The Role of Nurses in Disaster Management in Asia Pacific

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Editors
Sheila Bonito
University of the Philippines
Open University
Manila
Philippines

Hiroko Minami
University of Kochi
Kochi
Japan

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Foreword

The Asia-Pacific region, the most disaster-prone region in the world, has at the core of its health workforce nurses and midwives performing essential, foundational and pivotal roles in disaster prevention, mitigation and management. *The Role of Nurses in Disaster Management in Asia Pacific* highlights the contributions of nurses in disaster preparedness and response, through ten illustrative disaster nursing case studies of floods, cyclones or typhoons, earthquakes and tsunamis, as well as infectious disease outbreak preparedness and response. The disasters depicted take place in countries ranging from small Pacific islands, with populations of 105,000 to China, with a population of over 1.3 billion.

Working in a rapidly changing, disaster-prone world, nurses, other health practitioners, volunteers and others may ask: *How can I better prepare for potential disasters? What skills do I need? Who could I work with in the event of a disaster? Who could help to enhance our efforts to help communities respond to disasters?* Readers of the case studies will find answers to these questions and be inspired to take disaster preparedness actions focused on the most vulnerable populations at risk for or impacted by disasters.

This publication is a welcome companion piece to *Nurses and Midwives in Action During Emergencies and Disasters: Case Studies from the Western Pacific Region* (WHO, 2013), contributing to the growing knowledge base of nursing and disaster management. Disaster management concepts, competencies and frameworks presented by the book's editors, Dr. Sheila Bonito and Dr. Hiroko Minami, serve as the unifying context for the case studies. The conceptual framework (APEDNN, 2011) of the Asia Pacific Emergency and Disaster Nursing Network (APEDNN) is represented in the case studies by contextual assessments of disaster events; interventions, including provision of essential public health services; policy changes; and collaboration, all aimed at building the resilience of affected families and communities.

The case studies describe situations in which nurses respond to disasters affecting remote outer island, rural and urban residents in temporary housing, as well as other populations in disaster-prone areas. The competencies applied cross all phases of the disaster management continuum—from mitigation and preparedness to response and recovery. Multiple essential public health disaster competencies are illustrated, from Ebola response infection control preparedness training to family and field community assessments targeting water, sanitation and hygiene, as well as

counselling and health education focused on enhanced self-management of chronic conditions. Family and community engagement serve as cornerstones of response efforts described.

Collaboration, partnerships, teamwork, policy change, inclusiveness as well as shared expertise are some of the many leadership principles exemplified by the case studies. Cross-border collaborative research between the Nursing Association of Nepal (NAN) and the Philippines and Japan enabled the adoption and use of an electronic health information system to support communication, data collection and research following the 2015 Nepal earthquake. The benefits of university partnerships within and across borders are clearly shown in the case studies of Japan and China. The essential roles played by national nursing associations are illustrated in the Nepal and Philippines case studies. Policies underpinning the integration of national nursing associations and Ministry of Health nursing leaders in national disaster response committees or clusters are evident in the Solomon Islands and Philippines case studies. The China and South Korea case studies highlight the vital roles played by military nurses and military nursing academies in disaster preparedness and response.

The Role of Nurses in Disaster Management in Asia Pacific, an important publication, expands, enhances and disseminates knowledge in the field of disaster nursing. Future publications which could further expand the evidence base for disaster management decision- and policy-making might include outcomes of nursing interventions, preventive community vulnerability and risk assessments as well as mechanisms and outcomes of interdisciplinary and cross-sector partnerships.

Kathleen L. Fritsch
Former WHO Western Pacific Regional
Adviser in Nursing (2000-2013)

Contents

List of Contributors

Syahirul Alim, PhD Faculty of Medicine, Secretary of Basic and Emergency Nursing Department, School of Nursing, Universitas Gadjah Mada, Yogyakarta, Indonesia

Sheila Bonito, DrPH University of the Philippines Open University, Manila, Philippines

Evan Casella, RN Nursing, Midwifery & Nutrition, College of Healthcare Science, James Cook University, Cairns, QLD, Australia

Sunshine Chan, RN, MAN School of Nursing, The Hong Kong Polytechnic University, Hong Kong, China

Maria Regina Estuar, PhD Ateneo de Manila University, Diliman, Quezon City, Philippines

Bettina Evio, RN, MAN College of Nursing, University of the Philippines Manila, Manila, Philippines

Yuko Fujiwara Kobe Women's University, Kobe, Japan

Andrea Grimes, RN Nursing, Midwifery & Nutrition, College of Healthcare Science, James Cook University, Cairns, QLD, Australia

Mele Havealeta Disaster Response Team, Nuku'alofa, Tonga

Fusi Kaho Disaster Response Team, Nuku'alofa, Tonga

Sakiko Kanbara, PhD Kochi University, Kochi, Japan

Shiori Katsunuma University of Hyogo, Hyogo, Japan

Virya Koy, RN, SNAR, MSNc, MHPEd, PhD Chief Bureau of Nursing and Midwifery, Ministry of Health, Phnom Penh, Cambodia

Akiko Kurotaki University of Hyogo, Hyogo, Japan

Michael Larui Ministry of Health and Medical Services, Honiara, Solomon Islands

National Nursing Administration, Honiara, Solomon Islands

Si Jian Li, RN, MAN School of Nursing, The Hong Kong Polytechnic University, Hong Kong, China

Hiroko Minami, RN, PhD University of Kochi, Kochi, Japan

Yohko Nonami Kobe Women's University, Kobe, Japan

Apsara Pandey, MSc Nursing Association of Nepal, Tribhuvan University Institute of Medicine, Kathmandu, Nepal

Tara Pohkrel, PhD Nursing Association of Nepal, Tribhuvan University Institute of Medicine, Kathmandu, Nepal

Alison Ripiapu Ministry of Health and Medical Services, Honiara, Solomon Islands

Public Health Emergency and Surveillance Unit, Honiara, Solomon Islands

Kumiko Sasaki Miyagi University, Miyagi, Japan

ChandraKala Sharma, MSc Nursing Association of Nepal, Tribhuvan University Institute of Medicine, Kathmandu, Nepal

Etsuko Shiono Miyagi University, Miyagi, Japan

Kazuko Takahashi Miyagi University, Miyagi, Japan

Miho Takami University of Hyogo, Hyogo, Japan

Amelia Afuha'amango Tuipulotu Ministry of Health, Nuku'alofa, Tonga

Yuuko Ushio University of Hyogo, Hyogo, Japan

Caryn West, PhD, MPH, RN Nursing, Midwifery & Nutrition, College of Healthcare Science, James Cook University, Cairns, QLD, Australia

Aiko Yamamoto University of Hyogo, Hyogo, Japan

Toshiko Yoshida Miyagi University, Miyagi, Japan

Seun Young Joe Korea Armed Forces Nursing Academy, Daejeon, South Korea

Introduction

1

Sheila Bonito and Hiroko Minami

1.1 The Asia Pacific Region and Natural Disasters

The Asia Pacific region (see Fig. 1.1) is the world's most disaster-prone region in terms of natural disasters (UN-ESCAP 2015). Countries in Southeast Asia are located in the "Pacific Ring of Fire" that causes devastating earthquakes and volcanic eruptions and/or lies in the path of strong tropical cyclones or super typhoons. East Asia has the greatest concentration of exposed economic assets to tropical storms, floods, earthquakes, and threats of emerging infections. There are high seismic and flood risks in South and Southwest Asia. Small islands in the Pacific are vulnerable to typhoons, floods, earthquakes, and tsunamis.

In the last decade (2005–2015), Asia Pacific has experienced 1731 natural disasters, 39% of natural disasters that occurred globally. These resulted in 444,761 deaths, representing more than half (53%) of the total global deaths related to natural disasters. These also affected 1.5 billion people in the Asia Pacific, roughly 82% of people affected by natural disasters globally. More than half (52%) of total damage due to natural disasters also occurred in the Asia Pacific region. These statistics show why Asia Pacific has been called the epicenter of disaster (see Fig. 1.2).

Out of these natural disasters, 42% was due to floods, 29% tropical storms, and 10% earthquakes (see Fig. 1.3). The highest number of people killed was due to earthquakes and tsunamis (208,195 deaths) and tropical storms (168,526 deaths). The largest number of people affected was in floods (796M) and tropical storms (333M). The costliest were earthquakes (USD 371B), floods (USD 220B), and tropical storms (USD127B) (EM-DAT 2016).

S. Bonito, RN, MAN, DrPH (✉)
University of the Philippines Open University, Manila, Philippines
e-mail: srbonito@up.edu.ph

H. Minami, RN, PhD
University of Kochi, Kochi, Japan

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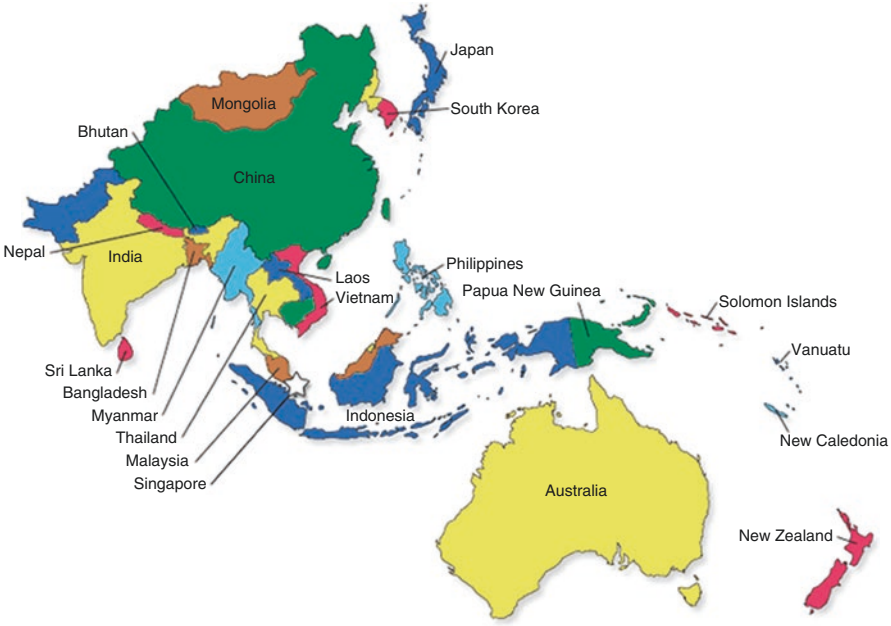

Fig. 1.1 Map of the Asia Pacific region

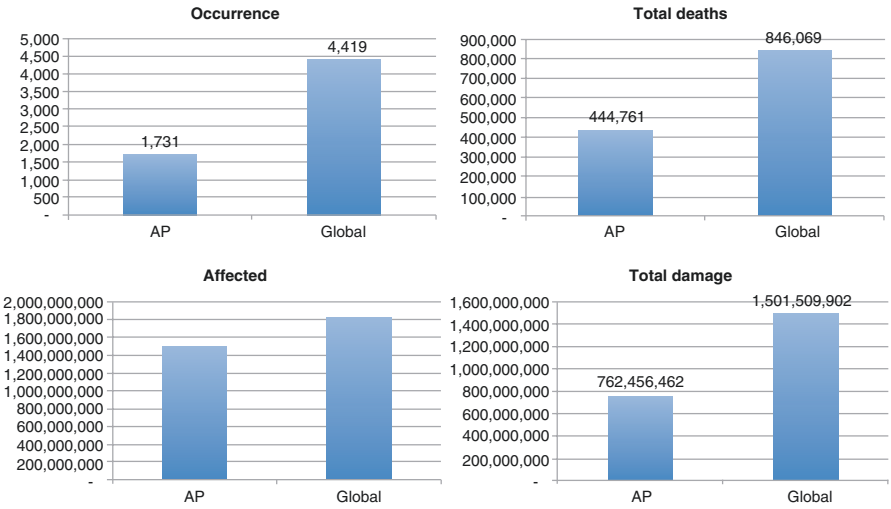

Fig. 1.2 Occurrence and impacts of natural disasters in Asia Pacific and the world (2005–2015) (Data source: EM-DAT: The OFDA/CRED International Disaster Database 2016)

Within this period, the region has experienced overwhelming natural disasters that challenged the health systems of upper-middle and high-income countries like Australia, China, Japan, and South Korea and slowed down the development of low- and lower-middle-income countries like Cambodia, Indonesia, Nepal, Philippines,

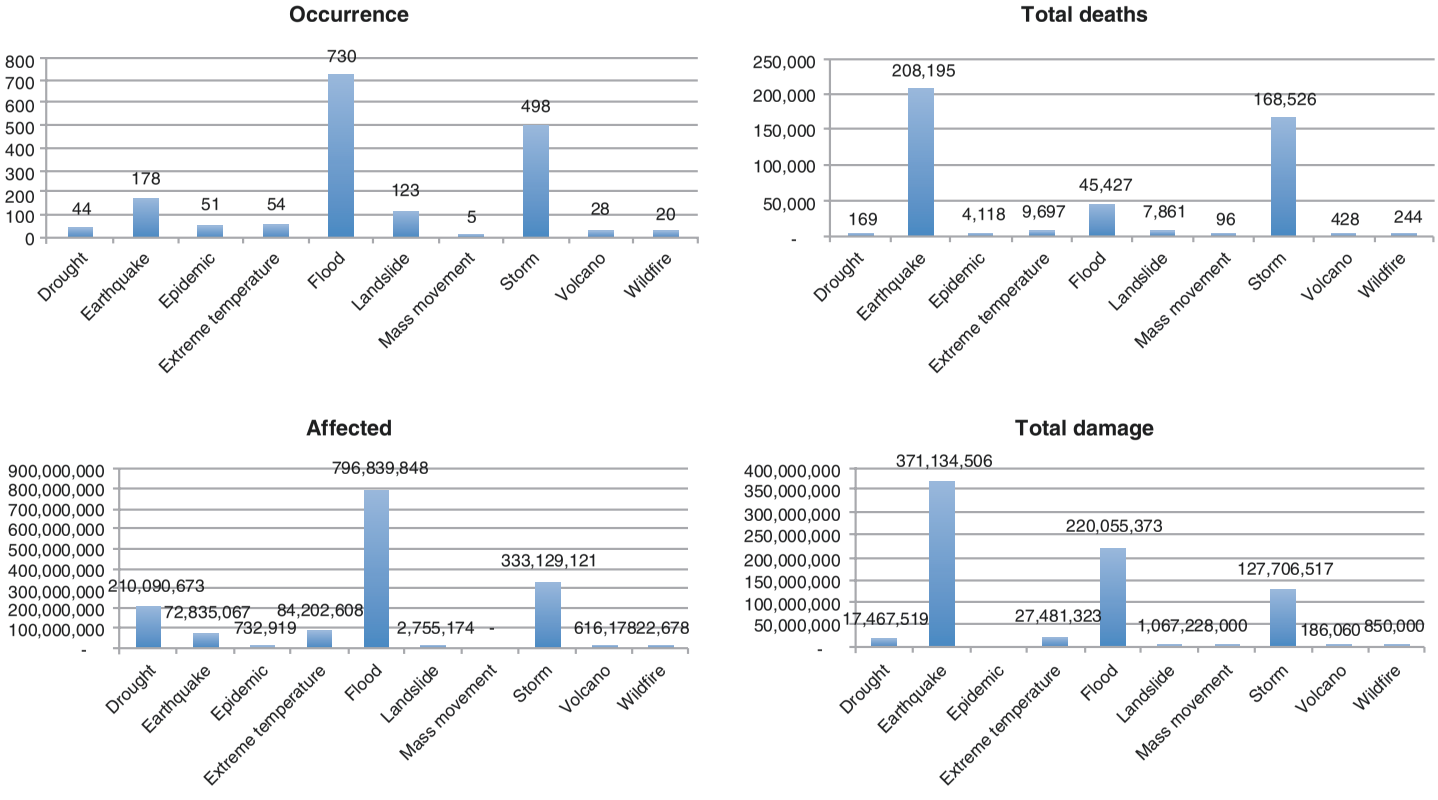

Fig. 1.3 Distribution of natural disasters in Asia Pacific (2005–2015)

Solomon Islands, and Tonga (World Bank 2016). These countries have been hit and devastated by killer earthquakes, super typhoons, and massive floods and threatened by emerging infections like SARS, MERSCoV, and Ebola.

The killer earthquakes were the Sichuan earthquake with a 7.9 magnitude in Sichuan province in China in 2008, the Tohoku earthquake with a 9.0 magnitude that generated a tsunami in the East Coast of Japan in 2011, and the Nepal (Gorkha) earthquake with a 7.6 magnitude in the district of Dolakha, East of Kathmandu. These three powerful earthquakes killed a total of 116,153 people, affected 12.5 million people, and damaged properties worth USD 115.8 billion.

The strongest typhoon in recent recorded history was Typhoon Haiyan in 2013 that killed 7354 people and devastated several provinces in the Philippines. Typhoon Yasi in 2011 also brought unprecedented destruction in Northern Australia prompting evacuation of communities. Cyclone Ian in 2014 also wreaked havoc in the small island of Tonga and neighboring Pacific islands.

The worst floods were experienced by Cambodia in 2011 and Solomon Islands in 2014 brought about by seasonal flooding in the Mekong basin and heavy torrential rains, respectively.

Aside from natural disasters, the region is also under threat of emerging infections like SARS, MERSCoV, and Ebola from other regions due to widespread travel of people in the present. Table 1.1 presents the worst natural disasters in Asia Pacific

Table 1.1 Worst natural disasters in Asia Pacific (2005–2015)

Disaster event	Date	Country	Deaths	Affected	Damage (000 USD)
1. Cyclone Nargis	May 2, 2008	Myanmar	138,366	29,622,000	125,000,000
2. Sichuan earthquake	**May 12, 2008**	**China**	**87,476**	**5,639,722**	**85,000,000**
3. Kashmir earthquake	October 8, 2005	Pakistan	73,338	5,128,309	30,000,000
4. Tohoku earthquake	**March 11, 2011**	**Japan**	**19,846**	**3,700,000**	**15,800,000**
5. Gorkha earthquake	**April 25, 2015**	**Nepal**	**8831**	**3,222,224**	**15,000,000**
6. Typhoon Haiyan	**November 8, 2013**	**Philippines**	**7354**	**22,000,150**	**50,000,000**
7. North India floods	June 12, 2013	India	6054	134,000,000	40,000,000
8. Yogyakarta earthquake	**May 27, 2006**	**Indonesia**	**5778**	**3,177,923**	**12,500,000**
9. Cyclone Sidr	November 15, 2007	Bangladesh	4234	19,624,000	30,000,000
10. Yushu earthquake	April 14, 2010	China	2968	2,671,556	8,000,000

Source: Based on data from EM-DAT: The OFDA/CRED International Disaster Database. Available from http://www.emdat.be/ (accessed July 2016)

from 2005 to 2015 based on the total number of deaths. Five of the top worst natural disasters are included in this case studies book.

Asia Pacific's increasing disaster risk can be largely attributed to several factors, such as:

1. Increasing population density in cities
2. Human vulnerability due to poverty and social inequality
3. Increased settlement in high-risk areas
4. Poor infrastructure and poor urban planning
5. Environmental degradation and effects of climate change

According to UN-ESCAP (2015), Asia Pacific has one of the world's most rapid rates of urbanization with 45% of the population living in urban areas in 2010 expected to rise to 64% in 2050. Many of these cities struggle to provide basic services such as water supply, sewage disposal, public roads, and infrastructures. Furthermore, around 740 million city dwellers in Asia and the Pacific are now at "extreme" to "high" disaster risk—often living in multi-hazard hotspots that are vulnerable to cyclones, earthquakes, floods, and landslides (UN-ESCAP 2015). Many of the people also lack the resources to take preventive measures and do not have savings to draw upon should disaster strike. Among the poor, the most vulnerable to natural disasters are women, children, older persons, persons with disabilities, and migrants. The government also lacks resources to provide social protection. The economic cost of disasters becomes an additional burden and siphons funds meant for development.

Coping with disasters includes the role of health systems to ensure that rapid health needs are met and health-care services are continuously provided to the affected population. With the increasing risk for disasters in the Asia Pacific, it becomes imperative for health-care workers and health systems of countries to support disaster risk reduction efforts and to be able to help communities become disaster resilient.

The UN Sendai Framework (UNISDR 2015) emphasizes the importance of health in measuring expected outcomes of disaster risk reduction efforts, that is, "the substantial reduction of disaster risk and losses in lives, livelihoods and *health* and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries." It also identifies the role of health systems in the seven global targets:

1. Reduce number of deaths
2. Reduce number of affected people
3. Reduce direct disaster economic loss
4. Reduce damage to health and educational facilities
5. Increase national and local strategies
6. Provide support to developing countries
7. Provide access to early warning information

1.2 The Role of Nurses in Disaster Management

Nurses, being at the forefront of health-care services, are often called upon to respond to emergencies and provide substantial care to individuals, families, and communities. Nurses have demonstrated their value in a number of emergency and disaster events because they possess the knowledge, skills, and attitudes that support humanitarian efforts. Nurses have shown their dedication, courage, expertise, and compassion in helping communities prepare for, respond to, and recover from disastrous events.

Nurses have often been involved in the care of survivors whether in hospitals or in temporary shelters where they perform health assessments, give basic emergency care (field triage, first aid, wound care, etc.), provide primary health-care services (immunizations, nutritional interventions, promotion of water, sanitation, and hygiene practices), support health education and risk communication, and conduct monitoring of diseases of potential outbreak, in an effort to help save lives and support communities build back better.

Nurses should have certain competencies in all phases of disaster management (see Fig. 1.4). In disaster prevention, nurses should know about measures to provide permanent protection of individuals and communities from disasters, such as disaster awareness and relocation from hazardous areas. In disaster mitigation, nurses should be conversant about measures to reduce impact of hazards in society and environment, by providing vaccination, improving health and nutrition, health education on flood protection, and relocation from risk areas. In disaster preparedness, nurses should know about measures that predict, respond, and help individuals cope

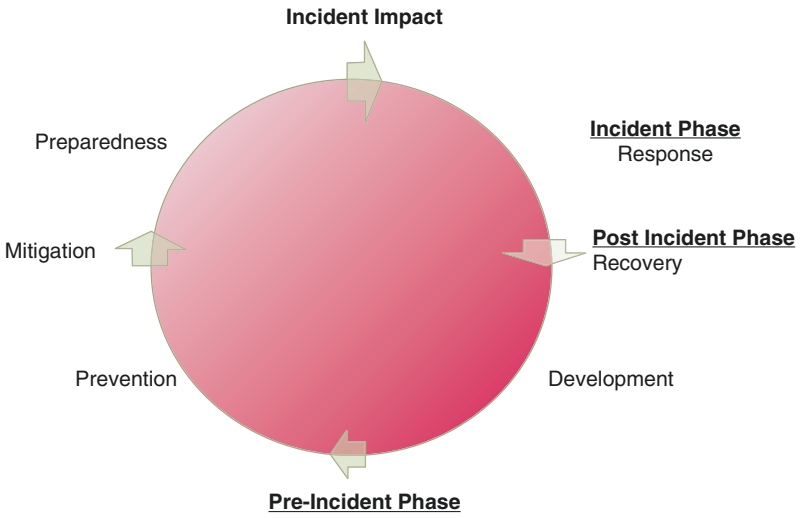

Fig. 1.4 The disaster management cycle

with the effect of a disaster, such as early warning systems, emergency/evacuation plans, policies, and training programs. In disaster response, nurses should know how to provide immediate and acute care to individuals and communities who are victims of disasters, such as conducting triage, first aid, trauma care, emergency surgery, treatment of diseases of epidemic potential, vector-borne diseases, and diseases of public health significance. In recovery, nurses should be aware of measures to help communities go back to pre-disaster state, such as restoration of preventative health-care services, priority disease control programs, and services of noncommunicable diseases (NCDs). In rehabilitation, nurses should be involved in restoring individuals/communities to original or better state, such as rehabilitation of disability, orthotics, prosthetics, and psychosocial care.

The International Council of Nurses (ICN) listed the competencies of nurses and organized them under the following areas: (1) mitigation/prevention competencies, (2) preparedness competencies, (3) response competencies, and (4) recovery/rehabilitation competencies. The ICN believes that "Nurses with their technical skills and knowledge of epidemiology, physiology, pharmacology, cultural-familial structures, and psychological issues can assist in disaster preparedness programs, as well as during disasters" (ICN 2006).

More than having the needed competencies in providing needed care for individuals and communities affected by disaster, nurses should also be flexible and adaptable when working in less than ideal situations, often with large number of patients at a given time. They should also be able to work closely with other professions involved in disaster management and understand the roles of different sectors as well as the Incident Command System and its operations.

1.3 Disaster Nursing Frameworks

The work of nurses in Asia Pacific on emergency and disaster is largely guided by two nursing frameworks: ICN Framework of Disaster Nursing Competencies (2009) and the Asia Pacific Emergency and Disaster Nursing Network Ecological Framework (2011).

The ICN Framework of Disaster Nursing Competencies (ICN Disaster Nursing Competencies 2009) builds on the ICN Framework of Competencies for the Generalist Nurse. It is organized using the four main phases in the disaster management continuum, namely, mitigation/prevention, preparedness, response, and recovery/rehabilitation. Ten domains were identified under which nurses' competencies were listed. Figure 1.5 shows this organizing structure for the competencies.

The Asia Pacific Emergency and Disaster Nursing Network (APEDNN) organized by the World Health Organization Western Pacific and Southeast Asia regions presents a disaster nursing curriculum and a conceptual framework guiding its network members. Just like the ICN Framework for Disaster Nursing Competencies, the curriculum is also organized along the phases of emergency and disaster response:

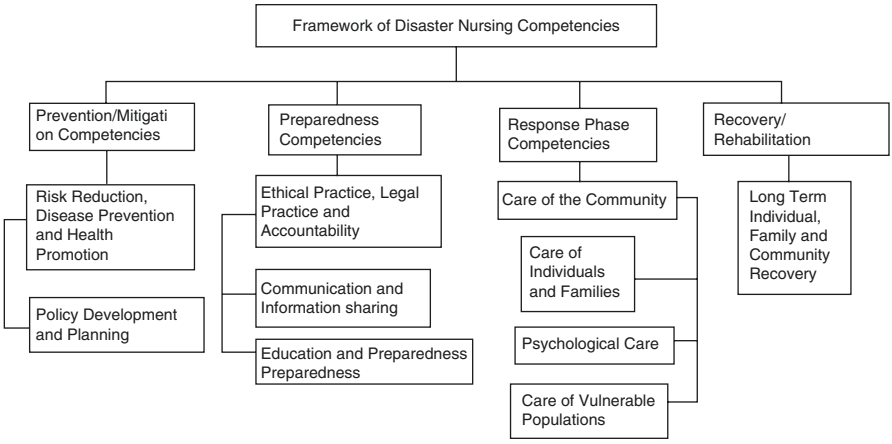

Fig. 1.5 ICN Framework of Disaster Nursing Competencies (Source: ICN 2009)

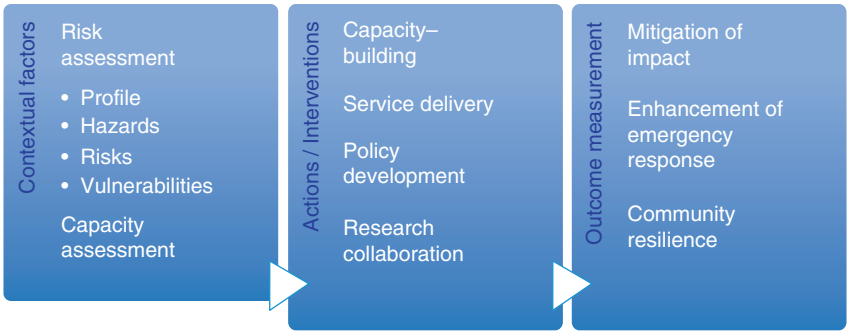

Fig. 1.6 APEDNN Framework (Source: APEDNN 2011)

preparation, acute response/intervention, recovery and rehabilitation, and post disaster. It includes rapid and full version of course content which countries or institutions can tailor-fit to their needs given time constraints and priorities. Psychosocial and mental health issues and support is also identified as a crosscutting theme.

