land and move to another land. This movement is called disaster displacement, or environmental refugees, who move to shelters where jobs and food are plentiful. This can be seen as the emergence of an entirely new living environment. In this context, environmental health factors vary from acute events to slow onset. Still, all have a direct impact on health, including mortality, morbidity, injury, mental health, and other health impacts.

If these challenges are not addressed simultaneously, SDG 16, "promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels," cannot be achieved. For this reason, the goal of "SDG 17 strengthen global partnerships to protect the health, especially by disseminating knowledge locally" is essential.

In this case, the human security framework can be used to narrow the ideological divides that may inform and privilege some governments' current policy approaches in addressing threats to human security.

1.4 About This Book

In the context of the above, the uniqueness of this book is that it demonstrates through various case studies of disaster nursing how it contributes to the ongoing initiative toward SDGs on health and well-being. It also adds value that the "care" approach can provide adequate proactive human security. The hallmark of disaster nursing is identifying global health problems and ways to appropriately recognize and solve them. Nurses are constantly confronted with new health problems. During a disaster, it is often impossible to predict the causes of illness and disease in a community. The face of a community changes from moment to moment. A local problem in one area is transmitted to the world and becomes a global problem. Not only the physical, chemical, and biological environment but also the sociocultural and political-economic environment can be significant. Long-term challenges to the actual upstream causes will be necessary.

The book consists of 30 chapters divided into 6 parts. Part 1 contains four chapters on global health and care for disaster risk reduction. The second part consists of seven chapters on the contribution of nursing care for disaster risk reduction. Part 3 contains six chapters on fostering care in sustainable communities. Part 4 consists of four chapters on evaluating care on the disaster. Part 5 has seven chapters on decision-making for people-centered health EDRM. Finally, Part 6 contains two chapters on future perspectives and challenges (Fig. 1.3).

1.5 Way to Forward

The question that arises from the experience of COVID-19 is whether a new paradigm of nursing science that transcends the boundaries of these disciplines is necessary. The spread of COVID-19 infection is now underway on a worldwide scale. It is a global phenomenon that the response differs not only by country but also by region (in Japan, prefectures, municipalities, etc.). The outbreak of COVID-19 was as protracted as any sudden disaster, and over time, the term was transformed into the contradictory term of routine emergency. There was a gradual shift from instantaneous initial response to long-term emergency medical care.

Nursing under unusual conditions for human life, where people have experienced isolation and self-restraint, and their living space has been narrowed, requires public health thinking but also creates a situation where ethical perspectives such as people's dignity and autonomy may be ignored in each situation where care is provided. It is precisely when a new response is required that the nursing profession's ability to make ethical judgments comes into play, and the contribution of nursing to protecting people's peace and dignity becomes essential. In the spread of

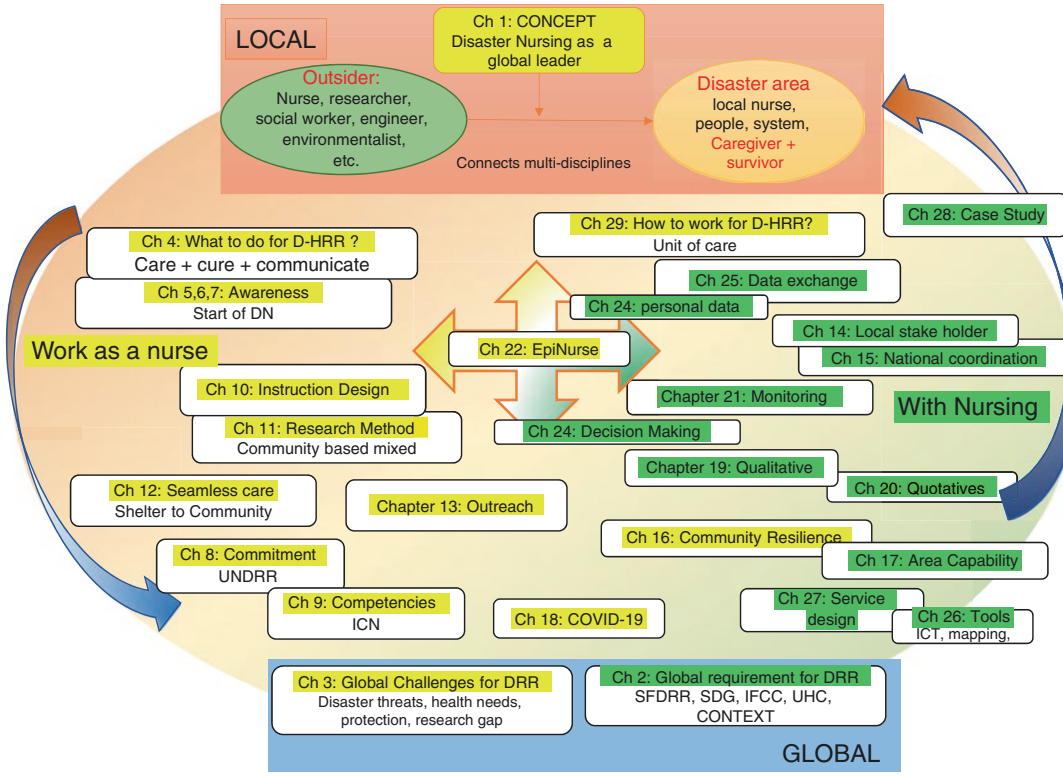

Fig. 1.3 Overview of this book: Disaster Nursing, Primary Health Care in Uncertainty (Yellow: corresponding author is Nurse)

COVID-19 infection, the challenges were compounded and complicated when earthquakes and torrential rains struck a particular area. The challenges are exacerbated and complex when a disaster strikes one specific area, such as an earthquake or torrential rains, where people are unhealthy due to inadequate health policies. It is visualized that people's unhealthy conditions caused by insufficient health policies, etc. fail to achieve SDG 3 and pose a high risk to secondary disasters and livelihood reconstruction as a vulnerability when a disaster strikes a region.

Local nurses have been involved in many aspects of nursing care, from prevention of infection among citizens to prevention of the spread of infection through isolation of infected patients, treatment of asymptomatic and mildly ill patients, critical care of moderately and severely ill patients, and home care after hospital discharge. It is synchronized with Florence Nightingale's advocacy of nursing approaches to infection, which she experienced in the camps in Crimea during the Crimean War. It is the starting point of current public health nursing, infection nursing, disaster nursing, and nursing science.

COVID-19 is a clear example of how two approaches that are thought to be different, disaster risk reduction and sustainable development, have merged and been found to have a common challenge and system: resilience. Nurses have been an integral part of community recovery and reconstruction after various crises and social changes at home and abroad, and from that standpoint, they have taken a transformative approach to build healthy communities by bringing people and health systems together. As learned from the experience of COVID-19 which has forced the nursing profession to respond severely, the disaster nursing perspective may help to understand what causes this difference. In terms of "community resilience," it is the fundamental basis for building the resilience of community members,

both in everyday life and in emergencies. In this context, each healthcare provider take the lead in recognizing medical services in extreme situations, and the importance of ICN disaster nursing competency, which includes a broad perspective on medical care in emergencies, is also reaffirmed.

In the future, there is an urgent need to visualize the role of nurses in sustainable development in a concrete way, and the nursing profession must once again be an empowering force for sustainable development in the world, preventing the spread of disease. It is needed to explore the implications of their experiences to propose a new nursing science in the next new infectious disease pandemic, and large-scale disasters with climate change. Nursing is a unique discipline that integrates and fuses domains of cure and care into a new type of field in the health arena. Nursing Science is expected to mature into the integration and fusion of natural science and human science. Dr. Sasaki (1996), a Japanese historian of Science, said in his book that he believes that the science of the twenty-first century will be led and guided by a new type of scientific society like nursing scholarship. Nurses always keep in mind that Florence Nightingale in the nineteenth century proclaimed that nursing is a fuse of art and science (McDonald 2009). Nursing scholars should work to contribute to the development of nursing science and other scientific communities for disaster risk reduction for SDGs that would have a great influence on the improvement of evidence-based nursing practice as well as health and social services in every country and the international community.

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2 Global Requirement to Disaster Nursing

Rajib Shaw and Sakiko Kanbara

2.1 Introduction

Globalization affects various disasters and health risks. It speeds up information gathering and exchange, distribution, and transportation access and accelerates the spread of infectious diseases and other illnesses, including social. Human beings benefit from globalization, but they are being exposed to its adverse effects and suffer from health problems. In addition, community people left behind by the global market are still suffering from inadequate resources, infrastructure, and public services. They have fallen into a negative cycle of poverty, which has become a severe problem. Globalization requires us to solve the above issues globally, and it also deepens mutual understanding, including cultural diversity. The Internet has also made it possible to share accurate information globally, leading to the speedy development and sharing of research and practice experience.

There are many disaster experiences and developed a legal system for disasters. Regardless of the cause, there is a similar disruption of the supply-demand balance in medical care and public health. Disaster medical response provides the best possible medical care for the many injured and sick. However, disasters always occur. It is an unprecedented experience in a changing society. There are repeated social changes, disaster systems, and cultures that are common knowledge among citizens. We need to think again about how community resilience works. All global citizens could be the first responders who cannot predict where the next disaster will occur. Global nurses have to solve these global health problems that may occur anywhere. Human security and resilience regarding disaster nursing and care as visualization of potential risk in uncertainty. Understanding global health issues and all-hazard approach on community helps cut across the current conceptual dilemma that had prevented more effective use of proactive care or governance formulation and implementation. It is helpful to be sensitive in reality and learn from the history of disasters.

The year 2015 is considered as a landmark year, when three major global frameworks, Sustainable Development Goals (the "SDGs"), Sendai Framework for Disaster Reduction (SFDRR), and Paris Agreement on Climate Change (the "Paris Agreement"), were agreed upon by the member states of the United Nations. Sustainable Development Goals (SDGs) had 17 goals with 169 targets for 2015–2030, reflecting

R. Shaw
Graduate School of Media and Governance, Keio University, Fujisawa, Japan

S. Kanbara (✉)
Graduate School of Nursing, University of Kochi, Ike Kochi City, Kochi, Japan
e-mail: kanbara@cc.u-kochi.ac.jp

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the triple-bottom-line approach to human and planetary well-being: economic development, environmental sustainability, and social inclusion (UN 2015a). The 17 SDGs are "(1) no poverty; (2) zero hunger; (3) good health and well-being; (4) quality education; (5) gender equality; (6) clean water and sanitation; (7) affordable and clean energy; (8) decent work and economic growth; (9) industry, innovation, and infrastructure; (10) reduced inequalities; (11) sustainable cities and communities; (12) responsible consumption and production; (13) climate action; (14) life below water; (15) life on land; (16) peace, justice, and strong institutions; and (17) partnerships for the goals."

The Sendai Framework for Disaster Risk Reduction (SFDRR) puts forward four priorities as follow: "(1) Understanding disaster risk; (2) strengthening disaster risk governance to manage disaster risk; (3) investing in disaster reduction for resilience; and (4) enhancing disaster preparedness for effective response, and to "Build Back Better" in recovery, rehabilitation, and reconstruction" (UN 2015b). SFDRR had seven specific targets: "(A): reduce global disaster mortality, (B): Substantially reduce the number of affected people, (C): reduce direct disaster losses, (D): Substantially reduce disaster damage to critical infrastructures and disruption on basic services, (E): Substantially increase the number of countries with national and local disaster risk reduction strategies, (F): Enhance international cooperation, and (G): increase the availability of and access to early warning system". SFDRR had a strong focus on "health" issues, unlike the previous framework (Hyogo Framework for Action). The term "health" is used 76 times in the framework. The framework has pointed out:

"To enhance the resilience of national health systems, including by integrating disaster risk management into primary, secondary and tertiary health care, especially at the local level; developing the capacity of health workers in understanding disaster risk and applying and implementing disaster risk reduction approaches in health work; promoting and enhancing the training capacities in the field of disaster medicine; and supporting and training community health groups in disaster risk reduction approaches in health programs, in collaboration with other sectors, as well as in the implementation of the International Health Regulations (WHO 2015) of the World Health Organization" (UN 2015b).

The Paris Agreement on Climate Change (the "Paris Agreement") was reached in December 2015. The target is to reduce global warming by 2 °C, preferably by 1.5 °C (UN 2015c). The agreement focuses on mitigation, adaptation, and damage and losses. By 2020, the countries needed to submit their plans for climate actions known as Nationally Determined Contributions Targets (NDC).

An analysis of these three international frameworks (Shaw et al. 2016) showed that all the frameworks emphasized the importance of the term "local," which has been used 10 times in 35-page SDG document, 48 times in 25-page SFDRR document, and 9 times in 32-page Paris Agreement. The term "local" was used in terms of authorities, communities, culture, materials, knowledge, priority, adaptation actions etc. This shows that the importance of local implementation is recognized in all three global frameworks.

The frameworks also emphasized the importance of establishment of two scientific and technological methodologies. First is the promotion of interdisciplinary research, which aims to improve the disaster prevention and mitigation literacy of humankind by linking the humanities and social sciences, which are engaged in disaster impact assessment and behavioral elucidation of the cognitive world of individuals. The second is the promotion of cooperation between science and the community. It was revealed that the promotion of disaster prevention measures based on science and technology is the frontier of disaster prevention and mitigation. Researchers and practitioners from various countries promote disaster reduction measures in their context that suit the actual conditions of each country. They also promote a national disaster risk reduction that realizes cooperation among various entities and effectively promotes international cooperation.

2019 and 2020 were important years for health and disaster risk management. WHO published

the landmark Health Emergency Disaster Risk Management (Health-EDRM) framework in 2019 (WHO 2019), emphasizing the critical importance of prevention, preparedness, and readiness, together with response and recovery, to save lives and protect health. It outlines the need to work together because EDRM is never the work of one sector or agency alone. It shows how the whole health system can and must be fundamental in these efforts. The other important document was the health supplement to the resilience scorecard of UNDRR (UNDRR 2019), where the considerations for health issues are strongly embedded in the urban resilience concept. In 2020, Chan and Shaw (2020) published a landmark book on "public health and disasters" highlighting the health emergency and disaster risk management issues in Asia.

A global campaign, "Nursing Now," was launched and implemented globally with the support of the World Health Organization (WHO) and the International Council of Nurses (ICN). The campaign was to encourage nurses to take action to contribute to the improvement of human health until the end of 2020, the bicentennial of Nightingale's birth. At the same time, there were concerns about the collapse of health care due to the prolonged spread and spread of the new coronavirus infection, and at the same time, the exhaustion of healthcare workers in the field. It was reaffirmed that the nursing profession should contribute not only to the health of people but also to the fostering of a culture of health in the community and to the development of society, no matter what the situation of society.

(1) The Japan Nurses Association (JNA 2020) has declared the following contributions of nursing to share the efforts and achievements of Japan with the world achieve the global goals of the SDGs, and improve the health of people around the world and healthy lives; (2) to participate in decision-making to promote change in practice and policy so that the nursing profession can meet the needs of society and fully demonstrate its capabilities in all settings; and (3) to contribute to better decision-making based on the best available evidence. To engage in the broad accumulation of evidence to contribute to better decision-making based on the best available evidence, it is an important action to achieve the goal of "strengthening the capacity of all countries, especially developing countries, for early warning, risk reduction and management of national and global health risks" and at the same time to broaden the path to UHC and to implement the Sendai Framework, IHR (2005), and Paris Agreement in a coherent manner.

In order for the nursing profession to respond to these changes and play a more active role, it is important that local health issues are appropriately assessed and that they influence health policy, and it is necessary to create various conditions and environments for this to happen.

2.2 Disaster Risk and Health

"Health" is a key dimension to be addressed within an all-hazard approach to disaster risk reduction (DRR). SFDRR highlights concerns about human health and well-being common to DRR, climate change, and sustainable development (Gaillard and Mercer 2012; Aitsi-Selmi and Murray 2016; UN 2015b). SFDRR mitigates the effects of disasters regarding loss of life, injury, health effects, and socioeconomic determinants that affect population health. It calls for a wide range of DRR activities. There are many references to health, including the implementation of an all-hazard approach to managing disaster risk (UN 2015b), links to communicable diseases and pandemics, several references to the International Health Regulations (WHO 2015), as well as rehabilitation as part of disaster recovery (Aitsi-Selmi and Murray 2016; UN 2015b), among other references. Within health policy, a focus on human vulnerability and capacity can help reduce the severe impacts of disasters on health and well-being.

The following risk formula is commonly used:

$$\text{Disaster risk} = \text{Hazards} \times \text{Vulnerability} / \text{Coping capacity}$$

If an event occurs due to a hazard such as a flood or a landslide, but there are no people or houses in the area, and no one suffers damage or loss, then disaster risk is avoided. On the other hand, if the hazard touches people's vulnerability, such as buildings with low earthquake resistance or people with low immunity, the disaster risk increases.

Disaster risk reduction is a concept that emphasizes citizen-driven measures to minimize damage based on the premise that it is difficult to reduce the damage caused by major natural disasters and also difficult to reduce the damage caused by small human mistakes, i.e., disasters and sudden incidences cannot be prevented. This is why the public health approach is considered very compatible. This is because of the "statistical probability of developing a disease among people exposed to a certain factor," which is the probability that a disaster may occur, the probability of suffering a disaster, the damage situation, the impact on human life, the economy, etc., which can be viewed as disaster risk. For this, the concept and methodology of epidemiology, which are the basis of public health, can be useful.

Disasters affect community health through a variety of mechanisms. There are relatively direct impacts, such as heat waves, floods, and storms, as well as more complex pathways, such as changes in infectious disease patterns, disruption of ecosystems such as agriculture, and potential population movements over depleted resources such as water, fertile land, and fisheries (IPCC 2007). The risks include systematic differences in vulnerability and capacity in health status among different socioeconomic groups. Groups at risk include emerging countries and communities, those geographically vulnerable to extreme weather events and those who heavily depend on agriculture for their livelihoods. Besides population growth, poverty, and land scarcity, urbanization has led people to live more exposed to natural hazards. Much of the migration associated with natural disasters are likely to occur in developing regions with inadequate public health resources (McMichael et al. 2007; McMichael and Lindgren 2011).

Evidence shows, at least in relative terms, the existence of widespread (and growing) risks due to vulnerabilities in health today. The need to take action to mitigate these risks and their root causes is more urgent than ever in managing the risks of large-scale disasters. These risks are socially generated, inequitable, and preventable. The economic consequences of natural disasters are long term and far-reaching, especially in developing countries. It requires a bird's-eye view of the evidence that can guide countermeasures and a new vigilance to monitor the impacts so that no population segment is excluded or undermined.

2.3 Global Risk Landscape and Science Technology

We live in an ever-changing global risk landscape, where "living with uncertainties" is the key word. The global risk landscape and risk outlook published by the World Economic Forum (WEF), which is held every year, shows how risk is changing. The analysis shows different categories of risks (economic, environment, social, technological) in terms of likelihoods and impacts. It seems that the environmental risks (climate change, extreme weather, disasters, biodiversity losses) are taking top 3 to top 5 positions in terms of both likelihood and impacts from 2011 onward. In 2021 Risk Outlook (WEF 2021), infectious disease tops the list in terms of impacts due to the global pandemic we observed in 2020.

Because of climate change, the water cycle of rainfall and evaporation has become more active, resulting in seasonal and localized hazards such as monsoonal floods, cyclones, and disease outbreaks in some areas. In contrast, many areas are subject to drought. In addition, deaths and illnesses due to heat waves, which are caused by environmental destruction, are increasing. Indirect effects of extreme weather events include an increase in the geographic range and duration of infectious disease-carrying organisms. In contrast, higher temperatures and increased flooding are thought to increase infectious diseases fur-

ther. There have been infectious disease epidemics globally, including those caused by new and reemerging infectious diseases. The Middle East Respiratory Syndrome Coronavirus (MERS-CoV) and Ebola virus disease were also included. The flooding caused by the Corona disaster in July 2020 was not a coincidence but an inevitability. Regardless of the end of the Corona disaster, it will be necessary to take a multifaceted approach to health and medical policies and disaster prevention measures in line with complex disasters that include various health emergencies and climate change adaptation measures. There are two other issues, which are of increasing concern are digital power concentration and digital inequality, which are considered as high risk in terms of likelihood. This shows increasing dependence on the digital world, and possibly a new concept of digitally poor people would arise, who would be prone to different other types of risk in the coming years. Therefore, digital inclusivity becomes very important, as well as cybersecurity, and enhanced digital infrastructures. This is especially relevant to Japan, which is promoting DX (digital transformation) aggressively where the rural and smaller towns of the country are dominated by an aged population with less access to digital technology.

Single measure at a time is no longer sufficient. Local communities need to prepare and adapt flexibly to this uncertain situation. To cope with the effects of disasters, we need to understand the exposure to social and environmental risk in vulnerability and an integrated manner. It is necessary to adapt step by step to challenging situations without spreading the damage, based on the recognition that current science and technology cannot wholly prevent natural hazards when a disaster occurs and causes extensive damage. After a disaster, people must carry out emergency relief activities, take care of their health, psychosocial aspects, and cope with more complex situations. In addition, to overcome disasters, it is essential to build a resilient society that can continuously transition to better recovery and reconstruction. Global Assessment Report (GAR 2019) presents a representative figure, which shows the future of disaster risk reduction. While in the current time, we are talking about disaster response, prevention, disaster management, the future depends on risk informed decision-making with the concept of "living with uncertainties." This report was published in 2019, and we have seen how uncertain it was during the global pandemic in the year 2020 and 2021. Adaptive governance becomes a key pillar, where new ways of governance mechanism need to be performed. This has been the key focus in 2020, where we have seen natural hazards within prolonged global pandemic, which urged us to take different adaptive governance measures (like evacuation, shelter management, volunteer management), which will possibly be a new normal in the coming years.

The other aspect is to focus on "systemic risk" that has been appearing in international conferences and UN meetings for a couple of years now. We see increasing interdependency of different systems, and therefore, hazard-specific approach or disaster cycle approach may not work as before. We need to look at the system as a whole and see what the key systemic risks are arising, what are the key barriers for data sharing and data management, etc. Both horizontal and vertical links of systemic risk are required, where the risks need to be linked to local level governance.

2.4 Postscripts

As mentioned, and elaborated in the previous sections, public health and disaster risk reduction become inseparable in the global risk landscape. The importance of disaster nursing and providing care services for people and communities becomes the core of public health issues. Here are a few postscripts toward a futuristic and resilient world.

Context 1. Interdisciplinarity/transdisciplinary/multidisciplinary: After the Great Hanshin-Awaji Earthquake 26 years ago, it was argued that earthquake safety and earthquake risk management cannot be achieved by earthquake engineering alone. When a disaster strikes, no single field can solve the problem, and no single spe-

cialized field can solve the problem, so interdisciplinary, transdisciplinary, and multidisciplinary approaches must be taken in various fields. Similarly, the public health issues and disaster nursing need to be linked to other disciplines of data science, governance, policy, ecology, etc. For the past 30 years, the following disciplines have played an active role in the disaster prevention and management field (Shaw 2020):

- Traditional disciplines: engineering, science, architecture, urban planning, economics, geography, etc. (from 2000~)
- Nontraditional disciplines: health science, nursing, development specialist, education specialist, communication, data specialist, etc. (from 2005~)
- Emerging disciplines: DRR policy, innovation, diplomacy, critical raw material (from 2016~)

As a futuristic context, disaster policy and governance would play a critical role, and the importance of disaster nursing, community health, public health needs to be recognized in public policy and governance.

Context 2: Knowledge society: The Japanese Cabinet Office is making a big push for Society 5.0, and what we need to focus on is how to change it into a knowledge society. Society 5.0 essentially talks about human/people-centric technologically connected society. There are various meanings of "knowledge society," and among them, there is specialized knowledge, traditional wisdom, and knowledge that exist in the region. Society 5.0 is not only about AI (Artificial Intelligence), but it is also about how to change society into a comprehensive knowledge society, using technology and breaking the digital divide. There is a need to change the mindset from "human-centric" to "people-centric." The core value lies in the fact, not on human or nonhuman (machine), but it focuses on the role of people and communities in this newly developing technology-driven society.

Context 3: Open science and open data: At the Sendai Conference on Disaster Risk Reduction, how disaster reduction should be viewed as a public good was widely discussed. There are two types of public goods: *good* public goods and *bad* public goods. For example, "relief" is often considered a bad public good, because it creates dependency. On the other hand, early warning or resilient infrastructures are considered good public goods. UNESCO has been promoting the concept of open science and open data with DRR as public goods. Open science policy needs to be accessible, efficient, democratic, and transparent. It has several components of open source, open data, open innovation, citizen science, crowdfunding, etc. It is important to note that for the future digital transformation in Japan elsewhere, it is important that open data and open governance are properly ensured.

Context 4: Grassroots and process innovation and citizen science: In Japan, citizen science has not yet been taken up in the framework of disaster management, but in other countries, citizen science has been taken up in the field of environment, although disaster management is not so common. There is a lot of talk about who provides the data, the citizen side, the rights of the data, the owner of the data, etc. It is important to involve citizens in a participatory way to collect and own data, which becomes effective in the open governance and open science scheme mentioned above.

Context 5: Youth leadership: When thinking about the future of disaster risk reduction, it is essential to have the youth group involved in the process of risk reduction. Youth leadership is gradually recognized globally. IRDR (Integrated Research for Disaster Risk) is a program where 162 young scientists participate from 46 countries for different disciplines and conduct cutting-edge research in the related field. Similarly, the U-Inspire Alliance initiated by UNESCO had made its impact on several Asian countries to provide a platform for youth groups to take leadership in disaster risk reduction.

Context 6: *Sci-preneurship* is a new evolving field: There is a strong need to change the mindset of people to create disaster-related business opportunities and develop science-based entrepreneurship (*Sci-preneurship*). Disaster risk reduction fields need social innovation. It is important to create an ecosystem that supports new innovation and encourages youth groups to take the lead on this as a future career opportunity.

2.5 Way to Forward

The current social change agenda, the SDGs, requires the community to take the initiative and call for action. Various transnational relationships should also be understood in a more cross-cutting and inclusive manner. Nurses as global citizens should promote mutual understanding between stakeholders and community members to achieve the SDGs and facilitate the stakeholders' decision-making and the smooth cooperation of multiple stakeholders interested in the development of a sustainable healthy community. Establishing a system to facilitate cooperation among multiple stakeholders interested in developing sustainable healthy communities is necessary.

Responding to current crises will also prepare us for future crises. The second point is the co-creation of ecosystems among existing organizational systems. If each organization's aid policies, guidelines, and even reporting formats must be taken into account, residents will not be able to take action. There is a need to minimize people-centered transactions.

In the future, equity and equitable access will be required. Innovation is expected not only to create cutting-edge products but also to achieve equity. Innovation is expected in solutions that can reach more people, deliver results faster, are easier to use, and are cheaper. This kind of ecosystem leads to community engagement.

Local nurses should discuss their roles in this change and collaborate with global citizens in sustainable development. From the above insights of experienced nurses and local community and back-casting for sustainability, we suggest that communities work with disaster nursing for social change in a global context.

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Challenges of Global Health with Nursing

3

Sakiko Kanbara and Sayumi Nojima

3.1 Sustainable Development Goal 3 and People-Centered Disaster Risk Reduction

Climate change not only makes natural disasters more likely but also increases the frequency and intensity of hazards, such as climate-sensitive diseases (e.g., dengue fever and malaria). As forests diminish, the soil loses these functions and becomes more prone to disasters. As disasters and livelihoods become more complicated, people can no longer live on the land and move to another ground. This is called disaster displacement or environmental refugees (UNHCR). This is called disaster displacement who move to shelters where jobs and food are plentiful. It seems the emergence of an entirely new living environment and community. In this context, environmental factors of health vary from acute events to slow onset. Still, all have a direct impact on health, including mortality, morbidity, injury, mental health, and other health impacts.

Reducing disaster risks to humans and health requires coordinated action across a wide range of disciplines, institutions, and specialties. There is a gap between practice and research in health care and disaster initiatives, including how to modify the patterns of knowledge, practices, and values that constitute comprehensive health care.

Universal health coverage on sustainable development requires the establishment of a primary healthcare system as an innovation, keeping disasters and social change in mind. The essence of the SDGs is that the 17 goals are interrelated. The Sendai Framework for Disaster Reduction, which is a global agenda for disaster reduction, provided an opportunity to address fundamental issues in an interdisciplinary discussion and to grasp the overall picture of issues and challenges occurring in the world related to the SDGs and the direction in which the world is moving in the future.

Disaster nursing needs to comprehensively discuss and organize disaster risk with a focus on SDG 3. Priority 1 of SFDRR is to understand disaster risk. Disaster risk needs to consider not only where the hazards are but also who is vulnerable. In the same way that needed to assess the damage—houses collapsed or flooded—we need to consider their health and the safe living environment for each person as essential issues in a situation where people are forced to live in shelters and instantly become unsafe. When a disaster strikes, community health issues can change rapidly. It is required to know which health is secured or threatened in the region by infectious disease outbreaks, climate change, environmental degradation, migration pressures, and limited health services.

S. Kanbara (✉) · S. Nojima
University of Kochi, Kochi, Japan
e-mail: kanbara@cc.u-kochi.ac.jp

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It depends on the type, scale, location, and timing of the disaster; the social, health, and economic conditions; the characteristics of the local population; and the emergency relief system and response. These include social isolation, loss of income, lack of legal knowledge, etc. Considering this wide range of determinants requires a community-based response by health professionals who can consider the wide range of health impacts that can occur from natural disasters, many of which are outside the traditional remit of emergency response departments. Traditional epidemiological and statistical studies in medical health are insufficient. There is an urgent need to develop a shared understanding of the concepts and principles that underlie actions to assess vulnerability and capacity. It is critical to determine conditions and factors that influence population-level outcomes in the aftermath of disasters.

Box 3.1 SDG3 Target

1. By 2030, reduce the global maternal mortality ratio to less than 70 per 100,000 live births
2. By 2030, end preventable deaths of newborns and children under 5 years of age, with all countries aiming to reduce neonatal mortality to at least as low as 12 per 1000 live births and under 5 mortality to at least as low as 25 per 1000 live births
3. By 2030, end the epidemics of AIDS, tuberculosis, malaria, and neglected tropical diseases and combat hepatitis, water-borne diseases, and other communicable diseases
4. By 2030, reduce by one third premature mortality from noncommunicable diseases through prevention and treatment and promote mental health and well-being
5. Strengthen the prevention and treatment of substance abuse, including narcotic drug abuse and harmful use of alcohol
6. By 2020, halve the number of global deaths and injuries from road traffic accidents
7. By 2030, ensure universal access to sexual and reproductive healthcare services, including for family planning, information and education, and the integration of reproductive health into national strategies and programs
8. Achieve universal health coverage, including financial risk protection, access to quality essential healthcare services and access to safe, effective, quality, and affordable essential medicines and vaccines for all
9. By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water, and soil pollution and contamination
   (a) Strengthen the implementation of the World Health Organization Framework Convention on Tobacco Control in all countries, as appropriate
   (b) Support the research and development of vaccines and medicines for the communicable and noncommunicable diseases that primarily affect developing countries, provide access to affordable essential medicines and vaccines, in accordance with the Doha Declaration on the TRIPS Agreement and Public Health, which affirms the right of developing countries to use to the full the provisions in the Agreement on Trade-Related Aspects of Intellectual Property Rights regarding flexibilities to protect public health, and, in particular, provide access to medicines for all
   (c) Substantially increase health financing and the recruitment, development, training and retention of the health workforce in develop-

ing countries, especially in least developed countries and small island developing States

(d) Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risk

Figure 3.1 shows a categorization of common health problems and care needs observed so far, based on interviews with local nurses, nursing associations, and local governments at past disaster sites.

To escape from a natural disaster, we must first save lives. And those lives must be protected. In addition to trauma, people may suffer from chronic diseases and psychological damage. In addition to the damage caused by losing loved ones and homes, they must endure until they are freed from the lack of food, water, shelter, and other necessities. It takes a long time to understand the risks that disasters pose, maintain good health, and rebuild their lives with clean water, food, and sanitation in the affected areas. Findings from fieldwork and practice show the severity of the inability to provide health care outside of identified shelters, especially vulnerable populations who lack access to information and communication.

3.2 Health Problem in Social System

Ensuring that people are born healthy, survive, and thrive begins with a combination of high-impact interventions, including quality prenatal, delivery, and postnatal care for mothers and their newborns, prevention of mother-to-child transmission of HIV, and immunization to protect children from infectious diseases. For example, the SDGs aim to reduce maternal mortality to less than 70 per 100,000 live births (UN 2015). Maternal mortality decreased by 37% between 2000 and 2015; however, there were approximately 303,000 maternal deaths worldwide in 2015, most of which were due to preventable causes. Globally, "2.4 million children will die in the first month of life in 2019, and about 6700 newborns die every day. About one-third of newborn deaths occur within the first day of life, and nearly three quarters occur within the first month (UNICEF 2020)". Lack of access to quality

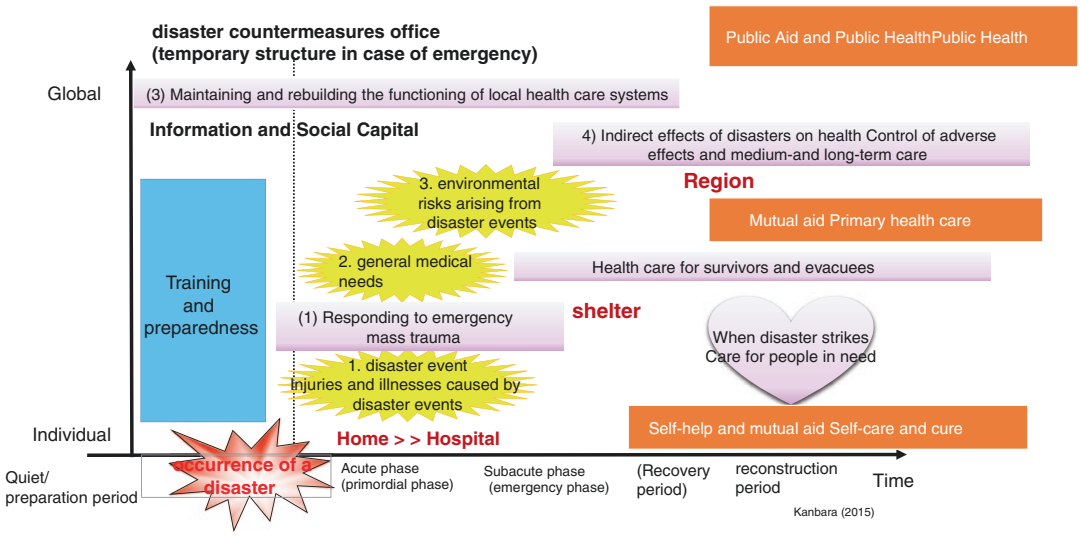

Fig. 3.1 Healthcare matrix on disaster risk reduction

health care is one of the significant factors behind the figures and regional data revealing the highest neonatal mortality rates.

In the future, natural disasters and limited emergency resources could soon be overwhelmed by a surge in the number of children patients. Communities may face the additional challenge of protecting children during emergencies because of economic, geographic, or racial/ethnic disparities. For example, rural and metropolitan communities have insufficient emergency response personnel, shelters, medical facilities, or equipment for their populations (Sritart et al. 2020). If current trends continue, more than 60 countries will fail to meet the SDG neonatal mortality target for 2030. About half of these countries will not meet the target by 2050 (UNICEF 2019).

The link between community resilience and public health in emergencies is well known. Human security is closely linked to human development and can only be effectively implemented if it considers sociocultural values as well. By recognizing the similarities and differences, effective response and preparedness can be achieved. In normal times, public health considers the underlying social, economic, political, and environmental determinants of health. Social determinants of health include income, employment, occupation, education, housing, residential area, social exclusion, transportation, diet, and access to health care (Lindsay 2003; Wilkinson and Marmot 2003; Public Health Advisory Committee 2004). These factors are also present as determinants of vulnerability in the literature on emergency management and disasters (Lindsay 2003; UNISDR 2005; UNISDR 2005; Hogg et al. 2016). Disaster risk is needed to understand the fundamental causes for security and health.

Poverty is the lack of these resources to provide the necessities of life (World Vision n.d.). SDG1 refers to building the poor and those in vulnerable situations and reducing their exposure and vulnerability to climate-related extreme events and other economic, social, and environmental shocks and disasters (UN 2015). In high disaster risk societies, health care is still unavailable to many people, as are basic human needs such as food and shelter and opportunities for sustainable livelihoods for future generations. In the immediate aftermath of a natural disaster, relief and recovery efforts focus on primary, life-threatening needs, leaving human security approaches as an afterthought. Not all households can cope with stress and repeated shocks in the same way. In the long term, affected communities are adjusting to the loss of infrastructure and institutions and changes in community structure due to disasters, while at the same time lacking access to health services for acute and chronic illnesses, leading to disaster-related deaths. There are situations where a lack of medical care causes preventable deaths from nonviolent causes. The consequences of those deaths that go unrecorded can be tragic.

People's health status depends on various social factors, including communication, technology, occupation, education level, self-actualization, quality of life, and social support in response. Risks to livelihood continuity determine a household's level of vulnerability to insecurity in terms of income, food, health, and nutrition. It is essential to understand the risks related to health and disasters. However, when considering the need for education, it is also necessary to address the lack of access to appropriate education due to poverty, SDG Goal 1 "end Poverty" and Goal 4 "Quality Education." It is essential to address these issues in conjunction with SDG Goal 5, "end gender discrimination." For example, people with disabilities are less likely to receive the assistance they need during humanitarian crises and are less likely to recover in the long term. Common experience has shown that people with disabilities are more likely to be left behind or abandoned during disaster evacuations due to lack of preparation and planning, inaccessible facilities and services, and transportation systems (Fernandez et al. 2002; Peek and Stough 2010; Iezzoni

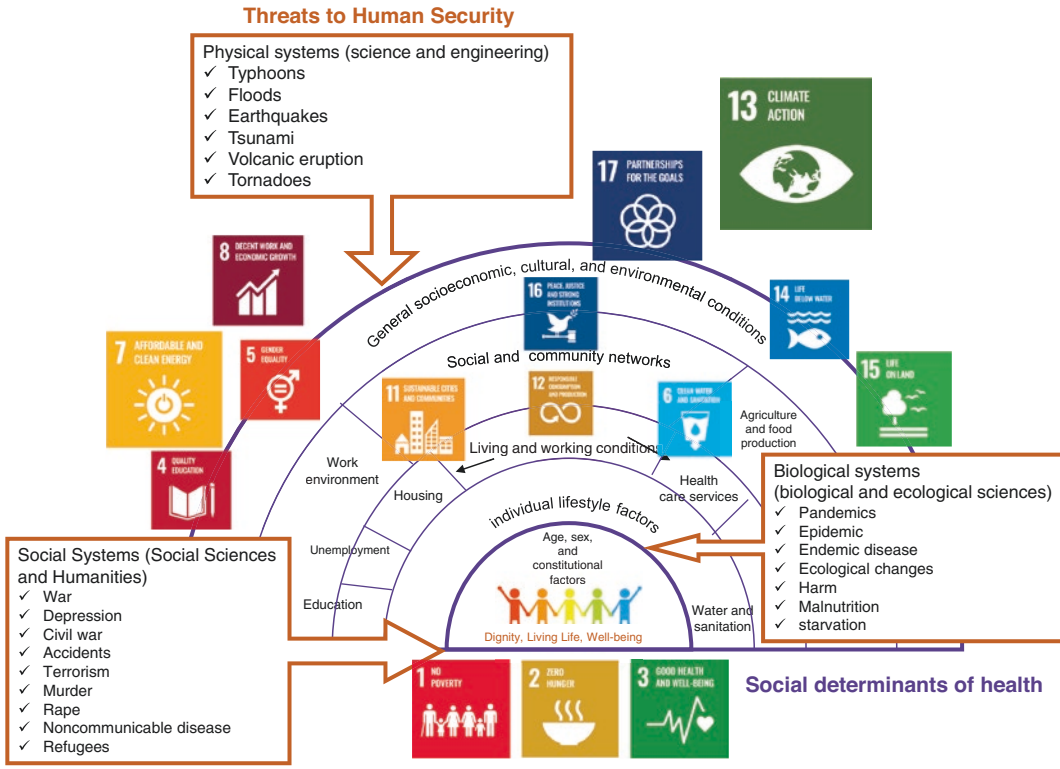

Fig. 3.2 Threat to human security on social determinant of health

2011). Most shelters are not accessible, and people with disabilities are often even turned away from shelters because of their perceived need for complex medical services. In this situation, the availability of a lot of data and information during a disaster can be overwhelming if healthcare providers do not know how to make decisions. Attention should also be paid to how vulnerable and resource-poor groups can adapt in different ways to minimize the health impacts of disasters (ICPP 2001). Studies of low-income populations have used more objective indicators, such as data from disaster task forces, the safety of providers, data capture and monitoring of affected populations, and public health data on distance, travel time, terrain, air, water, sanitation, utilities, and all healthcare facilities (including shelters and other surge-capable facilities). Only a few studies have applied more objective indicators (Fig. 3.2).

3.3 Health Problem in Biological Environmental System

Access to quality health and medical care includes essential medicines and vaccines, sanitation, hand washing, food, daily necessities, and an appropriate environment. When you consider that this includes access to safe water for handwashing, many in the environment suffer from these diseases because of air pollution or unsanitary conditions and lack of access to clean water. Health is an essential need for all people and must be incorporated into an overall framework for organizing and delivering care in a people-centered, efficient, equitable, and cost-effective way (Stigler et al. 2016). The move toward universal health coverage (UHC) is now one of the most prominent global health policies (Rumbold et al. 2017). All UN member states have agreed to achieve universal health coverage by 2030 (WHO

and World Bank 2015). This includes high-quality and affordable essential medicines and vaccines (WHO 2019). As more countries commit to universal health coverage, the report guides on achieving universal health coverage and building more resilient health systems in terms of health services and financial protection (WHO and World Bank 2017). The discussion on how to achieve UHC, especially for vulnerable groups, is becoming increasingly important. The definition of UHC needs to be revisited to determine what is included in UHC in infectious diseases and disasters. Access to medicines and innovation must be helpful to all patients under shock and stress.

In 1978, a joint meeting of WHO and UNICEF adopted the Alma Ata Declaration, which became the basis for subsequent international health policy (WHO 1978). Since then, patient-centeredness, comprehensiveness, integration, and continuity of care have been among the core characteristics of primary health care, which has been repeatedly associated with improved health outcomes, cost-effectiveness, and user satisfaction (O'Malley et al. 2015). Primary care has been reported to lead not only to reduced costs but also to longer life expectancy, lower infant mortality, and lower under-5 mortality, suggesting that investing in primary care is a wise choice (Hsieh et al. 2015). Improving accessibility to people, providing patient-centered, long-term care, emphasizing prevention, and reducing unnecessary medical care are all things that a robust primary health system can provide (Rao and Pilot 2014). Appropriate technology in the community for this purpose is becoming more diverse. Progress has been made in increasing access to clean water and sanitation and in reducing the spread of malaria, tuberculosis, polio, and HIV/AIDS. Similarly, new technologies, such as the Internet, will enable the digitization of health records and make it easier for healthcare providers to access online medical resources. In the future, we will also need people-centered health monitoring, distribution mechanisms, and ethical innovations to manage emerging hazards (Ramsey 2017).

Economic protection and strengthening of the primary healthcare system through universal coverage are considered the golden path to achieving health for all. Once again, the role of primary health care should be emphasized to achieve universal health coverage (Rao and Pilot 2014).

3.4 Health Problem in Physical System

SDG 11, "make cities and human settlements inclusive, safe, resilient and sustainable," is related to disaster risk reduction and resilience. However, it is also about promoting maximum individual and community self-reliance. It focuses on maximizing individual and community self-reliance and must involve urban planning, community organization, project implementation, monitoring, and health behavior. There are two sides to disaster response: "risk management" and "crisis management." The difference between mere health and well-being and disaster risk reduction is that a crisis is unpredictable and cannot be fully prepared. It is challenging to predict areas at risk and their impact. Understanding the actual conditions of health and living conditions during disaster evacuation will, over time, reveal the various issues that exist in the community and the need for support. In addition, there must be a system to understand those who have been separated from their original homes and those living in a mutually supportive environment without government or support systems. Many papers have been published studying situations that need to be addressed immediately after a disaster, such as the impact of an earthquake on trauma surgery. However, the impact of these situations and delayed events on health problems and community vulnerability resulting from disaster risk management is a neglected and underreported area.

While it is vital to prevent and prepare for disasters and other crises that can be predicted to some extent, resilience goes beyond that and implies a more comprehensive preparation in uncertainty. Protecting against the adverse effects of various

known and unknown threats also requires a focus on the sustained capacity of individuals, communities, and institutions to withstand, mitigate, and recover from adversity. This requires a preemptive approach that fosters these capacities before adverse events occur.

Regardless of the type of threat for which resilience is being built (widespread, sudden, man-made, natural, known, or unknown), the process involves identifying existing resources within the community (Chandra et al. 2011). It can also be said that fundamental resilience is compounded and weakened. According to the preamble of the Sendai Framework for Disaster Reduction, an international framework on disaster risk reduction released by the United Nations in 2015, in the past decade, the impact of disasters on people and property has increased more rapidly than the prevention of facing them in all countries. As a result, it states, new community-level risks and short-, medium- and long-term economic, social, health, cultural, environmental, and social problems have emerged. In addition to identifying and avoiding causal hazards, improving health and well-being capacities to cope with human risks and vulnerabilities is critical to avoid preventable deaths and health hazards. Health is an example of the larger concept of resilience, in which many sectors contribute to the well-being of individuals, communities, and organizations. If resilience to health is weak, it is just as likely that resilience in other sectors will be weak as well.

The effects of climate change will have the most negative impact on susceptible populations, including children, pregnant women, low-income people, the elderly, people with disabilities, the chronically ill, and certain minority groups. It can be the greatest threat to health systems in crisis (Costello et al. 2009). Climate change is responsible for certain natural disasters and has created direct and indirect humanitarian and health crises. In addition to these conditions on a city, regional, national, and even continental scale, climate change directly affects the lives and health of those involved, especially the most vulnerable (Ebi et al. 2006). On the reasons for climate-related deaths, UN-Habitat (2016/2017) estimates that by 2030, climate change and natural disasters could push an additional 77 million urban residents into poverty. Currently, 844 million people may not have access to essential drinking water services. Rising temperatures and more extreme and unpredictable weather conditions are expected to alter rainfall, snowmelt, river flows, and groundwater availability and distribution (UN-Water 2018). Environmental and climatic changes will make people's access to water and food more vulnerable and insecure. As a result, wastewater use impacts health and food security (Khalid et al. 2018; Jaramillo and Restrepo 2017), sanitation concerns, refugee dynamics, and political instability (UN-Water, 2018).

People need to know what health risks they may face due to global environmental change; what actions they can take to protect their lives, livelihoods, and health; and how they can contribute to risk assessment and management (WHO 2017). This also requires building partnerships with environmental services to collect appropriate climate, weather, and environmental data to facilitate the management and communication of climate-related health risks (WHO 2013).

3.5 Way to Forward

Inevitably, the nursing profession requires a sense of solidarity as global citizens, respect for human rights and human security as universal values, and recognition of cultural pluralism that requires diverse orientations, efforts, and cooperation.

Since the first declaration issued in Alma Ata, the meaning and structure of community have changed. There are many other forms of groups, such as religious, political, age, caste, etc. On the other hand, in Japan and other Asian countries, mutual help in the community is decreasing due to urbanization, low birthrate, aging population, and nuclear families. More and more people are migrating overseas, and the number of families is decreasing. In addition, social disparities have

created health disparities, and the increasing service-oriented nature of nursing care has led to policies that place more emphasis on supporters than on the people concerned, which seems to be reducing the independence of residents. Exposure to the risk of crises and disasters in such a context is a special phenomenon due to the migration of people, the collapse of existing healthcare systems, and unexpected donors. Rapid globalization and the advancement of information and communication technologies have recently changed the perception of society, including the advancement of women in society. The most crucial feature of conflicts, disasters, and new health problems that threaten the lives and livelihoods of large numbers of people is that the multicultural space and environment itself is spreading across national borders with diverse interests and concerns. As information is readily available and can be purchased from other countries, the conventional wisdom on who should provide disaster relief is rapidly changing. With the development of information and communication technology and the advancement of information disclosure, residents are using technology to solve problems through grassroots activities and to bring voices to those who cannot speak up.

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Care for Disaster Risk Reduction

4

Sakiko Kanbara, Archana Shrestha Joshi,
Shoko Miyagawa, and Hiroyuki Miyazaki

4.1 Introduction

The human right to health is recognized in a number of international instruments. Everyone has the right to food, clothing, housing, and a standard of living that includes health care and necessary social services (CESCR 2000). Health is an essential aspect of human security. It is both necessary and a means to human survival, livelihood, and dignity. Lack of deprivation of health care leads to insecurity, which fundamentally threatens the survival and well-being of individuals. Moreover, these insecurities undermine human dignity and diminish human freedom. Freedom from fear means safety from violence and human rights violations; freedom from scarcity means at least minimal health, food, and income (UN 2009).

The United Nations has set 13 targets and 28 indicators for SDG 3. Almost all of these are related to health, and almost all the other 16 goals will indirectly contribute to health. The SDGs are based on the Integrated Report on Sustainable Development. Pathways to Dignity to 2030 place people and the planet (environment) at the center of the concept.

Every year, millions of people are forced to leave their homes due to floods, tropical storms, droughts, melting glaciers, earthquakes, and other natural disasters. Many will find shelter within their own countries, but others will have to move abroad. Some movements are well documented, but the total number is unknown. Climate change is projected to increase movement within and across borders in the future. Displacement can have devastating effects on people and communities. It creates complex humanitarian and development challenges that urgently demand partnerships and action. This issue is addressed in the 2030 Agenda for Sustainable Development and the Sendai Framework for Disaster Reduction 2015–2030. It illustrates the need for coordinated cross-sectoral action to address the diverse and region-specific challenges of human mobility in the context of disasters and climate change.

Since the Sustainable Development Goals aim to address these multifaceted factors, achieving these goals will also reduce the vulnerability of at-risk populations during disasters. Comprehensive solutions to these goals will truly lead to risk reduction for the community and people. First of all, it should be connected with own small choices of care that have an impact on the achievement of

S. Kanbara (✉)
University of Kochi, Kochi, Japan
e-mail: kanbara@cc.u-kochi.ac.jp

A. S. Joshi
AMDA, Okayama, Japan

S. Miyagawa
Keio University, Kanagawa, Japan

H. Miyazaki
University of Tokyo, Tokyo, Japan

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the SDGs. On other hand, it is important to realize that we are both reducing disaster risk and causing disasters in different countries and that addressing "care" including nursing care, self-care, primary health care, and unpaid care in the context of the SDGs will help us evolve into a resilient community in an uncertain society.

In this chapter, we discuss the importance of basic care in the community and the need to utilize data by appropriate emerging technology. It focuses on human security and sustainable processes that bear fruit in the long term (UN 2009).

For self-care, it is required to add disaster literacy on changing social context. People need to make more independent decisions, such as engaging in preventive measures and knowing when to seek self-care, given that they may not be able to get to a hospital. To increase the capacity of community resilience, collective care should be recommended from an individual's collective knowledge and bird's-eye view to maximize the reduction of people's health risks and to protect the health of populations as public health. In the community, we need to take an approach based on the principles of primary health care and foster community engagement, that is, the trust and relationships that people have with each other offline/online. It should engage the community to identify the needs and appropriate technology for solutions.

4.2 Care for Disaster Risk Reduction

Care is the core of nursing, and its definition is diverse. First of all, we should recognize and respect the meaning of "care" in SDGs. "Care" is used in the "Target 5.4: Recognize and value unpaid care and domestic work through the provision of public services, infrastructure and social protection policies and the promotion of shared responsibility within the household and the family as nationally appropriate". Furthermore, its indicator 5.4.1 Proportion of time spent on unpaid domestic and care work, by sex, age, and location to achieve Goal 5, not Goal 3. In the background of this target, it is known that there is a very close relationship between economic poverty (SDG1) and time poverty. It is known that there is a very close relationship between economic poverty (SDG1) and time poverty. (Most health care is provided in the home (SDG 3). Many of these activities are socially assigned to women as a matter of course (SDG 5, 8, 10). Lack of services such as drinking water, electricity, and transportation infrastructure, which occur in multiples during disasters, increases unpaid work hours and has a significant impact on women (SDGs 6, 7, 9, and 11).

The role of nursing care for individuals varies from country to country. Primary health care is population-based which includes nurses as community members.

Henderson's theory of needs by the International Council of Nurses is applicable in any part of the world. It is considered relevant to both the nurse and the patient, whether ill or healthy. It resulted in the *Basic Principles of Nursing* (Henderson 1960a, 1960b), one of the landmark books in nursing and considered the twentieth century equivalent of Nightingale's Nursing Memoirs. This ICN publication has been published in 29 languages and is currently in use around the world.

The 14 components of Virginia Henderson's needs theory represent a holistic nursing approach that covers physiological, psychological, spiritual, and social needs.

Physiological Components

1. Normal breathing.
2. Adequate food and drink.
3. Elimination of waste products from the body.
4. Physical activity and maintaining good posture.
5. Sleep and rest.
6. Appropriate clothing selection—putting on and taking off.
7. Maintain an average body temperature through clothing and environmental changes.
8. Keep the body clean and skin protected.
9. Avoid surrounding hazards and avoid hurting others.

Psychological Aspects of Communication and Learning

10. Communicate with others by expressing feelings, needs, fears, and opinions.

Spiritual and Moral Components

11. Worship according to one's faith.

Socially Oriented Occupations and Pastimes

12. Do work that gives them a sense of accomplishment.
13. Play and participate in various forms of recreation.
14. Learn, discover, and satisfy the curiosity that leads to normal development and health, and use available health facilities.

Disaster nursing covers the emergency response immediately after a disaster and people's lives and health conditions, including the recovery and preparation phases, to minimize the damage to their health during a disaster while being aware of daily risks and understanding their needs according to their characteristics. In the community, activities for "disaster reduction" are essential to support people's lives. Care for daily disaster reduction" as actions to reduce disaster risks by taking care of "water, food, living environment, and health" based on human security (Kanbara et al. 2016). Disaster nursing requires activities to spread this kind of disaster reduction care in the community over a long period. It is essential to collect and disseminate information on disaster reduction care and collaborate by sharing it with other fields.

Exposure to risk in crises and disasters is a unique phenomenon due to the migration of people, disruption of existing health care systems, and unexpected donors. The practice of care in disasters and health crises is collaborative. It is preserved in local languages and diverse media, including research papers, as the experiences and perceptions of local people. Even when good practices of community resilience and care activities are discussed, it is difficult to find clues to the issues that need to be resolved simply by collecting memoirs, documents, uniform interviews, and questionnaires by others. Practical knowledge and expertise, such as the global health system approach and research experience specific to disaster nursing, are necessary to remove bias and lead to an objective evaluation.

4.3 Health and Care on Disaster

The SDGs are meant to leave no one behind, with particular emphasis on covering vulnerable groups. It is crucial that complex disasters have a high risk of syndemics. The SDGs focus on improving equity to meet the needs of women, children, and disadvantaged groups so that "no one is left behind" in the face of environmental change and climate change.

This target is the result of the Millennium Development Goals (MDGs), a set of eight goals signed by UN member states in September 2000 to achieve goals and combat poverty, hunger, disease, illiteracy, environmental degradation, and discrimination against women. The UN says "great strides have been made in increasing life expectancy and reducing some of the common causes of death among children and mothers. Significant progress has also been made in improving access to clean water and sanitation and reducing the spread of malaria, tuberculosis, polio, and HIV/AIDS. However, much more needs to be done to control a wide range of diseases and address persistent and emerging health problems.

Moreover, going forward, as many have experienced, pandemics have become destructive. Epidemics are proving to be of a critical magnitude beyond the control of nations. Low- and middle-income countries must continue to fight existing infectious diseases such as AIDS, tuberculosis, malaria, polio, and Ebola even after the coronaviruses have subsided. Most of the indicators on SDG3 are affected. The effects of such diseases can severely disrupt the social, economic, and political fabric of a nation, not to mention the enormous loss of life. It means other SDGs are also damaged. Historically, it is in developing and poor countries that infectious diseases remain until the end.

Health is "a state of complete physical, mental, and social well-being, and not merely the absence of disease or infirmity". This definition

was adopted at the International Health Conference held in New York from 19 June to 22 July 1946 and came into effect on 7 April 1948. This definition has not been amended since 1948. Health is a fundamental human right indispensable for the exercise of other human rights and the well-being involved. Every human being is entitled to the enjoyment of the highest attainable standard of health conducive to living a life in dignity (CESCR 2000). The report states that the content of health services includes the entire spectrum of essential and quality health services along the life course.

By Florence Nightingale, "Health is not only to be well but to be able to use well every power we have (Sher 2018)."

Public health has been described as:

"The science and art of preventing disease, extending life, and promoting health through the organized efforts and informed choices of societies, organizations, public and private sectors, communities, and individuals. Collective health is also essential for social cohesion and stability (Winslow 1920)." When health is neglected or sacrificed for other issues, dissatisfaction and conflict can arise among affected individuals and communities. The social and economic consequences can destabilize society and threaten political stability. The devastating effects of neglect can deplete a nation's resources and reverse economic growth and development gain. The complex interplay of factors ranging from limited resources, poor infrastructure, and widespread corruption to a lack of commitment to and understanding of the catastrophic consequences of health problems can magnify the impact of human security health issues on individuals and communities. In contrast, public health and infectious disease control systems are weak.

During a crisis where people are dying in front of our eyes, how do we prepare for disasters and infectious diseases that may occur at any time? In a society that will continue to change in the future, it will no longer be possible to provide support vertically for each target population or health problem.

Resilient individuals, communities, and organizations must cope with everyday adversities and various unpredictable events that may adversely affect their lives, livelihoods, and dignity. However, governments cannot protect their citizens from all hardships that threaten people's survival, lives, and dignity and tend to focus primarily on specific threats that have been identified. In a disaster healthcare system, the injured and sick are treated in hospitals, diagnoses are made, and medical records and surveillance are recorded. During a disaster, the demand for medical care dramatically exceeds the supply. Therefore, triage is conducted in front of the hospital by first aid teams and emergency tents, life-saving treatment and first aid are provided according to symptoms and syndromes. At this point, the role of nurses is mostly to cares rather than to cure. In evacuation centers and communities, people with and without symptoms live together. To protect people's safety and security, not only nurses, public health nurses, and support volunteers, but also families and individuals must take care of (1) water, (2) food (nutrition), (3) environment (living space, especially hygiene management, waste disposal), and (4) health (diseases, health, and medical services) so that people do not get ill and can maintain their health) apart from disease diagnosis (Fig. 4.1). At the individual and community level, effective and consistent risk communication and health promotion strategies are needed to increase the resilience of vulnerable communities and regions. Close collaboration among public health professionals, scientists, and spokespersons is needed to consider what might happen in the future, including the emergence and spread of pathogens.

For the above, the human security approach can emerge care needs to the address health and well-being of individuals and communities. Emergency care understands that following human security and fundamental human rights is the most immediate and vital step in ensuring health. Because both human security and care are essentially about human development, nursing and residents can empathize and co-create care locally by highlighting human security threats to health and well-being in the home, community, and environment. The human security paradigm "calls for institutions to respond by providing

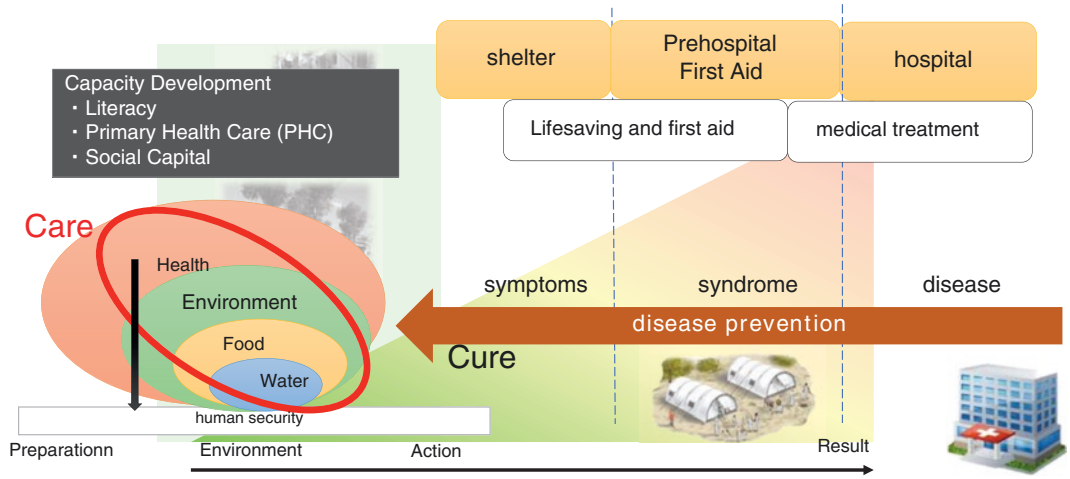

Fig. 4.1 Disaster care in community

protection that is neither temporary nor static, but consistently predictive rather than reactive so that people can weather the recession with confidence" (Sen 2000). In an environment of conflicting interests, political dilemmas can be alleviated through dialogue, sharing of information, and learning from the experiences of others. Opening the political space allows for more ideas and expertise to emerge, helping to address problems quickly from the bottom up.

Innovative, interdisciplinary, people-centered, and participatory research can foster important trust, transform people's perceptions of risk and risk-reducing behaviors, and inform prevention (WHO 2017).

4.4 Self-Care and Health Literacy for Disaster Risk Reduction

Much research has been done in other fields on disaster preparedness and disaster education. It is essential to understand self-care in the disaster from a nurse's perspective, its prevalence among all segments of society, and its relationship to the impact of disasters. Research on nurses contributes to the development, implementation, and evaluation of community preparedness to reduce hazards in the workplace, home, and community. Already, the term "health literacy" is frequently used to describe participating in and evaluating health risk reduction and promotion and coordinating and collaborating with community organizations. It refers to "cognitive and social skills, that is, an individual's ability and willingness to access, understand, and use the information needed to maintain and promote health." Many important factors are added to such literacy, such as cognitive ability, social skills, ability to obtain information, insight, desire, and confidence (Nutbeam and Kickbusch 1998). Suppose these concepts can be incorporated into nursing activities from the perspective of supporting community residents. In that case, the effectiveness of health communication and educational methods may enhance the disaster self-care capabilities of residents. However, they should evolve with the changes in society, and to clarify the concepts, a more comprehensive and ongoing effort is needed. "Literacy, born from people's experiences of disasters, is not only the information required in times of disaster but also the element that links awareness, knowledge, and skills." "Literacy is the ability to recognize the risks associated with disasters, obtain information about disasters habitually, and to make appropriate decisions to ensure one's safety in times of disaster". It is not only 'knowledge' but also "the ability to recognize hazards related to disasters, obtain information about disasters daily, and make appropriate decisions to ensure one's safety in the event of a disaster" (Kanbara et al. 2013). It depends on

"local characteristics" and "individual characteristics." People's sense of safety and security is subjective and depends on local characteristics, such as the types of disasters that frequently occur in the area. Risk reduction will not be realized unless individuals are aware of the issues and link them to actual local culture and customs actions. The problem with this approach is that the diverse contexts may be hidden or not obvious infrequent disasters and changing environmental cultures.

Recently, there has been an increase in the use of illustrated drills that use the five senses to develop judgment and application skills and enhance the ability of individuals to solve problems and recognize the risks. There is also an increasing number of comprehensive programs that integrate disaster prevention and lifestyle education to help people develop good habits. It is crucial to involve families, communities, and other organizations to improve literacy in self-medication, care, and disaster health preparedness, and mutual aid activities are required in the community. There is also an increasing number of comprehensive programs that integrate ethics and SDGs including climate change to help people develop good habits. More active wisdom providers are needed in the community. It is crucial to involve families, communities, and other organizations to improve literacy in self-medication, care, and disaster health preparedness, and mutual aid activities are required in the community. With better data from community involvement, we can provide more effective knowledge (Fig. 4.2).

4.5 Collective Health Needs

Public health needs resulting from environmental changes in the "emergency" situation of disaster or crisis, epidemiological thinking, and a spatial matrix with a vertical axis that looks at the size of the individual, family, or socially troubled "group" in the "place" where the crisis occurred, and a horizontal axis that looks at the passage of time geographic information is essential (Kanbara et al. 2013).

Various responses to so-called "individual" needs, such as trauma caused by individual disasters, worsening chronic diseases, and the emergence of symptoms due to changes in living conditions, are addressed simultaneously with approaches to potential "collective" risks that threaten people's safety. The relationship between disasters and health hazards, especially in the immediate aftermath of a disaster, shows apparent differences and commonalities among regions.

A local community is a specific group of people living in a defined geographic area who share common culture, values, and norms and are placed

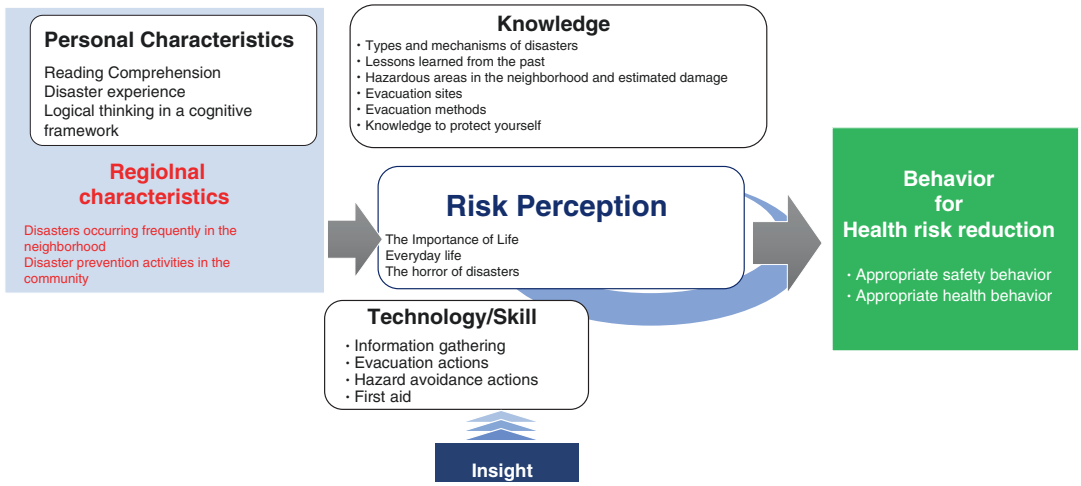

Fig. 4.2 Disaster literacy for disaster risk reduction

within a social structure based on the community's relationships. A group of people often living in a defined geographical area, who share a common culture, values, and norms, are arranged in a social structure (WHO 1998). The first step in community outreach is to "start where the people are," as Nyswander puts it. The challenges of mutual aid in disasters have become even more pronounced during the global epidemic of COVID-19 infection and the local response. In supporting worldwide disasters, the COVID-19 epidemic was challenging to keep from outside the region and had to be handled within the area, forcing "local" people to work with limited resources for flood control and infection prevention. The involvement of the local community plays an essential role in the resilience process to face and recover from health crises like COVID-19. The power that individuals could not generate needs to be systematized as collective knowledge rather than treated as a majority rule or promises so that care that can be shared cooperatively can respond to social vulnerabilities. Health systems should be deliberately designed to demonstrate responsibility for responding to disasters wherever people are located, through their actions and leadership in developing national health adaptation plans (WHO 2013).

4.6 Appropriate Technology for Care on Disaster

Improving more proactive care in the community and appropriate technology in a cultural context can strengthen the commitment of local caregivers, including nurses, to provide more efficient care in prehospital settings. The entire scenario needs to be viewed from various research perspectives, including the self-medication, care, engagement, and communication of families, communities, and other organizations that influence the health provided during a disaster.

Schumacher proposed appropriate technology in 1973. In his book *Small Is Beautiful* (Schumacher 1973), he pointed out that efficiency-centered, large-scale, specialized agriculture and industry not only causes environmental pollution and poor working conditions but is also economically inefficient in the larger scheme of things. It is proposed as an appropriate technology or intermediate technology. Intermediate technology is defined as "production technology by the masses, utilizing the best of modern knowledge and experience, promoting decentralization, not violating the laws of ecology, not overusing resources, and designed to serve humanity. The need for appropriate technology is to help the poor and those who need help the most. It advocates "making a local commitment" to development and "making a conscious effort to develop and apply intermediate technologies." More active care providers are needed in the community for better support from community involvement. It can visualize the need for health monitoring and care.

(a) Define problems and goals in terms of local cultural characteristics, customs, and norms.
(b) Carefully examine how local culture complicates care in isolation from the impact of the disaster response.
(c) Redefine the problem or goal in terms of disaster characteristics, practices, and norms.

The principle of caring communication in a disaster should be:

1. Awareness of issues
2. Respect for others
3. Communication skills
4. Reconciliation and resolution

4.7 Challenges to Care for Local Communities with Diverse Individuals

In the physical system, accurate public health data on air, water, sanitation, utilities, and all healthcare facilities, including shelters and other emergency response facilities, are essential for effective disaster planning and response activities. Tracking these data at all stages of the disaster cycle is also important for incident command, communications, and medical safety. It can help assess the impact of a disaster and plan where emergency services are needed.

On the other hand, considering a much more human-centered all-hazard approach, it is necessary to build a social capital system that encourages broad community to participate, based on a mutual understanding of the diversity of the community and the premise that everyone in the community can be a comprehensive supporter and receiver. In recent years, the process of community engagement has become an indispensable concept. Community engagement is a concept that refers to the intrinsic motivation of residents to interact and cooperate with each other in activities to improve the community. The five principles of a community organization that form the basis of community engagement are equity, justice, empowerment, participation, and self-determination. Empowerment is one of the most important concepts in health promotion and is defined as follows in health promotion. Empowerment is the process by which people gain greater control over the decisions and actions that affect their health, and people need to rebuild their lives again once they have been affected by a disaster. To better understand this concept in the context of health and disaster risk reduction, it is essential to follow the health promotion principles and strong policy policies developed by WHO from 1986 to the Shanghai Declaration in 2016. According to the definition in the WHO policy document, community engagement is the process of building long-term relationships between organizations and individuals that benefit the community, with a collective vision for health promotion, and is "primarily a practice of moving the community toward positive change through empowerment."

The challenge for this to become "mainstream" is that the field is still considered to be divided. Health and care data should focus on micro health status data as well, which can increase community resilience and provide a foundation for emergency response rather than statistics of damage. The Sendai Framework for Disaster Reduction 2015−2030 (SFDRR) calls for the involvement and partnership of the entire society to reduce disaster risks with the inclusive and accessible participation of those disproportionately affected by disasters (Gaillard and Mercer 2013; Aitsi-Selmi and Murray 2015; UNISDR 2015). We define these activities as "participatory health monitoring and care for disaster risk reduction," which aims to prevent the spread of damage and the deterioration of health conditions using appropriate technology including emerging technology. It is recommended to clearly imagine and visualize the time frame and the region from an impartial perspective.

To remove bias and connect to local human security, practical knowledge, and expertise, global health system thinking and research experience, specifically disaster nursing are necessary. In this case, considering policies and strategies that focus on overarching human security to reduce vulnerability and prepare households, communities, and health systems for emergencies is the overarching key to developing effective DRR and increasing the focus on health in disaster risk management. Care approaches could adopt a DRR framework based on human security as community wisdom. Systematic use of technology-based public services using emerging technology can improve the quality of data. The use of mobile devices can support individual and community preparedness and emergency response. It requires the application of interoperable ecosystems with relevant baseline information provided by different agencies, especially in extreme disasters and emergencies, and connected to the mainstream of health data exchange.

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Part II

Contribution of Nursing Care for Disaster Risk Reduction

Disaster Health in Shelters in Japan

5

Mayumi Kako, Alison Hutton, and Sakiko Kanbara

5.1 Introduction

On a global basis, the number of dislocated people has been increasing (UNHCR 2021). Climate change and natural disasters can force people to flee from their homes and community. In 2019, the number of dislocated people reached more than 80 million people worldwide (UNHCR 2019b). This number includes people dislocated by conflicts and wars as well as disasters (UNHCR, UNHCR 2021). During times of disaster, people often go to shelters for temporary housing and to seek help (UNHCR 2019a). This form of shelter provides basic living needs for dislocated evacuees by maintaining their health and well-being (UNHCR). The experience of living in such a shelter has an impact on how evacuees recover from a disaster experience, particularly in relation to their physical, psychological, and psychosocial health (Hayakawa 2016). To promote recovery from a disaster, standardization of health and quality of healthcare services in shelters is essential (Urata et al. 2019). Through standardization of health care, these shelters become better equipped to protect and promote the health of evacuees (The Sphere Project 2011).

The need for community health globally has increased due to significant changes in population demographics over recent decades (Bennett et al. 2018). For example, chronic illness management of noncommunicable diseases (NCDs) for older and frail people is a significant healthcare burden in Japan, particularly given its rapidly aging society (Tener 2006). Japan Visiting Nursing Foundation reported that approximately 43% of home care nursing service in 2016 was provided for those who were NCDs (Japan Visiting Nursing Foundation 2021). Therefore, it is expected that some older population in shelters will require specialized care.

Over recent decades, evidence in relation to the quality of living standards in shelters has been established by international organizations such as the World Health Organization (WHO), the United Nations High Commissioner for Refugees (UNHCR), the ICRC (International Committee of the Red Cross), and Sphere (The Sphere Project 2011). The Sphere standards are an international set of standards for planning, managing, and implementing humanitarian response (UNHCR 2019a). One of their key recommendations is to set up shelters to protect evacuees. Other strategies include securing and

M. Kako (✉)
Hiroshima University,
Hiroshima City, Hiroshima, Japan
e-mail: mayumika@hirosihma-u.ac.jp

A. Hutton
The University of Newcastle, Newcastle, Australia

S. Kanbara
University of Kochi, Kochi, Japan

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improving water supplies, improving sanitation, promoting hygiene, ensuring food security, and focusing on nutrition and health. These human basic needs are essential in maintaining the health of evacuees in shelters. To fulfil these human basic needs can also contribute to achieve the SDGs3 goal. This chapter will review disaster health particularly at disaster shelters in Japan, based on the concept of Universal Health Coverage (Chap. 3) and how it can contribute to Disaster Risk Reduction and SDGs 3 goal, particularly.

5.2 The Importance of Quality of Accommodation in Shelter

Health care is an essential element of disaster relief work and is a major focus of the Sphere standards (Sphere Association 2018). The "sudden onset" and uncontrolled study environment limits how disaster health research can be conducted (Substance Abuse and Mental Health Services Administration (SAMHSA) 2016). Yet the standardization of shelter environments slowly progresses in Japan, and there is still little known about the levels and quality of health care provided due to the lack of evidence post-disaster (Veenema et al. 2015).

The implementation of the Sphere guidelines has been recognized as an attempt to standardize the quality of temporary living in shelters (Harada et al. 2019). The implementation of the standard relies largely on local governments and humanitarian agencies that are responsible for managing and operating the shelters. Therefore, depending on the resource availability of local governments, there would be some differences in levels of preparedness in each shelter. For example, a smaller local government with limited resources might need to consider alternative approaches to organizing shelters. Such an approach might entail training volunteer community disaster risk reduction officers. These officers could then work to empower community members to be part of creating a more resilient community. The impact of the current COVID-19 pandemic on how the community copes with and plans to respond to unexpected disasters has shown us that various challenges still exist to ensure the quality of the disaster shelter environment. Although standards have been developed by organizations such as the WHO and Sphere, there is still a need to develop resources to implement these standards, and a corresponding system to monitor the effectiveness of these within the shelter environment.

The next section will review studies conducted in Japan on the health care provided at disaster shelters (DS) in order to suggest improvements to the quality of the health care provided. The findings also bring into question how an accountability system can be established within relief work. Further, the findings will discuss the role health professionals, particularly nurses, can play in promoting health and contribute to care of disaster-affected people.

5.3 The Impacts on Health Within the Disaster Shelter Environment

The health care provided in DS has been expanded based on symptoms that are likely to occur the post-disaster period, and there has been an accumulation of studies focusing on symptoms such as DVTs, infections, and hypertensions (Tokumaru et al. 2021). One of the reasons for this change could be due to the introduction of national and international humanitarian standards as well as learning from past disaster experiences. Health care in this area of research and practice has moved away from reactive care to preventative aspects, such as health promotion and prevention. Care delivery, including prevention, ensures the promotion of recovery of affected people. Nurses are in the best position to coordinate those healthcare needs at DSs (Susanti et al. 2019; Xue et al. 2020). Further, there is a dearth of evidence on the healthcare outcomes provided for those who need care in a DS (Veenema et al. 2015).

The health impacts of disasters are evident in the literature. Disasters can have serious impacts

on health lasting from several months to a number of years (Nomura et al. 2016). They also state that health impacts do not necessarily resonate with the frequency or severity of the event. In other words, all types of disaster events affect people's health in similar ways over what can be lengthy periods of time. However, there are other factors to be considered. For example, the speed of disaster occurrence, slow onset or sudden onset, this difference could impact on the recovery phase. Further contributing factors include assessing the resilience of the healthcare system, as well as the affected community during the non-disaster period. Indirect disaster affects can be prolonged for months and even years following a disaster. This affect can impact on the daily life of evacuees which had previously managed their health and well-being. How the disaster impacts individuals is also dependent on their income, age, gender, and health status, for example, whether they are older persons, pregnant women, chronically ill, and/or marginalized groups. These people are at significant risk compared to the rest of the population within the wider healthcare system. Disaster damage can lead to potential increased health expenditures for both in the short and long term. Being informed of the disaster risks to the wider health system prior to a disaster can facilitate in the allocation of resources. Moreover, this allocation and organization can foster and promote universal health coverage that "all people have access to the health services they need, when and where they need them without financial hardship" (World Health Organization 2021).

5.4 Newly Emerged and Highlighted Health Conditions in Japanese Shelters

This section will provide the findings from the previous studies conducted in Japan in relation to health conditions in Japanese shelters. Various studies are conducted, and the findings are based on the studies conducted only in shelters.

5.4.1 Water and Sanitation, Hygiene (WASH)

5.4.1.1 Health Issues

We mentioned the Sphere standard prior to this section, and Water and Sanitation, Hygiene (WASH) is a part of this standard (Sphere Association 2018). Different studies focused on WASH; for example, Ramesha et al. (2015) reviewed the literature on WASH and reported that point-of-use interventions focused on handwashing and provision of soap directly to households may be effective and cost-effective for controlling diarrhea. It seems a simple solution, however, where clean water access is difficult; this strategy can be a foundation to maintain health leading to disaster-affected people's well-being.

Other humanitarian activities report how WASH can contribute to the health of different persons in communities. Women play an important role to promote WASH and to prevent infectious diseases after a disaster Alam and Rahman (2019) reported that the important role of women to prevent infectious diseases after a disaster recovery phase. Further, Richard and Kiani (2019) conducted rapid review on WASH for older people and people with disabilities in humanitarian activities. Their findings show that to provide WASH for people with disabilities, the service must be inclusive and accessible.

Okada et al. (2014) conducted the survey with the evacuees who stayed at shelters after, for example, the case of the GEJE. The 60% of responses indicated that there was no access to clean water to wash their hands. They also pointed out that only 25% of the respondents were aware of handwashing promotion activities by humanitarian relief groups. Showing appropriate leadership to maintain sanitation at shelters can prevent unwanted communicable diseases occurrences.

5.4.1.2 Recommendations for Practice

Health professionals can lead and support shelter leaders to implement and commence WASH activities as soon as needed. Nurses can lead a

series of health promotion activities within shelters, such as handwashing, and assuring the hygiene environment provided within DSs. At these shelters environment, providing clear water access enables to contribute to SDGs Target 3.9.

5.4.2 Nutrition

5.4.2.1 Health Issues

In the DSs, food for the evacuees was usually provided through donations and/or food service companies; however, the variety of the food was often limited. Harada et al. (Harada et al. 2016) investigated the nutritional intake of evacuees at 386 DSs in Miyagi Prefecture, 1 month after the Great East Japan Earthquake. Nutritional intake was assessed according to the nutrition recommendations made by the Japanese Ministry of Health and Labour (The Ministry of Health and Labour 2019). The results indicated that 47% of the study respondents had unbalanced nutrition and insufficient intake while in a DS. The authors based their assessment on five areas of balanced nutrition, energy intake, protein, and vitamins B1, B2, and C. Harada also found that nearly half of the respondents could only access a balanced diet while they were in a DS (Harada et al. 2016). Once families left shelters, it was difficult for to obtain food for a balanced diet. However, overall nutrition and the amount of food provided need to be considered further for evacuees. As the period of stay in a DS lengthens, the negative impact on evacuees' health is often greater.

On the other hand, Kasaoka et al. (Kasaoka et al. 2014) investigated food delivery and procurement at DSs. They found that DSs record the type of food that is provided for evacuees. Kasaoka et al. pointed out three factors necessary to enable a nutritious diet, communication with the centers in each neighborhood, food delivery by catering services, and securing of organizational support. Finally, the availability of nutritionists in the DSs was another important factor in providing nutritious and balanced food for evacuees.

5.4.2.2 Recommendations for Practice

Sudo and Yoshike (2008) revealed a significant dilemma for dietitians in disaster situations. They conducted a survey to investigate how the role of dietitians was integrated into the disaster preparedness planning of the local government. The survey findings indicated that for the prevention of the secondary health impacts of disasters, food stockpiling and food availability are important. In addition, the preparation and availability of fresh food daily, including exceptional food for infants and older people who have swallowing issues, are essential. Sudo and Yoshiike emphasized that to maximize their role as a nutritionist in a disaster situation, regular communication between the health emergency department and the shelter was essential to facilitate an appropriate diet for evacuees so that their quality of life would be improved during such stressful periods.

5.4.3 Shelter and Items for Daily Needs

5.4.3.1 Size of Shelter and Conditions of Shelters

The size of the DS was an important aspect of providing health care for evacuees. Tanioka et al. (2007) discussed the period of time the evacuees spent at the shelter according to its size. They claimed that in the smaller enclosed environments, evacuees were encouraged to be independent compared to in the larger DSs. They concluded that if the size of the DS was smaller, the evacuees at the shelter became independent earlier than in the larger DSs. Their work has shown that the inclusion of the size of the DS is important, as the size of the DS can enhance the quality of the living space for evacuees.

Yokose (2015) reported that a prolonged stay in a shelter resulted in worsening living conditions. This was evident after the 2011 Great East Japan Earthquake disaster, where house dust was evident in the shelters. From this experience, the Japan Primary Care Association formed a public health team to monitor the DS environment to

prevent house dust from accumulating in the shelters. Their activities included changing the bedding, disinfecting, or drying bedding, and providing antimicrobial tools and insect repellent. These activities were undertaken with the cooperation of volunteer disaster recovery groups who were formed through the local volunteer centers. This strategy was successful with improvements to the living environment, and prevention of further increases in house dust was reported.

A survey conducted by the Cabinet of Japan (Cabinet of Japan 2015) found that there was a difference in the length of stay in DSs between people whose activities of daily living (ADLs) were independent and those who had a dependent family member. For example, evacuees who had frail and independent families such as older people requiring ADLs support and families with children were more likely to stay in a DS. Additionally, people with frail family members who required care at home delayed their move into community housing due to the setup and preparation of their living environment to suit their living needs (Cabinet of Japan 2013). Moving from one DS to another center was also more likely to happen to those who had dependent family members. This was due to evacuees looking for a more suitable living environment for those in need of higher care. In addition, people who were pregnant, had small children, and people with disabilities required care and support for their ADLs.

5.4.3.2 Health Issues

(Oral Health Care)

As the result of a lack of appropriate shelters environment, basic care access such as oral care was limited. Like nutrition for evacuees, oral health care was provided as part of public health disaster relief. Moritani et al. (2014) reported on the development of an assessment tool to maintain oral hygiene for evacuees. They asserted that it was critical to visualize the oral healthcare needs of evacuees and that there was previously a lack of focus on oral health care for evacuees in these centers. The authors argue that dental hygiene tends to be left behind in the turmoil of a disaster situation. However, it is important to pay attention to oral health care, as this can affect the long-term quality of life of evacuees.

Coupled with the ageing population in Japan, oral health care should have a greater focus. Aggarwal (2018) argued for the importance of oral health care being attended to in complex emergencies, as it can be an early warning sign in preventing systemic disease and deprivation. Yamanashi Prefecture (one of Japan's municipal areas) updated their guidelines for oral health care in disaster situations, stating the importance of continuity of care in DSs (Yamanashi Prefecture 2019). In addition, Kubo et al. (2019) claimed that evacuees should not have more than 3 days without oral health care after a disaster. Until healthcare deployment arrives, it is important to promote evacuees' oral health care by encouraging thorough gargling, as well as oral healthcare promotion during evacuees' stay in a DS.

5.4.4 Developing Interventions to be Used at Shelters

Ishii et al. (2016) assessed evacuees' health conditions at 328 centers during the Great East Japan Earthquake disaster. In their study, a large volume of data was manually collected and required a significant amount of time and human resources to analyze. From this experience, a newly improved rapid assessment system was developed. This system, RASECC-GM (Rapid Assessment System of Evacuation Center Condition feat. Gonryo and Miyag surveillance system), was the evaluated by Sugishita et al. (2015) after the Great East Japan Earthquake disaster. They found that collecting data on the symptoms of evacuees was more useful than collecting diagnoses, because it was easy to collect and collate the total number of symptoms that can indicate the potential spread of communicable diseases and other disaster-prone illnesses. This illness and symptom-focused approach is essential to monitor disaster-affected people's health needs enabling deployment of appropriate

health relief services. However, considering the prolonging the length of stay at shelters in Japan, the innovative assessment and monitoring methods can also be used to inform the mid- to long-term recovery of disaster-affected people. To monitor the health of medium- to long-term evacuees, Kitano et al. (2020) developed an assessment sheet to assess evacuees' health when they first register at shelters. This early assessment and information is important, because healthcare providers (humanitarian services) would be able to support disaster-affected people in the long term (from non-disaster period to disaster period).

5.4.5 Common Health Issues at Shelters in Japan

The Sphere guidelines focus attention on the impact of interrupted health systems, particularly for those who are facing long-term treatment for diseases such as HIV and tuberculosis (Sphere Association 2018). Other studies focused on nutrition (Harada et al. 2016; Kasaoka et al. 2014), oral health (Moritani et al. 2014), pressure area care (Ishii et al. 2016), and child health (Kako 2007). These studies were published over the last 5 years and highlight the importance of continuing care at DSs to protect evacuee health. In the following sections, these themes will be discussed.

5.4.5.1 Infection Control

Health Issues

The Sphere guidelines state that infections and mental health should be the focus of humanitarian response at DSs (Sphere Association 2018). Infection control is one of the fundamental tasks in emergency health management in a disaster situation. As the COVID-19 situation continues, infection control at DSs needs to be carefully considered. Tokuda et al. (2014) focused on the DS environment 2 weeks after the Great East Japan Earthquake disaster of 2011. They found that evacuees did not have enough space, as there were not enough shelters available and accommodation was tight. Sufficient space is important for preventing infections such as influenza. Tokuda et al. (2014) showed that infectious disease prevalence was lower where there was disinfectant and hand hygiene supplies available at DSs. In disasters, getting people inside a DS is important. It allows people to feel like they are supporting their community and can assist in taking their minds of their current situation. In addition, ensuring that people have access to clean water and food post-disaster is important. It is important to encourage people not to eat any food that has come in contact with flood or storm water. Teach people to smell food for an unusual odor, color, or texture, and if they are not sure about its quality it is best they throw it away.

Clean water can become quite scarce post-disaster, so it is important to teach community members not to wash dishes, prepare food, brush teeth, and/or wash hands with contaminated water. If possible, recommendations can be made for boiling and/or treating water. Once water is treated, it can be used for drinking and preparation of food, and completion of personal hygiene.

COVID-19 has shown that education and reinforcement of general infection control issues are still important, and topics include the need for hand hygiene, appropriate/better sanitation/sewage facilities, outbreaks/occurrences of unusual infectious diseases, overcrowded conditions, poor environmental decontamination, and a general lack of preparedness on behalf of public health responders in relation to infection control issues.

5.4.5.2 Mental Health

Health Issues

Mental health was another major concern for evacuees, with two studies focusing on this issue. As a part of the SDGs goal 3.4.2, mental health is listed and indicated to reduce the suicide mortality rate. In the past studies, there were small number of studies focusing on mental health care in Japanese literature. For example, Matsuzaki et al. (1995) described the mental health care provided during and after the Miyake Island volcanic eruption in 1986. Mental health services were provided for the evacuees, focusing on vulnerable

people such as the elderly, mothers, and children. A retrospective descriptive study by Matsuzaki et al. (1995) found that most mental health symptoms of evacuees were comprised of irritation, concern, and unsettled feelings. These feelings peaked 1 week after evacuation from their hometown. The evacuation of residents from Miyake Island lasted 1 month during which the evacuees were displaced. The study found that the health care provided for vulnerable populations needed to be improved as there were many evacuees who fell sick during this period. For example, some evacuees felt irritated and anxious, as they did not know when they could go home, and temporary living in a crowded space without privacy was stressful for them. Furthermore, Matsuzaki et al. (1995) recommended the establishment of mental health support aids and a systematic approach to supporting evacuees at the centers.

Tategaki (2012) investigated the mental health needs of disaster-affected people after the Great East Japan Earthquake disaster and found three main concerns for responders: to "listen to/counsel" evacuees, "medication management," and "assessment of mental health status." The importance of listening to the evacuees, coupled with the sharing of disaster experiences, acted as an aid to psychological healing in the post-disaster period. While Matsuzaki et al. (1995) and Tategaki (2012) took a people-centered approach to their research, Saito et al. (2013) studied stress levels after a disaster by measuring the stress of participants through biological markers. To measure stress levels, they examined urine samples of the participants to ascertain whether there was a difference of 8-OHdG or higher among participants living in temporary housing after moving from a DS. The findings revealed that once the evacuees moved out of the DSs and into temporary housing, their level of 8-OHdG decreased back to the normal range. This indicated that they had a high amount of stress once out of the shelters.

It is not only adults whose health was affected by spending time in a DS but also children. Although Kako (2007) discussed the mental health needs of children and did not focus the difference between the mental health impact with adults and children, emphasizing the importance of the continuity of healthcare support as the period of living in a DS lengthens. These authors found that providing mental health support was not enough for the evacuees while they were in the DS. In addition, mental health care should continue after evacuees move to temporary housing in a new community setting, emphasizing the importance of continuity of care for evacuees. Even the affected people's place of living charges, mental health care needs to continuously provide over a period, especially where the affected communities cannot rebuild again, in terms of place and member of communities which are different and difficult to develop. This situation would create isolation of affected people in newly built communities as well (Kako and Ikeda 2009; Kako and Mayner 2019).

Not only disaster relief health providers but also people who are involved in supporting people traumatic situations voluntarily are expected to be aware of Psychological First Aid (PFA) (World Health Organization 2013). While it is nature for disaster relief personals to prioritize, disaster-affected people's physical health as a first instance, those providers are anticipated to be aware of assessment of psychosocial aspect by considering the right timing as well as coordinating and reaching out to the right support healthcare providers.

5.4.5.3 Deep Vein Thrombosis

Health Issues

Deep vein thrombosis (DVT) (Hanzawa 2013, Taniguchi 2012, Tsubouchi et al. 2016, Shibata 2012) is known to be the most common complaint from evacuees immediately after disaster. One rationale put forward by Hanzawa was that people stayed in their cars post-disaster leading to higher incidence of DVT (Hanzawa et al. 2013). However, Taniguchi claimed that there is no correlation between the occurrence of DVT and the evacuees' environment (Taniguchi 2012), so there is still work to be done in this space.

Given that this condition is common, two articles have made recommendations for treatment. Shibata et al. (2012) emphasized that the risk of

DVT for smokers was high, and interventions such as introducing regular exercise and wearing compression stockings were recommended, while evacuees are living in the shelters. Hanzawa et al. (2013) suggested introducing a portable bedding system in the DSs as a part of the standardizing evacuation environment to prevent DVT. Improvements to the living environment and promotion of greater mobility for evacuees can prevent DVTs.

5.4.5.4 Pressure Injuries

Pressure injuries are reported as a part of increasing hospital and community care (Nguyen et al. 2015; Wilson et al. 2019; Padula and Delarmente 2019). The national and global concern is not only on the financial cost as well as it impacts on the quality of life of the person. Due to the length of stay at shelters in Japan as well as who can be accommodated, the demographics of evacuees may change. During the recovery phase of the Great East Japan Earthquake disaster, disaster-affected people stayed for more than 30 days (on average) until they could find temporary housing (Cabinet of Japan 2013).

Health Issue

Nakagawa and Ishii II (2012) surveyed the frequency of Pressure Area Sores (PAS) in DSs where disaster relief nurses were deployed after the Great East Japan Earthquake disaster. The living environment of the DS, such as lying on the floor (beds were not available), had a significant impact on frail evacuees who were at high risk of PAS. This study highlighted the high prevalence of PAS in DSs with frail elderly evacuees.

Providing appropriate bedding for high-risk people to prevent and promote healing of PAS is important to prevent unnecessary problems. In addition, the introduction of cardboard beds has been rapidly developed in Japan, also incorporating COVID-19 considerations, which contributes to space management as well as promoting quality of life for evacuees at DSs. Decreasing the ADLs at DSs can cause both DVT and pressure injuries. Those people who are suffering those conditions could have underlying NCDs, whose health conditions are worsen by staying at DSs. Therefore, managing those conditions and early health promotion as well as prevention will contribute to SDGs 3.4.1.

5.5 The Role of Nurses in a DS

What was highlighted in this review was the variety of care needs from the affected evacuees. These are in line with the Sphere standards such as infections and mental health. Further our work has shown that dental hygiene, vascular DVTs, and pressure areas are also problems in Japanese DSs. Nutrition assessment was also defined to be a part of the standards necessary for humanitarian relief response. The focus on dental care (Moritani et al. 2014), food security, and nutrition (Harada et al. 2016; Kasaoka et al. 2014) are newly focused care needs in disaster health research. Adding to those areas, WASH is important area to focus as it leads to prevention of infection.

Mental health is another aspect mentioned in this review. While Sphere standards recognize human vulnerabilities and capacities, people respond differently to disaster according to their age, gender, current disability, or illness. Therefore, the maintenance of chronic disease, mental health, and psychosocial care should be recognized as essential forms of health care for affected people in humanitarian crises, including disasters. By strengthening psychosocial support and self-support, it is possible to create a safer environment for affected people to recover psychosocially and emotionally (UNHCR 2019a). These perspectives are important, and the Sendai Framework for Disaster Risk Reduction encourages a people-centered approach to disaster risk reduction to achieve a holistic framework to assist disaster-affected people (UNISDR 2015).

The review further described that health-related disaster relief teams provided a variety of care at DSs after disasters. Promoting health, preventing illness, and providing care should reach people who are in need and affected by disasters. Providing prompt health assessment for evacuees is an essential part of disaster health (Ramos 2015). Although we may consider that the proac-

tive involvement to these activities such as health promotions, management, and prevention could only impact on post-disaster period, however, those activities can contribute to SDG 3 in long term, and these activities are important to bridge again to the extent phase of disasters.

Intervention tools are great support for health professionals to provide prompt assessment. After identifying the needs of affected people, health professionals would assess whether they are capable for self-care or health professionals need to support them to reach out to secure the relief service for them. This action of coordination of health care for affected people is the key to maintain the quality of care at DSs. For example, coordination with health welfare sector to maintain the continuity of care so that the affected people's health and well-being will be protected and maintained. There is no literature in this study mentioned the role of nurses to coordinate those services for affected people; however, nurses are well positioned to take these responsibilities of coordination as they are working close to those people during non-disaster period. By coordinating available services for disaster-affected people, nurses can contribute to their recovery. Therefore, utilizing the non-disaster phase relationships and preparing to coordinate by elaborating and escalating to change the disaster phase are important.

While health professionals conduct health management at DSs, health and care data should focus on micro health status data. Those micro health data represent immediate health needs of disaster-affected people, as well as health needs in the recovery phase of disaster. The health impacts of the disaster-affected people continue, and this visualization of continuum health data can create opportunities for affected people to access healthcare services equitably. This development of continuum health data can be communal activities. We define these activities as "community-based participatory health monitoring," which aims to prevent the spread of health damage and the deterioration of health conditions, which can increase community resilience in long-term period and provide a foundation for emergency response rather than statistics of damage. In other words, this will also lead to contribute to the SDG3.

The systematic use of technology-based public services using emerging technology can improve the quality of data. Furthermore, the use of mobile devices can support individual and community preparedness and emergency response. For example, WHO-EMT Minimum Data Set (MDS) is developed for those who are in disaster Emergency Medical Team (EMT) to report and share to Emergency Medical Team Coordination Cell (EMTCC) for further healthcare needs assessment and coordination for continuing relief activities (Kubo et al. 2019). The recent frequent occurrence of disaster reminds us the importance of the application of interoperable ecosystems with relevant baseline information provided by different agencies. The importance amplifies especially in extreme disasters and emergencies and be connected to the mainstream of health data platform such as this MDS (Fig. 5.1). As the Fig. 5.1 indicates, not only the health damages such as injuries but also long-term health damages such as excavating chronic conditions and mental health illness with psychosocial problems (contribution to the SDG3). Visualizing and quantifying of those long-term health needs will be next objective to achieve in the future.

5.6 Conclusion: The Quality of Care Provided at DSs

This chapter reviewed disaster health at shelters and community based on Chap. 3 which discussed on how the point of view of universal health coverage can contribute to disaster risk reduction.

Firstly, focusing on the quality of health care provided in the DS setting. The reviewed articles focused on "how health care providers know what the evacuees need is," rather than asking "what is good quality care provided in the disaster shelter?". While issues such as oral care, DVTs, nutrition, and mental health are important,

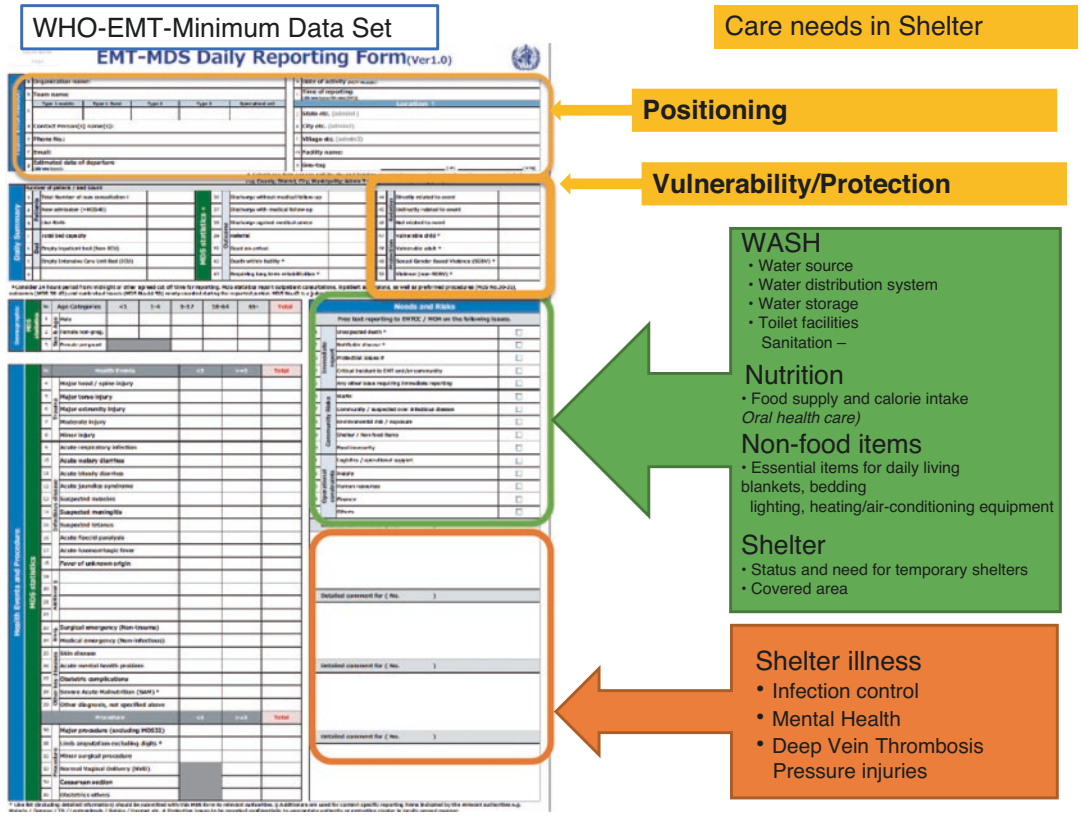

Fig. 5.1 Proposed shelter assessment on WHO-EMT minimum data set

the delivery of services and the system for maintaining evacuee health at DSs had not been discussed.

