

Knowledge and Practice among Public Health Nurses in Disaster Response Phase

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ABSTRACT

A disaster can be delineated as an occurrence that threatens and disrupts people's lives and means of subsistence caused by natural, non-natural, and human factors, resulting in loss of life, environmental damage, loss of property, and psychological consequences. As a flexible profession that covers all conditions, nurses, particularly PHNs, are expected to be limited to providing care in the community and required to work in conditions of disaster emergency response. This literature review aims to identify the knowledge and perceived ability to practice of PHNs in the disaster emergency response phase. The study is based on a systematic review approach. The source of information for the present study derived from Internet-based literature, in the form of research results from online libraries at the local, national and international levels. Totally 43 references were used to establish this review study. The knowledge and perceived ability to practice PHNs in the disaster response phase will typically be identified in six viewpoints: warning, triage of disasters, saving and stabilizing lives, surveillance, risk communication, and technical skills. Therefore, handling situations among the alert and steady states is quite atypical; hence nurses must skillfully and technically deal with these conditions.

KEYWORDS: Nurses, Public Health Nurses, Disaster Management, Disaster Nursing, Response Phase

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INTRODUCTION

Indonesia is threatened by disasters every year. Over the last decade, Indonesia, a country predisposed to disasters, has been hit by natural disasters with significant casualties, direct losses, and infrastructure damage¹. The last major earth quake, followed by a tsunami, impacted December 2004 Aceh and some parts of North Sumatra, more than 150,000 people died². In general, a disaster is specified as an occasion that disrupts the functioning of a community resulting in the need for external resources to maintain essential services³. Natural disasters often occur suddenly or unexpectedly⁴. While, man-made disasters can occur due to mistakes, negligence, or deliberate damage such as bioterrorism, explosive threats, epidemics, fires, radiation leaks, and war⁵. In brief, a disaster is a condition in which the destructive effect of a natural or human-induced event exceeds the available resources required by the society or territory⁶.

Today, Indonesia has changed its disaster management strategy. Here, PHNs will be played an important role in collaborating with other healthcare providers since they know well about the basic information regarding communities and populations which benefit them in disaster management⁷. For instance, the PHNs in the USA identified their roles

while facing a disaster that attacked in late August 2005. They could render the care along with the nightmare of collapsed infrastructure, depleted resources, disoriented and destitute evacuees, fractured social networks, environmental degradation, and personal physical exhaustion⁸.

However, several critical factors in an effective disaster management plan, such as public knowledge, health service involvement, comprehensive training, protocols, technology, and effective communication, are still far from expectations⁹. Thus, the responsibility and participation of various cross-sectors are essential, including the government, various community organizations, and the community together with health service providers, especially nurses¹⁰.

Nurses are the most significant health workers from other health care teams who need regular training to maintain the skills and competencies required during disasters to save lives and protect victims during catastrophe¹¹. However, there may be a gap between knowledge and practice because of inadequate and discontinuous preparation for disaster response. An earlier study from Hsu et al.¹² revealed that PHNs consider themselves insufficiently prepared for disasters because of limitations in their participation in several training practices as an essential element of disaster preparedness. Moreover, studies on the perception of PHNs in disaster management revealed that most of them often feel they are missing out on opportunities to attend a training course or a disaster-related education session, did not participate in

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disaster exercises to prepare for a disaster, or limited communication, planning, supplies, and equipment. It makes them unsure how to respond to a catastrophe^{5,13}.

This study will investigate the contribution of disaster management, particularly in the response phase. The study's specific objectives include exploring the existing disaster management guideline, particularly in the response phase, and describing the PHNs' knowledge and perceived ability to practice in the response phase. In the early stages, it is necessary to save many lives. During this time, nurses provide physical, psychological, and holistic care for persons, families, and communities whose priority is given to susceptible groups such as pregnant women, children, and seniors¹⁴. In addition, the nursing profession, especially PHNs, can perform medical assistance and treatment in a disaster response situation. Therefore, PHNs must have good knowledge and skills to provide disaster emergency assistance in various forms.