The APEDNN Framework (2011) illustrates an ecological guiding approach to the work of the network in the region (see Fig. 1.6).

Contextual factors denote characteristics of nurses and other health workers in relation to the underlying factors impacting the work of APEDNN, which include risk assessment and capacity assessment. Actions or interventions include activities in capacity building, service delivery, policy development, research, and collaboration. Outcome measurements focus on mitigation of impact, enhancement of emergency response, and community resilience. Within this framework, participation, inclusiveness, and collaboration are emphasized, aimed at achieving outcomes, which mitigate the impact of disasters, through enhanced capacities and responses, community empowerment, and resilience.

1.4 Disaster Nursing Case Studies from Asia Pacific

The last decade, 2005–2015, has seen a number of overwhelming natural disasters in the Asia Pacific—from tropical storms, floods, earthquakes, and tsunamis to threats of emerging infectious diseases. Countries worst affected by these disasters had to mobilize a number of its health workers to respond to the crisis. Nurses, being at the forefront of providing care to individuals and families, were among the ones who worked hard to save lives and minimize the impact of the disasters to human lives.

Case studies from ten countries during this period are showcased in this book highlighting the contribution of nurses in helping individuals and communities prepare for, respond to, and recover from disastrous events. Nurses in Australia were involved in patient evacuation in hospitals and aged care facilities threatened by a tropical storm. Cambodian nurses were called upon to provide aid and care during the annual flooding of the Mekong River. Nurses in China were rapidly deployed to the devastated sites of Sichuan earthquake to help survivors. Nurses from a school of nursing in Indonesia showed their competencies in managing survivors during the Yogyakarta and Central Java earthquakes. Nursing schools from two universities in Japan conducted pairing activities to help support survivors in Tōhoku earthquake.

National nursing organizations in Nepal and the Philippines demonstrated the important role of professional nursing organizations in disaster management from disaster preparedness to disaster response during an earthquake and super typhoon, respectively. Nurses from the Pacific island countries showed the role of nurses in helping communities during typhoon and flooding. Nurses from South Korea conducted preparedness training for civilian and military nurses deployed in Ebola-stricken country. Altogether, they highlight the need for nurses' concerted efforts during preparedness, response, and recovery periods.

1.5 Purpose of This Case Studies Book

This case studies book highlights the work of nurses in some of the worst disasters in the Asia Pacific in the recent decade. It aims to inspire and equip nurses and other health professionals to help people in disaster-affected areas and contribute to community resilience. Nurses from the worst hit areas were asked to write their experience and highlight their contributions in the disaster management. Some of the stories in these case studies highlight the need for leadership, critical thinking, adaptability, and teamwork in working in disaster situations. It also highlights the need for capacity-building activities and forming linkages and networks before any emergency or disaster takes place. It also shows the necessary work needed in the different phases of disaster management, where nurses play various important roles.

This is intended for nurses who work closely with individuals and communities in times of emergency and disaster. It highlights the different roles of nurses in saving lives and helping people "build back better" after devastating disasters. It

describes the different contributions of nurses from different parts of Asia Pacific in times of emergency and disaster. This is also essential for nurse educators who are shaping the minds, hearts, and spirits of students to make them resilient nurses who could be tapped to help in future emergencies and disasters.

This book can also be helpful to nurse administrators who are most often involved in planning activities within hospitals/communities and collaborating with local, national, and international disaster management agencies. This aims to show the nurses' dedication, courage, expertise, and compassion in helping communities prepare for, respond to, and recover from disastrous events. It also aims to inspire and equip nurses and other health professionals to support people in disaster-affected areas and contribute to community resilience.

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The Role of Nurses in Disaster Management in Asia Pacific Cyclone Yasi: Far North Queensland, Australia

2

Caryn West, Evan Casella, and Andrea Grimes

2.1 About the Natural Disaster

2.1.1 Description of the Disaster Event: What, When, Where, Why, How

On Thursday, 3 February 2011, Severe Tropical Cyclone (TC) Yasi Category 5 ravaged its way through Tropical Northern Queensland, Australia. The centre of this devastating system aligned almost directly with the small tourist village of Mission Beach, 138 km south of Cairns (Australian Government Bureau of Meteorology 2017). TC Yasi was to be the biggest cyclone system ever recorded to cross the Queensland coast (Hayes 2011), the ramifications of which would reach far and wide, altering lives, livelihoods and landscapes alike.

The cyclone season in Australia runs from November to April, with very few cyclones recorded in the first months (Australian Government Bureau of Meteorology 2016b) and coincides with the annual tropical monsoon season. The 2010–2011 forecast expected above-average tropical cyclone activity due to the La Nina effect which is the most conducive for cyclonic activity (Australian Government Bureau of Meteorology 2016a).

It is this monsoonal climate that contributes to the formation of these powerful, spiralling storm systems known through the Australia-Pacific region as tropical cyclones and elsewhere as typhoons and hurricanes (Australian Government Bureau of Meteorology 2016b). In order to form, two elements are required: a cluster of thunderstorms and a warm body of water from which the storm draws its energy (Kamenev and Pickrell 2011). Once the system can sustain winds of 63 km/h, they

C. West, PhD, MPH, RN (✉) • E. Casella, RN • A. Grimes, RN
Nursing, Midwifery & Nutrition, College of Healthcare Science, James Cook University, Cairns, QLD, Australia
e-mail: caryn.west@jcu.edu.au

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Table 2.1 Tropical cyclone categorisations

Category	Wind speed	Barometric pressure	Storm surge	Damage potential
1 (Weak)	75–95 mph 65–82 kts 33–42 m/s	>28.94 in. Hg > 980.0 mb > 97.7 kPa	4.0–5.0 ft. 1.2–1.5 m	Minimal damage to vegetation
2 (Moderate)	96–110 mph 83–95 kts 43–49 m/s	28.50–28.93 in. Hg 965.1–979.7 mb 96.2–97.7 kPa	6.0–8.0 ft. 1.8–2.4 m	Moderate damage to houses
3 (Strong)	111– 130 mph 96–113 kts 50–58 m/s	27.91–28.49 in. Hg 945.1.–964.8 mb 96.2–97.7 kPa	9.0–12.0 ft. 2.7–3.7 m	Extensive damage to small buildings
4 (Very strong)	131– 155 mph 114–135 kts 59–69 m/s	27.17–27.90 in. Hg 920.1–944.8 mb 91.7–94.2 kPa	13.0– 18.0 ft. 3.9–5.5 m	Extreme structural damage
5 (Devastating)	> 155 mph > 135 kts > 70 m/s	<27.17 in. Hg <920.1 mb <91.7 kPa	>18.0 ft. >5.5 m	Catastrophic building failures possible

Adapted from Australian Government Bureau of Meteorology (2017)

are officially classified as a tropical cyclone. In the Australia-Pacific region, the Australian Bureau of Meteorology (BOM) classifies tropical cyclones into five categories, with Category 1 the weakest system and Category 5 the most destructive (Table 2.1).

Tropical Cyclone Yasi was the fourth TC to impact the Queensland coast during the 2010–2011 cyclone season. Forming as a tropical low on 29 January 2011, northwest of Fiji, Yasi formed only days after TC Anthony had crossed the coast 200 km south of Townsville, NQ, as a Category 2 system (Australian Government Bureau of Meteorology 2016c).

Intensifying rapidly the system officially became a TC on 30 January. By the following day, TC Yasi had escalated to a Category 3 system and began tracking west towards the North Queensland coastline. Such was her speed and intensity that by 2 February, Yasi was upgraded to a Category 5 system with a central pressure of 930 hPa (Little et al. 2012) and very destructive winds up to 285 km/h. Tracking west-southwest towards the regional town of Innisfail, it was only in the final 8 hours that TC Yasi twisted slightly southward and crossed land near the small communities of Cardwell, Tully and Mission Beach.

It is important to note that on landfall TC Yasi was 500 km wide with a central eye 30 km across. Wind gusts were estimated at 290 km/h (180 mph) and landfall coincided with a 'king' tide which gave rise to valid concerns of a tidal surge of more than 5 m above highest astronomical tide (HAT). Fortunately, TC Yasi slowed prior to crossing the coast, and these two phenomena did not occur concurrently, but the predicted threat strongly influenced disaster preparedness and response activities across the region (Australian Government Bureau of Meteorology 2017).

2.1.2 Description of the Population Affected: Geographical Area, Demographic and Socioeconomic Profile, Hazards and Vulnerabilities

Tropical North Queensland is divided into two clear regions: North Queensland (NQ), a coastal region centred on the city of Townsville (population 231,628 and covering 80,041.5 km^2) (Australian Bureau of Statistics 2011b), and Far North Queensland (FNQ) which covers an area of 934,600 km^2. The region consists of many Aboriginal and farming communities and industries including tourism, cattle grazing, agriculture (sugar cane and tropical fruits) and mining of both sand and bauxite. In 2012 the region's population was 301,256 of which 146,778 lived in Cairns (Australian Bureau of Statistics 2011a).

At the time of TC Yasi, the communities directly impacted (Innisfail, Tully, Mission Beach and Cardwell) had an approximate population of 28,000 residents (Australian Bureau of Statistics 2013); however, the total population indirectly affected by TC Yasi was well over 300,000 individuals spread over a 400 km radius.

What was to prove most challenging was not just the magnitude and ferocity of the cyclone but the combination of unique geography, sheer size of the area under threat (Fig. 2.1) and a dispersed and diverse population many of whom had never experienced weather events such as this.

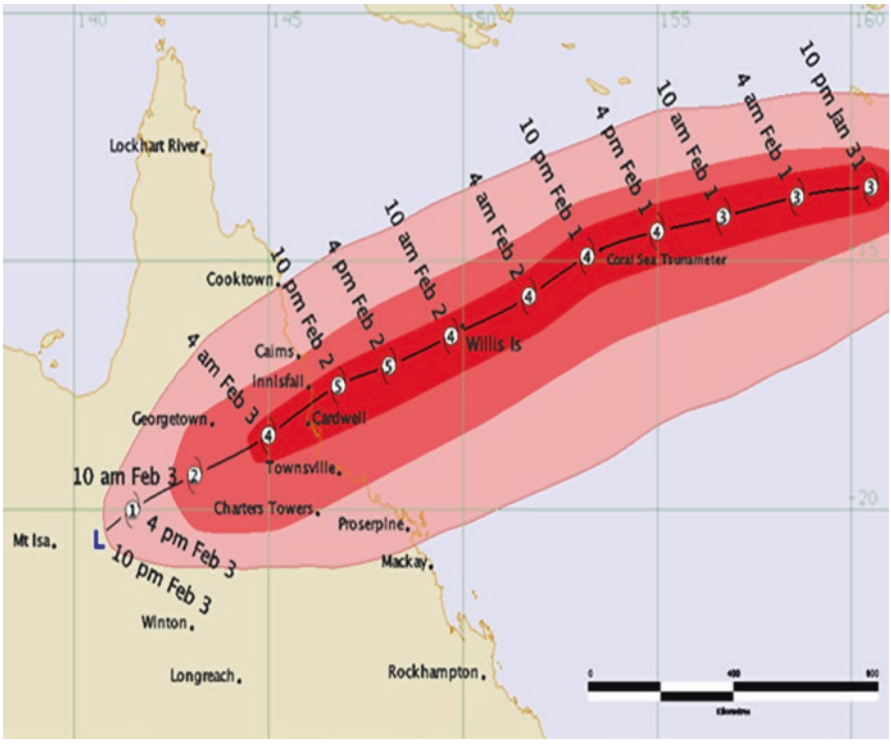

Fig. 2.1 TC Yasi tracking map. Reproduced by permission of Bureau of Meteorology, © 2017 Commonwealth of Australia

Geographically this area is made up of vast areas of thick rainforest vegetation, farm land and tropical coastlines. The region has a large number of tidal rivers and creeks that snake through the landscape and areas of low-lying mudflats and mangroves. Seasonal flooding is a common occurrence and is not always without inconvenience as large areas can become isolated due to flooding making access to food and goods expensive and difficult.

One major highway services the entire North Queensland coastal region and is primarily single carriageway access. Although a number of flood mitigation projects have been implanted, the nature of tropical weather and cyclone activity makes this highway prone to frequent flooding in a number of places.

Socioeconomic measures of the region (SEIFA Index of Disadvantage) indicate that many communities in Tropical NQ experience marked levels of disadvantage such as low income, low educational attainment, high unemployment and jobs in relatively unskilled occupations (Medicare Local 2012). Paralleling this is an increasing population of retirees and individuals abandoning city living in favour of taking up a semirural lifestyle in the coastal communities.

As mentioned earlier, agriculture and farming play a large role in the economic stability of NQ. Banana farming accounts for 70% of the countries production, and 95% of the sugar produced in Queensland is grown in the north (Department of Agriculture & Fisheries 2014). Just prior to TC Yasi, it was estimated that approximately 20% of the northern workforce were employed in the farming industry (Australian Bureau of Statistics 2011b).

Tourism is high in the region with a number coastal centres offering fishing and seaside bases for accessing the Great Barrier Reef. Tourist demographics impact considerably on population numbers in NQ and FNQ and can pose a number of serious implications during disasters primarily due to transportation and accommodation. Although there are many source accommodations in non-private dwellings such as hotels and motels, an increasing number reside in more temporary accommodation such as caravans, campervans and tents.

Renowned for its unparalleled beauty, world heritage sites and unencumbered lifestyle, the very nature of what Tropical NQ offers is also its greatest weakness during catastrophic weather events such as TC Yasi. Road access is cut, remote and coastal areas become hard to access and transient and vulnerable populations dispersed across the region are difficult to account for.

2.2 Impact of the Disaster

2.2.1 Direct Impact: Deaths, Injuries, Illness, Psychosocial Concerns

Miraculously, given the size of TC Yasi, physical injury and death were low. One death was recorded and attributed to carbon monoxide poisoning from a portable generator being operated indoors (Woods et al. 2014). From a health perspective,

the greatest impact was in the psychological damage caused by the event. In the days preceding landfall, media reports were frenzied, sensationalising the impending devastation and possible loss of life. Dubbed the 'Killer Cyclone' and 'Armageddon', fear and panic were generated unnecessarily in an already hypersensitive and frightened population.

For those that witnessed the brutal force of TC Yasi's fury, the experience for many bought significant feelings of being at the mercy of nature. Survivors were stripped down to their raw emotions, emerging into a drastically changed environment, where many houses were damaged or lost and much of the landscaped was ravaged (Woods et al. 2014). For most the shock and sadness were profound, all they owned was gone leaving only memories.

For some these feelings were amplified, and the experience has triggered ongoing stress responses particularly to those who have experienced traumatic or threatening events (Usher et al. 2012). Sadly for many, the loss, the financial burden and the very real possibility that it would happen again has forced them to leave the region.

2.2.2 Indirect Impact: Property Damage, Facilities and Infrastructures, Lifelines

The indirect impact costs of TC Yasi well exceeded $800 million. Over 50,000 cyclone-related claims were lodged in the region, and for the communities that bore the brunt of her fury, about 1000 houses had their roofs torn off and others were flattened. Six hundred kilometres of electrical cable and conductor line were damaged, and 2500 power poles were lost during the storm. Over 200,000 properties lost power and telephone access, and over 700 were without these services for more than a month after TC Yasi crossed the coast. Tidal storm surge devastated coastal roads, destroyed vegetation and crops, eroded beaches and uprooted sea grass beds that grow in the tropical shallows. Boats were swept inland and piled like children's toys, ports destroyed and holiday resorts deemed irreparable and uninhabitable in the post-cyclone assessment. Particularly affected was the agricultural industry with an estimated economic impact of over $300 million which crippled the sugar and banana sector (Queensland Government Department of Agriculture; Forestry and Fisheries 2012; Queensland Government Workplace Health & Safety 2015) (Fig. 2.2). Compounding this was the region was still recovering from the physical, emotion and financial impact of TC Larry (C4) which had struck in 2006 and caused $480 million in damages and loss to industry.

In the worst affected areas, storm surge pushed coastal structures up to 300 m inland, beaches were devoid of sand, entire marinas were decimated and every structure was damaged to some extent (Michael 2011). In Cairns, just north of TC Yasi's landfall, the unparalleled decision was made to evacuate both public and private hospitals due to tidal surge threats (Little et al. 2012). This process was repeated in Townsville where over 200 elderly residents were evacuated from

Fig. 2.2 TC Yasi: Widespread devastation. Clockwise: Banana farm post TC Yasi; flood waters close the Bruce Highway; Port Hinchinbrook; residence in Cardwell (Image courtesy: www.telegraph.co.uk) Severe Tropical Cyclone Yasi (retrieved 09.03.2016) http://www.telegraph.co.uk/news/earth/earthpicturegalleries/8300159/Cyclone-Yasi-Queensland-wakes-up-after-cyclone-causes-widespread-devastation.html?image=24

waterfront care facilities. All along the coastline residents were ordered to evacuate, especially those in waterfront and low-lying areas. This mass displacement of populations along the coast (300 kms) had a number of implications for emergency management staff who needed to ensure evacuation shelters could accommodate people. These challenges were further compounded when roads were cut and the water supply facility was damaged (Woods et al. 2012).

Forty-eight hours after landfall, severe flooding left many (including emergency workers) stranded. Flooding and torrential rain was experienced in Alice Springs, northern South Australia and northwest Victoria with recorded rainfalls. Emergency supplies were even required at Anna Creek Station, the world's largest cattle station, some 2800 km southwest, which was isolated due to TC Yasi's rains (Mennie 2011), making TC Yasi the costliest cyclone in Australia history.

2.3 Health Sector Response

2.3.1 Actions Taken and their Outcomes

The sheer magnitude of TC Yasi meant significant actions were needed during and after the event. One of the most critical decisions was to evacuate both the public and private hospitals in Cairns to multiple hospitals in Brisbane, some 1700 km away. Due to the age of both facilities, the cyclone ratings were unknown, making them highly vulnerable to wind damage especially from a Category 5 cyclone. The geographical location of both hospitals was also a contributing factor. Located on or very close to the foreshore in Cairns, tidal surge was a very real concern (Wilkie 2013), and as such at 09:30 hours on 2 February, Anna Bligh—the State Premier—made the evacuation decision, at which point an unprecedented operation in Australia was commenced. All patients within the hospitals were identified for discharge, commercial transfer, transferred on a stretcher or critical care transfer. Patients were triaged in the Cairns Hospital Emergency Department and then transferred to the Cairns Airport where the Royal Flying Doctor Service, the Australian Defence Force Hercules vessels, Careflight Air Ambulances, Qantas and Virgin charted flights and a government-allocated jet were ready and waiting.

A total of 250 hospital inpatients were transported including a female with postpartum haemorrhage and an intubated male with an undifferentiated head injury (Little et al. 2012). Additionally 70 patients requiring renal dialysis, 4 newborns, 20 mental health patients, 10 forensics mental health patients and 19 palliative care patients were evacuated. By 05:00 hours the next morning, Cairns Hospital was empty (Little et al. 2012). With the hospitals now redundant, a secondary field facility was required to serve the health needs of the town. An Emergency Medical Centre was setup within a sporting complex in one of the outer suburbs (Little et al. 2012).

Although the hospitals were not damaged or inundated during Yasi, the decision to evacuate was deemed appropriate given the level of risk upon on the town's most vulnerable people (Wilkie 2013). Nobody died during the evacuations, and all evacuees were eventually returned home (Woods et al. 2011). The secondary field Emergency Medical Centre did experience some issues, though it successfully treated 76 patients during its 28 hour operating time.

The public evacuations were largely successful given the vast number of evacuees. Purpose-built evacuation centres were used, local shopping centres and sports complexes appropriated and libraries, schools and universities made available manned by volunteer groups such as the St John Ambulance and the Australian Red Cross (St Johns Ambulance 2011).

In the aftermath, a number of services were critical to clean-up and recovery efforts to ensure the health and safety of survivors. The Australian Defence Force (ADF) dispatched over 4000 troops to Townsville (Woods et al. 2011) who delivered critical supplies, cleared roads, infrastructure and vegetation clean-up and aerial damage assessments (The Australian Army 2015). Volunteer organisations,

Fig. 2.3 Unprecedented moves: hospital evacuation. Clockwise: Cairns Airport triage; ADF Hercules critical care evacuation; ambulances queued and waiting; evacuation shelter in a shopping centre (Image courtesy: www.defencejobsbroadcasts.gov.au). Severe Tropical Cyclone Yasi Hospital Evacuation (retrieved 09.03.2016) https://www.defencejobsbroadcasts.gov.au/health/articles/cyclone-yasi-mercy-mission/

such as the State Emergency Service (SES), rescued countless people from inundated homes, delivered supplies and helped significantly with the clean-up (State Emergency Services 2011). The Red Cross visited over 12,000 homes in an effort to check on how people were coping (Australian Red Cross 2011), and Ergon Energy—the state electricity provider—initiated the 'biggest field response of electricity workers in Australian history' to deal with power outages (Ergon Energy 2011). Importantly, local communities formed the backbone of recovery efforts from this event. Neighbours helped neighbours, working together to offer support and solace and eventually rebuilding their communities (Fig. 2.3).

2.3.2 Resources that Were Needed and Received or Lacking

The evacuation of two Cairns hospitals required immense resources and considering the limited preparation time (24 h) were met largely without major incident. Multiple aircrafts, land transport, communications systems, staff and hospital beds were required for the operation, and in post-analysis a number of lessons were learnt and as such are now part of hospital disaster policies.

Firstly, an electronic system that was able to link patients with essential information, such as date of birth, medical status, allergies and medical history, was lacking. Given patients were being evacuated to multiple hospitals via a number of air modes, an electronic system could and would have lessened the number of hardcopy patient files being lost or misplaced and help ensure continuity of care pre-, during and post evacuation.

Secondly, a critical shortage of medication and portable equipment was noted during the transfers resulting in missed doses of medication and unmonitored transfers. In particular the shortage of portable oxygen was of particular concern.

Thirdly, staffing was a challenge. Although the majority of healthcare staff secured their homes and families and returned to the health facilities, this added the stress of being separated from loved ones and not knowing and could be avoided in future evacuations if transfer teams were sent from receiving facilities.

As mentioned previously, TC Yasi is the costliest cyclone to hit Australia. Post cyclone the Australian Government responded to 273,944 claims from the National Disaster Recovery Fund, resulting in $309,790,800 in payouts. A further $8,021,655 was paid in income recovery subsidy grants. Private insurance claims totalled millions with leading claims made for roof damage, window damage and water ingress. A study performed by Woods et al. (2012) a year after TC Yasi found that only 60.7% of a sample population had adequate insurance cover, and those that did make a claim found the claiming process particularly difficult to navigate, and extensive repayment waiting times were experienced. The study also found that much of the population was suffering significant acute stress disorders which were either exacerbated or initiated by ongoing financial issues caused by Yasi, signifying a breakdown in financial support despite the aforementioned government initiatives.

2.3.3 Factors that Facilitate and Hindered Health Sector Response

As with any disaster event, a number of factors affect outcomes. In TC Yasi the key to effective healthcare was the staffing response. Staff assisted in the evacuation of health facilities where required and manned operational hospitals and health centres throughout the storm. Post event both paid and volunteer healthcare staff worked across affected areas to ensure the health and safety of the population. Cooperation was high between healthcare facilities, and this was identified as greatly beneficial as evacuated patients were provided with beds despite a lack of appropriate patient information. Given the likelihood of major weather events occurring in North Queensland, robust disaster response and medical retrieval systems are in place which proved invaluable with rapid and effective evacuations and healthcare responses performed (Little et al. 2012).

Factors that hindered the health sector response were predominantly around communication breakdowns- some human, some due to infrastructure damage. As noted by Wilkie (2013), there was some confusion between Cairns and Brisbane during the initial stages of the hospital evacuations, primarily surrounding who

would initiate the evacuation orders. Much debate and confusion ensued regarding the inappropriateness of controlling an evacuation from an office completely removed from the locality of the event (Wilkie 2013). For a number of smaller communities, isolation due to flooding and damage to communications systems seriously hampered healthcare responses. With roads closed and electricity and telephone systems down, healthcare staff walked or drove around the area to service client needs.

The rapidly initiated field Emergency Medical Centre in Cairns also posed a number of challenges. One critical challenge was that there was no designated location for a centre of this capacity. This resulted in a rush to select and prepare a facility for operation. It was subsequently found that the building chosen and prepared was deemed unsafe by Queensland Fire and Rescue Service to withstand a Category 5 cyclone. A number of additional measures were required to meet minimum standards such as boarding of windows and supply of three-phase power backup via a commercial generator.

2.4 Contribution of Nurses

2.4.1 Specific Roles and Functions of Nurses in the Disaster Management of this Particular Event

Disaster management in Australia is a coordinated and orchestrated process, and although nurses fill very valid and important roles, disaster response is governed by the hierarchy of the hospital and health services. All hospitals in North Queensland have cyclone plans that are reviewed annually prior to cyclone season. Routinely preparations are put into place in the advent of a cyclone impacting on the hospital including adequate staffing levels and sufficient stocks. When a cyclone watch is declared, the cyclone plan is put into action regardless of the categorical size of the cyclone. Measures to secure the facility are initiated, and specific preparations are then dependent on landfall. Decisions to evacuate or to shelter in place are rarely a decision made by nursing staff, yet suitability for discharge or transfer out is always conducted collaboratively between the nursing and medical staff.

During TC Yasi, the above processes were followed and even though in some areas healthcare facility evacuations occurred, nursing roles and functions remained stable and within the scope of practice. Main duties involved ensuring safe decisions were made regarding the discharge of patients and that adequate documentation followed those patients where were transferred out.

2.4.2 Factors that Facilitate and Hindered Role of Nurses in Disaster Management

Prior to and at the time of TC Yasi, neither hospital in Cairns had a full hospital evacuation plan; rather plans were available for partial evacuation of a ward or floor

to a designated assembly area. Given this and the window period available for evacuation, it was imperative that any decision made was efficient and effective. Evacuation planning commenced at 10:00 hours, and evacuation of the most seriously ill commenced at 14:00 hours on 2 February.