Health issues discussed in this chapter were typically observed, although there are differences in terms of type of disasters, the geological locations, non-disaster period healthcare service system, and so forth. We consider the reason for this is that healthcare providers (disaster relief personnel) usually focus on their tasks in a DS, as presumably, the tasks they are involved are temporary. Deployed health professionals work according to their organizations plan, and their personal practice and experience may not be shared in widely while their organizational experience and report can be shared publicly. This closed information system may promote focus on "getting tasks done" rather delivering quality care." Therefore, further studies focusing on wholistic approach to oversee the continuum of care needs changes in different disaster phases.

Secondly, while this chapter discusses the healthcare services at DSs, access to all other resources in society, in other words, social determinants of health, is impacted and gives difficulties to access those for disaster-affected people. Healthcare professionals are in a good position to assess and coordinate and bridge to other resources to protect those people. The continuous activities can contribute to the goal of SDGs 3.

Lastly, further studies concerning with view of UHC will be required. UHC has been established in Japan, and we observe its impact on the longevity of life since its implementation. Disaster will impact not only on people's life but also healthcare system where the disaster occurs. Medical expenditure per citizen in Japan has been increasing since the 1960s, and disaster damage can amplify the medical expenditure. While the investigation on DRR with the health and UHC focus should be considered, we need to produce evidence to support those investments.

To monitor those disaster health damages and healthcare needs, comprehensive monitoring system will be required not only focusing on the onset of the disaster but also on long-term healthcare needs.

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Research of Disaster Nursing in Japan 2005–2020

6

Maki Nakajima and Sakiko Kanbara

6.1 Introduction

Many disasters have occurred in Japan. Disaster nursing was established in Japan after the Great Hanshin-Awaji Earthquake in 1995. People's sense of values regarding disaster nursing has changed dramatically since. At the time of the Great East Japan Earthquake of 2011, many nurses from all over Japan voluntarily rushed to the disaster areas to participate in health-related activities for the affected populace. However, knowledge of disaster nursing was inadequate and identified in a general manner, and the number of disaster nursing experts was insufficient (Sakashita 2014). Many disaster experiences have called for an expansion in the role of nursing. In order for nurses to respond to issues one by one, local knowledge and transdisciplinary risk communication are most helpful, rather than nursing knowledge and skills. It is necessary to support the reconstruction of the community from a broader perspective and identify and empathize with the real needs of internal supporters and respond flexibly. Therefore, it is needed to make use of nurses who have once been affected by a disaster, and their practical knowledge of disaster relief. In the end, it is impossible to say what is the best way to respond to health needs in times of disaster.

6.2 Concept Analysis of Disaster Nursing in Japan

Disaster nursing in Japan has evolved along with its history of disasters. The definition of disaster is also varied, and the definition of disaster nursing is diverse. There is no single, universally accepted definition of disaster, just as there is no single accepted definition of disaster nursing. The Japan Society of Disaster Nursing defines disaster nursing as "activities to minimize the impact of a disaster on human life and health by systematically and flexibly using specialized knowledge and skills in disaster nursing and by working in cooperation with professionals in other fields." Knowing the definition of disaster nursing leads to concrete activities rooted in the framework, direction, and role of disaster nursing. Therefore, the purpose of our study was to describe the concept of disaster nursing, using Rodgers' (2000) evolutionary concept method (Rodgers 2000).

M. Nakajima (✉)
Nagoya University Graduate School of Medicine, Nagoya City, Aichi Prefecture, Japan
e-mail: nakajima@met.nagoya-u.ac.jp

S. Kanbara
University of Kochi, Kochi, Japan

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6.2.1 Materials and Methods

6.2.1.1 Data Collection

Literature for the period 1995–2020 was reviewed from the Japanese database Ichushi-Web. This database is the sole Japanese database of health professionals' research articles. Using "disaster nursing" as a keyword, 678 articles were found. Twenty-three articles that clearly described disaster nursing were extracted from the literature. The literature review included articles that clearly defined disaster nursing, to arrive at a common definition (Table 6.1). To be included in the review and analysis, the literature had to be consisted of journal articles and web pages covering information on disaster nursing. A conceptual analysis was performed using the commonly used definition of disaster nursing.

6.2.1.2 Data Analysis

Rodgers' (2000) evolutionary concept analysis posits that when contextual factors change, the

Table 6.1 Definitions of disaster nursing

Author	Definition
Jintoku et al. (1996)	The content and quality of daily life is closely related to a person's health, and changes in life also bring about changes in health. Even in the event of a disaster, maintaining and adjusting people's health and daily life is an important role of nursing. In the event of an emergency during a disaster, to prepare the subject's daily life, the minimum stockpile of supplies to maintain the health condition and potential health problems should be grasped in advance, depending on the subject and situation. It is necessary to provide ingenious and predictable nursing care. Disaster nursing education is one of the efforts of disaster nursing activities in the quiet period of the disaster cycle
Otsuka et al. (2000)	Disaster nursing is involved in everything in the disaster cycle, not just critical care in the acute phase. In particular, there is growing interest in mental health care. Although it is a wide range of disaster nursing, there is necessary assistance according to the disaster cycle
Japanese Red Cross Society of Nursing Science (2001)	Disaster nursing is nursing activities related to the entire disaster cycle in collaboration with other people by applying knowledge and skills related to disaster nursing to minimize the damage to the lives and healthy lives of people affected by disasters inside and outside the country
Minami and Yamamoto (2007)	Disaster nursing is the activities for nurses to make full use of their knowledge and skills in the event of a disaster and to reduce the damage to their lives and healthy lives in cooperation with people in other specialized fields
Ohara (2007)	A disaster is a situation called a natural disaster or man-made disaster, in which the lives and health of many people are seriously threatened at unforeseen circumstances. Not only primary damage caused by earthquakes and fires but also secondary life and health A disaster is a mass disaster that affects a large number of groups, and in most cases, it cannot be dealt with by the emergency medical system in the area due to its scale and the victims. Nursing in the event of such a disaster refers to nursing activities to protect people's lives and healthy lives from disasters by cooperating with disaster nursing's unique knowledge and skills and other specialized fields, and the ever-changing disaster cycle. In response to this, it is necessary to carry out nursing activities from the physical and mental aspects. Immediately after a disaster, nursing activities are carried out in an emergency, and the role of nursing is different from normal times. The activity differs from normal nursing activities because it takes place in an emergency and in the turmoil of lack of human and physical resources. In addition, the content of activities varies depending on the type and scale of the disaster, the time of the disaster, and the place of activity
Sakai (2011)	Disaster nursing systematically and flexibly uses the unique knowledge and skills of nursing at the site of a disaster or the site where a victim is carried and cooperates with other fields to deal with the damage to life and healthy life caused by a disaster
Minami (2016)	Disaster nursing is based on the philosophy of "human security" and aims to support the strengthening of resilience to disaster risks in people's health and life. It covers continuous people's lives and health conditions, from the time of disaster preparedness to the time of medium- to long-term recovery and reconstruction, to understand the characteristic needs of each period and to support the issues of human life, living, and health

Table 6.1 (continued)

Author	Definition
Disaster nursing global leader degree program (DNGL)	Disaster nursing covers people's lives and health conditions during the period of disaster preparedness, to the acute period immediately after the disaster, to the mid- to long-term recovery and reconstruction period. In addition to identifying the distinctive needs of each period, disaster nursing provides support activities to address the issues of human life, living and health. The philosophy of disaster nursing is to protect people's basic human rights and freedoms from disasters that pose widespread and serious threats and to help people prepare for disasters and recover themselves from the harsh conditions of the disaster. (from "human security"). Based on this philosophy, the purpose of disaster nursing is to help strengthen the resilience of people's health and lives to disaster risks
Japan Society of Disaster Nursing	Disaster nursing is activities to minimize the impact of a disaster on human life and health by systematically and flexibly using specialized knowledge and skills in disaster nursing and by working in cooperation with professionals in other fields

Author's translation

definition of a concept varies (Rodgers 2000). This method is inductive, nonsequential, and descriptive and includes an examination of the social, cultural, and political contexts of a concept over time. The method comprises the identification of a concept's defining attributes, antecedents, and consequences.

Each document was read in its entirety to obtain an impression of the work and to identify its use of the concept. The documents were perused to identify and extract content for each aspect of the concept separately and consecutively: attributes, antecedents, consequences, and contextual information. A thematic analysis of the extracted text for each conceptual aspect was conducted. The themes were examined for their meanings, patterns, and similarities. Data were organized and reorganized until a consistent system of categories and relationships emerged for the attributes, antecedents, and consequences of disaster nursing.

6.2.2 Results

The conceptual map of disaster nursing in Japan is shown in Fig. 6.1.

6.2.2.1 Attributes of Disaster Nursing

Six attributes of disaster nursing were identified: "Use disaster nursing knowledge and skills"; "make the most of the nurse's abilities"; "providing necessary nursing care for victims and the affected areas"; "support for people's life, living, and health issues"; "activities in collaboration with professionals in other fields"; and "understand potential health problems and prepare for disasters". The contents of disaster nursing were also clarified. Collaboration is important in conventional nursing but especially so in the event of a disaster. In such a scenario, various specialists are active, and nurses often play a role in connecting specialists with local residents. Additionally, the International Council of Nurses describes the role of nursing in disaster as "disaster preparedness, including risk assessment and multidisciplinary management strategies at all system levels, is critical to the delivery of effective responses to the short-, medium-, and long-term health needs of a disaster-stricken population" (International Council of Nurses [ICN] 2006). Therefore, the role of nursing in disaster preparedness is important.

6.2.2.2 Antecedents of Disaster Nursing

Two antecedents of disaster nursing were identified. The first attribute was place (disaster-affected area, community), and the second was time (all disaster cycles). The disaster cycle is an important keyword in disaster nursing, coined to indicate when and what is needed in response to a disaster. In general, the disaster cycle is defined with five phases: an acute phase, a subacute phase, a chronic phase (restoration and reconstruction phase), a quiet phase, and a precursory

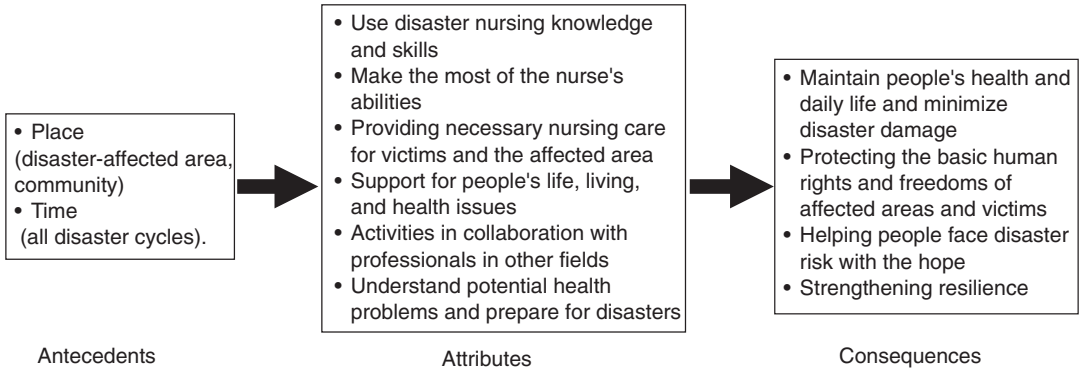

Fig. 6.1 The conceptual map of disaster nursing in Japan

phase. In addition, the disaster risk management cycle consisted of four phases: prevention, mitigation, preparedness in the pre-disaster stage, and response and rehabilitation/reconstruction in the post-disaster stage. Although disaster nursing begins with relief activities after a disaster, disaster nursing is seamlessly involved in all disaster cycles. In recent years, disaster preparedness and disaster risk reduction activities have received particular attention.

6.2.2.3 Consequences of Disaster Nursing

Four consequences of disaster nursing were identified: "Maintain people's health and daily life and minimize disaster damage"; "protecting the basic human rights and freedoms of affected areas and victims"; "helping people face disaster risk with the hope"; and "strengthening resilience". The purpose and direction of disaster nursing are revealed.

Nurses are key players in disasters. The ICN describes the value of nurse involvement in disasters as "nurses with their technical skills and knowledge of epidemiology, physiology, pharmacology, cultural-familial structures, and psychosocial issues can assist in disaster preparedness programs, as well as during disasters" (ICN 2006). The World Health Organization and ICN describe "nurses, as the largest group of committed health personnel, often working in difficult situations with limited resources, play vital roles when disasters strike, serving as first responders, triage officers and care providers, coordinators of care and services, providers of information or education, and counsellors" (WHO and ICN 2009). However, health systems and healthcare delivery in disaster situations are only successful when nurses have the fundamental disaster competencies or abilities to rapidly and effectively respond. The term disaster nursing is imprecisely defined in the literature (Jennings-Sanders et al. 2005); however, it can be said that the results of this analysis are generally consistent with the global concept of disaster nursing. Disaster nursing often differs from typical nursing roles due to the lack of human and material resources. In disaster nursing, which requires nurses to make the most of their abilities, support and education for nurses are essential. In addition, nurses need to be involved in disaster mitigation and prevention, not only during disasters. Based on human security, disaster nursing needs to evolve further.

6.3 Literature Review on Disaster Nursing Research Area

6.3.1 Materials and Methods

To ensure a broad assessment of the progress and trends related to disaster nursing, we searched the literature of Japan and other countries. The nursing literature of the Japanese search was conducted on the Ichushi-Web database on December 2020, using the keywords "nursing" and "disaster" as extracted from the Delphi survey in 2010

(Kanbara et al. 2010); "preparedness"; "system of coordination"; "support for vulnerable people"; "mental health"; "disaster cycle"; "specific and multiple disasters"; "international"; and "construction of disaster nursing build (nursing education)." A search on the literature of other countries was conducted on PubMed databases using the same keywords. Relevant literature was compared and analyzed for content.

6.3.2 Findings

The number of studies in each research area is shown in Fig. 6.2.

6.3.2.1 Preparedness

The total number of Japanese studies on preparedness amounted to 453. There were several reports on manuals for hospitals, elderly care facilities (Yamauchi 2007), and home nursing stations (Kawahara-Maekawa et al. 2006). There are newer reports on specific measures and preparedness tailored to the characteristics of the target population. In the studies from other countries, there were 425 studies on preparedness, and the number of studies has been increasing since the late 2000s. Although studies on disaster preparedness from the nurses' perspective have been conducted in various countries (Taskiran and Baykal 2019; Hutton et al. 2016; Zhang et al. 2018), health professionals and support staff may not be fully prepared for disasters (Gowing et al. 2017). This is an area where more nursing research is required in the future.

6.3.2.2 Collaboration Systems

The total number of Japanese studies on collaborative systems equaled 964, with the number increasing after 2011, including reports on collaboration multi-professional collaboration (Tamura 2016) and public health networks (Sasaki and Iwamuro 2013). In research conducted in other countries, there were 141 studies on collaborative systems. Barriers to humanitarian aid management (Safarpour et al. 2020) provide continuity of care to dischargeable patients during disasters (Feizolahzadeh et al. 2019). This area of research has attracted particular attention in Japan.

6.3.2.3 Vulnerable People

A total of 108 Japanese studies on support for vulnerable people were extracted. In the search by target population, there were 476 studies on the elderly, 243 on children, 67 on pregnant and nursing women, 120 on the disabled, and 28 on foreigners. There were reports on the reactions of people with disabilities during earthquakes (Takahashi 2004), reports on factors that saved

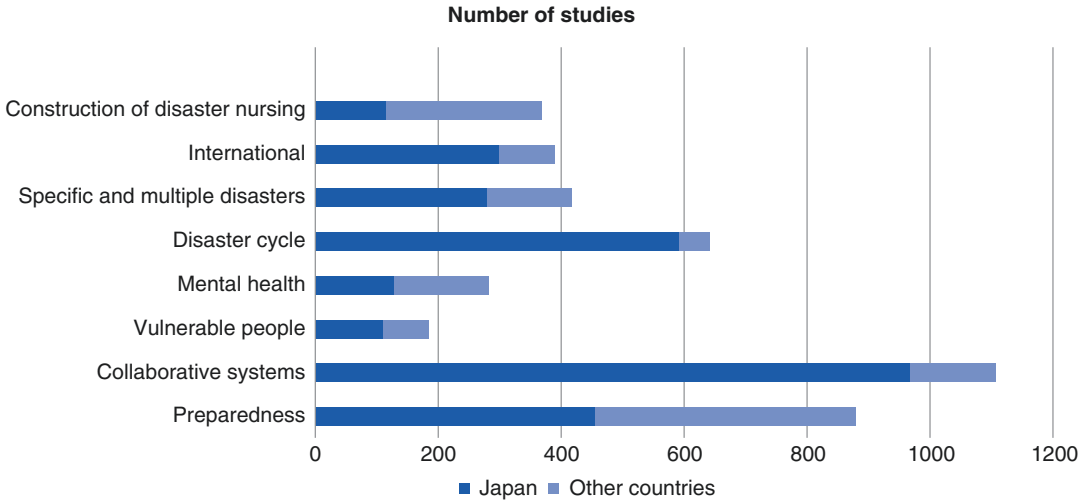

Fig. 6.2 The number of studies in each research area

lives during floods in wards for children and people with severe mental and physical disabilities (Yamamoto et al. 2009), and reports on responses of vulnerable people at evacuation centers (Yamanaka et al. 2018). Seventy-six studies conducted in other countries were extracted. In the search by target population, there were 44 studies on the elderly, 150 studies on children, 33 studies on pregnant and nursing women, 6 studies on people with disabilities, and 3 studies on foreigners. There were reports about economically vulnerable people (Cohen et al. 2019) and education on disaster responders who care for this vulnerable population after a disaster (Edinger et al. 2019).

6.3.2.4 Mental Health

The number of studies on mental health in Japan totaled 126. There were reports on mental health care for survivors, relief workers, and nurses (Yamaga et al. 2002), long-term mental health effects (Nagata et al. 2015), new reports on critical incident stress and coping behaviors (Nishino et al. 2016), and resilience (Uchino 2014). In studies from other countries, the number of cases was 154, and this has increased since 2014. There were reports on the long-term effects of avalanches on survivors' mental health (Bakker et al. 2019), long-term psychological reactions, and resilient processes after a large-scale burn disaster (Wu et al. 2020). There is a need for long-term follow-up studies on mental health during disasters to capture the progress of disaster victims' psychological responses, including medical professionals. This is a high-priority research area.

6.3.2.5 Disaster Cycles

Studies on disaster cycles were conducted using disaster cycles and evacuation sites (shelter, temporary housing, and reconstruction housing). The total number of Japanese studies on disaster cycles was 591. Most studies were related to shelters, with 495 cases. The number of studies on the recovery phase has increased since 2011. There have been reports on support activities in evacuation centers (Nishigami et al. 2009) and the recovery process (Sakuyama et al. 2014). The number of cases in other countries was totaled 51. There were reports about the role of the nurse in empowering people at all stages of the disaster cycle (Deeny et al. 2010), and recognition of nursing roles in each phase of the disaster cycle (Hanes 2016). The situation at each cycle varied depending on the situation before the disaster and the type of disaster. Longitudinal research and highly individualized nursing support from a long-term perspective are necessary.

6.3.2.6 Specific and Multiple Disasters

The total number of Japanese studies on specific and multiple disasters was 278. There were several reports on nuclear accidents caused by the Great East Japan Earthquake (Sasatake et al. 2017), and other reports on train accidents on the JR Fukuchiyama Line (Nojima 2018). A total of 139 studies were conducted in other countries. There have been reports about the September 11, 2001 (9/11), terrorist attacks in New York (Garfin et al. 2018; Holman et al. 2016), family emergency plans and preparedness for man-made disasters (Makama et al. 2017), design and validation of emergency department preparedness cases of radiation accidents, nuclear accidents, and nuclear terrorism (Marzaleh et al. 2020). Further research is needed to systematize nursing care for special and multiple disasters.

6.3.2.7 International

The total number of Japanese international studies was 297. There have been reports on overseas disaster relief activities (Otsuka et al. 2000; Takada 2005), reports on stress factors of dispatched personnel (Sakai 2003), and the process of emotional experience (Aureus et al. 2013). The number of cases in studies conducted in other countries was 91. There was a report on the confusion of nurses regarding the SDGs (Porta et al. 2019) and assessment of training in disaster preparedness (Noh et al. 2018). There is a strong need for international collaboration and sharing of experiences among countries.

6.3.2.8 Construction of Disaster Nursing: Nursing Education

In the construction of disaster nursing, we focused on disaster nursing education. The total number of studies included was 114. There have been reports on efforts to establish disaster nursing (Minami 1996) and disaster nursing education programs (Yamamoto et al. 2005). In recent years, attention has been paid to disaster nursing education in graduate schools (Kobayashi 2015), issues in practice (Horiuchi et al. 2015), and the development of disaster nursing competency (Kumagai et al. 2011). The number of cases in the studies from other countries all reported on education for disasters (Kalanlar 2019; Liou et al. 2020; Wang et al. 2013), and there have been reports on simulations (Livingston et al. 2016) and competencies (Al Thobaity et al. 2016). It is important that disaster nursing education reflects disaster experience, and due consideration is given to teachers and teaching methods.

6.4 Discussion

The progress and trends of current research in Japan are consistent with previous research priorities of urgent and significant research. In Japan, most reports are based on disaster experience. There is an urgent need to develop a systematic study of disaster nursing under circumstances in which disasters occur frequently around the world. Nursing researchers in various countries have begun to take initiatives related to COVID-19, but a coordinated effort to identify research areas has not been identified (Pickler et al. 2020). Nursing research related to SDGs is increasing, but there are critical needs, and there is a need for nursing research, nursing practice, and nursing policy development to achieve the nursing curriculum and the 2030 goals (Osingada and Porta 2020). It has been suggested that there is a need for nursing researchers in each country to conduct secondary analysis of data from multiple countries, with particular focus on culture, psychological distress, and social determinants of health (Chen et al. 2020). The role of disaster nursing has become clearer. But in the end, it is impossible to say what is the best way to respond to health needs during a disaster. It is all a process within the community. At first, it may seem like everything is an emergency response, but it depends greatly on the various people involved, the infrastructure at the time, and the pre-disaster preparations that have been made by the government and the community. Even if we consider climate change, we will not be able to build consensus and maintain consistency unless we share knowledge, i.e., research on disaster nursing, not only within nursing but also with people from various fields. Also, the imbalance of power between departments is hindering progress. The universality of the relationships, care, and communication by local nurses in disaster nursing might contribute for future efforts to that occur in the process of achieving the goals of the SDGs Nursing research advances nursing practice and shapes systems and policies that support people's health. It is necessary for nurses and researchers to have a shared understanding of the concept of disaster nursing and to disseminate research from the perspective of nurses to the world.

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7 Nursing Experience on Disaster and Health Emergencies

Sonoe Mashino, Sheila Bonito, Yudi Ariesta Chandra, Kaori Matsuo, Qin Hu, Ye Tao, Eni Nuraini Agustini, Sushila Paudel, and Sakiko Kanbara

7.1 Introduction

The first mention of disaster relief in the world dates to B.C. (Komnenich and Feller 1991). However, it was not until the Red Cross Society was founded in 1863 that organized disaster relief activities began in earnest. Initially focused on rescuing and assisting victims, the American Red Cross eventually became concerned with the stresses of disaster relief workers, which influenced their training (Mascelli 1988).

One of the first scholarly attempts at disaster relief was Florence Nightingale (Nightingale 1858). She established criteria for assessing care during the Crimean War and compared the mortality rate of wounded soldiers in the British army with that of civilian wounded. By using this data, she was able to improve the standard of living and the quality of medical services for wounded soldiers.

In Japan, based on the lessons learned from the Great Hanshin-Awaji Earthquake (1995), in the community, nurse volunteers look after temporary housing and provide support its residents for their daily life. Nurses continue to provide health counseling at a place where survivors gather in the community naturally because nurses care for their changing health even long after a disaster. There is also recognition of the need to consider the individual needs of disaster relief, such as the elderly, children, and people with chronic diseases, which had not been included in previous plans, and this led to a review of health care and disaster relief.

This chapter aims to communicate how disaster nursing has been developed in each country from the standpoint of nursing and community health care by incorporating the perspectives of building back better. Cases from China, Indonesia, Nepal, and the Philippines are presented, along with how nurses take their roles to respond to the situation and provide disaster health relief assistance. The cases were based on literature review and authors' experiences. The author of each case is a young nursing leader who practiced nursing care at the time of the disaster that drastically impacted the paradigm of disaster countermeasure between each country and global.

S. Mashino (✉) · Q. Hu · Y. Tao
University of Hyogo, Akashi, Japan
e-mail: sonoe_mashino@cnas.u-hyogo.ac.jp

S. Bonito
University of the Philippines Manila, Manila, Philippines

Y. A. Chandra · S. Paudel · S. Kanbara
University of Kochi, Kochi, Japan

K. Matsuo
Mukogawa Women's University, Nishinomiya, Japan

E. N. Agustini
Syarif Hidayatullah State Islamic University, Jakarta, Indonesia

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Each study provides an example of good practice undertaken by the community. The nursing emergency response had to be delivered, enabled by the cooperation of hospital and public health nurses. It describes that the expectation to nurse is changed in the health sector on disaster countermeasure aftermath and consider that security and well-being for revitalization, community engagement, and empowerment are essential as implications for disaster nursing toward overcoming issues.

7.2 Nursing at the Time of Disaster

A disaster is defined as "a serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic and environmental losses and impacts (World Health Organization 2020)." The health challenges posed by disasters are becoming more diverse, protracted, and complex. Identifying and avoiding contributing hazards, providing equitable assistance to vulnerable populations, and improving the capacity of healthcare providers are crucial to avoiding preventable deaths and damage to health.

Although nurses can provide "nursing care" without a physician's order, it is not always easy to distinguish between "care" and "cure" performed by nurses. For example, "observation of progress" can be the beginning of a nurse's work and is understood as care, but going beyond general observation and ascertaining findings according to the medical condition is of a nature similar to an auxiliary act of "diagnosis" by a doctor. While nursing care is multifaceted, academic exploration continues as it changes with the progress of medical care and the needs of society. In evacuation centers and communities during disasters, health risks are threatened in various ways due to rapid changes in the living environment and the lack of essential living resources. While most of the nurses who go to evacuation centers and communities are volunteers and often work independently in the absence of physicians, they also need specialized knowledge and skills as nurses to watch over the individuals and living environments that change daily.

Nurses are usually the only healthcare professionals who provide care in the community. In many cases, they are on the front lines of a disaster and may have important insights into the community's immediate needs but may not always be able to communicate this to the community, local government, or disaster response headquarters. The experiences and needs of nurses in the field who are called upon to provide immediate assistance during a disaster are not always well-documented preliminary reports, studies, etc. They respond to care needs without expressing their ideas in the field and often do not participate in administrative decision-making. For more efficient disaster response, to achieve these goals, medical information coming in and out of the affected areas also needs to be provided and wisdom shared on how relief can be reached in each room, along with knowledge of specific and unprecedented relief needs that arise.

In Japan, the Great Hanshin-Awaji Earthquake of 1995 and the sarin gas attack in the metropolitan subway system raised public awareness of natural and man-made disasters and led to a movement to accumulate and systematize the knowledge of disaster nursing. As for practice in the community, watchful waiting and psychosocial support in temporary housing by volunteers and health counseling in reconstructed housing by the Japan Nurses Association were continued as "community health center" projects. Consideration for the individual nature of "disaster relief," such as the elderly, children, and people with chronic diseases, which had not been included in previous plans, was recognized and led to a review of subsequent health management and post-disaster support. We have led the world to clarify disaster nursing research, emphasize practical reports, systematize disaster nursing, and train professional nurses and global leaders. Currently, the Japan Society of Disaster Nursing is promoting the development of "Gensai Nurse" who can be involved in the activities of local disaster prevention departments in regular times.

We are engaged in the research and development of interdisciplinary health care by residents that can flexibly respond to any disaster and contribute to the mutual support of the community.

Nurses have researched and practiced disaster nursing in broad ranges. They are invaluable in disaster response efforts. Some cases study in this chapter how nurses evolve disaster nursing each country after experiencing chaos.

7.2.1 Indian Ocean Tsunami, Indonesia

7.2.1.1 Impacts of Indian Ocean Tsunami in Indonesia

A massive 9.3-magnitude earthquake occurred in the Indian Ocean on December 26, 2004. An undersea earthquake followed by a devastating tsunami smashed the five countries nearby the Indian Ocean, Indonesia, Sri Lanka, India, and Thailand. An enormous number of injured people around 422,750 people and more than 227,000 people dead due to the 2004 Indian Ocean Tsunami (WHO 2005). Aceh, Indonesia, the hardest-hit area, suffered from tsunami, a total of 170,000 were killed and over 400,000 were displaced (WHO).

7.2.1.2 Nursing Roles in Indian Ocean Tsunami in Indonesia

In the aftermath of the tsunami, the health services in Aceh were collapsed. A total of 592 health facilities were damaged including the provincial hospital, and *Zainal Abidin* hospital was severely damaged. *Around 208 healthcare personnel had lost their lives, including 97 nurses/midwives, while other health personnel were injured.* The data of injured survivors was hard to collect after the tsunami because of the extensive number of victims and survivors, the local health sector had shattered, and services were not readily available. In response to the disaster, Indonesian nurses from all the areas in Indonesia were deployed to Aceh on behalf of the Indonesia National Nursing Association (INNA) along with other Emergency Medical Team (EMT). Around 100 nurses were sent to Aceh every week and made up a total of 1000 nurses who deployed to the affected area eventually (Garfield and Hamid 2006). Indonesia nurses' roles are to assist in the implementation of health rapid assessment and triage in the disaster area, involve in the rescue and evacuation of victims, assist in the evacuation of IDPs/refugees, and provide outpatient health services at the health post. Indonesia nurses and international aid agencies offered a wide range of direct care such as wound care for fractures and laceration. The majority of wounds had been severely infected with necrosis of the superficial tissue due to the lack of medical attention and the heavy contamination by seawater (Fan 2006). Another major case was aspiration/near drowning because many survivors were caught in the waves of the tsunami and were struck against underwater objects and debris. Nursing care is not always performed at hospitals or health posts, sometimes nurses have to do a home visit. Many local nurses admit that they do not have sufficient clinical skills when working with foreign health teams. This is because of the expertise of foreign emergency teams and unfamiliar with their work styles and equipment (Fan 2006). INNA was aware that Indonesian nurses lack skill and knowledge of disaster nursing. Then in 2005, INNA, the Ministry of Health, and WHO took action to improve the nurse's capacity in a disaster. The disaster nursing training curriculum and module were developed. There were several levels of disaster nursing training, from a basic level up to an advanced level.

On the other hand, there was a need to provide mental health care in the aftermath of a disaster. WHO reported that up to 50% of the tsunami-affected people in Aceh experienced significant psychological distress, and 5–10% developed diagnosable stress-related psychiatric disorders (WHO 2005). Unfortunately, the mental health facilities and resources were shattered. The Banda Aceh mental health hospital is the only mental health hospital in Aceh that was devastated due to the tsunami. In addition, the health personnel were reported dead or missing. The Indonesian mental health nurses together with other mental health professionals were deployed to the affected area. Their task is to support the

Fig. 7.1 Nurse at Indian Ocean Tsunami, Indonesia

Banda Aceh mental health hospital service and to identify and take care of the psychosocial problems. The team found there was no existing community mental health system; moreover, the number of mental health professional was limited, and only three psychiatrists were available. Therefore, to overcome the issue, WHO, Ministry of Health, and mental health professionals developed a new program, Community Mental Health Nursing Program (CMHN). CMHN trained PHN to be able to provide mental health care in primary care together with community volunteer members (Prasetiyawan et al. 2006). This program has successfully overcome the need for mental health care in the community. Due to the efficacy of the program to fill the lack of mental health professional resources, CMHN has been replicated in all provinces. The 2004 Indian Ocean tsunami has been a turning point for the health system including the nursing profession to reform disaster management. Prior to the tsunami event, Indonesia's government has no Disaster Management Act. Then 3 years after the catastrophic event, eventually the disaster management Law of 2007 was released. The Disaster Management Law of 2007 provides the foundation for disaster management and disaster risk reduction in Indonesia. The effect of the 2004 Indian Ocean Tsunami inspired many international agencies to renew the cluster approach, emergency responses procedures, and standards for emergency preparedness. The 2004 Indian Ocean Tsunami demonstrated that a catastrophic event can be a momentum to turn adversity into an advantage (Fig. 7.1).

7.2.2 Wenchuan Earthquakes, China

7.2.2.1 Impacts of Wenchuan Earthquakes

On May 12, 2008, a magnitude 8.0 earthquake struck Sichuan, China. This earthquake was called the Sichuan earthquake or Wenchuan earthquake. It was the most destructive earthquake in China since the founding of the People's Republic in 1949[1], and the number of deaths in this earthquake was 69,226 (Hui 2008). When the earthquake struck, approximately 15,000 nurses from China were deployed to disaster-affected areas to assist survivors (Conlon and Wiechula 2011).

7.2.2.2 Nursing Roles in the Wenchuan Earthquake

In the acute phase, nurses cooperated with other rescuers to work in the spots of disaster, tent camps for victims. Local hospitals conducted on-site rescue, mass casualty triage, trauma care, psychological support, emergency management, medical records maintenance, health surveillance of rescue responders, patient transportation, etc. (Liu et al. 2012; Zhang et al. 2011). In total, more than 91,177 injuries were treated, and 10,048 victims

were transferred to 20 provinces by airplanes, ambulances, and trains (Zhang et al. 2011).

Disaster nurses also served for prolonged periods. In post-disaster period, nurses worked with doctors in prefab house communities to provide medical care services including health records establishment, health education for patients with chronic diseases, vaccination for children, psychological support, referral the patients who need further medical help, and so on (Liu et al. 2009). Furthermore, nurses also cooperated with health professionals and volunteers to support special groups of victims, such as the families who lost their children and disabled victims. Because 4737 students were killed in the earthquake, many families lost their only child (Zhang et al. 2011). As part of the reproductive medical support teams, the nurses helped these families to have another child. Moreover, the earthquake caused over 7000 disabled (Yu 2009), and 70% of them had long-term rehabilitation supporting needs (Zhang et al. 2010). Therefore, nurses also assisted to provide rehabilitation care in communities.

After Wenchuan earthquake, Chinese disaster nursing has been vigorously inspired and developed. During the Disaster, many nurses near Wenchuan area are dispatched to the disaster site. It was found that although the nurses have emergency rescue knowledge and skills, they have not been systematically trained with disaster nursing-related knowledge and skills and lack real disaster rescue experience. In addition, other problems such as inadequate experience on patients with multiple diseases are still obvious. Since then, China has realized the importance of having disaster nursing education and training as soon as possible. In June 2008, Sichuan University and the Hong Kong Polytechnic University institute for disaster management and reconstruction support, and research center has been built, which aimed to cultivate disaster nursing master and doctoral students in China. There are 55 master students graduated after 2013 (Liu et al. 2016).

Additionally, it was also found that the medical institutions in disaster areas have a lack of awareness, preparation, and response ability on public health emergencies. A unique policy designated by other provinces in China to assist and rebuild Wenchuan disaster-stricken areas, which called pairing-assistance, has helped hospitals in Wenchuan to reconstruct first aid equipment, hospital emergency management, and personnel emergency training. After 5 years of the Wenchuan earthquake, all the 18 investigative hospitals in the areas have established disaster emergency management systems, more than 80% of hospitals have their own hospital rescue team and 60% of hospitals have carried out emergency education and drill for local citizens (Gu et al. 2015).

Disaster reconstruction is a long-lasting project. Based on the guidelines from SDGs and Sendai Framework for disaster risk reduction to build back better, a more systematic and comprehensive reconstruction plan can be established and help disaster victims recover eventually (Fig. 7.2).

7.2.3 Typhoon Haiyan, Philippines

The Philippines is visited by an average of 20 typhoons every year, 5 of which are usually strong enough to cause deaths and damages. On November 8, 2013, the Philippines experienced the worst typhoon in its recorded history. This was Typhoon Haiyan (locally known as Typhoon Yolanda)—one of the most powerful tropical cyclones ever recorded in the world.

Typhoon Haiyan was classified as a category 5 Super Typhoon when it entered the Philippine Area of Responsibility (PAR) midnight of November 6, 2013, with maximum sustained winds of 195 kph near the center and gustiness of 230 kph. This further intensified to 235 kph near the center with gustiness of 275 kph the day before its first landfall over Guiuan, Eastern Samar. It made five additional landfalls on the same day over Tolosa, Leyte, crossing north toward Daanbantayan in the northern tip of Cebu Province, Bantayan Island, in the late morning, Concepcion by noon, and then Busuanga, Northern Palawan, before it finally exited PAR in the afternoon of November 9, 2013 (NDRRMC 2013).

Fig. 7.2 Nurses at Wenchuan earthquake, China

7.2.3.1 A Impact of Typhoon Haiyan

Three days after the impact of the typhoon, 6300 individuals were reported dead, 28,688 injured, and 1062 missing from across all regions. Most deaths were due to drowning and trauma. Many were displaced with a total of 161,973 families (792,018 individuals) preemptively evacuated to 812 evacuation centers in 37 provinces, 38 cities, and 215 municipalities. These people were from geographical areas impacted by the tidal surge and/or damages resulting from extreme winds and those areas in the direct vicinity of the typhoon path in Central and Western Visayas (NDRRMC 2013).

There was huge damage to property and the environment. People suffered from loss of livelihoods with destroyed crops and supplies. Health facilities were badly damaged including lifelines like power and water supply. A total of 3,434,593 families (16,078,181 persons) were affected in 12,139 barangays in 44 provinces, 491 municipalities, and 57 cities in 9 regions in the country (NDRRMC 2013).

Health assessments done in affected areas showed various concerns: from nutritional needs, water, sanitation and hygiene (WASH), noncommunicable diseases, and mental health and psychosocial needs. Nutritional needs include breastfeeding promotion challenges, availability of healthy food for infants and young children, acute malnutrition and micronutrient deficiencies among the under 5-year-olds, and provision of regular healthy meals, especially in evacuation centers. WASH interventions include the provision of safe water, proper hygiene, adequate sanitation, proper waste management, and vector control in badly affected areas. Preexisting health conditions such as noncommunicable diseases also necessitated the provision of health consultation and access to treatment and medicines. Psychosocial distress, fear, changes in behavior manifested as sadness, crying, and other exaggerated emotions, and increased alcohol consumption were also observed in the affected population.

Due to the immensity of the destruction caused by Typhoon Haiyan, the World Health Organization (WHO) rated it as a Level-3 Emergency according to its Emergency Response Framework. The response was likewise massive, involving both national and international support. UN agencies and NGOs organized themselves following the Inter-Agency Standing Committee (IASC) cluster approach to complement the government's relief efforts (Evio and Bonito 2017).

The immediate emergency response focused on the provision of direct health care. The loss of healthcare facilities meant the discontinuance of healthcare services. Philippine and international medical teams from other regions provided primary, surgical, and specialized care to those most in need. Preposition of medicines, hygiene supplies, dignity kits, and trauma kits for quick deployment in the affected areas was prioritized. Healthcare response also targeted chronic dis-

eases, particularly high-risk diseases such as tuberculosis (TB) and HIV/AIDS and STI.

7.2.3.2 Nursing Role During Typhoon Haiyan

Nurses are at the forefront in the delivery of healthcare services; thus, they are counted upon to plan for and respond to emergencies (Bonito and Minami 2017) and to provide substantial care to individuals, families, and communities in all healthcare settings during and after the emergency or disaster (Evio and Bonito 2017).

The role of the Philippine Nurses Association (PNA) as the national nursing organization was crucial in preparing and mobilizing nurses for disaster response after Typhoon Haiyan. Prior to Typhoon Haiyan impact in the country, PNA through its Disaster Preparedness Committee has been strengthening its program, policies, and networks to be ready for any emergency or disaster. Since 2010, PNA conducted training and workshops on disaster management every year, including national training on emergency and disaster management. This national training involved nurses from local chapters across the country who serve as focal persons in times of emergency/disaster in their locality. The topics included in the training are (1) challenges and roles of nurses in emergency and disaster management, (2) basic emergency care, (3) mental health and psychosocial support (MHPSS), (4) community health interventions (water, sanitation, and hygiene or WASH), (5) communication and coordination in an emergency, and (6) emergency response planning. PNA also passed an organizational policy on the activation of the incident command system during emergencies, which clarifies the roles of the PNA national and local chapters in responding to emergencies and disasters. PNA also formalized its commitment to the Department of Health as a member of the UN cluster groups, namely, Health Cluster, WASH Cluster, and MHPSS Cluster, and sits in the planning meeting at the national level. These preparedness activities were important in mounting response efforts after Typhoon Haiyan struck the country.

Immediately after the typhoon struck, PNA checked about nurses and their communities in the affected areas through the use of social media and its system of reporting to the PNA national office. Through the situational reports received from the local chapters, priority actions were set by the PNA National Office, which include the provision of calamity funds to local chapters who were severely affected, and organization and mobilization of nurse volunteers to help in medical missions and relief operations. PNA local chapters near the worst affected areas were mobilized as local volunteers. The PNA National Office organized a nurse volunteer system to help deploy available competent nurses where they are needed in partnership with the Department of Health and Philippine Red Cross. Orientation programs were conducted to brief nurse volunteers on their work assignment, preparedness, and safety precautions and also to review the use of psychological first aid in dealing with survivors. The enthusiasm and optimism among the nurse volunteers were very encouraging which reflected the spirit of caring and humanitarian heart of Filipino nurses (Evio and Bonito 2014) (Fig. 7.3).

Humanitarian relief efforts continued as people moved toward recovery and rehabilitation. PNA nurses, within their respective local chapters, continued giving their full support. Some important lessons learned were:

1. Preparedness in terms of (a) training nurses in disaster management, (b) having clear policy and guidelines in emergency response, and (c) building networks with disaster management agencies is important in mounting coordinated response efforts.
2. An organized system of volunteer recruitment and local coordination facilitate volunteerism and effective disaster response.
3. Getting nurses ready to respond is part of the goal of saving lives, minimizing disabilities, and helping build resilience among individuals and communities during emergencies and disasters.

In all these, the role of Philippine Nurses Association as a national organization was crucial in coordinating and supporting the nurses in

Fig. 7.3 Nurses at Typhoon Haiyan, the Philippines

the local area in preparing and responding to emergencies and disasters.

7.2.4 Gorkha Earthquake, Nepal

7.2.4.1 Impacts of Gorkha Earthquake

Nepal, a South Asian country, is a landlocked Himalayan country located in between China and India. Classified as one of the global hotspots for natural disasters (The World Bank 2005), more than 80% of its population is exposed to the risk of multiple natural hazards which include earthquakes, droughts, floods, landslides, extreme temperature, and glacier lake outburst floods (GLOFs) (Ministry of Home Affairs 2017). The risk of natural hazards is due to its rugged and fragile geographical structure, high peaks, high slopes, complex geology, variable climatic conditions, flood-prone rivers, and active tectonic processes. Apart from such a diverse topography, increasing population, poverty, unplanned settlement, limited domestic economy, and low literacy rate have further intensified the disaster vulnerabilities (Ministry of Home Affairs 2017, 2018; CFE-DM 2020). This makes the country among the 20 most disaster-prone countries in the world (UNDRR 2019). Globally, it is ranked fourth, 11th, and 13th in terms of vulnerability to climate change, earthquake, and flood risks, respectively (Maplecroft 2010; Baruwal 2014). Between 1971 and 2013, over 32,000 people lost their lives to natural disasters in Nepal (Desinventar 2013). This was more than two lives lost every day (Nepal Risk Reduction Consortium 2013).

7.2.4.2 Nursing Roles in Gorkha Earthquake, Nepal

Nursing responses to emergencies in Nepal can be traced back to the 1890s, where nursing services and education began with the establishment of Bir Hospital. Nurses in hospitals and communities as critical healthcare providers have been responding to disasters, emergencies, and crises through a wide range of care like triage, trauma, life support, mental health, and infection control. However, the Nepal earthquake (Gorkha Earthquake 2015) became a turning point for the development of disaster nursing in Nepal, when a lack of systematic knowledge and skills on disaster nursing were realized. The Gorkha Earthquake of 7.6 magnitude struck Nepal on April 25, 2015, causing massive loss of life and property. Subsequent aftershocks, including one of magnitude 7.3 on May 12, resulted in additional casualties and property damage. Nearly 9000 were

killed and more than 22,000 were injured (Ministry of Home Affairs 2018; DPNet-Nepal 2016), and more than 1200 health facilities were either totally or partially damaged (National Planning Commission 2015). The devastation was extensive, having long-term consequences in terms of human casualties, social suffering, and environmental, infrastructural damages (Ministry of Home Affairs 2018). More than 36 national and 137 international medical teams from 36 countries responded to the government of Nepal's call for humanitarian assistance, and within 2 weeks, about 117,000 patients were treated in outpatient departments, 41,200 were admitted to hospitals, and 7124 surgical procedures were done (Goyet et al. 2018). Doctors and nurses worked tirelessly without breaks for days (Koirala and Basnet 2019).

The Nursing Association of Nepal (NAN) sent some nurse teams to the impacted regions to give medication and other relief. In shelters, prevention from communicable and infectious diseases related to water, sanitation, and hygiene were important priorities following the earthquake (WHO 2015). The primary concern for nurses was how to care for individuals in the open field, how to reach out to those who are actually in need, and how to obtain information to aid communities in recovery (Pohkrel et al. 2017). A research team from Japan and the Philippines approached NAN to assist in the information systems to perform rapid health assessments and acquire information to prevent outbreaks (Pohkrel et al. 2017). Critical attention was necessary for the hygiene control and sanitation in shelters to prevent outbreaks and to maintain at least a minimum level of health security. In collaboration, the researchers established a monitoring and surveillance system, named "EpiNurse" program short form of "epidemiology" and "nurse" (Kanbara et al. 2018). Local nurses were trained to perform monitoring of the living environment using the digital information and communication technology (ICT) toolkit. They performed periodic visits to 34 shelters initially in 10 affected districts for 4 months, performed risk assessment, identified relief needs, provided health care, and reported data to local authorities, governmental agencies, and health clusters (Pohkrel et al. 2017; Kanbara et al. 2018; Paudel 2017). Nurses learned a lot from their disaster experiences, and more importantly, they worked hard to put what they learned into practice. This contribution of nurses was also recognized by the Munich Re Foundation and its partners UNISDR and GRF Davos and announced as the winner of the 2017 RISK Award (RISK Award 2017—EpiNurse project in Nepal 2017), and the participatory approach was also included in 1 of 30 innovations linking disaster risk reduction with sustainable development goals (Izumi et al. 2020).

By 2019, around 200 nurses from different regions of Nepal including 20 school nurses were trained (Barthelt and Loster 2020). The system for dispatching nurses by NAN during disasters wasn't formally initiated (Chandra et al. 2020); however, volunteer nurses from central Kathmandu who wished to provide support at affected areas were deployed during Nepal Flood 2017, Flood 2018, and Tornado 2019. Because of these experiences, a disaster nursing responding team was established among the board members at the Nursing Association of Nepal in 2019. In 2020, the COVID-19 crisis became another wake-up call for better public health preparedness. Healthcare workers, including nurses at the forefront, put their lives on line, even working through the infection themselves.

Based on lessons learned from catastrophe, overtime, the concept of disaster nursing has evolved in Nepal. Even in the world, disaster nursing is still in the developing stage as one domain of nursing (Yamamoto 2013). Although the disaster nursing competencies among Nepalese nurses are inadequate (Basnet 2016), revision of existing nursing curriculum and incorporating a course of disaster, periodic drills, and training are efficient ways to build risk reduction knowledge, skills, and abilities.

The Government of Nepal has established several legislative and institutional mechanisms to plan and administer disaster risk reduction and management activities (Ministry of Home Affairs 2018). So the next step for nursing association is to create an academic society and build a disaster nursing network under cooperation between professional nursing organizations, the Ministry of

Fig. 7.4 Nurses at Gorkha earthquake, Nepal

Health, Asia–Pacific Emergency and Disaster Nursing Network (APEDNN), International Council of Nurses (ICN) Disaster Nursing Network, and the World Society of Disaster Nursing (WSDN). For this, limited human resources, financial resources, ethical issues, and security to nurses have remained the major challenges. Considering the increasing number of disasters, human resources development and capacity building for disaster nursing are high priority in Nepal (Fig. 7.4).

7.3 Way Forward

People living all over the world are at risk of health emergencies and disasters. The physical and mental healthcare needs of people have been rapidly increasing over the years, and on top of that, disasters make that healthcare needs more complex. It is due to the high healthcare demands and less available resources during disasters. At the time of disasters, nurses may become victims while being healthcare providers. It makes it more difficult for nurses to think about how to protect the health of the people when they themselves are the survivors. Thus disaster nursing is emerging care. Although nurses have been involved in critical care, the experience of disasters by both the nurses and individuals in the community has drawn more attention toward the risk reduction activities in daily life, not just during hospital emergencies. Healthcare models during emergencies need to shift from traditional critical care to more primary health care in the local setting. Thus, it is necessary to think together with the community from the normal times in the context of universal health coverage ensuring equitable access to health services contributing to the stability of the people's living and health security.

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8 The Sendai Framework and the Bangkok Principles for Nurses

Hanae Miura and Sakiko Kanbara

8.1 Introduction

Nursing practices during disasters consist of health risk reduction during normal times, developing an understanding of the situation immediately after the disaster, swift and proper deployment during rescue operations, and appropriate reconstruction. These are not concepts whose use is limited to disasters, and the basis of nursing during normal times is to take actions to contribute to improving the situation as much as possible within the time frame of the region that spans from immediate lifesaving until the region is part of the reconstruction. These practices have already contributed to many regional communities, in achieving the SDGs 3: Target 3.d: "Strengthen the capacity of all countries, especially developing countries, for early warning, risk reduction and management of national and global health risks." Research that focuses on how the global effects of these practices can contribute to disaster risk reduction (DRR) in other countries, and a wide variety of other fields is necessary. And it should be adopted for basic education to health professionals in each country as well as achieving the SDGs 3: Target 3.c: "Substantially increase health financing and the recruitment, development, training and retention of the health workforce in developing countries, especially in least developed countries and small island developing States."

The Sendai Framework for Disaster Risk Reduction (SFDRR) 2015–2030 is a 15-year guideline of action for DRR for the global society. It adopted the Sendai Declaration and is a successor of the Hyogo Framework for Actions (Ministry of Foreign Affair of Japan 2015). This framework defined DRR as "the concept and practice of reducing disaster risks through systematic efforts to analyze and manage the causal factors of disasters, including through reduced exposure to 11 hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events" (UNDRR 2015). In its preamble, improving preparedness and national coordination for disaster response, rehabilitation, and reconstruction and using post-disaster recovery and reconstruction to "Build Back Better" are supported by strengthened modalities of international cooperation. It was declared that there must be a broader and more people-centered preventive approach to disaster risk. "The substantial reduction of disaster risk and losses in lives, livelihoods, and health and the economic, physical, social, cultural and environmental assets of persons, businesses, com-

H. Miura (✉)
Japanese Red Cross College of Nursing Japan, Tokyo, Japan
e-mail: h-miura@redcross.ac.jp

S. Kanbara
University of Kochi, Kochi, Japan

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munities, and countries" is being brought up as a result anticipated for the next 15 years. In addition, reducing mortality rates, the number of affected people, economic loss, and damage to critical infrastructure and increasing the number of countries with national and local DRR strategies, international cooperation, and the availability of and access to multi-hazard early warning systems and disaster risk information have been specifically indicated as target values.At the end of 2016, the practical guidelines from the SFDRR were presented as "word into action." These actions are focused on the goals of the global agenda to promote a common understanding between stakeholders in other fields of disaster risk reduction, and they serve as a guide to accomplishing interdisciplinary and international research. The plan is that these actions will be assessed in 5 years. The health sector, which has become quite important, has also agreed, and studies to contribute have been requested. It is necessary for them to cooperate with actions through academic and international networks, both inside and outside the country, and it is essential to coordinate the actions that are happening all over the world.

8.2 Sustainable Development Goals 2015–2030 and the Sendai Framework for Disaster Risk Reduction 2015–2030

Between 2015 and 2030, a variety of other global initiatives will change, and in the next 5 years, initiatives will be decided on and started on a variety of levels. It is being looked at as an extremely important time for citizens around the globe. In addition, "Transforming our world: the 2030 Agenda for Sustainable Development" was adopted at the United Nations Sustainable Development Summit in September of 2015. These goals are the successor Millennium Development Goals (MDGs) (UN 2000), and they brought up Sustainable Development Goals (SDGs) that consist of 17 goals and 169 targets (UN 2015a, b). To "ensure healthy lives and promote well-being for all at all ages," which is related to health, and "make cities and human settlements inclusive, safe, resilient and sustainable," which is related to disaster risk reduction, it is important to move forward while comprehensively looking at multiple goals and not tackling each of them separately.

The Sendai Framework for Disaster Risk Reduction (SFDRR) 2015–2030 is a 15-year guideline of action for DRR for the global society. It adopted the Sendai Declaration and is a successor of the Hyogo Framework for Actions (Ministry of Foreign Affair of Japan 2015). This framework defined DRR as "the concept and practice of reducing disaster risks through systematic efforts to analyze and manage the causal factors of disasters, including through reduced exposure to 11 hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events" (UNDRR 2015). In its preamble, improving preparedness and national coordination for disaster response, rehabilitation, and reconstruction and using post-disaster recovery and reconstruction to "Build Back Better" are supported by strengthened modalities of international cooperation. It was declared that there must be a broader and more people-centered preventive approach to disaster risk. The outcomes of both the Sendai Framework for Disaster Reduction and the Sustainable Development Goals (SDGs) are recognized as products of interrelated social and economic processes. As a risk-informed sustainable development outcome, the Sendai Framework for Disaster Reduction indicators have also been shown to complement the monitoring of 11 indicators within SDGs 1, 11, and 13 (UNDRR 2019).

8.3 Target of Disaster Risk Reduction for Sustainable Community

The SFDRR not only explains the current critical situations, but it also sets the aim of "a sustainable community for the future that is being aspired to." At the end of 2016, the practical guidelines from the SFDRR were presented as "word into action."

These actions are focused on the goals of the global agenda to promote a common understanding between stakeholders in other fields of disaster risk reduction, and they serve as a guide to accomplishing interdisciplinary and international research. "The substantial reduction of disaster risk and losses in lives, livelihoods, and health and the economic, physical, social, cultural and environmental assets of persons, businesses, communities, and countries" is being brought up as a result anticipated for the next 15 years. In addition, reducing mortality rates, the number of affected people, economic loss, and damage to critical infrastructure and increasing the number of countries with national and local DRR strategies, international cooperation, and the availability of and access to multi-hazard early warning systems and disaster risk information have been specifically indicated as target values. It sets targets intended for reaching each of the goals, and they will be assessed along with indicators in the related fields. Many of the methodologies and theoretical foundations for combining a variety of fields into one area are primarily based on the natural sciences. Not all factors for this critical situation have been scientifically specified. The indicators that will be used must stand for both analytically and with regard to policy. Such a community's peace of mind is also dependent on subjective awareness. These indicators should focus on humans and take a more comprehensive and lateral view of relationships and transcend national borders. It is necessary for them to cooperate with actions through academic and international networks, both inside and outside the country, and it is essential to coordinate the actions that are happening all over the world. The health sector, which has become quite important, has also agreed, and studies to contribute have been requested.

8.4 Disaster Risk Reduction in Health Sector

Health professionals used the Bangkok Principle and Health Emergency and Disaster Management (Health ERDM) to optimize the implementation of the SFDRR 2015–2030. In 2016, the United Nations Office for Disaster Risk Reduction (UNDRR) released the Bangkok Principles for the implementation of the health aspects of the Sendai Framework for Disaster Risk Reduction 2015–2030 (UNDRR 2015). The Bangkok Principles elaborated seven measures to prevent and reduce the risk of health emergencies, including (1) promote systematic integration of health into policies and plans and inclusion programs in health strategies; (2) enhance cooperation between health authorities and other relevant stakeholders; (3) stimulate people-centered public and private investment; (4) integrate DRR into health education and training and strengthen capacity building of health workers in DRR; (5) incorporate disaster-related mortality, morbidity, and disability data into a multi-hazard early warning system, health core indicators, and national risk assessment; (6) advocate for and support cross-sectoral and transboundary collaboration for information sharing, science, and technology; and (7) promote coherence and further development policies and strategies, legal frameworks, regulations, and institutional arrangements. On the other hand, the World Health Organization (WHO) established Health Emergency and Disaster Risk Management (Health EDRM) (WHO 2019a, b). It highlighted the essentials of prevention, preparedness, responses, and recovery to save lives and protect health. It sets guiding principles for DRR in health sectors, such as a risk-based approach, comprehensive emergency management, all-hazard approach, multi-sector and multidisciplinary collaboration, whole-health system-based, and ethical considerations.

Notwithstanding, regardless of the health sectors, existing studies, or guidelines, including these two frameworks, still could not describe specifically the nursing field in supporting DRR. Kanbara et al. (2010) indicated that the importance of issues related to DRR and supporting people in need have become very distinct according to a Delphi survey authored by disaster nursing specialists (Kanbara et al. 2010). Showing the effects of preventive measures after a disaster struck was remarkably difficult. Many

studies of disaster nursing from the last 10 years focused on nursing awareness behaviors, case studies of activities, or educational development. There was nearly no increase in studies focusing on disaster risk indicators or outcome indicators in the nursing field. We should provide a more contextual tactics with much more target of SDGs for nursing specialists to enhance their contribution within the global agendas (Fig. 8.1).

As a foundation of the SDGs 2015–2030 from the nursing perspective, nursing professionals continue to exist in local regions, and they are part of the intellectual class that is the most interested in health and having a safe and secure human society. In June of 2015, the International Council of Nurses (ICN) held an international conference, and in the keynote speech given by Margaret Chan, director general of the WHO, she likened groups of nurses around the world to the "silent giant (WHO 2018)." She stated that it was not an exaggeration to say that success of the post MDGs and achievement of the future global agenda will be influenced by how active nursing professionals are in global and local communities (Kanbara et al. 2017). She emphasized the importance of the nursing profession in handling future health crises. In addition, Kanbara et al. (2017) emphasized that, in the era of the SDGs, nurses can evaluate issues that threaten human security, which are not directly linked to hazards or diseases (Kanbara et al. 2017).

Nursing specialists should also focus on health security issues in the community. The Cabinet Office of Japan (2015) indicated that strengthening the capacities of the community to reduce disaster risk toward expected disasters is crucial (Japan Cabinet Office 2015). Saito and Kunimitsu (2011) stated that preparedness for a future public health emergency must address all types of natural hazards and other accidental disasters (Saito and Kunimitsu 2011). Nakasa et al. (2017) stated that nurses can play a vital role in the restoration of public health services and assessment of the high-risk and vulnerable population and encouraged nurses to be involved in shelter management and outreach programs for shelter evacuees. Furthermore, Kanbara et al. (2017) stated that Japanese public health nurses have made a tremendous contribution to enhance a healthy, safe, and sustainable society (Kanbara et al. 2017). It is crucial for public health nurses to identify high risk and vulnerability in the population. They should also examine issues with related target and indicators that threaten human security and take initiatives for community health.

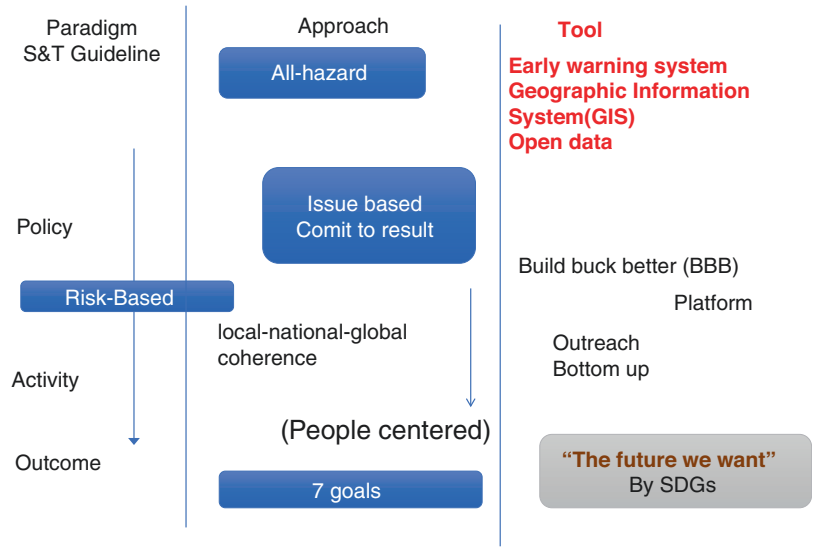

Fig. 8.1 Key concept of the Sendai framework from the perspective of healthcare provider

8.5 Disaster Nursing Initiative

The Japan Society of Disaster Nursing (JSDN) has defined disaster nursing as "the systematic and flexible utilization of knowledge and skills specific to disaster-related nursing, and the promotion of a wide range of activities to minimize the health hazards and life-threatening damage caused by disasters, in collaboration with other specialized nursing fields" (Japan Society of Disaster Nursing 1998). It seems like this Japanese definition used disaster risk to mean both "emergencies" and "hazards." Considering that disaster risk is used in the context of protecting human lives and health as an "impact caused by the disasters to human lives and economic aspects," it is a notion that combines a vast number of things. Thus, it is essential to redefine DRR and identify more subdivided concepts to present the indicators gleaned from the lessons learned in Japan to a global audience.

8.5.1 Nursing Commitment for Implementation of the Sendai Framework

This following commitment, by incorporating disaster nursing research and practices in Japan, attempted to decipher the SFDRR 2015–2030 so that nurses can understand how to contribute to disaster risk reduction globally beyond discipline. This paper is based on the report of the Working Group of Contribution of JSDN for the SFDRR 2015–2030 that consisted of disaster nursing experts from Japan.

Adopting the Bangkok Principles, we developed 7 points as commitment from the nursing society to the SFDRR 2015–2030. These 7 points elaborated more actual actions as guidelines for nurses to contribute to strengthen the Sendai Framework. These initiatives are listed as commitments on the UNDRR website (UNDRR 2020). Each of the points will be described, also showing the relationship with the goals and targets of the SDGs.

1. ***Promote systematic integration of health into policies and plans and inclusion programs in health strategies*:** Establishment of a position as experts in disaster nursing or build a collaboration system as an advisor in an accord. At federal and local government levels, nurses who are well informed on people's health and lifestyles collaborate with related occupations and local disaster prevention organizations and routinely attend meetings. They continuously evaluate how health aspects are incorporated into processes such as surveys, frameworks, plans, and evaluation and propose necessary plans.
2. ***Enhance cooperation between health authorities and other relevant stakeholders*:** At each government level, a platform is required to invite those involved with health risk management to routinely discuss the conditions and challenges with new emergencies (health emergency), including disasters and infectious diseases. At these discussions, nurses who are familiar with local issues propose cooperation among stakeholders from the viewpoint of lifestyle and health.
3. ***Stimulate people-centered public and private investment*:** Cooperating with other fields and presenting evidence of investing in human-centered health activities, nursing science researchers use human science methods to examine possible problems and realistic responses based on case studies and local risk assessments. They promote investment especially by visualizing the importance of prevention and process.
4. ***Integrate DRR into health education and training and strengthen capacity building of health workers in DRR*:** Enhance the nurturing of disaster nursing specialists, training highly skilled people within graduate programs, etc., who can gain a comprehensive view of multidisciplinary issues during disasters with limited information and resources while cooperating with various occupations and exerting leadership. As nurses start to play an important role in companies, government institutions, and international organiza-

tions, collaborative and cross-sectional training with various disaster-related departments is promoted. Not only practice and educational research specialized for disasters, but within various nursing specialties, content related to disasters is spread and evolved.

5. ***Incorporate disaster-related mortality, morbidity, and disability data into multi-hazards early warning system, health core indicators, and national risk assessment*:** Identify those for whom to care during disasters from the viewpoint of health risk management and develop a disaster risk management index. To this end, create a disaster nursing risk database with ICN, Japanese Nursing Association, and Association of Nursing Academics. Develop tools for collaborative research and database in academic fields. By sharing data, disaster support can be provided with priorities given to those who need support based on social resources that are available during disasters.
6. ***Advocate for and support cross-sectoral and transboundary collaboration for information sharing, science, and technology*:** Promote studies and disseminate information regarding big data, social networking service, location information, Twitter, and translation functions that are rapidly progressing in recent years and can be used in health and life. By routinely using such information, a regional alert and continuous monitoring system can be developed. To this end, we must nurture nurses with international academic education who are able to collaborate with technologists and private communication companies.
7. ***Promote coherence and further development policies and strategies, legal frameworks, regulations, and institutional arrangements*:** Based on academic aspects, confirm that there is a consistent policy at each government level for not only acute phase care immediately after a disaster but also for mid-term to long-term health risks, along with necessary systems and regulations. Propose enhancement of skills to realize such policies. Not only have skills to respond to disasters but also propose disaster reduction policies by enhancing health and lifestyles of people during ordinary times.

8.5.2 Critical Challenges and Suggestions

The SFDRR was adopted, advocating the importance of people-centered and health-centered DRR. The following year, in 2016, experts in the health field led the compilation of the "Bangkok Principles for Implementing the Health Aspects of the Sendai Framework" (UNDRR 2016a, b). The discussion included integration of DRR initiatives into health/medical policies, development of disaster-resilient health/medical systems, investment in health/medical infrastructure, capacity building, organization and use of health data, and promotion of science and technology. Kanbara et al. (2017) stated that an evaluation is necessary to improve the contribution of nursing through various activities in the community, because they have enormous capacities to make transformative changes in health for disaster risk reduction. So far, nurses have already taken action to improve the situation as much as possible during disasters. In the practice of disaster nursing, from lifesaving, reconstruction, disaster prevention, and all the phases of the disaster cycle, appropriate nursing care should be done for each period in accordance with the situation. Further consideration should answer questions, such as where the initiatives like those activities should be situated, what parts of them contribute, and what is lacking. Immediately after a disaster, it is important to do exhaustive studies and investigate the situation. These questions should all be investigated, and the answers connected to future actions.

Living environment and the primary health care in the community should be reviewed and assessed in advance during normal times to guarantee health safety from a nursing perspective. To achieve "SDG11 Make cities and human settlements inclusive, safe, resilient and sustainable," it is vital to discuss "SDG3.9 Strengthen the capacity of all countries, in par-

ticular developing countries, for early warning, risk reduction and management of national and global health risks," "SDG1.4 By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters," as well as "SDG5.5 Ensure women's full and effective participation and equal opportunities for leadership at all levels of decision-making in political, economic and public life." It can be a basic concept of nursing for disaster risk reduction in a community. In Japan, local communities are expected to address the unique challenges of each region proactively and autonomously, from disaster response to community resilience (Japan Cabinet Office 2018). Resilience is recognized in the social sciences and public policy as a process, rather than an outcome of disaster risk reduction itself (Norris et al. 2008), the ability of community members to take joint and purposeful action to collectively cope with extreme situations during normal times. Disaster nursing, starting with pre-disaster preparedness, relates to the lives of people deprived of a secure living space, along with a variety of social resources, over the long term. In conducting research related to nursing care support and preventive risk reduction practices, life reconstruction, and disaster-related deaths, we have found that the limitations of external support and diverse disaster mitigation care activities based on community resilience have contributed to this. As a means of community resilience, attention has been paid to the ability of communities and systems to cope with emergencies, and the carrying capacity of local people to grow from them (Cohen et al. 2013). Community resilience itself does not depend on capacity building within the community, but on primary health care, health promotion, and community engagement, which have been advocated by the WHO and practiced in the community. There is a need for effective and coherent strategies for DRR and health promotion that increase the resilience of vulnerable communities.

Disasters are becoming even greater in magnitude, and the amount of information has increased due to the progress of information technology to the point where it does not even compare to a decade ago. There is a gap in research and practice with respect to institutional change in the healthcare sector, including how to modify the patterns of knowledge, practices, and values in comprehensive health care. It is considered important and urgent business based on the point the scientific world and scientific research organizations will need to cooperate with policy-makers to coordinate scenario analysis and risk factors, and it is not only considered important by governments but also by other stakeholders like private businesses, civil societies, and the mass media. Effective communication requires close collaboration among health professionals, practitioners, and scientists, especially about future risks of diseases. Risk communication efforts during short-term extreme weather events or catastrophes appear to be more effective in motivating adaptive change than health risks or climate change, for example, regarding the emergence and spread of pathogens, rather than health promotion. The prompt utilization of inexpensive monitoring data to respond to the health crisis being faced is a very urgent matter with SDGs 9.c Significantly increase access to information and communications technology and strive to provide universal and affordable access to the Internet in least developed countries by 2020.

Since the beginning of 2020, the global society has been facing a pandemic of coronavirus disease 2019 (COVID-19). So far, 188 countries confirmed COVID-19 cases with more than 360,000 global mortalities (WHO 2020a, b). COVID-19 has transformed rapidly from health issues to the economic, social, and geopolitical crisis after being declared as a pandemic in March 2020 (Djalante et al. 2000; Shaw et al. 2020; WHO 2020a, b). In health sectors, this pandemic is not only causing sickness and loss of lives but extends to disruption of the health system, and it threatens to loosen decades of progress against the other health issues. All disciplines, professions, stakeholders, and even nations are working together to overcome these unprecedented challenges.

It is also recommended that these considerations be included in plans related to a variety of health care from the start. This is because in addition to the disaster risks within a single country or region, creating a plan or cooperative system for each health risk including outbreaks is very difficult regardless of how robust that place is (WHO 2019a, b). The variation of expertise, body of knowledge, and competency of each health discipline determine a health professional to view a health risk or hazard. For instance, during this COVID-19 pandemic, some health professionals use the perspective of the disaster cycle to respond to the pandemic, while others seem more focused on infection control (Djalante et al. 2000; WHO 2020a, b).

An example of an initiative related to the health sector and disasters is the World Health Organization (WHO)'s endorsement of the strategy for regions and countries all over the world based on the concept of "all-hazard/whole-health" approaches (WHO 2019a, b). This strategy states that regardless of the type of hazards, healthcare needs should be focused on all hazards, including natural, societal, technological until biological hazards (WHO 2013); and there should be a plan to handle challenges, an early warning, cooperation between departments, an evacuation, and a model for community and health service recovery within the healthcare system. It is desirable to have a plan for whole health that subsequently coordinates the emergency measures with other areas.

8.6 Conclusion: Nursing Response to Resilience in Trust

In 2017, an urban resilience score table was developed for local governments to monitor progress and challenges in implementing the SFDRR 2015–2030 (UNDRR 2017), and items such as disaster medical statistics were added in 2019 for public health integration. At the same time, the WHO has developed a comprehensive framework for disaster and health risk management, the Health EDRM framework. It advocates strengthening risk reduction by focusing on vulnerability and capacity, making preparedness a system-wide responsibility rather than a departmental one, prioritizing risk management over post-disaster response, and seeking the participation of local communities. Rather than simply evaluating the cost-effectiveness of the SDGs, each stakeholder is expected to demonstrate its commitment and practical guidelines, and various actors are expected to collaborate to improve the power of the local people and create solutions. In order to implement these concepts in society, it is necessary to understand the vulnerability, public health needs, and policies of local communities from the perspective of various health crises and DRR, and it is also necessary to fully understand and use the existing population-centered public health activities, such as universal health coverage and comprehensive primary health care. Local nurses are ideal advocates for group action related to DRR and health and can play a role in public education and awareness through the timely mutual exchange of information, advice, and opinions among professionals, community leaders, officials, and those most at risk. More innovative, interdisciplinary, human-centered, and participatory research can foster critical trust, change people's perceptions of risk and risk-reducing behaviors, and inform prevention. With regard to these things, analyzing the parameters related to nursing and disseminating the results and information from this analysis are urgent tasks. It also needs to be adapted to each community.

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9 History of the Development of Competencies for Disaster Nursing

Sakiko Kanbara and Aiko Yamamoto

9.1 The Importance of a Global Perspective in the Aftermath of Disasters

The set period of the SDGs, 15 years until 2030, is significant for global citizens in that specific solutions will be determined and interdisciplinary efforts will be made (UN 2015). Specifically, Goal 3 of the SDGs aims to "ensure healthy lives and promote well-being for all people at all ages" (UN 2015). The comprehensive nursing approach differs from the standard medical model, targeting specific diseases. People who have survived a disaster experience high stress levels trying to rebuild their lives and livelihoods. There are many different cultures and many ways of living within them. When a disaster strikes, the initial focus is on urgently saving lives. Still, health promotion and maintenance in the medium to long term after the disaster is also essential. The recovery process from a catastrophe ensures survival, livelihood, and dignity and should be addressed by the entire society and the affected people. Nursing takes a broad approach to healthcare services and naturally reflects the ideas discussed above and should be integrated into "Target 3.d Strengthen the capacity or early warning, risk reduction and management of national and global health risks" and its indicators. Nurses already contribute to reducing everyday health risks and improving health through a human-centered approach.

Nursing is a profession that can take a transformative approach to building healthy communities by connecting people and healthcare systems (Murphy 2005). Nursing professions such as public health nurses, midwives, and nurses are often directly involved in health responses at these stages. They need to play an essential role in a wide range of disaster health systems and care, including medical response and coordination and take a long-term perspective. In addition, due to environmental and social contexts such as climate change and poverty, unimaginable natural and human disasters are expected to increase, and a local-based global perspective is needed to solve these problems. To mitigate human-caused disasters, interdisciplinary collaboration with scientific and technological fields is essential. Industry-academia-government partnership is required to raise awareness of disaster preparedness, from the national level to local governments and the private sector. The diversity of the nursing profession advocates ICN disaster nursing competencies. They include risk reduction, disease prevention, policy development and planning, education and preparedness, and care for vulnerable populations

S. Kanbara (✉)
University of Kochi, Kochi, Japan

A. Yamamoto
Shitennoji University, Habikino, Japan

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and special needs, with other stakeholders understanding their roles.

9.2 The Development of Disaster Nursing Competency in Japan

9.2.1 Historical Background

In the Great Hanshin-Awaji Earthquake, many people lost their jobs and had to leave their familiar areas and move to temporary housing in unfamiliar places by lottery. In the 3 years since 1997, when people moved from temporary housing to permanent housing, the Hyogo Nursing Association has conducted 174,392 home visits. Many people whose illnesses and symptoms had worsened after interruption of treatment or suffered from physical and mental symptoms due to stress are caused by drastic changes in their environment, anxiety about the future, and loss of will to live. Some of them showed signs of dementia, were at risk of suicide, or had become alcoholics (Committee to examine Nursing Education 2004).

According to the results of a longitudinal survey conducted by Ii et al. (2001), 3–4 years after the Great Hanshin-Awaji Earthquake on residents' health problems after they moved into permanent housing, more than 60% of the residents answered that they were subjectively healthy. Still, they were suffering from some kind of disorder, and many of them had high blood pressure, heart disease, and diabetes. In addition, even if they had the opportunity to go out, it was limited to "shopping" or "hospital appointments. Many of the residents tended to stay indoors. In addition, a survey of residents in disaster recovery housing conducted 9 years after the disaster cited social isolation of the elderly and disabled as an issue (Chikada 2004). These factors made nurses realize the vital need to develop long-term care activities immediately after the disaster.

On the other hand, disasters also frequently occur globally, and all nurses professions need to take care of the survivors during disasters. Nurses were dispatched long term for health maintenance/promotion, including support for the Sumatra-Andaman earthquake and tsunami, refugee assistance, and HIV/AIDS work. This type of nurse accounted for the most significant percentage of the medical staff dispatched. It was required to engage in a wide range of activities, from lifesaving in the immediate aftermath of the disaster to health and lifestyle guidance during the recovery period.

For example, from April 2004 to March 2006, the Japanese Red Cross Society sent 229 staff members to international relief operations. In 2004, when the Sumatra earthquake and tsunami struck, 108 staff members were dispatched overseas, including 76 to Indonesia and 6 to Sri Lanka; in 2005, 121 staff members were sent to provide medium-term support for the Sumatra earthquake and tsunami and emergency relief for the Pakistan earthquake. Looking at the dispatched staff by job category, 93 (40.6%) were nurses, followed by 68 (29.7%) administrative staff, 44 (19.2%) doctors, and 24 (19.2%) other skilled personnel.

Disaster nursing is essential for nurses and midwives to learn and understand, however, in many country, little education on disaster nursing in nursing basic education. For example, in many countries in Japan, 60% of the educational programs that provide primary nursing education did not have any subject on disaster nursing. Despite the growing interest in disaster nursing education, little is being done to teach disaster nursing in Japan. Looking at the international situation, several nursing universities offer courses in emergency disaster management in their master's programs, and the WHO also has education and training programs on disasters. However, education and training in this field were not widely available. There was also a severe shortage of faculty members and researchers in disaster nursing (Graduate School of Nursing, University of Hyogo, 2006).

According to a survey by Mashino and others (2006), the number of faculty members who can teach disaster nursing is limited. Fifty-eight schools (12.7%) have full-time faculty teaching disaster nursing, and 20 courses (4.4%) have

part-time instructors. However, nearly 80% of the 354 courses did not have faculty teach disaster nursing faculty number of researchers are also in the field of adult findings indicate that to establish disaster nursing as primary nursing education, obstacles such as the curriculum structure, schedule, and lack of faculty need to be overcome, and education methods need to be devised.

9.2.2 Developmental Steps of Disaster Nursing Competencies for New Undergraduate Graduates in Japan

Disaster nursing began with a focus on health and the essentials humans must secure to survive. As part of the Center of Excellence (COE) program titled the development of the center of excellence for disaster nursing in a ubiquitous society funded by the Japanese government, the University of Hyogo was implementing a project. This project established core competencies in disaster nursing for new undergraduate graduates (University of Hyogo 2006).

Three frameworks were utilized to develop core competencies for disaster nursing. One is the framework for core competencies developed by the International Council of Nurses titled ICN Framework of Competencies for the Generalist Nurse (Alexander et al. 2003). The second is the "Educational Competencies for Registered Nurses Responding to Mass Casualty Incidents" developed by the INCMCE (International Nursing Coalition for Mass Casualty Education). The last framework is "achieving practical nursing ability: attainment objectives for university graduation" developed by the committee on nursing education in the Japanese Ministry of Education, Culture, Sports, and Technology. Each framework has its characteristics (University of Hyogo 2005).

Based on world movements and health services, the International Council of Nurses has stipulated the standard competencies needed in knowledge, skills, and judgment to respond effectively to the situation. These have been devised with the generalist nurse and are essential competencies for nurses in any field. The competencies designated for the generalist nurse are divided into three categories of (1) professional, ethical, and legal practice; (2) care provision and management; and (3) professional development.

INCMCE (Stanley et al. 2003), which focuses mainly on CBRNE(chemical, biological, radiological, nuclear, and explosive agents), proposes the three areas of Core Competencies, Core Knowledge, and Professional Role Development necessary for nurses working on the front line of a large-scale disaster. The Core Competencies area is subdivided into the four sections of (1) Critical Thinking, (2) Assessment, (3) Technical Skills, and (4) Communications. The Core Knowledge area consists of 5 sections: (1) Health Promotion, Risk Reduction, and Disease Prevention, (2) Health Care Systems and Policy, (3) Illness and Disease Management, (4) Information and Health Care Technologies, and (5) Human Diversity. Attainment objectives to be achieved by university graduation are specified. These are mainly focused on man-made disasters, immediate post-disaster emergency care, and activities in medical and healthcare institutions.

In Japan, the committee formed to discuss nursing education developed the report entitled, "Achieving practical nursing ability: attainment objectives for university graduation." The five areas specified in this report were (1) practical competencies related to basic human care, (2) nursing competencies for planning and developing care, (3) practical competencies to treat people with specific health issues, (4) competencies for maintaining the care environment and team system, and (5) basic competencies of work-based action research (Table 9.1).

9.2.3 Content of Basic Competencies

Knowledge, skills, and judgment are integrated to form basic competencies, where the ICN defines competency. Basic competencies have

Table 9.1 Three frameworks of competencies for disaster nursing

Source	Competency				
Achieving practical nursing ability: attainment objectives for university graduation	Group I Practical competencies related to basic human care	Group II Nursing competencies for planning and developing care	Group III Practical competencies to treat people with specific health issues	Group IV Competencies for maintaining the care environment and team system	Group V Basic competencies of work-based action research
INCMCE (USA)	Core competencies 1. Critical thinking. 2. Assessment. 3. Technical skills. 4. Communications. 5. Human diversity.		Core knowledge 1. Health promotion, risk reduction, and disease prevention 2. Healthcare systems and policy 3. Illness and disease management 4. Information and healthcare technologies		Professional role development
ICN	Professional, ethical, and legal practice		Care provision and management		Professional development

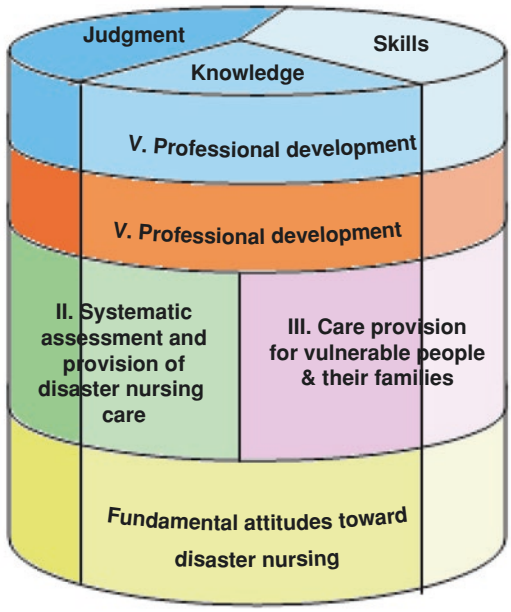

Fig. 9.1 Conceptual model of basic disaster nursing, by Yamamoto et al., University of Hyogo (2006)

been broadly divided into five domains and structured in the way shown in Fig. 9.1. The five domains are each split into between two and seven categories. These are then further divided into detailed subcategories.

The five domains are each split into between two and seven categories. These are then further divided into detailed subcategories.

The first domain is "fundamental attitudes toward disaster nursing." It is the basis for all further development of disaster nursing, and it comprises the following five categories.

9.2.4 Expansion of Academic and Educational Activities

The Japan Society of Disaster Nursing was established in 1998 to promote the systematization of knowledge and practice of disaster nursing to contribute to people's lives and health through the development of disaster nursing, to raise awareness of disasters, to increase the number of people involved in disaster nursing and build a global network, to systematize disaster nursing based on the experience, and to build a system to understand the various nursing needs of the affected areas. In addition, the Japan Society Association of Disaster Nursing was established in 2010 to share the lessons and wisdom gained from the experiences of global disasters such as the Sumatra earthquake and tsunami. Prof. Hiroko Minami, President of the Japan Society of Disaster Nursing, stated that the significant developments in the past 10 years include (1) definition of disaster nursing, (2) methods of disaster nursing support in the disaster cycle,(3) increase in terms related to disaster nursing,(4) increased involvement of nurses in disaster

response, (5) positioning in nursing education, (6) establishment of disaster nursing networks, (7) increased international exchange, and (8) promotion of disaster nursing research (JSDN). The report of COE proposes the future direction of disaster nursing.

In the aftermath of the Great East Japan Earthquake in 2011, various issues became apparent. Future leaders were expected to respond to and resolve crises and demonstrate leadership skills in a global and interdisciplinary environment for sustainable development. Graduate education needed to be reformed not to train nurses in the current healthcare system but to develop global leaders who can design and innovate care from human safety. It was necessary to train leaders who could contribute to global health issues. Kochi Prefectural University, University of Hyogo, Tokyo Medical and Dental University, Chiba University, and the Japanese Red Cross College of Nursing combined their resources and expertise to launch a graduate program in disaster nursing. The program's goal was to produce global leaders in disaster nursing who will contribute to improving the health of society based on the principle of ensuring human security.

9.3 ICN Disaster Nursing Competencies for Global Health

The ICN and WHO have developed disaster nursing competencies for general nurses based on the University of Hyogo work mentioned above. The disaster nursing competencies for available nurses were developed in 2009 (WHO and ICN 2009).

Nursing competencies are the knowledge, skills, abilities, and behaviors needed to perform a job. Core competencies are familiar to workers in multiple occupations and in specific geographic areas, to which further discipline-specific and specialized competencies are added.

The Disaster Nursing Competencies were first developed in the United States of America (USA) by the International Collation for Mass Casualty Education (INCMCE) at Vanderbilt University to promote leadership and awareness of the role of nurses in mass casualty incidents, the USA for the first time. It was developed through a two-step research process from a Japanese program. The University of Hyogo Graduate School of Nursing conducted a study to identify the core competencies of undergraduate students studying disaster nursing (Yamamoto 2006a, b). Core competencies were considered the result of integrating relevant knowledge, skills, and judgment.

Since the first publication of the competitions, the practical disaster, an emergency response literature, has expanded exponentially. The competencies are being used in continuing education and curriculum development worldwide. Hutton et al.'s (2016) review describes the psychosocial factors that help nurses care for themselves and their colleagues. These may include self-care and support for mutual care of others at all stages of deployment, the need for reflection during preparation, stress management at all stages of deployment, personal protection during deployment, and mental health after deployment. It is also recommended that future research explore how ICN competencies can help improve disaster survivorship.

Ideally, the ICN nursing competency framework can be adapted internationally to be culture-specific for various locations by modifying the content as needed. In-country interpretation of the framework and review of the competencies is essential to ensure relevance to global and local disaster risk reduction. The role of nurses in healthcare institutions, communities, and societies has continually evolved in response to changing circumstances and needs. Much of the nursing care provided to individuals and communities today is driven not only by needs and traditions but also by environmental changes in society. In addition, many healthcare organizations have developed their competencies for different professions to meet the needs of other countries. In 2019, 10 years after the ICN competencies were developed and updated to 2.0, the ICN has divided the nurses who need competencies in disaster nursing into three levels according to their level of complexity.

9.4 New Challenge of Disaster Nursing on DRR and SDGs

On May 26, 2016, WHO Member States established a new Health Emergencies Programme. It was created to provide comprehensive support and additional operational capacity for health responses to all hazards that cause health emergencies, such as disease outbreaks in disasters and conflicts (WHO 2016). Subsequently, the "Bangkok Principles" strongly emphasized coordination to reduce risks from hazards, including biological ones. They call for a multi-sectoral, interoperable approach to promote systematic cooperation and integration.

WHO is also currently promoting a strategy based on the concept of "health emergency and disaster risk management" in all regions and countries (WHO 2019) for governments to take action, lead, and work with communities to coordinate global cooperation for effective relief and recovery.

As referred on Chap. 8, the Japan Society Disaster Nursing declared voluntary commitment (UNDRR 2017). Bangkok Principles stated (1) integrate disaster risk reduction into health education and training and strengthen capacity building of health workers in disaster risk reduction. We recommend "Enhance nurturing disaster nursing specialists, training highly skilled people within graduate programs, etc., who can comprehensively understand multidisciplinary issues during disasters with limited information and resources while cooperating with various occupations and exerting leaderships," considering how to manage the capacity of care as decent work of nurses (SDG8), unpaid care, and domestic works (SDG5). As nurses play an important role in companies, government institutions, and international organizations, collaborative and cross-sectional training with various disaster-related departments is promoted. Not only is practice and educational research specialized for disasters, but contents related to disasters are spread and evolved within various nursing specialties.

Furthermore, the Delphi study in Japan revealed that the higher priorities of disaster nursing research are:

1. Status quo and future issues for disaster nursing training as part of basic nursing education
2. Health management in evacuation shelters for vulnerable people who are highly dependent on medical care
3. Improvement of nurses' knowledge, skills, and awareness concerning disaster nursing
4. State of evacuation awareness and behaviors among seniors

Ultimately, there would need coherence between disaster risk management and health risk management. The principles share the need for risk assessment, monitoring, early warning systems, resilient infrastructure, and coordinated incident management. Transformation by demand-based innovation is necessary as the interrelated and transnational nature of disaster risks increases (Fig. 9.2).

On the latest global agenda and social changes and concerns of nurses Margaret Chan, director general of WHO, in her keynote address at the International Council of Nurses (ICN) conference in Seoul (June 2015), reminded us that although the nursing profession is sometimes referred to as a "sleeping giant," she emphasized that nurses are fully capable of transforming the way the health services sector is organized and the way health care is delivered to local and global communities. He called on nurses worldwide to act and "sprint" the starting line toward the set goals. Such a role was also expected when the primary healthcare (PHC) goal "health for all by the year 2000" was set (WHO 1981). The concept of PHC, based on equity and social justice, was used in health policies and essential health services worldwide. In 1985, Dr. Halfdan Mahler, director general of WHO, stressed the importance of the role of nurses in PHC. He urged the nursing profession to commit itself to achieve "health for all through PHC". Today, many global initia-

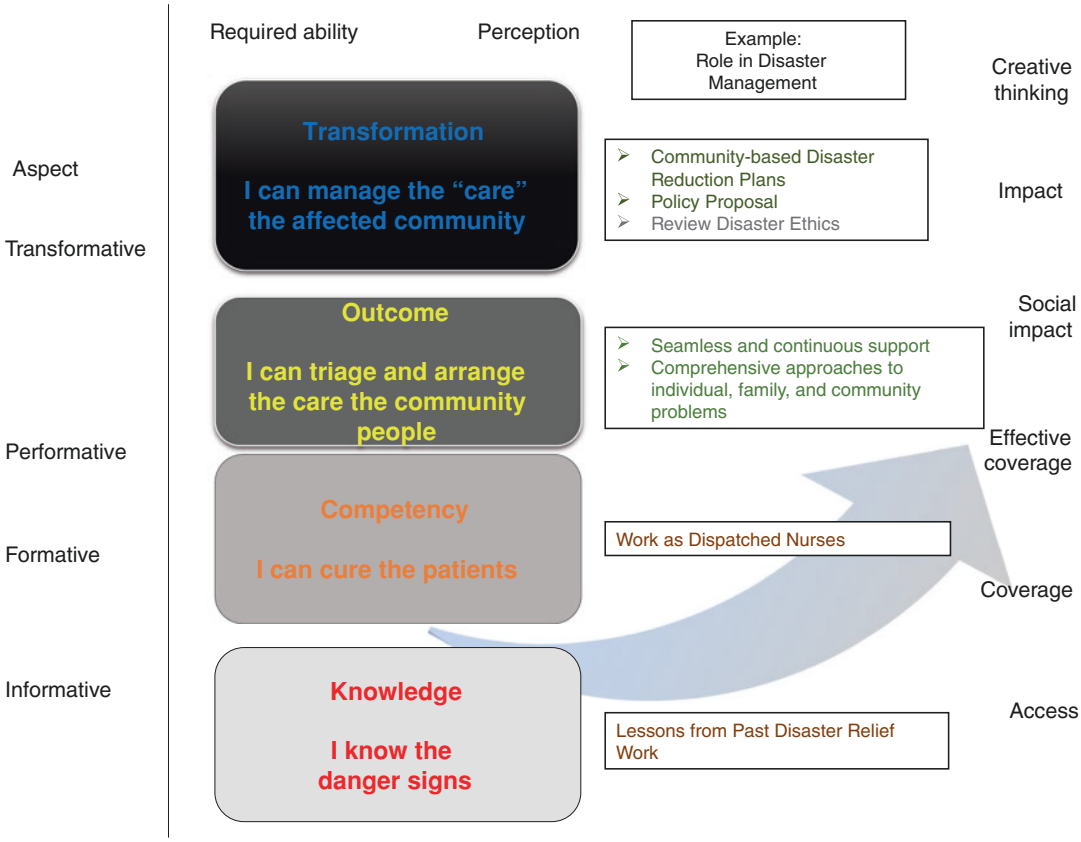

Fig. 9.2 Transformation of disaster nursing competency

tives are being introduced and activated for the Sustainable Development Goals (SDGs); the SDGs include potential solutions to complex social, global, and environmental problems (UN 2015). Competencies would be required to communicate and establish standards of care, develop ethical/responsible practices, and plan the association's organizational structure.

9.5 Appendix

Content of basic competencies developed by COE, University of Hyogo (2006)

The first domain is "Fundamental attitudes toward disaster nursing." This is the basic for all further development of disaster nursing, and it comprises the following five categories.

9.5.1 Fundamental Attitudes Toward Disaster Nursing

1. Ethical practice: Respect for human dignity and human rights.
   (a) Understand individual and different values and beliefs regarding life and death during disasters.
   (b) Protect human dignity and rights during disasters.
   (c) Understand what pertains to collection and protection of personal information.
2. Professional responsibility and accountability during disaster (awareness of responsibilities as a profession)
   (a) Protect life, health, and basic standards of living of self and family.

(b) Be aware of one's own scope of responsibilities, and act with judgment expected of professionals.
(c) Be aware of one's own knowledge/skills and level of authority during disasters, and act according to personal limits.
(d) Understand the roles of people involved in relief activities during disasters, and act in coordination with them.

3. Legal practice: Understanding and following laws and regulations
   (a) Understand international and domestic laws (laws, statutes, ordinances, etc.) regarding disasters.
   (b) Act in cooperation with disaster-relief-related organizations.
4. Building supportive human relationships with understanding toward disaster survivors' diversity and individuality
   (a) Understand the diverse backgrounds of disaster survivors.
   (b) Create human relationships to support disaster survivors.
   (c) Continue support that meets the changing needs of disaster survivors.
5. Supporting disaster survivors' decision-making
   (a) Grasp information necessary to support decision-making of disaster survivors.
   (b) Support disaster survivors so they can act based on decisions they make.

The second domain is "systematic assessment and provision of disaster nursing care." This involves the competencies necessary to systematically develop nursing care appropriate to each stage of the disaster cycle and consists of the following seven categories.

9.5.2 Systematic Assessment and Provision of Disaster Nursing Care

1. Basic knowledge about disasters and assessment of disaster situations
   (a) Have basic knowledge regarding disasters.
   (b) Be able to give the definition of disaster nursing.
   (c) Be able to collect necessary information during disasters and to assess care needs.
2. Providing nursing care for initial relief
   (a) Be able to identify information needed by individual disaster survivors and know how to acquire such information.
   (b) Understand the roles of organizations and act as a member of such organizations.
   (c) Have knowledge regarding emergency care to be administered immediately after disasters, and use basic nursing skills.
   (d) Understand the role of nursing in shelters after disasters, and know how to survivors.
   (e) Interact with disaster survivors with understanding regarding psychological impacts suffered from disasters.
   (f) Understand how to take care of bodies of the deceased during disasters.
3. Providing nursing care in the mid- and long-term phases
   (a) Understand the conditions of mental and physical health, daily living and living environments of disaster survivors in the mid- and long-term phases of disasters.
   (b) Understand care needs at shelters, temporary housing, and permanent housing.
   (c) Understand care activities required for those with high care needs during disasters.
   (d) Understand what is involved in the maintenance of health in the mid- and long-term phases of disasters.
   (e) Have knowledge of care activities to help with drastic changes in living environments after disasters.
4. Knowledge and practice for disaster preparedness
   (a) Understand disaster prevention measures of the prefecture.
   (b) Understand the system and preparations of universities in case of disasters.
   (c) Be personally prepared for disasters.
5. Providing mental health care in times of disaster

(a) Interact with disaster survivors with understanding toward psychological impacts suffered from disasters.
(b) Provide mental health care according to the mental and physical health and living conditions of disaster survivors.
(c) Recognize the importance and necessity of identifying those in need of support at an early stage and referring them to specialized organizations.

6. Providing care for bereaved families
   (a) Interact with bereaved families.
7. Maintaining care providers' own health
   (a) Secure one's own safety and establish living conditions.
   (b) Depending on the circumstances after disasters, take necessary measures to prevent secondary infection to oneself.
   (c) Be aware of one's abilities and work with knowledge of personal limits (take breaks as needed, etc., since it is common for people to overextend themselves during disasters).
   (d) Understand the importance of maintaining mental health of supporters themselves, and manage stress appropriately.

The third domain is "Care provision for vulnerable people and their families in a disaster." This deals with the practical competencies for helping vulnerable people, or those who are likely to suffer most in a disaster, and is divided into the following 6 categories of people.

9.5.3 Care Provision for Vulnerable People and Their Families in a Disaster

1. Care for pregnant women, child-rearing mothers, and their families during disasters
   (a) Understand the mental and physical responses to disasters of pregnant women and postpartum mothers, and provide support.
   (b) Gain a grasp of the current circumstance of disasters, and make adjustments to try to provide a good living environment for pregnant women and postpartum mothers.
   (c) Provide support after disasters regarding daily lives and health for pregnant women, postpartum mothers, and newborns.
   (d) Understand the support needed for families of pregnant women and postpartum mothers who have become disaster survivors.
2. Care for children and their families during disasters.
   (a) Gain a grasp of the impacts of disasters on children with consideration to the mental and physical characteristics of children, and provide support.
   (b) Adjust the surrounding environment so that children can return to their normal lives as much as possible, even during disasters.
   (c) Understand the necessity of coordinating resources and environments that support playing and learning for children.
   (d) Provide support for families of children who have become disaster survivors.
3. Care for chronic disease patients and their families during disasters
   (a) Understand health problems arising from disasters for people with chronic diseases, the impacts on their daily lives, and the support they need.
   (b) Understand medical management and support for medical visits after disasters.
   (c) Understand support for utilization of resources regarding convalescent periods after disasters.
   (d) Understand support needed for families of people with chronic diseases who have become disaster survivors.
4. Care for mentally and/or physically disabled persons and their families during disasters.
   (a) Understand health problems arising from disasters for people with mental and/or physical disabilities, the impacts on their daily lives, and the support they need.
   (b) Understand medical management and support for medical visits after disasters.

(c) Understand support for utilization of resources regarding convalescent periods after disasters.
(d) Understand support needed for families of people with mental and/or physical disabilities who have become disaster survivors.

5. Care for elderly persons and their families during disasters.
   (a) Prevent health problems and support healthy lifestyles of elderly persons with consideration to the mental and physical characteristics of the elderly.
   (b) Support elderly persons in need of support and/or nursing.
   (c) Support the families of elderly persons.
6. Care for persons with mental illnesses and their families during disasters.
   (a) Understand the impacts related to illnesses and health disorders caused by disasters and the necessary support.
   (b) Understand the needs for medical management and support for medical visits after disasters.
   (c) Understand support needed for families of people with mental illnesses who have become disaster survivors.
   (d) Understand support for utilization of resources regarding convalescent periods after disasters.

The fourth domain is "Care management in disaster situations." These are the competencies for maintaining systems to provide care in a disaster, and they fall under the following seven categories.