METHODOLOGY

The study is based on a systematic review approach.

The source of information for the present study derived from Internet-based literature, in the form of research results from online libraries locally, nationally, and internationally.

References search based on inclusion criteria were all articles originating from research articles, such as research on disaster nursing in community and clinical areas. Moreover, systematic review papers responded to the search question: whether there is already available guideline related to disaster nursing or disaster management. The exclusionary criteria were items that did not match the research question and were published in the last 20 years.

The various methods were applied using the variant line to search relevant published papers and other extensive reports from the standard nursing and health-related databases. Databases used include PubMed, CINAHL, ProQuest Medical Library, and Mendeley from 2001 to 2021. In addition, the universal web-based case entry (Google-web or G-scholar) was also used. Articles qualified or meeting the criteria were selected on a systematic basis.

One researcher conducted the literature search seven

TABLE I: SUMMARY OF THE DISASTER MANAGEMENT GUIDELINES IN THE DISASTER RESPONSE PHASE

Author, year, country	Population	The response phase of disaster management	Competencies
⁽¹⁸⁾ , 2002, Canada	All parts of the health sectors: PHC system, PHN, and communities	<p><i>Hazard assessment:</i> This component will be included understanding the risk of hazard or disaster, vulnerability population, and coping resources</p> <p><i>Risk management:</i> This component will be included risk estimation, risk evaluation, and risk control</p>	<p><i>Hazard assessment:</i></p> <ol style="list-style-type: none"> Identify the possible risk of disaster Identify the vulnerability population to disaster impacts Identify the agency and other resources in the community to cope with disaster impacts <p><i>Risk management:</i></p> <ol style="list-style-type: none"> Estimate the possible loss from the disaster Evaluate the number of disaster impacts Ensure recovery will be established after the disaster
⁽¹⁹⁾ , 2005, Sri Lanka	Health sectors	<p><i>Warning:</i> It aims to warn the community in case of disaster adequately.</p> <p><i>Emergency:</i> It aims to limit the number of disaster victims and deliver appropriate care in a chaotic situation.</p>	<p><i>Warning:</i></p> <ol style="list-style-type: none"> Provide information to the community in case of a disaster. Identification of the source, content, and disaster alert mechanism. <p><i>Emergency:</i></p> <ol style="list-style-type: none"> Conduct health services during an emergency, which includes primary health care in an emergency, control of infectious disease, immunization, public health surveillance, and primary health care and outreach Conduct initial needs assessment in displaced populations, including water/sanitation, food/nutrition, shelter/site plan, health service, and coordination between health resources.
⁽⁵⁾ , 2007, USA	Occupational and environmental health professionals' including nurse	<p><i>Event (response/relief):</i> The response phase refers to immediate actions in an emergency and during a disaster based on the type or level of disaster.</p>	<p><i>Event (response/relief):</i></p> <ol style="list-style-type: none"> Notify a disaster event to the community Perform initial response immediately during the disaster Develop chain command structure and scene assessment. Perform search and rescue for disaster victims Conduct victim extrication Perform disaster triage Provide care for stabilization of victim's condition Transport the victims who need further care
⁽²⁰⁾ , 2004, USA	Community/ PHNs (C/PHNs)	<p><i>Phase II (Disaster):</i> Roles of C/PHNs in this phase will be included a caregiver, case managers, and educators.</p>	<p><i>Phase II (Disaster):</i></p> <ol style="list-style-type: none"> Perform triage to prioritize care and provide holistic care for disaster victims as a caregiver Maintain liaison interagency and community, provide health service referrals, maintain coordination of health services, and establish a system to track patients that have been treated were included as case manager roles. Incorporate secondary levels of prevention of health problems were included as educator roles.

times, from March 1 to August 31, 2021. Some keywords were utilized to derive those articles: disaster management, disaster nursing, response phase, nursing roles, public health nurse, PHNs competencies in disaster, search and rescue, triage, first aid, and victim's evacuation. Following a systematic search, 43 references have been chosen for this study: 14 research articles, five feature articles, 12 review articles, six guidelines articles, four books, and two reports.

