Knowledge and Perceived Ability to Practice in Disaster Management among Public Health Nurses in Aceh, Indonesia

Ardia Putra

A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Nursing Science (International Program)

Prince of Songkla University

2011

Thesis Title	Knowledge and Perceived Ability to Practice in Disaster Management among Public Health Nurses in Aceh, Indonesia
Author	Mr. Ardia Putra
Major Program	Nursing Science (International Program)

Major Advisor:

(Asst. Prof. Dr. Wongchan Petpichetchian)

Co-advisor:

(Asst. Prof. Dr. Khomapak Maneewat)

Examining Committee:

Chairperson
(Assoc. Prof. Dr. Praneed Songwathana)

(Asst. Prof. Dr. Wongchan Petpichetchian)

(Asst. Prof. Dr. Khomapak Maneewat)

(Prof. Dr. Virasakdi Chongsuvivatwong)

(Asst. Prof. Dr. Jom Suwanno)

The Graduate School, Prince of Songkla University, has approved this thesis as partial fulfillment of the requirement for the Master of Nursing Science (International Program)

(Prof. Dr. Amornrat Phongdara)
Dean of Graduate School

Thesis Title	Knowledge and Perceived Ability to Practice in Disaster Management among Public Health Nurses in Aceh, Indonesia
Author	Mr. Ardia Putra
Major Program	Nursing Science (International Program)
Academic Year	2010

ABSTRACT

The increasing number of disaster events around the world has challenged every country to develop better disaster-management strategies. It has been verified that healthcare providers, including public health nurses, should have the appropriate knowledge and skills for working actively in the preparedness, response, and recovery phases of disasters. This descriptive survey study aimed to identify the level of knowledge and perceived ability to practice regarding disaster management among public health nurses in Aceh, Indonesia. A stratified proportionate random sampling method was employed to recruit 252 public health nurses at eleven districts and municipalities in Aceh, Indonesia. The data instruments consisted of three questionnaires: the Demographic Data Questionnaire, the Public Health Nurses' Knowledge Regarding Disaster Management Questionnaire, and the Public Health Nurses' Perceived Ability to Practice Regarding Disaster Management Questionnaire.

The subjects were less than 30 years old (61.1%), were female (79.8%), were married (69.8%), had less than five years of working experience as PHNs (42.1%), and were educated at the diploma level (89.7%). More than half of

them did not have experience with assisting disaster victims (55.2%), had never attended disaster training and education (54.4%), sometimes attended seminars and conferences, and sometimes searched out disaster-related information, such as by reading books on disasters (50%-75%).

The study results revealed moderate levels for both the PHNs' knowledge (n=42.5%, M=70.73%, SD=8.41) and the PHNs' perceived ability to practice (n=38.1%, M=74.57%, SD=13.27) regarding disaster management. In this study, it was found that the subjects' working area, working experience, previous disaster experience, nursing education, and disaster training and education all contributed to their moderate level of knowledge and perceived ability to practice. The public health nurses across the nation should be aware of these findings and prepare themselves to be ready for future disaster occurrences by increasing their own knowledge and skills in clinical practice, particularly those skills relating to disaster management competencies.

Keyword: Public health nurses, knowledge, perceived ability to practice, disaster management

ACKNOWLEDGEMENTS

Alhamdulillaahirabbil'alamiin.

All praise to Allah SWT for blessings have been given and *shalawat* to His messenger, Muhammad SAW, peace be upon him, who brought a light of knowledge.

I would like to express my sincere appreciation and gratefulness to my major advisor and the Chairperson of the International Program of Master of Nursing Science, Assist. Prof. Dr. Wongchan Petpichetchian, for her assistance, guidance, thought, encouragement, and support throughout the study. Also, my appreciation goes out to my co-advisor, Assist. Prof. Dr. Khomapak Maneewat, who gave me valuable suggestions, cordial support, and kind cooperation. I also would like to thank to all experts involved in the instrument validation for their constructive input.

Next, I would like to express my gratitude to my academic advisor, Assist. Prof. Dr. Urai Hattakit, for her kind support prior to and during my study in Thailand. I would also like to acknowledge the Director of the Institute for Research and Development on Health and Epidemiology Unit, Prof. Dr. Virasakdi Chongsuvivatwong, for his initiation of Aceh-Southern Thailand Collaboration. Also, thanks are extended to the Rockefeller Foundation for the scholarship I was awarded during my study. My thankfulness also goes to the Graduate School, Prince of Songkla University, Thailand, which provided partial support for this thesis project.

I am infinitely grateful to the public health nurses who participated in this study and to the research assistants. Also, I would like to thank the faculty and staff of the Faculty of Nursing, Prince of Songkla University, for their help and

support during my study. I wish to thank all my colleagues in the School of Nursing, Syiah Kuala University, who were in Aceh and in Thailand for their prayers and kind support. Also, I am grateful to Mr. Teuku Samsul Alam, SKp., MNSc, and to Mr. Hajjul Kamil, SKp., M.Kep, for their recommendations that I continued studying in Thailand.

A special thanks goes out to my mother, Siti Hasanah; your love, prayers, and warmth are greatly appreciated. To my father, Muchtar Abraham, I would like to say that your dedication, support, and assertiveness contributed to my success. To my brother and sisters, I would like to say that your prayers, support, and kindness meant a lot to me, and I will not forget them. There are no words worthy to be offered to my beloved wife Nur Hafni or to my son M. Farhan Alfarisi; you are my spirit. Also, I offer special appreciation to my wife for her love, prayers, and empowerment, which gave me strength to continue my overseas studies. My sincere gratitude also goes to my parents-in-law for their prayers and support of me in completing my study.

Finally, this work is dedicated to my blessed land, Aceh, and the nursing profession in Indonesia. Many works are waiting to be accomplished and contributed.

Ardia Putra

CONTENTS

CONTENTS (continued)

CONTENTS (continued)

LIST OF APPENDICES

Page

LIST OF FIGURES

Page

Figure

LIST OF FIGURES (continued)

Page

Figure

LIST OF TABLES

Page

CHAPTER 1

INTRODUCTION

Background and Significance of the Problem

A disaster is classified as the biggest catastrophe that can threaten people's livelihoods, health, and lives (Yamamoto, 2006). Recently, the frequency of disasters has been increasing around the world (Vogt & Kulbok, 2008), and since 1974 more than 255 million people have been impacted by disasters (Kahn, Schultz, Miller, & Anderson, 2009). Around 62,000 people per year die as a result of large-scale global disasters (Sztajnkrycer, Madsen, & Baez, 2006).

Disasters can happen naturally or can be human-caused. Natural disasters often occur suddenly or unexpectedly, such as storms, floods, earthquakes, tsunamis, and volcanic eruptions (Vogt & Kulbok, 2008). Humans can also cause disasters as a result of errors, neglect, or bad intentions, examples being bioterrorism, bomb threats, epidemics, fires, radioactive material leaks, and wars (Rogers & Lawhorn, 2007).

Currently, disasters occur in large numbers throughout the world (Vogt & Kulbok, 2008). This situation evokes challenges for every country to develop appropriate strategies to reduce the impact of disasters (Yamamoto, 2006). For example, Indonesia, a country that is vulnerable to disasters every year (Indonesian Disaster, 2010), should develop an appropriate disaster plan in order to cope with unpredicted situations. Indonesia is located in Southeast Asia between the Indian Ocean and the Pacific Ocean. This is an active tectonic region with three major active tectonic plates. There are 500 young volcanoes; out of this number there are

approximately 120 active volcanoes in the region, representing 15% of the active volcanoes in the world (Tempo, 2005).

Among the provinces of Indonesia, Aceh province is at the greatest risk of natural disasters like earthquakes and landslides. Most districts and cities in Aceh are located at the boundary of a tectonic plate and an earth fault (Her, 2010). Therefore, people who live in Aceh are at great risk of disastrous life events. The worst disaster in Aceh was the earthquake on December 26, 2004, followed by the tsunami which hit six countries in Asia and Africa: Indonesia, India, The Maldives, Somalia, Sri Lanka, and Thailand (Vogt & Kulbok, 2008). As a result, there were a large number of victims in Aceh: more than 120,514 deaths, 403,428 homeless persons, and 37,000 people who were missing and presumed dead (Vogt & Kulbok).

Due to the above reasons, Aceh should develop a plan for natural disaster management, and it needs the support of many kinds of professionals (Savage & Kub, 2009). Nurses are one type of professional who are responsible for helping people during and after a disaster (Stanley, 2005). In this regard, nurses should have the appropriate knowledge to fulfill the essential activities necessary when involved in disaster management. Nurses are currently well recognized and trusted in their communities, where they frequently work closely with disadvantaged and vulnerable groups who are often affected by disasters. Therefore, nurses are a group which should actively be involved in disaster management (World Health Organization, 2006).

Historically, nurses have played several roles in disaster management since the era of Florence Nightingale (Jakeway, LaRosa, Cary, & Schoenfisch, 2008). For instance, they have cared for victims during and after floods and tornados (Magnussen & Schafter, 1956). Nurses are needed in disaster events because they are qualified in

assessment skills, setting priorities, communication, collaboration, and critical thinking. Additionally, they can make essential decisions in emergency situations (Stanley, 2005).

Furthermore, since disasters affect people's health and the public healthcare system, Public Health Nurses (PHNs) have a major role; they must manage and provide assistance during all disaster phases (Vogt & Kulbok, 2008), including pre-event (preparedness), event (response/relief), and post-event (recovery). Training PHNs for involvement in all these phases is recommended as part of a comprehensive disaster management strategy (Polivka et al., 2008; Rogers & Lawhorn, 2007).

In order to provide successful health system responses and ongoing care delivery in disaster situations, and lessen the harmful effects of potential disasters, PHNs should possess certain related knowledge within the scope of their responsibility (Jakeway et al., 2008). In addition, PHNs must obtain disaster competencies by gaining experiences from their regular professional practice that will enable them to respond rapidly and effectively during disasters (Fritsch & Zang, 2009; Gebbie & Qureshi, 2002).

In addition, determining the current preparedness of PHNs for future disasters is very crucial. Disasters, particularly natural disasters, mostly occur without specific warning (Vogt & Kulbok, 2008). As frontline responders, PHNs are responsible for acquiring the necessary knowledge and skills to care for disaster survivors, as well as ensuring readiness for future disasters (WHO, 2006). However, there may be some gaps in their knowledge and abilities due to poor preparedness and discontinuous training.

A previous study conducted in the USA by Hsu and colleagues (2006) revealed that PHNs considered themselves inadequately prepared for disaster events

due to the limitations of their training. Another study regarding PHNs' perceptions of disaster management revealed that most PHNs feel that they lack the chance to attend training courses or educational sessions related to disasters, that they do not take part in enough disaster drills to prepare themselves for disastrous situations, and that their communication skills, planning skills, supplies, and equipment are too limited. These facts lower their confidence in responding to disasters (Fung, Loke, & Lai, 2008; Rogers & Lawhorn, 2007).

PHNs are not often appointed to important positions dealing with legislation, policy systems, and regulations, which are positions from which one could improve and sustain disaster management plans (Boatright & McGlown, 2005). This lack of representation in decision-making positions may be due to the limitations of PHNs in understanding their scope of responsibility during disaster event (Jakeway et al., 2008) as well as their limited knowledge in disaster management. These conditions combine to cause PHNs to feel insufficiently prepared and thus inadequately integrated into national disaster policy-making efforts regarding disaster response teams (Fritsch & Zang, 2009). As a result, they make limited contributions to national action plans for improving nursing practices during disaster management. This situation is particularly true in the healthcare system of Indonesia. To overcome such a situation, disaster management guidelines are needed to help PHNs improve their competencies relating to disaster response.

Currently there is one framework from Jennings-Sanders (2004) and three guidelines from Manitoba Health (2000), World Health Organization (2005), and Rogers, Randolph, and Mastroiannias cited in Rogers & Lawhorn, 2007) being developed for use in several countries. These guidelines can be applied to various

disaster events, including tsunamis. Modification of these guidelines for Indonesia would be helpful in developing the country's disaster management practices.

Currently, there are no known disaster management guidelines which apply to PHNs in Aceh, nor to nurses in Indonesia itself. In this study, the researcher modified the existing guidelines mentioned above to guide the study in order to examine the level of knowledge and perceived ability of nurses in Aceh to deal with disaster-related nursing situations. Disaster management covers three phases, including the preparedness, response, and recovery phases. The findings of this study can be used to further develop action plans to maintain or improve PHNs' disaster management knowledge and nursing practice in Aceh province.

Objectives of the Study

The objectives of the study are to:

1. Identify the level of knowledge regarding disaster management among PHNs in Aceh, Indonesia.
2. Identify the level of perceived ability to practice regarding disaster management among PHNs in Aceh, Indonesia.

Research Questions

This study aims to answer the following research questions:

1. What is the level of knowledge regarding disaster management among PHNs in Aceh, Indonesia?
2. What is the level of perceived ability to practice regarding disaster management among PHNs in Aceh, Indonesia?

Conceptual Framework

The conceptual framework for this study was constructed based on the work of Polivka et al. (2008), Jennings-Sanders (2004), and the three existing guidelines (Manitoba Health, 2000; WHO, 2005; Rogers et al., as cited in Rogers & Lawhorn, 2007). Polivka's three phases and Jennings-Sanders's four phases of disaster management were combined into only three phases, namely preparedness, response, and recovery. For each phase, the existing guidelines were integrated to explicitly address the knowledge and practice skills PHNs should acquire to respond to disasters.

Preparedness

Preparedness is the phase of developing a strategy to organize disaster response efforts prior to a disaster's occurrence, with the aim being to create awareness of disasters and to be prepared for specific types of disasters (Qureshi & Gebbie, 2007). In this phase, PHNs have to understand the key terms and concepts, and also their roles in disaster preparedness (Jennings-Sanders, 2004). Also, PHNs must be knowledgeable of the possible risk of disasters in their areas as well as of the most vulnerable population groups (Jennings-Sanders, 2004; Manitoba Health, 2000; Rogers & Lawhorn, 2007). In addition, PHNs should identify related agencies and other resources in order to develop disaster plans to limit the morbidity and mortality rates, and they should construct an appropriate communication system among these parties for responding to disastrous events (Jennings-Sanders; Manitoba Health; Rogers & Lawhorn, 2007).

Response

Response is the phase of implementing the disaster plan that was developed previously (Qureshi & Gebbie, 2007). In this phase, the first action is the sending of an adequate warning to the community regarding the disaster event that will occur (Rogers & Lawhorn, 2007; WHO, 2005). However, the major focus during this phase is on saving lives and on administering first-aid and emergency treatment (Davies, 2005).

According to Jennings-Sanders (2004) and Rogers and Lawhorn (2007), PHNs should establish a disaster triage strategy in order to sort and prioritize casualty victims for treatment. After this activity is completed, they should then continue providing care for disaster victims to save their lives and stabilize their conditions (WHO, 2005). For this purpose, PHNs should have sufficient technical skills, including the ability to administer medication/vaccinations at mass dispensing sites, conduct case investigations, and apply personal protective equipment (PPE) (Polivka et al., 2008).

Furthermore, PHNs need to calculate and evaluate the number of disaster impacts (e.g., infectious diseases and mental and psychosocial problems of individuals, families, and communities) by using surveillance methods (Manitoba Health, 2000; WHO, 2005). Finally, in order to maintain collaboration and coordination among healthcare service providers, and to inform the community of the risk of disaster, PHNs need to be familiar with communication equipment. If they are, the chain of command and coordination among healthcare resources can be maintained (Jennings-Sanders, 2004; Rogers & Lawhorn, 2007). In addition, the Association of State and Territorial Directors of Nursing (ATSDN) also recommends

that PHNs obtain this knowledge and practical experience with it. It concluded that PHNs must be competent in such areas as recognition of unusual events, knowledge of the incident command system, epidemiology, disease investigation and surveillance, mass dispensing, and risk communication (ATSDN, 2002).

Recovery

Recovery is the phase in which the disaster is over but its impact on the community and population remains (Wynd, 2006). During this phase, PHNs will focus more on restoration, reconstruction, and rehabilitation of the affected populations (Davies, 2005). Their activities can range from providing a continuum of care to victims to instituting mental health interventions such as rehabilitation and reconstruction activities in order to counter the long-term effects of the disaster. This would include rebuilding and repairing the infrastructure that was damaged in the disaster (Vogt & Kulbok, 2008). In addition, during this phase PHNs are responsible for evaluating the outcomes from the various disaster management activities. The goal of the evaluation process is to determine the impacts of the disaster, including mortality rates, healthcare costs, and disaster-related costs. Another goal is to evaluate the quality of PHN's disaster nursing knowledge, the effectiveness of the disaster nursing plan, and the degree of collaboration among organizations (Jennings-Sanders, 2004). This process will be useful for identifying necessary modifications to the disaster plan.

Initially, the responsibility of PHNs to identify disaster plan modifications is a necessary part of the effort to reevaluate and revise the current disaster plan. The modifications will be useful in minimizing the weaknesses f the previous plan, making the new plan all the more valuable for use in future disaster

occurrences (Jennings-Sanders, 2004; Rogers & Lawhorn, 2007). However, in the current context of the Aceh healthcare system, PHNs have no responsibility to conduct this activity. The head of the health department and the head of the public health center (PHC) or nursing administration are currently the two people responsible for this task (working in collaboration with other agencies).

Another role that should be accomplished by PHNs in this phase is providing support to disaster victims. For this task, PHNs should understand the physical and psychosocial impacts that commonly result from a disastrous event. This knowledge will be valuable for PHNs; it will help them to deliver appropriate care to victims that have physical and/or psychosocial problems (Jennings-Sanders, 2004; Rogers & Lawhorn, 2007; WHO, 2005).

Finally, health promotion for the overall community is also considered an important activity in the recovery phase. After the disaster is over, a camp will most likely be created as a temporary living place for the many disaster survivors. New problems will thus arise due to the crowded conditions and lack of living resources. To minimize the problems among survivors living in a camp, health promotions can be used to teach the community members how to protect themselves, their families, and the overall population from several types of infectious and communicable diseases (WHO, 2005).

Definition of Terms

PHNs' knowledge regarding disaster management

PHNs' knowledge regarding disaster management refers to the understanding that PHNs have about their roles and competencies regarding disaster management, during the preparedness, response, and recovery phases.

Knowledge in the preparedness phase includes the understanding that PHNs have regarding their roles in disaster preparedness and the risks which disasters pose to the population. Areas of knowledge in the response phase include early warnings, disaster triage, life saving and stabilization skills, surveillance, the risk of miscommunication, and various technical skills. Lastly, knowledge in the recovery phase includes assessing public health impacts and health promotion for the community. PHNs' knowledge regarding disaster management was measured by using the Public Health Nurses' Knowledge Regarding Disaster Management Questionnaire (PHNK-DMQ), which was developed by the researcher. A high score on this questionnaire indicated a high level of knowledge for the PHNs.

PHNs' perceived ability to practice regarding disaster management

PHNs' perceived ability to practice regarding disaster management refers to the PHNs' individual perceptions of their ability to practice based on the existing disaster management guidelines and during each phase of the disaster, including the preparedness, response, and recovery phases.

The perceived ability to practice in the preparedness phase relates to inter-agency collaboration and risk identification of disasters that could affect the population. The perceived ability to practice in the response phase includes a PHN's

perception of his or her ability in early warning, disaster triage, life saving and stabilization skills, surveillance, risk communication, and various technical skills. Finally, the perceived ability to practice in the recovery phase includes the two areas of assessing the public health impact and overall health promotion for the community. The PHNs' perceived ability to practice regarding disaster management was measured by using the Public Health Nurses' Perceived Ability to Practice Regarding Disaster Management Questionnaire (PHNPP-DMQ), which was developed by the researcher. A high score on this questionnaire indicated a high level of perceived ability to practice for the PHNs.

Scope of the Study

This study was conducted at twenty-seven randomly selected PHCs in Aceh province, Indonesia. PHNs who worked in the selected PHCs were included. Disaster management in this study focused mainly on natural disasters, particularly earthquakes, tsunamis, floods, hurricanes, and landslides.

Significance of the Study

The results of this study contribute to nursing administration, nursing education, and the development of future nursing research in the following ways:

1. For nursing administration, the results of this study provide useful information regarding PHNs' knowledge and perceived ability to practice regarding disaster management situations. The information gained in the study can be used to propose guidelines. Nursing administrators and higher authorities can use these findings to plan for improving PHNs' competencies in their areas by conducting appropriate disaster drills and training.

2. For nursing education, the study findings enhance the understanding of PHNs about disaster management. The findings are useful for developing disaster nursing curricula and training programs, particularly in the area of public health nursing.
3. To benefit nursing research, this study provides evidence-based information to enhance interventions and PHNs' knowledge of, and practice in, disaster management. The interventions that will be developed can then be further investigated through additional research studies.

This thesis has thus far contributed to the following publications:

1. Putra, A., Petpichetchian, W., & Maneewat, K. (2011). Review: Public health nurses' roles and competencies in disaster management. *Nurse Media Journal of Nursing, 1*, 1-14.
2. Putra, A., Petpichetchian, W., & Maneewat, K. (2011). Perceived ability to practice in disaster management among public health nurses in Aceh, Indonesia. *Nurse Media Journal of Nursing, 2.* (in press).
3. Putra, A., Petpichetchian, W., & Maneewat, K. Public health nurses' knowledge in disaster management: A survey study in Indonesia (in progress).

CHAPTER 2

LITERATURE REVIEW

1. Overview of Disasters
    1.1. Definition of disaster
    1.2. Types of disasters
    1.3. Common disasters in Indonesia, particularly in Aceh province
2. Overview of Disaster Management
3. Overview of Public Health Nursing
    3.1. Scope of public health nursing
    3.2. Public health nursing in Indonesia
    3.3. Nursing education in Indonesia
4. Roles of PHNs in Disaster Management
5. Competencies of PHNs in Disaster Management
6. Existing Disaster Management Guidelines
7. Knowledge and Perceived Ability to Practice Regarding Disaster Management
8. Factors Contributing to PHNs' Knowledge and Perceived Ability to Practice Regarding Disaster Management
9. Summary of the Literature Review

Overview of Disasters

In current times, disasters seem to occur quite often (Vogt & Kulbok, 2008). The incidence of disasters has even been estimated at once a week (Fung et al., 2008), and there are approximately six large natural disasters in the world every year, on average (Morgan et al., 2006). For example, between August 2004 and October 2005, the United Stated was hit by hurricanes four times (Vogt & Kulbok). Pakistan was struck by an earthquake in 2005 (Yamamoto, 2006) and there was an earthquake in Wenchuan county, Sichuan Province, China, in May 2008 (Fritsch & Zang, 2009).

There is a high concern in every country over the impact of disasters (either natural or man-made) and other catastrophes, such as terrorist attacks and pandemics (Fung et al., 2008; Halpern & Chaffee, 2005).

Definition of disaster

A disaster can be defined as an occasion of ecologic disruption, or as an emergency of higher severity and magnitude which results in deaths, injuries, illnesses, human suffering, economic and social disruption, and damage to community and private property (Rogers & Lawhorn, 2007). Moreover, a disaster results in many problems throughout a community that cannot be resolved by using regular procedures, so assistance is needed from other sources (Veenema, 2006).

In short, the disaster is an event which produces destructive effects and creates the potential for mass casualties, public panic, and chaos. Hence, many disciplines are involved in caring for disaster victims.

Types of disasters

Disasters, like emergencies, happen naturally or can be caused by humans (Vogt & Kulbok, 2008). A natural disaster is an event which results from

environmental interference. A human-made disaster is an occurrence that results from human activity or is caused by humans (Gebbie & Qureshi, 2002). Natural disasters include events such as earthquakes, floods, tornadoes, hurricanes, volcanic eruptions, ice storms, tsunamis, and other geological or meteorological phenomena. Manmade disasters consist of biological and biochemical terrorist attacks, chemical spills, radiological (nuclear) events, fires, explosions, transportation accidents, and conflicts or war (Veenema, 2006).

Common disasters in Indonesia, particularly in Aceh province

As mentioned previously, Indonesia is considered to be a country at high risk of natural disasters, such as floods, landslides, droughts, land/forest fires, and earthquakes (Tempo, 2008). In terms of geographic position, Indonesia is located between two oceans (Indian and Pacific) and contains more than 15% of the active volcanoes in the world (Tempo, 2005). From this, it can be inferred that Indonesia is at a high risk of being affected by disasters.

Several big disasters have occurred in Indonesia since 2004. In Aceh province on December 26, 2004, for example, an earthquake (8.7 magnitude) was followed by a tsunami, a double disaster which affected more than 500,000 people (Vogt & Kulbok, 2008). An earthquake of moderate severity (6.3 magnitude) occurred later, on May 27, 2006, near Yogyakarta city. It resulted in 5,700 fatalities, 37,000 injuries, the collapse of over 300,000 buildings, and approximately 28 trillion rupiahs in economic loss (more than three billion US dollars) (Indonesian Disaster, 2010). More recently, a 7.7 magnitude earthquake occurred on April 7, 2010, in a coastal area of Aceh in northwestern Indonesia. Although no tsunami developed and there were no fatalities, the event had a major psychological effect on the population,

as panic erupted. Also, there were power blackouts around Simeulue Island (Ahmadi, 2010). Aside from these three big events, Indonesia is continually threatened by smaller disasters every year. In 2009, it was noted that several disasters had occurred monthly in various provinces in Indonesia. Specifically, there were five earthquakes (with magnitudes ranging from 6 to 7.5 in severity), four landslides, three volcanic eruptions, two floods, and one forest fire (Indonesian Disaster).

Moreover, based on media reports and further investigation about Aceh, during the period between 2006 and 2008 the province was hit 540 times by natural disasters (Aryono, 2009). According to WALHI-Aceh (as cited in Aryono, 2009), natural disasters that often happen in Aceh include earthquakes, floods, hurricanes, landslides, and abrasions. Natural disaster events are scattered throughout the many districts and municipalities of Aceh province, but there is no specific pattern relating disaster type to district location. However, based on past observations, floods, hurricanes, and abrasions seems to occur most often in the east of Aceh (Aryono; Putro, 2007). In the west, earthquakes, floods, and landslides are the most common types (Ahmadi, 2010). Based on this evidence of frequent disasters in Indonesia, the need for the nation, and particularly Aceh province, to develop a feasible disaster management strategy or program in order to reduce the impacts from disasters is clearly apparent.

Overview of Disaster Management

Generally, human knowledge and technology cannot predict and prevent natural disasters (Vogt & Kulbok, 2008). Therefore, the public health system must prepare all healthcare staff by developing their skills and developing adequate disaster

management strategies. This will make staff confident when delivering care during a disastrous event (Tekeli-Yeşil, 2006).

Disaster management can be defined as the arrangements made to minimize the potential adverse effects of a disaster (Manitoba Health, 2000). Initially, disaster management aims to create a safe environment and continue necessary healthcare services for victims throughout the disastrous event (Qureshi & Gebbie, 2007).

According to Manitoba Health (2000), the goals of disaster management can be achieved by using two strategies: decreasing the numbers of people impacted by a disaster and enhancing a community's ability to prepare itself for future events. However, the success of disaster management is dependent on the capacities of an appropriately-designed system to provide adequate healthcare services. One element of this is a staff with the competence to work in the disaster situation (e.g., able to use disaster management tools) and to provide the necessary collaboration between organizations and agencies (Qureshi & Gebbie, 2007).