9.5.4 Care Management in Disaster Situations

1. Understanding the local emergency management system, and the roles and functions of health services/medical services/nursing in the system
   (a) Understand the structure and mechanisms of organizations.
   (b) Understand the positions and roles of nursing staffs within organizations.
2. Sharing information appropriately during disasters
   (a) Recognize and distinguish important information during disasters.
   (b) Understand and utilize existing information sources and information sharing methods during disasters.
   (c) Understand the information network system in place.
3. Grasping local medical/health service needs during disasters
   (a) Aggregate information regarding medical and healthcare needs arising in disaster-stricken areas.
   (b) Aggregate information regarding support provided from outside as well as within the disaster-stricken areas.
4. Coordinating health/medical support activities in and outside disaster-stricken areas
   (a) Allocate medical/nursing support from outside as well as within the disaster-stricken areas to meet the needs of each area.
   (b) Provide information regarding provision of support to support teams from outside.
5. Building a system for supporting disaster survivors' daily life
   (a) Create teams of specialists to support disaster survivors.
   (b) Build systems consisting of personnel involved with welfare, administration, NGOs, etc. for information sharing and exchanges transcending borders.
   (c) Support establishment of autonomous organizations of residents of disaster-stricken areas.
   (d) Create a system to support those in need of nursing/support.
   (e) Prepare a care system that meets the needs of disaster survivors, such as conducting health consultations and making individual visits, to maintain and control the health of disaster survivors.
6. Understanding and performing one's role within the institutions' emergency command system

(a) Understand the disaster prevention plan and systems employed during disasters and the chain of command of the facility/organization of affiliation, and recognize one's own role during disasters.
(b) Make necessary reports, communicate and keep records in coordination with disaster headquarters and other divisions.
(c) Switch the mode of system and actions from normal to emergency.
(d) Recognize the limits of care teams, and ask for help when needed.

7. Assessing care management during disaster
   (a) Understand the necessity of assessing care management during disasters.

The fifth domain is "Professional Development." This domain includes to develop one's own abilities and contribute to knowledge accumulation of disaster nursing.

9.5.5 Professional Development

1. Reporting nursing practice in times of disaster and developing knowledge related to disaster nursing
   (a) Summarize experience and actual nursing practice during disasters and make a report (share with others).
   (b) Clarify issues to be addressed in nursing based on firsthand experience and nursing practices during disasters.
   (c) Make actions to challenge issues, and resolve problems recognized through nursing practices during disasters.
2. Acquiring knowledge and continuously developing one's own abilities
   (a) Recognize one's own weaknesses that need to be addressed, and continue making efforts to acquire new knowledge and skills to prepare for future disasters.
   (b) Understand the importance of practice drills to prepare for disasters, and actively participate.

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10 Capacity Development and the Instructional Design for Achievement Goal

Miyuki Horiuchi and Takujiro Ito

10.1 Introduction

The purpose of this chapter is to explore the potential answers to these questions. Nurses who are involved in disaster nursing usually feel great concern about their preparedness for the role. For example, they often think, 'I don't know what I should be learning to improve my disaster nursing on climate change' or 'I don't know how to assess how much progress I've made in learning the knowledge and skills I need. In future aspect'.

Instructional design (ID) provides a systematic approach for the development of educational programmes to ensure that they are effective, efficient, and motivational. ID theory has been described as the know-how for the effective implementation of training through a series of prescribed processes. Specifically, these entail confirming the objectives of the educational or training programme, laying out what needs to be accomplished for the programme to be considered an 'effective programme', and selecting, implementing and evaluating the most effective and motivational methods possible given the characteristics of the learners, the educational/training environments and the resources available. After the learners return to their organizations, the effectiveness of the programme is evaluated, including assessment of trainee's behavioural change, in order to improve the training methodology.

This chapter includes how to educate adult readers who acquire the knowledge and skills needed to promote sustainable development including sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and nonviolence, global citizenship and appreciation of cultural diversity (SDG4.7). In contrast to pedagogy, children's education, adult education is known as andragogy, which refers to self-directed learning (SDL), an educational process systematized by the American adult learning theorist Malcolm Knowles. According to Knowles, 'self-directed learning describes a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes' (Knowles 1975, p 18).

As shown in Table 10.1, Knowles assumed that andragogy differs significantly from pedagogy in five ways, that is, from the standpoints of self-concept, learner experience, readiness to learn, orientation to learning, and motivation to

M. Horiuchi (✉)
Faculty of Health Sciences, Naragakuen University, 1-15-1 Naka-Tomigaoka, Nara, Japan
e-mail: m_horiuchi@nara-su.ac.jp

T. Ito
ICNET Ltd., Saitama, Japan

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Table 10.1 The characteristics of andragogy (as currently practiced in adult education)

As a person matures, his/her self-concept moves from that of a dependent personality towards that of a self-directed human being
As a person matures, he/she accumulates a growing reservoir of experience that becomes an increasing resource for learning
An adult's readiness to learn becomes oriented increasingly to the developmental tasks of his/her social roles
An adult's orientation towards learning shifts from one of subject-centredness to one of problem-centredness
An adult's motivation to learn comes to depend more on internal factors, such as self-esteem and self-actualization

learn. It is assumed that adults do not make good progress in learning when the goals are determined by someone else and that, in adult education, the learner needs to believe in the necessity or value of the learning activity. In addition, it is assumed that learners have prior knowledge and experience that they will utilise as they proceed to fill in gaps in their learning (SDG 4.a). Supporting rather than hindering the application of that knowledge and experience makes adult education more effective, efficient, and motivating. Particularly for practitioners working in rural areas or clinical settings, adult education differs from school learning because it requires both SDL and self-regulated learning (SRL). To understand why self-regulation is important in adult learning, one needs look no further than John B. Carroll's model of school learning (Carroll 1963). Carroll considered that the reason for differences in grades was not children's individual characteristics (e.g. innate ability and IQ) but rather that they did not spend the time needed to get good grades. If they spent only 1 h on an assignment that should take them 2 h, their success rate would be 50%, but if they had studied for 2 h, it would have been 100%.

However, learners' abilities are diverse. Nursing education also depends on social context, local health system and their basic education in each country. There are many factors that affect learning time, such as adaptability to new tasks, comprehension and quality of learning resources (e.g. class quality) especially thinking local capacity even when initiating to global learning to SDG 4.b and 4.c. This also applies to adult learning. If the learners could spend the necessary time on learning something, they could increase their learning rate despite various constraints. But that'll require self-regulation. After designing their own unique learning programmes, based on objectives the learners set for themselves, the key to success is how well they control their behaviour (including self-motivation) as there will be no instructor to ensure the plan is followed.

As the name suggests, ID theory explains how to design instructional programmes. However, knowing how to develop a good training plan provides insight into how to devise a good learning plan, and one of the aims of this chapter is to assist learners with their learning plans to improve their learning efficiency.

10.2 ID-Based Learning Design

10.2.1 The Instructional Objective-Assessment-Strategy Triad: Mager's Three Questions

One of the most important principles of ID is that instructional objectives, assessments and strategies should be aligned. In the 1960s, Robert Mager (1961), a pioneer in ID, pointed out the importance of clearly laying out where they are going, how they will know when they have arrived and how they are going to get there. In other words, learners need to be able to answer the following questions. (1) What is my learning objective? (2) What is my learning assessment? (3) What is my learning strategy? Without clearly defining the learning objective, learners will not be able to show how to assess success or what their strategy is for achieving that success. It is essential that 1 and 2 are aligned; once the learner has determined the answers to those questions, they can decide on a learning strategy through task analysis or selection of learning materials. Only the learner can decide the strategies to use to bridge the gap between the current level of learning and the

objective. Although this process is derived from ID, it is essentially SDL, the adult learning model described by Knowles.

A *learning objective* is achieved as a result of learning activities. An example of a good learning objective is 'to acquire the ability to advise residents in an evacuation centre on how to stay healthy'. However, the following are not good examples of a learning objective: 'debating issues related to implementing psychological first aid (PFA)'; or 'learn the precautions to be observed when performing triage'. The reason is that the results of learning are not observable. Then, what kind of assessment would be 'aligned' with a learning objective? A *learning assessment* is nothing more than a verification of 'whether as a result of your learning activities, you are able to perform the functions defining the objective'. Once the learning objective and assessment method are clearly defined, next the learner needs to determine how to learn to perform the learning objective. The learner will need to perform a *hierarchical analysis* to identify essential components or learning tasks. For example, to learn the component of being able to give advice, the learning strategy would be to practice giving advice. However, in this case, the information a person would need to learn in order to give advice would vary in depth and breadth depending on how much of a gap there is between their individual prior knowledge and experience and the objective. As a result, the time and energy needed for learning differ by individual.

10.2.2 Gagné's Taxonomy of Learning

In ID, a recommended way to sequence tasks is by ease of learning. Robert Gagné, who is considered the father of ID, theorised that instructional strategies and assessments would differ for each learning task. For each instructional objective, Gagné classified component learning tasks and their outcomes into five major categories (Table 10.2), focusing on how they qualitatively differed rather than on their comparative ease of learning (Gagné and Briggs 1974).

Motor skills are a category of learning outcomes that are easy to understand by imagining testing a 'practical skill'. Performance is measured, for example, for accuracy, speed and

Table 10.2 Gagné's taxonomy of learning

Learning outcome	Nature of achievement	Sample of action verb	Evaluation of achievement
Intellectual skill	Ability to apply rules to new examples Procedural knowledge Include (1) discrimination, (2) concrete concept, (3) rule using and (4) problem-solving	Plan Design Formulate Generate Create	Apply to new examples rather than reproduce the rule itself. Give questions from all types of tasks, to confirm the range over which the rule can be applied
Cognitive strategy	Is an internal process by which the learner controls his/her own ways of thinking and learning	Apply Construct Illustrate Explain	Apply the process of learning rather than the result. Observe the process of learning or use self-description report
Verbal information	Memorize specified items Declarative knowledge Reproductive knowledge	List Describe Name	Recognize or reproduce the information that is presented in advance. Test all the items or randomly extract
Attitude	Mindset to choose/avoid a certain thing or situation	Select Adopt Contribute	Prepare the scene to observe action or expression of intention to act. Deal with personal choice behaviour, not in general terms
Motor skills	Ability to move/control muscles activity	Execute Operate Manipulate	Perform the task: The knowledge of how to do something and the ability to carry it out are different. Utilize lists and check precision, speed and smoothness

smoothness. *Attitude* can be a challenging outcome category to describe, because many kinds of learning experiences can affect a person's attitude towards learning. In general, the instructor checks whether the learner engages in learning activities spontaneously or avoids them. Change in attitude is usually assessed using a self-reported questionnaire or other instrument to rate the extent of the learner's interest or to have the learner write about how they feel about trying to do the learning activities. *Verbal information* refers to the outcomes of learners tasked with committing specific information to memory. Written tests are used to assess a learner's ability to recall and use that information. *Cognitive strategy* refers to 'learning how to learn', for which performance assessment occurs via self-monitoring and self-assessment reports.

Intellectual skills refer to learning the skills of applying knowledge in both familiar and unfamiliar cases. Assessment can be conducted using either written or verbal testing. However, learners are not always candid in their responses, so these assessments need to be viewed with a critical eye. Monitoring of students would be best, but that would need to take place in many different situations, which would be so time-consuming that, frequently, a self-reported questionnaire is used as a substitute.

Regarding *learning strategies*, an exercise is included at the end of this chapter for practice. Because ID emphasises the importance of trying things out over learning theory alone, I suggest that readers pick a learning task corresponding to each of the categories in Table 10.2 and consider potential learning strategies. For example, the classroom is usually considered not the best place for learning a new *motor skill*, but what kinds of strategies would be useful for learning *verbal information*? Although attending one of the many training programmes in disaster nursing recently available presents an opportunity to encounter new knowledge, a *verbal information* learning assessment consists of testing whether the learner remembers that information, not whether he or she was exposed to it. If the targeted learning outcome is verbal information alone, more effective strategies for committing information to memory might be self-learning via reading books or using an eLearning application or some other technology-based product rather than attending a training course. From an ID perspective, people developing training programmes should review the alignment of their learning strategies and outcomes to ensure that programmes consist only of learning tasks that need to be performed in a group. In addition, rather than attending a training programme simply because it is on offer, learners should confirm that the programme's objectives align with their own learning tasks and that the objectives and design of the programme are effective and efficient in ID terms. This enables time to be used more meaningfully, leading to an effective, efficient, and motivating learning experience. Thus, it is important that learners do not consider 'attendance' as meaningful in and of itself but rather consider whether attending the programme is a learning strategy that aligns with their learning tasks.

Figure 10.1 shows an example of a crisis management training programme that I ran for hospital managers. All attendees used the same textbook. Before the start of the programme, they were instructed to commit to memory *verbal information*, such as the definitions of terminology used in the text, starting with what, exactly, was meant by 'disaster', 'disaster nursing' and 'CSCATTT' (Command and Control, Safety, Communication, Assessment, Triage, Treatment and Transport). The intention of this assignment was for these practitioners to commit to engage in self-regulated learning and to align the group around the same starting point. In addition, before starting the programme's main topic, I asked them to meet in small groups to confirm what they had learned on their own (this could have been done via a written or verbal test). Doing so allowed us to spend more time discussing the main topic, which was assessing 'hospital disaster prevention/mitigation plans'. To encourage everyone to evoke previous experiences and learning, trainees' questions were shared with the entire class so that they could hear others' opinions.

Objectives to be achieved

At end of training, trainees will be able to:
1. Explain the roles of nursing staff and managers in their organization's disaster management plan
2. Identify the tasks in their organization's disaster management plan
3. Propose a suggestion for disaster management in his/her own organization
4. Acquire confidence of management in case of disaster response

Learning Tasks

1. Confirm understanding of the content in the text (Disaster Nursing Fundamentals, pp. 175-187) that was relevant to hospital disaster prevention/mitigation
2. Confirm the disaster nursing competencies required of nurses working in medical facilities (from the literature)
3. Preparation: (Group work) Think about the developmental support that nurses in training would need to be able to contribute to disaster management planning
4. Preparation: Think about what a disaster management plan in a hospital would need to entail.
5. Disaster response: Simulate the role a manager would play

Learning Strategy

Lectures & group work (In this case, there were 6 groups of 3-4 people)
Q & A format based on each person's prior knowledge and training
Sharing of current status using a software application (smartphone/tablet)
Task explanations and management plan: Facts from task assessment based on previous literature and studying management plans.

Training schedule

Time	Minutes	Activity
9:30 - 9:35	5	Welcoming remarks, Self-introduction
9:35 - 9:40	5	Explanation of the training schedule
9:40 - 10:00	20	Sharing in small groups regarding the preparatory assignment
10:30 - 10:50	20	Q & A for questions that came up that the group was unable to resolve
10:50 - 11:00	10	Break
11:00 - 11:20	20	Sharing of competency status
11:20 - 11:50	30	Discussing support for competency acquisition for staff

Fig. 10.1 Training programme sample in which learning tasks and strategies were aligned
Note for the marked activity: Other ways to confirm their understanding would be to have trainees do oral reports in their groups or have them take a quiz

10.2.3 Merrill's First Principles of Instruction-Five Fundamental Principles Underlying All ID Theories

In his *First Principles of Instruction*, Merrill (2002) presented a useful real-world model for the phases of effective instruction based on five principles common to all ID theories. They are as follows.

1. Learning is promoted when learners are engaged in solving real-world problems.
2. Learning is promoted when existing knowledge is activated as a foundation for new knowledge.
3. Learning is promoted when new knowledge is demonstrated to the learner.
4. Learning is promoted when new knowledge is applied by the learner.
5. Learning is promoted when new knowledge is integrated into the learner's world.

In the 'problem' phase, by tossing learners a problem to solve that is likely to occur in the real world, knowing that what they are learning will help them solve a problem in plain sight psychologically creates in the learner an active learning posture. Moreover, learners can clearly explain their engagement in learning. In the 'activation' phase, the learners' attention is focused on the fact that their present level of learning is insufficient and additional learning is needed, but that mobilizing (activating) relevant knowledge gained from past experience promotes the learning of the new knowledge. In the 'demonstration (show me)' phase of instruction, it is more important to demonstrate to learners than to tell them what is to be learned. Therefore, in order to observe a concrete example of what needs to be learned, it may be effective for learners to, for example, search the internet for relevant images. In the 'application (let me)' phase, the learners should create their own opportunities to use the new knowledge and skills learned. This is easy to understand by considering how training in nursing adeptly uses case studies. For example, to use knowledge regarding primary triage, it should be performed on simulated patients under conditions that have been provided.

10.3 ID-Based Learning Approaches for Experienced Practitioners Interested in Disaster Nursing Practice

As explained in Chap. 6, education to transition into disaster nursing has largely been based on studies of the curriculum for basic nursing. In other words, the learning objectives have been designed for nursing students. There are several potential approaches for training and education programmes for experienced practitioners. Here, I introduce the reader to just two, which I think are useful starting points: competency-based learning (CBL) and problem-based learning (PBL). In addition, I introduce the reader to the well-known attention, relevance, confidence and satisfaction (ARCS) model of ID to support ongoing learning.

10.3.1 Competency-Based Learning (CBL)

CBL is an approach that uses a standard set of competencies required to perform a specific job to design programmes to teach the knowledge, attitudes and skills specifically related to those competencies. For disaster nursing, those competencies have been compiled by the International Council of Nurses (ICN), with the cooperation of disaster prevention officials from many countries, in the *Core Competencies in Disaster Nursing, Version 2* (ICN 2019). Thus, by using CBL, it is possible to design a training programme by focusing on all or specific parts of this compilation. Competencies describe the attitudes and behaviours of outstanding performers as examples of individuals who have mastered them. As a result, individual learners can use each of these competencies as a learning objective and target the acquisition of the knowledge and skills they lack in order to master that com-

petency. Learners who use the compilation as a checklist can also use it to assess their mastery of each of the required competencies. These competencies are made up of multiple elements; thus, by breaking down a competency (see the learning task analysis that follows) into several levels of behaviours, learning objectives can be shown by level.

10.3.2 Problem-Based Learning (PBL)

PBL is an approach used to set training and learning objectives in order to resolve a specific issue. For example, assume a scenario in which care for aid workers' mental health is being neglected; furthermore, it has become clear that the underlying problem is that across the entire organization, staff lack adequate awareness of the necessity for mental healthcare support for aid workers and how that support can be provided in practice. A potential training strategy for the organization would be to implement a PFA training plan. In that case, the training objective might be for all participating staff to be able to deliver PFA. However, the issue to be resolved is that aid workers themselves are unable to receive adequate mental health care. While learners' objectives may be to be able to provide aid workers with adequate mental health care, the learners are not going to have the same levels of knowledge, skills, or experience as each other. Person A may need to start by learning the PFA guidelines (verbal information), while Person B is already adequately familiar with PFA and needs to learn by using that knowledge, perhaps, by performing simulations of responses to cases on paper (intellectual skills). Person C may have no problem thinking of responses to cases in paper-based exercises and be ready for a learning strategy involving practicing by role-playing scenarios with real people (motor skills). Thus, for learners to achieve their objective of being able to provide aid workers with adequate mental health care, they need to determine the specific learning objectives that would bridge the gap between their ultimate objective and their current skill level.

Another learning model that focuses on issues and their resolution is elaboration theory, a macro design theory proposed by Reigeluth and Stein (Reigeluth and Stein 1983). It is referred to as the 'zoom lens model' because it first looks at the whole problem and then iteratively takes a look at ever more elaborate parts, always returning to their relationship with the whole. The learner looks at the whole issue, then at one part and, after confirming its relationship with the whole, 'zooms in' to learn the details. Once that learning is more or less completed, the learner 'zooms out' to take a broader view again to confirm how the part relates to the whole. Then, looking at how the next part relates to the whole, the learner 'zooms in' again, and so on. Each part is learned iteratively with respect to its relationship with the whole. In doing so, it is not necessary to learn the details of each part completely. The minimal amount of learning is fine. Ultimately, knowledge and skills are enhanced as progress is made easy with the learner feeling a sense of accomplishment through the sequential iterative understanding of the relationship of the detailed levels of an issue with the whole. Reigeluth and Stein pointed out that, to make this zoom lens learning strategy feasible, the design of the learning approach needs to accommodate multiple learning objectives.

10.3.3 Increasing Learner Interest Through Motivational Design

One of the important elements of instructional design is how to make training more interesting and engaging. Although there are many motivational theories, among others, in nursing, we tend to be familiar with Maslow's hierarchy of needs (Maslow 1943), which defines a process through which human motivations gradually move through five levels of human needs, starting at the base with physiological needs.

Here, I introduce the reader to the ARCS model for systematically motivating learning (Keller 2010). The significance of each element is shown in Table 10.3.

Table 10.3 ARCS model of motivation

Elements	Significance
Attention	Capturing the learner's attention: Securing interest in the subject in which the learner is to be trained *Wow! This is very interesting!*
Relevance	Showing the value of learning related to the learner's goal *Ok, I see how important it is for me!*
Confidence	Building confidence in the achievement *Yes, I can do it!*
Satisfaction	Making learners feel happy with the outcome *I am glad I did it!*

When designing an instruction/learning programme, it is not necessary to use every element. For example, for highly motivated people, there is no need to worry about including the elements of attention. In addition, since relevance and attention overlap, there is no need to make a clear distinction between the two for people who are already motivated.

To illustrate how the model works, imagine buying a book or magazine: the first thing you look at is the cover. Readers of *this* book might have been encouraged to pick it up based on such words as 'disaster' or 'disaster mitigation' in the title (attention). Some of you may have scanned the table of contents to check whether the book would help you with one of your learning tasks (relevance). If so, it would have been important that the difficulty level would not be too much trouble to start to read the book with your current level of knowledge. Furthermore, you would need to feel confident that the amount of information there was to learn would be aligned with the amount of time you had available (confidence). If so, you would read the book to the end (complete the training). Learning is a repetition of this process. If it can be sustained, it results in deeper learning. All of you picked up this book thinking that you would like to learn more about disaster nursing and read this far. As a result, I wonder whether you have now developed an interest in ID. Furthermore, you might have gone from feeling that ID looked like it might be useful to feeling as if you would like to try using it; and once you have finished reading the assessment section hereafter and completed the exercises, I'm hoping that you will feel satisfied that you can design a learning programme using ID principles, in just one chapter.

Table 10.4 Sample application of the ARCS model in a classroom

ARCS	Sample action
Attention	Capture trainee attention with audiovisual materials such as videos related to the topic with people talking about their experiences; e.g. images of situations at disaster sites and real nurses in action
Relevance	Stimulate learner interest by linking the training to trainees' backgrounds and issues or to a relevant research topic. For example, advertise a seminar as being for people involved in the operation of evacuation centres on 'infection prevention measures during the COVID-19 pandemic and assessing their effectiveness'
Confidence	Start learning with simulations of simple cases, and then move on to cases involving more complex problems. For example, begin with a single issue and its countermeasures, and move on to issues with many causes needing many countermeasures
Satisfaction	Ensure tasks assigned are appropriate in quantity and level of difficulty. Give trainees opportunities to have their progress assessed; for example, offer an award upon training completion or a certification

The ARCS model is, without doubt, an ID theory. Table 10.4 provides suggestions to illustrate how an instructor could use the ARCS model. Anyone who is concerned that they have never studied ID even though it is something they always do can now confidently boast that their training plans are designed according to ID principles.

10.4 Assessment of Self-Directed Learning (SDL)

In adult education, unlike the education of children, learning tends to be self-directed, with the adults themselves determining the objective, how they will determine that their objective has been achieved and what learning resources they need to achieve that objective (Mager's three questions). In this chapter, I presented what I consider the fundamental principles of ID theories that would be most familiar to clinical nurses and useful when there is an opportunity to put adult learning principles into practice in the future.

Thinking of the work-related training you have received, and, for those of you with experience as instructors, all of the training you have provided were all programmes designed according to ID principles? Again, the purpose of this chapter is to help anyone who picks up this book to learn more about disaster nursing to design their own disaster nursing learning programme. I guess that some of you who have read up to this point might not be completely sure you understand how to do that. Therefore, as this chapter draws to a close, let us try to assess how much you have learned so far about using ID principles. Please answer questions 1 to 3 on a separate piece of paper. I hope you will take the recommendation of John Dewey, a much-quoted American educational philosopher who talked about the importance of learning by doing, an educational technique in which the learner learns through the experience of practice rather than simply listening to someone talk (Dewey 1938).

By all means, give it a try.

1. Refer to the Disaster Nursing textbook, and list two or three skills or things you need to know in order to work as a practitioner in disaster nursing.

   (Suggestion) Imagine the job you would like to be able to do in the future. Try writing down what you have already learned at this point in time as well as what you still need to learn in order to be able to do that job (i.e. clarifying exactly what you would need to learn). To confirm whether the knowledge and skills you thought of cover everything you need to learn, please refer to the textbook.
2. How would you assess whether you were able to do that job? What skills would show that you have achieved your goal? Try writing down how you would make that assessment and what indicators you would use.

   (Suggestion) Think about details, such as whether you are aiming to acquire or apply knowledge, whether the skill is one you can learn by looking at a procedure manual, and whether the question is one of improving the speed or accuracy related to a skill.
3. Try drawing up a learning plan that would ensure you successfully pass the assessment test proposed in 2.

   (Suggestion) Base the plan on ID principles without relying on your prior experience or intuition. Consider your work–life balance and how much time you can allocate to each task. Make a 1-year plan with assessments performed at 3 months, 6 months, and 1 year.

Sample Responses (For 1 and 2)

1. I want to be able to manage evacuation centres.
   (a) Things you have already learned to be able to do that job
      - I know how to gather information related to running an evacuation centre.
      - I plan and manage simulation training for the opening and managing of an evacuation centre jointly with relevant parties.

   (b) Things you still need to learn to do that job
      - I need to practice by conducting simulations of how to provide emergency treatment and transport for community residents who have a sudden health problem.
      - I need to learn about infectious disease prevention, including COVID-19.
2. Assessments
   (a) Able to comply with laws and regulatory systems related to the construction of evacuation centres.

(b) Able to list and outline the laws and systems frequently used in the operation of evacuation centres in the event of a disaster.
(c) Able to perform in a simulation how to allocate existing (human and material) resources to the community.

Able to plan and implement simulation training using knowledge about infectious diseases that are likely to occur in evacuation centres and how to deal with them.

10.5 Case Study: Local Map Making and Reading Workshop

The workshop on 'Map Reading and Making' was conducted in Nursing Association Nepal (NAN) with 26 participants among which 19 were EpiNurse from the disaster-affected district of Nepal in 2015 and remaining the executive members of NAN. In preparation for this training workshop, a meeting was conducted consisting of the Core Team and the executive members of NAN. The workshop included interactive lectures, working group discussions, 'hands-on maps' group discussions and 'hands-on' training. All the materials for the workshop were translated into the Nepali language, and simultaneous translation into English was available for all the discussions and lectures.

The topics covered in lectures and discussions included Disaster Risk Reduction and importance of Maps, a background of mapping and topographic maps of Nepal, hands on with topographic maps, mobile mapping, installation of offline mapping tool (Maps. me), mobile mapping (location sharing, creating bookmarks, compass and navigation, routing and distance measurements, adding POIs missing in OpenStreetMaps) and mapping essentials.

10.5.1 Introduction to Workshop and Need for Training

As Nepal is a developing country and the technology hasn't reached its maximum level, there isn't adequate knowledge among the local EpiNurse. As a result, the local nurses who are working in the disaster-affected areas are not being able to localize the location of the places, and the risk of disaster has increased. So to decrease the disaster risk and to capacitate the local EpiNurse, a training workshop was conducted on map reading and making for the sustainability of the system that is going to be prepared.

The training assessed the participant's knowledge, taught the basic skills that are required for making and reading the maps and made them able to make the maps.

10.5.2 Objectives

The overall objective was capacity building of local EpiNurse.

Specific Objectives

- To assess the knowledge of the local nurses in making the map
- To give information about Disaster Risk Reduction and the importance of the maps
- To install the offline map (Maps.me)
- To make the local EpiNurse capable of using the maps

10.5.3 Training Team

The members of the training team were Dr. Uttam Paudel, Geomorphology and GIS, Center for Spatial Information Science and System Coordinator of the Project for facilitation of the training workshop

10.5.4 Target Audience

There were 26 participants including the executive members of NAN representing the disaster-affected areas of Nepal. Participants were trained to become trainers in building the capacity of local EpiNurse at various districts of Nepal and help in the disaster risk reduction and sustainability of the system.

10.5.5 Day 1

10.5.5.1 Training Workshop Methodology

The workshop provided participants with the experience and tools for the implementation of effective education and training activities. The interactive learning methods were used to train participants with the objective that they would be able to adapt and use a mapping tool while working in the disaster. Through the hands-on training, group exercises, brainstorming and presentations, the participants were able to simulate their future training activities.

The workshop had several components with lectures, working group discussions and 'hands-on maps'. The training focused on educating the trainer about the mapping. The working language during the workshop was Nepali, with simultaneous translations in English for all the sessions (interactive lectures, discussions, hands-on maps).

10.5.5.2 Lectures and Discussions

The topics covered in interactive lectures and discussions included the following: disaster risk reduction, importance of map, a background of mapping, topographic maps of Nepal, hands on with topographic maps, installation of offline mapping tool (Maps.me), mobile mapping (location sharing, creating bookmarks, compass and navigation, routing and distance measurements, adding POIs missing in OpenStreetMaps) and examples and mapping essentials.

10.5.5.3 Training Workshop

After that, Dr. Uttam Paudel started the workshop by assessing the knowledge of the local EpiNurse in making the map. He divided the total participants in four groups; provided them with chart paper, pencil, eraser, tape, scissors and colour pens; and asked them to make a map of their community or the place where they work. Their group work was presented by one of the members of the group and evaluated by all the participants. The following were the recommendations that are made by the participants:

- There should be the direction in the map.
- Scale must be in any map.
- Legends should be same for similar heading and should be specific.

The session continued in which Dr. Uttam Paudel gave information about the disaster risk reduction and importance of maps in disaster risk reduction. He explained the general terms that are used in the disaster like hazard, risk, disaster, vulnerability, reduction, mitigation and disaster preparedness. Additionally, he also explained about the disaster management cycle, brainstorming on the role of the community in disaster management. Furthermore, he also described why Nepal is in the high risk of disaster; how the hills, mountains and oceans were formed; what is the process for the occurrence of the earthquake; and what are the effects of unplanned urbanization. He also added some information about the humanitarian open space, the scope, and the importance of technology in disaster risk reduction. He explained that there are only two types of the topographic map available in Nepal Finida Maps and JICA maps, contour lines and index lines, scales used in map.

Topographic maps are the two-dimensional model of Earth's surface which are also called contour maps as it shows the elevation above sea level using the contour lines. Contour lines on the maps are the line that connects points of equal elevation and shape of the land. The difference in elevation between each line must be equal spacing and never crosses each other.

- Index contour—Usually, every fifth line is printed darker and has an elevation printed on it.
- Map scales—Indicates the distance on the map compared to distance in the real world.
- Graphical—By a line divided into equal parts and marked in units of length.
- Numerically—Usually by writing a fraction to show what part of the true distances map distances really are. For example, 1:63,360. One inch on the map equals 63,360 inches in the real world.

After an hour of interactive lecture, the participants were given with the topographic maps and asked them to identify the boundary, rivers, places, contour lines, index lines, scales, legends, etc., and the session ended at 4 pm.

10.5.6 Day 2

Following welcome by Dr. Uttam Paudel, the session started by giving information about the mobile mapping and explaining its uses. Offline mapping tool (Maps.me) was installed in all the android mobile of the participants. After installing the app in their mobile, they were taught about how to locate the location and sharing of the location, bookmarks, use of compass and navigation, routing and distance measurement, adding POIs missing in open street, and explained about map essentials.

Finally the four groups were asked to make the same map that they had made at the time of assessment, which provides help in evaluating the effectiveness of the workshop. At this time, all the groups included the very small information that are required in maps like legends, direction, scale, latitude and longitude of the location. Participants and the training team clicked some photos with the map they had made before and after the workshop.

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Nursing Research on Disaster

11

Sakiko Kanbara and Yoko Nakayama

11.1 Disaster Nursing Research for Health and Well-Being

The "care" provided by nurses needs an update of knowledge and research that supports delivering the highest standards of care possible along with social needs (Majid et al. 2011). Nurses are responsible for contributing to developing the profession's knowledge through research. Research is a systematic inquiry that uses disciplined methods to answer questions and solve problems (Polit and Beck 2009). The goal of the research is to refine and expand a body of knowledge (Sharma 2010). Nurses develop a knowledge base with solid foundations built on research (Pam 2016). To design a nursing research in a human-centered disaster risk reduction, human-centered is necessary to understand people and define a knowledge base. There is a knowledge base of collective intelligence needed to find solutions that require insight and data to build a consensus with multi-stakeholder and how the research result.

Most research on healthcare services has focused on the outcome of the innovation, with the development being the target of evaluation, as has been the case with drug development. Partnerships with technology experts in industry and academia were leveraged to advance implementation. Traditionally, health has often been measured in terms of health levels in the context of biochemical technologies and advances in medical services (Bombard et al. 2018). Researchers will try to help healthcare providers by quantifying the results and comparing the effects of these innovations, such as randomized control. Research is based on a method that effectively and efficiently integrates and embeds evidence-based interventions into everyday primary health care and self-care. On the other hand, research with public health should include a theoretical lens that considers social justice and political goals. As with diverse data collection and analysis methods, it is necessary to identify multiple methodologies, various worldviews, and various assumptions. Considerable preparation is required for nursing research in the community, because it must change the health behavior in the community. And approval from an ethics committee is mandatory before research begins. It ensures that the community is protected from inappropriate study designs and unethical research practices (Eeltink et al. 2017). It is often needed for disaster nursing to narrow down the research content to consider the implications on site. In what capacity can a researcher define "knowledge worth knowing" in an unexpected disaster? Conversely, this process includes the aspect of unintentionally defining "knowledge

S. Kanbara (✉) · Y. Nakayama
University of Kochi, Kochi, Japan
e-mail: kanbara@cc.u-kochi.ac.jp

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that is not worth knowing". This point requires humble self-examination, but it is often unconsciously overlooked. The importance of conducting research is how to be aware of the behaviors of the community during a disaster, which may affect the elucidation of the problems of disaster phenomena.

One of the most critical roles of disaster nursing is caring for health in a local cultural environment. Nurses must develop an understanding of the local context of the study area to ensure a culturally appropriate program. Inform research questions and research design as the following ideas: (1) adaptation and testing of essential intervention messages, (2) be culturally appropriate and sensitive, (3) acceptable at the family and community level, and (4) modifying interventions and approaches to suit local conditions.

Disaster nursing often needs interdisciplinary field research that needs consensus like "what" and the "how" of the research based on the intended outcomes, i.e., where they want to get the result. There are many gaps between researcher and community (or "government officials" and "community people," "doctors," and "clients" with significant and worth knowing knowledge. It is a fundamental part of community research, so it is necessary to be aware of it carefully and humbly. For example, when discussing "build back better," is the unit of 1 year or 1 kilometer the same for government officials as it is for survivors? By what standard can we measure the sufficient number and size? To reduce disaster risk, we need to understand the current state of global health and what is happening there. Why is this reality happening? It is important to think about the causes of this situation and share them with people. It is not just a response but a sustained need to reduce the actual risks that cause the problem. Pragmatic research on disaster must agree with the idea that breakdown always occurs within a social, historical, political, or another context. The fields of health care, disaster prevention, and technology are changing side by side. By a disaster risk reduction on primary health care, "health" is the result of resilience and the result of the self-selection of individuals and communities.

Yanagida stated, "disaster nursing is difficult to standardize and academize. It is essential to recognize the universality of science. The universality of the story of human life is entirely different things." (Sakai 2006). The story's universality is essential for human life because of what kinds of perceptions were used for these actions. He also stated that "especially when constructing disaster nursing. It is vital to universalize human emotions and wonder without systematizing it or making it a manual like other nursing sciences". He emphasizes the recognition of the universality of science. The universality of human stories is entirely different. The universality of stories is fundamental in human life. It is not that individual stories are meaningless because we cannot generalize them into equations or manuals. The universality of disaster nursing is like feeling, humanity, mutual help in the community, the warmth of people, vulnerability, and the inspiration of hope for life. Therefore, even if many things happen after a disaster, it will be an energy source for people to do their best. Thus, disaster nursing should be developed research-wise while emphasizing health and well-being's universality on human security.

11.2 The Research Approaches in Disaster Nursing

It is critical to look closely at the phenomena, such as what approaches are possible in a disaster and what problems are occurring in health and well-being. It is essential to combine different research methods for human-centric approaches. This book will discuss several critical strategies in Chaps. 18, 19, and 20. We need to understand for what purposes, when, and what types of research can be applied from the perspectives of nursing, public health, and disaster management. These methods are organized by the interdisciplinary team focusing on finding commonality. Workable data collection will be considered for each study, which research approach will be used for data collection and analysis, whether the questions will be open-ended or structured, and whether the data analysis will focus on quantified

or unquantified data. The appearance of new information and science technology means the systematic leveraging of knowledge assets. As with the definition of knowledge, strategies have diversified in recent years as computer technology has advanced data analysis and analyzes complex models that contribute to disaster and social research approaches.

In the 1980s, nursing research was focused on aspects of nursing practice, that is, the generation of knowledge for the practice of nursing, such as in the area of health promotion, prevention of illness, development of the cost-effective healthcare delivery system, and the development of strategies that provide effective nursing care to a high-risk group (Polit and Hungler 1991). Nurse researchers were required to develop evidence-based practice using quantitative methods as scientific approaches. Qualitative research has primarily used the constructivist perspective, i.e., the pluralistic meanings of individual experiences, socially or historically constructed meanings, the intent to create theories and patterns, and the participatory perspective, i.e., political problem-oriented, collaborative, and change-oriented, as the basis for defining knowledge. Inquiry strategies such as narrative, phenomenological, ethnography, grounded theory, and case studies are also used. The researcher intends to collect data that emerge through open-ended inquiry and develop themes fundamentally rooted in the data.

A disaster is a complex phenomenon that is a crisis that affects people's lives and health. Therefore, nursing research in disasters requires a multidisciplinary and interdisciplinary approach. For example, to support disaster victims, both researchers must understand the living conditions of people affected by disasters and understand people's disaster experience. For these reasons, research using the mixed approach has been incorporated into disaster nursing research.

In nursing, triangulation, or "the combination of several research methods in the study of a phenomenon," is often used to refer to mixed methods, which is "a research method that combines one complete method with supplementary measures derived from another secondary method" (Doorenbos, 2014). The strategy of inquiry used is that data collection can be parallel or sequential to understand the research question best. Data collection also collects both quantified information (e.g., through measurement tools) and textual information (e.g., through interviews), and the final database will represent both quantitative and qualitative information in character. Researchers are expected to be clear about the purpose of their "mix" and the rationale that explains why they are mixing quantitative and qualitative data.

Knowing that every method has its limitations, researchers believed that it could neutralize the biases inherent in any processor that the biases could counteract the biases of other ways. The triangulation of data sources as a means of convergence across qualitative and quantitative methods was born (Jick 1979). From the initial idea of triangulation, a rationale for mixing multiple data types has subsequently emerged. For example, some argue that results from one method can be used to develop other methods (Greene et al. 1989). Others say that it is possible to incorporate one method into another for a different level of analysis or unit of insight (Tashakkori and Teddlie 1998).

11.3 Other Methodology Using Emerging Technology

Technologies enable valuable knowledge to be remembered via organizational learning and cooperative memory, and they also allow valuable knowledge to be widely disseminated to all stakeholders (Dalkir 2013). Because of each technological method's sophistication, it has become more difficult for a single researcher to acquire the most advanced theoretical and empirical knowledge in their field and become familiar with multiple methods. For this reason, successful collaboration often involves researchers using different methods working together or another researcher being more aware of the findings of a researcher using a different method. What is needed for effective collaboration is for researchers to become experts in each

method and become familiar with other methods, recognize their strengths and weaknesses, and have a firm understanding of their substantive research results. There is a need for human resources with knowledge of statistics. There are challenges in creating an environment where big data can be used in various fields, such as visualizing the effects of solutions to problems and promoting understanding.

The research environment is becoming more and more capable of efficiently collecting and sharing vast amounts of data. It enables miniaturization and reduction of IoT-related devices such as smartphones and sensors, obtained from location information and behavioral history via smartphones, information on viewing and consumer behavior on the Internet and TV, and miniaturized sensors. A diverse and vast amount of digital data is being generated, distributed, and stored on networks. The characteristics of big data differ from each user's perspective and supporter of data from the data user's perspective. There are three characteristics required of big data: (1) volume (data that can be broken down into the individual elements that make up an event and can be grasped and responded to, (2) velocity (data with high temporal resolution in terms of acquisition and generation frequency, such as real-time data), and (3) variety (a wide variety of data, including unstructured data such as data from various sensors). To satisfy these characteristics, a "big" data is consequently required (Ministry of Internal Affairs and Communications 2012).

Japan is strategically working on major social innovations while maintaining its goal of realizing "Society 5.0" to contribute to the achievement of the SDGs(Cabinet 2021). In particular, the expansion of the Corona disaster has made Japan's lag in digitalization and DX more apparent and acute. While strongly sympathizing with the proposals of the SDGs, the vision for the future society is based on Japan's unique values of "trust" and "sharing." It emphasizes a recycling-oriented society for coexistence with society and nature, a sense of secularity based on trust, the social concept of "three ways are good," and the empathy of sharing. In the future, the following measures are said to be important (1) to gain social acceptance for the promotion of Society 5.0 through the use of new architectures and Evidenced-Based Policy Making; (2) to strengthen the priority research fields by integrating humanities and science, AI, robotics, use of real data, security, trust, and ICT infrastructure technologies (quantum technologies) toward human-centered and distributed collaboration. Trust, ICT infrastructure technology (quantum technology, Beyond 5G), and (3) acceleration of social implementation through a new innovation style to realize well-being (JEITA 2010).

Most noteworthy is the need to nurture, attract, and utilize a variety of human resources (young, senior, women, overseas, interdisciplinary) as (4) IT/AI—using human resources and diverse human resources to promote the social implementation of Society 5.0. An innovation style is needed to realize well-being. For the early implementation of Society 5.0, it is necessary to change gears and realize the development of new technologies and combinations of existing technologies and social systems. It is crucial to build an environment where data can be provided with confidence and prototyping, and verification can be carried out in an eco-friendly manner. A network is needed to enable an eco-friendly process from idea generation and problem-solving to prototyping, implementation, and verification. The provision of resources from companies, universities, and other institutions in each process will significantly reduce the threshold for data provision, including verification of the data and its source sensor, the authenticity of the data, and copyright.

In addition, it is also essential to ensure that the benefits are appropriately returned to the data providers, prototyping resource persons, and other related parties after the business are completed. Creating ideas through international interdisciplinary frameworks and cross-industrial collaboration such as Integrated Reach for Disaster Reduction and Future Earth is already

underway internationally. The acceleration of social demonstrations may be the key. Disaster nurses, engaged in human-centered risk reduction research activities for social issues, including disaster prevention and countermeasures, are expected to join such activities and conduct joint research and demonstrations in the future. The need for people and capital to be connected and contribute to each other's growth is a point that should be advocated from care.

New procedures are needed for nursing to research as human sciences. The analysis shall start from the requirements of visualization, the end-user side. It is with requirement specifications of information delivered to decision-makers—analysis of visualizations through discussions on what input and analysis are required for the required visualization. The requirements shall be analyzed by pre-impact, impact, and post-impact phases because of notable differences in the time scale to process data. For example, pre-affected phases do not need real-time acquisition, while impact phases should be real-time processing because of rapid changes in disaster situations. After formulating requirements, available technologies and human capacity resources shall be reviewed to compare with requirements. In cases where the available resources do not satisfy requirements, the difference between requirements and availability are the gaps to be filled by new solutions, including technology applications and human capacity development. Because data collection is mostly a significant constraint in the data processing stream, reviewing data collection will lead to more realistic logic and discussions followed by checking available resources in the analysis and visualization stages. It is necessary to promote its disclosure and distribution and promote cross-sectoral cooperation to enable sharing of knowledge and information throughout society through the cross-sectional utilization of an enormous amount of data generated in various fields. In addition, it is required to work on resolving technological issues, considering the international trends in institutional issues and the progress of technological development.

11.4 Challenge During Disaster Research as Human Science

There is a lack of research on emergencies and disaster response, as well as a lack of comprehensive information systems and standardized global health indicators for effective decision-making and policy recommendations.

Geospatial and temporal data delivery methods should be more comprehensive and indicate the role of national, local governments, local communities, and international organizations, as well as other sophisticated tools for epidemiological approaches to link environmental causes and associated diseases (FAO 2017) more accurately. The use of aerial photographs and maps can greatly improve information sharing among organizations and support rescue and recovery efforts; GIS development can improve situational awareness by reflecting disaster response activities on a base map, designating, and overlaying necessary information areas (Katada et al. 2000). The time axis is the only universal axis that can be shared by people from various standpoints and serves as a guideline in times of disaster. Describing the process of various problems faced by disaster victims, such as their background, disaster situation, relationship with neighbors, and thoughts, in the natural flow of time, can help us understand their needs. On the other hand, it is difficult for the nurse to research for scientific visualization on time if it takes a step as same as clinical research (Fig. 11.1).

11.5 Case Study

To enable residents to collect data on living environment factors (water, air, infectious diseases, sanitation facilities, etc.), which are necessary for practical public health nursing, through continuous participatory monitoring, we aimed to obtain objective and reliable indicators through participatory monitoring by residents by effectively utilizing information and communication technology for each type of data. The goal was to create a data set that could be acquired in near real-time and then integrated and analyzed.

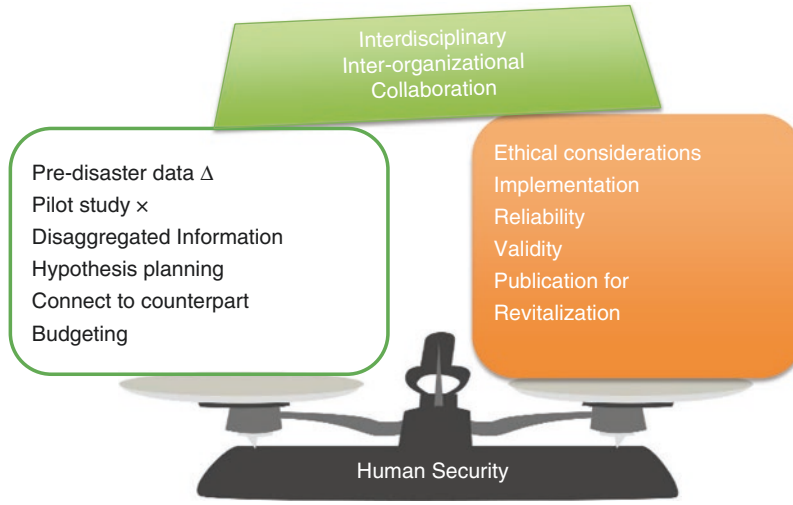

Fig. 11.1 Challenge during disaster research

As a case study, we used the urban, mountainous, and southern disaster-prone areas of the Federal Republic of Nepal, which are in the process of disaster recovery, as a field to assess the impact of water sanitation and hygiene in the event of a "health emergency," as newly defined by WHO in June 2016. The study was conducted on a geographic information system (GIS) as a tool to augment the sharing of information in the region via the Internet, assuming the prevention of environmental degradation and the spread of infectious diseases. Through this study, the data on living environment maintenance, which is difficult to manifest as data and is a factor of health hazards in communities and households, was utilized for public health nursing, and a new way of living environment monitoring was devised to respond to global issues such as natural disasters.

1. We will develop a method for real-time participatory monitoring that can be collected comprehensively by residents (Fig. 11.2).

   To make the method practical for health emergencies, we decided to make the method highly real-time and have a function to identify the person, time, and place who posted the data and analyze it.

   (a) Web questionnaire—In anticipation of the current situation and the near future, we will basically use smartphones and tablets at first, but if necessary, PCs, phones, and paper will also be used as a control. We will also consider a system that provides feedback to the residents and allows them to make their intentions more accurate. We will also try to collect interactive conversations and text data. We will also consider introducing new interactive devices as needed.
   (b) Photo data—In addition to understanding the local situation, the location information attached to the photos will be used to obtain the location of the reporting.
   (c) Simple environmental measurement kit—To increase the reliability of monitoring from the perspective of public health by developing off-the-shelf products that can be procured in a timely manner at a low price by using existing tests besides the test subject using a simple, quick qualitative kit and smartphone microscope, which are necessary for water and environmental pollution to prevent infectious diseases during disasters.
   (d) Crowd sourcing mapping—Create a simple data mapping method by building a data

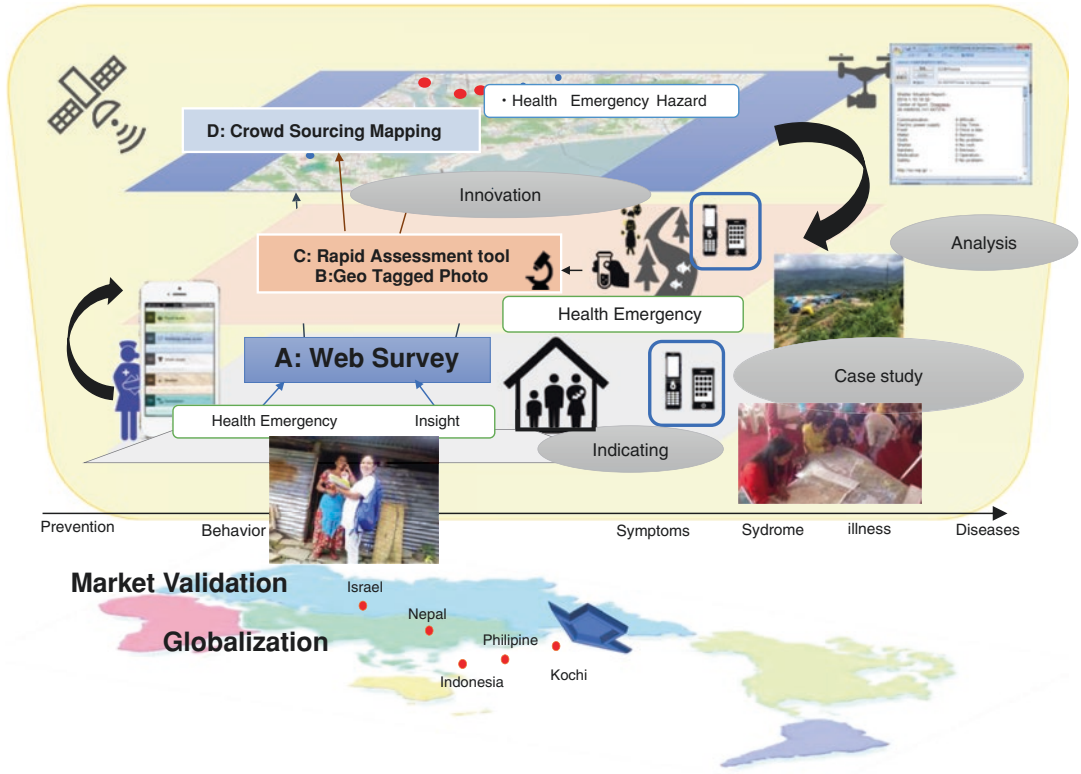

Fig. 11.2 Spatial model of disaster nursing research

collection system using GPS and a simple digital camera and linking it with GIS.

The current situation and readiness of the target area were discussed with the local collaborators, and it was decided to collect the data using the existing observation data and the monitoring method. We used this as a tool to support the existing information management for the involvement of resident collaborators and nursing staff. A workshop was held to provide training in inputting data, and a scenario was used to simulate data collection in the event of a disaster or emergency. Community nurses acted as monitors, using smartphones and tablets to collect input data from resident collaborators, which were then displayed and checked as management records.

2. Implementation on Disaster Site

The main goal was to develop a tool to collect message data and photos of facilities related to the living environment from smartphones and tablets through a participatory survey of residents in order to examine the basis for utilizing maps in the areas affected by the torrential rains in western Japan in July. In fact, the information obtained was not about the damage situation but about the information needed on the spot. Posters at evacuation centers, useful word-of-mouth information, and location information were obtained by visiting the sites. The information was visualized on OpenStreetMap with easy-to-understand icons and fed back to the residents. The location information was checked for consistency of latitude and longitude using Google Maps. In addition, we checked the items so that they could be used in Kathmandu, Nepal. Data

were obtained in real-time for Kurashiki City, Okayama Prefecture, where the water disaster occurred and was used for analysis. As a social implementation experiment in the actual flow of time, practical bottlenecks such as the workload of registration and publication, reflection of sudden changes in the information, and fluctuation of manually entered names were revealed.

In Kathmandu, Nepal, we conducted a workshop for nurses on the assessment method of collecting message data and photos from smartphones and tablets. We examined the necessary training from information literacy and instructional design for monitoring. We discussed the training needed from information literacy and instructional design for those conducting monitoring. Although it is possible to obtain objective and reliable indicators in near real-time by effectively utilizing information and communication technology, access to appropriate information and rapid response is necessary. It was also necessary to refine the communication and visualization methods to ensure timely decision-making on health risk reduction. The interviews confirmed that this process would improve the delivery of quality health care and bring sustainability to the community through improved health.

It was suggested that visualization of information on vulnerability and health, as well as disasters themselves and risks, is important but largely untapped. It is necessary to collect information and cite the capacity to manage and respond to crises on the spot. The results of the monitoring collection to date were presented, and the current and previous floods and how the monitoring methods in this study were situated were discussed. The nurses focused on the health hazards and diseases of the people outside the community. Still, through disaster and livelihood monitoring, they need to have the ability to recognize the intangible hazards such as culture, lifestyle, etc. that they indirectly suffer from, the possibility of becoming ill much later in life and having a mechanism to be actively involved in prevention—monitoring of the living environment based on the health effects of disasters. During normal times and emergencies, the family provides basic living environment monitoring and care. This is due to the strong family ties that underlie Nepalese social values. Therefore, monitoring with the participation of residents is effective. However, with the rapid globalization and advancement of information and communication technology, including women's social advancement and migration, it is no longer always possible to receive care from relatives. We found that the concept of disaster relief is also changing rapidly due to globalization. It was concluded that there is a need to secure human resources which can be more proactive in providing care in the community; along with the cooperation of the community, there is also a need to prepare for self-medication, care, involvement of the family, community, and other organizations, and literacy on the health effects of disasters.

The living environment monitoring for public health nursing proposed in this study is to accurately observe and describe the three elements of people, place, and time (frequency of disease occurrence, distribution, and related information) in human populations and consider the basis for hypothesis setting. It was also thought that observing and converting data that is flexible and difficult to measure into data in advance and preparing it as open data for local policies would be effective.

The dissemination of necessary daily life information from residents is not an implementation of developed technology as a solution for the last mile. Still, an immediate solution for the first mile and several awards were given to develop innovative methods as concrete methods. The importance of col-

laboration among researchers in health risk management, living environment safety, satellite data analysis, and geospatial information, who have integrated cloud services, mobile terminals, etc., and have built a local research base, and a place for discussion were also considered important. The results of this study are expected to contribute directly to the indicators listed in the Global Agenda, early warning, and access to disaster risk information. The results of this research can be used as a basis for recommendations for action.

The practical gap on disaster research includes barriers when integrating practice systems from existing organizational and professional designs. Applying the innovative approach should require organizing information flow, and addressing it needs collaboration among government, medical, and private sectors to solve challenges. The solution requires complex coordination and cooperation for an invisible indicator of various vulnerabilities in the living environment. This effort involves the collaboration of multiple organizations and groups for human security. With restrictions on privacy data sharing, especially among agencies, interoperability becomes a challenge and results in information gaps in the community. It is assumed that local subjects will position and recognize the process as a proactive and sustainable social development process. It is necessary to develop monitoring that emphasizes qualitative data. There are needed uniform guidelines to lead what to change, think about innovation, and guess ethics. Facilitators and interpreters with native communication skills are also required.

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Part III

Fostering Care in Sustainable Community

12 Needs of Cultivating Seamless and Individual Care

Megumi Fujii, Marina Inagaki, Kengo Kobayashi, Shigeru Miyamae, Akihisa Sakai, Kosuke Sasaki, and Sakiko Kanbara

12.1 Individual Illness and Care Needs in Disaster

Disaster nursing described that nursing has been responding to a wide range of natural disasters (e.g., floods, earthquakes, tsunami) and disasters related to human activity for many years (Bonito and Minami 2017). Naturally, a preventive practitioner, who contributes to disaster prevention activities and reduces adverse health risks within the affected area, has experience with rehabilitation and staying at sites for long periods. But it is neither sufficient nor appropriate to just repair or recover the affected disaster site. Many disasters related to death occurred in affected communities. Nurses who reside in a disaster-affected area know their community, but nurses who are not from the affected area are temporary with the local community. During the commotion, it is required how local nurses should collaborate with relief outside to do the best for sustainable health care. The diverse types of people that disaster nurses care for and the environment in which shelters have been treated in disaster response nurses should be prepared.

In Japan, when a disaster strikes, public buildings such as schools and community centers are often used as evacuation centers (Central Disaster Management Council 2020), where people live until they are ready to return home. Evacuation centers have limited space and are crowded with people of all genders and ages who have medical and nursing care needs, making it difficult to ensure a safe living for each person.

Besides, although relief supplies such as water and food are delivered to evacuation centers from all over the country and distributed to evacuees, these supplies do not take into consideration the individual needs of the various evacuees, and in many cases, the necessary items are not available.

Under these situations, evacuees who live in severe shelters are subjected to a heavy physical and mental burden, and even if they can evacuate after a disaster, their health may suffer after-

M. Fujii (✉)
Japanese Red Cross Toyota College of Nursing, Toyota, Aichi, Japan
e-mail: m-fujii@rctoyota.ac.jp

M. Inagaki
Research Institute of Nursing Care for People and Community, University of Hyogo, Hyogo, Japan

K. Kobayashi
Japanese Red Cross Kumamoto Hospital, Kumamoto, Japan

S. Miyamae
Tokyo Medical and Dental University Medical Hospital, Tokyo, Japan

A. Sakai
University of Fukui, Fukui, Japan

K. Sasaki · S. Kanbara
University of Kochi, Kochi, Japan

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ward. Therefore, many medical teams and NPOs and NGOs are dispatched immediately after the occurrence of a disaster to protect the health of people living in severe evacuation centers, but it is difficult to provide individual support and continuous support, and furthermore, support for people living in evacuation centers other than evacuation centers is not available. Japan's birth rate is declining, and the population is aging, with the percentage of people aged 65 and over-reaching 28.4% in 2019, and this percentage is expected to increase in the future (Statistics Bureau, Ministry of Internal Affairs and Communications 2019). Moreover, 19.6% of those aged 65 and over live in single-person households, and 40.4% live in married-couple-only households (Ministry of Health, Labor and Welfare 2019a, b). Thus, the number of households with only the elderly is increasing. As the household structure changes due to the declining birthrate and aging population, it is becoming more and more difficult for people to take care of their sick or disabled family members or their children only in their home. Besides, social capital and mutual aid between family members, relatives, and neighbors are changing, which also affects in the time of disasters.

Against this backdrop, the need for medical and nursing care services has been increasing year by year, the shift from a medical system that focuses on the treatment of illnesses in hospitals to a system called the Community-Based Comprehensive Care System that allows people to continue to use medical or nursing care services and lifestyle support services in their own homes is underway. As a result, people with chronic illnesses and disabilities are now able to lead their daily lives at home. However, those who are vulnerable in terms of their health condition are at a higher risk of having their health affected due to the disruption of access to these care services in times of disaster.

We do not know when a large-scale disaster will occur. This chapter discusses the living environment after evacuation to prevent health problems for all people including those with health risks in this uncertain society, and how nursing should prepare for the future.

12.2 Disaster and Preventable Casualty

When a disaster strikes, people are at high risk of losing their lives, even if they can survive. In Japan, since the Great Hanshin-Awaji Earthquake of 1995, attention has been focused not only on the direct damage caused by collapsed buildings, fires, and flooding but also on secondary damage such as deteriorating health conditions and deaths caused by the increasing physical and mental strain of living after evacuation. This situation has given rise to the concept of "disaster-related deaths," or indirect deaths due to disasters, and the occurrence of disaster-related deaths has been taken up as a social problem. In Japan, the following are recognized as disaster-related deaths: those who died due to worsening of injuries caused by the disaster or illness caused by physical burden during living in an evacuation, etc., and were recognized as having died due to the disaster in accordance with the Act on Provision of Disaster Condolence Grant (Act No.82 of 1973). In fact, this includes those who have not received condolence grant for disasters but excludes those whose whereabouts are unknown (Cabinet Office 2019).

In the Great Hanshin-Awaji Earthquake, 919 out of 6434 deaths were identified as disaster-related deaths (Hyogo Prefecture 2005, Hyogo Prefecture 2006), and the effects of influenza and other diseases in evacuation centers have been clarified (Ueta 2009). In the Niigata Prefecture Chuetsu Earthquake of 2004, 52 out of 68 deaths were identified as disaster-related deaths (Niigata Prefecture 2009), and post-disaster deep vein thrombosis attracted attention. In the Great East Japan Earthquake of 2011, 3738 out of the 19,689 deaths (Fire and Disaster Management Agency 2019) were identified as disaster-related deaths (Reconstruction Agency 2019). The causes of death for those identified as disaster-related deaths were mostly respiratory and circulatory diseases (Ueta 2012), and the number of such deaths was over the long term. Furthermore, in the 2016 Kumamoto earthquake, the number of 217 disaster-related deaths was reported to be four times higher than the 50 direct deaths caused

Table 12.1 The number of deaths and the number of people identified as disaster-related deaths in Japan in recent years

	Deaths	Disaster-related deaths	Major factors
The Great Hanshin-Awaji Earthquake (1995)	6434	919	Influenza
The Niigata Prefecture Chuetsu Earthquake (2004)	68	52	Pulmonary thromboembolism
The Great East Japan Earthquake (2011)	19,689	3738	Respiratory and circulatory diseases
The Kumamoto Earthquake (2016)	272	217	Respiratory and circulatory diseases

by the earthquake (Kumamoto Prefecture 2020). They are shown in Table 12.1.

As can be seen from these reports, disaster-related deaths are not caused by hazards, such as collapsed buildings caused by earthquakes, fires, or flooding caused by tsunamis. In the aftermath of a disaster, the burden on physical and mental increases due to the harsh and unfamiliar life in evacuation centers; on the other hand, the health condition cannot be maintained due to the lack of proper rest and nutrition. Besides, the interruption of medical and nursing services, which they normally use daily, causes their physical condition to deteriorate. In other words, disaster-related deaths are caused by a poor living environment after the evacuation and the inability to use services that they normally use, and these are lives that could be saved in normal times.

Such preventable deaths which can be helped in normal times are an important issue for nurses who are involved in health support during disasters. The maintenance of living environment and the early detection and response to signs of abnormality are important roles for nurses in everyday life, and it is necessary to take measures to protect people's lives and health in times of disaster.

12.3 Case Study: Disaster-Related Deaths in the 2016 Kumamoto Earthquake Were Four Times Higher than Direct Deaths

12.3.1 Damage Caused by the Disaster

The 2016 Kumamoto earthquake struck the Kumamoto region of Japan on April 14, 2016, with a magnitude of 6.5 and a maximum intensity of 7 on the Richter scale. Two days later, on April 16, there was another earthquake with a magnitude of 7.3 and a maximum intensity of 7. During the first 15 days after the earthquake, the seismic intensity of 1 or higher occurred 2959 times (Earthquake and Volcanic Department, Japan Meteorological Agency 2018). Beyond damage to houses and other structures, fear of extended seismic activity has led to an elongated evacuation period and an increase in the outdoor evacuation, including overnight stays in the vehicle (Project Team for Activity Compilation Records of the 2016 Kumamoto Earthquake 2018).

Damage of houses in Kumamoto Prefecture was about 200,000 houses (Kumamoto Prefecture 2020). Furthermore, after the earthquake, about 427,000 households in Kumamoto Prefecture had their water supply cutoff, about 455,200 households had power dropouts, and 100,844 houses had their gas supply suspended (Kumamoto Prefecture 2018). The electricity was 100% restored by 4 days after the disaster, and the water and gas were 99% restored by 2 weeks after the disaster (Nojima 2016).

The highest number of evacuees was 183,882 on the day after the earthquake (855 evacuation centers opened), and all were closed 7 months after the earthquake. The number of evacuees at welfare shelters, which are defined as places where the elderly, people with disabilities, and other people with special needs can stay while receiving necessary support (Cabinet Office 2008), and which are mainly private social welfare facilities designated by the municipal government, was 823 at its highest (101 welfare shelters opened). All of them were closed 11 months after the earthquake (Kumamoto Prefecture 2018). In fact, it has been reported that only about a quarter of the prear-

ranged number of welfare shelters were opened, and many people in need of care were unable to enter welfare shelters (Asahi Shimbun 2016).

12.3.2 Relief Activity of Medical and Healthcare Team

In Japan, many organizations throughout the country provide support activities, including nursing professionals, in times of disaster (Chap. 15). In the case of the Kumamoto earthquake, there were 2282 members of Disaster Medical Assistance Teams (DMATs) under the jurisdiction of the Ministry of Health, Labor and Welfare; 5653 members of medical relief teams consisting of the Japanese Red Cross Society and the Japan Medical Association; 911 members of Disaster Psychiatric Assistance Teams (DPATs); 1961 disaster relief nurses operated by the Japanese Nurses Association; and 8609 public health nurses. Moreover, even though the number of members among NPOs and NGOs was unknown, at least a dispatched number of 364 people was confirmed (Fujii et al. 2020).

In terms of place of activities, DMATs worked in hospitals and evacuation centers; medical relief teams worked in hospitals, first aid centers, evacuation centers, temporary housing, and homes; DPATs worked in hospitals, first aid centers, and evacuation centers; disaster relief nurses worked in first aid centers and evacuation centers; public health nurse worked in evacuation centers and homes; and NPOs and NGOs worked in hospitals, first aid centers, evacuation centers, welfare facilities, welfare shelters, temporary housing, and homes. NPOs and NGOs were working in hospitals, first aid centers, welfare facilities, evacuation centers, welfare shelters, temporary housing, and homes (Fujii et al. 2020). All of these groups entered the affected area within a few days of the disaster and reached the peak of their activity 2–3 weeks later, and all but NGOs and NPOs and DPATs withdrew within 2–3 months (Fujii et al. 2020).

Thus, while all organizations provide support to hospitals, first aid centers, evacuation shelters, and other places where many injured, sick, and evacuees gather immediately after a disaster, health and medical teams provide less support to welfare shelters, social welfare facilities, and homes than to hospitals and evacuation shelters. In other words, current health and medical support in times of disaster mainly consist of support to maintain hospital functions, first aid at evacuation centers, and response to seriously injured people. Indeed, people living in evacuation centers can also obtain temporary support for the maintenance of health conditions and prevention of health damage. On the other hand, people who continue to live outside evacuation centers, such as at home, do not receive such support.

12.4 Who Needs Individualized Care and Where?

In total, the death toll from the Kumamoto earthquake was 272, with 1184 people seriously injured (Kumamoto Prefecture 2020). The number of people identified as disaster-related deaths was 217, about 80% of all deaths and four times as many as direct deaths from the earthquake.

According to data compiled by Kumamoto Prefecture (The Kumamoto Earthquake Digital Archive 2018), more than 90% of those identified as disaster-related deaths were over 60 years old (78% over 70 years old), and 87% had a medical history. Death time was within 1 week in 26% of the total, within 1 month in 61%, within 3 months in 85%, and within 6 months in 96.5%, respectively. The causes of death were respiratory disease (28.4%), circulatory disease (27.9%), sudden death from internal causes (14.2%), suicide (8.1%), and infectious disease (7.1%). The living environment at the time of death was home (40%), hospitals and nursing homes (20%), and shelters (5%). Furthermore, 40.2% of the deaths were due to the physical and mental burden of the earthquake and aftershocks, 29.7% due to the physical and mental burden of living in evacuation centers, and 17.3% due to the delay in initial treatment caused by the shutdown of medical institutions. Hence, the attributes of those who died of disaster-related causes were that most of them were elderly and had chronic diseases, that

their deaths occurred not only immediately after the disaster but also over the medium to long term, and that the place of death was not often a shelter but often their home. In addition, physical and mental stress caused by the earthquake and aftershocks, the stress in daily life after the disaster, and delays in medical treatment were found to have contributed to disaster-related deaths.

While about 180,000 people took refuge in evacuation centers the day after the earthquake, 2 weeks later, the number of evacuees had dropped to about half, and a month later, it was less than a quarter. For this reason, it is thought that evacuees who had taken refuge in the shelters have returned to their homes at an early stage. Additionally, it has been reported that welfare shelters are opened only about a quarter of the time as they agreed in advance, and many people in need of care could not enter welfare shelters (Asahi Shimbun 2016). It indicates that those who were unable to live in evacuation centers over a long period, which are vulnerable populations including the elderly, were evacuated to their known home from the early disaster stage. Nonetheless, because both human and material support in disaster times are concentrated at evacuation centers, they might not have taken the necessary support and care by being lived as evacuees at home. Furthermore, even if their health condition deteriorated while living as evacuees at home, they may not have been able to access medical facilities as quickly as in normal times during a disaster when hospital functions are reduced or suspended.

Thus, people who are at high health risk need healthcare support and continuous care are difficult to live in evacuation centers where the living environment is not well-developed. As a result, they continue to live in their homes or other places with inadequate infrastructure that has been damaged by the disaster. Yet, the support provided by health and medical teams during disasters is concentrated in hospitals, first aid centers, and evacuation centers, and people who continue to live in their homes, who are at high risk of disaster-related deaths and significantly need support, are not recognized and cannot access healthcare services that they used to use daily. This situation has led to the catastrophic loss of lives that could have been saved immediately after the disaster but were lost later in life.

12.5 Way Forward

12.5.1 Limitation of Rapid Response to the Individual; Who Should Care? How Can we Prepare?

People who continue to live at home with health risks after the disaster are at high risk of disaster-related deaths, but they are also the people who are least likely to receive healthcare assistance and are the most likely to be left behind.

In Japan, public health nurses play a central role in community health activities in times of peace, and their role is also required in times of disaster, and their activities are extremely diverse (Japan Association of Public Health Nurse Directors 2013). For example, vulnerable people including the elderly are at high risk of deteriorating health conditions during a disaster, so continuous monitoring is necessary. In the case of the Kumamoto earthquake, public health nurses confirmed the safety of those registered on the list of those who require support for evacuation activities and special care, through telephone calls and individual visits, in cooperation with the community leader, community welfare volunteer, and the community fire department (Kumamoto Prefecture 2018). On the other hand, it was also revealed that the evacuation status of them could not be quickly ascertained, and therefore, sufficient support could not be provided (Kumamoto Prefecture 2018). The national average number of public health nurses working in Japan is 41.9 per 100,000 population (Ministry of Health, Labor and Welfare 2019a, b), which is not enough to perform all tasks during a disaster, and the larger the disaster, the more difficult it is to support each resident.

On the other hand, as we have mentioned, most of the support provided by dispatched healthcare teams in times of disaster is to places where many injured and sick people and evacuees gather, and individual support to homes away from evacuation centers is given later. One of the reasons is

utilitarianism in disaster situations, where more people need to be helped. In order to help more people during a disaster, it is believed that it is more efficient to work in places where there are more people gathered, and top-down decisions are made to deploy aid workers to areas that are likely to be severely damaged based on assessments by the disaster response headquarters of the prefecture in the disaster area. Besides, most of the dispatched healthcare teams are specialized in post-disaster acute phase activities. This is because, based on the experience of the Great Hanshin-Awaji Earthquake, it has been said that 72 h is the time limit for saving lives during a disaster (Central Disaster Management Council 2020). However, in light of the current situation in Japan, it has not been evaluated whether providing support by investing manpower only in hospitals and evacuation centers in the acute phase of disaster times is really efficient and appropriate.

Furthermore, other reasons include issues related to the information and privacy of community residents. Public health nurses, who know the residents daily, have information on people who need support, the location of their homes, and the services they use on a daily basis, and in the event of a disaster, they can predict care needs based on this information and provide support. On the other hand, those dispatched from other areas do not have such information, and as a result, they are forced to provide support at hospitals and evacuation centers where they can operate without detailed information in advance. In Japan today, there is no system that the personal information of the residents held by public health nurses and other government staff is shared with the dispatched healthcare teams.

As a result, it is difficult for public health nurses alone to provide prompt support to people at home after a disaster, while the manpower of dispatched public health teams is not utilized, and as a result, people who need support at home are put off. Improving this situation will lead to the prevention of preventable deaths during disasters. In other words, in order to protect residents living in disaster-affected areas from disaster-related deaths, it is necessary to shift from a medical-centered support system concentrated in hospitals and evacuation centers to a community-wide care system that includes social welfare facilities and homes where people with high health risks continue to live as evacuees.

12.5.2 Role of Nursing and Preparation to Prevent Disaster-Related Deaths

The role of nursing in disasters is not only to respond to the injured and sick in hospitals at the time of a disaster but also to provide long-term support for the health of residents living as evacuees in the community, to support disaster preparedness from normal times and for residents themselves to become more resilient. In order to achieve these goals, it is necessary to consider changes in social structure, disaster and medical policies, and to collaborate across organizations and fields. Three preparations that nursing should make to prevent disaster-related deaths are described below.

12.5.2.1 Development of an Evacuation Environment Where All People Including Those Who Require Special Care Can Live Safely and Securely

Many vulnerable people are unable to live in ordinary evacuation centers during a disaster, and at home due to changes in their living environment such as lifelines. Shelters, where those people can stay healthy and receive the care they need, are very important.

It is necessary to select appropriate welfare shelters and secure human and material resources to ensure that such places can function properly in times of disaster. On the other hand, most of the places designated as welfare shelters in Japan are social welfare facilities operated by the private sector, and there are issues regarding compensation and liability in the event of a disaster. Therefore, the municipal government needs to consider with those private facilities, and the national and prefectural governments should

review them, including the legal system. Also, it is necessary to further improve the environment in general evacuation centers by providing welfare spaces so that people in need of care can stay there and to develop various evacuation sites including hotels and other accommodation facilities as other evacuation facilities. The nursing profession needs to participate in this kind of government-led development.

12.5.2.2 Expansion of Bottom-Up Support and Establishment of the Support System

It was found that after a disaster occurred, nursing support was mostly distributed to hospitals and evacuation centers in the hardest-hit areas as directed by the disaster task force of the affected prefecture, and less to social welfare facilities and homes. However, disaster-related deaths occur not only in evacuation centers, where evacuees are concentrated, but also among those who continue to live in the same place, including their homes, after the disaster as they did before. Information on people with health risks cannot be obtained from places that are difficult for supporters to access, and as a result, people who need help are overlooked.

Therefore, what is needed for disaster relief in the future is to understand the many individual needs of people in places other than hospitals and evacuation centers that have been difficult to reach in the past and to provide support for the entire community, specifically, the assessment and monitoring of the life and health of each evacuee at home and the provision of nursing care. With regard to these issues, human resources are required to deliver support to various evacuation sites including those at home and to monitor the health of the entire community, in cooperation with public health nurses who will support the community after a disaster. However, home support is highly localized and often requires continuous support, and it is necessary to follow local conditions. Therefore, the challenge is to increase the number of nurses who have a good understanding of the local community and can provide continuous support activities immediately after a disaster occurs.

In Japan, one such human resource is the Disaster Relief Nurses of the Japan Nurses Association. As of March 2020, there will be approximately 10,000 registered disaster relief nurses throughout the country (Japanese Nursing Association n.d., https://www.nurse.or.jp/nursing/practice/saigai/index.html). So far, their activities have been conducted at hospitals and evacuation centers, but in the future, it will be necessary to provide support at home as well. Since the disaster relief nurses are located all over Japan, they are able to provide localized support when a disaster occurs in their own area of residence or in a neighboring area. It is also necessary to establish a system that can provide support in the affected areas immediately after a disaster by utilizing other human resources, such as nursing faculty members who are usually active in the community and latent nurses who have retired or are on leave.

Considering the above, in order to support the health of the entire community after a disaster, a bottom-up approach is needed to identify individual needs that have not been reached in the past and provide care to all those who need it, and there is an urgent need to establish a system for this purpose.

12.5.2.3 Standardization of Assessment and Continuous Follow-up to Prevent Disaster-Related Deaths

In the past, health assessments at home during disasters were conducted by public health nurses who visited people's homes and filled out health counseling sheets and connected them to medical and welfare services in cases of concern. However, risk assessment of disaster-related deaths is not easy because it requires a comprehensive assessment that includes medical knowledge and social environmental factors. Furthermore, the current system does not allow for longitudinal follow-up observation of changes in living environment and health status over time, making it difficult to quickly and accurately identify and monitor high-risk individuals.

Therefore, in addition to increasing the number of personnel who can visit homes by expanding

the scope of nurse dispatch as described above, it is necessary to standardize the content of assessments so that these home supporters can quickly and accurately assess the risk of disaster-related deaths at the first time and then follow-up. For this purpose, it is necessary to identify high-risk items for disaster-related deaths based on analysis of factors that lead to disaster-related deaths in past cases and to create a standard assessment form. In addition, it is necessary to establish a system for sharing monitoring data among supporters so that they can respond immediately when risks increase.

12.6 Imaging Essay

12.6.1 Nursing Student Activities at Welfare Shelters

~Focusing on the Care of the Elderly after the Torrential Rain Disaster in Western Japan

Hidemi Kunimatsu (Baika Women's University, School of Nursing and Health Sciences, Department of Nursing)

12.6.2 Introduction

Following the occurrence of severe disasters such as the Great Hanshin-Awaji Earthquake and the Great East Japan Earthquake, volunteer activities by nursing students (hereafter referred to as "students") at times of disaster have been reported to include community building at evacuation centers and temporary housing, and support for the health care of affected residents. In these activities, it is important to collaborate with nursing professionals stationed at evacuation centers and temporary housing.

After seeing the disaster-stricken areas after the occurrence of the disaster, students are eager to work in the disaster-stricken areas, saying, "If there is anything we can do, we would like to participate, and we would like to learn nursing so that we can help the nurses working in the disaster-stricken areas. This paper reports on the support provided by the faculty and the learning of the students in order to respond to these feelings of the students.

12.6.3 Preparation Before the Activity

The participating students were three fourth-year students. They had been reading research papers on disaster victims and nurses who worked in the disaster areas in order to work on their graduation research on disaster nursing. Therefore, we shared the meaning and risks of working in the disaster area with the faculty and proceeded with the activity planning.

1. Activity planning
   We made preparations for self-contained activities, such as purchasing volunteer insurance and confirming routes and calculated the necessary expenses.
2. Obtaining a budget
   In order to obtain the "student volunteer budget" of their university, the students prepared an application form, which was signed by the faculty members.
3. Coordination with nurses in charge of welfare shelters
   Considering the importance of working under the guidance of the nurses in charge, the teachers coordinated the activities.

12.6.4 Actual Activities

Although this was the first time for the students to be involved in evacuation shelter activities in the disaster area, they wanted to do something that would be as useful as possible for the disaster victims, even though the place where they would be working was inconvenient. With this in mind, we began by having the nurse in charge explain the situation at the evacuation center, listen to the current problems and nursing needs, and share the students' own thoughts and the thoughts of the nurse in charge.

1. Activities during the 3 days

   We organized the problems by developmental stage based on the problems with the facilities and nursing needs at the site and the living conditions of the disaster victims and drew up an activity plan for nursing care of the elderly: (1) foot bathing, (2) setting up nurse calls, (4) watching over the elderly at night, and (5) assisting in making breakfast, and proposed the plan to the nurse in charge.
2. Foot bathing: A call was made on posters, and the nurse in charge selected those in particular need. Hot water containing carbonated bath salts was prepared, and edema was observed before and after the footbath. During the footbath, we listened to the thoughts of the victims.
3. Installation of a nurse call system: Students prepared a blueprint that took into consideration the prevention of falls due to electrical leakage and wiring and drafted a budget for the necessary items.
4. Nighttime watch: Students learned about nursing care for the elderly at night by watching over elderly people who go to the bathroom to make sure they don't fall and by talking to people who can't sleep.
5. Assistance in making breakfast: Vegetable soup and omelets were made to support dietary habits that are deficient in vitamins and proteins.

12.7 Summary

The fourth-year students had acquired the ability to think about problem solving and integrate nursing care through their nursing practice, and they were able to fully apply their basic skills in disaster volunteer activities, such as building trusting relationships while communicating through care such as foot baths. Learning about disaster nursing at the disaster site is inevitable, but it also involves risks, so the cooperation between the nurses at the site and the instructors led to deeper learning by drawing out more power than expected. It is necessary to continue to provide opportunities for learning that are unique to the "field," and we would like to make every effort to systematize this in nursing colleges, including obtaining budgetary support.

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13 Primary Health Care (PHC), Universal Health Coverage (UHC), Disaster Risk Reduction (DRR), and Role of Local Caregiver

Hastoro Dwinantoaji, Hasti Widyasamratri, Sushila Paudel, Yuko Fushimi, Ikuko Moriguchi, and Sakiko Kanbara

13.1 Introduction

In recent years, disasters have become more prolonged, diversified, and complex, and there is a limit to the amount of post-disaster emergency assistance, dissemination, and reconstruction aid that can be provided. Therefore, communities must participate in planning, vulnerability assessment, disaster prevention, and mitigation activities. To this end, sustained efforts by the community are essential for the implementation and achievement of district disaster reduction plans, and due consideration should be given to long-term sustainability and generalization.

According to the preamble of the Sendai Framework for Disaster Risk Reduction, the exposure of people and property to hazards has been increasing faster than vulnerability has been decreasing in all countries over the past decade, resulting in new risks and disaster losses with significant short-, medium-, and long-term economic, social, health, cultural, and environmental impacts. Disasters lead to widespread mortalities, epidemics, and morbidities and cause disruption in health systems, quality of water, food, hygiene, and other essential health services vital for better health care. Natural disasters, health emergencies, and global pandemics directly affect people and society's health and influence it by causing trouble for health systems, equipment, and services (Dwinantoaji et al. 2019, Dwinantoaji and Sumarni 2020). Disaster risk reduction (DRR) prevents or reduces deaths, injuries, diseases, disabilities and mental problems, and other risks arising from the impact of the disaster. Due to the vital role of PHC facilities in health emergencies, they must remain in service when disasters occur (Aitsi-Selmi and Murray 2016; Djalali et al. 2014; UNISDR 2015).

13.1.1 Primary Health Care (PHC) for Universal Health Coverage (UHC)

Universal health coverage (UHC) is now one of the most prominent global health policies. According to the World Health Organization, universal health coverage means that all people have access to the health services they need, when and where they need them, without financial hardship. It includes the full range of essential health services, from health promotion to

H. Dwinantoaji · S. Paudel · Y. Fushimi
S. Kanbara (✉)
University of Kochi, Kochi, Japan
e-mail: kanbara@cc.u-kochi.ac.jp

H. Widyasamratri
Sultan Agung Islamic University, Kota Semarang, Indonesia

I. Moriguchi
University of Hyogo, Hyogo, Japan

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prevention, treatment, rehabilitation, and palliative care (WHO 2019a, b).

The target of SDG 3.8 is to "achieve universal health coverage, including financial risk protection, access to quality essential health-care services, and access to safe, effective, high-quality, and affordable necessary medications and vaccinations for everyone." Furthermore, SDG 1, which aims to "end poverty in all its forms worldwide," might be imperiled if UHC is not implemented, as health costs impoverish about 90 million people each year (World Bank 2019). Out-of-pocket health payments are unaffordable for many people including in high-income countries, and universal health coverage targets to cover everyone, everywhere, without financial hardship—leaving no one behind (WHO 2021a, b).

To leave no one behind, we should look at the nature of health problems. The nature of health problems is changing in ways that were only partially anticipated and at a rate that was wholly unexpected. Likewise, health systems are not insulated from the rapid pace of change and transformation that is an essential part of today's globalization. On top of this, occasional conditions like disasters exacerbate the impacts. The rise of COVID-19 has put immense demand on health and broader social and economic resources, calling into question the UHC premise of health for all. People are becoming more frustrated with health-care providers' incapacity to offer national coverage levels that satisfy stated demands and evolving requirements, as well as their failure to provide services in ways that meet their expectations. Few would argue that health systems need to adapt to the challenges of a changing world better—and faster. That is something PHC is capable of (World Health Report 2008).

Primary health care (PHC) is a whole-of-society approach to health and well-being centered on individuals, families, and communities' needs and preferences. It addresses the broader determinants of health and focuses on the comprehensive and interrelated aspects of physical, mental, and social health and well-being (WHO and UNICEF 2018; WHO 2019a, b). It provides whole-person care for health needs throughout the lifespan, not just for a set of specific diseases (Kanbara et al. 2017; Ray and Ghimire 2019). PHC ensures people receive comprehensive care that includes health promotion and prevention interventions, curative care, rehabilitation, and palliative care as close as accessible to people's daily environment.

Despite the fact that the two agendas (UHC and PHC) originated mostly independently of one another, their common objective is to see healthy people living in healthier communities. The goals of primary health care and universal health coverage are clearly related in their definitions; and in fact, many have stated that primary health care is necessary to achieve universal coverage (Van Weel and Kidd 2018). Primary health care is the first level of contact for individuals, the family, and the community with the national health system and addresses the main health problems in the community. For example, a child gets the care at the camp, or health education is provided in a community, or community people can be cured at the primary health-care center, which consequently reduces cost and time and promotes health. Scaling up primary health-care (PHC) interventions across low- and middle-income countries could save 60 million lives and increase average life expectancy by 3.7 years by 2030 (WHO 2021a, b). A study of 102 low- and middle-income countries found that expanding primary care coverage was connected to higher life expectancy, reduced infant mortality, and lower under-five mortality, indicating that primary care is a wise investment (Hsieh et al. 2013).

When it comes to universal health coverage, effective coverage is essential to leave no one behind. Tanahashi's model considers five elements necessary for effective coverage (Fig. 13.1). At each step, the framework seeks to identify the target population that is left behind (those left behind are shown by the coverage curve and the box that represents those who do not contact the services) (Tanahashi 1978). If we strengthen primary health care, we can identify barriers and facilitating factors in the domains of availability, accessibility, acceptability, contact, utilization, and effective coverage with quality and the reasons why the prioritized subpopula-

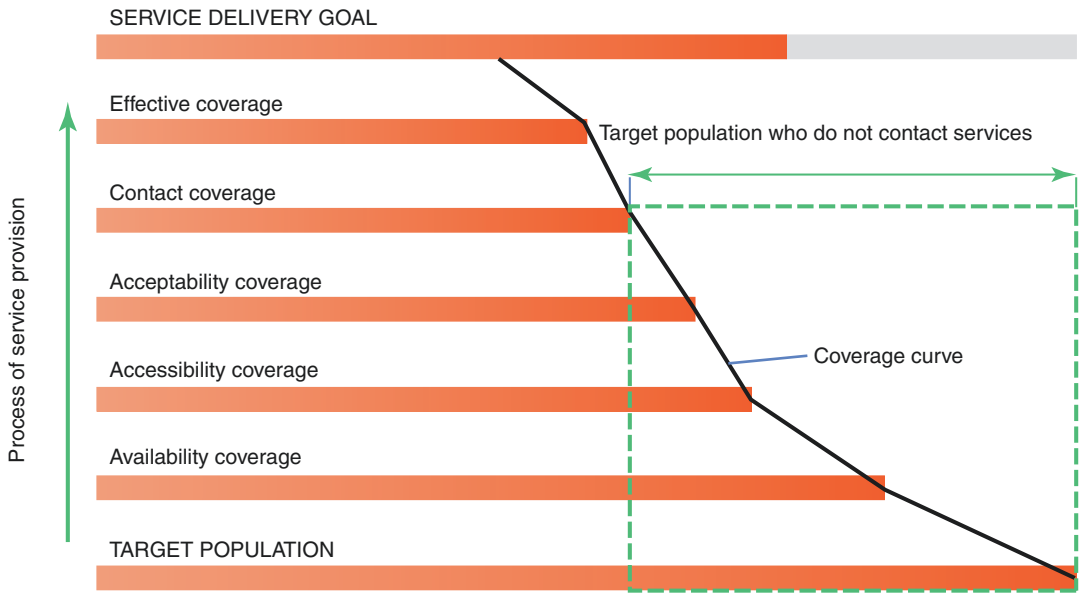

Fig. 13.1 Tanahashi framework for effective coverage

tion is not accessing or benefiting (World Health Organization 2016).

As more and more countries commit to universal health coverage, they are faced with the challenge of how to quantify it and track progress towards key targets, both in terms of health services and economic protection. A joint report by WHO and the World Bank Group published in 2015 entitled "Tracking universal health coverage: first global monitoring report" provides guidance on how countries can achieve universal health coverage and build more resilient health systems. However, a true understanding of health and disaster risk during a disaster requires a risk assessment to identify local hazards and vulnerabilities. This can be done with the participation of the community, so that health risks can be mitigated before an emergency occurs and appropriate preparations can be made. In the first few hours after an emergency, many lives can be saved through effective local response before outside assistance arrives. Residents can also play a leading role in the recovery and reconstruction efforts. These are based on the principle of primary health care, where collaboration with diverse disciplines using appropriate technology and community participation plays a central role.

In this context, nurses and other health-care professionals play an important role in working with the community to reduce health risks and difficulties that may arise in their lives. Women and volunteers are also expected to play a leadership role in providing a timely voice for the fluid needs of the community. Primary health care can provide such a framework. It must be embedded in a holistic framework for organizing and delivering care in an efficient, equitable, and cost-effective manner, with a focus on people across the country and the region. To achieve this, SDG 4 education and SDG 5 gender issues must also be addressed together to ensure additional capacity.

The SDGs, especially SDG 3, are based on the principles of equity and "leaving no one behind" (World Health Organization 2016). Efforts need to be made to minimize discrepancies between those who are most and least vulnerable to disasters. An overall healthy population can make people of all ages more resilient to disasters. Primary health care is a general policy and practice approach to promoting and protecting health, keeping communities safe, and providing services to vulnerable populations to "leave no one behind," a principle that is even more important in times of disaster.

Together with the SDGs, an all-hazards approach, taking a holistic view of all types of emergencies and disasters and the impact of health risks and providing the highest possible standards of health and well-being for all people, will contribute to building resilient health systems that can achieve universal health coverage. These policies and strategies need to be multidisciplinary and cross-cutting and apply a comprehensive all-hazards risk management approach.

Several obstacles, however, impede the provision of primary health care and, as a result, hamper the accomplishment of the SDGs: first, inadequate government funding on health allocated to primary health care; second, the shortage of the health workforce; third, untrained health workforce in multisectoral actions and workloads of an overwhelming nature; and finally, health illiteracy among the population (Chotchoungchatchai et al. 2020). So the emphasis should be placed on the role of primary health care in achieving universal health coverage such as adequate funding, management of workforce, and disaster health awareness.

COVID-19 has uncovered major flaws in global health systems, exacerbated quality and service gaps, and highlighted the crucial importance of excellent primary health care (PHC) during a public health emergency. According to a new World Bank report, well-designed PHC can help flatten the curve during a health crisis like COVID-19 by providing measures like surveillance, testing, and contract tracing, community outreach, and vaccine coverage, as well as preventing hospitals from becoming overburdened with critically ill patients (World Bank Group 2021).

Primary care provides a place to which people can bring a wide range of health problems—it is not acceptable that in low-income countries primary care would only deal with a few "priority diseases" (World Health Report 2008). Strong primary health care can help communities get the quality health services they need—without discrimination or financial hardship. Committing health spending to primary care not only saves money, but it also aids in the development of countries. Thus, primary health care is not just about reducing costs but more than that. Improving PHC is the path to achieving UHC.

We experienced the need to recognize that people's views of health are not immutable but change in response to various cofactors in society. The factors that change are influenced by technology mechanisms, information technology, occupation, educational level, self-actualization, quality of life improvement, and social support in the research on health views. Given this situation, it is desirable to have a system that allows for a dynamic process rather than evaluating social programs and their results based on fixed values in advance. Through the autonomy of the local community, it is possible to gain health and social independence and rich, productive activities.

There has been a continuous increase in disaster losses, especially at the local and community levels. Improving the capacity of health-care support to respond to human risks is a critical key to avoiding preventable deaths and health hazards. Therefore, this chapter focuses on the health-care sector and reconsiders primary health care, which is a community approach, from the perspective of disaster nursing to obtain suggestions for district disaster prevention.

13.2 Integration of Disaster Risk Reduction (DRR) in Primary Health Care (PHC)

Disaster impacts are strongly influenced by physical, social, economic, and environmental factors. Hence, reducing disaster risk requires concerted action across a wide range of sectors, institutions, and disciplines. The Sendai Framework for Disaster Risk Reduction (SFDRR) 2015–2030 calls for an all-off society engagement and partnership to reduce disaster risk with inclusive and accessible participation of people disproportionately affected by disasters (Aitsi-Selmi et al. 2015; UNISDR 2015). It also identifies the need to strengthen the link between health security and human resources management and DRR (Aitsi-Selmi and Murray 2016).

Currently, the Health Emergency and Disaster Risk Management (EDRM) Framework is promot-

ing a strategy based on the concept of all-hazards, risk management approach with the broad engagement of the health system and multiple sectors and a strong community-centered PHC in all regions and countries around the globe (WHO 2019a, b). The Health EDRM Framework emphasizes the critical importance of prevention, preparedness, and readiness, together with response and recovery, to save lives and protect health for the people affected by disasters, particularly vulnerable groups. Furthermore, PHC focuses on adequate access to essential health services to improve health status, build community resilience, and provide the foundation for responding to emergencies and disasters (Dwinantoaji et al. 2019; Kanbara et al. 2017; Ray and Ghimire 2019). Strong PHC rooted in community participation and action with proper disaster preparedness is the foundation of every health system. Not many countries can achieve "health for all," the core principle of the Alma Ata Declaration (Balabanova et al. 2013; Ray and Ghimire 2019; WHO 2019a, b). Hence, all health-care facilities, including the PHC system, need to create, practice, and implement efficient disaster preparedness to provide adequate basic needs and essential health services for people affected by disasters.

The difference between community health planning and disaster management planning is whether the health risk in predicting the hazard area and impact is expected. To protect human life and health, "the probability that a disaster may occur" should be considered together with "the impact of a disaster on human life, the economy, etc." and even "the fact that the people, goods, money, and information involved in responding to a disaster are disaster risks themselves." Therefore, a typical countermeasure is to know the "hazard" and prepare for the ability to respond to the needs of an emergency. However, health crises are unpredictable when hazard areas and impacts are difficult to predict. Therefore, policies and strategies should focus on equipping and preparing PHC to reduce the vulnerability of individuals, families, communities, and public health systems caused by disasters.

PHC has a vital role in proactive engagement and appropriate communication with communities, which not only supports a disaster. Effective engagement also improves the ability to anticipate and identify events. It reduces the impact of inevitable events when they occur through co-developing appropriate and trusted systems before, during, and after a disaster. As PHC has pre-existing links with communities and has the capacities and networks to understand the environmental, social, and cultural elements that affect health, it can deliver context-appropriate care as well as effective risk communication and continuing work with the communities through the emergency into recovery (Interagency Standing Committee 2013).

Behind these elements lies a series of basic principles identified in the Alma Ata Declaration that should be formulated in national policies to launch and sustain PHC as part of a comprehensive health system and coordinate with other sectors.

13.3 Primary Health Care and Disaster Nursing

Primary health care (PHC) is essential health care (health-care activity) based on technology that is locally practicable, scientifically based, socially acceptable, accessible to all in the community, based on participation in a spirit of self-reliance and self-determination, and sustainable for each stage of development in the community and country. It is essential health care (health activity) based on technology that can be sustained at each stage of development in the region and country. It is the first stage in which individuals, families, and communities come into contact with the national health system, and it is the first element of a continuum of health activities that are provided as close as possible to where people live and work. Occupying an important place in the national health system, PHCs have also played a central role in the overall socioeconomic development of the region.

The Five Principles of PHC

1. Measures based on the needs of the people
2. Effective use of local resources

3. People's participation
4. Coordination and integration with other sectors (agriculture, education, communication, construction, water, etc.)
5. Use of appropriate technology

Activities of PHC

1. Health education (health promotion)
2. Food security and proper nutrition
3. Safe drinking water and basic environmental sanitation
4. Maternal and child health (including family planning)
5. Immunization against major infectious diseases
6. Countermeasures against local endemic diseases
7. Treatment of simple illnesses and injuries
8. Supply of essential medicines

Equitable distribution of health care—according to this principle, primary care to meet the leading health problems in a community must be provided equally to all individuals irrespective of their gender, age, caste, color, urban/rural location, and social class.

Community participation—to make full use of local, national, and other available resources. Community participation was considered sustainable due to its grassroots nature and emphasis on self-sufficiency instead of targeted (or vertical) approaches dependent on international development assistance.

Health human resources development—comprehensive health care relied on an adequate number and distribution of trained physicians, nurses, allied health professions, community health workers, and others working as a health team. It is supported at the local and referral levels.

Use of appropriate technology—medical technology should be provided that is accessible, affordable, feasible, and culturally acceptable to the community. Examples of proper technology include refrigerators for cold vaccine storage. Less appropriate measures of medical technology could consist of, in many settings, body scanners or heart-lung machines, which benefit only a tiny minority concentrated in urban areas. They are generally not accessible to the poor but draw a large share of resources. Co-design and community-based participatory research or action research is required.

Multi-sectional approach—recognition that health cannot be improved by intervention within just the formal health sector; other sectors are equally important in promoting the health and self-reliance of communities. These sectors include, at least, agriculture (e.g., food security); education; communication (e.g., concerning prevailing health problems and the methods of preventing and controlling them); housing; public works (e.g., ensuring an adequate supply of safe water and basic sanitation); rural development; industry; and community organizations (including local governments, voluntary organizations, etc.).

In summary, PHC recognizes that health care is not a short-lived intervention but an ongoing process of improving people's lives and alleviating the underlying socioeconomic conditions that contribute to poor health. The principles link health, development, and political interventions rather than passive acceptance of economic conditions.

National and local health and disaster risk management arrangements need to ensure that PHC is recognized as a vital contributor to all aspects of disasters. At present, global and national health security activities focus mainly on national- and central-level structures and institutions, with PHC underrepresented or absent. There is a need to recognize and include PHC in national health disaster risk management policies, plans, and programs at the national level. At the regional, district, and community levels, primary care needs to have well-defined and recognized roles and functions in disaster preparedness, response, and recovery integrated into health facility risk management plans and linked with secondary and tertiary care systems. Primary care leaders must be included in the planning and coordination mechanisms for health disaster risk management at all levels.

13.4 Focusing on Communities, Individuals and Health Workers

A people-centered approach within primary care should focus on ensuring that individuals are engaged in the design, delivery, and monitoring of health services and empower them to protect themselves and their communities, promote health, and reduce the risk of disaster. Local communities are vital in preventing and preparing for disaster, and investments in community-level interventions strengthen this cooperation and build community resilience. Misinformation, common in emergencies, can be addressed by ensuring continuous, proactive communication with the population (Shuaib et al. 2014). In addition to this, viewing and empowering communities as co-designers of service delivery and other solutions, such as addressing environmental and societal issues, could also help to reduce the risk of disaster and is essential for recovery (Siekmans et al. 2017). The culture and customs that have taken root in a region depend on local characteristics such as the types of disasters that frequently occur in the region, and the security of the region depends on subjective awareness, and there are relative disparities. Even if plans and manuals are prepared, they will be useless in times of emergency if individuals are not aware of the issues and have not experienced the actions described in the manuals. Some residents may find it difficult to obtain information or take action, and resources are also needed. Particularly in times of disaster, issues emerge, such as the inability to reflect the opinions of the silent majority.

The reconstruction process was very different between the severely damaged areas and those that were not. It is important to consider whether there was a "build back better" mindset. While carefully addressing the vulnerabilities and inequities in society that already existed before the disaster, it is necessary to take care of the environment, promote resilience, and rebuild sustainable communities. We witnessed that this is not a top-down, one-way process but an interaction that requires the participation of communities and local people, whose culture shapes healthcare policies and becomes institutions.