FINDINGS AND DISCUSSION

Disaster Management Guideline

Since the Florence Nightingale era, she had implemented the role and responsibility of caring for disaster victims¹⁵. No single entity, discipline, agency, organization, or jurisdiction can assert responsibility for the complex set of challenges associated with disasters and emergencies. However, PHN expertise must be leveraged in all stages of the disaster cycle: mitigation, preparedness, response, and recovery¹⁶.

On the other hand, nurses recognize that they are less involved in the workplace and act in vital legislation, policy systems, and regulations that can strengthen and support practice in any circumstance¹⁷. Therefore, their contribution to the national action plan to improve their knowledge and practices concerning disaster management is limited. Some have introduced Disaster Management Guidelines, and many organizations and experts have developed a Nursing Disaster Management Model for Comprehensive Disaster Management; these are included the Manitoba Health¹⁸, WHO¹⁹, Rogers and Lawhorn⁵, and a framework from Jennings-Sanders²⁰. These resources are valuable for healthcare providers, particularly nurses, to guide and bring up their actions in disaster events²¹. Details for each guidance presented in **Table I**.

PHNs' Knowledge and Perceived ability to Practice in Emergency Response Phase

The Essential Skills of the Disaster Management Guidelines outlined in Table I will be used to ascertain the knowledge and perceived ability to practice PHNs in this study. Although disaster management capabilities have not been fully described, critical expertise and perceived ability to implement successful disaster management have been demonstrated in every disaster phase process. Moreover, further evidence from Martono M 2019¹⁰, Sultan MA 2018¹¹, Magnaye B 2011¹⁶, Polivka BJ et al.⁷, Vogt V 2008⁴, and Kuntz SW 2008²¹, and many others have been utilized to support specific disaster management skills for PHNs, including the contribution of PHNs during the disaster response phase.

Response refers to the implementation phase of an emergency plan²². The first step in this phase is to issue a proper warning to the community about a disaster^{5,19}. Nevertheless, the primary focus during

this phase is on saving a life, first-aids, and emergency treatment²³. Afterwards, PHNs should develop a disaster triage strategy to track victims and prioritize appropriate care^{5,20}. Once completed, they are expected to continue providing life-saving and life-sustaining care to those affected¹⁹. To achieve this, PHNs need adequate technical skills⁷.

Furthermore, PHNs must calculate and assess the magnitude of the impact of a disaster using the surveillance method¹⁸⁻¹⁹. Finally, to maintain collaboration and coordination between health care services and inform the community of disaster risks, PHNs should familiarize themselves with the communications equipment. The chain command structure and coordination between health care resources can be sustained^{5,20}. The disaster response phase detailed the knowledge and perceived ability to practice for PHNs.

1- Early warning

PHNs need to be concerned about the response phase's warning, pre-impact, mobilization, and evacuation priority. Here, it is crucial to assess the preparedness of PHNs for future disasters. Catastrophe, particularly natural disasters, is mainly generated unintentionally and without specific warning⁴. As the first-line responder, PHNs must prepare to gain the knowledge and skills to care for disaster survivors and prepare for future disasters²⁴.

The first action to be concerned with is sending a proper warning to the commonwealth of the catastrophes^{5,19}. According to Vogt V 2008⁴, more precise information on sources and systems used, such as the responsible person sending the warning information to the community, including regular training is needed. An adequate warning also will be informed to a community to prepare appropriately. The contributing warning factors such as source, content, mechanism, individual perception, and belief can influence people to evacuate if a disaster occurs⁴. So, transparent information and knowledge on resources²³ and gradually skill development⁴ and continuous support to affected person and communities are required¹⁵.