With a critically short lead time, it was imperative that the medical staff completed all necessary paperwork and medication orders either for discharge or transfer. A steady stream of ambulances ferried patients to a second triage at the Cairns airport, and an endless supply of taxis and relatives were called on to transport discharged patients. Even though no benchmark exists for quick efficient movement of patients out of hospitals, both hospitals where empty 14 h after the first plane departed (Little et al. 2012).

Success in part can be attributed to the management of nursing staff. Although many needed to leave to secure their own families or lived long distances away, a number of staff stayed or returned to assist this massive undertaking. Overwhelmingly the commitment and unselfish actions of nurses across the disaster zone was to be commended. Many in the critically impacted areas worked tirelessly and without recompense during the first 72 h, often to the detriment of their own well-being and that of their families.

Interestingly the noted hindrances for nursing staff were technologically related. Electrical equipment sent with evacuee patients to the airport ran out of battery life due to limited sources of electricity in the waiting areas. In addition the airport air-conditioning system had not been started, adding to the discomfort of the 356 patients, staff and relatives awaiting flights.

As before communication was highlighted as a problem for the nursing staff. Vital to patient safety, communication at the best of times can be problematic in the healthcare sector, and with the added stress and uncertainty of a disaster, it is not surprising that communication suffered at times (Wilkie 2013).

2.4.3 Lessons Learned in Implementing Disaster Prevention, Preparedness, Response, Recovery and Rehabilitation Efforts by Nursing Sector

Although disaster management in Australia is of high standard, a number of lessons were learnt from TC Yasi. Firstly, the need for a full hospital evacuation plan is imperative. Currently very little published data on full hospital evacuations is available, resulting in minimal guidance for the implementation of such plans and policies (Little et al. 2012).

Secondly, when plans are developed, review and practice is paramount. Evacuation and disaster plans should be reviewed critically by all healthcare stakeholders. During TC Yasi particular problems were linked to patient tracking, simply put, who went where. In the post-disaster analysis phase, this is exactly the type of question that can be safely problem-solved, but the solution is dependent on all parties being present, not just the end users. This same philosophy can be applied to a number of situations that arose, not solely those associated with the hospital evacuations.

The third major lesson learnt was around communication. Good communication is critical in all phases of disaster and imperative to successful outcomes. Given the magnitude of this weather event, the window for evacuation and no predefined evacuation plan, it is fair to say that for most parts, teams communicated well. However, as noted by Wilkie (2013), 'communication can become a hurdle when not complete, clear or timely' and as such a timely reminder has been provided around the importance of communication on all levels and between all parties involved.

2.4.4 Key Issues in Planning, Coordinating, Communicating and Evaluating Nursing Efforts

Post-TC Yasi debriefing and counselling sessions for the majority of healthcare workers were conducted in a timely manner. But anecdotal evidence from some of the smaller and worst-hit communities suggests that this much-needed process and support was either late in the offering or non-existent for some staff members. The importance of these sessions is well documented as often individuals who have experienced a disaster undergo feelings of fear, disbelief, anxiety and shock (Usher et al. 2012).

For staff who did attend, the debriefings allowed for discussions regarding what worked and what did not. They allowed for planning and evacuation policies to be updated and implemented as well as a systematic review of the current emergency systems. Particular attention was paid to patient issues, equipment, staffing and secondary medical facilities (Little et al. 2012; Wilkie 2013). Unfortunately as is often the case in disaster lessons, the ability to 'test' changes made to local health systems is reliant on a disaster of the same or similar magnitude.

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Cambodia: Nurses' Role During Riverine Floods

3

Virya Koy

3.1 Introduction

Cambodia is one of the most disaster-prone countries in Asia, with floods as the primary natural hazards to affect the country. These have caused significant loss of life and substantial damages to infrastructure, agriculture, and livelihoods. The frequent floods have exacerbated the vulnerability of the mostly poor and rural population. In addition, issues with significant humanitarian impact, including climate change, landmines, environmental degradation, water and sanitation, health, and other developmental issues, also affect Cambodia, severely obstructing development in a country (CE 2014).

Cambodia is a vulnerable country to natural disasters such as flood and tropical storm (Chea and Sharp 2015). In the World Risk Index, Cambodia is ranked the ninth among the most vulnerable countries because of high disaster risks, high exposure, and limited technical assistant (Chea and Sharp 2015). Eighty to eighty five percent of population is farmers, who live in rural area of central flood plains. One out of five households lives below poverty line due to the impact of nature disaster.

There are two main seasons in Cambodia, dry season (from October to late April) and rainy season (from May to late September). The past experience of flooding showed that the light flood is caused by typhoons and several other weather calamities (Alert 2015). Eighteen out of twenty four provinces were affected by annual river flooding along with the two major watershed, Mekong River and Tonle Sap Lake.

Nurses are often called upon to provide aid and care during a disaster event of riverine flood that disrupt the normal delivery of healthcare to the community and local emergencies that temporarily strain resources. In these settings, nurses utilize

V. Koy, RN, SNAR, MSNc, MHPEd, PhD
Chief Bureau of Nursing and Midwifery, Ministry of Health, Phnom Penh, Cambodia
e-mail: virya2403koy@gmail.com

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their unique skills, abilities, and understanding of the community to the betterment of the population by striving to deliver the highest attainable level of care that the adverse circumstances allow.

Nurses are often the first medical personnel on site after flooding strikes. In these situations where resources are scarce, nurses are called upon to take roles as first responder, direct care provider, on-site coordinator of care, information provider or educator, mental health counselor, and triage officer (WHO and ICN 2009).

An increase in disasters in the Asia Pacific region stresses the need to promote healthcare workers' preparedness to respond when required. Nurses make up the majority of frontline responders in disasters, so it is particularly important to ensure that their knowledge and skills are adequate to respond to such events (Usher et al. 2015).

Unfortunately, there have been a number of recent claims that nurses do not possess the required competencies for this task (Usher 2010; Usher and Mayner 2011; Khalaileh et al. 2012; Jiang et al. 2015). Over 86% of Cambodia lies within the Mekong basin, their significance, undoubtedly of critical importance to Cambodia, in terms of both current benefits and resources available for future development. These include (1) fisheries resources for food security and a social safety net, (2) large potential water resources for expanding irrigated agriculture, (3) navigation and domestic water transport, and (4) ecotourism (CNMC 2014).

3.2 Riverine Floods in Cambodia

Cambodia is mainly exposed to disasters related to floods having been severely affected by floods almost every 2 years over the last decade. In 2000, flooding affected almost 3.2 million people in 21 of Cambodia's 24 provinces (UNISDR 2015).

The flood started from 1996 until 2016. It showed that the Mekong flood in 2000 was the worst experience during last 70 years in Cambodia, causing both socioeconomic and physical damages. According to the NCDM official report, the floods affected about 3.4 million people with 347 fatalities, of which 80 percent of fatalities were children. Moreover, schools and other infrastructures such as hospitals, houses, and pagodas were seriously damaged, with a total estimated loss of US$161 million. Repeatedly, floods hit Cambodia in 2001 and 2002, creating a damage approximately US$36 million and US$12 million respectively.

3.3 Impact of Riverine Floods

Following Sawada (2007), disasters can be classified into three major groups. The first type is the natural disaster, which includes hydrological disaster (flood), a meteorological disaster (storm or typhoon), a climatologically disaster (drought), a geophysical disaster (earthquake, tsunami, and volcanic eruptions),

or biological disaster (epidemic and insect infestation). The second type of disaster comprises technological disasters, i.e., industrial accidents (chemical spills, collapses of industrial infrastructures) and transport accidents (by air, rail, road, or water). The final group of disasters is manmade and includes economic crises (hyperinflation, banking, or currency crisis) and violence (terrorism, civil strife, riots, and war). This chapter is focused only on riverine flood in Cambodia.

In 2001, the floods killed 62 people, while in 2002 the floods killed 26 (40 percent of whom were children), and many schools were destroyed (Alert 2015). Extreme flooding is wreaking havoc in Cambodia, with 45 people killed and tens of thousands made homeless by rising waters (Khmer Time 2016).

There has been no new data since NCDM's data of 28 October, which showed that 350,274 households (over 1.64 million people) have been affected including 700,000 children and 51,594 households evacuated. Eighteen out of 24 provinces in Cambodia have been affected with Kandal, Kampong Thom, Prey Veng, and Kampong Cham being the most badly affected provinces. There have been 247 fatalities and 23 injuries as a result of the floods. Four hundred twenty-three thousand four hundred forty-nine hectares of rice fields have been affected with 265,804 hectares reported as damaged (with the total area of planted rice at 2,466,429 hectares, this represents 10.7% of total crops destroyed).

Riverine floods accounted for 70% of rice production losses between 1998 and 2002, most severely in 2002, when more than 2 million people in eight provinces were affected. The total economic loss from natural disasters in Cambodia from 1999 to 2008 was US$ 214 million (Oxfam-America 2008). PreventionWeb's (2014) country profile on Cambodia has useful and clear information on disaster risks, maps, and statistics but requires updating. Geophysical hazards are few, even if there is a small risk from tsunamis.

The Mekong River started to rise in early August 2011, with the water level rising significantly when Typhoons Nesat and Nalgae in late September and early October brought heavy rain. Eighteen out of twenty four provinces and municipalities were inundated and over 1.5 million people affected. The damage from the 2011 flooding is expected to exceed that of floods in 1996 and 2000, both in terms of loss of life and impacts on infrastructure and agricultural crops, largely because the water rose and receded three times. This not only prolonged the period of inundation but also hindered the initiation of meaningful remedial measures.

In 2013, World Food Program found that there were 14 out of 24 provinces that were affected by floods (see Fig. 3.1). About 59% provinces were affected by floods. About 377,356 households were affected and displaced households were 31,075. In addition, there were more than 1.7 million people affected by floods (WFP 2013; NCDM 2014).

Households most affected by the floods are those who rely primarily on rice farming and live in isolated rural areas of the country. Damage to the rural road

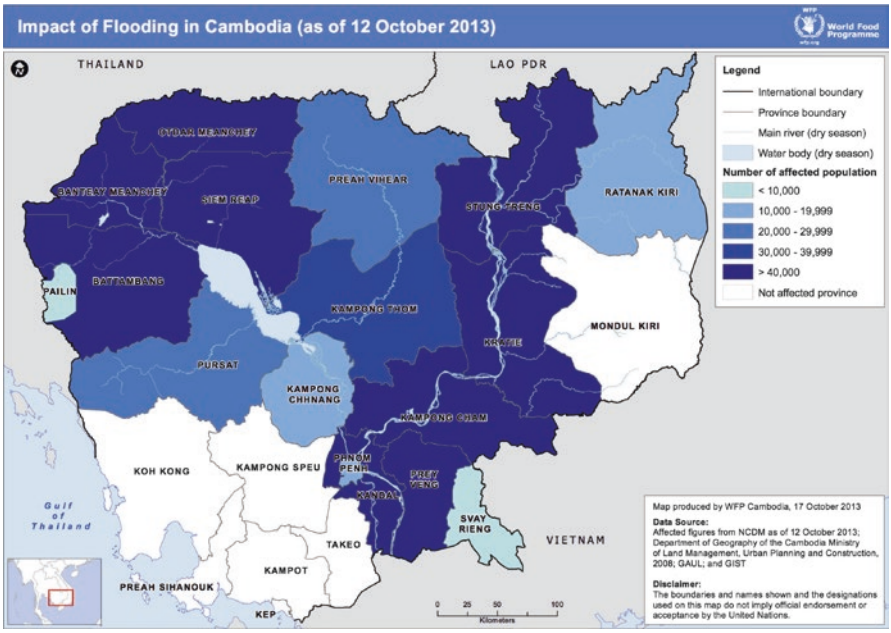

Fig. 3.1 Impact of flood in Cambodia (Source: World Food Programme)

network, on which they depend for sustaining livelihoods, has severely hampered access to basic services such as water supply and sanitation, health, education, and irrigation. As a result, the flood had a magnified impact on the poorest people and vulnerable households, including women and children living in rural areas (ADB 2012).

Despite the positive overall economic performance of Cambodia in 2011, the flood slowed the potential for sustained economic growth due to the devastating impact at the household and macroeconomic levels. As a result, the growth potential in different sectors of the economy was not realized. Preliminary estimates indicate that the direct damage to assets and economic losses amounted to $624 million dollars (ADB 2012). Approximately two-thirds of the total negative effects of the flood are due to the damages and one-third due to the losses.

In addition to the sources of income and the number of members earning income, the post-flood survey also asked households to report whether the relative amount of their income had changed as compared to before the floods. Roughly two-thirds of households (64 percent) had seen their income decrease since before the floods. Households in the poorest wealth quintile, those considered severely affected by the affect index, and those with fewer income earners compared to before the floods were most likely to report that they had seen their income decrease (78, 74, and 75 percent, respectively) (UNICEF 2012).

Nationwide reports from Provincial Education Offices show that 904 schools were affected by floods at the end of September, increasing to 1369 by mid-October and

reducing to 374 by early November. In total 303 brick school buildings and 173 wooden school buildings were damaged by the floods. The Provincial Education Offices reports list 110 school buildings that must be replaced. It is not proposed to repair wooden school buildings because such repairs would not be cost effective. The 303 brick buildings can be repaired and the 110 buildings replaced, for a total estimated cost of $9,156,000. Flooding initially caused significant school closures due to school infrastructure being flooded, access to the school being limited by water, and in some cases the use of schools as safe areas. Now that the flood waters have receded, many schools have reopened. However, the issues affecting education now are (1) delays of 1–2 months in reopening schools, (2) loss of school furniture and learning materials, and (3) loss of textbooks from children's homes, which could cause children to dropout if not replaced. The following table summarizes the number of schools that were affected by flooding as reported by the Provincial Education Offices, where a flood-affected school is defined as one that was prevented from opening by flooded access roads, flooded school compounds, or flooded buildings (ADB 2012).

An increased prevalence of fever, diarrhea, typhoid, dengue, and skin problems has been reported as resulting from the floods. Among the children, the most commonly reported health problems were acute respiratory infection and malnutrition. More severe health problems were expected to materialize since basic facilities and livelihood activities in affected rural areas affected were not yet rehabilitated. While the Ministry of Health has been monitoring reports from health centers, this information is unlikely to be fully representative of the actual health situation due to the limited access to health facilities due to distance and damage to roads. Reports indicate that people were not attending health facilities and instead treating at home due to access constraints and cost. The Ministry of Health (MOH) and the World Health Organization (WHO) conducted a joint rapid assessment in 10 provinces, visiting two health centers per province. Findings suggest that in the majority of cases, affected health centers were able to resume activities after a few days and that there was little indication of losses of drugs and medical supplies, damage to medical and office equipment, or loss of patient records. However, it was observed that while the majority of health centers are in reasonably sound condition, the existing problems of poor access to healthcare by vulnerable populations have been magnified by the flooding (ADB 2012).

The damage to health structures was estimated by assuming it was similar to education facilities. Since the number of health centers flooded was less than 1/3 of schools, the damage was estimated at $3 million. However, it was more difficult to estimate losses for the health sector as most would materialize in the long term through indirect effect of deterioration of hygiene and in general livelihood conditions in affected areas (ADB 2012).

A report was made by ADB (2012) showing that the damaged infrastructures included national/provincial roads (363 km) and 177 bridges/culverts (overall 925 km affected). Furthermore, the rural roads needing priority repairs were 1842 km (overall 4470 km affected). Moreover, the irrigation were 329 schemes partly damaged (includes damage to 54 km of canals and 122 km of reservoir embankment). In addition, the rural water supply was 77,544 wells and 579

community ponds were contaminated (affecting more than 456,000 families). Lastly, 1396 schools and 115 health centers and rice fields were damaged: around 10% of which and 6.6%, respectively, were fully destroyed (ADB 2012).

3.4 Health Sector Response to Riverine Floods

In the aftermath of floods, a primary concern and uncertainty was the extent to which they had impacted the health and nutritional status of the population. In a fundamental sense, the overall well-being of a community is reflected in the health of its women and children, and indicators related to economic, agricultural, and food security conditions are captured to help explain this overall measure. The health and nutrition indicators presented in this section were chosen because they represent standard, comparable measures of well-being for these groups.

WHO had provided funding and technical assistance to the MoH to perform rapid health assessments and start daily surveillance of communicable diseases in flood affected districts. To date, the MoH has not identified a significant increase in diseases in flood affected areas. According to a recent MoH-WHO assessment in eight affected provinces in Cambodia, while floodwaters had inundated approximately 108 health centers in areas assessed, healthcare officials continue to deliver health services to affected populations. Floods have submerged water sources in many flood-affected provinces, limiting affected families' access to safe drinking water. While officials have not reported any significant outbreaks of diseases at this time, consumption of contaminated water puts people at risk for the spread of waterborne diseases. Following recent field assessments, the USAID/OFDARA noted the need for increased access to safe drinking water in conjunction with hygiene and sanitation activities in flood-affected areas to prevent an increase in waterborne diseases (WFP 2013).

A fleet of five speedboats set off from Sisowath Quay on Tuesday afternoon carrying Phnom Penh's governor, 19 local officials, several bodyguards, and a press team, as the municipal authorities' plan to deal with flooding in several districts of the city switched into first gear. Over the past 2 weeks, storms have caused severe flooding across ten provinces as water levels in the Mekong and tributary rivers surged, claiming at least 30 lives and forcing almost 10,000 families from their homes, according to the figures released by the NCDM (2014).

One goal was to check on changes to the river that has swollen due to heavy rains and flooding elsewhere in the country, he said on Sisowath Quay after disembarking from a speedboat, adding that the party was also checking if sand dredging was contributing to the flooding. The city hall was prepared to respond to a disaster, though it was unlikely that the 10.50 m emergency level on Phnom Penh's riverfront would be breached (Cambodia Daily 2013). More than 170 families are living in unofficial safety areas after they said they decided to evacuate to higher ground.

In addition, the core challenges of riverine floods are water resource management in terms of access and distribution. Management of water resources requires

looking at both supply- and demand-side issues and placing greater emphasis on balancing water sustainability, efficiency, and equity. Underpinning this is the need to establish the institutions to manage water resources more sustainably and equitably among different uses and users after floods (MoWRM 2016).

Resources are at work to ensure affected households, especially young children, stay safe, maintain proper hygiene and good health, and have access to nutritious food during their period of evacuation or after floodings. Heavy rains since the third week of September have resulted in floods in at least 16 provinces throughout the northwest and along the Mekong River in central and southern Cambodia (MRC 2010). The flooding has seriously affected six provinces: Banteay Meanchey, Battambang, Siem Reap, Kampong Thom, Preah Vihear, and Takeo. The needs to help flood victims are as follows:

First is providing relief based on the greatest needs of those most affected. In Banteay Meanchey and Battambang province, where heavy flooding is threatening the livelihood of thousands of people, the need is helping evacuate people to non-flooded areas such as pagodas and schools.

Second, at evacuation points, is providing shelter and child-friendly spaces for children—centers where children learn about hygiene, child protection, prevention from drowning through playing games, and other fun activities that help them deal with the trauma caused by the flooding (WVC 2013).

Third is the distribution of food items, water filters, and water purification sachets and installing latrines and rubbish bins in the non-flooded areas where people move to, preventing people, especially children, from malnutrition and diarrhea (WVC 2013).

Aside from other needs during the period of severe flooding, safety for children is paramount. The disaster preparedness training is conducted to provide lessons to children and parents on how to prevent children from drowning. An important area of intervention is the work with young children, where they learn about the dangers of floodwaters and how to avoid drowning and snake bites.

As the largest manpower group in the healthcare team, nurses play an important role in flooding care. Nurses' "roles are not only in the emergency phase of a flooding, to rescue life and safeguard the health of the disaster sufferers, but in fact, nurses have special roles in disaster preparedness and aftermath long-term recovery" (Davies 2005; Brewer 2010). By providing leadership and guidance in different phases of a disaster, nurses can safeguard the health of the general public and reduce death tolls (Subbarao et al. 2008).

3.5 Role of Nurses in Riverine Floods

One of the roles and functions of Cambodian nurses is the care of people which is defined as emergency cases by the Ministry of Health (2003). Disaster refers to an event or situation that is of greater magnitude than an emergency; disrupts essential

services such as housing, transportation, communications, sanitation, water, and healthcare; and requires the response of people outside the community affected. The term disaster particularly signifies an event that carries unforeseen, serious, and immediate threats to public health. Disaster is any occurrence that causes damage, economic disruption, loss of human life, and deterioration in health services on a scale sufficient to warrant an extraordinary response from outside the affected community area according to the World Health Organization.

Nurses have been a part of riverine floods preparedness and response as long as nurses have existed. Although the early nurses who responded to emergencies during historic events may have been something other than the fully educated, licensed, certified, professional nurses as we know them today, their described role is consistent with a modern understanding of nursing: attention to the injured or ill individual; assuring provision of water, food, clean dressings, and bedding; providing relief from pain; and offering a human touch. Nurses have a special role in advocating systematic healthcare services during flood. Nurses are needed for prevention, surveillance, and response of every type (Haddow and Haddow 2008).

Nurses are a part of the response mounted each time there is a report of a weather or geological event, such as flood. Professional nurses are routinely assigned to assist in triage and screening for health problems, administration of first aid and psychological support, implementation of infection control procedures, and monitoring so that the congregate living situation does not lead to an outbreak of disease. They have always been key players during epidemic situations by performing contact tracing and conducting case investigations, engaging in surveillance and reporting, collecting specimens, administering immunizations, and educating the community. Hence, nurses are a key staff member behind the rapid establishment of refugee camps for those who need shelter after flooding occurred.

As the largest manpower group in the healthcare team, nurses play an important role in care of patients during flooding. Nurses' roles are not only in the emergency phase of a flooding, to rescue life and safeguard the health of the disaster sufferers, but in fact, nurses have special roles in disaster preparedness and aftermath long-term recovery (Davies 2005). By providing leadership and guidance in different phases of a disaster, nurses can safeguard the health of the general public and reduce death tolls (Subbarao et al. 2008).

3.5.1 Prevention and Mitigation

From the focus group interviews, there was consensus of nurses from all three specialties considered: risk assessment and management, provision of appropriate protective materials, development and planning of organizational guidelines or protocol for flooding management, and planning for specific incident management as required flooding nursing competencies. However, only the critical care and community health nurses regarded adhering to infection control principles and the need for contingency plans for floods as important competencies in flooding prevention.

3.5.2 Preparedness

Cambodia nurses developed good communications among hospitals, communities, and other agencies to report incidences. Training course for flooding management related to 'drills, audits, or talks' and the 'knowledge and skills in different flooding situation' were conducted sometime.

In addition, the code of conduct is required in flooding care. All nurses considered legal liability, and professional code of ethics should be reinforced in flooding care. Further, the principles of human dignity and absence of discrimination in flooding care have been introduced to nurses. The communication skills and reporting systems and use of various tools for communication and information sharing are needed. Nurses were trained to use computer for updating information about new flooding, training in information technology, and communication skills.

3.5.3 Response

During floods, there is a need to be concerned about psychological care and crisis intervention in a floodings. Nurses should (1) have knowledge of prioritizing care, (2) use reminder cards for management of specific severity from the floods in order to enable efficient triage and prioritize care, and (3) prioritize vulnerable groups as a neglected population with special needs.

Moreover, there is a need to establish logistics for care of victims and perform holistic care. Nurses emphasize the need for psychological care including coping skills and knowledge on disaster care and posttraumatic stress disorder care.

3.5.4 Recovery and Rehabilitation

Nurses talked about the importance to have a plan for evaluation and planning in management during and after floods. For example, medical/surgical nurses identified the need to learn restoration of normal services. Particular unit in hospital noted the significance of multidisciplinary approach in the recovery stages of a disaster and the knowledge of psychological care for victims. Nurses emphasize the collaboration between community and family for post-disaster recovery, systematic long-term care for flood recovery, and district support in resources allocation, as well as evaluating and planning for future flood management.

In the emergency situations, and in case there was absent of physcian, nurses could play important roles to safe withims' life while waitinf for physicians. In this regards, nurses have right to use the written emergency protocol while the physician was absent. Furthermore, nurses must complete necessary actvities to take care the patients untill the physician' intervention has been started.

These activities must be compulsorily done with the written report dated and signed by nurses, then present to physician with attaching the patient profile. Nurses must try all their best to provide nursing care as muuch as she/he can.

Nurses have been part of riverine floods preparedness and response as long as nurses have existed. Although the early nurses who responded to emergencies during historic events may have been something other than the fully educated, licensed, certified, professional nurses as we know them today, their described role is consistent with a modern understanding of nursing: attention to the injured or ill individual; assuring provision of water, food, clean dressings, and bedding; providing relief from pain; and offering a human touch. Nurses have a special role in advocating systematic healthcare services during floods. Nurses are needed for prevention, surveillance, and response of every type.

Cambodia's unique hydrological system and low coverage of water control infrastructure makes it vulnerable to climatic and natural disasters. Floods in Cambodia are a dangerous threat that occur frequently, but the management policies to respond and prepare for the flood are still limited. The lack of preparedness and systematic planning in commune, district, provincial, and national level is a serious problem.

The levels of damages of flood were much different in recent years, higher than previous year floods. Flooding not only caused economic impact but also social and environmental problems. The flood has the most negative impact on the rice and mixed crops productions. There is a need for more improved management strategies in preparedness, emergency, and rehabilitation and recovery of healthcare workers, with nurses included.

First, in the stage of prevention and mitigation phase of flood, the most neglected competencies were the preparation of nurses in preventing flooding, regular review of protocol, and quality and safety guideline.

Second, in the preparedness phase, nurses must practice according to professional standard, updating information about new diseases, training in information technology and communication skill, skills in psychological intervention, and understanding of the nature of disaster. For preparedness response, nurses involved in flooding intervention must conduct collecting data and information. The creation of provincial and district preparedness plan updated the methodologies on how to share information with relevant agencies. There is a need for government to provide more funds to support the training program for nurses' competencies in flood management in Cambodia.

Third, during the response phase, the competencies related to forming critical incident support team, familiarity with different resources, support network, and referral for victims and families, and the ability to identify vulnerable populations, posttraumatic stress care, and care of special population with special needs are really needed. In the recovery phase, the evaluation and planning of management after a flooding, restoration of normal service, collaboration between community and family for post-flooding recovery, and systematic long-term care for flooding recovery require more attention. For emergency response, nurses have to report the flood situation and affected people. The provisions of food emergency needs are sufficient for affected people especially the basic needs. Nurses need to take care of patients and provide holistic care with compassion based on the Cambodian Code of Ethics. Nurses must provide holistic care such as physical, mental, social, and spiritual.

Fourth, previous studies have found that most nurses were not adequately prepared (Fung et al. 2009; Usher et al. 2015). Nurses were not aware of their roles in preparing the community or the vulnerable population for flooding. In order to be prepared and be competent for flooding, all nurses should be competent for riverine flooding care through continuing education and training. Disaster nursing has not yet been established as a core topic/subject to be included in nursing programs in Cambodia, though there is a global demand for the inclusion of this component of disaster care in the education program. The lesson learned from this case study provides a clearer picture of the inadequate preparations of nurses for flooding. It can guide nurse educators and/or healthcare administrators to develop training programs for nurses.