We would like to suggest that we reconsider the need to break away from paternalism in health care and disaster prevention. In other words, we need to prevent disasters by taking the initiative of those in a strong position, rather than intervening, interfering, and supporting those in a weak position, regardless of their intentions.

The health workforce is central to the success or failure of any disaster prevention, preparedness, response, or recovery measures. Based on defined roles and responsibilities, risk management capacities for health disasters must be built into frontline staff through training and greater engagement in disaster risk assessment, planning, coordination mechanisms, and action. This requires the recruitment and retention of adequate numbers of health workers at the local level (Witter et al. 2017), appropriate and timely remuneration, and supportive policies and structures for a conducive work environment to protect staff during every aspect of the disaster response.

13.5 Case Study

13.5.1 Case Study 1: Role of Community Health Volunteers in Indonesia

The WHO has shown that community health volunteers (CHVs) can play an important role in achieving Goal 3 on the Sustainable Development Goals (SDGs) health indicators. Known as in-demand leaders in health promotion, CHVs in Indonesia are built on the national women's family welfare movement of the 1970s. They are trained to carry out health and nutrition promotion activities in their villages. Health cadres are characterized by how well they are integrated into the community, and their character, dedication to service, academic performance, and willingness to set aside the necessary time to support services at the integrated health service post (Paysandú), among other characteristics, are selected by the community.

The health cadres in Kemijen also conduct mosquito eradication activities, particularly monitoring visits to each household in the community to test for mosquito larvae in bathrooms and water tanks. This activity involves making a monthly record, disseminating it to neighboring congregations, and submitting the report to their respective sub-districts and puskesmas. There is also a growing awareness to ensure the cleanliness of water resources as people, especially women, feel ashamed of their culture if they do not live a clean and healthy life.

In Semarang, Indonesia, rising sea levels, rising tides, and land subsidence are frequent occurrences. Coastal flooding can negatively affect people in communities living in these coastal areas. Flooding adversely affects drinking water, sanitation, access to health care, and safe food. Storm surges can cause insecurity in the lives of residents. The Indonesian government has introduced community-based disaster risk management (CBDRM) to reduce disaster risks. CBDRM can reduce flood disaster risk reduction (DRR) by reducing public health risks, enhancing disaster preparedness, and building trust among all stakeholders. It has potential. The government expects the participation of health professionals as community assets for DRR. However, it is difficult to apply the CBDRM approach involving health cadres at the grassroots level. In times of disaster, they must risk their own lives to help others.

Therefore, we interviewed stakeholders and found that to apply the PHC approach during disasters, it is necessary to have (1) appropriate health information management at the community/PHC level; (2) community health workers and community health volunteers trained in disaster preparedness, response, and recovery; and (3) systematic communication for early warning and evacuation, among others. Furthermore, we found that continuous field research and accurate information are needed to build and shape safer policies and provide evidence for DRR.

Therefore, a questionnaire was distributed to 227 health cadres to determine what factors influence the willingness of health cadres to participate in flood disaster management. The results showed as following; Health cadres who (a) had relatives (OR = 0.25, $p = 0.04$), (b) obtained four togas for home visits (OR = 0.21, $p = 0.01$), participated in meetings with puskesmas and health centers (OR = 0.18, $p = 0.02$), (c) feels inadequate support. 02), (c) perceived inadequate support in terms of direction and supervision (OR = 0.52, $p = 0.03$), insurance coverage (OR = 0.64, $p = 0.02$). Lack of stipend (OR = 0.57, $p = 0.04$), ineffective coordination and dispatch mechanisms (OR = 0.82, $p = 0.00$), unreachable. They face existing obstacles such as unreachable distance, cost, and time (OR = 0.37, $p = 0.04$). Furthermore, the gender dimension is an important and sensitive issue in DRR. However, there were no male health cadres in the present study, and only female health cadres participated in the reality. There is a need to think about how capacity building can be done more appropriately in a culture where men go to the rescue in times of disaster (Fig. 13.2).

Fig. 13.2 Disaster education to health cadre

13.5.2 Case Study 2: Role of Women on Community-Based Disaster Risk Reduction in Japan

Community-based disaster risk reduction requires a more cross-sectional and comprehensive view of various relationships from residents' perspectives. However, some cultures and customs are rooted in local characteristics, such as the types of disasters that frequently occur in the area, and community safety depends on subjective awareness and relative disparities. Even if plans and manuals are prepared, they will be useless in times of emergency if individuals are not aware of the issues and have not experienced the actions described in the manuals. In addition, some residents find it difficult to obtain information or act, and resources are also needed. In addition, there will be problems such as the opinions of the silent majority not being reflected. In communities and evacuation centers, unpaid "informal care work" in communities and households plays an important role before the external and official support of the local government. It is an extension of the evacuees' daily lives, addressing the difficulties of everyday life through ongoing childcare, nursing care, and health care at home. It plays an essential role in disaster risk reduction and health maintenance, relying on the community and family. Unpaid informal care is not appreciated as a matter of course, especially for women. It is not easily visualized that health crises in environments with inadequate public services, such as displaced people, increase women's informal care.

In addition, women may not speak up because they feel that this situation is normal. Men often dominate local activities, especially those related to decision-making, resulting in an imbalance of age and gender between donors and beneficiaries. There is also an imbalance between the ages and genders of supporters and beneficiaries. The BOSAI WOMEN project trains women to lead disaster reduction efforts in their communities. The participants are about 30 women in their teens to 60s who applied for the open call. They included women with different occupations, positions, and literacies. They ranged from college students and office workers to disaster prevention specialists, voluntary disaster prevention organizations members, and officers of neighborhood associations.

13.5.2.1 Implementation of the Project

The project was carried out continuously for 1 year. Lectures and group work were held about once every 2 months. The theme of the study was decided according to the participants and the progress of the work.

We were divided into two groups to create action plans. One was to develop a system to communicate with society. The other was to visualize the problems based on the experience of past earthquakes. After that, they set the objectives and goals of the group work and formulated a 1-year plan.

13.5.2.2 Progress of the Group Work

Group work was set for about 1 h each time. We respected the independence and initiative of the participants and avoided giving specific instructions. Since some of the participants were aiming to acquire knowledge and some were not used to work initially felt uneasy about the progress of the group, as discussions went astray and some members appeared hostile and reluctant. Therefore, we asked the nursing students assigned to each group to summarize the discussion and provide advice and followed up each lecture by providing knowledge about the situation in the disaster area, simulations of life after the disaster, and examples of various initiatives in the prefecture. If the discussion did not go well, a consultation session was held on another day. We also provided support for participants who were absent to continue, leaving the decision to continue participation. As a result, through repeated discussions and trial and error, the participants understood and respected each other, cooperated, and utilized their experience, knowledge, and unique skills to move forward with the plan. Although some groups changed their plans from the original method, all members agreed to change direction and create something better. In addition, they were proactive in seeking out

further extracurricular activities, believing that knowledge was not enough to achieve the action plan.

13.5.2.3 Examples of Actions

Output 1: First, we offered our knowledge and skills (about using plastic wrap for first aid, stopping bleeding, and toilets in emergency) to female residents who we thought already knew about disaster preparedness. Eventually, we shared our initial ideas with the residents. The participants expressed their sympathy, saying they wanted to try and do what they could. This should be the driving force and starting point for action in the community and create "gender responsive map for DRR" (Fig. 13.3).

Output 2: A leaflet was created to visualize the respective stockpiles and preparations for pregnant women, women living alone, and women in elderly households. In the intergenerational workshop, a traditional baby sling made of one roll of cloth was introduced to the child-rearing generation, useful in their daily lives. It was also suggested that nursery schools with disaster prevention measures for children could serve as shelters for children and their families and help each other in the community.

Output 3: "We can do it too" cards were created as a tool to help women run evacuation centers. It was explained that by having everyone play a role based on what they are good at and what they can do, the needs of the evacuation center could be closely monitored, and the division of roles based on gender can be reduced. We also created a leaflet that allows people to choose what they can do in the event of a disaster, such as "take care of children," "take care of the elderly," "ask for help," and "pass on information." By handing out these leaflets at the reception, we proposed that everyone feel free to get involved in the management of evacuation centers (Fig. 13.4).

Fig. 13.3 Creating gender responsive map for DRR in Kochi, Japan

Fig. 13.4 Creating gender responsive map and graphic recording in Kurashiki, Japan

13.5.2.4 Change in Participants' Awareness

At first, some participants were reluctant to participate. However, they eventually learned they had a role to play and felt the joy of communication. Sharing their experiences and motivations for participation created a sense of solidarity and trust in each group. Their experiences led them to participate in disaster prevention activities and training sessions actively. The formation of the groups was characterized by the formation of a division of roles in which each member oversaw what they were good at, without a leader according to the amount of knowledge and skills, even though the members had various knowledge and experience in disaster prevention. (1) The relationship was not hierarchical but equal, and the leader respected everyone's opinions. (2) When a relationship of mutual respect and trust was established, discussions took a developmental direction, and proposals for solving problems were generated.

Although it is often assumed that women are not active in community disaster management, they were highly interested and played an active role in such efforts as primary health-care initiatives. All groups included information in their action plans about people who need to be taken care of during disasters, such as children and the elderly. They also assumed diversity, considering different backgrounds, such as elderly women and women living alone.

These are because many women have been involved in caring for children and the elderly in their homes and childcare, medical care, and nursing care. The proposal was focused on the time of the disaster and on solving the difficulties of living in daily life. The knowledge and skills necessary between daily life and crisis, such as eating, washing, cleaning, etc., were translated and naturally reflected in the contents.

They did not work alone throughout the project but communicated with others and shared

their issues to solve them. This showed that each person brought out the strength of the entire project by demonstrating their strengths, and they also recognized the need for communication skills such as talking and empathizing with people from different positions and backgrounds from the same perspective. In the event of a disaster, the voices of those who need to be taken into consideration during a disaster, such as the elderly, children, and people with disabilities, who are said to be less likely to speak up, can be carefully heard. This can also be expected to play an active role in primary health care as a community health resilience.

13.6 Ensuring the Quality of Care

Disasters and health vary in scale, type, and season of damage, the geographic area at risk, the stage of recovery, and the seasons and assistance obtained. In addition, disasters are becoming more diverse, protracted, and complex. It is no longer possible to pinpoint a specific catastrophe as the cause of the problem or divide assistance vertically by target population or health problem. It is essential to identify issues that can be solved with the help of communities (groups) rather than individuals and respond to them seamlessly to improve efficiency. To achieve this, it is important to identify cases with a sense of urgency and adapt to the situation rather than following a plan. Developing adaptive technologies for local people's use will help them better utilize and restore the resources available in the region.

In disaster, on the other hand, routine primary care services may be neglected in favor of disaster preparedness, compromising the quality of care and patient safety. Providing safe, effective, people-centered, and quality primary care services will help build trust in primary care and increase utilization. National policies, strategies, and plans on quality need to consider the continuum of quality before, during, and after disasters. Critical foundations for quality care include essential infection prevention and control and the provision of water, sanitation, and hygiene.

Furthermore, from the above case study, women are the majority and necessary leaders in primary health-care activities for disaster risk reduction (DRR). However, a key challenge to achieving women's leadership and participation in DRR is the need to recognize the burden of unpaid care work and the obstacles it poses to women's ability to engage as leaders and decision-makers, as enshrined in Target 5.4 on SDG 5 which recognizes unpaid care and domestic work through the provision of public services, infrastructure, social protection policies, and social security, including through the promotion of shared responsibilities within the household, as critical to achieving gender equality (Enriques 2019). In addition, DRR advocates for the provision of services to protect women from the various risks as well as reduce the burden of unpaid care work and to support the redistribution of unpaid care work in households and communities to enable women to participate and lead in DRR (ActionAid 2017). Overcoming barriers to unpaid care work will greatly reduce budgetary bias and the burden of achieving UHC within the community.

Therefore, the country must respond with appropriate public policies to simultaneously harmonize, protect, and realize primary health care with unpaid care reducing the risk. Opportunities for residents to choose how to meet their own resident-centered care needs should be provided, and cross-sectoral and interlinkages, necessary budgetary provision, and decent working conditions (including decent salaries) for paid care workers should be guaranteed. This is a cross-cutting issue that is in line with all of the SDGs.

13.7 Way to Forward

Without adequate financial protection mechanisms following disasters, impacts on health and well-being can lead to potentially impoverishing health expenditures in the short and long run (Clarke and Le Masson 2017). Universal health coverage offers the greatest policy platform for improving health and well-being for all and for reducing the vulnerabilities of the most marginalized groups in society to disasters. The aim of universal health coverage (UHC) is to ensure that everyone has access to quality health care with-

out enduring financial hardship. During disasters, domestic financing backed up by international funding makes the foundation for the efforts of universal health coverage. Domestic financing depends upon the economic situation of the country and the community, and their economy might be in a weak situation even before disasters or after the disaster. So, we need to depend mostly on open public and private donations. For universal health coverage (UHC) to be truly universal, a shift is needed from health systems designed around diseases and institutions towards health systems designed for people, with people. From our fieldwork experiences, it is often seen that most of the donation or funding goes to the central cities or to the area accessible by roads. The community, which is geographically isolated, inaccessible by roads, is usually left behind. The proper visualization of overlapping and missing of the budgeting and financing is necessary to protect community people from financial hardships. Similarly, most of the outsiders (helpers) are paid or funded by the deploying agency. However, local health workers or volunteers at the community are mostly the ones to work but are often unpaid or underpaid. We should not forget that they are also the survivors, liable to be in a state of loss of family members and/or property. Most of the frameworks often ignore or primarily focus on the logistic management of the medical supplies; however, incentives, allowances, insurance, and security of the local health-care providers need to be thought of together with financial hardships of community people in the long term. Strong primary health care can help communities get the quality health services they need—without discrimination or financial hardship. Committing health spending to primary care not only saves money, but it also aids in the development of countries.

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14 Key Players of Cross-Sectoral Collaboration in DRR

Shoko Miyagawa, Tetsuya Myojo,
Yasuhiro Ueshima, and Archana Shrestha Joshi

14.1 Sendai Framework for Disaster Risk Reduction and People-Centered Disaster Reduction

The Sendai Framework for Disaster Risk Reduction, formulated at the 2015 Third United Nations World Conference on Disaster Risk Reduction, called for people-centered catastrophe reduction in its preamble (United Nations Office for Disaster Risk Reduction 2015). Disaster management practices must be multi-hazard and multi-sectoral accommodating in nature, accessible for efficiency and effectiveness, and require collaboration between the public and private sectors, civil society organizations, academic institutions, and scientific research organizations. Specifically, third sector organizations such as civil society organizations, volunteers, organized voluntary work organizations, and community-based organizations are expected to participate in the planning and implementation of disaster response and disaster risk reduction. The framework also recommends that local and national governments should collaborate with the third sector in policy formulation and implementation.

From the perspective of people-centered disaster reduction, recovery faces the difficult task of reconciling the dual goals of rescuing survivors as quickly as possible, and creating communities where people can live more comfortably and with less disaster risk. While the construction of urban infrastructure, housing, industrial units, and other facilities progresses relatively quickly, it takes time to rebuild people's livelihoods and communities. To rebuild local networks such as neighborhood associations and unions, to revitalize cultural resources such as tourist attractions and festivals, to coexist with the natural environment, and to build disaster-resilient education, health, and welfare services, it is necessary to provide long-term support to local residents and the community as a whole, in addition to developing the necessary infrastructure.

The fragmentation of communities due to disasters leads to the dilution of mutual aid and even self-help. This leads to people's isolation. There is an increase in the number of those requiring nursing care, suffering from loneliness, needing help from alcoholism, and domestic violence, which can have serious implications for health and life. Although the use of a lottery sys-

S. Miyagawa (✉)
Faculty of Nursing and Medical Care, Keio University, Fujisawa, Kanagawa, Japan
e-mail: miyagawa@sfc.keio.ac

T. Myojo
Japan Voluntary Organizations Active in Disaster, Tokyo, Japan

Y. Ueshima
Peace Boat Disaster Relief, Tokyo, Japan

A. S. Joshi
AMDA, Okayama, Japan

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tem ensures fairness when moving from shelters to temporary housing, it also separates residents from the neighborhoods they were familiar with before the disaster, severing community ties. Moving to public disaster relief housing makes for a more comfortable living environment, but at the same time, it is not easy to build a new community with strangers when one is missing the presence of long time neighbors.

In the Great Hanshin-Awaji Earthquake of 1995, approximately 48,000 temporary housing units were constructed in Hyogo Prefecture—the hardest hit area. However, by July 1999, when most of the temporary housing had been cleared, the number of lonely deaths had risen to 253. Compared to women, lonely deaths and alcohol dependence were more common to men (Sakurai and Ito 2013). This suggests that they tend to be more isolated from their neighbors than women and that they are at a higher risk of turning to alcohol to distract themselves from the isolation and sense of entrapment they feel in temporary housing, having lost their homes, jobs, and acquaintances.

Various efforts are being made to deal with the community fragmentation that occurs after a disaster and the health risks that arise from this fragmentation. These include the establishment of community centers for residents, door-to-door visits by livelihood supporters, and individual consultations (Sakurai and Ito 2013; Honda 2017). The role of the supporters is not merely to clean up houses immediately after the disaster and support survivors with food, clothing, and housing. The essence of their role is to help the survivors and their communities develop the strength to recover on their own, to accompany them through the recovery process, and to see that the local community regains its strength and creates a more livable community.

14.2 Cooperation Among Local Communities, Government, and the Third Sector

This section provides an overview of the role played by organizations involved in disaster relief in people-centered disaster reduction (Fig. 14.1).

The public sector is responsible for disaster reduction measures not only at the time of the incident but also during normal times. Local governments formulate disaster response plans

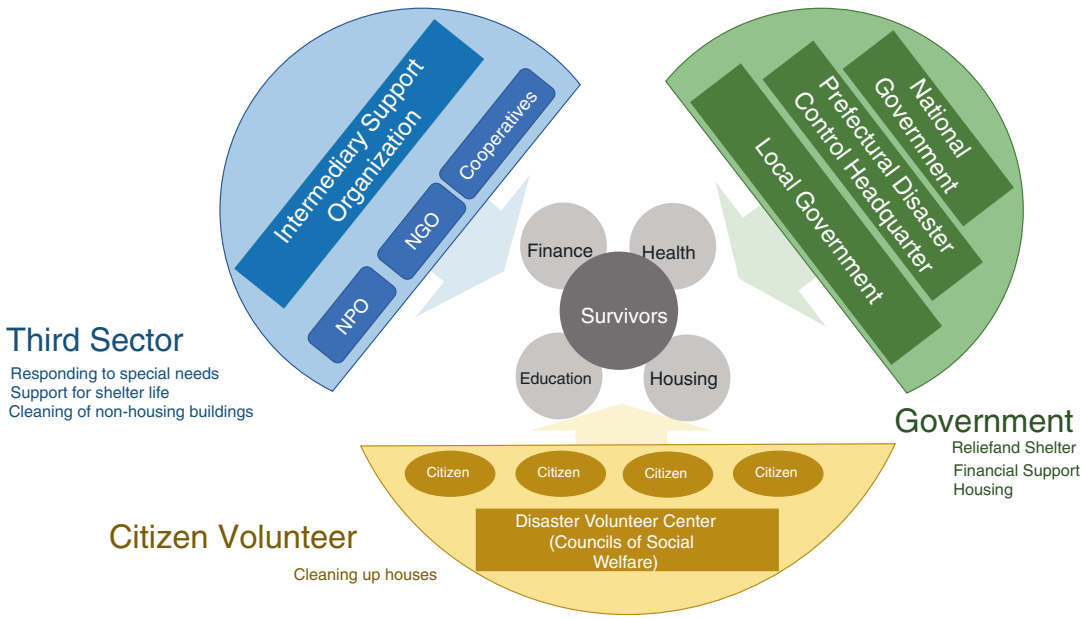

Fig. 14.1 Key players of cross-sectoral collaboration in DRR

for each area, stockpiles supplies in preparation for disasters, prepare hazard maps showing areas with high hazard risks such as cliff collapses and floods, and improve hazardous areas. In the event of a disaster, in accordance with the response plan formulated in advance and depending on the situation, the government will (a) collect and disseminate information, (b) set up and operate response headquarters, and (c) provide support to survivors by opening evacuation shelters. In addition, to promote supporters who are active in sites that cannot be covered by the government, the following measures will be taken: (d) improve the environment for the activities of support groups; and (e) establish a cooperative system with supporters.

The local government acts as a contact point for survivors for various kinds of support enacted by law. They are also responsible for the management of evacuation shelters where survivors who are unable to live in their own homes can take temporary refuge. In addition, they provide emergency temporary housing, manage the bodies of the deceased, assess the emergency risk level of houses, issue disaster victim certificates to residents, dispose of waste caused by the disaster, and perform other tasks related to recovery for the entire region.

Local governments have a wide range of duties to perform when a disaster strikes, but in principle, local governments are not involved in the restoration of the private property of affected residents. As a result of the Great East Japan Earthquake of 2011, 118,636 houses were totally destroyed, 182,193 houses partially destroyed, and 602,773 houses partially damaged. Many residences damaged by the tsunami had to be cleared of mud and cleaned before they were habitable again. It is often difficult for the already overwhelmed local governments to cope with the special needs of children, the elderly, and foreigners in evacuation shelters. Support for residents who have taken refuge in places other than designated evacuation shelters also tends to lag behind. Individual volunteers and disaster relief organizations often take the role of providing support in these areas.

The "third sector" refers to organizations belonging neither to the public sector (i.e., the government) nor to the private sector (profit-making private enterprise), such as charities, voluntary and community organizations, social enterprises, and cooperatives. In the third sector, there are many organizations responsible for disaster relief. In the aftermath of the Great East Japan Earthquake, many including individual volunteers, NPOs, international aid NGOs, and corporations, provided support for the disaster relief efforts because of the enormous scale of the disaster. In particular, NPOs, which are diverse in both size and nature of their activities, used their speed and expertise to respond to the needs and were important players in disaster relief. The number of NPOs and other support organizations that were active in the affected areas is said to have reached more than 1400. In addition, many NPOs were established in the affected areas after the disaster struck, and some moved beyond the urgent need to support disaster survivors to take on the role of long-term community development. Unfortunately, in some cases this had an adverse effect as support activities were concentrated and overlapped in affected areas because each NPO carried out activities at its own discretion. For this reason, an intermediary support organization that collects and disseminates information on the activities of NPOs and takes charge of coordination has become necessary. The intermediary support organization is also engaged in many initiatives that support recovery and reconstruction led by local communities in the affected areas.

Disaster risk reduction in Japan involves many actors, including the government, private sector organizations, third sector organizations, individuals, and local communities. However, it cannot be overemphasized that those in disaster risk reduction, post-disaster livelihood reconstruction, and recovery and reconstruction are residents and local communities. The public and the third sectors take the role of empowering individuals and local communities to become the main players in disaster recovery. Entities that come from outside the disaster area to provide support will withdraw once it is contained.

On the other hand, the reconstruction of people's lives and local communities continues for many years. It is the local community that can provide this kind of long-term support. The key issue in disaster recovery is to create a system in which community-based supporters, with the cooperation of local governments and residents, can accompany people through difficult situations. The role of government and the third sector is to foster such local activities.

14.3 Citizen Volunteers and Their Coordination

The momentum of volunteer activities in Japan has grown significantly since the Great Hanshin-Awaji Earthquake in 1995. University students, NGOs from Japan and abroad, professionals such as doctors and architects, and volunteer groups from companies gathered in affected areas and provided support. On the other hand, there was no established contact point for volunteers in affected areas, and about 70% of volunteers were new to disaster response activities. This led to problems such as emotional friction with survivors and disunity of activity policies among volunteers, causing confusion in affected areas (Cabinet Office Japan 2018).

In response, the Disaster Countermeasures Basic Act of the Japanese government was amended in 1995 to clearly state that national and local governments shall strive to improve the disaster prevention environment through volunteers.

In the face of the unprecedented damage caused by the Great East Japan Earthquake, there was a nationwide upsurge in volunteerism to support recovery efforts primarily in Iwate, Miyagi, and Fukushima prefectures in Tohoku region. Around 1.5 million volunteers worked through the Council of Social Welfare. Volunteers played a major role in supporting survivors, by removing mud from the houses of the residents, cleaning up, and distributing supplies at evacuation centers.

In light of the importance of the roles that volunteers played in disaster prevention and response, the Disaster Countermeasures Basic Act was further amended to clearly state that efforts should be made to collaborate with volunteers. Since then, when typhoons, floods, earthquakes, and other disasters of a scale that cannot be handled by just the neighboring residents helping each other occur, disaster volunteer centers are opened to provide support to the survivors and to the community for recovery and reconstruction. In Japan, it is now a well-established practice for local governments to operate disaster volunteer centers as part of their regional disaster response plans.

The Council of Social Welfare (CSW) in Japan is responsible for the establishment and operation of these disaster volunteer centers. CSW is a special organization established by law. In normal times, CSW carries out projects in each municipality, such as welfare services and consultation activities for those who need support, including children, the elderly, and the disabled, support for volunteer and civic activities, and cooperation in community chest campaigns.

Disaster volunteer centers are operated based on the three principles of being "victim-centered," "locally based," and "collaborative." They coordinate with the government and other related organizations, identify the needs of disaster survivors and match them with volunteer activities, procure materials and equipment, disseminate information, and perform many other coordination tasks related to disaster victim support activities.

However when the amount of support needs exceed the human and financial capacities of CSW, it can be difficult to operate the disaster relief volunteer center only by themselves. For this reason, in recent years, CSW's and NPO's have been cooperating to establish a system of staff support. In cases where a disaster relief volunteer center in the affected area require more human resources, whether for pure man-power or technical skills, staff from CSW outside the affected area or NPOs with experience in operation may be requested to collaborate in the operation of a disaster relief volunteer center. In terms of funding, part of the costs of operating a disaster volunteer center will be covered by the national budget.

In Japan, the number of people affected by flooding continues to increase every year, and volunteers are becoming a major force in helping survivors to recover. In 2019, Typhoon Hagibis caused flooding in 39,245 houses nationwide, and the number of volunteer centers operated by the CSW totaled 112, with 196,740 volunteers (Council of Social Welfare n.d.). In one flooded house, generally, a total of 10–20 people were involved in cleaning up and moving furniture. From this, it is estimated that about 10,000–20,000 households (25–50% of the affected households) were being assisted. However, COVID-19 infection also casts a shadow on the disaster volunteers. In 2020, Kumamoto Prefecture was hit by a torrential rainstorm that occurred while COVID-19 was rampant. The number of volunteers who responded to this disaster stood at only about half that of the previous year's Typhoon Hagibis, which caused extensive damage in Nagano Prefecture. Balancing infectious disease control and disaster recovery has become both a major challenge and concern (see Box 14.1).

Box 14.1 Impact of New Coronavirus Infections

The global epidemic of COVID-19 halved the number of volunteer workers in 2020. The damage in Nagano Prefecture caused by Typhoon Hagibis in 2019 and that in Kumamoto Prefecture caused by the torrential rains in July 2020 was at the same level in terms of scale of damage. However, while the disaster volunteer center in Nagano Prefecture was able to finish responding to victims after 104 days of operation, it took 258 days in Kumamoto (see Table 14.1). In Kumamoto Prefecture, the spread of COVID-19 restricted the activities of volunteers and support groups from outside the prefecture. This suggests that the impact of infectious diseases is delaying the rebuilding of the livelihoods of disaster survivors.

Table 14.1 Comparison between Typhoon Hagibis in 2019 and the heavy rains in July 2020 (Prepared by Ueshima of Peace Boat Disaster Relief (Peace Boat Disaster Relirf n.d.) based on materials released by the National Council of Social Welfare and the Cabinet Office)

	Heavy rain in July 2020	Typhoon Hagibis in 2019
Region	Kumamoto prefecture	Nagano prefecture
Number of houses affected (destroyed, partially destroyed, partially damaged, flooded above floor level)	6860	6909
Number of volunteers	38,256	72,131
Number of days disaster volunteer centers opened	268	104

14.4 Efforts of Disaster Risk Reduction by the Third Sector Organizations

Organizations and groups from the third sector have become one of the major actors of disaster relief in Japan. Activities that utilize the specialties unique to each organization, such as healthcare, education, and foreign language interpretation, have been developed and play an important role in responding to the problems of the survivors, support evacuation life, and the reconstruction of daily life. In addition to third sector organizations, there are many private companies that act as supporters from the perspective of corporate social responsibility (CSR). The exact number of organizations that were active in the aftermath of the Great East Japan Earthquake was never ascertained; however, it is estimated to be between 1500 and 2000 based on actual records and between 5100 and 5200 based on a survey of NPOs. with legal status (JILPT 2015).

According to the report from the Red Feather Community Chest of Japan, the number of disaster volunteers who worked through third sector organizations in the Great East Japan earthquake was 4 million, far more

than the 1.5 million individual volunteers who worked through CSW operated disaster volunteer centers. This suggests that a variety of actors from third sector were involved in the relief efforts. Also, in the Kumamoto Earthquake of 2016, it is estimated that as many if not more people worked through the disaster centers operated by third sector organizations than did individual volunteers working under the CSW.

Third sector organizations that provide disaster relief in Japan can be broadly categorized as follows.

14.4.1 Nonprofit Organizations (NPO)

An NPO is a civic organization which aims to achieve a specific public interest and do social contribution activities on a nonprofit basis. They are funded by membership fees, donations, grants, and subsidies from members who agree with the ideals and objectives.

In Japan, the Great Hanshin-Awaji Earthquake of 1995 led to the enactment of the NPO Law, which allows civic organizations that engage in activities in the public interest to have a legal personality. The NPO Law was further revised in 2011, leading to the establishment of the certified NPO system, which allows organizations to receive preferential tax treatment. As a result, NPOs with a high level of public interest can receive preferential tax treatment for donations from individuals and corporations, leading to the strengthening of their financial base.

NPOs that specialize in disaster response have accumulated experience and know-how in disaster relief as their expertize. For this reason, there are cases that they collaborate with the government and other organizations in the affected area that do not necessarily have sufficient know-how in disaster response to ensure that appropriate support is provided according to the phase of the disaster. On the other hand, there are also cases where organizations that do not specialize in disaster response play the role of supporters who respond to special needs arising from disasters in their respective fields of expertise, such as childcare, education, nursing care, and support for the disabled.

14.4.2 Medical and Health Support NPO

NPOs that provide international medical assistance also act as medical and health responders in the event of a disaster in Japan. Some teams may join the medical coordination headquarters of the local government to provide support to local hospitals affected by the disaster, while others may provide first aid to survivors in the vicinity of evacuation centers. In addition, NPOs with nurses, public health nurses, caregivers, and other care workers may provide care and livelihood support to the elderly and other survivors who need medical care in evacuation centers. Many medical and health support teams will withdraw when the acute phase of the disaster is over and the local health care system is recovering. However, healthcare needs remains through-out the various phases of a disaster, and become an obstacle to livelihood reconstruction over the long term. Medium- and long-term health support have not received attention until now, but it is a major issue in medical assistance.

14.4.3 Companies and Economic Organizations

In recent years, companies have increased their presence in disaster relief activities. In the aftermath of the Great East Japan Earthquake, many companies provided various types of support, both direct support to the survivors and indirect support to relief organizations. Companies, as part of their corporate social responsibility, are providing support by leveraging their strengths, providing supplies and services, and encouraging employees to participate in volunteer activities and financial and material support to relief organizations. Keidanren (Japanese Business Federation), a nationwide economic organization in Japan plays a big role in coordinating these support activities.

14.4.4 Cooperatives

A cooperative is an organization of individuals and businesses that come together to help each other for a common purpose. Co-ops, agricultural cooperatives, fishing cooperatives, and others with members in the disaster or neighboring areas provide mutual aid payments, livelihood support, and help for the resumption of business to their members in the event of a disaster. They also use their nationwide organizational network to join in support activities not only for their members but also for the affected people in the community in general.

It is not only organizations from outside the disaster-affected area that play a major role for disaster relief; there are many from within the area as well. NPOs and volunteer groups that have been active in the area before the disaster, and those that were established later, use the local relationships and networks that they have established before as a foothold to understand and support the needs of the affected area and provide support. In contrast, organizations from outside the region have know-how on disaster response, but often do not have the network to reach the survivors. Supporters from outside are also those who will leave the area sooner or later. Those in the affected areas are expected to act not only as a link between internal and outside supporters in the emergency phase but also as entities who accompany people in their long-term recovery efforts. For a smooth transition from the emergency phase, in which external supporters play a central role, to the mid-to long-term phase, when local players are the key, the government, CSW, NPOs, and volunteers, both inside and outside the affected area must share and seek the goal of rebuilding the livelihood of the survivors by collaborating while fulfilling the roles that each entity is responsible for.

The activities of the third sector organizations may vary depending on the scale of the disaster. In the case of large-scale, widespread damage such as the Great East Japan Earthquake, where a tremendous number of houses were swept away by the tsunami, government social services and lifelines were cut off, and people were forced to live in evacuation shelters for onwards of 6 months, third sector organizations provide various kind of direct- and indirect support to the survivors. These include providing and transporting supplies, removing rubble and debris, cleaning up houses, caring for and playing with children, supporting children's and students' learning, serving food, and providing medical, nursing, and public health care and holding public health activities. Indirect support includes facilitating relief activities, such as information gathering and dissemination, donations, logistical support for organizations working in the affected areas, and support for the operation of disaster volunteer centers.

In addition, some of the third sector organizations provide highly specialized support including medical care by health professionals; removal of mud, and driftwood using power tools such as fixtures and chainsaws; emergency housingrepairs of dangerous areas such as rooftops; and professional services such as foreign language interpretation and legal advice. It is difficult for general volunteers to provide this kind of specialized support, so the third sector organizations with expertise and know-how in disaster relief play an important role.

It is essential for NPOs and volunteers to raise funds, materials, and other resources. However, while it is easy to do this in the event of a large-scale disaster, it becomes more difficult to secure a budget when responding to or preparing for a small-scale one. To help NPOs and other organizations develop the foundations for their activities, aid bodies (such as the Red Feather Community Chest of Japan and the Nippon Foundation) and the economic organizations need to provide intermediary support in terms of grants to the disaster relief organizations and volunteer groups.

14.5 Coordination by Intermediary Support Organizations

In disaster relief, the relationship between third sector organizations and the government is a midst of change. After the Great East Japan

Earthquake, the Disaster Countermeasures Basic Law clearly stated "cooperation with volunteers," and after the torrential rains in the Kanto and Tohoku regions in 2015, the Disaster Prevention Basic Plan included a specific action to "establish a place to share information with NPOs, NGOs and other volunteer groups" (Central Disaster Prevention Council 2020). Since then, "cooperation with volunteers" and "cooperation with NPOs and other volunteer groups" have been repeatedly emphasized (Japan Cabinet Office 2009, 2021). At present, Japan's Basic Disaster Management Plan states that the national government (Cabinet Office; Fire and Disaster Management Agency; Ministry of Education, Culture, Sports, Science and Technology; Ministry of Health, Labour and Welfare; etc.) and municipalities (prefectures) should respect the autonomy of volunteers and promote cooperation with the Japanese Red Cross Society, CSW, NPOs, etc., as well as with intermediary support organizations. Here we outline how intermediary support organizations, which play the role of coordinating support, have come to be the focus of attention in disaster relief and what roles and functions they are expected to play.

Reflections on the inadequate coordination of the third sector organizations and collaboration with the government in the wake of the Great East Japan Earthquake (see Box 14.2) have created the momentum for the establishment of an organization to handle a new coordination role. Japan Voluntary Organizations Active in Disaster (JVOAD n.d.), established in 2016, is a network organization that plays this coordination role. In addition to national social welfare organizations that provide disaster relief, JVOAD includes various organizations from the third sector, such as a network of NGOs that provide international cooperation, a network of NPOs that have been working on disaster prevention in Japan, Japanese Red Cross Society, The Salvation Army and other national disaster relief organizations with a similar awareness of the issues.

When two disasters occurred, a flood in the Kanto and Tohoku region in 2015 and the Kumamoto Earthquake in 2016, although JVOAD had not been established as a formal organization and

Box 14.2 Issues at the Time of the Great East Japan Earthquake

In the aftermath of the Great East Japan Earthquake in 2011, in addition to disaster volunteer centers, which coordinate individual volunteers, many third sector organizations both from Japan and overseas came to affected areas and provided supoort. Some teams arrived on the scene immediately after the disaster, and many activities were carried out, including soup kitchens, material support, and in education, health and welfare. However, although the government was aware of the role of the disaster relief volunteer center, it had little knowledge about the acceptance and coordination of third sector organizations with expertise and experience in disaster relief. From the government's point of view, the third sector organizations were not perceived as "major actors" and were not considered as targets for cooperation. In addition, there was no "coordination" function to grasp the overall picture of the support provided by the government, disaster volunteer centers, and third sector organizations, as well as to adjust for excesses and deficiencies in support. As a result, it took a long time for third sector organizations to build relationships with local governments and to understand the needs of local residents, and it was difficult to say that they were able to exert their full strength from the beginning.

For emergency humanitarian assistance in developing countries, the Code of Conduct for the International Red Cross, the Red Crescent Movement, NGOs in Disaster Relief (IFRC n.d.) and the Sphere Handbook (Sphere Association 2018) reiterate the importance of coordination. While it is common practice in international aid to provide support under coordination, as of 2011, such a concept had not been considered in Japan. This made it difficult, especially during the initial response, to confirm

whether there were areas where support had not yet reached and whether there were problems that had not been resolved. During the reconstruction period, coordinated centers were established in Iwate, Miyagi, and Fukushima prefectures, and networks were formed in Ishinomaki, Kesennuma, Rikuzentakata, and other municipalities, and information was shared among support groups, and coordination was attempted.

The issue of coordination, including with NPOs, was also pointed out in a report by Miyagi and Iwate prefectures that examined their response to the 2011 earthquake, as follows:

"The government did not distinguish between self-contained volunteer groups, such as NPOs and NGOs, and general volunteers, and did not establish an appropriate system for accepting each group (Disaster Response Verification Report on the Great East Japan Earthquake and Tsunami, Iwate Prefecture 2012 (Iwate Prefecture 2012))."

"To prepare for future disasters, it is necessary to establish a new system for coordinating the acceptance of NPOs and NGOs that is different from the one for coordinating the acceptance of individual volunteers through the disaster volunteer center (The Great East Japan Earthquake: Miyagi Prefecture's Six-Month Disaster Response and Its Verification, Miyagi Prefecture 2012 (Miyagi Prefecture 2012))."

was still in the preparatory stage as an organization at the time, it took on the role of coordinating support in the field, and the necessity and effectiveness of "tripartite cooperation" among the government, disaster volunteer centers, and the third sector organizations were recognized (see Box 14.3). Although JVOAD is a national-level organization, networking at a more local level is needed when looking at long-term recovery from disasters. The effectiveness of local networking after the Kumamoto earthquake has been recognized by the government. Training on networking through tripartite cooperation is now being conducted at the local level. In addition, the national disaster prevention basic plan clearly states "building a cooperative system including intermediary support organizations is necessary," and there have been movements such as the conclusion of agreements between the government and intermediary support organizations.

Box 14.3 Case Studies of Tripartite Cooperation Supported by an Intermediary Support Organization

1. Case study of the 2015 Kanto-Tohoku torrential rains

   In September 2015, when the momentum for the establishment of JVOAD was growing, a flood disaster caused by the Kanto-Tohoku Torrential Rain occurred. While more than 6000 residents were forced to live in evacuation centers, it was also necessary to remove sediment from houses, clean up, and provide livelihood support to evacuees in shelters and at home. There was a need for working with the government to tackle problems that could not be solved by the disaster volunteer centers (CSW) and NPOs on their own. Information sharing meetings were held where these three parties gathered to share and discuss issues. These meetings were the catalyst for the three parties to work together. For example, in previous disasters it was rare for support organizations to improve the environment inside evacuation shelters, but through the information sharing meeting at Joso City, they were able to recognize the issues and coordinate their activities for improvement of the evacuation shelters.
2. Case Study of the 2016 Kumamoto Earthquake

   In April 2016, two consecutive earthquakes of magnitude 6.5 and 7 struck Kumamoto Prefecture. 8,667 houses

were completely destroyed and 183,882 people were forced to evacuate. From the experience of the previous year's Kanto-Tohoku torrential rains, people learned that it is effective to set up an "information sharing meeting". On April 19, soon after the disaster, the "Kumamoto Earthquake Support Group Hinokuni meeting" was held, where the local and national government, CSW and NPOs participated and collaboratively discussed support plans. The issues of the evacuation shelters were shared, and with the support of the prefectural government, NPOs conducted a survey to understand the actual conditions of the shelters and became involved in improving the living environment and supporting the management of the evacuation shelters. Since then, they worked together to address issues related to the consolidation and closure of evacuation centers, the distribution of supplies to temporary housing, and the establishment of a system for mutual support in local communities. This collaboration also worked when there was confusion among evacuees over moving into temporary housing and dismantling condemned houses at public expense. The NPO managing the evacuation shelter, quickly caught the situation, and was able to work in between evacuee and local government to deliver the correct information.

In Kumamoto, information sharing and public-private partnerships among supporters led to the establishment of a network in the prefecture, and the Kumamoto Volunteer Active in Disaster (KVOAD) was established with local NPOs through this effort. KVOAD continues to link the support of residents and NPOs and to work in cooperation with the government. Its establishment has led to improvement of local disaster response capabilities.

Intermediary support organizations are required to promote cooperation among support-related bodies, such as the government, disaster volunteer centers (CSW), and NPOs. They identify gaps between the needs of survivors and available support by understanding the status of activities of each party and facilitate solutions.

In order to achieve this, the following systems are essential.

1. A system to identify the diverse needs of disaster survivors.
2. A system for collecting information on support from the government, disaster volunteer centers (CSW), NPOs, etc.
3. A system to hold "information sharing meetings", where supporters gather to share issues and discuss solutions.
4. In addition, even during normal times when no disaster has occurred, the system is expected to play a role to foster local organizations by conducting training and drills based on local issues and considers accepting support from outside the region, thereby improving the region's disaster response capabilities.

In July 2020, a large-scale torrential rain disaster occurred under the COVID-19 pandemic. The traffic of people to and from various areas to provide aid became a challenge. The local government was forced to limit the number of supporters from outside the affected prefectures. It was difficult to find a balance between "delivering the necessary support" and "preventing the spread of COVID-19 in the affected areas" (JVOAD 2020) (JPF 2021). The solution to this problem lies in building a prefecture-wide network to enhance local disaster response capabilities. In addition to the government, CSW, and third sector organizations in the prefecture, it is important for those involved in medical care, welfare, professional services, and business to collaborate in planning and training for support in the event of a disaster.

While the development of intermediary support organizations that are responsible for coordination has been promoted based on the experience of disaster response in recent years, there are still

issues that need to be addressed in the future. The current challenges include spreading the coordination system of intermediary support organizations to all regions; improving the quality of coordination so that cross-sectoral support can be provided in situations where multifaceted support is needed, such as health, welfare, and education; and establishing a sustainable system for intermediary support organizations, such as securing a financial base and human resource development. By working through these challenges, coordination ability in disaster relief will be expanded, the local capacity to provide and receive support will be strengthened, and the unevenness of support will be eliminated. Continuous efforts toward a society where there are no "invisible needs" or "survivors left behind" is required.

14.6 Disaster Risk Reduction and Health

Medical and health supporters are expected to act first and foremost to respond to the rapid increase in medical needs immediately after a disaster. At the same time, it is also important to identify unseen needs and listen to the voices of the voiceless in order to prevent the deterioration of health conditions, isolation, and lonely deaths during prolonged evacuation. For this purpose, medical and health supporters are required to collaborate with various supporters in a cross-sectional manner and to create a system for this purpose.

External medical and health supporters who go into affected area as emergency assistance acsertain the health status of the population through evacuation shelter assessment. On the other hand, they do not know where to connect the health needs revealed by the assessment because they do not have information and networks about local medical and health resources.

Furthermore, as time passes after the disaster and the response to acute and chronic illnesses settles down, mental health needs will increase. Since mental health needs are often latent, it is important to find out what these needs are. In some cases, the need for psychological and spiritual support for children and parents became apparent through non-medical support activities (e.g., support for children's play), and supporters who noticed the care needs of the elderly in evacuation centers were able to provide appropriate support by connecting with volunteer nurse groups through information sharing meetings. In disaster-stricken areas, a variety of needs, including health care needs, are inextricably linked. Cross-sectoral cooperation among supporters is essential for discovering and responding to health care needs.

The major medical and health related disaster relief teams and their roles will be discussed in detail in Chap. 15, but this section will briefly introduce some of the teams and programs, including those institutionalized by the government and those in the third sector.

14.6.1 DMAT (Disaster Medical Association Team)

DMAT is a medical team specially trained to provide emergency medical treatment and medical support activities in the hyper-acute stage within 48 h of the occurrence of a disaster. Each DMAT team includes one or more nurses.

14.6.2 First Aid Team

A medical team dispatched by the Japan Medical Association Team (JMAT), university hospitals, the Japanese Red Cross Society, the National Hospital Organization, the Japan Hospital Association, the All Japan Hospital Association, etc. It takes over the duties of the DMAT and provides medical support in the acute phase of a disaster. Each team includes one or more nurses.

14.6.3 DPAT (Disaster Psychiatric Assistance Team)

DPAT is a medical team that operates when the mental health care function in the disaster area is temporarily reduced and the demand for mental health care increases due to new mental problems caused by disaster stress.

14.6.4 DHEAT (Disaster Health Emergency Assistance Team)

DHEAT is a team led by public health nurses that responds to health and hygiene issues during a disaster. It conducts hygiene management of the living environment in evacuation shelters, looks after maternal and child health, mental health, conducts infectious disease surveillance, and visits evacuees at home.

14.6.5 Disaster Relief Nurse

Nurses who are responsible for providing appropriate medical and nursing care in disaster areas so that disaster survivors can maintain their health. They also play a role in relieving and supporting the burden of local nurses who are often overwhelmed by the disaster. They have completed a certain level of training and are registered with the prefectural nursing association.

14.6.6 Community Disaster Mitigation Nurses Program by Japan Society of Disaster Nursing

The purpose of this program is to conduct disaster mitigation activities for residents of residential areas during the calm period in order to mitigate disasters in the fields of health and welfare for people in need of care, in cooperation with voluntary disaster prevention organizations and municipal offices. Currently, the society is providing training for instructors and aims to support the health and lives of disaster-affected residents together with municipal administrative personnel and local residents.

14.6.7 Prefectural Disaster Medical Coordinators (Regional Disaster Medical Coordinators)

These coordinators are appointed by prefectural governors and are responsible for organizing meetings of disaster medical personnel and coordinating with other organizations in the event of a disaster. Within 48 hours of the occurrence of a disaster, DMATs take on the role of the coordination function, giving disaster medical coordinators time to setup, at which point they will take over the role.

Most of the national-level disaster medical assistance such as DMAT and disaster relief nurses, in addition to other major third sector medical supporters such as medical NGOs, begin their support activities under the coordination of the local government's disaster control headquarters. On the other hand, some co-medical and allied health support groups, such as psychological support teams, rehabilitation teams, and volunteer nurse groups, may not be coordinated by the disaster control headquarters and go into each local community as civil aid. When the scale of the disaster is large and the local medical resources are severely damaged, coordination between the disaster control headquarters and the third sector support coordination organizations will lead to smooth health support. Channels are needed for cooperation between government and private medical supporters. This includes holding information sharing meetings, training support coordinators, and collecting information on the status of support activities. It is important for the long-term care of disaster victims to create an environment that enables cross-sectoral support through the use of information and communication technology and other means to improve efficiency.

14.7 Summary

This chapter provided an overview of what actors are involved in "people-centered" disaster reduction. The role of individual volunteers and third sector organizations, along with local communities and governments, will become increasingly important in disaster response. The role of third sector organizations is significant as an entity that can work with the people in the affected areas to support their recovery and as an entity that can cross-sectionally respond to various health risks that may arise in the process of mid- to long-

term livelihood reconstruction. In Japan, with the establishment of intermediary support groups that are responsible for coordination, collaboration among the government, the third sector, and local communities has been progressing, but the efforts are still insufficient. While cross-sectoral collaboration has the potential to meet diverse and potential needs, it also has a large overhead. The challenge for efficient collaboration will be to design a system that allows for the smooth distribution of information and to utilize information communication technologies to achieve this.

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15 Roles, Rules, and Tools for National Humanitarian Networks on H-EDRM

Yasuhiro Ishimine

15.1 Introduction

A number of people can lose their lives if effective relief activities are not promptly initiated immediately after a large-scale natural disaster has occurred. Health and medical workers as well as rescue team members must work in chaotic and dangerous situations during the hyperacute stage of such a disaster. They should collaborate with civil defense officials, firefighters, police officers, and other stakeholders to maximize their overall performance in order to mitigate damage and restore the livelihood of the people affected by the disaster.

We have already experienced several serious natural disasters and learned many lessons from our responses to them; this includes incidents in which more people could have survived if relief activities had been well-organized and had been conducted efficiently without confusing or redundant information. Retrospective studies on disaster response activities have revealed that available human resources and logistics were not used in many cases simply because there was no sharing information regarding their availability or the simultaneous occurrence of high-priority tasks at different locations.

These lessons, especially those learned from the Great East Japan Earthquake, have enhanced the organization of disaster assistance teams and the training of the members of such teams in Japan, enhancing their disaster responses. A notable feature of this trend in Japan is that various professional organizations have launched associations with specialized support teams based on their field of expertise. For example, psychiatrists have established mental care teams, dietitians have formed nutritional counseling teams, and physiotherapists and occupational therapists have organized rehabilitation assistance teams. These various teams have worked in collaboration with Japanese Disaster Medical Assistance Teams (DMATs) which mainly consist of emergency physicians, during recent natural disasters in Japan. Joint training involving multiple team associations are also widely conducted to build good relationships. In addition, enormous efforts have been made to take advantage of recent rapid advances in ICT to efficiently share disaster information.

The tragedies caused by two earthquakes prompted Japan to enhance its information technologies to facilitate disaster responses. The first was the Kobe earthquake, which occurred in 1995 and claimed over 6,400 lives. Hospitals in the most severely affected areas could not pro-

Y. Ishimine (✉)
Department of Health Crisis Management, National Institute of Public Health, Wako-shi, Saitama, Japan

Volcanic Disaster Research Center, Mount Fuji Research Institute, Yamanashi, Japan
e-mail: ishimine@mfri.pref.yamanashi.jp

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vide sufficient medical services during the disaster because so many patients visited hospitals, despite these hospitals being severely damaged and most of their equipment inoperable. In contrast, few patients visited large hospitals outside of the disaster area, even though these hospitals were prepared to accept ICU patients who were, for example, caught in collapsed buildings. These situations occurred primarily because the hospitals could not share information with one another. The Kobe earthquake occurred during a period when the world was becoming increasingly connected via the Internet. Thus, the idea was posed that sharing hospital information using the Internet might facilitate efficient responses during disasters. This resulted in the development of the Emergency Medical Information System (EMIS), which shares information on hospital conditions during disasters and has been operated by the Ministry of Health, Labour and Welfare of Japan since 2006.

The second tragedy was the Great East Japan Earthquake, which had a magnitude of 9.0 on the Richter scale (all indications of magnitude below are based on the Richter scale) and hit the coastal area of east Japan on March 11, 2011. The earthquake triggered a large tsunami and resulted in more than 22,000 casualties. The Great East Japan Earthquake occurred when smartphones began to play a major role as personal communication tools. People in disaster areas used smartphones to contact their families, and people all over the world viewed photos of the catastrophe that were posted on the world wide web from the area hit by the tsunami. Search and rescue teams also used social network services to identify people who needed help. The experiences of the Great East Japan Earthquake led many to recognize the potential of information technologies to improve the quality of relief activities during disasters. Accordingly, nationwide information systems for facilitating health and medical support during disasters were implemented. Japan-Surveillance in Post Extreme Emergencies and Disasters (J-SPEED) is an example of such an information system; its function and creation are outlined in the third section of this chapter.

The usefulness of these assistance teams and information systems has been verified in a number of local and regional natural disasters that occurred in the decades after the Great East Japan Earthquake in Japan. This means that Japanese countermeasures for protecting people's lives and health from natural disasters in Japan have been rapidly improving in the quarter of the century after the Kobe earthquake. Close coordination between stakeholders is, however, essential to making these assistance teams helpful and the information system effective. In particular, conditions during a disaster often require quick responses to uncertain situations that vary from hour to hour and prompt decision-making regarding high-priority tasks. The various stakeholders should share common rules to meet such demands. In addition, the members of disaster assistance teams must be trained repeatedly to master practical procedures. This chapter outlines the present state of Japan in its effort to enhance health and medical support during disasters by organizing assistance teams, developing information tools, and establishing training courses.

15.2 Humanitarian Networks for Cooperation

Before 1995, when the Kobe earthquake occurred, health and medical assistance during natural disasters was conducted primarily by local governments, the Red Cross Society, and volunteers. The Japanese Red Cross Society was established in 1887, and soon after, it deployed a medical team for relief activities at the Bandai volcano in Fukushima Prefecture, which erupted in 1888 and killed 477 people. This was only 20 years after the Japanese political system changed to a modern regime in 1868. This means that disaster medical assistance commenced contemporaneously with modern medicine in Japan. The Japanese Red Cross Society also carried out relief activities during the Nobi earthquake in central Japan in 1891, which killed more than 7000 people, and the Meiji Sanriku Tsunami in the Tohoku region of Japan in 1896, which killed approximately 22,000 people.

These activities significantly increased membership in the Japanese Red Cross Society, which reached 900,000 in 1903 (Konishi 2014). When, in 1923, the Kanto earthquake hit Tokyo and the surrounding area and caused the death of 105,000 people, many nurses provided health and medical care. This is the origin of the local health services that health workers have long provided in Japan. The Community Health Act, executed in 1947, prescribes that all 47 prefectures and designated large cities in Japan must establish health centers. Approximately 40,000 health workers are currently employed in health centers, playing a key role in public health management during disasters as well as in ordinary times.

By reading the above descriptions, some readers might think that Japan had established a sophisticated health and medical management system for natural disasters at a very early stage of modernization based on abundant experience and knowledge accumulated through devastating disasters in the past. In fact, the disaster medical system has been stagnant since the end of World War II, in contrast to remarkable advances in various other medical services. One reason for this stagnation is that countermeasures against natural disasters have focused too much on building large structures like embankments or coastal levees, the expectation being that the rapid progress of science and technology would overcome vulnerability to natural disasters. For example, the Building Standards Act was executed in 1950 to promote the construction of earthquake-resistant buildings based on lessons learned from a magnitude 7.1 earthquake that occurred in Fukui Region of Central Japan in 1948 and that killed 3769 people. Large tide walls were constructed in the 1950s because several typhoons hit coastal areas of Japan, each of which caused more than 1000 casualties.

The Kobe earthquake was the first natural disaster to cause more than 1000 casualties since the Isewan typhoon that hit coastal areas of Central Japan in 1959, which resulted in approximately 5000 people missing or dead. In the Kobe earthquake, more than 6000 people were killed in Kobe city, and the surrounding areas and many city offices and other facilities were severely damaged. Water and power failures occurred over a large area. This forced many hospitals in the disaster area to reduce medical services, and as a result, many people lost their lives, even though they would have survived if they could have received medical treatment under normal conditions. In contrast, many hospitals outside of the severely affected areas could not effectively deploy human and medical resources, even though they could have accepted many patients. For example, on the day of the Kobe earthquake, a relatively small hospital in a severely affected area had only 7 doctors but accepted 1033 patients (a doctor to patient ratio of 1:148); however, a large hospital a mile away had 112 doctors and accepted 366 patients (a doctor to patient ratio of 1:3) (Homma 2015). The essential reason for this imbalance was the failure of the hospitals to share information.

The preparedness of hospitals and other medical organizations for natural disasters was insufficient in a variety of ways at the time of the Kobe earthquake. Few hospitals had response plans for establishing a command system for emergency management, and thus, they could not conduct effective, well-coordinated response activities. They had insufficient pharmaceutical stockpiles. Neither had any water, food, or energy reserves. They failed to distribute medical resources efficiently because the concept of triage was not widely known at the time in Japan. These lessons led to a thorough review of the medical responses to the Kobe earthquake, resulting in a national overhaul of the framework for disaster medicine.

The national government produced a new regime of disaster medicine that included four main subjects based on research into the medical assistance provided during the Kobe earthquake (Working Group on an Ideal Regime of Disaster Medicine Suggested by the Kobe Earthquake 1996). The first task was to designate some hospitals as “disaster base hospitals” that would play a central role during disasters. The second was to develop the Emergency Medical Information System (EMIS), which is a web-based tool for sharing medical information. The third was to prescribe the procedure for effectively arranging long-distance transportation of patients using

aircraft belonging to various stakeholders. The fourth was to organize DMATs that could be sent immediately after a disaster (Kondo et al. 2009). EMIS began operating in 1996 and the DMATs were officially established in 2005.

As described above, the regime of disaster medicine in Japan was completely renovated in the decade after the Kobe earthquake. The new regime has worked well at least in responses to relatively small disasters, such as two earthquakes in Niigata Prefecture in Central Japan: the Chuetsu earthquake (magnitude 6.8) occurred in 2004 and resulted in 68 deaths, and the Chuetsu-Oki earthquake (also magnitude 6.8) occurred in 2007 and resulted in 15 deaths.

The Great East Japan Earthquake, however, revealed that the level of preparedness was inadequate. The area affected by tsunami were much larger than was the case in the Kobe earthquake. So was the population in the affected area. Many government offices and health centers in coastal areas were totally inundated or severely damaged by the tsunami, and most of the functions of these facilities were halted. Because of the Fukushima Daiichi nuclear disaster, all of the staff and patients in many surrounding hospitals were forced to evacuate during an acute phase of the disaster. This means that much of what occurred during the Great East Japan Earthquake exceeded the scope of expectations, and thus, relief activities faced extreme challenges.

To tackle these challenges, various health and medical professional organizations hastily established assistance teams similar to DMATs and conducted relief activities based on their own specialties. These same organizations have recently launched official associations of special-purpose assistance teams, such as the Disaster Psychiatric Assistance Team (DPAT) organized by psychiatrists to focus on mental health and the Japan Rehabilitation Assistance Team (JRAT) organized by physical and occupational therapists and other experts related to rehabilitation to support disabled people during disasters. Many Japanese health and medical workers believe that these organizations should enable the resolution of many issues, including the long-term assistance required after disasters.

However, many are also aware of the importance of a more powerful command system that facilitates information sharing and enhances effective collaboration between various assistance teams. The most serious cause of confusion for relief activities during the Great East Japan Earthquake was the lack of a well-organized decision-making procedure based on reliable information and scientific evidence. Thus, many members of disaster assistance teams were at a loss regarding what to do in areas hit by a tsunami in 2011 because many local health centers were severely damaged and not functioning. As a result, they could neither see the bigger picture of the disaster nor obtain information regarding high-priority tasks. Therefore, the Japanese government established the Disaster Health Emergency Assistance Team (DHEAT) in 2018 to support local health centers in coordinating health and medical assistance during disasters.

As there are numerous assistance teams in Japan today, the outlines of some of these teams are described below.

1. DMAT = Disaster Medical Assistance Team

   DMATs primarily focus on emergency medical care in the acute phase immediately after the onset of a large-scale natural disaster or major accident. The Japanese government launched the DMAT project in 2005 based on a review of incidents that occurred during the Kobe earthquake in 1995 and trial operations during some incidents including the Chuetsu earthquake in 2004. One unit of a DMAT usually consists of four or five members: a physician, nurses, and logistic and processing personnel who usually work at the same hospital. Though significantly smaller than such units in the United States, this makes it possible for a Japanese DMAT unit to be deployed promptly in a single vehicle in case of an emergency. DMAT members are rigorously trained through repetitive drills on disaster responses and are highly mobile even in extraordinary situations. Some of the senior members of a DMAT serve as disaster medicine coordinators for local governments and control the overall medical response in a

disaster area. To support this role, the DMAT gathers and analyzes information and develops activity plans. During the Great East Japan Earthquake, 383 teams comprising 1,852 members were deployed to disaster areas for 12 days after the earthquake. The number of DMAT members reached 14,000 in 2019, though it only had approximately 5000 members in 2011, immediately before the Great East Japan Earthquake.

2. DPAT = Disaster Psychiatric Assistance Team

   DPAT specializes in psychiatric assistance during disasters. The organizational framework and activities of the DPAT are similar to those of the DMAT, though the DPAT is deployed much longer than the DMAT, typically several months after the onset of a disaster. The Japanese government launched the DPAT in 2013 based on lessons learned during the Great East Japan Earthquake. An after-action review of medical responses revealed that psychiatrists were needed to support a number of times during the acute phase; however, mental care during disasters has typically focused on long-term disorders such as post-traumatic stress disorder and depression, which usually develop several months after a disaster. Acute phase support includes psychiatric care for patients who experience the exacerbation of pre-existing problems in an evacuation shelter, consultations with family members of victims who died suddenly, and escorting inpatients being transported from hospitals that have been severely damaged and forced to close their facilities.

3. JRAT = Japan Rehabilitation Assistance Team

   JRAT is organized by a consortium of the Japanese Association of Rehabilitation Medicine, the Japanese Physical Therapy Association, the Japanese Association of Speech-Language-Hearing Therapists, and ten other associations. The JRAT supports disabled and elderly people who are forced to stay in inconvenient evacuation shelters during disasters. For example, the JRAT encourages people in evacuation shelters to exercise in order to prevent the development of disuse syndrome, provides joint range-of-motion training, and offers instruction on how to walk with a crutch. To improve the quality of life in evacuation shelters, the JRAT also builds ramps for wheelchairs, lays ground guide tape for the visually impaired, and installs handrails in restrooms.

4. JDA-DAT = Japan Dietetic Association-Disaster Assistance Team

   The JDA-DAT was established in 2012 and consists of dietitians who belong to the Japan Dietetic Association. The JDA-DAT provides nutritional support during disasters. In order to maintain dietary and nutritional conditions, the JDA-DAT members offer advice and provide assistance to disaster-affected people, particularly those staying in evacuation shelters. They transport special foods via their own trucks to provide assistance to vulnerable people, including infants, elderly people, and individuals with dysphagia, food allergies, or metabolic disorders, who cannot eat food usually supplied in evacuation shelters.

5. DHEAT = Disaster Health Emergency Assistance Team

   The DHEAT consists of public health professionals who usually work in a public health center operated by a local government. The main role of the DHEAT is to support the coordination of the headquarters of local governments in a disaster area. The DHEAT gathers and analyzes information on health and medical requirements and controls the deployment of disaster assistance teams. A review of the Great East Japan Earthquake revealed that relief activities were ineffective because, primarily, of the lack of well-defined command and control procedures, even though a number of health and medical workers visited the disaster areas. The review also indicated serious problems with the health management of evacuees and hygiene measures in evacuation shelters, which were caused primarily by prolonged evacuation. The Japanese government initiated a DHEAT training course in 2016 and officially launched the operation during an actual disaster in 2018, when heavy rain caused flooding in large areas of western Japan, resulting in 245 missing or dead.

6. ISUT = Information Support Team

   The Japanese government established the ISUT in 2019. The ISUT consists of experts in geographic information systems (GIS) that integrates disaster-related information gathered from a number of stakeholders and distributes it with multifold data formats to be used in any system. The ISUT uses the Sharing Information Platform for Disaster Management (SIP4D), which is an information sharing platform for disaster management developed by the National Research Institute for Earth Science and Disaster Resilience, Japan. We will outline the function of the SIP4D in the next section. Although the SIP4D automatically collects plentiful amount of information, some disasters require unanticipated types of information, and so, the ISUT promptly responds to generate universal GIS data. For example, the ISUT generated a map of high-priority roads for recovery efforts when Typhoon Faxai hit Japan in 2019 and caused numerous trees to collapse and obstruct roads.

15.3 Information Tools Based on ICT

As described in the previous section, a number of special-purpose assistance teams were organized in the decade after the Great East Japan Earthquake. These teams work together during a disaster primarily by sharing information at the disaster headquarters, which is usually established in the office of a local government of a disaster area. Information can be shared more efficiently by using functional information tools connected via the Internet, with responders working in a disaster area and those waiting outside the area serving as backup. This means that we can reduce the mismatch between demand for relief activities and regional disparity of assistance. Functional information tools based on ICT are definitely essential for efficient relief activities during disasters.

The Internet has been widely used to facilitate disaster responses in Japan since the 1995 Kobe earthquake. Based on the lessons learned from the earthquake, the DMAT secretariat launched the operation of an information tool called EMIS, which stands for an emergency medical information system. The EMIS connects DMAT members via the Internet to share information on the status of medical facilities in disaster areas, as well as the activities of DMATs and other health and medical assistance teams. The EMIS is also used to share information on evacuees and evacuation centers. However, statistical data derived from the medical records of patients examined in first aid centers in disaster areas were not included in the EMIS. Such data have been gathered via paper-based documents via J-SPEED, a reporting system that can now be used as a smartphone app called J-SPEED+.

A variety of information on the damage caused by a disaster, including the distribution of seismic intensity, extent of area inundated, number of casualties, power supply status, and road conditions, has been gathered by governmental officials, public enterprises, and academic institutes. Most organizations now publish such information via their own websites, and a great quantity of related information can be obtained in this manner. When health and medical assistance teams gather such information by visiting individual websites, they often encounter difficulties in unifying similar data derived from different agencies and in incorporating additional assessment criteria into an existing dataset. Many geographical datasets are embedded in a web-mapping system or provided as a unified figure, which makes them difficult to combine with other datasets. Other difficulties arise from the classification of parameters. Some organizations classify the degree of damage into five or ten levels, but others divide them into only two, such as “good” and “bad.” Other problems arise from restrictions on sharing personal data, especially information related to patients.

To address the above issue, the Cabinet Office of Japan created the Strategic Innovation Promotion (SIP) Program in 2014 and developed the SIP4D (Usuda et al. 2019). The SIP4D is not a tool that consolidates large quantities of data but rather a converter that connects various datasets.

This enables the compilation of a large number of datasets regardless of the content uniting them in an interoperable platform. This means that various organizations, such as the DMAT secretariat, can generate a tailored map by combining GIS data obtained through the SIP4D.

Here, we describe the outline of EMIS, J-SPEED+, and SIP4D, which are now widely used by disaster assistance teams.

1. EMIS = Emergency Medical Information System

   The EMIS is a central to decision-making for health and medical assistance during a disaster, as it collects, via the Internet, information about hospitals, clinics, evacuation shelters, and assistance teams deployed in a disaster area using well-defined assessment criteria. EMIS includes a list of basic hospital information, such as the numbers of doctors, nurses, and hospital beds, which is updated on a regular basis. After the onset of a disaster, DMAT members also share information on the number of patients requiring immediate medical treatment, the possibility of medical examinations, the number of available ICU beds, the availability of DMAT assistance, the amount of water and food available, and fuel requirements. Clerks in each hospital are rigorously trained through repetitive drills to promptly assess the conditions of buildings, the power supply, water, means of communication, and other aspects of their hospital and to enter these into the EMIS when an incident occurs. The EMIS can also display geographic information on a map.

   If a hospital is too severely damaged to have access to the EMIS, a nurse at a local health center in the neighborhood or a DMAT member sent as an advance party to assess damage can enter the information instead. To ensure prompt reporting on a situation even in the event of serious devastation, many DMATs and local health centers use satellite-based mobile communication equipment. The capacity to share information about evacuation shelters was added to the EMIS after the Great East Japan Earthquake because DMATs and other assistance teams found extremely high demand for professional health and medical support for evacuees in the shelters.
2. J-SPEED+ = Japan-Surveillance in Post Extreme Emergencies and Disasters Plus

   J-SPEED+ is an information sharing application developed for smartphones and tablets that use the paper-based format J-SPEED. J-SPEED integrates the medical records of patients examined in first aid centers in disaster areas. The original SPEED was used to coordinate international relief activities during a 2009 disaster in the Philippines caused by a tropical storm. J-SPEED was adapted to Japan by, for example, decreasing the components related to tropical infectious diseases and increasing those related to geriatric conditions (Kubo et al. 2014).

   J-SPEED+ helps assess recovery conditions of disaster areas because it adopts unified survey items with a simple evaluation index that can easily be used by any health and medical assistance team. As a result, it has successfully reduced confusion by comparing inconsistent reports from various assistance teams, many of which consisted of handwritten notes. Following the success of J-SPEED, the World Health Organization recently introduced the Minimum Data Set (MDS), which is based on J-SPEED, as a worldwide standard format for the rapid assessment of a disaster.
3. SIP4D = Sharing Information Platform for Disaster Management

   As described above, SIP4D was developed by the SIP Programs in 2014. SIP Programs aim to advance collaboration between a number of governmental organizations, public enterprises, and private companies in diverse fields of science and technology. This includes an automated driving system and advanced medical diagnosis based on artificial intelligence to create valuable products for society. SIP4D was developed by one SIP program called Enforcement of Resilient Function for Disaster Reduction and Mitigation.

   An outstanding feature of SIP4D is that it does not directly collect information from a number of related organizations but trans-

forms the format of data to adapt them to any information tools used in all related organizations. This means that SIP4D facilitates information sharing between various stakeholders working during a disaster, even as they use their own independent and distributed information tools. In a sense, SIP4D is a pipeline for disaster information. This approach is especially appropriate for Japan because there are a number of organizations that possess unique information tools comprising an enormous dataset with exclusive formats.

For example, the Japan Meteorological Agency maintains a dataset of historical seismic intensities in its information tool; the Ministry of Land, Infrastructure, Transport and Tourism a dataset of landslides triggered by earthquakes; the Fire and Disaster Management Agency a dataset of fires caused by earthquakes; and the National Police Agency a dataset of highway regulations created in response to earthquakes and fires. Each organization provided local governments, mass media, and other stakeholders with such datasets as summary figures and lists before SIP4D is available. Many organizations did not publish their datasets but only summary figures and lists via the Internet. Therefore, these datasets could not be combined to create an integrated map.

SIP4D makes it possible to convert a data in an arbitrary format into one that includes digital GIS. As a result, anyone may easily obtain any type of map that might prove helpful in making decisions regarding high-priority tasks. Figure 15.1 is an example of the kind of map generated using SIP4D; it illustrates the distribution of seismic intensities actually observed during the 2016 Kumamoto earthquake (magnitude 7.3) as well as the locations of hospitals. The list on the right shows hospitals ranked in order of seismic intensity, which can be used to estimate the urgency of the need for relief activities at each hospital.

15.4 Rules for Efficient Use of Information

Over the past quarter of a century, Japan has developed human resources, human networks, and supporting information tools for disaster response. The development has been significantly enhanced by the lessons learned during the Kobe earthquake and the Great East Japan Earthquake. A number of experts in various health and medical fields now participate in training programs for disaster response, and sophisticated information tools with GIS-based maps are widely used via the Internet. Thus, Japan's ability to respond efficiently and effectively to disasters has improved significantly in recent years (Kondo et al. 2019).

To maximize the performance of relief activities as a whole, a number of assistance teams with an array of functions must be organized into a unified system. Each assistance team should be familiar with the specialties and action guidelines of other teams to understand the procedures for working with together. It is also important to follow a common rule to establish an efficient collaboration. Many Japanese assistance teams are now familiar with the concepts of the Incident Command System adopted in the United States for coordinating relief activities. In addition, the philosophy of the Sphere Project is widely understood. As a result, many assistance team members appreciate the importance of coordination for efficient and effective responses.

In addition, we need to establish a common rule regarding the procedure for sharing information to make appropriate decisions on disaster responses. First, liaison officers from each assistance team should attend daily meetings of the disaster response headquarters. They should briefly describe the present status and future plans of their efforts and communicate with other teams to ascertain what actions must be prioritized in the collaboration. The information should be shared with members of each assistance team, including those who are waiting outside the disaster area to begin their involvements in the coming days.

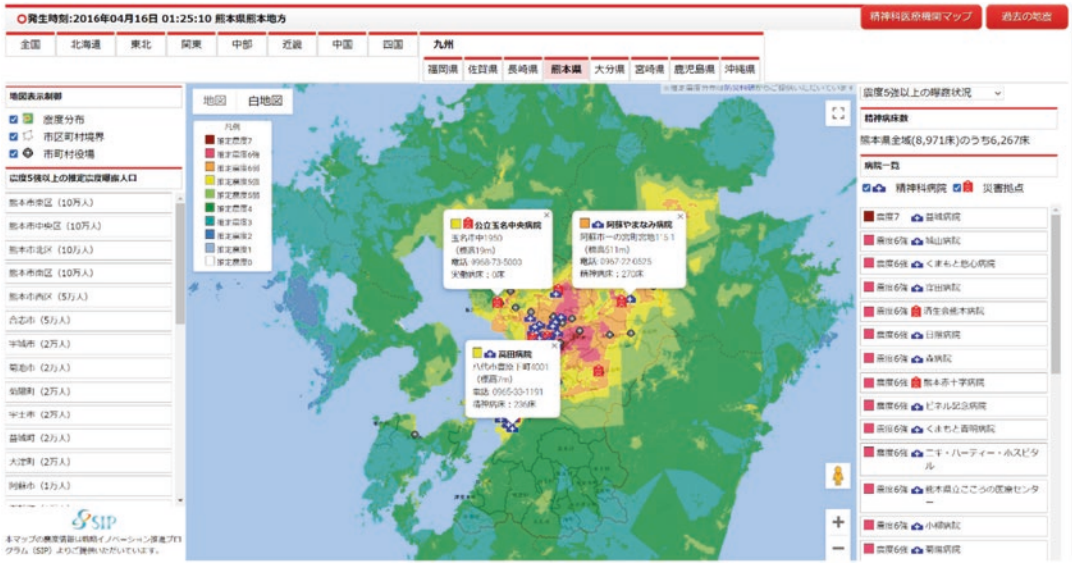

Fig. 15.1 Example of a map using a dataset supplied by the SIP4D. The map shows the distribution of seismic intensities and the location of hospitals. The list on the right-hand side indicates hospitals located in severely damaged areas

Any information tool should be used carefully. We should be aware that too much information without any evaluation standard increases the difficulty of making a decision. It is crucial to integrate a variety of disaster information into sophisticated criteria that are directly incorporated into action plans. The SIP4D, for example, should be improved based on user reviews because it is not sufficiently customizable in terms of the information essential for each assistance team, even though it now involves multiple superimposable map layers of related information.

We also need a common rule on the procedure for unifying information that is often collected by related organizations, such as information on the conditions of evacuation shelters. When we attempt to merge such information into a unified dataset, we often encounter difficulties because the information involves various components and evaluation standards with different data formats. Descriptions of some components may be too qualitative, as in, for example, good/bad or available/unavailable. To facilitate the production of statistics that describe a disaster as a whole, it is desirable to quantify evaluation standards.

Timestamp information is also crucial for the appropriate integration of multiple datasets. The conditions rapidly change during a disaster, and so, we should distinguish the latest information from older information. Since there may be a time lag between when the information is obtained and when it is entered into an information tool, we should provide a clear indication of when an event actually occurs. In addition, some information may be wrong, even if it is the latest, and so, it is desirable to indicate the degree of reliability of the information. We should establish a procedure for confirming the actual conditions when we obtain inconsistent information from different sources. Data archiving is also a necessary function.

Regarding location information, it seems preferable to GPS information from photos to map related facilities rather than latitude/longitude data generated from postal addresses using geocoding technology because the latter involves a certain degree of error at present. In addition,

rules for sharing personal data should be established beforehand.

15.5 Training for Effective Operations

The establishment of diverse health and medical assistance teams has led to a well-organized human network in Japan. A number of information tools that support relief activities are now available. However, they are insufficient. Training is necessary to improve practical disaster response skills. In particular, the iteration of realistic drills is crucial.

Many assistance teams require their members to receive training programs to acquire skills and knowledge related to relief activities. Many training programs focus on how an organization may command and control a situation rather than on the professional skills required of health and medical workers (Fig. 15.2). They also emphasize the importance of the procedure for receiving and sending support. They also mention the importance of the unified management of information and planning based on scientific analysis of collected data.

The training programs of the DMAT, DPAT, and DHEAT are based on the standard framework of the Incident Command System adopted in the United States. They also employ some approaches of the Major Incident Medical Management and Support developed in United Kingdom, particularly its procedure for the initial stage of crisis response, such as the Command, Safety, Communication, and Assessment steps. Training the staff of local health centers mainly focuses on the procedure for receiving support in case of a disaster.

Joint training exercises involving several types of assistance teams are also conducted to facilitate mutual understanding and to facilitate the teams working together efficiently. DMATs and other assistance teams also participate in large-scale drills conducted by local or national governments to effectively collaborate with civil defense, the police, fire departments, and other stakeholders. Moreover, senior members of a DMAT often give lectures during training programs for other assistance teams because some recently launched teams do not possess sufficient expertise for training exercises.

15.6 Summary

A framework for preparedness with respect to health and medical assistance during large-scale natural disasters has been promoted in the last few decades in Japan, especially based on lessons

Fig. 15.2 Tabletop exercise conducted in the DPAT training program that focuses on a command and control procedure

learned from the experiences of the Kobe earthquake in 1995 and the Great East Japan Earthquake in 2011. Many assistance teams are now ready to work in disaster areas. Teams include DMATs, which consist primarily of emergency physicians; the DPAT, which specializes in mental support; the JRAT, which is a unified team of experts in fields related to rehabilitation, such as physical and occupational therapists; and the DHEAT, which primarily supports the coordination of health and medical responses from a headquarters.

A variety of information tools supporting health and medical assistance activities have also been developed in the last few decades. Special-purpose information tools, such as the EMIS and J-SPEED+, were developed in the early stages for use in DMATs and other assistance teams. Recently, the SIP4D, developed by the SIP Program, facilitates the sharing of disaster information between multiple organizations. This has led to efficient collaboration between multiple stakeholders. Further improvement will be achieved by appropriately unifying information that is similarly classified. Such information tools may be more helpful if they can assist in decision-making by suggesting prompt deployment of assistance teams with appropriate specialties. Japanese health and medical assistance teams have also prepared common rules and training programs for diverse assistance teams, which are essential for realizing efficient collaboration during disasters. These activities are sure to enhance the resilience of Japanese society to natural disasters.

However, the risk of natural disasters in Japan is still extremely high because earthquakes, which are as large as a magnitude 8.0 or larger, have repeatedly occurred on the Pacific coast of Japan. Such large earthquakes have regularly occurred at an interval of 100 or 200 years, causing tsunamis in wide and densely populated areas. Three quarters of a century have passed since the last two earthquakes in 1944 (M7.9) and 1946 (M8.0). The Japanese government has estimated that the next one will occur in the coming few decades and that it could, in the worst case, kill more than 230,000 people. Another 270,000 people might require assistance because they could be trapped in a confined space under a collapsed building and 530,000 might be injured. We must begin now to prepare for such an unprecedented crisis.

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16 Community Resilience, Disaster Nursing, and the UN Sustainable Development Goal

Odeya Cohen, Judith Shamian, and Sakiko Kanbara

16.1 Implementations and Expected Impacts

In 2015, the UN determined 17 Sustainable Development Goals (SDGs) for the years 2015–2030. SDGs reflect the triple line approach to human and planetary well-being—economic development, environmental sustainability, and social inclusion (Assembly 2015; Sachs 2012). The implementation of the SDGs is a critical issue. According to Van Zanten & Van Tulder (2020), the progress towards achieving the SDGs has been too slow. Allen et al. (2018) measured its implementation in 26 countries and found that while initial planning had begun, true progress was not often measured, and critical gaps remain in assessing interlinkages, trade-offs, and synergies between targets. In an attempt to make the 17 goals more attainable, they were broken in the initial process by the UN down into 169 targets set to maximize implementation (Stafford-Smith et al. 2017). However, as various agencies strive to implement these goals, realization is growing that aiming at each on its own may not be effective and that areas of overlap should be sought, so that work will focus on integration and commonalities of different SDGs. In this chapter, two attempts will be described, one in Israel, the other in Japan, to integrate the fields of disaster nursing and community resilience as a partnership to achieve some of these goals—each on its own and in their areas of overlap.

16.1.1 Relevant SDGs for This Chapter

This chapter focuses on linking the community resilience approach; healthcare services during emergencies, especially from the nursing perspective; and the implementation of the SDGs. Previous studies dealing with community resilience in the context of SDGs were critical of the challenges in applying SDGs indicators at the local level (Kapucu and Sadiq 2016). The community resilience paradigm provides a local framework for achieving a range of global development policy commitments (Croese et al. 2020), and, in light of the implementation

O. Cohen (✉)
Department of Nursing, Recanati School for Community Health Professions, Ben-Gurion University of the Negev, Beer-Sheva, Israel
e-mail: odeyac@bgu.ac.il

J. Shamian
International Council of Nurses ICN President Emerita, FAAN, Toronto, ON, Canada

S. Kanbara
Faculty of Nursing, University of Kochi, Kochi, Japan

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difficulties, it seems that linking between different SDGs advances the potential in applying them (Stafford-Smith et al. 2017). As such, we highlighted the straight interlink between Goal 3, good health and well-being; Goal 11, sustainable cities and communities; and Goal 10, reducing inequalities, which directly results from implementing the first two.

16.1.1.1 Nursing and the Implementation of the SDGs

Beyond the uniqueness of the community resilience approach mentioned above for implementing the SDGs, nursing is recognized as one of the core components in implementing the SDGs (Lilienfeld et al. 2018). According to Rosa et al. (2019), the United Nations 2030 Agenda for Sustainable Development aligns with the holistic philosophy inherent to nursing, since nurses are primed to lead changes toward achieving health equity and social justice. The crucial role of nurses during disasters at the healthcare giver level presents them as the main chain in implementing the SDGs. The ongoing global climate changes caused the increase in disaster attacks around the world, influencing the engagement of nurses in designing response plans for emergencies in the spirit of the implementation of the SDGs (Yamashita and Ali 2021). Osingada and Porta (2020) note that nurses are advancing critical research and policy efforts to achieve all 17 of the SDGs, and this trend was demonstrated especially during the COVID-19. Lilienfeld et al. (2018) highlight that nurses become actively involved in implementing the SDGs aiming to mitigate, adapt, and enhance the resilience in the context of policy making, patient advocacy, conducted research, and practice opportunities. In the chapter we will describe the community resilience approach and the importance of health workers, especially nurses, for the assimilation and implementation of the SDGs in the context of emergency preparedness and response.

16.2 Community Resilience in the Light of the Sustainable Perspective

16.2.1 The Rise of the Resilience Paradigm

Resilience is a metaphorical concept in the field of human behavior and response. Rooted in physics and mathematics, *resilience* refers to a matter's ability to return to equilibrium after displacement (Norris et al. 2008). It was Holling's (1973) influential ecological study that brought the concept of resilience from the exact sciences to the human perspective (Norris et al. 2008), defining resilience as the system' ability to absorb changes of state variables, driving variables, and parameters and still persist (Holling 1973). In the social sciences, Norris et al. (2009) viewed resilience as a trajectory for successful adaptation after trauma or severe stress. In contrast to resistance, they focused on the ability to evolve over time following the coping with the crisis (Norris et al. 2009). Currently, the resilience approach is commonly used in the concept of community resilience in the social sciences and public policy and is related to local and global threats such as economic crises, climate change, and terrorism. Community resilience focuses attention on the response capacities of communities and systems facing these situations and the capacity to overcome or even thrive from emergencies (Cohen et al. 2013). SDG11 is to make sustainable city and community including "resilient."

In the social sciences, the individual's resilience is seen as a dynamic developmental process that includes imparting positive adaptability in the context of significant distress (Cicchetti 2010; Masten 2001). Bonanno (2004) defined resilience as the Individual's capacity to maintain healthy, symptom-free functioning following stressful life events. The definitions entail two significant conditions to achieve SDG 3..: first, exposure to a major threat, severe distress, or trauma, and second—positive adaptation despite the attacks on the developmental process (Cicchetti 2010).

Resilience research began in the 1970s with children's studies, when pioneering researchers tried to understand how children and adolescents defined as children at risk succeed in developing positive adaptive capacities despite being exposed to severe phenomena such as poverty (SDG1), neglect, abuse, racist violence, or discrimination (SDG16) (Wright 2013). According to Harvey (2007), the study of resilience in the social sciences has addressed the effect of stress and trauma on individuals and the effects that a variety of factors have on the sediment that will leave him exposed to trauma (Norris et al. 2008). These factors also included individual character, sociodemographic variables, access to social and ecological resources, and interrelationships (Harvey 2007; McFarlane and Yehuda 1996).

With increasing knowledge gained about individuals' resilience, community psychology studies began to thrive, focused on environmental conditions that affect what is done within the community (Caplan and Nelson 1973; Cowen 1994). The research paradigms constructed for understanding the interactions between individuals and their community led to the psycho-ecological approach to resilience (Harvey 2007). According to the psycho-ecological approach, humans, like other organisms, live in interdependence with their environment. The ecological analogy incorporates the perspective of the resources available to the individual or the community (SDG14.15), which could develop adaptive capacities and be described in terms of community resource development, conservation, and exchange (Hobfoll and Lilly 1993; Kelly 1968).

16.2.2 Community Resilience in Routine and Emergencies: From the Sustainable Approach to Disaster Risk Reduction

The sustainable approach encompasses environmental, social, and economic aspects. In models of inter-relations between the three, the social characteristics are considered least accessible (Hutchins and Sutherland 2008; McKenzie 2004). Social sustainability refers to a society's ability to thrive beyond mere social subsistence (Magis and Shinn 2009). A community characterized by social sustainability may balance cross-cutting interests, manage its economic and environmental resources, and develop community traits that will advance its resilience in the face of changes (Magis and Shinn 2009). Magis (2010) perceived community resilience as an indicator for social sustainability and identified resilience as the existence, development, and engagement of community resources by community members to thrive in an environment characterized by change, uncertainty, unpredictability, and surprise. Nelson (2011) described the differences between community adaptation and community resilience, with the former being implemented in the short term for coping with changes, whereas the latter expresses a long-term worldview. Thus, when a crisis or change cannot be prevented, a resilient community will adapt a lifestyle that promotes society's capacity to deal with it.

Regarding disaster risk reduction, community resilience is perceived as a process rather than as outcome (Norris et al. 2008). Pfefferbaum et al. (2013) referred to the community members' ability to take joint, directed, and purposeful action to improve the community's collective coping with extreme situations. Community resilience is associated with the ability to enrich the community's everyday life, promoting the community's coping with future changes or emergencies (Phillips and Pittman 2008; Sovacool et al. 2012). With climate-related changes (SDG16) increasing the frequency of disasters, what had been two distinct approaches—disaster risk reduction and sustainability—are now coming closer together, as areas of overlap are expanding.

16.2.3 Community: Who Is Your Community? Structures of Current Communities

Community resilience cannot be understood without a definition of community (Wilson

2012). Neal (2009) found over a hundred definitions for community, relating to everything from social structures to place-based aspects and performance. Other definitions refer to common interests (Phillips and Pittman 2008) and virtual or local arrangements (Borne 2010). Some definitions perceived individuals as communities based on networks (Blau 1964) and shared values (Etzioni 1995). Chaskin (2001) defined a community by geographical area and social attributes. The geographical area is characterized by natural boundaries, unique history, demographic patterns, and industry and organizations' existence. Social attributes include language, customs, sectarianism, and/or ethnicity. Community is manifested in a series of characteristics that include a sense of community, a level of commitment among community members, community problem-solving ability, and access to resources. Community is embedded in individuals, organizations, and networks (Chaskin 2001).

Although communities are traditionally place based, virtual communities, which could run parallel with, or separately from, place-based communities, must be considered as well (Smith and Yell 2020). The virtual dimension in a community seems to deepen its ability to develop resilience (Sankaran and Demangeot 2017). Like physical communities, virtual communities provide their members with a sense of community and offer high communication capacities, which are of great importance in emergencies (Hasan 2018). Virtual space allows the existence of multiple social interactions, even when the physical space does not allow it (e.g., in emergencies that require maintaining physical distance), and in doing so, it can help to deal individually and collectively with various stressors (Neubaum et al. 2014). At this point, SDG9, especially, target 9.1, is vital to achieve beforehand. Members of these communities can share knowledge, experiences, support, and be supported, thus also building resilience (Sankaran and Demangeot 2017). In general, it can be noted that social media and the means of communication belonging to this group have become significant players in times of emergency and have a unique reference to community resilience (Houston 2018: Purohit and Peterson 2020).

16.2.4 Community Resilience: The CCRAM Approach—Results from Relevant Studies

The CCRAM (Conjoint Community Assessment Measurement) is a tool for assessing community resilience (Cohen et al. 2013; Leykin et al. 2013). The CCRAM, developed by a multidisciplinary group, examines five components of community resilience: leadership, collective efficacy, preparedness, place attachment, and social trust (Leykin et al. 2013). *Leadership* is manifested in the ability to lead the community from routine to emergency and be fair and transparent in managing resources and needs to provide services updated, necessary relevant information (Berkes and Ross 2013). *Collective efficacy* reflects communication and connectedness through involvement in the community and reciprocity in helping others (Hobfoll et al. 2007). *Preparedness* is composed of awareness, being aware of one's role and knowledge of it, and being familiar with emergency situations (Cutter et al. 2008). *Place attachment* is the sense of belonging, pride, and ideological identification with the community, as well as emotional attachment to it (Cutter et al. 2010). The fifth and final component is *social trust*, which relates to the community member's confidence in the quality of the relationships within the community (Poortinga 2012).

Finding from research using the CCRAM yielded unexpected correlations between these five components and the community resilience. It was found, for example, that even during times of traumatic stress, older adults had a higher resilience score than did younger ones (Shapira et al. 2020), suggesting that rather than viewing them as a subpopulation with special needs, they could a resource for the community (Cohen et al. 2016a, 2016b). In a study of the specific factors associated with vulnerable community members and with resilient members, collective efficacy was a significant factor in both subpopulations. In the vulnerable population, it was the leadership factor that was significant in the vulnerable population, but it did not play a significant role in the resilient populations (Cohen et al. 2016a).

These findings could be used to develop evidence-based intervention plans for strengthening subpopulations within the community.

16.3 The Role of Health Services in Building Community Resilience

Despite the lack of a uniform definition of community resilience, health plays a significant role as a core component in the community resilience approach, especially the role of health services during all phases of the emergency cycle (Patel et al. 2017). Health services are perceived as a critical infrastructure, a fundamental element, one whose strength or weakness the community will survive or fail (McDaniels et al. 2008).

The issue of the resilience of the health service itself has come into focus, examining the degree of change a health system can withstand and still maintain its functionality (Biddle et al. 2020). Barasa et al. (2018) distinguished between planned resilience, designed during routine periods, and the adaptive resilience which characterizes times of emergency, this in addition to resilience during acute shocks. Additionally, the dynamics between the organizational and the individual perspectives are also to be considered when approaching health systems' resilience (Biddle et al. 2020).

16.3.1 The Importance of Health Services to Community Resilience in Times of Change and During Emergencies

Effective public health response depends, first and foremost, on strong healthcare systems (CDC 2011; Redwood-Campbell and Abrahams 2011), showing that resilient communities are those with healthy individuals and families who have access to healthcare. Moreover, this access is combined with the knowledge and knowledge of where to turn and how to care for others in both routine and emergency situations and the resources to do so. Ongoing, available healthcare services during an emergency may be more important than outside medical assistance (Cohen et al. 2020; Charney et al. 2013).

A study conducted during the COVID-19 pandemic (Cohen et al. 2020) examined the associations between satisfaction with healthcare services and community resilience scores among minority populations that live in urban and suburban communities. The results showed people in suburban communities were more satisfied with their healthcare service, and had more confidence in them, than city dwellers. However, an examination of the relative contribution of these variables to the variance in community resilience, revealed that the satisfaction was only with primary healthcare services and not with the community type (urban vs. suburban).

Positive correlation between availability and accessibility of local healthcare services and community resilience score was found among healthy individuals and those who suffer from chronic illnesses, between people who live in suburban and urban communities, and among both minorities and general populations (Cohen et al. 2016a, 2016b; Cohen et al. 2020). These findings were consistent with those of other studies that revealed that health organizations such as hospitals are vital for preserving resilience in time of emergencies, even among the healthy population (Charney et al. 2013).

The crucial role of healthcare services during emergencies brought the issue of health system resilience to the fore, highlighting the interfaces between the system and the healthcare professional (HCPs) workforce, where nurses play a major role. Biddle et al. (2020) noted that since the Ebola crisis, the concept of health system resilience has transformed from being an overall capacity to a recognition of the individuals within it. The focus has shifted to individuals' agency and taking a broad view of the social, economic, and political environment in which the response is provided and needs met (Martineau, 2016).

16.3.2 The Critical Role of Nurses in Emergencies

On routine days, nurses are often those who provide initial care. Additionally, they play a significant role in emergency preparedness and response plans throughout all phases of the emergency cycle, from pre-emergency to rehabilitation (Veenema et al. 2016). Nurses possess important treatment skills and knowledge, including aspects of epidemiology, psychology, pharmacology, and cross-cultural competencies (WHO & ICN 2009).

Overall, nurses are the largest segment of the healthcare workforce; thus an effective first response in an emergency depends heavily on their surge capacity (Couig et al. 2017; Rowney and Barton 2005). Kanbara et al. (2017) found that in Japan nurses assumed the roles of community health coordinators, restoring public health and maintaining it. Because their work is collaborative by nature, nursing professionals are most adept at addressing the population's social and medical needs, as they deal with community health issues, high-risk situations, and community vulnerability.

Clear leadership and disaster rescue policies are thus an essential skill and capacity for nurses working in disaster settings, as these ensure that they can react optimally to disaster situations (Veenema et al. 2016). In 2019, the International Nursing Council (ICN) joined the World Health Organization (WHO) in proposing a disaster care framework that included statements on diagnoses, outcomes, and interventions appropriate to disaster response (ICN 2019). The ICN Framework of Disaster Nursing Competencies was updated to encompass eight competencies required in public health, mental health, healthcare workers, emergency managers, nursing, and disaster nursing. These are preparing and learning, communication, incident management systems, safety and security, assessment, intervention, recovery, and law and ethics (ICN 2019).

16.3.3 Local Nurses at Emergency: The Cultural Context

Within the ICN Framework, the ICN asserts that patients have the right to culturally and clinically appropriate care. Nurses should exhibit cultural competence by being aware of their own culture without letting it influence those from other backgrounds. It is necessary to accept that cultural beliefs may vary between patients and providers and that there may be need to modify care in order to best meet the patient's culture and expectations and provide culturally appropriate care that will ensure best patient comfort and outcomes (ICN 2013).

16.3.4 The Cultural Context During Emergency

In a crisis situation, trust must be established immediately between patient and caregiver, and this requires a culturally competent approach. Nurses must be particularly aware of this when responding to members of minority groups, a population not only more vulnerable to emergencies but also often suspicious of the authorities. As Dass-Brailsford (2007) has demonstrated, culturally insensitive treatment during and after disasters may be experienced as disrespectful and interpreted as racism. Cultural identities, values, and traditions play a key role in community resilience. As disasters often disrupt social texture and networks (Britton 1988), it is minority groups who are often more impacted by this outcome. Disasters find groups such as immigrants, asylum seekers, and ethnic minorities in a position that is already weakened due to loss, displacement, and discrimination (Silove et al. 2017). Emergencies often exacerbated existing intergroup tensions, and the increased racism and discrimination may have a severe social and economic on the minority group, putting it in greater risk (Schleussner et al. 2016).

Within this complicated framework, the role of local nurses, especially those who work in a

community setting, takes on extra weight, with studies linking the role of nurses during emergencies and the development of community resilience. According to Heagele (2017), nurses should be provided with a foundation for resilience-building activities that may save lives during the emergency and accelerate community recovery after the disaster. The Japanese experience demonstrated that, during emergencies, nurses are the healthcare professional group most suited to deal with community health issues, high-risk situations, and vulnerable communities. Kanbara et al. (2017) found that nurses can address social needs and help communities over changes (Kanbara et al. 2017). Kulig et al. (2018) found relationships between the nurses' descriptive profile of community engagement and community resilience. While the literature has identified factors that are likely to be correlated with achieving resilience for communities, these domains have been rather broad and lack the specificity required for implementation. The relationship between health and resilience has been explored in the past, and good health prior to disasters has been reported to support greater resilience in the disaster setting (Chandra et al. 2010; Ray-Bennett et al. 2010). In the present exploration of community resilience, we aimed at finding the core factor, the factor that, when enhanced, will have a tangible effect on the augmentation of resilience (Cohen et al. 2016a). We suggest that the availability of healthcare services during an emergency, and the predefined role of HCPs, especially nurses, in this domain, becomes a routine resilience-building action that would lead to sustainable development. This suggestion is based on the evidence presented above and will be demonstrated in the case studies below.

16.3.5 Case Studies from Two Different Locations

The following case studies, one from Israel during the first year of COVID-19, the other from Japan, serve to illustrate the potential contribution of nurses during crises, the associations between nurses in emergencies and community resilience, and the relationship between these measures and meeting SDGs.

16.3.5.1 The COVID-19 Pandemic: The Israeli Case Study

While the COVID-19 outbreak threatens health and economics worldwide, it is racial and ethnic minorities who are most vulnerable to its physical, financial, and psychological effects (CDC 2020). The literature attributes this vulnerability to cultural, social, and economic factors, including poor knowledge of the majority's language, overall lower socioeconomic status, healthcare disparities, and isolation (Guha-Sapir et al. 2013). Dense living conditions that are common in underprivileged societies were closely associated with the chances of contracting COVID-19. As a multicultural country, Israel can serve as a case study for exploring the roles of culture and ethnicity, as well as sociodemographic variability, in times of crisis. Indeed, the COVID-19 outbreak deepened existing social gaps, with public attention directed at two groups—ultra-Orthodox Jews and large segments of the Arab Muslim population. Both populations are characterized by large families, dense living conditions, low trust in formal leadership, and strong community ties, and often Hebrew (the national language) is not their mother tongue.

The intervention described here was conducted in parts of the Arab sector in northern Israel. To increase adherence to health restrictions in the Arab community, a group of four experienced male and female Arab nurses, all graduate students in Nursing or Emergency Medicine at Ben-Gurion University of the Negev, was organized to respond to acute needs of their communities. The group, led by staff members from Ben-Gurion University of the Negev Nursing Department in the Faculty of Health Sciences and the Department of Education in the Faculty of Social Sciences and Humanities, jointly with the group members, tailored intervention plans for a wide range of subpopulations: day centers for elderly adults, teachers and school principals, pupils with their parents, preschool caregivers, and the general community. The inter-

vention included short films for disseminating on social media and presentation-based lectures with references to reliable information sources, common questions, and examples of fake news with relevant responses as correcting facts and explaining the process of fake news development. Together with the Home Front Command, and based on the COVID-19 morbidity rate in the selected authorities, the group was activated. Beyond consulting the municipal authorities and lecturing, the group members identified healthcare professionals from three authorities in the north district, based on personal acquaintance. The group provided the materials for lectures and supported the local lecturers. Although this pilot process was not measured by scientifically valid tools, based on the Israeli Ministry of Health data, the COVID-19 morbidity rate in those authorities had decreased, and stakeholders and community members involved in this process expressed high levels of satisfaction. Beyond seeking the immediate goal of increasing compliance with the regulations, the aim was to enhance the resiliency of these communities. Therefore, the perspective of this process focused on strengthening local authorities using HCPs from their communities, who are known by the community members as professionals, and as community members, the HCPs know the language, the hidden meaning of questions, the sensitive challenges, stressors, and capacities of their community members.