Several activities should be conducted at each stage or phase of disaster management. These phases have been classified by different authors. For instance, according to Langan and James (as cited in Vogt and Kulbok, 2008), a disaster is viewed as a relating cyclic phenomenon, which includes a non/inter-disaster stage, pre-disaster stage, impact stage, emergency stage, and reconstruction stage. First, the none/inter-disaster stage is the period prior to a disaster, in which planning and preparation are necessary. Second, the pre-disaster stage takes place when a disastrous event is approaching but has not yet occurred. Third, the impact stage is defined as when the disaster actually occurs. Fourth, the emergency stage is the time when a disaster has already occurred and affected people. Finally, efforts in the recovery

stage focus on restoring, reconstructing, and rehabilitating affected populations (Davies, 2005; Vogt & Kulbok).

Rogers and colleagues (as cited in Rogers & Lawhorn, 2007) applied the Haddon matrix pattern to develop a comprehensive disaster management model. The modified pattern consists of three phases: pre-event (preparedness), event (response/relief), and recovery (post-event). It was recommended that all healthcare providers be actively involved and responsible during each phase. The specific details of each phase are discussed as follows.

Pre-event (preparedness phase)

The first disaster management phase is defined as pre-disaster, pre-impact, or pre-event. During this phase, the focus is on prevention, protection, and preparation (Wynd, 2006). In this phase, healthcare providers must assess their capacity to effectively respond to disasters and emergency events (Jakeway et al., 2008). They should have the competency necessary to identify vital resources, such as funds, shelters, cooperative agreements with other community agencies, the previous training attended related to disaster education, and the existing disaster management plan and disaster assessment tools (Jennings-Sanders, 2004). In addition, Noji (as cited in Davies, 2005) pointed out that the activities in the preparedness phase consist of planning, preparing, assessing the threat, simulating exercises, and implementing mitigation strategies.

Event (response/relief phase)

In the response phase, responses are implemented and care is provided to disaster survivors (Qureshi & Gebbie, 2007). The top priority actions needed in this

phase are warnings, mobilization, and evacuation. First, adequate warnings will inform the community to prepare appropriately. Several factors related to warnings, such as their source, content, and mechanism, as well as individuals' perceptions and beliefs, can influence people in their decision-making when a disaster occurs (Vogt & Kulbok, 2008). PHNs are responsible for possessing information and knowledge about resources, delivering first aid to victims (Davies, 2005), working to gradually develop their own skills (Vogt & Kulbok), and providing continuous support to affected people and communities, as required (Jakeway et al., 2008).

Post event (recovery)

In the recovery phase, efforts focus on stabilizing things and returning to the normal situation (Jakeway et al., 2008). Good efforts in this phase can strengthen the ability of the public health system and communities to prevent future disasters. The activities of this phase include the restoration, reconstruction, and rehabilitation of affected populations (Davies, 2005). According to Jennings-Sanders (2004), nurses should also be involved in performing assessments, planning, and implementation to ensure that the victims get appropriate care and management.

Overview of Public Health Nursing

Scope of public health nursing

Primarily, public health nursing (PHN) is defined as "the practice of promoting and protecting the health of populations using knowledge from nursing, social, and public health sciences" (American Public Health Association, 1996). According to the WHO (as cited in Rofii, 2010), community/public health nurses are

responsible for taking care of populations by enhancing the ability of communities to identify and solve their own health problems before they seek out national healthcare services.

Public health is a specialty in nursing because it has a different focus and scope of practice than other nursing specialties. Public health nurses (PHNs) are categorized by their work, which focuses on populations by helping communities to maintain the health of their own people by emphasizing preventive strategies and interventions that can be made at the community level. These efforts concern the health of all members of the population or community, particularly vulnerable subpopulations (Williams & Stanhope, 2008).

According to the Institute of Medicine (as cited in Kuntz, Frable, Qureshi, & Strong, 2008), community/public health nurses (C/PHNs) have the responsibility to support the mission of the public health system in order to maintain and improve the health of the community or population in question. In this regard, PHNs should be able to deliver healthcare services and help individuals and communities equally, regardless of an individual's economic or social status (Jakeway et al., 2008). PHNs are also responsible for providing assistance to people to help them stay healthy, based on the PHNs' knowledge and skills (Jennings-Sanders, Frisch, & Wing, 2005) This is true not only in normal situations (Kuntz et al., 2008), but also in disaster situations, in which PHNs play a major role (Vogt & Kulbok, 2008).

Public health nursing in Indonesia

A health development goal of the Indonesian government is to achieve a healthy life for every citizen in order to optimize overall community health.

Therefore, the Indonesian Ministry of Health has established the Public Health Center (PHC) system, namely *Puskesmas*, to accomplish this mission. Initially, *Puskesmas* will serve as the technical implementation unit of each public health district that is responsible for organizing health development in a working area (UI, 2009). This institution should offer sustainable, quality healthcare services, and it must reach all levels of each community, especially vulnerable or high-risk subpopulations (Santoso, 2009).

According to the Indonesian Ministry of Health (as cited in Rofii, 2010) public health nursing is defined as an approach to nursing services which is integral to the overall healthcare service, which has the involvement of other healthcare teams, and which aims to bring about a higher level of health in individuals, families, and communities. PHNs who work at the PHC are responsible for establishing several primary programs, including those for maternal and child health; family planning; nutrition improvement; environmental health; communicable disease eradication; basic medical treatment; public health education/promotion; school, occupational, elderly, and sport health programs; dental and oral health; mental health; ocular health; the administration of traditional healers; and the recording and reporting of information in the health system (UI, 2009).

Furthermore, these programs must be supported by several other activities, such as efforts to encourage communities to be autonomous, efforts to inform communities about how to search for and use healthcare resources, efforts to assist communities with medical treatments and health referrals, the provision of direct health services, and collaboration with other related sectors when implementing health programs (UI, 2009). In addition, to ensure the success of public health

assistance, PHNs are required to obtain certifications in certain competencies by attending several training and education sessions. These cover such areas as community healthcare, coordination of clinical management, emergency skills (including basic life support), care of patients with HIV/AIDS, community mental health nursing, acute respiratory infections, healthy living, nutrition, and bird flu (Santoso, 2009).

Based on the explanation above, the PHC in Indonesia has used its community healthcare program as an integral part of its basic healthcare services (Santoso, 2009). The staff nurses in the PHC are responsible for establishing this program in order to prevent health problems and to improve community health by providing direct care and attention to entire communities (Rofii, 2010). Also, these nurses are responsible for training qualified nurses who can face the complexity of emergencies that commonly occur from natural disasters and conflict/war in some areas (WHO, 2002).

Initially, PHNs in Indonesia should be trained and educated so that they have the specific knowledge and skills essential for disaster management. Although the required training mentioned above is useful for disaster occurrences, there are other essentials that these nurses must be trained in order to function well in emergencies and disaster preparedness work. Related concepts include the types of emergencies and disasters (Chapman & Arbon, 2008) and the organizational structure (e.g., system, policy, planning, command structure/hierarchy, and communications) (INCMCE, 2003). Other training areas should include the safety of clients and practitioners, triage, decision-making, professional assessment of one's own competencies in role performance, infection control, mental health and psychosocial

support, and victim mobilization (Chapman & Arbon, 2008; WHO, 2006). However, the contents of existing training courses and programs related to disaster competencies offered to PHNs, in Aceh in particular and in Indonesia in general, have never been published. Therefore, there is no data available to determine the background of these nurses in disaster training and education.

Nursing education in Indonesia

As the most numerous type of healthcare provider, nurses are responsible for many healthcare functions, including promotion, prevention, curing, rehabilitation, and supportive care to individuals, families, and groups (WHO, 2006). In Indonesia, approximately 40% of nurses work in government and private hospitals, and health and sub-health centers, and this proportion is higher than other healthcare providers (Saha, 2006). Of these, 39% are diploma nurses, 1% are bachelor's degree nurses, and the rest have only a secondary school level of education (SPK) (Shields & Hartati, 2003). Details on nursing educational levels are provided as follows:

1. SPK: This is a three-year nursing course which is similar to senior high school. Junior high school graduates can register for an examination to become a student at the nursing school (Saha, 2006).

2. Diploma: This is a three-year nursing course; the students are recruited from senior high school graduates who pass a local examination given by each diploma nursing school. The diploma nursing program was started in 1965, and initially it was only offered in the capital city and regional cities (Saha, 2006).

3. Bachelor's degree: In 1985, the Bachelor of Nursing degree was initiated at the University of Indonesia, Jakarta. There are two programs, a four-year program and two-year program. The first one recruits the senior high school graduates

who pass the national examination, whereas the latter program enrolls diploma nurses who continue to study for another two years to obtain their degree (Saha, 2006).

The limitations of each level of education are clear. Nurses who earn an SPK certificate are prepared for only the lowest level of nursing tasks. This was found to be a factor enhancing the mortality rate and lowering overall nursing care standards. This may be due to their very young age (± 17 years old) and their inability to care for patients with complex health problems or who are delivering babies (Shields & Hartati, 2003). Because of this, it is no longer offered in most provinces, nor in government or private nursing schools. In 1997, the Indonesian government decided to improve the standard of nursing care by mandating attendance at nursing education institutions and fading out the SPK, essentially making the diploma the new minimum qualification level (Saha, 2006).

There are 96 credits in the diploma nursing curriculum in Indonesia (Pusdiknakes, 1999). It consists of eight credits of general education, 12 credits of basic nursing skills, and 76 credits of special areas of nursing. For a four-year, bachelor's degree curriculum, the Asosiasi Institusi Pendidikan Ners Indonesia (AIPNI) has approved a program ranging from 144-160 credits, composed of three areas of courses representing core competencies (60%), supporting competencies (20%), and local/institutional competencies (20%) (AIPNI, 2008). These two educational levels are expected to produce professional nurses who have a rational, professional, and ethical attitude (Saha, 2006). However, both curricula only prepare nurses to be generalists, rather than specialists. Not surprisingly, there is no specific subject covering disaster management nursing in either the diploma or the bachelor's degree curriculum. For the more advanced nursing educational levels, the master's

and doctoral levels, these programs are available. However, there is no course or major program specializing or focusing specifically on disaster nursing (Universitas Indonesia, 2008).

Roles of PHNs in Disaster Management

PHNs are responsible for helping their communities in all situations, including during disastrous events (Vogt & Kulbok, 2008). In this regard, PHNs should know the scope of their responsibilities and identify their own roles in preparing for, responding to, and recovering from disasters and their impacts (Jakeway et al., 2008). The goal of nursing care for disaster management is to minimize the health hazards and life threatening events caused by disasters through collaboration with other specialized professionals (Kuntz et al., 2008), and to decrease the negative consequences for peoples' health and for the public healthcare service (Vogt & Kulbok).

Consequently, networking with members of the public health workforce would be recommended (Stanley et al., 2008); it would benefit PHNs, helping them to do quality work in chaotic environments with limited resources (O'Boyle, Robertson, & Secor-Turner, 2006). PHNs play an important role in collaborating with other healthcare providers since they are very familiar with the basic information regarding communities and populations, something which benefits them during disaster management (Polivka et al., 2008). For instance, the PHNs in the United States fulfilled their roles well when facing a hurricane disaster that occurred in late August of 2005. They were able to provide care despite the difficult situation: collapsed infrastructure, depleted resources, disoriented and destitute evacuees,

fractured social networks, environmental degradation, and personal physical exhaustion (Durham, 2008).

In addition, PHNs should also enhance their profession's capability to ensure adequate healthcare services before and after a disaster by means of their contribution to all disaster phases (Fung et al., 2008). The roles of PHNs for each disaster phase will be discussed below.

PHNs' roles in the preparedness phase

The preparedness phase refers to the concept of planning a response to disasters and other emergency events in order to enhance public awareness of the nature of disasters and to prepare for future disastrous events and their consequences (Qureshi & Gebbie, 2007). In this phase, PHNs must identify disaster risks and populations at risk, particularly those who are vulnerable to the effects of disasters. PHNs must cooperate with other agencies in developing plans to decrease the morbidity and mortality rates, and they must be advocates for, and help to develop, public policies that will reduce the potential effects of disasters (Vogt & Kulbok, 2008). In addition, Polivka et al. (2008) recommended that PHNs concentrate on personal preparedness, such as understanding key terms, concepts, and roles regarding disaster preparedness, as well as becoming familiar with the health department's disaster plan and communication equipment.

PHNs' roles in the preparation phase are very crucial towards success in the disaster response and recovery phases (Rowney & Barton, 2005). PHN's interventions and programs for managing disaster situations will be actively and directly carried out by the PHNs in order to proactively help individuals and families in a community (Jakeway et al., 2008). Moreover, additional activities in the

preparedness phase include allocating educational training for health personnel who serve as first responders (in particular, knowledge and skills on resuscitation and life sustaining treatments), collaborating with other key responders from other sectors, providing essential supplies and equipment, preparing inventory resources to be used during a disaster, and running workshops or simulation exercises on the topic of disaster management training. To accomplish quality disaster management, support must come from qualified staff nurses; their capability to provide care and perform disaster management activities in each phase is particularly important (Stanley et al., 2008).

PHNs' roles in the response phase

In the response phase, the first priority is to warn, mobilize, and evacuate. Subsequent activities include assessing the impact of the disaster, compiling a list of the direct needs of the affected community, and assessing and communicating information regarding health-related effects to relevant government agencies. PHNs then have to continue performing their duties to help the victims of the emergency situation (Vogt & Kulbok, 2008).

Furthermore, the major focus of PHNs immediately after a disaster is over is to provide life-saving rescue efforts (Davies, 2005). Here, PHNs must sort out and prioritize casualty victims by using disaster triage in order to allocate adequate treatments (Polivka et al., 2008). The following duties must be performed: a rapid needs assessment; administration of first-aid and medical assistance; the prevention of injuries and the promotion of sanitary food and water; the establishment or restoration of modes of communication and transportation; surveillance for any public health effects of the disaster, including infectious diseases and mental and psychosocial

problems affecting individuals, families, or communities; and a risk assessment by inspecting shelter sites. In addition, the evacuation of community members from affected areas must also be conducted in this phase (Polivka et al.; Vogt & Kulbok, 2008).

In 2002, ATSDN also made suggestions regarding the basic knowledge that PHNs must have during the emergency phase. These suggestions include the recognition of unusual events and an understanding of the incident command system, epidemiology, disease investigation, and mass dispensing. PHNs also should be able to assess the effects of disease and injury by calculating the crude mortality rate (CMR). This data will provide the basis for investigations on the major causes of death in a disaster and the effects of communicable diseases after the disaster, knowledge of which will benefit the development of future prevention programs (Davies, 2005). Additionally, PHNs should support community efforts to be involved in identifying potential disaster risks, mapping locations in their own areas, and conducting prevention, preparedness, and mitigation activities (Vogt & Kulbok, 2008).

PHNs' roles in the recovery phase

Efforts in the recovery phase aim to return the condition of the public health system and the community back to normal, as well as increase the strength of staff and the community in regards to future disaster management. In this phase, the activities will be more focused on restoration, reconstruction, and the rehabilitation of the affected populations (Davies, 2005). The activities include providing a continuum of care to victims, instituting mental health interventions (such as rehabilitation and reconstruction activities to help victims cope with the long-term effects of the

disaster), and rebuilding and repairing any damaged infrastructure (Vogt & Kulbok, 2008).

There are several roles and responsibilities that PHNs have in this phase. Their main concern is, however, to provide a continuum of care to the victims as soon as the disaster is over. In addition, they should participate in the evaluation of the disaster response and the subsequent redrafting of response plans for future disaster management, along with other healthcare providers. For instance, PHNs should participate in the interviewing process, contribute to disaster plan modifications, and coordinate community efforts to address the psychosocial and public health impacts of the disastrous event (Polivka et al., 2008). Additionally, Vogt and Kulbok (2008), and Jakeway and colleagues (2008), suggested that nurses should use the concept of the nursing process when managing disasters. This process consists of assessment, diagnosis, disaster response planning, implementation, and evaluation in all phases of the disaster. Moreover, mitigation may also need to occur in this phase so as to enhance the ability of all parties to cope with subsequent disasters and to improve their preparedness and response capabilities (Vogt & Kulbok).

As mentioned above, these three phases are interrelated and inextricably linked with each other. Therefore, all PHNs need to clearly understand their roles in every phase, as well as develop their competencies in disaster management, which will be discussed in the following section.

Competencies of PHNs in Disaster Management

As the largest subgroup of the healthcare workforce (Fung et al., 2008), nurses should be aware of their importance and prepare themselves to be ready to respond to disastrous events by learning from the effects and impacts of previous

disasters (Kuntz et al., 2008). Nurses are valuable resources who can help with the nursing and medical care needs of injured victims and prepare medical equipment, medication, and other supplies needed in disasters (Cole, 2005). Here, the major role of nurses during disaster response is caring and providing essential healthcare services and psychological support for the victims. Because of this, nurses need to develop their competencies in the management of and response to emergency or disaster events (Fritsch & Zang, 2009; Polivka et al., 2008).

Competency is defined as the performance of a group member by integrating and applying his or her knowledge, skills, and personal abilities to perform a professional role safely and ethically (World Health Organization, 2008) in order to improve or achieve an organizational goal (Hsu et al., 2006; Rowney & Barton, 2005). Personal competency, on the other hand, is defined as the qualified capability of a person to take some action that is covered by the law (The American Heritage, 2007). From this, PHNs must have certain fundamental knowledge and skills in order to respond well to disaster situations.

In 2003, the International Nursing Coalition for Mass Casualty Education (INCMCE) described 64 competencies for disaster management, which it stated were required for every nurse, from beginner to expert, who works in disaster management (Smith, 2006; Stanley, 2005). According to these guidelines, every nurse is required to develop certain core competencies in disaster management, such as critical thinking, general and specific assessment skills, communication skills, illness and disease management skills, knowledge of vital information and healthcare technologies, ethics, and an understanding of human diversity (INCMCE, 2003).

Additionally, beyond the required competencies, PHNs should be well-grounded in emergency preparedness competencies (Polivka et al., 2008). Polivka and colleagues came to a consensus regarding disaster management by reviewing and analyzing competencies from 49 existing documents. The study results revealed that directors of nursing from local health departments, state nursing leaders, and national nursing preparedness experts choose 25 competencies that they felt were the most essential competencies for PHNs to have during all three phases of disaster management (preparedness, response, and recovery).

These 25 competencies became the crucial guideline for PHNs to meet in order to improve their population-based practice and capacity for disaster management (Stanley et al., 2008). Stanley (2005) also stated that the disaster management competencies should be integrated into nursing curricula based on the assumption that preparing nurses for disaster events at the educational level will result in their future readiness to perform. Furthermore, according to Polivka and colleagues (2008), and Stanley and colleagues, collaboration between educational programs that use adult-learning principles and regularly practice those competencies will enhance the ability of PHNs to achieve the identified/expected competencies. Details on these PHN competencies for disastrous situations are presented in the public health nursing journal compilation (Polivka et al.).

Existing Disaster Management Guidelines

Florence Nightingale was a nurse who skillfully implemented the nursing roles and responsibilities of caring for disaster victims (Jakeway et al., 2008). Between the 1800s and the 1900s, nurses involved in community health investigated communicable diseases. They were a valuable healthcare resource because they

collaborated with other healthcare providers when they provided care in such emergency response events as World War II and other disasters in the early to mid-20th century (Rogers & Lawhorn, 2007).

Currently, the incidence and frequency of disasters has been increasing; they are occurring at an approximate rate of every two months in some areas around the world (Morgan et al., 2006) as a result of both natural and human-caused factors (Gebbie & Qureshi, 2002). Global climate change as a result of environmental degradation is also generating new problems, primarily weather pattern disturbances and their consequences, which particularly threaten human health (Schipper & Pelling, 2006). Consequently, high alertness is needed from all healthcare providers, especially nurses who work in the community/public health area. They must be actively involved in planning and managing for the effects of disasters (Kuntz et al., 2008). The aim of the nursing profession in disaster management is to make the best use of limited resources and equipment to provide maximum care in a chaotic situation (O'Boyle et al., 2006).

Many nurses feel themselves to be unqualified to work and act in important positions related to legislation, policy systems, and regulations that can improve and sustain nursing practice in disastrous situations (Boatright & McGlown, 2005). They often feel inadequately prepared and integrated into national disaster policy-making and the response teams which fulfill the critical role of disaster prevention, response and recovery (Fritsch & Zang, 2009). As a result, these nurses make limited contributions to the national action plan, and they fail to improve their own knowledge and practice ability regarding disaster management.

To overcome this situation, disaster management guidelines are actually needed for PHNs so that they can improve their own knowledge and skills related to emergency and disaster preparedness (Fung, et al., 2008; INCMCE, 2003) in order to manage disasters well (Fritsch & Zang, 2009). However, according to Jennings-Sanders (2004), nursing guidelines and standards of care for disaster management are still rare, with the result being a lack of direction for nurses.

Some disaster management guidelines and a model of disaster nursing management have been developed for comprehensive disaster management by several organizations and groups of experts. There include Manitoba Health (2000); the WHO (2005); Rogers, Randolph, and Mastroianni (as cited in Rogers & Lawhorn, 2007); and Jennings-Sanders (2004), who provided a framework. These resources are valuable for healthcare providers, and particularly for guiding nurses and improving their abilities relating to preparing for, responding to, and recovering from disastrous events (Kuntz et al., 2008). The details of each guideline are discussed as follows:

Manitoba health disaster management

In 2000, the Manitoba Health Organization developed disaster management guidelines to serve as a standard for disaster management. The purpose of these guidelines was to decrease the impacts from disasters, such as deaths, physical injuries, and psychosocial problems. These guidelines consist of four essential components: hazard assessment, risk management, mitigation, and preparedness (Manitoba Health, 2000). The details, definitions, and directions for each component were presented, and included a strategy for improving the quality of the disaster management model. The detailed activities necessary to perform each component, and the involvement of healthcare providers during and after the disaster

event, however, were not explained, which is unfortunate because these components are the most necessary for enabling all healthcare providers to provide quality assistance to disaster victims (Davies, 2005).

Guidelines on disaster management: A compilation of expert guidelines on providing healthcare

Disaster management guidelines were also developed under the cooperation of the WHO and some organizations in Sri Lanka. The general agreement from all the experts was that healthcare providers should participate in the warning, emergency, rehabilitation, and recovery phases. According to these guidelines, the common knowledge and skills needed in disaster management were identified as relating to the following areas: management of injuries, near-drowning situations, infectious diseases, chronic diseases, maternal and child health services, health and water supply management for refugee camps, nutrition and food hygiene, sanitary facilities, proper garbage disposal, drugs used in disaster events, psychosocial support, and communication relating to dealing with the media. As can be seen, most of the areas entail a medical care focus, so these guidelines appear appropriate for disaster events like tsunamis (WHO, 2005).

Disaster management

As cited in Rogers and Lawhorn (2007), Rogers, Randolph, and Mastroianni (2003) produced the standard for disaster management by applying the Haddon matrix pattern. This pattern was originally utilized in injury prevention research and interventions for almost 20 years. This standard they developed relates to the three phases of an injury (pre-event, event, and post-event) (Barnett et al., 2005).

Moreover, in order to develop appropriate disaster management guidelines, Rogers and colleagues (2003) used a similar pattern, which consists of the pre-event, event (response/relief), and post-event (recovery) phases. These researchers stressed the details of the various activities and indicated the required knowledge and skills necessary for each phase for effective and successful of disaster management.

Jennings disaster nursing management model

The Jennings disaster nursing management model was launched by Jennings-Sanders in 2004, and mainly focused on community/public health nurses (C/PHNs). This model consisted of four sequential phases: phase I (pre-disaster), phase II (disaster), phase III (post-disaster), and phase IV (positive client/population outcomes). This model was developed based on the concept of the nursing process: "assessment", "planning", and "implementation" were included in phases I and III and "evaluation" concluded the outcomes of the disaster impacts. During the disaster event (phase II), Jennings-Sanders viewed C/PHNs as serving in the roles of caregiver, case manager, and educator.

The application of these guidelines is of interest for healthcare providers, particularly for PHNs to help them minimize the gaps in their existing knowledge and practices by following the disaster management guidelines. The similarities and differences of each set of guidelines are presented in Table 1.