Fifth, the ICN Disaster Nursing Framework has suggested that there is much needed attention on planning and preparation, as well as the understanding of the whole disaster management process. Therefore, nurses must have some understanding of the needed competencies in prevention, preparation, response, and recovery phases of flooding care. However, nurses may have difficulty meeting the disaster nursing competencies, which ensure that they provide nursing care effectively during emerging situations.

Last, the successful response to flood in Cambodia, nurse managers in flooding, should have strong linkage with key stakeholders. They have their own responsibilities for overall flood management activities. Flood management depends on effective integration of planning preparedness, emergency, rehabilitation, and recovery response in national, district, community level.

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China: Disaster Nursing Enlightened by the 2008 Wenchuan Earthquake (前事不忘 后事之师: 2008年汶川地震灾害护理之启示)

4

Sunshine Chan and Si Jian Li

4.1 Introduction

China is located between the two largest seismic belts—the circum-Pacific seismic belt and the circum-Indian seismic belt which makes it prone to earthquakes. These earthquakes are usually characterized by high frequencies, seismic intensity, shallow epicenter, and wide distributions. In the last 60 years, more than 100 destructive earthquakes have struck China and resulted in more than 300 thousand deaths.

The Great Wenchuan Earthquake along the Longmenshan Fault in the southwestern Sichuan Province was known as one of the most extensive, most destructive, and most costly earthquakes in China since the founding of the People's Republic of China in 1949.

4.2 The Great Wenchuan Earthquake

This Great Wenchuan Earthquake, which occurred at 14:28 on 12 May 2008 measured 7.9 on the Moment Magnitude Scale at the epicenter with a focal depth of 19 km. The total hit areas extended into 440,000 km^2 of land affecting 46.24 million people in 417 counties, which resulted in 87,148 deaths (including 17,921 presumed deaths) and 374,643 persons injured.

In addition, 53,295 km of road were damaged, rendering transportation on the ground impossible; 8,426 water plants and 48,276 km of water supply channels were damaged resulting in suspension of clean water supply; as well as 37,028 km of optical cable damaged causing power cut in 54 counties and telecommunication coming to a halt (State Council Information Office by Xinhua News Agency 2008, 2009).

S. Chan, RN, DHSC (✉) • S.J. Li, RN, PhD
School of Nursing, The Hong Kong Polytechnic University, Hong Kong, China
e-mail: sunshine.chan@polyu.edu.hk

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An Earthquake Disaster Relief Headquarter was immediately set up by the State Council of the People's Republic of China, and the Premier Wen Jiabao acted as the commander in chief. This catastrophic event had called for more than 140,000 healthcare professionals nationwide into the relief and aftercare (Xinhua News Agency 2008). Over 400 healthcare professionals from Cuba, France, Germany, Hong Kong, Japan, Macau, Taiwan, Russia, the UK, the USA, as well as 5,000 from other provinces provided assistance in this difficult time.

4.3 Health Sector Response to Wenchuan Earthquake

Among the 374,643 persons injured in this disaster, about one in four were seriously injured. Due to collapse of buildings, the wounded were characterized by multiple trauma, complex wounds, and organ injuries. Lives could only be saved if medical attention were made available immediately following the evacuation from the debris. As the service of medical facilities in the disaster sites were paralyzed by the structural damage and loss of personnel, many injured persons were required to wait until external assistance became accessible.

The People's Liberation Army of the People's Republic of China had established a disaster command center in Chengdu 10 min after the earthquake to assume the role of command and control (Xinhua News Agency 2008). Mobile rescue teams from military medical hospitals were being instructed to work with the local healthcare professionals to cope with the surge in demand.

As over half of the health facilities were damaged or totally destroyed and roads were badly damaged which made transfer of patients out of the earthquake zones almost impossible initially, field hospitals were established by the Chinese People's Liberation Army at the hardest hit sites to improve survival and reduce morbidity.

In one of these field hospitals in Dujiangyan with an area of 1000 m^2, it was divided into triage zone, resuscitation area, treatment area, critical care unit, diagnostic unit, surgical wards, medical wards, obstetric wards, pharmacy, living area, and logistic support zone (Li et al. 2008a). Major machinery included mobile operation theatre, radiological diagnostic machines, respirators, cardiac monitors, resuscitation trolleys, transfer machinery, telecommunication equipment, and portable electricity generators.

The Central Military Commission of the People's Republic of China and the People's Liberation Army General Logistics Department instructed different hospitals to send medical rescue teams to the disaster sites. These teams composed of doctors, anesthetists, and nurses. They initially worked in the open space and later in the medical tents (Niu et al. 2008). On-site emergency treatment included cardiopulmonary resuscitation, shock management, rehydration, bleeding control, pain control, and trauma care (Han et al. 2008; Niu et al. 2008; Teng et al. 2008a; Yang et al. 2008a).

In response to the need to perform emergency operations, field operation theatres were also built. For instance, the 153 Central Hospital of People's Liberation Army

and the Chengdu General Military Hospital had set up field operation theatres in the disaster sites and performed operations (Jiang et al. 2008; Li and Niu 2008; Wang and Gong 2008). Prior to the setting up of the field hospital machineries, electrical circuit, oxygen pipelines, vacuum piping, and monitor display circuit pathways had to be established. To facilitate operation, all anesthesia machines, multifunction monitors, suction apparatus, and surgical lights had to be placed in their predesignated space, powered, and checked. As power was cut at the initial stage, power was supplied by portable electricity generator. Alternatively, the People's Liberation Army General Hospital used field operation theaters on trucks (Li and Niu 2008).

4.4 Impact of Great Wenchuan Earthquake on the Hospital System

In this devastating disaster, a total of 96,544 patients had been admitted into hospitals. All hospitals in the Sichuan province were involved in the provision of treatment to the patients. For instance, on the day of the earthquake, Chengdu Military General Hospital admitted 450 patients and conducted 181 surgical operations (Lu et al. 2008b).

In order to vacate hospital beds for the seriously injured, temporary medical tents were set up in the courtyard of the hospital to accommodate the inpatients. Triage, resuscitation, and emergency treatment zones were set up in the parking lot in front of the hospital. Mobile surgical theatre, x-ray suite, and blood collection room were made available on the wheels. Setting up the triage zone in the parking space in front of the hospital had the advantage of allowing access for traffic and transportation of patients. As most of the patients arrived in groups via ambulances, private cars, public vehicles, and trucks, specific personnel were required to control the traffic. Signs were put up so that walking patients and trolleys would not fight for space.

Crush injuries were suffered by a good number of people because they have been trapped and compressed by heavy debris for prolonged period of time. When the tissue pressure exceeded the perfusion pressure within a closed muscle compartment, muscle and nerve ischemia would result. When victims were being released, they might suffer from life-threatening conditions including acute renal failure, hyperkalemia, and metabolic acidosis. In order to reduce mortality and the risk of intravascular coagulation in this type of patients, continuous renal replacement therapy had successfully been used (Quo et al. 2008; Wang and Cui 2008; Wang et al. 2008b).

During the initial phase after the earthquake, over 80% of patients being treated had mechanical injuries requiring surgical interventions. Materials needed for the procedures included surgical and orthopedic equipment, anesthetics, analgesics, antiseptics, intravenous fluids, splints, dressing supplies, urinary catheters, and personal protective equipment (Li et al. 2008b; Ruan et al. 2008). Nurses were responsible for the estimation, ordering, transferring, controlling, and stock taking these

materials to the disaster sites. Apart from anesthetic agents, most of these items were collected and sent to the disaster sites by air or by truck. To avoid loss in the transfer, all items were packed in waterproof boxes and clearly labeled with permanent ink. In the disaster sites, all materials were placed on shelves and protected from rain and floodwater.

A few days after the earthquake, the Chinese Center for Disease Control and Prevention issued orders for provincial Disease Control Centers to instigate public health measures to control disease outbreak (Chan 2008). Infection control measures included outbreak surveillance; vector control; and maintenance of water, food, and environmental hygiene (Niu et al. 2008). People's Liberation Army 302 Hospital published and disseminated guidelines for nosocomial infection control in the earthquake zones (People's Liberation Army 302 Hospital 2008).

In the field triage units and tent hospitals, care was exercised to prevent nosocomial infections. Disposable gloves were worn when there was risk of body fluids contact, hands were soaked in chlorinated water after patient care, environment and floor were disinfected with household bleach or 0.2% peracetic acid, and toilets were sanitized with lime powder (Yang et al. 2008b). Medical equipment was sterilized by boiling for 30 min before autoclaving was made available by portable power generator (Teng et al. 2008b). Medical wastes and sharps were put in specially labeled bins for incineration (Dong et al. 2008).

In regional and local hospitals, infection control policies were set, and designated personnel was assigned to make sure that infection control measures were strictly implemented (Wang et al. 2008c; Xi et al. 2009; Zhang et al. 2008a). Infection control was noted to be particularly crucial in taking care of patients with multi-organ failure, immune-compromised, extensive open wounds, and life-threatening conditions (Wang and Cui 2008). Third degree fractures of tibia and fibular were stabilized with external fixation in conjunction with vacuum sealing drainage rather than internal fixation to minimize the incidence of serious wound infection (Liu et al. 2012).

In the community, there was an increased risk of diarrheal diseases and skin infection due to high temperature, continual torrential rains, lack of toilet facilities, damage of sewage system, and limited supply of clean water, compounded by crowded living conditions. On 27 May 2008, just over 2 weeks after the major quake, an increase in fever, diarrhea, and skin rash was observed. The Ministry of Health had deployed 10,000 professionals from 30 provinces, autonomous regions, and municipalities across the country to the quake zones to fight against epidemic outbreak. In this connection, nurses had provided hepatitis A, cholera, encephalitis B, and measles vaccination to the vulnerable population. They had also provided widespread health education to all patients with diarrheal disease on how to prevent the spread of their disease to other survivors (Tan et al. 2008). Educational strategies invariably included health talks, distribution of health materials, and health visiting. Emphasis was put on personal cleanliness, food hygiene, water safety, proper disposal of excreta, and vector control (Long and Wang 2008). Apart from the general public, special attention and tailor-made education were also provided to the military troops (Zhang et al. 2008c).

4.5 Roles of Nurses in Wenchuan Earthquake and the Challenges

China West Hospital in Sichuan is one of the biggest single site hospitals in the world with 4,800 beds. Within the first 3 weeks following the earthquake, it had treated 2,618 patients. In order to improve work efficiency, the nursing department swiftly organized their first disaster relief team with 35 nurses from various departments. They had also internally transferred the stable patients to the garden to make beds available for the earthquake victims. Within the first 10 hours, three quarters of the patients admitted had orthopedic problems. Three orthopedic wards with 248 beds were expanded into 700 beds, and an additional 88 nurses were deployed from other units to cope with the workload. In order to better utilize the existing resources, the critically ill patients were segregated and cared for by designated groups of specialists. In alignment with this hospital policy, an intensive care unit (ICU) was formed by 123 ICU nurses and 47 nurses from other units. In collaboration with the renal nurses from the international team, continuous renal replacement therapy was instituted at the bedside. Altogether 152 nursing personnel have been deployed to emergency service, orthopedic and traumatology wards, and intensive care unit; these included 26 nursing officers, 91 advanced practice nurses, and 35 nurses (Cheng et al. 2008).

Within the first 2 weeks after the earthquake, emergency departments of hospitals as well as the field triage sites in the affected areas were confronted with an overflow of patients. This situation was further complicated by the breakdown of the clinical management system within hospitals and aftershocks in the field. In order to cope with the large number of casualties, there was a need to classify the injured so that the greatest number of lives could be saved (Lu et al. 2008b). Experienced nurses from orthopedic, neurosurgical, abdominal surgical, thoracic surgical, and renal departments were deployed to work with nurses and doctors from the emergency department to form triage teams. Nurses were responsible in assessing patients, assisting doctors in the triage process, documenting essential information on the triage cards, and providing life-sustaining nursing service to the critical ill patients and arrangement for patient transfer.

The demand for immediate care had clearly exceeded the capacity for hospitals in the Sichuan province to cope. While drawing on the help provided by other provinces might mean that patients would need to be transferred by truck, train, or plane. To this end, apart from identifying the "right" patients to be transferred, nurses had to organize manpower, means of transport, medicine and materials, and method to ensure transfer safety.

Before the transfer, nurses would make sure that life-threatening events would not occur and that essential medicine and materials were prepared for the trip. Medicine included resuscitation drugs, mannitol, diuretics, intravenous fluid, antibiotics, analgesics, antihypertensive agents, antipyretics, sedatives, and laxatives. Materials included equipment for resuscitation, vital sign monitoring and recording, hemostasis, wound dressing, lighting, stretchers, safety belts, blankets, gowns, gloves, and masks. Materials also included domestic items such as water and food,

toilet rolls, and sanitary pads. Transport vehicles were disinfected using household bleach, 3% hydrogen peroxide, or 0.5% peracetic acid before and between transfers (Feng and Li 2008). Before the trip, receiving hospitals were informed of the forthcoming patients. Some hospitals even sent their doctors and nurses to escort their patients during the transfer (Xu et al. 2008).

During the trip, escort nurses monitored patient conditions and ensured airway patency and intravenous lines and urinary catheters in working condition. They were also responsible for close monitoring vital signs and recording the conditions of the patients, providing physical and psychological support accordingly, and attending to the activities of daily living. They were also responsible to report patient conditions to the receiving hospital. For the critically ill air-lifted patients, receiving hospital received their patients at the airport terminal.

Patients who had undergone neurosurgery required close monitoring and life-sustaining treatment. In the immediate post-operative period, nurses monitored patients' conscious level, intracranial pressure, pupil size, blood pressure, pulse, respiration rate, blood oxygen saturation, urine output, mobility, and wound condition. Life-sustaining treatment included frequent suctioning, nebulization, and oxygen therapy to maintain airway patency and adequate oxygenation; intravenous therapy to maintain fluid and electrolyte balance; prophylactic antibiotics therapy to prevent infection; nasogastric feeding to maintain nutritional balance; oral care to maintain oral hygiene; and regular turning to prevent pressure ulcers (Pang et al. 2008a,b).

Other than acute trauma, many elderly survivors with preexisting chronic illnesses presented with life-threatening medical conditions after the earthquake required immediate stabilization. Over 70% of elderly patients had medical diseases complicating their trauma, these included cardiovascular diseases, obstructive airway diseases, metabolic diseases, anemia, and urinary tract infection (Fu et al. 2008). Caution was taken by nurses to prevent them from developing deep vein thrombosis, hypostatic pneumonia, pulmonary embolism, pressure ulcers, and stroke.

As large number of patients were seriously injured with contaminated wounds, West China Hospital of Sichuan University had converted an internal medical ward with 130 beds into a "traumatic infection ward" to provide prompt treatment to patients with infection and to prevent the spread of the infection (Chen et al. 2009). Nurses were involved in the setting up infection control protocols in consultation with the Hong Kong Hospital Authority and assumed a leadership role in the management of patient care. Anti-tetanus toxoid was given to all patients with open wounds, and their wounds and body surfaces were disinfected with TCCA. Alcohol-based hand disinfectant was placed in each patient bed end to facilitate hand hygiene. Medical wastes were collected in colored bags, labeled, and incinerated. Floor was cleaned with disinfectant four to six times per day. Patients who were suspected to have infectious conditions such as gas gangrene or *Pseudomonas aeruginosa* were put into isolation rooms. Specific infection control guidelines and training were provided to nurses before they were being designated to look after these patients. Special attention was paid to train the international humanitarian aid workers,

visitors, and volunteers. Nursing audit was performed daily by a nursing quality monitoring team of the hospital to ensure that all personnel follow the infection control policy strictly (Chen et al. 2009).

Apart from the physical demand, nurses who had been to disaster sites faced with a large number of survivors who had lost their homes or families, or suffered from injuries after a narrow escape exhibiting acute stress reactions. For example, one study reported that between 12 and 15 days after the earthquake, over 60% survivors, who sought help from the psychological rescue team, were found to have acute stress reaction such as fear, sleep disturbance, flash back, or withdrawal (Liu et al. 2008). It is clear that healthcare providers should be equipped with psychological care and communication skills on top of the technical skills for the deployment.

In the recovery and reconstruction period, nurses contributed to the psychological support of survivors, control of infection, as well as preventing and treating complications. These actions potentially resulted in the reduction of health burden. For survivors who had sustained from amputation, spinal cord injuries, traumatic brain injuries, other serious physical and mental conditions, or exacerbation of pre-existing medical conditions required long-term and transdisciplinary rehabilitative services in the community. Nurses were best positioned to assume a coordinator role in the multidisciplinary team to make transition between hospital and home seamless for the patients. Regrettably, community nursing and mobile rehabilitation services were not well developed in China, and this disaster had highlighted the demand for further development (Hu et al. 2011). Besides those injured, most survivors were living in the community. Ongoing care for the vulnerable groups such as the bereaved, children, disabled, elderly, pregnant women, and those with chronic medical conditions would be essential as such care would make the improved functional outcomes sustainable and also have a positive impact on their general health.

Although China has experienced many natural disasters in the past, the development of disaster nursing was still very slow. Prior experience of disaster relief was confined to 12 nurses, being part of the China International Rescue Team, who were involved in the relief work in Indian Ocean Tsunami in December 2004, Pakistan Earthquake in October 2005, and Indonesia Earthquake in May 2006 (Zhang et al. 2008b). Disaster nursing was not a formal part of the curriculum in the general nursing training in mainland China. In a survey of 20 baccalaureate nursing programs in China, only two military schools offered formal training on disaster nursing, a few schools offered less than 4 h of disaster nursing within 30–60 h of emergency nursing input (Zhang 2009). There was no contingency plan or drills for mega-disasters, except in military hospitals.

Studies confirmed that many nurses who had participated in the relief work in this earthquake had no prior training on disaster nursing and felt underprepared for their undertakings (Li et al. 2015; Yan et al. 2015; Zhang and Peng 2012; Zhou et al. 2015). Most of the nursing workforce were drawn from military service or selected groups of experienced nurses. These experienced nurses, drawn from various hospitals within and outside the disaster site, who were proficient in providing services in an optimal condition in the hospital settings were challenged with lots of difficulties in performing duties in the disaster situations. For example, nurses from the Chinese

People's Liberation Army General Hospital, originally trained to work in combat situations, required special training on caring for the earthquake trauma civilians prior to their departure (Li et al. 2008a). Two handbooks were produced to guide nursing practice, one on the emergency care for earthquake injuries and the other on infection control measures in the earthquake sites.

Yang et al. (2010a) conducted a qualitative study on the experiences of nurses who had volunteered to provide nursing services immediately after the earthquake for a period between 16 and 55 days. Respondents reported that they felt unprepared for the work physically, emotionally, and intellectually. As roads were blocked at the initial phase after the earthquake, these nurses were required to carry the medical supplies with them and walked long hours in order to reach the disaster site. They were further challenged by the aftershocks and debris flow hazard. In the disaster site, they were overwhelmed by the huge number of injured who spoke a different dialect, and they found that they were not able to exercise any of their professional expertise before they could control the crowd. Witnessing deaths visually and the smell of corpse further challenged their ability to cope. Apart from professional duties, these nurses needed to "search for food, cook, and arrange accommodation for the entire rescue team" (Yang et al. 2010a: 221).

During immediate response, data were not systematically collected and recorded. Because of this, national, provincial, population-based, and even local clinical data were incomplete. There was also a lack of standardization of practice, documentation protocols, and outcome indicators. For example, there were wide variations between practitioners and hospitals on the way triage, and emergency interventions were carried out. Without doubt, standardization of practice could only be achieved by adoption of evidence-based national or global clinical guidelines and adequate training on the implementation. During the post-earthquake period, in coping with the urgent need, several important national guidelines had been developed followed by just-in-time training. However, there is still room for improvement. In order to evaluate the usefulness of these guidelines when they were being put into practice, clear and systematic documentation would be essential. As record keeping was largely neglected at the expense of life saving in the first few days, valuable clinical and epidemiological data were lost in this disaster.

In response to the need to better prepare nurses for the response and recovery, the Regional Nursing Advisor of the Western Pacific Regional Office of the World Health Organization; the Director of Nursing, Ministry of Health, China; and the Director of Nursing of the West China Hospital, Sichuan University agreed to collaborate with School of Nursing, The Hong Kong Polytechnic University; Hong Kong Hospital Authority; and University of Technology, Sydney, Australia to develop an emergent 2 day train-the-trainers capacity building program between 25 and 26 June 2008 in "Disaster and Emergency Nursing Care: A Training of Trainers Course in Trauma, Universal Precautions, Wound Care and Psychosocial Care" for 50 advanced practice nurses. Peking Union Medical College was instrumental in the translation and printing of teaching and reference material after they were being developed by the teaching team. As the train-the-trainer program was very well

received and much needed, the School of Nursing of The Hong Kong Polytechnic University produced online self-learning materials based on the contents covered with an intention to facilitate nurses to take the training on-the-job without needing to be released from duty. As online access was not available in some rural hospitals, the teaching contents were put onto 3,000 compact discs and disseminated to nurses in these hospitals.

Because of this disaster, different schools of nursing in the mainland realized the urgent need for disaster nursing education. A generous donation was received from Hong Kong Jockey Club to educate nurses on disaster nursing at the postgraduate level. Between 2013 and 2017, 55 graduate nurses were sponsored to undertake a master's degree in disaster nursing jointly offered by Schools of Nursing of The Hong Kong Polytechnic University and Sichuan University. The first cohort of 28 masters' students graduated in November 2015.

In addition, these two schools of nursing also prepared six doctoral students to become leaders and active researchers in the field of disaster nursing. In view of the pressing need for disaster nursing education all over the world, The Hong Kong Polytechnic University in collaboration with the University of Manchester had developed a full online master program to develop and expand participants' knowledge in disaster management. Building on the support from the Sichuan Provincial Government, the Ministry of Civil Affairs, the Ministry of Education, and 0.2 billion RMB by the Hong Kong Jockey Club, The Hong Kong Polytechnic University and Sichuan University jointly established the Institute of Disaster Management

Photo 1 Official opening of the Institute of Disaster Management and Reconstruction in Chengdu, Sichuan in 2013

Photo 2 Prof CHENG Yi-yuan, the Nursing Director of the China West Hospital, received the National Nightingale Award from Xi Jinping, the President of the People's Republic of China, in 2015 in the recognition of her contribution in the 2008 Wenchuan Earthquake

and Reconstruction in 2013 Photo 1. This is the world's first institute dedicated to research and development on disaster science, education and training, and international communication and cooperation.

Nurses had critical contribution in the provision of immediate response. Actions included timely onsite emergency management, rapid triage, safe transfer to other health facilities, and competent hospital treatment. The key to success was teamwork and coordination. The Nursing Director of the China West Hospital in Sichuan, Cheng Yijuan, was instrumental in assuming the leader role in this disaster and had received high praise from the Primer Wen Jiabao in 2008, when he paid visit to the hospital after the earthquake. She was also given the National Nightingale Award in 2015 on the International Nurses Day in the recognition of her unfailing contribution in the disaster relief Photo 2.

In short, appropriate disaster response relies on adequate preparation. Such preparation involves manpower, machine, and materials. Inadequate preparation would delay the appropriate response resulting in less favorable clinical outcomes or even deaths.

Nurses had faced a lot of challenges in the process of disaster relief in the Wenchuan earthquake. Because of the scale of the disaster, large number of nurses who had no prior training or experience were being called for service to treat mass casualties. Nurses who had worked as a responder in this disaster generally felt that more formal education on disaster training and adequate planning would be required so that nurses could be better prepared for the next disaster. With respect to contingency planning, it would be important to have plans from the central government down to the grass root levels. It should also be stressed that plans are nothing but planning is everything. To this end, nurses should be included in the process of developing disaster contingency plan to ensure speedy, effective, and proactive response. If nurse were not being involved in the planning process, they could only play a reactive role in the execution of duties.

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Indonesia: Lesson Learned from Yogyakarta and Central Java Earthquakes

5

Syahirul Alim

5.1 Introduction

Indonesia is located in the Pacific Ring of Fire (an area with a high degree of tectonic activity). It is in constant risk of volcanic eruptions, earthquakes, floods, and tsunamis. In the last 15 years, Indonesia has experienced devastating earthquakes that resulted in the deaths of hundreds of thousands of human and animal lives and affected the infrastructure and economy of the country.

5.2 The 2006 Yogyakarta and Central Java Earthquakes

The 2006 Yogyakarta and Central Java Earthquakes (also known as the Bantul earthquake) with a magnitude of 6.4 and a maximum intensity of IX (*Destructive*) on the Medvedev–Sponheuer–Karnik scale hit the southern coast of Java near the city of Yogyakarta on May 27, 2006. The earthquake was originally thought to be related to the eruption of Mount Merapi and then to the Opak Fault that lies to the east of the affected areas, but later interferometric synthetic aperture radar (InSAR) analysis revealed that another previously unknown fracture was responsible for the sequence of shocks.

5.3 Impact of Yogyakarta and Central Java Earthquakes

Yogyakarta and Central Java earthquakes on May 27, 2006 led to numerous casualties. It was reported that the number of casualties were more than 5700 people reported killed and more than 37,000 people reported injured (see Table 5.1).

S. Alim, PhD
Faculty of Medicine, School of Nursing, Universitas Gadjah Mada, Yogyakarta, Indonesia
e-mail: syahirul_alim@ugm.ac.id

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Table 5.1 Number of people reported killed and people reported injured

Province and district	People reported killed	People reported injured
Yogyakarta	*4659*	*19,401*
Bantul	4121	12,026
Sleman	240	3792
Yogyakarta City	195	318
Kulonprogo	22	2179
Gunung Kidul	81	1086
Central Java	*1057*	*18,526*
Klaten	1041	18,127
Magelang	10	24
Boyolali	4	300
Sukoharjo	1	67
Wonogiri	–	4
Purworejo	1	4
Total	*5716*	*37,927*

Source: Yogyakarta Media Centre, 7 June 2006 (as cited in BAPPENAS, 2006)

5.4 Health Sector Response to Yogyakarta and Central Java Earthquakes

The scale of the damage was made worse by failure to meet safe building standards and employ basic earthquake-resistant construction methods (FuturArc, 2006). Most of the houses in the area were built with low-quality materials without structural frames and reinforcing pillars. Many deaths and injuries occurred when buildings and walls collapsed.

The condition during response phase right after the quake was chaotic with people scrambling around due to the misguided information about the prediction of tsunami. People rushed off to the street using motorcycles and cars causing traffic jams in some areas in Yogyakarta to the higher places. This condition also caused some casualties. This case leads to an important lesson to consider the proper way to ensure that information related to the exact and updated condition from the government authority could clearly reach the people. In reverse, how the authority could have the right information related to the condition of people killed, injured, and affected by the event must be considered as well.

5.5 Role of Nurses in Yogyakarta and Central Java Earthquakes

The School of Nursing of the Faculty of Medicine of the *Universitas Gadjah Mada* took active responsibility to take care of survivors with mild injured to moderate injured from several days through the second week after the quake at the campus building (simulated hospital). The simulated hospital, located on the first floor of

School of Nursing's campus building for skills laboratory purpose, at the time of acute response served as a real hospital.