16.3.5.2 The COVID-19 Pandemic: The Japanese Case Study

In a high context culture like Japan, there is often not much need to explain with unspoken understanding among people and communication between community members, and local nurses may be best for understanding health with the implicit context of social conventions, silences, nuances, and the tone of the native voice to convey meaning. It requires working with native implicit and explicit communicators and decision-makers to draw on the data to address individual health issues, to ethically open it up as environmental data that protects people from miscellaneous information processing, and to iterate solutions in diverse ways. Based on the findings of disaster nursing, nurses had improved their caring ability in various communities by experience of disaster, leading to community resilience. Community nurses promote community resilience plan, collaborating with community people to improve the plan continuously. During COVID-19, social distance and isolation among immigrant child and elderly is significant. More crucial issues were digital divide and informatics to avoid social isolation and loneliness such a super elderly society in rural areas. Rather than just moving to a safe place, there was not enough strategy to provide facilities for them without mutual assistance to evacuate and cope with new emerging care needs, on multiple hazards. It is necessary to be aware of people's inner perceptions that lead to isolation and to compare them with the phenomena of the real world, rather than taking measures based on administrative statistics. Residents embodied the "conditions" of the cultural environment and made the community plan with a consensus by communicating their decisions to each other from the perspective of community resilience by repeating the workshop and interview. Tosa Town in Kochi Prefecture is aiming to become a sustainable town by 2030, so that no one will be left behind. The town is committed to building a town that is resilient to social changes, including rapid disasters, based on efforts to connect the traditional values of life with the future. The narrative data was published directly as action to "safety and security" in the regional plan. The committee named "SDGs Promotion Council" was set up as a place for residents to monitor the status of achievement of these goals on a quarterly basis. Policymakers, administrators and professionals often required mindset change for consensus building unexpected challenges when trying to put the innovative plan into practice. Assessing outcomes alone is not enough; community nurses probably need a communication process of how they perceive the risk and understand like caring.

16.4 Summary: The Role of Disaster Nurses in Meeting the SDGs

In this chapter, we suggest potential contributions of disaster nurses to the SDGs' implementation. The chapter discusses the relationships between sustainability, the resilience approach, public health and healthcare, and the role of HCPs and nurses during an emergency.

Traditionally, disaster nurses have been associated with the provision of medical treatment during emergencies. The COVID-19 outbreak presented a new challenge as there was a gradual change from instant first response to long-term emergency care and little knowledge about the future.

Professionals and experts had led the perception of the healthcare services during extreme situations and identified disaster nursing competencies in the ICN Frameworks, which include broad perspectives on healthcare during an emergency. The ongoing case of COVID-19 provides a clear example of the merging of two approaches that have been seen as distinct—sustainability and disaster risk reduction—which were found to share a common issue, approach, which is the resiliency approach. The associations between community resilience and health aspects were established in the literature, and the community resilience' perception considers the healthcare services as critical infrastructure. Studies of the role of healthcare services during an emergency found them to be fundamental to the community members' sense of resilience during both routines and emergencies, beyond the provision of medical treatment. At the same time, according to the WHO's current Health Emergency and Disaster Risk Management Framework, proactive approaches are seen as responses to emergencies. Reviewing the difficulties of SDGs' implementation, we suggest that the role of nurses at emergencies could bridge these gaps, increasing the synergies between targets. Highlighting nurses' education, knowledge, and treatment competencies would advance health and well-being (SDG3), promote sustainable cities and communities, and may reduce inequalities.

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17 Caring Ecosystems for Area-Capability

Satoshi Ishikawa

17.1 Possibility of Transdisciplinary Research

The challenges of SDG3 are becoming more complex for human society as they overlap with previously social issues that have been discussed vertically, such as global population aging, social disparities and health disparities, the double burden of chronic diseases and disabilities and infectious diseases, the problems of young people who will lead the next generation, the destruction of local ecosystems and human life and livelihoods due to conflict and developments that reduce biodiversity, and global environmental changes. The ecosystem comprises many species which are closely related to each other. To create solutions towards environmental problems on a global of health and well-being and sustain the development of human society, more people will have to understand what the blueprint of a sustainable society is in both developed and developing countries. Global activities such as Future Earth should promote the need to build a research system where more people can participate in environmental and transdisciplinary research, including social science.

S. Ishikawa (✉)
School of Marine Science and Technology
Univeristy and Graduate School of Oceanography,
Shizuoka, Japan
e-mail: oounagi@scc.u-tokai.ac.jp

Evidence-based medicine and actions have been widely adopted in many sectors. In the medical and nursing fields, medicine has evolved over the past 70 years for health management in the community. When it comes to local public health practice, the approaches are methodological pluralism, operated through specific structures to promote. They have been trying to make the processes and structures for finding causes of illnesses using evidence more transparently and are considering how to balance between the scientific evidence with other reasons from non-medical stakeholders and then to structure their actions. Think about sustainable environmental health; it would be necessary for everyone who utilizes any ecosystem services to carry out conservation efforts; setting limits on resource use is made to prevent overuse in many cases. The importance of scientifically based management has also been pointed out for fishery resources by the FAO (FAO 1995). It has been incorporated into several international efforts, e.g., in Indian Ocean Tuna Commission and Western Central Pacific Fisheries Commission. However, management, where the individual is responsible for compensating for a target resource, does not apply to conservation efforts that concern sustainable ecosystem health. It would be impossible to understand for all determinants of a healthy ecosystem which is comprised of many species through scientific research. Cooperation among

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many stakeholders and planned budgets are necessary to monitor and evaluate natural resources. The collaboration and participation of many stakeholders into utilization and conservation efforts are also necessary for disaster risk reduction and health care. Before collecting scientific data on it, we need to recognize which encompasses a wide range of stakeholders who desire to use evidence more effectively in decision-making. There is a need to understand what is shaping the production and use of knowledge by people in the first place. It could be required the data based on the fact of local commitments linking to global agendas. As seen during the typhoon evacuation on Panay Island (shown later in this chapter), presenting scientific data to people has little effect on their thinking and behavior. Suppose people participate in scientific data collection and understand the impact of conservation efforts, such as the stock enhancement projects. In that case, people have a more substantial interest in scientific data and information of nature and their environment and act more quickly.

It is required for many people in many areas that the importance of caring for the environment and society will be better understood. This topic will be one of the research questions under transdisciplinary researches. The key is locality to changing their paradigm of behavior and thinking. That is an improvement in their scientific literacy through daily activity not to control it through scientific measures and technological development lecture on the tabletop. People must learn how to sympathize with nature to direct their interests in scientific data. It may be necessary for us to consider a lifestyle of living in harmony with nature. These conservation efforts should be called "care" and extend to "primary health care" based on its principles: (1) equitable distribution, (2) community participation, (3) inter-sectoral coordination, and (4) appropriate technology. However, no concrete model or methodology of transdisciplinary research has been presented so far. Under this situation, the area-capability (AC) approach has been proposed as a framework for efforts in transdisciplinary research aiming to create a sustainable society based on the results of several case studies in Japan and Southeast Asia (Ishikawa and Watanabe 2015). Among them, the activity model called AC cycle (Fig. 17.1) was also proposed as a possible framework of transdisciplinary research.

To promote care, it is necessary to develop local awareness of the community-centered eco-

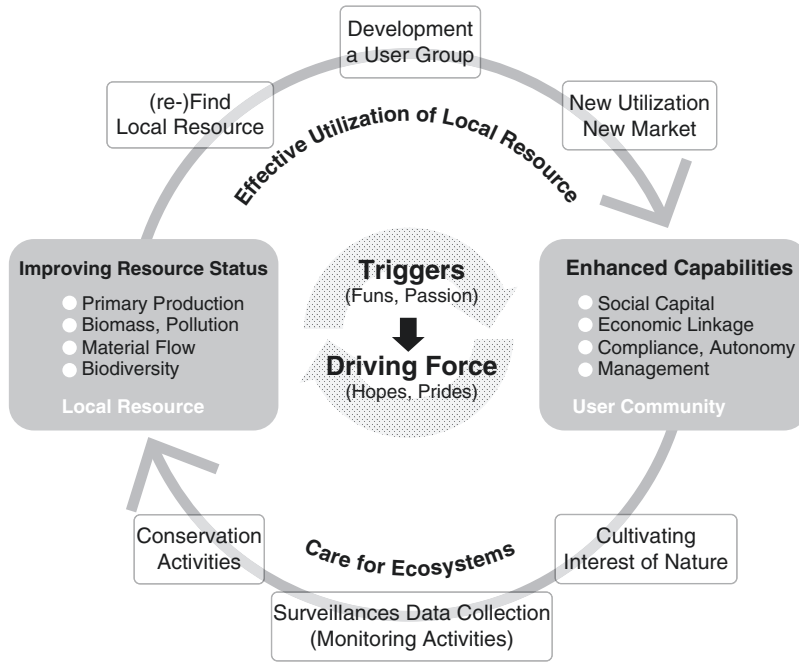

Fig. 17.1 Modified area-capability cycle suggested by Ishikawa (2017)

system. People who try to conserve the ecosystem conduct conservation efforts that protect endangered species (e.g., mangrove planting, building protected areas for essential species, etc.). These efforts are important in protecting the environment when incidents such as oil spills, tsunami, and other disasters occur. However, in many cases, when people try to conserve in places where there are restrictions on resource utilization, conflicts between resource users and conservationists will occur, especially if the natural resources are the resources user's livelihood (SDG8). This is particularly true in poverty-stricken areas, where conservation restrictions to protect the environment affect the resident's livelihood in a negative way. For example, when there are strict fishing restrictions to protect endangered tropical fish, fishermen cannot catch many fish, which affects their income. In consequence, these fishermen did not obey the conservation restrictions implemented. It means SDG 1, 2, and 3 are the basic need to achieve SDG14, 15, and other SDGs on human-centered approach.

Cambodia's Tonle Sap Lake, the largest freshwater lake in Southeast Asia, has flooded every year. Development aid agencies in developed countries paid large amounts of money to prevent flooding by building embankments around the lake. Floods were significantly reduced by this embankment, but on the other hand, traditional rice cultivation lacked water and made life for farmers and consumers difficult. As a result, part of the embankment was destroyed by residents regally. Floods began to occur again, but no death incidents or buildings were damaged. The farmers around Tonle Sap Lake typically cultivate several kinds of crops that are harvested during different times to avoid crop annihilation as a flood countermeasure. The houses around Tonle Sap Lake are also built on stilts for when floods occur. Residents live on the premise that floods are inevitable. Floods are not seen as disasters in this area. It would be required to the redefinition of hazards for the human settlements inclusive including, safe, resilient, and sustainable (SDG 11) as well as adaptation of Global climate changes (SDG 13).

In this chapter, the concept of "area-capability" proposed as a framework of transdisciplinary research is shown with some examples of actions conducted in Japan and the Philippines. Area-capability is a concept enhancing the importance of the "care" and adaptation to primary health care of natural resources to achieve equity, community participation, community needs orientation, and emphasis on preventive activities and those environments together for our healthy lives instead of managing natural resources for SDG3 as well as whole SDGs.

17.2 The Change in Consciousness of Residents and Strengthening the AC to Improve Adaptability

The AC cycle was constructed in reference to cases from several areas. One case example is the stock enhancement project that took place in Lake Hamana, Japan (Ishikawa and Watanabe 2015; Fushimi and Watanabe 2017).

In 1972, a community-based stock enhancement national project was conducted around the Hamana Lake in Shizuoka Prefecture, Japan. Before launching this project, fishermen protested against the Japanese government which promoted to reclaim coastal area that was under a heavy industrial priority policy. Due to the industrializations, coastal habitats and nurseries for fishery species were destroyed, and its resources were drastically cut. The Japanese government launched the community-based stock enhancement project as a compensation for fishermen and countermeasures to the fishery stock reductions.

The stock enhancement project of Lake Hamana did not have any problems at first. In the initial period of the project, the seven villages located around Lake Hamana had little human interaction and no cooperative relationships due to historical and cultural reasons (human interaction between villages had been prohibited by the Shogunate during the Edo period). Moreover, the conflict between villages and its fishermen was extremely fierce because they used the same fishing ground (Lake Hamana). This limitation of

coastal resources was raised as another community problem. Even in the seedling release project, which started as a national project, did not have any cooperation or understanding from the residents. At the time, fishermen did not know about conservation and resource management, and their understanding about the importance of the environment was low. As a result, many fishermen initially did not expect for the release project to be successful. The target species to be released was decided as the tiger shrimp after considering the resident's opinions. However, the seedling production technology was not established, and technology development for intermediate aquaculture before the tiger shrimp release was necessary. Therefore, local fishermen did not expect that the stock enhancement project would be successful.

A young researcher (Dr. Fushimi), who was assigned to duty at the Seedling Release Center in 1978, struggled in many ways. During his first 2 years (1978–1980), Dr. Fushimi worked alone to improve seedling production techniques. He also conducted an environmental survey to determine the location of the intermediate breeding pond and to decide the shrimp's release and catch time, as well as a stock survey to assess the stock's enhancement effects. The survey was repelled and hindered by the fishermen because they did not understand its meaning or significance. Despite these setbacks, Dr. Fushimi succeeded in the release of 1.7 million juvenile shrimps in 1980.

The release of these juvenile shrimps was immediately recognized by the fishermen because they were able to catch many small shrimps. As a result, young fishermen from the Shirasu Village, which was near the intermediate aquaculture ponds, offered to cooperate with Dr. Fushimi. The fishermen cooperated with Dr. Fushimi with the intermediate aquaculture feedings and environmental surveys which resulted in a release of three million juvenile shrimps in 1981.

These sequenced releases of juvenile shrimp resulted in fishermen to catch more shrimp. The increase in catch had led many village fishermen to offer to participate in stock enhancement projects. The cooperation of fishermen made it possible to further develop the release efforts, and in 1983, the release of ten million juvenile shrimp was achieved. Around this time, catching juvenile shrimp after release was banned, and the wholesale of fishery products including shrimp began in the seven villages. These changes led to the rise of catching many large shrimps, and it became possible to collect statistical data on the seafood caught. Through the cooperation between the seven villages in wholesale, the fishermen were able to raise their prices, which improved their livelihood. Most importantly, these changes and regulations were made by the fishermen themselves, including the ban on the catch of juvenile shrimp. The system and its fishing regulations were not implemented from the top down by the government but by the fishermen who fully understood the purpose of the system, which increased its compliance and functionality.

In 1985, the national project was completed, and the budget was no longer subsidized by the state. However, the fishermen continued to invest in themselves, and the stock enhancement efforts continued. In the end, the fishermen were able to understand the importance of resource preservation and the environment that supports them and learned how to care for it by AC cycle as Fig. 17.2.

The stock enhancement project was most successful at Hamana Lake. Resources increased, and fishermen began to care more about the environment because they recognized that conserving and supporting the reproductions of their target species is necessary and important (Ishikawa and Watanabe 2015).

17.3 Strengthening AC Also Increases Adaptability Towards Natural Disasters

Efforts towards improving livelihoods, restoring resources, increasing nature awareness, and carrying out conservation efforts through stock enhancement projects are possible not only in Japan but in developing countries as well. In the AC project of the Research Institute for Humanity and Nature (implemented from 2012 to 2017), a stock enhancement project with black tiger shrimp

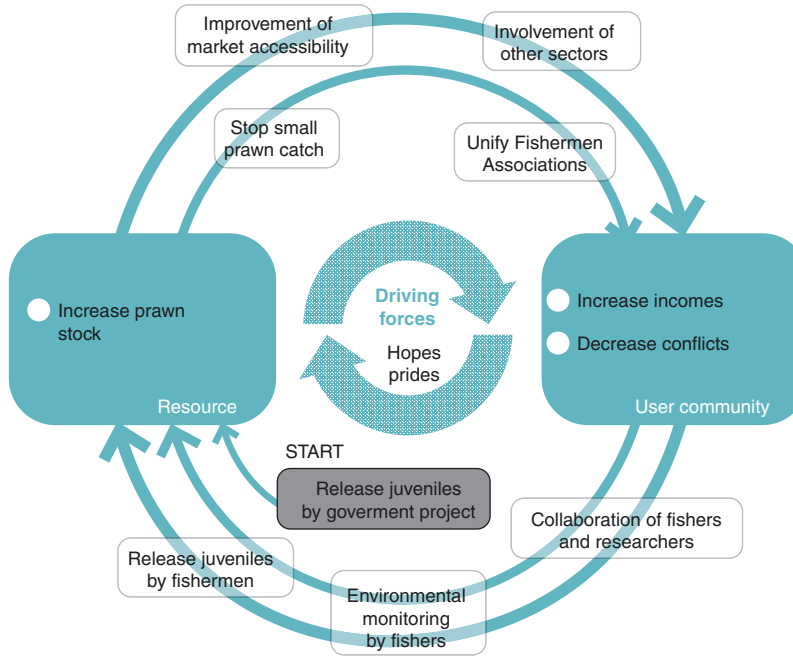

Fig. 17.2 AC cycle of shrimp stock enhancement

Fig. 17.3 Intermediate aquaculture ponds in Batan Bay, managed by local fishermen

was carried out in Batan Bay in the northern part of the Panay Island, Philippines, while referring to Lake Hamana's project. Project members obtained a permit from the local government and invited researchers from the University of the Philippines to participate as collaborators and explained the purpose and expected results of the stock enhancement project to the local fishermen and residents (Kurokura et al. 2017).

In addition to resource surveys, household surveys about the resident's awareness on the natural environment were also conducted during the AC project to measure the effects of the stock enhancement efforts. During the 5-year project period, juvenile shrimp were released seven times. Feeding the shrimp and environmental monitoring during mid-term aquaculture were carried out in cooperation with the local fishermen. In the first release trial, the shrimps in the intermediate aquaculture ponds were stolen just before the release day. After this incident, the villagers discussed anti-theft measures and created a new rule. After this new rule was implemented, no further theft occurred. Autonomous institutional design and operation led to voluntary participation in resource management, and increased crime prevention effects also led to improved quality of life (Fig. 17.3).

Some of the released shrimps were tagged, and the recapture rate after release was calculated to be 8%. This recapture rate was higher than expected. Afterwards, many large tagged black shrimps were captured, which encouraged the local fishermen to cooperate with the stock enhancement efforts because they recognized the magnitude of the impact it can achieve. Opinions to release other target species other than black tiger shrimp started to arise. These occurrences were like those that happened at Lake Hamana.

Fig. 17.4 Photos after Yolanda struck Batan Bay shown by Kamiyama (2015)

Fig. 17.5 Local markets in Batan Bay 2 days after the Yolanda struck in Kamiyama (2015)

Unfortunately, after the successful recapture of black tiger shrimps, a super typhoon named "Yolanda" struck the Panay Island, which caused great damage due to its high tides caused by the strong winds and local low pressure. In Tacloban, the central city of Leyte Island, the storm surge was amplified up to 6 meters due to the terrain at the innermost part of the bay, and the entire coastal area was engulfed by large waves. Later, the Philippine government reported that the disaster-struck region had 5803 casualties and 1729 missing people. The Batan Bay of Panay Island suffered a great deal of damage such as collapsed houses (Fig. 17.4). The intermediate aquaculture ponds and facilities for the stocking project were also destroyed. Fortunately, no casualties around the bay was reported Babaran et al. and Kamiyama (2015).

Furthermore, during this project, health checks were conducted to see if people were getting healthier. It was important to show data such as blood pressure in this group, which indicated that they had become healthier, but more importantly, we were able to collect reliable data smoothly on lifestyle habits related to the prevention of noncommunicable diseases in a highly collaborative community based on the daily collaboration on the stock enhancing project. Such data is more valuable for subsequent primary health care and community-based participatory risk management than one-way data collection without communication.

Several relief efforts and surveys took place during the evacuation within the AC project. Many residents knew more than a day before that the typhoon Yolanda will come, and it would be bigger than ever. However, evacuation took place only shortly before the typhoon. This may mean that no matter how accurate scientific information, such as the scale and speed of the typhoon, is communicated, people may not respond accordingly. Furthermore, when it came to how people evacuated, most people evacuated with their friends or acquaintances within the neighborhood. Therefore, in order for scientific information to change the consciousness of residents, it is not enough to simply present the information, but it is necessary for this information to directly affect individuals' daily life experiences. It has also become clear that during emergency evacuations, the impact of communicating with friends and acquaintances daily is very important.

The markets around Batan Bay on Panay Island reopened only 2 days after the typhoon struck (Fig. 17.5). The sale of seafood, such as shrimp, has made the community worry less about food shortages, and incidents such as riots and thefts rarely occurred. Strengthening AC will promote the increase of natural resources through the resident's act of caring for the environment and will also strengthen the local community with this resource utilization. Strengthening AC can improve disaster response actions.

17.4 From Management to Care Under the AC Concept

Area-capability (AC) has been proposed as a framework for efforts in transdisciplinary research aiming to create a sustainable society (Ishikawa and Watanabe 2015). In conventional efforts related to sustainable resource use of the natural environment (such as local crops and fish), "management" has been promoted based on setting limits on target **resources** and regulations to avoid overuse (FAO 1995). However, **resource** reproduction under this management is supposed to exist naturally, and no consideration has been made on how to create a healthy environment where these **resources** can reproduce smoothly. At the same time, there isn't much attention towards people who use resources as their livelihood. In developing countries and deprived areas, restrictions on resource use could be a major issue for residents. For this reason, regulations may be rarely followed and are inadequate to achieve sustainable use of resources. Ignoring the low class to develop their region and improve their livelihood does not fit the SDGs' motto of "nobody gets left behind." When developing a sustainable society, we should consider improving the livelihoods of residents and resource sustainability; otherwise it will not be a sustainable effort.

For improving livelihoods, "area-capability (AC)" does not aim to expand the economy or its efficiency by increasing people's income, jobs, or GDP but to increase "local resources" in local natural areas and through culture. "AC" was advocated as a regional development idea to build a highly resilient and sustainable society that can respond to any environmental changes, such as natural disasters and climate change, by strengthening the utilization of local resources through its communities. In addition, a framework for utilizing local resources called AC cycles has also been proposed (Fig. 17.1), and increasing these AC cycles in the region is a solid method to enhance AC. The number of AC cycles can indicate the number of resources available, as well as the number of activities being conducted by residents in the target area. In the AC approach, the number of AC cycles can be an indicator of regional potential and resilience, which represents the ability to adapt to various changes (Ishikawa and Watanabe 2015).

The AC cycle was formulated based on several successful cases of local efforts in Japan, such as the shrimp stock enhancement project at Lake Hamana. The AC concept is quite different from other conventional regional development strategies, such as industrial promotion, because it tries to incorporate "care for the environment and society" through resource utilization. Typically, to use resources sustainably, management regarding its use is important. As Herman Daly*2 suggested in the World Commission on Environment and Development, the number of reproducible resources used should not exceed the amount of its reproduction. This concept may currently be accepted worldwide.

In many cases, it is important to incorporate restrictions in resource management when utilizing sustainable resources. However, it is not enough to just achieve utilization of sustainable resources, especially if they are reproducible resources.*3 A vast tidal flat took place at Tokyo bay in the nineteenth century, and many seafood resources such as shellfish and Sillago fish were caught. However, during the period of high economic growth in early the twentieth century, more than 90% of the tidal flat was reclaimed to improve the port and secure the land for factories. After the landfill was completed in the 1970s, the fish population in Tokyo Bay dropped dramatically and has not risen since then. Consequently, the fishermen went out of business, leading to a sharp drop in fishing activities (utilizations), and the fishery stocks did not increase. Therefore, no matter how restricted the target resource is, sustainable use of resources cannot be achieved unless the resource environment is protected (Ishikawa and Fishimi 2019).

17.4.1 Way to Forward

To transition into a more sustainable society, it is necessary for global and local resource users to deepen their understanding about conserva-

tion. We can begin this by igniting interest in resources users about the resources that they use and the environment, as well as cultivating their hopes and understanding on sustainable developments. Creating a system that monitors both the resources and the environment through its users is quite effective. Actions that care for the ecosystem in the AC cycle are (1) to promote interest in nature, (2) to monitor resources and its environment through daily resource uses, and (3) to improve resource and environment situations through conservation efforts (Fig. 17.1).

In the AC cycle linked to primary health care, it could be enhancing the consistency of local community commitments to SDG14, and 15, and subsequently to achieve SDGs as this book show SDG3 and 11 for 1 and 2, through the use primary health care, and support of the local resources and environment done by the local organizations and its members are all seen as one set. It is important for users to understand the importance of not only the resources sustainability but also the environment conservations. It could be connected equity of universal health coverage. Being aware of the resource status and the environment is important to maintain sustainability. Users can monitor this in their daily life. If this concept can be firmly grasped, users can be resilience as well as carry out conservation activities.

*1. Future Earth is a global network of scientists, researchers, and innovators collaborating for a more sustainable planet (https://futureearth.org/). In this action, participation of many kinds of stakeholders into scientific research from the planning phase, is requested to conduct "Transdisciplinary research".

*2. Herman Daly was Senior Economist of the World Bank, and he suggested three rules on resource use which aim for sustainable society development:
   1. Sustainable use of renewable resources means that the pace should not be faster than the rate at which they regenerate.
   2. Sustainable use of non-renewable resources means that the pace should not be faster than the rate at which their renewable substitutes can be put in place.
   3. Sustainable rate of emission for pollution and wastes means that it should not be faster than the pace at which natural systems can absorb them, recycle them, or render them harmless.

*3. Szuwalski et al. (2015) showed the importance of environmental conservation for fishery resource sustainability.

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18 Big Challenge for SDGs: Case Study—COVID-19

Archana Shrestha Joshi, Hu Qin, Rini Damayanti, Shigeru Miyamae, Kengo Kobayashi, Parvati Bista, and Sakiko Kanbara

18.1 Introduction

Since 2019, the world is facing a global health crisis due to COVID-19 destabilizing the global economy, spreading human suffering, and costing lives of billions of people around the globe. Over 949 million people has tested positive and 20 million has been reported dead by January 2021. According to research, 15% of patients diagnosed with COVID-19 will develop severe health complications, 5–10% will require intensive care due to the seriousness of the symptoms, and the mortality rate is 3–5% (Baud et al. 2020). Not only mortality by infection, a pandemic of a new coronavirus infection is threatening the Asia-Pacific region's progress towards the key targets of the Sustainable Development Goals (SDGs), according to a recent report released by UNDP and the Asian Development Bank (UNDP 2020a, b). It has been observed that "although Asia and the Pacific has achieved remarkable development, the new coronavirus has revealed social and economic dividing lines that have the potential to undermine sustainable and inclusive development in the region" (ADB 2021). Deep-seated inequalities, social norms, and unequal power relations exacerbate many risks. For example, it is estimated that the number of people living in extreme poverty due to the pandemic increased by 75–80 million in developing countries in Asia last year, compared to what would have happened in the absence of the new coronavirus outbreak. Across the region, progress has also been slow in areas such as hunger (SDG2), health (SDG3), and education (SDG4), where previously there have been disproportionate but significant gains.

Before the COVID-19 pandemic, major steps were taken and progress has been made to improve the health of millions of people and significant strides were made in increasing life expectancy and preventing newborns, children under 5 years of age, premature mortality from non-communicable diseases through prevention and treatment and promote mental health and well-being by various global agenda including Millennium Development

A. S. Joshi (✉)
AMDA, Okayama, Japan

H. Qin
University of Hyogo, Hyogo, Japan

R. Damayanti
Faculty of Medicine, School of Nursing, University of Udayana, Bali, Indonesia

S. Miyamae
Disaster Medical Care Office, Medical Hospital, Tokyo Medical Dental University, Tokyo, Japan

K. Kobayashi
Kumamoto Red Cross Hospital, Kumamoto, Japan

P. Bista
Public Health Office, Kathmandu, Nepal

S. Kanbara
University of Kochi, Kochi, Japan

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Goals. Major Global Goals of Sustainable Development set by United Nations in 2015 by focusing on providing efficient funding of health system, improved sanitation and hygiene; and plans have been formulated and implemented to achieve the target to end epidemics of AIDS, tuberculosis like The Stop TB Partnership, malaria and neglected tropical diseases, combat hepatitis, water-borne diseases, and other communicable diseases. The nurses have addressed the health disparities within the communities by focusing on the environmental, physical, and social determinants of health with various stakeholders.

SDGs Progress Report in 2020, the UN secretary general stated, "due to the Covid-19, an unprecedented health, economic and social crisis is threatening lives and livelihoods, making the achievements of Goals even more challenging." With sufficiently strategic and bold investment in key development factors, the global community can move beyond crisis and cash in on the opportunity (Hughes et al. 2021). It will be required to show different aspects about the household and ambient air pollution, unsafe water and sanitation, unintentional poisoning from hazardous chemicals, and air, water, and soil pollution and contamination. And much more support will be required for the development of vaccines and medicines for communicable and non-communicable disease and to provide access to medicine for all. Nurses are working hard to overcome and recover from the worst pandemic people have seen in a century. Nurses provided care in the preventive phase, isolation phase, critical care phase, and home care phase. Nurses provide direct healthcare, lead research programs, coordinate public health workers, and advise the government to develop policies.

The actual situation of nursing care contribution has not been revealed enough. There are many situations where information disclosure is restricted, and the issues and countermeasures faced by nursing in each country and region are unknown, comparing nursing effort all over the world.

Nurses should review their adopted capacity to substantially increase health financing and the recruitment development, training, and retention of the health workforce. Strengthen and develop the capacity for early warning, awareness, risk reduction, and management of national and global health risks (SDG3.d). A comprehensive evaluation of the nursing care, operational capacity, and social and economic system is now needed to prepare for future pandemics; identify weaknesses, strengths, and lessons learned for the next pandemic; and to respond to large-scale disasters which are supposed to occur in the near future. We gather the actual situation of the nurses around the world who are working in various countries and communities to contribute to the prevention of infection spread and medical collapse as a case study. It will help for the advocacy of nursing efforts against infection experienced by Florence Nightingale in camps of Cameron during the Cameron was the origin of current public health, care and control of infectious diseases, and disaster nursing.

18.2 Case Studies

18.2.1 Case Study 1: Communication, COVID, PHC, and Resilience from the Perspective of Disaster Nursing

Hu Qin

Coronavirus disease (COVID-19) is another serious public health emergency that has occurred after SARS in 2003. The experience of fighting SARS has helped China to have a rapid response. After the outbreak of COVID-19 in Wuhan, Hubei province, China has sent 42 thousand medical staff to support Wuhan, and nearly 70% of them are nurses (National Health Commission of the People's Republic of China 2020).

A system with unified command, deployment, and action for prevention and control of the pandemic has been established, which helped to manage human resources, medical supplies, and logistics. Nurses dispatched to the supporting team consisted of the group leader leading the team, a professional from ICU, and a nurse with working experience in the respiratory department or infec-

tion department. Meanwhile, flexible working shifts were made in order to ensure enough rest.

In the process of fighting against the pandemic, nurses were the closest people to the patients. They provided various nursing care, including basic vital sign care as well as professional nursing care like ECMO care. In addition, psychological care for the patients has not been ignored. They paid attention to the emotional changes of patients, offered mental counseling, and helped to build up the confidence to overcome the disease.

In addition to the role of nurses, the primary healthcare (PHC) setting played an important role in community pandemic prevention as well, which was the most effective defense during the pandemic. Nearly four million primary doctors and nurses were involved in first-line epidemic prevention (National Health Commission 2020).

The primary medical and health institutions played a crucial role in the overall national fight against the pandemic and mainly made efforts from the following four aspects (Fu et al. 2020). Firstly, it helped to have the early detection of suspect patients. Primary medical and health institutions are closer to the community and can find fever patients early through pre-screening, triage, household investigation, fever screening, and epidemic history inquiry in public places and traffic arteries. Secondly, it helped to manage the close contact person from the key areas and local patients with fever or medical isolation at home, including the follow-up of patients who are isolated by centralized or at home, assisting with an epidemiological investigation, conducting health examination, reporting epidemic information, and participating in the transfer of suspected patients. Thirdly, carry out extensive mobilization and publicity together with health consultation and psychological counseling for community residents. According to the prevention and control requirements, the guidlines and information materials shuld be provided by the superior prevention and control institution to carry out publicity. Fourthly, participate in joint prevention and control on community management - for example, assist the community in carrying out epidemic prevention and control on public disinfection, environmental sanitation and so on.

The COVID-19 has helped a more intuition about how unprepred and vulnarable the global health system is to prevent the social risks this time. Along with the unknown development of COVID-19, it has become a constant disaster. To make a resilient community is a matter of great urgency. Once the pandemic occurs again, the resilient communities can mobilize the community material and human resources quickly and start the emergency plan in time to reduce the vulnerability and disorder in the process of prevention and control of COVID-19. Prevention knowledge should be trained and publicized to the community residents, and emergency plans should be made for the community. It is also necessary to prepare enough emergency supplies and refuge space and other resources that cannot be quickly integrated after the pandemic. Meanwhile, it is vital to strengthen the protection of vulnerable groups such as the elderly living alone, children, disabled people, and pregnant women.

All in all, in order to fight against the COVID-19, PHC, resilient community, and nurses are indispensable. PHC is the foundation, resilient community is the prominent bone, and nurses are the key.

18.2.2 Case Study 2: "Bounce Back" Mobile Application – Nurturing the Frontline Nurses' Resilience During the COVID-19 Crisis in Bali, Indonesia

Rini Damayanti

Reference: Ongoing project by Damayanti Made Rini: The effectiveness of mobile application 'bounce back' on frontline nurses' wellbeing and resilience during Covid-19 pandemic in Bali, Indonesia

18.2.2.1 Introduction

A year after the declaration of the global pandemic status by the World Health Organization (WHO), coronavirus disease (COVID-19) remains a major threat in many parts of the

world. The first case in Indonesia was confirmed in early March 2020 (Indonesian Ministry of Health 2020); to date, the transmission rate and the number of cases has not been suppressed. Various mitigation strategies, preparedness, and responses from the health authorities to minimize the spread have not been able to control the outbreak.

Bali is among the hardest hit, with new cases increasing significantly even in early 2021. Bali has recorded the highest number of cases, sitting in the fourth position nationally, with mortality rates also higher than the national average. Per 5 February 2021, data from Bali Provincial Health Department recorded 27,127 confirmed cases with 2.59% mortality (702 people), which were mainly clustered in the Denpasar area (The Covid-19 Handling Task Force of Bali Province 2021).

18.2.2.2 Problem

The prolonged COVID-19 pandemic has impacted almost all sectors, concerning not only the health but also the economy, social, education, politics, defense and security, and the overall welfare of the Indonesian population (The Indonesia Ministry of Health 2020). In the health sector, the pandemic has increased the need for services to the point that resource management crisis in some areas is threatening the sustainability of the health system. In Bali, for example, at the time of this report writing, the occupancy rates of all COVID-19 referral hospitals had exceeded the ideal bed occupancy ratio (The Covid-19 Handling Task Force of Bali Province 2021).

In order to meet the demand of healthcare services and facilities, the Indonesian government has designated a number of hospitals as COVID-19 referral facilities, established makeshift hospitals, and provided integrated facilities to treat the positive cases (Accelerated Covid-19 Handling Task Force 2020). The government has also recruited extra volunteer health workers with professional certification from various fields, including junior nurses (Center for Indonesia's Strategic Development Initiative 2020; Indonesian Health Personnel Council 2020).

Although the recruitment of junior nurses could be an ideal solution to help accelerate the response to the pandemic and emergency, it is also risky because they are generally novice nurses with limited clinical experience. From the job security perspective, the nurses' status as contract workers may leave them with low bargaining power, which consequently puts them in a vulnerable position. They are more prone to risks and negative impacts of working with COVID-19 cases compared to registered nurses. They may experience high work pressures and challenges due to the heavy workload, risk of transmission, unpreparedness, and uncertainties due to the prolonged pandemic (International Council of Nurses 2020). In fact, nurses in the current project were found to be experiencing various psychological problems such as anxiety, fear, stress, burnout, and other somatic symptoms. This condition has the potential to affect the health and well-being of the volunteer nurses; and if left unaddressed, nurses may be unable to provide quality nursing care (Wu et al. 2020). Overall, this will not only jeopardize patients' safety but also lower the likelihood of the junior nurses to stay in the profession during this critical moment. All things considered, the nurses' well-being and livelihood in times of crises such as in the current pandemic needs serious consideration.

18.2.2.3 Approach/Stakeholder Participation

Entering the fourth trimester, the transmission of COVID-19 in Bali could be categorized into a super-spreader with a sporadic community transmission pattern (The Covid-19 Handling Task Force of Bali Province 2021). Volunteer nurses and other healthcare professionals at the frontline would be experiencing increasingly heavy and prolonged work pressures. To prevent the negative impacts on mental well-being, our team from the nursing department at Udayana University created a mobile-based educational program called "Bounce Back." This mobile application (app) is designed to provide educational media for volunteer nurses and organizations/institutions that need simple, practical, real-time, and

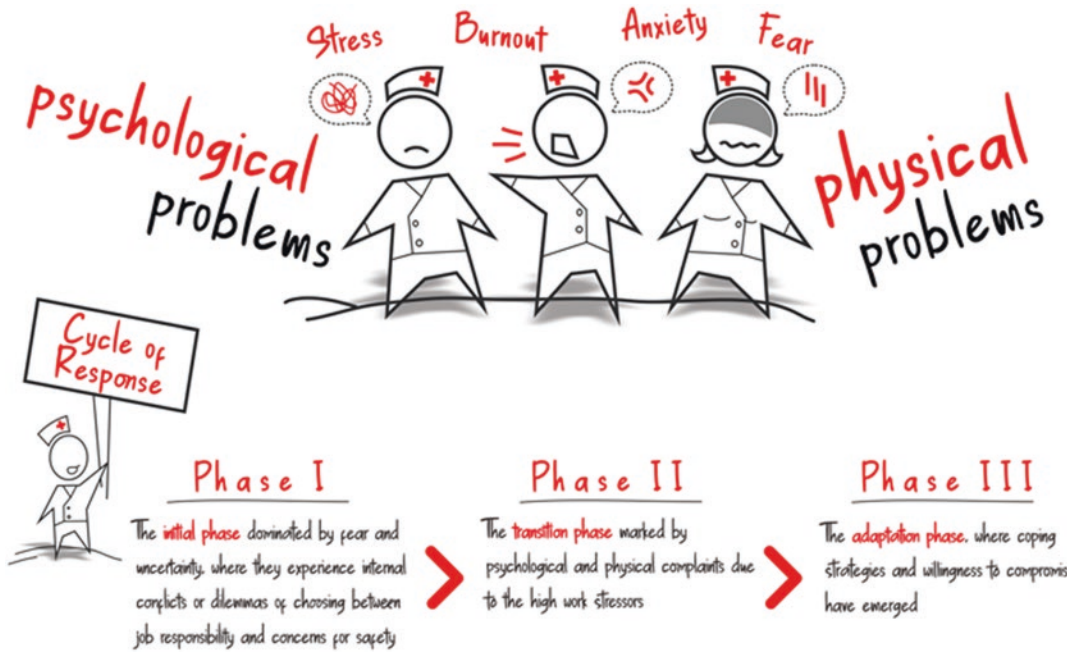

Fig. 18.1 Cycle of response

free-of-charge access to relevant references. It will help them adopt strategies to improve the welfare and resilience of frontline nurses to optimally serve their community see also Fig. 18.1.

This project began by analyzing the situation through a series of interviews with volunteer nurses to gauge their experiences in working at the frontline. The identification shows that the volunteer nurses were identified to be experiencing a cycle of responses with a generic pattern attributed to crisis situations, namely: (1) the initial phase dominated by fear and uncertainty, where they experience internal conflicts or dilemmas of choosing between job responsibility and concerns for safety; (2) the transition phase marked by psychological and physical complaints due to the high work stressors; and (3) the adaptation phase, where coping strategies and willingness to compromise have emerged. Each nurse has gone through these phases at different paces. Knowing which stages are being experienced by nurses is important to determine the appropriate intervention.

The second stage of this project focuses on the design of the "Bounce Back" app see also Fig. 18.2 based on the empirical evidence, input from panel experts, and interview data we obtained from the previous stage. This had allowed us to add nurses' experiences and the cultural context into the proposed intervention. In other words, this project focuses not only on the effectiveness of the intervention being applied but also on the feasibility, practicality, and appropriateness. This is necessary because interventions must be context-relevant and meaningful, as well as positively experienced by the targeted group of people (Shaw et al. 2014).

In the early development stage of the "Bounce Back" app, the intervention seeks to optimize the use of resources owned by individuals as well as support from peers and community. Based on the participants' responses, we identified a tendency for volunteer nurses to put aside their own needs for the sake of patients and organization. This information becomes the foundation of app development. The aim is to raise awareness among nurses about the importance of self-care in nursing practices, which is not at all selfishness as some may believe but a foundation for productivity that will help them stay resilient.

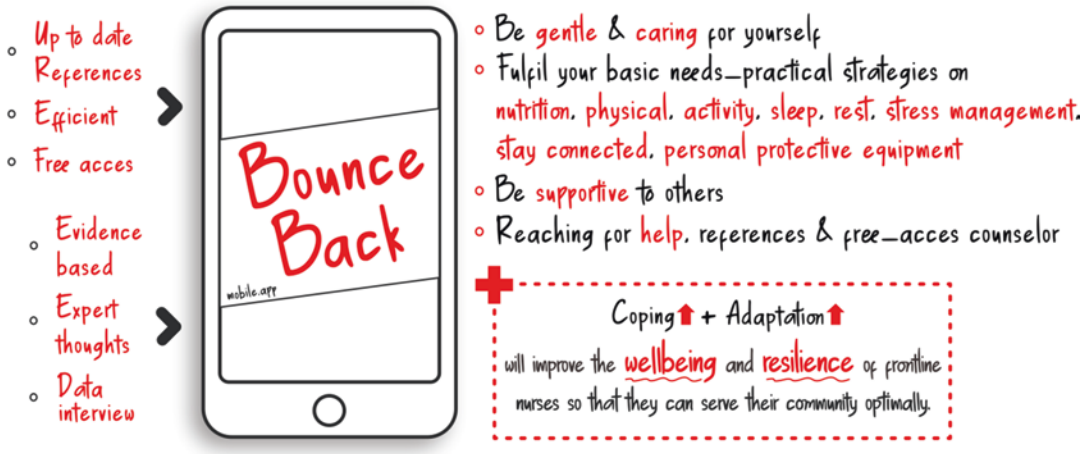

Fig. 18.2 Mobile application: Bounce Back

The next stage focuses on the strategies to meet the basic needs, especially the physiological and safety needs, which include healthy nutrition intakes, recommended physical activity, adequate rest/sleep, normal working shifts, adequate personal protective equipment, coping strategies, stress management, and so on. Nurses are also educated on the strategies to optimize the existing peer and social support: for example, by checking up on the condition of team members during shift transitions, implementing a work buddy system for novice nurses, regular formal or informal debriefing meetings with team members, and other relevant strategies to improve the general well-being. The app also provides a number of additional references and counselor service contacts that can be accessed by its users 24/7 for free. Input and feedback from participants before, during, and after the project had provided insights for the development of intervention programs. This is necessary to meet the needs, characteristics, and preferences of the target groups that have become increasingly dynamic during the pandemic.

18.2.2.4 Conclusion

Normalizing self-care, personal health, and well-being is not an easy task because this is related to professional culture and other practical factors. This project shows how an intervention that is implemented by involving the target groups at the problem identification stage and app design can increase awareness, sense of belonging, and willingness to adopt a program.

A key takeaway is that the well-being and resilience of nurses and other healthcare providers are not just their personal responsibility but a shared responsibility of all parties including the organizations, the government, and other relevant parties, as well as the society at large. It is advisable that intervention project development is carried out by involving all stakeholders. This pandemic has also reminded us that having strong health professionals at the frontline is the foundation for a robust health system in responding to disasters and crises. This pandemic has presented challenges as well as an opportunity to build a more resilient nursing workforce and health system.

18.2.3 Case Study 3: Disaster Response to the COVID-19 Outbreak on Cruise Ships in Japan

Shigeru Miyamae and Kengo Kobayashi

18.2.3.1 Background

Japan's response to the COVID-19 outbreak on a cruise ship was unprecedented in the world. This report focuses on the activities of the Diamond

Princess (hereinafter referred to as DP), which was the first cruise ship to respond to the outbreak.

The DP was a cruise ship that departed from Yokohama Port on 20 January, via Kagoshima, Hong Kong, and Naha ports, and returned to Yokohama Port on 4 February. However, a passenger who disembarked in Hong Kong on 25 January was found to be infected with COVID-19, and the captain of the ship was notified via an IHR (International Health Regulation) call on 2 February, and quarantine began on 3 February on the DP anchored off in Yokohama Port. The next day, infected passengers and crew were discovered, and the disembarkation of the passengers was postponed. The Japanese requested that the DP remain at sea until the end of quarantine, and quarantine measures for the DP began (Ministry of Health, Labor and Welfare 2020). At that time, there were 3711 passengers and crew members on board, and to respond to the medical (health) needs of the passengers and crew members on board, a Disaster Medical Assistance Team (DMAT), including the author and others, was dispatched, and activities were continued from 8 February until 1 March, when all the passengers disembarked.

In this case, the Cabinet Office; Ministry of Internal Affairs and Communications (MIC); Ministry of Land, Infrastructure, Transport and Tourism (MLIT); Minister of Defense; Ministry of Internal Affairs and Communications (MIC); and Ministry of Health, Labor and Welfare (MHLW) were involved because of the relevance of international laws such as the United Nations Convention on the Law of the Sea and the legal system in Japan (Asia-Pacific Initiative 2020). In addition, more than ten teams of experts in the health and medical fields, including DMAT, DPAT (Disaster Psychiatric Assistance Team), the Self-Defense Forces, the Japanese Red Cross Relief Team, and a team of experts in infectious diseases, gathered to respond to the disaster. In this case, an essential requirement is the construction of logistics as healthcare and the coordination between multi-institutes and multi-teams. The eight competencies required for disaster medical logistics specialists are headquarter management, cooperation and coordination with related organizations, safety management, securing accommodation and activity sites, organizing and processing information, communication technology, procurement of supplies, and securing transportation (Japan Society of Disaster Medicine 2019). In addition, disaster medical coordination is an activity to bring together the functions of health, medical care, and welfare, which have complementary relationships, and to secure systems for saving lives, securing emergency medical care systems, continuing medical care and health management, and restoring health and welfare service systems (Morino 2020). In other words, the response in the DP will be to coordinate the complex legal system and the roles and activities of multiple organizations so that the necessary information can be consolidated and to analyze the information while establishing the 6Rs (right information, right coordination and cooperation, right time, right place, right person, right materials) (Fujiwara 2020) and coordinate all resources to develop activities to provide appropriate medical care and treatment.

18.2.3.2 Activities Onboard Diamond Princess

At the beginning of the operation, there were more than 60 new fever cases per day onboard. To cope with this, it was necessary to take immediate countermeasures against infection, establish a PCR testing system, secure a place to accommodate passengers and crew, establish a medical treatment system, and implement health management and screening. On the other hand, on 5 February, passengers were informed to stay in their cabins due to the outbreak of infection onboard and would have quarantined for 14 days in principle through the ship's announcement; some people were running out of their regular medicines at that time (Koyanagi 2020). The main activities were headquarter operation, infection control, medical treatment activities, psychological care, dispatch of patients who have tested positive, prescription of medicine for passengers and crew members, and health observation of the team members, who were divided into onboard and offboard groups.

However, due to the lack of information and uncertainty about the unknown virus and the unclear scope of authority in a multi-organizational situation, multiple consultations and permissions were required, and it took 3–4 days for the team to meet the patient. Thereafter, the flow of medical treatment and dispatch of patients who have tested positive was arranged through repeated negotiations with multiple organizations and discussions within the healthcare team. However, it took us about a week to establish an environment where we could provide medical care on the same day as the patients have tested positive. In addition, regarding emergency medication, priority was given to prescribing life-threatening medication, but with so many passengers on board, it was not possible to prescribe all the necessary emergency medication.

When dispatching a person infected with COVID-19, it was challenging to secure a medical institution to receive the patient and procedures such as protection of medical personnel, explanation to passengers and crew, and consent of family members because the virus was still unknown at that time. After making the decision, the collection of luggage and quarantine permission was necessary to transfer the patient to the vehicle outside the ship to be dispatched to the hospital. It took 1–3 hours for each patient to be dispatched. While I was checking the patient's condition lying on the stretcher in the transport vehicle, I could feel her cold hand even through medical gloves in the middle of February. When it was still cold in mid-February, the patient grabbed my hand and said, "I have a fever and weakness but I am relieved, and finally I am going out." I will never forget the tears of relief on her face. After that, the patient gradually talked about her life on the ship and contact with her family, which strongly reminded us that the physical distance of isolation strongly affects the psychological distance between people. Dispatching COVID-19-positive patients to the hospital and the family response were a problem. Even in cases where the infection was discovered in the family, few medical institutions allowed the family to accompany the patient at first. Sometimes, the family had to be admitted to a medical facility far away from the hospital. There was a lot of thought and error involved in dealing with the problem of family members being separated from each other and facilitating communication and visits to provide explanations when the patient's condition deteriorated. Other tasks included coordinating the transportation for chartered flights from overseas for the return home, and the activities of the healthcare team came to an end when all passengers and crew disembarked on 1 March.

18.2.3.3 Remaining Issues from the Perspective of Disaster Nursing

Japan has been hit by many disasters in the past, and with each disaster, the country has accumulated experience in disaster response. It can be said that the knowledge gained from experience greatly supported the activities during the first response to the cruise ship, as there was not a single death on board. However, many issues remain to be addressed through this case, and two issues are described in this section.

Complexity Due to the Involvement of Multiple Organizations

As mentioned earlier, this case involved various legal systems and organizations, which led to a lack of organized activities. In other words, it was necessary to confirm the authority, role, and responsibility for each matter and then obtain the communication method and consent to decide. These are often encompassed in the concepts of disaster medical logistics and disaster medical coordination. For example, many consultations, negotiations, and discussions are required before a response policy can be decided, and the date, time, and location of these discussions must be set. In this case, due to many related legal systems and organizations, it took a long time to conduct these activities, and it is difficult to say that an environment for providing the necessary medical care was quickly established. During this time, the situation and healthcare needs were changing rapidly, and the people were still waiting for the necessary medical treatment and care.

It is necessary to review the purpose of the coordination for disaster medicine and look at the activities from the perspective of why medical care could not be provided immediately. This information has to be used to improve the support system for healthcare and welfare under emergency conditions so that necessary medical care will not be disrupted at any time.

Disconnected Communities Due to Closed Environments

It can be said that the situation on the DP was a double-closed environment: at sea and in-cabin isolation.

Acquisitions of information were limited due to Internet interruption and restricted time for walking around the ship, although the communication environment for guests was secured (Koyanagi 2020; Yaguchi 2020). With fragmented information both inside and outside the ship, passengers could not contact family and friends outside the ship, nor were they allowed to meet with people they had met on board. Solnit and Takatsuki (2020), using the words of a World War II survivor, describes the formation process of a "disaster utopia" in which the tragic events of disaster give rise to a strong community in which human nature is made manifest. The process of formation is described in the words of a World War II survivor: "By sharing widely the dangers, losses, and shortages, a sense of intimate, first and foremost group solidarity is created among survivors, which helps them overcome social isolation, provides a pathway for close communication and testimony, and is a major source of physical and emotional support and security". Yaguchi (2020), who experienced isolation on the ship, and isolation at a home that continued after disembarkation, wrote, "At least on the ship we were a group of people who had been experiencing the same thing". It is easy to imagine that if it had not been for the infectious disease that required isolation, a strong community would have emerged on board, and that community could have been a source of peace of mind for the people. It is easy to imagine that the double-closed environment on the DP would have been disconnected from the community. In addition, although the process of forming human relationships with the target population is considered important in disaster nursing, it can be said that the nurses in DP were unable to fully engage with the target population. In the DP, however, it can be said that the nurses were not able to fully engage with the target group. It is necessary for disaster nursing to explore how to intervene in such an environment where it is difficult for the nurses to make use of their inherent abilities and where the nurses are restricted from directly engaging with the target group.

18.2.3.4 Conclusion

After responding to the DP, one of the authors also responded to the COVID-19 outbreak on the cruise ship Costa Atlantica, which was docked in Nagasaki Prefecture in April of the same year, and developed activities based on the DP experience. We supported the health of the passengers and crew and were able to complete our activities without any fatalities. We hope that the experiences described in this section will contribute to the development of disaster nursing in the future.

18.2.4 Case Study 4: COVID-19 Experiences and Activities in Nepal

Parvati Bista

COVID-19 has affected all the dimensions of human life across the world. Developing nations like Nepal have been severely affected by the COVID-19 pandemic, with a growing number of confirmed cases and casualties in recent days. The country is vulnerable due to low health literacy among the general people, poor housing and overcrowding in urban areas, a fragile health system with a shortage of adequately qualified frontline healthcare personnel, and poor diagnostic capability of laboratories. In this deadly pandemic, the frontline healthcare workers, especially nurses, are fighting the battle against the virus. The nursing profession in Nepal had two aspects: general nursing and public health nursing. Due to the lack of training, specialization, and experience in disaster nursing, it would

be difficult to work in the field during the disaster.

The role of the nursing profession was very significant before and has increased the role and responsibility by higher folds in this pandemic despite limited resources and personal protective equipment. In Nepal, the roles of nursing professionals were very much significant, and most of the nurses in Nepal are regularly performing duties of their respective health facilities and hospitals. Nurses provide health services in various areas like reproductive health service, management of COVID and non-COVID-19 cases in hospitals or isolation centers, working in entry and exit portals of airports and borders, and some in risk communication and information management or logistics management. The nurses are also engaged in vaccine management, and some are involved in case management, case investigation, and contact tracing. Besides those works, some are also responsible for district disaster management as a focal person, and many are working as counselors and health promoters in various areas of the country.

The number of nurses infected by COVID-19 was high, as they are the frontline caretaker and had close contact with patients in the first phase of the pandemic. So, the Government of Nepal had provided vaccines to all health workers in the first phase of the national vaccination campaign, which was started from 27 Jan to 9 Feb 2021. During that vaccination campaign, nurses got the first dose of vaccine and completed the second dose in April. The second wave of COVID-19 started in April, which created a devastating situation by increasing the infectivity rate and mortality in the country. All the hospitals were overloaded with the COVID-19 patients, and the duty of nurses increased by more than before. The nurse/patient ratio of Nepal was very low, one nurse had to take care of 20 to 30 patients in normal situations, but during the second wave, the patient number increased.

Being in the nursing profession in a developing country like Nepal is tougher because there are many issues like low salary, excessive workload, and no incentives and motivation during the pandemic while working day and night, leaving our children and family. Besides this, during this pandemic, we face various physical and psychological violence while performing our duties. In the last week of May, there was an incident where nurses and doctors were attacked in the Bheri Hospital of Banke district, leaving them injured, and four of the health workers jumped from the first floor to save their life from brutal attacks. This type of situation is repeated frequently, and these types of violence are increasing day by day. We, nurses, face physical and psychological violence and verbal harassment from the people around, making us demotivated. Another problem faced by nurses are the stigma-related problems during this pandemic. Society is stigmatizing us, and, in some places, nurses are not allowed to enter their rented homes from the house owner. One of the studies conducted during the pandemic in Nepal also showed that a considerable proportion of health workers face stigma related to COVID-19, and the stigma is a major reason for the mental health outcome like stress, anxiety, fear, and insomnia (Chandra et al. 2020).

Similarly, another study reveals the prevalence of anxiety among nursing staff was 43.6% (Khanal 2020). We, nurses, are ready to work very hard, but with the fear of contagion and stigmatization of COVID, social isolation has made us unmotivated and stressed, so we request every stakeholder to support the health worker and help in combating this deadly pandemic together. Despite the burden of work and low paid salary, we are 24 hours ready to save lives and make our country healthier and happier. The country is in a tough situation because of the second wave of the pandemic, and our role has increased to support the country's health system. Despite having many challenges, we also have the capability to fight against the pandemic with full potential. We request the Government of Nepal to take quick fine steps to save the life of people from this deadly virus. Many people are dying in front of us by not getting beds or oxygen or ICU in hospital. In the middle of the second wave, all the issues of health workers, including nurses, should be addressed, and there should be a provision of a favorable environment to perform the duty. We are hopeful that the day will come when the gov-

ernment of Nepal will understand the importance of nurses and will address all the issues regarding our profession. Lastly, Nepalese people should get quality healthcare, and no one will have to die by not getting proper facilities and quality health services.

18.2.5 Discussion of Case Study

This chapter presented four case studies from China, Indonesia, Japan, and Nepal in response to COVID-19 outbreak as a nurse. COVID-19 has not only impacted the health sector but almost all the sectors including social, education, and economy, and so the WHO has characterized it as a pandemic.

The first case studies illustrated primary healthcare, resilient community, and nurses are essential to fight against COVID-19. Nurses were the closest medical personnel to the patients, paid attention to the psychological care and emotional changes of patients, offered mental counseling, and helped to build up the confidence to overcome the disease. The primary medical and health institutions played a crucial role in the overall national fight against the pandemic and mainly made efforts from the following four aspects: Firstly, it helped to have the early detection of suspect patients through pre-screening, triage, household investigation, fever screening, and epidemic history inquiry in public places and traffic arteries. Secondly, it helped to manage the close contact person from the key areas and local patients with fever or medical isolation at home, including the follow-up of patients who are isolated by centralized or at home, assisting with an epidemiological investigation, conducting health examination, reporting epidemic information, and participating in the transfer of suspected patients. Thirdly, carry out extensive mobilization and publicity to control requirements, guidelines, and information materials. Fourthly, participate in joint prevention and control on community management like assisting the community in carrying out epidemic prevention and control on public disinfection, environmental sanitation, and so on. Prevention knowledge should be trained and publicized to the community residents, and emergency plans should be made for the community. It is also necessary to prepare enough emergency supplies, refuge space, and other resources that cannot be quickly integrated after the pandemic. All in all, to fight against the COVID-19, PHC, resilient community, and nurses are indispensable. PHC is the foundation, resilient community is the prominent bone, and nurses are the key.

The second study in Indonesia expressed the concern that though recruiting junior nurses could be an ideal solution to help accelerate the response to the pandemic and emergency, it is also risky because they are generally novice nurses with limited clinical experience. They are more prone to risks and negative impacts of working with COVID-19 cases compared to registered nurses. They may experience high work pressures and challenges due to the heavy workload, risk of transmission, unpreparedness, and uncertainties due to the prolonged pandemic, which consequently puts them in a vulnerable position.

The free mobile-based application called "Bounce Back" is designed to provide education for nurses and organizations/institutions that need simple, practical, real-time, and free-of-charge access to relevant references. This project helps them to adopt strategies to improve the welfare and resilience of frontline nurses through a series of interviews. The generic pattern attributed to crisis situations includes the initial phase dominated by fear and uncertainty, where nurses experience internal conflicts or dilemmas of choosing between job responsibility and safety concerns; the transition phase marked by psychological and physical complaints due to the high work stressors; and the adaptation phase, where coping strategies and willingness to compromise have emerged. In the second stage, the empirical evidence, input from panel, and interview data were obtained for effectiveness of intervention being applied, feasibility, practicality, and appropriateness.

The intervention seeks to optimize the use of resources owned by individuals as well as support from peers and community. The next stage

focuses on the strategies to meet the basic needs, especially the physiological and safety needs, which include healthy nutrition intakes, recommended physical activity, adequate rest/sleep, normal working shifts, adequate personal protective equipment, coping strategies, stress management, and so on. Input and feedback from participants before, during, and after the project had provided insights for the development of intervention programs. This is necessary in order to meet the needs, characteristics, and preferences of the target groups that have become increasingly dynamic during the pandemic.

The third case study explained the response to the COVID-19 patients on cruise ships in Japan. Japan has been hit by many disasters in the past, and with each disaster, the country has accumulated experience in disaster response. However, many issues remain to be addressed through this case, and two issues are complexity due to the involvement of multiple organizations and disconnected communities due to closed environments. The writer described two issues that remain unresolved, and more study must be done to this issue to accumulate experience in the future.

When dispatching a person infected with COVID-19, it was challenging to secure a medical institution to receive the patient and procedures such as protection of medical personnel, explanation to passengers and crew, and consent of family members because the virus was still unknown at that time. After deciding, the collection of luggage and quarantine permission was necessary to transfer the patient to the vehicle outside the ship to be dispatched to the hospital. Even in cases where the infection was discovered in the family, few medical institutions allowed the family to accompany the patient at first. There was a lot of thought and error involved in dealing with the problem of family members being separated from each other and facilitating communication and visits to provide explanations when the patient's condition deteriorated. In the fourth case study, Nepal has been severely affected due to low health literacy, a fragile health system, poor diagnostic capabilities, limited resources and equipment, and inadequate frontline healthcare personnel during the pandemic of COVID-19. Nurses provide significant contributions to combat the fight against pandemics providing healthcare services, management of COVID and non-COVID patients, communication and information management, or logistic management roles. The health workers are verbally, physically and psychologically harassed. The nurses also have to work long hours, leave family and children, and experience social isolation, so they are emotionally demotivated and have mental health issues like stress, anxiety, fear, and insomnia. Some of the health work had contagion and stigmatization of COVID. Despite this hardship, the nurses of Nepal fought and worked hard to care for patients with the spirit no one should die for not getting proper facilities and quality health service.

18.3 Way to Forward

The targets of SDG 3 had seen remarkable progress in recent years, including reductions in infant and maternal mortality, control of the HIV/AIDS epidemic, and halving the number of deaths from malaria.

The COVID-19 pandemic has diverted resources, workforce, and investment away from SDG3 targets of ensuring healthy lives and promoting well-being at all ages. Due to the rapid spread of COVID-19, hospitals are in a critical shortage of beds, medical supplies, and nurses. So, nurses are caring for many more patients than their usual capacity during their work shift with their skills, compassion, and determination to ameliorate COVID-19 patients and save lives putting their own lives in risk. Nurses and other health workers are suffering from physical and mental stress because they must work with not enough resources like personal protective equipment, staff shortage, overwhelming numbers of patients, underprepared health systems, and failures of the supply chain. Health service faces a situation of regression in the achievements not only due to the new coronavirus infection itself but also due to the discontinuation of routine medical care, health checkups, and campaigns.

The pandemic has laid bare long-ignored risks, including inadequate health systems, gaps in social protection, and structural inequalities. More deeply rooted, it has been pointed out that many people have lost educational opportunities (SDG4) and jobs (SDG8) since the start of the coronavirus. On the other hand, the challenges of women's unpaid care and domestic work (SDG 5.4) have increased manifold.

Nurses are the frontline of patient care in hospitals and actively involved with the monitoring and evaluation in the communities, there is an urgent need for timely on-the-ground data and action guidelines to ensure that no one is left behind by the reconstruction process, focusing not on averaged people but on the disparities that have opened up, especially among the poor and vulnerable. We need to create a fairer and more resilient world, not only by reducing long-standing inequalities.

Nurses need to update the understanding of the ethically justified expectations of their roles and responsibilities achieving SDG3.c, which the family and coworkers expect during public health emergencies (Johnstone and Turale 2014). Based on the above research and work experience, the organizational structure, plans, environment, technologies, and empowerment are essential to fulfill the needs of different working environments, situations, communities, and individuals during the COVID-19 pandemic. At the same time, health workers should know mental health assessment and treatment for themselves is also essential after disaster response (Xiang et al. 2020).

The SDGs encompass almost all aspects of what is healthy for humanity and the planet, and if we can achieve them, we can bring about a stable and prosperous life for all and keep the planet healthy. People have come to understand that each challenges discussed in above case study cannot be addressed separately, and the COVID-19 disaster needs to be seen as both a challenge and a great opportunity for community care giver to include the Sustainable Development Goals. It revealed the importance of basic public health and strengthening health systems and emergency preparedness, as well as the effects of healthcare providers such as nurses taking care on the frontlines to safeguard the lives of every patient. It will bring home the importance of basic public health and strengthening health systems and emergency preparedness.

More efforts and focus are needed to fully eradicate a wide range of diseases and address many different persistent and emerging health issues of global health emergencies such as COVID-19 which pose and have shown the critical need for preparedness. From the point of disaster nursing, we could have saved many of these nurses, their families, and patients from suffering from COVID-19 disaster if our policymakers, politicians, and nurses had focused on proactive risk reduction and all-hazard approach sooner. Nurses are now actively involved in COVID-19 intervention, and they will remain key players in controlling and eradicating the pandemic with adequate assistance. The pandemic provides a watershed moment for health emergency preparedness and investment in critical twenty-first-century public services. The lesson learned from the COVID-19 pandemic is that more nurses prepared as public health nurses with skills such as community-based health promotion for the time of the next health emergency or disaster., epidemiology and contact tracing and developed more jobs in public health nursing. To prevent an experience such as the one we are having with COVID-19, we would like policymakers and nurses to focus on public health by rebuilding public health infrastructure and nursing educators to shift their focus in curriculum and research to public health nursing on primary healthcare.

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Part IV

Assessing Care for Disaster Risk Reduction

19 Quantitative Approach for Assessment Health in Disaster

Tomohiro Matsuda and Sakiko Kanbara

19.1 Origin of Epidemiological Approach

It is easy to imagine that the approach needed in a disaster situation would be clinical care, with the main focus on treating the injured and infected in front of us. In the very short term, this is true. However, without an epidemiological approach, we will not be unable to effectively care for a large group of people and maintain the health of the injured and sick over the long term, and our countermeasures against the next disaster will be ad hoc and people-dependent. In this chapter, we would like to examine how the epidemiological approach, seemingly incompatible with an emergency, can be incorporated into disaster nursing to maximize its effectiveness.

Epidemiology is broadly considered by some to be a discipline or tool for taking countermeasures against diseases based on routine surveillance or over a longer period of time, such as targeting lifestyle-related diseases and making future estimates. It is true that many readers may think that epidemiology is not suitable for mitigating the damage caused by disasters that are occurring right now since it is a science or a kind of research requiring a long time for analysis that targets large populations and monitors overall trends. However, considering its origin, the best tool for disasters in terms of preventing the spread of immediate damage is epidemiology. In a review study, the author concluded that "disaster epidemiology" is to understand the frequency and severity of disasters, to figure out the needs of the survivors rapidly, and to minimize the public health impacts of future disasters (Svendsen 2018). Recently, a textbook has been published on these topics, as well (Public Health and Disasters 2020).

The pandemic of cholera was the first target, and reducing mortality by stopping water intake from a pump was the first epidemiological countermeasure in London in the nineteenth century (Snow 1856). According to the experience of the cholera pandemic, there are two elements here. The first is to count cholera deaths, and the second is to visualize the area of the outbreak. These two actions allow us to quantify the magnitude of the impact of cholera infection and to understand whether the infection is spreading chronologically or spatially. The basis of mass control of a disease is to understand the actual situation quantitatively. In addition, by recording the patient's health status, age, gender, etc., it is possible to determine which demographic groups have the highest burden. This will allow us to adjust the direction of medical support. Just knowing

T. Matsuda (✉)
National Cancer Center, Tokyo, Japan
e-mail: tomatsud@ncc.go.jp

S. Kanbara
University of Kochi, Kochi, Japan

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Table 19.1 Differences in approaches

	Epidemiological approach	Clinical medical approach
Target	Group of people	Individual
Method	Research and measurement	Diagnosis
Action	Prevention, assessment, and planning	Treatment, care, and nursing

whether the disease is mild or severe, whether there are complications, and whether it is more common among the young or the elderly will change the efficiency of disaster medical care and nursing. Accordingly, they were able to infer from map plots that the source of the infection was the water intake pump, and they were able to stop the spread of the infection by stopping the intake. How can we apply this epidemiological approach to disasters? In the immediately after a disaster, if the disaster is widespread, it is important to understand where the human losses are. If the disaster is likely to have a continuing impact (whether it is an aftershock from an earthquake, the second wave of a tsunami, or the continuing damage from a typhoon or flood), evacuation of survivors must proceed as soon as possible. In this case, emergency information should be provided based on social infrastructure and communication network. We need to know the residents beforehand, and the local network, which will be covered in other chapters in this book, will be more powerful than emergency information gathering.

19.2 Data Collection in Disaster Nursing

19.2.1 Evidence-Based Healthcare

In recent years, with the advance of information and communication technology (ICT), we are able to construct people's knowledge systems, and the research activities based on such knowledge have actually been developed. In the field of healthcare, we experienced the emergence of the concept of evidenced-based medicine (EBM) and evidenced-based public health in 1990s, in which medical information is not based on someone's empirical measurement but is analyzed and processed efficiently, and both healthcare providers and users are consequently able to use medical information autonomously. Evidence-based concept is now common knowledge in the field of nursing and has been established as both an academic and educational discipline (LoBiondo-Wood et al. 2018).

Epidemiology and clinical medicine differ significantly in their targets and approaches (Rothman 2020). The former targets populations, and the method of approach to the target is observation. As a result of observation, interventions at the local and national levels, environmental improvements, and the formulation of legal systems are used to improve the situation. The target of the latter is the individual patient. The approach to the patient is the individual diagnosis, and the response is to treat the individual because of the diagnosis (Table 19.1).

19.2.2 Data Collection and Processing in the Internet Era

The epidemiological approach that should be taken during a disaster is to collect information in a "standardized" way, to quickly establish a mechanism to consolidate that information in one place, and to use that information for anti-disaster planning. It is also necessary to improve processing methods for information collection and dissemination functions.

In the Internet era, we are able to share the information all over the world. This data-oriented mind and data sharing are keys for disaster nursing. The recent rapidity of communication via the Internet makes it easy to overlook important information. When collecting and processing information, who will collect and organize the information by item, and by what means will the information be output? In addition to human resources, it is necessary to determine how many

information devices and equipment will be needed and to check their operation at least once.

Complete survey is ideal as a data source of disaster support activities. However, sampling survey can be the best way to figure out the situation. Sampling is used to select a group of individuals as a data source to represent the total individuals in a defined population (Stratton 2019).

19.2.3 Figure Out Current Status of Disaster

The first piece of information that should be collected in the event of a disaster is the extent of damage threatening people's health caused by the disaster, especially damage to public infrastructure such as electricity, water, gas, communications, and transportation (Box 19.1). Some information can be obtained more quickly through social networking services such as Twitter, reported by administrative officers, medical experts, and survivors themselves (Vera-Burgos and Griffin Padgett 2020). If the information is the same from both sources, it is very likely to be reliable; if it is only on social networking sites and cannot be confirmed directly, we have to be more prudent to use or spread such information.

The methods of spatial epidemiology have been studied and modified for a long time, and statistical methods have been developed that can minimize chance variation even in small populations (Spatial Epidemiology 2001). Damage does not depend on the geographical boundaries of the municipality. In other words, even if there is information on the name of a place with damage, there are places that are affected and places that are not within the area. A common understanding of geographical information on a map will lead to accurate information sharing. GIS should be considered as a system in which local officials in charge of the area, who are familiar with the local geography, can grasp the situation in the district and make efforts to understand it. During the recent worldwide pandemic of COVID-19, GIS has contributed a lot to control infection (Kamel Boulos and Geraghty 2020).

Box 19.1: Items to be Included in Public Health Information Management for Disasters

1. Population summary.
2. Evacuation sites and essential commodities.
3. Environment, water supply, and sanitation.
4. Food and nutrition.
5. Health status and risks.
6. Places where first aid facilities and preventive activities are available.

19.2.4 In Case of Power Loss During a Disaster

Information collected about the disaster must be recorded and shared among government officials, medical personnel and disaster victims. In light of the congestion and limitations of regular cell phones and Internet connection under disaster setting, it is necessary to introduce satellite phones, IP phones, etc. so that data sharing can be done without relying on a single channel. There is no doubt that electronic database has a lot of advantages compared with paper-based records (Akhu-Zaheya et al. 2018). In low- and middle-income countries, medical information is still managed paper-based. Cancer registration is a good example of this situation of transition (Bray et al. 2014). If there is a loss of power supply or lack of ICT equipment such as PCs during a disaster, then classic paper-based case management will be necessary. If the electronic database is completely inaccessible, even the most sophisticated system will be useless. Mobile devices and wireless communication is a prerequisite, and it is useless if the system cannot cope with emergencies. In addition to preparing emergency batteries and database backups, it would be a

good idea for administrators and medical personnel to learn the methodology of surveying in paper format and managing simple databases using cards, which was the mainstream until the 1990s.

Standardize the items to be collected when conducting surveys and interviews on paper, and consolidate them on a single sheet of paper for each patient. If electronic registration is not possible, it may be useful to refer to the coloration on the fingers of patients who have already voted in elections in developing countries to determine whether they have been diagnosed or interviewed. Even in a situation where high technology is functioning, there was an incident in Tokyo after the Great East Japan Earthquake when the telecommunication did not work well. In preparation for future disasters, we need to think of ways to integrate these old technologies into our information systems.

19.2.5 Challenge to Create Useful Information

There have been limitations in objectively and timely obtaining and explaining data that can define the population of disaster victims, visualize the original demand, and explain the precise balance of supply and demand for public healthcare from the chaotic phenomenon of forced migration away from the original residence and mutual aid outside the familiar government and support system. No matter how the data and information processing environment are prepared, it is necessary to analyze the situation according to the actual data. The pitfalls and challenges regarding issues related to information management in healthcare during disasters are (1) pre-disaster information which is sometimes useless due to residents' mobility, (2) uncertainty of ICT infrastructure, (3) unguaranteed accessibility of information and data, (4) difficulty in visualization of welfare and residents' insights, (5) difficulty in simultaneous collection of information with time differences, (6) information duplication, (7) ensuring reliability and validity of data, (8) setting cross-cut points for reporting information, (9) overlook of vulnerable population, and (10) update of the situation.

19.2.6 Action During Information Collection

Epidemiology of disasters is characterized by the need for emergency action even while collecting data and differs greatly from epidemiology of noncommunicable diseases, such as cancer, and chronic diseases in this respect. What is most worrisome is the blank area where there is no information at all, even though the damage is presumed. Rather than waiting for information reports from these areas, we must immediately go out with lifesaving and rescue teams.

19.3 Data Preparedness for a Disaster

As for the high risk of disasters, it is expected that hazard maps are prepared in advance, evacuation sites and routes are illustrated, and acceptable medical institutions are registered. Since it is impossible to predict the location, scale, and type of disaster, it is undoubtedly important to make individual decisions when a disaster occurs. However, it is possible to mitigate the magnitude of damage by being properly prepared (Kapur and Smith 2010). Information related to disasters, life, and health should not be focused on the occurrence of emergencies but rather on indicators and methods that allow for broad and continuous monitoring, district understanding, and diagnosis, together with the risk of disaster occurrence, so that measures can be taken in public health and health policies and projects during normal times (Box 19.2). For example, in simulations based on estimated damage data for disasters such as the massive Nankai Trough earthquake in Japan, there is concern about the possibility of a rapid increase in sanitation and healthcare needs even if human suffering is drastically reduced because of the variety of damage depending on the time and season of the disaster and the rapid progress (Japan 2019). In the event

of a disaster, the prognosis for all aspects of the community is uncertain, budgets may not be fixed, ethical considerations are local and cross-sectoral, and we are forced to respond to crises in a way that cannot be designed or pre-tested. The premise of such health crisis management assuming natural disasters is multi-disciplinal collaboration, improvement of users' information literacy and how to use it according to their roles, and the need to consider and prepare countermeasures while observing social trends.

Box 19.2: Preparation Check for Information Collection Activities

- ☐ Which areas and populations should be assessed (the whole affected area, the whole city, a specific group)?
- ☐ What are the smallest group units (families, shelters, individuals) and subgroups (gender, age-groups) for which information will be collected?
- ☐ How long will it take for information collection during disaster?
- ☐ Are information collection applications, systems, sheets, etc. available and appropriate?
- ☐ Who is responsible for checking the reliability, accuracy, and timeliness of data and materials and for delivering them as information?
- ☐ Where should the information be consolidated and to whom should it be communicated?
- ☐ Is advance briefing and introductory training on information collection necessary or provided?
- ☐ How do we re-collect missing data due to disaster for decision-making?
- ☐ Do we have the necessary human resources, transportation, number of people, and equipment?

If we prepare data, we can provide meticulous care to evacuees in emergency situations, for example, in dealing with allergies in shelters and medical institutions (Hirase et al. 2019). To achieve the goals proposed in the SDGs, "11.b By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015–2030 (Reduction UNOFDR 2015), holistic disaster risk management at all levels" and "11.5 By 2030, substantially reduce the number of people killed and affected by disasters, including water-related disasters, and substantially reduce direct economic losses as a percentage of global gross domestic product, with a focus on protecting the poor and vulnerable groups," not only urban planning, disaster drills, and local networks but also advance information development will be necessary.

19.3.1 Personal Identification System

A personal number to identify and register the injured person or patient is indispensable during disaster. In particular, since it is not always possible to expect people to carry passport, driver's license, cell phone, or insurance cards in times of disaster, we must hasten to establish a system that links all such independent numbers or information with an unique ID, so that people can be referred to such a database by asking for their name, date of birth, and address. When investigating the effects of the nuclear power plant accident, it was regretted that it was not possible to get a complete picture of the situation in the end because the residents were in flux due to evacuation.

In Japan, data sharing systems on the Internet have been developed since the Great Hanshin-Awaji Earthquake in 1995 (Homma 2015). After the Great East Japan Earthquake, the sharing of medical information was reviewed, and there are signs of sharing among hospitals (Ido et al. 2019). However, databases developed by various vendors are already in disarray, and although each is being used in various situations, there is no horizontal linkage. The reason for the lack of com-

munication between databases is that the laws and regulations governing each of them are different and the administrators have different interests. Another fatal factor is that there is no personal identification number to connect the databases. Even if such numbers were to be assigned to all databases in the future, the assignment of numbers would only be prospectively. Since it is almost impossible to assign numbers retrospectively, such as disease history which is important for disaster nursing, the system must be developed as soon as possible. From the perspective of personal information protection, there are naturally concerns about information leaks, but the benefits of maintaining and using the information, along with strict security control measures, will greatly outweigh the risks in modern society.

In the COVID-19 pandemic, the public health information system that had been established during a regular time came to light in some areas that worked well and in others that did not. In the Netherlands, where the complete database is covering a broad area of the life of population, almost real time of analysis of chronic disease diagnosis has been done during the pandemic (Dinmohamed et al. 2020). Construction of a database that can be applied to future pandemics and disasters and population-based management are being considered (Burkle et al. 2021a, b). If a country has a weak information infrastructure, it can be considered as an opportunity. If there are no intricate laws, regulations, and interests, it is possible to build an information system that prioritizes the use of information at all times and in emergencies. Once a database is built, it is very difficult to connect it to other databases or to use it for other purposes.

19.3.2 International Data Resource

It is most important to establish an information collection system in advance. From the perspective of disaster risk management, the Sendai Framework for Disaster Reduction issued in 2015 states that disaster risk management policies and practices should be based on real-time access to reliable data; the use of space and space-based information systems, including geographic information systems (GIS); and the use of social and human science thinking to solve problems (Aitsi-Selmi and Murray 2015). Although individual baseline data and research data for the indicators of the new global agenda by 2020 are being produced in increasing quantities, the construction of cross-sectional databases and disaster prevention models across disciplines such as meteorology, geology, civil engineering, social science, and health is a challenge because the natural science perspective is dominant. Human science perspective is not easily available and challenging. There has been a remarkable increase in the types and means of disaster information that can be obtained in the medium to long term and in real time before and after a disaster compared to a few years ago, including the development of a system for information sharing using big data.

In the event of a natural disaster or political conflict, information management is key to ensuring that relief efforts proceed as efficiently and quickly as possible. Reliable information is essential to determine where people are in need of humanitarian assistance. The OCHA is responsible for collecting, analyzing, and sharing such information (https://www.unocha.org/). This information is gathered through a broad network of organizations and sectors, including not only UN agencies but also affected communities, aid organizations, governments, and the media.

19.4 Implementation and Evaluation of Support

19.4.1 Short Term

In a situation where there is an imbalance between the supply and demand of medical care, it is necessary to organize the public health and medical care delivery systems as public assistance, evacuation shelter living environment development as mutual assistance, and self-help health protection by citizens. It is also necessary to analyze the results in order to be able to make

decisions for rapid and appropriate response, reduction of health risks that exist during normal times, and appropriate recovery. The information reported from each site and evacuation center should be organized into items by departmental resources in charge of human damage, physical damage, and response, so that it can be easily tracked, managed, and updated.

19.4.2 Long Term

Using epidemiology to understand disaster health and the use of maps in the immediately after a disaster can greatly improve information sharing and consensus building among supporting organizations and facilitating rescue and recovery efforts. Apart from identifying disaster exposure and direct mortality, waterborne diseases and animal-borne diseases as the main health hazards are also investigated as further public health items to overview and assess the disaster as a whole (Veenema et al. 2015).

After assessing the damage directly caused by the disaster and the occurrence of secondary diseases, it is necessary to determine the priority targets, areas, etc. and formulate countermeasures. When formulating countermeasures, it is also necessary to understand the infrastructure and human resources that are available. It is also necessary to gather information on the status of medical and evacuation facilities that can be used in the event of a disaster and to compile a list of medical personnel, caregivers, and volunteers who can be dispatched. The next step is to select an intervention method that can be implemented according to the available resources. If there are several evidence-based intervention methods, we will choose one from among them.

19.4.3 After Disaster

There is a lack of evidence-based interventions to evaluate implementation effectiveness under disaster setting (Chan et al. 2019). Disaster support activities vary from small-scale individual activities to those involving large budgets from national and international organizations, but we need to be aware that the results of these activities will provide useful information for the future activities. It would be a great contribution if we could record the details of what went well and what did not and analyze them scientifically. Japan's Ministry of Health, Labour and Welfare (MHLW) is working on creating a database to collect evidence and accumulate information in nursing care services for scientific nursing care. This database is called "CHASE" and will be used in the future. In the United States, there is already an accumulation of scientific interventions in cancer control. The site Cancer Control Planet (https://cancercontrolplanet.cancer.gov/planet/) allows users to search for "effective" methods of prevention and early detection.

19.4.4 Evaluation Cycle

After the support is implemented, process and outcome evaluations of the support project are conducted (Fig. 19.1). By doing this, it is possible to determine whether the support method currently being implemented is correct or whether the method should be changed. The outcome evaluation will also enable us to determine at what stage we should shift from emergency nursing care to normal nursing care. Monitoring and evaluation is more difficult in emergencies, but it is especially necessary to record after the fact whether the measures taken this time worked or not and, if they did, what was done well and at what point. In this respect, too, a scientific perspective is necessary, leading to the scientific accumulation of intervention methods mentioned in the previous chapter. In an emergency situation, it is difficult to construct a so-called research design for intervention, but it is important not to divide disaster medicine/nursing and science.

19.5 Summary

Epidemiological approaches are already well-established in disease control during peacetime, but they are also extremely effective in nursing

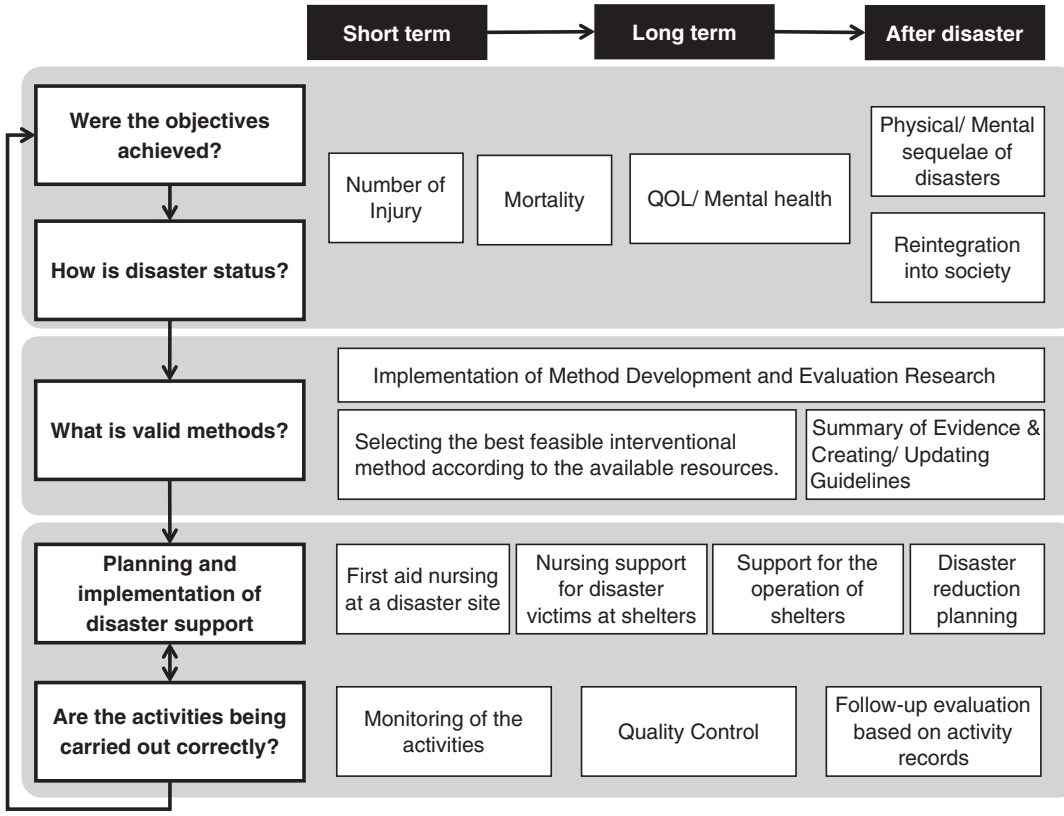

Fig 19.1 Cycle of disaster nursing

care during disasters. It is necessary to eliminate the prejudice that regular medical care and emergency medical care, epidemiological approaches, and clinical medicine approaches are all separate. The following points are totally common for the both: (1) to collect information, (2) to provide scientifically based interventions for populations, and to (3) evaluate them, which are necessary elements for any field.

Once a disaster occurs, it is necessary for each organization to set up a task force or activity headquarters to carry out quick and accurate activities with the goal of saving lives and reducing disasters. Information collection, analysis, and evaluation should be paid special attention, which is the main role of the disaster management. Epidemiology of disasters is characterized by the need for emergency action even while collecting data and differs greatly from "typical" epidemiology. The important thing in information management is not to make acquisition and analysis the goal but to utilize the information toward the goal. While analyzing the current situation from a bird's-eye view using epidemiological thinking from miscellaneous information that changes rapidly from hour to hour, we should keep an eye on non-aggregated and qualitative data and link it to the response to high-risk and vulnerable people. Ongoing information management is required to support decision-making.

In a disaster situation, it is too costly and time-consuming for a single organization to acquire focused information for the purpose. If we do not determine how much of the measures to budget and how much effort to put into them, the disadvantages may outweigh the advantages, resulting in adverse events and burdens to the community members. Using the prepared information by the community, academic discipline, and methodology, more efficient, scientific, and ethical disaster support activities are realized. In this chapter, I touched the specificity of the nursing activities in emergency time. However, I would like to emphasize much more that the evidence-based

preparedness mind in addition to the EBM mind and information management is always the key to getting through a disaster while minimizing the damage.

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20 Qualitative Approaches to Investigating Health in Disaster: Cases from Nepal and Japan

Hyeon Ju Lee and Miho Murata

20.1 Introduction

In the afterhours of a disaster, collecting detailed and accurate health data is an unsurmountable task for many researchers although it is the utmost necessity to understand the nature and ways disasters affect the human health. For disaster preparation and mitigation in disaster-prone areas, a clear understanding to health threats and risks that arise before and after the disaster is a prerequisite knowledge. Disaster health researchers particularly need more comprehensive understanding to health threats that exist in shelters and temporarily set-up communities. One of the ways in which more meaningful data with immediate accuracy can be collected is through close observations and participatory investigation. The nursing researchers who are interested in more qualitative methods in approaching disaster research have utilized ethnography and phenomenology.

20.2 Ethnographic Approach to Disaster

Ethnographic fieldworkers are "present and in dialogue with participants to gather local knowledge and information, are far more appropriate for exploring the process of adjustment and recovery than are more synchronic forms of research" (Hoffman and Oliver-Smith 2002:12–13). Shuhei Kimura argues "Disaster, which arises from the crack in the coupling between nature and culture, is something that anthropology has to explore" (Kimura 2012: 66). This quote assumes that the very same phenomenon that is labeled by humans as *disaster* is not called a disaster when occurred in the realm of nature and does not affect us humans (Kelman et al. 2015). When the phenomenon affects and disrupts human lives, we call it disaster. This way of looking at disaster is quite similar to the way medical anthropologists have approached the notion of disease and illnesses. Donald Joralemon (2010) borrowed a political scientist Peter Sedgwick's word on our way of thinking about disease in that, "Outside the significance that man voluntarily attaches to certain conditions, there are no illnesses or diseases in nature" (as quoted on P. 2). Sedgwick's position iterates those diseases and illnesses are cultural categories of natural phenomenon (such as fractures and fatal ruptures of tissues, presence of infectious and contagious bacilli) that people have created. What we humans call 'disaster' and 'epidemics' are cultural categories that human societies have developed through culture, anthropological approach would bring out grounded and meaningful ways to look at assessing the

H. J. Lee (✉) · M. Murata
University of Kochi, Kochi, Japan
e-mail: lee_hyeonju@cc.u-kochi.ac.jp

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causes and vulnerability to threatening epidemic causing agents in disaster times. It is well documented in disaster anthropology that "disaster proneness is socially conditioned and reproduced through everyday life" (Kimura 2012:66). Yet disaster experts, as the geographer Hewitt has pointed out, "…ignore [the social conditions within which disaster occurs] and as a result, they increase disparity and vulnerability" (Kimura 2012: 67). This "disparity and vulnerability" problem is what field workers have investigated and can be addressed by looking at disaster risk problems ethnographically – by observing and participating in the field, in community, with the people who are in the middle of going through the recovery from the chaos.

In disaster settings, researchers and fieldworkers need to go to the communities where disaster occurs to collect information. Fieldworkers are in direct contact with the people who are affected by the disaster. Through listening to people's tales of the disaster and observing the impact in the area, the fieldworkers can collect direct information and make more insightful decisions about where the health risks lay. Since all disasters occur at the local level, community members own the stories of and about the disaster they experience. The local people also own the knowledge of what and how they dealt with in disaster. At the same time, the information in the field is raw and need to be processed as data so that the information can be interpreted in a meaningful way by external monitoring agencies. For health security, the health officials need the more immediate and direct healthcare needs information in disaster-struck areas, and the information must be in form that is translatable to medical experts and relief workers who are oftentimes outsiders, unfamiliar to the ways of the people in disaster-struck areas.

20.3 Case 1: Nepal Earthquakes of 2015

When Nepal was shaken by a magnitude 7.8 earthquake in nine provinces, including the capital city of Kathmandu, on April 25, 2015, the relief work by international NGOs and government started around the capital city. But in the vast rural areas where these helping hands did not reach, Nepali people helped each other to survive the aftermath of the earthquake. During these trying months in the post-earthquake chaos, Nepali nurses[1] visited numerous evacuation centers and shelters in nine remote regions to care for the sick and the injured. The first voluntary group of nurses who were reported to be offering voluntary services were at evacuation centers in the Kathmandu area. One particular nurse named Takchi Sherpa had set up a temporary emergency tent to offer health services (Epi-Nurse Nepal 2017). She was operating a 24-hour service station in a tent and offered nursing care. Soon after, other Nepali nurses also began their voluntary assistance in remote areas where access to medical service was nearly absent. Their voluntary spirit came with their identity as a nurse. One EpiNurse once told the author, "I am a nurse. I will help those who need me."

According to the field reports from these initial group of volunteering nurses, real cases and threats of communicable diseases were much more common (EpiNurse Nepal 2017). Other non-disaster-related but urgent medical needs such as pregnancy and childbirth required these nurses' assistance as well. These nurses also reported that the living conditions in temporary housing shelters, especially in tents, were hazardous for health due to crowded living situations and deteriorated living conditions. Monitoring of the living environment for potential health hazards and medical checkups of individual evacuees were a dire need. From these experiences, many Nepali nurses realized the need for more systematic approaches to healthcare and health data collection during disasters. So Nepali nurses got organized and created a group of nurses called EpiNurse. These nurses are registered nurses who hold a membership at the Nepal Nursing Association in Kathmandu, the capital city of Nepal. Many of these local nurses became EpiNurses through participating in international projects. The name EpiNurse was born out of combining two words, "epidemiology" and "nurse."

[1]This group of nurses later became EpiNurses.

20.4 Nurses' Positionality in Disaster

The EpiNurses reside and work in their communities. This positionality allows these nurses to better assess living environment epidemiologically and report to the health authority when the needs occur. These nurses are equipped with medical and local knowledge. This allows them to connect better with people in other remote places. One EpiNurse wrote in personal communication this sentiment in the following:

> "It was really exciting and interesting to get a chance to work with a different modality in the same circumstance and same scenario [of going through the earthquake], with facing and overcoming the obstacles, meeting the disaster survivors and getting to know them by their point of view by establishing a good interpersonal relationship, good rapport building that facilitated me an ideal opportunity to explore individual, family and community perspectives (Shresta 2018)".

Reflected in this note is the proximity of the nurse to the evacuees in shelters which is very much similar to that of an ethnographer. She gains the knowledge of the place and the people through interpersonal relationship and by learning about the points of view of the villagers. This proximity to the evacuees in shelters allow the nurses to gather so much more information about their health status and health needs that the evacuees themselves may not have been even aware of. This unique positionality of the nurses in shelters opens up an opportunity to collect greater amount of accurate health information in times of disaster provided that nurses are equipped with tools to collect the data from the field. Oftentimes, much of health data are lost due to the elapsed time and due to the remoteness of the areas from the researchers at the time of disaster.

Disaster risk reduction is a huge topic among all professionals working in disaster-related areas. Anyone living in a disaster-prone country can testify how destructive and disruptive an occurrence of a disaster can be. So now it has become a topic among international leaders to focus on sustainable disaster risk reduction. Reducing the risk requires multidisciplinary approach. The very concept of EpiNurse is multidisciplinary and multidimensional. The name "EpiNurse" is a composite word that was created by taking parts of the two words, "epidemiology" and "nursing." This came out of a realization that maintaining health in disaster times requires epidemiological approaches to reducing harmful pathogens in the living environment at the same time as the treatment of the sick. Oftentimes in disaster setting, the goal of health professionals is saving as many lives as possible and attending to as many evacuees. Hence health status data are often lost or not collected systematically. To avoid this, the EpiNurse concept was formulated in that information and communications technology for gathering health data is built into monitoring the environment and health status (Kanbara 2016). EpiNurses bring a handheld device to a remote, disaster-stricken village to collect epidemiological information and health status of the people to ensure health security. To investigate, gather information, and build databases for health security information in disaster-prone areas, there needs to be a multidisciplinary method for the most effective assessment, evaluation, and delivery of treatment to any eminent outbreak of disease or illnesses in the affected areas. An anthropologist of disaster, Shuhei Kimura, in his article "Lessons from the Great East Japan Earthquake" has reiterated Kenneth Hewitt's position in his statement that "mainstream disaster studies or studies of disaster management are too formalistic to ameliorate local situations (2012:67)." Since disaster causes damages to all aspects of life, it is natural for taking multidisciplinary actions to rescue and recover from disaster and to build back better for the future.

So now let us take a look the works of anthropologists in the field of anthropology of disaster, applying their trainings in disaster-struck, vulnerable, and prone areas and looking at the core concepts of medical anthropology whose anthropological perspectives have helped "ameliorate human sufferings" (Joralemon 2010:ix). A couple of public anthropologists in Japan have applied their anthropological skills in Tohoku area after the 2011 earthquake and tsunami which was complicated further by the ensued nuclear power

plant disaster (Voices from Tohoku n.d). When the Great Eastern Earthquake of Japan occurred on March 11 in 2011, David Slater and his students volunteered in disaster areas to help out in any ways. However, they found it difficult to do more than clean up the areas. Then they begin to notice that many of them wanted to talk about their stories of the disaster they experienced. He noted in his article that "there had been many who had "stolen" survivors' stories, in the media or academic researchers, who had perverted their words into unrecognizable articles of their own making, or, more often, who have simply disappeared, leaving the local residents without any idea of what became of their words." So, his students collected the stories from the victims and created a website called "Voices from Tohoku." The way in which this archive came about was through the use of "anthropological knowledge and experience to make a positive, direct impact on society" (Slater and Veselic 2014: 118). Also, they argue that "a public anthropology should be collaborative" since it "breaks down the scholarly conceit of subject and object, anthropologist and informant, through the process of continual engagement" (ibid). In anthropology of disaster, anthropological methods, particularly fundamentality of doing ethnographic fieldwork of narrative and observation, are highly emphasized.

20.5 Case 2: Phenomenological Approach for Disaster-Affected Areas

Miho Murata

The phenomenological approach is another qualitative research method often utilized by nursing scientists who aim to deepen the understanding of the nature and meaning of everyday experiences (Van Manen 1990). Therefore, this method is preferred when an understanding of a target population is the utmost concern of the researcher. A quite large volume of studies in disaster-struck areas are often conducted quantitatively as an attempt to understanding the general situation. While this way of investigation is useful in considering and evaluating policies and configuring necessary assistance in these areas, this may not be the most effective way to measure how each individual disaster victim within the same disaster-affected areas experience different thoughts and feelings. These differences include the ways in which each individual experience reconstruction process in the post-disaster phase. Such differences would be difficult to be drawn out from a quantitative approach. Accordingly, qualitative research that uses people's narratives as data is more effective as an evidence to answering the questions that otherwise maybe overlooked. Specifically, the voices of highly vulnerable groups, such as the elderly, people with disabilities, and mothers with children, are the most important, as their issues are of the highest priority and need to be addressed most promptly.

Nurses hold a duty to provide detailed care to these vulnerable groups of people to ensure that no gap exists in the way care is provided. To do so, it is necessary to identify the real concerns of the affected people and analyze them for monitoring and evaluation. The disaster victims' voices help outsiders better understand their situations and problems. Nurses who work closely with these people bear a heavy responsibility to recognize these voices and to incorporate them in policymaking.

The following section describes the ways in which a phenomenological approach in disaster nursing research was implemented by narrating the author's experience of conducting a doctoral thesis research in Tohoku region in Japan after the 2011 earthquake.

After the accident at the Fukushima Daiichi Nuclear Power Plant caused by the Great East Japan Earthquake, the author was working as a nurse in the village of A, a community in which the residents were ordered to evacuate from their village due to the radiation disaster. Six years later, the evacuation order was lifted, and the residents of Village A were allowed to return to their village. The elderly residents of Village A were interested in how they would accept and decide to return to their village. Nineteen elderly (in their early seventies to early nineties in age) interview-

ees had evacuated from the village upon the evacuation order and returned to the village after the lifting of the order. Based on the narratives of their experiences from the disaster and evacuation to the present day, the meaning of "recovery," including rebuilding their own lives, for the elderly was analyzed based on Giorgi's phenomenological method. The narrated experiences of the elderly residents of Village A were divided into five different temporal phases as their experiences expanded over more than 6 years. The most meaningful themes that had emerged from each period include "Unwanted evacuation" under evacuation phase, "Change in values caused by the radiation disaster" under living in evacuation phase, "Strong desire to go home" under decision point to return home phase, "Living in a village with radiation" under life in the village phase, and "Health necessary for life more than before" under challenges upon returning home phase. Integration of the themes revealed that the meaning of the recovery/reconstruction for the elderly was rebuilding their lives by being receptive to their circumstances despite their uncertain feelings throughout evacuating, returning, and living in the village. The will to rebuild their lives was supported by their unwavering desire to live in their own village despite the various problems resulting from the radiation disaster.

The results above suggested that the elderly have the power to rebuild their way of life after the disaster and that it is necessary to establish a system to pick up the voices of the elderly and promptly reflect them in the reconstruction policy, to build a reconstruction plan and support system in line with each person's life plan, and to involve the nursing profession in the reconstruction policy. The process of finding the theme of the results showed the characteristics of the elderly people affected by the nuclear power plant accident well and needs to be analyzed very carefully. The way of expressing the integrated theme of recovery for the elderly should be explained so that the overall results can be expressed in general.