Table 1

Summary of the Existing Disaster Management Guidelines

Author/organizer, year, country	Population	Phase of disaster management	Competencies in each phase
Manitoba Health, 2001, Canada	All components of health sectors, including public health system, PHNs, and communities	1. Hazard assessment: This component concerns understanding the risks of hazards or disasters, the vulnerability of populations, and coping resources 2. Risk management: This component includes risk estimation, risk evaluation, and risk controls 3. Mitigation: This component aims to reduce risk throughout the community	1. Hazard assessment: a. Identify possible risks of the disaster b. Identify populations vulnerable to disaster impacts c. Identify agencies and other resources in the community to cope with disaster impacts 2. Risk management a. Estimate the possible losses from the disaster b. Evaluate the disaster impacts c. Ensure recovery will occur after the disaster 3. Mitigation a. Reduce the risk to health facilities and programs b. Advocate for risk-reduction measures within the community

Table 1 (continued)

Author/organizer, year, country	Population	Phase of disaster management	Competencies in each phase
		4. Preparedness: Aims to develop decision making in preparation for disastrous events, which includes planning, training/education, resource management, and drilling	4. Preparedness a. Identify and develop the disaster plan among healthcare providers b. Conduct a training and education program to provide the appropriate knowledge and skills to implement the plans. c. Identify resources, such as plans, equipment, and staff, in order to respond to the disaster d. Put the current knowledge and skills into a practice scenario or disaster drill.
World Health Organization, 2005, Sri Lanka	Health sectors	1. Warning Aims to deliver adequate warning to communities regarding disaster events	1. Warning a. Inform the community regarding the disaster event b. Identify the source, content, and mechanism of the warning when a disaster occurs

Table 1 (continued)

Author/organizer, year, country	Population	Phase of disaster management	Competencies in each phase
		2. Emergency Aims to limit the number of disaster victims and deliver appropriate care in chaotic situations	2. Emergency a. Conduct health services during emergency situations, which include basic health care for emergencies, control of communicable diseases, immunizations, public health surveillance, and primary health care and outreach b. Conduct initial needs assessment in the displaced population, which includes areas such as water/sanitation, food/nutrition, shelter/site plan, health services, and coordination of health resources.
		3. Rehabilitation Aims to provide a continuum of care after the emergency period	3. Rehabilitation Conduct post-emergency health care, such as management of injuries and near-drowning
		4. Recovery Aims to restore conditions to the same as conditions before	4. Recovery a. Guard the victims from infectious diseases b. Provide care for chronic diseases and maternal

Table 1 (continued)

Author/organizer, year, country	Population	Phase of disaster management	Competencies in each phase
		the disaster occurred, and to improve the ability to lessen the consequences of future disasters	and child health services c. Develop health management strategies for refugee camps that include the areas of water supply, nutrition and food hygiene, sanitary facilities, and proper garbage disposal d. Develop drug standards for disaster events e. Provide psychosocial support f. Communicate and deal with the media to release information regarding the disaster event
Rogers, Randolph, and Mastroianni (as cited in Rogers & Lawhorn, 2007), USA	Occupational and environmental health professionals, including nurses	1. Pre-event Pre-event refers to preparedness among public healthcare workers for facing a disaster event	1. Pre-event a. Establish an emergency response and disaster planning committee b. Develop a communication and decision-making or reporting chain of command. c. Identify potential work-areas, resources, or equipment for an emergency situation d. Disseminate the developed disaster plan

Table 1 (continued)

Author/organizer, year, country	Population	Phase of disaster management	Competencies in each phase
			e. Develop evacuation plans for regular and vulnerable populations f. Identify the risk of hazards or disasters g. Establish procedures and train employees on how to report an emergency h. Plan a back-up system for any important documents and records i. Conduct disaster drills at least annually
		2. Event (response/relief) The response phase refers to immediate actions during an emergency or disaster, based on the type or level of disaster	2. Event (response/relief) a. Notify community of the disaster event b. Perform an initial response immediately during the disaster c. Develop a command chain structure and scene assessment d. Perform search and rescue operations for disaster victims e. Conduct victim extrication f. Perform disaster triage

Table 1 (continued)

Author/organizer, year, country	Population	Phase of disaster management	Competencies in each phase
			g. Provide care to stabilize victims' conditions h. Transport victims who need further care
		3. Post-event (recovery) The recovery phase takes place after the disaster event and aims to restore and rebuild the damaged community facilities	3. Post-event (recovery) a. Rebuild destroyed or damaged structures and facilities b. Reestablish activities to return the community to its normal routine c. Hold a debriefing among healthcare providers to identify disaster plan modifications for future disaster events. d. Assess the physical and psychosocial impacts of disaster victims
Jennings-Sanders, 2004, USA	Community/Public Health Nurses (C/PHNs)	1. Phase I (Pre-disaster) Assessment, planning, and implementation are the main roles of C/PHNs in this phase	1. Phase I (Pre-disaster) a. Assess the potential resources and risks in the work settings b. Plans for disaster action include allocating resources appropriately, defining the roles of

Table 1 (continued)

Author/organizer, year, country	Population	Phase of disaster management	Competencies in each phase
			C/PHNs in disaster events, developing cooperative agreements with community agencies, developing or activating disaster assessment tools/plans, developing training/educational programs, and training the volunteer disaster nurses c. Practice the developed disaster plan
		2. Phase II (Disaster) The roles of C/PHNs in this phase include those of caregiver, case manager, and educator	2. Phase II (Disaster) a. Perform triage to prioritize care and provide holistic care for disaster victims: caregiver roles b. Maintain a liaison for interagency and community communications, provide health service referrals, maintain coordination of health services, and establish a system in order to track patients that have been treated. These are all case manager roles c. Incorporate secondary level of prevention of health problems: educator role

Table 1 (continued)

Author/organizer, year, country	Population	Phase of disaster management	Competencies in each phase
		3. Phase III (Post-disaster) Assessment, planning, and implementation are the main roles of C/PHNs in this phase	3. Phase III (Post-disaster) a. Re-evaluate the healthcare needs of clients and assess the current disaster plan b. Revise the existing plan and develop a plan for future disasters c. Practice the implementation of the new/revised disaster plan
		4. Phase IV (Positive client/population outcomes) This phase aims to evaluate the effectiveness of the disaster management program	4. Phase IV (Positive client/population outcomes) Determine the outcomes for the client/population from the activities in phases I through III in order to decrease mortality rates, decrease healthcare costs, decrease disaster-related costs, improve health status, increase disaster nursing knowledge, increase the effectiveness of the disaster nursing plan, and improve the collaborative relationships between nurses and other community agencies.

As shown in the Table 1, each of the guidelines proposes the same disaster phases and common competencies in each phase that are necessary for healthcare professionals, in particular PHNs, to be effectively involved in disaster management. As can be seen, all guidelines and frameworks were developed in Western countries. Guideline utilization and the implementation of these models therefore needs to be congruent with the healthcare context in which implementation will occur (Gerrish & Griffith, 2004), in this case Indonesia.

Knowledge and Perceived Ability to Practice Regarding Disaster Management

A basic understanding of disaster science and the key components of disaster management is very important for nurses (Halpern & Chaffee, 2005), particularly for preparing themselves for disaster preparedness (Veenema, 2006). This detailed knowledge consists of definitions and classification systems for disasters, disaster epidemiology and measurement of the health consequences of a disaster, the areas of focus in emergency and disaster preparedness (preparedness, response, and recovery), and common problems that may be faced when responding to disasters. Knowledge of all these areas is essential for PHNs.

The quality of disaster management also depends on the amount of practice the providers have (Qureshi & Gebbie, 2007). Regular practice was found to enhance the knowledge and attributes of healthcare providers (Lia-Hoagberg, Schaffer, & Strohschein, 1999). Moreover, practice is considered an important way to improve the knowledge and psychomotor skills that influence nurses' competencies when making decisions (Arbon, 2004), particularly when they are faced with uncommon situations like disasters. In this study, since disasters are unpredictable, the researcher will not be able to measure the real practice PHNs acquire after implementing the proposed

disaster management guidelines. Because of this, the ability of participating PHNs in disaster management was measured by their level of perceived ability to practice after the disaster management guidelines were implemented.

The criteria used in this study to determine the PHNs' knowledge and perceived ability to practice consisted of the core competencies derived from the disaster management guidelines proposed by Manitoba Health (2000), the WHO (2005), Rogers et al. (as cited in Rogers & Lawhorn, 2007), and Jennings-Sanders (2004). As discussed earlier, although the competencies related to disaster management were not described completely, the essential knowledge and perceived ability to practice successful disaster management were clearly illustrated by the organizations and the experts in each disaster phase: preparedness, response, and recovery. In addition, other evidence from Polivka et al. (2008), Vogt and Kulbok (2008), and Kuntz et al. (2008) was used to specify the specific disaster management competencies for PHNs, including PHNs' roles in disaster preparedness, risks of disasters to the population, early warnings, disaster triage, the risk of miscommunication, and the assessment of public health impacts. Also, the general competencies related to disaster management that were developed by PHNs in clinical settings were included. Examples of these were life saving and stabilization, surveillance, technical skills, inter-agency collaboration, and health promotion.

Knowledge and perceived ability to practice in the preparedness phase

The knowledge and perceived ability to practice in the preparedness phase related to the roles of PHNs in disaster preparedness, risk identification regarding disasters and the population, and inter-agency collaboration.

PHNs roles in disaster preparedness

As mentioned earlier, all nurses, and particularly PHNs, need to have a basic knowledge of all disaster management phases, including preparedness, response, and recovery (Jakeway et al., 2008; Polivka et al., 2008). For example, they have to understand disaster science and the key components of disaster preparedness to be ready to help the nation when a disaster strikes (Veenema, 2006).

Regarding preparedness, PHNs have to focus on personal preparedness. They must acquire an understanding of key terms, concepts, and roles in disaster preparedness, and they must be familiar with disaster plans and the communication equipment used during disaster situations (Polivka et al., 2008). In addition, they should able to identify the types of disastrous events that could possibly occur in their area (Qureshi & Gebbie, 2007), and identify any vulnerable populations that could be threatened by such disasters (Vogt & Kulbok, 2008). In the response phase, nurses should focus on providing essential healthcare services, caring for victims, and providing psychological support (Cole, 2005). Here, PHNs need to have knowledge of rapid needs assessment, surveillance, disaster triage, risk communication, and technical skills. Finally, in the recovery phase, knowledge regarding public health impacts (including physical and psychosocial impacts) (Polivka et al.) and health promotion (INCMCE, 2003) is required in order to help the nurses provide essential care to disaster victims.

Furthermore, in order to improve and update their knowledge regarding their roles in disaster preparedness, PHNs should attend regular educational training, workshops, and simulation exercises or disaster drills. Such continuing education should be required for them to continue providing care and performing disaster management activities during all disaster phases (Stanley et al., 2008).

Identify risks of disaster to the population

The increasing rate of disasters in the last ten years has had increasing impacts on human health and property (Schipper & Pelling, 2006). As a result, it has become increasing important to develop quality disaster management plans. Every nurse, particularly PHNs, has a significant role to play, based on his or her knowledge and skills, in responding to disasters (Jakeway et al., 2008) in order to prevent and diminish negative impacts on communities (Rogers & Lawhorn, 2007). For example, nurses should have the skill to identify the types of disasters, either natural or man-made, which have the potential to occur in their areas (Qureshi & Gebbie, 2007). They should also identify populations that may possibly be affected (Vogt & Kulbok, 2008). Particular groups of people, such as the elderly, those who are physically impaired, and those with mental health problems, are considered vulnerable, and as such, are worthy of specific focus (Dyer, Regev, Burnett, Festa, & Cloyd, 2008; Rothman & Brown, 2007; Vogt & Kulbok).

Moreover, the importance of assessing vulnerable populations necessitates the creation of specific plans for them, both for evacuation when a disaster occurs and for the delivery of nursing care after the event (Vogt & Kulbok, 2008). From this, PHNs should fully understand that some groups are vulnerable and need additional assistance (Dyer et al., 2008; Rothman & Brown, 2007; Vogt & Kulbok).

Generally, elderly people, disabled people, and people with sensory problems have the most difficulty surviving and evacuating when a disaster occurs (Dyer et al., 2008). People with mental health problems are at high risk for relying on inappropriate coping strategies such as isolation, and they have difficulty in expressing their needs and in seeking help (Rothman & Brown, 2007). The difficulty

in evacuating these vulnerable groups is heightened by their tendency to reject assistance and refuse to cooperate with the evacuation plan (Eisenman, Cordasco, Asch, Golden, & Glik, 2007). The research data derived from assessing vulnerable populations, therefore, can provide the opportunity to nurses to develop specific evacuation plans or public policy plans which will reduce the potential effects of disasters on these vulnerable populations (Vogt & Kulbok, 2008).

Inter-agency collaboration

Since disasters affect many people and communities, disaster victims require assistance from many organizations (Kuntz et al., 2008). Therefore, the collaboration between organizations and professions needs to be well planned (Jakeway et al., 2008). During emergencies, good teamwork and communication are essential between emergency personnel from all disciplines in order to establish appropriate responses for the victims (Kuntz et al.). In this regard, PHNs should be knowledgeable of the emergency response plans and strategies in place in order to be ready for disasters.

Good collaboration between organizations and health practitioners will be assured during chaotic events when adequate assistance and healthcare services for a community are maintained (O'Boyle et al., 2006). PHNs need to be flexible about the types of the tasks and duties they perform, without exceeding their knowledge, skills, and authority. For example, a nurse who normally works in the area of adult nursing might be assigned to work in a disaster shelter with significant numbers of children. Here, effective assessment of any health problems in the children may require determining whether any other on-site provider has specialty knowledge and skills relating to children's health. In addition, they may also need to

speak with consultants over the telephone or seek out other assistance related to a problem. Moreover, in case a PHN cannot manage a problem, he or she needs to know the protocol regarding accessing communication with hospital medical services and arranging immediate transfers to a hospital (Gebbie & Qureshi, 2002).

PHNs need know the details regarding inter-agency collaboration, such as the list of all organizations and their roles in emergency response, their locations, how to access them, and how to keep informed of any revisions to the disaster plan. Furthermore, PHNs should attend regular meetings to be informed and re-informed of the responsibilities of each agency and to evaluate the action plan (INCMCE, 2003). All agencies should also commit to this course of action in order to enhance effective communication and collaboration, and to limit the morbidity and mortality rates during disasters (Vogt & Kulbok, 2008). Most importantly, PHNs should build trust and strong relationships with all stakeholders and people in their communities to improve their awareness and their readiness for future disasters (Rogers & Lawhorn, 2007).

Knowledge and perceived ability to practice in the response phase

The knowledge and perceived ability of PHNs to practice in the response phase include the following areas: early warning, disaster triage, life saving and stabilization, surveillance, risk communication, and technical skills.

Early warning

PHNs need to be concerned with the areas of warning, pre-impact, mobilization, and evacuation as their first priority of action in the response phase. Adequate warning of an impending disaster will serve to inform the

community. According to Vogt and Kulbok (2008), clear information on warning sources and systems used, such as who is responsible for sending out warnings, needs to be provided during regular training.

Moreover, PHNs also need to identify the available resources and equipment that they can use to inform the community when a disaster is coming. They should think creatively to identify manual or technological equipment that can aid in early detection and community notification (Gebbie & Qureshi, 2002). The plan should include the designation of a well-trained spokesperson for each community area who is familiar with that community (World Health Organization, 2007). For example, in an Islamic community, warnings and announcements can be delivered from a mosque or other religious institution. Additionally, the development of advanced technological information systems, such as tsunami early warning systems, (TEWS), cellular phones, satellite phones, television broadcasts, and two-way radios, (INCMCE, 2003) can allow communities to use these systems as the main tool for early warnings. In summary, an adequate warning will provide the opportunity for community members to evacuate and will decrease the morbidity and mortality rates of disaster occurrences.

Disaster triage

The word "triage" is derived from the French verb "trier," meaning to "sort" or "choose" (Sztajnkrycer et al., 2006). Originally, triage was used by the military to sort out soldiers' wounds in battle for the purpose of establishing treatment priorities (Gilboy, Tanabe, Travers, Rosenau, & Eitel, 2005). In the Napoleonic Era, triage was also used to sort injured soldiers by estimating the severity of injuries and chances to live in order to classify victims into the groups of those who

needed immediate care and those that could safely wait to be treated (Lairet & McManus, 2008). Currently, the term triage more commonly refers to the concept of daily triage, which is used in hospital settings, especially in emergency departments (Gerdtz & Bucknall, 2001). This method is used to prioritize patient care needs during certain periods of the day, in particular when resources (typically beds) are limited (Sztajnkrycer et al.). The purpose of triage is to identify those who are in critical condition so they can be grouped as such, allowing them to receive advanced care first (Ihlenfeld, 2003). Hence, the highest level of care (immediate care) is provided to these patients, even if they have a low probability of survival (Sztajnkrycer et al.).

Conversely, triage can be performed at different times by different groups of healthcare providers (e.g., nurses) for a variety of reasons during the provision of emergency care (Lerner et al., 2008). In a disaster situation, triage refers to a system used when available resources are insufficient to meet the needs of all victims (Baker, 2007). An accurate disaster triage system is therefore viewed as the most important initial medical function during a mass-casualty event (Sztajnkrycer et al., 2006). Here, ethical considerations such as "do as much as possible, for as many as possible, as quickly as possible" are a big factor (Hilton & Allison, 2004; Sztajnkrycer et al.). Therefore, the principle of triage has changed from caring for the most critically ill first to caring for the victims that are most likely to survive first (Ihlenfeld, 2003).

The implications of disaster triage for a mass disaster seem to be quite clear (Sztajnkrycer et al., 2006). This method is used to improve the quantity of surviving victims by leaving the worst victims and instead focusing on treatment for the victims with less complications (Veatch, 2005). At a disaster scene, primary triage or pre-hospital triage (Sztajnkrycer et al.), needs to be done first by PHNs and other

healthcare providers in order to classify the victims (Hilton & Allison, 2004). The plan should cover all of the victims (Lerner et al., 2008). Here, a quality triage system, as well as a quality training program for PHNs, is highly needed in order get the most benefit from triage efforts (Gilboy et al., 2005).

According to triage competency theory, PHNs need to identify their own capabilities in a disastrous event to ensure that they are prepared to cover the needs of all survivors (Polivka et al., 2008). During the response phase, PHNs need to perform primary triage, which will occur in the initial period of victim assessment at the disaster site (Sztajnkrycer et al., 2006). Lerner and colleagues (2008) identified at least nine existing mass-casualty triage systems (including two pediatric-specific systems): Simple Triage and Rapid Treatment (START), Jump START, Homebush, Triage Sieve, Pediatric Triage Tape (PTT), CareFlite, the Sacco Triage Method (STM), Military Triage, and CESIRA. Of these, the most common type of primary triage system used in disaster situations is the Simple Triage and Rapid Treatment (START) system (Lerner et al.; Sztajnkrycer et al.).

The START system involves four labeling colors, which are green, yellow, red, and black. These colors are used to classify the survivors' conditions. "Green" is used for victims who are capable of walking by themselves. Victims who are not ambulatory but have normal physiologic parameters are classified into the "yellow" group. In the yellow group, even though victims have potential health problems, they require no immediate life-sustaining interventions, and treatment can be delayed, typically for four to six hours. "Red" is used for victims who immediately have an abnormal respiratory, perfusion, or mental status, but whose conditions are considered treatable. Lastly, "black" is used for victims who have sustained mortal injuries and display signs of impending death, with a poor

opportunity to survive under the resource-constrained triage efforts (Sztajnkrycer et al., 2006).

A study conducted by Kahn and colleagues (2007) involving a train crash compared 132 patients' assigned triage codes to their ultimate outcomes and found that 64 patients (48%) were classified correctly, 65 were classified too high in severity (49%), and 3 were classified too low (2%). The results reflected a poor relationship between the a priori triage levels assigned by the START system and the a posteriori outcomes for each level (Garner, Lee, Harrison, & Schultz, 2001). The START triage system can ensure acceptable levels of under triage (100% red sensitivity and 89% green specificity) but incorporates a substantial amount of over triage. However, START is useful in prioritizing the transport of the most critical patients to area hospitals (Kahn et al.).

In short, to effectively deal with disasters, knowledge, skills, and regular rehearsal in simulated situations are required (Halpern & Chaffee, 2005). PHNs must be educated and empowered to remain within their population-based specialty in order to perform sorting and to assign treatment priorities to survivors (Baker, 2007). Based on this, survivor-focused care during a disaster can be handled appropriately, even with a large number of victims.

Life saving and stabilization

After disaster triage is established, providing life-saving treatment and support to persons and communities affected by a disaster is the next important action (Jakeway et al., 2008). Here, PHNs must engage in life-saving efforts to stabilize victims through rescue efforts, first aid, and emergency treatment

(Davies, 2005). The ability to perform these activities is therefore required of PHNs in order for them to deliver essential care in an emergency response (Jakeway et al.).

An immediate response to help manage the victims' health problems is necessary in order to minimize casualties and arrange for advanced-care needs. INCMCE has described several competencies necessary to establish care for disaster victims, including basic first aid skills and the skill to conduct primary assessments from head to toe. This detailed assessment includes the following areas: the integument (wounds, burns, and rashes), the airway, the respiratory system, the cardiovascular system (vital signs recording and signs of shock monitoring), pain, the gastrointestinal system (including specimen collection), a basic neurological assessment, and a musculoskeletal assessment (INCMCE, 2003).

From this, PHNs should undergo regular first aid training in order to complement their skills. This training must cover external bleeding management, the securing of airways, the splinting of fractures, and suitable techniques in the handling of injuries (WHO, 2007). Knowledge of and skills relating to basic life support (BLS) and advanced life support (ALS) are also necessary for first-line responders (Coyle, Sapnas, & Ward-Presson, 2007; Supe & Satoskar, 2008).

Surveillance

In mass casualty incident management, a regular surveillance system is necessary to obtain data regarding injuries, morbidity and mortality rates, and diseases and illnesses (WHO, 2007). According to Rothman, Greenland, and Lash (2008), surveillance refers to the process of collecting data on a health problem and then managing, analyzing, interpreting, and disseminating or reporting the data so that it may be used to generate prevention programs. It can also be used to identify

changes in nature, the extent of health problems, and the effectiveness of public health interventions (Pryor, 2007). Furthermore, surveillance provides information based on the basic epidemiology parameters of time, place, and person. It provides descriptive information regarding when and where health problems are occurring and who is being affected (Rothman et al.).

As members of the public health system whose role is to identify and interview persons potentially exposed to disasters, PHNs should be actively involved in the epidemiology and surveillance functions and should participate in disease outbreak investigations. Hence, they are expected to know the signs and symptoms of all suspected diseases and to use this knowledge to assess, triage, isolate, treat, and provide public health support for victims (Rowney & Barton, 2005).

Traditionally, a surveillance system was classified into four categories: passive, active, sentinel, and special. In passive surveillance, the data are routinely obtained from the reports of the public health system or health institutions. In active surveillance, the public health department actively investigates cases throughout the field area. The sentinel system involves selected cases from the data obtained from the public healthcare system or health institutions. Finally, the special system is more focused on one disease or type of surveillance data, or it can function as a combination of several different types of surveillance systems (Pryor, 2007).

In short, PHNs should be actively involved in epidemiology and the surveillance functions of public health centers, and they should participate in disease outbreak investigations after disasters. Because nurses are considered to have the ability to identify and interview persons potentially exposed to disasters, they need to know the signs and symptoms of all suspected diseases (Rowney & Barton, 2005).

Risk communication

In order to deliver adequate healthcare service, every PHNs should have knowledge of the lines of authority and communication that exist during an emergency response (Jakeway et al., 2008). Although PHNs can function in many capacities, they are most likely to be deployed to the ''operations section'' because they bring leadership capacity; a broad understanding of community systems; and nursing knowledge, skills, and abilities. They are also considered to be knowledgeable of the overall organizational structure, making their ability to connect with the agency command structure during an emergency invaluable (INCMCE, 2003).

As mentioned previously, collaboration and communication within and between agencies is important throughout an emergency response (Gebbie & Qureshi, 2002). In order to successfully collaborate and inform a community about the risk of disaster, PHNs need to be familiar with and skilled with all emergency communication devices in their agency, based on its local emergency disaster plan (e.g., fax machines, two-way radios, Blackberry devices, electronic mail, laptops, satellite phones, and cell phones) (INCMCE, 2003).

Initially, before disasters occur, each organization or agency should understand its specific roles and responsibilities regarding a disaster event. Then, it should provide this information to both its own staff and the staff of external agencies, since all disaster responders need to know the communication roles of themselves and others in order to conduct effective communication and coordination (Gebbie & Qureshi, 2002). Lack of staff knowledge and skill in using the communication plan and equipment will lead to failure in implementing the plan, as well as failure in communication and coordination when a disaster occurs (Gebbie & Qureshi). The detailed roles and responsibilities of each agency should be

documented in the disaster plan. The staff should evaluate both the plan and their own competency at least once a year (Jakeway et al., 2008).

Technical skills

The essential technical skills necessary for responding to disaster events include being able to administer medication/vaccinations at mass dispensing sites, conduct case investigations, and apply personal protective equipment (PPE) (Polivka et al., 2008).

Since disasters are unpredictable and not a routine occurrence, it is maybe impossible to pre-determine the types of injuries that may occur, the number of victims, and the type of disaster event. However, nurses can still prepare and develop their competence in responding to disaster events by following a standardized plan or adhering to evidence-based knowledge (Gebbie & Qureshi, 2002). The pre-requisite knowledge and skills needed during a disaster include the ability to administer medication (INCMCE, 2003), including vaccinations or communicable disease immunizations (Watson, Gayer, & Connolly, 2007). An adequate medication stockpile for vaccinations used in emergencies (e.g., measles, hepatitis A, vitamin A, and tetanus) is also needed (WHO, 2005).

Moreover, PHNs should be able to recognize the uses of vaccinations and immunizations for disaster victims. For example, a single case of measles is adequate to necessitate measles control activity, including the measles vaccination (Waring & Brown, 2005). However, it is not recommended to use the hepatitis A vaccine to prevent outbreaks in the disaster area. This vaccine is only effective in preventing hepatitis A outbreaks in small communities, and even then, the vaccination must be administered early in the course of the outbreak (Watson et al.,

2007). Similarly, a mass tetanus vaccination program to prevent tetanus is not recommended. This vaccine is only necessary for people with large open wounds or other injuries. Vaccinations should be administered along with other control prevention measures (Waring & Brown, 2005).

Disease outbreaks following a natural disaster must be a priority concern for PHNs in order to prevent an epidemic. Public health officials should provide adequate shelter for displaced people where they can have access to proper sanitation and personal hygiene, clean water, appropriate nutrition, vaccinations, vector control, and health education (Waring & Brown, 2005). PHNs should conduct case investigations by identifying the problems, including endemic and epidemic diseases that exist in the affected area. They should also identify the living conditions of the affected population, including the number, size, location, and density of each settlement; the availability of safe water and adequate sanitation facilities; the underlying nutritional status and immunization coverage of the population; and the degree of access to healthcare and to effective case management that the people have (Watson et al., 2007). Adequate information from an investigation will help PHNs to develop an appropriate plan in order to prevent the spread of diseases and illnesses.

PHNs have the knowledge and skill to use familiar equipment in their daily professional practice. However, during emergency situations, PHNs may be required to use equipment which is not a part of their everyday practice. Recognizing the settings to which PHNs may likely be dispatched can afford them the opportunity to learn how to use such equipment in advance. Public health nurses may need to be familiar not only with standard personal protective equipment used as part of an agency's infection control program (e.g., gloves, gowns, and respiratory masks) but also with advanced equipment and procedures used in emergencies (e.g., donning

and doffing full body suits and setting up and using decontamination equipment) (Gebbie & Qureshi, 2002; INCMCE, 2003). Such knowledge and experience will be useful in protecting PHNs from disease contamination when they deliver healthcare services to disaster victims.

Knowledge and perceived ability to practice in the recovery phase

The knowledge and perceived ability of PHNs to practice in the recovery phase consists of assessing public health impacts and health promotions for the community, as follows.

Assessing public health impacts

The assessment of public health impacts from natural disasters has been increasing in importance; the goal is to determine the effects of disasters on a population (Lechat, 1979). There are three important reasons for assessing public health impacts. First, the data will provide a basis of information for estimating the assistance needs of the community. Next, assessing disaster impacts will provide specific information about the affected population. Finally, the data will play a major role as a valuable source of information for developing further plans to reduce the consequences of future disasters (Lindell & Prater, 2003). The components of public health impacts from a disaster consist of physical impacts, psychosocial and mental health impacts, and disease outbreaks.

Physical impacts include the mortality rate, the morbidity rate, and the amount of property damage in the community (Lindell & Prater, 2003). Determining the mortality rate of disasters depends on several factors, such as the disaster type, the concentration and allocation of people living in one area,

environmental conditions, the level of preparedness, and the presence of an adequate early warning system (Lechat, 1979). According to Noji (as cited in Lindell and Prater), approximately 1,250,000 people died in Asia, Africa, and South America between 1947 and 1980 from a variety of natural disasters, such as hurricanes, earthquakes, volcanic eruptions, landslides, and tsunamis. Moreover, the big earthquake and subsequent tsunami of 2004 killed more than 230,000 people in six countries in Asia and Africa (Vogt & Kulbok, 2008). There were a large number of victims in Aceh (more than 120,514 deaths) (Clark, 2008).

However, it is not easy for public health agencies to determine accurate mortality and morbidity rates for disasters (Lindell & Prater, 2003). However, information regarding morbidity and mortality rates is important for determining community care needs, and the data is vital to developing prevention plans for potential chronic health effects (van Kamp et al., 2006). This information is also useful for estimating the number of healthcare personnel and the quantity of resources necessary to help survivors (Lechat, 1979).

As mentioned above, since the common physical impacts of disasters will vary, depending on the type of disaster, PHNs need to have knowledge of every common physical impact for each specific disaster. For example, fractures will be the dominant problem caused by earthquakes, especially fractures of the clavicle, lower extremities, spine, and pelvis (Lechat, 1979). Earthquakes also cause crushing damage and organ failure (e.g., kidneys) as a result of severe muscle and tissue injury (Vogt & Kulbok, 2008). Aspiration problems and general trauma, on the other hand, are mostly caused by tsunamis. Aspiration problems arise from near-drowning and can lead to pneumonia, asphyxia, and acute respiratory distress syndrome (WHO, 2005). Trauma arises when people are hit by the waves and swept

away. Trauma can be classified into soft tissue injury and orthopedic trauma (fractures or dislocations). Leg fractures are most common, followed by fractures of the upper and lower extremities. Other common fractures occur in the spinal and lumbar areas. Shoulder dislocation is also commonplace (Prasartritha, Tungsiripat, & Warachit, 2008; Wattanawaitunechai, Peacock, & Jitpratoom, 2005).