The injured survivors were first registered in the hospital and moved to the available beds in the simulated hospital. The chart below showed the flow of patients or survivors from the field through our simulated hospital during the response phase (see Fig. 5.1). Faculty staffs and students hand in hand took care of patients in our simulated hospital.

Total number of patients who had been treated in the simulated hospital was 108 patients. Most of patients were fractures (62%) while patients with the spinal trauma were the second highest (11.2%) (see Table 5.2).

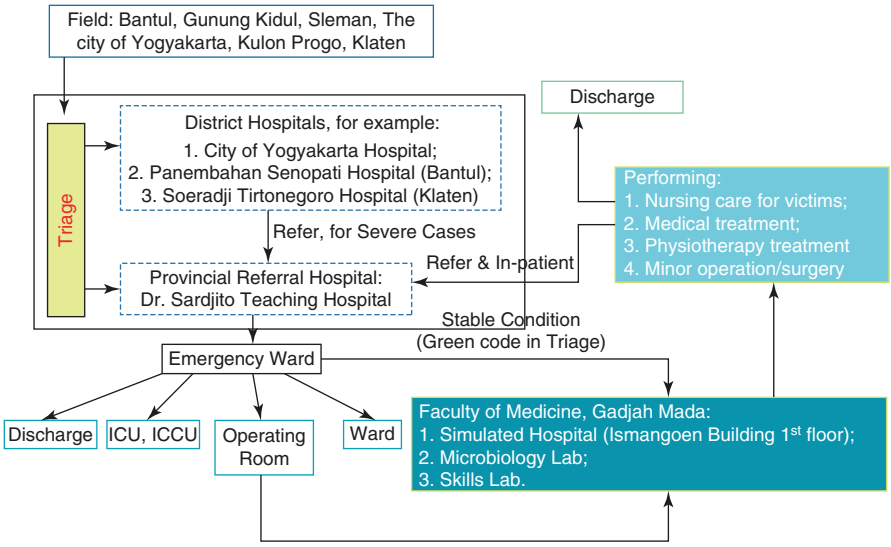

Fig. 5.1 The flow of patients or victims from the field through simulated hospital

Table 5.2 Trends of patients treated in the simulated hospital

Diagnoses	Number of cases	Percentage
Fracture	78	62.40
Spinal trauma	14	11.20
Head injury	9	7.20
Thoracal trauma	8	6.40
Joint dislocation	6	4.80
Vulnus laceratum	4	3.20
Ocular trauma	3	2.40
Abdominal trauma	1	0.80
Anemia	1	0.80
Vulnus punctum	1	0.80

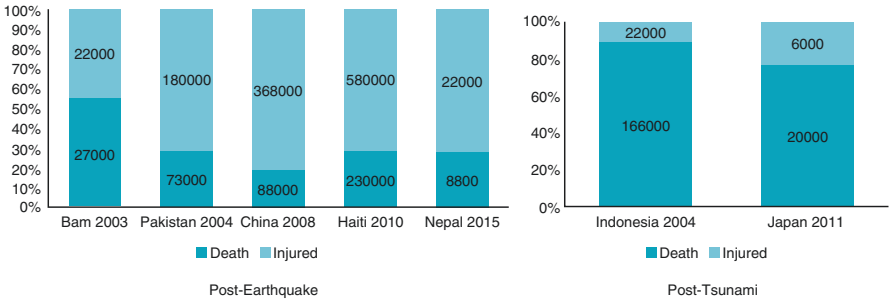

Fig. 5.2 The relationship between death number and injured number in post-earthquake

Referring to the trends of the post-earthquake casualties that the injured number to death number ratio is 3:1, compare to the post-tsunami casualties where injured number to death number ratio is 1:3 (see Fig. 5.2).

The experience of the UGM School of Nursing to response to a disaster, such as the Yogyakarta and Central Java earthquakes, provided a foundation to disaster nursing curriculum development. During the acute response, the school's simulation hospital managed the inpatient rooms with staff and nursing students as rolling nurses system. They divided the assignments in order to smoothly deliver the healthcare service to our patients. They dealt also with the patients' family by involving them in day-to-day nursing care.

In the recovery phase, the School of Nursing had two prominent projects granted by Japan International Agency (JICA) for two years' implementation from 2006 to 2008. The first project was comprehensive mobile rehabilitation by empowering the community. The second project was empowering local community by developing the emergency response team.

The first project was conducted to address the needs for rehabilitation in the community setting. The idea was to bring the rehabilitation as close as possible to the community and empowered social components into the activity. They involved mothers and housewives who have been voluntarily active as local health cadres into all project activities.

In the post-earthquake scenario, the number of injured people was high. Therefore, the need to do the rehabilitation was very crucial. The School of Nursing extended its project on empowering local community by developing the emergency response team project. They conducted basic emergency response training for 361 health cadres and elementary school teachers from nine villages in Bantul. The project gained positive result in improving health cadres' capacity in response for emergency-related condition. The project also revealed the high level of participation of the affected community.

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Japan: Pairing Support Activities Between Universities After the Great East Japan Earthquake

6

Aiko Yamamoto, Shiori Katsunuma, Akiko Kurotaki, Yohko Nonami, Yuuko Ushio, Miho Takami, Yuko Fujiwara, Kumiko Sasaki, Etsuko Shiono, Kazuko Takahashi, Toshiko Yoshida, and Sheila Bonito

6.1 Introduction

Historical data show that Japan has experienced devastating earthquakes since 600 AD. Its location near three major tectonic plate boundaries and the Pacific Ring of Fire makes it exposed to earthquakes, volcanic eruptions, and tsunamis. The deadliest earthquake was the 1923 Great Kantō earthquake, while the strongest and costliest earthquake was the 2011 Tōhoku Earthquake.

6.2 The Tōhoku Earthquake

The Tōhoku Earthquake also known as Great East Japan Earthquake was the most powerful earthquake ever to hit Japan (Japan Meteorological Agency, 11 March 2011). The 9.0 magnitude earthquake triggered a powerful tsunami with heights up to 40.5 m in Iwate Prefecture (Japan Meteorological Agency, 11 March 2011). This caused extensive and severe structural damage in North Eastern Japan including the nuclear reactors in the Fukushima Daiichi Nuclear Power Plant complex (Branigan, 13 March 2011).

A. Yamamoto (✉) • A. Kurotaki • Y. Ushio • M. Takami
University of Hyogo, Hyogo, Japan
e-mail: a_yamamoto@cnas.u-hyogo.ac.jp

Y. Nonami • Y. Fujiwara
Kobe Women's University, Kobe, Japan

S. Katsunuma • K. Sasaki • E. Shiono • K. Takahashi • T. Yoshida
Miyagi University, Miyagi, Japan

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

S. Bonito, H. Minami (eds.), *The Role of Nurses in Disaster Management in Asia Pacific*, DOI 10.1007/978-3-319-41309-9_6

6.3 Impact of Tōhoku Earthquake

The National Police Agency of Japan (NPAJ 2016) confirmed 15,894 deaths, 6152 injured, and 2562 people missing across 20 prefectures. Most casualties were from Miyagi, Iwate, and Fukushima prefectures. Majority of the fatalities recovered a month after the disaster died from drowning with most of the victims older people: 65% were 60 years and older, with 24% being in their seventies (Japan Times, 21 April 2011).

The damages caused by the earthquake and tsunami were estimated to be 15.8 billions of US dollars (EM-DAT CRED 2016). The NPAJ (3 April 2011) reported that 45,700 buildings were destroyed and 144,300 were damaged by the quake: 29,500 structures in Miyagi Prefecture, 12,500 in Iwate Prefecture, and 2400 in Fukushima Prefecture. Three hundred hospitals with 20 beds or more in Tōhoku were damaged by the disaster (Japan Times, 9 June 2011).

6.4 Health Sector Response to Tōhoku Earthquake

The University of Hyogo and Miyagi University formed a partnership in 2006 through a joint research on disaster preparedness. When the Great East Japan Earthquake struck, the University of Hyogo confirmed the safety of the teaching staff at Miyagi University, which is located in the quake-hit area, and the disaster situation as well, and exchanged information with Miyagi University about the needs of the affected people and the actual status of disaster support activities. Since Miyagi University started support activities soon after the earthquake, University of Hyogo offered logistical support to assist Miyagi University's activities. University of Hyogo secured and provided means of communication and sent relief supplies including masks, goggles, work gloves, long rubber boots, and security buzzers. University of Hyogo also provided "guidelines on people requiring assistance" and other documentation prepared based on the experiences of the Great Hanshin-Awaji Earthquake to assist in providing health assistance for affected people.

One month after the earthquake, University of Hyogo faculties visited the quake-hit area and shared their experiences and exchanged information about earthquakes with their counterparts at Miyagi University. After that, University of Hyogo cohosted seminars with Miyagi University and participated in seminars organized by Miyagi University. While deepening their exchanges, both universities proceeded with preparations for support activities. Through these activities, the universities continued to contact with each other and shared information inside and outside the quake-hit area. As a result, supplies and knowledge to meet local needs were provided promptly and in a timely manner.

Miyagi University was consulted with University of Hyogo, which had experienced the Great Hanshin-Awaji Earthquake, and received suggestions and carried out disaster support activities. University of Hyogo also received information from Miyagi University concerning the actual living conditions of people of the Tohoku

Region, which only the local university could obtain, and then sent such information to the outside world in consideration of local needs. Accordingly, capitalizing on their respective strengths, the two universities established a relationship and system that allows them to consult with each other in line with the situation.

The two universities started a joint research project, "Review of guidelines on people requiring assistance during disasters," and compared their guidelines on people requiring assistance, which was created based on experience of the Great Hanshin-Awaji Earthquake, with opinions from the perspective of people who had experienced the Great East Japan Earthquake. Since there were many differences, for example, in the disaster outcomes, between these two earthquakes, a study to integrate and reconstruct knowledge on disaster nursing was launched. University of Hyogo, together with Miyagi University, published nursing activity reports and articles in disaster nursing journals, transmitting information on the local situation in a timely manner while accumulating new knowledge.

Through these activities and the establishment of a collaboration and cooperation system, University of Hyogo and Miyagi University were able to lay the foundation for pairing support. Some of the important activities that the paired universities accomplished include the establishment of collaboration and cooperation with Kesennuma City Health Promotion Section. The universities suggested the following activities: (1) offering health consultation and home visits to understand the health conditions and health needs of residents, (2) holding tea gatherings to provide a place and an opportunity for communication among residents, and (3) holding an event such as a health festival according to the situation. Kesennuma City requested medical checkups, so that it could be confirmed that the people's needs matched the project activities. As for the activity system, graduate student was were pemporally stationed on-site, and therefore they could provide health assistance for more than one temporary housing complex area, regardless of the scale of the temporary housing complexes and geographical distances, if transportation was secured. The university also said that it would meet the demands of the city. With respect to the cooperation system with the city's public health nurses, it was decided that the scope of activities would be determined in consultation with the city's public health nurses and that the daily activities would be reported.

In Kesennuma City, not only the city but also various volunteer groups were carrying out their support activities in coordination with each other. The university staff explained the details of the project to the Kesennuma District Support Center, KRA, and JVC, asked them to allow the university staff to provide health consultation at tea gatherings and some events, and obtained their acceptance. The Kesennuma District Support Center, KRA, and JVC were the main organizations that provided life support for residents living in temporary housing complexes in Kesennuma City: the Kesennuma District Support Center carried out home visits to prevent social withdrawal and unattended deaths; and the KRA and JVC created a place and opportunity for communication in temporary housing complexes. As there were several home visitor gathering groups in the Kesennuma District Support Center, some residents felt redundant visits to be burdensome. There was demand

for adjusting the dates for home visits or gathering to prevent different groups from visiting the residents on the same day. As a result, the Kesennuma District Support Center checked and adjusted the home visit schedule.

The city also decided that the health assistance would be provided for eight temporary housing complexes (569 people of 201 households) in the S district among 93 temporary housing complexes (3504 households) in Kesennuma City. The university asked the city to arrange an appointment for a city public health nurse to meet with the head of the residents' association of the temporary housing complexes to explain the health assistance, and the city accepted the request. Organizations and groups involved in supporting the residents in the S district temporary housing complexes and those living in their disaster-affected homes would gather once a month and perform the following: report their activities, share and exchange information about life and health problems in the temporary housing complexes and the community situation, and report individual cases and discuss what to provide in the support program.

Information about some elderly cases were shared and exchanged. These cases, which were detected in the health consultation of this project, included abnormally high systolic pressure of 200–299 mmHg resulting from being unable to take internal medication due to the worsening of dementia, patients not being able to keep themselves clean, and careless handling of fire. Support activities for these elderly persons were discussed with each organization and group, and the elderly persons were soon placed under the control of appropriate support organizations.

6.5 Role of Nurses in Tōhoku Earthquake

Clarification of the health conditions and health needs of temporary housing residents and identification of high-risk persons were very important. Through health consultation and home visits, nurses could identify the health conditions and needs of 34 residents (8 males and 26 females) who were living in temporary housing complexes 1 year after the earthquake.

In the Tōhoku Region, there is a custom whereby neighbors usually get together for tea gatherings. In their daily lives, they usually place pickles and confectionaries within close reach in their homes. Due to this custom, it was observed that they frequently consumed foods with high levels of salt and sugar. In addition, after the earthquake, tea gatherings were held so often for the purpose of enhancing community development activities, and as a result, the frequency of confectionery consumption increased.

The health problems observed after the earthquake include an "increase in blood pressure" (average blood pressure: 140–200/80–100 mmHg) despite continuously taking medication, "increase in weight" (an average 5–10 kg increase from before the earthquake), "sleep disorders" such as hypnagogic disorders and waking in the middle of the night, "disuse diseases," "worsening of dementia," and "alcoholism." The background factors to these diseases and symptoms were loss of jobs, changes

in social roles and relationships with others, lack of exercise, decrease in occasions for out-of-the-house activities, concerns about their future lives, and fear of aftershocks. Moreover, in the affected areas where many buildings were being reconstructed, carpenters and those in the construction industry were busy with their work and did not have time to rest.

There was a need for improvement of health education and self-care ability. Many of the residents visited the hospital periodically for treatment and were continuously taking internal medication in accordance with their doctor's instructions. However, it was made clear that they lacked the knowledge to judge their disease conditions and knowledge concerning self-care for chronic diseases, and as a result, although they had concerns and questions about their health conditions and living routines, they did not know how to respond to their health problems. Hospital visits are a good opportunity for health education. However, it was also observed that because they were reluctant to ask questions to doctors, their questions remained unanswered, and it was also found that they had no facility or person that they could rely on for health consultation. When the university started health consultation, it seemed at first that the residents were not cared about their health conditions. However, as the university staff talked with them about their lives in detail, residents started asking questions about what they should eat or what increased their blood pressure, and it was found that health education was required to acquire knowledge about diseases and knowledge about and techniques for self-care. So it was determined that the first step should be to check one's own health conditions and to pay attention to one's health. Currently, increases in blood pressure and body weight related to living routines have been observed, and high blood pressure, diabetes, and cardiac diseases have also been recognized. Measures to prevent lifestyle diseases should be taken soon.

From March 16 to March 23, 2012, the university faculties provided health consultation three times a week mainly at the assembly hall of Shishiori Junior High School and participated in tea gatherings and events organized by volunteer groups and provided health consultation there. Health consultation was notified by distributing flyers to each household and posting them on signboards in the temporary housing complexes and on the walls of the assembly hall and the conversation lounge.

When only health consultation was provided, the number of visitors was one to three per day, and there were few people who were willing to visit voluntarily. Therefore, to reduce their feelings of burden caused by home visits, the university faculties found an opportunity to talk to residents who were walking outside or whom the faculties saw while distributing flyers. The faculties also provided health consultation at the residents' tea gatherings. At a tea gathering, about 3–10 people (mainly women) get together in the conversation lounge of each temporary housing complex, and as a result, they easily accepted health consultation. In the course of natural conversation, they talked about their health conditions, which the university faculties recorded with their consent.

In a week, 20 patients, mostly in their seventies and eighties, were given consultation. Many of them have existing hypertension, history of myocardial infarction

and arrhythmia, diabetes, hypercholesterolemia, asthma, cataracts, glaucoma, backaches, arthralgia, and other chronic diseases. Despite continuous medication after the earthquake, the blood pressures of people were constantly high. However, they had few subjective symptoms, and as a result, there were few people complaining of feeling ill even when their blood pressure was high. Waking in the middle of the night and other sleep disorders resulting from remembering the experience of the earthquake and tsunami, fear of aftershocks, and concerns about their future lives were also observed. Weight increases and uncontrolled high blood-glucose levels as a result of fewer out-of-the-house activities and increases in consumption of snacks and cakes at tea gatherings were also recognized. Survivors came for health consultation mainly for blood level measurements and for receiving dietary instructions. When visiting, they talked about various concerns for 30–60 min, ranging from their experiences of the earthquake and tsunami to their current living conditions. The university faculties measured their blood pressure, listened to their experiences and living conditions, and collected information about their lives.

There were various groups that offered support to residents in temporary housing complexes. Disabled persons, elderly people, alcoholics, and other high-risk persons were mostly followed in the city's commissioned projects, and they were already being looked after. However, except for the elderly, the health of the residents suffering from chronic diseases were not fully considered, and it was made clear that heath support must be provided for those who were likely to become high-risk persons. Furthermore, it was found that there were some people affected by the earthquake who were living in their own homes, and thus no attention was paid to them at all. It was therefore necessary to identify high-risk persons living in their own homes and to provide support for those people, too.

6.5.1 Creating a Place and an Opportunity for Communication Among Temporary Housing Residents

In the temporary housing complex at Shishiori Junior High School, residents came from the same community and many of them knew each other. The March 24 health consultation served as a place and opportunity for the temporary housing residents to promote their communication. It was attended by the residents of nearby Ootogeyamakami temporary housing complex as well, and it was observed that the residents of different temporary housing complexes interacted with each other, and the health consultation worked well as a place and opportunity to enhance communication between different temporary housing complexes. The university will continue to create such opportunities for communication. The problem with this consultation opportunities was that there were few men, children, or young people among the participants. It is therefore necessary to create a place and opportunity for communication among men, especially those who have lost their jobs and rarely go out.

6.5.2 Establishment of a Community-Based System to Support the Health and Lives of Temporary Housing Residents

The public health nurses belonging to Kesennuma City involved in this support activity, the Social Welfare Council, the temporary housing residents support center, the residents' association head, and various volunteer groups in Kesennuma City understood our project activities and offered us their cooperation. As a result, the university faculties could obtain various information on the local community and carry out support activities, such as health consultation at tea gatherings, in a way that was suitable for the community. Moreover, the university staff regularly participated in meetings where the residents' health conditions and problems were discussed and shared, which helped to establish a system to create living circumstances and provide support to maintain the residents' health. In Kesennuma City, not only governmental organizations but also various volunteer groups offer their own support. Many of them become involved in such activities as home visits and care support to prevent unattended deaths and social withdrawal, community development, and the prevention of disuse diseases, and they also improve residents' living environments. In this way, they are in a position to support residents from various aspects. The faculty participated in liaison meetings of various volunteer groups to share information and exchange opinions. As a result, various support groups could share the same problems and work together to solve the problems. However, it is assumed that these volunteer groups will soon leave the city. Therefore, in the resident's independence support program, it is necessary to continue support activities through which the residents are able to manage their own health and to set up a system for the local government to continue offering cooperation.

6.5.3 Presentation of a Disaster Support Model Plan in Nursing University's Pairing Support Activities

The two nursing universities inside and outside the affected area collaborated and cooperated with each other to carry out health support activities based on knowledge in the nursing field. Both universities (1) shared their experiences of the disaster inside and outside the affected area and exchanged their views, (2) provided consultation in the disaster support activities, and (3) integrated and reconstructed knowledge concerning disaster nursing through joint research. Through these activities, the two universities were able to establish a collaboration and cooperation system, in which they provided health support to temporary housing residents as part of their pairing support activities. Through the pairing support provided by the universities inside and outside the affected area, the university offering support inside the area provided necessary information and clarified the needs of the affected area. Meanwhile, the university outside the affected area established a system to compensate for insufficient manpower in the affected area, and as a result, it could respond to the needs quickly and provide external information for the university inside the affected area. Furthermore, by sharing and examining the past and current

experiences of the Great Hanshin-Awaji Earthquake and the Great East Japan Earthquake between University of Hyogo and Miyagi University, both universities could start to reconstruct and accumulate knowledge on disaster nursing. Through pairing support, it is considered that both university's network and tools further expanded and that opportunities to send information and establish knowledge increased.

In developing the project activities 1 year after the earthquake, it was necessary to provide assistance for health problems and to meet the needs of the affected area. A long-term health support activity has great significance. At the moment, although various support activities have been provided in the affected area, there are few health-related activities. This means that the nursing field, which looks after the lives and health of the residents, can make a great contribution in health assistance. Compared to the support activities conducted by a single nursing university, the disaster nursing support activities based on the advantages of pairing support of two universities enhanced the activity system and expanded the scope of activities, and as a result, more effective health support was provided to the residents. The health conditions and needs of residents in all temporary housing complexes and all individual houses have to be made clear. Therefore, it was necessary to observe the living conditions, continue confirming the health conditions and needs of the temporary housing residents, and examine and implement measures to meet their health needs. The support activities should continue to be carried out in cooperation with the city.

Acknowledgment This activity was conducted with the fund by Japan Association of Nursing Program in Universities.

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Nepal: The Role of Nurses After Nepal Earthquake 2015

7

Tara Pohkrel, Sakiko Kanbara, Sheila Bonito, Maria Regina Estuar, ChandraKala Sharma, and Apsara Pandey

7.1 Introduction

Nepal is situated in one of the most seismically active regions of the world (see Fig. 7.1). Historical data show that it has experienced a number of devastating earthquakes. The earliest record was the 7 June 1255 earthquake, measuring 7.8 on the Richter scale and wiped out a third of Kathmandu's then population. Since then, Nepal has witnessed at least one major earthquake per century.

7.2 The Nepal Earthquake

Nepal earthquake, also known as the Gorkha earthquake, killed over 8600 people and affected more than 5.6 million individuals, with damage estimates exceeding 3.9 billion US dollars (CRED 2015).

The earthquake occurred at 11:56 local time on 25 April 2015, with a magnitude of 7.8 Mw and a maximum Mercalli Intensity of IX described as violent shaking. Its

T. Pohkrel, PhD (✉) • C. Sharma, MSc • A. Pandey, MSc
Nursing Association of Nepal, Tribhuvan University Institute of Medicine, Kathmandu, Nepal
e-mail: tarapokharelnp@hotmail.com

S. Kanbara, PhD
Kochi University, Kochi, Japan

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

M.R. Estuar, PhD
Ateneo de Manila University, Quezon City, Philippines

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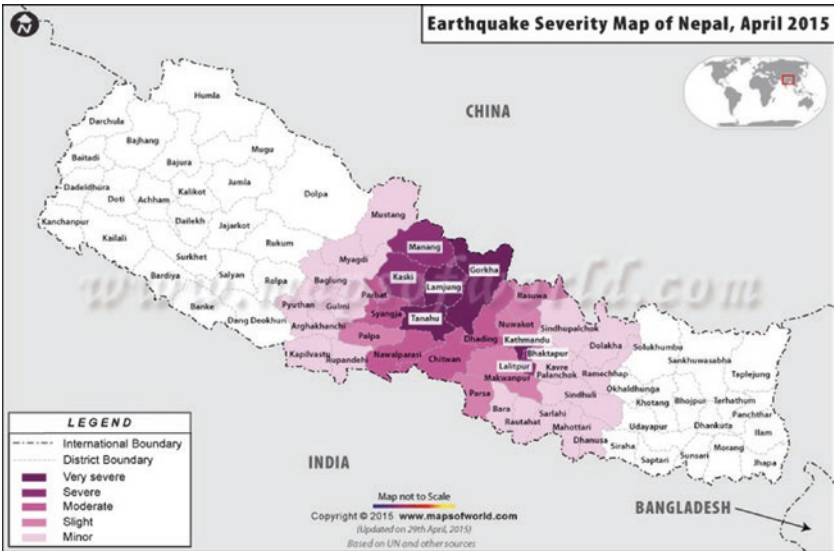
District wise Earthquake severity Map of Nepal



Major Earthquakes in Nepal

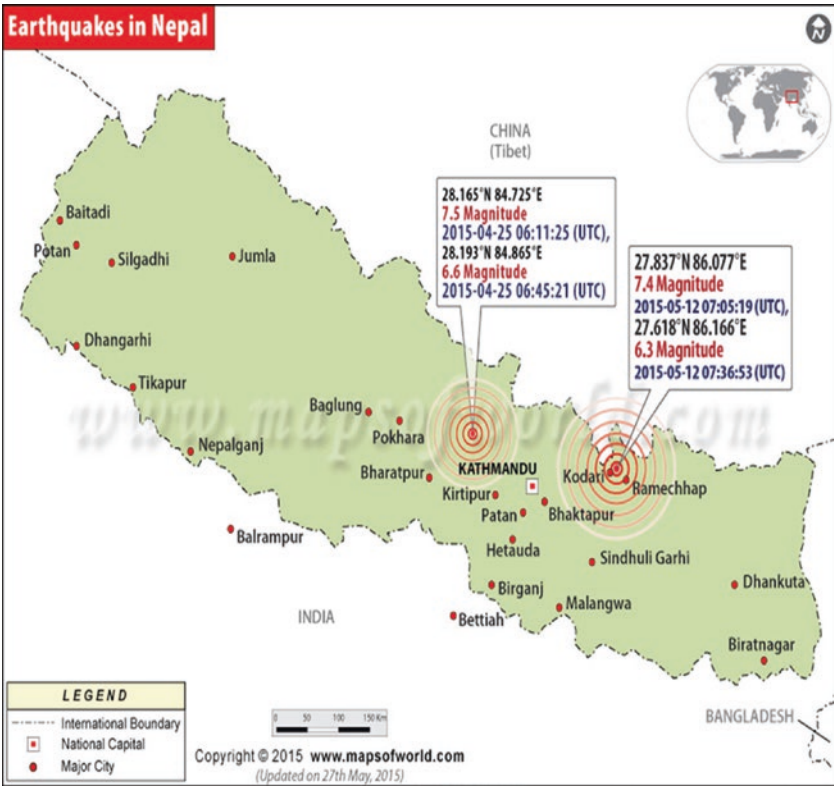


Fig. 7.1 Map of earthquake-affected areas in Nepal (Source: USAID 2015)

epicenter was east of the district of Lamjung, and its hypocenter was at a depth of approximately 8.2 km (5.1 mi). Intensity VIII (severe shaking) was felt in Bhimeshwar, Kathmandu, and Kirtipur and Intensity VII (very strong shaking) at Bhaktapur, Bharatpur, Bidur, Ghorahi, Lalitpur, and Pokhara (USGS 2015).