When a scholar conducts a field research, it is extremely important that she selects the methods and participants after carefully considering the scale of a disaster, the situation in the field, and the elapsed time since the occurrence of the disaster. The recruitment of research participants inevitably requires a careful planning and deep ethical consideration. On the one hand, research participants, who are the victims of a disaster, may be willing to talk or impart knowledge to the researchers because they feel that the researchers would understand their concerns. On the other hand, they may not want to talk about the disaster yet, or they may feel that outsiders would not understand them. This in itself can be a part of the process toward understanding the victims. To conduct research about disaster victims who may possess different sentiments, researchers must understand their situations and pay attention to the context of their willingness or unwillingness to participate in the research. When recruiting research participants, scholars need to develop trusting relationships, or *rapport*, with counterparts who are the key persons to relate knowledge about the disaster-affected areas. For the above case study of the Village A, the author had several years of interactions with a public health nurse in the Village A through participating in healthcare activities in temporary housing, health consultations, and some surveys. The mutual understanding between the author and participants deepens the author's understanding of her doctoral thesis research and the role of cooperation in recruiting research participants.

Particularly when collecting the narratives of disaster victims through interviews, the most important factor that influences the success of extracting meaningful data is the abovementioned trusting relationship with the interviewees, as many victims in disaster-affected areas are sensitive to the word "research." In fact, while the author was in a disaster-affected area, many victims often said, "I feel like a guinea pig." Many studies, both quantitative and qualitative, are conducted in disaster-affected areas. Therefore, when conducting research in these areas, scholars need to be careful about their own behaviors and attitude toward disaster victims and disaster-affected areas. It is also essential to explain to the target population the significance and purpose of

the research, such as how the research will help the participants.

When applying the phenomenological approach in a disaster-affected area, researchers must be physically present in the field, as it would help them understand the research participants' contextual positions. Researchers need to recognize the situation in the field and capture changes in it. In many cases, however, researchers are not familiar with the field before disaster strikes. To understand the research participants' stories, scholars must not only study the current situation but also imagine the life and culture that existed there before the disaster. Additionally, research participants' thoughts and core values are often expressed in their daily lives. Hence, observing their current living environment and lifestyle to the maximum extent possible will also help researchers understand their words.

The phenomenological approach in disaster nursing research also pertains limitations. One is that studying a large number of people as research subjects is not possible. This is because, as mentioned above, the purpose of this approach is to gain a more comprehensive understanding of the nature and meaning of each research participant's experience. If researchers intend to study a large number of victims, then a quantitative approach is a better choice. Disaster nursing research via a phenomenological approach focuses on a small and specific group of people in a disaster-affected area. When using this method, researchers must clarify and describe the kind of group the research subject belongs to in the disaster-affected area. It must be recognized that the results are based on the sentiments of specific research participants in disaster-affected areas and do not necessarily apply to all victims.

Case study 2 is unique in that the target group was the elderly people who had experienced a rare radiation disaster and the researcher could listen to the real voices of individual elderly victims. Commitment to long-term engagement with research participants must be prioritized when conducting a phenomenological study in disaster nursing, and continuing development of the research will enhance our ability to better monitor health status of the people in disaster areas.

20.6 Qualitative Approaches to Disaster Research

Organizations and agencies involved in the healthcare sector and critical infrastructure should consider the adapted guidelines when implementing emergency management plans. It should be noted that the healthcare sector represents different aspects of resilience. The first aspect relates to the fact that research, monitoring, regulation, and management in the healthcare sector rely on the concept of "quality," which serves as a framework for all scientific activities in disaster management (some of the concepts and approaches of resilience engineering are actually derived from this work). The second aspect relates to the individual and team resilience that healthcare professionals demonstrate on a daily basis and under extraordinary circumstances. In this case, however, managing this resilience, i.e., systematically creating the conditions for resilient practices to take place, has proven to be challenging. In the context of these concepts of resilience, guidelines and approaches for the healthcare field should be of interest to managers and practitioners outside this field. The efforts described in this chapter should provide assessment measures to cross-disciplinary efforts needed to disseminate knowledge and implement collaboration among decision-makers in the healthcare field, including government, policy advisors, educators, and academia, that can bring changes in the field of resilience and crisis management.

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Chronological Approach for Disaster Response and Monitoring

21

Muneyoshi Numada, Tomoyuki Sowa, and Sakiko Kanbara

21.1 Introduction

Addressing health needs during a disaster is a process, not a single action or condition. While everything looks like an emergency response for the first time, it depends on a variety of stakeholders and important antecedents, such as infrastructure and response training, that were prepared before the disaster occurred. Consistency cannot be achieved unless there is knowledge transfer among jurisdictions on a local scale. The imbalance of power between sectors also hampers progress. Future disaster primary healthcare initiatives can benefit from adopting a theory of change that clarifies the purpose of the initiative and how it is intended to achieve a particular outcome. A theory of change for care needs in disaster management needs to identify contextual factors, including antecedents, inputs, and intervening human, technological, and organizational factors that are important to bring about a particular outcome. These outcomes include holding primary healthcare contexts accountable for their respective not only SDG3 but systemic efforts for the other SDGs such a 1 or 5 as well as 11. Visualizing and monitoring processes among local communities and across different spatial scales (e.g., local, national, global) may enable coordination of sustainability policies and outcomes at different levels.

This chapter explains two points: the first one is the method measuring the disaster response processes by the individual, community, and government, and the second one is the evaluation indicators regarding monitoring the working process.

Effective health emergency response and rational decision-making by local governments need to manage the emergency phase's entire disaster response processes based on the standardization and systematization of disaster responses. The disaster response process can be created by the analysis of the complicated and various activities concerning stakeholders. The effects of the standardization and systematization of disaster response are as follows. (1) Accumulation of knowledge and technology development: The acquired knowledge and technology can be accumulated as the entire organization's property, not as a closed individual. (2) Improvement of technical capabilities: By advancing research and development throughout the organization based on the accumulated technology, the organization will enhance technologi-

M. Numada (✉)
The University of Tokyo, Tokyo, Japan
e-mail: numa@iis.u-tokyo.ac.jp

T. Sowa
Kobe Design University, Kobe, Japan

S. Kanbara
University of Kochi, Kochi, Japan

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cal capabilities for effective operations. (3) Improvement of quality of responses: Disaster management with stable and flexible quality is possible according to the visualization of a comprehensive working process. (4) Depersonalization of emergency responses: It is possible to work with inexperienced and unspecialized personnel by using technological tools who are specialized in and comfortable using the tool.

Monitoring the performance of emergency response progress can use the process-based approach to check the completed or not started processes. The method to evaluate the organizational progress during an emergency can use three elements: quality, cost, and duration to assess health emergencies' performance.

A process is a structure of behavior in which the sequence of inputs, outputs, and work activities are specified (Van Manen 1990). If processes are systematized, it is possible to achieve results continuously without relying too much on individual abilities. Visualization of the process is a prerequisite. If we do not move toward the development of a system to prevent recurrence, rather than psychological theories without specifics, another incident will naturally occur. The nursing process is a step-by-step approach to assessing and caring for patients. It is a tool for both students and nurses to provide a consistent and strategic approach to patient care. There are five steps in the nursing process: assessment, nursing diagnosis, planning, intervention, and evaluation. These five steps are used cyclically and repeatedly in the care of a patient. To ensure that the patient's needs are met, this sequence must be followed from start to the last (Morris 2006). The acuity of patient care in hospitals has improved significantly over the past decade. It is difficult for nurses to cope with the demands of disaster response as well as diverse healthcare challenges.

Overall, the process provides a valuable framework for thinking critically and continuously assessing and reassessing the health status of a community. It is a valuable tool for looking at the whole picture and not losing sight of the central facts. Nurses collaborate with many medical disciplines and serve as gatekeepers for people's well-being. Even though various ICT technologies have simplified the process, it is important to maintain the basic principles. This is especially important when risk signals are identified during the assessment phase.

The core of performance assessment in disaster response is to identify the key responses to be delivered and provide measurable targets. Each project will show an increase in coverage, and in the case of interdisciplinary activities such as disaster risk reduction, the goals of the collaborators and practitioners for each objective should be clearly defined. These objectives will be used to describe the intent of the program being funded. The categories of projects and operations should also be indicated in the matrix.

Monitoring is the regular tracking of key elements of a project's performance, usually inputs and outputs. It is investigated through record keeping, regular reporting, monitoring systems, field observations, and subjects. The program or project manager will identify areas where more effort is needed. Well-designed monitoring will help in subsequent outcomes and evaluation. It will be important to select a limited number of indicators that will actually be used by program implementers and managers at a more global level. There is a tendency to collect information on many indicators and report levels of information that are not or cannot be used for effective decision-making.

Evaluation is the quick assessment of how a risk reduction intervention has changed the targeted outcome. In other words, evaluation directly links an intervention to a specific output or outcome after some time has passed. Evaluation helps program and project managers to determine the temporary value of a particular program or project. Evaluation of cost-effectiveness can help determine the added value of a particular program or project.

The performance of the monitoring and evaluation toolkit should be measured and documented in each service delivery area and validated against various levels of indicators with agreed target values. The following case study illustrates a spe-

cific example from disaster management training. This will contribute to the measurement of the entire operation. Set goals to show broader progress, and the indicators used need to be taken more broadly.

To evaluate the response in shelters in Chap. 5, we refer to the Sphere standards (Sphere Association 2020) and others and break it down into water, food, shelter environment, health, medicine, and care. For each project, we choose indicators to report on progress. These are measurable and represent the progress of the project. Targets will be set for baseline and ongoing measurement.

The achievement of frequent targets should be aligned with existing data collection and reporting systems whenever possible. The first indicators to be reported are low-level indicators, such as mere plans, individual activities, those supported, and the number of organizations served. Once implementation has been established, this should be reported. High-level output and outcome indicators are needed. Aimed at outreach, these should be reported, such as the number of people for whom care has been provided. How the continuous health care is maintained (1) the number of volunteers who went in to provide care, and (2) the services provided also need to be reported, but most importantly, the number of people who reached these services, not the number distributed. A mixed-methods approach (see Chap. 11) can help to provide a more substantive understanding of the program's progress.

Numada et al. developed the Business Operation Support System (BOSS) for effective disaster management. BOSS is a workflow system with a database that shows the comprehensive response workflows, and each workflow has the details such as overview, checkpoints, related documents, link to the disaster management plan, etc. Concerning stakeholders can share the contents of the BOSS through the cloud database system. As the EOC (Emergency Operation Center) members can monitor the workflow's progress on the BOSS to understand the delayed responses, EOC will allocate necessary resources based on the response situations. In this paper, the BOSS will be explained as the case system for the experiment of response processes compared with a paper-based manual.

21.2 Method Measuring the Disaster Response Processes

The following five components are essential for practical disaster response work: (1) standard workflow for disaster response process; (2) information sharing and distribution to analyze the situation on the site, such as evacuation centers; (3) effective allocation and management of human resources with considering the various types of resources; (4) information management and distribution of materials and types of equipment; and (5) continuous follow-up on basic logistics/policies against infectious diseases, etc., under the COVID-19 case. This chapter focuses on the standard workflow for disaster response to achieve common understanding and knowledge sharing with or without natural disasters.

21.2.1 BOSS Overview

The disaster process management system BOSS was developed to support a disaster response process at the local governments' EOC (Fig. 21.1). The BOSS has a database of disaster response procedures during the emergency phase and preparedness. It visualizes the disaster response framework's whole image by processing knowledge related to all disaster countermeasures (layer 1). Detailed responses can show the complex workflow to work in the site (layer 2). By constructing the detailed information for each detailed workflow with a checklist of the work, the responders can realize the response's details. Every job has working detail information (layer 3) that describes the implementation method (who, when, what, how), and EOC members can easily understand the contents. Besides knowledge banks (layer 4) with related data/documents and systems connected to the detailed information (layer 3), responders who don't have real disaster management experiences can

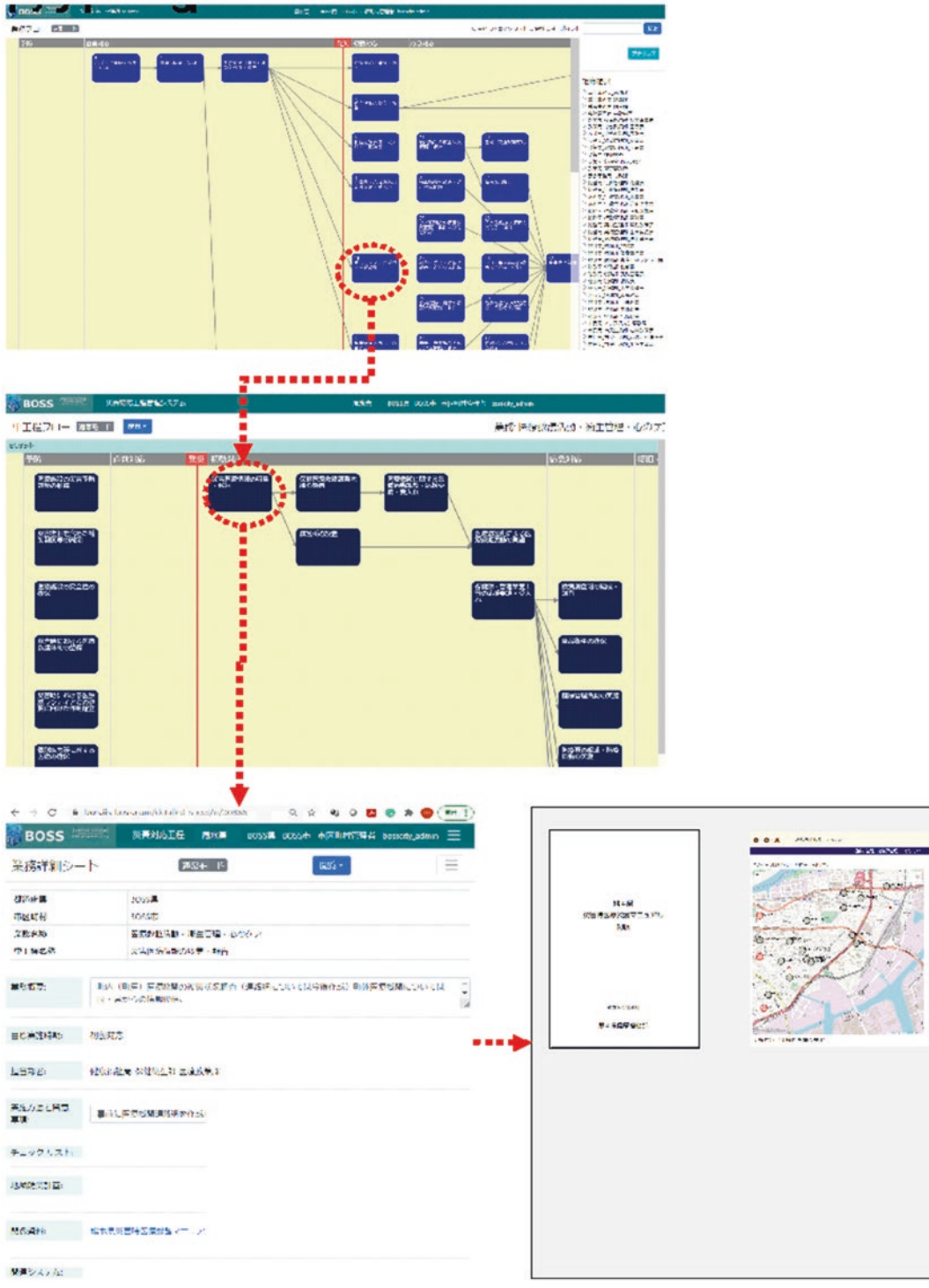

Fig. 21.1 BOSS overview

understand the critical points to respond to each situation.

The details on associating manuals, guidelines, past issues, lessons, and other knowledge are distributed to each work. It is easy to take over and share the knowledge for responses even if the person in charge of the disaster prevention department changes to a different department.

Even if there is a vast/various volume of disaster prevention plans in local governments, the relevant part of the regional disaster prevention plan can directly link to each. EOC members can quickly grasp the contents of the agenda.

Since in the BOSS disaster mode, it is possible to mutually understand all operations' progress at the EOC and on-site. By making the disaster response work in a flowchart style, decision-making becomes clear simultaneously, and stakeholders can share the decision-making process.

21.2.2 Case Study of Shelter Operation

This study compared and verified the operations of evacuation shelters with or without the BOSS in the case of flood disaster in Kawasaki City, Kanagawa Prefecture, under COVID-19 (Yasui et al. (2020)). Kawasaki City managed a large-scale disaster for the first time due to the 2019 East Japan Typhoon damage, subject to the Disaster Relief Act. Kawasaki City analyzed the weather information during the typhoon and used a disaster warning system for 2 days before it was approaching. The city prepared and responded with the strategy of "thinking the worst-case and doing everything." However, various kinds of issues became apparent, such as the site reporting the damage information to the EOC.

Based on this experience, this case study compared the response of shelter management under COVID-19 by two teams (with the BOSS or without the BOSS) that both consisted of one leader and four members. Both teams tried to operate evacuation shelters at Kawasaki City Nakanoshima Elementary School with shelter management committee members, school staff, and ward office staff on Tuesday, August 4, 2020.

The BOSS team leader was a young staff member who had no experience of actual shelter operations and how to utilize the BOSS, and the members without real disaster experiences were more senior staff than the leader. Also, verify that young leaders can effectively direct senior members. The leader instructed the functions to the BOSS members at the entrance of the evacuation center (Fig. 21.2). The BOSS team had no experience establishing shelters and only checked the BOSS contents in advance.

On the other hand, the manual team leader without the BOSS has experience in natural disaster management. The manual team had similar training at the experiment place a day before the experiment to confirm the manuals' detailed procedure.

As a result of the experiment, the manual team (without the BOSS) had 32.5 min to complete the

Fig. 21.2 The BOSS team members (left, the leader instructs the responses; right, the flowchart of the BOSS)

work, and the total number of jobs was ten kinds. On the other hand, the BOSS team had 36 min to complete the work, and the total number of jobs was 15. This result indicates that the BOSS team carried out more responses than the manual team because the manual team had 0.31 work/min and the BOSS team had 0.42 work/min in terms of unit time.

Figure 21.3 describes Gantt charts showing that the horizontal axis is time (minutes) and the vertical one is work performed by one leader and four members of each team. The horizontal axis' time analyzed the performance time of members by 0.5 min (30 s). The meaning of colors on the Gantt chart is that yellow is the work time by one member, orange is the time performed by multiple members simultaneously, and gray shows the leader's waiting time.

Figure 21.3a is a Gantt chart by the BOSS team. There is almost no rework, and each work is completed before moving on to the following jobs. Therefore, less waiting time is seen. In the latter half, some waiting time occurs because of the person who completed each work earlier for other members to finish theirs.

Figure 21.3b is a Gantt chart by the manual team. In the first stage, works, once completed, can be resumed later. The waiting time is observed in the middle stage and the latter half. Some works were completed in the intermediate stage, and the members were unsure what to respond to next. A member who finished early waited for other members to complete their work in the second half. Regarding the BOSS team's waiting time, although Mr. K had a waiting time in the middle stage, the waiting time was not so long.

As one characteristic of the manual team was that the leader took the initiative and delivered it to other members, the manual team had a longer waiting time than the BOSS team. In particular, according to the Gantt chart, Mr. E, Ms. G, and Ms. H continued to stay without any instructions during the work.

For the manual team, the number of works performed by the leader and the number of response works was smaller than the BOSS team. The leader and members were working while discussing the following jobs to respond. The leader was not checking the manual, but Ms. G and Ms. H reviewed it occasionally. This is because the manual team prepared the work a day before and the leader can take the initiative. Looking at the Gantt chart, the manual team started the work without a meeting where leaders should share their plans and instructions.

In contrast, the BOSS team had time to meet with members to confirm the working procedures. The manual team received few instructions from the leader and worked while appropriately considering the members, and the leader took the initiative in responding. Therefore, some members responded to the same works simultaneously.

For the BOSS team, the number of leader's work is smaller than the manual team. The BOSS team's leader instructed the members about the work contents by having a meeting with the members, and the leader can focus on the BOSS operations to guide the procedures to the members.

21.2.3 Evaluation Indicators Regarding Monitoring the Working Process

For the effective health emergency response, QCD (quality, cost, and delivery) will be possible indicators to evaluate response management's effectiveness by concerning stakeholders. Notably, resource allocation is one of the critical decision-making during an emergency; EOC members will achieve rational management based on the characteristics and conditions of the QCD.

21.2.3.1 Q: Quality

To improve each process' quality, the characteristics of works with high quality needs to be analyzed. Q depends on (1) priority of work and (2) difficulty of work (necessity of special qualification and experience). The decision-maker will provide the necessary support concerning the effective allocation of resources. Concerning the assignment of works to support staff from other local governments, works' priority and difficulty consider securing and allocating human resources.

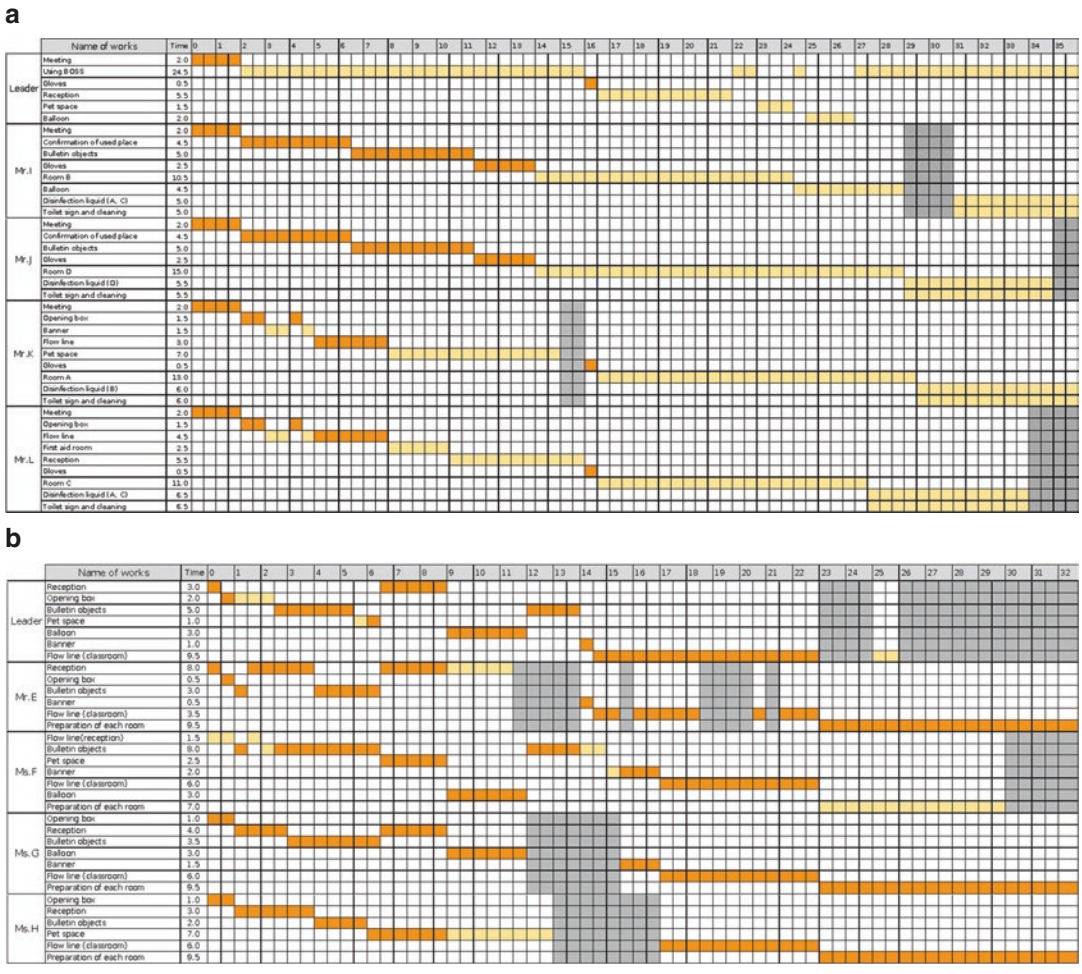

Fig. 21.3 (**a**) Gantt chart of the BOSS team. (**b**) Gantt chart of the manual team

In the experiment above explained, the BOSS team performed more work than the manual team as a whole. In both cases, the BOSS team spent less time working the same job with each staff member. The quality level and needs of works consider the instructions from the leader based on the BOSS. For the BOSS team, members included checking the toilet's status and setting up an emergency room for the improvement of the quality of life for evacuees.

21.2.3.2 C: Cost

C depends on (1) operations that require many human resources and (2) equipment purchases and expenditures to residents. The work-related to cost-based activities require many workers, such as shelters, supplies management, emergency risk assessment of buildings, and building damage investigation. The load analysis of the entire work is performed to determine the concentration and distribution of staff.

Financial resources for processing government expenditure (other than personal expenses) are strategically used to save life or quick response to the affected area. The evaluation of cost-effectiveness due to advanced measures also needs to be planned.

The use of the BOSS clarified the instructions of the leader. Under clear instructions, it is considered that the staff can move quickly without

the wait for instructions from the leader. Therefore, it will be easier to grasp the workflow of the whole work even without experience, and it will be possible for even inexperienced leaders to give appropriate instructions.

21.2.3.3 D: Duration (Period)

D depends on (1) process length, (2) stagnation between works, and (3) gap between supply and demand. The characteristics of the work in a short time frame or a long time frame need to be analyzed to improve the bottleneck. Recovery and reconstruction phases require long-term continuous operations. The difference between the end and the start of each process is necessary to reduce. Also, the shortage of personnel, materials/equipment, and information that cause the waiting are needed to eliminate. The demand gap between supply and demand will appear as the difference between the demand generation timing and the actual supply timing. To understand each work's characteristics, such as the time that is required to do the tasks, EOC will manage total emergency response time.

21.2.4 Way to Forward of BOSS

This case study explained the method measuring the disaster response processes and the evaluation indicators regarding monitoring the working process. Young or inexperienced staff can follow the procedures to achieve the necessary responses from comprehensive disaster response processes with experiences and documents based on the manual. The BOSS is an effective tool to manage the response progress. However, if the contents are poor, the staff cannot follow the BOSS. Therefore, the manual and the BOSS combination is effective preparedness for the emergency responses to make enough and comprehensive contents.

The evaluation indicators show as QCD. Engineering fields use these approaches to improve effective disaster management. Remarkably, members such as in EOC take rational decision-making based on characteristics of high-quality work, cost-related work, and long period or short period of work.

21.3 Recording and Reflecting on the Experience

The counterpart to "process" is "non-explicit management methods," which manage organizations with ambiguous job functions, authority/responsibility relationships, and evaluations, and does not allow us to work globally with people of different ethnicities, religions, and cultures. In this case, managing the process – systematically creating the conditions for resilience – has proven difficult.

In disasters, for example, it is often difficult to determine the denominator or population to be used when assessing coverage. In addition to the need to include the local denominator when considering the whole, there is also a need to take into account the human rights of groups affected by the entry or benefiting from the intervention. When dealing with minority populations or high-risk groups, it is the groups of people who will benefit from the intervention that are targeted. When designing interventions, efforts should be made to clearly define the target population. These definitions are usually based on the likelihood of direct and indirect health effects. The target population may be the general population, or it may be defined as an ethnic minority or subgroup. In such cases, qualitative data, such as those in need of care in the community and those at high risk, can help address the nature of the challenges faced.

In recent years, with the increasing diversification of education, many workshop-style learning opportunities have been provided in disaster risk reduction. Workshops are "collaborative learning environments in which multiple members with different fields, knowledge, and experience work together to pose problems and create solutions" and focus on "reflection" (Mogi 2006), in which participants reflect deeply on the learning process by meticulously recording and sharing their experiences.

In workshops, where various learning styles are generated by the participants' diverse backgrounds, such as expertise, taste, experience, and proactivity, as well as by their communication with each other, in-depth reflection based on detailed records can improve the learning capacity of the participants. In particular, in workshops, which are regarded as creative and cooperative learning activities and places based on communication, the goal of learning is not to acquire knowledge but to discover new selves in cooperative relationships with other people, to experience interesting things that one has never noticed before, and to reconfigure and reconstruct existing things. It is said that "learning is the process of discovering new selves, experiencing interesting things that we have never noticed before, recombining existing things, reconsidering them, and reconstructing them" (Mogi et al. 2014), and it is necessary to provide information to reflect on cooperative relationships. The information necessary for reflection is recorded in a multifaceted manner using not only text but also diagrams, pictures, audio, and video and is called real-time documentation (RTD) (Ueda and Nakahara 2013). One of the RTD is real-time video (RTV), which is a visual and auditory editing of the workshop process using video, still images, audio, and text information.

21.3.1 Disaster Prevention Workshop Using RTV

In this study, we analyzed the participants' reflective tendencies based on the RTVs during the disaster prevention workshop held in November 2020.

The RTV produced was 3 min and 45 s in total. We filmed and edited the characteristic activities of each group based on three types of camerawork: meta-perspective, group perspective, and proximity perspective (Fig. 21.4) *4. The edited RTVs were viewed by all participants at the end of the workshop (Fig. 21.5) *5 to reflect on the activities. The reflection was carried out through group discussion and a questionnaire with free descriptions.

Of the 96 responses to the questionnaire, word cloud analysis and co-occurrence keyword analysis were conducted by text mining using User Local text mining tool (https://textmining.userlocal.jp/) of the free text self-evaluations of 95 responses, excluding one response that did not belong to a group*6.

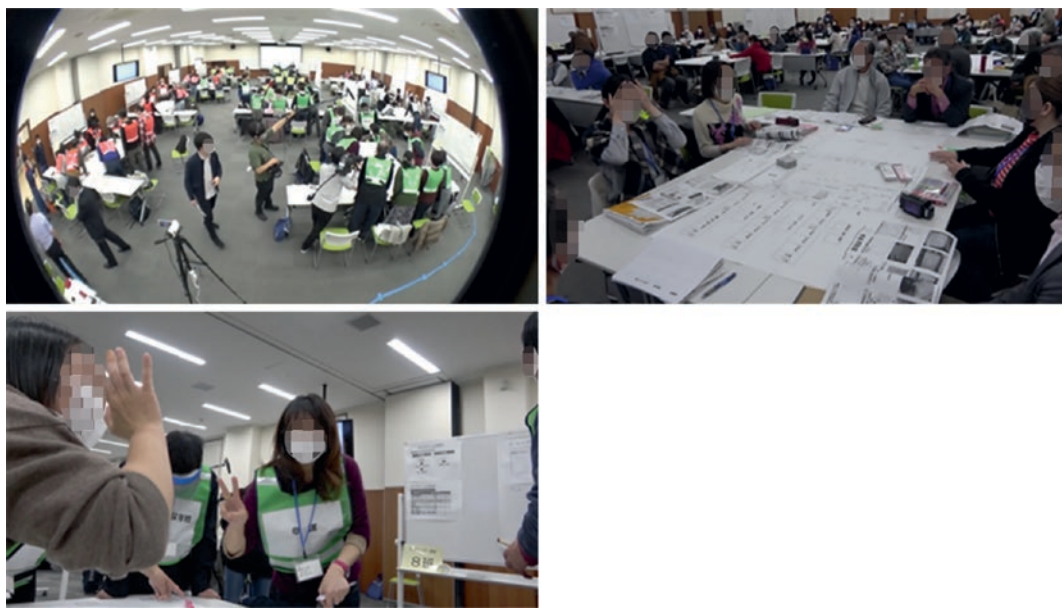

Fig. 21.4 Camera work in RTV

Fig. 21.5 RTV viewing by all participants

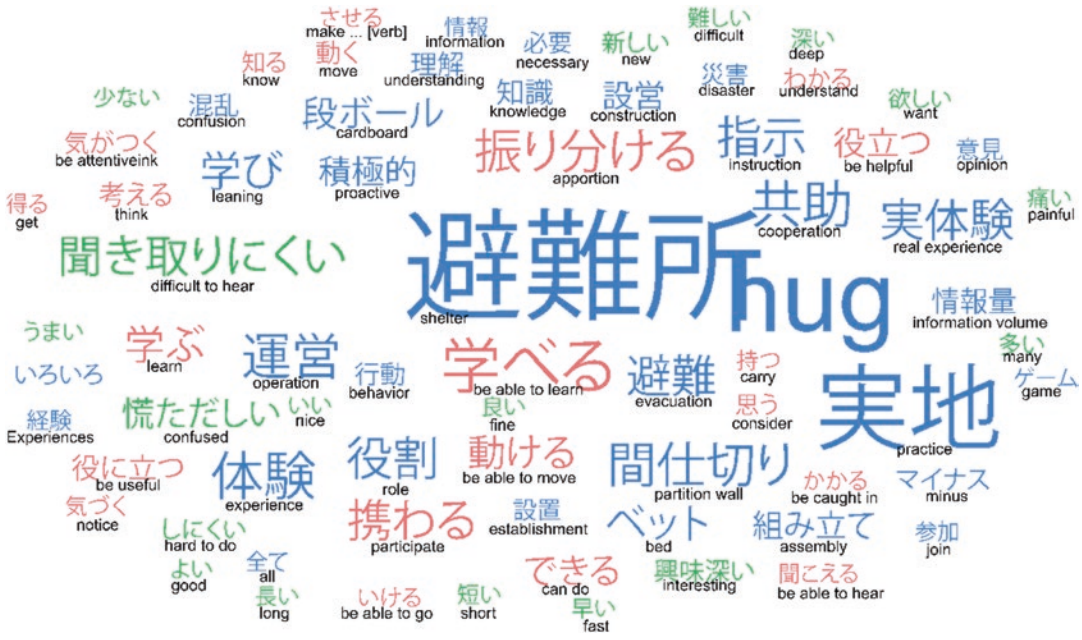

Fig. 21.6 Word cloud in self-evaluation before viewing RTV by User Local text mining tool (https://textmining.userlocal.jp/)

Figure 21.6 shows the word cloud of the self-assessment before viewing the RTV. The word cloud is a count of words appearing in the description by parts of speech such as nouns, verbs, adjectives, and inspirations.

This shows that there are many occurrences of nouns such as shelter, hug, actual, and operation. When we look at the top five occurrences of each part of speech, we see that, except for the verbs "can" and "think," most of the words

that appear more than 10 times are nouns (Table 21.1).

Figure 21.7 shows the co-occurring keywords in the self-assessment before viewing RTV. Co-occurrence keywords are categorized according to the pattern of words appearing in the text, with words with more occurrences being displayed larger, and the stronger the degree of co-occurrence, the thicker the line.

Table 21.1 Number of word occurrences in self-assessment before viewing RTV

Part of speech	Word	Number
Verb	Can	27
Noun	Evacuation center	21
Noun	Operation	19
Noun	Experience	18
Verb	Consider	18
Verb	Think	11
Noun	Hug	10
Noun	Practice	10
Verb	Know	8
Verb	Understand	8
i-adjective	Much	8
i-adjective	Nice	5
i-adjective	New	4
i-adjective	Good	4
i-adjective	Fine	3

The distribution of the co-occurrence keywords shows that the relationship between the nouns and the co-occurrence keywords is strong, such as evacuation center-management, hands-on-experience, cardboard-assembly, and knowledge-information. In detail, as seen in Table 21.2, only evacuation center-management and hands-on-experience co-occurred more than 10 times, while the other word pairs tended not to co-occur as often.

As for the other word pairs, the number of co-occurrences did not tend to be high. Looking at the descriptions, we found that "The combination of HUG and hands-on experience helped me to get an image of evacuation center management," "It made me think about the balance between evacuation center management and evacuees' needs. I

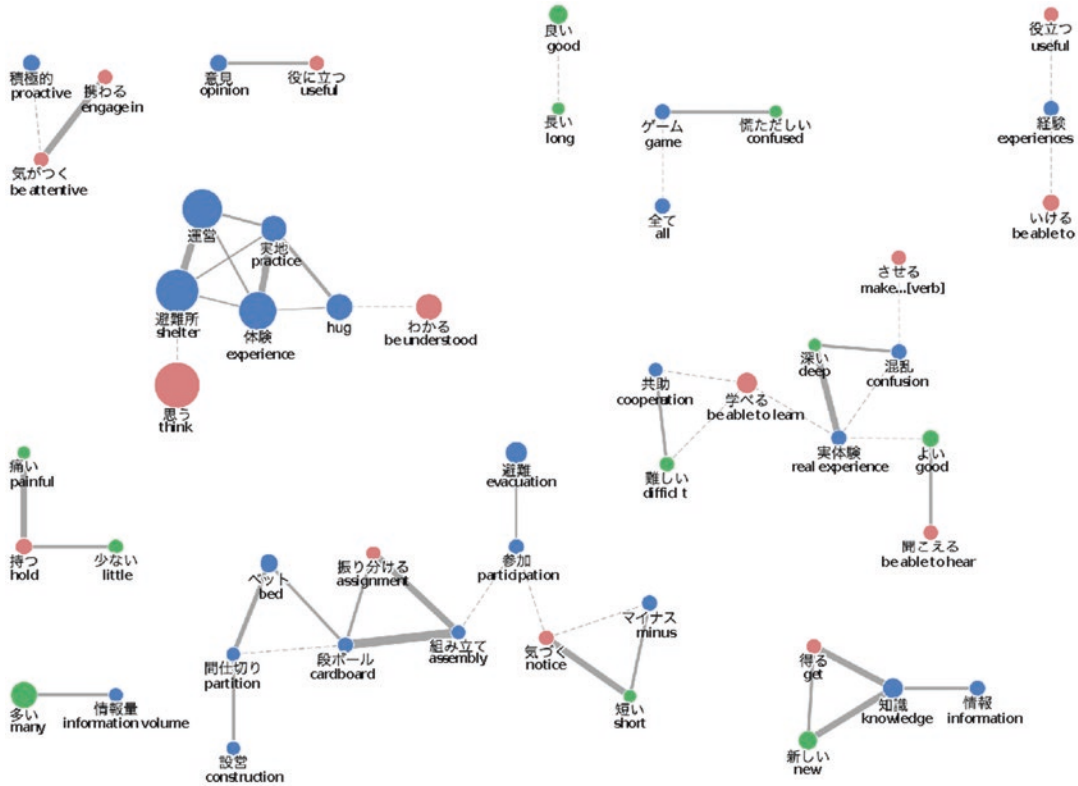

Fig. 21.7 Co-occurring keywords in self-evaluation before viewing RTV

Table 21.2 Word pairs and number of co-occurrences in self-assessment before viewing RTV

Pear of word	Co-occurrence count
Operation—evacuation shelter	14
Experience—practice	10
Experience—operation	9
Can—experience	8
Experience—evacuation shelter	8
Can do—evacuation shelter	7
Practice—operation	7
Practice—evacuation shelter	7
Consider -evacuation center	7
Can do—know	6
Hug—experience	5
Hug—practice	5
Hug—operation	5
Can do—operation	5
Operation—evacuation	5
Necessary—operation	5
Necessary—evacuation	5
Can do—learn	5
Think—operation	5

couldn't find any answers," and "It was my first time experiencing running an evacuation center, and I was reminded of how little I could do."

This suggests that the participants described what they felt and thought about their own experiences and understanding of each program and did not take the perspective of observing their roles and relationships in the group while objectively reflecting on their own actions and behaviors.

Next, looking at the text mining of self-evaluation descriptions after watching RTV, verbs such as "can tackle" and "can move" have a large weight in addition to nouns such as "actual place" and "shelter" as seen in Fig. 21.8. Looking at the number of times a word appears, verbs such as "can" and "think" appear more often than other parts of speech (Table 21.3).

In addition, the co-occurrence keywords in the self-evaluation after viewing RTV (Fig. 21.9) shows that co-occurrence with verbs such as "deepen" and "involve" occurred.

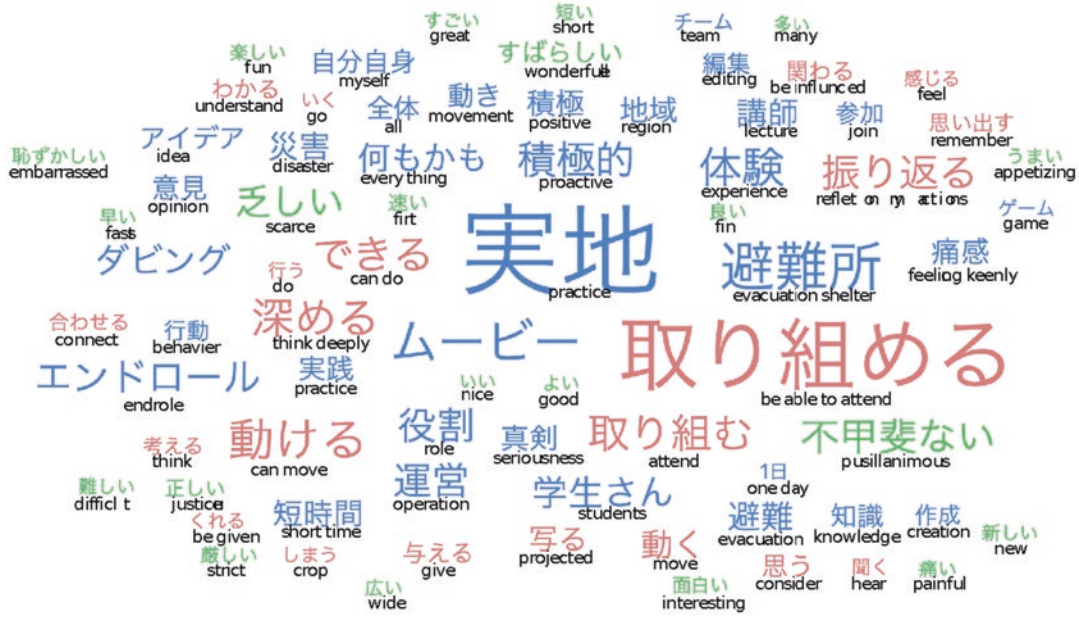

Fig. 21.8 Word cloud in self-evaluation after viewing RTV by User Local text mining tool (https://textmining.userlocal.jp/)

Table 21.3 Number of word occurrences in self-assessment after viewing RTV

Part of speech	Word	Number
Verb	Can do	27
Verb	Consider	20
Noun	Experience	9
Noun	Operation	8
Verb	Understand	8
Noun	Participation	7
Noun	Movie	6
Verb	Can move	6
Verb	Move	6
Noun	Practice	5
i-adjective	Interesting	3
i-adjective	Good	3
i-adjective	Nice	3
i-adjective	Difficult	2
i-adjective	Fast	2

The word pairs and the number of co-occurrences are shown in Table 21.4. The number of word pairs and co-occurrences is shown in Table 21.4.

Looking at the free descriptions, it was clear that the students tended to evaluate the actions of the group and the group as a whole, such as "I could understand what the other groups were doing," "I was able to work as a member of the team even though I was not able to do all the assigned tasks and roles perfectly," and "It was good to see the group working seriously."

21.3.2 Utilization of RTV

The management of evacuation centers requires not only knowledge and experience but also on-

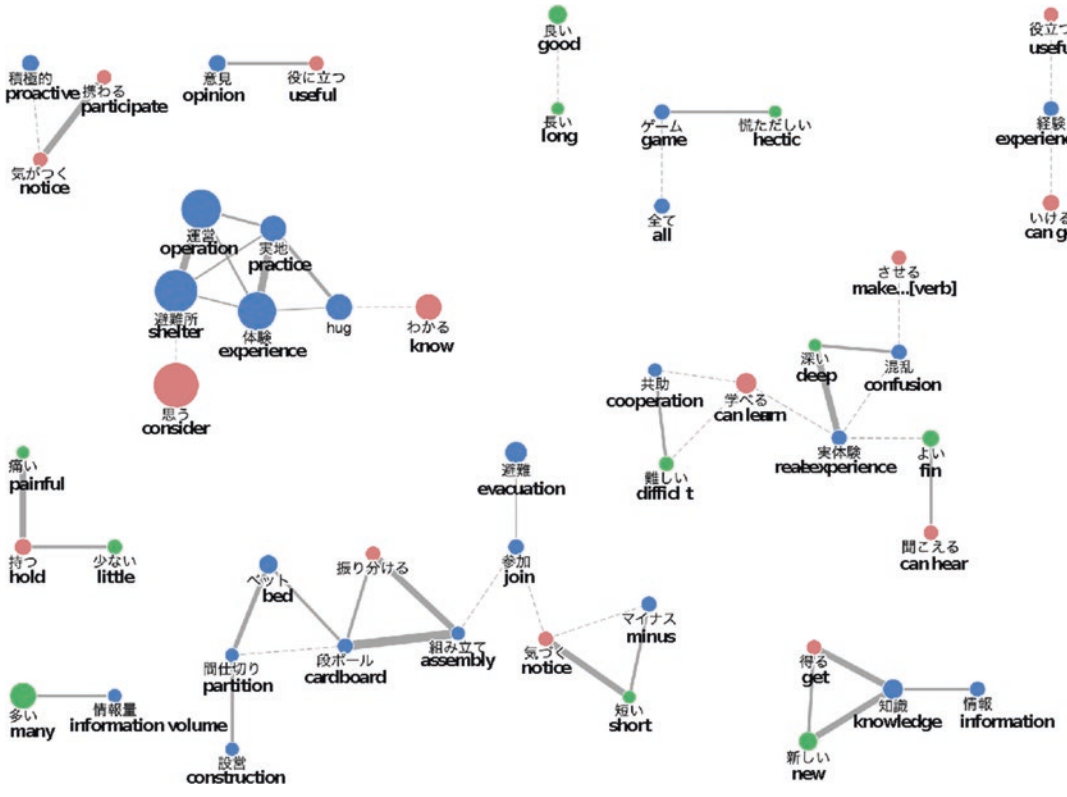

Fig. 21.9 Co-occurring keywords in self-evaluation after viewing RTV by User Local text mining tool (https://textmining.userlocal.jp/)

Table 21.4 Word pairs and number of co-occurrences in self-assessment after viewing RTV

Pear of word	Co-occurrence count
Can do—consider	10
Can do—operation	7
Can do—consider	7
Can do—participate	6
Operation—evacuation shelter	6
Can do—can do	6
Can do—think	4
Participation—think	4
Experience—practice	4
Move—think	4
Can do all	4
Can do—understand	4
Can do—consider	4
Can do—game	4
Can do—listen	4
Movie—look back	3
Can move—consider	3
Can do—serious	3
Can do—active	3
Can do—movement	3

site communication skills and the ability to see the whole picture. By introducing RTV this time, in particular, metacognition by reflection guides stakeholders and practitioners to

- Assess the effectiveness of their roles and responsibilities during a crisis.
- Modify (if existing) and/or define a common action plan through regular coordination.
- Develop a common action plan through regular coordination activities and training (if existing).
- Increase knowledge to identify system vulnerabilities and apply procedures and responses to crises.
- Assess gaps between imagined and implemented work.
- Adapt the results to practitioners in each area and develop a plan for later adoption.
- Begin to think not only about what went well but also about what did not go well.
- Value and improve communication plans with the public during emergencies.

* 4*5 In order to capture the situation of the workshop as objectively as possible, and to share the experience, it is mandatory for all participants to view the video together after the workshop.

*6 Analysis by User Local text mining tool (https://textmining.userlocal.jp/).

21.4 Way to Forward

It is becoming a consensus across sectors that sustainability planning at the local scale needs to be community-involved, community-driven, and have a so-called bottom-up approach to increase the likelihood of success, which calls for a rethinking of the primary healthcare approach. There are two possible reasons for this: first, local actors are the only ones with the close ties to and local knowledge of a place that is needed to develop place-based solutions. Then, rural areas have undergone years of governance, and economic transitions have been repeated and often imposed from above, creating skepticism among residents about top-down planning and change. By articulating their priorities in community-driven plans, communities can make the case for sustainable development in their towns to decision-makers and funders. In order to protect people's lives, health, and livelihoods from disasters, diverse social needs must be met together with diverse organizations. To be a regional plan for sustainability, local actions need to be carefully planned to be consistent with global and national priorities. A plan that uses the SDGs to make visible the process of local community action and allows for bottom-up monitoring may be consistent across geographic scales and aligned with global goals.

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22 Introduction to EpiNurse: Emerging Care, Communication, and Health Monitoring in Nepal

Apsara Pandey, Tara Pokharel, Chandrakala Sharma, Archana Shrestha Joshi, and Sakiko Kanbara

22.1 Introduction

Nepal occupies an area of 147,181 square kilometers, including both the high Himalayas to the north and plain lands to the south. Nepal is highly prone to multiple hazards within this geography, primarily because of its diverse topography and climatic conditions, geological position, rugged mountains, and steep landscape. Earthquakes, landslides, floods, fire, and thunderbolts are the major causes of disaster events that caused major damage in the past, weakening the fragile ecosystem of the country. EpiNurse refers to local nurses who perform epidemiological surveillance and care to ensure human security and communicate with health authorities on the health status of communities. They collect and report epidemiological information by using easy-to-use technology in communities in which access to health information of the populace is hindered by catastrophic accidents or other geo−/sociopolitical reasons.

Nepal not only has relatively young mountains and geology but also encompasses around one-third of the world's total 2400 km of the Himalayas. The variation of altitude from 59 m to 8848 m within less than 200 km has led to the prevalence of natural disasters. Nepal's steep slopes and the still growing Himalayan range coupled with heavy monsoon rainfall patterns lead to a wide range of geological and hydrometeorological hazards across the country, including landslides, debris flows, floods, and glacial lake outburst floods (GLOFs), epidemics, droughts, etc. Environmental degradation and climate change both interact with and exacerbate the occurrence and impact of natural hazard events. The frequent disasters caused by these hazards have shown an uprising trend.

22.2 Disaster Situation of Nepal

Nepal is in the central of the Himalayan range and is one of the most disaster-prone countries due to its topography and climatic condition in the world. Earthquakes, landslides, floods, fire, and thunderbolts are the significant causes of disaster events that caused significant damage in the past, weakening the fragile ecosystem of the country. Economic vulnerability analysis shows that Nepal exhibits enormous losses due to significant exposure at risk and high levels of hazards. These phenomena not only cause loss of lives and properties but also pose severe threats to

A. Pandey (✉) · T. Pokharel · C. Sharma
Maharajgunj Nursing Campus, Institute of Medicine, Tribhuvan University, Kathmandu, Nepal
e-mail: apsara.pandey@mnc.tu.edu.np

A. S. Joshi
EpiNurse, Kobe, Japan

S. Kanbara
University of Kochi, Kochi, Japan

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physical infrastructure and also disrupt economic development.

Nepal is exposed to many natural and human-induced hazards as a country with diverse typography, complex geology, and a highly varying climate. In a global comparison, Nepal ranks fourth in terms of climate risk according to the Global Climate Risk Index, which assesses the impacts of meteorological events in relation to economic losses and human fatalities (Eckstein et al. 2019). Nepal also ranks 4th and 11th in terms of global risk for climate change and earthquake respectively (MoHA 2015). The country is in the top 20 of all the multi-hazard countries in the world.

22.3 National DRR Policy and Strategic Action Plan

Over the years, the Government of Nepal (GoN) has shifted its focus from a reactive to a proactive approach to disaster risk management (DRM) and has undertaken efforts to strengthen legal frameworks, policy and planning, organizational aspects, institutional capacities, and partnerships for DRM.

Further, the Government of Nepal committed to implementing the new Sendai Framework for DRR 2015–2030 at the Third United Nations World Conference (March 2015) on DRR. It will enhance efforts to strengthen DRR to reduce losses of lives and assets from disasters (United Nations Office for Disaster Risk Reduction, 2015). Globally, 2015 was marked by various global agendas, i.e., Sendai Framework for DRR, Financing for Development, SDGs, and COP21. Priorities under each global agenda are mutually reinforcing and guide Nepal to further prioritize the country's resilient and sustainable development.

The 2015 Gorkha earthquake was a catalytic event that cost thousands of lives and economic loss to the country. Major disaster risks remain, including the recurrence of similar types of flooding, landslides, droughts, GLOFs, as well as earthquakes.

In this context, the Ministry of Home Affairs (MOHA), Prime Minister's Office (PMO), and National Planning Commission (NPC), together with key line ministries, have started preparation for a new roadmap for the post-2015 framework for Nepal to address priorities under the Sendai Framework for DRR. Taking into account the experience gained through the implementation of Hyogo Framework for Action:2005–2015/NSDRM, lessons from the 2015 Gorkha earthquake, and other existing/emerging initiatives around Climate Change and Sustainable Development Goals, the Government of Nepal has initiated the process for formulation of "National Disaster Risk Reduction Policy and Strategic Action Plan."

22.4 Health Service of Nepal

The nursing profession has developed as an extension of the duties provided to a sick person in one's house by women (Mckee and Lessof 1992). Nursing needs to be viewed as a human caring science, which emphasizes human-to-human care transactions that affect patients' health and well-being (Watson 1979; Winstead-Fry 1980; Leininger 1988). Furthermore, what constitutes the job duties of nurses vary depending upon the culture of the respective countries.

According to recent data, Nepal has 0.17 doctors and 0.50 nurses per 1000 population, representing a total ratio of only 0.67 doctors and nurses per 1000 populations (MoHP 2012). This number is significantly lower than the one recommended by the WHO, which is 2.3 doctors and nurses per 1000 population. These figures indicate that Nepal's number of health professionals is lower even compared to other countries in South Asia. Although Nepal has been facing a chronic shortage of nurses, the government of Nepal has mandatorily set the ratio of a nurse and patients in a general ward at 1:4 to meet the international standard. However, a single nurse may serve more than four patients a day. Nurses in Nepal are trained not only to give medicines, carry out dressings, and execute administrative

tasks but also to set up IV infusions and carry out suturing, usually performed by medical doctors. Due to the scarcity of medical doctors, nurses are compelled to share these burdens, which is probably why nurses mainly focus on task-oriented care for patients. Several patients can be served by an available number of nurses, no matter how small that number is.

Nepal has made significant progress in meeting the Millennium Development Goals in poverty reduction, education, and health sectors (NPC & UNCTN, 2013). But the country still has a higher infant mortality rate, maternal mortality rate, and under-five mortality rate compared to other Asian countries. Almost half of the under-five Nepalese children suffer from some nutritional disorder. Several women's deaths are due to pregnancy and reproductive issues (MoHP, 2018). Infectious diseases such as respiratory infections, diarrheal diseases, malaria, etc. are still prevalent, and they remain the leading public health concern in Nepal. Therefore, immediate improvement in health provision quality is crucial considering the high poverty rate, illiteracy, and geographical features. In economically deprived communities, most diseases are treated using traditional medication such as Ayurveda and homeopathic medicine (Dixit 2005). In addition, self-medication is widely practiced (Shankar et al. 2002).

In Nepal, varieties of herbs and medicinal plants are found in abundance, which are used at essential stages of illness. These medicines are used because of their low cost, no side effects, and easy availability (Jawla et al. 2009). A hospital becomes the first choice only when there is a medical emergency. The primary focus of hospitals and health professionals would be on medical treatment. Patients visit a hospital only when they need immediate treatment. For example, in some cases, a person is in a critical condition or seriously injured. Hospitals in Nepal have a role as emergency hospitals where a patient's foremost priority is to receive medical treatment rather than regular or preventive medical examinations. Usually, family caregivers of a patient are expected to deliver primary care, such as personal hygiene, self-care, and nutritional requirements; often family caregivers are on standby around the clock at hospitals in Nepal (Joshi, 2015) because of a strong bonding relationship among family members, which underlie the nation's social values. Social perceptions in Nepal have been changing drastically in the past couple of decades. Unlike in the past, a patient may not receive care from one's relatives at a hospital. The number of relatives who can devote their time to looking after a patient has been dropping in recent years as more and more women have held official jobs. In addition, several people have been migrating to foreign countries, resulting in fewer members the family. Considering these changes in society, it may be very burdensome or even infeasible for family members and relatives to provide day-and-night patient care during hospitalization.

22.5 Introduction of EpiNurse

EpiNurse refers to local nurses who perform epidemiological surveillance and care to ensure human security in and communicate with health authorities on the health status of communities. Nurses are at the forefront of the healthcare response to different cycles of all disasters (Pandey & Kanbara 2016) from the work of Florence Nightingale in the Crimean War to the recent care provided by nurses in the aftermath of Hurricane Katrina in 2015, the Asian tsunami of 2004 (ICN and WHO 2009), Great East Japan Earthquake in 2011 (Kako et al. 2014), Gorkha earthquake in 2015 (Pandey & Kanbara 2016), and COVID-19 pandemic in 2019–to the present.

EpiNurse is an epidemiology nurse working in their own local community to prevent and promote public health to attain optimum health security of the community. EpiNurse should have knowledge of primary nursing care, pharmacology, first aid and psychological first aid, nutrition, microbiology, environmental sanitation, disaster cycle, and its health consequences, and epidemiological approach. So, in Nepal, registered nurses working in community-based healthcare organizations with an additional

3 days of training in epidemiological approach, disaster nursing, and the innovative concept of ICT in nursing were involved in working as an EpiNurse.

22.5.1 Aim of EpiNurse Program

The aim of the EpiNurse program was to ensure the health security of community people by assessing the living environment and living standards by using ICT. Identifying the potential health threats associated with different kinds of disasters in the community and reducing such health risks as much as possible based on the Sendai Framework for DRR is the primary goal of the EpiNurse program.

22.6 Roles and Responsibilities of EpiNurse

Surveillance: Epidemiological surveillance of communicable disease outbreaks and post-disaster health threats following a disaster is one of the important tasks of EpiNurse. They should play a key role in assessing and having knowledge of community people to reduce the potential risks for their optimum health security through assessment, planning, implementation, and evaluation in every aspect of the healthcare system.

Health assessment: EpiNurse assesses the health status of the community and the community environment where people live after a disaster to ensure the health security of the community. Assessment of potential health risks for natural or man-made disasters and working to reduce such risks using ICT is also an important function of EpiNurse.

Direct care and treatment: EpiNurse provides care for the sick, injured, and healthy individuals in the community. They work as first responders at the time of disaster to provide first aid care and psychological support in preventing illness and promoting the healthy environment of the community.

Advocacy and health education: Local nurses are advocates to ensure the health security of community people. They work in a different cycle of disaster. They provide health education to prevent disease, promote health, and alleviate suffering.

Liaison between public and authorities: EpiNurses work with local healthcare institutions, local authorities such as municipalities, primary healthcare centers, and district health offices to ensure the health of community people. They also work as a liaison between community people, local authorities, and a central government body to fulfill the health needs of people, and coordinate and collaborate with different organizations to make sure a multidimensional approach optimizes community health security.

Resources management: EpiNurse has to manage required resources to fulfill the healthcare needs of the community in different cycles of disaster.

Leadership: EpiNurse plays a leadership role in planning, preparing, and responding to disasters and public health emergencies.

22.6.1 EpiNurse Approach

EpiNurse, a local nurse, works in the community for the prevention and promotion of health of the community people by using an epidemiological approach. The incorporation of ICT in epidemiological nursing is an innovative approach for the EpiNurse program. They attempt to communicate and care for the most vulnerable people using technology and ensure the health security of the community people with trust. The use of a participatory approach with the community involvement for monitoring and assessment of the vulnerability of the community (over all aspects of potential hazards) make them aware and encourage to create a self-help group and networking by using their Smartphone, assess the nearby hazards, safety precautions, vulnerable group of population and helping them to minimize the exposure and loss during a disaster (Fig. 22.1).

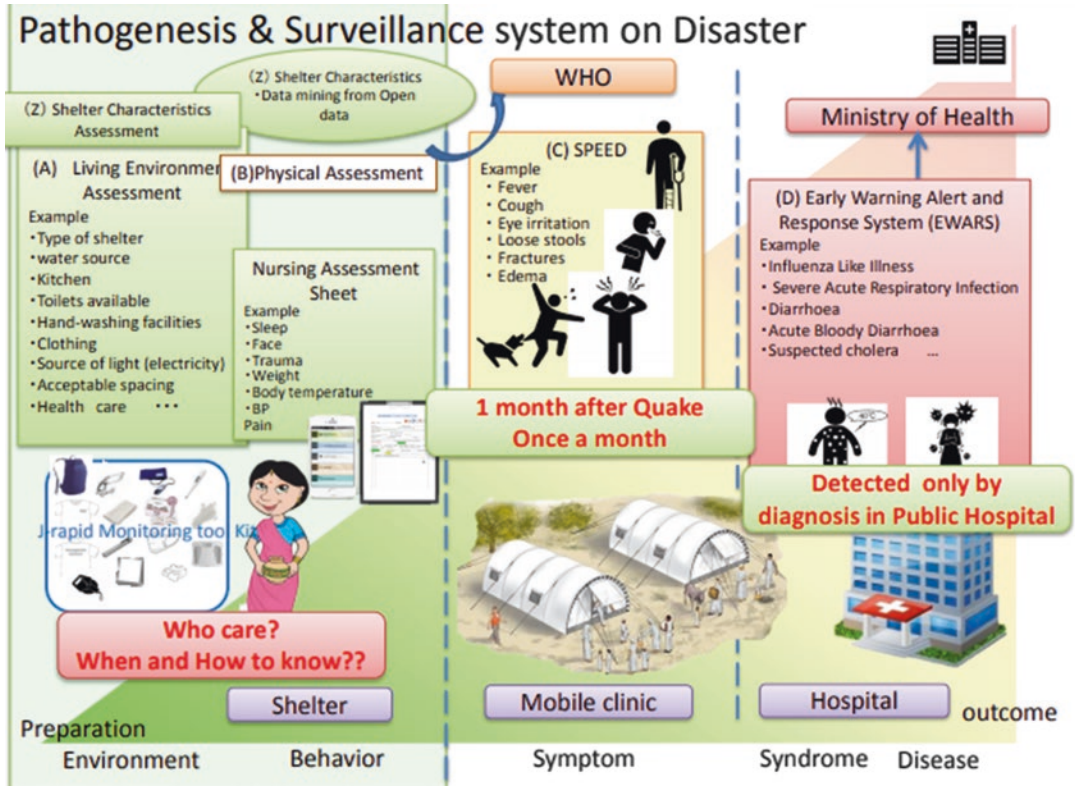

Fig. 22.1 Pathogenesis and surveillance system on disaster (Kanbara 2017)

22.7 EpiNurse in DRR and Sustainable Development (SDG) Goals

Disasters directly impact the health of the population, resulting in physical trauma, acute disease, and emotional trauma. In addition, disasters may increase the morbidity and mortality associated with chronic disease and infectious disease through their impact on the healthcare system (Giorgadze et al. 2011). Disasters may create environmental imbalances, increasing the risk of communicable diseases and environmental hazards. The psychological, emotional, and social well-being of the population in the affected community may also be affected. Disasters may cause shortages of food and cause severe nutritional deficiencies and large population movements (refugees), creating a burden on other healthcare systems and communities as well. Displaced populations and their host communities are at increased risk for communicable diseases and the health consequences of crowded living conditions (Pandey and Kanbara 2016).

In September 2015, the United Nations General Assembly adopted the 2030 Agenda for Sustainable Development and its SDGs. Health is in a vital position in SDG 3 among 17 goals. SDG 3 states to ensure healthy lives and promote well-being for all at all ages. Other SDGs such as education, food, water, sanitation, environment, gender discrimination, and abuse are social determinants of health. Aligning these SDGs, the Nepal government has launched the SDGs and a roadmap for 2016–2016 and set targets and indicators which will be used to assist in tracking progress for the indicated years such as 2015, 2019, 2022, 2025, and upon conclusion of SDGs implementation by 2030. The proposed SDG 3 targets include reduction of MMR to less than 70 per 100 thousand live births, reduction of preventable death of newborns and children to less

than one percent, and almost elimination of the prevalence of HIV, TB, malaria, and other tropical diseases, and waterborne diseases by 2030 (National Planning Commission 2017). Other SDGs agendas related to poverty, nutrition, education, gender, water, sanitation, and climate are considered as health threats and hazards that are frequently linked with health. During disasters, the health of communities is affected directly, increasing the health hazards and health risk behavior. So, in order to prevent disease, promote health, and maintain resilience, the EpiNurse program is of the utmost reasonable importance.

There are some success stories in response to the disaster and the EpiNurse program in Nepal.

22.7.1 Case Study 1

Participatory Monitoring to Ensure Communicable Disease After Greater Earthquake 2015.

Nepal was highly vulnerable to public health emergencies in the aftermath of the disastrous earthquake on 25 April 2015. Temporary shelters for survivors of the earthquake became long-term residences, and there were different types of public health issues. One of the main issues was the lack of reliable health data nationwide. So, the Nursing Association of Nepal (NAN) set up a project to deal with that problem. It was one of the J-RAPID Programs. In collaboration with three Nepalese governmental institutions, the Japan Science and Technology Agency (JST) initiated support for five projects related to the magnitude 7.8 earthquake that struck Nepal in April 2015, within the framework of the J-RAPID Program that supports urgent international collaborative research. The NAN wants to enhance the public health emergency preparedness of the country through an innovative approach by using ICT, in which the access to health information of people will be easier. They also collected shelter information linked to health from 24 shelters in ten earthquake-affected districts such as Kathmandu, Bhaktapur, Lalitpur, Gorkha, Dolakha, Sindhupalchok, Nuwakot, Kavrepalanchok, Dhading, and Rasuwa (Fig. 22.2).

After a two-day workshop to prepare EpiNurse (Local community nurses) who were

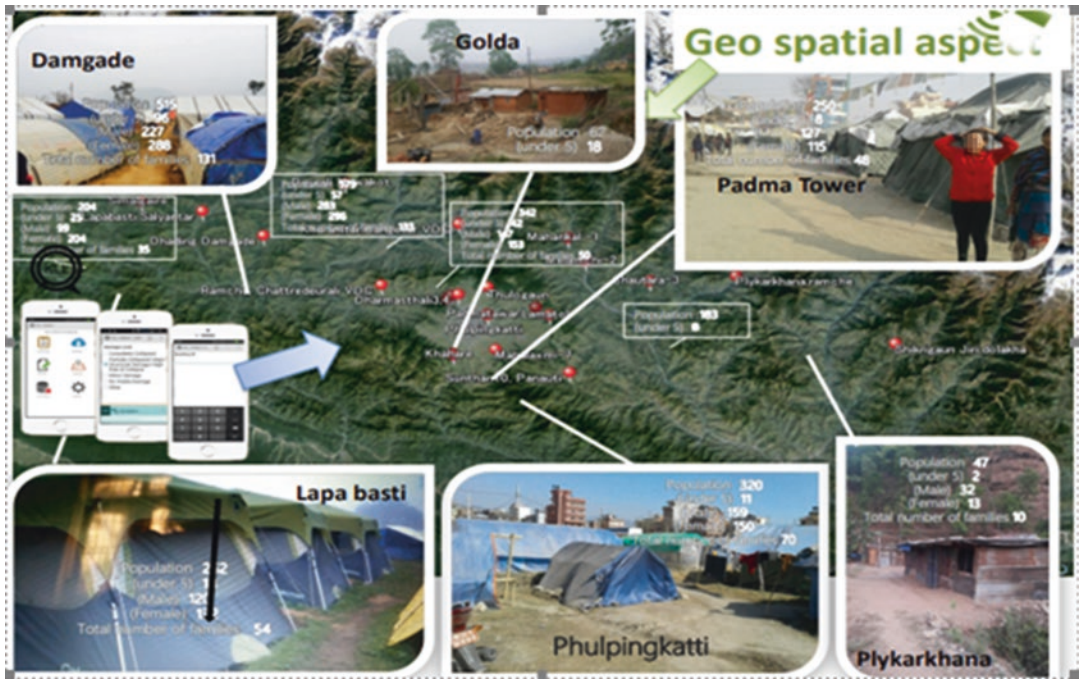

Fig. 22.2 Temporary shelters for survivors from earthquake 2015

working at nearby shelters, they were mobilized to assess communicable diseases of the population, and surveillance was done to evaluate the local living environment using a participatory approach. EpiNurse identified barriers to monitoring communicable diseases and priority activities for intervention, developed a smartphone application, and shared the information with the government, donors, and other concerned authorities.

This program was supervised by a committee (chaired by Ministry of Education, Science and Technology) for research that contributes to collecting scientifically essential but short-lived data, speedy restoration after disasters, and improvement of disaster preparedness in the future. Project partners from Japan include the Disaster Nursing Global Leadership Program, University of Kochi (DNGL), The Japan Society of Disaster Nursing (JSDN), and World Society of Disaster Nursing (WSDN); partners from Nepal include NAN and global partners include eBayanihan, Ateneo De Manila University, and the WHO WPRO.

This project aims to visualize and summarize the prevention of communicable diseases in real time with Nepalese nurses monitoring in the field through communication, so the information could be delivered to health clusters for making informed decisions to protect and promote the health and safety of people and the community during disasters. EpiNurse identified the symptoms of different communicable diseases of shelter people and referred them to the nearby health center for treatment (Table 22.1).

The most critical challenge is data collection to generate credible information to predict whether something is likely to occur. Our interest lies in collecting data on:

A. Adequate water and sanitation facilities.
B. Availability of food.
C. Control vectors.
D. Syndromic surveillance focused on the most common health conditions encountered after disasters for preventing communicable diseases rather than detecting outbreaks by dispatched nurses.

Table 22.1 Symptoms of suspected communicable disease among shelter people reported by EpiNurse (2015)

Health issues	Total cases: under 5 years	Total cases: above 5 years
Fever (FEV)	352	536
High blood pressure >140/90 (HBP)	0	242
Difficulty in breathing and wheezing (AAA)	135	212
Fever with headache, muscle pains and any of the following: eye irritation, jaundice, skin rash, scanty urination (LEP)	38	122
Loose stools with visible blood (ABD)	39	52
Yellow eyes or skin with or without fever (AJS)	15	15
Known diabetes (KDM)	0	83
Fever with spontaneous bleeding (i.e. nose bleeding, gum bleeding) (AHF)	6	15
12 months and over: sudden onset of fever (>38 °C) with severe headache and stiff neck; <12 months: fever (>38 °C) with bulging fontanel, or refusal to suckle (MEN)	4	0
Animal bites (ANB)	7	9
Spasms of neck and jaw (lock jaw) (TET)	2	2
Loose stools, 3 or more in the past 24 h with or without dehydration (AWD)	206	270
Fractures (FRS)	6	22
EYE itchiness, redness with or without discharge (CON)	104	247
Skin disease (SDS)	136	261
Open wounds and bruises/burns (WBS)	36	142
Fever with other symptoms not listed above (FOS)	13	36
Fever with rash (MEA)	44	64

So, the action plan was to establish a health coordination mechanism; develop the tool kit after visiting the model site and pre-meetings with NAN, as consulted by leading organizations (WHO, MoHP, JICA, MOH); and conduct a disaster nursing workshop to train Nepali nurses to use the tool kit, in Kathmandu.

It was exciting and interesting to get a chance to work with a different modality in the same circum-

stance and same scenario, with facing and overcoming the obstacles, meeting the disaster survivors, and getting them to know circumstances from their point of view by establishing a good interpersonal relationship, good rapport building that facilitated me an ideal opportunity to explore individual, family and community perspectives as well as it, was a new concept and experience to implement nursing activities applying ICT along with. Even in the twenty-first century of the technological era, we Nepalese are very weak in ICT use, so the experience of using smartphones for ICT systems for data collection, analysis, and mapping of the locale has provided me with an opportunity to realize the current need of technology along with nursing profession for the best assessment and put it into action with the best result. In countries like Nepal with geographical variation, ICT is especially important to assess, analyze, interpret, and put into action as soon as possible without any delay, especially during the period of emergency. So, this concept of technology application and professional experts, whether in a technical field or the administrative field. The government and concerned authorities should think about and put it as a priority program for the development of competency with the world.

Following are the challenges faced by EpiNurse during field activities (Fig. 22.3).

1. Time management: Regular duty and shelter assessment, surveillance was done parallelly.
2. Access to the shelter: Geographical variation, no vehicles, should walk for hours.
3. Access to the networks: No/very limited access to the Internet and cell network, difficult communication.
4. ICT literacy: Poor ICT literacy especially among nurses makes it hard to perform actual tasks on time.
5. High expectation of community people, avoidance of our presence.

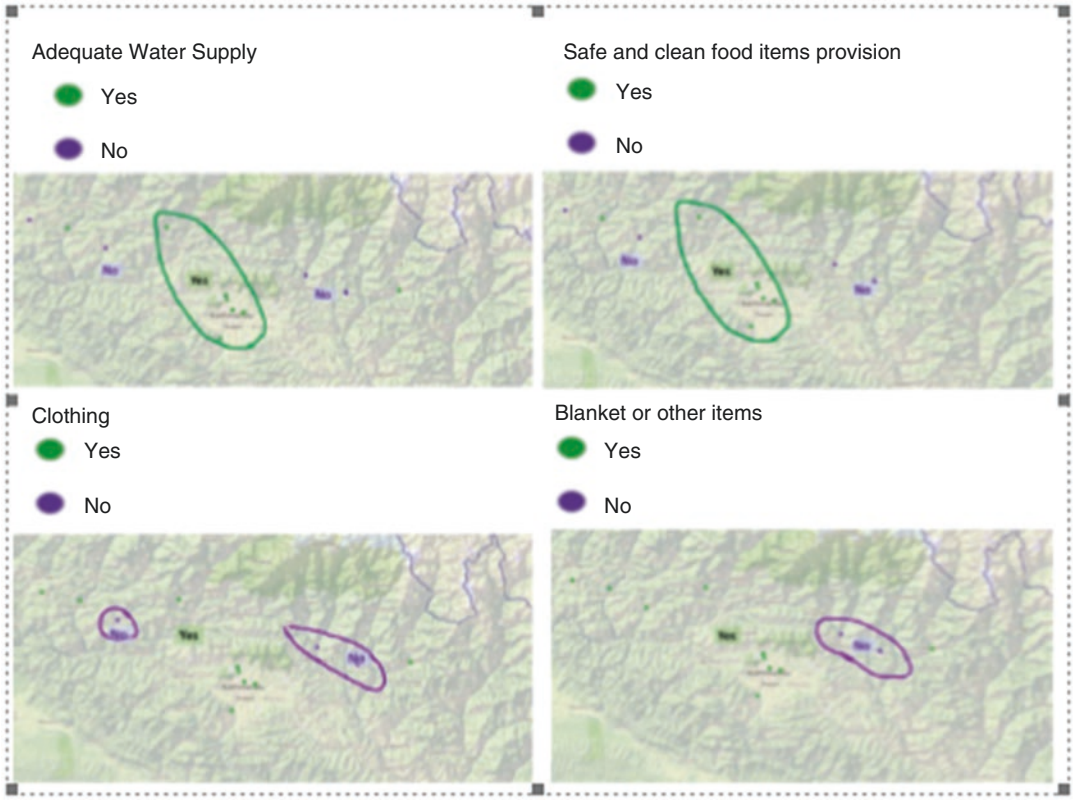

Fig. 22.3 Example geospatial aspect of shelter monitoring 1 year after the Nepal earthquake (April 2016)

6. Underestimation of nursing activities in all levels of authority even more during the crisis due to high competition of various NGOs, INGOs, and other funding agencies to sustain their program.
7. Political interference.
8. Sociocultural barrier.
9. Shortage and scarcity of basic needs create crisis among the community people, especially in disaster-affected communities.
10. Lack of awareness and education regarding various disasters and health security among community people – need a bottom-up approach to achieve the goal of DRR.
11. Poverty and unemployment (a dominant problem in most of the community).
12. Unavailability of IEC (information, education, communication) materials regarding health to the community.

Future challenges:

- To stand on the platform of UNISDR based on the Sendai Framework for Disaster Risk Reduction
- To sustain the EpiNurse program in Nepal because it is a very new concept in Nepal.
- To include the EpiNurse program in national policy and implementation.
- To incorporate the EpiNurse and disaster nursing in the nursing curriculum.
- To engage the community nurses as EpiNurse in disaster risk reduction.
- Political instability may interfere with applying and implementing new concepts and programs.

The following are details presented in the group discussion of nurse responders.

22.7.1.1 Primary Health Issues (During a Disaster)

When the big earthquake hit central Nepal, many people were injured. We rushed the patients with open wound cuts to the healthcare center. However, the collapse of public health infrastructure, overcrowding, and lack of health services affected people's health. Nurses and other health workers working in the health post served the patients. But the limited access to the affected population and poor coordination made it complicated to provide adequate health services on time. In addition, there was mass population movement and resettlement in temporary locations where three to four families had to live together in one tent. Overcrowding the environment, scarcity of water, poor sanitation, and waste management are factors that help develop communicable diseases like diarrhea, dysentery, measles, fever, jaundice, worm infestation, viral fever, skin disease, and headache. In addition, food shortages create a poor nutritional status, which causes the malnutrition problem mainly seen in children and pregnant women. With many treatment centers being damaged and patients forced to travel further to receive care, there is heightened concern of potential disruption to some treatment of patients for tuberculosis (TB) and other chronic diseases. The earthquake has also disrupted birthing centers for safe deliveries and access to primary and comprehensive care.

After the massive earthquake, most of them lost their homes and had no income. Many people suffer from psychological problems such as post-traumatic disorder syndrome (PTSD), depression, psychological stress and fear, anxiety, and high blood pressure.

So the affected people in the 14 districts needed mental health support. Heavy smoking and alcoholism are also the results of the psychological stress and fear which was usually seen in the shelter among men.

Furthermore, the lack of human security approach to the affected population was the weakness of the disaster management committee in Nepal. Women and girls living in the shelter were sexually abused and raped and went to the health center. The condition of patients was vulnerable; medical treatment and psychological treatment were needed.

Large numbers of people who are forced to live in a temporary shelter in crowded conditions

with inadequate sanitation and waste management; compromised sources of drinking water, and low levels of nutrition all play a vital role in compounding the devastation (Connolly et al. 2004). The geographical and social factors also affect the relief and recovery efforts. The earthquake's area is primarily hilly and has mountainous areas, where landslides and flooding frequently occur after the earthquake, and an outbreak occurs very quickly in those conditions and circumstances.

22.7.2 Case Study 2

22.7.2.1 EpiNurse Response to 2017 Nepal Flood Disaster

The monsoon season brought massive flooding in Nepal, and the southern belts of the Terai region suffered significant damage. While the system development phase of EpiNurse was in progress, EpiNurses visited rural flood-affected communities of Rautahat and Siraha districts of Nepal, where health services had not reached yet, and the team performed shelter assessment with mapping and ICT tool kit. They reached up to 225 families, covering 1659 people.

The team assessed the cases of communicable diseases following the flooding disaster; monitored the environmental status, hazards, vulnerable groups, and socioeconomic condition; and provided psychological support and public health education regarding personal hygiene, environmental sanitation, nutrition, safe drinking water, and prevention of communicable diseases.

The data were collected through a mobile application named SADEN (Shelter Assessment following Disaster) by EpiNurse Nepal which uses geotagging function and contained questionnaires regarding demography, living environment assessment developed by the WHO, and post-disaster Early Warning Alert and Response Network (EWARN), used by the Ministry of Health. The collected information was shared with local health centers, local governments, the nursing association, and concerned authorities to plan further actions for disaster risk reduction programs (Fig. 22.4).

22.7.3 Case Study 3

22.7.3.1 Post Tornado Risk Assessment by EpiNurse

The teams of EpiNurses were mobilized by the Nursing Association of Nepal after coordinating with MoHP, HEOC, and EDCD, 2 days after the disastrous tornado that hit Bara and Parsa on 31 March 2019. The objectives of the visit were to observe the overall scenario after the disaster,

Fig. 22.4 EpiNurses in Terai Flood, 2017: home visiting and actual need assessment, action taken as priority-based health education

assess the immediate basic needs of the survivors, provide immediate care, and link to the appropriate support system as per need. The team also assessed the living environment and temporary shelter, identified the potential health threats, and provided community awareness related to preventing unusual health events.

The first team of EpiNurse reached the affected area on 2 April 2019, and the second team joined on 5 April 2019; EpiNurses coordinated with the NAN branch, Parsa. The team visited Narayani Sub-Regional Hospital, National Medical College, and Kalaiya Hospital Bara; visited affected areas of Pheta Rural Municipality wards no. 1, 2, 3, and 6 and Kalaiya Sub Metropolitan City ward no. 18 of Bara district to assess the situation and provide awareness to reduce possible health hazards; met key personnel of the affected wards and gathered information related to the loss (lives, livestock, and property), infrastructure damage, support system, and environmental sanitation; and shared information to the key personnel.

Major findings of the visit:

Most of the families were living in temporary tents. There was a common mess for around 500 to 2000 people having two meals a day. The water supply was directly from hand pumps without any treatment. Toilets were common and lacked privacy and were not adequate either. Environmental sanitation was not maintained, debris was scattered everywhere, and waste disposal was not appropriate. There was overcrowding of relief distributors, and local leaders and survivors were in a hurry to get the relief materials.

22.7.3.2 Interventions of EpiNurses at the Affected Area

The EpiNurse provided health education and a mass awareness program in the community on environmental sanitation, food hygiene, storage and distribution, proper waste and sewage disposal, etc. They also focused on malnutrition, menstrual hygiene, and special care to the vulnerable group of people. The team also provided psychological support to the survivors who lost their family members and referred them as needed to the appropriate organization and support groups (Fig. 22.5).

22.8 Risk Award 2017

EpiNurse Nepal Project won the 2017 Risk Award from Munich Re Foundation and its partners UNISDR and GRF Davos on 24 May 2017 in a ceremony at the 2017 Global Platform for Disaster Risk Reduction in Cancun, Mexico. The award supported the prevention and control of communicable diseases following a disaster by equipping local nurses with a simple information and communication technology tool kit that

Fig. 22.5 EpiNurses collecting data using EpiNurse application at Pheta-6, Purenia, Bara

allows them to monitor the health security and disaster risk situation. EpiNurse Nepal developed easy-to-use innovative tool kits (smartphone application), assessed the living conditions of communities, and surveyed their health conditions in post extreme emergencies and disasters. The collected data will be shared with other health actors and the Ministry of Health through an application programming interface. This facilitates the development of models that support health risk management decisions in the aftermath of disasters. The project as Risk Award Challenge 2017 aims to complete a disaster risk reduction method to ensure health security in disaster-prone communities from Nepal to the global society. The project collaborates with local Nepali nurses, named EpiNurses (epidemiology+nurse), who conduct participatory monitoring using the ICT tool kit; the project aspires to protect and promote health and safety in shelters and communities. The framework for integrating innovative ongoing surveillance leads to a better understanding of disasters by enhancing the human dimension in ad hoc surveillance systems for risk identification and building resilience. An open framework can easily enable APIs for integration with other systems. These may help in improving community resilience and assist in disaster risk reduction. There are descriptions of assessment tools that provide a calculation of community health. However, the scientific basis for developing these tools is often an enclosed and fixed community or a small sampling of volunteers, thus reducing the scientific validity of the study. The primary informants of monitoring were women who remained in shelters and became health security keepers as well as unpaid care workers. Local nurses were required to equip themselves with the ability to mitigate risks. It requires greater cultural knowledge of how people interpret and live with risks and how human behaviors contribute to putting them in vulnerable situations. Local nurses restore public health in disaster settings by ensuring a healthy level of people and the living environment and by identifying high risks and vulnerability among the population, including the unique needs of survivors.

The project provided an open framework using an application programming interface for integration with other information technologies. Experimental trials used a prototype for data collection, simulations, and simulated response drills. In order to put it into practice, nurses and community people need to find ICT literate bottlenecks through responsive education as well as standard drills. Once trained, local nurses and community people can arrange the community resources to allow smooth cooperation among stakeholders of health security (Fig. 22.6).

22.9 Conclusion

Disaster can never be predicted, and there is no certainty of time; the commitment of the nation in relation to developing strategies, policy, and action plans is also an essential part of disaster risk reduction. Though in spite of the strategies, policies, and plans, EpiNurse has played a significant role in uplifting and enhancing the optimum level of positive health among the survivors of these disasters. Keeping in view the different success stories related to the post-disaster situation in Nepal, the EpiNurse program has played a significant role in uplifting the lives of the community people who have been affected by the disaster that might be a flood, drought, earthquakes, etc. Therefore, the EpiNurse program has been a success in helping to achieve optimum positive health in the community.

Fig. 22.6 EpiNurse Nepal received the trophy of Risk Award 2017

We need a system that allows people to get involved in prevention proactively. Households can provide primary care such as help with toileting, hygiene support, and food and monitor the living environment change, even during emergencies and in hospitals. Suppose nurses could focus more on the health hazards and diseases of the people outside the community. In that case, they could notice the intangible risk, such as the possibility of getting sick much later. They need the opportunity for proactive care considering culture and lifestyle.

The challenge is how to contribute as a global citizen on the human security agenda forward. One of the significant themes that emerged in our team, how we make communication and human development for good health. For caring for human security, communication by good governance needs to be equal at each level and taken into vulnerability.

They are limited because the health problems come from individuals now. As the general pattern has shown, governments act in a certain way in times of health crisis. Access to hospital and medical relief has become more of a privilege than an entitlement. Primary healthcare is not a high priority and is not well known nowadays.

A range of intervention options needs to be made available to high-risk populations facing various circumstances rather than one specific group approach. To enhance the human security of vulnerable populations at different levels, a system approach has been conceived based on the self-care, risk reduction, and communication: the notion that relief to individuals, development of primary healthcare as mutual assistance in community and public health policy, and interventions for the crisis are a continuum of related activities, not separate and discrete initiatives. Disaster nursing can be enhanced by one or a combination of the intervention strategies described in the book.

Routine Health Security Monitoring and Emergency Reports Based on Public Health.

Resources are often limited and do not allow monitoring tools to incorporate all of the reporting sources. The government must coordinate the interoperability of rapid assessment with other data services for further cooperation with other sectors, such as infrastructure, energy, transport, and water, and close partnerships with local volunteers. These teams responsible for rapidly assessing each emergency should exist in a sustainable community for health security. Routine monitoring and communication are essential in adapting over time to changing social context, environment systems, and technology. At a minimum, communication and regular social capital evaluation should be undertaken. This trajectory may later result in a mode of transferring guidance to first responders and civilian populations regarding DRR and behavior and reaching large populations.

22.10 Capacity Building Including Human and Technology in Sustainable Community

With formal education and drilling as well as ICT utility, competency can be developed in public health. It may enable local nurses to make a decision to create a system that would allow smooth cooperation among stakeholders. In local communities, nurses collect information and mitigate communicable disease risks. Effective leadership might also be necessary to manage improvement in reconstruction settings. By being a member of every part of the healthcare system, they can become critically needed leaders in emergency management and disaster preparedness. Nurses may manage community settings as well as a hospital ward. They can play a vital role in restoring public health under disaster conditions (water, sanitation, food, and shelter) and identifying high-risk and vulnerable populations, including the unique needs of children in the disaster.

This project has explored how the data collected by local nurses could become the basis of the daily community health information system, which could be a monitoring model and benchmark of Nepal toward SFDRR from the point of view of nursing science. The local Nepalese nurses gather firsthand information from evacuees in shelters and transmit data in near real-time communication to other health organizations,

which would make informed decisions to prevent communicable diseases before an outbreak, enhance organizational development through teamwork around data collection, and improve the quality of care by linking community and government surveillance records.

22.10.1 The Issue Faced on Community Monitoring

Their behavior of disaster reduction and living environment covers a wide range of flexible activities in the community. Fluid data that were previously not collected, such as living environment, were now available and could be aggregated and used for a national reporting system by crowdsourcing and IoT. Rapid measurement through interdisciplinary work rather than observation must increase accuracy. The reliability and validity are required to convert qualitative data to another quantitative surveillance system.

One of the values of the project is in delivering up-to-date information application relevant and actionable to stakeholders so that there is a significant shift in preparedness paradigms and, consequently, preparedness behavior. This is a broad study that included all affected districts that are geographically representative. The nurse also discovered other health problems and responses on-site and reported to the EpiNurse center, though the surveillance is limited by the relatively small sample size and sampling method.

All participants of the research were local nurses who worked and lived in the community and were likely familiar with the conditions of the study areas. This approach contributes to the development and ongoing enhancement of sustainability in the communities. The cultural gaps between the survivor and the responder will require implementing flexible communication. Being sensitive to unique cultural behaviors and traits will increase the understanding, appreciation, and respect of cultural differences and similarities within and between groups.

During the monitoring training, the EpiNurses were educated about the purpose of the study and became committed to the usage of the new tool. It enabled them to maintain a sense of control, build further support during implementation, and also minimize resistance to change. As well as solving the immediate practical problems after a disaster, a significant outcome was that the research process helped initiate, develop, and maintain new opportunities for professional dialogue as nurses, community leaders, and other stakeholders such as local government, central government, and relief organizations worked toward the common goal of improving healthcare for community people. This process helped build a team in a hierarchal environment where professionals were not used to operating in daily situations. The EpiNurses were given an opportunity to work in new ways with community workers and social workers who were usually at different workplaces within the health system.

The reciprocal process, in which the researcher and practitioners informed each other, established new knowledge and effective problem-solving actions as well as technology. As a result of the research team working directly with the nurses as health professionals who know the community people, they demonstrated increased professionalism. The National Nursing Association should be supportive of such a simple change that enhances the working environment for nurses in a way that can be sustained. Improved science and technology allow quicker coordination, communication, and results. The SFDRR signals a clear mandate to the science, technology, and innovation community as human centered on improving the resilience of communities, saving lives.

22.10.2 Way Forward

Our study showed that identifying a shared goal and engaging Nepali and Japanese researchers in this project to achieve this goal can bring the suggestion to the Nepalese government to build

back better reconstruction. This project has explored how the data collected by local nurses could become the basis of the daily community health information system, which could be a monitoring model and benchmark of Nepal toward SFDRR from the point of view of nursing science. The local Nepalese nurses gather firsthand information from evacuees in shelters and transmit data in near real time to relate health organizations, who would make informed decisions to prevent communicable diseases before an outbreak, through the action research which assess living-environmental conditions and health risks, to improve the quality of reporting system in shelters, to enhance organizational development through teamwork around data collection, and to improve the quality of care by linking community and government surveillance records.

This result is one of practical, solution-oriented research, which in a way challenges the conventional public health security monitoring systems which require near real-time, population-based, statistical alarms to alert to unusual activity. It also includes some key issues in developing the next methodological health monitoring model, offering a robust interactive network that crosses cultural and societal differences, geographies, and generations. The potential of this collaboration is not only to produce innovative research outcomes involving the improvement or optimization of services utilizing ICT but also to promote research knowledge and idea exchange regarding social issues and challenges in the field of emergency preparedness and response.

We faced some difficulties because the people-centered and bottom-up approach for reporting by nurses is biased toward monitoring among people seeking care in the disastrous situation. Geographic information of the tentative migration point did not have a collect address. Only GPS on a picture in a smartphone enabled it to identify the shelter. If the infrastructure is unavailable, it takes more time to update the data. In this research, EpiNurses did not have a smartphone, electricity, and telephone after the disaster in some areas. It could become more powerful by applying location information acquired from smartphones used for data collection. Identification of typical behavior patterns could also provide valuable insights to the health security assessment comparing differences between community and temporary shelter site hourly using the brief EpiNurse communication.

It is urgent to apply geospatial technology for people's behavior modelling in a disaster situation and suggest exploring the potential use of social networks to enhance the government's understanding of people's health security level.

The development of trans-community preparation for comparative decision making for prompt disaster response is also an urgent task for global health security.

22.11 Policy Recommendation

22.11.1 Routine Health Security Monitoring and Emergency Report Based on Public Health

Resources are often limited and do not allow monitoring tools to incorporate all of the reporting sources. The government must coordinate the interoperability of rapid assessment with other data services for further cooperation with other sectors, such as infrastructure, energy, transport, and water, and close partnerships with local volunteers. These teams responsible for rapidly assessing each emergency should exist in a sustainable community for health security. Routine monitoring and communication are essential in adapting over time to changing social context, environment systems, and technology. At a minimum, communication and regular social capital evaluation should be undertaken. This trajectory may later result in a mode of transferring guidance to first responders and civilian populations regarding DRR and behavior and reaching large populations.

22.11.2 Capacity Building Including Human and Technology in Sustainable Community

With formal education and drilling, competency can be developed in public health. It may enable local nurses to make decisions to create a system that would allow smooth cooperation among stakeholders. In local communities, nurses collect information about and mitigate communicable disease risks. The data produced and their improved quality confirms the claim by others that this information can assist with the allocation of resources, establishment of budgetary and long-term planning, and productivity measurement and allotment of the work depending on the literacy and skills of the community. Capacity building for local nurses to coordinate the effective actions and interventions, as well as periodical on-site risk assessment is crucial. Effective leadership might also be necessary to manage improvement in reconstruction settings. By being a member of every part of the healthcare system, they can become critically needed leaders in emergency management and disaster preparedness. Nurses may manage community settings as well as a hospital ward. They can play a vital role in restoring public health under disaster conditions (water, sanitation, food, and shelter) and identifying high-risk and vulnerable populations, including the unique needs of children in the disaster.

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Part V

Decision Making for People-Centered H-EDRM

Risk-Based Approach for VUCA World

23

Shoko Miyagawa and Sachiko Ohta

23.1 Information and Decision-Making in Disaster Situations

23.1.1 "There Is No Information"

This is a phrase that is often heard in the aftermath of a major disaster, both from the victims and from responders, such as local governments, businesses, and private volunteers who are engaged in disaster response. Why do we need information? The reason is that many decisions need to be made in times of disaster, and information is essential for this decision-making. We cannot carry out disaster response in the same way as normal operations. The first step in responding to an "unusual" situation is to understand where and how the disaster has affected the area. The following are some examples of decision-making challenges that governments, disaster victims, and private responders may face because of a lack of information.

S. Miyagawa (✉)
Faculty of Nursing and Medical Care, Keio University, Fujisawa, Kanagawa, Japan
e-mail: miyagawa@sfc.keio.ac.jp

S. Ohta
Department of Medical Business Pharmaceutical Science, Nihon Pharmaceutical University, Tokyo, Japan

23.1.2 "We Don't Know Where to Send a Rescue Team"

In the aftermath of the Great East Japan Earthquake, it took a lot of time to grasp the entire picture of the damage caused by the massive and widespread tsunami. In the coastal municipalities, many administrative staffs were affected by the tsunami, and government buildings were devastated. Thus, they were in no position to even notify the prefectural and national governments about the very fact that they had become victims of the disaster. As a result, the prefectural and national governments could not make quick decisions on where to send rescuers.

23.1.3 "Can We Eat All the Food We Have Now?"

People who evacuated to designated shelters, commercial facilities, temples, and shrines will spend anywhere from several days to several months in these places. If they run out of necessities such as water, food, medicine, hygiene products, clothes, blankets, and fuel, they will face difficulties in merely staying alive. When the next relief supplies will arrive is an important piece of information that directly affects the distribution of how much food people can eat today and tomorrow.

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23.1.4 Where Should We Go and How Much Can We Deliver?

Governments, companies, and private relief organizations that are trying to deliver relief supplies want to know where to go to find survivors and how much supplies to bring to meet their needs. If the amount of relief supplies is too small for the needs of the shelter, it may become a risk factor in maintaining order in the shelter. If a large amount of unneeded supplies are delivered, they will take up space and place an excessive burden on the supply managers. What and how much the disaster victims need is an essential information for relief workers to effectively and efficiently use the resources at hand to help them. Furthermore, once we know where and what supplies are needed, we need to gather information on how to deliver them. We also need information on logistics, such as whether the highways and national roads leading to the affected areas have been restored and whether vehicles and gasoline are available for transportation.

23.1.5 "I Don't Know Who to Talk To"

Once the acute phase of the disaster has passed and the minimum environment necessary for survival has been established, people in the affected areas face the challenge of how to rebuild their lives. These issues include the following:

- People who have been laid off from their jobs due to the disaster and have no means of earning an income.
- People with chronic illnesses that are stagnant and may worsen if not treated.
- People with physical disabilities, mental disabilities, or dementia who find it difficult to live in groups at shelters.
- People with food allergies who cannot get enough nutrition from rationed food.
- Elderly single-person households who cannot clean up their homes.
- No place for children to play to the fullest or study quietly.

These issues above are often perceived as trivial compared to the more "obvious" damage of losing a family member or a place to live because of a disaster. For this reason, people often find it difficult to talk about these issues in group living, and because they are difficult to understand from the outside, they are difficult to detect, and people tend to think that these are problems they need to solve on their own. Because there is a lack of understanding that these issues should be discussed with specialists such as doctors, social workers, and lawyers, there are many cases where victims are left alone to deal with their problems. In addition, such issues related to daily life often involve several interrelated problems. It is also important to sort out the relationships between the problems and discover where to provide the most effective support. The first step to solving problems is for the people concerned to know that various social supports exist to solve their problems and for the people around them to realize the existence of their problems and find and connect with supporters who can help them.

The various issues mentioned above are all caused by the lack of sufficient information needed for decision-making. This chapter outlines risk and uncertainty as key factors in decision-making during disasters and introduces the risk-based approach that will be necessary for future disaster response. It also explains the necessity of an information platform to realize the risk-based approach.

23.2 Risk, Uncertainty, Information, and Decision-Making

According to ISO 31000, the international standard for risk management, risk is defined as "the effect of uncertainty on objectives" (International Organization for Standardization [ISO] 2018). What is noteworthy about this definition is the idea that risk is not just a "negative chance" but that the impact of uncertainty is the risk. Often, when calculating the magnitude of a risk, we see the formula "(likelihood of occurrence) × (impact)," which is the very definition of risk.

Uncertainty is the state of being unable to say with certainty what is happening now or what will happen in the future. For example, it is impossible to predict accurately when a direct earthquake will hit Tokyo. Also, when a tsunami strikes a coastal area, it is not possible to accurately show in advance which area it will reach or which buildings will be safe. In addition, when a major disaster actually occurs, it is difficult to know immediately after the disaster exactly how many people have been killed or injured, how many people will need beds and food in shelters, and to what extent the electricity and communication infrastructure will be shut down.

On a day-to-day basis, we manage uncertainty by making various predictions, such as that the supermarket will be open and have plenty of food if it is not a holiday or that we will get an appointment at the hospital within a week. These predictions are based on our accumulated experience of our daily lives. However, in the event of a disaster, this situation changes drastically. The infrastructure that supported our daily lives, such as electricity, water, communications, and roads, as well as services in the medical, logistics, and IT fields, will be devastated. The supermarkets cannot stock what they need to sell, and medical services will be disrupted due to damage to staff and equipment. Disasters increase our uncertainty.

How can we manage this uncertainty in times of disaster? Claude Shannon and Warren Weaver, mathematicians and founders of computer technology, say it is "information." In their book *Information Theory*, Shannon and Weaver explain that information is something that reduces uncertainty (Shannon and Weaver 1949). Suppose there are several possible outcomes in a situation, and we have to take some action on them. When we are not given any information about them, we assume that they all have the same chance of happening. However, if we have "news" that one outcome is more likely to happen—this is what information is—we can make a guess what will happen. To take a simple example, when we go out in the morning, if we do not have any information about the weather, we are forced to assume a 1/2 chance that it may rain. However, if we get information from the weather forecast that there is a 70% chance of precipitation in the afternoon, we can make a decision to go out with an umbrella. When appropriate information is given to the decision-making problem of whether or not to bring an umbrella, the uncertainty of not knowing whether it will rain is reduced, and the path to better decision-making is opened. Information, which reduces uncertainty and aids decision-making, is derived from data. Knowledge is gained from the integration of information, and wisdom is gained from the practice of using knowledge. See Box 23.1 for more on this.

Box 23.1: Data, Information, Knowledge, and Wisdom

Data, information, knowledge, and wisdom are often confusedly understood. It is important to understand the difference when understanding and assessing risk, as discussed in this chapter. In making decisions to protect people's health in times of disaster, we need to perceive and determine what is actually happening, what the implications of what has happened are, what it will bring, and what we can do to protect our lives and livelihoods. Data, information, knowledge, and wisdom are used in this process in the following ways:

- *Data*: Data is the representation of what is actually happening by some symbol, such as a letter or number. Data by itself has no meaning. Data can be counted, such as the number of people in an evacuation shelter or the amount of food on hand, or it can be a description of the situation based on observation, such as "many people are confused" or "there are fires around."
- *Information*: Information is data that has been interpreted and processed into a form that is useful for our decision-making. For example, if we compare the number of people in a shelter with the

amount of food available and find that there are only 1 day's supplies of food, that is information. Also, if we know that the shelter is not in order because people are confused, or that there is a possibility of fire spreading to the shelter, that is information.