Moreover, PHNs also think creatively and generate manual or technological equipment for early detection and send notifications²⁵. A specific plan, including the designation of a well-trained spokesperson, is also needed to develop for each community area compatible with local or communications planning²⁶. For example, the warning and announcement can be made from a mosque or other religious services in the Islamic community. In summary, adequate notice will allow the community to evacuate themselves and decrease the morbidity and mortality rate from disaster occurrences.

2- Disaster triage

The nurse's domains of role as early responding in the disaster include preventing the damage to the

patients, triage, first aid, resuscitation, mobilization, and evacuation¹¹. Disaster triage was used to prioritize patient care needs during the day, mainly when resources (typical beds) are limited²⁷. In a disaster situation, triage refers to a system used where available resources are inadequate to meet the needs of all victims. Therefore, the accurate disaster triage system is the most critical initial medical function during a mass casualty. Here, ethical considerations such as "do as little as possible, for as many as possible, as quickly as possible" must be highly concerned with triage used²⁷.

PHNs and other healthcare providers must first do primary or pre-hospital triage to classify the victims at the disaster scene. The plan should also cover the number of all victims²⁸. According to triage competency, PHNs need to identify their capabilities in a disaster event to assure that all population and survivor needs will be covered⁷, because during the response phase, nurses need to accomplish a primary triage that will be occurred during the period of the victims' initial assessment at the disaster site²⁷.

Lerner EB et al.²⁸ have identified at least nine mass casualty triage systems: START, Jump START, Homebush, Triage Sieve, PTT, CareFlite, STM, Military Triage, and CESIRA, including two pediatric-specific systems. The most common primary triage type system used in a disaster situation is the START triage²⁷⁻²⁸.

As the requirement of PHNs during the disaster event, knowledge about disaster triage is required to deliver appropriate care for injured victims before they are transferred to get further treatment in the hospital²⁹. Limited expertise in this competency might occur because the subjects in this study may refer to the concept of daily triage, which is regularly performed in hospitals, especially in the ED²⁷. In addition, a study led by Mitani S 2003²⁹ found that about a third of nurses did not seem aware of the principles of disaster triage and that about 39.8% of nurses did not understand the techniques.

A study conducted by Kahn CA 2009³⁰ compares the triage codes assigned to 132 patients with their results showing that 48.5% of patients were sorted correctly, 49.2% were over-sorted, and 2.3% were under-sorted. The result reflected the discrepancy between the sorting levels assigned by START during a train crash and the a priori outcome criteria for each group³¹. The START triage system can ensure suitable levels of sub-triage (100% red sensitivity and 89% green specificity) but incorporates a significant number of over-triage. START is also helpful for prioritizing the transportation of the most critical patients to local hospitals³⁰.

In short, effective disaster response requires knowledge, skills, and regular rehearsals³². In this case, PHNs must be educated and enabled to remain in their population-based specialty to screen and

assign treatment priorities to the survivor³³. Thus, survivor-focused care during the disaster can be delivered with the appropriate care for many victims.

3- Life-saving and stabilization

Providing life-saving and support to disaster-affected individuals and communities will be the following significant action¹⁵. Here, PHNs must engage in life-saving and stabilization of victims through rescue efforts, first aid, and emergency treatment²³. Therefore, performing these activities requires appropriate knowledge and skills to deliver essential care in emergency response¹⁵.

Immediately responding and helping manage the victims' health problems is necessary to minimize the life-threatening and the arrangement for advanced care needs. INCMCE has described several knowledge and skills to establish care for disaster victims, including basic first aid skills and primary assessments from head to toe. The detailed evaluation includes integument (e.g., wound, burn, and rash), airway, respiratory, cardiovascular (e.g., vital signs recording and signs of shock monitoring), pain; gastrointestinal, including sample collection; baseline neurological assessment; and musculoskeletal assessment²³.