7.3 Impact of Nepal Earthquake

Hundreds of thousands of people were made homeless with entire villages flattened across many districts of the country. Centuries-old buildings were destroyed in the Kathmandu Valley, including UNESCO World Heritage sites (Nepali Times 2015). A big number were also killed and injured from an avalanche at the Mount Everest Base Camp.

A second earthquake occurred on 12 May 2015 at 12:50 local time with a moment magnitude (Mw) of 7.3 (USGS 2015). The epicenter of this aftershock was 76 km east of Kathmandu and resulted in landslides, further deaths, injuries, and damages.

The Ministry of Health and Population in Nepal identified 14 districts that were severely affected by the second earthquake (WHO Nepal 2015).

7.4 Health Sector Response to Nepal Earthquake

Initial public health concerns were caring for the survivors with wounds and injuries, majority with minor cuts and bruises and fractures and with some number requiring surgery and blood transfusion (see Fig. 7.2).

Communicable and infectious diseases related to water, sanitation, and hygiene were also priorities after the earthquake given the reduced access to safe water and sanitation systems and damaged sewage infrastructures. Other endemic communicable diseases such as hepatitis and cholera and diseases associated with overcrowding such as measles, diphtheria, pertussis, and acute respiratory infections were all major concerns (WHO Nepal 2015).

Reproductive and sexual health was also a concern given Nepal's high mortality ratio at 229 and total fertility rate of 2.6 (NDHS 2011). WHO Nepal (2015) estimated that there were 60,000 pregnant women and 637,000 adolescent girls in 14 districts most severely affected by the earthquake. Emergency response needed inclusion of access to emergency reproductive health services and implementation of the Minimum Initial Service Package (MISP) for reproductive health.

Malnutrition was a major public health concern even before the earthquake with anemia seen to be very high at 46% among children aged 6–59 months and at 35% among women aged 15–49 years (NDHS 2011). Interventions such as infant breastfeeding, feeding programs, and screening children for acute malnutrition were badly needed.

Mental health and psychosocial support was also needed to care for survivors showing a wide range of symptoms of normal distress caused by severe loss, trauma, continuing danger, and constrained social and living conditions. Environmental risks were also assessed to protect people from possible harmful exposures.

Fig. 7.2 Health worker providing first aid

Critical attention should be paid to hygiene control in shelters to maintain minimum level of health safety. In this context, reducing risks involves changed behaviors and lifestyle during the temporary evacuation period after disaster.

To prevent unnecessary deaths by early detection of potential diseases for an outbreak, Nepali nurses communicated with survivors in order to protect and promote health and safety of people and communities during disasters.

7.5 Role of Nurses in Nepal Earthquake

The Nursing Association of Nepal (NAN) is the only one professional organization of nurses in Nepal. It is a nonpolitical non-sectoral organization not influenced by class and religion determined to provide quality nursing service to the people and to protect

and promote the professional rights and interests of all nurses in Nepal. NAN was established in 1962 and became a member of International Council of Nurses in 1969.

Two days after the earthquake, an immediate concern was how to care for people in the open field and how to reach out to populations in need. One crucial factor was how to get information to help communities recover from the impact of the earthquake and prevent possible epidemics. NAN sent nurse teams to affected areas such as Sindhupalchowk (Thulobhotang, Chautara, Melamchi), Jiri, Dhading, Nuwakot, Sankhu, Bhaktapur, Harishiddhi, Sitapaila, Ramkot, Macchegaon, and White Gumba to bring medicine, rice, food, clothes, water, and soup and distribute these to the affected areas.

7.5.1 Rapid Health Assessment

NAN also played a crucial role in health information management over an extended period. Collaborative research team by Japan and the Philippines reached out to NAN to help set up information systems to make rapid health assessment and gather more information to prevent outbreaks.

The Philippines project "eBayanihan" attempted to communicate with Nepal to help nurses in gathering information that could help in rapid health assessment. This system had a SHEREPO which collected evacuation shelter reports, creating profiles that helped determine disaster preparedness and post-disaster needs in the evacuation shelters. This system allowed nurses to contribute and receive disaster-related information through the use of mobile phone to send SMS (short message service) and through the web to submit reports.

7.5.2 Surveillance System

To continue to help improve the accuracy of data collection by nurses so that they can be informed about real living conditions and health needs of disaster-affected communities in remote areas, the EpiNurse (that means "epidemiology + nurse") project and center was launched at NAN by J-RAPID program of Japan Science and Technology Agency (JST). A 2-day workshop was conducted with representative nurses so that they pay more attention to hygiene control to maintain minimum health safety. Monitoring was conducted by trained local nurses using the toolkit in Kathmandu for 4 months at 24 camps in 9 affected districts (Kathmandu, Gorkha, Dolakha, Sindhupalchok, Nuwakot, Rasuwa, Bhaktapur, and Lalitpur).

7.5.3 Use of Electronic Health Records and Referral

The most critical challenge is data collection to generate reasonable information that can be used in predicting whether something is likely to occur, which always behind unpaid care works by women. During EpiNurse project, SHINE OS+ (Secured Health Information Network Exchange) of the Philippines was also

introduced to nurses of NAN, which originally intended to help health workers in recording, reporting, reminding, and referring patients in the community, developed and maintained through a partnership between academe (Ateneo de Manila University) and a private telecommunications provider (Smart Communications, Inc.) in the Philippines. It is developed using an open-source framework and designed to interoperate with other systems.

Based on lessons learned from catastrophic disaster, local nurses are required to perform various roles including collecting of information to know the 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. For preparedness, it was revealed that routine communication is essential in ensuring to adapt daily health security, environments systems, and technology. This trajectory must later result in a mode of transferring guidance to local nurse as first responders regarding DRR and behavior and also as a way to reach large populations. Through the electronic health record systems, nurses could invaluable in helping monitoring communicable diseases for potential outbreaks. The challenges experienced during the development of SHINE OS+ for Nepal were about the backend design challenge in standardization and interoperability, transmission challenge because of limited infrastructure, geographical challenge in identifying geographical location of ad hoc shelter sites, and usability challenge in the choice of language. With formal education and drilling, it is possible for local nurses to make decisions to create a system that would allow smooth cooperation among stakeholders. Nurses may manage community's health environment as well as hospital wards.

The reciprocal processes—in which the researcher and practitioners beyond the border inform each other—establish new knowledge bases and effective problem-solving solutions as well as technological methods.

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8 Philippines: The Role of the Philippine Nurses Association in Disaster Preparedness and Response During Typhoon Haiyan

Bettina Evio and Sheila Bonito

8.1 Introduction

By its geographical location, the Philippines is considered to be among the world's naturally prone nation to environmental disasters, which include floods, droughts, typhoons, landslides and mudslides, earthquakes, and volcanic eruptions (World Bank 2013). Over 20 typhoons affect the country annually, with 8 or 9 making landfall, mostly coming from the southeast, which are generally the strongest, affecting Samar, Leyte, eastern Quezon province, and the Batanes islands. The country is also particularly vulnerable to sea level rise and storm surge since about 60% of its municipalities and ten of its largest cities are located along the coast, (where roughly 60% of the population resides). Flooding often results from heavy or prolonged rainfall associated with typhoons and tropical depressions, which can destabilize soils along mountain slopes, resulting in landslides and mudslides and causing severe damage to nearby villages (ACAPS 2014). The damages brought about by extreme events such as heavy rainfall and tropical cyclone and the shift in the typical path of typhoons hitting communities with very little experience in tropical storms are seen to likely increase under a changing climate (World Bank 2013).

The Philippines ranks third among 173 countries most at risk to disasters (World Risk Index of 27.98%) and likewise third in terms of extreme exposure to natural hazards (52.46%) in 2012. The World Risk Index is the product of exposure index and vulnerability index (susceptibility, the lack of coping capacities and the lack of adaptive capacities) (Alliance Development Works 2012). The World Risk Report 2015 shows the Philippines with the same rank in terms of risk and exposure. There

B. Evio, RN, MAN (✉)
College of Nursing, University of the Philippines Manila, Manila, Philippines
e-mail: bdevio@up.edu.ph

S. Bonito, RN, MAN, DrPH
University of the Philippines Open University, Manila, Philippines

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are complex factors at play, such as climate/weather related, geophysical, ecological, and anthropogenic (human and developmental factors), that may contribute to vulnerability (Alliance Development Works and United Nations University, 2015).

8.2 About Typhoon Haiyan

Typhoon Haiyan made its first landfall over Guiuan, Eastern Samar, early morning on November 8, 2013, at 4.40 a.m. It has been recorded as the 23rd tropical cyclone for the year 2013 and the 9th to make landfall (NDRRMC 2013). It began from a low-pressure area in the Western Pacific as early as November 2, 2016, and was later reclassified as a tropical depression by the Joint Typhoon Warning Center (JTWC). Tracking westward over the next few days, environmental conditions favored its growth in size and strength causing it to be reclassified as a tropical storm by November 4 and given the name Typhoon Haiyan (see Fig. 8.1). JTWC upgraded it into a category 5 Super Typhoon (NDRRMC 2013) when it entered the Philippine Area of Responsibility (PAR) midnight of November 6, 2013, and already has 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 (NDRRMC 2013). Following 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. It finally exited PAR in the afternoon of November 9, 2013 (NDRRMC 2013).

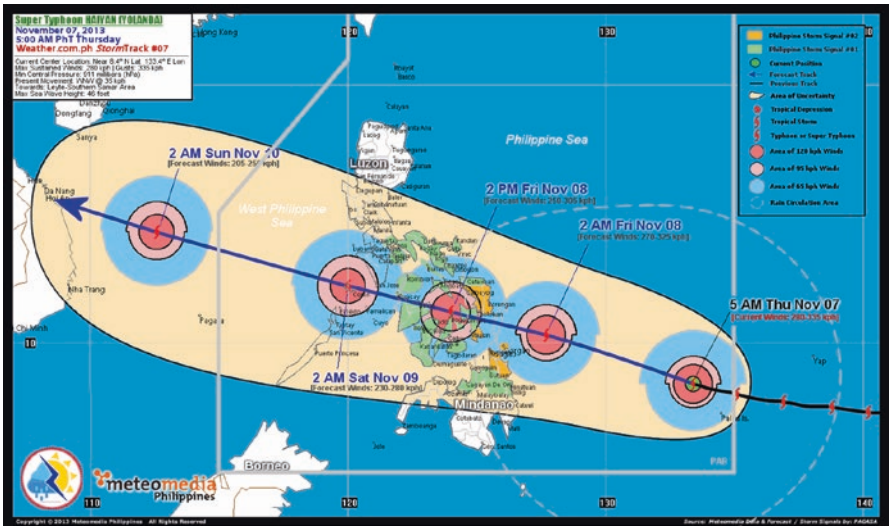

Fig. 8.1 Track of Typhoon Haiyan

8.3 Impact of Typhoon Haiyan

The National Disaster Risk Reduction Management Council (NDRRMC) reported 6300 individuals as dead, 28,688 injured, and 1062 still missing from across all regions (see Table 8.1). Majority of the casualties came from Region VIII, particularly in the province of Leyte (*see breakdown below*). Most deaths were due to drowning and trauma (NDRRMC 2013).

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. Topmost among the regions affected were regions VIII, VII, VI, V, and IV-B (NDRRMC 2013).

Region VIII, Eastern Visayas Region, a largely rural area comprised of six provinces, lies in the eastern boundary of the Visayas Region of the Philippines facing the Pacific Ocean (PCED 2014). The islands of Samar, Leyte, and Biliran are characterized by flat lands near and along the coasts and mountains and hills in the interior. Forty-five percent (45%) of its total land area is devoted to agriculture (Department of Agriculture 2014). Region VII Central Visayas Region at the center of the Philippine archipelago between the islands of Luzon and Mindanao has four main island provinces with a terrain characterized by highlands with narrow coastal strips of arable land, except for Bohol, which has a level plateau for its agricultural crops (ReliefWeb 2015a; Philippine Statistics Authority 2013). Between the Sibuyan Sea and the Visayan Sea in Central Philippines lies Region VI, Western Visayas Region, composed of five provinces. The region's total land area is approximately 6.74% of the total land area of the entire country (ReliefWeb 2015b). It has a topography characterized by relatively wide stretches of coastal lowlands with rugged hills and mountains in the interior. Fifty-two percent (52%) of the total land area is agricultural, of which 35.4% is rice land.

Region V or the Bicol Region is located at the southernmost tip of Luzon, in the eastern seaboard of the country, making it prone to typhoons coming from the Western North Pacific Ocean. The region is generally hilly and mountainous except for a few stretches of plains and several smaller coastal and inland plains in other

Table 8.1 Distribution of casualties across the affected regions in Typhoon Haiyan

Region	Dead	Missing	Injured
IV-A	3	–	4
IV-B	19	24	61
V	6	–	21
VI	294	28	2,067
VII	74	5	348
VIII	5,902	1,005	26,186
IX	1	–	1
X	1	–	–
Total	*6,300*	*1,062*	*28,288*

Source: NDRRMC (2013)

parts of the peninsula. It is likewise home to three active volcanoes, namely, Bulusan in Sorsogon, Iriga in Camarines Sur, and Mayon in Albay (ReliefWeb 2015c). Region IV-B also known as MIMAROPA which is the acronym for the provinces comprising the region is located southwest of Luzon (ReliefWeb 2015d). The topography of MIMAROPA varies from one island to another consisting of flat coastal areas and the upland interior areas of moderate rolling and undulating plains and hills and mountains.

Together the five most affected regions (MIMAROPA, Bicol Region, and Western, Central, and Eastern Visayas) comprise 16.4% of the total gross domestic product (GDP) in 2012 (ACAPS 2014) (see Table 8.2). The main economic drivers in the country have been agriculture and industry. But recent data show that the service sector has consistently been driving the economy since 2009 accounting for more than half of the country's total GDP. Before the typhoon, the combined gross values added to the economic sectors by the five regions comprise 26.5% to agriculture, 15.2% to industry, and 15% to services. In addition to the main source of livelihood, households maintain secondary or tertiary livelihoods (topmost of which is on wholesale and retail trade/repair of motor vehicles), thus maintaining more than one income source to augment family income and complement lean periods in one activity (ACAPS 2014).

Nevertheless, poverty rate remains very high in these regions particularly in the Visayas Region as compared to the national poverty rate of 19.7% in 2012 as shown in Table 8.2. And it is most severe and most widespread in rural areas where agriculture (subsistence farming and fishing) is the primary and often only source of income for poor rural people. The poverty impact assessment of the Asian

Table 8.2 Sociodemographic characteristics of affected regions before Typhoon Haiyan

Region (provinces)	Population (millions)[a]	GRDP percent contribution to GDP[b]	Poverty incidence among families (%)[c]
Region IV-B (Occidental and Oriental Mindoro, Marinduque, Romblon, and Palawan)	2.7	1.7	23.6
Region V (Albay, Camarines Norte, Camarines Sur, Catanduanes, Masbate, and Sorsogon)	5.4	2.0	32.3
Region VI (Aklan, Antique, Capiz, Guimaras, and Iloilo)	7.1	4.1	22.8
Region VII (Bohol, Cebu, Negros Oriental, and Siquijor)	6.8	6.3	25.7
Region VIII (Leyte, Southern Leyte, Samar [Eastern, Western, Northern], and Biliran)	4.1	2.3	37.4
Philippines (country level)	*96.7*	*100.0*	*19.7*

[a]ReliefWeb (2015e)
[b]Philippine Statistics Authority (2013)
[c]National Statistical Coordination Board (2013)

Development Bank (ADB 2013) discussed the link between natural disasters and poverty based on the 2013 report on disasters, poverty, and extreme climate. It stated that the poor, especially those in rural areas, are the most vulnerable to the effects of natural hazard shocks with long-run economic consequences for those in the lowest income and wealth quintiles. Table 8.3 shows the sociodemographic characteristics of the affected regions after Typhoon Haiyan.

A total of 161,973 families (792,018 individuals) were preemptively evacuated to 812 evacuation centers in 37 provinces, 38 cities, and 215 municipalities, in Regions IV-A, IV-B, V, VI, VII, VIII, X, XI, and Caraga (NDRRMC 2013). By December 2013, although a large number remained in evacuation centers, an overwhelming majority of displaced people are living outside these facilities, most of them in all provinces of Region VI (Western Visayas), with the largest number in one province coming from Leyte (Region VIII Eastern Visayas) (ACAPS 2014). These people come from geographical areas impacted by the tidal surge (east coast of Leyte and south coasts of Samar and Eastern Samar), or damages resulting from extreme winds (inland areas of Leyte and western coast of Samar), and those areas in the direct vicinity of the typhoon path in Central and Western Visayas. Many of the internally displaced people are believed to have sought shelter from friends and family in places outside their community taking advantage of the free flights offered by the military to Metro Manila and other unaffected cities and interisland transport vessels carrying busloads of people away from their damaged communities. They took shelter from relatives or were hosted by DSWD shelters and "tent cities" (ACAPS 2014).

During assessments done in affected areas, psychosocial distress, fear, and changes in behavior manifested as sadness, crying, and other exaggerated emotions were noted in Iloilo in Region VI and in Leyte and Eastern Samar Provinces in

Table 8.3 Sociodemographic characteristics of affected regions after Typhoon Haiyan

Region (provinces)	Population (million)[a]	GRDP percent contribution to GDP[a]	Poverty incidence among families (%)[b]
Region IV-B (Occidental and Oriental Mindoro, Marinduque, Romblon, and Palawan)	2.9	1.6	22.0
Region V (Albay, Camarines Norte, Camarines Sur, Catanduanes, Masbate, and Sorsogon)	5.8	2.0	30.9
Region VI (Aklan, Antique, Capiz, Guimaras, and Iloilo)	7.5	3.9	24.2
Region VII (Bohol, Cebu, Negros Oriental, and Siquijor)	7.3	6.5	27.0
Region VIII (Leyte, Southern Leyte, Samar [Eastern, Western, Northern], and Biliran)	4.3	2.0	39.3
Philippines (country level)	*99.9*	*100.0*	*21.1*

[a]PSA (2015, July). Note: Data is as of year-end 2014
[b]PSA (2016, March). Note: Data is as of first semester of 2015

Region VIII. Some negative behaviors particularly noted in Iloilo included alcohol consumption and fighting seen among adult men. One of the response gaps noted is insufficient psychosocial support for unaccompanied and separated children, parents and siblings who have lost family members, and older persons.

Across all affected regions, the number of damaged houses was reported at 1,140,332 houses (550,928 totally and 589,404 partially), most number coming from Regions VIII Eastern Visayas Region and VI Western Visayas Region. Damage report based on Post-Disaster Needs Assessment resulted to a total damage of PhP 89.6 billion and estimated amount of losses of PhP 42.8 billion (NDRRMC 2013).

Facilities for health, education, agriculture and irrigation, as well as government buildings and private establishments incurred considerable damage and losses. After the typhoon, the most heavily damaged of community services were schools. These remained non-operational in a third of all barangays as of mid-December. The infrastructure sector suffered damages to land transport (national and provincial roads and bridges), seaports, and airports, including flood control, water utilities, power supply, drainage system, and telecommunications. Damage and losses amounted to PhP 9.6 billion, 52% of which was from Region VIII (NDRRMC 2013; ACAPS 2014).

Across affected regions, the productive sector which includes agriculture and fisheries (including aquaculture structures and coral reefs), mining and quarrying, trade, industry and services, and tourism suffered a total amount of PhP 24 billion in terms of loss (NDRRMC 2013). Since the damage caused by the typhoon particularly affected agricultural and fishing, livelihood activities from these were disrupted and left many important assets destroyed. Aside from the income losses, reports showed that the damages also left over 29% of affected population food insecure and dependent on food assistance (ACAPS 2014).

8.4 Health Sector Response to Typhoon Haiyan

Disaster management in the Philippines is under the National Disaster Risk Reduction and Management Council (NDRRMC) governed by the Philippine Disaster Risk Reduction and Management Act of 2010. The Council is composed of members from key government agencies and institutions, including civil and private sector representatives, with the Office of Civil Defense as the lead agency. Disaster response and relief operations follow the cluster approach to facilitate coordination between national government cluster leads and international humanitarian assistance. With respect to health; water, sanitation, and hygiene (WASH); nutrition; and mental health/psychosocial services, the government lead is the Department of Health (ACAPS 2014).

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 the national and the international support. UN agencies and NGOs organized themselves following the IASC cluster approach to complement the government's

relief efforts. To facilitate response and relief operations, coordination hubs were established in Tacloban City, Roxas City, Cebu City, Borongan, Guiuan, and Ormoc.

The health response to Typhoon Haiyan, led by the Department of Health (DOH) and WHO, is summarized below (MacPherson et al 2015):

- Coordination of foreign medical teams whose services included consultations (over 20,000) and surgeries (5000)
- Delivery of several hundreds of tons of medical equipment and supplies
- Training of healthcare workers in key areas—disease surveillance, maternal and child health (essential intrapartum newborn care and kangaroo mother care), mental health and psychosocial support (psychological first aid and Mental Health Gap Action Programme), water quality, and waste management
- Vaccination campaign across affected areas (e.g., against measles and poliovirus in children)
- Restart of vaccination campaign for rabies across Eastern Visayas Region, which included dog vaccines and vaccine carriers after replacement of equipment

Immediate emergency response focused on provision of direct healthcare with international and Philippine medical teams from other regions providing primary, surgical, and specialized care to those most in need and preposition of medicines, hygiene supplies, dignity kits, and trauma kits for quick deployment in the affected areas. The loss of healthcare facilities meant the discontinuance of healthcare services; thus one of the focused treatment during the response targeted chronic diseases, particularly high-risk diseases such as tuberculosis (TB) and HIV/AIDS and STI (WHO 2014).

McPherson et al. (2015) also documented that outcomes of actions taken included not only medical and health services provided but also other positive programs that enhanced health response and served as future guidelines. Some of these consisted of the development and use of new guidelines for maternal and newborn care following emergencies and disasters, including implementing kangaroo mother care in several health facilities, improvement of coordination of services for people with disability, trained health service providers following the WHO Package of Essential Non-communicable Disease Interventions, improved functional referral system, WHO use of social media as a key part in risk communication strategy (which is a first), and likewise use of the classification and registration form for foreign medical teams for better coordination. Other components of the health response that proved beneficial included a community-based alcohol intervention program (piloted in Tacloban City), assessment of evacuation centers to determine size and mixed level of services, management of the dead, sanitary surveys, water quality testing and integrating with other clusters to provide clean water and appropriate sanitation in homes and in healthcare facilities, treatment and safety planning, and surveillance and rapid response for potential outbreak diseases such as diarrhea and vector-borne diseases such as dengue and *Chikungunya*.

In order to prevent outbreaks and spread of infectious diseases given the lack of basic infrastructure, clean water and food supplies, overcrowding in evacuation

centers, and migration, the health cluster undertook preventive activities on four key areas: vaccination, rabies prevention and control program (which was an ongoing project in the affected regions prior to the typhoon), surveillance on communicable diseases by activating the "Surveillance in Post Extreme Emergencies and Disasters" or SPEED (particularly on measles and dengue), and water, sanitation, and hygiene (WASH) which included not only water quality testing and healthcare waste management but also training sessions in these areas.

In the weeks immediately following the typhoon, a Multi-Cluster/Sector Initial Rapid Assessment (MIRA I) was carried out to gather data for response and strategic planning. First phase or MIRA I (2013 November) provided information on the impact at the community level, while the second phase or MIRA II (2013 December) focused on assessment at the household level.

The UNDP Philippines Humanitarian Country Team (2013) assessed the humanitarian needs of the affected areas and came up with this list:

- Food, water, and shelter needs
- Decline in health and nutritional status of those in worst-affected areas
- Food security through livelihood support and reestablishment of productive capacity
- Access to homes and public infrastructure
- Community services for water and sanitation, education, and social welfare
- Protection of the vulnerable groups (women, children, elderly, and disabled) particularly those displaced and staying in temporary evacuation centers
- Enhancing resilience

MIRA II (2013) assessment showed that both female and male respondents expressed that their immediate priority needs centered on reconstruction and repair of housing, continuation of food assistance, and fulfillment of cash requirements.

Health cluster activities focused on immediate emergency response. Given the damages to existing health facilities and infrastructure, lack of transport access to adequate health services became the key concern for more than a third of the affected population. Six months into the recovery and rehabilitation period, the health cluster report presented a consolidated picture of response and resource activities (WHO 2014):

- Over 150 foreign medical teams (composed of 2469 doctors, nurses, midwives, and staff) coordinated 107,000 consults and performed over 5000 field surgeries.
- Over 500 tons of medical supplies and equipment were coordinated either for use or distribution as needed (medical supplies, medicines, medical shelters, vaccines, hygiene and sanitation kits, etc.).
- Six health cluster hubs were established among 209 health cluster partner organizations.

Donations from several countries for essential and emergency healthcare to the affected population were received and documented by the WHO and the

corresponding national government agency. The same holds true for those coming from local and private entities in the country, which were coursed through the respective government agencies. Funding was also received from various organizations such as the Central Emergency Relief Fund of the United Nations (UN) and from the Japan Private Kindergarten Association along with staff from the WHO Nongovernmental Organization Consortium (NGO Consortium) and members of the Global Outbreak Alert and Response Network (GOARN). A Funding Status of Action Plan for Health was drawn up for the various health-related projects with their respective appealing agencies. This was regularly updated based on inflow of donations.

Overall, humanitarian access and relief operations faced constraints resulting from factors brought about by damaged roads and local infrastructure since local security situation across the affected areas placed no substantial restrictions. However, initial operations were challenged by obstacles arising from general lack of transportation, extremely limited communications systems, and seriously disrupted government services (MIRA II 2013, December).

Factors for consideration in future responses included the need for the people to understand in order to act in response to a call for preemptive evacuation as the lack of it posed the greatest risk for dying during a storm including the use of terms such as "storm surge" and difficulty in medicine management combined with donations of short-dated or near-expiry and unnecessary items.

Three key lessons from the overall response can be summarized into risks for some communicable diseases (e.g., rabies, dengue, measles) that extend into the rehabilitation/recovery period and demands for noncommunicable diseases, mental health, and maternal health continuing for months beyond the official response period.

8.5 Role of Nurses in Typhoon Haiyan

In response to the growing global awareness for the need for disaster preparedness, the Philippine Nurses Association (PNA), through its Disaster Preparedness Committee, has been conducting important activities to support the Philippine Disaster Risk Reduction Management Plan as well as lead the nursing sector in providing a collective response to help individuals and communities affected by disasters. The activities of PNA include capacity building for nurses, deployment of nurses to support the needs of survivors in disaster-stricken communities, managing nurse volunteers during disasters, and networking with national and local agencies involved in disaster management.

8.5.1 Capacity Building for Nurses

PNA Disaster Preparedness Committee conducted training programs for nurses from different local chapters (different parts of the country) on emergency and disaster management (see Fig. 8.2). The training program consists of lectures, discussions, tabletop exercises, and skills demonstration on the following topics:

Fig. 8.2 Training in disaster management at PNA

- Challenges and roles of nurses in emergency and disaster management
- Basic emergency care
- Mental health and psychosocial support (MHPSS)
- Community health interventions (water, sanitation, and hygiene or WASH)
- Communication and coordination
- Emergency response planning

  The training seminar aimed to capacitate the nurses and, eventually through them, their respective chapter members in preparing for and managing disaster events in coordination with government agencies and international humanitarian relief efforts.