- *Knowledge*: Knowledge is an organized and structured level of information that is obtained by integrating repeated information. Knowledge can be used not only in specific situations but also in other situations with similar circumstances. For example, "if more evacuees than expected arrive at the shelter, there may be food shortages." "Immediately after a disaster, people are confused and it is difficult to maintain order at the shelter" are knowledge of disaster response.
- *Wisdom*: Unlike data, information, and knowledge, wisdom is the principle and norm of behavior that people in society use to make decisions. Beliefs and ethics, such as "we must not leave behind the vulnerable in times of disaster" or "we should give priority to distributing food to those whose inability to eat is a direct health risk," are obtained through repeated decision-making using information and accumulating practices using generalized knowledge.

When considering and acting on the goals of the SDGs in times of disaster, understanding the structure and use of data, information, knowledge, and wisdom is the shortest and most solid path to its realization.

Uncertainty brings with it a variety of risks. However, knowing the uncertainty is not enough to determine the risk. This is because risk is the "effect of uncertainty," not uncertainty itself. If we use the weather example above, we can explain it like this. Assuming a 70% chance of precipitation, the effects of rainfall will vary depending on the situation. If you are out by car and can park your car in the parking lot of the building, even if the probability of rain is high, it will not affect you much. However, if you commute to work by train and have to walk 15 min from the nearest station if you go out without an umbrella on a day with a high probability of rain, you will have to be prepared to work all day in soaking wet clothes. On the other hand, if you go out for a run instead of going to work, there is no need to bring an umbrella even if you spend 30 min outdoors. You're going to take a shower when you get home anyway, so all you have to do is just run and get soaked. So far, we have dealt with uncertainty by learning possible patterns from similar experiences that have occurred in the past. However, in recent years, we have been required to respond to unpredictable and unprecedented situations, such as large-scale disasters and global epidemics of infectious diseases. In order to respond quickly to such situations, a new method of decision-making is required.

23.3 VUCA: Uncertainty at Multiple Levels

As mentioned in the previous section, the use of "information" can reduce uncertainty in decision-making. However, this basic theory alone seems to be insufficient to reduce risk under today's complex and intertwined uncertainty. In recent years, the keyword VUCA has been used to describe increasingly complex systems and situations; the term VUCA is an acronym for volatility, uncertainty, complexity, and ambiguity (Bennis and Nanus 1985). First used in leadership theory since the 1980s, the term came to global attention when it was used at the World Economic Forum (Davos) in 2016. Each of these four words expresses the following situations/states: Volatility refers to instability and rapid change. Volatility refers to things that vary widely from place to place and time to time or that change dramatically over time. Uncertainty refers to a situation in which we do not have accurate

information about whether a particular situation can occur in the future or has already occurred, making it difficult to predict. Complexity refers to a state in which there are numerous events or components that are interrelated and cannot be easily understood or explained in terms of their overall behavior. Ambiguity is a situation in which the situation or goal is ambiguous and it is not clear what should be grasped or what should be achieved. The keyword "VUCA" expresses a situation in which it is becoming increasingly difficult to predict the impact when something happens in today's world where various events are interrelated in a complex manner. In fact, every day we face situations that are difficult to predict and require a flexible response, such as changes in market players because of rapid technological innovation, large-scale disasters because of climate change and their impact on production, the UK's exit from the EU (Brexit), and the global epidemic of new coronavirus infections.

In such unstable, uncertain, complex, and ambiguous situations, decision-making becomes increasingly difficult. It is not just a matter of having or not having information but also of not knowing what information to get, not knowing how to get the information, not knowing whether the information needed to decipher the whole picture is available, and not knowing whether the previously obtained information is still valid when the situation changes. In this sense, a large-scale disaster is truly a VUCA situation: to use the example given in Sect. 23.1, the decision to eat food now depends not only on whether or not food is available but also on when additional food will arrive. Further, when the food aid will arrive depends on whether the responders have correctly identified the food needs, what the delivery schedule is, and whether they have the means to transport the aid to the site. In order to make the right decisions, these complex problems need to be solved. Meanwhile, the information available at the shelters in the affected areas is extremely limited. This means that there are many situations where decisions must be made based on insufficient information.

23.4 Systemic Risk

Unlike a closed environment such as a laboratory, disaster risk management is on an open system where various elements are intricately related, and many of these elements are beyond the control of the risk response actors. This kind of risk, in which the elements are intricately related and a single local incident can spread to the entire system, is called systemic risk.

As an example of systemic risk, let us consider the supply chain of automobile production. In the past, Japanese automakers bought parts on a long-term, stable basis from specific suppliers with whom they had deep capital and human relationships and who were geographically located nearby. In recent years, however, this structure has changed, and there is a growing trend to buy parts from overseas and to share the same suppliers with other automakers. As the supply chain has become more complex and globalized, various risks have emerged that had not been considered in the past. For example, in one case, climate change caused flooding in Thailand, which made it impossible to buy parts for car seats being manufactured there, and production stopped on almost all car models (Chongvilaivan 2012). Risks such as climate change, which are unpredictable and impossible for any one company to control, are embedded in the supply chain. In addition, the supply chain has become so complex that it is impossible to know what the overall impact will be until a plant is actually shut down. These make it difficult to solve the problem.

We have already experienced other cases where the collapse of a company's stock price has spread to the global financial markets, causing panic and the collapse of financial functions. The recent COVID-19 also caused unexpected disruptions in logistics. If the Internet infrastructure is shut down because of a cyberattack, online stores that depend on websites for all their sales will suffer fatal damage to their operations. The list of social unrest caused by the interaction and propagation of risks is endless.

Disaster response also has this inherent systemic risk, from macro to individual responses.

For example, a few days after the Great East Japan Earthquake in 2011, there was a massive outage in the online banking system. This was because of the large number of donations being transferred through online banking to the banks that served as donation windows. In addition, due to the damage to the nuclear power plants caused by the tsunami, there were frequent power outages in the Tokyo metropolitan area, which had not been severely damaged by the earthquake. As a result, home healthcare patients on ventilators had to be hospitalized or otherwise dealt with urgently. In addition, the power outages brought factories to a halt, resulting in a drop in production of various items such as semiconductors, automobiles, cell phones, synthetic detergents and cosmetics, and synthetic resin products, which had a significant impact on the production of parts and commodities in Japan as a whole.

The COVID-19 infection that has been spreading around the world since 2020 is still unpredictable as of this writing on March 2021. The epidemic has caused lockdowns in major cities around the world and has had a significant negative impact on the food, clothing, travel, and entertainment industries (Zhu et al. 2020). While a large number of people have lost their jobs in these industries, Internet-based teleconferencing services such as Zoom and Internet-delivered content services such as Netflix have made significant gains. Previous business experience is not a useful source of information for decision-making under COVID-19. In addition, changes caused by the spread of the virus will occur in all sectors of society and are difficult to predict. It is impossible to predict when the pandemic will end. Minciu et al. found that organizations directly affected by the COVID-19 epidemic in business were characterized by a lack of established action plans for such VUCA situations, and their employees were not prepared to respond quickly to major changes (Minciu et al. 2020).

In the healthcare field, the increase in the number of patients with COVID-19 infections has resulted in a shortage of personal protection equipment such as ventilators, masks, and oxygen cylinders. While there is a shortage of doctors and nurses, more and more healthcare professionals are becoming exhausted and burnt out from dealing with unpredictable infectious diseases (Matsuo et al. 2020). In addition, as infection rates and severity rates change with viral mutations, guidelines are frequently changed, adding to the confusion in the field. Sometimes, ambulances have refused to transport patients because they could not find a hospital to admit them due to lack of available beds, and in other cases, treatment and surgery for patients with other diseases have been postponed in order to prioritize the treatment of patients with COVID-19 (Coleman et al. 2021). Baruch et al. consider COVID-19 infections as one of the events in the VUCA world and discuss the methods of responding to a pandemic using the crisis leadership model and Lean methodology (Baruch et al. 2021). As Baruch pointed out, the new risk of COVID-19 is intricately intertwined with other risks and has a great impact not only on people's health but also on the entire social system. In this sense, the pandemic is one of the most revealing examples of systemic risk in the VUCA world, not only in the healthcare domain but also in all sectors of society.

Compared to the Millennium Development Goals (MDGs), the predecessors of the SDGs (Sustainable Development Goals), the social context of the SDGs has changed significantly. One of them is the VUCA situation, and another is the need to handle systemic risks. The reason why the SDGs cover 17 different areas is that current social issues need to be addressed in an integrated manner from multiple perspectives and with multiple approaches.

23.5 Event-Based and Risk-Based Approach

Conventional disaster response has been conducted on an event-based basis, that is, by defining rules for events, such as "do X when A happens." The idea is to model the overall problem by deriving rules for the occurrence of events from the preconditions for the occurrence of each event and then combining the rules for each event. This approach worked to some extent

when we had only limited information about the preconditions for disasters to occur. Or rather, there was no other way to do it. Turning a blind eye to the intrinsic complexity of disasters, we modeled disaster operations by saying "this is what we will do in case of a flood" or "this is what we will do in case of an earthquake." However, we now know the complexity of disasters. This is because we now have access to a variety of data on disasters. For example, in the case of the nuclear accident on the Great East Japan Earthquake, we know that the radioactive materials spread in a northwesterly direction instead of concentric circles (US Department of Energy, National Nuclear Security Administration 2011). Measurements taken by the US Department of Energy revealed this using the Aerial Measuring System (AMS) on board US military aircraft. This data shows that the radioactive material was spread by the air currents. The development of technology has brought about an environment where such detailed data can be obtained in a short time. While detailed data can contribute to better decision-making, it has also brought to light the fact that the decision models that we used to think of as simplistic are actually more complex. When the overall problem is complex, the decision model is also complex as described in the following:

- If A happens and B happens, do X1.
- If A happens and B and C happen simultaneously, do X2.
- If A happens and B does not happen and C happens, do X3.

The more events form a complex set of conditions, the more branches there are. The number of consequences increases in a geometrical progression, and eventually, it becomes difficult for humans to grasp the entire picture of the model. Furthermore, if you consider a situation where multiple risk factors interact, such as in systemic risk, it becomes difficult to manage the situation using an event-based approach. In the case of the diffusion of radioactive materials, the model is not a simple concentric circle model but includes various factors such as the amount of released materials, topography, wind direction that changes with time, and weather such as rainfall and snowfall. In the impact on people's daily lives, there is a wide range of factors, such as whether or not the area is residential, the gender and age of the residents, whether they are currently pregnant or are likely to become pregnant in the future, whether they are engaged in outdoor work such as farming or forestry, and in the case of agricultural land, the type of agricultural products they produce. With such a large number of variables, the model becomes very complex, and even the best person would have difficulty making decisions using such a complex model with other variables. The risk-based approach is a new way of thinking to support decision-making in such complex problems. In the risk-based approach, the first step is to assess what is the risk to the entity (risk assessment), identify the factors that cause the risk (risk identification), and plan to eliminate each factor (response). In addition, a risk management cycle is created by repeating the regular review and reporting of risk responses, and the risk-based approach is continuously implemented.

The risk-based approach is used for decision-making in VUCA environments such as large-scale plants like nuclear power plants and finance, where the system is huge, complex, and uncertain. The risk-based approach has also been introduced in ISO 9001, the international standard for quality management, and has become a standard approach for quality management in various businesses. From the perspective of people-centered disaster prevention, which is the theme of this book, it is appropriate to apply this risk-based approach to the disaster preparedness of each individual. Each person's life is different. Family structure, work, health status, community relations, life goals, and values are all different. How many family members cannot evacuate on their own, whether there are pregnant women or infants, what kind of chronic illnesses they have, whether they need continuous medical care such as dialysis or oxygen inhalation, the distance between work and home, whether they can expect warning notifications from their neighbors during evacuation, and whether they want to continue living in the area

after the disaster. Depending on these circumstances and attitudes, how one prepares for a disaster and what actions one should take in the event of a disaster will vary. In contrast, disaster preparedness guidelines for people have so far been based on an event-based approach. Only generalized rules were shared, such as how to protect oneself in case of an earthquake, how to prepare for a disaster, and what actions to take in case of an alarm. In recent years, Japan has been experiencing frequent disasters that have exceeded previous expectations. In the case of Typhoon Lionrock in 2016, a typhoon that had once left Japan approached again and made landfall from the Pacific side of the Tohoku Region for the first time in recorded history, causing a lot of damage in areas that lacked typhoon preparedness (Cabinet Office, Government of Japan 2016). In addition, in the heavy rains of July 2008, there was unexpected rainfall in a short period of time because of the occurrence of linear precipitation zones, which led to river flooding. In order to cope with this situation, the government revised the guidelines for local governments to release information on evacuation each time. As a result, the guidelines became more complex and difficult to understand. Specifically, citizens did not fully understand when the elderly should start evacuating, resulting in a situation in which many people were affected by the disaster due to delayed escape. In addition, there was confusion among local governments because they made different decisions on when to release information on evacuation depending on the type of disaster, such as "landslide," "river overflow," or "earthquake." Thus, in the event-based approach to disaster response, as the situation becomes more complex, the rules become more complicated, exceeding human management, and this leads to a vicious cycle that causes even greater damage. The Disaster Countermeasures Basic Act, revised in 2021, adopts a risk-based approach for the first time. This means that each evacuee, such as the elderly or disabled, will be required to make a plan for evacuation support methods and evacuation sites, considering their individual risks. This is exactly the risk-based approach described above, where individual risks are considered according to the situation and plans are made to reduce the risk of disaster. This is also an important initiative from the perspective of "sustainable cities and communities" as stated in the SDGs. In the future, it is expected that various environmental and institutional improvements will be made to support the preparation of individual evacuation plans and that the development of more effective individual evacuation plans will become a major pillar of disaster prevention for society.

23.6 Information Flow Management and Factor Analysis for Risk-Based Approach

We have been passing on the knowledge gained from past disasters in the form of "legends" and "lessons learned." For example, the phrase "tsunami -tendenko" has been handed down from generation to generation in some areas of the Tohoku Region that were hit by the tsunami that followed the Great East Japan Earthquake. It means "In case of a tsunami, each one run to higher ground individually without regard to others around you" (Kodama 2015). In this land that has been repeatedly hit by tsunamis in the past, people have passed on the wisdom of disaster prevention to save the lives of future generations through these words. In this section, I will discuss how the various wisdoms that we have passed down as lessons to support decision-making in times of disaster can be created, distributed, and used in modern society. With the development of ICT in recent years, we can now obtain evidence-based information on disasters, which until recently could only be conveyed as "lessons learned." However, ICT itself is neither a magic wand nor a silver bullet to defeat werewolves. As for the use of ICT in disasters, we should carefully consider whether they fit the challenges of disasters and the behavior of people during disasters. If not, ICT will be useless. For example, if the terminals of a system for collecting information at shelters are supposed to be connected to the government network all the time, such a system will not work in practice. The

system must be able to function via the Internet or offline if communication facilities are damaged. The first priority is to determine what the real problem is. In the case study introduced at the beginning of this chapter on how lack of information makes decision-making difficult, we introduced the case of "not knowing who to consult." This is an issue that arises from the interrelationship of complex factors in the process of surviving the acute phase of a disaster and rebuilding one's life in temporary housing. In such examples, it is easy to focus only on the events that are immediately apparent and ignore the various factors that cause the issues. However, if the factors causing the events are not resolved, the same problems will inevitably resurface. As an example, we'd like to take up the issue of dying alone in temporary housing. In the Great East Japan Earthquake, 614 people were reported to have died alone in the 10 years since the disaster. Factors that contribute to dying alone include chronic diseases, alcoholism, lack of employment, not being married, and lack of social connections (Tanaka et al. 2010). We structured the factors and made the diagram to show how these factors are related to loneliness (Fig. 23.1). This diagram was created using a method called the CRT (current reality tree), which is proposed in the TOC (theory of constraints) thought process (Goldratt and Cox 1984). In the diagram, causality progresses from the bottom to the top; the ellipse connecting the two lines indicates that the top condition is satisfied if all two or more conditions in the bottom row are met. This diagram is by no means a complete list of risk factors for death by loneliness, but it shows how living in temporary housing, with its poor accessibility and isolation from conventional human relationships, can increase the risk of death by loneliness. Assuming that moving into temporary housing is a condition that cannot be changed, if we cannot understand the causal structure between this moving into temporary housing and lonely deaths, we will have to take inefficient measures, such as frequent visits to everyone, in order to prevent lonely deaths. By clarifying this structure through the creation of CRTs, it will be possible to focus interventions on more specific issues, such as providing transportation support to go shopping or implementing social participation programs to relieve loneliness. In addition, when it is difficult to provide mobility support, it is possible to take the next best action that can be taken depending on the situation, such as intro-

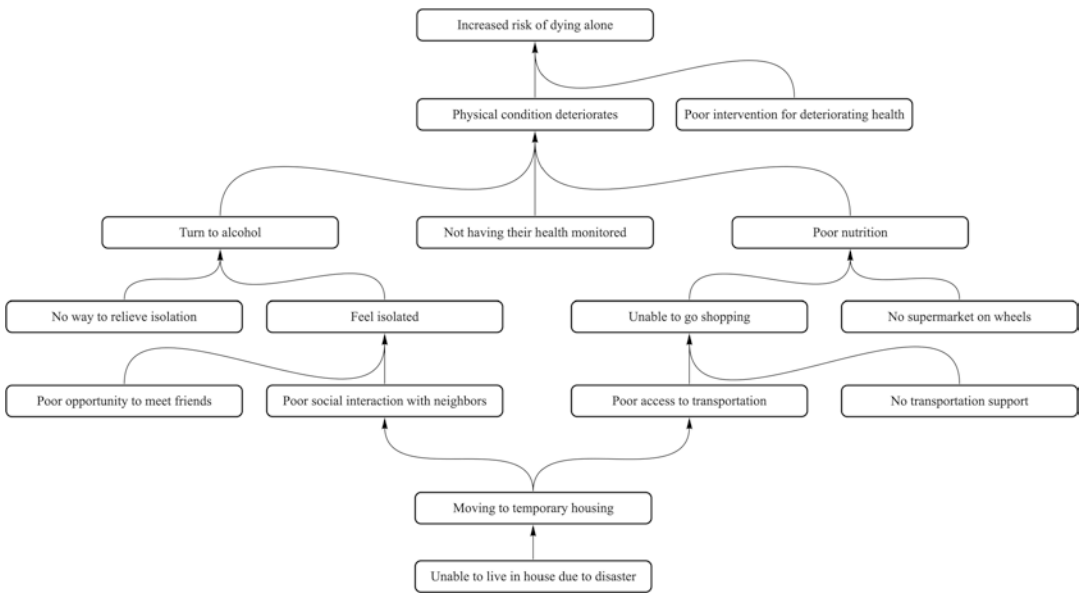

Fig. 23.1 The factor analysis diagram of dying alone in temporary housing

ducing supermarkets on wheels. In the risk-based approach, this way of thinking can also help plan solutions and make decisions on implementation. It is important to identify the factors that affect the individual risk. Some of these factors cannot be changed, and some can be changed through advance preparation and the use of social support. By structuring risk, we can understand the factors that make up the risk, so that we can respond to them.

23.7 Summary

In this chapter, we outlined risk and uncertainty, which are the keys to decision-making during disasters. We introduced the risk-based approach, which is necessary for future disaster response. In addition, we explained the necessity of information flow management and factor analysis to realize the risk-based approach. Uncertainty is an inherent part of decision-making. More precisely, uncertainty is the reason why decision-making is necessary. In order to make better decisions, we need appropriate information. However, in a VUCA situation such as a disaster, the data representing the current situation changes as time progresses, and numerous risks intertwine in a complex manner and stand in the way of decision-making. In order to consider human-centered disaster prevention, we must leave behind the old approach of preparing responses based on events such as what to do in the event of an earthquake, or a Tsunami, or the eruption of a volcano and move to a risk-based approach which considers what the disaster's impact will be to the affected peoples' lives. In turn, in order to respond to disasters with a risk-based approach, it is necessary for individuals and communities to be able to assess their own risks in normal times and to have timely information available to assess risks in the event of a disaster. Information flow management and factor analysis are the basis of risk assessment. We need to continually develop and disseminate methods for assessing risks in advance of a disaster.

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24 Personal Life Records (PLR) for Health Decision-Making in Disaster Situations

Sachiko Ohta, Tadashi Okamoto, Naonori Kato, and Sakiko Kanbara

24.1 Introduction

Survivors may experience diverse changes in their health status during a disaster, and their health, medical, and welfare care needs (hereinafter collectively referred to as "health care needs") change depending on the "time phase" after the disaster. How quickly survivors can return to their original lives depends on the extent to which appropriate actions can be provided in a timely fashion (e.g., data management) in response to their changing health care needs after the disaster. Appropriate actions may be self-help, support from local residents, or support from various teams (mutual assistance, public assistance), but there is an active movement to anticipate changes in support due to disasters and adopt action plans in advance. On the other hand, there is reportedly a gap between the current state of preventive preparedness and actions for long-term resilience after disasters, and further efforts are needed to bridge the gap between predictive and actual behaviors, taking into account the impact of both acute and long-term disasters (Gowan et al. 2015).

As mentioned in the previous chapter, it is important that teams engage in both information sharing and collaboration that contribute to the decision-making of service providers so that the teams that provide health, medical, and care services can quickly understand the needs of disaster survivors and take appropriate actions. Both the sharing of information from non-disaster times and information related to real-time, accurate health care needs after a disaster play an important role in decision-making for supporters and ultimately enhance the resilience of disaster survivors until they return to a safe and secure life.

In general, various organizations have been involved in people's health, medical, and welfare services in non-disaster times. It is not uncommon for patients to receive treatment at more than one medical institution within the same time period, and the data for such patients are not linked, while drugs prescribed at other medical institutions cannot be recognized as concomitant drugs by the system in the institution. In addition, the patient's hospitalization or death at another medical institution cannot be confirmed in detail from the data on his/her own institution. Basic patient's information and profile data may also

S. Ohta (✉)
Department of Medical Business Pharmaceutical Science, Nihon Pharmaceutical University, Tokyo, Japan
e-mail: s-ohta@nichiyaku.ac.jp

T. Okamoto
Ginza Partners Law Office, Tokyo, Japan

N. Kato
KDDI Research, Inc., Tokyo, Japan

S. Kanbara
University of Kochi, Kochi, Japan

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vary greatly depending on the hospital's information system, and it is becoming more and more difficult to standardize the data in a diversified society. As for the content of the prescriptions, in one 1993 case, 15 patients in Japan have prescribed the concomitant use of antivirals and anticancer drugs from separate hospitals, triggering death cases. The "prescription record handbook," which allows patients themselves to record drugs that were prescribed to them, was introduced in the wake of the incident. Although some prescription record handbooks have been digitized, cooperation has only been achieved between the prescribing pharmacy and the patient, and their use is still limited. It is expected that these problems will be solved in the future by introducing unique IDs and using those IDs to integrate patient data that exist in different systems.

In non-disaster times, medical professionals create a template from the necessary data and accumulate the medical information as structured data. In the event of a disaster, the supporter observes the survivor and then selects and inputs information. If the survivors themselves can practice self-care and accumulate data that are important to them, they can obtain more detailed and timely data for themselves. Aside from prior action plans and health care needs in non-disaster times, and in addition to blood pressure, pulse, smoking history, and alcohol consumption required for personal management, the data should ideally include various needs that are difficult to structure and objectify, as well as records of people's life reconstruction, as perceived by the survivors themselves due to the changing environment and their health status after the disaster.

Data are naturally important for receiving individual support from the survivors themselves, but effective use of individually recorded data, such as text mining, to capture the circumstances of the individual and to determine the support needed or to grade them for assistance in a disaster situation, can provide more effective disaster response. Further risk assessments by gender and region, as well as creating alerts for those situations that threaten the security of high-risk people, could reduce the temporal and geographic burden of rapid health crisis management and care practices within hospitals.

By applying the concept of interoperability to the system, which authorizes not only the supporters but also the disaster survivors themselves to input use data, redundancy in recording information can be reduced, and information processing can be performed more efficiently.

We believe that the seamless application of an interoperable system from non-disaster times to disaster situations is important, and we have proposed the use of a Personal Life Record (PLR) that records both objectively obtained data and data that are subjectively required by individuals. While objectively obtained data indicates health risks that are currently manifested, subjectively required data collected over time may represent potential health risks that are not always clearly recognized by the individual or the people around them. Understanding potential health risks by integrating subjectively required and objectively obtained data will enable health risk reduction and management through early warning and early response to health crises in the event of a disaster, as described in SDG 3.d. This chapter outlines future issues and directions regarding information for providing timely and appropriate support for health care needs during disasters, including attempts during the heavy rainfall in Western Japan in 2019.

24.2 Health Care and Welfare Needs Associated with Disasters

24.2.1 Disasters and Health Care Needs

From an epidemiological perspective, disaster health care needs are easy to understand when considered along the time axis. First, the health care needs that can occur immediately after a disaster concern the expiration of drugs and medical devices that were used during non-disaster times. Among them, it is necessary to take immediate measures to deal with drug needs such as

dialysis, insulin-dependent diabetes mellitus, and endocrine diseases in which the health status changes significantly due to discontinuation of oral medication.

Subsequent characteristic health disorders in the acute phase include injuries caused by trauma due to delayed escape; diseases caused by environmental peculiarities such as overnight stays in rescue centers or in cars; infectious diseases from a water, food, and hygiene perspective; blood clots due to immobility from the residential environment; heatstroke caused by cold and heat shock; etc. After the subacute phase, chronic diseases such as cardiovascular diseases, hypertension, respiratory infections, and gastric ulcers are aggravated due to stress and deterioration of the living environment, the so-called post-disaster-related diseases. Aoki et al. conducted a survey in Japan based on emergency personnel mobilization records after the Great East Japan Earthquake. It has been reported that heart failure, acute coronary syndrome, stroke, out-of-hospital cardiopulmonary arrest, etc. increase in the acute phase, and post-traumatic stress disorder (PTSD) and lifestyle-related diseases worsen in the chronic phase (Aoki and Shimokawa 2017). A post-hurricane prospective study in the United States reported that those who had lost their jobs, racial minorities, or persons with disabilities were more likely to seek access to health care institutions after a flood (Flores et al. 2020), indicating the necessity to focus attention on those in need of consideration.

Post-disaster-related diseases are also known to lead to disaster-related deaths, but to reduce preventable deaths, it is important to detect changes in health status as soon as possible not only during the acute phase but also continuously throughout the chronic phase and to initiate collaboration with medical and nursing teams in a timely and systematic manner.

24.2.2 Disasters and Welfare Needs

Health care and welfare needs are inseparable. If we take stroke as an example, in one case, a decline in physical function can persist due to cerebrovascular occlusion after the onset of the disease, making it necessary to live with hemiplegia, and welfare needs are required in parallel with medical needs. Japan is one of the world's leading super-aged societies, and welfare needs have steadily increased in non-disaster times as the entire population ages.

Responses to welfare needs are guaranteed by welfare policies in other countries as well. In Japan, the level of disability is categorized by the welfare system for persons with disabilities, the nursing care insurance system, and the mental health and welfare system, and welfare services are officially provided in accordance with this system. In recent years, the Ministry of Health, Labour and Welfare, which is responsible for the health and welfare bureau, has taken the initiative to promote the creation of a community-built "Regional Comprehensive Care System,"[1] in which all public and private sector actors involved in health, medical care, and welfare cooperate inclusively, centering on all those requiring support, so that the elderly can live their lives out with reassurance and safety at their homes in areas they are familiar with (MHLW 2017). Within the regional comprehensive care system, the effective use of informal care by private businesses to provide more detailed services and not only public services is urged, and this movement is gaining global momentum, not just in Japan (Plöthner et al. 2019).

It goes without saying that those who need welfare support at non-disaster times will continue to require it after a disaster in rescue centers, shelters, or areas other than rescue centers. The so-called informal care-level needs are also expected to increase due to changes in the living environment in places other than one's own home, such as increased need for shopping daily necessaries or needs for help with personal hygiene, etc. It is expected that the welfare needs

[1]The regional comprehensive care system is a system in which municipalities that are public insurers of the elderly can provide all services including housing, care prevention, life support, insurance, medical treatment, and nursing care, so that elderly people can continue to live their own lives until the end in the areas they have been inhabiting, based on regional condition proactively.

associated with health problems will increase if disaster-related health problems are added, while resources providing services in the event of disasters decrease in many cases, resulting in an imbalance between needs and demand. In the face of this imbalance, to accurately understand needs and implementation of effective support, it is necessary for the disaster survivors to disclose appropriate support information to the supporters, and the supporters need to respond accordingly by sharing roles to effectively use the resources.

24.3 Current Status and Challenges of Collecting Health Care Information in Rescue Centers

In order to understand the changing health care needs, support teams go to the affected areas and conduct health needs surveys and assessments mainly at rescue centers, leading to appropriate support. This support comes from dispatched teams from a variety of sectors, including the national government, local governments which are prefectures and municipalities to which the disaster-stricken areas belong, and private organizations, including NPOs. The members of the team also vary from administrative staff to professional groups and volunteers. Each support team collects data, keeping in mind the support they can provide and the handover of survivors to other teams according to their needs, but the main collection is investigated through print media, and repeated investigation of the same content is often conducted by each support team. According to a survey the authors conducted in 2020, among the data found in various questionnaires, duplicate data were found in a number of investigated items, including not only basic information on the survivors, such as names, addresses, and contact information, but also pharmaceuticals that must be continually taken orally, and physical conditions requiring support. Moreover, the details varied slightly among the support teams. For example, among the items asking about the current regular prescription, four options of the assessment questionnaire for survivors by the Ministry of Health, Labour and Welfare (MHLW) are antihypertensive drugs, diabetes mellitus, psychotropic drugs, and others, while in the health-counseling sheet for public health nurses, the presence or absence of regular medication and the content of the medication are freely stated, and the Japan Surveillance in Post Extreme Emergencies and Disasters (J-SPEED) listed seven items: antiplatelet drugs, anticoagulants, warfarin, diabetes treatment drugs (insulin/oral drugs), steroids, antiepileptic drugs, and others. The purpose of collecting these items is to clarify the necessity of emergency prescription while definitively grasping the prescription drug whose presence or absence from oral administration has a large effect on health status after the disaster, and investigation may have happened for the same purpose, but no unification has been attempted. From a medical and nursing perspective, this unification is appropriate, and since regular prescriptions before the disaster do not change after the disaster, if the support teams can coordinate with each other, there should be no need to collect duplicate data. Similar situations were observed in the degree of welfare-related disabilities and the degree of independence in daily life.

It is evident that the investigation of rescue centers is carried out mainly by each support team. The informing data collection flow is to recognize that a support team is needed and to investigate survivors who have been evacuated to shelters, collect data, conduct assessments, and provide support services. If a survivor is unable to speak out or evacuates outside a pre-specified shelter, he/she will be missed in the investigation of the support organization. Under the Disaster Countermeasures Basic Act, in order to mitigate disasters, it is recommended that in the event of a disaster, local governments define elderly persons, persons with disabilities, infants, pregnant women, and foreigners who need assistance in case of disaster as persons requiring consideration or persons requiring evacuation activities in advance and that they register information and formulate and share individual evacuation plans. It is stipulated that this information will be linked

to the support organization and will be used in the event of a disaster only with the prior consent of the person in question. However, in the first place, they will not be included in the list of persons requiring special consideration or persons requiring evacuation activities without their prior consent. In addition, it is often difficult to make effective use of paper registries, with the information occasionally not reaching the necessary supporters and provision of outreach to evacuees who have evacuated to shelters other than the designated ones sometimes being difficult. The idea that the disaster survivors themselves enter and manage data seems to be one solution.

Based on the above information, the issue of collecting information in rescue centers can be summarized with the following four points:

1. Although accurate data such as disease names and oral medications are already available at medical institutions in non-disaster time, the survey relies on memory in the shelter and lacks accuracy.
2. The survey is centered on supporters, and the survivors who need support cannot send out their own information, while some survivors may possibly be missed.
3. The purpose of the organization and use of the collected data are not defined as a whole, and it is difficult to conduct a comprehensive survey from the beginning.
4. Surveys are mainly conducted using print media, and there are no mechanisms for sharing and confirming collected data among various teams and for aggregating individual data for effective use.

24.4 Future Directions for Resolving Challenges

24.4.1 Use of Health Care and Nursing Care Data During Non-Disaster Times

The so-called health care needs during non-disaster times are often accumulated in the information system of medical institutions as a result of consultations or accumulated in the information system of care insurance facilities as a result of nursing care services. If each individual can manage their non-disaster time during health care and welfare needs, hands-on, accurate information may be provided to support teams during disasters.

In Estonia, which is famous for its state-of-the-art medical ICT, the e-government has built a blockchain foundation in the medical field. The health care information is linked to the ID number assigned to people through a secure mechanism, and medical information can be controlled by the patients themselves. In the event of a disaster, because medical data are aggregated and stored in the country into a single repository, the mechanism makes it possible to transmit individual peacetime electronic medical records, prescriptions, and medical images to the data provider (Mizushima 2019; Mano 2018).

In Japan, it is presently still difficult to obtain individual patient data for countrywide medical treatment and welfare services as in the case of Estonia. Some studies have made secondary use of statistical information from several existing national databases on health, medical, and nursing care and are simulating how the health care delivery system should respond to regional demand in the event of an anticipated disaster. Governments and municipalities have taken initiatives to use these results to strengthen the health care delivery system. The idea is to prepare for a disaster by grasping the quantity of medical staff and supplies that can respond to the increase in the demand for medical and care services. For example, Toida et al. predict the demand for pediatric emergency services in the event of an earthquake directly beneath the Tokyo metropolitan area and visualize health facilities that are burdened by the increase in demand using a hospital bed count index (Toida et al. 2019).

Data on the health, medical care, and welfare of individual survivors, rather than statistical data, is needed to fully understand the individual needs of all survivors. Accurate data that do not rely on memory lead to proper decision support for support teams. Japan's insurance claim

prescription data[2] represents accurate and useful data for understanding medical and nursing care services in non-disaster situations, and the government is working to realize a system to feedback these data to individuals as personal health record (PHR).[3] According to the data from the Ministry of Internal Affairs and Communications, in March 2021, the results of specific health checkups[4] and medical prescription data were linked to My Number,[5] which was issued as a unique national ID. Subsequently, the plan is for residents themselves to be able to check individual data on their smartphones as of late 2022 (Sasano 2021), after the revised Public Key Infrastructure Law for Individuals. The realization of the PHR will enable disaster survivors to provide accurate information on disease names, drug names, and drug dosages and administration that were frequently surveyed at rescue centers.

On the other hand, there are also challenges in using medical prescription data during disasters. In other words, the prescription information does not include an evaluation of the environment and living functions, which are considered important for understanding health care needs. ICF (International Classification of Functioning, Disability and Health) coding can be one tool to solve this problem. ICF is regarded as important in the WHO-FIC (Family of International Classification) along with ICD (International Statistical Classification of Diseases and Related Health Problems) related to diseases and injury names, and it evaluates subjects from three perspectives: mental and physical function at an individual's biological level, individual-level activities, and social-level participation. If the ICF code is known, the supporters can understand what kind of environment the survivors faced and the role they played or how much activity was possible. Supporters may be able to identify changes in activities that take into account the environment of disaster survivors through the changes in ICF codes and judge that they need substantial support. However, ICF is still underutilized due to coding difficulties. In addition, ICF does not cover everything related to the environment, and a different mechanism is necessary to collect data.

24.4.2 Data Required After a Disaster and the Usefulness of PLR

As the construction of PHR progresses from existing medical and nursing care data, individual survivors are expected to be able to use accurate information on medical and nursing care services during peacetime, but those are not the only data needed during a disaster. It is also necessary to change health information in response to the disaster and to change activities in response to environmental changes, as in the concept of the ICF code. To begin with, it is also important to avoid risks such that individuals, families, and communities will not need medical care and to respond to health care needs, including a hygienic environment. In addition, data related to life reconstruction are also needed to regain one's own physical, mental, and social health as defined by the WHO. Among the data actually investigated in the rescue centers, the collapse situation of residences was also included.

From a lawyer's perspective, Okamoto summarized about 40,000 free consultation cases in areas that were heavily damaged by the Great East Japan Earthquake and reported many cases related to inheritance, disaster-related legislation (support system), housing loans, real estate leases, and insurance (Okamoto 2018). In the past, it was believed that legal needs had not been fully understood in rescue centers, but if legal

[2]This is an electronic version of what medical institutions and nursing care facilities charge insurers. The content includes disease names, claims items, claims dates, number of claims, billing costs, etc. and is stored in the database in the same format. For prescriptions, the prescription name, dosage, and administration can be checked.

[3]PHR is defined as medical and welfare care or care-related information that can be viewed and managed by individuals.

[4]In Japan, it is mandatory by law for people aged 40–75 to undergo lifestyle-related health examinations as specific health checkups.

[5]My Number™ is the so-called individual number system in Japan that started in 2015 with the aim of streamlining administration, improving public convenience, and realizing a fair and just society.

needs could be picked up early among various personal records, the anxiety of the survivors could be further reduced, and the time required to rebuild their lives could be expected to be shortened.

Medical and nursing care data at non-disaster times, data related to the changing health care needs after a disaster, environmental data, and care needs aimed at rebuilding life are comprehensively needed to ensure that the survivors thoroughly understand their situation, provide independent and cooperative care, and communicate their health care needs and problems to the necessary teams when needed. Collectively, these are defined as a Personal Life Record (PLR). The overall view of PLR is shown in Fig. 24.1.

During the devastating flood in Western Japan in the summer of 2018, Kanbara et al. examined the use of PLR and data portability to convey care needs aiming for health management and life reconstruction that exhibits self-help functions (Kanbara et al. 2019). Given Japan's handbook culture (e.g., the *Maternal and Child Health Handbook*), they have created an A4-sized PLR self-care handbook named *Ima Kara Techo* (*Handbook from Now*). For the basic information page, in addition to name, affiliation, blood type, etc., the following information was made visible: "needs that must be considered" such as chronic diseases and allergies; "living essentials" such as contact lenses, medicines, and children's clothing; and "living support needs," immediately after a disaster. Detailed problems can also be written like in a diary, so that changes can be recorded before clarifying whether or not they need to be communicated to the support team.

Data recorded in the handbook from now on will be completely under the control of the individual, since they record their own changes after the disaster, as necessary. If a support team's help is required even if independent prevention is attempted during the process, data over time can be provided according to one's own will, and the support team can grasp the needs more precisely. Furthermore, vulnerable individuals can visualize their needs in a bottom-up fashion, enabling fair decision-making that is not overlooked by support teams.

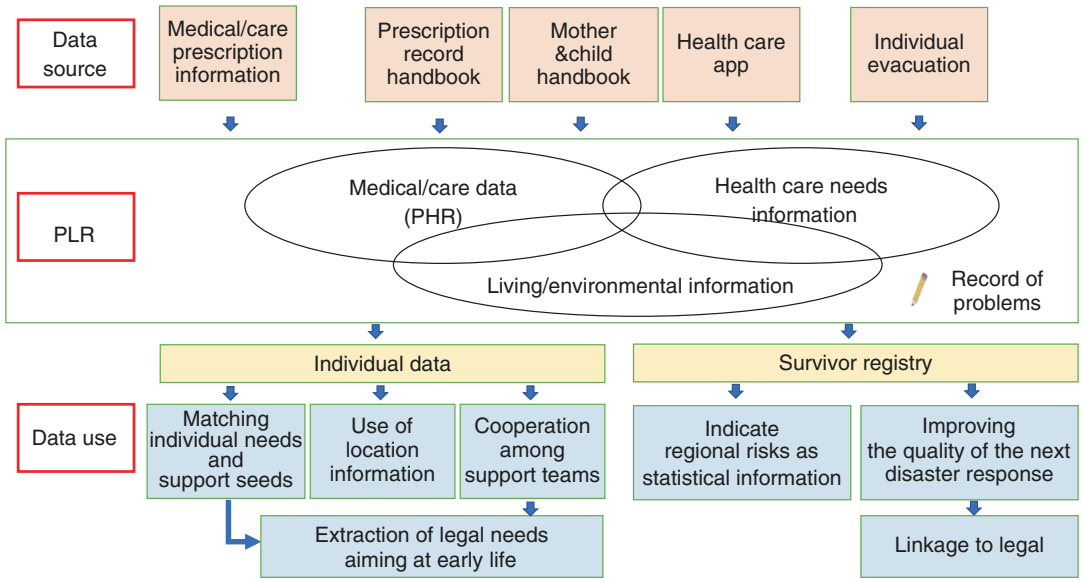

Fig. 24.1 Overview of PLR and ICT use. Medical and nursing care data refer to patients' health insurance information, degree of care required, the name of the procedures or surgeries the patients underwent, and prescription data such as name, dosage, and duration of prescription medicine, already accumulated in PHR. Health and nursing care needs information includes health and care needs information required by individuals but that are not included in PHR, and living/environmental information includes environmental information necessary for the entire life reconstruction and records of problems whose category is unknown

24.4.3 Effective Data Collection and Use Through ICT

24.4.3.1 Multidisciplinary Data Linkage

ICT is best at streamlining data collection operations and ensuring cooperation between the survivors themselves and the support teams. Care needs are not necessarily completed by services provided by a single support team alone. Though support teams in charge of medical treatment and nursing care may differ, electronically linking the changes in daily life activities generated by medical treatments leads to the provision of nursing care services without time lags.

The timing of data collection and the survey can be summarized as shown in Table 24.1. Although collection by PLR is useful for most of the individual data, items that are difficult to collect with PLR can be collected according to this framework, and work efficiency can be improved through team coordination.

24.4.3.2 PLR Digitization and Data Linkage

The *Ima Kara Techo* that gives expression to PLR is also being developed for digitization. The merit of digitization is that the data entered by individuals can be used in a variety of situations.

Data linkage to support teams eliminates the need for repeated investigation of basic matters for each support team, and the support teams can concentrate on the missing information and listen efficiently, enabling support without delay. The challenge is which data to disclose to which support team. Technically, it is possible for the survivors themselves to restrict access, but they themselves need to understand the advantages and disadvantages of restricting or not restricting access.

Some benefits arise from simpler data aggregation. In rescue centers, aside from individual health care, needs such as regular meals and hygiene supplies also arise. Since these needs may be obtained as a result of individual aggregation, data aggregation that is automated by ICT

Table 24.1 Data collection timing and survey target

	Collect in advance	Collect at the shelter immediately after	Situation change update
Individual (Mostly from PLR)	Underlying disease Daily life support needed Information requiring consideration	Information on health and living needs	Information on health and living needs
Household	Household member Street address	Collapse information Contact address	
Rescue centers	–	Living environment in the shelter Total number of residents' request	Total number of residents' requests

Effective collection

However, to implement data collection and enable data use in this framework, data digitization and data linkage are indispensable

would allow for the investigation procedure for the entire rescue center to be omitted.

ICT is useful not only for data digitization and collaboration but also for decision-making support. On the basis of the gender, medical treatment, nursing care, and health management information entered, it is possible to create a mechanism that displays an alert that some kind of support is needed and a list of support seeds according to care needs. Survivors and support teams can identify the need for support through alerts before they become aware of it.

In order to display alerts and the support seed list, data definitions are required to match the care needs indicated by the data with the support seeds. Alternatively, there may be a way to achieve this with the use of AI (artificial intelligence).

24.4.3.3 Construction of a Disaster Survivor Registry and Preparing for the Next Disaster

The ultimate objective of obtaining data on health care needs is to improve outcomes such as preventing deaths that are preventable and preserving living functions by allowing the collected data to lead to subsequent decision-making for care, including self-help and assisted help. The impact on outcomes needs to be verified. To improve the quality of care, it is also crucial to develop and monitor indicators for improving outcomes and to run PDSA (Plan-Do-Study-Act) cycles that review the support content for each disaster. Survivor registries play an important role in improving outcomes and monitoring indicators.

In the event of a disaster, EMIS (Emergency Medical Information System) operates as an information source on medical institutions, while J-SPEED operates as a source of patient information, and various data are entered in each different system. In the case of EMIS, the damage status and operating conditions of medical institutions during disasters, such as information on staff who can operate and information on whether or not patients can be accepted, are available, and in the case of J-SPEED, standardized medical records are established, and unified patient data are recorded. These data are also considered useful for post-disaster verification, and their integration with PLR will further improve their usefulness.

The aforementioned Okamoto issued recommendations for various measures, including the establishment of the "Guideline for Private Arrangement of Individual Debtors," which is a system that allows the exemption of loans for disaster survivors while avoiding the disadvantages of bankruptcy, using the results of a review of the legal needs. PLR registry data should also be provided to researchers as open data and actively used in research to further improve disaster response.

24.4.3.4 Benefits of PLR Portability

Evacuees do not always evacuate to predetermined rescue centers. The 2020 COVID-19 pandemic has also led to the recommendation that the three Cs be avoided through dispersed evacuation: closed spaces, crowds, and close contact in rescue centers in evacuation during complex disasters, such as infectious diseases and floods. Dispersed evacuation may include home evacuation, evacuation to acquaintances' houses, or staying in a car. A small number of survivors may be dispersed and found in the vicinity of the disaster area. It is difficult for support teams to visit scattered evacuation sites to collect data, and support may be delayed if survivors with health care needs are outside the evacuation centers.

"Data portability" indicates that the disaster survivors themselves can carry the collected and accumulated data and reuse them in other services. Data portability also makes it possible to acquire the location information of disaster survivors. Visualizing the current location of the disaster survivors by GIS will lead to understanding the needs of the survivors who are scattered about, fostering timely and appropriate support for the needs of all survivors.

24.5 Remaining Challenges of Data Linkage

Although PLR, which becomes useful in the event of a disaster, has been explained, various data that can be effectively used as PLR after a disaster also exist, including medical prescription information and nursing care prescription information; timelines, which are disaster prevention action plans, considered by residents as disaster reduction measures; individual disaster plans; mother and child handbook and prescription record handbook; and health-related apps that are usually used. However, they vary from one entity to another, with or without institutional support, and are challenged by difficulties in data linkage.

On the basis of the Sendai Disaster Prevention Framework's person-centered disaster prevention and concept of not leaving anyone behind, data linkage between different systems is indispensable, and a high-level mechanism that allows this information to be linked during disasters is necessary. In March 2021, EpiNurse, in collaboration with the Next-Generation Fundamental Policy Research Institute (NFI), made five recommendations for sharing information in the event of a disaster: (1) comprehensive and complete information management based on a single ID, (2) active use of personal information, (3) thorough identity verification and effective grasp of contact information, (4) prompt information sharing and handling, and (5) consideration of necessary and sufficient safety management measures (Morita and Kato 2021). Implementing these will lead to organic coordination of information, leading in turn to meaningful use in the event of a disaster.

24.6 Handling of Personal Information in Case of Disaster

The handling of personal information is a serious issue when survivors themselves use their individual data or use them in cooperation with supporters (Kato 2019). If we take the list of persons requiring support in times of disaster as an example, due to the revision of the Disaster Countermeasures Basic Act in 2013, a list of persons requiring support in times of disaster has been created, and emergency contact information has been submitted based on individual disaster plans, while information coordination is progressing. Article 49–11, Paragraph 3, of the Disaster Countermeasures Basic Act stipulates that in the event of a disaster, information on the evacuation list may be provided without the consent of the person when it is deemed particularly necessary to protect the lives or bodies of persons requiring evacuation from disasters. However, the issue is that it is difficult to provide evacuation support without obtaining prior consent (Sub-Working Group 2020 on the Evacuation of the Elderly, etc., based on Typhoon No. 19 of the 2019 Cabinet Office) for actual operations during disasters, for reasons such as difficulties in determining the specific time of application as to "when it is considered particularly necessary." In fact, since registration is based on consent, the proportion of registered persons requiring special consideration varies depending on the region.

Information coordination in the event of a disaster requires that necessary information be delivered to the person for self-help; for mutual assistance, information sharing is necessary among the entities concerned. Legal systems, including the Personal Information Protection Law (PIPL), include necessary measures such as exemption provisions. However, if we look at the legal system such as the PIPL, there are necessary measures such as exemption clauses, but situations such as (1) many mechanisms that require prior consent as a principle, (2) differences in the scope of measures required for various legal systems (national laws and local ordinances), and (3) difficulties in implementing measures such as proof of concept (PoC) due to regulatory considerations end up in a bottleneck. Under Japan's personal information protection system, private companies are subject to the PIPL, and the government's administrative organs apply the PIPL, while local governments protect personal information under the ordinance

of each municipality. Some of these institutions and teams have provisions that prohibit the online binding of information with medical institutions such as hospitals. Both which rules should be referred to during mutual assistance and the degree of information sharing that is possible depending on the referenced rules.

In the case of PLR, data protection is even more important because it includes living conditions, which are private, in addition to the medical information, which requires security as sensitive information. Many survivors will want to be supported for their problems, but depending on the content, they may not want their problems disclosed, or the informant may want to disclose it only to persons they trust. It is important to anticipate what kind of use will be made during non-disaster times so that the survivors themselves can control the initiative of access authority.

24.7 Summary

This paper summarizes the usefulness of PLR as a mechanism to appropriately deliver the necessary care needs of the survivors, no matter how small their number, without missing out on any details to the supporters. Data to be registered in PLR should include extensive data on daily life and the environment with an outlook toward maintaining health and rebuilding life, including objective data that exist in medical institutions and nursing care institutions during non-disaster times, and post-disaster health and care need data. Although issues remain around the mechanism for automatically linking and importing data from external systems into PLR, the implementation of data portability should definitely improve the resilience of disaster survivors. In the future, it will be important to develop a comprehensive mechanism that focuses on who and how PLR data are used to support decision-making, including the establishment of a registry to verify that the data needed were properly acquired and, most importantly, that will contribute to improving the outcomes of the survivors.

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Management of Health- and Disaster-Related Data

25

Maria Regina Estuar, Shoko Miyagawa, Christian Pulmano, John Noel Victorino, Sachiko Ohta, Hiroyuki Miyazaki, and Sakiko Kanbara

25.1 Introduction

Disasters and extreme emergencies bring about uncertainty, especially when the public is trying to make sense of the situation and how it has affected their lives. Timely, accurate, and appropriate information reduces stress and anxiety and aids in making the public navigate during and post-disaster situations. Dissemination of public information through traditional methods such as television and radio can be amplified by using more modern technologies such as online news, social media, and web and mobile information applications, which are widely used by the public. However, information to be meaningful requires understanding its components, how they are collected and how they are stored. This section describes different aspects of data related to information systems.

The case study of the end of the chapter seek to provide an open framework using application programming interface for integration with other information technologies. Experimental trials used prototypes for data collection, simulations, and simulated response drills. To put into practice, nurses and community people need to be IT literate through formal education and exercises step-by-step. Once trained, local nurses and community people can arrange the community resources that would allow smooth cooperation among stakeholders of health security. Therefore, we would always call for the transdisciplinary collaboration with various types of researchers who initiate about gender (SDG 5), education (SDG 4), and emerging technology (SDG 9) in resilient society (SDG 11) forward to inclusive SDG development.

25.2 Definition of Data from a Database Systems Perspective

Data is a source of information, such as a set of numbers and strings, used for inputs to some analytical process, such as statistical and machine learning algorithms. A single "data" rarely could contribute to the information. Instead, we should prepare several numbers of "data" for generating information. For example, data showing "City A

M. R. Estuar (✉) · C. Pulmano · J. N. Victorino
Ateneo de Manila University,
Quezon City, Metro Manila, Philippines
e-mail: restuar@ateneo.edu

S. Miyagawa
Keio University, Fujisawashi, Kanagawa, Japan

S. Ohta
Nihon Pharmaceutical University, Saitama, Japan

H. Miyazaki
University of Tokyo, Tokyo, Japan

S. Kanbara
University of Kochi, Kochi, Japan

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has 50,000 of the population" is not sufficient for useful information for decision-making in disasters. We cannot know how many people are severely or slightly affected from that data, so we cannot determine the accurate amount of humanitarian aid. Also, it sometimes misleads decision-making for politicians not aware of "City B neighboring City A has 200,000 of the population," which likely has more severe damages than City A. Some experts mean data by "dataset," especially in fields of data engineering, to discriminate data with a number or a string from a dataset with a set of data. However, we call a set of data as well "data" in this chapter.

A database is a set of data with keys to the link between data. As discussed in prior, several numbers of data are required for proper decision-making on disaster responses and planning. However, just a collection of data is not sufficient for information. The data have to be linked among themes. In our previous example of City A, even if we have several numbers of data on damages as well as population, a list of damages is not still useful for identifying whether damages in City A is severe or slight. The data becomes a useful source for information when the numbers are with names of cities linking the data over themes. Besides, the spatial relations, such as "Community C is within City A," are also considerable keys even if the datasets cannot have common keys with exact matching like city names.

The importance of a database is also discussed in the context of personal health records in Chap. 24, so it is encouraged to review the chapter for a more solid understanding of aspects of needs, requirements, and supporting technologies.

25.3 Data Management

The database requires continuous maintenance and updates to capture daily changes in the real world. Along with the scope scaling, more changes need to be captured to keep the databases updated. Database management systems (DBMSs) help keep transactions, such as inserting and editing data, in inconsistencies. Manual transaction process is still durable in a small-scale database with transactions less than 100 per day but not able to perform transactions properly in disaster situations with thousands of transactions per day.

Another notable function of DBMS is linking data by keys, typically implemented as "JOIN" by structured query language (SQL) on relational database management systems (RDBMSs). The function helps integrate data acquired from various sources by keys set commonly among the data. Because the function depends on data structure with keys commonly shared among datasets, designing DBMS needs to be inclusive of fields to link datasets.

The third benefit of DBMS is with many frameworks to visualize data for end users, specifically web-based frameworks. In the fields of disaster nursing, the end-user interfaces need to be configured for each of various levels—from nonexperts to professionals. The ready-to-use frameworks benefit rapid cycles of interface development satisfying the various levels from the users.

While DBMSs have a wide range of scalability and configure ability, it requires finely tuned scope for system development; otherwise, it will be with a lot of costs to support. We will discuss the details on designing systems in Chap. 24.

25.4 Data Standards

Good decision-making needs precise information, and precise information requires accurate data. Therefore, accurate data is important for decision-making as people in the data science field say "garbage in, garbage out." However, it is impossible to achieve 100% accuracy in practice, so we have to allow a certain level of potential errors in data. Data standards are agreements about data quality among technical communities for practical applications.

Another consideration of data standards is formats and protocols. As long as data is managed, processed, and visualized in computer-aided ways, formats and protocols among datasets shall be identically the same because computers can-

not flexibly understand how to read and process the datasets. Data standards are also agreements about the formats and protocols among technical communities.

Several communities have established standards. International Standardization Organization (ISO), the most formal body for standardization, has a technical committee on geographic information/Geomatics (ISO/TC 211),[1] covering all components of geographic information, not only data quality. Open Geospatial Consortium (OGC) is another community to develop standards for geospatial data. OGC is less informal than ISO, so the standardization process is faster to include recent technology trends while the OGC's standards are with more specified focuses.

In contexts of health informatics, ISO/TC 215 Health informatics established a standard ISO 18104:2014 "Health informatics—Categorical structures for representation of nursing diagnoses and nursing actions in terminological systems," supporting interoperability in the exchange of meaningful information between information systems in respect of nursing diagnoses and nursing actions.[2]

Referring standards is an essential step to designing databases owing to experiences and knowledge embedded in the standards. Databases with support of standards will be solid and extensible from pilot operations to future developments.

25.5 Data Storage

There are many ways of storing data. The most primitive one is paper-based storage. Papers are not efficient in the searching process and storage spaces, but those are sure to work even without electricity, the probable situations in disasters. However, digital devices nowadays take indispensable roles in saving more people's lives after disasters. Therefore, knowledge of the technologies will help improve efficiency in disaster nursing operations.

A spreadsheet is the simplest method of storing data in digital form. It is also the most widely used method of storing data in preparation for analysis and reports. Microsoft Excel is a popular software to manage data on spreadsheets. However, it has limitations in collaborations especially if groups who are working together are using offline versions. The online versions of spreadsheets such as Google Sheets are preferred especially if the data is constantly updated and by different persons. In many cases, spreadsheets are sufficient means of storing and analyzing data. Spreadsheets come with analytics packages that are usually used in. Although cloud addresses real-time update, this kind of storage requires further verification of data because there are no restrictions and no validity checks when data is updated.

Databases are usually set up when storing data is done through an information system. The person storing or retrieving the information does not usually deal directly with the database but can add, edit, delete, and perform other functions such as query from the list of functions that is provided to the user via a menu. Databases are a more secure way of storing data because by design, it has built in security features from the database management system that houses the data. Database management systems allow users to view the data as a whole or in parts depending on the fields or variables selected by the user. Some database management software allow users to produce and view reports or charts producing meaningful information out of a set of variables.

When multiple databases coming from different information systems are required to be processed to produce information, there might be a need to set up a data warehouse so that interoperability between and among the systems is easily managed. The interoperability part, how one system communicates with another system to share information, is done via application programming interface or what is commonly called as APIs. When database APIs are set up, an information system can exchange data with other systems. The data warehouse also provides a reason for standardizing data across the different systems. Processing data in a data warehouse is done

[1] https://www.iso.org/committee/54904.html

[2] https://www.iso.org/standard/59431.html

through the extract, transform, and load process. These processes are made by writing small scripts of code that produces a subset of the data warehouse, commonly referred to as a data mart which usually contains a set of variables or fields that pertain to a particular domain. For example, if the data warehouse contains data coming from different disaster management information systems, a set of fields can be grouped together to represent health (health data mart), and another set of fields can be produced for shelter (shelter data mart).

In order to utilize large-scale data, it is a major challenge not only to handle large amounts of data mechanically but also to evaluate the population and reliability of the data. With the advent of big data, the idea of storage also evolved including nonrelational databases for easier storage and processing of information. Several datasets are used for analytics and modeling. Most common datasets used in disaster management are health data, disaster data, shelter data, population data, and geospatial data, to name a few. Many of the data sets used in disaster management are not collected for human security purposes, so they often do not consider what the data means to humans and tend to miss the digital divide and people at high risk. Simply having a huge amount of data is an undeveloped collection of data, and in order to make better use of it, we need to understand and visualize where the sources of real-world data are located. In general, the larger the scope and volume of data to be analyzed, the more difficult it becomes to reasonably assess the quality of individual data. In addition to the technical aspects of information processing, it is also necessary to consider the protection of personal information and the creation of rules for secondary use of data. In addition, in developing countries like the Philippines, where there are still areas that require great improvement in Internet infrastructure, ICT solutions must be multi-platform, capable of continuously providing information both online and offline.

25.6 Making Sense of Data from Experiences

Beginning 2015, there has been an increasing number of individual baseline and research data that can be used as indicators for the new global agenda proposed by the SDGs and the Sendai Framework for Disaster Reduction. In the same momentum, databases and disaster risk reduction models have been developed across meteorological, geological, civil, social, health, and other fields. The potential for natural science and technology-based countermeasures is also increasing. Advances in information and communication technology (ICT), such as the construction of information sharing and utilization systems based on big data, have made it possible to build people's knowledge systems. Activities with new technologies, the types and means of disaster information available in the medium and long term, and in real time before and after disasters, have increased significantly. It seems that it is becoming necessary to organize useful information from miscellaneous and excessive information, rather than lack of information. In addition, in the field of EBPM (evidence-based policy making), it is recommended that local data be efficiently collected, analyzed, and processed, rather than measured empirically, so that both information providers and consumers can autonomously obtain information and receive appropriate government services.

This section provides examples of how data was transformed into meaningful information based on the design, development, and implementation of disaster information management systems.

Each platform was designed and developed at various events and stages in health risk management. As such, not all case analyses are indicative of the actual impact on the target community. However, it is expected to provide insights into technologies relevant to human security, specific to health and well-being, during health emergencies at the community level. Each project promotes a community-driven, preventive, and

sustainable response by addressing the various insecurities faced by the target communities. Through a local culture of prevention and empowerment, the projects help to further strengthen the community's capacity for prevention and coping, thereby improving long-term growth and sustainable development.

25.6.1 Project eBayanihan and SHEREPO: Participatory and Crowdsourcing

Since the Great East Japan Earthquake, there has been a problem of inadequate humanitarian information during the long evacuation period after the disaster. Government and NPOs encountered a great deal of difficulty in discerning basic information relevant to the lives of many, such as the location and sanitation of evacuation facilities and the in-demand relief materials at the time of large-scale disaster. The difficulty in access to relevant information to save lives is common across humanitarian groups. This section describes the nature of two independent disaster management systems and how it was redesigned to be used as one system.

25.6.1.1 The Story of eBayanihan

Using the 2009 Typhoon Ondoy (international name: Ketsana) experience as an inspiration on how several Filipino communities were able to develop several data collection systems to assist government, local units, and NGOs in disaster response, in 2013, Project eBayanihan was designed as a participatory and crowdsourcing web- and mobile-based platform that collects, analyzes, and visualizes pre-, during, and post-disaster information from stakeholders. Going through several iterations of design based on data gathered from disaster response teams in selected local government units in the country, the current system is composed of three main parts, namely, eHANDA (Fig. 25.1) which allows communities and groups to upload information that is needed during disaster, eBayanihan (Fig. 25.2) which allows for posting of incident reports and requests for assistance that are reported by actual victims or collected by information volunteers, and eULAT (to report) which produces reports on initial assessment and summaries. For the first year, the platform was developed and further refined to accommodate seamless entry of data and analysis of datasets that produce relevant information to aid in response, rescue, and recovery.

25.6.1.2 The Story of SHEREPO (Shelter Reporting)

In Japan, the promotion of open data has been in full swing since 2012. Disaster prevention information is considered to be the most suitable genre for data release, and open data related to disaster prevention attracted worldwide attention, and various open data were promoted, including the Ideathon/Hackathon.

In order to carry out activities aimed at saving lives and mitigating disasters quickly and accurately, it is necessary to set up a task force or

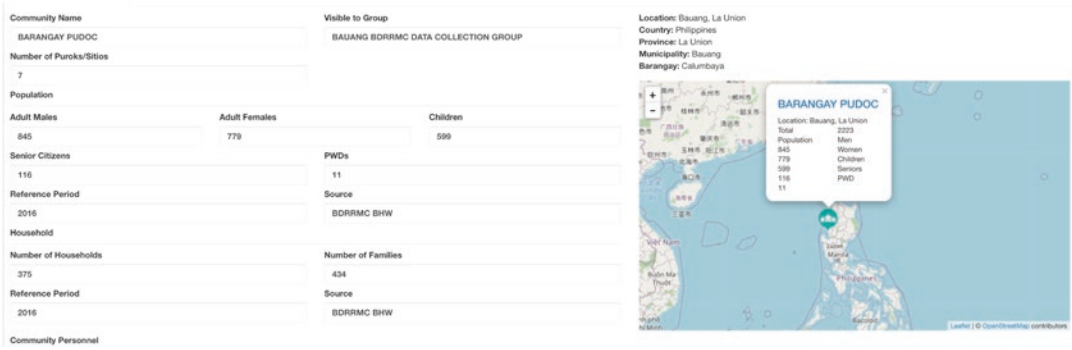

Fig. 25.1 eHANDA tool in eBayanihan

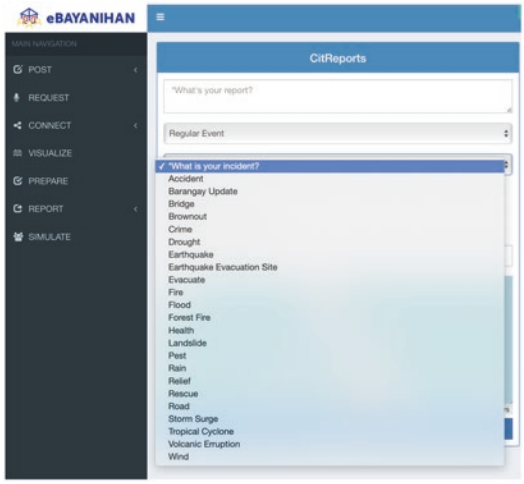

Fig. 25.2 Citizen report tool in eBayanihan

activity headquarters at city hall. Since the Great East Japan Earthquake, there has been a problem of insufficient information on disaster life during the long evacuation period after a disaster.

The issues raised were (1) the uselessness of pre-disaster information due to displacement, (2) uncertainty of IT infrastructure, (3) inability to confirm the accessibility of information and data, (4) inability to visualize welfare and residents' insights, (5) simultaneous display of information with time differences, (6) discrimination of information duplication, (7) ensuring reliability and validity, (8) setting crosscut points for reporting information, (9) the more vulnerable situations and people are overlooked, and (10) not reporting when improvements are made. While recognizing these things, it was found to be important to generate information that can be used for decision-making and subsequent analysis of responses and instructions (Kanbara 2015).

Many national governments may not have the capacity to analyze and use data, even if they have the means to collect them. Development actors and the private sector have the capacity, but the true dividends of interoperable, convergent data and analytics are missed. There is often a disconnection between "knowing" something, making it "available and accessible," and "applying" what is known. It is critical that momentum is not lost and that coordinated, integrated global and national efforts strengthening data generation, statistical capacity, and reporting continue.

From the perspective of disaster risk management, the Sendai Framework for Disaster Risk Management issued in 2015 states that disaster risk management policies and practices should promote real-time access to reliable data; the use of space-based and ground-based information, including geographic information systems (GIS); and the use of innovative information and communication technologies to enhance the collection, analysis, and delivery of measurement tools and data.

To realize this, at the World Bank-sponsored Disaster Prevention Hackathon held in 2014, a prototype of SHEREPO (Fig. 25.3) was built. SHEREPO (Shelter Reporting) is an evacuation center information application that intuitively and quickly extracts evacuation center information indicators (water, food, living environment, and health hazards) and immediately visualizes the information on OpenstreetMap.

Evacuation managers can update the information in real time providing quick assessment on the current status of food, water, clothing and nonfood items, sanitation, medication, and safety in each area.

25.6.1.3 Connecting SHEREPO with eBayanihan

Through the Philippine Council for Industry, Energy and Emerging Technology Research and Development (PCIEERD), Department of Science and Technology (DOST), and Japan Science and Technology (JST), the shelter reporting application, SHEREPO, was included in the eBayanihan platform.

Figure 25.4 shows the initial version of SHEREPO in eBayanihan. Following its original design, the system allows users to add additional shelter details including number of evacuees and address of the evacuation site. Additional information on electricity and communication status were added as part of the security indicators.

Figure 25.5 shows the current version of SHEREPO in eBayanihan. As part of preparedness, shelter information including name, loca-

Fig. 25.3 Initial version of interface of SHEREPO (2013)

tion, manager, and type as well as its capacity and current state of resources are already uploaded in the platform.

As part of evacuation management, SHEREPO can easily be updated to adjust and report current capacity and state of resources. The system also allows the addition of new shelters whenever necessary. A simple visualization is also provided showing the availability of each security indicator at a quick glance.

The eBayanihan-SHEREPO platform was repeatedly demonstrated in Japan and the Philippines to explore the issues and solutions. The pioneer in the implementation of eBayanihan-SHEREPO was the municipality of Bauang in La Union, Philippines. With the approval of the mayor, the city's disaster risk reduction management team embraced the use of eBayanihan as its primary ICT tool for disaster reporting. The municipality also uses the SHEREPO feature for community profiling. eBayanihan-SHEREPO has been implemented in the municipalities of Vigan, Paoay, Santa (Northern), and Tacloban in Leyte, San Francisco in Cebu, and Cagayan de Oro in Mindanao. Currently, eBayanihan-SHEREPO is managed by Ateneo de Manila University. A commercial version, tugon.ph (*tugon* in English means response), is used by several NGOs to monitor gender-based violence in emergencies.

25.6.2 EpiNurse Project in Nepal: Community Engagement on Health Information

The eBayanihan-SHEREPO experience provided insights on the need to establish a health information network in communities so that there is baseline information on health assessment during disasters. Just the SDGs and the Sendai Framework for Disaster Risk Reduction were proposed in 2015, a big earthquake occurred in Nepal. A prototype of the SHINE OS+ electronic medical record platform, already deployed in selected rural health facilities in the Philippines, was developed for use by field nurses in Nepal. At that time, the current surveillance plug-in available in SHINE OS+ includes surveillance on typhoid, measles, and dengue. A version was developed based on the proposed integrated model for health monitoring (Fig. 25.6).

The model utilizes ICT as the tool that connects information exchange among individuals,

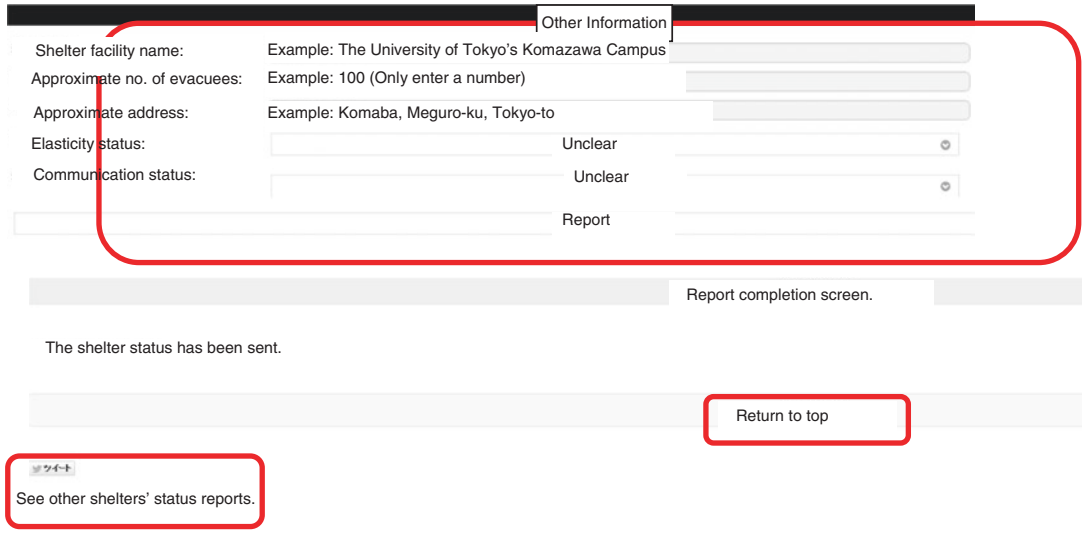

Fig. 25.4 Initial integration of SHEREPO in eBayanihan

communities, nurses, and response teams. Information collected is used as input to propose health risk surveillance, an essential part of disaster planning and management, through planned response. The proposed model has practical applicability, as it may be embedded in risk reduction plans both in times of routine and during emergencies. For example, such planning can be useful for preparing for future potential health risks and global disaster response for large earthquakes. One of the added values of the project is in delivering up-to-date information relevant and actionable to stakeholders and community people so that there is a significant shift in preparedness paradigms and, consequently, preparedness behavior as well. Disaster risk reduction literacy in civilian and professional populations is one outcome, and the development and ongoing enhancement of resilience in the communities selected are another. The cultural gaps between the civilian populations and the healthcare professionals required implementing a flexible tool.

In 2017, EpiNurse received funding through the Risk Award, a funding established to assist in risk reduction and disaster management projects. This presented an opportunity to actualize the integrated model for health monitoring (Fig. 25.6) framework for epidemiology nurses. One objective of the project was to design and develop a mobile- and web-based data collection application that can be used for assessment of health and disaster information. At the systems level, the project made use of an open source tool provided by SHINE OS+, a secured and networked electronic medical record platform developed in the Philippines, to develop a version for disaster nursing. The application was designed to be accessible on any web browser-enabled device.

The EpiNurse web application serves two purposes. The first is to set up a registration system for disaster nurses coming from the Nursing Association of Nepal. Nurses registered in the EpiNurse application can use the web application to view reports that are directly transmitted from the field. A dashboard (Fig. 25.7) is designed to provide information at a glance. A menu is also provided to view health information in greater detail.

Following the integrated framework, the EpiNurse data collection system is designed to collect information grouped into the following categories: community nursing, health assessment, and mother and child.

Information collected at the community level include disaster-related information, housing and shelter information, hygiene, health condition, family planning methods, and assessment on mental health.

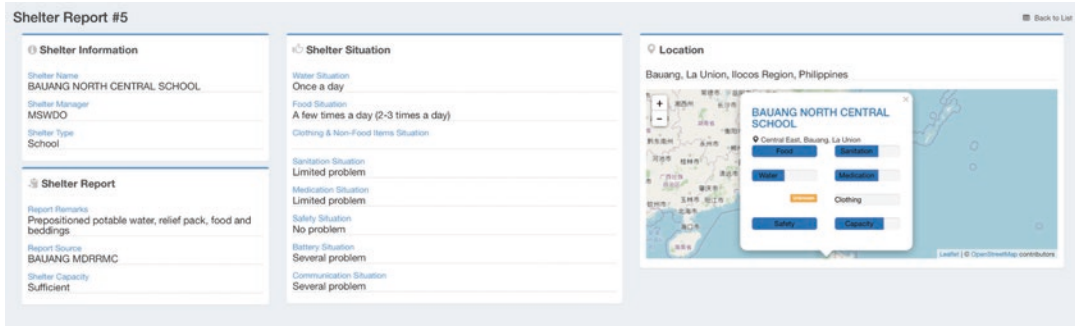

Fig. 25.5 Current version of SHEREPO in eBayanihan

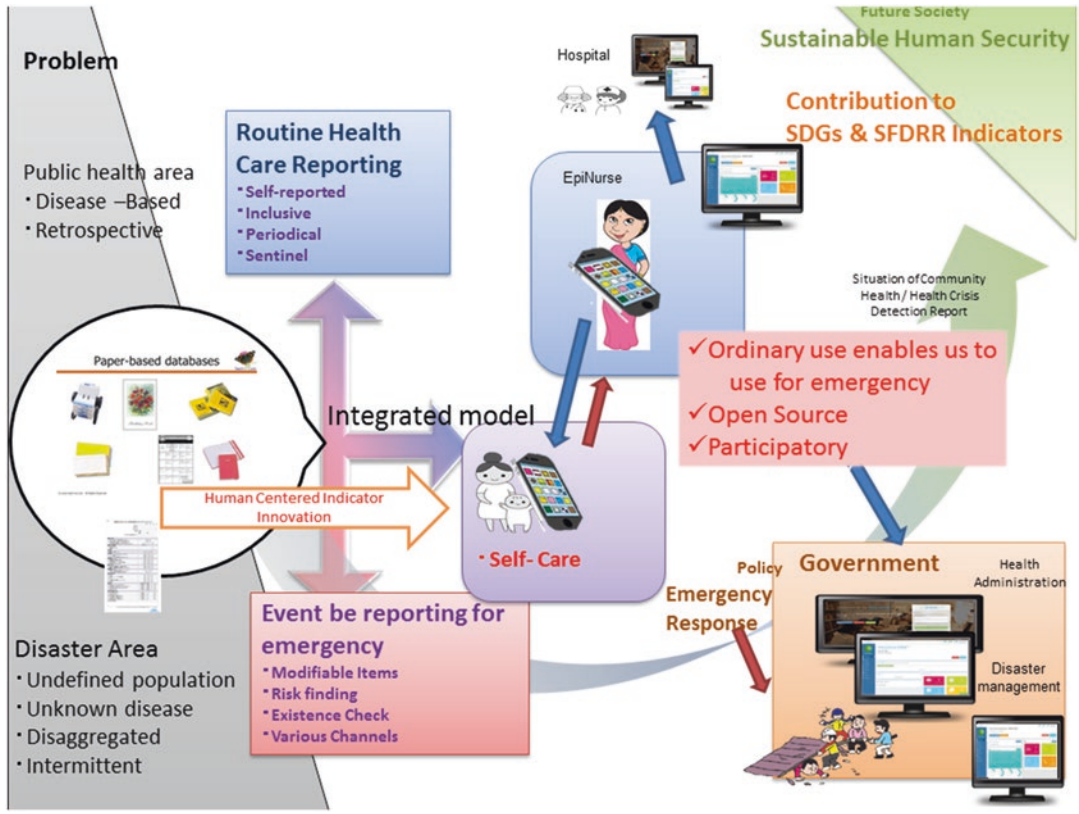

Fig. 25.6 Proposed integrated model for health monitoring

The mobile version of EpiNurse was designed for field use (Fig. 25.8). The data collection is also patterned after the integrated framework. The premise is that health and disaster risk indicators should regularly be collected at the household level, including specific information on mother and child, and also at the school level which is the second home of children in communities.

The mother and child form provides information specific to the needs of the women and the children (Fig. 25.9).

School assessment is also important as most schools are used as evacuation sites during disas-

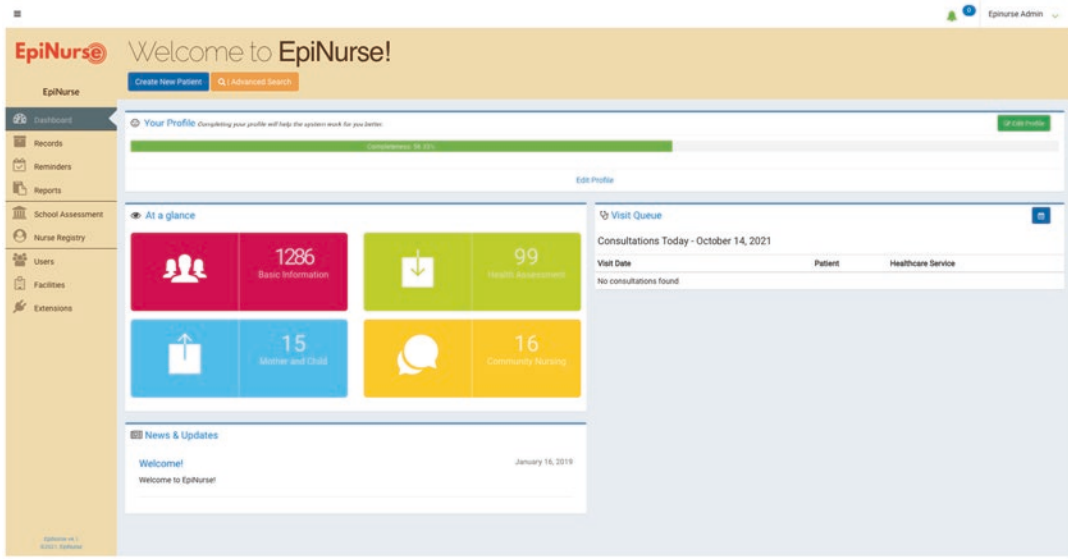

Fig. 25.7 EpiNurse web application: dashboard page

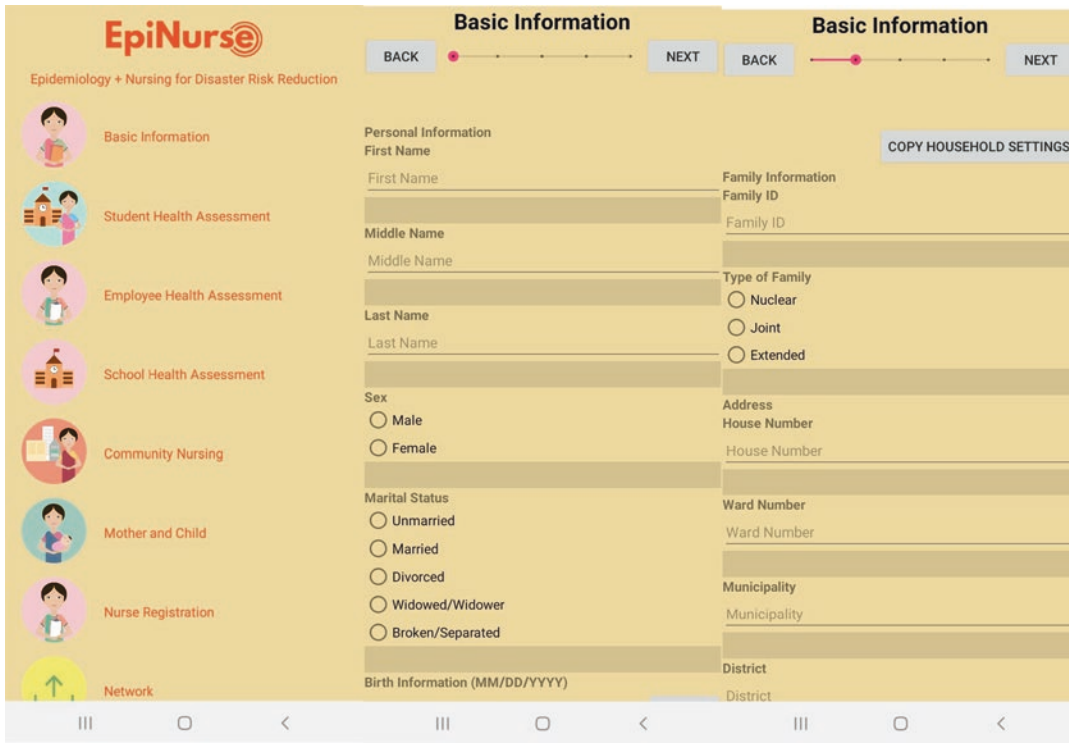

Fig. 25.8 EpiNurse mobile application registration and basic information

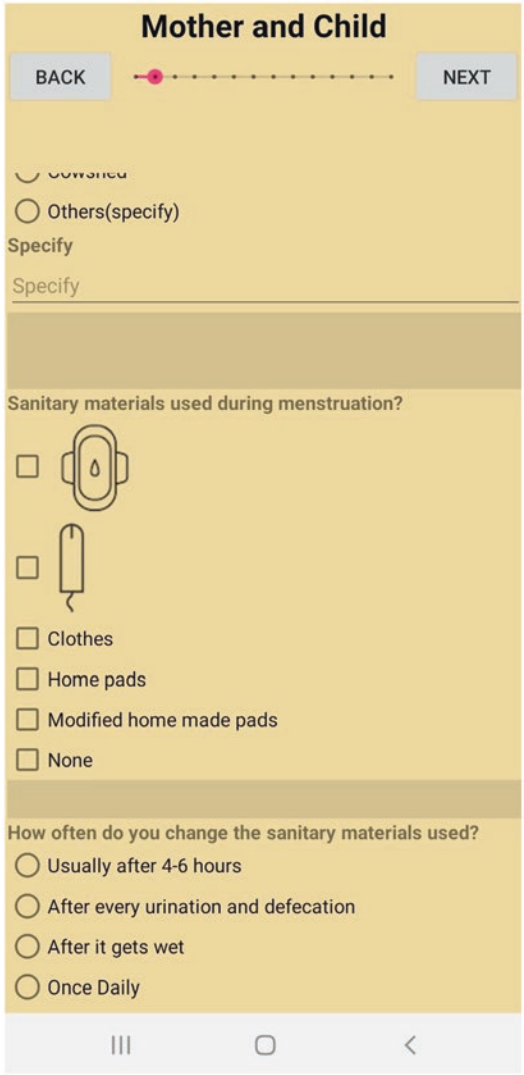

Fig. 25.9 Mother and child form

ters. Figure 25.10 shows some of the information collected at the school level including types of hazards,

facilities available, and extracurricular activities available at school.

The development of EpiNurse Nepal highlights the need to localize data collection to suit the needs of the community. The electronic medical record is a necessary component in the regular collection of health information as it serves as baseline information during health emergencies and disaster. Therefore, collection should be done at the household, community, and school level. There is also a need to collect information on the vulnerable population, women, and children who have additional needs that may not easily be addressed during disasters. Visualization of information through the form of appropriate graphics is also an important aspect of localization as it makes collection of data more efficient.

The teams of these case study aimed to complete a disaster risk reduction method to ensure health security in disaster-prone communities from Nepal to the Global Society. Eventually, collaborating with local nurses, named as EpiNurses (Epidemiology+Nurse), who conduct a participatory monitoring by using ICT toolkit, the project aspires to protect and promote health and safety in shelters and communities.

At present, EpiNurse web and mobile applications continue to be improved based on the data collection needs of EpiNurses deployed in Nepal.

25.6.2.1 Way Forward

As the entire world continues to recover from the COVID-19 pandemic, the realization of an integrated disaster and health data exchange becomes more salient. Emergency teams can provide better and more appropriate response if a variety of information related to humanitarian response is made available as a single data source. Therefore, it is important to develop a disaster and health information exchange that will standardize all information coming from three sources: humanitarian groups, health systems, and disaster information systems.

However, extraction of the minimum dataset poses a challenge as government agencies, local government agencies, and nongovernment agencies use different data collection tools.

With the vast amount of information that are collected by different groups, the emergency teams only need minimum dataset to respond appropriately. There are descriptions of assessment tools that provide a calculation of community health, but the scientific basis for the development of these tools is often an enclosed and fixed community or a small sampling of volunteers.

We are developing the framework for integration of innovative surveillance tools that will lead

Fig. 25.10 EpiNurse mobile screening forms

to a better understanding of disasters. This functions as an enhancement of the human dimension in ad hoc surveillance systems for risk identification and building resilience. From the technical point of view, it seeks to provide an open framework that can quickly enable APIs for integration with other systems. These may help in improving community resilience and assist in disaster risk reduction.

The primary informants of health monitoring during disasters are women who remain in shelters and become health security keepers as well as unpaid care workers. Local nurses are potentially equipped with ability to mitigate risks. Righteous health monitoring during disasters requires more excellent cultural knowledge on how people interpret and live with risks and how human behaviors contribute to putting them in vulnerable situations. Nurses can restore public health in a disaster setting by ensuring healthy level of people and living environment and by identifying high risks and vulnerability among population, including unique needs of survivors.

Geographic Information System (GIS) and Data Visualization

26

Hiranya Sritart and Hiroyuki Miyazaki

26.1 Geographic Information System in Healthcare and Disaster Nursing

In medical and healthcare support, the concept of GIS has become an important tool in contributing and analyzing the relationships between human health and location. Among the first who observed this concept is the father of medicine, Hippocrates, who discovered 2400 years ago the relationship between the environment and humans and described the two significant characteristics of the location that influenced the people's health (Musa et al. 2013). Based on airs, waters, and places, he observed that people who live in high elevation, mountain countries, which have clean water and better climates in different seasons, appeared to have large body with good health and bravery. While people who live in low altitude, having stuffy air and warm water, appear opposite to the people's characteristics, consequently, they are more likely to develop malaria (Khashoggi and Murad 2020). To understand this relationship between locations that impact humans, therefore, spatial mapping was applied in consideration to issues since there was no computer-based system.

The 17 goals of the SDGs cover a wide range of issues, including poverty, food, gender, and environmental issues. The 17 goals can be easily understood by dividing them into three tiers, called the "wedding cake model of the SDGs," devised by the director of the Resilience Institute in Sweden. The 17 goals can also be easily understood by dividing them into three levels, called the "wedding cake model of the SDGs," devised by the director of the Resilience Institute in Sweden. In order to understand and correct the regional disparities, GIS analysis is indispensable.

Priority 1 of the Sendai Framework for Disaster Reduction is to understand disaster risks. It states that "disaster risk management policies and practices should be based on an understanding of all types of disaster risks."

It details that "geospatial information technology should be used as much as possible to develop location-based disaster risk information, including risk maps, which should be regularly updated and made available in appropriate formats to decision-makers, the general public, and local communities at risk of disasters," and promote real-time access to reliable data; the use of space and ground-based information, including geographic information systems (GIS); and the use of

The original version of the chapter has been revised. The spelling of the author's name "Hiranya Stritart" was incorrect in the original version of this chapter. This has been now corrected to "Hiranya Sritart". A correction to this chapter can be found at https://doi.org/10.1007/978-3-030-98297-3_31

H. Sritart
Thammasat University, Bangkok, Thailand

H. Miyazaki (✉)
University of Tokyo, Tokyo, Japan
e-mail: heromiya@csis.u-tokyo.ac.jp

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innovative information and communication technologies to enhance the collection, analysis, and provision of measurement tools and data.

Also, at the global and regional levels, it is important to "facilitate and enhance access, sharing, and use of unclassified data, information, communications, geospatial information, space technology, and related services through international cooperation, including technology transfer, maintain and enhance ground-based and remote sensing observations of the Earth and its climate, and enhance the use of media, including social media, traditional media and big data and cell phone networks that support a national approach to successful disaster risk communication, as appropriate and in accordance with national laws."

In epidemics, GIS is a significant support in battling against the infectious disease. Due to the challenge of tracking data on the disease incidents and how the disease spread, GIS enables us to understand where the disease occurred and spread and how to minimize it.

In the distant past, the history of GIS began in 1854 with the cholera epidemic occurred in London, England. Dr. John Snow, the father of modern epidemiology who first applied the concept of GIS, began to draw a spatial map which contains the number of features that are relevant to the disease, for example, location, the outbreak, road, boundary of property area, and waterline (Gilbert 1958; Musa et al. 2013). After adding these features into a map, he discovered that the cholera incidents occurred along the waterline; particularly the significant number of deaths reported was centered around the water pump. Therefore, based on his spatial maps, he found that the cholera was spreading through the water, instead of the previous belief through the air. Therefore, eliminating the infected pump led to the immediate solution to the cases in the area. Ever since, GIS concept has an impact on numerous health situations.

26.2 Geographic Information System

GIS is basically an abbreviation of three technical words: *geographic information system*. Fundamentally, *information systems* have been described as combinations of hardware, software, and telecommunication networks that are created and used to collect, generate, and distribute useful data, typically in organizational settings. Therefore, as an additional "geographic," GIS is the combined technology providing the ability to collect, store, integrate, analyze, manage, and display the data related to the surface of the Earth.

Based on the main concept of the map layer provided by GIS, the technology supports us to make maps that enable to perform analysis and better communicate and able to solve complex problems. To demonstrate how different kinds of map layers are combined is shown in Fig. 26.1. Layers are the contents of the maps. Each layer contains a wide range of information, for example, imagery provides a visual reference to the geographic region; the census track layer shows the population information and characteristic of population; the road layer offers the reference to critical infrastructure and transportation; disaster areas represent locations that required supports, and the hospital layer provides the reference for medical matters.

Geographic information system (GIS) is a computer system that provides the ability to collect, store, integrate, analyze, manage, and display the data related to the surface of the Earth. They contain the data that reference the location of the Earth; in other words, in geography, the data is spatial. Therefore, the technology allows to map and analyze spatial information to better understand the spatial pattern and relationship to be applied in a wide range of areas.

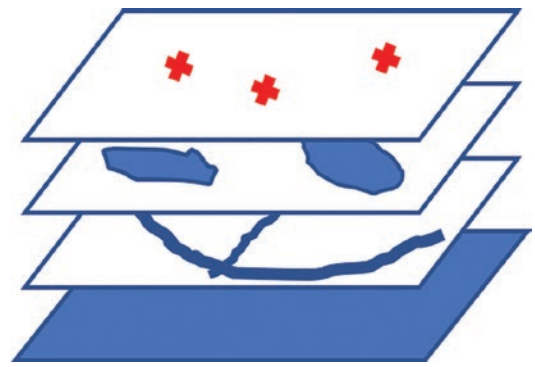

Fig. 26.1 Example of map layers provided by GIS

Since the late 1960s, after the computer technology began to transform the discipline, accelerating the development of computerized mapping processes, this advancement brought an enormous revolutionization and made modern GIS more rapidly and effectively updated. Now map could be created much faster and more precisely than ever before; therefore, diseases or problem issues could more simply be mapped and analyzed. With the advanced computer technology, more nonspatial data, called attribute data," can be linked to the spatial data in the digital maps that are particularly advantageous for the further analysis in clustering and expanding the assessment of the patterns and increasing the understanding of those relationships.

In recent times, a new virus, causing severe acute respiratory syndrome (coronavirus disease, COVID-19), rapidly spread around the world. As critical tool in tracking the disease, GIS is today in the center of attention than ever before because it provides necessary and deeper understanding of the new infection source for timely and epidemic monitoring and effective response. Because when disease can travel so quickly, information needs to move even much faster. Therefore, GIS map-based dashboards become a crucial source of information in collecting, mapping, and displaying of disease cases in an interactive and near real time (Kamel Boulos and Geraghty 2020). The GIS—dashboard by the Johns Hopkins University Center for systems Science and Engineering—provides the interactive map that locates, counts, and visualizes the COVID-19-infected cases, fatalities, and recoveries globally (JHU 2021). Hence, GIS allows the public and viewers to gain awareness of the situation, understand the states of impacts, and improve identification of the affected areas and communities. Further investigation and analysis in spatial model using the GIS platform offer useful insight on the targeted intervention for deep understanding of the relationship between the disease outbreak and other factors, for example, income inequality, median household income, the proportion of Black females, and the proportion of nurse practitioners (Mollalo et al. 2020).

26.2.1 Assessing Accessibility for Delivering Medical Services for Broader Population

To identify the inequality of spatial organization of limited medical service, the GIS platform provides a significant set of tools in exploring the relationship between health outcome and access and how to improve the delivery of health support. For several decades, the GIS contribution has increased rapidly due to the significant ability to connect various layers of population and environmental conditions to characterize the different dimensions in medical needs (McLafferty 2003). Applying GIS-based analysis enables the researchers and health authorities find the suitable sites for healthcare facilities on inaccessible zone (Mishra et al. 2019). Indeed, previous studies applied GIS as the based measurement in defining the service area of physician or primary healthcare center by a threshold travel time and travel distance to the facilities (Luo and Qi 2009; Luo and Wang 2003), by considering the transportation mode of people (McLafferty 2003), or further factors of socioeconomic status of population (Comber et al. 2011). These factors have significant impact on the accessibility of healthcare in both rural and urban areas.

For instance, GIS was a significant tool used to examine the access of maternity care of pregnant mothers in a rural state of North Dakota, USA (Gjesfjeld and Jung 2011). Applying GIS technique, the study reveals that women from over half of the state's counties would have to travel over 65 km to the hospital to give birth. Therefore, they may face significantly essential geographic barriers, receiving healthcare in the prenatal, delivery, and postpartum phases of their pregnancy. In addition, another research applied the GIS combined with a community-based cross-sectional survey to investigate the challenges and obstacles for pregnant women living in remote areas in Cambodia (Yasuoka et al. 2018). They also collected the GIS data by the global positioning system (GPS) that supports in precisely calculating the travel distance for the greater detail of environmental barriers to access the health facilities. On the other hand, another

study shows the utility of GIS in the rural areas to enhance snakebite treatment in Costa Rica (Hansson et al. 2013). Based on the district level of reported cases and environmental factor influencing snake presence, the populations located in high-risk areas for snakebite have been identified and evaluated. Consequently, these GIS applications highlight the geographical dimensions of healthcare access and provide essential evidence for the health policy makers or local health practitioners to raise healthcare service and effective management.

26.2.2 Planning for Minimizing Losses and Enhancing for Disaster Preparedness

In disaster and emergency management, GIS technology plays an important role because it is crucial to collect the accurate information and display logically at the right time during a real emergency, particularly to respond and take appropriate action. In various studies, the applications of GIS were utilized and supported in all different phases of emergency management.

Identifying potential sources of disaster problems and determining the location of risk factors are the significant processes in disaster planning and preparedness phase. Furthermore, defining the locations for evacuation to where people should be evacuated in case of emergency which can be based on a broad range of variables, such as location of shelter, elevation or altitude, access to medical services, and connection of the infrastructure, is also a significant means in minimizing losses and safeguarding people from the hazardous areas and situations.

Numerous methods and techniques are proposed using GIS platform in different disaster situations, for example, flooding (Cai et al. 2019; Sritart et al. 2020; Zhang et al. 2020; Sharma et al. 2020), earthquake (Akamatsu and Yamamoto 2019; Theilen-Willige et al. 2016; Zhai et al. 2019), and tsunami (Hereher 2020; Poliyapram et al. 2017). Sritart et al. proposed a GIS framework to identify the flooding areas and analyze imbalance between the high demand and limited capacity and locations for evacuation shelters in Japan. Through the area-based mapping technique, the vulnerable group of population and shelter to flood were able to pinpoint and highlight for enhancing disaster preparedness (Sritart et al. 2020). Another study applied GIS weighted coefficient technique to analyze the emergency shelter after an earthquake in Japan (Akamatsu and Yamamoto 2019). Therefore, as the visual analysis and results, the study suggests the suitable place for newly built establishment on the digital map of GIS for the consideration of disaster planning.

26.2.3 Real-Time Information Sharing in Disasters for People's Prompt Response and Recovery

The ability of the modern GIS in rapidly modifying the visualized data and analyzing technique is one of the powerful aspects to understand how and why the disasters occur and, therefore, how to respond to the situation. As regards to disaster response, the use of GIS and spatial mapping are the most publicly visible tools and supports in general. The significant role of GIS for disaster warning is to provide the initial awareness for disaster response. Commonly the hazard GIS-based maps are used for visualizing and displaying of approaching hazards, for example, flood, hurricane, tsunami, wildfire, etc.

One of the recent examples of applying GIS in better response of emergency is the #FireMappers project. #FireMappers is an interactive mapping project that volunteers can provide for information gap on new fires and altering fire boundaries and connect the fire locations on the map (NAPSG-Foundation. 2020; Fig. 26.2). With the GIS platform, this mapping can communicate and link data to added resources and update information and sharing by authorities on who should be evacuated and how they should be evacuated. Another example of utilizing GIS application in the disaster is a web-based GIS of Mabi Care (Data-cradle. 2018; Fig. 26.2). This online map was established after the worst flooding in 2018 in

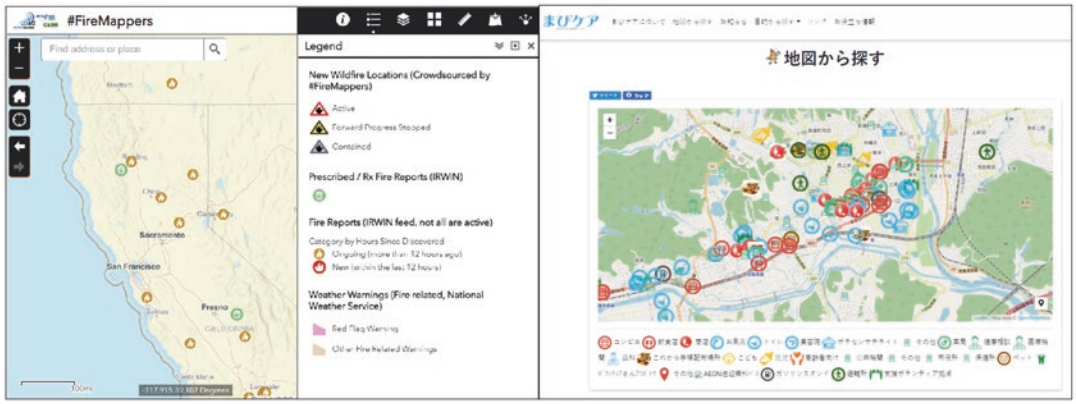

Fig. 26.2 Example of web-based GIS of #FireMappers and Mabi Care

the small town in Japan, called Mabi, to support the communities in coping and recovery from the disaster. After numerous households and facilities in town were destroyed by flooding, the recovered information and location of the healthcare and sanitary facilities, shelters, or public offices are updated, simply visualized on the Web, and provided to people to slowly recover and adapt to post-flooding situation.

26.2.4 Support Authorities in Prioritizing the Precise Target Areas for Decision-Making

Regarding to the health of population in the community, health analysis and profiling are one of the challenging issues in public health care. Numerous data may directly and indirectly influence the health outcomes of population. Multiple factors of health behaviors, for example, physical activity, tobacco or alcohol use, and food consumption, are only few examples of variables that shape condition of health and well-being of populations. Therefore, exploring these data with GIS application that enables to link with the spatial location of the communities, such as restaurant or grocery shops, hospitals or clinics, road, or other facilities, helps us to understand the relationship between people's health and their environments.