Communicable diseases also affect victims but are classified as indirect disaster impacts since they are primarily associated with population displacement (Watson et al., 2007). These diseases generate a wide range of impacts and increase the risks of morbidity and mortality for displaced people due to their lack of basic needs and sanitation, such as safe water, adequate shelter, and primary healthcare services. Common communicable diseases following natural disasters include diarrhea, acute respiratory infections (ARI), measles, tetanus, and vector-borne diseases (Waring & Brown, 2005; Watson et al.).

Diarrhea (caused by cholera and dysentery) was found to be a major cause of death following a natural disaster. It occurs because of contaminated water sources, poor sanitation, and overcrowding in shelters (Waring & Brown, 2005). In 2004, a study in Calang, Aceh Province, Indonesia, found that more than 80% of tsunami survivors suffered from diarrhea because they drank unclean water. Moreover, as a result of an earthquake in 2005, approximately 750 out of 1,800 displaced people in Muzaffarabad, Pakistan, were affected by acute diarrhea due to the poor sanitation of their surroundings (Watson et al., 2007).

Acute respiratory syndrome (ARI) was also considered to be a major contributing factor in the high mortality and morbidity rates of victims living in shelters, particularly in children less than five years old, among whom it caused approximately 20% of total deaths (Waring & Brown, 2005). The combination of

overcrowding, exposure to smoke from cooking in close quarters, poor ventilation, and lack of nutrition increased the incidence of ARI (Watson et al., 2007). In addition, the lack of access to healthcare services and antimicrobial agents increased the risk of mortality from ARI.

Morbidities and mortalities arising from measles were associated with low rates of immunization among the people living in shelters, as well as poor nutrition (Waring & Brown, 2005). Hence, immunization should be given to all displaced people living in overcrowded conditions in temporary shelters as soon as possible after a disaster; this will decrease the possibility of viral transmission. Tetanus is caused by a toxin from the anaerobic tetanus bacillus *Clostridium tetani.* The major causes of tetanus were crushing injuries, general injuries, and contaminated wounds. In countries where tetanus vaccination coverage is low or nonexistent, tetanus can be expected to occur after a disaster such as an earthquake or tsunami (Watson et al., 2007).

Another health problem during disasters, particularly for victims in crowded conditions, is vector-borne disease outbreak, examples being malaria and dengue (Waring & Brown, 2005). Natural disasters such as cyclones, hurricanes, and floods have a high potential to create vector-breeding sites and thus vector-borne disease transmission. Appropriate shelter management is therefore highly important in order to prevent this problem. In this situation, PHNs should actively educate their community and organize campaigns to clean and monitor water tanks and other sites with standing water (Watson et al., 2007) to inhibit the breeding of Anopheles sp. and Aedes aegypti sp. (Waring & Brown).

Beyond physical impacts, psychosocial and mental impacts are also consequences of disasters. These impacts can develop and become long-term

problems which extend for months and even years (van Kamp et al., 2006). There are four contributing factors which increase a community's vulnerability to developing psychosocial problems from a disaster situation. The first factor is the severity of the disaster and the amount of property damage in the affected area. The loss of economic resources, high mortality and morbidity rates, and feelings of uncertainty regarding assistance from external resources all combine to contribute to the development of psychological distress. Relatives being affected by injuries, life-threatening situations, panic during a disaster, separation from family and relatives, extensive property loss, and relocation or displacement were also found to be factors which contribute towards an individual's development of psychological problems (Vogt & Kulbok, 2008).

In general, psychosocial impacts from disasters include anxiety, depression, grief, behavioral effects relating to sleep and appetite changes, ritualistic behavior, and substance abuse (Lindell & Prater, 2003). In one study by van Kamp et al. (2006), it was found that nearly 30% of participants reported mental health problems after a disaster, such as anxiety, depression, and feelings of insufficiency. A common medical diagnosis for disaster victims is post-traumatic stress disorder (PTSD).

According to the medical criteria for PTSD (APA and DSM-IV-TR), symptoms must be present for at least one month or more (van Kamp et al., 2006). If this occurs, PHNs working in disaster situations should assess the extent and severity of the problem for both individual clients (e.g., victims, rescue personnel, and others) and the overall population (Vogt & Kulbok, 2008). Crisis counseling, mental health treatment, and the use of available social support systems (e.g., friends, family, neighbors, and coworkers) are three resources that can be used to assist people who have psychosocial problems (Lindell & Prater, 2003).

Health promotion for communities

Providing health education regarding health risks and disease prevention is the main responsibility of PHNs in their communities (ATSDN, 2002). In relation to the disaster management approach, after a disaster is over, a camp will be created as a temporary place for the displaced victims. Such a camp needs to be appropriately managed by PHNs to prevent further health problems from occurring. One strategy used by PHNs to prevent health problems is conducting an educational program focused on health promotion in order to increase community health awareness and better health behaviors among individuals (INCMCE, 2003). In this regard, collaboration between PHNs and communities or populations is important to reducing health risks and for promoting, maintaining, and restoring people's health. Hence, PHNs should advocate for systems-level changes to improve health (Jakeway et al., 2008).

Initially, PHNs need to identify possible threats in a community area and assess the potential impacts to the health of the community. They should be able to identify populations in need of assistance once a disaster strikes (INCMCE, 2003). According to the WHO (2005), areas that need to be given high priority when a shelter or camp is organized include water supply, nutrition and food hygiene, sanitary facilities, and proper garbage disposal. PHNs must also provide essential health education for disaster survivors in order to prevent and limit the transmission of common infectious diseases that may occur after a disaster event. They must also work to ensure good hygiene practices, safe food, and safe water sources. PHNs should encourage victims to seek treatment early in order to limit their exposure to disease agents; contamination of water, air, and food supplies; and the elements (INCMCE).

Factors Contributing to PHNs' Knowledge and Perceived Ability to Practice Regarding Disaster Management

Knowledge and skills are needed by PHNs in every phase of a disaster. Such competence is required to ensure the disaster arrangements for handling an impact are run effectively (Polivka et al., 2008). The preventive element of public health practice is crucial, even during the post-disaster phase, since much of the normal infrastructure is damaged or non-existent (Chapman & Arbon, 2008). In this situation, PHNs will be faced with a lack of equipment and accommodation for victims. As a result, it can affect these nurses' ability to perform their profession in a disaster situation (Jakeway et al., 2008).

In 2004, a report on the tsunami in Aceh, Indonesia, found that many healthcare providers, including nurses, avoided responding during the emergency. During the situation, many were thinking and wondering things like, "Do I have a role in this situation?" or "Who will help my family members and me to overcome this problem?" (WHO, 2006). Certainly, there are some factors that will contribute to a PHN's preparedness for disaster management, such as training and education (Stanley, 2005; Stanley et al., 2008; Veenema, 2006; Yamamoto, 2006), and also experience (Arbon, 2004; Suserud & Haljamie, 1997). Detailed information regarding the factors that contribute to PHNs' knowledge and perceived ability to practice will be described below.

Training and education

The increased involvement of PHNs in disaster management begins with their understanding of the comprehensive scope of their practice and its standards. They must strive to achieve individual competencies so that they can

provide better collaboration with others and contribute to emergency preparedness and response efforts (Jakeway et al., 2008). Because of this, the preparation of PHNs by training and disaster nursing education programs is important so that they can improve their practice competencies beyond regular knowledge in order to reduce their uncertainties when faced with a disaster situation (O'Boyle et al., 2006; Stanley et al., 2008).

Nursing education is therefore needed to develop an educational program, nursing care strategies, an information database, and other training programs, all with the goal of making PHNs ready to mitigate the health effects of disasters in their communities (Yamamoto, 2006). However, in most countries, disaster nursing education is seldom provided at the basic nursing education level (Smith, 2006). Education, though, is one of the vital factors influencing PHNs' competencies during disaster responses.

Another component which influences a nurse's competency in disaster response is continuing nursing education. As the largest subgroup of the healthcare workforce and as a vital resource in dealing with unforeseeable disasters and learning from them, nurses have to be aware of the importance of disaster preparedness (Fung et al., 2008). Continuing nursing education and training is therefore the best way to prepare nurses to be knowledgeable and skillful as first responders in a disaster (Wetta-Hall, Fredrickson, Ablah, Cook, & Molgaard, 2006).

The content of a training or education program for emergency and disaster preparedness needs to include definitions of the types of emergencies, disasters, and other crises. It should also cover essential knowledge and skills (like basic life support) (Chapman & Arbon, 2008) and organizational details (e.g., systems, policies and plans, command structure/hierarchy, and communications)

(INCMCE, 2003). Moreover, training and education should cover decision-making authority, strategic plans for working in damaged facilities and with damaged equipment, and nursing care in various types of emergencies and disasters (chemical, biological, radiological/nuclear, and explosive incidents). Other areas which should be addressed in training include the safety of clients and practitioners, triage decision-making, a framework for prioritizing services and materials, teamwork skills, professional self-assessments relating to role performance, infection control, mental health and psychosocial support, and social mobilization. This educational background will serve healthcare providers well during disaster management (Chapman & Arbon, 2008; WHO, 2006).

Several research studies on the importance of training and education for nurses revealed that many nurses lack knowledge on disaster management (Fung et al., 2008; Jennings-Sanders et al., 2005). Jennings-Sanders also suggested that nursing disaster management should be taught at the educational level. This study revealed that nursing students have limited knowledge of disasters, including even the definition of disaster nursing. They also lack knowledge and experience in community empowerment, disaster drills, the utilization of disaster models to help disaster victims, and the role of nurses in a disaster event. A study conducted by Fung and colleagues (2008) revealed that the majority of nurses (97%) believed that they were inadequately prepared for disastrous events. The researchers recommended that training be conducted for them in basic nursing education. A systematic review on the effectiveness of disaster training for health workers, conducted by Williams and others (2008), also found that training would increase the competency of health workers when responding to disaster events.

The organizations that employ nurses have a significant responsibility to ensure that their nurses have the necessary competencies to response to disaster situations appropriately (Stanley, 2005). Every nurse needs to sustain his or her skills in order to effectively respond to disaster events while still preserving personal safety. Institutions should conduct regular training, provide educational modules or courses, conduct practice simulations in varied settings, and improve collaboration between nurses and other professions (Stanley).

A variety of educational strategies can be used for disaster preparedness training. These strategies include lectures, seminars, distance/online education, field experience, independent studies, database or computer-assisted learning, and informal discussions (Jakeway et al., 2008; Stanley et al., 2008).

In addition, Stanley et al. (2008) also recommended that every nurse undertake continuing education and activity-based learning from The Public Health Nursing Surge Curriculum, which provides 50-hour classes that meet over the course of a 12-month period. The curriculum has three components: an independent study (Explore Surge Trail Guide), a daylong classroom session (Explore Surge Hiking Workshop), and the opportunity for learners to discuss their training progress through bimonthly phone conferences.

Currently, the public health nursing surge curriculum is an example of a disaster education package that provides discipline and specialty-specific training for PHNs; it consists of surge trail guidelines and a hiking workshop, which were developed and implemented for nurses. This educational program aims to increase the uniqueness of PHNs in comparison to traditional clinical approaches to emergency or disaster incidents. For instance, the competency-based "Explore Surge" guide provides a path for discipline-specific preparedness that can guide PHNs in improving

their competencies relating to disaster events and can provide them with the ability to practice public health nursing in disaster management (Stanley et al., 2008).

After course completion, PHNs are expected to have improved their knowledge and skills, and be capable of articulating the value of their profession to disaster management. Consequently, other healthcare professionals will come to understand the unique abilities that PHNs possess for helping with unexpected situations like disaster events.

Experience

Another factor which influences the competency of PHNs in responding to disaster events is personal experience, including previous disaster experience and clinical work experience. However, the nature of the settings in which nurses acquire experience to develop their competency is not well understood, although the nursing profession continues to value clinical experience highly (Arbon, 2004).

Direct disaster experience would naturally make all healthcare providers and community members alert and prepared for possible future disasters. PHNs who have such experience feel more prepared than those who lack disaster experience (Suserud & Haljamie, 1997). Relevantly, Arbon and colleagues (2006) stated that previous disaster experience can help nurses to improve their ability to allocate limited resources during a disaster event. Also, it can enhance nurses' awareness of disaster skills and the importance of practice, and it can increase their confidence in disaster response (Duong, 2009).

The term "readiness," as it applies to PHNs involved in disasters, is described as knowing what should be done, being able to cope with the situation, and

feeling secure and confident in one's nursing activities during the disaster response. The importance of having qualified personnel like PHNs at a disaster site has been widely recognized. Here, one who has experience with accidents and emergency nursing will act more competently and consistently than less experienced PHNs (Suserud & Haljamie, 1997). Also, experience will enhance a PHNs' ability to make autonomous decisions (De Felice, Giuliani, Alfonsi, Mosca, & Fabiani, 2008) and will diminish his or her feelings of inadequacy and fear concerning the unknown situation (Hammad, Arbon, & Gebbie, 2010).

Moreover, degree of work experience in a clinical setting may also be associated with a PHN's ability in disaster management. Several studies noted that the duration of a PHN's experience in clinical nursing practice is directly related to that nurse's competencies (Arbon, 2004; Bigbee, Otterness, & Gehrke, 2010; Lia-Hoagberg et al., 1999). Furthermore, the process of becoming an experienced nurse is described as a progressive and continuous interaction between experience, meaning, and the actual world that results in a personal and unique understanding of nursing practice for the subject (Arbon, 2004). In this regard, the basic knowledge derived from an individual's experience will be applied during a disaster event. As a result, the confidence of the PHN to deal with disaster situations will improve. Therefore, providing care to patients in an everyday clinical practice will provide a basis for enhancing a PHN's knowledge and ability to identify potential health problems during the response to a disaster event (Gebbie & Qureshi, 2002).

Summary of the Literature Review

Natural and man-made disasters are occurring in record numbers around the world. These occurrences have resulted in a high motivation for the nursing profession to set up strategic plans to deal with such situations (Coyle et al., 2007), as nurses are considered to play a central role in providing or delivering care in disaster events (Cole, 2005).

In addition, as one of the types of healthcare providers, PHNs should be actively involved in disaster management programs (Polivka et al., 2008). PHNs' involvement in disaster management should equally apply to all disaster phases: preparedness, response, and recovery (Jakeway et al., 2008; Polivka et al., 2008). To be actively involved in these phases, PHNs require basic knowledge and skills regarding disaster management (Fung et al., 2008) that will help them to work effectively when a disaster occurs (Fritsch & Zang, 2009).

Furthermore, as a country that is commonly struck by disasters, Indonesia should have an appropriate disaster plan to reduce disaster impacts on its communities and population. This situation challenges PHNs to be involved in the management of disaster situations (Kuntz et al., 2008). However, PHNs often feel incapable of take action in disaster events due to their exclusion from important positions related to legislation, policy systems, and regulations concerning disaster situations (Boatright & McGlown, 2005). Jakeway and colleagues (2008) concluded that the limitations of PHNs in understanding their scope of responsibility in disaster management cause them to refuse to be involved in disaster events. Moreover, the limitations of the existing practice guidelines relating to disaster management for PHNs in Indonesia cause uncertainty in PHNs; they are reluctant to upgrade their roles and competencies related to emergency and disaster response.

In order to fill this gap, this study aims to discover the current knowledge and perceived ability to practice, regarding disaster management, among PHNs in Aceh province, Indonesia. The knowledge derived from the literature review provides a basis to develop a conceptual framework underpinning this study. The tentative guidelines in this study will be developed based on the existing guidelines proposed by The Manitoba Health (2000), The WHO (2005), Rogers et al. (as cited in Rogers & Lawhorn, 2007), and Jennings-Sanders (2004). In addition, in order to develop this knowledge and perceived ability to practice, the roles and competencies of PHNs in disaster events identified by INCMCE (2003), Polivka et al. (2008), Vogt and Kulbok (2008), and Jakeway et al. (2008) were addressed in this study.

In this study, PHNs' knowledge of and perceived ability to practice disaster management were divided into three phases: PHNs' roles in disaster preparedness, the risk of disaster, and population identification (including inter-agency collaboration in the preparedness phase). Early warnings, disaster triage, life saving and stabilization, surveillance, risk communication, and technical skills were addressed in the response phase. Finally, disaster plan modification, assessment of public health impacts, and community health promotion were included in the recovery phase. The development of disaster management and practice guidelines for public health nurses in Aceh, Indonesia, is expected to provide clear direction for PHNs in an Indonesian context. It is also expected to result in better nursing practice, better outcomes, and a significant reduction in the negative effects of disasters throughout the nation.

CHAPTER 3

RESEARCH METHODOLOGY

In order for the researcher to successfully conduct this study, a two-phase approach was used. The first phase was a literature review; in this phase, the researcher conducted a systematic literature review in order to obtain a full understanding of what was already known of the variables under investigation. Three objectives of this review were identified. They were the following: to explore the roles of PHNs in disaster management, to explore the competencies of PHNs in disaster management, and to describe the contributing factors to PHNs' competencies in disaster management.

Concerning method, the literature review began with a search of the relevant literature through several databases, including PubMed, CINAHL, the Cochrane and ProQuest Medical Library, and Science Direct. Key phrases included "roles and competencies of PHNs or community nurses in disasters," "disaster management," and "disaster nursing." The search was limited to full-text publications in the English language, starting from 2000.

The major finding of this review was that PHNs are considered to be valuable resources and that it is recommended that they be actively involved in disaster management. For this reason, PHNs should be required to acquire basic knowledge and skills related to disaster management in order to improve their self-preparedness and awareness, and to accomplish their roles and competencies in all disaster phases: preparedness, response and recovery. Moreover, most PHNs are well-recognized and trusted in their communities because they work closely with

disadvantaged and vulnerable groups who are affected by disasters. For this reason, PHNs must engage in disaster management. The details of this literature review have been presented at the Java International Nursing Conference and were published elsewhere (Putra, Petpichetchian, & Maneewat, 2011).

While the literature review was the first phase, the second phase was an actual descriptive study which aimed to identify the level of knowledge and perceived ability to practice of public health nurses regarding disaster management in Aceh, Indonesia. The details of the research design and its methodology involve the population and setting, the sample and sampling technique, the instrumentation, the data collection procedure, ethical considerations, and the data analysis; these are presented as follows.

Population and Setting

The target population in this study was public health nurses who worked in Public Health Centers (PHCs) in Aceh, Indonesia. According to Dinas Kesehatan Aceh (2009), there are 309 PHCs under the authority of the Health Department of Aceh Province, and the number of PHNs working in these PHCs is 2,292.

Sample and Sampling Technique

Sample size estimation

The researcher used a proportion of the known population to determine the sample size for this study. According to Singchangchai, Khampalikit, and Na-Sae (1996), if the size of a population ranges from 1,000 - 9,999, approximately 10% of its subjects can be used to represent it. Thus, 229 PHNs working at PHCs in Aceh

were recruited to represent the 2,292 PHNs in Aceh, Indonesia. To ensure that the minimum number was met, an additional 10% of subjects were added to the sample. Thus, 252 potential participants were initially approached.

Sampling technique

In this study, a stratified proportionate random sampling method was used. Firstly, the researcher determined the number of PHCs and PHNs in Aceh province. Then, the researcher split all districts and municipalities into two strata based on location: urban and suburban/rural areas (Appendix A). This method was used to ensure the representativeness of the recruited subjects (Burns & Grove, 2005). After that, the researcher selected the areas/districts by using simple random sampling. The researcher randomly selected 50% of the areas from each location to serve as the targeted areas. After random selection of the areas (Figure 1, Level 3), the PHCs in each area were randomly selected using a lottery. However, there were two PHCs which requested financial support. Therefore, random sampling without replacement was conducted to replace these (Figure 1).

There were 1,000 nurses in the selected areas who met the following criteria: a government or contract employee, an educational background of at least a diploma in nursing, and the ability to communicate in the Indonesian language. After that, the eligible nurses who had been working for at least one year in the community were directly approached at the selected PHCs by the researcher or research assistants. They were asked to participate in the study. This process was facilitated by the head of each PHC. By using proportionate sampling, the number of PHNs selected from urban districts and suburban/rural districts was 149 and 103, respectively.

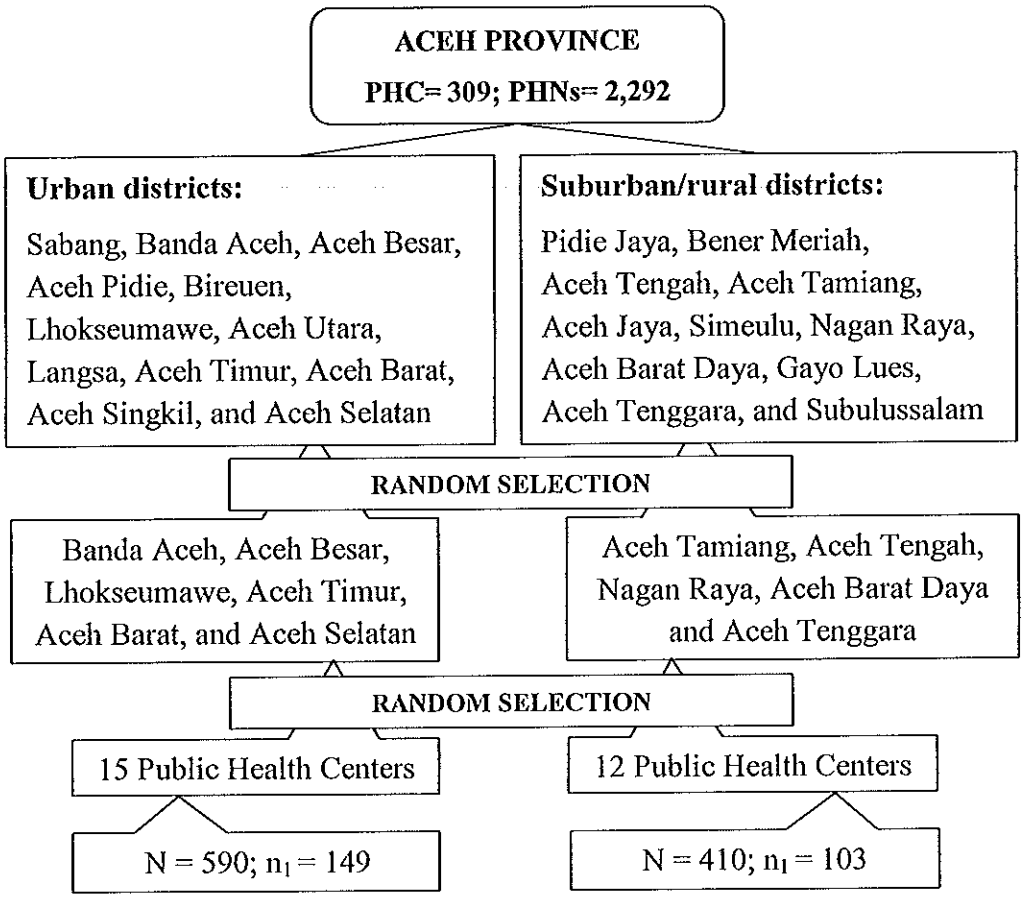


Figure 1. Sampling technique.

Altogether, 252 subjects were recruited from the total population, based on a calculation using the following formula:

$$n_1 = \frac{N1}{N\,total} x\ n$$

n_1 = Sample from each district/municipality

N1 = Population of each district

N total = Total population of randomly selected districts (N= 1.000)

n = Sample (252)

The distribution of subjects by district and municipality is presented in Table 2.

Table 2

Number of Subjects from Each District and Municipality

No	District/Municipality	N1	n_1
1	Banda Aceh	29	7
2	Aceh Besar	109	28
3	Lhokseumawe	155	39
4	Aceh Timur	153	39
5	Aceh Barat	65	16
6	Aceh Selatan	79	20
7	Aceh Tamiang	63	16
8	Aceh Tengah	83	21
9	Nagan Raya	96	24
10	Aceh Barat Daya	48	12
11	Aceh Tenggara	120	30
	Total	1000	252

Instrumentation

Instruments

Self-reporting questionnaires were developed for use in this study. There were three in total: (1) a Demographic Data Questionnaire, (2) a Public Health Nurses' Knowledge Regarding Disaster Management Questionnaire, and (3) a Public Health Nurses' Perceived Ability to Practice Regarding Disaster Management Questionnaire. The details of each part are given as follows:

Demographic Data Questionnaire (DDQ)

The demographic data questionnaire consists of eight items designed to collect the subject's demographic data, including age, gender, marital status, period of work, educational background, previous experiences in assisting disaster victims, training and education, and methods used in developing knowledge and skills (Appendix C).

Public Health Nurses' Knowledge Regarding Disaster Management Questionnaire (PHNK-DMQ)

The public health nurses' knowledge regarding disaster management questionnaire was developed based on the research framework of this study (Appendix D). The questionnaire consists of 36 items using a true/false format; a score of 0 or 1 is given for an incorrect or correct answer, respectively. The total score is the sum of all correct answers and can range from 0 to 36. Higher scores indicate higher levels of knowledge. For interpretation, the researcher divided the transformed scores into four levels (McDonald, 2002), as follow:

Score (%)	Level of knowledge
< 60.00	Needs Improvement
60.00-69.99	Low
70.00-79.99	Moderate
> 80	High

Public Health Nurses' Perceived Ability to Practice Regarding Disaster Management Questionnaire (PHNPP-DMQ)

This questionnaire was developed based on the research framework, and was designed to assess the level of public health nurses' perceived

ability to practice according to the disaster management phases. These practice skills include interagency collaboration and disaster risk identification for the population in the preparedness phase. Other skill areas covered by this questionnaire involve early warnings, disaster triage, life saving and stabilization, surveillance, risk communication, technical skills in the response phase, and the assessment of public health impacts and community health promotion in the recovery phase. This questionnaire consists of 30 items. Each item was rated by using a five-point Likert scale with the following values: 0= Not able to practice this at all, 1= Hardly able to practice this, 2= Uncertain ability to practice this, 3= Able to practice this when following given instructions, and 4= Able to practice this automatically (Appendix E). The possible scores range from 0 to 120 and are transformed into percentages. Higher scores indicate higher levels of perceived ability to practice. Concerning interpretation, the researcher divided the transformed scores into four levels using the same criteria as indicated in PHNK-DMQ.

Translation of the instruments

The original instruments for this study were developed in English. Then, the instruments were validated by three experts from the Faculty of Nursing, Prince of Songkla University, Thailand. After validation, the instruments were translated by two bilingual translators from the Language Center of Syiah Kuala University, Banda Aceh, Indonesia. The first translator translated the instrument into the Indonesian language. Then, the second translator translated the instrument back into English. Finally, the researcher compared both English versions and determined the discrepancies between the two English versions by following the suggestions of the translators (Brislin, 1970). There were some English words that were not

translated similarly, but they had the same meanings. Therefore, no modifications were made.

Validity and reliability of the instruments

The validity of the instruments

Three experts from the Faculty of Nursing, Prince of Songkla University, Thailand, with expertise in public health nursing, disaster nursing, and disaster management examined the content validity of the three instruments. Then, the recommendations of all three experts were used to modify the instruments.