8.5.2 Responding to Needs of Survivors

Immediately after the news from national media about the devastation left by Typhoon Haiyan started pouring in, the PNA Emergency Response Plan was activated jumpstarting the communication and coordination between the PNA National Office and the Disaster Preparedness Committee to establish contact with the PNA local chapters of the affected areas. The use of social media was maximized, such as PNA Facebook and Twitter, and also PNA website and email to solicit for situational reports. These reports became essential in determining the kind and extent of

Fig. 8.3 Call for donations and volunteers during Typhoon Haiyan

assistance to be provided to the affected areas. Call for donations and call for volunteers for services to disaster survivors were issued, to which a good number of people responded (see Fig. 8.3).

Through the situational reports received from the local chapters and national agencies, priority actions were set by the PNA National Office, which include provision of calamity funds to local chapters severely affected, organization and mobilization of nurse volunteers to help in medical missions and relief operations, and participation in the meetings with national agencies, particularly with the Department of Health (DOH), Philippine Medical Association (PMA), and Department of Social Welfare and Development (DSWD). An active search for nurses in affected areas was also done and calamity funds were given to support them.

8.5.3 Managing Volunteers

One of the challenges faced by PNA was managing nurse volunteers. To put a system to the increasing number of nurses wanting to volunteer, PNA Disaster Preparedness Committee set up a database to screen the volunteers. All volunteers were asked to register in this database to indicate their current affiliation, previous training, and skills related to disaster management and their availability for volunteer work. The enthusiasm and optimism among the nurse volunteers were very encouraging which reflected the caring spirit and humanitarian heart of Filipino nurses.

Anticipating the need for nurse volunteers for possible deployment to any of the affected areas and/or evacuation areas, the Disaster Preparedness Committee

conducted series of orientation seminars for nurse volunteers. The orientation gave them an idea of the current situation in the affected areas and the PNA response effort. They were also provided with a review of psychological first aid and were prepared on what to expect during response activities.

The rise in the number of survivors being flown in to Manila by Philippine and American C130s, mostly from Leyte and Samar, prompted the need for nurse volunteers in the evacuation sites (see Fig. 8.4). A total of 26 nurse volunteers who attended the orientation seminars was deployed to assist in the "OPLAN Salubong for Yolanda Survivors" at Camp Aguinaldo on November 21, 2013, and in Villamor Air Base in Pasay City on November 26, 2013. The PNA Disaster Preparedness Committee participated in the planning meetings conducted by the National Disaster Risk Reduction and Management Council (NDRRMC) together with DOH and DSWD and other different agencies both from the local and private sectors in Camp Aguinaldo. PNA nurses were tasked to handle triage and initial assessment of all survivors requiring medical attention, the "under 5" children, pregnant women, and senior citizens requiring vaccination, and assist in providing emergency treatment as needed. To formalize PNAs volunteer work under the health sector, coordination was made with DOH. Since the activity lasted for several days, a schedule for shift work was organized.

PNA officers and members who have participated in the national training seminars also mobilized their respective chapters to provide assistance to the typhoon

Fig. 8.4 Helping survivors of Typhoon Haiyan

survivors. Several PNA local chapters partnered with local government units, and others partnered with international organizations, such as UNICEF, Philippine National Red Cross (PNRC), and Plan International to help provide services to affected areas. PNA local chapters mobilized nurses from different sectors (academe, hospitals, community) to help in repacking supplies and goods in coordination with DSWD and PNRC for distribution to typhoon survivors in the different evacuation areas. Nurses were also given orientation on MHPSS, WASH, nutrition, and SPEED and deployed to Bantayan Island in Cebu on November 14–17, 2013.

8.5.4 Coordination with National Agencies and NGOs

The PNA Emergency Response Plan and Policy was also crafted describing the communication and coordination mechanism inside the association in times of emergency and disaster. Networking and linkage with the Department of Health has also been formalized through a memorandum of understanding, making PNA a member of the health cluster, mental health and psychological support services (MHPSS) cluster, and water, sanitation, and hygiene (WASH) cluster.

The local chapters in the Visayan region continued their direct provision of relief efforts, services, and assistance to the survivors of Typhoon Yolanda. The PNA National Office, on the other hand, continued coordination with national agencies and private organizations: DOH, DSWD, PMA, PNRC, Project HOPE, and PNA America, so that the PNA can further determine the type and extent of assistance it could provide through its nurse volunteers.

Humanitarian relief efforts continued as people moved toward recovery and rehabilitation, and PNA nurses, within their respective local chapters, continued giving their full support. Nurses are always at the forefront in any emergency and disaster event. The services they render are invaluable. But they can only maximize their full potential in facing up to the challenge of responding to disaster events at the level of their preparedness.

The experience that Super Typhoon Haiyan gave the country will not be forgotten for a long time, not only by those who suffered loss of family members and property but also by those who stood to face the challenge of helping the survivors discover hope at the end of the tragedy.

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Solomon Islands: The Role of Nurses in the April Floods in Honiara City and Guadalcanal

9

Michael Larui and Alison Ripiapu

9.1 Introduction

Solomon Islands is situated in the South Pacific Ocean lying east of Papua New Guinea, north-east of Australia and north-west of Vanuatu. The country's capital, Honiara, is located on the islaand of Guadalcanal. It is in the Western Pacific Region of the World Health Organization (WHO), which is referred to as the world's disaster epicentre (WHO 2015). Solomon Islands is rated 6th in the World Risk Index at 18.5%.

The country has experienced disasters since World War II when it became a battleground for the war between Japan and the Allied Forces supporting the United States of America from 1942 to 1945. The Country has experienced natural- and human-induced disasters including emerging diseases. These include the Guadalcanal Weather Coast Earthquake in 1977 which killed 10 people and affected 1000 and the tropical cyclone Namu of 1986 which killed 103 people with an estimated USD100 million of economic loss.

The civil unrest in 1999 and years following which also affected the country, killing 200 people and 30,000 displaced. Property loss as a result of the conflict was valued at USD350 million. The 2012 Festival of Pacific Arts in the country also introduced dengue and issues of solid waste management and wastewater emergencies. The festival helped the health team to prepare for mass gathering. Emerging diseases have been experienced with recurrent outbreaks of diarrhoeal diseases,

M. Larui (✉)
Ministry of Health and Medical Services, Honiara, Solomon Islands

National Nursing Administration, Honiara, Solomon Islands
e-mail: MLarui@moh.gov.sb

A. Ripiapu
Public Health Emergency and Surveillance Unit, Ministry of Health and Medical Services, Honiara, Solomon Islands

Ministry of Health and Medical Services, Honiara, Solomon Islands

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dengue and others. The dengue outbreak particularly in Temotu Province was compounded by the Tsunami in 2013, which killed 8 and affected 7689 people. The flash flood of 2014 was also followed by diarrhoeal outbreak adding to the dead tally in the post-flood period.

People live in a rapidly changing world where the population continues to grow with changing climate and diseases spreading rapidly across the globe (Kim 2014). The world also faces frequent disaster situations. All of these changes threaten health security and put health at stake (Ailan 2014). Health security threats include emerging infectious diseases, food safety incidents and emergencies, Humanitarian emergencies and disasters and many more (WHO 2015).

Nurses throughout the world have involved in many ways to contribute to health security by involving in disaster responses, preventing and responding to outbreaks and rehabilitative work both in the hospitals and other health centres. In Solomon Islands, nurses play major roles in response and rehabilitation in events of natural- and human-induced hazards. In a country where health programmes are mostly nurse-led, nurses are always called and deployed to manage, lead, coordinate and involve in clinical and public health interventions to address the effects of disasters and emergencies on affected populations.

The frequent occurrence of disasters in the country needs strategic all-hazard approach to disaster risk management. In a country that is nurse-led in most of its health programmes, nurses play significant roles in contributing to disaster response and rehabilitation. This case study describes the flash floods of April in 2014 and how it was managed by the Solomon Islands Government through the Ministry of Health and Medical Services and the roles of nurses in the response and rehabilitation work.

9.2 April Flash Floods in Honiara City and Guadalcanal Province

At 1100 on 3 April 2014, a tropical low with a central pressure of 1002 hectopascals was located near 11.1 degrees latitude south and 158.7 degrees longitude east, approximately 63 nautical miles north-west of Bellona Island and 100 nautical miles south of Guadalcanal Island; 732 mm of rain were recorded (see Fig. 9.1). Heavy rain from the tropical depression for 4 days caused severe flooding in the capital Honiara and Guadalcanal Province. National disaster was declared on 4 April 2014 (Oritaimae 2014a).

In Honiara, the Mataniko River that flows through the centre of the city swept houses belonging to settlers and villages along the banks. These include Tuvaruhu, Mataniko village, Vara Creek and Koa Hill squatter settlements and Fijian Quarter. At the river mouth, there is the Lord Howe settlement and Mamana wata communities.

The increasing population along the riverbank consists of traditional landowners residing in the Mataniko village. Koa settlement, the mostly affected consist of working people in the city while some are unemployed but have lived there ever since they migrated to Honiara from other provinces. Chinatown, which consists

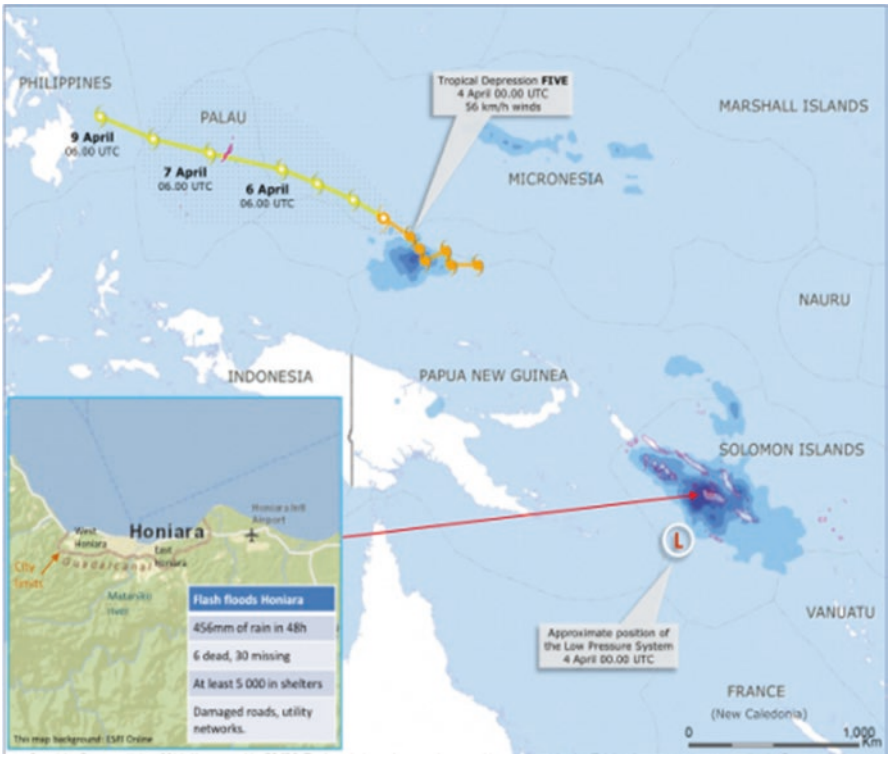

Fig. 9.1 Map of Solomon Islands:(Inset Honiara)

mainly of the Chinese business community, was also affected causing shops to be closed for a few days after the flood. The Mataniko Health Centre and Pikinini (Children's) Clinic also in new Chinatown and built close to the edge of the river were also affected by damages to the flooring, walls and the surroundings accumulated with debris and mud.

White River in west Honiara was also flooded and destroyed residential houses with minor damages to the White River health centre. In east Honiara, the Lungga River, which is the largest in Honiara also flooded resulting in water level rise to the Burns Creek communities and the many settlements along the river bank. Many of the residents have to be evacuated to King George the sixth school. The increased water level of Lungga River also affected the Honiara International Airport causing suspension of domestic and international flights.

The affected communities and buildings showed the level of vulnerability to flooding and rising water levels. There is lack of proper planning prior construction of residential buildings and not adhering to advices by the National Disaster Management Office of the need to move to higher grounds during flooding and prolonged rainy conditions.

In Guadalcanal, multiple rivers burst their banks washing away houses and affecting an estimated 40,000 people. The Guadalcanal plain, which hosts the Guadalcanal Plains Palm Oil Limited (GPPOL) is the largest plain in the country. It

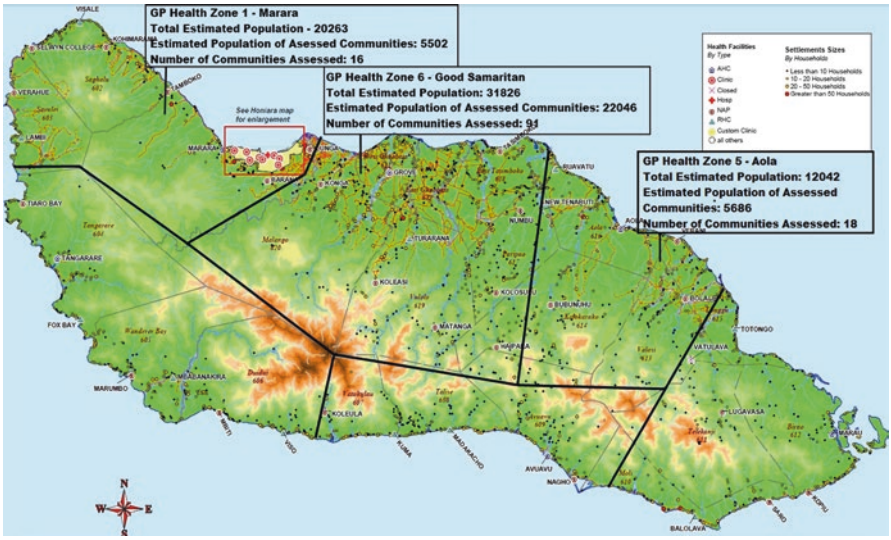

Fig. 9.2 Affected communities in Guadalcanal

is always vulnerable to flooding and increased water level as it has some of the biggest rivers in the province, namely, Tenaru, Metapona, Ngalimbiu, Mbalasuna and Mbarande rivers. These are all in Guadalcanal Province health zone 6 (see Fig. 9.2).

The Gold Ridge mining company in Central Guadal canal highlands discontinued operations due to continuous rain and increasing water level at the dump facing risk of spillage of harmful chemicals in the rivers and streams to nearby communities and villages. This led to the closure of the company leaving workers to abandon the site.

Other provinces appear to be less severely affected, but Malaita, Makira and Isabel Provinces did experienced flooding, and assessments were conducted to fully understand the degree of damage and impact in the population.

9.3 Impact of the Flash Floods

Twenty-three people were confirmed dead as a direct result of the flood and others were missing. There were approximately 10,500 displaced persons in evacuation centres (ECs) in Honiara and an unknown number in Guadalcanal Province. Many bridges were damaged or destroyed, and transportation to much of Guadalcanal was only by boat, limiting assessment and relief efforts. Water and sanitation infrastructure was seriously damaged. Two hundred and fifty-four families lost their homes and livelihoods. It was the first time in the history of Solomon Islands for an urban centre to be affected to such an extent by a natural disaster. The destruction was valued at USD107.8m in economy loss and relief cost was estimated at SBD16m.

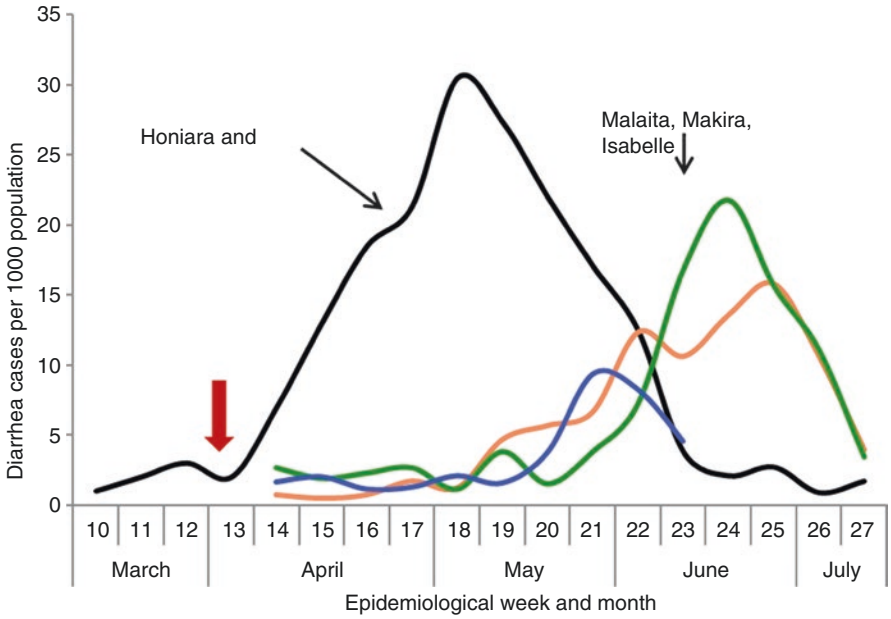

Fig. 9.3 Diarrhoea outbreak

A risk assessment from 7 to 9 April 2014 identified multiple post-disaster conditions predisposing to a communicable disease outbreak, specifically poor sanitation, limited and poor quality water, displaced populations living in dirty and densely populated evacuation centres, exposure to flood water and increased exposure to disease vectors (Nilles 2014).

Diarrhoea was immediately declared following the floods and poses threat to affected people in the evacuation centres (see Fig. 9.3). This was also reported in three other provinces as shown in the chart above. A total of 18, mostly children, reportedly died as a result of the outbreak.

9.4 Health Sector Response to the Flash Floods

The health sector response, challenge, strategic issues and lessons learnt during the floods are categorized under the following Disaster Risk Management for Health framework key components (Ripiapu and Larui 2015):

9.4.1 Policy Planning, Governance and Coordination

In this component, the National Disaster Council being the authority met and gave advice for the declaration of the state of disaster. The National Emergency Operation

Fig. 9.4 Consultation meeting

Centre (NEOC) at the National Disaster Management Office (NDMO) in the Ministry of Environment, Meteorology, Climate and Disaster (MEMCCD) was activated. The National Disaster Operation Centre (NDOC) clusters were responsible for coordination of activities (see Fig. 9.4).

Ministry of Health Emergency Operations Centre (MoHEOC) led implementation from the Control and Command Centre headed by the incident controller who is the permanent secretary of the Ministry of Health. MoHEOC was activated following the declaration and implemented its activities through the planning, operations and logistics domains. The committee worked very closely with development partners, non-government and faith-based organizations and volunteers to plan and support the operations of the Ministry of Health. NDOC was continually being updated from the Situational Reports produced by MoHEOC.

Communication was made with the affected provincial Emergency Operation Centres—Honiara City Council and Guadalcanal Province. The other provinces that also reported flooding and diarrhoea outbreak were also being continually assessed.

The planning domain headed the National Director of Nursing, and the head of the Surveillance Unit was responsible for the situational reports, information, communication, resources and management of operations.

Human resource deployment was also a function that was done by the Operations Centre to ensure that sufficient human resource is being deployed to areas that are needed.

The operations domain was headed by the medical superintendent and chief executive officer of the National Referral Hospital (NRH). The head of departments of Public Health Programmes and Hospital units were responsible to update their activities to the MoHEOC meetings under this domain. The departments working as health clusters involved in public health interventions such as health promotion, nutritional programmes, immunization and clinical services.

The logistics domain headed by the financial controller and manager of the National Medical Stores was responsible for supplies, transport and finance. Transport was organized as well as medicines and supplies to needed areas especially to the affected provinces and Honiara City Council health centres.

In further assisting the affected provinces, the Undersecretary Health Improvement and National Director of Nursing were deployed to Guadalcanal Province and Honiara City Council, respectively. They assisted the Provincial Health Emergency Operations Centres by providing advice on the response, and rehabilitation in response to the flood.

In the response, recovery and rehabilitation under this component, there were challenges that the Ministry of Health experienced. Integration and collaboration were challenging as stakeholders also have other priorities in their action plans, thus making it difficult to work together. This was the same for coordination and accountability for interventions developed to address the affected population of the flood.

The Humanitarian Assistance Program (HAP) and Rapid Assistance Program (RAP) were coordinated by the Ministry of National Planning and Aid Coordination and WHO, respectively, and the Ministry of Health has to do rapid assessments to see areas that need help under the assistance programmes. Roles and responsibilities for officers involved in response and rehabilitation need clarification. Continuity of functions during the floods was properly demonstrated as there were issues with deployment of health workers. Communication was also a challenge especially with affected provinces and the city council.

The strategic issues that need to be considered for future operations are the need for sectoral policy for planning, governance and coordination in disaster situations and in the event of emerging diseases, integration of response, recovery, rehabilitation to development agenda of the sector and in particular urban health. The lessons learnt from the floods under this component are as follows:

1. Develop health sector policies and guidelines
2. Develop a National Disaster Risk Management for Health Plan
3. Establish the governance and coordination system
4. Establish a Disaster Risk Management for Health Unit
5. Focus on urban health

9.4.2 Information and Knowledge Management

Under this component, multisectoral assessment was carried out at different dates by the National Disaster Management Office (NDMO), Solomon Islands Red Cross and other non-government organizations (NGO), Ministry of Health, the WASH and Protection clusters. The Surveillance Unit with assistance from WHO was able to develop the Early Warning Alert and Response Network (EWARN) post-flood. MoHEOC also was involved in the Health Information System and Risk Communication (see Fig. 9.5).

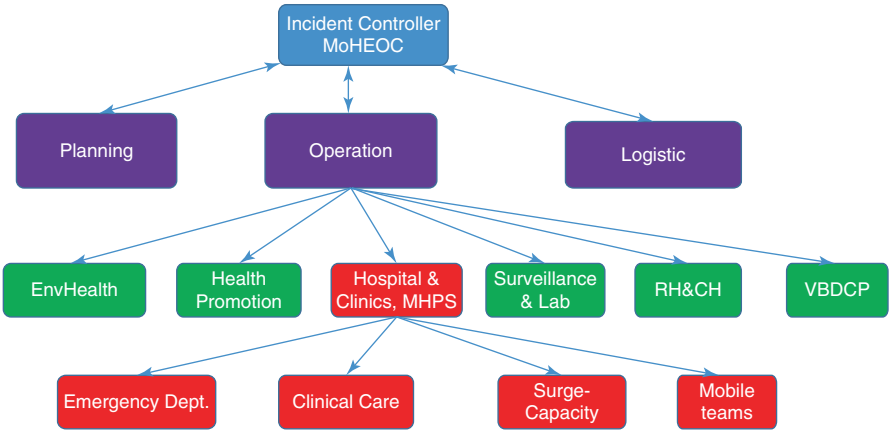

Fig. 9.5 Members of the MoH emergency operations centre

The challenge under this component is with coordination and that information pre-event was not centrally stored. Collection, collation, analysis of important data and reporting remain a challenge as well. Ownership and sharing of information are important but also a challenge including risk communication.

The strategic issues under this component are to look at vulnerability and risk mapping and develop integrated EWARN and the establishment of Ministry of Health data repository on Disaster Risk Management for Health (DRM-H).

Lessons learnt under the Information and Knowledge Management include establishing a system for collection, storage and use of information and establish procedures for risk communication and central information system within the DRM-H unit. Training should be provided for responders on agreed assessment tools to cover collection, collation, analysis of data and reporting. There is also a need to establish and strengthen the Epi-net team and the Health Information System and Post-flood EWARN and risk communication.

9.4.3 Service Delivery

The health sector provided surge mechanism by deploying health officers to the affected people and communities. Much of the deployment has been to support the mobile clinics to evacuation sites and the accident and emergency unit. The committee also developed the process of getting in Foreign Medical Teams as the Australia and New Zealand Medical Assistance Teams were being deployed to support the local team on ground. Other organizations such as Red Cross, Doctors without Borders and teams from the UN agencies were also part of the response and rehabilitation work.

The challenges were shortage of staff to support the surge mechanism, working on contingency plans including accessing funding resources and logistics in time for operations. The National Referral Hospital is vulnerable to hazards and to use it during such response is a challenge in itself. In identifying strategic issues under this component, health service delivery to rural communities and to vulnerable and marginalized population is significant. The flooding in the city also signals the strategy of improving urban health services. The lessons learnt under this component during this disaster raise the need for the following:

- Strengthen and enhance surge mechanism
- Develop scenario contingency plans
- Identify hospitals for "safe hospital initiative"
- Focus on vulnerable and urban health service

9.4.4 Resources

In the response, recovery and rehabilitation, the health sector emphasized building relations and teamwork. With the many support coming in from countries, development partners, organization and communities, the need to strengthening the team approach was important during this disaster.

The medical aid from developing partners was coordinated by the National Medical Stores Manger. The hospital and health service grants were also used for financing the operations. The health sector also worked with central agencies for clearing and procurement of supplies.

The following challenges were experienced in this response:

- Meeting staff welfare includes organizing payments for allowances as officers were deployed to provide services at the evacuation sites and the affected villages and settlements.
- Identifying human resource skill sets to provided effective service delivery.
- Getting the right number of health workers to involve in the operations.
- Accessibility to appropriate financial resources.
- Formulated guidelines and procedures for such disaster and emergency situations.
- Operation, planning, and coordinating supply chain

The lessons learnt during the course of response, recovery and rehabilitation include the need to strengthen supplies management and stockpile in appropriate locations. The need to develop and organize the human resource skill sets was also realized in this operation. There is also the need to develop contingency plans for disaster situation and to have a fast-tracking mechanism to access financial resources in the event of response.

9.5 Role of Nurses in the Flash Floods

In a country where there is shortage of medical doctors and most of the programmes are nurse-led, nurses are always called upon to contribute to response and rehabilitation during the events and situations of natural- and human-induced hazards such as the flood in Solomon Islands.

Senior nurses were involved in coordination of MoHEOC activities. The National Director of Nursing was the leader of the planning domain, while the head of the Health Surveillance Unit also a nurse was involved in the coordination of the operations.

The Director of Nursing at the National Referral Hospital (NRH) was the leader for surge capacity looking at distribution of human resources in response from the hospital. Nurses in the accident and emergency unit were increased to deal with the casualties and also the diarrhoea outbreak that followed.

At the Honiara City Council (HCC) Emergency Operation centre, the Urban Health Emergency Committee was activated and lead by the Supervising Health Director and director of nursing. The Nurse Manager of HCC was the main coordinator of activities, while the assistant director of nursing was the logistics coordinator for the health team in the city who also assisted in planning for the Rapid Assistance Programme (RAP) by United Nations by which affected health centres were rehabilitated. The Public Health Nurses of HCC led the mobile clinics which consist of all nurses to visit the evacuation sites daily and conduct clinics.

The Guadalcanal Province Emergency Operations Centre (GPEOC) was also activated. Senior nurses in the province assisted the Provincial Health Director in the response and rehabilitation. The Director of Nursing and Nurse Educator were responsible for deployment of nurses and other health workers to the affected villages and evacuation sites.