For example, a GIS has been used to demonstrate the heterogeneity of the cardiovascular drug prescribing pattern in Taiwan and show a clear pattern of north-south disparity of the country that can help to prioritize the target areas that require better education concerning drug use (Cheng et al. 2011). In another study, nurses applied the GIS to understand the relationship between spatial, numeric, and health populations and to relate nursing practices focusing on health disparities, health promotion, and disease prevention (Moss and Schell 2004). As a significant tool, obtaining and visualizing GIS technology can expand the border of profession and impacts on nursing management of patients. An impact on physical activity of the population may be impacted by the access to green space that might consequently relate to the weight status. Therefore, GIS technology can support multiple stakeholders to design effective interventions and policies for the prevention and control of childhood obesity (Jia et al. 2021).

26.3 Technology of GIS Application

Over the last decades, the development of GIS technologies has been increasing as a result of wider development in information technology. Due to the advancement of the Internet, faster and reasonable price of computer system and numerous hardware and software, therefore the capturing, storing, and processing of geographic information have now become easier and faster in

digital form. The key aspects that define GIS and distinguish from other information systems are spatial data acquisition, management, analysis, and visualization.

26.3.1 Data Acquisition

The most important steps and time-consuming part of the GIS process are data acquisition and entry process (Bajjali 2018). For performing practical and meaningful GIS tasks, the reliable and accurate data is importantly required. Traditionally, in the previous period, the end user used to rely on governmental, commercial agencies or cartographic center which are one of the most challenging barriers to access to these geodata due to high cost and licensing fees in combination with time-limited and purpose-limited copyright limitations. Nevertheless, in the recent time, the concepts of free and available to everyone to use and republish in Open data have been increasing and are also extended to geospatial data and enable various organizations, such as research institutes, governmental agencies, and nonprofit organization, to collaborate on the data product. Numerous sources of GIS data and other raw geospatial data are recently available in various formats. Many countries and organizations have driven and provided open statistics, spatial databases, and useful datasets that can be applied in GIS and for purposes of geospatial analysis and cartographic mapping.

Open database like national or governmental statistics is one of the reliable sources and therefore was investigated and applied to be a representative of national trends. Traditionally, geospatial data and statistics were attributed to various organizational objects in each area. However, the relationship of statistics and geography can generate information far beyond the simple representation of data on a map (Eurostat 2019). Over the last few years, census bureau in numerous countries has developed and maintained the comprehensive national geospatial database, such as locations of housing units, statistical and administrative boundaries for the nation, and a digital representation of all the roads in the USA to serve as source of quality data about the people and places (Jarmin 2019).

Another example for the significance of advanced GIS technology combined with the open data paradigm is OpenStreetMap (OSM). OSM is one of the most successful and well-known crowdsourcing geographic information projects that allows public to create and apply OSM data. OSM has been recognized by scientific and industrial communities based on the increase to become a major geodata distributor, and its contribution in building a global network of volunteers is to assist with geodata collection and maintenance (Arsanjani et al. 2015). While there are some data quality issues with the OSM database, therefore, previous efforts and research were investigated in quality of OSM geodata and led to the development of numerous tools and methodologies for the improvement (Minghini and Frassinelli 2019). OSM is increasingly being used in a range of practical or scientific applications in various domains. The key applications of development of different special routings and navigations are one of a wide range of research scales, for instance, OSM was applied in a research to support wheelchair routing in Heidelberg, Germany (Mobasheri et al. 2018). Another study utilized OSM routing in cardiovascular research and developed the approach to calculate driving distances to hospital care in Sweden (Lindholm et al. 2017). As for in disaster and emergency, OSM data and application play an important role when the disaster strikes, for example, in 2015 during the earthquake in Nepal, the abilities of OSM and open technologies have encouraged new contributors to join increasingly, and over one million new features were added than before (Parr 2015).

According to the successful GIS tasks and applications, one significant approach is volunteered geographic information (VGI) or crowdsourcing. Crowdsourcing is one of the major advanced techniques in gathering data and information from population and communities through the Internet (Mooney and Minghini 2017). Due to the advanced open technologies and public accessibility, volunteers can actively support in recording surveys in digital format easily.

Nowadays, portable devices such as smart phone, tablet, and digital recording equipment have made the data collecting much simpler. Particularly during the emergency situation, due to lack of official data, gathering information by crowdsourcing from social media, via SMS and from OSM, becomes essential for the disaster response. A study case applied flood map tool managed through crowdsourcing during the disastrous flooding in 2015 of Chennai, India (Naik 2016). To prevent further casualties, people can participate in updating the flood map information and inform the flooded street. Within 24 hours after the flood, more than 2500 streets have been reported by the citizens using this approach.

An example of platform and application for field work data collection is Kobo toolbox. It is a free open-source software for field data collection that is used by researchers and professionals who support in humanitarian crises in many developing countries (OCHA 2020). This application allows user to easily create forms and collect data using mobile devices such as mobile phone and tablet or any browsers. This tool was developed by the Harvard Humanitarian Institute and used by numerous studies and organizations in various contexts. For example, the Red Cross Society of Seychelles used Kobo toolbox in online survey for mobile data collection for dengue outbreak in 2016 (IFRC 2016). Also in Haiti, the Health Equity International team applied Kobo toolbox to create a customized data collection to track and support follow-up in HPV vaccination campaign (SBHF 2018).

Another platform that was also used in humanitarian work is Ona System (https://company.ona.io/) which was first created in 2013 for individuals and professionals who work in health and humanitarian relief efforts. It is an application for data collection and real-time monitoring. The form that captures GPS, signature, photo, and other information can be collected by mobile device, smart phone, or desktops with or without data connection. So numerous organizations applied this platform in disaster and first response, for example, in 2019 after the Cyclone IDAI hit Southeast Africa, the Government of Mozambique cooperated with UNICEF utilized Ona platform in collecting data, which create map-based information management portals that support in providing data and maps to support emergency response teams (Erik 2019).

26.3.2 Data Analysis and Visualization

GIS has broadened its range of applications and services to a wide range of areas due to the tremendous progress of its ability to combine map and database. Web GIS, called as web maps, offer a modern implementation for how the maps can be viewed, accessed, and used in spatial information everywhere. The web GIS applications enable people from the same organization and outside organization to share and participate in the maps. These types of distribution of information system are comprised with only a server and a client. While the server is a GIS server, and the client is a web browser, desktop application, or mobile application, therefore, the users can access, analyze, and visualize on their own computer, Web, tablets, and smart phones for a complicated range of activities to operate advanced geographic information.

According to the handy technology, web GIS was applied in several practical cases. In 2012, to monitor and inform vulnerable communities against the disaster, the Philippines initiated a responsive program for governmental warning agencies to be able to deliver a six-hour warning period (Lagmay et al. 2017). So due to flooding situation, a web GIS using mashups of freely available source codes and application program interface was developed and greatly used by local government units in the Philippines in their disaster prevention and mitigation efforts. Numerous applications employed web GIS in disaster preparation and response to serve as an online mechanism for early warning, such as for flood events of a broad area of a river in Greece (Athanasiou et al. 2018), typhoon risk assessment in Asian countries (Jeong and Cheong 2012), and fire control for forest (Kalabokidis et al. 2013).

Many studies have developed at various ways in representing geographic data in order to make it more useful to the end user. Several tools and approaches have been developed to collect data and publish a thematic map to represent the spatial distribution or geographic patterns of specific data matters for selected geographic areas. The key components for most thematic maps are a base map and statistical data. A base map helps users familiarize themselves with the geographic area covered on the map, whereas statistical data aims on each spatial variability of a specific pattern or theme in those areas. Heat maps are one of the familiar representations in several studies, for example, to visualize fire incidents (Liu et al. 2019), hot spot analysis to explore vaccine exemption clustering in Michigan, and analysis on the relationship between violence, crime hot spot, and people's health condition (Dong et al. 2020).

An example of software that supports data visualization and advanced analysis is ArcGIS Pro. It is a powerful single desktop GIS application from Esri that is able to combine multiple data sources to make maps which also provide scientific analytical tools on two-dimensional, three-dimensional, and four-dimensional data to visualize and identify patterns and make predictions and further analysis. With the context-sensitive tools in the software, the data can be edited and analyzed, and the analysis of results or maps can be shared as web services or on ArcGIS Online and with another platform. An additional option of software in helping data analysis and visualization is QGIS. QGIS, also known as quantum GIS, is also a desktop GIS application which is a free and open-source platform that supports in exploring, editing, and analyzing geospatial data. Based on the open-source application, QGIS offers expanding number of functions and plugins from various organizations globally.

26.3.3 Data Management and Sharing

Because significant volumes of data are stored in GIS, therefore, it must be made accessible to various users. Previously, gathering data and sharing the findings from different groups of organizations are exceedingly challenging tasks due to the guidelines or rules. However, in the last period, the advanced technology enabled user to store and access data over the Internet from the remote server. Cloud computing as for GIS Could system is well recognized as a great tool to improve the conventional GIS applications and deliver a comprehensive range of services to users across the globe. Therefore, various GIS applications have also been increasingly moving to the cloud. Many global organizations have additionally taken a technical step forward to the cloud-based data management and provide specified purpose service for the users, for example, Esri, GIS Cloud Ltd. It makes more convenient for field data collection using mobile data collection that enables to easily transform the workflow of paper to digital form. So, cloud GIS offers suitable on-demand network access that can share and provide resources, including servers, storage, applications, network, and services for management effort (Bhat et al. 2011).

In scientific area, several studies also proposed a framework for improved flexibility and confidence of exchanging with various types of data, private and public data, to be applied by different sectors and expanded its valuable benefits (Cao and Wachowicz 2019; Helmi et al. 2018). Another approach in interdisciplinary studies for data management and analytics is an Open geospatial infrastructure (Jeppesen et al. 2018). For instance, GeoNode is a web-based application and platform for developing GIS and for deploying spatial data infrastructures that are applied for the disaster management (Damalas et al. 2018).

The basic examples of software that support data management and sharing are general cloud applications like Google Drive, OneDrive, Drobox, etc. As the capacity that allow users to store files on their servers, synchronize the data across devices, and share files, these are the conventional applications to store, manage, and share spatial data. Several platforms also propose the function of simple management of the data storage and sharing of this information between organizations, for example, Kobo Toolbox, ArcGIS, QGIS, etc. Another example

of software is Ushahidi (https://www.ushahidi.com). It is an open-source software application that was initiated and developed to map reports of violence in Kenya after the post-election violence in 2008. Based on the crowdsourcing concept, this application provides an initial model such as activist mapping and, therefore, is used as a platform for crisis response, such as in 2015 Nepal earthquake in ongoing relief efforts being conducted by various government, nongovernment, and volunteer groups (Waugaman 2015), human rights reporting such as deployment in tracking and counting casualties and honoring the victims of the Syrian conflict (Meier 2011), and election monitoring as in 2012 US Election (Manning 2016).

26.4 Steps for Establishing the GIS-Based Decision Support System

The data resources and functions of GIS introduced in this chapter are helpful in delivering information for decision support in primary healthcare and disaster responses. However, each function standalone cannot contribute to the outcomes. Those have to be connected and integrated. Besides, you have to choose the resources and functions among the various options precisely focusing on the needs of end users in the limited resources and budgets for primary healthcare and disaster responses.

In the next chapter, we learn the basics of service designs and extend it to methods of designing decision support systems.

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Designing Data for DRR (Disaster Risk Reduction) Services

27

Hiroyuki Miyazaki and Shoko Miyagawa

27.1 Introduction

27.1.1 What Is Service Design

Service design is a series of analytical methods that were devised in response to the traditional emphasis on the value of goods and to evaluate the entire process of creating benefits to users (Schneider and Stickdorn 2011). Therefore, it has an aspect of client orientation, in which any service should have benefits to end users.

In recent years, various industries apply the method, especially in marketing. For example, in space industries, they focused mostly on the operation of satellites in space, the astronauts' safety on the space station, the manned space flight, and the research and development of technologies to support these outcomes. However, in recent years, there has been a shift in focus to the benefits that these achievements bring to users, and some research groups cited service design as a useful method (GESTISS n.d.). With the rise of the small satellite industry, the need for service design is becoming more important as the potential resources to satisfy growing varieties of user needs.

H. Miyazaki (✉)
University of Tokyo, Tokyo, Japan
e-mail: heromiya@csis.u-tokyo.ac.jp

S. Miyagawa
Keio University, Kanagawa, Japan

In this way, service design is a useful method for utilizing data, information, and technologies. This chapter aims to the understanding of the basics to apply the method to the fields of primary health care and disaster risk reduction (DRR), in which the decision-makers suffer flooding data, information, and technologies.

27.1.2 Why Do We Need Service Design in the Primary Health Care

As discussed in other chapters, collecting, managing, and analyzing data and information is an essential process in primary health care. It sounds that we should collect, manage, and analyze *all* data and information. However, it is not true because data and information are not cost-free. Every process of collection, management, and analysis requires human resources, time, and also knowledge and skills to use advanced technologies. Since resources are not infinite, we have to implement the operations in the limited resources, budget, and time.

The methods introduced in this chapter will help you solve these problems. By focusing on what users really need and identifying the minimum requirements, you can bring technologies and innovations for data and information in primary health care and disaster risk reduction.

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In service design, it is necessary to clarify the needs for services based on the concrete image of a person, rather than abstracted types or classification classes, in order to draw concrete scenarios (Schneider and Stickdorn 2011). This approach is very effective in primary health care, which is a human-centered approach that requires care tailored for each individual's circumstances. Through this process, including the specific scenarios, we can reveal critical requirements that were previously unnoticed.

In addition, service design has several techniques for visualizing ideas by the use of charts and symbols (Stickdorn et al. 2018). For primary health-care issues that involve many stakeholders, the techniques help the stakeholders express their thoughts and ideas for achieving inclusive teamwork. This is an important process in clarifying the relationship between users and providers of services and in making the minimum requirements for implementations. Therefore, the service design method is useful for solving problems in primary health care and DRR and is worth learning whether you are the service users or providers.

27.1.3 Coverage of Service Design in this Chapter

With this chapter, the reader of this book will learn skills and knowledge about the following:

1. Defining scopes based on the specific needs of service users and develop minimum requirements for data and information.
2. Frameworks and steps to develop the minimum requirements.
3. Prototyping of the designed systems.
4. Online tools to help with these steps.

By acquiring this knowledge and skills, you can achieve sufficient prototyping to validate the effectiveness of your service development even if you have a limited budget and time or a disaster. While this chapter intends to be as concise as possible so that anyone can put it into practice, it sometimes lacks details. I would encourage the readers to follow the provided references if you need the details.

27.2 Define and Scope the Problem

27.2.1 Specifying Problems by Asking Why

This is the most important knowledge works at the beginning of service design. The defined problem represents your contribution and value of the newly developed services. By defining the problem to be addressed, especially in teamwork, you can share values and behavioral norms and promote highly spontaneous and efficient service development.

When we say "problems," it includes several types (Holyoak 1990). For example, a social problem is a situation with a lot of inequity, while a problem in the fields of engineering and science shows a limitation and is sometimes called a research question in academia. They seem to be completely different, but they have a common point: they are the problems to be solved. Therefore, we define "problem" here as a matter to address by employing the service design.

Problems are usually in a nested structure. For example, the problem of flood hazard management includes the following questions:

1. Where does the flood appear? (Hazard).
2. How many people will be exposed? (Exposure).
3. How vulnerable is the exposed population? (Vulnerability).

For the first question about the hazard, we can now predict where floods will appear with sufficient accuracy owing to flood modeling methods by decades' research efforts. However, what about other issues? For example, we can discuss a region's vulnerability issue to flood hazards as the following:

- Q. Why is the region vulnerable to disasters?
- A. This is because the care and support for vulnerable people are not sufficient.
- Q. Why does the region lack care and support for the vulnerable people?
- A. This is because the government and communities have not yet recognized realities of vulnerable people.
- Q. Why do government and communities not yet recognize the realities of vulnerable people?
- A. Because ...

Let's take another example, as shown below. Imagine that you are in charge of disaster management in a place you have never even visited:

1. Q. Why is the disaster management plan for this area not adequate?
2. A. Because the exposed population is not properly identified.
3. Q. Why is the exposure population not being properly identified?
4. A1. Because censuses have not been conducted for 10 years, even though there have been significant changes in the last 10 years.
5. A2. Because censuses represent the residential or nighttime population, not the distribution of the population that works during the day.
6. A3. Because the census does not have the attributes necessary for vulnerability assessment. For example, it is not possible to tell from a census whether an elderly person is an 80-year-old who runs every day or a bedridden 60-year-old.
7. Q. Why ...

By repeating "why," we can scope the problem. This is like analyzing causes in methods of problem trees (Veselý 2008) and fishbone diagrams (Ilie and Ciocoiu 2010).

You can represent the problems structured in this way like Fig. 27.1. The root of this structure is the domain from which we raise problems to analyze the causes. You will see some problems solved and the others yet not solved. You will take a problem with your interests and valuable contributions.

27.2.2 A Tip for Teamworks Between Tech Users and Providers

Most of the works on service design are in a team, not standalone. Therefore, the definition of the problem involves brainstorming with team members. Brainstorming is a process of free ideation, but by using a frame guiding ideation, you can encourage purposeful ideas and effectively consolidate the team's ideas in a short time.

Readers of this book, which aims to apply ICT to problem-solving in primary health care, will include not only nurses who face problems in the field but also ICT professionals who want to apply their skills to such problem-solving and experts with experience in both. The key issue is to link these as users and providers of technologies to form a team and to form technology solutions solving the problems.

The method proposed by the author is to have the team write their ideas for problems and solutions of interests on sticky notes and organize them into a matrix with problems and

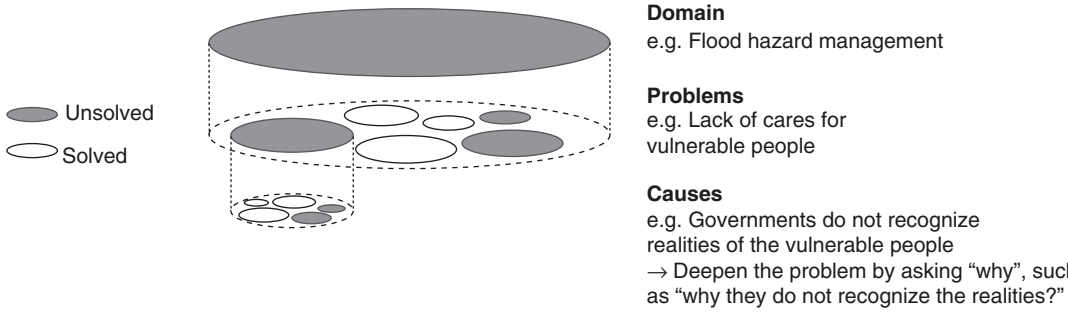

Fig. 27.1 Structuring problems

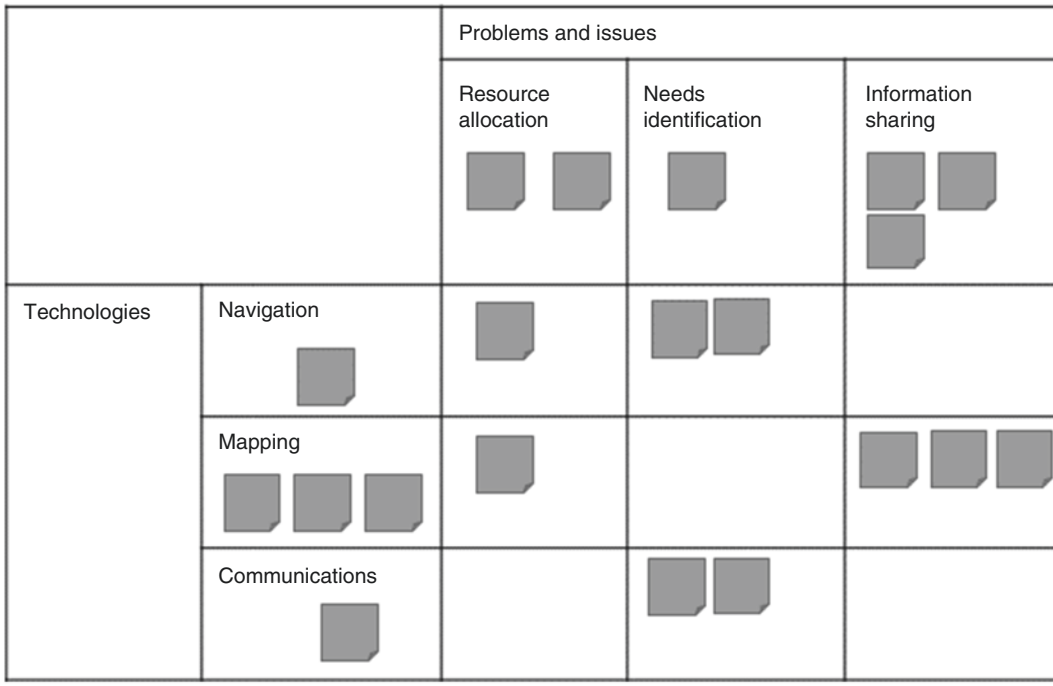

Fig. 27.2 A matrix for mapping teammates' interests

issues and technologies (Fig. 27.2). This helps to visualize the team members' awareness of the problem, their interests, and their potential contributions and to identify what the team can do immediately. This helps the team decide about what to work on for rapid prototyping. The method is especially useful in training programs where time is limited and in emergency disaster response practices. With the recent availability of online virtual whiteboards, it has become feasible for international teams to work together.

27.3 Identify and Analyze Stakeholders

The purpose of this section is to learn about identifying the stakeholders involved in the service, analyze and organize what each of them wants, and equip a method for clarifying the user-oriented requirements for technology development.

27.3.1 Who Are Stakeholders?

A stakeholder is any person who has a stake in an issue. Since the word "any" is exhaustive, we will focus on the key roles and identify the following key stakeholders:

- Service users and beneficiaries: The users of the service and those who will benefit from it. This is the most important player in this analysis.
- Service provider: The player who provides the service. Often it is yourself or your team working on the service development, but be aware that this may not always be the case. For example, in an international development project, a government agency operates the service, so it is not the same as a service developer.
- Optional.
  - Data providers: A player that provides data. This includes owners of data infrastructure

and businesses that analyze and provide data.
- Opponents: A person who is disadvantaged by the service being developed. This could be an existing alternative service or a competitor.

Initially, it is good if you can identify at least the service users and service providers. We may revisit this in future steps.

27.3.2 What Do They Want and Need? What Information Do They Want for Next Steps?

Identify what the key stakeholders want. In this process, one of the following cases will emerge for the targeted issue:

Case 1: Missing information necessary for stakeholder's decision-making: When the provision of information, such as "I want to know _____," allows the stakeholder to take the next step.

Case 2: Conflicts and contradictions among stakeholders: When "I want to _____" causes conflicts and contradictions among stakeholders. Government: "I want to accept evacuees." Residents: "I don't want to accept evacuees because it will make public safety worse."

At first glance, the relationships may seem different, but they are the same. This is because Case 2 results from suboptimal decision-making by the government, while Case 1 is the missing of information necessary for proper decision-making. After going through this analysis, we can specify what information is needed for stakeholders. Additional stakeholders may need to be added.

The above steps will help you narrow down exactly what information is missing for proper decision-making. In Sect. 27.4 and beyond, we will discuss the data and technology needed to provide the information.

27.3.3 Methods for Analyzing Stakeholders

In this section, we will show you some methods to show the stakeholder's positions and relationships in a more concrete way. None of these are required, but they are useful for analyzing the problem from different perspectives when the ideas are stifled.

27.3.3.1 Customer Value Chain Analysis

It is a method of diagraming the relationship between stakeholders in terms of benefits and compensation. This summarizes conflicts and contradictions. Although this chapter focuses on the analysis of the problem, it can also apply to the relationships among stakeholders after the service has been launched for a desk review.

For analysis, the framework by Donahue and Joyce (2001) is useful, which analyzes players in terms of their functional competency and motivational incentives. They demonstrated the framework to analyze the relationship between national and local governments and to make recommendations on information control in emergency disaster response.

27.3.4 Customer Journey Maps

This is a method of charting how service users feel and respond to problems by assuming their characteristics. This is useful for analyzing the phases of each individual user's perspective. The method is effective in primary health care, where the behavior of individuals interest a wide variety of service providers and users. The analysis of pre- and post-service provision is useful for desktop validation of a service design and the customer value chain analysis.

27.4 Design and Define Specification Requirements of Information and Data

In this section, we learn about defining the data and technology specifications required for the services that may provide a solution to the problems and missing information identified in the previous sections. Owing to diverse data resources, the options for fulfilling requirements are almost unlimited, but not all options are available. There is a trade-off between data accuracy and cost, and extra high accuracy can lead to enormous costs. The selection of data fitting to the minimum requirements is critical to feasibility. In the field of primary health care, some data resources are difficult to use for R&D and operations because of privacy protection. In this section, you will learn how to select data resources and make services workable by identifying the minimum requirements of data that contribute to solving the problem.

27.4.1 Data Precision

In primary health care, because spatiotemporal data often takes an important role, it is necessary to analyze the requirements of spatial precision and temporal precision. Measurement precision is important in laboratory experiments, but we take only spatial precision and temporal precision in this chapter because it is considerably important for primary health care to capture the variation and variability of location, time, and environment.

27.4.2 Spatial Precision

The spatial precision refers to the spatial spacing and density at which data is observed and acquired and is sometimes referred to as resolution and scale. For example, satellite imagery displayed on Google Earth has a resolution of 0.3 m/pixel and can distinguish land objects larger than 0.3 m. However, if the imagery displayed on Google Earth is to be used for purposes other than viewing on Google Earth, you need to purchase them from Maxtor, a data provider, at a cost of approximately USD 20/km^2. This trade-off also applies to positioning technologies such as GPS. The precision of positioning with a typical smartphone is around 10–100 m, but equipment that compensates for centimeter-level accuracy can cost USD 10,000.

High precision data may seem useful to apply to all applications, but the trade-off between precision and cost causes a lack of versatility. In addition, highly accurate data can sometimes be privacy invasive, making it rather difficult to use. Selecting the appropriate spatial resolution for the data is a key issue to keep the cost reduced to a workable scale. The data sources for spatial data are very diverse, so consultation with experts is a must.

27.4.3 Temporal Precision

Temporal precision refers to the interval at which data is observed and acquired and is often referred to as frequency. Latency that indicates lags for data to reach users is also a specification on temporal precision. Like spatial precision, there is a trade-off between cost and latency and depends not only on cost but also on performing the communication facility. Of course, the data transmission cannot exceed the maximum speed of the communication facility. Also, in remote areas, the frequency may be limited due to power outages.

Sacrificing frequency can significantly save money or even improve the accuracy of the communication. For example, a cell phone communicates through a call connection, but during the call, it is always connected. In situations where the communication infrastructure is not well developed, voice quality is poor, and information may not be transmitted accurately. However, by sending text (SMS) instead, the information transmission becomes more accurate. This improves the performance of information transmission at the expense of real-time performance and saves money by reducing connection time.

As with spatial precision, the specification of appropriate temporal precision can be done through consultation with experts, which can save money and even improve the quality of service.

27.5 Prototyping

This section presents the steps to develop a prototype based on the specifications identified in the previous sections. In this prototyping, we focus on developing within a limited time and budget. This constraint and condition will be important for the rapid release of customized applications, especially in disaster response.

In addition, the prototyping presented in this section provides a protocol for users and developers to exchange needs and requirements. This will allow us to refine features and performance by demonstrating them with technology that is ready to go and by identifying useful features, useless features, extra performance, and missing features and performance.

If you shape the specification in the previous section, then there is no complicated work. Since this step only involves fitting the existing technology, it can be done concisely. However, you may get new ideas while investigating the latest technologies. In that case, you can always go back to the previous section. Repeatedly reviewing problems and issues and technical specifications will refine your service development.

27.5.1 Searching Available Data Sources and Technologies

Once you have defined the specifications of the data you need, search for technologies that meet those specifications. When you are searching for the first time, you may not immediately decide which of the many search results you should take. One thing that may surprise you is the cost and pricing. However, technologies with large cost estimates are often over-specification. In such cases, the problem and the specification of the data should be reviewed again.

Sometimes, no matter how sharp the problem or specification, technologies required for data acquisition may be very expensive for your budget. In such cases, it is possible to sample only the minimum amount of data needed to validate the functionality or to prepare dummy data.

Expert advice is also important in the search for the right technology. This will determine how prototyping can be achieved within a limited budget and time.

27.5.2 No Data? Apply Dummy Data

The data source, which inevitably cannot be removed from the specification but is very costly, can be replaced with dummy data to proceed with the prototype. As long as sufficient prototyping and demonstration can be done, the budgets will follow later.

In order to create dummy data, we assume a typical scenario that corresponds to the provision of services to specific users. In order to operate the service, it is necessary to supply data for a variety of scenarios, but for a few scenarios, the amount of data should be quite small. To construct scenarios, it is useful to analyze them from the user's perspective using personas and customer journey maps, which are part of the service design method.

In the service to be developed, we assume the data will be supplied automatically, but we have no choice but to create it manually. This is a labor-intensive process, but through describing the data while envisioning the scenario, you may notice oversights in the design.

27.5.3 Demonstration and Evaluation

Once the prototype development is completed, verification and evaluation through trial operation are carried out. Here, besides verifying that the system works stably, it is important for users to touch the system to get feedback.

As for the point of getting feedback, the following questions must be asked:

Question 1: Was the information provided at the right time and in the right form?
Question 2: If they are not properly informed, what was with problems?

Regarding Question 2 above, a problem is the following:

1. Data presentations are too technical for users to catch up with their understanding.
2. Data on critical timing is missing because of insufficient frequency.
3. Latency is not enough to provide services when users need them.
4. Inability to make accurate decisions because of inappropriate spatial precision.

After analyzing these perspectives, we review the data specifications. Alternatively, the problem may be reviewed again if it turned out that it cannot be supported by current technology.

27.5.4 Rapid Prototyping in Disasters

In disaster nursing, prototyping methods are also useful in emergency disaster responses where services need to be released quickly, even if the functionality is not perfectly implemented. Here, the technology provider and the user come together to rapidly implement and validate the service under a concise prioritization. Also, it is important to adopt a framework that allows for easy functional extension. Japan's Mabi Care is an outstanding example of how this procedure is effectively carried out. Selecting frameworks requires experts' advice because functionality and usefulness depend on applications and development stages.

In order to implement such prototyping during disaster response, it is necessary to cultivate the foundation for team building during normal times, and Civic Tech is an initiative that encourages dialogue between users (citizens) and developers to facilitate team building even during emergency response.

27.6 Conclusion

In this chapter, we have presented the basic concepts and some examples of procedures for designing and constructing information and data services. These are basic methodologies, and since there are a variety of methods for implementation, the actual operation should be adjusted to suit the nature and constitution of the stakeholders and workshop participants.

It is preferred that the series of steps outlined in this chapter be implemented consistently in a program, but this requires considerable effort and time. It may be possible to implement only a minimum portion of the program under a limited resource. In such a case, the outline in this chapter may be useful in designing and planning the program.

In the next chapter, some case studies are presented by the methods presented in this chapter.

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Case Studies of ICT/GIS Application for DRR

28

Hiroyuki Miyazaki, Shoko Miyagawa,
Archana Shrestha Joshi, and Sakiko Kanbara

28.1 Introduction

In the aftermath of the East Japan Earthquake and Tsunami in 2011 in Japan, the promotion of open data started in 2012, and disaster prevention information is considered to be the most suitable genre for data disclosure. The Sendai Framework for Disaster Risk Management issued in 2015 states that disaster risk management policies and practices should promote real-time access to reliable data and space-based and ground-based information, including geographic information systems (GIS). Innovative information and communication technologies enhance the collection, analysis, and delivery of measurement tools and data.

In 2016, the Basic Law on Public and Private Data Promotion was enacted to comprehensively and effectively promote the use of public and private data, thereby contributing to the realization of a safe and secure society and a comfortable living environment for the public. The number of individual baseline data and research data for the indicators of the new global agenda is increasing, and cross-disciplinary databases and disaster prevention models are being developed across meteorological, geological, civil engineering, social, and health fields. The number of possible natural scientific and technological measures has also increased. With the advancement of information and communication technologies (ICT), such as the establishment of a system for information sharing and utilization based on big data, it has become possible to construct people's knowledge systems and activities with new technologies and the types and means of disaster information available in real time before and after disasters have increased remarkably. It seems that it is now necessary to organize helpful information from miscellaneous and excessive information rather than lack of information. In 2016, the website of the Geospatial Information Center opened, providing a one-stop service for searching and obtaining geospatial information and related information maintained by various entities for various purposes (AIGID 2016). The year 2017 saw the Cabinet's approval of the new Basic Plan for promoting the Geospatial Information Utilization (Cabinet Secretariat 2017). In times of disaster, common understanding through location information on maps will lead to accurate information sharing. As a basis for multi-organizational cooperation, reporting on information sharing systems using GIS (geographic information sys-

H. Miyazaki (✉)
University of Tokyo, Tokyo, Japan

S. Miyagawa
Keio University, Kanagawa, Japan

A. S. Joshi
EpiNurse, Kobe, Japan

S. Kanbara
University of Kochi, Kochi, Japan

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tems) effectively centralizes and visualizes changes over time.

Kanbara and Estuar (2015) summarize the key challenges of information issues as follows:

The challenges of pre-disaster information due to displacement of people during disaster events are the following:

- Uncertain IT infrastructure.
- Inability to confirm the accessibility of information and data.
- Failure to visualize the insights of social welfare of residents.
- Simultaneous display of information with time differences.
- Discrimination of information duplication.
- Ensuring reliability and validity.
- Setting crosscut points for reporting information.
- Overlooking the issues related to vulnerable situations and people.
- Not saying the progress of improvements.

While recognizing these things, it was essential to generate information that can be used for decision-making and subsequent analysis of responses and instructions (Estuar and Kanbara 2015). The research model was developed and improved so that the communication environment permits; reporting with photos or videos of the situation will dramatically increase the confirmation and understanding of the case by lesson learned of disaster (Fig. 28.1).

28.2 Mabi-Care and Machi-Care

Here, we analyze Mabi-Care, a quickly established system to facilitate information sharing in the Mabi-Cho area of Kurashiki City, which was affected by the 2018 torrential spots of rain in Western Japan.

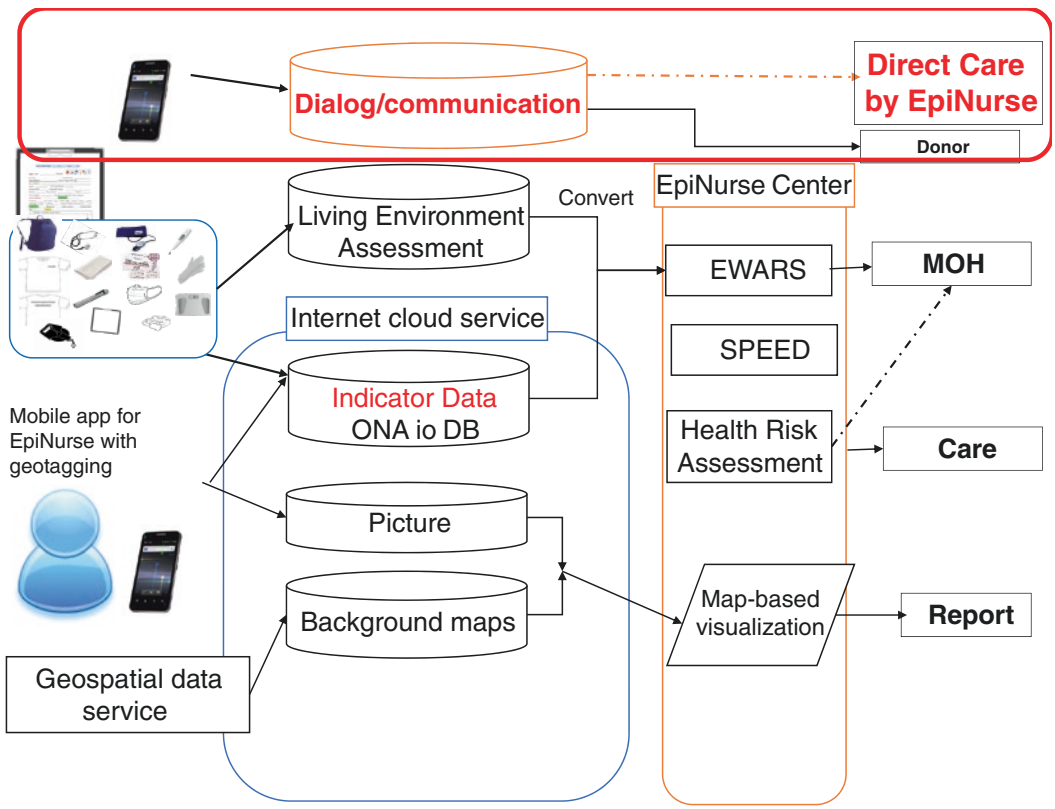

Fig. 28.1 Spatial information disaster nursing model

28.2.1 Problems Addressed by the Solution

Private humanitarian aid organizations and citizen volunteers who had survived the disaster developed care activities, but each group was required to coordinate their activities even though they were dispersed, which had not been done successfully so far.

Most times, even if the needs are identified, they are not reached because the affected citizens have not been encouraged to seek help.

28.2.2 Stakeholders of the Problems

The problem is substantially caused by a lack of communications and coordination between survivors who need humanitarian aids and private humanitarian aid groups, such as volunteers and local enterprises.

28.2.3 Users and Beneficiaries of the Provided Information and Data

Mabi-Care is a system that plots on a map the contents and locations of not only public support but also private and volunteer support, so that disaster survivors find where to reach humanitarian supports which are not publicly disseminated. It has made it easier for disaster survivors to see the private support that is not shown in the conventional public support gathered around public shelters.

28.2.4 Outcomes of the Solution

This service contributed notably to the immediate post-disaster situation where people sought to ask for humanitarian assistance they needed. After that, disaster survivors could access the supports with no wait until public dissemination of humanitarian aid.

28.2.5 Key Technology Specifications

The system does not use advanced technologies or high spatiotemporal precision. However, the information was provided with sufficient spatial accuracy, such as a level of blocks and landmarks that local people recognize precise locations. Scoping "sufficient for local people" is important in the disaster response because it reduces technical requirements and costs of implementation during emergency responses where available resources are much limited.

The system still has issues with temporal precision or timeliness. For example, when a relief provider distributes all supplies, the information should be updated immediately; otherwise, disaster survivors come up for the relief offer though it is out of stock. The system would require real-time monitoring of relief supplies to address the issue, but such a function is difficult to implement during emergency disaster responses. Besides, the service areas are not highly populated, so the demand for relief supplies did not exceed the store, and thus the impact of information delay was not significant.

Here, regardless of such limitations, the system succeeded in reaching out humanitarian assistance to the disaster survivors due to the rapid implementation immediately after the disaster while reducing spatiotemporal precision.

28.3 IT DART Early Assessment Supporting System

28.3.1 Problems Addressed by the Solution

When a disaster strikes, several private aid organizations send teams to the affected areas to survey the situation to plan for assistance. These teams need to conduct their surveys in coordination and by sharing information with the logistic support team, but timely information sharing in the disaster area is not always easy. Sharing photos with geographical information, such as lati-

tude and longitude, would be preferred; however, existing social networking services are not suitable for this type of information sharing because the services remove geographical information from photos to protect privacy. Disaster information of the entire region is reported through the mass media. Still, information on the disaster of individual dwelling units should not be made widely available because of privacy issues and the risk of fraud and malpractice targeting the disaster survivors. The information shall be shared only within limited groups promptly that is useful for planning emergency support.

28.3.2 Stakeholders of the Problem

The two major types of groups need to share information for aid planning: private aid organizations that send survey teams immediately after disasters and intermediary organizations that provide long-term aid coordination. Furthermore, the private support groups are classified into two subgroups: external humanitarian assistance groups and internal disaster prevention groups. They also need to provide information to the government to help them understand the disaster situation to coordinate early collaborations with the government. Besides, the information is shared with the Self-Defense Forces, medical support teams, and other stakeholders depending on the disaster situation and expected support needs.

28.3.3 Users and Beneficiaries of the Provided Information and Data

The role of the advanced team is to collect local information that will be necessary for aid planning. This mainly includes information on damage to houses, such as flooding, collapses, and roof damage; damage to transportation infrastructures, such as roads and railroads, because of inflow of sediment, submergence, and earthquake damage; damage to living infrastructure, such as electricity, gas, water, sewage, and telecommunications; and information on where and how residents are living. Since the resources that the advanced team can bring and use in the field are limited, the main survey activity is to take photos using smartphones. The photo information, along with location information and comments accompanying the photos, shall be shared and accumulated among the survey teams and the logistic team. From the shared photos, comments, and geographic information, the logistical support team will assess the overall disaster situation, procure necessary support resources, estimate support organizations, and prepare for possible coordination.

As a mechanism to realize the information sharing, IT DART developed the advanced team system. It provides a function that accumulates photos, comments, and location information from the survey team in a cloud database via a chat system and visualization of this information by plotting it on a map. LINE, a widely used chat system in Japan, was adopted as the interface. Besides being a system that users, including the research team, are familiar with regularly, it has a function to send user's location information as a message. And it has a rich API (application programming interface) for linking with external systems, so this function was used to identify the approximate locations where photos and comments were taken. The data and information are visualized with background maps using the OpenStreetMap.

28.3.4 Outcomes of the Solution

The early assessment of the disaster situation by private supporters will facilitate the launch of support activities and networking among supporters, leading to the community's recovery. In particular, when the affected local government is not familiar with the disaster, the government likely delays public support launch. By grasping the disaster situation at an early stage, private support groups can provide support to the government by approaching the government and providing advice on planning necessary support measures, or by creating a system to outsource tasks that require know-how, such as the opera-

tion of evacuation centers, to the government. It also accelerates establishing a system to provide detailed support to those who cannot be reached by administrative support alone.

28.3.5 Key Technology Specifications

The advanced team system uses the photos, comments in texts and audios, location information, and timestamps showing when the data was posted on LINE by the survey team to visualize the data on a map. This function has enabled aid workers to estimate quickly the approximate number of affected households in the entire disaster area and the resources required for reconstruction.

It still has a major limitation in disasters. If the communication infrastructure in the disaster area is damaged, the data can only be sent after moving to a place where communications are accessible. In such a situation without communication infrastructure, location information and timestamps are not correctly shared because of the gap between location and time at which the photos are taken and those at the photos are sent to the cloud.

28.4 Humanitarian Assistance Allocation Visualization Systems

28.4.1 Problems Addressed by the Solution

In the aftermath of the Great East Japan Earthquake in 2011, besides individual volunteers, many NPOs/NGOs and other support groups ("support groups") came from Japan and abroad to provide assistance. In the affected cities, towns, and villages, disaster volunteer centers were set up to accept individual volunteers. Some of the support groups went to the affected areas immediately after the disaster struck and carried out a variety of activities, such as food distribution, material support, and support in education and welfare. However, although the government was aware of the Disaster Relief Volunteer Center, there was little knowledge about the acceptance and coordination of support groups with expertise and experience in supporting disaster-stricken areas. From the government's point of view, support groups were not perceived as major actors and were not considered as targets for collaboration. In addition, there was no coordination function in grasping the overall picture of the support provided by the government, disaster volunteer centers, and support groups in response to the disaster situation and to moderate excesses and deficiencies in support. As a result, many support groups needed time to build relationships with local governments and to understand the needs of residents and could not demonstrate their capabilities from the beginning. In response to this challenge, JVOAD (Japan Voluntary Organizations Active in Disaster), a private organization that provides assistance coordination in disasters in Japan, was established. In the 2016 Kumamoto Earthquake and the 2018 West Japan Typhoon, JVOAD supported setting up meetings for information sharing between the government and private support groups, contributing to collaboration and coordination. However, it still has an issue on timely provision of information on the status and activities by support group.

28.4.2 Stakeholders of the Problem

In addition to the intermediary support organizations at the national level that are responsible for coordination, local intermediary support organizations and organizational networks that play a role in the long-term reconstruction of the region will be the main players in the coordination of support. Each support organization working autonomously in the disaster area is the main entity that provides information on its activities to the intermediary support organizations. The support organizations receive information on status in which aid supplies are not satisfactory allocated and requests for coordination. Local governments, prefectures, the national government, and other government agencies use the

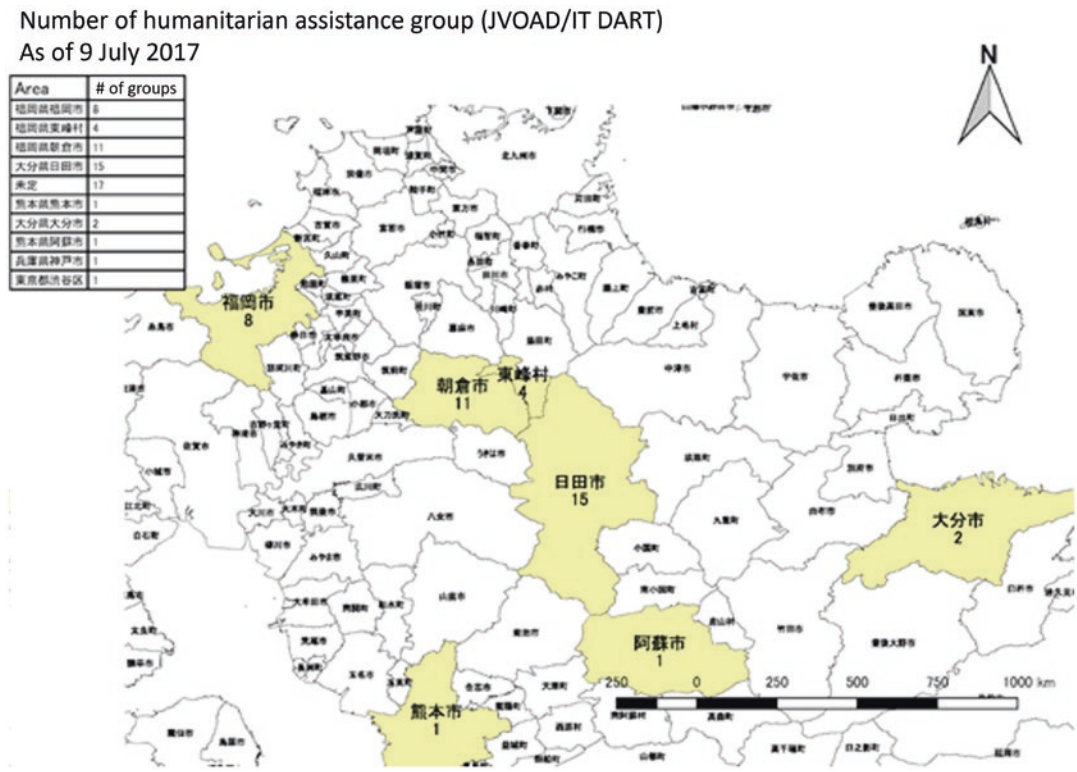

Fig. 28.2 Number of humanitarian assistance groups by city/municipality

information collected by the intermediary support organizations as a reference for planning their support and also provide support through the intermediary support organizations in cooperation with the public and private sectors.

28.4.3 Users and Beneficiary of the Provided Information and Data

The system collects information on when, where, and what kind of support is being provided by each organization that is autonomously conducting support activities, classifies the information by region and by type of activity, and visualizes it on a map. At the same time, the system collects information on the needs for support and matches the possible supplies with the needs. The information is collected by volunteers from outside the disaster area, who will input the information into a database and visualize it on maps using GIS (Fig. 28.2).

28.4.4 Outcomes of the Solution

In cases of wide-area disasters, aids are more provided to areas sensationalized in the media. However, even if the damage is serious, the scale may be small, and aid may not reach areas that are difficult to access for mass media. There is also an uneven distribution of support at the microlevel within the region, with different levels of support depending on the evacuation center. In addition, there are cases where special supports do not reach the people who need it, such as in areas with many foreigners, where supplies do not reach the people who need them because there is no support for providing information in multiple languages. The coordination organization's task is to identify

and resolve such mismatches in support within and between regions, and this can be done through the timely collection of information on support needs and the status of support, as well as the know-how and networking gained from the experience of intermediate support groups. Although it is preferred for each support organization to avoid mismatches, it is hard to report on the rapidly changing support status of their own organization, and it is also a duplication of works with reporting within the organization.

28.4.5 Key Technology Specifications

Currently, this advanced team system is mapping aggregated data by municipality or more detailed scaled scales, such as district. While it is possible to visualize the support situation for the entire district, it is difficult to grasp the situation for each evacuation center. For detailed mapping, the granularity of information collection needs to be more acceptable, such as requesting activity reports by the evacuation center instead of by the district, but this will increase the burden on support groups. It is needed to develop a system for a more accessible collection of information.

28.5 Satellite-Based Disaster Response Assistances

28.5.1 Problems Addressed by the Solution

Sentinel Asia, led by JAXA (Japan Aerospace Exploration Agency), is a consortium of space agencies that promotes the analysis and provision of Earth observation data in times of disaster (Kaku and Held 2013). Earth observation data is a valuable data tool to grasp the disaster situation over a wide area at once when a disaster occurs. However, the analysis of Earth observation data requires expertise in remote sensing, which makes it difficult for government disaster officials to use it directly.

28.5.2 Stakeholders of the Problems

Stakeholders of the systems cover data providers, data analyzers, and end users. Specifically in Sentinel Asia, data providers and data analyzers are called Data Provider Node (DPN) and Data Analysis Node (DAN). DPN comprises participating space agencies that operate Earth observation satellites. DAN includes universities and research institutes capable of analyzing Earth observation satellite data for disaster responses.

28.5.3 Users or Beneficiaries of the Provided Information and Data

Sentinel Asia primarily focuses on providing data analysis outputs in map formats showing disaster-affected areas to disaster management authorities. The maps are used for government agencies and possibly for intermediary organizations to estimate required resources and costs for responses and recoveries. In recent years, it has also promoted capacity development on handling Earth observation for disaster responses. Besides not only educating experts, but they also extend the activities to ground-based capacity development of citizens. They demonstrated satellite-based mapping for communities in a technical assistance project under the Asian Development Bank to improve community data preparedness.

28.5.4 Outcomes of the Solution

Sentinel Asia is working to make Earth observation satellite data more accessible to nonexperts on satellite remote sensing in disaster response agencies and relief organizations by providing data analysis and information.

28.5.5 Key Technology Specifications

Miyazaki et al. analyzed the systems in which Earth observation data is used for disaster response by phase. In this case study analysis, the

format of the data delivered to the users was also analyzed. Data standardization, such as CEOS (Committee on Earth Observation Satellites) and OGC (Open Geospatial Consortium), has contributed to the smooth process of data reaching the end users after analysis, suggesting integrating disparate information portals. The paper also discusses the need for capacity building to ensure that end users have a proper understanding of the system's operation, while the potential for contribution has been further expanded with the widespread use of smartphones.

Although Earth observation satellite data is mainly for understanding overview of the disaster-affected areas that are not directly relevant to primary health care, the broad-scale information acquired from Earth observation satellites helps coordination with the government and intermediary organization as discussed in the sections above.

Since the main application is to understand the disaster area by comparing the Earth observation satellite data before and after the disaster, it does not lead to the utilization in primary health care, which is the subject of this book. However, the approach presented in this chapter will be necessary to specify how to deliver what information and how to use it.

28.6 Way to Forward

This chapter presented four case studies of ICT and GIS applications in disaster management. The three case studies illustrated challenges of information delivery for decision-making in disasters, especially issues on timeliness. During a crisis period, risk communication and coordination are of utmost importance, far more than advanced technology and techniques. It is effective to coordinate scientific and technical activities among different groups when it is small and known to each other beforehand. This study discusses the work each group is doing, the data that can be shared, and their needs. This way one can avoid duplication of efforts and address needs.

Every group responding to a crisis has its own strengths. Local governments do not have that capacity, but they do need the data for decision-making through a coordinated approach. Similarly, local governments must be prepared to share the data they collect (e.g., road conditions) with the state and other organizations. Thus, effective partnership and transparency in data sharing become important. An important step in preparing for a disaster is to know which data must be shared and which data must be protected within the organization. Some data, even sensitive data, can be shared among government agencies but not outside the government due to privacy issues. It is important to know the boundaries and have a data usage agreement in place that can be used as needed. It is too late to ask the legal department to draft an agreement after a crisis has begun.

Local government bodies need to strengthen their capacity. Science and technology can help towns and cities run more efficiently on a day-to-day basis later on. It is not an advocacy for investing more money in hard infrastructure. Rather, even if money is not available, data collected on everyday aspects such as traffic, public works, public health, etc. can be used to save lives in the crisis situation, and there are ways to be more successful using capabilities that already exist. NGOs and volunteers can provide assistance at any time during the response. It is important to enlist their help in an earlier stage and delegate responsibility for mapping, data collection, etc. There is always someone willing to help at the time of disaster. The nature of voluntarism is also expanding from those who provides physical help after the disaster to specialized civil tech bodies who provide technical help. The partnership can be effective when the data is open and when the local government is sensitive to open governance.

Open governance is still an evolving culture, and available data is an essential tool for that. While there is a trend to make open data for geospatial information, it has emerged from the discussion above; it is necessary to have customized available data for people, well-being, health care,

etc. The transformation process takes time in Japan, possibly the same as many other countries. It needs both legal and technical changes. On the contrary, emerging technologies' evolution and their usage are going at a higher speed than ever. It is essential to properly synchronize and customize open data, open governance, and emerging/disruptive technologies to reduce disaster risk effectively.

The remaining issues are expected to be addressed by the research and development of advanced technologies. At the same time, the readers of this chapter are encouraged to bridge the needs discussed throughout this book to the technology providers.

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Part VI

Way to Forward: Challenges Global Primary Health Care with Local Nursing

Locality and Caring in Uncertainty

29

Sakiko Kanbara and Noriko Katada

29.1 Introduction

A wide variety of intermittent health emergencies threaten health and life in both developed and developing countries, impeding the achievement of SDG 3, which includes "ensuring healthy lives and promoting well-being for all at all ages" (UN 2015).

Health is "a state of complete physical, mental and social well-being, and not merely the absence of disease or infirmity" (WHO 1978), and health is "essential, and a means to human survival, life and dignity" (Human Security Unit 2016). Originally, the health of the people is also essential for social cohesion and stability. Public health is defined as "the science and art of promoting health through the organized efforts and informed choices of societies, organizations, public and private, communities and individuals" (Charles and Amory 1920). On the other hand, Nightingale defines health as "Health is not only to be well but to be able to use every power we have" (McDonald 2004).

The International Council of Nurses' Code of Ethics affirms human rights and the integrity and dignity of all persons and ensures appropriate care for all without discrimination. As the COVID-19 pandemic highlighted nurses' challenges, a new code was released in 2021 (ICN 2021). The charter will address equity, social justice, respect for the natural environment and climate, the impact of challenging unethical behavior, and especially the critical role technology plays. There is a new emphasis on the responsibility and accountability of nurses in terms of maintaining general and professional knowledge and accepting personal responsibility for keeping patients informed of cultural values, needs, and respect concerning digitized communication and artificial intelligence/intercultural work in an ever-changing world.

Understanding human behavior and thinking in a global disaster is vital to understanding the cultural environment. Nursing is concerned with the lives of the target population. There are many different cultures in the world and many ways of living within those cultures. Therefore, the concept of nursing differs according to the life of the subject, as stated in the following:

1. Living environments in times of disaster such as evacuation centers and shelters are under the jurisdiction of national and local governments, and the activities may be restricted.

S. Kanbara (✉)
University of Kochi, Kochi, Japan
e-mail: kanbara@cc.u-kochi.ac.jp

N. Katada
Kansai Medical University, Osaka, Japan

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2. Affected countries have various systems, and it may not be possible to bring in commonsense from one's own country.
3. Systems exist in terms of lifestyle, culture, religion, health service, and formal and informal systems.
4. Levels of health care diverse by region.
5. Affected people are forced to live a life of urgency different from normal times.
6. Never forget that we are outsiders and will eventually leave the scene. Think about how we can continue our activities after we leave.

On social system, when a crisis occurs, people are forced to leave their hometowns and migrate. Each person in the community suffers various economic and social damages, further aggravating the chaotic situation caused by repeated health crises. Mutual aid activities outside the familiar government and support systems will become more active. But community-based management during disasters, the impact of later events, and health problems are often ignored and unreported. The practice of care in disasters and health crises is a collaborative effort. It is preserved as the experiences and perceptions of local people in various media, including local languages and research papers. Even when good practices of community resilience and care activities are discussed, it is difficult to find clues to the issues that need to be resolved simply by collecting memoirs, documents, uniform interviews, and questionnaires by others as in Fig. 29.1.

In addition to personal health care, people familiar with the community will be able to "look out for" and "care for" each other in the language and insights of the community. From the outside, care needs are intangible. Emergency care support is largely informal, unpaid, and burdensome. In health care, frontline health-care providers, including hospitals, homes, and community health nurses, see the situation but do not have the luxury of having a voice in providing rapid health crisis management and care. Limited data sharing among agencies has led to interoperability problems and information gaps. To begin with, vulnerable communities are constantly offline due to rocky Internet connections, lack of access to Internet-enabled devices, and Internet capacity issues. Both offline and online tools are needed. These have resulted in inconsistent data with monitoring and indicators, lack of proper infrastructure, and lack of basic understanding. Disaster nursing activities based on a good understanding of these factors will play a role in global

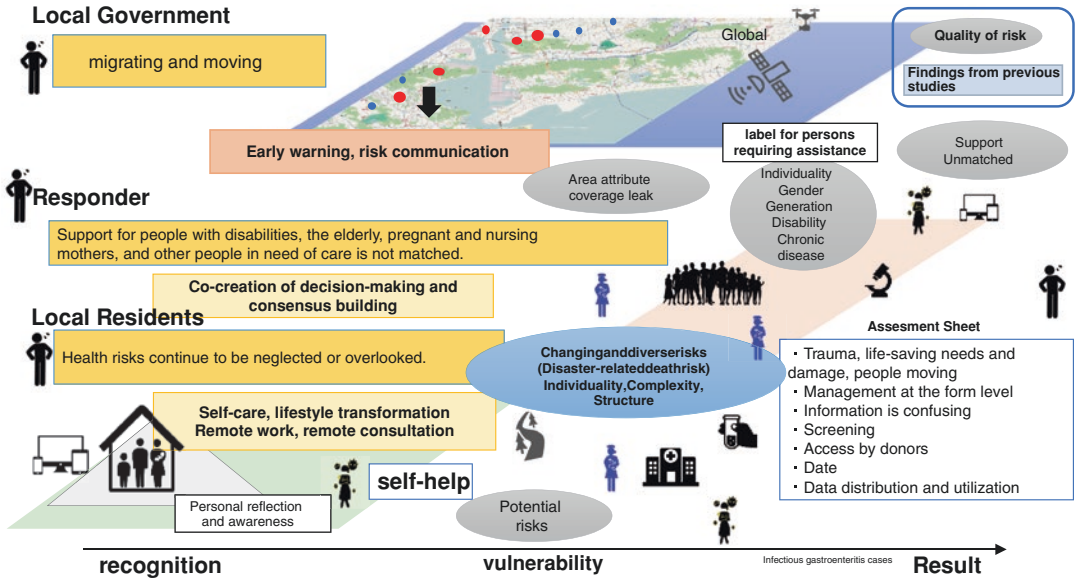

Fig. 29.1 Communication shortfall on disaster health statistics

health. In an uncertain society, there should not be a manual of "what to do." Rather, it should contain things like, "You should be careful about these things." Interpret the meaning of everyday actions and objects. For example, what does it mean to say "A scene of people gathering and talking in the center of the disaster area"? After identifying the time, we need to know the attributes, behaviors, and values. We should examine the meaning of how many patterns of residence there were, the circumstances, and the current situation. Community safety depends on subjective attitudes, and relative disparities, so the assessment may not align with the current situation. For disaster reduction in communities, alternative solutions must be sought. One answer is participatory self-monitoring and care by diverse individuals, which is the technical solution.

29.2 Nursing in the Local Cultural Environment of Disaster

Assessment and monitoring to know the community as a cultural approach begins with the preconceived notion that we cannot be objective or determine insiders or outsiders (Roper and Shapira 2000). In disaster nursing, being aware of this can help clarify one's position. Knowing the burden and impact of the caregiver's presence on the scene will also allow us to adjust our care according to the community's attitude. Bringing in outside supporters is like throwing a stone in the water and making waves. With this understanding, how many things can be researched and practiced immediately? At the disaster scene, we reach out to those who seem to be having the most challenging time, but for others, that person may not be the one who needs it the most. It is up to us to imagine and accept that when we are put in that situation. The first step in disaster medical response is information gathering and disaster health risk assessment. Public health nurses and local government officials are rarely involved in districts and do not have the human resources or time to conduct community assessments during standard times.

The definition of disaster medicine is that the demand for medical care dramatically exceeds the supply of medical care and requires external support (Ciottone et al. 2015). Approval according to this definition can only lead to recovery and reconstruction based on the disaster and its survivors. Since psychological and social damages and measures differ inside and outside the disaster area, there is a gap between supporters and recipients. Neither government nor experts can work together for recovery and reconstruction in cooperation with the community from the beginning. To begin with, people are physically, mentally, and socially isolated in a diversified society that involves migration and mobility. It is difficult to visualize the increasing informal care of women due to health crises in an environment where public services are scarce or inadequate in times of disaster. Policies emphasize support rather than help, and those who have the will and strength to seek help will move to where it is available. It is difficult to understand who is in the community, where they are, and who is taking care of them when a disaster happens. When visualizing social isolation, especially in times of disaster, both nurse researchers and supporters need to enter the community like air and take a community-based approach with practice. The credibility of the methods needs to be clarified. People who have been isolated for a long time need a higher level of attention. It is also essential to know how to do this quickly. Community ties are significant, but what is in the community is not always acceptable. Caregiving has multiple imbalances in the sharing of both burden and demand, both short and long term. Risks before social isolation that may lead to disaster-related deaths are individual needs that change over the medium to long term in the community before evacuation centers and hospitals and that continue to be left unresolved and overlooked in regular times, such as delayed health problems.

People are vulnerable even before a disaster occurs. It is hidden in the "unconsciousness of the individual and awareness" and does not show up in the data. It is triggered and developed by the individual and worsens in social relationships, leading to isolation. Ignoring this, vertical mea-

sures by disaster prevention, disease, and health crisis issues will force communities and people to take various actions. To prevent health hazards, appropriate physical, mental, and social care are essential along with developmentally appropriate personal health care, but physical attention and concern are hard to come by.

It is the essence of nursing, and its definition is diverse. In addition, the roles of nursing care and nursing activities in disaster situations vary from country to country and region to region. We have provided examples of good practices that are discussed in various parts of this book. These are examples of emergency responses by nurses, which were made possible through the cooperation of hospitals and public health nurses. And we found that the changing expectations of nurses in the health sector after disaster preparedness, safety, well-being for renewal, and community participation and empowerment are considered essential. Formal health policies and primary nursing education are critical to providing a seamless experience of such care activities and developing the capacity to identify high-risk and vulnerable populations, including their unique needs in different social settings. Effective leadership is needed to manage improvements for revitalization. This requires an in-depth knowledge of culture and how human behavior places individuals in vulnerable situations in a changing social context.

29.3 Urbanization and Caring

Urbanization and urban lifestyles associated with economic growth have created economic poverty, time poverty, and health disparities. For women, the fact that informal care is not valued is a matter of course. Various intermittent health crises threaten their health and living conditions, leading to further vulnerability, and have become an important global issue, as stated in the Sustainable Development Goals (SDGs). If we focus too much on care, we miss the opportunity to relearn skills such as self-care and mobility. As a result, they may lose focus on their proper health and lose opportunities to resume healthy complex lifestyles and escape from environments often trapped by social and cultural norms. Each community and family background and value system is different and impacts disaster-related deaths and health hazards. Demographic changes and crises have led to an abysmal decline in the social health of children and their parents. At the same time, communities cannot be expected to function as mutual support systems.

The assumption that self-reliance in living, including sobriety, is a goal that should be universally valued is only a stereotype. Self-care, or independent living itself, is not a universal aspiration. People in Asian cultures do not interpret "dependence" and "independence" in the same way as people in Western cultures and place great value on "interdependence" (Vignoles et al. 2016). Similarly, in Arabic culture and many countries in the southern hemisphere, interventions that focus on independence rather than interdependence are considered of questionable relevance and value (Wirz and Hartley 1999). Although dependency is denigrated in the West, in cultures with a tradition of mutual support and obligation, people in seemingly dependent positions need not be devalued. When it comes to physical independence, some studies show that supporters prioritize the ability to live without assistance, while people instead emphasize the ability to make autonomous decisions to take control of their lives. Reindal (1999) states that interdependence is "an essential feature of the human condition." Children depend on others for survival and are expected to become independent over time. Wehmeyer and Schwartz (1998) observes that "this is a movement from dependence to interdependence, not from dependence to absolute control." Independence has been ideologically constructed as the "norm." We all depend on others to a greater or lesser extent. Compassion and dependence are not dichotomies but a continuum.

Once we understand that all people are interdependent, we can no longer artificially compartmentalize everyday needs of supporters and recipients. This may enable us to recognize the

context of care and the reality of interdependence and intervene and support those involved in any network of care.

29.4 The Need and Significance of Establishing "Locally Developed Care"

There is a need for community-centered nurses who can address the health needs of local cultures in various specialties. In various fields of specialization, it is necessary to conduct education, research, and advanced practice activities based on the philosophy of community-centered nursing that can respond to the health needs of the indigenous cultures of local communities (Bekemeier et al. 2021). In various fields of specialization, it is necessary to conduct education, research, and advanced practice activities based on the philosophy of community-creative nursing that can respond to the health needs of the community's unique culture. In Japan, after 2020, "community development nursing science," which aims to work with residents to address health issues unique to each region, is being advocated (Science Council of Japan 2020). Therefore, to build a community where everyone can continue to live, the efforts will become practical research, and new knowledge will be obtained. The results of this research are unique to each "local." At the same time, they are also a methodology for "regional development" that "regions" in Japan and abroad can refer to. In particular, the idea of considering the solution of issues specific to each "region" in units of "locality" and the method of "local development" within that scope can be generalized in the sense of commonality. People who have lived in a local area for many years, including children, know it best and have the power to "care" in their own words in times of disaster. Their local disaster experience can be used in other disaster areas, but they are not in the disaster area and do not know the disaster area. Whether they know the area, have traveled there, or live there makes a big difference in the speed and quality. Both citizens and government need to support people to be concerned about their own "living needs" and "health risks," to create a "resilient" environment that is "fair," and to share information so that the community has available technology and a shared understanding of the problem. In today's societies, it is necessary to provide the detailed information required for health and well-being within the context of the community's unique culture and environment. Today's communities require a clear understanding of people's health and lifestyle needs in the unique culture and environment of the community and appropriate responses to these needs to solve problems. In addition to the education, research, and practice activities that have been carried out to date, the Institute of Nursing Research is required to establish an organization and system to develop education, research, and practice activities that boldly focus on the community's needs. They should learn and grow in leadership through such efforts to lead the nursing science in the community. The Network for Human and Cultural Exchange will serve as a medium for disseminating information and exchanging opinions on various activities and learning opportunities related to the nursing science of local creation. In addition, the base of local development nursing activities should be located within the university and in the local community, and open governance should be established.

In addition to students' participation in local life, culture, and economic activities as part of their studies and extracurricular activities, there is a need for a "place" as platform that can serve as the basis for various initiatives that allow residents to learn and interact through participation in university activities. The types and scale of these activities are diverse, with each local community and university accumulating know-how and knowledge through trial and error. Under these circumstances, it is essential to learn from each other's examples and collect knowledge domestically and globally.

29.5 Changes in Communication Through Emerging Technology

In COVID-19, the world experienced that a disconnected environment is essential not only for online support to help people lead peaceful lives while protecting their human rights but also for offline life support such as talking with and watching over people in the community. When a crisis occurs, people are forced to migrate away from their homelands, and mutual aid activities outside the familiar government and support systems become more active. On the other hand, from an external perspective, care needs are intangible, pre-disaster information is (useless) due to mobility, infrastructure including IT is uncertain, personal data is difficult to access, duplication of information is discriminatory, literacy of information providers varies, and reliability and validity of information, the timing of receiving information, and vulnerable populations are overlooked. It eased due to the nature of the information, the timing of receiving the data, and the changing needs of the affected communities. There are diverse issues such as vulnerable people being overlooked and lack of accountability even when improvements are made.

The information literacy gap that has opened should not be overlooked. Poor data consistency with monitoring and indicators in the first place, lack of proper infrastructure, and lack of basic understanding are all reasons why technology-based public services can be organized to improve the quality of life for the general public. Platforms are used differently by different groups of individuals. Internet-based platforms present several challenges. Vulnerable communities are constantly offline due to Internet connectivity in rocky areas, lack of access to Internet-enabled devices, and Internet capacity challenges. To solve this problem, both offline and online tools are needed. We also need to highlight the isolated people in the digital world, such as children, who did not have broadband or devices.

In an environment where people have experienced self-isolation and restraint and have been kept at a distance from others, ethical perspectives such as people's dignity and autonomy have been ignored. It has become clear that comprehensive care support is essential to preserve people's peace and dignity. In the future, much will be lost if the preventive health-care technologies needed in the community do not allow people to expand their capabilities. In addition, evidence-based practices alone, such as countermeasures against infectious diseases in hospital medicine, will not be enough to protect the population's overall health. It is now understood around the world that social and environmental forces limit the effectiveness of treatments.

Therefore, exploring alternative possibilities for human care through health monitoring from IoT and PLR should provide an opportunity to improve psychological and social health by caring for people, rather than logistically through treatment. Information and communication technologies (ICTs) can also offer opportunities for more thorough and consistent documentation of decisions made in health-care settings, improved continuity of care, and more effective communication between organizations and departments. In other words, it should be developed for the personalities of people around the world, rather than catering to the vulnerable groups that exist within the stereotypes of government.

Research and development are underway to develop the infrastructure for the use of technology and the information infrastructure to enable the everyday use of diverse data. Based on lessons learned in the past and knowledge gained in the field, nurses, lawyers, and livelihood support workers have been involved in the area for a long time. Individuals, families, and communities have been trying to solve problems through volunteer activities for self-help and mutual aid. There is also a movement toward networking, which enables residents to solve problems through grassroots activities using technology, delivering the voices of those who cannot speak up and connecting them to the broader society. Health crisis management in highly uncertain communities requires comprehensive knowledge and practice of individual self-care and social innovation through communication that changes people's values and behavior patterns.

29.6 Way to Forward

It is vital for care for DRR to be connected to the SDGs that the world is currently working toward. Local nurses play a significant role in building a healthy, safe, and sustainable society. Nurses have been involved in various activities, including care at the community level based on the awareness and understanding of the local people, rather than on their specialized knowledge of diseases and health crises. Nurses can be involved in all parts of the health-care system and be needed leaders in their communities. Various organizations involved in people's health and daily lives, such as insurers, businesses, corporations, medical institutions, mass media, and NPOs, will utilize their respective strengths to develop new business models implemented by national and local governments. Various organizations involved in people's health and daily lives, such as insurance companies, corporations, medical institutions, mass media, NPOs, etc., will utilize their respective strengths to collaborate with the national government and local governments. It is not a one-time initiative, but a medium- to long-term effort for "regional development." It is necessary to participate in "regional development" over the medium and long term. Industrial organizations need to propose practical strategies for developing new business models and branding for regional development and contribute to enhancing the region's competitiveness. Nursing should contribute to these developments through open research and education.

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30 Care for Disaster Risk Reduction and Communication: Lessons Learned and Way to Forward

Sakiko Kanbara, Shoko Miyagawa, and Hiroyuki Miyazaki

30.1 Introduction of Disaster Nursing for SDG3 and Primary Health Care

We have contributed to the mutual support of the community, not within the framework of medical care or disaster prevention to health and well-being directly contributed to SDG 3. Through the care of local nurses who can flexibly respond to any disaster, we have been visualizing the care and communication for disaster risk reduction while using new technologies. The local nurse is a knowledge base that exists continuously in the community and is most concerned with the health, safety, and security of the people in the society. It is expected to play a coordinating role in local health crises from the long-term and holistic perspective forward. "Target 3.d strengthen the capacity of all countries, in particular developing countries." Therefore, it is critical to update the knowledge about "early warning, risk reduction, and management of national and global health risks." Its social context and commitment to a sustainable future need to be revised and updated periodically to keep pace with new technologies and developments. Mutual support involving community-based organizations, private nonprofit organizations, private companies, educational and research institutions, and academic institutions is also essential. Broadening the space for action and allowing for more dialogue were also required to enable each institution to coordinate its response as appropriate. Thinking within a diverse global agenda frameworks allows for a multilateral and multisectoral approach to realizing the SDGs. This book would show a comprehensive "big blueprint" for global citizen to understand. "No one's health and well-being will be left behind" through disaster nursing and disaster risk reduction with emerging communication and data.

30.1.1 Part 1: Global Health and Care for Disaster Risk Reduction

Experience has shown that disaster relief does not reach poor people in geographically remote areas. Medical services are inadequate, and we have experienced that lack of medical services leads to secondary deaths from nonviolent causes. Not recorded deaths are not examined for prevention methods and are not used as lessons for subsequent years. As we strive to achieve health and

S. Kanbara (✉)
University of Kochi, Kochi, Japan
e-mail: kanbara@cc.u-kochi.ac.jp

S. Miyagawa
Keio University, Kanagawa, Japan

H. Miyazaki
University of Tokyo, Tokyo, Japan

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well-being for all, including the realization of the Universal Health Coverage (SDG 3.8), we thought it necessary to consider this in conjunction with some aspects of human security to explain the linkage with our obscured proactive risk reduction including care and community commitment. Given that the Commission on Human Security defines human security as "the protection of the vital core of all human life from serious and pervasive threats in ways that lead to long-term fulfillment," nursing has something to do with the core of human security, "freedom to survive," and "freedom from preventable death." It can also be thought of as freedom from the possibility of extinction. Based on the principles of human security, even before we consider the prevention from disasters and diseases, we can say "equitable and universal access to safe drinking water and sanitation (SDG 6), sufficient, safe, affordable, and nutritious food (SDG 2), safe, resilient, and sustainable habitats (SDG 11), affordable, reliable, and sustainable energy (SDG 7), poverty (SDG 1), hunger (SDG 2), quality education (SDG 4), and gender equality (SDG 2), safe, resilient, and sustainable habitats (SDG 11), universal access to affordable, reliable, and sustainable energy (SDG 7), a world without fear and violence (SDG 16), and social protection (SDG 10)" are essential. Using SDGs to analyze the nature of health problems during disasters, we found that the root causes existed before the health disaster and became apparent during the disaster and no data visualize it. Therefore, we had to consider the essence of its security and what health care is for. The operation of global agenda involves top-down norms, processes, and institutions such as the rule of law, good governance, accountability, and the establishment of social protection measures. In this context, it was constructive to see the introduction of a hybrid approach that combines a bottom-up-like promotion of open data and open governance to play a vital role in implementing their sustainable development.

Chapter 1, Disaster Nursing in the Community, is based on the remarks made at symposiums and notes of daily discussions by Professor Hiroko Minami, who founded the Japan Society of Disaster Nursing, served as the head of the International Association of Nurse Practitioners, and has been a leader in disaster nursing around the world. The Great Hanshin-Awaji Earthquake in 1995 was the beginning of research and education in disaster nursing. Since then, after the changes in Japanese society and the Great East Japan Earthquake, global agendas such as SDGs and SFDRR were adopted in 2015. In response, COVID-19 expanded in a variety of activities and research. As nursing science develops and the expertise of each field deepens, a new paradigm for nursing science across disciplines based on the experience of COVID-19 is required. It states that there is an urgent need to visualize the role of nurses in concrete target of sustainable development and that the nursing profession must once again become an innovative force for sustainable development, preventing the spread of disease in the world.

Chapter 2, "Disasters as a Global Health Issue," discusses the need to understand disasters and exposure to social and environmental risks in an integrated manner with vulnerability and to understand the SDGs and health from the mainstream of disaster management. It is essential to build a resilient society that can continuously move toward better recovery and reconstruction. Public health and disaster risk reduction are linked in the global risk landscape. The importance of disaster nursing and providing care services to people and communities is at the core of public health issues. Risk-informed decision-making is essential, based on the concept of "living with uncertainty." For a futuristic and resilient world, what is needed in the future are as follows: (1) interdisciplinarity, (2) knowledge society on Society 5.0, (3) open science and open data, (4) grassroots/process innovation and citizen science, (5) youth leadership, and (6) scientific entrepreneurship are the new evolutionary areas. From experienced nurses, community knowledge, and backcasting for sustainability, community work using disaster nursing to change the society in a global context was proposed.

Chapter 3, entitled "Health and Environment Surrounding Disaster Nursing," focuses on the SDGs and the disaster risks and social and envi-

ronmental factors that impede them. The job descriptions of nurses around the world reflect the health, political, and economic conditions of the country and the region and have regional characteristics. As societies change rapidly, we must understand the changing health crisis in the world and look after the health of our people. In this context, disaster risk needs to bed together with the social determinants of health that manifest as vulnerability as a threat to human security. Public health and DRR need to focus on critical services to improve health status as the same human security issue.

Chapter 4 introduced the basics of care for disaster reduction. Nursing is an integration of "care" and "cure." Disaster nursing differs from everyday nursing in that nurses have special needs during a disaster in a nonhospital setting. This idea has been derived from the basic nursing perspectives that have been provided to disaster victims in the affected areas, including securing water, food, clean bandages, and bedding and providing basic nursing care without treatment in shelter relief as needed. Regular monitoring of shelters, identification of high-risk and vulnerable populations, addressing sensitive issues such as abnormal sexual behavior and violence, and how practical information including gender issues, culture, and lifestyle should be accountable required the proper use of ICTs and traditional care techniques. The use of ICTs was necessary. It was necessary to continue to think about how communication could be achieved in this changing social context, environmental systems, and local people's perceptions of technology.

30.1.2 Part 2: Contribution of Nursing Care for Disaster Risk Reduction

How nursing has responded to natural disasters such as floods, earthquakes, tsunamis, and disasters associated with human activities is the subject of numerous articles on disaster nursing. In the chaos, local nurses were only expected to work with outside relief workers to give their best to the people in front of them to ensure sustainable health care. The local nurses on the front line with the affected people provided the best possible care on the spot. In many cases, the nurses from the base disaster hospitals in charge of the emergency response phase stayed in the evacuation centers for the medium to long term. They started disaster prevention activities based on the lessons learned. There were diverse skill gaps among professionals in the health-care field due to the different aspects of the disaster area each time. As a community resilience, it was necessary to focus on ways to ensure the community's health to radically reduce disaster-related deaths. In disaster health management, it was essential to meet basic needs such as "water, food, living conditions, and health maintenance," considering mobility and vulnerability to make effective decisions and policy recommendations. For this purpose, it was essential to cultivate basic nursing theories starting from Nightingale. Rather than community management, it is about caring for people in their daily lives. In other words, the relationship between people is the mainstay of nursing. It is only through the mutual relationship between the caregiver and the cared-for that both parties can grow, the so-called total effort. People needed to know the risks they might face due to the disaster and their actions to protect their lives, livelihoods, and health. Psychological and physical support was necessary, but information sharing, consensus building, and accountability to avoid risks were considered the most ecological systems that could reduce the burden on each. It was also considered essential that nurses living in the disaster area who know the area well, rather than emergency nurses dispatched from outside the disaster area, serve as re-instructors and informants of the resilience that has supported the community since before the disaster. It was thought that systematic and preventive implementation of disaster nursing would help achieve long-term stability and ensure sustainability of programs and policies. Inevitably, the nursing profession requires a sense of solidarity as global citizens, respect for human rights and human security as universal values, and recognition of cultural plu-

ralism that requires diverse orientations, efforts, and cooperation.

Chapter 5, Disaster Health in Shelter and Community, focuses on reviewing articles on disaster health issues in shelters and communities in Japan. Studies often focus on "how health-care providers identify the needs of evacuees" rather than the question, "what is the quality care provided in disaster shelters?" Disease prevention, such as oral care, DVT, nutrition, and mental health, is important, but the delivery of services in DS and the systems for maintaining evacuees' health were not discussed. There is a need for health coverage that focuses on a holistic approach to monitoring and maintaining the continuum of care that is needed during disasters.

Chapter 6, Research on Disaster Nursing (1995–2015), describes the progress and trends in disaster nursing research since the Great Hanshin-Awaji Earthquake and during the Great East Japan Earthquake. This topic is particularly relevant in today's scenario where disaster nursing is continuously evolving. Many studies describing disaster response experience lack an overarching and multifaceted perspective. Many studies have overlooked the contributions and experiences of nurses in disaster relief and prevention activities. It is not enough to repair and reconstruct the damaged sites and compile data on their thoughts and experiences. Given the broad scope and expertise of nurses worldwide who are involved in complex health situations during disasters (from pre-planning to recovery), we need to leverage their multifaceted perspectives on what nurses need to know and how to apply that knowledge. It is necessary for nurses and researchers to share the concept of disaster nursing and disseminate research from the nurses' perspective to the rest of the world.

Chapter 7 describes how nurses have faced disasters in Japan, Indonesia, China, the Philippines, Nepal, and other countries since the Great Hanshin-Awaji Earthquake in 1995, how they want to apply the lessons learned to the next disaster, how they have developed as disaster nursing, and how they are connected to nursing in those countries introduced. It also explains how these lessons are being used in practice.

Chapter 8, "The Sendai Framework, Bangkok Principles, and the Role of Nurses," discusses the Sendai Framework from the perspective of disaster nursing and how it should be pursued in the health field. In 2016, a year after the adoption of the Sendai Framework, the Bangkok Principles for the Implementation of the Health Aspects of the Sendai Framework (2016) were compiled by experts in the health field. The Japan Society of Disaster Nursing proposed commitments for disaster nursing in each field. It describes the necessary actions for disaster nursing, a human-centered framework that considers comprehensive primary health care with universal health coverage.

In Chap. 9, the competencies for disaster nursing developed by the International Council of Nurses (ICN) are used to describe the aspects of capacity building to address current global issues related to sustainable development. The competencies for disaster nursing have been developed and revised through disaster nursing education in primary and in-service education in Japan. It was stated that these competencies need to be applied and understood by other stakeholders as well.

In Chap. 10, instructional design of care for DRR is described. Instructional design (ID) for disaster nursing provides a systematic approach to developing effective, efficient, and motivating educational programs. ID theory is the know-how for effective implementation of training and needs to be structured and streamlined in a series of prescribed processes. Specifically, the objectives of an education or training program must be clarified, what must be accomplished for the program to be "effective" must be organized, and then the most effective and motivating methods must be selected, implemented, and evaluated. It is also necessary to consider the characteristics of the learners, the education and training environment, and the available resources.

Chapter 11, Expectations for Disaster Nursing Research, discussed what knowledge is needed to understand the human being in existence based on pragmatics to design and develop human-centered nursing research for disaster risk reduc-

tion. In disaster nursing, it is sometimes necessary to scrutinize the research considering its impact on the field. It is important to research with an awareness of the community's behavior during a disaster that may affect the elucidation of the problems of the disaster phenomenon. For this purpose, both qualitative and quantitative studies are essential. On the other hand, it is often impossible to follow a typical research process in times of disaster due to time, people, cost, and ethics. There is an urgent need to actively engage in innovative methods of elucidation using new information technologies that are not bound by conventional research methods.

30.1.3 Part 3: Fostering Care in Sustainable Communities

The third part focuses on communities and discusses the capacities required of local communities as potential disaster areas, the establishment of supporting communities, and the importance of collaboration between local communities and supporting communities. Building local capacity and focusing on empowerment measures are fundamental to promoting human security. The participation of community members and local counterparts in project activities and implementation provides an excellent opportunity to build local capacities and develop new ones. And participation needs to be mainstreamed. Careful planning needs to be integrated, emphasizing strategies and activities based on community capacities and resources. Community-based organizations are important players in disaster management in their communities. Many local disaster relief organizations have been established and continue to provide support. The fact that a community has a high level of cohesive social capital can be a powerful driving force to promote mutual assistance within the community during a disaster and help the community move toward self-sustaining recovery. On the other hand, when it is difficult to respond to a disaster with only resources within the community, bridging social capital is also expected to function to smoothly accept and utilize diverse supports from outside. In the case of supporters, if each organization conducts support activities individually, it will increase the cost of communication for disaster victims and cause bias and duplication of support to conduct health risk management as UHC, a platform by public organizations that is necessary.

Chapter 12 describes the roles, competencies, and preparations required of the nursing profession to explain what role they are expected to play in protecting the health of people in the community during disasters. From the case of the 2016 Kumamoto Earthquake, in which disaster-related deaths were four times higher than direct deaths, it was pointed out that people with high health risks and requiring continuous medical care and treatment cannot live in evacuation centers with inadequate environments and that health policies for welfare shelters, social welfare facilities, and home evacuees lag those for evacuation centers. In addition, it was suggested that risk communication and policies to prevent disaster-related deaths should include (1) making evacuation shelters a comfortable environment for people with high health risks, (2) collaboration between community health nurses and external supporters who know individual needs, and (3) development of risk assessment tools for disaster-related deaths and establishment of a follow-up system. A risk assessment tool for disaster-related deaths and a follow-up system were proposed.

In Chap. 13, the basic principles of primary health care and the need for this in local communities were described. Primary health care (PHC) is a society-wide approach to health and well-being that focuses on the needs and preferences of individuals, families, and communities. Through the autonomy of the local community, health, social independence, and enriching and productive activities can be obtained. Case studies from Indonesia and Japan were presented to explore the potential application of PHC in community disaster management. Local care providers, who are often women and mostly volunteers, have diverse perspectives on community risk and potential for new disaster risk reduction.

Chapter 14 looks at disaster response from a broader perspective and discusses how nonmedi-

cal private supporters are involved in disaster response and how they should collaborate. Private supporters can be broadly categorized as citizen volunteers, disaster relief organizations, and intermediary support groups. From the perspective of health risk management, it is essential for citizen volunteers and disaster relief organizations to be aware of people's health risks and to communicate health needs discovered promptly, but these efforts are still insufficient. It is suggested that one approach to solving this problem is for medical supporters to join in the coordination of support provided by intermediary support groups.

Chapter 15 discusses medical teams' roles, systems, and tools in Japan's disaster response. It introduces Japan's disaster medical response teams: DMAT, DPAT, JRAT, JDA-DAT, and DHEAT. It also describes the ICT systems used by these teams for information sharing, such as E-MIS and J-SPEED and ISUT, a team that supports information sharing. On the other hand, as pointed out in Chap. 14, information coordination among organizations is still insufficient. It was shown that it is desirable to unify the information format among teams and develop a system for information sharing to realize smooth collaboration.

Chapter 16 explains the importance of the community resilience approach in health support during disasters. To respond to a crisis, trust between the supporters and the people to be supported needs to be established immediately. It requires an approach that understands the culture of the community. Health professionals in the community, such as nurses and public health nurses, are aware of this community culture and the health risks inherent in the community. Their knowledge needs to be effectively utilized. Through case studies from Japan and Israel, this chapter describes the potential contribution of nurses in times of crisis, the link between nurses and community resilience in emergencies, and the critical importance of these measures for the realization of UHC.

Chapter 17 examines area capacity and disaster resilience, including the natural environment. Two case studies, one from Japan and the other from Indonesia, suggest that caring for the environment by residents can promote the increase of natural resources. The use of these resources can strengthen local communities and improve their response to disasters.

Chapter 18 presents the story of disaster nursing adopted by countries in the COVID-19 response.

Initially, it seemed difficult due to the uncertainty at each site and position, but they were able to engage in activities as much as possible within the nursing of their respective countries. On the other hand, primary health-care activities to ensure health and welfare were actively carried out by NGOs in the communities, as they should work where they live. However, there was a possibility that the government and the community did not recognize their role and authority to manage the health-care team and work in the community. The experience of such bottom-up prevention activities is one of the strongest steppingstones for global sustainability and should be re-recognized as a methodology to maintain health security to address SDG 3.

30.1.4 Part 4: Assessing Care for Disaster Risk Reduction

Part 4 discusses specific ways to gather the information needed to protect people's health during a disaster. Disasters are, of course, emergencies, and protecting people's lives and livelihoods is of paramount importance. However, it is difficult to provide an optimal health risk response simply by responding to what is happening on the spot. To respond effectively and efficiently to health risks with limited resources, it is necessary to collect data quickly and make decisions based on that data. These data can also serve as basic information for future retrospective evaluation of the implemented disaster response and long-term disaster response planning. While quantitative evaluation is emphasized in disaster management worldwide, visualizing the needs and contributions of activities is a challenge. Especially in the field of disaster reduction in Japan, the use of open data such as local statistics, original sur-

veys, and aid records has been rapidly expanding since 2015.

In times of disaster, the focus must be on sharing information, understanding, decision-making, responsibility, resources, and mutual support within and beyond communities to strengthen social capital. This is evolving in multicultural societies and within the bonds of affected communities.

Language, such as high-context communication, is essential to a preventive approach to care. In the chaos of a disaster site, it may be best to convey meaning through the implicit context of social conventions, silence, nuance, and native tone of voice. To visualize appropriate environmental data, use that data to address disaster-related health issues, and process and publish miscellaneous information, it is necessary to work with native implicit and explicit communicators and decision-makers.

The three approaches introduced in this part—epidemiological, anthropological, and time-series process analysis—are not contradictory and should be used in complementary ways. The case study of EpiNurse's activities in the Nepal earthquake presented in Chap. 22 shows how they planned for the local cultural background and social networks and used ICT to speed up epidemiological surveillance. While this part focuses mainly on post-disaster data collection, Part 5 also discusses data collection during normal times to know health risks in advance and prepare appropriately (Chap. 24).

Chapter 19 discusses the epidemiological approach to disaster management. It points out that the epidemiological approach is convenient not only in disease control during peacetime but also in disaster nursing and that (1) collecting information, (2) intervening with people based on scientific evidence, and (3) evaluating the results are essential for accumulating knowledge on disaster response and refining preparations for the next disaster. It also points out that the important thing in the epidemiological approach to disasters is using the information for the purpose, rather than acquiring and analyzing it. The epidemiological process to disasters requires continuous information management to support decision-making in ever-changing situations.

Chapter 20 discusses the importance of qualitative approaches to investigating health in disaster. At first glance, this argument may seem contradictory to Chap. 19, but it is two sides of the same coin. In other words, to rapidly collect epidemiological data on a community in an emergency such as a disaster, one must have information on the demographic characteristics of the community, human networks, and the way people make decisions. Such information is also needed to interpret epidemiological data obtained as numerical values. Thus, the anthropological approach is also essential for a better epidemiological system.

Chapter 21 discusses a method for analyzing disaster response from a time-series perspective. It is crucial to respond to what is happening now and anticipate what will happen in the future in disaster response. It is necessary to visualize what should be done in disaster response. In addition, it is crucial to understand the outcomes and the process of what happened. For this purpose, it is essential to visualize the events that occurred in the disaster response. From this perspective, this chapter clarifies that the disaster process management system BOSS can be used to create a chronological response plan through process analysis. Monitoring can be used to track the chronological evaluation through the experience of the workshop. Through the knowledge of the workshop, it is made clear that a chronological response plan can be created through process analysis using BOSS and that chronological evaluation can be tracked through monitoring.

Chapter 22 discusses and analyzes the EpiNurse activities in Nepal as a case study of the various methods described in Part 4 so far. This chapter has shown that the ICT-based surveillance conducted by EpiNurse during the 2015 Nepal earthquake can bring suggestions to the Nepalese government for better reconstruction through the collaboration of researchers from Nepal and Japan. This activity mentioned an urgent need to apply geospatial technology to model people's behavior during disasters. Social networks can be used as a means for the govern-

ment to monitor people's health and safety levels during disasters. It also pointed out the importance of cross-regional preparedness for comparative decision-making for rapid disaster response.

30.1.5 Part 5: Decision-Making for People-Centered H-EDRM

Efforts on risk communication and policy are needed. Considering the long-term consequences of disasters is essential for sustainable health and well-being. Risk transfer and financial responses are not always sustainable means. Aligning financing for resilience with funding for health in government development plans can support more excellent investment. To this end, robust information tools and long-term monitoring help a disaster nursing approach to effective targeting and monitoring. Infrastructure for people's records and epidemiological monitoring must be robust and have built-in redundancy to cope with shocks and stresses. Scientific evidence is essential for informed decision-making during implementation. Lack of useful, usable, and accessible information can lead to ad hoc and inefficient measures. While diverse actors in health-care and medical institutions contribute to improving society's resilience, there is a danger that the management of disaster response will become more complex and inadequate. The cascading effects of inefficient practices magnify the difficulty and value of providing health care during disasters and emergencies. Identifying and addressing potential weaknesses in the complex services, supplies, and infrastructure chain are essential. The challenge is to build a coordinated disaster response function with information management at its core.

In Chap. 23, disaster preparedness required in the VUCA world was discussed. Conventional disaster preparedness includes setting procedures for specific disasters, but this method has limitations in preparing for unpredictable disasters in the VUCA world. This chapter will discuss the idea that everyone is exposed to disaster risks due to systemic risks embodied in COVID-19. Moreover, that everyone should prepare for all risks using a risk-based approach in addition to an event-based approach. The revised Disaster Countermeasures Basic Act has been implemented as an example in Japan. In Japan, this has been implemented by revising the Disaster Countermeasures Basic Act. Many ICT applications have been practiced under disaster conditions and have contributed to promoting evidence-based decision-making. However, if the communication network is cut off due to a disaster, it will be completely useless. The risk-based approach with recognizing systematic risk by CRT is helpful for such problems. In addition, the need for a system to understand everyone's situation, including PLR, which is the basic background information for a risk-based approach, was presented.

Chapter 24 analyzed the efforts to collect and manage personal health records in Japan, especially the establishment and operation of J-SPEED and EMIS, and extended them to information necessary after a disaster, precisely medical care needs, and living environment information records. Although collecting and managing this information may seem extremely difficult, individual efforts are already made in Japan. Nevertheless, the lack of PLR operation and utilization in the post-disaster period indicates that there are still issues in coordinating this information and data. In response to this, this chapter presents the concept of data portability, which suggests that personal data should be made available to individuals and their supporters for service utilization and recommends a system design that EpiNurse explored.

Chapter 25 begins with essential background on data, databases, and data standards for using data for primary health care in disasters. It then shows how these technologies can be visualized for disaster data management and utilization by analyzing actual cases. The participatory information platform, eBayanihan, supported spatial decision-making by visualizing information on infectious diseases transmitted through social media such as Twitter. Furthermore, analysis of SHEREPO, which was implemented as an information platform

for shelter needs, showed the potential to strengthen the coordination of humanitarian assistance. In addition, the resources required to realize the operation of these platforms were classified into data acquisition, analysis, and visualization layers, and analysis examples were presented.

In Chap. 26, we learned about the history of geographical science in epidemiology and the essential functions of data acquisition, data analysis and visualization, and data management and sharing, followed by applications in practice. The chapter helps understand the broad extent of expertise required for applications of GIS and potentials as well. Although GIS takes an essential role in information delivery for decision-making, the components need designs satisfying users' requirements, consistently the processes among acquisition, analysis, visualization, management, and sharing. The issue is handed over to the next chapter.

Chapter 27 outlined the ways of initiating data systems for disaster risk reduction comprising data acquisition, data analysis, and data visualization. The process comprises a user-oriented process, including scoping problem domains, identifying stakeholders and valuable information, and specifying technical requirements of data for the information in spatial resolution and temporal frequency, the major specification requirements for selecting technologies and techniques. The chapter helps integrate the technology components into a user-oriented system, specifically important for primary health care, in which the stakeholders are usually not GIS experts.

Chapter 28 presents a case study that analyzes the problem, stakeholders, data and information needs, and technical requirements, with a focus on spatial resolution and time frequency. The case studies reviewed the actual activities of EpiNurse and other volunteers who support local care providers during disasters. The research model was developed and refined to dramatically improve case-by-case identification and understanding of disaster lessons learned, especially using photos and videos to report the situation. An open data format necessary for disaster care was also made available. The results of the analysis show example of successful balanced designs in the limited context of disaster response and also initiate a discussion of the remaining challenges for future development.

To answer the following bottlenecks discussed so far, Chap. 29 is based on a discussion with Dr. Noriko Katada, a world leader in nursing science, on how the disaster nursing approach should contribute to solving real and specific problems. Currently, disaster nursing in Japan is focused on meeting the needs of society, and the role of nurses is expanding from basic health care in hospitals to activities in the community. With the increasing need for disaster relief and preparedness, there is a need to discuss the lack of educational institutions, lack of knowledge and skills, and ethical issues in disaster nursing research. There is also a need for practical application of the technology, funds and human resources to commercialize it, and legal and financial support mechanisms to make it happen. We should advocate for local governments to have solid local capacity. Instead of simply advocating for more funding for complex infrastructure, data collected on everyday aspects such as public health can be used to save lives in times of crisis. The way to solve the problem using the care capabilities that people already have in existence is appropriate technology.

30.1.6 The Way of Disatster Nursing Communication in Uncertanity

Looking at the future of technological innovation and citizenship from the lessons learned from various disasters, we see the need for systems that allow people to collaborate and make decisions about their care. Exploring alternative possibilities for human care from IoT and PLR through health monitoring is an opportunity for all people to gain psychological and social health and well-being through human care rather than logical treatment through therapy.

"Health" is one of the basic rights that people expect in today's networked and globalized

world, but each disaster case shows a very different reality. Nurses in the affected areas needed customized communication tools to meet the specific pre- and post-disaster needs of disadvantaged populations.

We have led the world in clarifying disaster nursing research, emphasizing practice reporting, systematizing disaster nursing, and training professional nurses and global leaders. During our activities, our consideration of "individuality" with social, environmental, and cultural situation other than "health in diversity" has been appreciated and led to the subsequent review of health management and post-disaster support. Currently, the Japan Society of Disaster Nursing is promoting the development of "local nurses for DRR" who can be involved in the activities of local disaster prevention departments at standard times (SDG 3.d). We are working on research and development of interdisciplinary health management with adoptive technology (SDG 9.1) by residents that can flexibly respond to any type of disaster and contribute to mutual aid in the community. In the future, we need to develop this system according to the individuality and well-being of people all over the world rather than grouping and guaranteeing the vulnerable people who exist within the stereotypes of government (SDGs 1, 3, 10, and 16).

To make humane decisions, we also need leaders who have a bird's-eye view and can make decisions based on diverse opinions. If we are to solve local problems, we must now seek ways to effectively utilize local resources, involve and cooperate with residents, integrate multiple disciplines, and use appropriate technology to meet the needs of residents, based on the concept of primary health care, with the participation of diverse people and transparent communication. In this way, we will be able to improve the health, well-being, and quality of life of our people. On top of that, it is necessary to build a collaborative system that connects various experts, specialized organizations, support groups, and support companies that can provide advice and cooperation on multiple issues and peripheral areas related to health, medical care, and welfare. Sharing information such as good practices and ideas from various perspectives should lead to Universal Health Coverage (SDG 3.8) and effective use of resources and time of unpaid care (SDG 5.4).

The participation of a diverse range of stakeholders is essential. By creating, effectively training, and distributing to the population a dynamic workforce tailored to local capabilities and expertise, the constraints on the health-care system during disasters and emergencies can be mitigated. It will also lead to the development of human resources that can support surge capacity support and chronic disease prevention during disasters. NGOs and NPOs working on domestic and international issues include international NGOs working on large-scale projects and local NGOs and their sector and community networks. There are also party organizations. The role of civil society in "engaging" civil society is very multifaceted.

Rather than ending with an internal evaluation report by the government, it is necessary to conduct after action review and continuous monitoring of the entire society to identify vulnerabilities, response capacities, and lack of resources, to identify predictable and avoidable risks, and to create a cycle of improvement.

Correction to: Geographic Information System(GIS) and Data Visualization

Hiranya Sritart and Hiroyuki Miyazaki

Correction to:
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The spelling of the author's name "Hiranya Stritart" was incorrect in the original version of this chapter. This has been now corrected to "Hiranya Sritart".

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