The reliability of the instruments

Before actual data collection occurred, the researcher first examined the internal consistency reliability of the PHNK-DMQ and PHNPP-DMQ by testing the Indonesian version on 20 subjects who were similar to the subjects in the main study. For the PHNK-DMQ, a coefficient of .70 was found by using the Kuder-Richardson formula 20 (KR-20). The Cronbach's alpha coefficient for the PHNPP-DMQ was .92. Thus, these newly developed questionnaires were considered to be acceptably reliable (the coefficients exceeded .70) (Burns & Grove, 2005).

Data Collection Procedure

The data collection procedure was divided into two phases: the preparation phase and the implementation phase.

Preparation phase

1. The researcher obtained permission from the Institutional Review Board (IRB) of the Faculty of Nursing, Prince of Songkla University, Thailand.

2. The researcher asked for a letter written from the Dean of the Faculty of Nursing, Prince of Songkla University, to the highest authority in the Health Department of Aceh Province. After obtaining this permission, a letter from PSU and the Health Department was sent to the head of each district PHC.

3. The researcher informed seven research assistants (RAs) about the study's purpose and procedure, the subjects' recruitment, instrument completion, and the management of obstacles that might occur during the data collection process.

4. After permission was obtained, the researcher/RAs explained to the PHC heads the study's objectives, benefits, confidentiality, and method of data collection.

5. The researcher/RAs asked for a name list of nurses who work in the related PHCs and compiled a list of potential participants who met the inclusion criteria.

Implementation phase

1. The researcher/RAs distributed the questionnaires to the selected PHNs and explained the purposes, benefits, and ethical considerations of the study to each subject.

2. An appropriate amount of time (one day) was given to each subject to answer the questions. Then, the researcher collected the completed questionnaires from the subjects (or the PHC heads) and checked that the questionnaires were indeed completed.

3. Finally, the confidentiality of the subjects was consistently maintained, and after the data was entered into the computer program for analysis, the physical questionnaires were destroyed.

Ethical Consideration

Data collection started after the Institutional Review Board of Faculty of Nursing, Prince of Songkla University, Thailand, approved the research proposal. After that, the researcher obtained permission from the head of Provincial Health Department, followed by the head of each District Health Department, followed by the head of each PHC. Then, the researcher approached the subjects who met the inclusion criteria and explained the purposes of the study and the participation expectations. The subjects who agreed to participate in the study received an explanation on how to complete the entire questionnaire and were informed of their right to withdraw at any time for any reason without fear of negative consequences. Codes were used to maintain the subjects' confidentiality, and the information was utilized by the researcher for the research purposes only.

Data Analysis

In this study, descriptive statistics were used to analyze the data for all the instruments. The details of each instrument are as follows:

1. Demographic data were analyzed by using frequencies, percentages, means, and minimum and maximum scores.
2. The public health nurses' knowledge and perceived ability to practice were analyzed by using frequencies, percentages, means, and standard deviations.
3. The scores for the factors related to the public health nurses' knowledge and perceived ability to practice were examined by using the Spearman Rank correlation (r_s) and the Mann-Whitney U test.

CHAPTER 4

RESULTS AND DISCUSSION

This chapter presents the results of the study and a discussion of the findings. The results and discussion of the study are presented as follows: 1) the PHNs' demographic characteristics and experiences, (2) the level of the PHNs' knowledge regarding disaster management, and (3) the level of the PHNs' perceived ability to practice regarding disaster management.

Results

The demographic characteristics and experiences

The subjects consisted of 252 PHNs working in 27 PHCs; more than half of them worked in urban areas (59.1%). Most of the subjects were less than 30 years old (61.1%), with the mean age being 30 years old (SD=6.0). The majority of the subjects were female (79.8%), and approximately three-fourths of them were married (69.8%). Regarding working experience as PHNs, nearly half of the subjects (42.1%) had been working as PHNs for less than 5 years; the mean was 7.2 years (SD=5.7). The majority of them had a diploma level of education (89.7%). More than half of the subjects (55.2%) did not have direct experience in assisting disaster victims. For those who had experience in facing disasters, nearly half (47.8%) had experienced only one tsunami (47.4%) or flood (35%) (Appendix F). More than half of the subjects (54.8%) never received any specific disaster training or education. Conversely, nearly half (45.2%) were trained and educated in disaster management (Appendix G). The methods used by the PHNs in developing their knowledge and skills regarding disaster management included reading books and other materials

(74.6%), using the Internet (53.2%), and attending related seminars and conferences (49.6%) (Table 3).

Table 3

Frequency and Percentage of Demographic Data and Experiences (N=252)

Characteristic	n	%
PHNs' working area		
Urban	149	59.1
Suburban/Rural	103	40.9
Age (years) (Min-Max=20-55, M=30, SD=6.0)		
< 30	154	61.1
30-40	87	34.5
> 40	11	4.4
Gender		
Male	51	20.2
Female	201	79.8
Marital Status		
Single	68	27.0
Married	176	69.8
Widowed/Divorced	8	2.2
Working experience as a PHN (years) (Min-Max=1-32, M=7.2, SD=5.7)		
< 5	106	42.1
5-10	95	37.7
> 10	51	20.2
Highest level of nursing education		
Diploma	226	89.7
Bachelor's	26	10.3
Experience in assisting disaster victims		
Yes	113	44.8
No	139	55.2

Table 3 (continued)

Characteristic	n	%
Number of times involved in caring for disaster victims (Min-Max=1-10, n=113)		
1 time	54	47.8
2-3 times	42	37.2
4-10 times	17	15.0
Attending training and education		
Yes	114	45.2
No	138	54.8
Method used in developing knowledge and skills		
a. Reading books and materials related to disasters		
Never	27	10.7
Sometimes	188	74.6
Often	36	14.3
Always	1	0.4
b. Searching for disaster-related material on the Internet		
Never	93	36.5
Sometimes	134	53.2
Often	25	9.9
c. Attending seminars and conferences related to disasters		
Never	119	47.2
Sometimes	125	49.6
Often	8	3.2

The level of the PHNs' knowledge regarding disaster management

The total score for the PHNs' knowledge was at a moderate level (M=70.73, SD=8.41). The PHNs' knowledge of the preparedness phase and recovery phase was at a moderate level (M=76.23/77.33, SD=13.76/12.13, respectively), whereas their knowledge of the response phase was at a low level (M=64.75, SD=9.66) (Table 4). Nearly half of the subjects (42.5%) had a moderate level of knowledge (Table 5).

Table 4

Mean, Standard Deviation, Min-Max, Skewness, Kurtosis, and the Level of the PHNs' Knowledge Regarding Disaster Management (N=252)

Knowledge of Each Disaster Phase	M (%)	SD (%)	Min-Max (%)	Skewness /SE	Kurtosis /SE	Level
Preparedness (10 items)	76.23	13.76	20-100	-.62/.15	.44/.30	Moderate
Response (18 items)	64.75	9.66	33.33-88.89	-.02/.15	.25/.30	Low
Recovery (8 items)	77.33	12.13	37.5-100	-.72/.15	1.47/.30	Moderate
Total (36 items)	70.73	8.41	36.11-94.44	-.57/.15	1.39/.30	Moderate

Table 5

Frequency and Percentage Results for the PHNs' Level of Knowledge Regarding Disaster Management (N=252)

Level of the PHNs' Knowledge		n	%
Needs Improvement (< 60.00%)		20	7.9
Low	(60.00 - 69.99%)	95	37.7
Moderate	(70.00 - 79.99%)	107	42.5
High	(> 80.00%)	30	11.9

In addition, item analysis was performed to determine the number of subjects who could correctly answer each question (Table 6). The top five items that the subjects answered correctly on the PHNK-DMQ were items 1, 36, 4, 30, and 5. In contrast, the five items that received the lowest number of correct answers were items 18, 14, 16, 26, and 33.

Table 6

The Five Items with the Highest and Lowest Percentages of Correct Answers (N=252)

Item	Knowledge	n	%
	The five items with the highest percentage of correct answers		
1	Recognizing the emergency route for the community and directly informing the people about it	247	98
36	Prevention and delimiting of the transmission of infectious diseases among a sheltered population	240	95
4	Responsibility to conduct case investigations and provide public health information regarding a disease outbreak	239	95
30	The major cause of diarrhea following a natural disaster	237	94
5	Participating in disaster drills and training that are specific to the PHN's geographical area	235	93
	The five items with the lowest percentage of correct answers		
18	Basic Life Support (BLS)	44	17
14	Principles of disaster triage	52	21
16	Sorting and screening disaster victims	54	21
26	Vaccination routes	63	25
33	Strategies to increase community disaster awareness after a disaster	66	26

Additional analysis was also conducted to determine factors that may contribute to the PHNs' knowledge. Five factors were identified: working experience, previous disaster experience, educational level, disaster training and education, and the PHNs' working area. The normality assumption of the total score for PHNs'

knowledge and years of working experience was violated. Therefore, the non-parametric Spearman Rank correlation (r_s) was used for factors treated as ordinal scale data and the Mann-Whitney U test was used for factors which were categorical variables.

Only working experience was found to have a significant relationship with the PHNs' knowledge (Figure 2, Appendix F). Although the other four factors (nursing education, previous disaster experience, training and education, and working area) were not significantly related to the different knowledge scores, two vital issues could be identified (Figures 3-5, Appendix F). First, it was noted that PHNs with bachelors' degrees and those who received training had slightly higher levels of knowledge (Figures 4 and 5, Appendix F). Second, PHNs who had previous experience with disasters and who worked in urban areas had a lower level of knowledge (Figure 3, Appendix F) than the others, a finding which was unexpected.

The level of the PHNs' perceived ability to practice regarding disaster management

Overall, the total scores for the PHNs' perceived ability to practice were at a moderate level (M=74.57%, SD=13.27). The highest mean score was for the recovery phase (M=78%, SD=18.21), followed by the response phase (M=76.23%, SD=13.03) and the preparedness phase (M=66.15%, SD=16.63) (Table 7). More than one-third of the subjects (38.1%) perceived that their ability to practice was at a moderate level (Table 8).

Table 7

Mean, Standard Deviation, Min-Max, Skewness, Kurtosis, and the Level of PHNs' Perceived Ability to Practice Regarding Disaster Management (N=252)

Perceived Ability to Practice	M (%)	SD (%)	Min-Max (%)	Skewness /SE	Kurtosis /SE	Level
Preparedness (6 items)	66.15	16.63	20.83-100	-.50/.15	.29/.30	Low
Response (18 items)	76.23	13.03	25.00-100	-1.01/.15	2.11/.30	Moderate
Recovery (6 items)	78.00	18.21	4.17-100	-1.30/.15	1.82/.30	Moderate
Total (30 items)	74.57	13.27	25.00-100	-.90/.15	1.45/.30	Moderate

Table 8

Frequency and Percentage Results for the PHNs' Level of Perceived Ability to Practice Regarding Disaster Management (N=252)

Level of the PHNs' Perceived Ability to Practice		n	%
Needs Improvement (< 60.00%)		28	11.1
Low	(60.00 - 69.99%)	41	16.3
Moderate	(70.00 - 79.99%)	96	38.1
High	(> 80.00%)	87	34.5

Additionally, item analysis was performed in order to examine which items regarding perceived ability to practice had exceptionally high or low results (Table 9). The top five items were items 24, 14, 15, 30, and 29. The five items for which the PHNs perceived their ability to be lowest were items 2, 3, 4, 19, and 21.

Table 9

The Five Items with Highest and Lowest Percentage of Ratings Regarding the PHNs' Perceived Ability to Practice Disaster Management (N=252)

Item	Perceived Ability to Practice	M	Med	%
The five items with the highest percentage of ratings regarding the PHNs' perceived ability to practice				
24	Use standard personal protective equipment for infection control	3.61	4	90.1
14	Perform cardiovascular assessment	3.43	4	85.8
15	Perform integumentary assessment	3.41	4	85.2
30	Provide educational information to promote good hygienic practice	3.41	4	85.2
29	Provide educational information to prevent and limit infectious disease transmission	3.35	4	83.6
The five items with the lowest percentage of ratings regarding the PHNs' perceived ability to practice				
2	Identify the national organization or institution that is responsible to act during a disaster event	2.32	3	57.9
3	Lead the discussion and annual assembly between your own institution and the community stakeholders	2.33	3	58.1
4	Identify sources of potential hazards and disasters in your own district area, such as earthquakes, floods, etc.	2.43	3	60.7
19	Recognize the organizational command structure in emergency and disaster situations	2.62	3	65.5
21	Report and send information regarding a disaster situation and resulting conditions in your own area through fax, email, or any other computer program	2.70	3	67.5

In addition, an analysis to determine the factors that may contribute to the PHNs' perceived ability to practice was conducted. There were six factors identified: working area, working experience, disaster experience, nursing education, disaster training and education attendance, and the PHNs' knowledge. The normality assumption for the total PHNs' perceived ability to practice score was violated. Therefore, the non-parametric Spearman Rank correlation (r_s) was used for factors treated as ordinal scale data and the Mann-Whitney U test was used for factors which were categorical variables. It was found that working experience and PHNs' knowledge were significantly related to the PHNs' perceived ability to practice (Figures 8 and 12, Appendix F). Also, nursing education, previous disaster experience, and training and education attendance significantly contributed to their ability to practice (Figures 9-11, Appendix F). Interestingly, the subjects' working area was not a significant contributing factor to their perceived ability to practice (Figure 7, Appendix F).

Discussion

The findings of the study are organized into two main parts: 1) the PHNs' knowledge regarding disaster management and (2) the PHNs' perceived ability to practice regarding disaster management.

The PHNs' knowledge regarding disaster management

The PHNs participating in this study possessed a moderate level of knowledge of disaster management. The PHNs' had the most knowledge of the recovery phase, followed by the preparedness phase and the response phase (Table 4). This finding is not surprising. Generally, the basic nursing education in Indonesia

does not equip nurses with special knowledge of disaster management. Based on the researcher's personal experiences in teaching at a nursing institution in Aceh province, it was revealed that only two teaching hours are allocated for contents related to disasters, in both the diploma program and the bachelor's degree program. Furthermore, this subject is only taught in a classroom setting and only entails a general overview of disaster nursing management. Even in the US, where disaster events are also frequent, the time allocated for disaster-related content is inadequate. A 2003 survey of 2,013 schools of nursing in the US with 348 respondents revealed that only 53% of the schools offered content in disaster preparedness, and a mean of four hours was devoted to this content. In general, nursing school faculties were inadequately prepared to teach disaster preparedness content (Weiner, Irwin, Trangenstein, & Gordon, 2005).

Among the three areas of knowledge relating to the disaster phases, nurses achieved the highest mean score for their knowledge of the recovery phase. The preparedness phase was second, and the response phase was last. This finding was also not surprising. Although, on average, the scores for the preparedness and recovery phases were at a moderate level, the item analysis revealed that there were certain areas of questions that 93-98% of the subjects could answer correctly (Table 6). The item that the highest number of PHNs answered correctly was "recognizing the emergency route." This may be because the subjects had been working in their communities for some time already. They were familiar with the geographic structure and the routes of evacuation. According to AORN (2007) and Jakeway et al. (2008), specific knowledge concerning the assessment of the evacuation route is very important, as is knowledge of an agency's emergency response plan, the plan's

location, how to access it, and how to keep informed of any revised plans for the community. This knowledge then provides the basis for developing effective disaster planning (Adams, 2008) for evacuating communities, in particular vulnerable populations (the elderly, people with physical impairments, and people with mental health conditions) (Dyer et al., 2008; Rothman & Brown, 2007; Vogt & Kulbok, 2008).

Two other areas that a high number of PHNs (95%) had knowledge about were "the prevention and delimiting of the transmission of infectious diseases among sheltered populations" and "the responsibility to conduct case investigations and provide public health information regarding disease outbreaks." The prevention and delimiting of the transmission of infectious diseases is nowadays considered to be a "basic" type of nursing knowledge for which most nurses have been prepared and which they use in their routine work. Relevantly, because diseases are a contributing factor during a disaster event, the ASTDN noted that PHNs must be competent in epidemiological surveillance and the investigation of infectious diseases (ATSDN, 2002). Surveillance is useful for gaining important data regarding disaster victims in order to most appropriately utilize healthcare staff and equipment (Davies, 2005). A study conducted by Rogers and Lawhorn (2007) also indicated that nearly half of respondents (48%) felt unsure of their roles and responsibilities for providing health surveillance during a hurricane disaster.

It is not surprising that knowledge of the response phase received the lowest mean score (Table 4). Knowledge of this phase is considered situation-specific. It involves special, comprehensive content. Item analysis findings (Table 6) support that this is very specific knowledge. Only 17% and 21% of the subjects in this

study correctly answered the question regarding basic life support and the question regarding the principles of disaster triage, respectively. This was followed by knowledge of disaster triage (item 16) and vaccinations (item 26). The low level of knowledge the PHNs had regarding the response phase should be brought to the attention of the authorities, as PHNs hold major roles and responsibilities for assisting their communities, particularly during the response phase (Vogt & Kulbok, 2008). Therefore, PHNs should understand the scope and definition of their responsibilities and roles in responding to disaster impacts (Jakeway et al., 2008). The aims of nursing care during the response phase are to minimize the health hazards and life threats caused by a disaster (Kuntz et al., 2008) and to diminish its negative consequences for the people's health and the public healthcare service (Vogt & Kulbok). Consequently, the insufficient knowledge of the subjects regarding this phase may cause them uncertainty in responding during disaster occurrences.

A careful examination of why so few subjects in this study correctly answered the question regarding "Basic Life Support" revealed a few explanations. Firstly, the number of subjects who attended BLS training was quite low (29%). Thus, it can be assumed that a lack of BLS training can negatively impact a subject's knowledge of disaster response. Since BLS is a basic life-saving technique for use with all disaster victims, its use is expected to result in better outcomes for survivors (Handley, 1997). Thus, PHNs must have knowledge of this technique (Liberman, Mulder, & Sampalis, 2000). Secondly, the findings must be interpreted with caution due to the nature of the questionnaire itself. The BLS question asked, "Basic life support (BLS) includes stopping bleeding, cardioversion, and breathing support." The majority of the subjects who checked "True" for this statement (the correct answer is

"False") may not have read the statement carefully and assumed that "cardioversion" was similar to cardiac massage.

The small number (less than one-fourth) of PHNs who possessed knowledge of disaster triage (items 14 and 16, Table 8) has implications for the future work of PHNs. During a disaster event, PHNs really need to use this knowledge to deliver appropriate care to injured victims in order to save as many lives as possible (Mitani, Kuboyama, & Shirakawa, 2003). Similarly, a study conducted by Mitani et al. found that approximately one-third of nurses were unfamiliar with disaster triage principles, and 40% of them did not understand the techniques involved. Their limited knowledge in this area might be a result of the subjects' misconceptions about the concepts of daily triage and disaster triage. Daily triage is more common for PHNs since it is regularly performed in the hospital setting, especially in emergency departments (ED) (Sztajnkrycer et al., 2006).

For the response phase, item 26 (route of vaccinations) was also an item that few subjects got correct (25%). This might be because the majority of the subjects had a nursing diploma (89%). Similarly, a study conducted by De Felice et al. (2008) revealed that different levels of education (diplomas, practicing nurses, and post-graduate degrees), possibly resulted in differences in nurses' understanding of the transmitted smallpox and Y. pestis viruses, and the method of their transport. Therefore, it is recommended that PHNs improve their own knowledge and practices regarding immunizations and vaccinations. Also, there must be collaborative learning among PHNs and other professionals in order to update their knowledge regarding the advantages, barriers, benefits, and risks of vaccinations and immunizations (Kimmel, Burns, Wolfe, & Zimmerman, 2007).

In addition, the low to moderate level of knowledge that the PHNs in this study had may be associated with their lack of self-directed learning regarding disaster management. As mentioned previously, about 3-15% of the subjects "often" attended seminars and conferences, and studied disaster-related materials (either by accessing them on the Internet or reading books) (Table 3). Similarly, a study to examine the knowledge and perceived skill of PHNs in tsunami-affected and non-affected areas found that many nurses working in PHCs lacked self-preparedness for improving their own knowledge regarding tsunami disaster nursing (Maulidar, 2011). Accordingly, the majority of nurses (60%) in Indonesia have few opportunities to attend training to make preparations related to their professional roles and competencies, in general (Hennessy, Hicks, Hilan, & Kawonal, 2006). Consequently, their insufficiency of specific knowledge regarding disaster management will contribute to their lack of ability to respond during disaster events (WHO, 2006). Thus, it is highly recommended that PHNs improve their knowledge related to disaster competencies (Hammad et al., 2010) with the intention of developing their preparedness for future disaster events (Burstein, 2006).

Overall, the subjects' working areas, work experience as PHNs, inadequate previous disaster experience, educational backgrounds, and lack of disaster training and education may also have been factors which contributed to their moderate level of knowledge, as found in this study. In order to support this prediction, these factors were examined for their relationship with the PHNs' knowledge scores. Only working experience was found to have a statistically significant relationship with the PHNs' knowledge; the other factors were insignificant but indicated a positive trend between greater working experience,

higher nursing education, and more training and education on the one hand, and a higher level of knowledge on the other hand. In contrast, nurses with little disaster experience and they are who worked in suburban or rural areas had higher levels of knowledge. These findings can be explained as follows.

This study found that working experience was positively correlated with professional competencies, including level of knowledge, for the PHNs in Aceh. As seen, nearly half of the subjects had less than five years of work experience as PHNs (42.1%). Although the strength of the relationship between working experience and knowledge was found to be rather low (Figure 2, Appendix F), this factor is still considered to be associated with the moderate level of knowledge among Acehnese PHNs. A study conducted by Maulidar (2011) found that more than half of nurses (52.3%) who had less than five years of working experience had limited knowledge regarding disaster nursing management. It was also found that duration of experience in clinical nursing practice had a positive influence on the nurses' knowledge, in general (Arbon, 2004; Bigbee et al., 2010; Chan, 2007; Lia-Hoagberg et al., 1999). It was found that the nurses with a lot of work experience improved their own knowledge, skills, and attitudes more than those with little work experience. Primary nursing experience in clinical practice, therefore, contributed to the development of adequate knowledge and capabilities in nurses (Reed, as cited in Arbon).

Duration of professional experience was strongly correlated with level of knowledge (Bigbee et al., 2010). The basic knowledge derived from a nurse's individual experience could be applied during a disaster event, resulting in an improvement in that nurse's confidence in facing disasters. Therefore, providing care to patients in everyday clinical practice will provide the basis for enhancing the

PHNs' knowledge and ability to identify any potential health problems when responding to a disaster event (Gebbie & Qureshi, 2002).

Surprisingly, the findings from this study revealed that the subjects who had previous experience with disasters seemed to have lower knowledge scores, although this difference was not significant (Figure 3, Appendix F). This may be due to the low number of experienced subjects who participated in this study. As addressed previously, only 113 of the subjects (44.8%) had experience with assisting disaster victims. Nearly half of these (47.8%) had experienced only one disaster event, usually either a tsunami (47.4%) or a flood (35%).

As noted in a previous study conducted by Duong (2009), previous disaster event experience is important for PHNs in order to improve their awareness regarding disaster competencies and enhance their confidence for providing aid in disaster events. In this study, however, only 37% of the participants reported their involvement in a disaster response (Duong). Similarly, Hammad et al. (2010) also stated that previous involvement in a disaster response was valuable for enhancing nurses' knowledge and reducing their feelings of inadequacy and fear.

The different levels of nursing education attained by the subjects also contributed to their differing levels of knowledge regarding disaster management. Although this difference was not statistically significant, the bachelor's degree nurses had a higher knowledge regarding disaster management than the diploma nurses (Figure 4, Appendix F). In the past, approximately 39% of Indonesian nurses were diploma nurses, 1% were degree nurses (bachelor's), and the rest were educated at the secondary school level (SPK) (Shields & Hartati, 2003). Accordingly, the majority of the subjects in this study possessed a nursing diploma (89.7%). Previous studies

regarding nursing education in Indonesia revealed that diploma nurses possessed inadequate knowledge and skills (Carlisle, Luker, Davies, Stilwell, & Wilson, 1999; Hennessy et al., 2006; Saha, as cited in Maulidar, 2011).

Although the minimum level of nursing education in Indonesia was upgraded to the diploma level in 1997 (Saha, 2006), this may not have improved nurses' knowledge in all aspects. Importantly, the topic of disaster nursing is still not integrated into diploma nursing curricula in Indonesia (Pusdiknakes, 1999), even in the bachelor's degree nursing curricula (AIPNI, 2008). In addition, the AIPNI has made recommendations to add spesific subjects into the nursing curriculum of each province. Because Aceh is a high-risk province with the potential of experiencing annual natural disasters, this province should be a pioneer in the development of disaster nursing education in Indonesia (Nazar, 2009). The implication of this finding is that there should be further investigations into the feasibility of offering disaster-related classes at schools of nursing in Indonesia, particularly in Aceh province. The amount of time to be dedicated to them should also be investigated. Unlike Indonesia, other high risk nations such as Japan have already integrated disaster subjects into their nursing curricula (Yamamoto, 2008). Thus, adding more disaster-related contents to the basic nursing education program is recommended. This will better improve the capability of nurses in disaster management. Consequently, well-educated nurses in disaster nursing management will gain confidence and an understanding of disaster plans and equipment, how to minimize victim morbidity and mortality rates, and how to improve community health status and reduce disaster-related costs (Chapman & Arbon, 2008; Jennings-Sanders, 2004). In addition, the advancement of knowledge regarding disaster management is not only useful for

reducing the suffering of disaster victims, but can also be used for assisting regular patients in everyday practice at PHCs.

As mentioned previously, more than half of the subjects (54.8%) in this study had not attended any training or education related to disasters. Similarly, the previous studies which explored the importance of training and education for nurses noted that nurses had a lack of knowledge regarding disaster management (Fung et al., 2008; Jennings-Sanders et al., 2005). In this study, although the additional analysis did not reveal a significant difference (Figure 5, Appendix F), there was a positive relationship between training experience and knowledge of disaster mangement. Since the majority of the PHNs in this study were educated at the diploma level and had minimal experience in assisting disaster victims, additional training and education regarding disasters is highly necessary for PHNs.

From this, PHC administrators should be made responsible for providing appropriate public educational programs regarding disaster occurrences which are specific to each area, and should develop PHN training based on their disaster plans (Nur, 2010). Moreover, although nearly half of the subjects (45.2%) in this study undertook their own disaster training and education, the appropriateness of the content of this training or education is still questionable. In general, appropriate disaster training and education is useful for increasing PHNs' awareness of the decision-making process; improving their understanding of the information systems; enabling their use of standard operational procedures; limiting inaccuracies in their treatments, triage, and documentation; and diminishing insufficient training and resource shortages for future disaster events (Edwards, Caldicott, Eliseo, & Pearce, 2006; Henderson, Inglesby, O'Toole, & Grossman, 2001).

A report from the WHO (2006), however, found that many healthcare providers, including nurses, avoided engaging in their profession and were unclear on their roles and responsibilities during the earthquake/tsunami disaster in 2004 in Aceh. An evaluation on the appropriateness of the current training and disaster education programs is therefore needed (De Felice et al., 2008). The existing training courses being offered need to be further examined for content, time allocation, and training methods.