From this, PHNs should establish regular first aid training to competent their life-saving skills such as external haemorrhage management, airway fixation, fracture coupling, and proper techniques to treat injuries²⁶. Knowledge and skills on BLS and ALS are also vital for first-line responders³⁴⁻³⁵.

4- Surveillance

In mass casualty incident management, a regular surveillance system is necessary to obtain data regarding injury, morbidity, mortality rate, and disease and illness²⁶. According to Rothman KJ 2008³⁶, surveillance refers to collecting, managing, analysing, interpreting, and disseminating or reporting data regarding health problems that will be used to generate prevention programs. It is also used to determine changes in the nature or extent of health problems and whether public health interventions are effective³⁷. Furthermore, surveillance provides information based on baseline epidemiological parameters (time, location, and people). It includes descriptive information on the time and site of health problems and the people affected³⁶.

As a member of the PHS and the role to identify and interview those at risk of disaster, PHNs should actively participate in epidemiological and surveillance projects and participate in disease outbreak investigations³⁸. It has become clear that PHNs are critical to meeting surge capacity needs, whether those needs are in the area of surveillance, in shelter facilities, or massive drug distribution and vaccination centers^{16,38}.

As a relevant contributing factor in the event of a disaster, the ASTDN points out that PHNs need to be

competent in epidemiological surveillance and infectious disease investigations¹⁵. Indeed, surveillance helps obtain important disaster data to employ appropriate health care personnel and equipment²³. Rogers and Lawhorn's research⁵ also indicates that 48% of respondents indicated monitoring health during a hurricane disaster.

Other research by Akins RB 2005³⁹ regarding the ability of PHNs to participate in disease surveillance found that nurses with minimal clinical skills can enhance their skills while working in the community. Community service signings will improve their clinical expertise in PHN. After that, PHNs will be better prepared to handle disasters³⁹.

In short, PHNs should be actively involved in the epidemiological and surveillance functions of the PHC and participate in post-disaster outbreak investigations³⁸ because nurses are considered to have the ability to identify and interview people with potential disaster exposure by performing several activities, including contact tracing and leading investigations, involving surveillance and notification, compiling the specimens, handling immunizations and enlightening the society, and continuing to be critical players in the local and national level emergency response¹⁶.

5- Risk communication

To deliver adequate healthcare service, every PHNs should know the lines of command and communication when responding to an emergency¹⁵. Nurses must pay attention to the communication chain, identify the capabilities of their partners in operating programs, document, ensure access to medical equipment storage facilities, provide information to victims⁴⁰, and be prepared to use other communication tools⁴⁰.

While they can assist in many ways, they are more likely to be assigned to 'operations' because they bring leadership aptitude, a broad understanding of public systems, and nursing competencies. They are also considered to know how to design an organizational structure more likely to relate to the organization's command structure in an emergency⁴¹.

As mentioned previously, collaboration and communication within and between the agencies are essential throughout the emergency response²⁵. To determine successful collaboration and inform the community about the risk of disaster, PHNs need to be well-known and develop skills in functioning all disaster communication devices in their authority, according to local emergency disaster plan (e.g., facsimile, handy talkie, BB devices, email, portable computer, satellite phones, and handphones)⁴¹.

Before disasters occur, each organization or authority should inform their specific roles and obligations during a disaster. This information must disseminate to the staff in both internal and external agencies since all disaster responders need to know

their and others' communication roles to conduct effective communication and coordination. Lack of staff knowledge and skill in utilizing the communicating plans and device types will lead to inadequacy in performing the plan and failure in communication and coordination if a disaster occurs²⁵. Here, detail of the roles and responsibilities of each organization must be captured in the Disaster Response Plan and need to evaluate both the plan and one own competency at least once a year by the staff¹⁵.