The number of nurses deployed to Guadalcanal Province was increased through sending in nurses from the National Public Health programmes, the national nursing administration and nursing council in the Ministry of Health. Apart from nurses involving in clinical work, they were also called in to do rapid assessment to understand the situation following the disaster.

The issues identified for the Ministry of Health and Medical Services and the National Nursing Division to consider following the lessons learned after the flash flood of April 2014 are:

- Ministry of Health needs to strategically plan for natural- and human-induced hazards. Such plans must consider an all-hazard approach and cover phases of the disaster risk management cycle which includes prevention, preparedness, recovery and response.
- The Nursing Council should develop nursing competencies for disaster and outbreaks.
- A Nursing Officer should be given the role of disaster coordination and communication to work with the Public Health Emergency and Surveillance Unit.

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South Korea: The Role of Nurses in Ebola Preparedness

10

Seun Young Joe

10.1 Introduction

Starting March 2014, West Africa experienced the largest outbreak of Ebola in history, with multiple countries affected. Ebola is one of the emerging infectious diseases. An emerging infectious disease is an infectious disease whose incidence has increased in the past 20 years and could increase in the near future. Ebola killed thousands of people in West Africa from 2014 to 2015.

The South Korean government decided to dispatch medical personnel to help people who lived in the affected areas. But before deploying people to Sierra Leone in West Africa, the Korea Armed Forces Nursing Academy (KAFNA) conducted a training program to help prepare civilian and military medical personnel.

10.2 Impact of Ebola

The Ebola virus causes an acute serious illness which is often fatal if untreated. The outbreak in West Africa was the largest and most complex Ebola outbreak since the Ebola virus was first discovered in 1976. There have been more cases and deaths in this outbreak than all others combined. It has also spread between countries starting in Guinea then spreading across land borders. On August 8, 2014, the WHO Director-General declared the West Africa outbreak a Public Health Emergency of International Concern under the International Health Regulations (WHO 2014). As of April 13, 2016, there were 11,310 deaths due to Ebola. Four thousand eight hundred ten deaths (43%) were from Liberia, 3956 (35%) from Sierra Leone, and 2544 (22%) from Guinea (WHO 2016).

S.Y. Joe
Lieutenant Colonel Joe, Korea Armed Forces Nursing Academy, Daejeon, South Korea
e-mail: anjoe116@gmail.com

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10.3 Health Sector Response to Ebola

The most severely affected countries, Guinea, Liberia and Sierra Leone, have very weak health systems, lack human and infrastructural resources, and have only recently emerged from long periods of conflict and instability (WHO 2014).

Due to the Ebola virus outbreak, the UN Security Council created the first ever UN mission for a public health emergency, UNMEER, with the primary task of coordinating the UN agencies' vast resources to combat the epidemic under the leadership of the WHO (Reduk 2014). UN agencies, together with other international organizations and countries launched humanitarian responses and pledged resources, expertise and funds to the international effort in West Africa.

WHO first declared Liberia free of Ebola virus transmission on May 9, 2015. The country subsequently experienced a cluster of six Ebola cases in June 2015, and a second cluster of three cases was reported in November 2015. WHO declared the country free of transmission for the third time on January 14, 2016. WHO declared Sierra Leone free of Ebola virus transmission on November 7, 2015, after 42 days (two incubation periods) had passed since the last Ebola patient tested negative. Two new confirmed cases were reported in January 2016. On March 17, 2016, WHO declared the end of the flare-up after 42 days had passed since the last Ebola patient tested negative. WHO declared Guinea free of Ebola virus transmission on December 29, 2015, after 42 days (two incubation periods) had passed since the last Ebola patient tested negative.

10.4 Role of Nurses in Ebola Preparedness

There was not enough time between the South Korean government's decision to dispatch medical staff to West Africa in October 2014 and actual dispatch of relief team in December 2014. There was urgent need for a training program to prepare medical staff. KAFNA, having the experience in disaster training and excellent faculty members, was selected as the training institution for Ebola preparedness.

The disaster-related curriculum of KAFNA was developed in 2005. Earlier known as Emergency Nursing conducted for civilian and military staff, it was renamed as Disaster Nursing in 2008 with an updated curriculum and program of 96 hours conducted every year. KAFNA also offers Trauma Nursing Core Course and intensive courses for Korea Disaster Relief Team for dispatching to overseas disaster sites. The intensive course for Korea Disaster Relief Team is conducted four times every year and has so far deployed teams in Nepal, the Philippines, China, and including West Africa during disasters.

The problem-based learning method, tabletop exercise, simulation training, case-based discussions and exercises were usually applied in the training program. It was aimed to maximize medical personnel's ability to cope through practice-oriented education linked with theory.

After the request from the Ministry of Health and Welfare, the development of the training program was done in four stages: (1) team organization, (2) content development, (3) faculty competency development, and (4) training center installation.

10.4.1 Team Organization

KAFNA organized a team for the development of the curriculum. Korea Centers for Disease Control and Prevention (CDC) gave technical and budgetary support required for the curriculum development. KAFNA committed to develop an education content that is as similar as possible to clinical practice through problem-based learning and case-based method.

10.4.2 Content Development

For the reliability and validity of the educational content, an analysis of the programs carried out in the US Centers for Disease Control (CDC) and institutions of Ebola in the UK was done. One faculty member participated in a UK education program that trained medical personnel who were deployed to Sierra Leon (Table 10.1).

Table 10.1 Timetable of education which was developed and conducted in KAFNA (KAFNA 2014)

Day 1	Introduction of training program
	Overview of Ebola outbreak
	Ebola and clinical treatment
	Patient triage tabletop exercise
	Prevention and management of infection (principle of donning/doffing PPE)
	ETU practical session 1: donning and doffing PPE, blood sampling
Day 2	Introduction of Ebola treatment unit
	Tabletop exercise for constructing ETU
	Disinfection and hygiene (principle of patient movement)
	Understanding culture of West Africa
	Prevention of PTSD
	ETU practical session 2: disinfection and managing dead body
Day 3	Health promotion and case contact interview
	Medical staff management
	Understanding medical experience in the Africa
	ETU practical session 3: triage and patient movement
	Evaluation

10.4.3 Faculty Competency Development

Faculty members reviewed the Ebola guidelines of each country in a series of workshops. Based on the results, the faculty members developed hands-on training, tabletop exercise training, and simulation training. They improved their competencies by repeated rehearsals.

10.4.4 Educational Training Center Installation

The Ebola Training Unit was installed with rooms for donning/doffing of personal protective equipment (PPE) and for performing intravenous injection and catheter insertion (see Fig. 10.1).

Figure 10.2 shows where medical personnel can practice donning/doffing of PPE and practice intravenous injection. The principles and practice for preventing transmission of infectious agents were provided to anyone who has an opportunity for contact with patients or medical equipment.

Training materials and methods appropriate to the medical staff member's level of responsibility can improve the learning experience. To give a sense of reality, personnel practiced donning/doffing of PPE with equipment used in Sierra Leon. Figure 10.3 shows the floor plan for Ebola treatment training. It shows the

Fig. 10.1 Ebola Treatment Unit training center

Fig. 10.2 Personal protective equipment/intravenous practice room

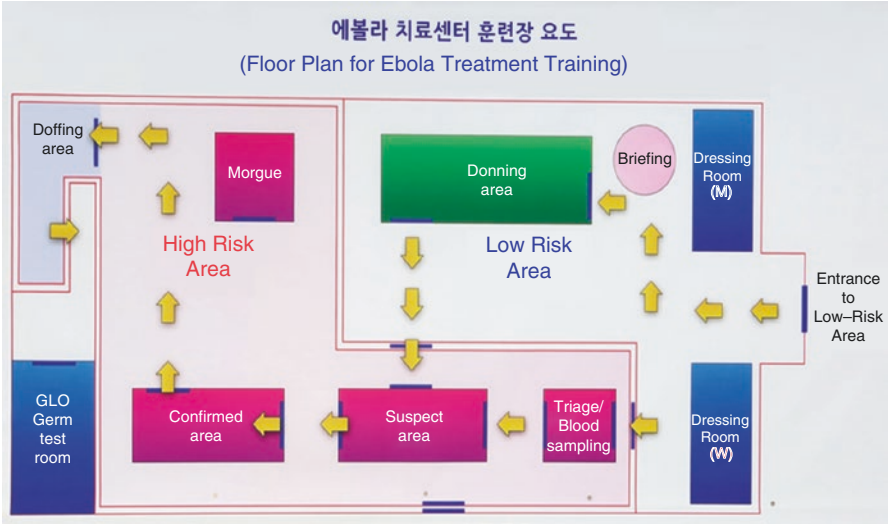

Fig. 10.3 Floor plan for Ebola treatment training

direction of movement from low-risk areas to high-risk areas. On the left side of the diagram, there is a test room to make sure one is not contaminated after taking off clothes.

10.4.5 Implementation of Training Program

Four training sessions were held with 35 participants from December 8, 2014 to February 2, 2015. Three training sessions were held for Ebola Emergency Relief Team, and once for the medical staff attached to Armed Forces Capital Hospital. To improve infection control capacity and to ensure the safety of medical personnel, education was focused on operating principles of Ebola Treatment Unit, building infection control capacity and internalization of capacity.

First in the training session were lectures about patient care and clinic work for participants to understand the operating principles of ETU. After that, tabletop exercise training and simulation using standardized patients were carried out. Training on contact management, triage, and design of unit was also conducted (see Fig. 10.4). After giving lectures, individual practices were repeated using tabletop exercises and simulations to improve working-level capacity of participants.

Medical personnel also learned the process of finding the optimal placement of the facilities and workflow after discussing the design of Ebola Treatment Unit (ETU) (see Fig. 10.5).

Fig. 10.4 Triage practice

Fig. 10.5 Placement of facilities in the Ebola Treatment Unit

Fig. 10.6 Practicing of donning PPE

To build capacity for the infection management of ETU, lectures on prevention of infection and donning/doffing of PPE without contamination, and repeated practice were conducted. They were also trained on taking blood sample, transporting patient, and management of the dead.

Medical personnel were also evaluated on hand washing techniques. Most of them were very surprised that their hand washing had not been perfect. They learned how to fix their personal items such as glasses. Before carrying out the procedure of changing to protective clothes, they were briefed on the importance of thorough checking. They worked in pairs to perform each step and check. Faculty members trained each team to follow carefully the donning and doffing of PPE (see Fig. 10.6).

After repeated practice, a comprehensive training was performed by developing specific scenarios for internalization and evaluation of donning and doffing of PPE was done using fluorescent material. Various scenarios were prepared for the training, and participants were given certain situations before entering the ETU.

Participants were also asked to check the supplies necessary for intravenous injections and blood extraction (see Fig. 10.7). They practiced taking blood samples from dummy arms with colored skin under the guidance of a faculty member.

When given the task of disposing patient's vomitus, participants performed the task by following the protocol and faculty members gave immediate corrections to ensure correct observation of the protocol. They also practiced transporting patients who had hematemesis in the triage area and managing bodies of patients who died in the ward.

After finishing the tasks given, participants practiced taking off PPE and checking if contaminants remained before and after donning/doffing PPE (see Fig. 10.8). This was important in internalizing infection control protocol. Faculty members checked very thoroughly to help participants identify highly-contaminated areas in the process of doffing.

Fig. 10.7 Practicing IV insertion and blood extraction

Fig. 10.8 Practicing of doffing the PPE and checking for contamination

The training program on Ebola preparedness for emergency relief teams contributed to the enhancement of national response policy as well as the successful performance of medical missions in Sierra Leone. The intensive training that tried to capture the reality also helped in the safe return of emergency relief teams.

The courage and dedication of the emergency relief teams did not go unnoticed. South Korean President Park Geun-hye conferred medals to them and praised their mission in the West African nation of Sierra Leone.

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Tonga: Cyclone Ian, Ha'apai Islands

11

Mele Havealeta, Fusi Kaho,
and Amelia Afuha'amango Tuipulotu

11.1 Introduction

Tonga is an archipelago in the South Pacific Ocean, directly south of Samoa and about two-thirds of the way from Hawaii to New Zealand. Its 169 islands, 36 of them inhabited, cover an 800 km (500 mi)-long north-south line (Wikipedia, 2017). The three main groups are Vava'u, Ha'apai, and Tongatapu. Tongatapu, the largest island, is where the capital city of Nuku'alofa is located and covers 257 sq km (99 sq mi). Tonga is exposed to tropical cyclones, mostly from November to April, though tropical cyclones can form and affect Tonga outside of the season.

11.2 Cyclone Ian

The US Joint Typhoon Warning Center designated the system as Tropical Cyclone 07P late in January 5 and was later named Cyclone Ian. From a category 1 tropical cyclone, Ian intensified into a category 5 severe tropical cyclone.

On January 11, 2014, Cyclone Ian with strong wind of up to 160 knots (296 KPH) struck Ha'apai islands group in Tonga—Ha'apai island groups consist of about 23 tiny atolls. Ha'apai is one of Tonga's main groups of islands located between Vava'u to the north and Tongatapu to the south. During the cyclone no telecommunications was able to reach Ha'apai.

M. Havealeta • F. Kaho
Disaster Response Team, Nuku'alofa, Tonga

A.A. Tuipulotu (✉)
Ministry of Health, Nuku'alofa, Kingdom of Tonga
e-mail: amyafuhaamango@gmail.com

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Fig. 11.1 Impact of Cyclone Ian in Tonga

11.3 Impact of Cyclone Ian

Cyclone Ian was one of the strongest cyclones ever to hit Tonga (UN OCHA, 2014), damaging 80% of houses in Ha'apai. The estimated population of Ha'apai is 5500 people and approximately 70% of the Ha'apai population was affected. Immediately at the aftermath, priority was given to the replacement of destroyed or damaged housing for the most vulnerable members of the community.

The direct impact and aftermath of Cyclone Ian in Ha'apai led to 14 people injured and one death (see Fig. 11.1). Most of the 1100 houses and many of the public facilities were damaged or destroyed including schools. Approximately 2300 people were left homeless by the storm. The major impact was the local food supply which was expected to be completely paralyzed for the next 6 to 10 months after the cyclone (MAFFF and FAO, 2014). The total damage from the cyclone was estimated to be around T$90.2 million (US$48 million).

11.4 Health Sector Response to Cyclone Ian

In anticipation of Cyclone Ian, all outlying health centers and hospitals (including Niu'ui Hospital at Ha'apai) were alerted to activate the preparedness and response plan. This plan included evacuation to a safer site (in Niu'ui Hospital)

in case of a worsening condition. After the cyclone, communications was received early on January 12, 2014, and urgent request from Niu'ui hospital included first aid supplies, sterile dressings, PPE, hand sanitizers, and certain drugs including antibiotics. Requested supplies and drugs were immediately packed and sent on first available flight to Ha'apai on January 12, 2014. One moderately severe and several minor injuries were confirmed, all of which could be handled at Ha'apai.

At 7 p.m. on Sunday, January 12, 2014, a meeting of the MOH disaster management committee was held. As a result of this meeting, a plan developed that medical staff were to be deployed urgently to Ha'apai, and supplies were sent to Ha'apai. Health inspector took water treatment pills and insecticides to be used for spraying for mosquitoes and flies. He ensured that proper processes are adhered to in order to sustain safe water supply and sanitation. One doctor, one nurse practitioner, senior nurse, three experienced emergency nurses, and one pharmacy staff member were deployed as the first healthcare team to be deployed to Ha'apai island immediately at the aftermath of the disaster.

11.5 Role of Nurses in Cyclone Ian

Nurses' main roles and responsibilities at the aftermath of Cyclone Ian aimed at a holistic assessment of population health status. The assessment included key areas of physical, psychological, mental, and social status of individuals, families, and communities. Health assessment and basic vital signs were conducted, and abnormal cases were referred immediately to the medical officer within the team. This included assessment of blood glucose level, blood pressure, and wounds. Most cases were managed at the site, while some of the abnormal cases were further referred to the hospital for further investigation and management. As there were many people within the population that suffered from noncommunicable diseases (NCDs), detail assessment was conducted on their medication status and their NCDs health card to ensure adequate management of their specific condition. Nurses also undertook a targeted assessment approach to vulnerable population which included women and children, elderly, and mentally ill clients. The immediate health needs of the vulnerable population were attended to—referral to other support systems was conducted and family support was encouraged given challenging situation.

During nurses' assessment of population basic health status, they also realized that people appeared to be still in shock (lelea e lotó) situation, and they were often not highly mobile even though much damages and work were evident to be done in most homes. When nurses asked some of the population about their reflection on their experiences during the cyclone, some cannot fully recall their experiences, while others kept repeating similar explanations. Nurses conducted immediate counseling to some of the population that still appeared shocked; however, at most

times population were referred to appropriate counseling system already established by the National Emergency Management Office (NEMO).

Nurses also conducted a scan assessment of the environment during home-to-home visit, and it included areas such as food supplies, residential condition, and bathrooms. During this home-to-home environmental assessment, nurses advised population on the importance of handwashing, ensuring that drinking water is safe and clean, proper disposal of rubbish, and extinction of flies and mosquitoes. Handwashing was however difficult to be encouraged given the lack of water and handwashing liquid.

Food security and safe drinking water were critical issues for population health during the aftermath of the cyclone. Nurses conducted thorough and comprehensive counseling of women, families, and vulnerable population on basic nutritious local food though these foods were often lacking—and canned manufactured products were increasingly becoming their main food intake. Nurses ensured that families of vulnerable populations—mothers, pregnant mothers, young children and babies, the elderly, and the disabled—have sound understanding of the need for best possible nutritious food intake for such populations.

The factors that hindered nurses' role at the aftermath included lack of basic safety standard gear for nurses and health professionals to protect themselves and the population and facilitate efficient disaster management. Basic safety gear is an area to be considered by the government for the future, and it included safety shoes, hats, vests, torches, mosquito nets, and life jackets. Safety shoes are needed because of high risks for injury from cyclone debris and spiky scatters. Hats were needed as walking was the main means of getting from home-to-home as there was lack of transportation. At one point a bicycle was used by nurses to visit homes; however, bicycles were limited.

The nurses recommended four key areas to enhance future planning and disaster response. Firstly, there is the need to strengthen policy direction specifically on the actual operation of disaster management at the aftermath of a cyclone. This policy direction should include adequate resource allocation and effective transportation and communication systems at cyclone disaster context.

Secondly, there is a need to strengthen the national health disaster response team—to undertake disaster management training for future efficient response. The team needs to fully understand the severe lack of basic resources at a cyclone aftermath context—which includes basic areas of sleeping (often a tent) and basic food. Nurses also need to consider deployment of adequate nursing staff to disaster context—to enable local staff at disaster site to take care of themselves, their families, and home and to adequately recover from the disaster.

The third recommendation is the need for adequate and efficient transportation. Nurses' work was conducted on a home-to-home and village-to-village approach; thus, efficient transportation was needed for timely management.

The fourth recommendation is the need to establish a comprehensive communication system where health care professionals are linked during deployment at remote islands and villages. Communication was lacking when nurses were conducting work for days in isolation at remote islands and contexts—such a situation can be challenging and difficult for nurses.

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Summary and Conclusion

12

Sheila Bonito and Hiroko Minami

12.1 Summary

Ten case studies in this book highlighted the role and contributions of nurses in disaster management. Nurses have demonstrated that with their technical skills and knowledge, critical thinking, creativity, coordination, courage, and dedication, they can help save lives and support communities in times of disaster. The case studies showed evidence of nurses' roles across the disaster management continuum—from disaster prevention and mitigation, preparedness, response to recovery, and rehabilitation.

12.2 Disaster Prevention and Mitigation

In disaster prevention and mitigation, the goal is to avoid hazards and mitigate their potential impacts by reducing vulnerabilities and exposure and enhancing capacities of communities. Identifying risk and taking appropriate action may prevent a disaster altogether or reduce the effects of the disaster (WHO and ICN 2009). Some activities that nurses participate in during disaster prevention and mitigation are conducting awareness campaigns on hazards, vulnerabilities, and risks, providing vaccination, and improving health and nutrition.

Nurses in their general practice are involved in ensuring that individuals and communities are with improved health and nutrition and that vulnerabilities are minimized if not completely removed. Nurses need to know the hazards and vulnerabilities of

S. Bonito, RN, MAN, DrPH (✉)
University of the Philippines Open University, Manila, Philippines
e-mail: srbonito@up.edu.ph

H. Minami, RN, PhD
University of Kochi, Kochi, Japan

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national and local areas to help individuals and communities cope with potential emergencies and disasters.

In the case study from Cambodia, nurses were fully aware of the danger when the Mekong River overflows every year. They also realized the need for updating competencies to ensure they can support flood prevention and management. Nurses recognize that risk assessment and management, provision of appropriate protective materials, development and planning of organizational guidelines or protocol for flooding management, and planning for specific incident management should be required nursing competencies.

12.3 Disaster Preparedness

Disaster preparedness is critical to the delivery of effective responses to the short-, medium-, and long-term needs of a disaster-stricken population (ICN 2006). In disaster preparedness, the goal is to establish and strengthen capacities of communities to anticipate, cope, and recover from the negative impacts of emergency occurrences and disasters. Preparedness is based on a sound analysis of disaster risks and good linkages with early warning systems and includes such activities as contingency planning, the stockpiling of equipment and supplies, the development of arrangements for coordination, evacuation and public information, and associated training and field exercises (UNISDR 2009).

Nurses are usually involved in disseminating early warning signals, planning for emergency evacuation plans, and conducting training and formulating policies on emergency and disaster. When Tropical Cyclone Yasi threatened Far North Queensland, nurses were involved in patient evacuation in hospitals and aged care facilities making sure people were kept safe. Nurses ensure that hospital evacuation plans are carried out systematically and that there is proper documentation of patients discharged and transferred. The evacuation of two hospitals given the limited preparation time (24 hours) required immense resources and great coordination and highlighted the important role of nurses in disaster preparedness.

12.4 Disaster Response

Disaster response refers to actions taken directly before, during, or immediately after a disaster in order to save lives, reduce health impacts, ensure public safety, and meet the basic subsistence needs of the people affected (UNISDR 2009). This includes the mobilization of responders to the disaster area to save as many lives as possible and provide for meeting the immediate needs of the survivors and reduce the longer-term health impact of the disaster (WHO and ICN 2009).

Nurses are oftentimes involved in providing immediate and acute care to individuals and communities who are victims of disaster, for example, triage, first aid, trauma care, emergency surgery, treatment of diseases of epidemic potential, vector-borne disease, and diseases of public health significance.

Nurses in China were mobilized to help survivors during the massive Wenchuan earthquake. Just-in-time training programs were developed to help nurses cope with the physical and psychosocial needs of survivors who were evacuated in specific locations. Nurses were involved in doing triage, controlling infection, providing psychological support, treating complications, and helping patients to start bedside rehabilitation in the recovery stage so that functional capacity and independence could be maximized.

Nurses from a school of nursing in Indonesia showed their competencies in managing survivors during the Yogyakarta and Central Java earthquakes by setting up a simulated hospital in the school campus where nurses did triage and gave needed basic emergency care for mild to moderate injuries.

Nurses in the Philippines also stepped in during the response to Typhoon Haiyan by providing relief and needed care for survivors who were moved to evacuation centers and temporary shelters. It highlighted how nurses were mobilized in a national scale to help support the needs of many communities affected by the disaster.

Pacific Island nurses also demonstrated the work of nurses in response to a disaster. Nurses in Solomon Islands hold key positions in the health system of the country and had to ensure surge capacity of hospitals to deal with increased casualties and manage the diarrhea outbreak that followed the flash floods.

Nurses in Tonga conducted holistic assessment of population health status after Cyclone Ian hit the islands and ensured that health needs are addressed such as noncommunicable diseases. Nurses also targeted needs of vulnerable populations which included women and children, the elderly, and mentally ill clients and conducted a scan assessment of the environment during home-to-home visit and included areas such as food supplies, residential condition, and bathrooms.

The role of nurses in the response phase is providing both physical and mental health care in a variety of settings under challenging conditions that require a knowledgeable, skilled, and creative workforce (WHO and ICN 2009).

12.5 Disaster Recovery and Rehabilitation

Disaster recovery is defined as restoring or improving of livelihoods and health, as well as economic, physical, social, cultural, and environmental assets, systems, and activities, of a disaster-affected community or society, aligning with the principles of sustainable development and "build back better," to avoid or reduce future disaster risk, whereas rehabilitation is restoration of basic services and facilities for the functioning of a community or a society affected by a disaster (UNISDR 2009).

During this phase, some activities where nurses are commonly involved in include restoration of preventative health-care services and providing priority disease control programs and services for noncommunicable diseases. Nurses continue in the role of providing care and support to those with physical and mental health needs (WHO and ICN 2009).

Nursing schools from two universities in Japan conducted pairing activities to help support survivors in Tōhoku earthquake. They provided health counseling and

home visits to understand the health conditions and health needs of residents who were relocated to temporary housing sites. Most of the residents who needed attention were those with chronic diseases that were not closely monitored.

In the recovery and reconstruction period, nurses in China contributed to the psychological support of survivors, especially those who had sustained injuries from amputation, spinal cord injuries, traumatic brain injuries, other serious physical and mental conditions, or exacerbation of preexisting medical conditions requiring long-term and transdisciplinary rehabilitative services in the community. Nurses were best positioned to assume a coordinator role in the multidisciplinary team making the transition between hospital and home seamless for the patients.

The role of nurses in information management was highlighted in Nepal when the national nursing organization helped in monitoring for potential outbreaks through the establishment of electronic health record and referral systems.

Conclusion

Nurses are at the forefront of caring for individuals and communities in times of emergency and disaster. Having the necessary skills, knowledge, and attitude that support humanitarian efforts, they have demonstrated their valuable contributions in some of the worst natural disasters that took place in the Asia Pacific. Nurses have been called upon to respond to the needs of individuals and communities—providing immediate care, giving psychosocial support, conducting health promotion and health education, and monitoring outbreaks. Nurses have shown their courage, compassion, competence, and care for individuals and communities in need.

Nurses play different roles in disaster prevention and mitigation, preparedness, response, recovery, and rehabilitation. In disaster prevention, mitigation, and preparedness, nurses have shown an understanding of health issues in the community that is crucial in disaster preparedness planning, such as knowing the community's hazards, risks, vulnerabilities as well as its resources and capacities. During response efforts, nurses provide care in different settings such as in hospitals, communities, schools, and temporary shelters. Nurses are involved in providing first aid, trauma care, triage, emergency care, acute care, infection control, and public health activities. In disaster recovery and rehabilitation, nurses continue to provide support to those with long-term care needs, both physical and mental.

Nurses work in all types of emergencies and disasters—from typhoons or tropical cyclones, floods, earthquakes, volcanic eruptions, and emerging infectious disease. Impact of climate change and certain socio-political and economic environment can make humanitarian efforts very challenging. There is a need for nurses not only to be updated in disaster nursing competencies but also to be involved more in program planning and policy-making bodies in disaster risk reduction and management for them to be able to fulfill their role in saving lives and helping build resilient communities.

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