Finally, the issue of the differences in the working areas of the PHNs in this study influenced the PHNs' level of knowledge. In this study, more than half of the subjects (59.1%) worked in an urban area. Although there was no significant difference in the level of knowledge of urban PHNs and suburban/rural PHNs, it was unexpectedly found that nurses who worked in rural areas attained higher knowledge scores (Figure 6, Appendix F). A study conducted by Bigbee et al. (2010) found that nurses who worked in rural or remote areas were considered to have less knowledge due to their lack of opportunity to receive formal educational preparation in public health nursing.

In this study, PHNs working in suburban/rural areas seemed to have a greater knowledge of disaster management than nurses in urban areas. This might be due to their perception that rural areas are at high risk of experiencing disasters. Many PHNs have an interest in developing their competencies and sharpening their abilities so that they can work effectively during future disaster events. This is also supported by the Transtheoretical Model of Change, which stressed that individuals who are motivated to reach certain achievements in life will have a positive impact on their clinical practice areas (Melnyk et al., 2004). In interpreting the above finding, one

issue should also be addressed. There might be a potential sampling bias in this study, with regard to the distribution of the subjects, as more were from urban areas than suburban/rural areas.

The findings regarding the PHNs' knowledge of disaster management in this study must be interpreted with caution due to some methodological issues. The True/False format of the questionnaire offers a 50% chance of error from guessing. This error may be even greater due to the fact that some subjects may simply fill in the questionnaire without thoughtful consideration. In addition, the researcher provided only one day to the subjects to complete the questionnaire. There is a debate between giving a long or short period of time, as both techniques have both pros and cons (Carey, Morrison-Beedy, & Johnson, 1997).

Secondly, the wording used in some question statements may cause confusion, such as the negative question forms used in items 18 and 26. This may have been the reason that the majority of the PHNs (83% and 75%, respectively) answered these questions incorrectly. Thirdly, the proportion of general/basic knowledge statements and specific knowledge statements in each phase was not equal. This may have contributed to the fact that the scores for the response phase were lower than the scores for the other two phases. The questions asked in the response phase mostly dealt with very specific topics; hence, to answer them correctly, the PHNs would need to have deep knowledge. Regardless of the three issues identified above, the fact that a low percentage of subjects answered items 14 and 16 correctly should truly indicate that they lacked knowledge regarding disaster triage principles. Therefore, each PHC should be given a standard operational procedure regarding vaccinations/immunizations in order to improve their

competency in this area. Moreover, training and continuing education related to disasters, such as disaster management, basic and advanced life support, and disaster triage, should be routinely provided by health policy makers in Aceh to enable the nurses to attain sufficient knowledge regarding disaster management competencies.

The PHNs' perceived ability to practice regarding disaster management

In this study, the PHNs' perceived ability to practice regarding disaster management was found to be at a moderate level. The highest level of the PHNs' perceived ability to practice was in the recovery phase, followed by the response and preparedness phases (Table 8).

This finding is worthy of high attention from the health service authorities. It indicates that organizations may not be prepared to respond properly in case of disasters. Large numbers of healthcare providers are not necessarily needed but the right levels of training are needed for existing providers (Veenema, 2007). In other words, training that result in high levels of ability to practice is the most important aspect.

Although Indonesia is one of the most vulnerable countries to natural disasters in the world, only half of the PHNs in this study received disaster training. When comparing this to data from other countries, such a result is not surprising. In the US, which is at very high risk of both natural and human-made disasters, nurses are not well prepared either. Weiner et al. (2005) found that only about 50% of the necessary disaster-related content was presented to nurses in the 348 schools of nursing in the US. Thus, it can be stated that most of the nursing schools were

insufficient in presenting the disaster management subject when attempting to develop well-prepared nurses for disaster occurrences. Given this explanation, the following additional findings are not surprising.

Among the three phases, the PHNs' perceived ability to practice was found to be lowest in the preparedness phase. This might be due to the subjects' lack of experience in assisting disaster victims. According to O'Sullivan et al. (2008), nurses with the perception that there is a low risk of a disaster occurring may allow this perception to influence their awareness and preparedness for disaster emergencies. This, however, does not imply that those who have no experience in disasters would have perceived lower risk perceptions. Another contributing factor might be the low number of subjects who undertook self-directed learning. The number of PHNs in this study who "sometimes" developed their own competencies regarding disaster management accounted for only 50-75% of the total participants. Thus, PHNs should gain more knowledge regarding disasters and emergencies (Hammad et al., 2010) in order to enhance their self-preparedness for future disaster occurrences (Burstein, 2006). This is because appropriate disaster preparedness will determine their successfulness in responding to and recovering from disastrous events (Rowney & Barton, 2005).

In the PHNPP-DMQ, the lowest mean scores were found for items 2, 3, 4, 19, and 21 (Table 9). The low mean scores for items 2 (57.7%, M=2.32) and 3 (58.1%, M=2.33) indicated that most of the subjects in this study were not confident in the sufficiency of their inter-agency collaboration skills regarding disaster preparedness. Moreover, the lack of perceived ability to practice regarding "addressing the national organization that is responsible to act during a disaster event"

might be derived from their lack of opportunity to attend training and education related to disasters. Initially, PHNs should be able to recognize the organizational structure in disaster responses (e.g., system, policy, planning, command structure/hierarchy, and communications) (INCMCE, 2003) in order to enhance the collaborative work of healthcare providers during a disaster response.

In addition, the low mean score for item 3 regarding "lead the discussion and annual assembly between your own institution and the community stakeholders" could be due to the fact that the PHNs in this study were more concerned about their roles and responsibilities in providing direct health services to their communities (UI, 2009). Also, they might have thought that this practice was the responsibility of a nurse manager/coordinator only. Furthermore, since the researcher did not take into account the PHNs' positions in the PHCs, the hierarchical status could be an important factor that influenced their low perceived ability to practice in this area.

A high percentage of the subjects of this study correctly answered questions 4 (84%) and 9 (85%) regarding "type of earthquake that is associated with tsunamis" and "the common natural disasters in Aceh," respectively. However, they perceived their abilities to be inadequate to address "additional potential hazards and disasters around their working areas," as noted from the low mean score for item 4 (60.7%). This poses certain questions regarding the PHNs' ability to recognize the signs of impending disasters.

Previously, the risk identification of disaster skill has been highlighted as necessary for community safety (Reissman & Howard, 2008). A study conducted by De Felice et al. (2008) also noted that insufficient knowledge among nurses will

lead to their inadequate performance in managing bioterrorism risks. As Indonesia is a country that is prone to frequent natural disasters (Her, 2010), this skill is very important for people in Aceh, in particular healthcare providers, who are most likely to have to deal with some form of catastrophic event. Identifying the risk of hazards and disasters is therefore an important step in order to develop strategies to diminish the impact of disaster occurrences (Manitoba Health, 2000).

Low mean scores were also found regarding risk communication skills, addressed by item 19 (65.5%, M=2.62) and item 21 (67.5%, M=2.70). According to Gebbie and Qureshi (2002), the lack of skill in using a communication plan and associated equipment will contribute to failure in implementing the plan and collaborating on actions during a disaster. The findings of this study might be due to the unfamiliarity of the PHNs with advanced technology devices such as fax machines, two-way radios, Blackberry devices, electronic mail, laptop computers, and satellite phones, as well as their unfamiliarity with how to operate them. Accordingly, communication is classified as one of the greatest barriers for healthcare providers during a catastrophe event (O'Boyle et al., 2006; Qureshi et al., 2005). Phillips and Lavin (as cited in Veenema, 2006) also reported that in the aftermath of the World Trade Center disaster, nurses were eager to offer assistance but many of them lacked proper training in communicating with disaster management teams and the specific skills necessary for dealing with the victims and their families (Veenema).

In contrast, the PHNs' had a higher perceived ability in the recovery phase, followed by the response phase. This can be seen from the high mean scores for the five items in the PHNPP-DMQ (Table 9). The first item with a high mean score was about the concepts of sterilizing techniques and contamination (90.1%,

M=3.61). This principle is fundamental to nursing, as it is used in everyday nursing care in clinical practice, so that may be the reason for the high score for perceived ability to practice for this skill. The nurses' capabilities in this skill were important and useful for protecting them from unknown infections that are commonly transmitted through the air-borne and injured sites (Mitani et al., 2003). Thus, their high perceived ability with this skill will help these nurses when working with limited resources and under stressful conditions (Rebmann, English, & Carrico, 2007). Consequently, their ability to control infections contributed to their high scores for the following items: "to prevent and limit infectious disease transmission" and "to promote good hygiene practice." This is proven by their high mean scores for items 29 (83.6%, M=3.35) and 30 (85.2%, M=3.41). Beyond their main responsibility to deliver physical, emotional, and psychological support during and after a disaster event (Secor-Turner & O'Boyle, 2006), PHNs are also responsible to conduct health education or promotions related to infectious diseases by partnering with their community (Rebmann et al.; Rogers & Lawhorn, 2007). The health educational programs, such as hand hygiene products/facilities, sanitation, and outbreaks of unusual infectious diseases were all classified as critical factors for preventing secondary disease transmission in overcrowded places, such as shelters (Rebmann, Carrico, & English, 2008).

High mean scores were found for life saving and stabilization skills (items 14 & 15). According to Kalb et al. (2006) and Rogers and Lawhorn (2007), good performance from PHNs in stabilizing victims' conditions during the response phase depends on their basic life support and first aid skills. Hence, the PHNs' responsibility in providing healthcare services, such as physical assessments and basic

medical treatments, in their clinical practice is considered something which contributes to their high perceived ability with this skill (UI, 2009).

Overall, the factors which contributed to the PHNs' level of perceived ability to practice were similar to those which contributed to their level of knowledge. These factors were examined to determine the relationships with the PHNs' perceived ability to practice scores. Here, it was found that greater working experience, disaster experience, nursing education, training and education, and knowledge were all congruent with higher levels of perceived ability to practice (Figure 8-12). , Whereas, PHNs who worked in suburban/rural areas had a higher level of perceived ability to practice (Figure 7, Appendix F) than their urban colleagues.

Firstly, the fact that their perceived ability to practice regarding disaster management was at a moderate level might be due to the subjects' working area. The data showed that more than one-third of the subjects in this study worked in suburban/rural areas (40.9%). Although there was no significant difference between the PHNs in urban areas and those in suburban/rural areas, it was noted that nurses who worked in rural areas had higher perceptions of their ability to practice regarding disaster management (Figure 7, Appendix F). Similarly, a study conducted by Bigbee, Gehrke, and Otterness (2009) found that PHNs who worked in rural areas were more competent than PHNs in urban areas. They had higher perceived competencies related to the community dimensions of practice skills. The findings of this study contradict the opinion that rural nurses are less skilled than urban nurses because they lack proper educational preparation in public health nursing (Bigbee et al., 2010). In fact, the subjects who worked in suburban/rural areas in Aceh had higher perceptions of their ability to practice regarding disaster management. As with the PHNs'

knowledge, the dissimilarity of the subjects who worked in urban and suburban/rural areas may have resulted in a potential sampling bias which could have affected the findings regarding the PHNs' perceived ability to practice regarding disaster management. Therefore, in future studies on PHNs' practices, it is recommended that the researchers include equal numbers of subjects from each of the two areas.

In this study, work experience in clinical settings was also considered to be a contibuting factor to the moderate level of perceived ability to practice regarding disaster management that was found. As noted, more than one-third of the subjects (42.1%) had less than five years of public health nursing work experience. Although the significance of the relationship between work experience and the PHNs' perceived ability to practice was rather low (Figure 8, Appendix F), it did indicate a trend where subjects with longer durations of work experience in clinical practice had higher levels of perceived ability to practice regarding disaster management.

The previous studies found a relationship between duration of work experience and level of performance in nursing clinical practice (Arbon, 2004; Bjørk & Kirkevold, 1999; Chan, 2007). According to Arbon, individual experience in clinical practice made nurses more able to accomplish their roles competently. In the nursing profession, nurses with greater work experience are considered to be more capable in applying their own knowledge, skills, and attitudes (Chan) than their less experienced colleagues, so they are subject to high expectations of efficiency and mastery when performing their professional duties (Bjørk & Kirkevold). From this, it can be stated that experience in clinical settings will provide advantages for PHNs in identifying the potential health problems of disaster victims and in improving the PHNs' confidence when responding to disaster occurrences (Gebbie & Qureshi,

2002). Relevantly, Akins et al. (2005) conducted a study in which they sought to monitor the ability of PHNs to participate in bioterrorism preparedness and disease surveillance; they found that nurses who had a minimum of clinical skills could improve their own skills by doing work in their communities. Dedication to community service is a factor which will help nurses to improve their own clinical competencies in public health nursing areas. This will enhance PHNs' self-preparedness regarding disaster management (Akins et al.).

Experience in assisting disaster victims may also influence the level of a PHN's perceived ability to practice. The findings of this study showed that more than half of the subjects (55.2%) were inexperienced, and the findings revealed statistically significant differences between the experienced and inexperienced subjects in terms of their perceived ability to assist disaster victims (Figure 9, Appendix F). Similarly, Maulidar (2011) also found that the level of perceived skill in tsunami disaster nursing was higher among subjects in tsunami-affected areas than in non-affected areas. This might be due the fact that all the subjects in the affected areas had direct experience with earthquakes and tsunamis in Aceh previously. According to Arbon et al. (2006), previous disaster experience will help nurses to adjust their use of limited resources during a disaster event. Also, it can enhance the nurses' awareness of disaster skills and practices and can increase their confidence during disaster events (Duong, 2009). Moreover, past experience in assisting disaster victims will help nurses to be more prepared for and aware of disaster impacts and consequences (Mitani et al., 2003; O'Sullivan et al., 2008; Suserud & Haljamäe, 1997). Also, previous experience enhances the perceived autonomy of PHNs to make decisions, as they feel fairly independent and competent (De Felice et al., 2008); their

experience diminishes their feelings of inadequacy and fear in the face of an unknown situation (Hammad et al., 2010).

In this study, the level of nursing education might have been an influence on both the knowledge and perceived ability to practice of the PHNs regarding disaster management. As mentioned previously, the majority of the subjects studied at the diploma level (89.7%), whereas the overall number of diploma nurses in Indonesia was only 39% (Shields & Hartati, 2003). Since 1997, the nursing diploma has been classified as the lowest educational rank in the nursing profession in Indonesia (Saha, 2006). This educational background might have lowered the level of perceived ability to practice regarding disaster management among the subjects in this study. It was also found that there was a significant difference among diploma and bachelor's degree nurses in terms of their perceived ability to practice regarding disaster management (Figure 10, Appendix F).

The moderate level of the PHNs' perceived ability to practice might be due to the fact that diploma nurses constituted the majority of the subjects. This educational background is still considered lack of clinical experience and nursing competencies that the PHNs had (Carlisle et al., 1999), and their degree of knowledge regarding common healthcare issues (Hennessy et al., 2006). Certainly, a higher educational level was considered to positively influence the nurses' clinical skills and practices (Chan, 2009). For this reason, all nurses are highly advised to improve their educational backgrounds in order to expand their professional competencies, as well as their personal and professional values (Crooks et al., 2005). Higher education is important for developing more knowledgeable and experienced nurses who are better equipped and trained in disaster management (O'Sullivan et al., 2008).

Training and education is considered one of the contributing factors which enhances a nurse's ability, in general (Gould, Berridge, & Kelly, 2007). It was certainly considered to be one of the factors that influenced the PHNs' perceived ability to practice in this study. The data showed that more than half of the subjects (54.8%) never attended a disaster training and education course, and attendance at such a course was found to be significantly associated with an improvement in the level of the PHNs' perceived ability to practice regarding disaster management (Figure 11, Appendix F). Similarly, a study conducted by Evers and Puzniak (2005) also found that nurses who lacked disaster training and education seemed to have a lower perception of their ability to perform the skills that should be performed during a bioterrorism attack.

The previous studies addressed the importance of this factor in improving nurses' skills and disaster preparedness (Duong, 2009; Gould et al., 2007; Hsu et al., 2004; Husna, Hattakit, & Chaowalit, 2011). A study conducted by Fung et al. (2008) also found that almost all nurses (97%) perceived themselves to be inadequately prepared for disastrous events due to a lack of training and education related to disasters. A systematic review on the effectiveness of disaster training for health workers by Williams et al. (2008) also clarified these statements. Regular training, particularly related to disasters and emergencies, is recommended for nurses to improve their own practice in clinical settings (Husna et al.) and to help them better perform their current roles, functions, and competencies when managing disasters (Gould et al.). Also, this training will be useful in addressing their individual limitations in order to develop their awareness and decision-making processes. Furthermore, it will help to improve information systems; develop standard

operational procedures for inexperienced nurses; limit inaccuracies in treatment, triage, and documentation; and avoid the problem of insufficient training and resource shortages during future disaster events (Edwards et al., 2006; Henderson et al., 2001).

In this study, the moderate level of the PHNs' perceived ability to practice may be due to their individual knowledge regarding disaster management. There is a small but significant relationship between the PHNs' knowledge and their perceived ability to practice regarding disaster management (Figure 12, Appendix F). This finding is not surprising, as people who have knowledge would naturally be better prepared to practice disaster management (Mitani et al., 2003; Rebmann et al., 2007; Sturgeon, 2008). Husna (2010), who examined the correlation between the knowledge and perceived skills of nurses who worked in hospitals in tsunami-affected areas, also found that knowledge was significantly positive correlated with they perceived skills regarding tsunami care.

When faced with unpredicted situations such as emergencies and disaster events, nurses must possess the essential scientific and technical skills to provide adequate physical and emotional support to the victims (Sturgeon, 2008), make immediate and effective decisions, and protect facilities and resources (Hsu et al., 2006). A study conducted by Mitani et al. (2003) found that only sixty-nine nurses (15%) participated in disaster victim care efforts during the Hanshin-Awaji Earthquake event in Japan because the rest of the participants were not familiar with disaster management. The lack of knowledge among nurses regarding preparedness and their disaster plan will lead to inadequate performance by healthcare providers in caring for disaster victims. Therefore, PHNs need to expand their disaster

management knowledge in order to diminish such unexpected problems (Rebmann et al., 2007).

In summary, the findings of this study showed that the PHNs' level of knowledge (n=107, 42.5%) and perceived ability to practice were both at a moderate level (n=96, 38.1%). Some factors which might have contributed to this included working area, working experience, previous disaster experience, educational background, and disaster training and education attendance.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

This descriptive survey study was conducted to identify the level of the PHNs' knowledge and perceived ability to practice regarding disaster management; it was conducted at twenty-seven PHCs in eleven districts and municipalities. There were 252 subjects who participated in this study. The subjects were requested to complete a set of three questionnaires: (1) a Demographic Data Questionnaire, (2) a Public Health Nurses' Knowledge Regarding Disaster Management Questionnaire, and (3) a Public Health Nurses' Perceived Ability to Practice Regarding Disaster Management Questionnaire. Before data collection was conducted, these instruments were evaluated for content validity by three experts from the Faculty of Nursing, Prince of Songkla University, Thailand. These evaluations were followed by a reliability to seek the internal consistency of the instruments. The KR-20 coefficient of the PHNK-DMQ was .70, and the Cronbach's alpha coefficient of the PHNPP-DMQ was .92. The data were collected during November and December of 2010. They were analyzed by using frequencies, percentages, means, standard deviations, and minimum and maximum scores. Additional analyses were performed to identify potential contributing factors to the PHNs' knowledge and perceived ability to practice regarding disaster management by using the Spearman Rank correlation (r_s) and the Mann-Whitney U test.

Summary of the Study Findings

There were 252 PHNs who participated in this study. Their mean age was 30 years. There were more females (79.8%) than males, and around three-fourths of the subjects were married (69.8%). Nearly half of the subjects had less than five years of work experience (42.1%), with the mean being 7.25 years. The majority of them (89.7%) were educated at the diploma level. Also, more than half of the subjects (55.2%) did not have experience in assisting disaster victims. With regard to disaster training and education, more than half of the subjects (54.8%) had not received any. Regarding the PHNs' preparation methods, they reported that sometimes attended seminars and conferences (49.6%), searched for information on the Internet (53.2%), or read books related to disaster nursing (74.6%).

Overall, the PHNs' knowledge of disaster management was at a moderate level (n=42.5%, M=70.73%, SD=8.41). In addition, this study showed that the subjects needed to improve their own knowledge in certain areas, including disaster preparedness; knowledge of BLS, disaster triage, and technical skills; and health promotion skills for sheltered populations.

This study also found that the PHNs' perceived ability to practice regarding disaster management was at a moderate level (n=38.1%, M=74.57%, SD=13.27). It is suggested that subjects in this study improve themselves in some areas, including inter-agency collaboration, identification of potential disasters or hazards, and risk communication in emergency and disaster situations.

Strengths and Limitations of the Study

The samples from 11 districts and municipalities in Aceh province provided an overall picture of the PHNs' knowledge and perceived ability to practice regarding

disaster management. However, some limitations should be addressed. Firstly, the majority of PHNs in the present study were female, which makes the findings less generalizable to male nurses. Concerning the instruments, the True/False format of the knowledge questionnaire offers a 50% chance of error, and some subjects may have filled out the questionnaire without thoughtful consideration. This study used a single method for data collection, a self report. This method has limitations when it is used for measuring human actions or performances. There is a trend toward social desirability of actions when responding to this kind of self-reporting questionnaire. Moreover, the contents of existing training courses/programs related to disaster competencies offered to PHNs in Aceh have never been disclosed publicly. There is no way to assess whether they are adequate to prepare the PHNs working at the PHCs, particularly those in the areas at high risk for disasters.

Recommendations

Nursing administration

The low level of knowledge for the response phase must be taken into detailed consideration for the purpose of improving the PHNs' working in the PHCs in Aceh province. Specifically, educational training together with disaster drills regarding basic and life support, disaster triage, and disaster-risk communication should be given on a regular basis (at least once or twice a year). However, this study did not look into the details of the contents of the training programs which some subjects had received. It is recommended that the existing training programs be further explored, and that the training outcomes be evaluated. Then, along with the findings of this study, more effective training programs can be established.

In addition, this study found that PHNs working in suburban/rural areas may have limited accessibility to continuing education, specifically disaster management training. Hence, provision must be made to include such PHNs in future action plans.

Nursing education

As mentioned previously, the moderate level of knowledge and perceived ability to practice among the PHNs in Aceh should be addressed by the integration of appropriate disaster content into basic nursing education. It also should be a reason to develop a specific disaster nursing curriculum as an integral part of public health nursing courses in order to increase disaster awareness among both nurse educators and nursing students. It will also contribute to increasing the knowledge and skill of future nurses who may face disaster occurrences. In addition, nurse educators should collaborate with nurse administrators in providing on-going, in-service disaster training.

Nursing research

The limitations of the True/False question format during data collection should be taken into consideration, and future studies should revise the knowledge questionnaire to put it into a multiple-choice format. Also, further validity and reliability testing of the questionnaires by experts in Indonesia is recommended in order to gain a better understanding of the public healthcare context of Aceh, Indonesia. Also, the proportion between general and specific competency statements regarding disaster management in each disaster phase should be equally distributed to reduce potential sampling bias in the results.

REFERENCES

Adams, L. M. (2008). Comprehensive vulnerability management: The toad to effective disaster planning with the community. *The Journal of Theory Construction & Testing, 12*, 25-27.

Ahmadi. (2010). No deaths in Indonesia quake; Tsunami alert lifted. Retrieved April 13, 2010, from http://www.reuters.com/article/idUSTRE6355GD20100407?

Akins, R. B., Williams, J. R., Silenas, R., & Edwards, J. C. (2005). The role of public health nurses in bioterrorism preparedness. *Disaster Management & Response, 3*, 98-105.

American Public Health Association. (1996). The definition and role of public health nursing. Retrieved November 28, 2009, from http://www.apha.org/member groups/sections/aphasections/phn/about/

Arbon, P. (2004). Understanding experience in nursing. *Journal of Clinical Nursing, 13*, 150-57.

Arbon, P., Bobrowski, C., Zeitz, K., Hooper, C., Williams, J., & Thitchener, J. (2006). Australian nurses volunteering for the Sumatra-Andaman earthquake and tsunami of 2004: A review of experience and analysis of data collected by the Tsunami Volunteer Hotline. *Australasian Emergency Nursing Journal, 9*, 171-78.

Aryono, A. M. (2009). 2006-2008, 540 natural disasters occurred in Aceh. Retrieved August 7, 2010, from http://www.solopos.com/2009/channel/nasional/2006-2008-540-bencana-alam-terjadi-di-aceh-809

Asosiasi Institusi Pendidikan Ners Indonesia [AIPNI]. (2008). Nursing curriculum. Retrieved January 11, 2011, from http://aipni.blogspot.com/p/nursing-curriculum.html

Association of State and Territorial Directors of Nursing [ATSDN]. (2002). Public health nurses' vital role in emergency preparedness & response. Retrieved 2009, July 20, from www.astdn.org/publication_nurses_preparedness_disaster.htm

Baker, M. S. (2007). Creating order from chaos: Part I: Triage, initial care, and tactical considerations in mass casualty and disaster response. *Military Medicine, 172*, 232-36.

Barnett, D. J., Balicer, R. D., Blodgett, D., Fews, A. L., Parker, C. L., & Links, J. M. (2005). The application of the Haddon Matrix to public health readiness and response planning. *Environmental Health Perspectives, 113*, 561-66.

Bigbee, J. L., Gehrke, P., & Otterness, N. (2009). Public health nurses in a rural/frontier one-nurse offices. *Rural and Remote Health, 9*, 1-12.

Bigbee, J. L., Otterness, N., & Gehrke, P. (2010). Public health nursing competency in a rural/frontier state. *Public Health Nursing, 27*, 270-76.

Bjørk, I. T., & Kirkevold, M. (1999). Issues in nurses' practical skill development in the clinical setting. *Journal of Nursing Care Quality, 14*, 72-84.

Boatright, C., & McGlown, K. J. (2005). Homeland security challenges in nursing practice. *Nursing Clinic of North America, 40*, 481-97.

Brislin, R. W. (1970). Back-translation for cross-cultural research. *Journal of Cross-cultural Psychology, 1*, 185-216.

Burns, N., & Grove, S. K. (2005). *The Practice of Nursing Research: Conduct, Critique,and Utilization* (5th ed.). St. Louis, Missouri: Elsevier Saunders.

Burstein, J. L. (2006). The myths of disaster education. *Annals of Emergency Medicine, 47*, 50-52.

Carey, M. P., Morrison-Beedy, D., & Johnson, B. T. (1997). The HIV-Knowledge questionnaire: Development and evaluation of a reliable, valid, and practical self-administered questionnaire. *AIDS and Behavior, 1*, 61-74.

Carlisle, C., Luker, K. A., Davies, C., Stilwell, J., & Wilson, R. (1999). Skills competency in nurse education: Nurse managers' perceptions of diploma level preparation. *Journal of Advanced Nursing, 29*, 1256-64.

Chan, M. F. (2007). A cluster analysis to investigating nurses' knowledge, attitudes, and skills regarding the clinical management system. *Computers Informatics Nursing, 25*, 45-54.

Chan, M. F. (2009). Factors affecting knowledge, attitudes, and skills levels for nursing staff toward the clinical management system in Hong Kong. *Computers Informatics Nursing, 27*, 57-65

Chapman, K., & Arbon, P. (2008). Are nurses ready? Disaster preparedness in the acute setting. *Australasian Emergency Nursing Journal, 11*, 135-44.

Clark, M. J. (2008). *Community health nursing* (5th ed. Vol. 2). New Jersey: Pearson Prentice Hall.