6- Technical skills

The essential technical skills in responding to disaster events include administering medicines and vaccines to mass distribution centres, investigating cases, and using PPE⁷. Since disasters are unforeseeable and not a routine occurrence, it is maybe impossible to pre-specify the type of injuries that might be happening, the numbers of victims, and the type of disaster occasion. Thus, nurses can prepare and develop their competence in responding to disaster events based on a standardized plan or evidence-based knowledge²⁵. The pre-requisite knowledge and skills needed during a disaster include administering medication⁴¹, including vaccination or immunization, and infectious diseases prevention due to disease outbreaks prevention from natural disasters⁴². An adequate medication stockpile related to vaccination used in an emergency (e.g., measles, Hep A, and tetanus) is also needed to supply¹⁹.

Moreover, PHNs should recognize the utilization of vaccination/immunization for disaster victims. For example, one case of measles is sufficient to support measles control activity, including measles immunization⁴³. Hep A vaccine is not recommended to prevent an outbreak in the affected area. Preventing Hepatitis A outbreaks in small communities is practical when vaccination begins early during the outbreak⁴². The comprehensive tetanus vaccine program is not indicated and is only suggested for people with large open wounds or other injuries. This vaccination should be conducted concurrently with other preventative measures⁴³.

Furthermore, the disease outbreaks following the natural disaster must prioritize concern for PHNs to prevent an epidemic. Public health should ensure that the displaced people's shelters have proper sanitation and personal hygiene, clean water and appropriate nutrition, vaccinations, vector control, and health education⁴³. They should conduct cases investigation by identifying many aspects, including a) endemic and epidemic diseases commonly found in the affected area; b) the living conditions of the affected population, including the number, size, location, and density of the facilities; c) access to clean water and adequate sanitation facilities; d) the underlying nutritional state and vaccine coverage within the population; and e) the level of access to health care

services and effective case management⁴². With adequate information from the investigation, it would be helped PHNs to develop an appropriate plan to prevent the diseases and illnesses from spreading.

To enlighten, PHNs also considered having knowledge and skill in using standard equipment daily. However, PHNs may need to use equipment not part of daily emergency practices. Recognizing the settings to which PHNs may likely be shipped off allows them to determine in advance how such things should be used. PHNs may need to be aware of not only the standard PPE used in an organization's infection control plan (e.g., gloves, gowns, and respirators) but also with advanced stuff and procedures used in crises (e.g., donning and doffing full-body suits, setting up, and using decontamination device)^{25,41}. This knowledge and practice will help protect PHNs from disease contamination when delivering healthcare services to disaster victims.

CONCLUSION

The increasing incidence of disasters worldwide makes every country ready to face the unexpected, including natural disasters. Therefore, proper disaster management in all phases of disaster is crucial to establish. Although multiple disciplines are required to support disaster management, nurses, particularly PHNs, are viewed as one of the health professions that must be trained to deal with natural disasters. Consequently, there is an urgent need to increase awareness among nurses working in high-risk areas in a disaster. In addition, nurses must prepare with essential knowledge and skills to respond to disasters. While PHC and health decision-makers are responsible for developing appropriate training and education in a disaster such as BLS, ALS, disaster triage, risk communication, and technical skills for all PHNs and other health providers as first responders in disaster, then, coordination between the Health Division and other agencies is necessary to develop routine disaster drills across health care providers and communities to improve self-knowledge and preparedness in the event of a disaster.

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AUTHOR CONTRIBUTIONS

Putra A: Manuscript writing and data collection
Kamil H: Writing and editing supervision
Yuswardi Y: Reference writing and editing
Satria B: Data collection and grammar correction

ABBREVIATION

ASTDN: Association of State and Territorial Directors of Nursing

ALS: Advanced Life Support

BLS: Basic Life Support

ED: Emergency Department

INCME: International Nursing Coalition for Mass Casualty Education

PHC: Public Health Center

PHNs: Public Health Nurses

PHN: Public Health Nursing

PPE: Personal Protective Equipment

PTT: Pediatric Triage Tape

START: Simple Triage and Rapid Treatment

STM: Sacco Triage Method

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