Cole, F. L. (2005). The role of the nurse practitioner in disaster planning and response. *Nursing Clinics of North America, 40*, 511-21.

Coyle, G., Sapnas, K. G., & Ward-Presson, K. (2007). Dealing with disaster. *Nursing Management, 38*, 24-30.

Crooks, D., Carpio, B., Brown, B., Black, M., O'Mara, L., & Noesgaard, C. (2005). Development of professional confidence by post diploma baccalaureate nursing students. *Nurse Education in Practice, 5*, 360-67.

Davies, K. (2005). Disaster preparedness and response: More than major incident initiation. *British Journal of Nursing, 14*, 868-71.

De Felice, M., Giuliani, A. R., Alfonsi, G., Mosca, G., & Fabiani, L. (2008). Survey of nursing knowledge on bioterrorism. *International Emergency Nursing, 16*, 101-08.

Dinas Kesehatan Aceh. (2009). *Profil Kesehatan Provinsi Aceh Tahun 2009*. (Aceh Provincial Health Profile 2009). Banda Aceh.

Duong, K. (2009). Disaster education and training of emergency nurses in South Australia. *Australasian Emergency Nursing Journal, 12*, 86-92.

Durham, J. C. H. (2008). Surge capacity of public health nurses. *Journal Compilation, 25*, 293-94.

Dyer, C. B., Regev, M., Burnett, J., Festa, N., & Cloyd, B. (2008). SWiFT: A Rapid Triage Tool for Vulnerable Older Adults in Disaster Situations. *Disaster Medicine and Public Health Preparedness, 2*, S45-50.

Edwards, N. A., Caldicott, D. G. E., Eliseo, T., & Pearce, A. (2006). Truth hurts – hard lessons from Australia's largest mass casualty exercise with contaminated patients. *Emergency Medicine Australasia, 18*, 185-95.

Eisenman, D. P., Cordasco, K. M., Asch, S., Golden, J. F., & Glik, D. (2007). Disaster planning and risk communication with vulnerable communities: Lessons from Hurricane Katrina. *American Journal of Public Health, 97*, S109-S15.

Evers, S., & Puzniak, L. (2005). Bioterrorism knowledge and emergency preparedness among school nurses. *Journal of School Health, 75*, 232-37.

Fritsch, K., & Zang, Y. (2009). The asia pasific emergency and disaster nursing network: Promoting the safety and resilience of communities. *Southeast Asian Journal of Tropical Medicine Public Health, 40*, 71-78.

Fung, O. W. M., Loke, A. Y., & Lai, C. K. Y. (2008). Disaster preparedness among Hongkong nurses. *Journal of Advanced Nursing, 62*, 698-703.

Garner, A., Lee, A., Harrison, K., & Schultz, C. H. (2001). Comparative analysis of multiple-casualty incident triage algorithms. *Annals of Emergency Medicine, 38*, 541-48.

Gebbie, K. M., & Qureshi, K. (2002). Emergency and disaster preparedness: Core competencies for nurses: What every nurse should but may not know. *The American Journal of Nursing, 102*, 46-51.

Gerdtz, M. F., & Bucknall, T. K. (2001). Triage nurses' clinical decision making. An observational study of urgency assessment. *Journal of Advanced Nursing, 35*, 550-61.

Gerrish, K., & Griffith, V. (2004). Integration of overseas Registered Nurses: Evaluation of an adaptation programme. *Journal of Advanced Nursing, 45*, 579-87.

Gilboy, I., Tanabe, P., Travers, D. A., Rosenau, A. M., & Eitel, D. R. (2005). *Emergency severity index, version 4: implementation handbook.* Retrieved from http://www.ahrq.gov/research/esi/esihandbk.pdf.

Gould, D., Berridge, E.-J., & Kelly, D. (2007). The national health service knowledge and skills framework and its implications for continuing professional development in nursing. *Nurse Education Today, 27*, 26-34.

Halpern, J. S., & Chaffee, M. W. (2005). Preface: Disaster management and response. *Nursing Clinics of North America, 40*, xiii-xv.

Hammad, K. S., Arbon, P., & Gebbie, K. M. (2010). Emergency nurses and disaster response: An exploration of South Australian emergency nurses' knowledge and perceptions of their roles in disaster response. *Australasian Emergency Nursing Journal, In Press, Corrected Proof*, 1-8.

Handley, A. J. (1997). Basic life support. *British Journal of Anaesthesia, 79*, 151-58.

Henderson, D. A., Inglesby, T. V., O'Toole, T., & Grossman, R. (2001). A plague on your city: Observations from TOPOFF. *Clinical Infectious Diseases, 32*, 436-45.

Hennessy, D., Hicks, C., Hilan, A., & Kawonal, Y. (2006). A methodology for assessing the professional development needs of nurses and midwives in Indonesia: paper 1 of 3. *Human Resources for Health, 4*, 1-8.

Her. (2010). Aceh diharap mampu kurangi risiko bencana. (Aceh should be able to reduce the risk of disaster) *Serambi Indonesia,* p. 1. Retrieved from http://www.serambinews.com/news/view/21765/aceh-diharap-mampu-kurangi-risiko-bencana

Hilton, C., & Allison, V. (2004). Disaster preparedness: An indictment for action by nursing educators *The Journal of Continuing Education in Nursing 35*, 59-65.

Hsu, E., Thomas, T., Bass, E., Whyne, D., Kelen, G., & Green, G. (2006). Healthcare worker competencies for disaster training. *BMC Medical Education, 6*, 1-9.

Hsu, E. B., Jenckes, M. W., Catlett, C. L., Robinson, K. A., Feuerstein, C., Cosgrove, S. E., et al. (2004). Effectiveness of hospital staff mass-casualty incident training methods: A systematic literature review. *Prehospital and Disaster Medicine, 19*, 191-200.

Husna, C. (2010). *Perceived clinical skills for tsunami care and its related factor.* Prince of Songkla University, Hatyai.

Husna, C., Hattakit, U., & Chaowalit, A. (2011). Emergency training, education, and perceived clinical skills for tsunami care among nurses in Banda Aceh, Indonesia. *Nurse Media Journal of Nursing, 1*, 75-86.

Ihlenfeld, J. T. (2003). A primer on triage and mass casualty events. *Dimensions of Critical Care Nursing, 22*, 204-07.

Indonesian Disaster. (2010). Natural disaster in Indonesia; Information page about natural disaster happened in Indonesia region and related link. Retrieved April 13, 2010, from http://indonesiandisaster.blogspot.com/

International Nursing Coalition for Mass Casualty Education [INCMCE]. (2003). Educational competencies for registered nurses to mass casualty incident. Retrieved October 15, 2009, from http://www.aacn.nche.ed/Education/pdr/INCMCECompetencies.pdf

Jakeway, C. C., LaRosa, G., Cary, A., & Schoenfisch, S. (2008). The role of public health nurses in emergency preparedness and response: A position paper of the association of state and territorial directors of nursing. *Public Health Nursing, 25*, 353-61.

Jennings-Sanders, A. (2004). Teaching disaster nursing by utilizing the Jennings disaster nursing management model. *Nurse Education in Practice, 4*, 69-76.

Jennings-Sanders, A., Frisch, N., & Wing, S. (2005). Nursing students' perceptions about disaster nursing. *Disaster Management & Response, 3*, 80-85.

Kahn, C. A., Schultz, C. H., Miller, K. T., & Anderson, C. L. (2009). Does START triage work? An outcomes assessment after a disaster. *Annals of Emergency Medicine, 54*, 424-30.

Kalb, K. B., Cherry, N. M., Kauzloric, J., Brender, A., Green, K., Miyagawa, L., et al. (2006). A competency-based approach to public health nursing performance appraisal. *Public Health Nursing, 23*, 115-38.

Kimmel, S. R., Burns, I. T., Wolfe, R. M., & Zimmerman, R. K. (2007). Addressing immunization barriers, benefits, and risks. *The Journal of Family Practice, 56*, S127-S35.

Kuntz, S. W., Frable, P., Qureshi, K., & Strong, L. L. (2008). Association of community health nursing educators: Disaster preparedness white paper for community/public health nursing educators. *Public Health Nursing, 25*, 362-69.

Lairet, J. R., & McManus, J. G. (2008). Triage. *Tactical emergency medicine* (pp. 94-99). Philadelphia: Lippincott Williams & Wilkins.

Lechat, M. F. (1979). Disasters and public health. Retrieved April 28, 2010, from http://desastres.unanleon.edu.ni/pdf2/2005/diciembre/pdf/eng/doc3628/doc3628-contenido.pdf

Lerner, E. B., Schwartz, R. B., Coule, P. L., Weinstein, E. S., Cone, D. C., Hunt, R. C., et al. (2008). Mass casualty triage: An evaluation of the data and development of a proposed national guideline. *Disaster Medicine and Public Health Preparedness 2*, S25-34.

Lia-Hoagberg, B., Schaffer, M., & Strohschein, S. (1999). Public health nursing practice guidelines: An evalution of dissemination and use. *Public Health Nursing, 16*, 397-404.

Liberman, M., Mulder, D., & Sampalis, J. (2000). Advanced or basic life support for trauma: Meta-analysis and critical review of the literature. *The Journal of Trauma, 49*, 584-99.

Lindell, M. K., & Prater, C. S. (2003). Assessing community impacts of natural disasters. *Natural Hazards Review, 4*, 176-85.

Magnussen, A. K., & Schafter, M. K. (1956). Nursing in disaster. *The American Journal of Nursing, 56*, 1290-92.

Manitoba Health. (2000). Disaster management model for the health sector, *Guideline for Program Development* (pp. 12): Manitoba Health.

Maulidar. (2010). *A comparative study of knowledge and perceived skills regarding tsunami disaster nursing during recovery phase between public health nurses working in tsunami affected and non-affected area in Aceh Province, Indonesia.* Prince of Songkla University, Hatyai.

McDonald, M. E. (2002). *Systemic assessment of learning outcomes: Developing multiple-choice exams*. Sudbury M A: Jones and Bartlett Publishers.

Melnyk, B. M., Fineout-Overholt, E., Fischbeck Feinstein, N., Li, H., Small, L., Wilcox, L., et al. (2004). Nurses' perceived knowledge, beliefs, skills, and needs regarding evidence-based practice: Implications for accelerating the paradigm shift. *Worldviews on Evidence-Based Nursing, 1*, 185-93.

Mitani, S., Kuboyama, K., & Shirakawa, T. (2003). Nursing in sudden onset disasters: Factors and information that affect participation. *Prehospital and Disaster Medicine, 18*, 359-66.

Morgan, O. W., Sribanditmongkol, P., Perera, C., Sulasmi, Y., Van Alphen, D., & Sondorp, E. (2006). Mass fatality management following the South Asian Tsunami disaster: Case studies in Thailand, Indonesia, and Sri Lanka. *PLoS Medicine, 3*, 0809-15.

Nazar, M. (2009). Aceh pioner pendidikan keperawatan bencana. (Aceh a pioner of disaster nursing education) Retrieved February 7, 2011, from http://koran.republika.co.id/berita/53667/Aceh_Pioner_Pendidikan_Keperawatan_Bencana

Nur, L. (2010). Gambaran kesiapsiagaan perawat puskesmas dalam manajemen bencana di puskesmas kasihan I Bantul, Yogyakarta. (Public health center preparedness in disaster management in Kasihan I Bantul, Yogyakarta). *Ilmu Keperawatan, 6*, Abstract.

O'Boyle, C., Robertson, C., & Secor-Turner, M. (2006). Public health emergencies: Nurses' recommendations for effective actions. *AAOHN Journal, 54*, 347-53.

O'Sullivan, T., Dow, D., Turner, M., Lemyre, L., Corneil, W., Krewski, D., et al. (2008). Disaster and emergency management: Canadian nurses' perceptions of preparedness on hospital front lines. *Prehospital and Disaster Medicine, 23*, s11-s18.

Polivka, B. J., Stanley, S. A. R., Gordon, D., Taulbee, K., Kieffer, G., & McCorkle, S. M. (2008). Public health nursing competencies for public health surge events. *Public Health Nursing, 25*, 159-65.

Prasartritha, T., Tungsiripat, R., & Warachit, P. (2008). The revisit of 2004 tsunami in Thailand: Characteristics of wounds. *International Wound Journal, 5*, 8-19.

Pryor, E. R. (2007). Surveilance System for Detection of Biological Event. In T. G. Veenema (Ed.), *Disaster Nursing and Emergency Preparedness for Chemical, Biological, and Radiological Terrorism and Other Hazard* (2nd ed., pp. 389-98). New York: Springer Publishing Company.

Pusdiknakes. (1999). Kurikulum yang berlaku secara nasional program diploma III keperawatan. (The national curriculum of diploma nursing). Retrieved March 15, 2011, from http://www.pusdiknakes.or.id/?show=data/kurikulum/kurikulum_akper

Putra, A., Petpichetchian, W., & Maneewat, K. (2011). Review: Public health nurses' roles and competencies in disaster management. *Nurse Media Journal of Nursing, 1*, 1-14.

Putro, D. (2007). Natural disaster: Floods and landslides struck Aceh. Retrieved August 7, 2010, from http://www.suarakarya-online.com/news.html?id=184897

Qureshi, K., & Gebbie, K. M. (2007). Disaster Management. In T. G. Veenema (Ed.), *Disaster Nursing and Emergency Preparedness for Chemical, Biological, and Radiological Terrorism and Other Hazard* (2nd ed., pp. 137-60). New York: Springer Publishing Company.

Qureshi, K., Gershon, R., Sherman, M., Straub, T., Gebbie, E., McCollum, M., et al. (2005). Health care workers' ability and willingness to report to duty during catastrophic disasters. *Journal of Urban Health, 82*, 378-88.

Rebmann, T., Carrico, R., & English, J. F. (2008). Lessons public health professionals learned from past disasters. *Public Health Nursing, 25*, 344-52.

Rebmann, T., English, J. F., & Carrico, R. (2007). Disaster preparedness lessons learned and future directions for education: Results from focus groups conducted at the 2006 APIC Conference. *American Journal of Infection Control, 35*, 374-81.

Reissman, D. B., & Howard, J. (2008). Responder safety and health: Preparing for future disasters. *Mount Sinai Journal of Medicine, 75*, 135-41.

Rofii, M. (2010). Community nursing Retrieved from http://staff.undip.ac.id/psikfk/muhammadrofii/2010/07/26/asuhan-keperawatan-komunitas/

Rogers, B., & Lawhorn, E. (2007). Disaster preparedness: Occupational and environmental health professionals' response to Hurricanes Katrina and Rita. *AAOHN Journal, 55*, 197-207.

Rothman, & Brown, L. M. (2007). The vulnerable geriatric casualty: Medical needs of frail older adults during disasters. *Generations, 31*, 16-20.

Rothman, Greenland, S., & Lash, T. L. (2008). *Modern Epidemiology* (3rd ed.). Philadelphia: Lippincott Williams & Wilkins.

Rowney, R., & Barton, G. (2005). The role of public health nursing in emmergency preparedness and response. *Nursing Clinics of North America, 40*, 499-509.

Saha, D. (2006). *Improving indonesian nursing students' self-directed learning readiness.* Queenland University of Technology, Queensland.

Santoso, D. Y. (2009). Role of the nurse in public health. Retrieved August 7, 2010, from http://maydwiyurisantoso.wordpress.com/peran-perawat-dalam-kesehatan-masyarakat/

Savage, C., & Kub, J. (2009). Public health and nursing: A natural partnership. *International Journal of Environmental Research and Public Health, 6*, 2843-48.

Schipper, L., & Pelling, M. (2006). Disaster risk, climate change and international development: scope for, and challenges to, integration. *Disasters, 30*, 19–38.

Secor-Turner, M., & O'Boyle, C. (2006). Nurses and emergency disasters: What is known. *American Journal of Infection Control, 34*, 414-20.

Shields, L., & Hartati, L. E. (2003). Nursing and health care in Indonesia. *Journal of Advanced Nursing, 44*, 209-16.

Singchangchai, P., Khampalikit, S., & Na-Sae, T. (1996). *Nursing research: Principle and process*. Songkhla: Tame Printing.

Smith, J. S. (2006). Disaster knowledge and preparedness affects all nurses: how can nurses prepare? *Virginia Nurses Today, 14*, 10.

Stanley, J. M. (2005). Disaster competency development and integration in nursing education. *Nursing Clinics of North America, 40*, 453-67.

Stanley, S. A. R., Polivka, B. J., Gordon, D., Taulbee, K., Kieffer, G., & McCorkle, S. M. (2008). The exploresurge trail guide and hiking workshop: Discipline-specific education for public health nurses. *Public Health Nursing, 25*, 166–75.

Sturgeon, D. (2008). Skills for caring: Valuing knowledge of applied science in nursing. *British Journal of Nursing, 17*, 322-25.

Supe, A., & Satoskar, R. (2008). Health services responses to disasters in mumbai: Sharing experiences. *Indian Journal of Medical Sciences, 62*, 242-51.

Suserud, B. O., & Haljamäe, H. (1997). Acting at a disaster site: Experiences expressed by Swedish nurses. *Journal of Advanced Nursing, 25*, 155-62.

Suserud, B. O., & Haljamäe, H. (1997). Role of nurses in pre-hospital emergency care. *Accidental and Emergency Nursing, 5*, 145-51.

Sztajnkrycer, M. D., Madsen, B. E., & Ba′ ez, A. A. (2006). Unstable ethical plateaus and disaster triage. *Emergency Medicine Clinic of North America, 24*, 749–68.

Tekeli-Yeşil, S. (2006). Public health and natural disasters: Disaster preparedness and response in health systems. *Journal of Public Health, 14*, 317-24.

Tempo. (2005). Country report Indonesia 2004. *Tempo*. Retrieved from http://www.adrc.asia/countryreport/IDN/2004/index.html

Tempo. (2008). Indonesia heading for disaster in 2050. *Tempo*. Retrieved from http://disasterindonesia.wordpress.com/category/earthquake/

The American Heritage. (2007). Competence. 6th ed. Retrieved November 29, 2009, from http://medical-dictionary.thefreedictionary.com/competencies

Universitas Indonesia [UI]. (2008). The faculty of nursing. Retrieved March 25, 2011 from http://www.ui.ac.id/en/academic/page/fik

Universitas Indonesia [UI]. (2009). Puskesmas: The primary health care system in Indonesia. Retrieved from http://repository.ui.ac.id/contents/koleksi/11/fb7c759299e54f5fab58d7f7415ef07368631a0c.pdf

van Kamp, I., van der Velden, P. G., Stellato, R. K., Roorda, J., van Loon, J., Kleber, R. J., et al. (2006). Physical and mental health shortly after a disaster: First results from the Enschede firework disaster study. *European Journal of Public Health, 16*, 252-58.

Veatch, R. M. (2005). Disaster preparedness and triage: Justice and the common good. *Mount Sinai Journal of Medicine, 72*, 236-41.

Veenema, T. G. (2006). Expanding educational opportunities in disaster response and emergency preparedness for nurses. *Nursing Education Perspectives, 27*, 93-99.

Veenema, T. G. (2007). *Disaster nursing and emergency preparedness*. New York: Springer.

Vogt, V., & Kulbok, P. A. (2008). Care of Client in Disaster Settings *Community Health Nursing: Advocacy for Population Health* (5th ed., Vol. 2, pp. 759-800). New Jersey: Pearson Prentice Hall.

Waring, S. C., & Brown, B. J. (2005). The threat of communicable diseases following natural disasters: A public health response. *Disaster Management & Response, 3*, 41-47.

Watson, J. T., Gayer, M., & Connolly, M. A. (2007). Epidemics after natural disasters. *Emerging Infectious Diseases, 13*, 1-5.

Wattanawaitunechai, C., Peacock, S. J., & Jitpratoom, P. (2005). Tsunami in Thailand. Disaster management in a district hospital. *The New England Journal of Medicine, 352*, 962-64.

Weiner, E., Irwin, M., Trangenstein, P., & Gordon, J. (2005). Emergency preparedness curriculum in nursing schools in the United States. *Nursing Education Perspectives, 26*, 334-39.

Wetta-Hall, R., Fredrickson, D. D., Ablah, E., Cook, D. J., & Molgaard, C. A. (2006). Knowing who your partners are: Terrorism-preparedness training for nurses. *The Journal of Continuing Education in Nursing, 37*, 106-12.

Williams, C. A., & Stanhope, M. (2008). Population-focused practice: The foundation of specialization in public health nursing. In M. Stanhope & J. Lancaster (Eds.), *Public health nursing: population-centered health care in community* (7th ed.). Philadelphia: Mosby Elsevier.

Williams, J., Nocera, M., & Casteel, C. (2008). The effectiveness of disaster training for health care workers: A systematic review. *Annals of Emergency Medicine, 52*, 211-22.

World Health Organization [WHO]. (2002). Government and people: Health and development challenge. April 6, 2011, from http://www.who.or.id/eng/strategy.asp?id=cs2

World Health Organization [WHO]. (2005). Guidelines on disaster management, *A compilation of expert guidelines on providing healthcare*. Sri Langka.

World Health Organization [WHO]. (2006). *The contribution of nursing and midwifery in emergencies*. Geneva.

World Health Organization [WHO]. (2007). Mass casualty management system: Strategies and guidelines for building health sector capacity (pp. 1-30). Geneva.

World Health Organization [WHO]. (2008). Integrating emergency preparedness and response into undergraduate nursing curricula. Retrieved from http://www.who.int/hac/publications/Nursing_curricula_followup_Feb08.pdf

Wynd, C. A. (2006). A proposed model for military disaster nursing. *The Online Journal of Issues in Nursing, 11*.

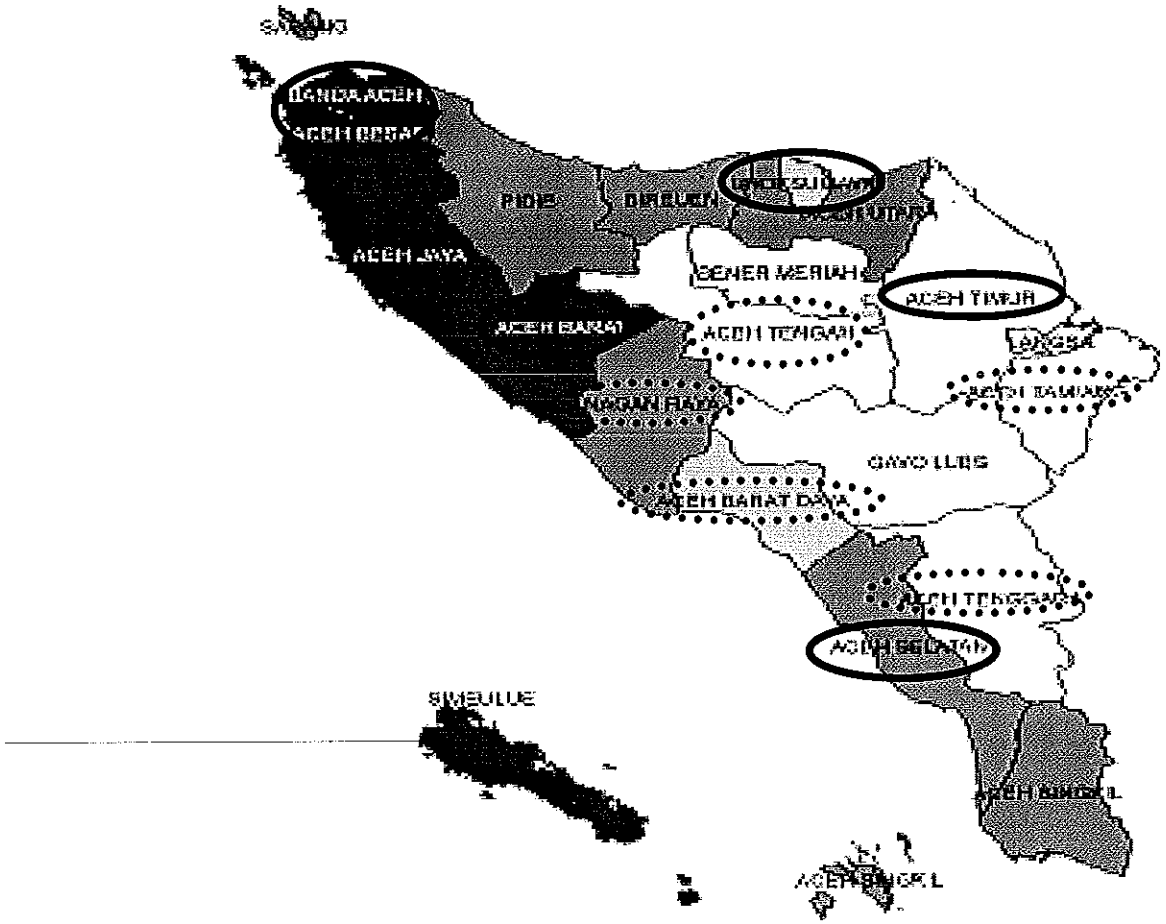
Yamamoto, A. (2006). Mid-term report on the project "Disaster nursing in a ubiquitous society" in the academic years 2003 and 2004. *Japan Journal of Nursing Science, 3*, 65-69.

Yamamoto, A. (2008). Education and research on disaster nursing in Japan. *Prehospital and Disaster Medicine, 23*, s6-s7.

APPENDICES

APPENDIX A

Geographic Location of Districts/Municipalities in Aceh Province



= Urban areas

= Suburban/Rural areas

APPENDIX B

Informed Consent Form

Study title: Knowledge and Perceived Ability to Practice in Disaster Management among Public Health Nurses in Aceh, Indonesia

My name is Ardia Putra; I am a master's student of the Faculty of Nursing, Prince of Songkla University, Thailand. I am also a nursing educator in Nursing School, Faculty of Medicine, Syiah Kuala University. I am now conducting a research, purposing to determine the level of knowledge and perceived ability to practices in disaster management among public health nurses in Aceh, Indonesia.

The study and its procedures have been approved by appropriate experts and the Institutional Review Board (IRB) of Prince of Songkla University, Thailand. I offer you to join in this research, and then you will be asked to complete the questionnaires within 20-40 minutes.

A code number is used so that your identity will not be discovered and I will keep your data in confidentially, so no one can know, read and open the data. Neither your name nor any identifying information will be used in the report of study, and finally, the questionnaire will be destroyed after completion of the study.

The information gathered will be used to write a research report, and it will help to enhance public health nursing care in disaster situation particular in the pre-hospital settings. It also will help to strengthen the disaster management program in term of facing natural disasters event for the nursing profession and beneficial for developing curricula related to disaster event for nursing education.

Your participation in this study is voluntary. There is no discomfort and risk to participate or not, and negative consequences to you. You also can withdraw from the research anytime if you want. Your signature in this form or only returning the completed questionnaire indicates that you understand and will participate in this research without pressure from anyone.

Date:.....

Participant Researcher

( ) ( )

If you have any inquire, please contact me or my thesis advisor (Assist. Prof. Dr. Wongchan Petpichetcian) at the following address:

Ardia Putra
School of Nursing,
Faculty of Medicine,
Syiah Kuala University
Darussalam B. Aceh
Cell phone: 08126976153

Assist. Prof. Dr. Wongchan Petpichetcian
Faculty of Nursing Prince of Songkla University
Hatyai, Thailand, 90112
Tel: +66-74-286513
Email: wongchan.p@psu.ac.th

APPENDIX C

Demographic Data Questionnaire (DDQ)

Code:.....

Date:.....

Instruction:

I would like to ask you some information regarding your personal data. Please answer by marking (✓) in the available space or filling in the blank that is appropriate for you.

1. Age: ..... years
2. Gender : 1 ( ) Male 2 ( ) Female
3. Marital status

   1 ( ) Single 2 ( ) Married 3 ( ) Widowed/Divorced
4. Working experience as PHN: .....years .....months
5. Educational background

   1 ( ) Diploma

   2 ( ) Bachelor
6. Experienced in assisting the disaster victim

   1 ( ) No

   2 ( ) Yes

APPENDIX D

Public Health Nurses' Knowledge Regarding Disaster Management Questionnaire (PHNK-DMQ)

This questionnaire is developed to measure public health nurses' knowledge regarding disaster management. Please read the following questions carefully and then answer each question by putting mark (✓) based on your own understanding regarding the disaster management.

No	Question	Answer	
		True	False
1	Public health nurses should recognize the emergency route for the community and directly informing the people about it	✓	
4	Public health nurses have responsibility to conduct case investigations and provide public health information regarding a disease outbreaks	✓	
5	As the persons who work in high-risk disaster area, public health nurses must participate in disaster drill and training that are specific to the PHN's geographical area	✓	
14	The principles on disaster triage is to deliver appropriate care for victim with the critical condition		✓
16	Victim with no spontaneous respiration after airway positioning is performed, he or she will be tagged with red color or "immediate priority"		✓

No	Question	Answer	
		True	False
18	Basic Life Support (BLS) includes stop bleeding, cardioversion, and breathing support		✓
26	Measles, hepatitis A, and tetanus vaccinations should be administered through intramuscular route		✓
30	The major cause of diarrhea following a natural disaster includes water source contamination, poor sanitation, and a crowded population in a shelter	✓	
33	The most powerful strategies to increase community disaster awareness after a disaster is to gain individual participation		✓
36	The prevention and delimiting of the transmission of infectious diseases among a sheltered population can be achieved by offering educational program related to hygiene practice, safe water and food, and safe water source	✓	

APPENDIX E

Public Health Nurses' Perceived Ability to Practice Regarding Disaster Management Questionnaire (PHNPP-DMQ)

Please read the following statement carefully and put a mark (✓) in the following columns that indicate your perceive ability to perform the regular practice for each competency based on the existing guidelines. Five possible options for each statement will indicate your perceived ability to practice level regarding disaster management including:

0 = Not able to practice this at all
1 = Hardly able to practice this
2 = Uncertain ability to practice this
3 = Able to practice this when following given instructions
4 = Able to practice this automatically

No	Statement	Perceived ability to practice				
		0	1	2	3	4
2	Identify the national organization or institution that is responsible to act during a disaster event					
3	Lead the discussion and annual assembly between your own institution and the community stakeholders					
4	Identify sources of potential hazards and disasters in your own district area, such as earthquakes, floods, etc.					
14	Perform cardiovascular assessment including vital signs and monitoring for signs of shock					
15	Perform integumentary assessment, particularly wound, burn and rash assessment					

No	Statement	Perceived ability to practice				
		0	1	2	3	4
19	Recognize the organizational command structure in emergency and disaster situations					
21	Report and send the information regarding disaster situation and resulting conditions in your own area through fax, email, and any other computer program					
24	Use standard personal protective equipment for infection control (e.g., gloves, gowns, and respiratory masks)					
29	Provide educational information to prevent and limit infectious disease transmission (water-borne, air-borne, food-borne and vector-borne diseases)					
30	Provide educational information to promote good hygienic practice, safe water and food consumption, safe water source and early seeking treatment behavior					

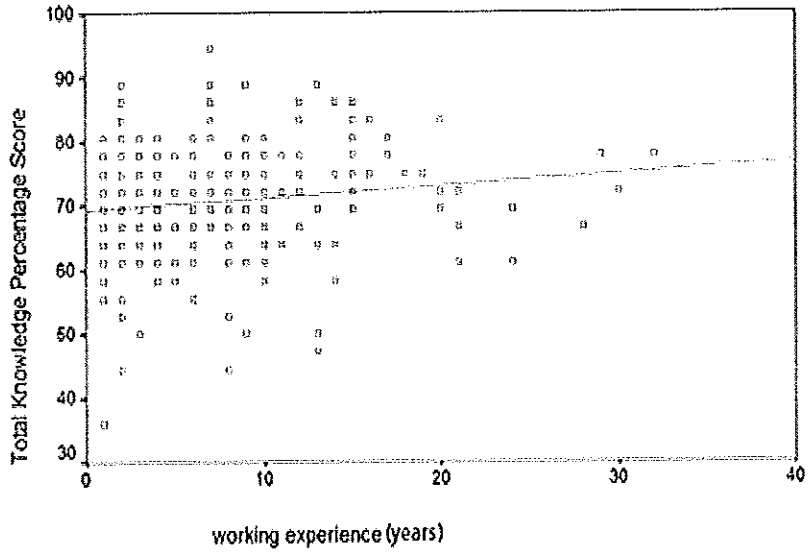
Additional reasons for some statement that you perceived "not able to practice this at all".

Statement Number	Reason

APPENDIX F

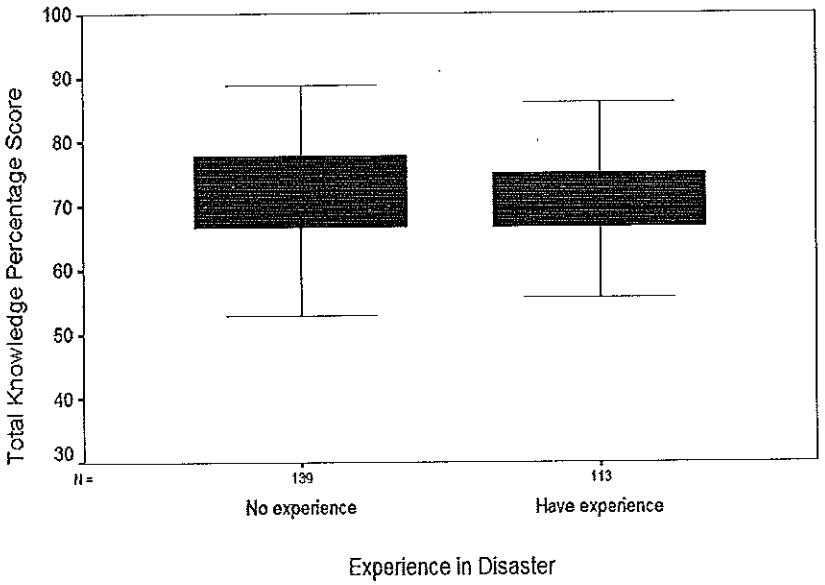
Factor Analysis to PHNs' Knowledge and Perceived Ability to Practice

PHNs' Knowledge Regarding Disaster Management



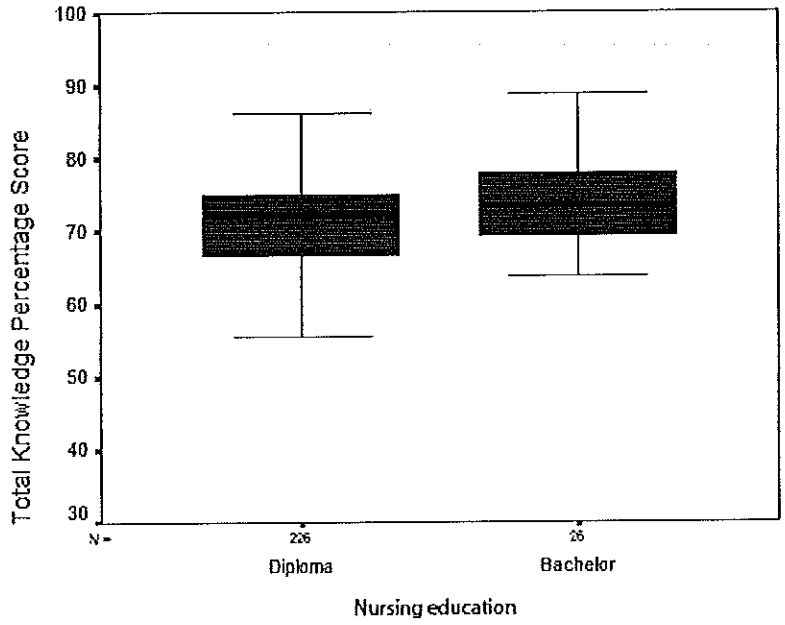
$r_s = .13$, $p = .039$

Figure 2 Scatter Plot Presentation between Working Experience and PHNs' Knowledge Regarding Disaster Management (Spearman Rank Correlation).



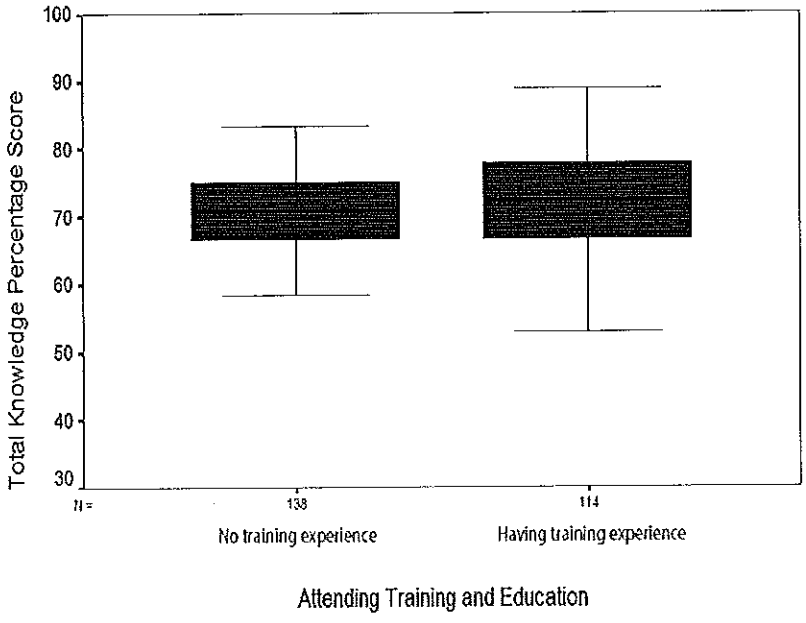
$Z = -1.17$, $p = .241$

Figure 3 Box Plot Presentation between Experience in Disaster and PHNs' Knowledge Regarding Disaster Management (Mann-Whitney U test).



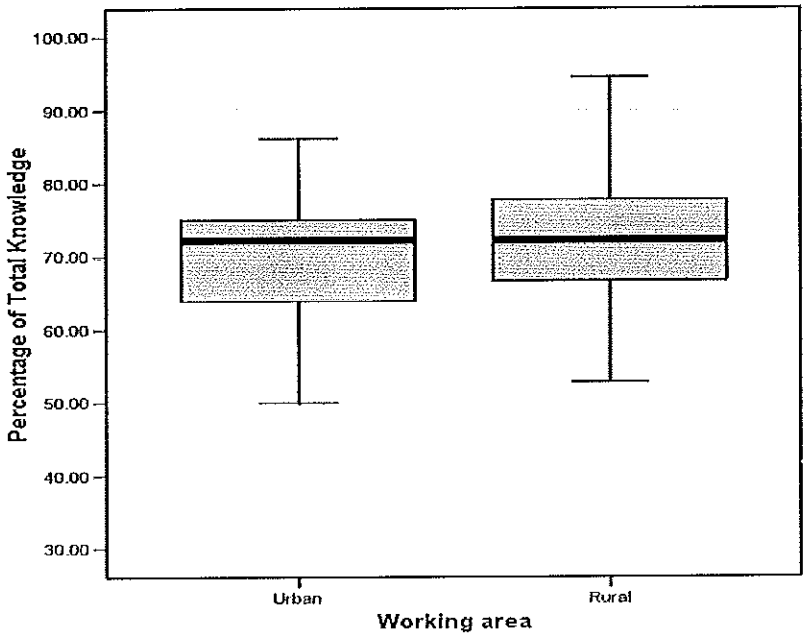
Z =-1.03, p =.054

Figure 4 Box Plot Presentation between Nursing Education and PHNs' Knowledge Regarding Disaster Management (Mann-Whitney U test).



Z =-1.93, p =.053

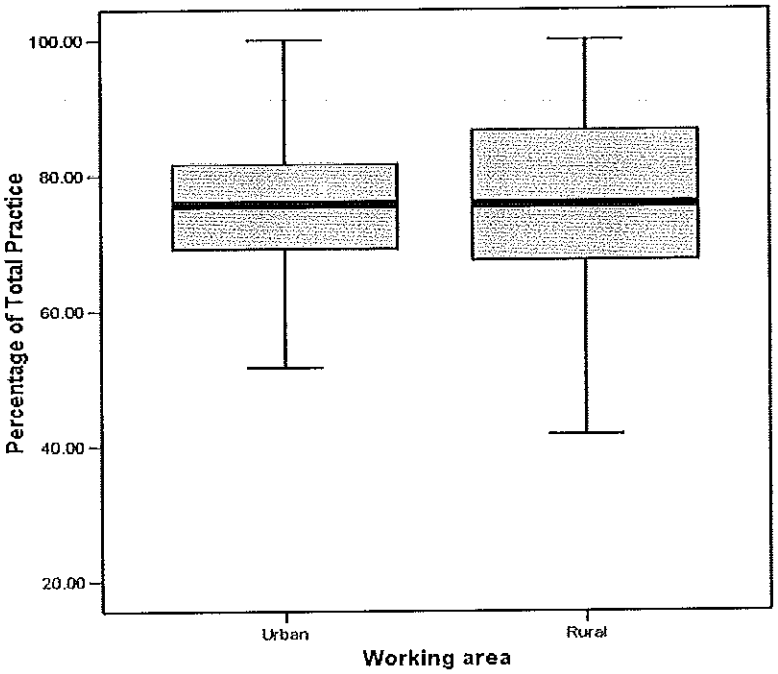
Figure 5 Box Plot Presentation between Attending Training and Education and PHNs' Knowledge Regarding Disaster Management (Mann-Whitney U test).



Z= -1.075, p= .282

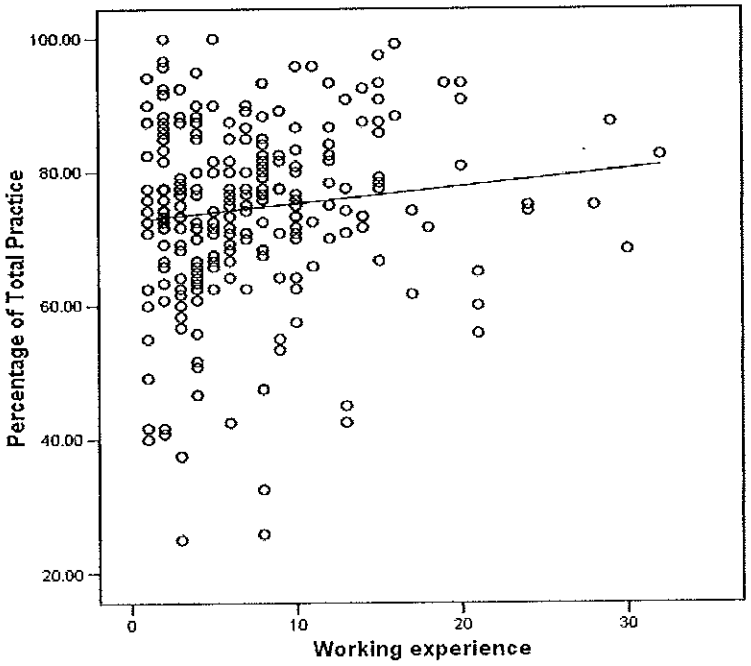
Figure 6 Box Plot Presentation between Working Area and PHNs' Knowledge Regarding Disaster Management (Mann-Whitney U test).

PHNs' Perceived Ability to Practice Regarding Disaster Management



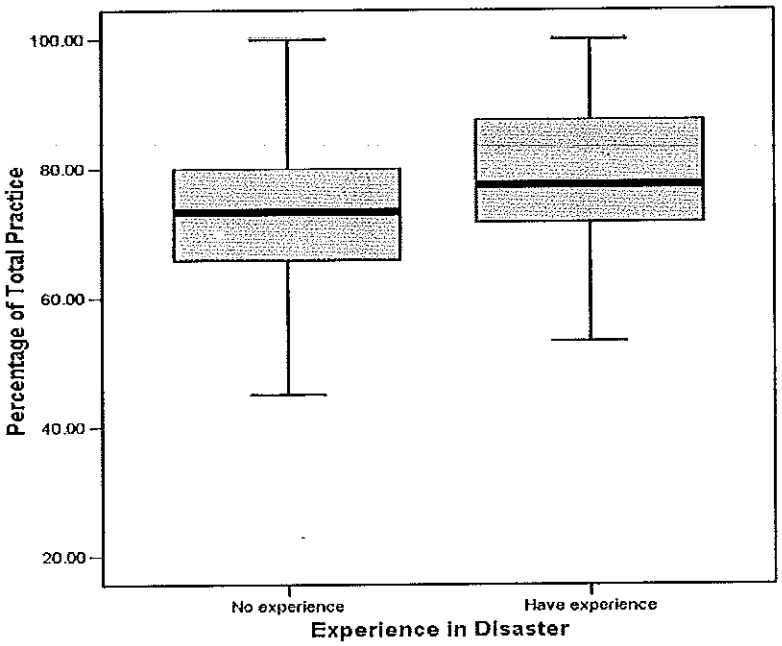
Z= -.746, p= .456

Figure 7 Box Plot Presentation between Working Area and PHNs' Perceived Ability to Practice Regarding Disaster Management (Mann-Whitney U test).



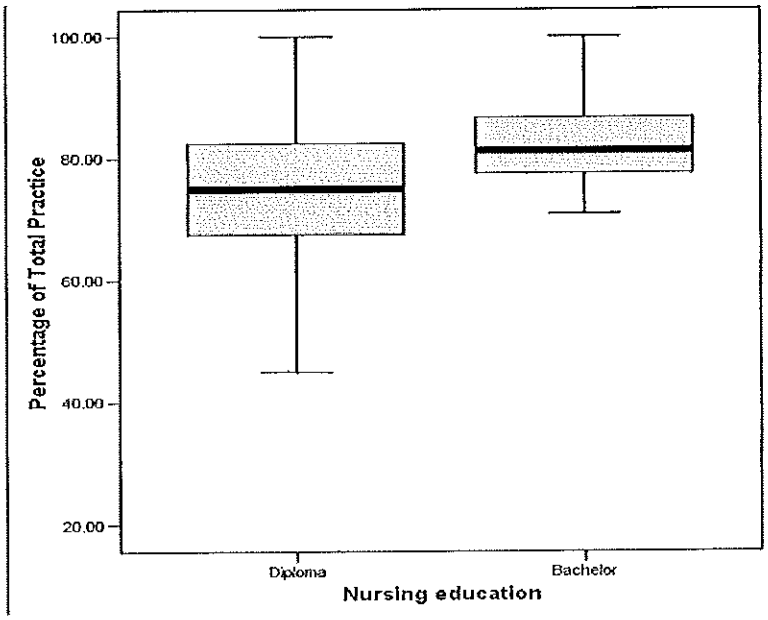
r_s = .13, p= .044

Figure 8 Scatter Plot Presentation between Working Experience and PHNs' Perceived Ability to Practice Regarding Disaster Management (Spearman Rank Correlation).



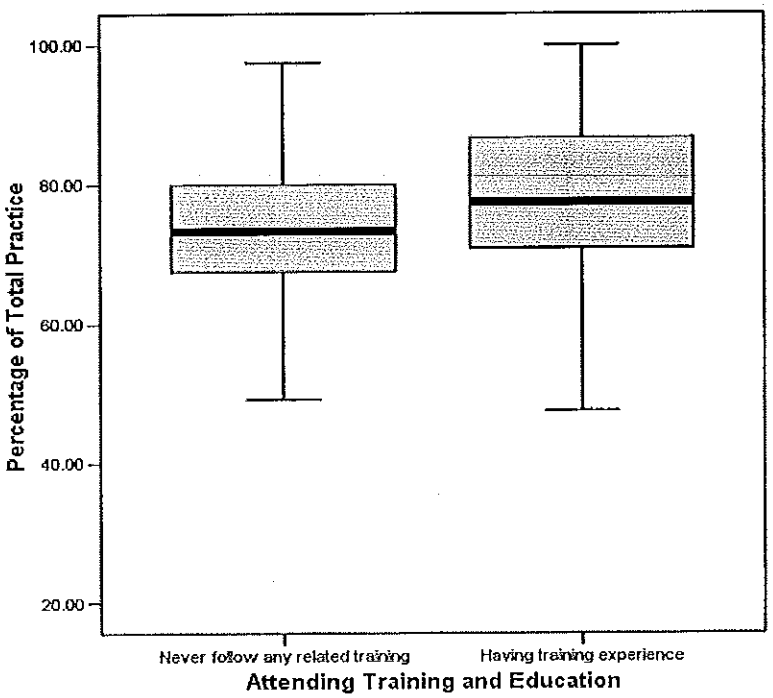
Z= -4.00, p= .000

Figure 9 Box Plot Presentation between Experience in Disaster and PHNs' Perceived Ability to Practice Regarding Disaster Management (Mann-Whitney U test).



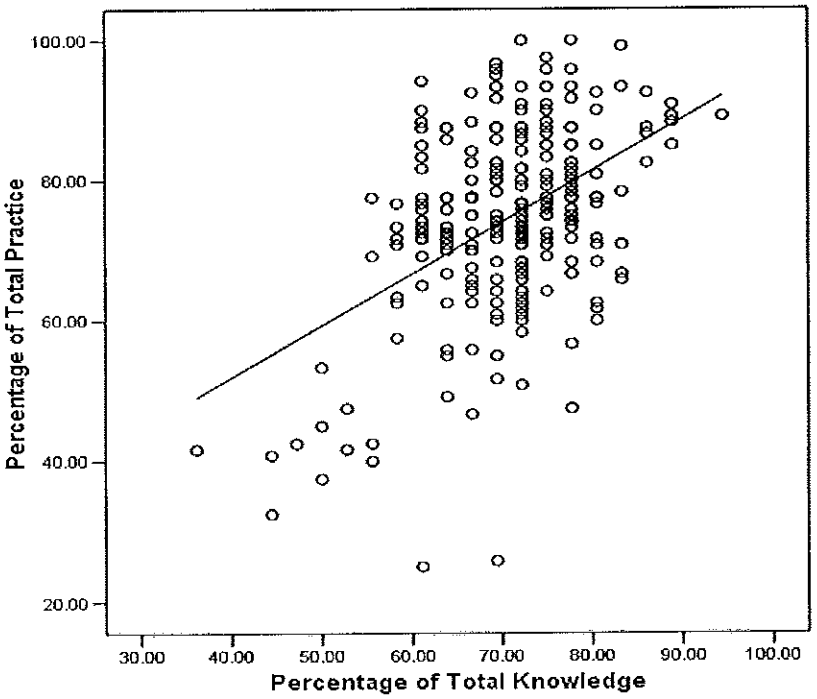
Z= -3.13, p= .002

Figure 10 Box Plot Presentation between Nursing Education and PHNs' Perceived Ability to Practice Regarding Disaster Management (Mann-Whitney U test).



Z= -4.00, p= .000

Figure 11 Box Plot Presentation between Training and Education and PHNs' Perceived Ability to Practice Regarding Disaster Management (Mann-Whitney U test).



r_s = .27, p= .000

Figure 12 Scatter Plot Presentation between PHNs' Knowledge and PHNs' Perceived Ability to Practice Regarding Disaster Management (Spearman Rank Correlation).

APPENDIX G

Types of Disaster Experience

Tsunami * Flood * Earthquake * Drought * Fire * Conflict Crosstabulation

Conflict	Fire	Drought	Earthquake			Flood		Total
						0	1	
0	0	0	0	Tsunami	0	139	32	171
					1	42	0	42
				Total		181	32	213
			1	Tsunami	0	2	0	2
					1	1	5	6
				Total		3	5	8
		1	0	Tsunami	0	5	2	7
				Total		5	2	7
	1	0	0	Tsunami	0	5	1	6
					1	10	0	0
				Total		15	1	16
		1	0	Tsunami	0	1		1
					1	1		1
				Total		2		2
			1	Tsunami	0	1		1
				Total		1		1
1	0	0	0	Tsunami	0		2	2
				Total			2	2
			1	Tsunami	0	3		3
				Total		3		3

APPENDIX H

Training Index, Frequency and Percentage of Training and Education (N=114)

No	Training	n	%
1	DM	13	11,4
2	CC	9	7,9
3	BLS	14	12,3
4	ALS	3	2,6
5	PMH	12	10,5
6	SDO	5	4,4
7	UP	3	2,6
8	DM, CC	5	4,4
9	DM, BLS	9	7,9
10	DM, ALS	4	3,5
11	DM, PMH	1	0,9
12	DM, SDO	1	0,9
13	DM, UP	1	0,9
14	DM, CC, BLS	3	2,6
15	DM, CC, ALS	1	0,9
16	DM, CC, PMH	4	3,5
17	DM, CC, SDO	1	0,9
18	DM, CC, UP	1	0,9
19	DM, CC, BLS, PMH	2	1,8
20	DM, CC, ALS, SDO	1	0,9
21	DM, BLS, ALS	2	1,8
22	DM, BLS, PMH	1	0,9
23	CC, BLS	1	0,9
24	CC, PMH	9	7,9
25	CC, SDO	4	3,5
26	CC, UP	1	0,9
27	CC, PMH, SDO	2	1,8
28	BLS, ALS	1	0,9
	Total	114	100,0

Note: DM= Disaster Management, CC= Communication & Counseling, BLS= Basic Life Support, ALS= Advance Life Support, PMH= Psychosocial & Mental Health, SDO= Surveillance & Disease Outbreak, UP= Universal Precaution

APPENDIX I

List of Experts

Three experts validated the content validity of the Demographic Data Questionnaire, Public Health Nurses' Knowledge Regarding Disaster Management Questionnaire, and Public Health Nurses' Perceived Ability to Practice Regarding Disaster Management Questionnaire, they were:

1. Assist. Prof. Dr. Urai Hattakit, RN

   Nursing Lecturer, Faculty of Nursing Prince of Songkla University

2. Assist. Prof. Dr. Umaporn Boonyasopun, RN

   Nursing Lecturer, Faculty of Nursing Prince of Songkla University

3. Dr. Hathairat Sangchan, RN

   Nursing Lecturer, Faculty of Nursing Prince of Songkla University

VITAE

Name Mr. Ardia Putra

Student ID 5210420037

Educational Attainment

Degree	Name of Institution	Year of Graduation
Bachelor of Nursing	Syiah Kuala University	2007

Scholarship Award during Enrolment

Rockefeller Foundation from the United Kingdom (UK)

Work-Position and Address

Nurse educator of School of Nursing, Faculty of Medicine, Syiah Kuala University, Banda Aceh, Indonesia. Phone +62-651-7555249

List of Publication

Putra, A., Petpichetchian, W., & Maneewat, K. (2011). Review: Public health nurses' roles and competencies in disaster management. *Nurse Media Journal of Nursing, 1*, 1-14.

Putra, A., Petpichetchian, W., & Maneewat, K. (2011). Perceived ability to practice in disaster management among public health nurses in Aceh, Indonesia. *Nurse Media Journal of Nursing, 2,* (in press).